Application for a Comprehensive Permit

Submitted to Winchester Zoning Board of Appeals

July 2015

Winchester North

416 Cambridge Street

Winchester, MA.

Winchester North

Winchester, Massachusetts

Comprehensive Permit Application
Under M.G.L. Chapter 40B, Sections 20-23

Submitted by:

FX Winchester, LLC

July, 2015

Town of Winchester Massachusetts
ZONING BOARD OF APPEALS

Premises affected: A 130,148 square foot parcel of land, at 416 Cambridge Street

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APPLICATION FOR A COMPREHENSIVE PERMIT
UNDER GENERAL LAW CHAPTER 40B, SECTIONS 20-23

FX Winchester, LLC (hereinafter the "Applicant") hereby applies to the Board of Appeals of the Town of Winchester, Massachusetts, pursuant to General Laws, Chapter 40B, Section 20 through 23, as amended, for the issuance of a Comprehensive Permit authorizing the applicant to construct 95 apartment style units and to renovate one existing single family resident for purposes of sale on land located at 416 Cambridge Street in Winchester, Massachusetts. The applicant and the development are more particularly described in the exhibits hereto annexed and submitted simultaneously herewith, all of which are incorporated herein by reference and constitute the documents required to be submitted under the regulations for filing a 40B application by the Massachusetts Department of Housing and Community Development (760 CMR 56.00).

REQUEST FOR FINDINGS OF FACT

The applicant requests that the Board of Appeals make the following findings of fact in connection with the action of the Board on this application:

1. FX Winchester LLC, a limited dividend organization within the meaning of General Laws, Chapter 40B and 760 CMR 56.02, and is eligible to receive a subsidy under a state or federal affordable housing program after a Comprehensive Permit has been granted.

2. The applicant has shown evidence of its site control to qualify it as a recipient of a Comprehensive Permit for this site.

3. Masshousing, as the Program Administrator of the New England Fund (NEF) Program, will be the subsidizing agency within the meaning of the regulations of 40B (760 CMR 56.00) and within the meaning of the procedural regulations of the Housing Appeals Committee (760 CMR:30.01(C)).

4. The number of low or moderate income housing units in the Town of Winchester constitutes less then ten percent (10%) as reported in the latest decennial census of the town and reported by the Department of Housing & Community Development as of Dec 5, 2014.

5. The development as proposed in the application is consistent with local needs within the meaning of General Laws, Chapter 40B, Section 20.

The applicant respectfully requests the Board of Appeals after complying with the procedural requirements as provided by law, to issue to the applicant a Comprehensive Permit for the development.

FX Winchester, LLC

By: Geoffrey Engler

Geoffrey Engler
Member

PROJECT DATA SUMMARY

1. Applicant

FX Winchester, LLC (the "Applicant") has been organized under the General Laws of the State of Massachusetts and is qualified to undertake the planning and development of the proposed apartment community in Winchester, MA. The Applicant will develop 95 apartment style units and renovate one existing single family home on a limited dividend basis as required under all laws and regulations of the Commonwealth of Massachusetts. The firm SEB LLC, whose principals are the members of the development team have extensive experience on a number of mixed-income housing development over the past 35 years. FX Investments is also a joint venture partner in this development. The Applicant respectfully requests that all notices from the Board in connection with this Application be sent to Geoffrey Engler at SEB LLC, 165 Chestnut Hill Ave #2, Brighton, MA 02135 or electronically to gengler@s-e-b.com.

2. Description of the Development

The proposed 95 unit building will serve a significant housing need/demand in the Town of Winchester as no rental housing of any significant size or scale has been developed in Winchester. This is an extremely underserved market in Winchester as seniors, young professionals, empty-nesters, people with mobility impairments all have very limited housing options in Winchester and surrounding suburbs. We are confident that the proposed development will be appealing to a large underserved community.

The proposed building has a horizontal massing that runs in a faceted manner along the main site plateau. This plateau, which is the main building vehicular and pedestrian entry level, is situated about 28 feet above the foot of Wainwright Street and approximately 90 feet below the highpoint of the adjacent condominium. The design features a 2 story pass through to the rear entry and to surface parking that is generally hidden from view. The west wing has 2 levels of garage space with three levels of residences above the garage. The garage is substantially below grade as viewed from the west. The east wing has 1 level of garage space with 4 levels of residences above.

Due to the unique location of this building with some neighboring residences looking down on the property it is our goal to create recesses in the north facing sloped roofs to shield any mechanical equipment from view.

The faceted shape essentially creates 3 distinct facades, a face toward lower Wainwright Street that is a landscaped slope and berm with 4 stories of residences, a middle face, the focus of which is the landscaped sitting areas, the main entry and the arched pass through. The final face is predominately the three levels of residences of the west wing. In order to emphasis the horizontal nature of the building there are three layers of materials. As the building meets the ground, a stone veneer will be incorporated at the garage level as a naturally occurring material in this area of Winchester. We are proposing stucco as the second layer to complement the stonework and to be capped by a belt course to again introduce a pedestrian scale feature to the façade. The remaining levels will likely have wood or hardiplank siding for its texture and residential character.

The individual units will have 2 elevator cores connecting the entry level, the garage levels and the residential corridors. The amenities will include several landscaped sitting areas with trellis, a fitness center, lounge areas and a library meeting room.

The proposed location is convenient to a heavily traveled thoroughfare in Route 3A (Cambridge Street) and is approximately 700ft from a shopping plaza on the Winchester/Woburn Town line which includes a Whole Foods, Toys-R-Us and many other retail offerings.

We are proposing 24 units (25%) to serve households earning up to 80% AMI in order to assure that households priced out of the Winchester housing market will be given a great opportunity to live in a beautiful new Winchester residence.

3. Qualification as a 40B Development

The development qualifies as assisted "low or moderate income housing" within the meaning of Massachusetts General Laws Chapter 40B, section 20 and will provide 24 units (25%) which will serve households earning at or below 80% of area median income and thus will meet the definition of low and moderate income under the statute. The Applicant desires to develop this project pursuant to the guidelines of the Masshousing New England Fund Program administered by Masshousing under which a site approval letter has been granted.

Preliminary architectural drawings and engineering plans are attached hereto in reduced form and under separate cover as full size drawings.

4. Local Need

According to figures complied by the Massachusetts Department of Communities and Development (DHCD), in December 2014, Winchester's subsidized housing inventory represented 1.9% of its total housing stock, which is below the threshold requirements established under Chapter 40B of M.G.L.

5. Exceptions and Approvals Requested

The subject property is zoned "RDA-20". Certain elements of the proposed development do not comply with the current underlying zoning. Consequently, an exception of use is required to enable multi-family residential at the proposed density to be constructed. Other exceptions to the Town of Winchester's Zoning Bylaws and other local land use regulations are specifically detailed in this application. If any specific exceptions have not been listed in this application, the applicant, upon notification of such an oversight, shall promptly amend the list of exceptions included herein.

CONCLUSION

For all of the foregoing reasons, and for the additional reasons the Applicant will present at the scheduled public hearing on this Application, the Applicant respectfully requests the Board, after complying with the procedural requirements as provided by law, issue to the Applicant a Comprehensive Permit for the Development.

APPLICANT STATUS

The applicant, FX Winchester, LLC is a Massachusetts limited liability company which is a Limited Dividend Organization within the meaning of 760 CMR 56.02 and an eligible applicant under 760 CMR 56.04. Pursuant to the New England Fund Program administered by MassHousing as the subsidizing agency, the applicant intends to enter into a Regulatory Agreement providing for (i) affordability of the proposed affordable units and (ii) limitation on the applicant's return on investment substantially in form attached.

MASSHOUSING

Massachusetts Housing Finance Agency
One Beacon Street, Boston, MA 02108

TEL: 617.854.1000 | FAX: 617.854.1091
VP: 866.758.1435 | www.masshousing.com

July 2, 2015

Geoffrey Engler
FX Winchester LLC
c/o SEB, LLC
165 Chestnut Hill Avenue, Unit #2
Brighton, MA 02135

Re: Winchester North, MassHousing ID # 766
Project Eligibility/Site Approval

Dear Mr. Engler:

This letter is in response to your application as "Applicant" for a determination of Project Eligibility (Site Approval) pursuant to Massachusetts General Laws Chapter 40B ("Chapter 40B"), 760 CMR 56.00 (the "Regulations") and the Comprehensive Permit Guidelines issued by the Department of Housing and Community Development ("DHCD") (the "Guidelines" and, collectively with Chapter 40B and the Regulations, the "Comprehensive Permit Rules"), under the New England Fund ("NEF") Program ("the Program") of the Federal Home Loan Bank of Boston ("FHLBB").

Winchester FX LLC has submitted an application with MassHousing pursuant to Chapter 40B. You have proposed to build 96 units of housing, including 95 rental apartments in a single building while retaining an existing single family home (the "Project") on a 2.99 acres property located at 416 Cambridge Street (the "Site") in Winchester (the Municipality). Approximately .3 acres of the Site is located in Woburn.

In accordance with the Comprehensive Permit Rules, this letter is intended to be a written determination of Project Eligibility ("Site Approval") by MassHousing acting as Subsidizing Agency under the Guidelines, including Part V thereof, "Housing Programs In Which Funding Is Provided By Other Than A State Agency."

MassHousing has performed an on-site inspection of the Site, which local boards and officials were invited to attend, and has reviewed the pertinent information submitted by the Applicant, the Municipality and others in accordance with the Comprehensive Permit Rules.

Charles D. Baker, *Governor* | Ronald A. Homer, *Chairman* | Thomas R. Gleason, *Executive Director*
Karyn E. Polito, *Lt. Governor* | Michael J. Dirrane, *Vice Chair*

Municipal Review and Comments

The Municipality was given a 30-day period in which to review the Site Approval application and submit comments and recommendations to MassHousing. At the request of the Town Manager, this period was extended by 21 days to 51 days. Attorney Mark Bobrowski, acting on behalf of the Town of Winchester, submitted a letter (received by MassHousing on June 19, 2015) summarizing comments from municipal officials and staff, and identifying specific concerns with the proposed Project.

In summary, Municipal comments described numerous technical, aesthetic and programmatic concerns with the Project, and identified additional information and mitigation that the Developer should provide should a Project Eligibility Letter (PEL) be issued.

- The Municipality expressed concern with the size and appearance of the proposed 95-unit apartment building, noting that its proposed architectural style, mass and height were incompatible with surrounding development patterns. They noted further that the number of units per acre proposed for the Site (33.4 units per acre) far exceeds density levels anywhere else in Winchester.

- The Municipality expressed concern that the project would exacerbate existing risks to pedestrian safety due to the lack of sidewalks along Wainwright Road and nearby portions of Cambridge Street. They noted further that Cambridge Street in this area was a divided highway with a guard rail and pronounced grade difference between the northbound and southbound lanes, making it extremely dangerous for those attempting to cross the street. They stated that should the Project move forward, the Applicant would be required to install new sidewalks in this area.

- The Municipality expressed concern that additional automobile traffic generated by the Project would result in increased congestion on area roadways (many of which are one-way) and pose heightened risks to drivers and pedestrians. They expressed particular concern about potential queuing on Wainwright Road for vehicles attempting to exit out onto Cambridge Street. They requested that the Applicant provide a Traffic Study to allow them to fully assess Project traffic and safety impacts, and identify appropriate mitigation.

- The Municipality expressed concern about the adequacy of the existing water and sewer systems to serve the proposed development, and requested that should the project move forward, the Applicant provide further study and mitigation as needed.

- The Winchester Fire Department noted that they would enforce requirements relative to emergency access and fire safety, including the provision of fire lanes around the building and necessary internal fire suppression systems.

- The Municipality expressed concern about potential drainage and stormwater management impacts on abutting properties and, in particular, on the hydrology and water quality of nearby Winter Pond.

- The Municipality expressed concern about the Project's visual and noise impacts on abutting properties, and noted that the Applicant would be required to provide mitigation as needed.

- The Municipality expressed concern about the quantity of blasting that would be required to construct the project, and the associated impacts on nearby properties, and requested that appropriate mitigation be provided.

The City of Woburn, in which approximately .3 acres of the northern side of the Site is located, was also notified and provided with a complete copy of the application but chose not to submit comments to MassHousing.

Community Response
In addition to the comments provided on behalf of Winchester Town Officials, MassHousing received and reviewed nine additional comment letters, including six from area residents, and one each from the Winchester Multicultural Network, the Winchester Housing Partnership Board, and the Winchester Disability Access Commission.

- Letters from area residents expressed general opposition to the Project due to its potential impacts on abutter safety and quality of life, noting increased traffic, visual impacts, and potential reductions in property value. One of the letters cited these same concerns, but also conceded Winchester's critical need for affordable, accessible housing, and concluded by expressing support for the project.

- The Winchester Multicultural Network expressed support for the Project, stating that it was consistent with the Town's 2009 Human Rights Statement.

- The Winchester Housing Partnership expressed support for the Project, stating that it was consistent with the Town's master plan relative to housing needs, and expressing a favorable opinion of the Project's design and location relative to services and access to public transportation.

- The Winchester Disability Access Commission expressed support for the project, noting that it addresses Winchester's pressing need for both affordable and accessible housing.

MassHousing Determination
MassHousing staff has determined that the Project appears generally eligible under the requirements of the Program, subject to final review of eligibility and to Final Approval. As a result of our review, we have made the findings as required pursuant to 760 CMR 56.04(1) and (4). Each such finding, with supporting reasoning, is set forth in further detail on Attachment 1 hereto. It is important to note that Comprehensive Permit Rules limit MassHousing to these

specific findings in order to determine Project Eligibility. If, as here, MassHousing issues a determination of Project Eligibility, the Developer may apply to the Zoning Board of Appeals of the Municipality for a comprehensive permit. At that time local boards, officials and members of the public are provided the opportunity to further review the Project to ensure compliance with applicable state and local standards and regulations.

Based on MassHousing's site and design review, and in light of feedback received from the Municipality and abutters, the following issues should be addressed in your application to the Winchester Zoning Board of Appeals, and you should be prepared to explore them more fully in the public hearing process:

1. Development of this Site will require compliance with all state and federal environmental laws, regulations and standards applicable to existing conditions and to the proposed use related to building construction, stormwater management, wastewater collection and treatment, and hazardous waste safety. The Applicant should expect that the Municipality will require evidence of such compliance prior to the issuance of a building permit for the Project.

2. The Applicant should be prepared to address Municipal and abutter concerns relative to pedestrian access in and out of the Site, and, in particular, the lack of sidewalks on Wainwright and Cambridge Streets, and to respond to reasonable requests for mitigation.

3. The Applicant should be prepared to address Municipal and abutter concerns relative to the size, scale and architectural style of the proposed multi-family building and its impact on the character of the surrounding neighborhood, and to fully describe proposed measures to address and mitigate these concerns.

4. The Applicant should be prepared to provide sufficient data to assess potential traffic impacts on area roadways and intersections, including the safety of proposed site access and egress, and to respond to reasonable requests for mitigation.

5. The Applicant should be prepared to provide detailed information relative to proposed water and sewer use and potential impacts on existing capacity, and to provide required mitigation.

6. In response to Municipal and abutter concerns relative to potentially negative visual and noise impacts, the Applicant should provide specific information about proposed mitigation measures including the preservation of existing vegetation and the introduction of new landscaping and structural and vegetative screening.

7. The Applicant should be prepared to verify that the site plan is fully compliant with public safety standards relative to emergency access and provisions for fire suppression.

8. The Applicant should provide a detailed stormwater management plan to be reviewed by the Municipality to ensure proper drainage on the Site and the protection of abutting properties.

9. MassHousing's Design and Technical staff ("D&T") recommends that, in light of the number of two and three bedroom units, the site plan should include dedicated play space for young children. D&T also recommended that the Applicant provide information relative to snow storage, mail delivery, and trash pick-up.

This Site Approval is expressly limited to the development of no more than 95 rental units and a single family home under the terms of the Program, of which not less than 24 of such units shall be restricted as affordable for low or moderate income persons or families as required under the terms of the Guidelines. It is not a commitment or guarantee of NEF financing and does not constitute a site plan or building design approval. Should you consider, prior to obtaining a comprehensive permit, the use of any other housing subsidy program, the construction of additional units, a reduction in the size of the Site, a change in tenure type or a substantial change to the overall Site Plan, you may be required to submit a new site approval application for review by MassHousing.

For guidance on the comprehensive permit review process, you are advised to consult the Guidelines. Further, we urge you to review carefully with legal counsel the M.G.L. c.40B Comprehensive Permit Regulations at 760 CMR 56.00.

This approval will be effective for a period of two years from the date of this letter. Should the Applicant not apply for a comprehensive permit within this period this letter shall be considered to be expired and no longer in effect unless MassHousing extends the effective period of this letter in writing. In addition, the Applicant is required to notify MassHousing of the following: (1) the Applicant applies to the local ZBA for a Comprehensive Permit, (2) the ZBA issues a decision and (3) any appeals are filed.

Should a comprehensive permit be issued, please note that prior to (i) commencement of construction of the Project or (ii) issuance of a building permit, the Applicant is required to submit to MassHousing a request for Final Approval of the Project (as it may have been amended) in accordance with the Comprehensive Permit Rules (see especially 760 CMR 56.04(07) and the Guidelines including, without limitation, Part III thereof concerning Affirmative Fair Housing Marketing and Resident Selection). Final Approval will not be issued unless MassHousing is able to make the same findings at the time of issuing Final Approval as required at Site Approval.

Please note that MassHousing may not issue Final Approval if the Comprehensive Permit contains any conditions that are inconsistent with the regulatory requirements of the New England Fund Program of the FHLBB, for which MassHousing serves as Subsidizing Agency, as reflected in the applicable regulatory documents. In the interest of providing for an efficient review process and in order to avoid the potential lapse of certain appeal rights, the Applicant may wish to submit a "final draft" of the Comprehensive Permit to MassHousing for review. Applicants who avail themselves of this opportunity may avoid significant procedural delays that can result from the need to seek modification of the Comprehensive Permit after its initial issuance.

If you have any questions concerning this letter, please contact Katy Lacy at (617) 854-1098.

Sincerely,

Thomas R. Gleason
Executive Director

cc: Ms. Chrystal Kornegay, Undersecretary, DHCD
James A. Johnson, Chair, Board of Selectmen
Lawrence Beals, Chair, Zoning Board of Appeals

Attachment 1

760 CMR 56.04 Project Eligibility: Other Responsibilities of Subsidizing Agency Section (4) Findings and Determinations

Winchester North, Winchester, MA # 766

MassHousing hereby makes the following findings, based upon its review of the application, and taking into account information received during the site visit and from written comments:

(a) That the proposed Project appears generally eligible under the requirements of the housing subsidy program, subject to final approval under 760 CMR 56.04(7);

The Project is eligible under the NEF housing subsidy program and at least 25% of the units will be available to households earning at or below 80% of the Area Median Income (AMI), adjusted for household size, as published by the U.S. Department of Housing and Urban Development ("HUD"). The most recent HUD income limits indicate that 80% of the current median income for a four-person household in Winchester is $69,700.

Proposed rent levels of $1,094 for a studio, $1172 for a one-bedroom, $1,373 for a two-bedroom, and $1,573 for a three bedroom unit plus proposed utilities (to be paid by the tenant) as shown on the table below accurately reflect current gross affordable rent levels for the Boston-Cambridge-Quincy HMFA under the NEF Program as follows:

	Project Rent	**Project Utilities**	**Gross Tenant Costs**	**HUD Affordable Rent**
Studio	$1094	$126	$1220	$1220
One Bedroom	$1172	$135	$1307	$1307
Two Bedroom	$1373	$195	$1568	$1568
Three Bedroom	$1573	$239	$1812	$1812

A letter of interest to provide financing under the NEF Program was provided by Salem Five, a member bank of the Federal Home Loan Bank of Boston.

(b) that the site of the proposed Project is generally appropriate for residential development, taking into consideration information provided by the Municipality or other parties regarding municipal actions previously taken to meet affordable housing needs, such as inclusionary zoning, multifamily districts adopted under c.40A, and overlay districts adopted under c.40R, (such finding, with supporting reasoning, to be set forth in reasonable detail);

Based on a site inspection by MassHousing staff, internal discussions, and a thorough review of the application, MassHousing finds that the Site is suitable for residential use and development

and that such use would be compatible with surrounding uses, and would directly address local need for affordable housing.

The Town of Winchester does not have a DHCD Certified Housing Production Plan. According to DHCD's Chapter 40B Subsidized Housing Inventory (SHI), updated through December, 2014, Winchester has 152 Subsidized Housing Inventory (SHI) units (1.9 % of its housing inventory). An additional 640 units would be required for the Town to achieve the 10% threshold of 792.

The need for additional affordable housing is further supported by U.S. Census data from the 2008-1012 American Community Survey, which indicates that 9.5% (720) households in the Town of Winchester earn less than 30% of the 2015 AMI ($98,500), approximately 17.1% (1,293) earn less than 50% AMI, and 21.4% (1,615) earn less than 60% of AMI.

(c) that the conceptual project design is generally appropriate for the site on which it is located, taking into consideration factors that may include proposed use, conceptual site plan and building massing, topography, environmental resources, and integration into existing development patterns (such finding, with supporting reasoning, to be set forth in reasonable detail);

Relationship to Adjacent Building Typology (including building massing, site arrangement, and architectural details):

The Project is located in an area characterized by a mix of architectural styles reflecting the surrounding mix of uses, including single-and multi-family residential, and small and "mid-size box" commercial development. The traditional, circa -1900 farmhouse at the front of the Site is similar in size and style to nearby single family residential development. While the multi-family building is clearly contemporary in its design, the use of traditional residential materials and details including multi-paned windows and projecting balconies help to integrate the structure into the surrounding mixed-use context.

The proposed multi-family building has a footprint that is comparable to nearby commercial development, though it is significantly taller. The massing of the building is angled in an effort to maximize the footprint while shortening the longer façade on Wainwright Street. Building height and massing is further minimized through the use of projecting bays and balconies, and a mix of cladding material including a rustic stone foundation with stucco and lap siding above. The perception of building height is reduced due to its placement mid-way up the hill, approximately 30' above eye level from Cambridge Street but lower than the eastern-most units of the Ledges, visible above.

Relationship to adjacent streets/Integration into existing development patterns
The Site is located on a busy section of Cambridge Street, marked by a mix of uses including commercial, single and multi-family development. While development immediately surrounding the Site is residential, the development pattern along this portion of Cambridge Street could be characterized as strip commercial, including a gas station, a shopping plaza, and car dealership. Due to the varied surrounding context, the proposed mixed use building should not appear out of context with surrounding development.

The building is sited with its longer, front elevation facing Wainwright Road, and its narrow side elevation oriented towards Cambridge Street. The preservation of the single-family residence at the front of the Site leaves the existing streetscape on Cambridge Street intact, and serves, along with existing vegetation, to partially screen views of the multi-family building behind it.

Density
The Project has an overall density of 33.4 units per acre, with a Floor Area Ratio (FAR) of .75 Given the use of podium parking on the interior of the building, however, the building lot coverage is only 27% leaving approximately 50% of the Site as usable open space.

Conceptual Site Plan
The site plan is straightforward, consisting of the existing single family home fronting on Cambridge Street, and a larger, multi-family structure located on a plateau at the center of the Site facing Wainwright Road. A divided entry drive leads upward into the Site from Wainwright Road approximately 300' from its intersection with Cambridge Street. The multi-family building is oriented east-west to maximize the site's level area and reduce (but not eliminate) the need for site grading.

Environmental Resources
The Site Plan preserves a significant amount of existing mature vegetation, providing attractive tree cover and a dense visual buffer around much of the Site's perimeter. An existing large ledge outcropping located between the existing house and the new apartment structure is also preserved and incorporated into the site plan.

Topography
The Site is located at the lower end of a steep hill that extends upward approximately 750 feet from Cambridge Street. The site plan works with existing topography to reduce the need for extensive grading, with the existing home at the front of the Site at street-level, and the larger apartment building sited mid-way up the hill on an existing level plateau approximately 30' higher than street level. Above the Site, the heavily wooded hillside continues upward for several hundred feet towards the Ledges Condominium development at the top.

The proposal uses the sloping site to conceal the lower interior parking level from view from Cambridge Street and Wainwright Road; a small surface parking lot located to the north (rear) of the building will also be hidden from view.

(d) that the proposed Project appears financially feasible within the housing market in which it will be situated (based on comparable rentals or sales figures);

The Applicant proposes the construction of 95 apartments and the rehabilitation of a single-family home to be financed under the NEF Program. There will be 72 market-rate units with proposed average rent levels of $2,145 for the studios, $2,500 for the one-bedroom units, $3,300 for the two bedroom units, and $3,750 for the three-bedroom units.

MassHousing's Appraisal and Marketing Division (A&M) reviewed comparable rentals in the area and has noted that proposed market rents for the studio and three-bedroom units are within the comparable range but that rents for the one- and two- bedroom units are slightly higher than at comparable developments. They recommend that an updated market and rent study be completed at Final Approval.

A&M noted the relative shortage of and demand for rental housing in Winchester, pointing to rental occupancy rates of 97.8%. Given the Project's proximity to public transportation and retail facilities, A&M speculated that the Project could command higher market rates, but recommended that a full market study be conducted prior to Final Approval in order to confirm the market area, the depth of the target market, and supportable rent levels at that time.

(e) that an initial pro forma has been reviewed, including a land valuation determination consistent with the Department's Guidelines, and the Project appears financially feasible and consistent with the Department's Guidelines for Cost Examination and Limitations on Profits and Distributions (if applicable) on the basis of estimated development costs;

MassHousing has commissioned an as "As-Is" appraisal which indicates a land valuation of $2,600,000. Based on a proposed investment of $11,395,660 in private equity, the pro forma appears to be financially feasible and within the limitations on profits and distributions.

(f) that the Applicant is a public agency, a non-profit organization, or a Limited Dividend Organization, and it meets the general eligibility standards of the housing program; and

The Applicant must be organized as a Limited Dividend Organization prior to applying for Final Approval. MassHousing sees no reason this requirement could not be met given information reviewed to date. The Applicant meets the general eligibility standards of the NEF housing subsidy program.

(g) that the Applicant controls the site, based on evidence that the Applicant or a related entity owns the site, or holds an option or contract to acquire such interest in the site, or has such other interest in the site as is deemed by the Subsidizing Agency to be sufficient to control the site.

The Site consists of a single parcel of land (Winchester Assessor's Map 26, Block 140) consisting of 130,148 square feet (2.98 acres). The Applicant controls the entire Site through a Purchase and Sale Agreement between 416 Cambridge Street Realty Trust (Seller), and FX Winchester LLC (Buyer). The expiration date of the P&S is June 1, 2017.

Development Team

Applicant/Developer

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PURCHASE AND SALE AGREEMENT

1. PARTIES

This ____ day of September 2014 DAVID J. EATON AND ANN L. EATON, Trustees of the 416 CAMBRIDGE STREET REALTY TRUST, U/D/T dated 1/18/2012 recorded with MSRD, Registered Land Division, as Document No. 1590142,Noted on Cert. of Title No. 250474 at Book 1411 Page 52 with an address of 416 Cambridge Street, Winchester, MA 01890 ***("SELLER")***, agrees to sell and FX Winchester, LLC a Massachusetts limited liability company with an address c/o FX Investments LLC 263 Huntington Ave, #174, Boston, MA 02115 ***("BUYER" or "PURCHASER")*** agrees to buy, upon the terms hereinafter set forth, the premises described in Paragraph 2 hereof.

2. DESCRIPTION

The certain parcel of land with the improvements thereon situated on property having post office address designated as 416 Cambridge Street, Winchester, Middlesex County, Massachusetts and being shown and more fully referenced as the described parcel on the attached Exhibit A ***("Premises")***.
For Title see MSRD, Registered Land Division, Certificate of Title No. 250474, Book 1411 Page 52.

3. APPURTENANCES

The Premises to be conveyed shall include all other rights, easements, privileges, licenses or appurtenances (if any there may now be assignable or transferrable) benefitting, affecting or relating to the Premises and including without limitation all rights in any adjoining public or private ways now existing or hereafter laid out or constructed, any appurtenances held by SELLER in any adjoining property and any appurtenant rights benefitting the Premises.

4. TITLE DEED

The Premises shall be conveyed by a good and sufficient quitclaim deed running to the BUYER or to a nominee designated by the BUYER, and said deed shall convey good and clear record and marketable title thereto free from encumbrances except:

a. Provisions of existing building and zoning laws;

b. Such taxes for the then current year as are not due and payable as of the date of the delivery of the deed; and,

c. Any liens for municipal betterments assessed and recorded after the date of this

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Agreement but before one year following the execution of this Agreement.

SELLER'S title hereunder shall not be deemed good and marketable unless:

a. Such title is insurable at standard rates by a recognized title insurance company licensed to do business in Massachusetts chosen by BUYER which shall insure the Premises as described in SELLER's deed to BUYER and each of the appurtenances to be conveyed pursuant to Paragraph 3 hereof without exceptions except as to matters permitted or waived under this Paragraph 4 and standard printed exceptions on the policy jacket and including survey insurance against "gaps and gores" and a so-called ALTA "comprehensive endorsement";

b. A survey commissioned by BUYER (if any) performed by a Massachusetts licensed real estate surveyor discloses no encroachments, including without limitation encroachments of structures, easements, or rights of way from adjacent properties onto the Premises, encroachments from the Premises onto adjacent property or gap or gores between the parcels comprising the Premises; and,

c. No person(s), commission or group has identified the Premises or any portion thereof as eligible or qualified for inclusion in the National Register of Historic Places or in any local historic district to the best of Seller's knowledge.

5. REGISTERED TITLE

In addition to the foregoing, if any portion of the Premises shall be registered SELLER's deed to BUYER shall be in form sufficient to entitle the BUYER to a Certificate of Title, and the SELLER shall deliver with said deed all instruments, necessary to enable the BUYER to obtain such Certificate of Title.

6. PURCHASE PRICE

The Purchase Price for the Premises is Three Million Two Hundred Thousand and No/100 Dollars ($3,200,000.00) of which:

$ 5,000.00	has been paid as a deposit as of the date hereof, receipt of which is acknowledged by SELLER
$ 30,000.00	as additional deposit will be paid upon the expiration of the Due Diligence Period, 90 days from the date of the signing of this Purchase & Sale Agreement, and shall be subject to satisfactory completion of due diligence by the BUYER.
$35,000.00	as additional deposit will be paid on the date that is 6 months from the expiration of the Due Diligence Period.
$50,000.00	as additional deposit will be paid on the date that is 12 months after the expiration of the Due Diligence Period.

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	This $50,000 deposit will give the Buyer an additional 6 months in which to obtain full permits and approvals, beyond appeal, for a total Permitting Period of 18 months from the expiration of the Due Diligence Period.
$4,000.00	as additional deposit will be paid on a monthly basis on the first of each month for up to 12 months after the expiration of Permitting Period should the Buyer need time to fight an appeal.
$(Balance)	The balance of the Purchase Price ($3,200,000.00 less the sum of the deposit payments made under this paragraph 6) will be paid at the time of Closing by certified or bank check, or by wired funds or conveyancing attorney's check.
$3,200,000.00	Total

7. DEPOSIT

The aggregate deposits referred to in Paragraph 6 (the "Deposit") shall be held in an interest bearing "Client's Account" by Seller's attorney, Cushing & Dolan PC (Escrow Agent), and shall be accounted for at the delivery of the deed and applied against the Purchase Price. Once paid, the Deposit shall be non-refundable except as provided in Paragraph 11 or in the event of SELLER's default.

8. TIME FOR PERFORMANCE

Provided that this Agreement shall not sooner have been terminated under any clause of this Agreement allowing for such termination, the deed is to be delivered ***(the "Closing")*** on a date established by the BUYER which is not later than 30 days after the Permit and Approvals Date established in Paragraph 22 hereof ***("Closing Date")***. Such Closing Date shall be established in a notice from BUYER to SELLER given in accordance with the provisions of Paragraph 28 hereof no later than seven (7) days after the Permit and Approvals Date. The Deed shall be delivered at the office of Schlesinger and Buchbinder, LLP, 1200 Walnut Street, Newton, Massachusetts, 02461 or by notice to SELLER at the office of BUYER's mortgagee's counsel within 15 miles from the City of Newton. Notwithstanding any of the foregoing, the time for performance shall occur on or before *6/1/17.* , failing which Buyer shall be deemed in default of this agreement and any deposits previously tendered shall be non refundable except as provided in Paragraph 11 or in the event of SELLER's default.

9. POSSESSION AND CONDITION OF PREMISES

Full possession of said Premises, free of all tenants and occupants and SELLER's personalty, except as provided herein and broom clean is to be delivered at the time of the delivery of the deed, said Premises to be:

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a. in the same condition as they now are, reasonable wear and tear excepted; and,

b. in compliance with any instrument referred to in paragraph 4; and,

c. subject to no liens or claims under G.L. c. 21E except as permitted under Paragraph 24; and,

10. EXTENSION TO PERFECT TITLE OR MAKE PREMISES CONFORM

If the SELLER shall be unable to give title or to make conveyance, or to deliver possession of the Premises, all as herein stipulated, or if at the time of the delivery of the deed the Premises do not conform with the provisions hereof, the SELLER shall use reasonable efforts to remove any defects in title, or deliver possession as provided herein, or make the Premises conform to the provisions hereof, as the case may be and the time for performance hereof shall be extended for such period as may be reasonably necessary but not more than ninety (90) days after notice of such defect for the SELLER to correct any such failure. Notwithstanding anything contrary herein, SELLER shall not be responsible for any liens or attachments placed on the Premises by BUYER's contractors as a result of work performed on the Premises; the cost of removal of such liens or attachments shall be solely BUYER's and the failure to remove such liens or attachments by BUYER shall not be a valid reason for BUYER to terminate this Agreement nor fail to perform under this Agreement.

11. FAILURE TO PERFECT TITLE OR MAKE PREMISES CONFORM, ETC.

If at the expiration of any such extended time the SELLER, shall have been unable to remove any defects in title, deliver possession, or make the Premises conform, as the case may be all as herein agreed then, in addition to such other remedies as the BUYER may have at law or in equity at the BUYER's sole option, except as provided in Paragraph 12, the Deposit shall be forthwith refunded and this Agreement shall be void without recourse to the parties.

12. BUYER'S ELECTION TO ACCEPT TITLE

The BUYER shall have the election, at either the original or any extended time for performance, to accept such title as the SELLER can deliver to the Premises in their then condition and to pay therefor the purchase price without deduction except as provided in this paragraph, in which case the SELLER shall convey such title. In the event the Premises have been damaged by a casualty for which insurance is available the BUYER shall have the further election to accept the Premises in their then condition together with the proceeds and SELLER's insurance or an assignment of SELLER's claim for insurance in which event the Purchase Price shall be reduced by the amount of the sum of (i) the insurance amount received or assigned to BUYER and (ii) any applicable deductible on SELLER's insurance policy.

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13. ACCEPTANCE OF DEEDS

The acceptance of a Deed by the BUYER or its nominee, as the case shall be deemed to be a full performance and discharge of every agreement and obligation of SELLER herein contained or expressed, except such as are, by the express terms hereof, to be performed after the delivery of the Deed.

14. USE OF PURCHASE MONEY TO CLEAR TITLE

To enable the SELLER to make conveyance as herein provided, the SELLER may, at the time of the Closing use the purchase money or any portion thereof to clear the title of any or all encumbrances or interests, provided that as to an institutional first mortgage written payoff letters are available from any institutional first mortgagee and that all instruments so procured from an institutional first mortgagee are recorded reasonably promptly after delivery of the Deeds in the usual and customary manner and all other instruments are recorded simultaneously with the recording of said Deed.

15. ADJUSTMENTS

Any applicable rent or use and occupancy charges (but only if BUYER accepts the Premises at the Closing subject to any existing tenants or occupants), municipal use charges, utility charges, assessments, and taxes for the then current year shall be apportioned as of the Closing, and the net amount thereof shall be added to or deducted from, as the case may be, the purchase price payable by the BUYER at the Closing. The SELLER shall provide final water and sewer bills at the Closing dated within 5 days of the Closing.

16. ADJUSTMENT OF UNASSESSED AND ABATED TAXES

If the amount of said taxes is not known at the delivery of the deed, they shall be apportioned on the basis of the taxes assessed for the preceding year with a reapportionment as soon as the new tax rate and valuation can be ascertained; and, if the taxes which are to be apportioned shall thereafter be reduced by abatement, the amount of such abatement, less the reasonable cost of obtaining the same shall be apportioned between the parties, provided that neither party shall be obligated to institute or prosecute proceedings for an abatement unless herein otherwise agreed.

17. BROKERAGE

BUYER and SELLER represent that neither has dealt with any broker in connection with the purchase of the Premises and the transaction which is the subject of this Agreement, and each party shall indemnify and hold the other harmless from and against any loss, cost, damage or expense which either party may suffer on account of any claim against the other for any commission or other payment in connection with the Premises (and the transaction) which is the subject of this Agreement which is made by any unidentified broker. The provisions of this paragraph shall survive delivery of the deed hereunder.

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18. TITLE INSURANCE

At the Closing the SELLER shall execute usual and customary title insurance company affidavits in form and substance reasonably satisfactory to SELLER to the effect that there are no parties in possession affecting the Premises and that no work has been performed upon the Premises by or on behalf of SELLER which would entitle any person to a mechanic's or materialman's lien upon any portion of the Premises. The SELLER shall further provide BUYER with information sufficient for IRS form 1099 if required.

19. ACCESS

The SELLER hereby agrees that the BUYER and the BUYER's representatives, consultants, engineers and/or agents shall have the right of access to the Premises at all reasonable times from the date of this Agreement up to and including the Closing, all at the sole risk and responsibility of the BUYER, to conduct surveys, engineering, hazardous materials and other construction or development tests, or to inspect the Premises. The SELLER acknowledges that the BUYER'S soils testing or other tests may require the digging of one or more borings or test pits on the Premises, and surveys may cause usual and customary holes, clearing of sight lines, or digging. The BUYER agrees promptly to re-grade and restore reasonably (without the necessity of any replanting) the Premises upon the taking of any borings or test pits and to undertake such tests using appropriate caution. BUYER agrees that BUYER's (including BUYER's contractors, employees and agents) access to the Premises is done at BUYER's sole risk. BUYER shall indemnify, defend and hold harmless SELLER from any property damage and/or personal injury and/or cost and expense (inclusive of attorneys fees) resulting in any way from such visits. In the event any liens or attachments are placed on the Premises by BUYER's contractor or agent for work performed on the Premises, BUYER shall promptly exercise its best efforts to remove such liens or attachments (including by litigating and/or paying for claims, charges and invoicing rendered by any such contracting or work) and shall indemnify, defend and hold harmless SELLER from any costs and expense (inclusive of attorneys fees) in removing such liens or attachments.
Buyer shall produce notarized contractor waivers and lien releases against the Seller's property prior to the expiration of Due Diligence from any contractors who have entered the property and performed any work thereon. Buyer also agrees to deliver to Seller prior to commencement of any work on the property copies of any and all required state, local or federal permits for work on the property.

20. BUYER'S DEFAULT

In the event the BUYER shall default in the performance of the BUYER's obligations hereunder all portions of the Deposit made by the BUYER prior to the date of default and all interest earned thereon, if any, shall be retained by the SELLER as liquidated damages, with the right to obtain all copies of BUYER's plans, permits, reports and studies performed on the Premises without recourse to BUYER as to the contents thereof and subject to use limitations imposed and copyright obligations in favor of the issuers,

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which shall constitute the SELLER's sole remedy at law or in equity.

21. PLANS AND PERMITS

SELLER agrees to reasonably cooperate with BUYER's filings for all of the permits deemed necessary or convenient by BUYER for development of BUYER's proposed project to the extent SELLER's cooperation or signature is required as owner of the Premises provided that such cooperation shall be at no expense to SELLER, and SELLER agrees to assign to the BUYER at the Closing all of the SELLER's right, title and interest in such plans, surveys, engineering reports, licenses, permits and governmental or quasi-governmental licenses, approvals or orders as exist as of the date of the Closing affecting the Premises, if any, including without limitation SELLER's rights if any as owner of the Premises under any zoning or comprehensive permit, site approval for financing, site plan approval or variance, any Order of Conditions pursuant to the Wetlands Protection act, any applicable MEPA approval for the Premises. All such governmental site approvals under G.L. c. 40B, zoning permits or comprehensive permits, site plan approvals, variances, Orders of Conditions, and other governmental or quasi-governmental approvals, licenses, permissions or authorizations usual, customary or necessary for development of BUYER's proposed project including without limitation a building permit are referred to herein collectively as the **"Permits and Approvals"**. In the event of default by BUYER or BUYER's failure to close for any reason in accordance with the terms of this Agreement, SELLER shall have no obligation to make such assignments as provided herein.

22. PERMITS AND APPROVALS

BUYER's obligations under this Agreement are subject to and contingent upon BUYER obtaining (in the exercise of all due diligence) all of the Permits and Approvals final beyond appeal with no appeal being filed. Further, if any appeal shall be filed or any other delay (whether by appeal or otherwise) shall be imposed in the exercise of any of the Permits, then such Permits shall be deemed not to have been granted until the appeal shall have been resolved by administrative proceeding or litigation as required in favor of BUYER in BUYER's sole judgment. Any Permit or Approval shall not be deemed to have been given unless it is exercisable on the date established for the Closing in the sole discretion of the BUYER. The configuration of BUYER's proposed project, the number and type of dwelling units proposed and all other elements of the proposed project shall be determined in BUYER's sole discretion, and Seller agrees that the minimum number of dwelling units for the proposed project to be economically feasible is Seventy (70) units. In the event that any of the Permits or Approvals shall be refused by the issuing authority with or without reason, or, if any of the Permits or Approvals shall be issued on conditions which BUYER shall determine in BUYER's sole discretion to be inappropriate, burdensome, uneconomic or unsatisfactory to BUYER or, if BUYER shall determine at any time in BUYER's sole discretion that one or more of the Permits or Approvals is unlikely to be issued by the issuing authority or is likely to be issued only upon conditions which in BUYER's sole discretion are inappropriate, burdensome, uneconomic or unsatisfactory to BUYER, then BUYER may by a notice to SELLER

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terminate this Agreement in which event the Deposit shall be retained by SELLER and the parties shall have no further obligations to each other hereunder.

BUYER shall be solely responsible for all costs of designing BUYER's project and obtaining the Permits and Approvals including but not limited to engineering fees, legal fees, consultant fees, filing fees, inspection fees, building permit fees and the like.

The date upon which BUYER shall have obtained all the Permits final beyond appeal or with all appeals having been resolved in favor of the BUYER and upon which date all the Permits shall be exercisable and all Approvals shall have been granted shall be referred to as the Permit and Approvals Date.

Notwithstanding any of the foregoing, the time for performance shall occur on or before *6/1/17*, failing which Buyer shall be deemed in default of this agreement and any deposits previously tendered shall be non refundable except as provided in Paragraph 11 or in the event of SELLER's default. In such case of Buyer default Seller shall be free to terminate this agreement and convey the property to any other third party.

23. REPRESENTATIONS AND WARRANTIES

A. The BUYER's Representations and Warranties. The BUYER hereby represents and warrants that the following representations and warranties are true and accurate as of the date hereof and it shall be a condition to the SELLER's obligation to close that they be renewed by the BUYER on the date of the Closing as if made at such time and shall survive the Closing:

(i) The BUYER is a duly organized legally existing Massachusetts limited liability company with full legal authority to enter into this transaction and to fulfill its obligations hereunder;

(ii) The person executing this Agreement on behalf of BUYER is an authorized signatory of the BUYER and has been duly authorized by all necessary action of BUYER;

B. The SELLER's Representations and Warranties: The SELLER hereby warrants and represents that the following representations and warranties are true and accurate as of the date hereof and it shall be a condition to BUYER's obligation to close that they be renewed by the SELLER on the date of the Closing as if made at such time and shall survive the Closing:

(i) The person executing this Agreement on behalf of SELLER is an authorized signatory of the SELLER and has been duly authorized by all necessary action of SELLER;

(ii) No person whose consent is required for SELLER's execution of this Agreement or for SELLER to fulfill its obligations hereunder is under any

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legal disability;

(iii) Neither the execution of this Agreement nor the consummation of the transactions contemplated hereby will constitute a violation of (or be in conflict with or constitute a default under) any term or provision of any order, agreement or lease to which SELLER is a party;

(iv) SELLER shall be the owner of the Premises subject to no claims of any person, rights of first refusal or rights of first or last offer that would adversely affect SELLER's ability to consummate the transaction provided in this Agreement;

(v) The Premises (at the Closing Date only) shall be subject to no leases, use licenses or occupancy agreements except for occupancy by the SELLER and on the date of Closing the Premises will be vacant;

(vi) There are no unpaid judgments, orders, or decrees of any kind against SELLER unpaid or unsatisfied of record, nor any legal action, suit or other legal or administrative proceeding pending before any court or administrative agency relating to the Premises nor is SELLER aware of any threatened legal action, suit or other legal or administrative proceeding relating to the Premises;

(vii) SELLER has not filed for bankruptcy nor is SELLER in the hands of a receiver; and there are no due but unpaid income, property or franchise taxes of SELLER which constitute a lien against the Premises;

(viii) SELLER has no knowledge of any pending violation of any law, municipal or other governmental ordinances, affecting the Premises, or any part thereof, nor is SELLER aware of any facts which might result in such a violation;

(ix) SELLER has no knowledge of pending or contemplated condemnation proceedings affecting the Premises, or any part thereof. SELLER has not made any commitment to any board, bureau, commission, department or body of any municipal, county, state or federal governmental unit or any subdivision thereof having jurisdiction over the Premises or the use or improvement thereof ("Governmental Authority") or to any third party to dedicate or grant any portion of the Premises for any public purposes or to impose any restrictions on the Premises;

(x) SELLER has received no notice that the Premises violates any environmental statutes, orders, directives or requirements applicable to the Premises;

(xi) To the best of SELLER's actual knowledge and without duty to inspect,

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investigate or verify the Premises has not been the site of a release or threat of release of oil or hazardous materials within the meaning of G.L. c. 21E;

(xii) There are no mechanics' liens against the Premises; no claims for labor, services, profit or material furnished for constructing, repairing or improving the same, nor does SELLER anticipate any such claims.

(xiii) BUYER acknowledges that SELLER is selling the Premises "as-is" without representation or warranty other than as set forth in this Agreement and acknowledges the SELLER has made no warranties or representations on which the BUYER has relied (other than those specifically set forth in this Agreement above), it being the understanding of the parties hereto that the entire agreement of the parties with respect to this transaction is fully set forth herein.

24. HAZARDOUS MATERIALS

(a) SELLER represents that SELLER knows of no (i) environmental reports relative to the Premises or (ii) releases or threats of release of oil or hazardous materials at or adjacent to the Premises reportable under G.L. c. 21E.

(b) BUYER agrees that BUYER shall at BUYER's expense except as provided herein undertake investigations of the environmental condition of the Premises including without limitation a so-called Phase I site investigation and including also in BUYER's sole discretion a so-called Phase II site investigation including without limitation soil and groundwater testing, and BUYER shall engage a licensed site professional ("BUYER's LSP") to review data obtained from the Phase I and (if applicable) Phase II investigation plus such other investigation as BUYER's LSP shall deem to be prudent under the circumstances.

25. BUYER'S RIGHT TO TERMINATE

Notwithstanding any other provision hereof the BUYER shall have the right to terminate this Agreement at any time prior to the Permits and Approvals Date with or without cause by written notice to SELLER, and in the event of such termination the SELLER shall retain the Deposit paid prior to the date of termination and any interest earned , provided, however that in the event BUYER shall terminate this Agreement within 90 days of the date hereof then SELLER shall return the initial $5,000.00 Deposit to BUYER.

26. BINDING EFFECT; ASSIGNMENT

The terms, conditions and covenants of this Agreement shall apply to, inure to the benefit of and be binding upon each of the parties hereto and their respective successors and assigns. BUYER may assign this Agreement and any of its rights and obligations hereunder, upon prior notice to SELLER, to a single purpose entity for purpose of receiving third party investment proceeds. In the event of any such assignment, the

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assignee shall assume all of BUYER'S obligations under this Agreement. In the case of an assignment, Patrick Cleary or FX Investments LLC shall continue to maintain a membership interest in the entity.

27. CAPTIONS

The captions herein are used only as a matter of convenience and are not to be considered a part of this Agreement or to be used in determining the intent of the parties to it.

28. NOTICES

Notices hereunder shall be deemed properly sent three days after posting if mailed, certified United States Mail, return receipt requested, postage prepaid, or on the date of delivery if delivered by courier (including overnight courier service) or served in hand to the BUYER at the address set forth herein, with a copy to Alan J. Schlesinger, Schlesinger and Buchbinder LLP, 1200 Walnut Street, Newton, Massachusetts 02461 fax # (617) 965-6824 and to the SELLER at its address first set forth herein with a copy to SELLER's attorney contact info at c/o Kevin Dolan, Esq, 375 Totten Pond Road, Suite 200, Waltham, MA 02451. Counsel for the parties may accept notice by email and are authorized to execute extensions of time under this Agreement on behalf of their respective clients.

29. TITLE STANDARDS

In matters respecting title to the Premises, standards of the Massachusetts Real Estate Bar Association shall be determinative.

30. MISCELLANEOUS

Construction of Agreement: This Agreement, which may be executed in multiple counterparts, shall be construed as a Massachusetts contract, is to take effect as a sealed instrument, sets forth the entire contract between the parties, is binding upon and inures to the benefit of the parties hereto and their respective heirs, devisees, executors, administrators, successors and assigns, and may be canceled, modified or amended only by a written instrument executed by both the SELLER and the BUYER.

Severability: In the event that any provision of this Agreement shall be deemed to be unenforceable for any reason the remaining portions of this Agreement shall be enforced in accordance with their terms, and this Agreement shall not be deemed to be terminated or unenforceable on account of invalidity of any particular provision.
Counterpart Execution: This Agreement may be executed in counterpart originals each of which together shall be deemed a single instrument.

31. ADDENDA, ATTACHMENTS AND EXHIBITS

The attached SELLER's Addendum and Exhibit "A" are incorporated herein by reference

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and are an integral part of this Agreement.

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Executed as a sealed instrument this date first set forth above.

SELLER
416 CAMBRIDGE STREET REALTY TRUST, U/D/T dated 1/18/2012 recorded with MSRD, Registered Land Division, as Document No. 1590142,Noted on Cert. of Title No. 250474 at Book 1411 Page 52

By: David Eaton Trustee
David Eaton, Trustee

By: Ann Eaton Trustee
Ann Eaton, Trustee

FX Winchester, LLC

By: _____
Its Manager

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Date PC

EXHIBIT "A"
(Premises description)

416 Cambridge Street

Parcel ID _____
Lot Size _____ sq ft

Owner(s) _____

Deed Information:

Date: Book _____, Page__

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Date

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Department of Housing and Community Development
Chapter 40B Subsidized Housing Inventory (SHI)
as of December 5, 2014

Community	2010 Census Year Round Housing Units	Total Development Units	SHI Units	%
Abington	6,364	511	478	7.5%
Acton	8,475	1,107	551	6.5%
Acushnet	4,097	133	103	2.5%
Adams	4,337	321	321	7.4%
Agawam	12,090	499	467	3.9%
Alford	231	0	0	0.0%
Amesbury	7,041	869	505	7.2%
Amherst	9,621	1,081	1,034	10.7%
Andover	12,324	1,428	1,145	9.3%
Aquinnah	158	41	41	25.9%
Arlington	19,881	1,429	1,121	5.6%
Ashburnham	2,272	147	32	1.4%
Ashby	1,150	0	0	0.0%
Ashfield	793	2	2	0.3%
Ashland	6,581	346	241	3.7%
Athol	5,148	247	247	4.8%
Attleboro	17,978	1,177	1,177	6.5%
Auburn	6,808	242	242	3.6%
Avon	1,763	74	74	4.2%
Ayer	3,440	456	290	8.4%
Barnstable	20,550	1,832	1,373	6.7%
Barre	2,164	83	83	3.8%
Becket	838	0	0	0.0%
Bedford	5,322	1,087	902	16.9%
Belchertown	5,771	398	372	6.4%
Bellingham	6,341	702	537	8.5%
Belmont	10,117	392	380	3.8%
Berkley	2,169	139	24	1.1%
Berlin	1,183	222	65	5.5%
Bernardston	930	24	24	2.6%
Beverly	16,522	2,142	1,946	11.8%
Billerica	14,442	1,487	857	5.9%
Blackstone	3,606	165	123	3.4%
Blandford	516	1	1	0.2%
Bolton	1,729	192	64	3.7%
Boston	269,482	52,453	49,324	18.3%
Bourne	8,584	1,227	596	6.9%
Boxborough	2,062	327	24	1.2%
Boxford	2,730	64	23	0.8%

Boylston	1,765	26	24	1.4%
Braintree	14,260	1,636	1,098	7.7%
Brewster	4,803	293	246	5.1%
Bridgewater	8,288	579	524	6.3%
Brimfield	1,491	80	80	5.4%
Brockton	35,514	4,485	4,485	12.6%
Brookfield	1,452	47	41	2.8%
Brookline	26,201	2,634	2,111	8.1%
Buckland	866	3	3	0.3%
Burlington	9,627	1,395	993	10.3%
Cambridge	46,690	7,174	7,084	15.2%
Canton	8,710	1,180	1,075	12.3%
Carlisle	1,740	52	46	2.6%
Carver	4,514	146	146	3.2%
Charlemont	615	3	3	0.5%
Charlton	4,774	83	83	1.7%
Chatham	3,460	176	170	4.9%
Chelmsford	13,741	1,545	1,169	8.5%
Chelsea	12,592	2,130	2,125	16.9%
Cheshire	1,481	0	0	0.0%
Chester	585	22	22	3.8%
Chesterfield	524	17	17	3.2%
Chicopee	25,074	2,588	2,551	10.2%
Chilmark	418	3	3	0.7%
Clarksburg	706	8	8	1.1%
Clinton	6,375	549	549	8.6%
Cohasset	2,898	325	311	10.7%
Colrain	731	0	0	0.0%
Concord	6,852	766	710	10.4%
Conway	803	0	0	0.0%
Cummington	426	16	16	3.8%
Dalton	2,860	158	158	5.5%
Danvers	11,071	1,472	1,109	10.0%
Dartmouth	11,775	959	929	7.9%
Dedham	10,115	1,152	1,107	10.9%
Deerfield	2,154	33	33	1.5%
Dennis	7,653	349	335	4.4%
Dighton	2,568	417	115	4.5%
Douglas	3,147	183	140	4.4%
Dover	1,950	69	17	0.9%
Dracut	11,318	1,004	719	6.4%
Dudley	4,360	104	104	2.4%
Dunstable	1,085	0	0	0.0%
Duxbury	5,532	441	196	3.5%
East Bridgewater	4,897	230	173	3.5%
East Brookfield	888	0	0	0.0%
East Longmeadow	6,072	504	436	7.2%

Eastham	2,632	59	50	1.9%
Easthampton	7,567	505	449	5.9%
Easton	8,105	629	531	6.6%
Edgartown	1,962	94	89	4.5%
Egremont	596	0	0	0.0%
Erving	778	0	0	0.0%
Essex	1,477	40	40	2.7%
Everett	16,691	1,314	1,314	7.9%
Fairhaven	7,003	473	473	6.8%
Fall River	42,650	4,927	4,831	11.3%
Falmouth	14,870	1,231	963	6.5%
Fitchburg	17,058	1,656	1,655	9.7%
Florida	335	0	0	0.0%
Foxborough	6,853	621	611	8.9%
Framingham	27,443	2,870	2,870	10.5%
Franklin	11,350	1,543	1,078	9.5%
Freetown	3,263	98	80	2.5%
Gardner	9,064	1,297	1,297	14.3%
Georgetown	3,031	354	354	11.7%
Gill	591	24	24	4.1%
Gloucester	13,270	986	951	7.2%
Goshen	440	6	6	1.4%
Gosnold	41	0	0	0.0%
Grafton	7,160	642	325	4.5%
Granby	2,451	66	66	2.7%
Granville	630	3	3	0.5%
Great Barrington	3,072	316	244	7.9%
Greenfield	8,325	1,160	1,143	13.7%
Groton	3,930	378	212	5.4%
Groveland	2,423	137	80	3.3%
Hadley	2,200	285	285	13.0%
Halifax	2,971	28	28	0.9%
Hamilton	2,783	124	84	3.0%
Hampden	1,941	60	60	3.1%
Hancock	326	0	0	0.0%
Hanover	4,832	455	455	9.4%
Hanson	3,572	270	148	4.1%
Hardwick	1,185	22	22	1.9%
Harvard	1,982	279	110	5.5%
Harwich	6,121	333	333	5.4%
Hatfield	1,549	47	47	3.0%
Haverhill	25,557	2,694	2,465	9.6%
Hawley	137	0	0	0.0%
Heath	334	0	0	0.0%
Hingham	8,841	2,161	561	6.3%
Hinsdale	918	0	0	0.0%
Holbrook	4,262	439	439	10.3%

Holden	6,624	507	393	5.9%
Holland	1,051	19	19	1.8%
Holliston	5,077	332	225	4.4%
Holyoke	16,320	3,411	3,368	20.6%
Hopedale	2,278	108	108	4.7%
Hopkinton	5,087	558	439	8.6%
Hubbardston	1,627	49	49	3.0%
Hudson	7,962	1,089	918	11.5%
Hull	4,964	93	93	1.9%
Huntington	919	47	47	5.1%
Ipswich	5,735	520	494	8.6%
Kingston	4,881	356	179	3.7%
Lakeville	3,852	572	256	6.6%
Lancaster	2,544	207	124	4.9%
Lanesborough	1,365	28	28	2.1%
Lawrence	27,092	3,926	3,907	14.4%
Lee	2,702	173	176	6.5%
Leicester	4,231	163	163	3.9%
Lenox	2,473	178	178	7.2%
Leominster	17,805	1,479	1,442	8.1%
Leverett	792	2	2	0.3%
Lexington	11,946	1,510	1,329	11.1%
Leyden	300	0	0	0.0%
Lincoln	2,153	310	238	11.2%
Littleton	3,443	643	431	12.5%
Longmeadow	5,874	267	267	4.5%
Lowell	41,308	5,250	5,215	12.6%
Ludlow	8,337	187	187	2.2%
Lunenburg	4,037	164	164	4.1%
Lynn	35,701	4,452	4,451	12.5%
Lynnfield	4,319	704	491	11.4%
Malden	25,122	2,628	2,562	10.2%
Manchester	2,275	122	110	4.8%
Mansfield	8,725	1,042	946	10.8%
Marblehead	8,528	399	333	3.9%
Marion	2,014	204	155	7.7%
Marlborough	16,347	1,728	1,660	10.2%
Marshfield	9,852	753	550	5.6%
Mashpee	6,473	314	298	4.6%
Mattapoisett	2,626	71	71	2.7%
Maynard	4,430	387	369	8.3%
Medfield	4,220	209	191	4.5%
Medford	23,968	1,685	1,647	6.9%
Medway	4,603	285	233	5.1%
Melrose	11,714	1,209	892	7.6%
Mendon	2,072	77	40	1.9%
Merrimac	2,527	397	141	5.6%

Methuen	18,268	1,938	1,649	9.0%
Middleborough	8,921	928	509	5.7%
Middlefield	230	4	4	1.7%
Middleton	3,011	173	151	5.0%
Milford	11,379	980	718	6.3%
Millbury	5,592	244	221	4.0%
Millis	3,148	184	121	3.8%
Millville	1,157	26	26	2.2%
Milton	9,641	733	477	4.9%
Monroe	64	0	0	0.0%
Monson	3,406	152	152	4.5%
Montague	3,926	423	391	10.0%
Monterey	465	0	0	0.0%
Montgomery	337	0	0	0.0%
Mount Washington	80	0	0	0.0%
Nahant	1,612	48	48	3.0%
Nantucket	4,896	179	121	2.5%
Natick	14,052	1,672	1,442	10.3%
Needham	11,047	969	838	7.6%
New Ashford	104	0	0	0.0%
New Bedford	42,816	5,155	5,124	12.0%
New Braintree	386	0	0	0.0%
New Marlborough	692	0	0	0.0%
New Salem	433	0	0	0.0%
Newbury	2,699	94	94	3.5%
Newburyport	8,015	720	606	7.6%
Newton	32,346	2,515	2,438	7.5%
Norfolk	3,112	144	111	3.6%
North Adams	6,681	886	880	13.2%
North Andover	10,902	1,393	932	8.5%
North Attleborough	11,553	308	296	2.6%
North Brookfield	2,014	142	142	7.1%
North Reading	5,597	645	533	9.5%
Northampton	12,604	1,586	1,521	12.1%
Northborough	5,297	718	605	11.4%
Northbridge	6,144	470	455	7.4%
Northfield	1,290	27	27	2.1%
Norton	6,707	898	588	8.8%
Norwell	3,652	426	271	7.4%
Norwood	12,441	992	980	7.9%
Oak Bluffs	2,138	158	146	6.8%
Oakham	702	0	0	0.0%
Orange	3,461	431	431	12.5%
Orleans	3,290	337	307	9.3%
Otis	763	0	0	0.0%
Oxford	5,520	404	404	7.3%
Palmer	5,495	329	284	5.2%

Paxton	1,590	62	62	3.9%
Peabody	22,135	2,146	2,031	9.2%
Pelham	564	4	4	0.7%
Pembroke	6,477	807	625	9.6%
Pepperell	4,335	197	129	3.0%
Peru	354	0	0	0.0%
Petersham	525	0	0	0.0%
Phillipston	658	11	11	1.7%
Pittsfield	21,031	2,078	1,957	9.3%
Plainfield	283	0	0	0.0%
Plainville	3,459	209	175	5.1%
Plymouth	22,285	840	692	3.1%
Plympton	1,039	63	51	4.9%
Princeton	1,324	21	21	1.6%
Provincetown	2,122	210	169	8.0%
Quincy	42,547	4,077	4,077	9.6%
Randolph	11,980	1,279	1,279	10.7%
Raynham	5,052	604	489	9.7%
Reading	9,584	1,137	742	7.7%
Rehoboth	4,252	95	23	0.5%
Revere	21,956	1,769	1,759	8.0%
Richmond	706	3	3	0.4%
Rochester	1,865	8	8	0.4%
Rockland	7,030	453	407	5.8%
Rockport	3,460	135	135	3.9%
Rowe	177	0	0	0.0%
Rowley	2,226	179	94	4.2%
Royalston	523	3	3	0.6%
Russell	687	13	13	1.9%
Rutland	2,913	81	81	2.8%
Salem	18,998	2,350	2,348	12.4%
Salisbury	3,842	555	342	8.9%
Sandisfield	401	0	0	0.0%
Sandwich	8,183	566	287	3.5%
Saugus	10,754	825	749	7.0%
Savoy	318	0	0	0.0%
Scituate	7,163	355	310	4.3%
Seekonk	5,272	88	84	1.6%
Sharon	6,413	472	472	7.4%
Sheffield	1,507	30	30	2.0%
Shelburne	893	51	51	5.7%
Sherborn	1,479	41	34	2.3%
Shirley	2,417	60	60	2.5%
Shrewsbury	13,919	957	860	6.2%
Shutesbury	758	2	2	0.3%
Somerset	7,335	271	271	3.7%
Somerville	33,632	3,270	3,258	9.7%

South Hadley	7,091	396	396	5.6%
Southampton	2,310	44	44	1.9%
Southborough	3,433	610	286	8.3%
Southbridge	7,517	490	490	6.5%
Southwick	3,852	177	173	4.5%
Spencer	5,137	268	267	5.2%
Springfield	61,556	10,247	9,970	16.2%
Sterling	2,918	269	68	2.3%
Stockbridge	1,051	111	111	10.6%
Stoneham	9,399	501	495	5.3%
Stoughton	10,742	1,535	1,207	11.2%
Stow	2,500	331	179	7.2%
Sturbridge	3,759	260	209	5.6%
Sudbury	5,921	575	354	6.0%
Sunderland	1,718	8	8	0.5%
Sutton	3,324	176	42	1.3%
Swampscott	5,795	218	212	3.7%
Swansea	6,290	247	236	3.8%
Taunton	23,844	1,844	1,650	6.9%
Templeton	3,014	476	198	6.6%
Tewksbury	10,803	1,306	1,037	9.6%
Tisbury	1,965	123	109	5.5%
Tolland	222	0	0	0.0%
Topsfield	2,157	164	146	6.8%
Townsend	3,356	214	150	4.5%
Truro	1,090	27	27	2.5%
Tyngsborough	4,166	638	340	8.2%
Tyringham	149	0	0	0.0%
Upton	2,820	223	178	6.3%
Uxbridge	5,284	427	257	4.9%
Wakefield	10,459	1,059	694	6.6%
Wales	772	55	55	7.1%
Walpole	8,984	470	470	5.2%
Waltham	24,805	2,253	1,785	7.2%
Ware	4,539	425	425	9.4%
Wareham	9,880	889	759	7.7%
Warren	2,202	108	108	4.9%
Warwick	363	0	0	0.0%
Washington	235	0	0	0.0%
Watertown	15,521	1,219	1,000	6.4%
Wayland	4,957	362	200	4.0%
Webster	7,788	666	666	8.6%
Wellesley	9,090	597	561	6.2%
Wellfleet	1,550	34	34	2.2%
Wendell	419	5	5	1.2%
Wenham	1,404	190	122	8.7%
West Boylston	2,729	429	136	5.0%

West Bridgewater	2,658	173	119	4.5%
West Brookfield	1,578	57	57	3.6%
West Newbury	1,558	86	34	2.2%
West Springfield	12,629	440	440	3.5%
West Stockbridge	645	0	0	0.0%
West Tisbury	1,253	38	23	1.8%
Westborough	7,304	718	668	9.1%
Westfield	16,001	1,138	1,138	7.1%
Westford	7,671	987	575	7.5%
Westhampton	635	10	10	1.6%
Westminster	2,826	274	87	3.1%
Weston	3,952	252	142	3.6%
Westport	6,417	449	222	3.5%
Westwood	5,389	611	493	9.1%
Weymouth	23,337	1,919	1,895	8.1%
Whately	654	2	2	0.3%
Whitman	5,513	218	218	4.0%
Wilbraham	5,442	254	253	4.6%
Williamsburg	1,165	51	51	4.4%
Williamstown	2,805	148	148	5.3%
Wilmington	7,788	1,048	820	10.5%
Winchendon	4,088	345	345	8.4%
Winchester	7,920	199	152	1.9%
Windsor	387	0	0	0.0%
Winthrop	8,253	637	637	7.7%
Woburn	16,237	1,318	1,150	7.1%
Worcester	74,383	9,983	9,971	13.4%
Worthington	553	22	22	4.0%
Wrentham	3,821	269	165	4.3%
Yarmouth	12,037	625	518	4.3%
Totals	**2,692,186**	**282,268**	**250,863**	**9.3%**

*This data is derived from Information provided to the Department of Housing and Community Development (DHCD) by individual communities and is subject to change as new information is obtained and use restrictions expire.

Form revised: 2/22/12

REGULATORY AND USE AGREEMENT

[Rental]

For Comprehensive Permit Projects in Which Funding is Provided By Other Than a State Agency

This Regulatory and Use Agreement (this "Agreement") is made this ___ day of _____, 20__, by and between the Massachusetts Housing Finance Agency acting as Subsidizing Agency (the "Subsidizing Agency"), as defined under the provisions of 760 CMR 56.02, on behalf of the Department of Housing and Community Development ("DHCD"), and _____, a Massachusetts _____ having a mailing address at _____, and its successors and assigns (the "Developer").

RECITALS

WHEREAS, the Developer intends to construct a housing development known as _____ at a __-acre site located at _____ in the [City/Town] of _____, Massachusetts (the "Municipality"), more particularly described in Exhibit A attached hereto and made a part hereof (the "Development"); and

WHEREAS, DHCD has promulgated Regulations at 760 CMR 56.00 (as may be amended from time to time, the "Regulations") relating to the issuance of comprehensive permits under Chapter 40B, Sections 20-23, of the Massachusetts General Laws (as may be amended from time to time, the "Act") and pursuant thereto has issued its Comprehensive Permit Guidelines (as may be amended from time to time, the "Guidelines" and, collectively with the Regulations and the Act, the "Comprehensive Permit Rules");

WHEREAS, the Development is being financed with a loan of approximately $_____ by _____, a Federal Home Loan Bank of Boston ("FHLBB") member bank (the "NEF Lender"), a non-governmental entity for which the Massachusetts Housing Finance Agency acts as Subsidizing Agency pursuant to the Comprehensive Permit Rules; and

WHEREAS, the Massachusetts Housing Finance Agency will serve as Subsidizing Agency on behalf of DHCD pursuant to the Comprehensive Permit Rules and in accordance with the terms and provisions hereof; and

WHEREAS, the Developer has received a comprehensive permit (the "Comprehensive Permit") from the Zoning Board of Appeals of the Municipality in accordance with the Act, which permit is [recorded/filed] at the _____ County [Registry of Deeds/Registry District of the Land Court] ("Registry") [in Book _____, Page ___/ as Document No. _____], as

amended by [amendments recorded in Book _____, Page ___/ as Document No. _____, and in Book _____, Page ___/ as Document No. _____, and by] the terms of this Agreement; and

WHEREAS, pursuant to the Comprehensive Permit and the requirements of the Comprehensive Permit Rules, the Development is to consist of a total of ____ rental units, of which a minimum of 25 percent (__ units) (the "Affordable Units") will be rented to Low or Moderate Income Persons and Families (as defined herein) at rentals specified in this Agreement and will be subject to this Agreement; and

WHEREAS, the parties intend that this Agreement shall serve as a "Use Restriction" as defined in and required by Section 56.05(13) of the Regulations; and

WHEREAS, the parties recognize that Affirmative Fair Marketing (as defined herein) is an important precondition for rental of Affordable Units and that local preference cannot be granted in a manner which results in a violation of applicable fair housing laws, regulations and subsidy programs; and.

WHEREAS, the parties recognize that the Municipality has an interest in preserving affordability of the Affordable Units and may offer valuable services in administration, monitoring and enforcement.

NOW, THEREFORE, in consideration of the agreements hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Subsidizing Agency and the Developer hereby agree as follows:

DEFINITIONS

1. In addition to terms defined elsewhere in this Agreement, the following terms as used in this Agreement shall have the meanings set forth below:

Act shall have the meaning given such term in the Recitals hereof.

Affirmative Fair Housing Marketing Plan shall mean the Affirmative Fair Housing Marketing Plan prepared by the Developer in accordance with the Guidelines and approved by the Subsidizing Agency, with such changes thereto that may be approved by the Subsidizing Agency, as further set forth in Section 3.

Affordable Units shall have the meaning set forth in the Recitals above.

Allowable Development Costs shall have the meaning given such term in Section 21 hereof.

Annual Income shall be determined in the manner set forth in 24 C.F.R. 5.609 (or any successor regulations).

Area shall mean the _____ Metropolitan Statistical Area (MSA) [or HUD Metro FMR Area (HMFA)] as designated by the Department of Housing and Urban Development ("HUD").

Area Median Income ("AMI") shall mean the median gross income for the Area, as determined from time to time by HUD. For purposes of determining whether Adjusted Family Income qualifies a tenant for treatment as a Low or Moderate Income Tenant, the Area Median Income shall be adjusted for family size.

Audited Annual Limited Dividend Financial Report shall mean an annual report to be submitted by the Developer on a form prescribed by the Subsiding Agency, pursuant to Section 12(b) hereof.

Comprehensive Permit shall have the meaning given such term in the Recitals hereof.

Comprehensive Permit Rules shall have the meaning given such term in the Recitals hereof.

Construction Lender shall mean the lender(s) making the Construction Loan, and its successors and assigns.

Construction Loan shall mean the loan to the Developer for the construction of the Development.

Construction Mortgage shall mean the mortgage from the Developer securing the Construction Loan.

Cost Certification shall have the meaning given such term in Section 21 hereof.

Cost Method shall have the meaning given such term in Section 7(d) hereof.

Developer Parties shall have the meaning given such term in Section 7(a) hereof.

Developer's Equity shall be determined in the manner set forth in Section 7(d) hereof.

Development shall have the meaning given such term in the Recitals hereof.

Development Revenues: All rental income, receipts and other revenue derived from the operation of the Development other than revenues derived from any sales, financing, or other capital transaction, and not including any amounts payable in respect of capital contributions paid by any members or partners of the Developer or any loan proceeds payable to the Developer.

Distribution Payments shall have the meaning given such term in Section 7(a) hereof.

Event of Default shall mean a default in the observance of any covenant under this Agreement or the Mortgage existing after the expiration of any applicable notice and cure periods.

Excess Development Revenues shall have the meaning given such term in Section 12(e) hereof

Excess Equity: Surplus Cash in excess of the permitted Limited Dividend Distribution, as calculated in accordance with the Audited Annual Limited Dividend Financial Report described in Section 12 hereof.

Excess Equity Account: An interest-bearing account maintained by the Lender (or if the Loan is paid off, with the Subsidizing Agency) for the benefit of the Development during the Term hereof containing Development Revenues which exceed the Limited Dividend Distribution in a given year or years.

Family shall have the same meaning as set forth in 24 C.F.R. §5.403 (or any successor regulations).

Fiscal Year: The fiscal year of the Developer ending [_____].

Guidelines shall have the meaning given such term in the Recitals hereof.

Housing Subsidy Program shall mean any other state or federal housing subsidy program providing rental or other subsidy to the Development.

HUD shall mean the United States Department of Housing and Urban Development.

Lender shall mean the Construction Lender and/or the Permanent Lender.

Limited Dividend Distribution: The aggregate annual distributions permitted to be made to the Developer from Development Revenues as calculated pursuant to the Audited Annual Limited Dividend Financial Report.

Limited Dividend Term shall have the meaning set forth in Section 23(b) hereof.

Loan shall mean the Construction Loan and/or the Permanent Loan.

Low or Moderate Income Persons or Families shall mean persons or Families whose Annual Incomes do not exceed eighty percent (80%) of the Median Income for the Area, and shall also mean persons or Families meeting such lower income requirements as may be required under the Comprehensive Permit or any applicable Housing Subsidy Program.

Low or Moderate Income Tenants shall mean Low or Moderate Income Persons or Families who occupy the Affordable Units.

Mortgage shall mean the Construction Mortgage and/or the Permanent Mortgage.

Permanent Lender shall mean the lender(s) making the Permanent Loan to the Developer, and its successors and assigns.

Permanent Loan shall mean the Permanent Loan made or committed to be made by the Permanent Lender to the Developer after completion of construction of the Development, which will replace the Construction Loan, or any subsequent refinancing thereof in compliance with any specific terms of the Comprehensive Permit or any Housing Subsidy Program applicable to the Development.

Permanent Mortgage shall mean the mortgage from the Developer to the Permanent Lender securing the Permanent Loan.

Regulations shall have the meaning given such term in the Recitals hereof.

Related Person: shall mean a person whose relationship to such other person is such that (i) the relationship between such persons would result in a disallowance of losses under Section 267 or 707(b) of the Internal Revenue Code, or (ii) such persons are members of the same controlled group of corporations (as defined in Section 1563(a) of the Internal Revenue Code, except that "more than 50 percent" shall be substituted for "at least 80 percent" each place it appears therein).

Substantial Completion shall have the meaning given such term in Section 20 hereof.

Surety shall have the meaning given such term in Section 22 hereof.

Surplus Cash shall have the meaning given such term in Section 7(c) hereof.

Tenant Selection Plan shall mean the Tenant Selection Plan, prepared by the Developer in accordance with the Guidelines and approved by the Subsidizing Agency, with such changes thereto which may be approved by the Subsidizing Agency.

Term shall have the meaning set forth in Section 23 hereof.

Total Development Costs ("TDC") shall have the meaning set forth in Section 7(h) hereof.

Value Method shall have the meaning given such term in Section 7(d) hereof.

CONSTRUCTION OBLIGATIONS

2. (a) The Developer agrees to construct the Development in accordance with plans and specifications approved by the Subsidizing Agency and the Municipality (the "Plans and Specifications"), in accordance with all on-site and off-site construction, design and land use conditions of the Comprehensive Permit, and in accordance with the information describing the Development presented by the Developer to the Subsidizing Agency in its application for Final Approval. All Affordable Units to be constructed as part of the Development must be similar in exterior appearance to other units in the Development and shall be evenly dispersed throughout the Development. In addition, all Affordable Units must contain complete living facilities including but not limited to a stove, kitchen cabinets, plumbing fixtures, and sanitary facilities,

all as more fully shown in the Plans and Specifications. Materials used for the interiors of the Affordable Units must be of good quality. The Development must fully comply with the State Building Code and with all applicable state and federal building, environmental, health, safety and other laws, rules, and regulations, including without limitation all applicable federal and state laws, rules and regulations relating to the operation of adaptable and accessible housing for the handicapped. Except to the extent that the Development is exempted from such compliance by the Comprehensive Permit, the Development must also comply with all applicable local codes, ordinances and by-laws.

(b) The Subsidizing Agency shall monitor compliance with the construction obligations set forth in this section in such manner as the Subsidizing Agency may deem reasonably necessary. In furtherance thereof, the Developer shall provide to the Subsidizing Agency (i) evidence that the final plans and specifications for the Development comply with the requirements of the Comprehensive Permit and that the Development was built substantially in accordance with such plans and specifications; and (ii) prior to commencement of construction, a certification from the Construction Lender concerning construction monitoring in a form acceptable to the Subsidizing Agency. If the information provided to the Subsidizing Agency is not acceptable to the Subsidizing Agency, or if at any time after acceptance the NEF Lender's construction monitor fails to provide adequate construction oversight in accordance with the requirements of the NEF Lender's certification, the Subsidizing Agency may require that the Developer fund the cost of a construction monitor retained by the Subsidizing Agency.

USE RESTRICTION/RENTALS AND RENTS

3. (a) The Developer shall rent the Affordable Units during the Term hereof to Low or Moderate Income Persons or Families upon the terms and conditions set forth in the Comprehensive Permit and this Agreement. In fulfilling the foregoing requirement, the Developer will accept referrals of tenants from the Public Housing Authority in the Municipality, and will not unreasonably refuse occupancy to any prospective tenants so referred who otherwise meet the requirements of the Tenant Selection Plan. The foregoing provisions shall not relieve the Developer of any obligations it may have under the provisions of other documents and instruments it has entered with respect to any applicable Housing Subsidy Program; provided, however, the Subsidizing Agency shall have no obligation hereunder, expressed or implied, to monitor or enforce the applicable requirements of any such Housing Subsidy Programs.

(b) The annual rental expense for each Affordable Unit (equal to the gross rent plus allowances for all tenant-paid utilities, including but not limited to tenant-paid heat, hot water and electricity) shall not exceed thirty percent (30%) of eighty percent (80%) of AMI (or such other percentage of AMI established by DHCD for Comprehensive Permit Projects In Which Funding Is Provided By Other Than a State Agency), adjusted for household size, assuming that an Affordable Unit which does not have a separate bedroom is occupied by one individual, and that a unit which has one or more separate bedrooms is occupied by 1.5 individuals for each separate bedroom. If rentals of the Affordable Units are subsidized under any Housing Subsidy Program, then the rent applicable to the Affordable Units may be limited to that permitted by

such Housing Subsidy Program, provided that the tenant's share of rent does not exceed the maximum annual rental expense as provided in this Agreement.

(c) For purposes of satisfying the requirement that the Affordable Units shall be occupied by Low or Moderate Income Tenants hereunder, no Low or Moderate Income Tenant shall be denied continued occupancy because, after admission, the Low Moderate Income Tenant's Annual Income exceeds eighty percent (80%) of Area Median Income. No Low or Moderate Income Tenant shall continue to be counted as a Low or Moderate Income Tenant as of any date upon which such tenant's Annual Income exceeds one hundred forty percent (140%) of the level at which a tenant may be qualified as a Low or Moderate Income Tenant provided, however, that the Developer shall not be in default regarding the requirements of this Agreement to maintain occupancy of the Affordable Units by Low or Moderate Income Tenants if the Developer rents the next available unit or units of comparable or smaller size to Low or Moderate Income Tenants as needed to achieve compliance with such requirements (thereupon, as rented to a Low or Moderate Income Tenant, such unit or units shall be deemed an Affordable Unit hereunder). Other than as provided above, any unit shall retain its character as an Affordable Unit occupied by a Low or Moderate Income Tenant until it is reoccupied, at which time whether or not such unit is occupied by a Low or Moderate Income Tenant shall be redetermined under the rules set forth in this Section 3, except that no reoccupancy of an Affordable Unit for a temporary period not to exceed thirty-one (31) days shall be taken into account for this purpose.

(d) If, after initial occupancy, the Annual Income of a Low or Moderate Income Tenant increases and, as a result of such increase, exceeds eighty percent (80%) of Area Median Income but is less than one hundred forty percent (140%) of Area Median Income for such a Low or Moderate Income Tenant, at the expiration of the applicable lease term, such tenant's rent may be increased to the higher of the total rental that may be required under any applicable Housing Subsidy Program (including both the tenant share and the subsidized portion) or thirty percent (30%) of such tenant's Annual Income. In the event that a Low or Moderate-Income Tenant's Annual Income increases and, as a result of such increase, exceeds one hundred forty percent (140%) of Area Median Income, the Developer may charge the formerly Low or Moderate-Income Tenant a market rate for the dwelling unit.

(e) Rentals for the Affordable Units shall be initially established as shown on the Rental Schedule attached as Appendix A hereto, subject to change from time to time (if necessary to reflect any changes in AMI) in accordance with the terms and provisions of this Agreement and any applicable Housing Subsidy Program. The Developer shall annually submit to the Subsidizing Agency a proposed schedule of monthly rents and utility allowances for all Affordable Units in the Development. It is understood that the Subsidizing Agency shall review such schedule with respect to the maximum rents for all the Affordable Units based on the size and required extent of affordability of each affordable Unit, and shall not take into account the actual incomes of individual tenants in any given Affordable Unit. Rents for the Affordable Units shall not be increased above such maximum monthly rents without the Subsidizing Agency's prior approval of either (i) a specific request by the Developer for a rent increase; or (ii) the next annual schedule of rents and allowances as set forth in the preceding sentence. Notwithstanding the foregoing, rent increases shall be subject to the provisions of outstanding

leases and shall not be implemented without at least 30 days' prior written notice by the Developer to all affected tenants.

(f) The Developer shall obtain income certifications satisfactory in form and manner to the Subsidizing Agency at least annually for all Low or Moderate-Income Tenants, or more frequently if required by any applicable Housing Subsidy Program. Said income certifications shall be kept by the management agent for the Development and made available to the Subsidizing Agency upon request.

(g) Prior to initial lease-up, the Developer shall submit an Affirmative Fair Housing Marketing Plan (also known as an "AFHM Plan") for the Subsidizing Agency's approval. At a minimum the AFHM Plan shall meet the requirements of the Guidelines, as the same may be amended from time to time. The AFHM Plan, upon approval by the Subsidizing Agency, shall become a part of this Agreement and shall have the same force and effect as if set out in full in this Agreement.

(h) The AFHM Plan shall designate entities to implement the plan that are qualified to perform their duties. The Subsidizing Agency may require that another entity be found if the Subsidizing Agency finds that the entity designated by the Developer is not qualified. Moreover, the Subsidizing Agency may require the removal of an entity responsible for a duty under the Affirmative Fair Housing Marketing Plan if that entity does not meet its obligations under the Affirmative Fair Housing Marketing Plan.

(i) The restrictions contained herein are intended to be construed as an affordable housing restriction as defined in Section 31 of Chapter 184 of Massachusetts General Laws which has the benefit of Section 32 of said Chapter 184, such that the restrictions contained herein shall not be limited in duration by any rule or operation of law but rather shall run for the Term hereof. In addition, this Agreement is intended to be superior to the lien of any mortgage on the Development and survive any foreclosure or exercise of any remedies thereunder and the Developer agrees to obtain any prior lienholder consent with respect thereto as the Subsidizing Agency shall require.

TENANT SELECTION AND OCCUPANCY

4. The Developer shall use its good faith efforts during the Term of this Agreement to maintain all the Affordable Units within the Development at full occupancy as set forth in Section 2 hereof. In marketing and renting the Affordable Units, the Developer shall comply with the Tenant Selection Plan and Affirmative Fair Housing Marketing Plan which are incorporated herein by reference with the same force and effect as if set out in this Agreement.

5. Occupancy agreements for Affordable Units shall meet the requirements of the Comprehensive Permit Rules, this Agreement, and any applicable Housing Subsidy Program, and shall contain clauses, among others, wherein each resident of such Affordable Unit:

(a) certifies the accuracy of the statements made in the application and income survey;

(b) agrees that the family income, family composition and other eligibility requirements, shall be deemed substantial and material obligations of his or her occupancy; that he or she will comply promptly with all requests for information with respect thereto from the Developer or the Subsidizing Agency; and that his or her failure or refusal to comply with a request for information with respect thereto shall be deemed a violation of a substantial obligation of his or her occupancy; and

(c) agrees that at such time as the Developer or the Subsidizing Agency may direct, he or she will furnish to the Developer certification of then current family income, with such documentation as the Subsidizing Agency shall reasonably require; and agrees to such charges as the Subsidizing Agency has previously approved for any facilities and/or services which may be furnished by the Developer or others to such resident upon his or her request, in addition to the facilities included in the rentals, as amended from time to time pursuant to Section 3 above.

EXPIRATION OF RESTRICTIONS - TENANT PROTECTIONS

6. (a) If, upon the expiration of the Term hereof, the affordability requirements under the Comprehensive Permit shall expire, the Developer shall deliver a written notice to all Low or Moderate or Income Tenants of such expiration (the "Expiration Notice") at the same time that it shall provide such notice to the Subsidizing Agency. The Expiration Notice shall inform all Low or Moderate or Income Tenants of the tenant protections described in this Section 6.

(b) For a period of one year after the date of expiration ("Year 1") (the date of expiration is hereinafter referred to as the "Expiration Date"), the Developer may not increase the rentals payable by any Low or Moderate-Income Tenant on the Expiration Date (a "Protected Low or Moderate-Income Tenant"), except for rental increases which would have been permitted by the terms and provisions of the applicable Housing Subsidy Program if such Expiration Date had not occurred.

(c) For a period of two years after Year 1 ("CPI Index Period"), the rentals for units occupied by Protected Low or Moderate Income Tenants may not be increased more than once annually by the greater of: (i) the consumer price index (applicable to the area in which the Development is located) times the rental rate in effect as of the Expiration Date; or (ii) such higher amount as the Subsidizing Agency shall approve. In no event may the Developer increase rentals for such Affordable Units in excess of any limitations contained in a Housing Subsidy Program which remains in effect after the Expiration Date.

(d) For three (3) years after the CPI Index Period (the "Transition Period"), the Developer shall provide Relocation Assistance, as defined herein, for any Protected Low or Moderate-Income Tenant who voluntarily terminates his or her lease during the Transition Period as a result of rental increases. For the purposes hereof, the term "Relocation Assistance" shall mean reasonable assistance in locating a comparable affordable unit, including the payment

of any broker's fees and the payment of reasonable moving expenses within a thirty (30) mile radius of the Development.

(e) Upon expiration, the Developer agrees to continue to use the form of occupancy agreement for all Protected Low or Moderate-Income Tenants until the expiration of the periods described in (b) and (c), above. Thereafter, the Developer may require that all Protected Low or Moderate-Income Tenants enter into the lease form used for tenants in the market-rental units or a lease substantially in the form published by the National Apartment Association, provided that any new occupancy agreement shall provide the Protected Low or Moderate-Income Tenants with the benefits of subsection (d), above.

(f) The provisions of this Section 6 shall survive the termination of any other provisions of this Agreement as a result of expiration until the expiration of the periods described in subsections (b), (c), and (d), above.

(g) Protected Low or Moderate-Income Tenants shall have a right to enforce the protections provided them in this Section 6.

LIMITED DIVIDENDS; USE OF DEVELOPMENT REVENUES

7. (a) The Developer covenants and agrees that no Distribution Payments may be made to the Developer other than Limited Dividend Distributions. Repayment of developer's fee loaned is treated as a Limited Dividend Distribution and is subject to the limitations set forth herein. Limited Dividend Distributions may be made: (i) on a quarterly basis within the Developer's Fiscal Year; (ii) only once all currently payable amounts as identified in subsection (i) below are paid as evidenced by a certificate provided by an independent accountant certifying that no such obligations are more than thirty (30) days past due and that there are no outstanding material extraordinary obligations incurred outside the ordinary course of business, even if thirty (30) or less days past due; and (iii) only after (x) submission by the Developer of the Audited Annual Limited Dividend Financial Report pursuant to Paragraph 12(b) below and (y) acceptance by the Subsidizing Agency of said report. Except with the prior written authorization of the Subsidizing Agency, Limited Dividend Distributions cannot be derived or made from borrowed funds or from the sale of capital assets.

For the purposes hereof, the term "Distribution Payments" shall mean all amounts paid from Development Revenues (herein called "Development Revenues") which are paid to any partner, manager, member or any other Related Person of the Developer (collectively, the "Developer Parties") as profit, income, or fees or other expenses which are unrelated to the operation of the Development or which are in excess of fees and expenses which would be incurred from persons providing similar services who are not Developer Parties and who provide such services on an arms-length basis.

(b) No Limited Dividend Distributions may be made when: (i) a default or an Event of Default has occurred and is continuing under this Agreement; (ii) there has been failure to comply with the Subsidizing Agency's notice of any reasonable requirement for adequate (as

determined by the Subsidizing Agency using its reasonable discretion) maintenance of the Development in order to continue to provide decent, good quality and safe affordable housing; or (iii) prior to the expiration of the Term hereof, there is outstanding against all or any part of the Development any lien or security interest other than a lien securing the Loan or a lien expressly permitted by the Subsidizing Agency.

(c) Subject to the provisions set forth above, Limited Dividend Distributions may only be made to the Developer from Surplus Cash, provided that no Limited Dividend Distribution for any Fiscal Year may exceed ten percent (10%) of Developer's Equity.

"Surplus Cash", which is a balance sheet calculation, represents the long-term accumulation of working capital from the Development's revenues that is available at the end of any given Fiscal Year to make: (i) Limited Dividend Distributions; (ii) deposits into the Excess Equity Account; and (iii), if necessary, a distribution to the Municipality for the purpose of developing and/or preserving Affordable Housing. The calculation of Surplus Cash is more fully detailed in Part A of the current "M.G.L. Ch. 40B RENTAL DEVELOPMENTS / Instructions for Use of Calculation Tool for Computation of Excess Equity and Limited Dividend Distributions" (as it may be amended, revised or replaced) available from the Subsidizing Agency and which currently is the form to be used in the preparation of the Audited Annual Limited Dividend Financial Report.

(d) For the purposes hereof the initial amount of "Developer's Equity" shall be $_____, subject to adjustment as provided herein. The initial amount of "Developer's Equity" is established at the time of Final Approval based on the Developer's projection pursuant to the Cost Method as defined below. This initial amount shall be adjusted and verified at the time of Cost Certification with respect to the construction of the Development in accordance with the "Inter-Agency 40B Rental Cost Certification Guidance for Owners, Certified Public Accountants and Municipalities" (as it may be amended, revised or replaced) as the greater of the amounts determined by (a) the "Cost Method" or (b) the "Value Method." For purposes hereof the term "Cost Method" is defined as (i) actual cash contributed by the Developer to the Development, including tax credit equity (if applicable) plus (ii) the deferred portion of the maximum allowable developer fee determined in accordance with DHCD policy, provided that any payment of such deferred fee from project cash flow is treated as a Distribution Payment in accordance with Section 7 hereof, plus (iii) the appraised "as-is" market value of the land that exceeds the actual purchase price paid by the Developer for said land, if any. For purposes hereof the term "Value Method" is defined as (i) the as-complete and stabilized appraised market value of the Development, as determined by an independent appraisal commissioned by the Subsidizing Agency in accordance with this Section 7(d), less (ii) the sum of secured debt on the Development plus public equity, whether structured as a grant or loan, as determined by the Subsidizing Agency.

Thereafter, Developer's Equity may be adjusted not more than once in any five year period with the first five - year period commencing with the first Fiscal Year of the Development. Any adjustments shall be made only upon the written request of the Developer. Unless the Developer is otherwise directed by the Subsidizing Agency, the initial appraised market value and any adjustment thereto shall be based upon an appraisal commissioned by (and

naming as a client) the Subsidizing Agency and prepared by an independent and qualified appraiser prequalified by, and randomly assigned to the Development by, the Subsidizing Agency. The appraiser shall submit a Self-Contained Appraisal Report to the Subsidizing Agency in accordance with the Uniform Standards of Professional Appraisal Practice (USPAP). The costs of such appraisal shall be borne by the Developer. Such appraisal shall use assumptions subject to the reasonable approval of the Subsidizing Agency.

Upon completion of an appraisal as provided above, the Developer's Equity shall be adjusted to equal the appraised value of the Development as determined by the appraisal less the unpaid principal amount of the sum of secured debt on the Development plus public equity, whether structured as a grant or loan determined as of the date of the appraisal. Such new Developer's Equity shall be the Developer's Equity commencing with the first day of the Fiscal Year following the date of such appraisal and remain in effect until a subsequent adjustment.

A sale or refinancing of the Development shall not result in a new evaluation of Developer's Equity, except as provided above.

(e) In the event that the amount available for Limited Dividend Distributions in a given Fiscal Year exceeds the Limited Dividend Distribution permitted for such Fiscal Year pursuant to Section 7(c) above, such excess shall be deposited and administered in accordance with Section 7(f) below. Amounts deposited into the Excess Equity Account may, subject to subsections (a) through (c) above, and pursuant to the Subsidizing Agency's Limited Dividend Policy, be distributed by the Lender (or the Subsidizing Agency, as applicable) to the Developer in amounts equal to the difference between the amount by which Limited Dividend Distributions actually made in any prior Fiscal Year were less than the amount permitted to be distributed under Section 7(c) hereof for such Fiscal Year. In the event that Surplus Cash is insufficient to allow the Developer to take its Limited Dividend Distribution as permitted herein and there are funds in the Excess Equity Account, Lender (or the Subsidizing Agency, as applicable) may distribute to the Developer an amount equal to the unpaid portion of the permitted Limited Dividend Distribution for such Fiscal Year, provided that, in no event shall the amount so distributed exceed the amount available in the Excess Equity Account.

Notwithstanding the foregoing, in the event that the amount available for Limited Dividend Distributions in a given Fiscal Year exceeds the Limited Dividend Distribution permitted for such Fiscal Year pursuant to Section 7(c) above, the amount of any such excess may be applied to pay, with simple interest, the amount by which Limited Dividend Distributions made in any of the preceding Fiscal Years were less than the amount permitted to be paid under Section 7(c) hereof for such Fiscal Years, subject to the provisions of subsections (a) through (c) above.

(f) Any amounts available for a Limited Dividend Distribution which may not be distributed in any year pursuant to the provisions of Section 7(c) above ("Excess Equity"), shall be deposited in the Excess Equity Account with the Lender (or if the Loan is paid off, with the Subsidizing Agency). No distributions may be made to the Developer from the Excess Equity Account except those permitted pursuant to Section 7(e) and (f) hereof. Upon the occurrence of an Event of Default under this Agreement or the Mortgage, the Lender (or the Subsidizing

Agency, as applicable) may apply any amounts in the Excess Equity Account to the payment of all or any portion of the debt secured by the Mortgage.

Upon the Developer's written request, amounts may also be withdrawn from the Excess Equity Account by the Lender (or the Subsidizing Agency, as applicable) during the Term hereof and applied for any purpose described in Section 7(i) hereof or for any purpose (i) that provides a direct and material benefit to Low or Moderate Tenants; (ii) that reduces rentals to Low or Moderate Tenants; (iii) that extends the affordability of the Development; or (iv) that provides relocation and transitional assistance to Low or Moderate Tenants as described in Section 6 hereof.

To the extent that the Term of this Agreement extends beyond satisfaction in full of the debt secured by the Mortgage, the Subsidizing Agency may, in its sole discretion, during the remaining Term, make amounts available from the Excess Equity Account to: (a) pay all or a portion of the annual monitoring fee that remains outstanding thirty (30) days after its due date, and/or (b) provide relocation and transitional assistance to tenants of Affordable Units.

Upon the Developer's written request, amounts may also be withdrawn from the Excess Equity Account during the Term hereof and applied for the following purposes: (i) payment of or adequate reserve for all sums due or currently required to be paid under the terms of the Mortgage; (ii) payment of or adequate reserve for all reasonable and necessary operating expenses of the Development as reasonably determined by the Developer; (iii) deposit of all amounts as may be deposited in a reserve fund for capital replacements reasonably determined by the Developer to be sufficient to meet anticipated capital needs of the Development which may be held by Lender or a lending institution reasonably acceptable to the Subsidizing Agency and which reserves shall be used for capital expenditures for the Development reasonably determined to be necessary by the Developer; (iv) payments of operating expense loans made by the partners, managers or members of the Developer for Development expenses, provided that the Developer shall have obtained prior written approval for such loans from the applicable Lender (or, if there is no mortgage, or after discharge of the Mortgage, from the Subsidizing Agency) and shall have supplied the applicable Lender (or the Subsidizing Agency) with such evidence as the applicable Lender (or the Subsidizing Agency, as applicable) may reasonably request as to the application of the proceeds of such operating expense loans to the Development; or (v) for any other purposes, subject to a determination by the Lender (or, if there is no Mortgage, or the Mortgage is discharged during the Term of this Agreement, the reasonable determination by the Subsidizing Agency) that the expenditure is necessary to address the Development's physical or financial needs and that no other Development reserve funds are available to address such needs. Notwithstanding the foregoing, payment of the items set forth in clauses (i), (ii) and (iv) above by the Developer shall be subject to the prior written approval of the Subsidizing Agency, which approval shall not be unreasonably withheld or delayed; it being agreed by the Subsidizing Agency that if the Developer can demonstrate that its proposed operating expenditures and reserves are substantially consistent with those made for comparable developments within the Commonwealth of Massachusetts, the Subsidizing Agency shall approve such request. Further, in no event shall such review or approval be required by the Subsidizing Agency to the extent any such capital expenditures or reserves are mandated by Lender.

In any event, cash available for distribution in any year in excess of 20% of Developer's Equity, subject to payment of a Limited Dividend Distribution pursuant to Section 7(c) hereof, shall be distributed to the Municipality within fifteen (15) business days of notice and demand given by the Subsidizing Agency as provided herein, or as otherwise directed by DHCD. Upon the expiration of the Limited Dividend Term (as defined in Section 23(b) hereof), any balance remaining in the Excess Equity Account shall (i) be contributed by the Developer to the replacement reserve held for the Development, if such contribution is deemed by the Subsidizing Agency (in its reasonable discretion) to be necessary, (ii) be distributed to the Subsidizing Agency for the purpose of developing and/or preserving affordable housing, or (iii) be distributed as otherwise directed by DHCD.

(g) All funds in the Excess Equity Account shall be considered additional security for the performance of obligations of the Developer under the Mortgage and this Agreement and the Developer hereby pledges and grants to the Lender (or the Subsidizing Agency, as applicable) a continuing security interest in said funds. Furthermore, the Developer recognizes and agrees that (i) possession of said funds by the Lender (or the Subsidizing Agency, as applicable) constitutes a bona fide pledge of said funds to the Lender (or the Subsidizing Agency, as applicable) for security purposes, (ii) to the extent required by applicable law, this Agreement, in combination, as necessary, with other documents referred to herein, constitutes a valid and binding security agreement, and (iii) the validity and effectiveness of said pledge will not be compromised if said funds are held in a bank or other financial institution. The Developer further acknowledges and agrees that, notwithstanding any nomenclature or title given to the Excess Equity Account by the bank or other financial institution at which the Excess Equity Account is held, or the fact that the Developer's tax identification number is used with respect to the Excess Equity Account, the Lender (or the Subsidizing Agency, as applicable), and not the Developer, shall be the customer of the bank or other financial institution holding the Excess Equity Account; such bank or other financial institution shall comply with instructions originated by the Lender (or the Subsidizing Agency, as applicable) directing the disposition of funds in the Excess Equity Account, without further consent of the Developer; and the Lender (or the Subsidizing Agency, as applicable), and not the Developer, shall have the exclusive right to withdraw funds from the Excess Equity Account.

(h) Payment of fees and profits from capital sources for the initial development of the Development to the Developer and/or the Developer's related party consultants, partners and legal or beneficial owners of the Development shall, unless otherwise limited by DHCD, be limited to no more than ten percent (10%) of Total Development Costs, net of (i) such fees and profits, and (ii) any working capital or reserves intended for operation of the Development and approved by the Subsidizing Agency. Such limited payment of fees and profits shall not include fees or profits paid to any other party, whether or not related to the Developer, to the extent the same are arm's length and commercially reasonable in light of the size and complexity of the Development. The Developer shall comply with the requirements of Section 21 below regarding Cost Certification. In accordance with the requirements of 760 CMR 56.04(8)(e), in the event that the Subsidizing Agency determines, following examination of the Cost Certification submitted by the Developer pursuant to Section 21 below, that amounts were paid or distributed by the Developer in excess of the above limitations (the "Excess Distributions"), the Developer

shall pay over in full such Excess Distributions to the Municipality within fifteen (15) business days of notice and demand given by the Subsidizing Agency as provided herein.

For the purposes hereof, the term "Total Development Costs" shall mean the total of all costs associated with acquisition, construction (including construction contingency), and general development (such as architectural, engineering, legal, and financing fees, insurance, real estate taxes and loan interest) for the Development. Total Development Costs include (i) developer overhead and developer fees, and (ii) any capitalized reserves intended for operation of the Development and approved by the Subsidizing Agency as being specifically excluded from the calculation of fees and profits payable from capital sources for the initial development of the Development.

(i) The Developer shall apply Development Revenues in the following order of priority: (x) payment of or adequate reserve for all sums due or currently required to be paid under the terms of the Loan; and (y) payment of or adequate reserve for all reasonable and necessary expenses of the Development as identified below. With respect to the application of Development Revenues as described above, the Developer agrees as follows:

(i) Payment for services, supplies, or materials shall not exceed the amount ordinarily and reasonably paid for such services, supplies, or materials in the area where the services are rendered or the supplies or materials furnished;

(ii) Reasonable and necessary expenses which may be payable pursuant to subsection (i), above, shall be directly related to the operation, maintenance or management of the Development; and

(iii) Without the Subsidizing Agency's prior written consent, the Developer may not assign, transfer, create a security interest in, dispose of, or encumber any Development Revenues except as expressly permitted herein.

(j) Notwithstanding anything to the contrary contained in this Agreement, a distribution resulting from the proceeds of a sale or refinancing of the Development shall not be regulated by this Agreement. A sale or refinancing shall not result in a new evaluation of Developer's Equity.

MANAGEMENT OF THE DEVELOPMENT

8. The Developer shall maintain the Development in good physical condition in accordance with the Subsidizing Agency's requirements and standards and the requirements and standards of the Mortgage and any applicable Housing Subsidy Program. The Developer shall provide for the management of the Development in a manner that is consistent with accepted practices and industry standards for the management of multi-family market rate rental housing. Notwithstanding the foregoing, the Subsidizing Agency shall have no obligation hereunder, expressed or implied, to monitor or enforce any such standards or requirements and, further, the Subsidizing Agency has not reviewed nor approved the Plans and Specifications for compliance with federal, state or local codes or other laws.

CHANGE IN COMPOSITION OF DEVELOPER ENTITY; RESTRICTIONS ON TRANSFERS

9. Prior to Substantial Completion, the following actions, without limitation, shall be subject to the Subsidizing Agency's prior written approval (which approval shall not be unreasonably withheld, conditioned or delayed):

(a) any change, substitution or withdrawal of any general partner, manager, or agent of the Developer; or

(b) the conveyance, assignment, transfer, or relinquishment of twenty-five percent (25%) or more of the Beneficial Interests (herein defined) in the Developer (except for such a conveyance, assignment, transfer or relinquishment among holders of Beneficial Interests as of the date of this Agreement).

For purposes hereof, the term "Beneficial Interest" shall mean: (i) with respect to a partnership, any limited partnership interests or other rights to receive income, losses, or a return on equity contributions made to such partnership; (ii) with respect to a limited liability company, any interests as a member of such company or other rights to receive income, losses, or a return on equity contributions made to such company; or (iii) with respect to a company or corporation, any interests as an officer, board member or stockholder of such company or corporation to receive income, losses, or a return on equity contributions made to such company or corporation;

(c) the sale, conveyance, transfer, ground lease, or exchange of the Developer's interest in the Development or any part of the Development.

Prior to any transfer of ownership of the Development or any portion thereof or interest therein, the Developer agrees to secure from the transferee a written agreement stating that the transferee will assume in full the Developer's obligations and duties under this Agreement.

10. The Developer shall provide the Subsidizing Agency with thirty (30) days' prior written notice of any pledge, assignment or mortgage of the Development, whether direct or indirect, and also, after Substantial Completion, of any sale, conveyance, transfer, ground lease or exchange of the Developer's interest in the Development or any part of the Development. As in Section 9 above, prior to any transfer of ownership of the Development or any portion thereof or interest therein, the Developer agrees to secure from the transferee a written agreement stating that the transferee will assume in full the Developer's obligations and duties under this Agreement.

BOOKS AND RECORDS

11. All records, accounts, books, tenant lists, applications, waiting lists, documents, and contracts relating to the Development shall at all times be kept separate and identifiable from any other business of the Developer which is unrelated to the Development, and shall be maintained, as required by applicable regulations and/or guidelines issued by DHCD and/or the Subsidizing Agency from time to time, in a reasonable condition for proper audit and subject to examination during business hours by representatives of the Subsidizing Agency or DHCD. Failure to keep such books and accounts and/or make them available to the Subsidizing Agency or DHCD will be an Event of Default hereunder.

ANNUAL FINANCIAL REPORT

12. (a) Within ninety (90) days following the end of each Fiscal Year of the Development, the Developer shall furnish the Subsidizing Agency with a complete annual financial report for the Development based upon an examination of the books and records of the Developer containing a detailed, itemized statement of all income and expenditures, prepared and certified by a certified public accountant in accordance with the reasonable requirements of the Subsidizing Agency which include: (i) financial statements submitted in a format acceptable to the Subsidizing Agency; (ii) the financial report on an accrual basis and in conformity with generally accepted accounting principles applied on a consistent basis; and (iii) amounts available for distribution under Section 7 above. A duly authorized agent of the Developer must approve such submission in writing. The provisions of this paragraph may be waived or modified by the Subsidizing Agency.

(b) In addition to the financial information required to be furnished by the Developer to the Subsidizing Agency pursuant to Section 12(a) above, the Developer shall furnish to the Subsidizing Agency, within ninety (90) days of the end of its Fiscal Year, an Audited Annual Limited Dividend Financial Report (including a certificate from the independent certified public accountant (the "CPA") who prepared the Developer's audited financial statements) in the form then required by the Subsidizing Agency. The Subsidizing Agency's agreement to waive or modify the requirement of an Audited Annual Limited Dividend Financial Report for a given Fiscal Year shall not be deemed to constitute a waiver or modification of the requirement of an Audited Annual Limited Dividend Financial Report for any subsequent Fiscal Year. Should the Developer fail in any given year to comply with its obligations under this subparagraph, the Developer acknowledges and agrees that such failure constitutes a knowing waiver and relinquishment of any Limited Dividend Distributions to which it might otherwise be entitled for such Fiscal Year pursuant to Sections 7(c) and/or 7(e) above.

(c) Such Audited Annual Limited Dividend Financial Report shall be accompanied by a Certificate of Developer (in the form as then reasonably required by the Subsidizing Agency) certifying to the Developer's best knowledge and belief, under the pains and penalties of perjury, as to matters such as, without limitation, the fact that (i) the Developer has made available all necessary financial records and related data to the CPA who prepared the Audited Annual Limited Dividend Financial Report, (ii) there are no material transactions related to the Development that have not been properly recorded in the accounting records underlying the Audited Annual Limited Dividend Financial Report, (iii) the Developer has no knowledge of any fraud or suspected fraud affecting the entity involving management, subcontractors, employees who have

significant roles in internal control, or others where the fraud could have a material effect on the Audited Annual Limited Dividend Financial Report and has no knowledge of any allegations of fraud or suspected fraud affecting the Developer or the Development received in communications from employees, former employees, subcontractors, regulators, or others, and (iv) the Developer has reviewed the information presented in the Audited Annual Limited Dividend Financial Report and believes that such determination is an appropriate representation of the Development.

(d) The Subsidizing Agency shall have sixty (60) days after the delivery of the Audited Annual Limited Dividend Financial Report to accept it, to make its objections in writing to the Developer and the Developer's CPA, or to request from the Developer and/or CPA additional information regarding it. If the Subsidizing Agency does not object to the Audited Annual Limited Dividend Financial Report or request additional information with respect to it, the Audited Annual Limited Dividend Financial Report shall have been deemed accepted by the Subsidizing Agency. If the Subsidizing Agency shall request additional information, then the Developer shall provide the Subsidizing Agency with such additional information as promptly as possible and the Subsidizing Agency shall have an additional thirty (30) days thereafter to review such information and either accept or raise objections to such Audited Annual Limited Dividend Financial Report. If no such objections are made within such thirty day (30) period, the Audited Annual Limited Dividend Financial Report shall be deemed accepted by the Subsidizing Agency.

To the extent that the Subsidizing Agency shall raise any objections to such Audited Annual Limited Dividend Financial Report as provided above, then the Developer and the Subsidizing Agency shall consult in good faith and seek to resolve such objections within an additional thirty (30) day period. If any objections are not resolved during such period, then the Subsidizing Agency may enforce the provisions under this Section 12 by the exercise of any remedies it may have under this Agreement.

(e) If upon the acceptance of an Audited Annual Limited Dividend Financial Report as provided above, such Audited Annual Limited Dividend Financial Report shall show that the aggregate Distribution Payments to the Developer during the applicable Fiscal Year exceed the allowable Limited Dividend Distribution for the Developer, then upon thirty (30) days written notice from the Subsidizing Agency, the Developer shall cause such excess to be deposited in the Excess Equity Account from sources other than Development Revenues to the extent not otherwise required by the Lender to remain with the Development.

If such Audited Annual Limited Dividend Financial Report as accepted shall show that there are excess Development Revenues for the Developer which have not been distributed ("Excess Development Revenues"), such amounts shall be applied as provided in Section 7(e) above within thirty (30) days after the acceptance of the Audited Annual Limited Dividend Financial Report as set forth in subsection (d) above.

FINANCIAL STATEMENTS AND OCCUPANCY REPORTS

13. At the request of the Subsidizing Agency, the Developer shall furnish financial statements and occupancy reports and shall give specific answers to questions upon which information is reasonably desired from time to time relative to the ownership and operation of the Development. The Developer covenants and agrees to secure and maintain on file for inspection and copying by the Subsidizing Agency such information, reports and certifications as the Subsidizing Agency may reasonably require in writing in order to insure that the restrictions contained herein are being complied with. The Developer further covenants and agrees to submit to the Subsidizing Agency annually, or more frequently if required in writing by the Subsidizing Agency, reports detailing such facts as the Subsidizing Agency reasonably determines are sufficient to establish compliance with the restrictions contained hereunder, copies of leases for all Affordable Units, and a certification by the Developer that, to the best of its knowledge, the restrictions contained herein are being complied with. The Developer further covenants and agrees promptly to notify the Subsidizing Agency if the Developer discovers noncompliance with any restrictions hereunder.

NO CHANGE OF DEVELOPMENT'S USE

14. Except to the extent permitted by the Comprehensive Permit, as it may be amended pursuant to the Comprehensive Permit Rules, the Developer shall not change the type or number of Affordable Units without prior written approval of the Subsidizing Agency and an amendment to this Agreement. Except to the extent permitted by applicable zoning requirements then in effect, the Developer shall not permit the use of the dwelling accommodations of the Development for any purpose except residences and any other use permitted by the Comprehensive Permit.

NO DISCRIMINATION

15. (a) There shall be no discrimination upon the basis of race, color, disability, religion, sex, familial status, sexual orientation, national origin, genetic information, ancestry, children, marital status, public assistance recipiency or any other basis prohibited by law in the lease, use, or occupancy of the Development (provided that if the Development qualifies as elderly housing under applicable state and federal law, occupancy may be restricted to the elderly in accordance with said laws) or in connection with the employment or application for employment of persons for the construction, operation and management of the Development.

(b) There shall be full compliance with the provisions of all state or local laws prohibiting discrimination in housing on the basis of race, color, disability, religion, sex, familial status, sexual orientation, national origin, genetic information, ancestry, children, marital status, public assistance recipiency or any other basis prohibited by law, and providing for nondiscrimination and equal opportunity in housing, including without limitation in the implementation of any local preference established under the Comprehensive Permit. Failure or refusal to comply with any such provisions shall be a proper basis for the Subsidizing Agency to

take any corrective action it may deem necessary including, without limitation, referral to DHCD for enforcement.

DEFAULTS; REMEDIES

16. (a) If any default, violation, or breach of any provision of this Agreement is not cured to the satisfaction of the Subsidizing Agency within thirty (30) days after the giving of notice to the Developer as provided herein, then at the Subsidizing Agency's option, and without further notice, the Subsidizing Agency may either terminate this Agreement, or the Subsidizing Agency may apply to any state or federal court for specific performance of this Agreement, or the Subsidizing Agency may exercise any other remedy at law or in equity or take any other action as may be necessary or desirable to correct noncompliance with this Agreement. No party other than the Subsidizing Agency or its designee shall have the right to enforce the Developer's compliance with the requirements of this Agreement. The thirty (30) day cure period set forth in this paragraph shall be extended for such period of time as may be necessary to cure a non-monetary default so long as the Developer is diligently prosecuting such a cure.

(b) If the Subsidizing Agency elects to terminate this Agreement as the result of an uncured breach, violation, or default hereof, then whether the Affordable Units continue to be included in the Subsidized Housing Inventory maintained by DHCD for purposes of the Act shall from the date of such termination be determined solely by DHCD rules and regulations then in effect.

(c) In the event the Subsidizing Agency or its designee brings an action to enforce this Agreement, unless the Developer prevails in such action the Developer shall pay all fees and expenses (including legal fees) of the Subsidizing Agency and/or its designee. In such event, the Subsidizing Agency and/or its designee shall be entitled to seek recovery of its respective fees and expenses incurred in enforcing this Agreement against the Developer and to assert a lien on the Development, junior to the lien securing the Loan, to secure payment by the Developer of such fees and expenses. The Subsidizing Agency and its designee may perfect a lien on the Development by recording/filing in the Registry one or more certificates setting forth the amount of the costs and expenses due and owing.

(d) The Developer hereby grants to the Subsidizing Agency or its designee the right to enter upon the Development for the purpose of enforcing the terms of this Agreement, or of taking all actions with respect to the Development which the Subsidizing Agency may determine to be necessary or appropriate to prevent, remedy or abate any violation of this Agreement.

MONITORING AGENT; FEES; SUCCESSOR SUBSIDIZING AGENCY

17. The Subsidizing Agency intends to monitor the Developer's compliance with the requirements of this Agreement. The Developer hereby agrees to pay the Subsidizing Agency fees as partial compensation for its services hereunder, as set forth on Appendix B hereto, initially in the amounts and on the dates therein provided, and hereby grants to the Subsidizing

Agency a security interest in Development Revenues as security for the payment of such fees subject to the lien of the Mortgage and this Agreement shall constitute a security agreement with respect thereto.

18. The Subsidizing Agency shall have the right to engage a third party (the "Monitoring Agent") to monitor compliance with all or a portion of the ongoing requirements of this Agreement. The Subsidizing Agency shall notify the Developer and the Municipality in the event the Subsidizing Agency engages a Monitoring Agent, and in such event (i) as partial compensation for providing these services, the Developer hereby agrees to pay to the Monitoring Agent an annual monitoring fee in an amount reasonably determined by the Subsidizing Agency, payable within thirty (30) days of the end of each Fiscal Year of the Developer during the Term of this Agreement, but not in excess of the amounts as shown on Appendix B hereto and any fees payable under Section 17 hereof shall be net of such fees payable to a Monitoring Agent; and (ii) the Developer hereby agrees that the Monitoring Agent shall have the same rights, and be owed the same duties, as the Subsidizing Agency under this Agreement, and shall act on behalf of the Subsidizing Agency hereunder, to the extent that the Subsidizing Agency delegates its rights and duties by written agreement with the Monitoring Agent. The Monitoring Agent shall apply and adhere to the applicable standards, guidance and policies of DHCD relating to the administrative responsibilities of subsidizing agencies where available, and otherwise shall apply and adhere to the standards and practices of the Subsidizing Agency where applicable.

19. The Subsidizing Agency may resign from its duties hereunder upon ninety (90) days prior written notice to DHCD, the Developer, and the Municipality. In such event, DHCD may appoint a Successor Subsidizing Agency hereunder. If DHCD fails to appoint a Successor Subsidizing Agency, the Subsidizing Agency shall identify a Successor Subsidizing Agency. The Successor Subsidizing Agency shall succeed to all the duties and rights of the Subsidizing Agency hereunder and the Subsidizing Agency shall turn over all amounts and security held by it hereunder to the Successor Subsidizing Agency.

CONSTRUCTION AND FINAL COST CERTIFICATION

20. The Developer shall provide to the Subsidizing Agency evidence that the final plans and specifications for the Development comply with the requirements of the Comprehensive Permit and that the Development was built substantially in accordance with such plans and specifications. Upon Substantial Completion, the Developer shall provide the Subsidizing Agency with a certificate of the architect for the Development in the form of a "Certificate of Substantial Completion" (AIA Form G704) or such other form of completion certificate acceptable to the Subsidizing Agency.

As used herein, the term "Substantial Completion" shall mean the time when the construction of the Development is sufficiently complete so that all of the units may be occupied and amenities may be used for their intended purpose, except for designated punch list items and seasonal work which does not interfere with the residential use of the Development.

21. Within ninety (90) days after Substantial Completion, the Developer shall provide the Subsidizing Agency with its Cost Certification for the Development. The Subsidizing Agency may allow additional time for submission of the Cost Certification if significant issues are determined to exist which prevent the timely submission of the Cost Certification, and may in certain circumstances (such as a halt in construction for a significant period of time) require submission of an interim Cost Certification within ninety (90) days of written notice to the Developer.

For the purposes hereof the term "Cost Certification" shall mean the Developer's documentation which will enable determination by the Subsidizing Agency of the aggregate amount of all Allowable Development Costs as a result of its review and approval of: (i) an itemized statement of Total Development Costs together with a statement of gross income from the Development received by the Developer to date, all in the format provided in the Subsidizing Agency's Cost Examination Program, which Cost Certification must be examined (the "Cost Examination") in accordance with the attestation standards of the American Institute of Certified Public Accountants (AICPA) by an independent certified public accountant (CPA) and (ii) an owner's certificate, executed by the Developer under pains and penalties of perjury, which identifies the amount of the Construction Contract, the amount of any approved Change Orders, including a listing of such Change Orders, and any amounts due to subcontractors and/or suppliers. "Allowable Development Costs" shall mean any hard costs or soft costs paid or incurred with respect to Development as determined by and in accordance with the Guidelines.

22. In order to ensure that the Developer shall complete the Cost Certification as and when required by Section 21 hereof and, if applicable, pay any Excess Distributions to the Municipality, the Developer has provided the Subsidizing Agency with adequate financial surety (the "Surety") provided through a letter of credit, bond or cash payment in the amounts and in accordance with the Comprehensive Permit Rules and in a form approved by the Subsidizing Agency. If the Subsidizing Agency shall determine that the Developer has failed in its obligation to provide Cost Certification as and when described above or to pay over to the Municipality any Excess Distributions, the Subsidizing Agency may draw on such Surety in order to pay the costs of completing Cost Certification and/or paying such Excess Distribution amounts due plus reasonable attorneys fees and collections costs.

TERM

23. (a) This Agreement shall bind, and the benefits shall inure to, respectively, the Developer and its successors and assigns, and the Subsidizing Agency and its successors and assigns, until the date which is thirty (30) years from the date hereof (the "Term"). Upon expiration of the Term, this Agreement and the rights and obligations of the Subsidizing Agency hereunder shall automatically terminate without the need of either party executing any additional document. Notwithstanding the foregoing, this Agreement may be released by the Subsidizing Agency if the Development is financed by a state or federal agency and, in connection with such financing, a regulatory agreement acceptable to the Subsidizing Agency is recorded in the Registry. The rights and obligations of the Developer and of the Subsidizing Agency under this Agreement shall continue for the Term, regardless of whether the loan from the NEF Lender is

still outstanding. Prior to the expiration of the Term, the Developer shall enter into a use agreement with the Municipality, or as otherwise required by the Comprehensive Permit Rules, ensuring that the Development will comply with the continued affordability requirements applicable to the Development.

(b) Notwithstanding subsection (a) above, the provisions of Section 7 herein shall bind, and the benefits shall inure to, respectively, Developer and its successors and assigns, and the Subsidizing Agency and its successors and assigns, and the Municipality and its successors and assigns, until the date which is the latter of (i) the expiration of the term of the Loan or (ii) fifteen (15) years from the date of Substantial Completion (the "Limited Dividend Term").

INDEMNIFICATION/LIMITATION ON LIABILITY

24. The Developer, for itself and its successors and assigns, agrees to indemnify and hold harmless the Subsidizing Agency and any Monitoring Agent against all damages, costs and liabilities, including reasonable attorney's fees, asserted against the Subsidizing Agency or the Monitoring Agent by reason of its relationship to the Development under this Agreement and not involving the Subsidizing Agency or the Monitoring Agent acting in bad faith or with gross negligence.

25. The Subsidizing Agency shall not be held liable for any action taken or omitted under this Agreement so long as it shall have acted in good faith and without gross negligence.

26. Notwithstanding anything in this Agreement to the contrary, no partner, manager, or member of the Developer and no officer, director, shareholder, trustee, member, manager, agent, or employee of the Developer or of any partner, manager, or member thereof shall have any personal liability for the payment of any sum of money that is, or may become, payable by the Developer under or pursuant to this Agreement or for the performance of any obligation by the Developer arising pursuant to this Agreement, and the Subsidizing Agency shall look only to the Developer's interest in the Development for such payment or performance.

Nothing herein shall preclude the Subsidizing Agency from asserting such claims as it may have at law or in equity against any partner, manager or member of the Developer or any officer, director, shareholder, trustee, member, manager, agent, or employee of the Developer or of such partner, manager or member for any loss or damage the Subsidizing Agency actually suffers as a result of any of the following:

(i) a willful breach by such person of the provisions limiting payments or distributions to partners, members, managers, or affiliates as set forth in this Agreement; or

(ii) intentional fraud committed by such person; or

(iii) a willful breach by such person of a warranty contained in this Agreement or a false representation of a material fact made by such person with respect to itself, the

Developer or the Development which was known by such person to be false when made; or

(iv) a false representation knowingly made by such person that it has legal capacity and is authorized to sign this Agreement on behalf of the entity on whose behalf such individual has signed.

Nothing contained in the provisions of this Section 26 or elsewhere shall limit: (i) the right of the Subsidizing Agency to obtain injunctive relief or to pursue equitable remedies under this Agreement, excluding only any injunctive relief ordering payment of obligations by any person or entity for which personal liability does not otherwise exist; or (ii) the liability of any attorney, law firm, architect, accountant or other professional who or which renders or provides any written opinion or certificate to the Subsidizing Agency in connection with the Development even though such person or entity may be an agent or employee of the Developer or of any partner, manager, or member thereof.

MINIMUM SUBSIDY REQUIREMENTS

27. To ensure that the minimum subsidy requirements of the Comprehensive Permit Rules are satisfied, the Developer shall provide to the Subsidizing Agency a certification from the Lender (which certification may, in the case of the Construction Loan, be combined with the certification required pursuant to Section 2(b) hereof) that the Lender is an FHLBB member bank and shall not transfer all or any portion of its interest in the Loan (including participations or sale of servicing rights, but not including foreclosure of its mortgage) or consent to a refinancing of the Loan (which the Developer hereby agrees not to seek) during the first five (5) years of the Loan without the prior written approval of the Subsidizing Agency.

CASUALTY

28. Subject to the rights of the Lender, the Developer agrees that if the Development, or any part thereof, shall be damaged or destroyed or shall be condemned or acquired for public use, the Developer shall have the right, but not the obligation, to repair and restore the Development to substantially the same condition as existed prior to the event causing such damage or destruction, or to relieve the condemnation, and thereafter to operate the Development in accordance with the terms of this Agreement. Notwithstanding the foregoing, in the event of a casualty in which some but not all of the buildings in the Development are destroyed, if such destroyed buildings are not restored by the Developer then the Developer shall be required to maintain the same percentage of Affordable Units of the total number of units in the Development.

DEVELOPER'S REPRESENTATIONS, COVENANTS AND WARRANTIES

29. The Developer hereby represents, covenants and warrants as follows:

(a) The Developer (i) is a _____ duly organized under, and is qualified to transact business under, the laws of the Commonwealth of Massachusetts, (ii) has the power and authority to own its properties and assets and to carry on its business as now being conducted, and (iii) has the full legal right, power and authority to execute and deliver this Agreement.

(b) The execution and performance of this Agreement by the Developer (i) will not violate or, as applicable, has not violated any provision of law, rule or regulation, or any order of any court or other agency or governmental body, and (ii) will not violate or, as applicable, has not violated any provision of any indenture, agreement, mortgage, mortgage note, or other instrument to which the Developer is a party or by which it or the Development is bound, and (iii) will not result in the creation or imposition of any prohibited encumbrance of any nature.

(c) The Developer will, at the time of execution and delivery of this Agreement, have good and marketable title to the premises constituting the Development free and clear of any lien or encumbrance (subject to encumbrances created pursuant to this Agreement, and any other documents executed in connection with the loan from the NEF Lender, or other encumbrances permitted by the Subsidizing Agency).

(d) There is no action, suit or proceeding at law or in equity or by or before any governmental instrumentality or other agency now pending, or, to the knowledge of the Developer, threatened against or affecting it, or any of its properties or rights, which, if adversely determined, would materially impair its right to carry on business substantially as now conducted (and as now contemplated by this Agreement) or would materially adversely affect its financial condition.

(e) **[for use when the Developer is nominee trust/otherwise delete] [**(i) The undersigned Trustee(s) are the sole Trustee(s) of said Trust, duly appointed in accordance with the terms of the Trust; (ii) said Trust has not been altered, amended, revoked, or terminated, and is presently in full force and effect as recorded; (iii) pursuant to the powers granted under said Trust, the Trustee(s) have the power and authority to execute this Agreement, transfer real estate, and to execute and deliver deeds and related closing documents of any or all trust property; (iv) if under said Trust the consent of beneficiaries is required to authorize the Trustee(s) to execute this Agreement, that written consent of all beneficiaries has been obtained; and (v) no beneficiary is a minor, a corporation selling all or substantially all of its assets or a personal representative of an estate subject to estate tax liens or is now deceased or under any legal disability.**]**

MISCELLANEOUS CONTRACT PROVISIONS

30. This Agreement may not be modified or amended except with the written consent of the Subsidizing Agency or its successors and assigns and Developer or its successors and assigns. The Developer hereby agrees to make such modifications to this Agreement as may be required by DHCD to implement the Comprehensive Permit Rules, as amended from time to time.

31. The Developer warrants that it has not, and will not, execute any other agreement with provisions contradictory to, or in opposition to, the provisions hereof, and that, in any event, the requirements of this Agreement are paramount and controlling as to the rights and obligations set forth and supersede any other requirements in conflict therewith.

32. The invalidity of any clause, part or provision of this Agreement shall not affect the validity of the remaining portions thereof.

33. Any titles or captions contained in this Agreement are for reference only and shall not be deemed a part of this Agreement or play any role in the construction or interpretation hereof.

34. Words of the masculine gender shall be deemed and construed to include correlative words of the feminine and neuter genders. Unless the context shall otherwise indicate, words importing the singular number shall include the plural number and vice versa, and words importing persons shall include corporations and associations, including public bodies, as well as natural persons.

35. The terms and conditions of this Agreement have been freely accepted by the parties. The provisions and restrictions contained herein exist to further the mutual purposes and goals of DHCD, the Subsidizing Agency, the Municipality and the Developer set forth herein to create and preserve access to land and to decent and affordable rental housing opportunities for eligible families who are often denied such opportunities for lack of financial resources.

NOTICES

36. Any notice or other communication in connection with this Agreement shall be in writing and (i) deposited in the United States mail, postage prepaid, by registered or certified mail, or (ii) hand delivered by any commercially recognized courier service or overnight delivery service, such as Federal Express, or (iii) sent by facsimile transmission if a fax number is designated below, addressed as follows:

If to the Developer:

_____
_____
_____

with copies by regular mail or such hand delivery
[or facsimile transmission] to:

_____
_____
_____

If to the Subsidizing Agency:

Massachusetts Housing Finance Agency
One Beacon Street
Boston, MA 02108
Attention: Director of Comprehensive Permit Programs
Fax: 617-854-1029

Any such addressee may change its address for such notices to any other address in the United States as such addressee shall have specified by written notice given as set forth above.

A notice shall be deemed to have been given, delivered and received upon the earliest of: (i) if sent by certified or registered mail, on the date of actual receipt (or tender of delivery and refusal thereof) as evidenced by the return receipt; or (ii) if hand delivered by such courier or overnight delivery service, when so delivered or tendered for delivery during customary business hours on a business day at the specified address; or (iii) if facsimile transmission is a permitted means of giving notice, upon receipt as evidenced by confirmation. Notice shall not be deemed to be defective with respect to the recipient thereof for failure of receipt by any other party.

RECORDING

37. Upon execution, the Developer shall immediately cause this Agreement and any amendments hereto to be recorded or filed with the Registry, and the Developer shall pay all fees and charges incurred in connection therewith. Upon recording or filing, as applicable, the Developer shall immediately transmit to the Subsidizing Agency and the Monitoring Agent, if any, evidence of such recording or filing including the date and instrument, book and page or registration number of the Agreement.

GOVERNING LAW

38. This Agreement shall be governed by the laws of the Commonwealth of Massachusetts. Any amendments to this Agreement must be in writing and executed by all of the parties hereto. The invalidity of any clause, part, or provision of this Agreement shall not affect the validity of the remaining portions hereof.

CONFLICT; PRIORITY OF AGREEMENT

39. In the event of any conflict or inconsistency (including without limitation more restrictive terms) between the terms of the Comprehensive Permit, any other document relating to the Development and the terms of this Agreement, the terms of this Agreement shall control.

This Agreement is senior to the Mortgage and to any other mortgage encumbering the Development. Furthermore, the Developer understands and agrees that, in the event of foreclosure of the Mortgage and the exercise by the Lender of the power of sale therein, the Development will be sold subject to the restrictions imposed hereby. The Developer acknowledges that any discharge or termination of this Agreement shall not affect the validity or enforceability of the Comprehensive Permit or the obligations of the Developer to comply with the provisions thereof.

[Remainder of page intentionally left blank.]

IN WITNESS WHEREOF, the parties have caused these presents to be signed and sealed by their respective, duly authorized representatives, as of the day and year first written above.

DEVELOPER:

By: _____
Name:
Title:

MASSACHUSETTS HOUSING FINANCE AGENCY, as Subsidizing Agency as aforesaid

By: _____
Gregory P. Watson, AICP, Manager,
Comprehensive Permit Programs

Attachments:

Exhibit A – Legal Description
Appendix A – Rent Schedule
Appendix B – Subsidizing Agency Fees

Acknowledgment of Zoning Board of Appeals

COMMONWEALTH OF MASSACHUSETTS

County of Suffolk _____, 20___

Then personally appeared before me, the undersigned notary public, the above-named Gregory P. Watson the Manager of Comprehensive Permit Programs of the Massachusetts Housing Finance Agency, as Subsidizing Agency as aforesaid, proved to me through satisfactory identification which was ____my own personal knowledge of identity of the signatory to be the person whose name is signed on the preceding document, and acknowledged to me that he/she signed it voluntarily for its stated purpose as the Director of Comprehensive Permit Programs of the Massachusetts Housing Finance Agency.

Before me,

_____
Notary Public
My Commission Expires:_____

STATE OF _____

County of _____ __, 20__

Then personally appeared before me _____, the _____ of_____, proved to me through satisfactory evidence of identification, which was [ ] a current driver's license, [ ] a current U.S. passport, [ ] my personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he/she signed it voluntarily for its stated purpose as his/her free act and deed, in such capacity, before me

_____
Notary Public
My Commission Expires:

EXHIBIT A

LEGAL DESCRIPTION

APPENDIX A
RENT SCHEDULE (INITIAL)
[Sample/Model]

Low-Income / Rental Assisted At or Below ____ % of AMI	Low/Moderate-Income [1] Rent Set at 30% of 80% AMI	Market Rate Unrestricted
Rental Assisted *[Delete Columns if N/A]*	Qualify with Incomes at or Below 80% of AMI	

Number of Bedrooms	1 BR	2 BR	3 BR	1 BR	2 BR	3 BR	1 BR	2 BR	3 BR
Number of Units	#	#	#	#	#	#	#	#	#
Net SF/Unit	---	-,---	-,---	---	-,---	-,---	---	-,---	-,---
Elev. (E) / Non-Elev. (N)	E or N	E or N	E or N	E or N	E or N	E or N	E or N	E or N	E or N
Applicable Base/Gross Rent:	$-,---	$-,---	$-,---	$-,---	$-,---	$-,---	$-,---	$-,---	$-,---
Per: [Identify[2]] MSA or HMFA									
Utility Allowance**	$---	$---	$---	$---	$---	$---	N/A	N/A	N/A
Tenant Rent*	**30% of adjusted gross income**			**$-,---**	**$-,---**	**$-,---**	**$-,---**	**$-,---**	**$-,---**

* Tenant Rents are net of utility allowances. The total of tenant rent and utility allowance may not exceed the Applicable Base/Gross Rent.

**Utility Allowances are based on the attached schedule or matrix prepared by the [Town Name] Housing Authority and dated _____, as the same may be amended from time to time. The dollar amount listed assumes the following utilities are to be paid by the tenant: [*list all that apply or "All utilities included in rent."*]
[Oil, Gas or Electric] Heat for the [e.g. "Low-Rise – Garden"] Housing Type;
[Oil, Gas or Electric] Water Heating; [Gas or Electric] Cooking Fuel; and Electricity

The following utilities are to be paid by the owner/landlord and included in the rent: [*list all that apply or "none"*]
[Oil, Gas or Electric] Heat for the [e.g. "Low-Rise – Garden"] Housing Type;
[Oil, Gas or Electric] Water Heating; [Gas or Electric] Cooking Fuel; and Electricity

[If alternative method for calculation of utility allowances is employed, describe here in detail.]

---

[1] Maximum NEF Ch. 40B affordable unit Rent Limits are calculated based on 30% of the 80% of the Area Median Income (AMI) Limit as derived from income limits published annually by HUD. Changes to the published income limits will result in changes to the rent limits. Unless subsidized under another housing subsidy program, the 80% of AMI Limit also is the standard used to qualify for occupancy at NEF Ch. 40B affordable housing developments.
[2] Identify subject income limit area, i.e. Metropolitan Statistical Area (MSA) or HUD Metro FMR Areas (HMFA) – See "Area" definition.

APPENDIX B

FEES PAYABLE TO SUBSIDIZING AGENCY

- **Masshousing NEF Rental Regulatory Agreement Affordability and Limited Dividend Monitoring Fees**
    - Initial Fee Due upon Execution of the Regulatory Agreement by MassHousing
        - $7,500
    - Annual Fee Payable at the time of Initial Occupancy and Annually thereafter
        - $200 per affordable unit per year

ACKNOWLEDGEMENT OF ZONING BOARD OF APPEALS

The undersigned duly authorized Chairman and members of the _____ Zoning Board of Appeals hereby acknowledges that, after due consideration of the Developer's request, pursuant to the requirements of 760 CMR 56.05(11), the Board hereby agrees that the foregoing Regulatory Agreement satisfies the requirements of the Comprehensive Permit as defined therein. Without limiting the generality of the foregoing, the units in the Development required to be affordable under the Comprehensive Permit shall be affordable if such units are rented in accordance with Section 3, 4 and 5 of the foregoing Regulatory Agreement; any local preference set forth in the Comprehensive Permit shall be implemented only to the extent in compliance with applicable state and federal fair housing rules; and compliance with the limited dividend requirement shall be determined solely by the Subsidizing Agency under the Regulatory Agreement using the standards of the Subsidizing Agency applicable to comprehensive permit projects in accordance with the Comprehensive Permit Rules. In addition, the conflict provision of the Regulatory Agreement shall control over any conflict provision of the Comprehensive Permit.

_____
Name:
Chairman, _____ Zoning Board of Appeals

_____
Name:

_____
Name:

_____
Name:

_____
Name:

COMMONWEALTH OF MASSACHUSETTS

_____ County, ss.

On this ____ day of _____, 20__, before me, the undersigned notary public, personally appeared _____, the Chairman of the _____ Zoning Board of Appeals, proved to me through satisfactory evidence of identification, which was [a current driver's license] [a current U.S. passport] [my personal knowledge], to be the person whose name is signed on the preceding instrument and acknowledged the foregoing instrument to be his or her free act and deed.

_____
Notary Public
My commission expires:

Preliminary Waiver Request - Town of Winchester Bylaws

LOCAL REGULATION	REQUIREMENT	PROPOSED
1. Use Regulations. Table of Principal Uses (3.0)	Apartments not allowed in the RDA-20 Zone	Multi-family apartment use
2. Table of Dimensional Requirements (4.1.1) side & rear yards	20 feet	19.4 feet rear yard
3. Table of Dimensional Requirements (4.1.1) minimum % Open space	75% open space	72.6% open space
4. Table of Dimensional Requirements (4.1.1) maximum building height	2.5 stories; 40 feet	4 stories; 64.5 feet
5. Table of Off-street Parking Requirements (5.1.3)	2 spaces /unit in RDA-20 zone	1.55 spaces/unit
6. Loading Bays (5.2.2)	Multi-family Apartment uses (Group I, Item #6 in the Table of Uses) are not exempt from loading bay requirements, according to this section (5.2.2) but in the Table of Off-Street Loading Facilities in the same section (5.2.2) multi-family apartments are not shown as a use which requires them.	No loading bays are proposed, but it is not clear to the applicant whether a waiver is actually necessary
7. Water Connection Permits		Request comprehensive permit in lieu of local approvals which are required to obtain a Town of Winchester water connection permit, except for standard connection permits required for development.
8. Sewer Connection Permits		Request comprehensive permit in lieu of local approval which may be required to obtain local and state sewer connection permits and a waiver of other charges not provided for, except for connection permits required for development
9. General Bylaw Chapter 13, Winchester Wetlands Bylaw (Section 1(e))	Jurisdiction extends to work in any area consisting of "poorly drained soil" as described by the National Cooperative Soil Survey"	Waiver requested as the requirement and additional jurisdiction is inconsistent with state law.
10. Rules and Regulations Regarding the Use of Public Sewers and Storm Drains in the Town of Winchester, Massachusetts (Section 4, 5, 6 and 7)		Request comprehensive permit in lieu of local approvals which may be required to obtain a local approval of sewer and stormwater program where the local requirement conflicts with state standards and law
11. Rules and Regulations Regarding the Use of Public Sewers and Storm Drains in the Town of Winchester, Massachusetts (Section 6.3)	Requires projects to be designed to match the pre- and post stormwater volume	Request comprehensive permit in lieu of local approval which may be required to obtain local approval of sewer and stormwater program where the local requirement conflicts with state standards and law

12. Special Provisions for the Construction of Roadways Including the Installation of Water, Sewer, and Drains in the Town of Winchester		A waiver is requested from this special provision as it is inconsistent with state standards and law
13. Signage (General Bylaw Chapter 9, Section 3, Signs in Residence and Conservancy Districts)		The applicant has not yet contemplated signage for this project, as such, this waiver may ultimately be unnecessary.
14. General Bylaw Chapter 18, Public Shade Trees		The applicant does not believe this waiver will be necessary but has not yet confirmed if any trees will be removed in the public right of way.
15. Rules and Regulations Governing Utility Petitions and Street Opening Permits in the Town of Winchester, Ma"		A waiver is requested from these rules and regulations where local requirements are in conflict with state standards and law

Note: The Applicant will update and revise the above waiver list as may be necessary and is customary as part of the public hearing process. Moreover, the applicant understands that the Town is currently considering revisions to the Zoning Bylaw at the Spring 2015 Town Meeting which may necessitate updating the waiver list.

TRANSPORTATION IMPACT ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT
416 CAMBRIDGE STREET
WINCHESTER, MASSACHUSETTS

Prepared for:

FX WINCHESTER, LLC
Brighton, Massachusetts

July 2015

Prepared by:

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EXECUTIVE SUMMARY

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a residential community to be located at 416 Cambridge Street in Winchester, Massachusetts (hereafter referred to as the "Project"). At present, the Project site contains a single-family home that will be retained as part of the Project and areas of open and wooded space.

Access to the Project site will be provided by way of a full-access driveway that will intersect the west side of Wainwright Road approximately 120 feet north of the driveway that serves The Ledges residential community. On-site parking will be provided for 144 vehicles comprised of both surface parking and garage spaces, or a parking ratio of 1.50 spaces per residential unit.

This study was prepared in consultation with the Town of Winchester, the City of Woburn and the Massachusetts Department of Transportation (MassDOT); was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*; and was conducted pursuant to the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports.

The Project site abuts Cambridge Street (Route 3/3A), a principal arterial roadway under the jurisdiction of the Massachusetts Department of Transportation (MassDOT). Accordingly, the Project will require the issuance of a State Highway Access Permit from MassDOT for so called "indirect" access to Route 3/3A by way of Wainwright Road. This is a perfunctory permit and focuses on ensuring that stormwater and grading associated with the Project will not be more detrimental to the operation of the State Highway system than existing conditions.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in April and June 2015. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area for the Project was selected to contain the major roadways providing access to the Project site including Cambridge Street and Wainwright Road, as well as the intersections of Cambridge Street at Country Club Road and Crescent Park Drive; Cambridge Street at the Horn Pond Plaza north driveway; Cambridge Street at Wainwright Road; Cambridge Street at the

Horn Pond Plaza south driveway; and Wainwright Road at The Ledges residential community driveway.

Existing Traffic Volumes

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts, manual turning movement counts (TMCs) and vehicle classification counts were completed in April 2015 while public schools were in regular session. The ATR counts were conducted on Cambridge Street and Wainwright Road in the vicinity of the Project site in order to record weekday daily traffic conditions over an extended period, with weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period manual TMCs performed at the study intersections. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for both the Project and the adjacent roadway network. The April traffic volumes were found to be representative of an above average-month condition and were not adjusted downward in order to provide a conservative (above-average) analysis condition. The following summarizes existing traffic volumes along Cambridge Street and Wainwright Road as measured in April 2015:

Cambridge Street:

Average Weekday Traffic: 21,665 vehicles[1]
Weekday Morning Peak Hour (8:00 – 9:00 AM): 1,694 vph[2]
Weekday Evening Peak-Hour (5:00 – 6:00 PM): 1,877 vph

Wainwright Road:

Average Weekday Traffic: 1,040 vehicles
Weekday Morning Peak Hour (8:00 – 9:00 AM): 80 vph
Weekday Evening Peak-Hour (5:00 – 6:00 PM): 82 vph

Pedestrian and Bicycle Facilities

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in April and June 2015. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities. Sidewalks are currently provided along the both sides of Cambridge Street north (west) of Country Club Road, and along the east side of Wainwright Road between Cambridge Street and Surrey Road, with a short segment of sidewalk (300± linear feet) provided along the Project site frontage on Cambridge Street. Sidewalks are not provided along the west side of Wainwright Road or either side of Cambridge Street between Country Club Road and Bonnell Ford (along the front of the Horn Pond Plaza). Marked crosswalks and pedestrian traffic signal equipment and phasing are provided for crossing Cambridge Street as a part of the traffic signal system at the Cambridge Street/Country Club Road/Crescent Park Drive intersection, which is located approximately ¼-mile north of Wainwright Road.

As noted above, at the present time there are no sidewalks or marked crosswalks that provide access to the Horn Pond Plaza from either Cambridge Street or Wainwright Road. A major impediment to providing such a connection is the raised median along Cambridge Street which is

[1]Two-way, 24-hour volume.
[2]Vehicles per hour (vph).

sloped to transition the grade differential between the north and southbound directions of travel on Cambridge Street.

Formal bicycle facilities were not identified within the study area; however, Cambridge Street provides sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared travelled-way configuration.[3] In addition, MassDOT is planning to construct a 7-mile tri-community bikeway that will link Wedgemere Station in Winchester, Horn Pond in Woburn and Recreation Park in Stoneham. Construction on the bikeway is expected to begin in the winter of 2015/2016.

Public Transportation

Public transportation services are provided within the study area by the Massachusetts Bay Transportation Authority (MBTA). The MBTA operates fixed-route bus service to the Town of Winchester and the City of Woburn by way of Route 350, *North Burlington – Alewife Station*. Bus Route 350 provides service along Cambridge Street between North Burlington and Alewife Station in Cambridge, serving the Burlington Mall, Lahey Clinic, and the MBTA Red Line subway system. The closest stops to the Project site are located on Cambridge Street at Wainwright Road (inbound) and the Horn Pond Plaza (outbound). Route 350 bus service is provided Monday through Friday from approximately 6:00 AM to 11:00 PM, on Saturday from approximately 6:30 AM to 11:00 PM, and on Sunday from approximately 7:00 AM to 7:30 PM. Bus Route 350 generally operates with 20 to 30-minute headways during the weekday commuter peak periods. Roundtrip fares for adults are $1.60, with a $0.80 fare for students, senior citizens and persons with disabilities. Children under the age of twelve ride for free when accompanied by an adult.

Spot Speed Measurements

Vehicle travel speed measurements were performed on Cambridge Street and Wainwright Road in the vicinity of the Project site over a continuous 48-hour period (Tuesday through Wednesday, inclusive) in conjunction with the ATR counts. Based on these measurements, the mean (average) vehicle travel speed along Cambridge Street in the vicinity of the Project site was found to be approximately 37 miles per hour (mph). The average measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be approximately 42 mph, which is 7 mph above the posted speed limit (35 mph). The 85th percentile speed is used as the basis of engineering design and in the evaluation of sight distances, and is often used in establishing posted speed limits.

The mean vehicle travel speed along Wainwright Road in the vicinity of the Project site was found to be approximately 25 mph, with the average measured 85th percentile vehicle travel speed found to be approximately 28 mph. Given that a speed limit is not posted on Wainwright Road, the "prima facie" speed limit pursuant to M.G.L. Chapter 90 Section 17 would be 30 mph given the nature of the abutting land use (thickly settled or business district).[4]

[3] A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared travelled-way condition.

[4] The "prima facie" speed is defined in M.G.L. Chapter 90, Section 17, as the speed which would be deemed reasonable and proper to operate a motor vehicle.

Motor Vehicle Crash Data

Motor vehicle crash information for the study intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2008 through 2012, inclusive) in order to examine motor vehicle crash trends occurring within the study area. Based on a review of the MassDOT data, the study area intersections were found to have experienced an average of less than three (3) reported motor vehicle crashes per year over the five-year review period. All of the study area intersections were found to have a motor vehicle crash rate below both the MassDOT statewide and District averages for a signalized or unsignalized intersection, as appropriate, for the MassDOT Highway Division District in which the intersections are located (District 4). In addition, no fatal motor vehicle crashes were reported to have occurred at the study area intersections over the five-year review period. ***Based on a review of the MassDOT motor vehicle crash data, no discernible safety deficiencies were apparent at the study intersections.***

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2022, which reflects a seven-year planning horizon consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. Independent of the Project, traffic volumes on the roadway network in the year 2022 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2022 No-Build traffic volumes reflect 2022 Build traffic volume conditions with the Project.

Specific Development by Others

The Planning Departments of the Town of Winchester and the City of Woburn were contacted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes at the study intersections. The City of Woburn identified that a rezoning petition is currently before the City Council to rezone 165 Cambridge Street to allow the construction of approximately 22 residential condominium units. This project has not yet been approved and is not expected to result in a material increase in traffic volumes within the study area beyond the general background traffic growth rate (discussion follows). No other developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate.

General Background Traffic Growth

Traffic-volume data compiled by MassDOT from permanent count stations and historic traffic counts in the area were reviewed in order to determine general background traffic growth trends. Based on a review of this data, it was determined that traffic volumes within the study area have generally increased by approximately 0.2 percent. In order to provide a conservative (high) analysis scenario and a prudent planning condition for the Project, a higher than average 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

Roadway Improvement Projects

MassDOT, the Town of Winchester and the City of Woburn were contacted in order to determine if there were any planned roadway improvement projects expected to be completed within the study area. Based on these discussions, MassDOT identified that they are advancing plans to improve four (4) intersections along Cambridge Street and Church Street to the south of the study area, including the installation of new traffic signals at the intersections of Cambridge Street at Pond Street and Cambridge Street at Everett Avenue and Myopia Road, and upgrading the existing traffic signals and adding turn lanes at the intersections of Cambridge Street at Church Street and High Street and Church Street at Bacon Street and Fletcher Street. These improvements will benefit overall traffic flow and safety at the subject locations, but are not expected to materially impact traffic operations within the study area. No other roadway improvement projects outside of routine maintenance activities were identified to be planned within the study area at this time.

No-Build Traffic Volumes

The 2022 No-Build condition peak-hour traffic-volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2015 Existing peak-hour traffic volumes.

Project-Generated Traffic

As proposed, the Project will entail the construction of a 96-unit residential apartment community. In order to develop the traffic characteristics of the Project, trip-generation statistics published by the ITE[5] for a similar land use as that proposed were used. ITE Land Use Code (LUC) 220, *Apartment*, with the independent variable of number of dwelling units equal to 96, was used to develop the traffic characteristics of the Project.

Using the aforementioned methodology, the Project is predicted to generate approximately 706 vehicle trips on an average weekday (two-way, 24-hour volume, or 353 vehicles entering and 353 exiting), with 51 vehicle trips (10 vehicles entering and 41 exiting) expected during the weekday morning peak-hour and 70 vehicle trips (46 vehicles entering and 24 exiting) expected during the weekday evening peak-hour.

Trip Distribution and Assignment

The directional distribution of generated trips to and from the Project site was determined based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the Town of Winchester and the City of Woburn, and then refined based on existing traffic patterns within the study area during the commuter peak periods. This methodology is consistent with the residential nature of the Project and commuter traffic patterns during the peak hours. In general, 58 percent of Project-related traffic was assigned to exit <u>to the south</u> on Cambridge Street, with 48 percent assigned to enter <u>from the south</u>; 37 percent was assigned to exit <u>to the north</u> on Cambridge Street, with 47 percent assigned to enter <u>from the north</u>; and 5 percent assigned to enter and exit to/from the southwest Wainwright Road. The difference in the assignment of entering and exiting trips on Cambridge Street is due to the restriction of left-turns to and from Wainwright Road at Cambridge Street.

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[5] *Trip Generation*, 9th Edition; Institute of Transportation Engineers; Washington, DC; 2012.

Build Condition Traffic-Volume Networks

The 2022 Build condition traffic volumes consist of the 2022 No-Build traffic volumes with the additional traffic expected to be generated by the Project added to them. The Project was shown to result in peak-hour traffic-volume increases outside of the immediate study area that is the subject of this assessment ranging from 2 to 36 vehicles. ***Such increases are considered nominal when dispersed over the peak-hour and would not result in a material impact (increase) on motorist delays or vehicle queuing outside of the immediate study area that is the subject of this assessment.***

TRAFFIC OPERATIONS ANALYSIS

In order to assess the impact of the Project on the roadway network, traffic operations and vehicle queue analyses were performed at the study intersections under 2015 Existing, 2022 No-Build and 2022 Build conditions. This analysis has indicated that the Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build). The signalized intersection of Cambridge Street at Country Club Road and Crescent Park Drive was found to be operating at an overall level-of-service (LOS) of A during the peak hours under all analysis conditions, with all movements operating at LOS C or better, where a LOS of "D" or better is generally defined as "acceptable" traffic operations. The addition of Project-related traffic to the intersection was not shown to result in a change in LOS for any movement at the intersection.

Left-turns exiting the Horn Pond Plaza north driveway at Cambridge Street were shown to operate at LOS F during the peak periods under all analysis conditions. Such operating conditions (LOS F) are typical of unsignalized driveways and side streets along the Cambridge Street corridor where left-turns are permitted and occur as a result of the relatively large volume of conflicting traffic travelling along the roadway. The U-turn/left-turn movement from Cambridge Street at the Horn Pond Plaza south driveway and right-turn movements exiting Wainwright Road at Cambridge Street were shown to operate at LOS C or better during the peak periods under all analysis conditions.

All movements at the intersection of Wainwright Road at the Project site driveway and at the driveway that serves The Ledges were shown to operate at LOS A during the peak periods under all analysis conditions.

SIGHT DISTANCE EVALUATION

Sight distance measurements were performed at the Project site driveway intersection with Wainwright Road and at the U-turn locations on Cambridge Street in accordance with American Association of State Highway and Transportation Officials (AASHTO)[6] and MassDOT standards. Based on these measurements, it was determined that the available sight lines exceed the recommended minimum sight distance requirements for a 30 mph approach speed along Wainwright Road and a 45 mph approach speed on Cambridge Street, which exceed both the posted or "prima facie" speed limit along these roadways and the measured 85th percentile vehicle travel speeds.

[6] *A Policy on Geometric Design of Highway and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2011.

In addition, a review of the location of the Project site driveway in relation to the driveway that serves The Ledges residential community was completed as it relates to sight lines and safety. The Project site driveway will be located approximately 120 feet north of the driveway that serves The Ledges as measured between the centerline of both driveways. This distance also approximates the separation between the conflicting movements exiting both driveways. In order to achieve safe operation of adjacent driveways, the suggested minimum separation between conflicting movements should be at least be equal to the safe stopping sight distance based on the traffic control measure that is present at each driveway. With both driveways under stop control, vehicles exiting the driveways from a stopped position would be travelling at a speed of 15 mph or less at the potential conflict point, which would require a minimum separation between the conflicting movements of 90 feet.[7] Given that the conflicting movements between the driveways are separated by 120 feet, both driveways can operate in a safe manner.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site and address any deficiencies identified at off-site locations evaluated in conjunction with this study. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the Project site will be provided by way of a full-access driveway that will intersect the west side of Wainwright Road approximately 120 feet north of the driveway that serves The Ledges residential community as measured between the centerline of both driveways. The following recommendations are offered with respect to the design and operation of the Project site driveway:

- The Project site driveway will be designed as a "boulevard" with a center median that is designed to be traversable by an emergency vehicle. The driveway cross-section should provide two 16-foot wide travel lanes separated by an 8-foot wide raised median with sloped granite curb.

- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.

- All signs and pavement markings to be installed within the Project site shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[8]

- Sidewalks should be provided within the Project site linking the proposed buildings and other amenities to Wainwright Road.

- Marked crosswalks and wheelchair ramps should be provided at pedestrian crossings within the Project site.

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[7] Based on the sight distance requirement for a 15 mph approach speed and a 10 percent downgrade between the driveway serving The Ledges and the Project site driveway.

[8] *Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.

- Signs and landscaping to be installed along the Project site driveway, internal to the Project site and at the Project site driveway intersection with Wainwright Road should be designed and maintained so as not to restrict lines of sight.

- A school bus waiting area should be provided at an appropriate location designated by the Town.

Off-Site

Cambridge Street at Wainwright Road

Independent of the Project it is recommended that a STOP-sign and marked STOP-line be installed on the Wainwright Road approach to Cambridge Street in accordance with the applicable standards of the MUTCD[9] in order to reinforce the vehicular right-of-way at the intersection and to define the desired stopping point for vehicles.

Pedestrian Accommodations

Pedestrian accommodations are not currently provided between the residential neighborhoods along Wainwright Road and the Horn Pond Plaza, a major impediment to which is the raised median along Cambridge Street which is sloped to transition the grade differential between the north and southbound directions of travel on Cambridge Street. The closest available pedestrian crossing of Cambridge Street is located at the signalized intersection of Cambridge Street with Country Club Road and Crescent Park Drive, approximately ¼-mile north of Wainwright Road; however, sidewalks are not currently provided along either side of Cambridge Street between Wainwright Road, the Cambridge Street/Country Club Road/Crescent Park Drive intersection and the Horn Pond Plaza. In order to facilitate pedestrian connectivity in the area, the Project proponent will contribute monies to the Town to be used to advance the development of a sidewalk master plan to accomplish a pedestrian connection to the Horn Pond Plaza, the MBTA bus stops located on both sides of Cambridge Street, and the completion of the existing sidewalk network along Cambridge Street.

Transportation Demand Management

The following Transportation Demand Management (TDM) measures will be implemented as a part of the Project in an effort to reduce the overall number of automobile trips in the area and to integrate the Project into the available transportation resources.

- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location;

- A "welcome packet" will be provided to new residents of the Project detailing available public transportation services, bicycle and walking alternatives, and commuter options available through MassRIDES' and their NuRide program which rewards individuals that choose to walk, bicycle, carpool, vanpool or that use public transportation to travel to and from work;

- Pedestrian accommodations will be incorporated within the Project site consisting of sidewalks and pedestrian paths linking buildings and parking to on-site amenities;

[9] Ibid.

- A mail drop will be provided in a central location; and
- Secure bicycle parking will be provided, including both exterior bicycle racks adjacent to building entrances and weather protected bicycle parking in a secure area within the parking garage.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing and improved transportation system.

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a residential community to be located at 416 Cambridge Street in Winchester, Massachusetts (hereafter referred to as the "Project"). This study evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing traffic conditions and future traffic conditions, both with and without the Project, along Cambridge Street and Wainwright Road, as well as at the intersections of Cambridge Street at Country Club Road and Crescent Park Drive; Cambridge Street at the Horn Pond Plaza north driveway; Cambridge Street at Wainwright Road; Cambridge Street at the Horn Pond Plaza south driveway; and Wainwright Road at The Ledges residential community driveway.

The project site abuts Cambridge Street (Route 3/3A), a principal arterial roadway under the jurisdiction of the Massachusetts Department of Transportation (MassDOT). Accordingly, the project will require the issuance of a State Highway Access Permit from MassDOT for so called "indirect" access to Route 3/3A by way of Wainwright Road. This is a perfunctory permit and focuses on ensuring that stormwater and grading associated with the Project will not be more detrimental to the operation of the State Highway system than existing conditions.

PROJECT DESCRIPTION

As proposed, the Project will entail the construction of a 96-unit residential apartment community to be situated on a parcel of land that is bounded by Cambridge Street and a commercial property to the north; Wainwright Road to the east; The Ledges residential community and areas of open and wooded space to the south; and areas of open and wooded space to the west. Figure 1 depicts the Project site location in relation to the existing roadway network. At present, the Project site contains a single-family home that will be retained as part of the Project and areas of open and wooded space.

Access to the Project site will be provided by way of a full-access driveway that will intersect the west side of Wainwright Road approximately 120 feet north of the driveway that serves The Ledges residential community as measured between the centerline of both driveways. On-site parking will be provided for 144 vehicles comprised of both surface parking and garage spaces, or a parking ratio of 1.50 spaces per residential unit.

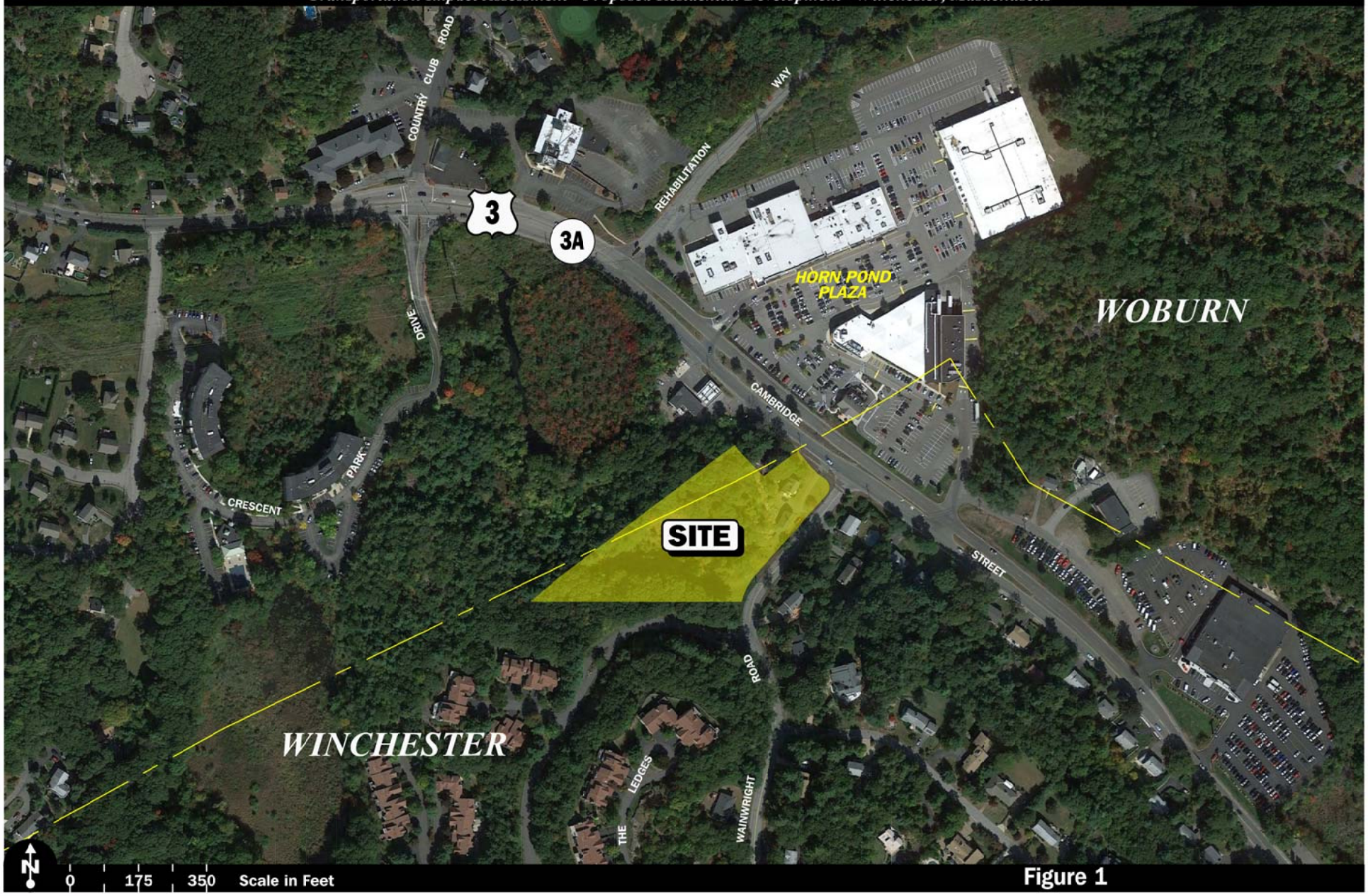

Figure 1

Site Location Map

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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STUDY METHODOLOGY

This study was prepared in consultation with MassDOT, the Town of Winchester and the City of Woburn; was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

The first stage involved an assessment of existing conditions in the study area and included an inventory of roadway geometrics; pedestrian and bicycle facilities; public transportation services; observations of traffic flow; and collection of daily and peak period traffic counts.

In the second stage of the study, future traffic conditions were projected and analyzed. Specific travel demand forecasts for the Project were assessed along with future traffic demands due to expected traffic growth independent of the Project. A seven-year time horizon was selected for analyses consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. The traffic analysis conducted in stage two identifies existing or projected future roadway capacity, traffic safety, and site access issues.

The third stage of the study presents and evaluates measures to address traffic and safety issues, if any, identified in stage two of the study.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in April and June 2015. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area for the Project was selected to contain the major roadways providing access to the Project site including Cambridge Street and Wainwright Road, as well as the intersections of Cambridge Street at Country Club Road and Crescent Park Drive; Cambridge Street at the Horn Pond Plaza north driveway; Cambridge Street at Wainwright Road; Cambridge Street at the Horn Pond Plaza south driveway; and Wainwright Road at The Ledges residential community driveway.

The following describes the study area roadways and intersections.

Roadways

Cambridge Street (Route 3/3A)

- Four-lane, principal arterial roadway under MassDOT jurisdiction
- Traverses study area in a general northwest-southeast direction
- Provides four 11 to 16-foot wide travel lanes separated by a guardrail and a sloped, vegetated median, with 1 to 3-foot wide marked shoulders provided
- A sidewalk is provided along both sides of the roadway north of Country Club Road
- Illumination is provided by way of street lights mounted on wood poles
- Posted speed limit is 35 miles per hour (mph) within the study area
- Land use consists of the Project site and residential and commercial properties

Wainwright Road

- Two-lane roadway under local jurisdiction
- Traverses study area in a general northeast-southwest direction

- Provides two 13 to 17-foot wide travel lane separated by a double-yellow centerline with no marked shoulders
- A sidewalk is provided along the east side between Cambridge Street and Surrey Road
- Illumination is provided by way of street lights mounted on wood poles
- Land use consists of the Project site and residential properties

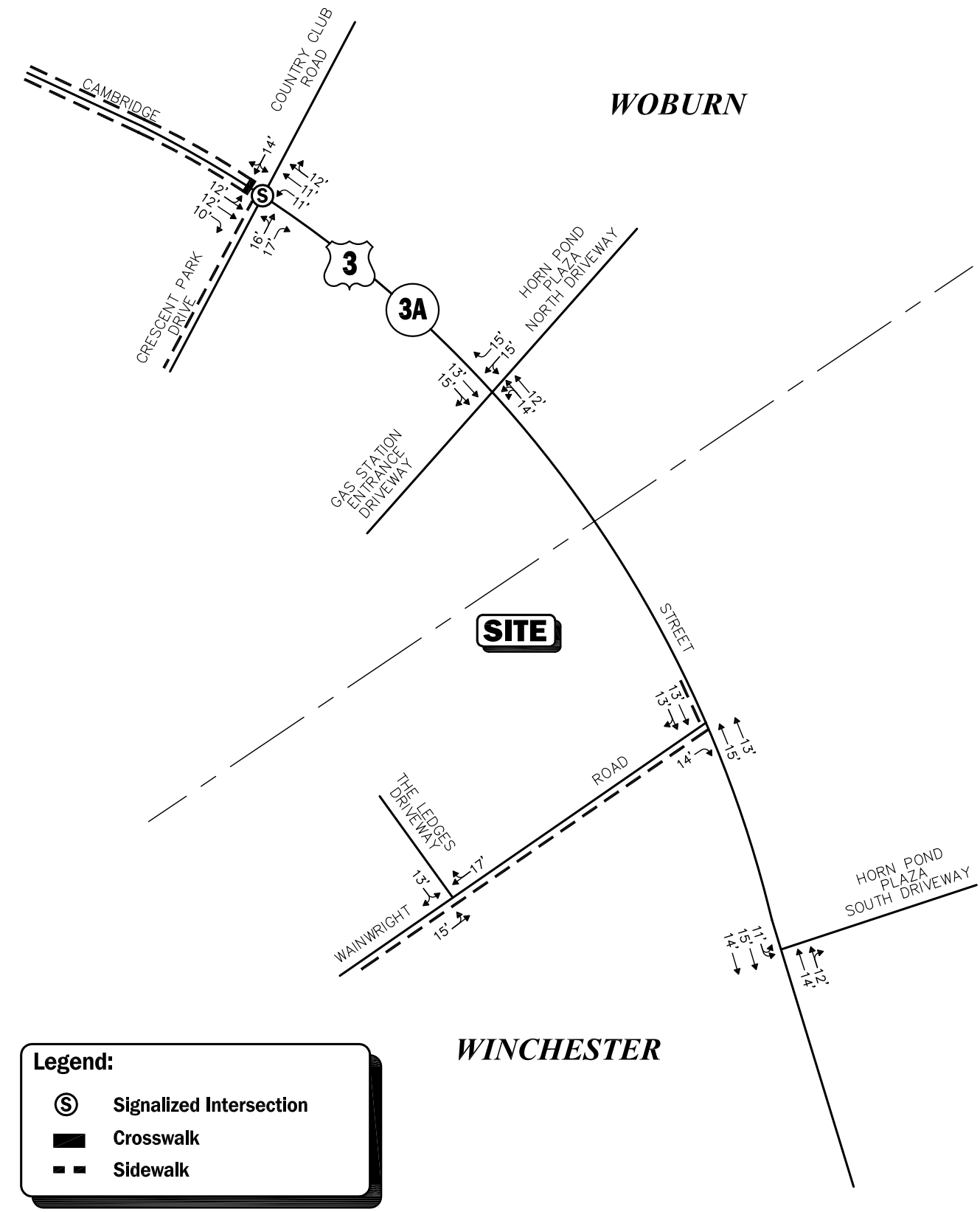
Intersections

Table 1 and Figure 2 summarize lane use, traffic control, and pedestrian and bicycle accommodations at the study area intersections as observed in April and June 2015.

Table 1
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Cambridge Street/ Country Club Road/ Crescent Park Drive	TS	2 per direction on Cambridge Street; 1 per direction on Country Club Road; 1 per direction on Crescent Park Drive with a channelized right-turn lane	Yes – 1 to 2 feet on Cambridge Street	Yes – both sides of Cambridge Street north of intersection; north side of Crescent Park Drive; Crosswalk across north leg	Yes[b] Shared travelled-way
Cambridge Street/ Horn Pond Plaza North Driveway and Gas Station Driveway	S	2 per direction on Cambridge Street; 2 exiting travel lanes on the Horn Pond Plaza driveway; 1 entering travel lane on gas station driveway	Yes – 2 to 3 feet on Cambridge Street	No	Yes[b] Shared travelled-way on Cambridge Street
Cambridge Street/ Wainwright Road	S[c]	2 per direction on Cambridge Street; 1 per direction on Wainwright Road	Yes – 2 feet on Cambridge Street	Yes –east side of Wainwright Road	Yes[b] Shared travelled-way on Cambridge Street
Cambridge Street/ Horn Pond Plaza South Driveway	NC	2 per direction on Cambridge Street with turn lane; 2 entering travel lanes on the Horn Pond Plaza driveway	Yes – 2 to 3 feet on Cambridge Street	No	Yes[b] Shared travelled-way on Cambridge Street
Wainwright Road/ The Ledges Driveway	S[c]	1 per direction on all approaches	No	Yes – east side of Wainwright Road	No

[a]TS = traffic signal control; S = STOP-sign control; NC = no control present.
[b]Combined shoulder and travel lane width equal to or exceed 14 feet.
[c]Assumed STOP-control; STOP-sign is not present.



Legend:

- Ⓢ Signalized Intersection
- Crosswalk
- Sidewalk

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 2

Existing Intersection Lane Use and Travel Lane Width

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EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts, manual turning movement counts (TMCs) and vehicle classification counts were completed in April 2015 while public schools were in regular session. The ATR counts were conducted on Cambridge Street and Wainwright Road in the vicinity of the Project site in order to record weekday daily traffic conditions over an extended period, with weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period manual TMCs performed at the study intersections. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for both the Project and the adjacent roadway network.

Traffic Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, MassDOT weekday seasonal factors for Group 6 roadways (urban arterials, collectors and rural arterials, the MassDOT functional classification for Cambridge Street) were reviewed.[10] Based on a review of this data, it was determined that traffic volumes for the month of April are approximately 8.7 percent above average-month conditions and, therefore, were not adjusted downward in order to provide a conservative (above-average) analysis condition. The 2015 Existing traffic volumes are summarized in Table 2, with the weekday morning and evening peak-hour traffic volumes graphically depicted on Figures 3 and 4, respectively. Note that the peak-hour traffic volumes presented in Table 2 were obtained from the TMCs and are reflected on the aforementioned figures.

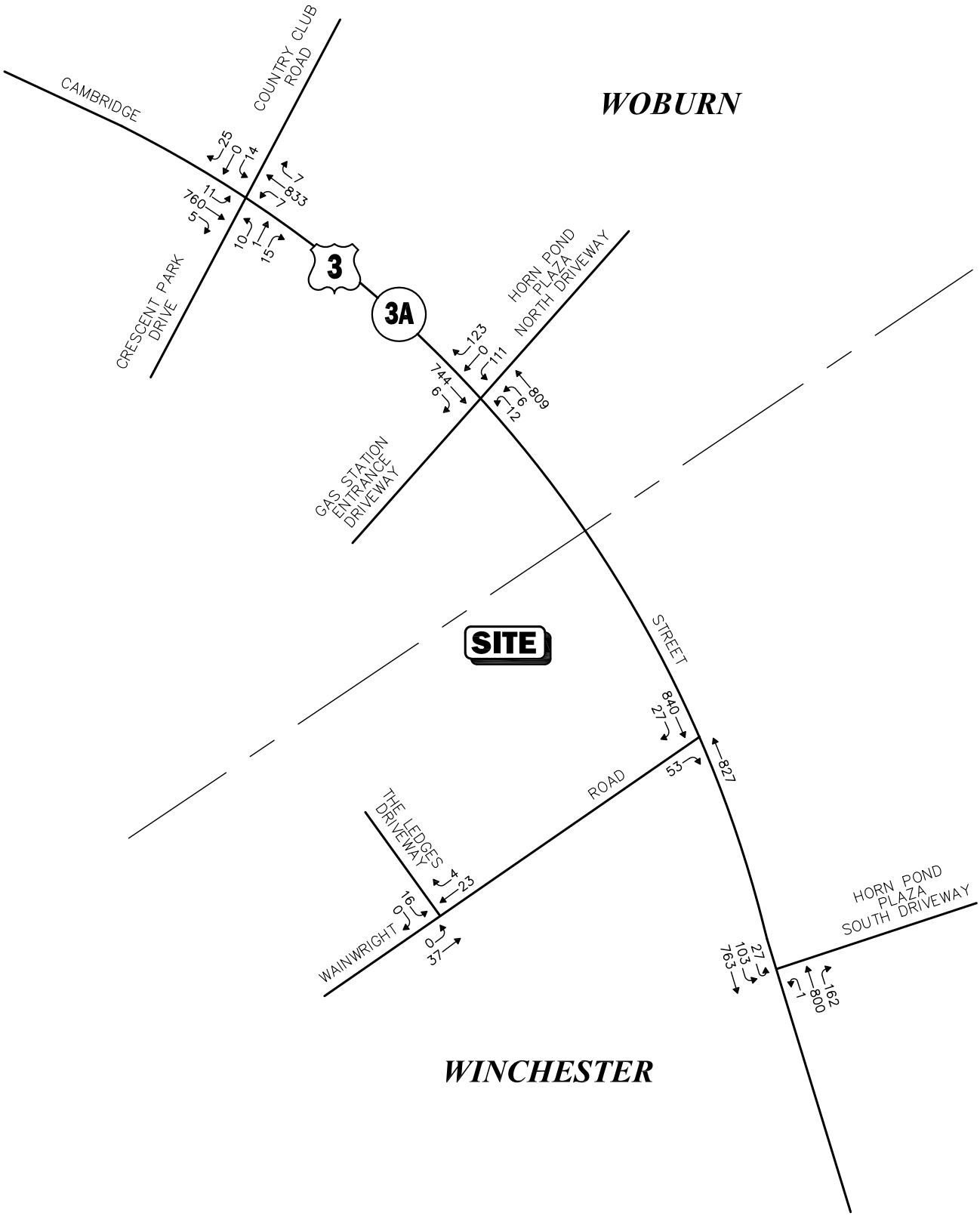
Table 2
2015 EXISTING TRAFFIC VOLUMES

		Weekday Morning Peak-Hour (8:00 – 9:00 AM)			Weekday Evening Peak-Hour (5:00 – 6:00 PM)		
Location	AWT[a]	VPH[b]	K Factor[c]	Directional Distribution	VPH	K Factor	Directional Distribution
Cambridge Street, north of Wainwright Road	21,665	1,694	7.8	51.2% SB	1,877	8.7	65.6% SB
Wainwright Road, west of Cambridge Street	1,040	80	7.7	66.3% EB	82	7.9	61.0% WB

[a]Average weekday traffic in vehicles per day.
[b]Vehicles per hour.
[c]Percent of daily traffic occurring during the peak-hour.
SB = southbound; EB = eastbound; WB = westbound.

As can be seen in Table 2, Cambridge Street in the vicinity of the Project site was found to accommodate approximately 21,665 vehicles on an average weekday (two-way, 24-hour volume), with approximately 1,694 vehicles per hour (vph) during the weekday morning peak-hour and 1,877 vph during the weekday evening peak-hour.

[10]MassDOT Traffic Volumes for the Commonwealth of Massachusetts; 2011 Weekday Seasonal Factors, Group 6 – Urban Arterials, Collectors and Rural Arterials.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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Figure 3

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2015 Existing Weekday Morning Peak Hour Traffic Volumes

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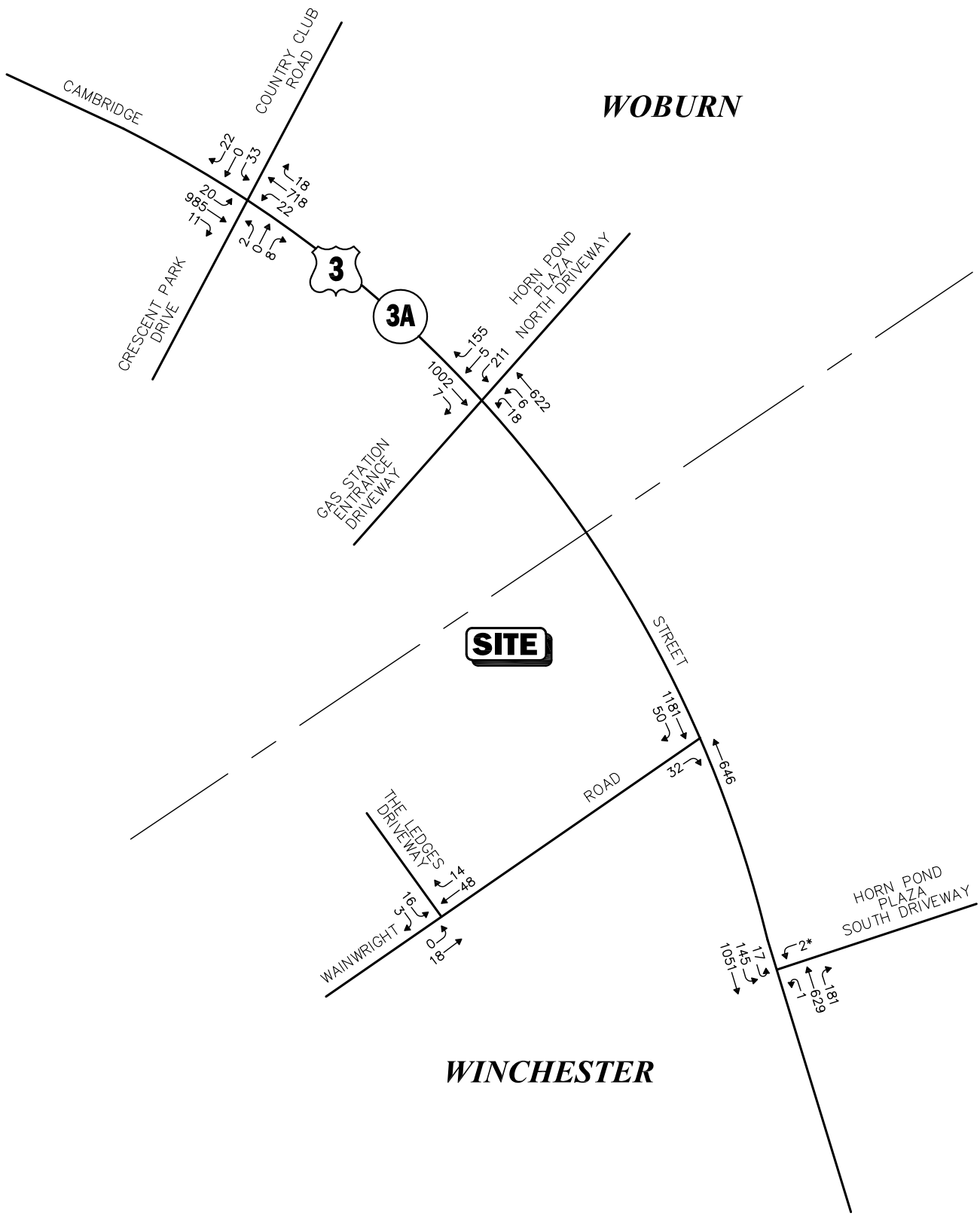

Notes: Imbalances exist due to numerous curb cuts and side streets that are not shown.
* Prohibited movement.

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Figure 4

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2015 Existing Weekday Evening Peak Hour Traffic Volumes

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Wainwright Road in the vicinity of the Project site was found to accommodate approximately 1,040 vehicles on an average weekday (two-way, 24-hour volume), with approximately 80 vph during the weekday morning peak-hour and 82 vph during the weekday evening peak-hour.

PEDESTRIAN AND BICYCLE FACILITIES

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in April and June 2015. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities. Sidewalks are currently provided along the both sides of Cambridge Street north (west) of Country Club Road, and along the east side of Wainwright Road between Cambridge Street and Surrey Road, with a short segment of sidewalk (300± linear feet) provided along the Project site frontage on Cambridge Street. Sidewalks are not provided along the west side of Wainwright Road or either side of Cambridge Street between Country Club Road and Bonnell Ford (along the front of the Horn Pond Plaza). Marked crosswalks and pedestrian traffic signal equipment and phasing are provided for crossing Cambridge Street as a part of the traffic signal system at the Cambridge Street/Country Club Road/Crescent Park Drive intersection, which is located approximately ¼-mile north of Wainwright Road.

As noted above, at the present time there are no sidewalks or marked crosswalks that provide access to the Horn Pond Plaza from either Cambridge Street or Wainwright Road. A major impediment to providing such a connection is the raised median along Cambridge Street which is sloped to transition the grade differential between the north and southbound directions of travel on Cambridge Street.

Formal bicycle facilities were not identified within the study area; however, Cambridge Street provides sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared travelled-way configuration.[11] In addition, MassDOT is planning to construct a 7-mile tri-community bikeway that will link Wedgemere Station in Winchester, Horn Pond in Woburn and Recreation Park in Stoneham. Construction on the bikeway is expected to begin in the winter of 2015/2016.

PUBLIC TRANSPORTATION

Public transportation services are provided within the study area by the Massachusetts Bay Transportation Authority (MBTA). The MBTA operates fixed-route bus service to the Town of Winchester and the City of Woburn by way of Route 350, *North Burlington – Alewife Station*. Bus Route 350 provides service along Cambridge Street between North Burlington and Alewife Station in Cambridge, serving the Burlington Mall, Lahey Clinic, and the MBTA Red Line subway system. The closest stops to the Project site are located on Cambridge Street at Wainwright Road (inbound) and the Horn Pond Plaza (outbound). Route 350 bus service is provided Monday through Friday from approximately 6:00 AM to 11:00 PM, on Saturday from approximately 6:30 AM to 11:00 PM, and on Sunday from approximately 7:00 AM to 7:30 PM. Bus Route 350 generally operates with 20 to 30-minute headways during the weekday commuter peak periods. Roundtrip fares for adults are $1.60, with a $0.80 fare for students, senior citizens

[11] A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared travelled-way condition.

and persons with disabilities. Children under the age of twelve ride for free when accompanied by an adult. The public transportation schedules and fare information is provided in the Appendix.

SPOT SPEED MEASUREMENTS

Vehicle travel speed measurements were performed on Cambridge Street and Wainwright Road in the vicinity of the Project site over a continuous 48-hour period (Tuesday through Wednesday, inclusive) in conjunction with the ATR counts. Table 3 summarizes the vehicle travel speed measurements.

Table 3
VEHICLE TRAVEL SPEED MEASUREMENTS

	Cambridge Street		Wainwright Road	
	Northbound	Southbound	Eastbound	Westbound
Mean Travel Speed (mph)	38	36	26	24
85th Percentile Speed (mph)	43	42	29	28
Posted Speed Limit (mph)	35	35	--[a]	--[a]

[a]Speed limit is not posted.
mph = miles per hour.

As can be seen in Table 3, the mean (average) vehicle travel speed along Cambridge Street in the vicinity of the Project site was found to be approximately 37 mph. The average measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be approximately 42 mph, which is 7 mph above the posted speed limit (35 mph). The 85th percentile speed is used as the basis of engineering design and in the evaluation of sight distances, and is often used in establishing posted speed limits.

The mean vehicle travel speed along Wainwright Road in the vicinity of the Project site was found to be approximately 25 mph, with the average measured 85th percentile vehicle travel speed found to be approximately 28 mph. Given that a speed limit is not posted on Wainwright Road, the "prima facie" speed limit pursuant to M.G.L. Chapter 90 Section 17 would be 30 mph given the nature of the abutting land use (thickly settled or business district).[12]

[12]The "prima facie" speed is defined in M.G.L. Chapter 90, Section 17, as the speed which would be deemed reasonable and proper to operate a motor vehicle.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2008 through 2012, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, and day of occurrence, and presented in Table 4.

Table 4
MOTOR VEHICLE CRASH DATA SUMMARY[a]

	Cambridge Street/ Crescent Park Drive/ Country Club Road	Cambridge Street/ Horn Pond Plaza North Driveway	Cambridge Street/ Wainwright Road	Wainwright Road/ The Ledges Driveway	Cambridge Street/ Horn Pond Plaza South Driveway
Traffic Control Type:[b]	TS	U	U	U	U
Year:					
2008	2	1	0	0	1
2009	4	1	0	0	0
2010	1	1	0	0	0
2011	3	2	0	0	0
2012	2	3	0	0	0
Total	12	8	0	0	1
Average	2.40	1.60	0.00	0.00	0.20
Rate[c]	0.32	0.19	0.00	0.00	0.02
MassDOT Crash Rate:[d]	0.80/0.77	0.60/0.58	0.60/0.58	0.60/0.58	0.60/0.58
Significant?[e]	No	No	No	No	No
Type:					
Angle	8	4	0	0	1
Rear-End	1	1	0	0	0
Head-On	0	1	0	0	0
Sideswipe	2	1	0	0	0
Fixed Object	1	0	0	0	0
Pedestrian/Bicycle	0	1	0	0	0
Unknown/Other	0	0	0	0	0
Total	12	8	0	0	1
Day of Week:					
Monday through Friday	9	6	0	0	1
Saturday	3	0	0	0	0
Sunday	0	2	0	0	0
Total	12	8	0	0	1
Severity:					
Property Damage Only	8	4	0	0	1
Personal Injury	4	4	0	0	0
Fatality	0	0	0	0	0
Total	12	8	0	0	1

[a]Source: MassDOT Safety Management/Traffic Operations Unit records, 2008 through 2012.
[b]Traffic Control Type: U = unsignalized; TS = traffic signal.
[c]Crash rate per million vehicles entering the intersection.
[d]Statewide/District crash rate.
[e]The intersection crash rate is significant if it is found to exceed the MassDOT crash rate for the MassDOT Highway Division District in which the Project is located (District 4).

As can be seen in Table 4, the study area intersections were found to have experienced an average of less than three (3) reported motor vehicle crashes per year over the five-year review period. All of the study area intersections were found to have a motor vehicle crash rate below both the MassDOT statewide and District averages for a signalized or unsignalized intersection, as appropriate, for the MassDOT Highway Division District in which the intersections are located (District 4). In addition, no fatal motor vehicle crashes were reported to have occurred at the study area intersections over the five-year review period. ***Based on a review of the MassDOT motor vehicle crash data, no discernible safety deficiencies were apparent at the study intersections.*** The detailed MassDOT Crash Rate Worksheets are provided in the Appendix.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2022, which reflects a seven-year planning horizon consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. Independent of the Project, traffic volumes on the roadway network in the year 2022 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2022 No-Build traffic volumes reflect 2022 Build traffic volume conditions with the Project.

FUTURE TRAFFIC GROWTH

Future traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, potential population growth and development external to the study area would not be accounted for in the resulting traffic projections.

To provide a conservative analysis framework, both procedures were used, the salient components of which are described below.

Specific Development by Others

The Planning Departments of the Town of Winchester and the City of Woburn were contacted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes at the study intersections. The City of Woburn identified that a rezoning petition is currently before the City Council to rezone 165 Cambridge Street to allow the construction of approximately 22 residential condominium units. This project has not yet been approved and is not expected to result in a material increase in traffic volumes within the study area beyond the general background traffic growth rate (discussion follows). No other

developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate.

General Background Traffic Growth

Traffic-volume data compiled by MassDOT from permanent count stations and historic traffic counts in the area were reviewed in order to determine general background traffic growth trends. Based on a review of this data, it was determined that traffic volumes within the study area have generally increased by approximately 0.2 percent. In order to provide a conservative (high) analysis scenario and a prudent planning condition for the Project, a higher than average 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

Roadway Improvement Projects

MassDOT, the Town of Winchester and the City of Woburn were contacted in order to determine if there were any planned roadway improvement projects expected to be completed within the study area. Based on these discussions, MassDOT identified that they are advancing plans to improve four (4) intersections along Cambridge Street and Church Street to the south of the study area, including the installation of new traffic signals at the intersections of Cambridge Street at Pond Street and Cambridge Street at Everett Avenue and Myopia Road, and upgrading the existing traffic signals and adding turn lanes at the intersections of Cambridge Street at Church Street and High Street and Church Street at Bacon Street and Fletcher Street. These improvements will benefit overall traffic flow and safety at the subject locations, but are not expected to materially impact traffic operations within the study area. No other roadway improvement projects outside of routine maintenance activities were identified to be planned within the study area at this time.

No-Build Traffic Volumes

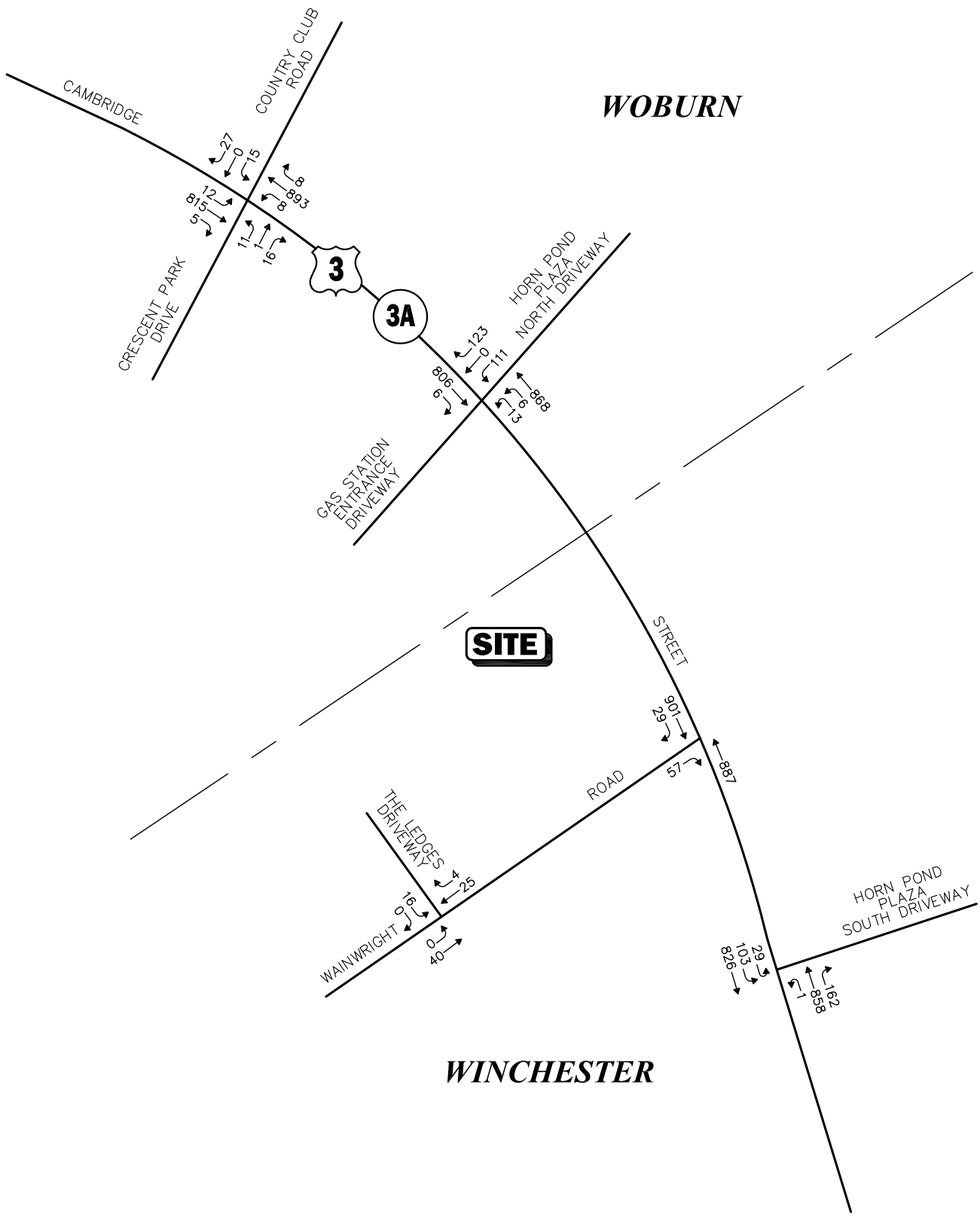
The 2022 No-Build condition peak-hour traffic-volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2015 Existing peak-hour traffic volumes. The resulting 2022 No-Build weekday morning and evening peak-hour traffic volumes are shown on Figures 5 and 6, respectively.

PROJECT-GENERATED TRAFFIC

Design year (2022 Build) traffic volumes for the study area roadways were determined by estimating Project-generated traffic volumes and assigning those volumes on the study roadways. The following sections describe the methodology used to develop the anticipated traffic characteristics of the Project.

As proposed, the Project will entail the construction of a 96-unit residential apartment community. In order to develop the traffic characteristics of the Project, trip-generation statistics published by the ITE[13] for a similar land use as that proposed were used. ITE Land Use Code (LUC) 220, *Apartment*, with the independent variable of number of dwelling units equal to 96, was used to develop the traffic characteristics of the Project. Table 5 summarizes the anticipated traffic characteristics of the Project.

[13]Ibid 5.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 5

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2022 No-Build Weekday Morning Peak Hour Traffic Volumes

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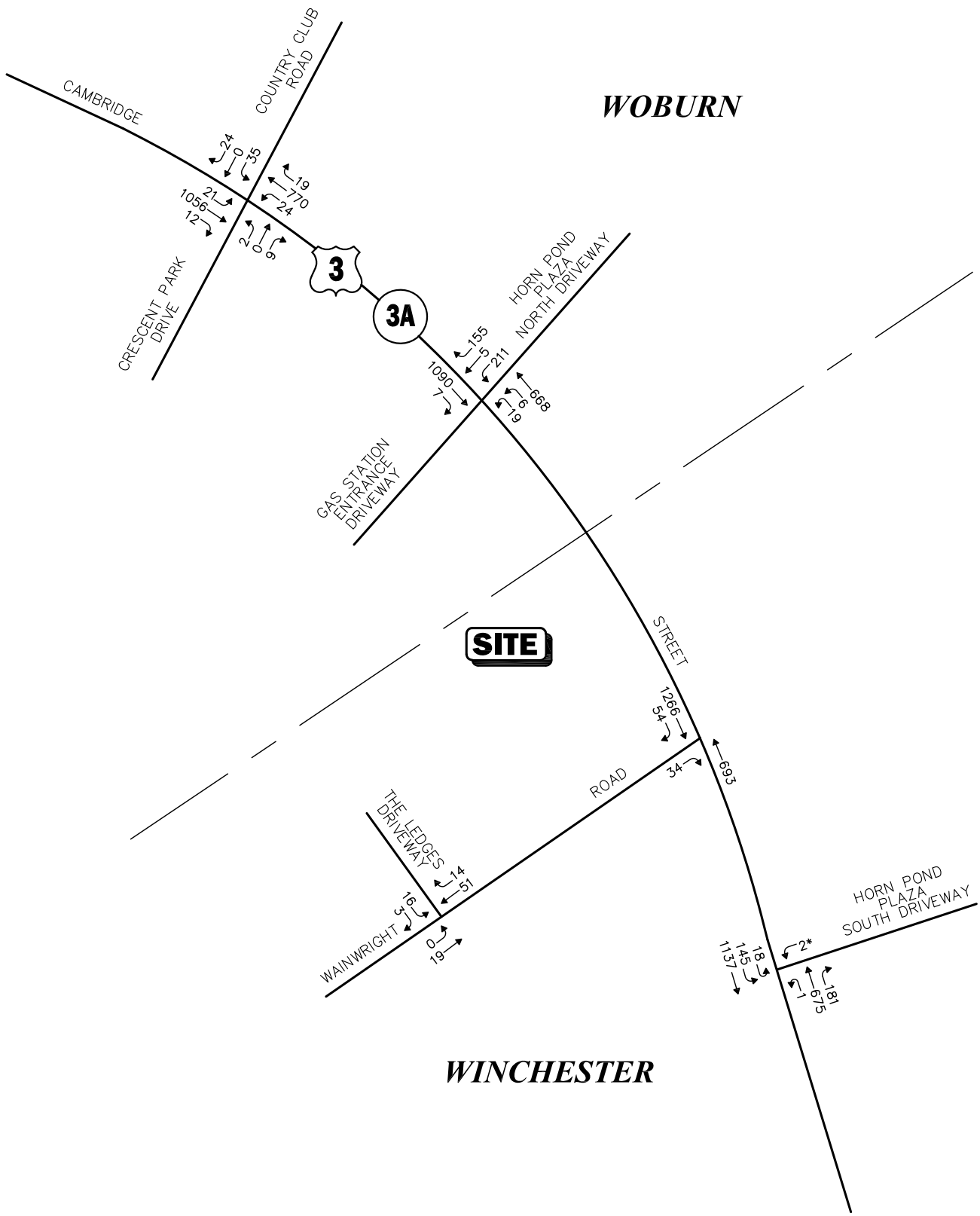

Notes: Imbalances exist due to numerous curb cuts and side streets that are not shown.
* Prohibited movement.

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Figure 6

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2022 No-Build Weekday Evening Peak Hour Traffic Volumes

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Table 5
TRIP GENERATION SUMMARY

Time Period/Direction	Vehicle Trips: Proposed Apartment Community (96 Units)[a]
Average Weekday Daily:	
Entering	353
Exiting	353
Total	706
Weekday Morning Peak Hour:	
Entering	10
Exiting	41
Total	51
Weekday Evening Peak Hour:	
Entering	46
Exiting	24
Total	70

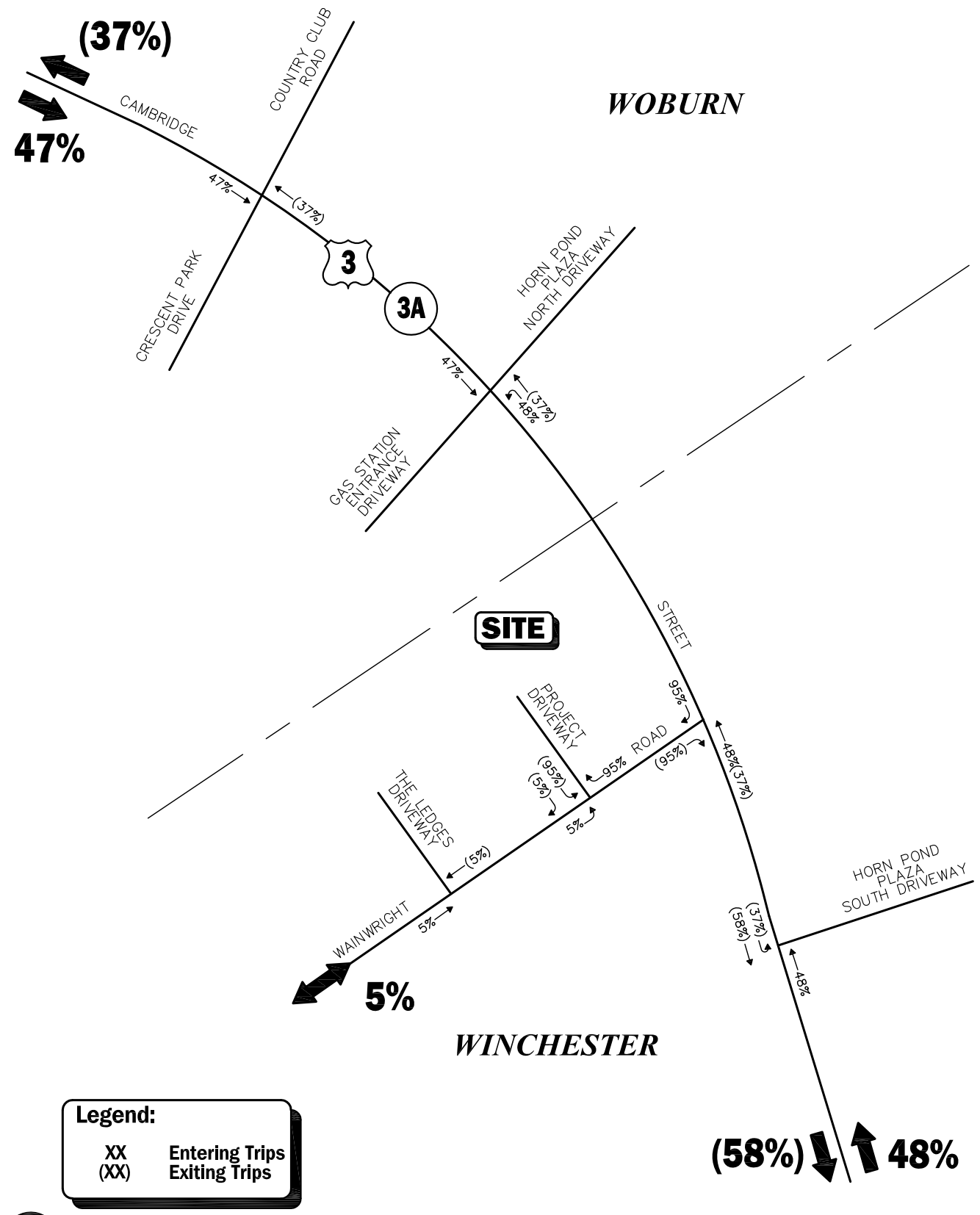
[a]Based on ITE LUC 220, *Apartment*.

Project-Generated Traffic Volume Summary

As can be seen in Table 5, using the aforementioned methodology, the Project is predicted to generate approximately 706 vehicle trips on an average weekday (two-way, 24-hour volume, or 353 vehicles entering and 353 exiting), with 51 vehicle trips (10 vehicles entering and 41 exiting) expected during the weekday morning peak-hour and 70 vehicle trips (46 vehicles entering and 24 exiting) expected during the weekday evening peak-hour.

Trip Distribution and Assignment

The directional distribution of generated trips to and from the Project site was determined based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the Town of Winchester and the City of Woburn, and then refined based on existing traffic patterns within the study area during the commuter peak periods. This methodology is consistent with the residential nature of the Project and commuter traffic patterns during the peak hours. The general trip distribution for the Project is graphically depicted on Figure 7 and summarized in Table 6. The additional traffic expected to be generated by the Project was assigned on the study area roadway network as shown on Figures 8 and 9.



Legend:

XX	Entering Trips
(XX)	Exiting Trips

Not To Scale

Figure 7

Trip Distribution Map

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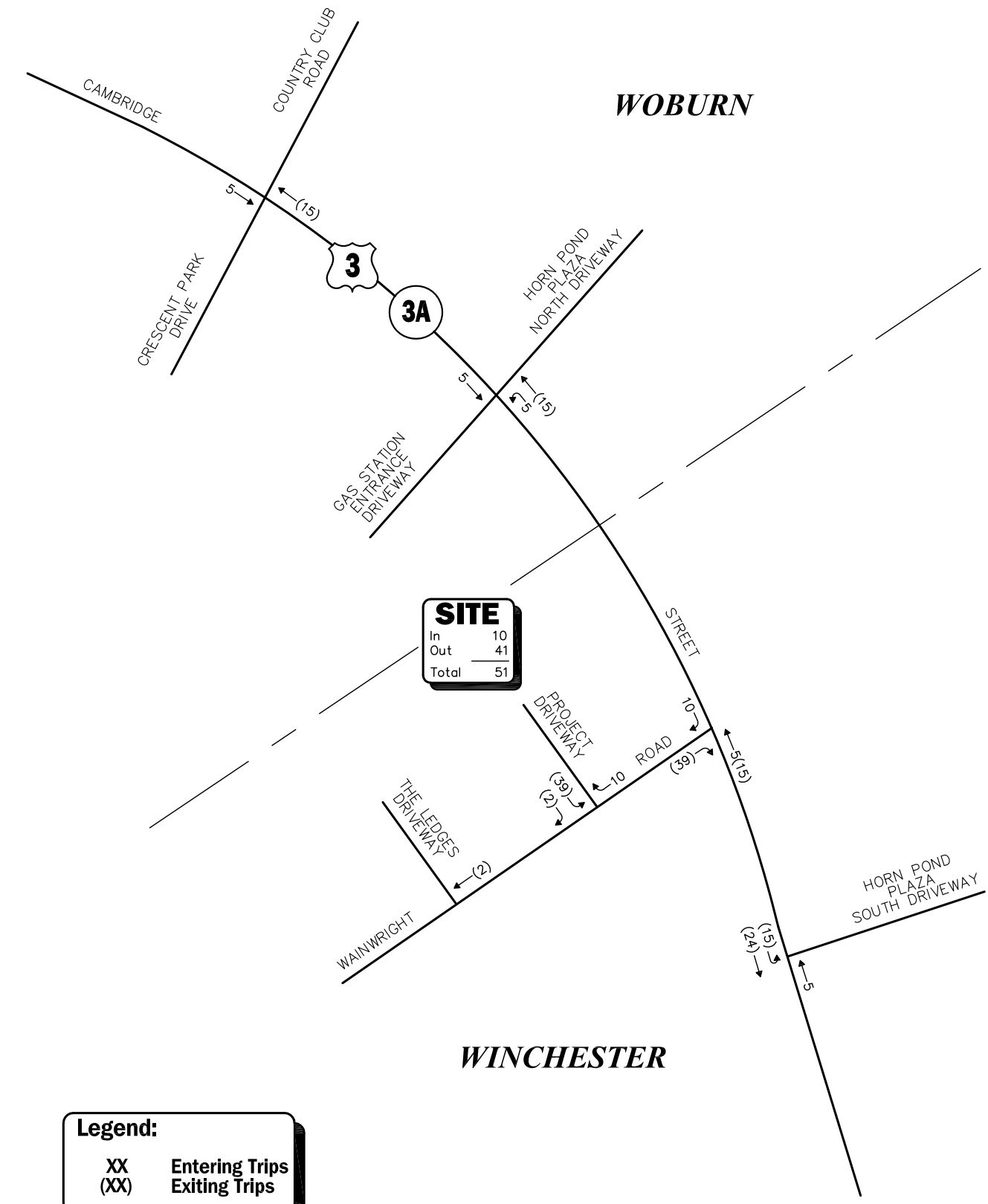

Legend:

XX	Entering Trips
(XX)	Exiting Trips

Not To Scale

Figure 8

Project Generated Weekday Morning Peak Hour Traffic Volumes

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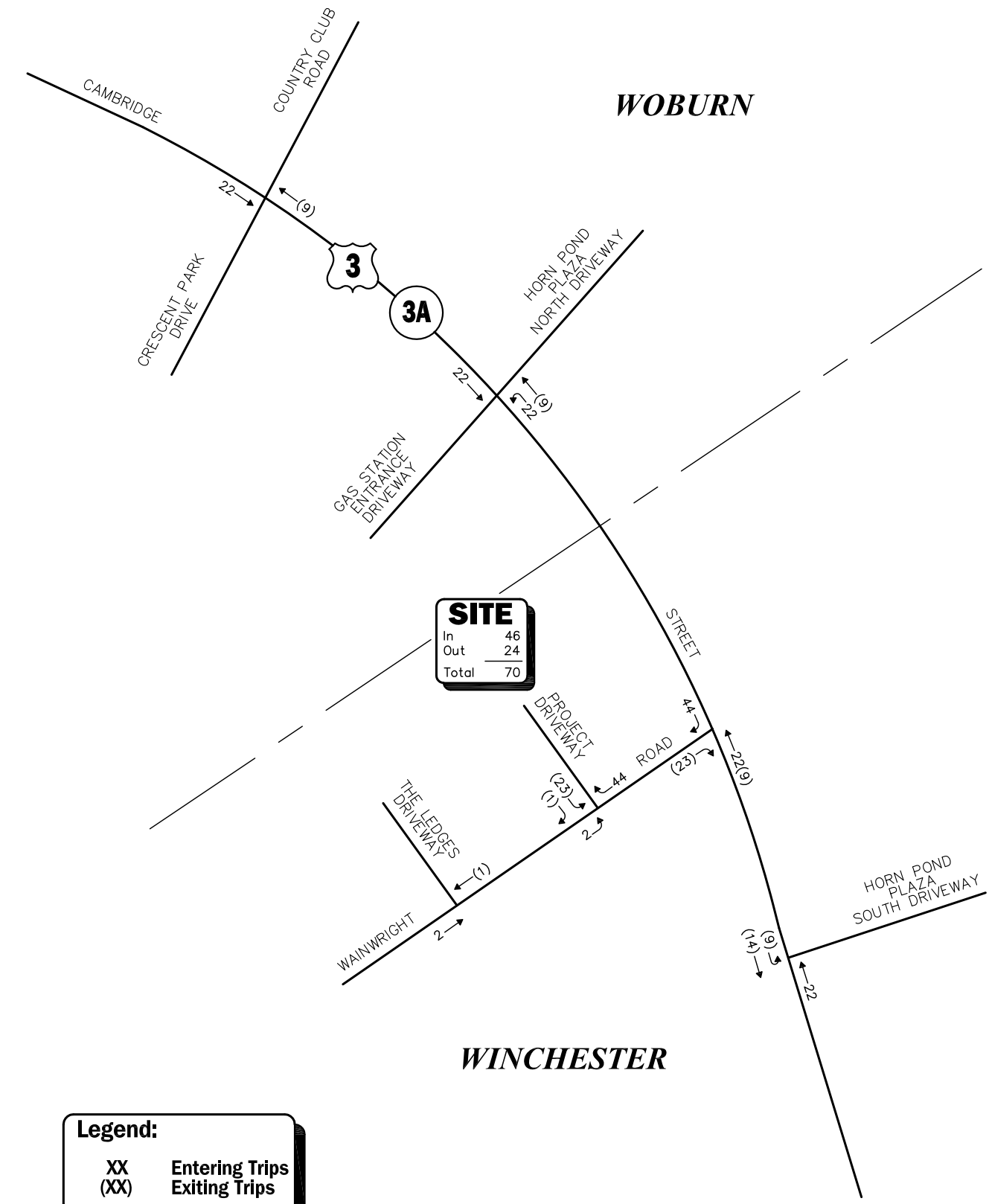

Legend:

XX	Entering Trips
(XX)	Exiting Trips

Not To Scale

Figure 9

Project Generated Weekday Evening Peak Hour Traffic Volumes

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Table 6
TRIP-DISTRIBUTION SUMMARY

Roadway	Directions	Percent To	Percent From
Cambridge Street	North	37	47
Cambridge Street	South	58	48
Wainwright Road	Southwest	5	5
TOTAL		100	100

FUTURE TRAFFIC VOLUMES - BUILD CONDITION

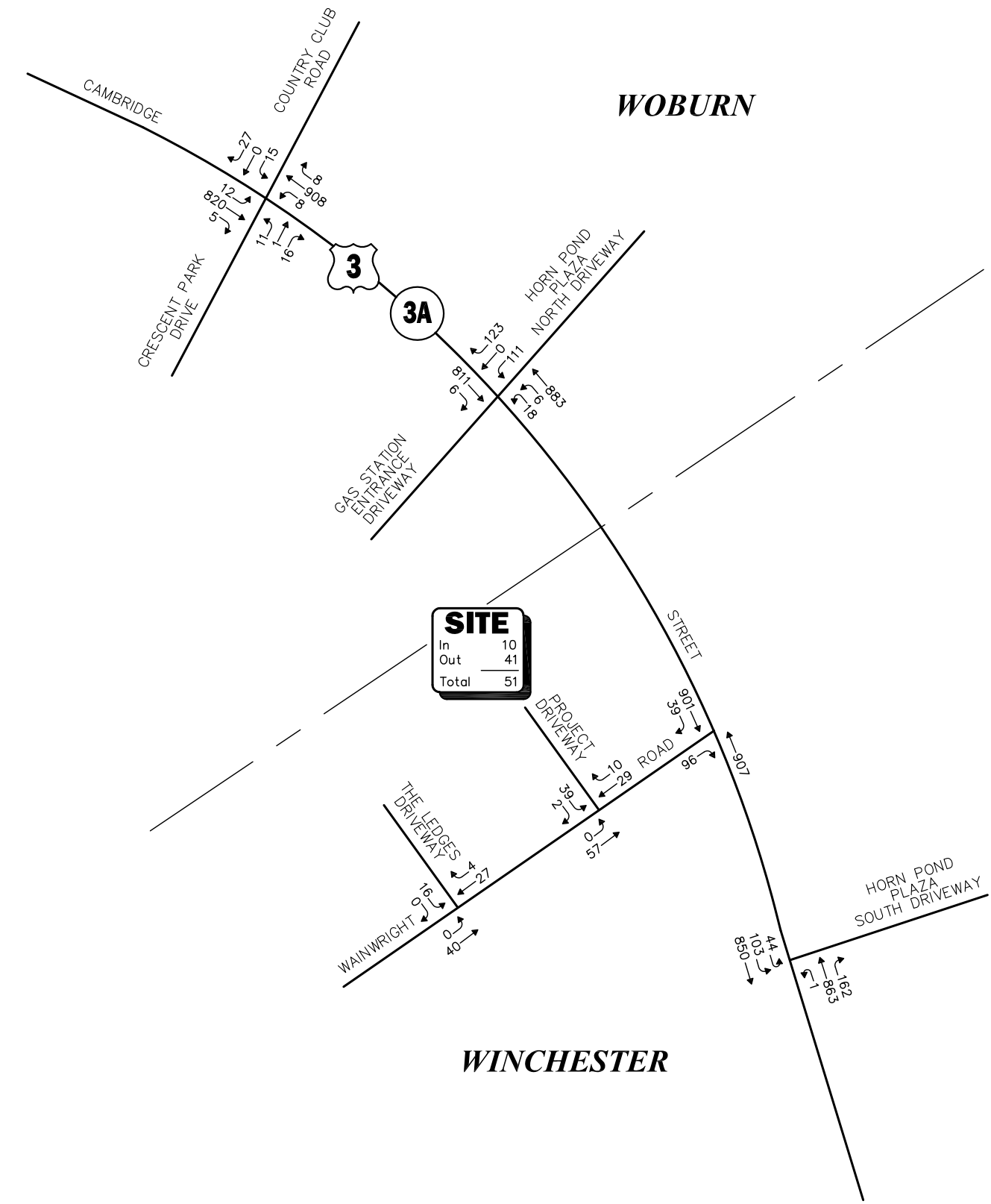
The 2022 Build condition traffic volumes consist of the 2022 No-Build traffic volumes with the additional traffic expected to be generated by the Project added to them. The 2022 Build weekday morning and evening peak-hour traffic-volumes are graphically depicted on Figures 10 and 11, respectively.

A summary of peak-hour projected traffic-volume increases external to the study area that is the subject of this assessment is shown in Table 7. These volumes are based on the expected increases from the Project.

Table 7
PEAK-HOUR TRAFFIC-VOLUME INCREASES

Location/Peak Hour	2015 Existing	2022 No-Build	2022 Build	Traffic Volume Increase Over No-Build	Percent Increase Over No-Build
Cambridge Street, north of Country Club Road:					
Weekday Morning	1,628	1,763	1,783	20	1.1
Weekday Evening	1,758	1,885	1,916	31	1.6
Cambridge Street, south of Horn Pond Plaza South Driveway:					
Weekday Morning	1,727	1,848	1,877	29	1.6
Weekday Evening	1,865	1,986	2,022	36	1.8
Wainwright Road, south of the Ledges Driveway:					
Weekday Morning	60	65	67	2	3.1
Weekday Evening	69	73	76	3	4.1

As shown in Table 7, Project-related traffic-volume increases external to the study area relative to 2022 No-Build conditions are anticipated to range from 1.1 to 4.1 percent during the peak periods, with vehicle increases shown to range from 2 to 36 vehicles. ***Such increases are considered nominal when dispersed over the peak-hour and would not result in a material impact (increase) on motorist delays or vehicle queuing outside of the immediate study area that is the subject of this assessment.***



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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Figure 10

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2022 Build
Weekday Morning
Peak Hour Traffic Volumes

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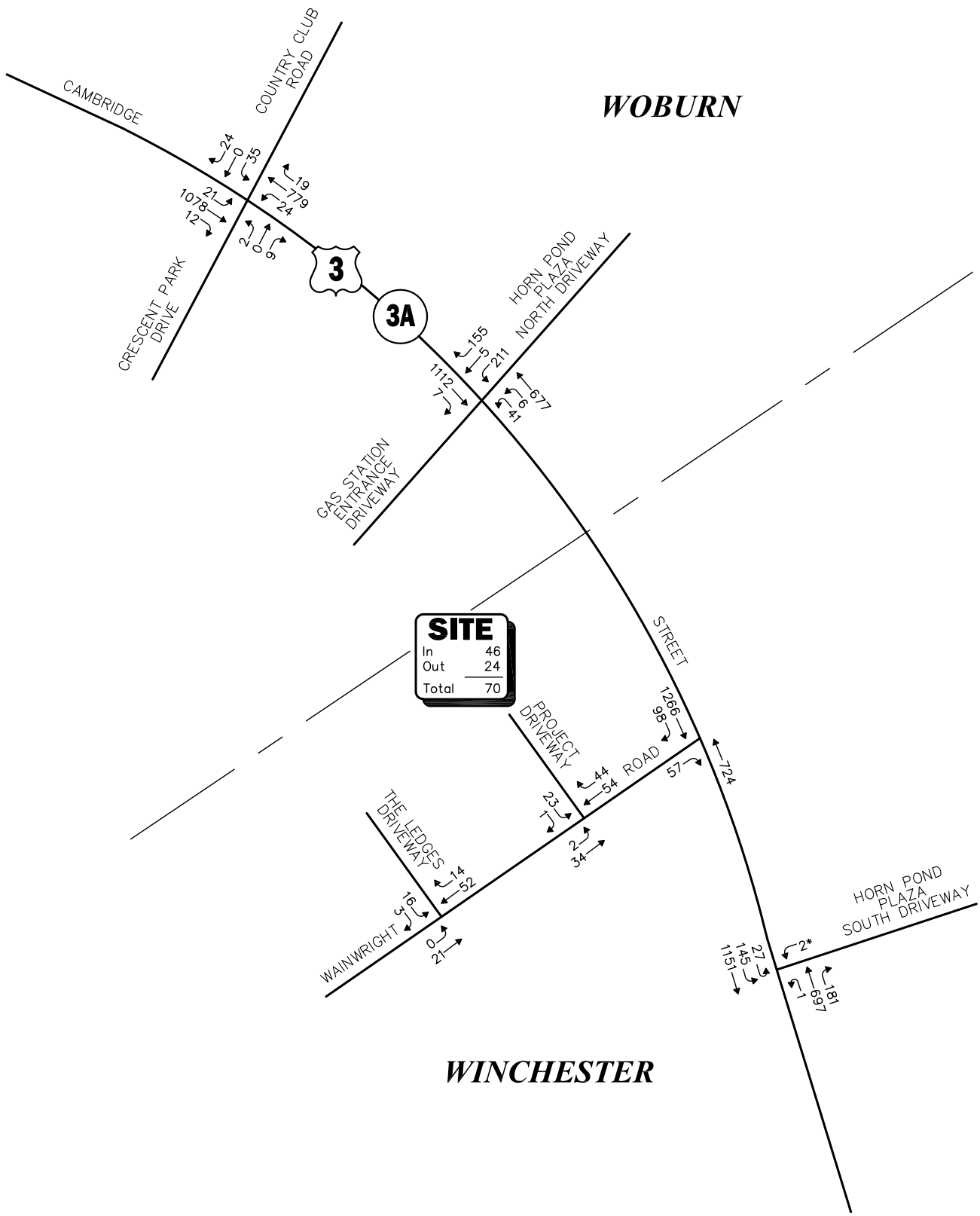

Notes: Imbalances exist due to numerous curb cuts and side streets that are not shown.
* Prohibited movement.

Not To Scale

Figure 11

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2022 Build
Weekday Evening
Peak Hour Traffic Volumes

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TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build and Build traffic volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.[14] The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

[14]The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual;* Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[15] Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the affects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2010 *Highway Capacity Manual*. Table 8 summarizes the relationship between level of service and average control delay for two way stop controlled and all-way stop controlled intersections.

Table 8
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[a]

Level-Of-Service by Volume-to-Capacity Ratio		Average Control Delay (Seconds Per Vehicle)
v/c ≤ 1.0	v/c > 1.0	
A	F	≤10.0
B	F	10.1 to 15.0
C	F	15.1 to 25.0
D	F	25.1 to 35.0
E	F	35.1 to 50.0
F	F	>50.0

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010; page 19-2.

[15]*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Signalized Intersections

The six levels of service for signalized intersections may be described as follows:

- *LOS A* describes operations with very low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Levels of service for signalized intersections were calculated using the Percentile Delay Method implemented as a part of the Synchro™ 8 software as suggested by MassDOT in order to compensate for errors found when employing the 2010 *Highway Capacity Manual* methodology as a part of the software. The Percentile Delay Method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on "percentile" delay. Level-of-service designations are based on the criterion of percentile delay per vehicle and is a measure of: i) driver discomfort; ii) motorist frustration; and iii) fuel consumption; and includes a uniform delay based on percentile volumes using a Poisson arrival pattern, an initial queue move-up time, and a queue interaction delay that accounts for delays resulting from queues extending from adjacent intersections. Table 9 summarizes the relationship between level-of-service and percentile delay, and uses the same numerical delay thresholds as the HCM method. The tabulated percentile delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 9
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS

Level of Service	Percentile Delay Per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro™ intersection capacity analysis software which is based upon the methodology and procedures presented in the 2010 *Highway Capacity Manual.* The Synchro™ vehicle queue analysis methodology is a simulation based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For signalized intersections, Synchro™ reports both the average (50th percentile) the 95th percentile vehicle queue. For unsignalized intersections, Synchro™ reports the 95th percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately three minutes out of sixty minutes during the peak one hour of the day (during the remaining fifty-seven minutes, the vehicle queue length will be less than the 95th percentile queue length).

ANALYSIS RESULTS

Level-of-service and vehicle queue analyses were conducted for 2015 Existing, 2022 No-Build and 2022 Build conditions for the intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized in Tables 10 and 11. The detailed analysis results are presented in the Appendix.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area.

Table 10
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2015 Existing				2022 No-Build				2022 Build			
Signalized Intersection/Peak Hour/Movement	V/C[a]	Delay[b]	LOS[c]	Queue[d] 50th/95th	V/C	Delay	LOS	Queue 50th/95th	V/C	Delay	LOS	Queue 50th/95th
Cambridge Street at Crescent Park Drive and Country Club Road												
Weekday Morning:												
Crescent Park Drive EB LT/TH	0.05	18.8	B	0/1	0.05	19.8	B	0/1	0.05	20.0	B	0/1
Crescent Park Drive EB RT	0.05	1.9	A	0/0	0.05	2.3	A	0/0	0.05	2.3	A	0/0
Country Club Road WB LT/TH/RT	0.12	0.6	A	0/0	0.13	0.6	A	0/0	0.13	0.6	A	0/0
Cambridge Street NB LT	0.01	2.0	A	0/0	0.01	1.9	A	0/0	0.01	1.9	A	0/0
Cambridge Street NB TH/RT	0.29	2.0	A	0/3	0.31	1.9	A	0/3	0.32	1.9	A	0/3
Cambridge Street SB LT/TH	0.32	5.1	A	0/5	0.34	5.0	A	0/6	0.34	5.0	A	0/6
Cambridge Street SB RT	0.00	0.0	A	0/0	0.00	0.0	A	0/0	0.00	0.0	A	0/0
Overall	--	**3.5**	**A**	--	--	**3.5**	**A**	--	--	**3.5**	**A**	--
Weekday Evening:												
Crescent Park Drive EB LT/TH	0.01	22.0	C	0/1	0.02	23.5	C	0/1	0.02	23.5	C	0/1
Crescent Park Drive EB RT	0.03	0.2	A	0/0	0.03	0.8	A	0/0	0.04	0.8	A	0/0
Country Club Road WB LT/TH/RT	0.22	2.1	A	0/0	0.26	3.1	A	0/	0.26	3.1	A	0/0
Cambridge Street NB LT	0.05	1.9	A	0/0	0.06	2.2	A	0/1	0.06	2.2	A	0/1
Cambridge Street NB TH/RT	0.32	2.5	A	2/2	0.36	2.8	A	2/2	0.36	2.8	A	2/2
Cambridge Street SB LT/TH	0.44	5.9	A	2/7	0.51	7.6	A	5/7	0.52	7.7	A	5/8
Cambridge Street SB RT	0.01	0.0	A	0/0	0.01	0.0	A	0/0	0.01	0.0	A	0/0
Overall	--	**4.2**	**A**	--	--	**5.2**	**A**	--	--	**5.2**	**A**	--

[a]Volume-to-capacity ratio.
[b]Percentile delay per vehicle in seconds.
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 11
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2015 Existing				2022 No-Build				2022 Build			
Unsignalized Intersection/Peak Hour/Movement	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
Cambridge Street at Horn Pond Plaza North Driveway and Gas Station Entrance Driveway												
Weekday Morning:												
Horn Pond Plaza North Driveway WB LT/TH	111	>50.0	F	6	111	>50.0	F	7	111	>50.0	F	8
Horn Pond Plaza North Driveway WB RT	123	13.5	B	1	123	14.0	B	1	123	14.2	B	1
Cambridge Street NB UT/LT/TH	827	0.4	A	0	887	0.5	A	0	907	0.6	A	0
Cambridge Street SB TH/RT	750	0.0	A	0	812	0.0	A	0	817	0.0	A	0
Weekday Evening:												
Horn Pond Plaza North Driveway WB LT/TH	216	>50.0	F	19	216	>50.0	F	21	216	>50.0	F	24
Horn Pond Plaza North Driveway WB RT	155	13.0	B	1	155	13.5	B	1	155	13.6	B	2
Cambridge Street NB UT/LT/TH	646	0.8	A	0	693	0.9	A	1	724	1.6	A	1
Cambridge Street SB TH/RT	1,009	0.0	A	0	1,097	0.0	A	0	1,119	0.0	A	0
Cambridge Street at Wainwright Road												
Weekday Morning:												
Wainwright Road EB RT	53	12.4	B	1	57	12.9	B	1	96	13.9	B	1
Cambridge Street NB TH	827	0.0	A	0	887	0.0	A	0	907	0.0	A	0
Cambridge Street SB TH/RT	867	0.0	A	0	930	0.0	A	0	940	0.0	A	0
Weekday Evening:												
Wainwright Road EB RT	32	14.5	B	1	34	15.4	C	1	57	16.9	C	1
Cambridge Street NB TH	646	0.0	A	0	693	0.0	A	0	724	0.0	A	0
Cambridge Street SB TH/RT	1,231	0.0	A	0	1,320	0.0	A	0	1,364	0.0	A	0
Cambridge Street at Horn Pond Plaza South Driveway												
Weekday Morning:												
Cambridge Street NB TH/RT	963	0.0	A	0	1,021	0.0	A	0	1,026	0.0	A	0
Cambridge Street SB UT/LT	130	14.3	B	1	132	15.4	C	2	147	17.3	C	2
Cambridge Street SB TH	763	0.0	A	0	826	0.0	A	0	850	0.0	A	0
Weekday Evening:												
Cambridge Street NB TH/RT	811	0.0	A	0	857	0.0	A	0	879	0.0	A	0
Cambridge Street SB UT/LT	162	12.3	B	1	163	12.9	B	1	172	13.9	B	2
Cambridge Street SB TH	1,051	0.0	A	0	1,137	0.0	A	0	1,151	0.0	A	0

See notes at end of table.

Table 11 (Continued)
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2015 Existing				2022 No-Build				2022 Build			
Unsignalized Intersection/Peak Hour/Movement	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
Wainwright Road at The Ledges Driveway												
Weekday Morning:												
Wainwright Road EB LT/TH	37	0.0	A	0	40	0.0	A	0	40	0.0	A	0
Wainwright Road WB TH/RT	27	0.0	A	0	29	0.0	A	0	31	0.0	A	0
The Ledges Driveway SB LT/RT	16	9.1	A	0	16	9.1	A	0	16	9.1	A	0
Weekday Evening:												
Wainwright Road EB LT/TH	18	0.0	A	0	19	0.0	A	0	21	0.0	A	0
Wainwright Road WB TH/RT	62	0.0	A	0	65	0.0	A	0	66	0.0	A	0
The Ledges Driveway SB LT/RT	19	9.0	A	0	19	9.1	A	0	19	9.1	A	0
Wainwright Road at the Project Site Driveway												
Weekday Morning:												
Wainwright Road EB LT/TH	--	--	--	--	--	--	--	--	57	0.0	A	0
Wainwright Road WB TH/RT	--	--	--	--	--	--	--	--	39	0.0	A	0
Project Site Driveway SB LT/RT	--	--	--	--	--	--	--	--	41	9.2	A	1
Weekday Evening:												
Wainwright Road EB LT/TH	--	--	--	--	--	--	--	--	36	0.4	A	0
Wainwright Road WB TH/RT	--	--	--	--	--	--	--	--	98	0.0	A	0
Project Site Driveway SB LT/RT	--	--	--	--	--	--	--	--	24	9.2	A	0

[a]Demand in vehicles per hour.
[b]Average control delay per vehicle (in seconds).
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; UT = U-turn movements; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Signalized Intersections

The signalized intersection of Cambridge Street at Country Club Road and Crescent Park Drive was found to be operating at an overall LOS A during the peak hours under all analysis conditions, with all movements operating at LOS C or better, where a LOS of "D" or better is generally defined as "acceptable" traffic operations. The addition of Project-related traffic to the intersection was not shown to result in a change in LOS for any movement at the intersection.

Unsignalized Intersections

Left-turns exiting the Horn Pond Plaza north driveway at Cambridge Street were shown to operate at LOS F during the peak periods under all analysis conditions. Such operating conditions (LOS F) are typical of unsignalized driveways and side streets along the Cambridge Street corridor where left-turns are permitted and occur as a result of the relatively large volume of conflicting traffic travelling along the roadway. The U-turn/left-turn movement from Cambridge Street at the Horn Pond Plaza south driveway and right-turn movements exiting Wainwright Road at Cambridge Street were shown to operate at LOS C or better during the peak periods under all analysis conditions.

All movements at the intersection of Wainwright Road at the Project site driveway and at the driveway that serves The Ledges were shown to operate at LOS A during the peak periods under all analysis conditions.

SIGHT DISTANCE EVALUATION

Sight distance measurements were performed at the Project site driveway intersection with Wainwright Road and at the U-turn locations on Cambridge Street in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)[16] requirements. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with on-coming traffic. In accordance with AASHTO standards, if the measured ISD is at least equal to the required SSD value for the appropriate design speed, the intersection can operate in a safe manner. Table 12 presents the measured SSD and ISD at the subject intersections.

[16] Ibid 6.

Table 12
SIGHT DISTANCE MEASUREMENTS[a]

Intersection/Sight Distance Measurement	Feet		
	Required Minimum	ISD[b]	Measured
Wainwright Road at the Project Site Driveway			
Stopping Sight Distance:			
Wainwright Road approaching from the northeast	235	--	350+[c]
Wainwright Road approaching from the southwest	180	--	372
Intersection Sight Distance:			
Looking to the northeast from the Project Site Driveway	235	290/335	350+[c]
Looking to the southwest from the Project Site Driveway	180	290/335	363
Cambridge Street Northbound U-Turn at The Horn Pond Plaza North Driveway			
Stopping Sight Distance:			
Cambridge Street approaching from the north	360	--	500+
Intersection Sight Distance:			
Looking to the north from Cambridge Street northbound	360	430/500	500+
Cambridge Street Southbound U-Turn at The Horn Pond Plaza South Driveway			
Stopping Sight Distance:			
Cambridge Street approaching from the south	360	--	500+
Intersection Sight Distance:			
Looking to the south from Cambridge Street southbound	360	430/500	500+

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011; and based on a 30 mph approach speed and a 10 percent grade on Wainwright Road, and a 45 mph approach speed and a grade of 3 percent or less on Cambridge Street.

[b]Values shown are the intersection sight distance for a vehicle turning right/left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

[c]Clear lines of sight are provided to and from Cambridge Street.

As can be seen in Table 14, the available sight lines exceed the recommended minimum sight distance requirements for a 30 mph approach speed along Wainwright Road and a 45 mph approach speed along Cambridge Street, consistent with the measured 85th percentile vehicle travel speed (28 mph) and the "prima facie" speed limit (30 mph) on Wainwright Road, and the measured 85th percentile vehicle travel speed and 10 mph above the posted speed limit (35 mph) on Cambridge Street.

In addition, a review of the location of the Project site driveway in relation to the driveway that serves The Ledges residential community was completed as it relates to sight lines and safety. The Project site driveway will be located approximately 120 feet north of the driveway that serves The Ledges as measured between the centerline of both driveways. This distance also approximates the separation between the conflicting movements exiting both driveways. In order to achieve safe operation of adjacent driveways, the suggested minimum separation between conflicting movements should be at least be equal to the safe stopping sight distance based on the

traffic control measure that is present at each driveway. With both driveways under stop control, vehicles exiting the driveways from a stopped position would be travelling at a speed of 15 mph or less at the potential conflict point, which would require a minimum separation between the conflicting movements of 90 feet.[17] Given that the conflicting movements between the driveways are separated by 120 feet, both driveways can operate in a safe manner.

[17] Based on the sight distance requirement for a 15 mph approach speed and a 10 percent downgrade between the driveway serving The Ledges and the Project site driveway.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

VAI has completed a detailed assessment of the potential impacts on the transportation infrastructure associated with the proposed construction of the residential community to be located at 416 Cambridge Street in Winchester, Massachusetts. The following specific areas have been evaluated as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; under existing and future conditions, both with and without the Project. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the ITE[18] for a similar land use as that proposed, the Project is expected to generate approximately 706 vehicle trips on an average weekday (two-way, 24-hour volume), with approximately 51 vehicle trips expected during the weekday morning peak-hour and 70 vehicle trips expected during the weekday evening peak-hour;

2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions);

3. No apparent safety deficiencies were noted with respect to the motor vehicle crash history at the study intersections; and

4. Lines of sight to and from the Project site driveway intersection with Wainwright Road and at the U-turn locations on Cambridge Street were found to exceed the required minimum distance for the intersections to function in a safe and efficient manner based on the appropriate approach speed along both roadways.

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations that follow.

[18] Ibid 5.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site and address any deficiencies identified at off-site locations evaluated in conjunction with this study. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the Project site will be provided by way of a full-access driveway that will intersect the west side of Wainwright Road approximately 120 feet north of the driveway that serves The Ledges residential community as measured between the centerline of both driveways. The following recommendations are offered with respect to the design and operation of the Project site driveway:

- The Project site driveway will be designed as a "boulevard" with a center median that is designed to be traversable by an emergency vehicle. The driveway cross-section should provide two 16-foot wide travel lanes separated by an 8-foot wide raised median with sloped granite curb.
- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.
- All signs and pavement markings to be installed within the Project site shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[19]
- Sidewalks should be provided within the Project site linking the proposed buildings and other amenities to Wainwright Road.
- Marked crosswalks and wheelchair ramps should be provided at pedestrian crossings within the Project site.
- Signs and landscaping to be installed along the Project site driveway, internal to the Project site and at the Project site driveway intersection with Wainwright Road should be designed and maintained so as not to restrict lines of sight.
- A school bus waiting area should be provided at an appropriate location designated by the Town.

Off-Site

Cambridge Street at Wainwright Road

Independent of the Project it is recommended that a STOP-sign and marked STOP-line be installed on the Wainwright Road approach to Cambridge Street in accordance with the applicable standards of the MUTCD[20] in order to reinforce the vehicular right-of-way at the intersection and to define the desired stopping point for vehicles.

[19] Ibid 8.
[20] Ibid 8.

Pedestrian Accommodations

Pedestrian accommodations are not currently provided between the residential neighborhoods along Wainwright Road and the Horn Pond Plaza, a major impediment to which is the raised median along Cambridge Street which is sloped to transition the grade differential between the north and southbound directions of travel on Cambridge Street. The closest available pedestrian crossing of Cambridge Street is located at the signalized intersection of Cambridge Street with Country Club Road and Crescent Park Drive, approximately ¼-mile north of Wainwright Road; however, sidewalks are not currently provided along either side of Cambridge Street between Wainwright Road, the Cambridge Street/Country Club Road/Crescent Park Drive intersection and the Horn Pond Plaza. In order to facilitate pedestrian connectivity in the area, the Project proponent will contribute monies to the Town to be used to advance the development of a sidewalk master plan to accomplish a pedestrian connection to the Horn Pond Plaza, the MBTA bus stops located on both sides of Cambridge Street, and the completion of the existing sidewalk network along Cambridge Street.

Transportation Demand Management

The following Transportation Demand Management (TDM) measures will be implemented as a part of the Project in an effort to reduce the overall number of automobile trips in the area and to integrate the Project into the available transportation resources.

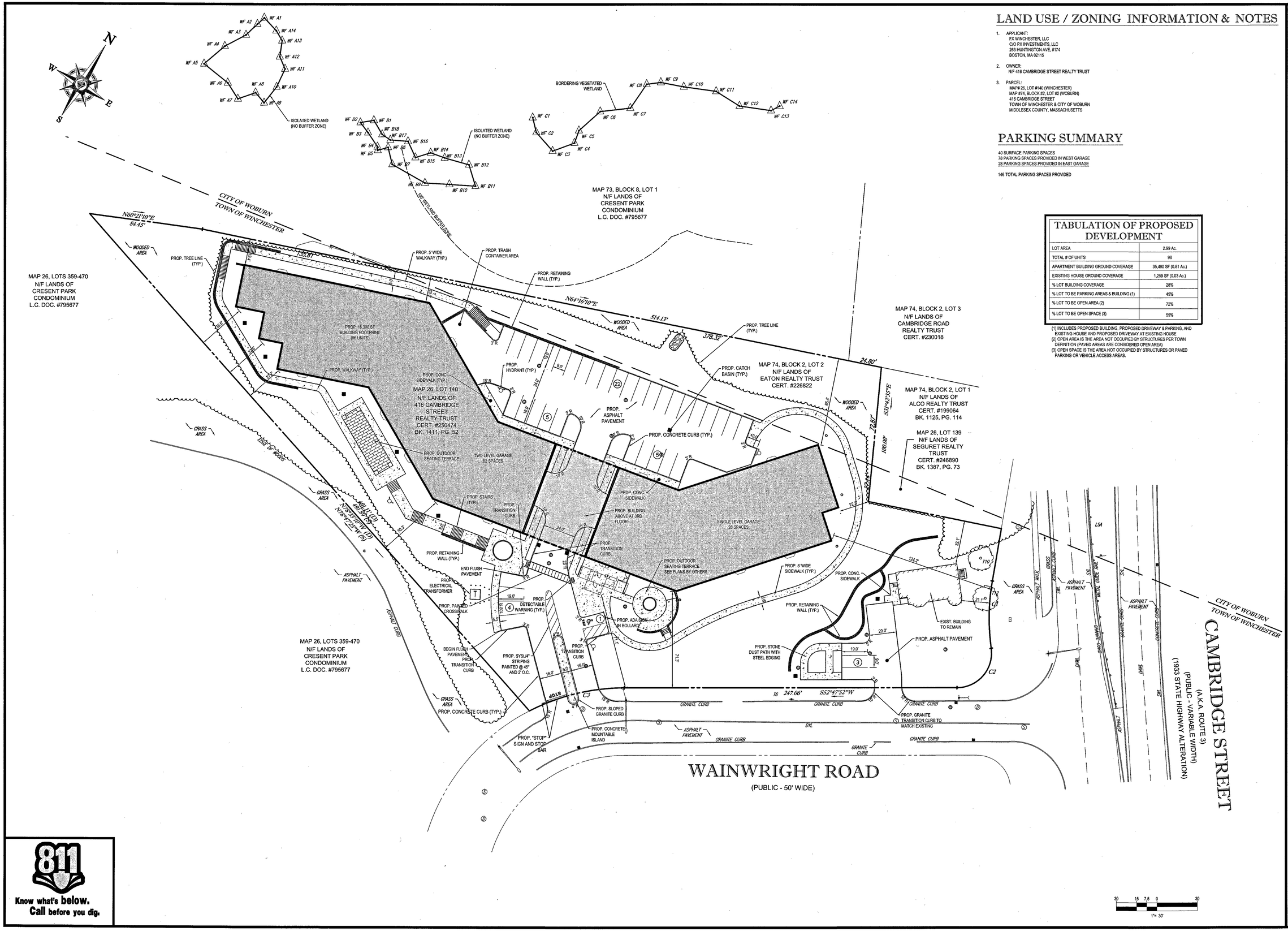
- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location;
- A "welcome packet" will be provided to new residents of the Project detailing available public transportation services, bicycle and walking alternatives, and commuter options available through MassRIDES' and their NuRide program which rewards individuals that choose to walk, bicycle, carpool, vanpool or that use public transportation to travel to and from work;
- Pedestrian accommodations will be incorporated within the Project site consisting of sidewalks and pedestrian paths linking buildings and parking to on-site amenities;
- A mail drop will be provided in a central location; and
- Secure bicycle parking will be provided, including both exterior bicycle racks adjacent to building entrances and weather protected bicycle parking in a secure area within the parking garage.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing and improved transportation system.

APPENDIX

SITE PLAN
AUTOMATIC TRAFFIC RECORDER COUNTS
MANUAL TURNING MOVEMENT COUNTS
SEASONAL ADJUSTMENT DATA
PUBLIC TRANSPORTATION SCHEDULES
VEHICLE TRAVEL SPEED DATA
MASSDOT CRASH RATE WORKSHEETS
GENERAL BACKGROUND TRAFFIC GROWTH
TRIP-GENERATION CALCULATIONS
JOURNEY TO WORK DATA
CAPACITY ANALYSIS WORKSHEETS

SITE PLAN



LAND USE / ZONING INFORMATION & NOTES

1. APPLICANT:
   FX WINCHESTER, LLC
   C/O PX INVESTMENTS, LLC
   263 HUNTINGTON AVE, #174
   BOSTON, MA 02115
2. OWNER:
   N/F 416 CAMBRIDGE STREET REALTY TRUST
3. PARCEL:
   MAP# 26, LOT #140 (WINCHESTER)
   MAP #74, BLOCK #2, LOT #2 (WOBURN)
   416 CAMBRIDGE STREET
   TOWN OF WINCHESTER & CITY OF WOBURN
   MIDDLESEX COUNTY, MASSACHUSETTS

PARKING SUMMARY

40 SURFACE PARKING SPACES
78 PARKING SPACES PROVIDED IN WEST GARAGE
28 PARKING SPACES PROVIDED IN EAST GARAGE

146 TOTAL PARKING SPACES PROVIDED

TABULATION OF PROPOSED DEVELOPMENT

LOT AREA	2.99 Ac.
TOTAL # OF UNITS	96
APARTMENT BUILDING GROUND COVERAGE	35,490 SF (0.81 Ac.)
EXISTING HOUSE GROUND COVERAGE	1,259 SF (0.03 Ac.)
% LOT BUILDING COVERAGE	28%
% LOT TO BE PARKING AREAS & BUILDING (1)	45%
% LOT TO BE OPEN AREA (2)	72%
% LOT TO BE OPEN SPACE (3)	55%

(1) INCLUDES PROPOSED BUILDING, PROPOSED DRIVEWAY & PARKING, AND EXISTING HOUSE AND PROPOSED DRIVEWAY AT EXISTING HOUSE
(2) OPEN AREA IS THE AREA NOT OCCUPIED BY STRUCTURES PER TOWN DEFINITION (PAVED AREAS ARE CONSIDERED OPEN AREA)
(3) OPEN SPACE IS THE AREA NOT OCCUPIED BY STRUCTURES OR PAVED PARKING OR VEHICLE ACCESS AREAS.

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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AVP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SB0

PROJECT:

SITE DEVELOPMENT PLANS
FOR
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

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CIVIL
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PROFESSIONAL ENGINEER
MASSACHUSETTS

SHEET TITLE:

SITE PLAN

SHEET NUMBER:

4
OF 14

REV 0 - 07/06/2015

P:\141W141161\DWG\W141161sd0.dwg, 04-Site, 10/6/2014, 4:26:00 PM, aplatt, Xerox5319-1-pc3, User834, 1:0.99999997

AUTOMATIC TRAFFIC RECORDER COUNTS

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA

6891VOL1

Start	14-Apr-15	SB		Hour Totals		NB		Hour Totals		Combined Totals	
Time	Tue	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		4	204			6	131				
12:15		8	246			2	110				
12:30		7	211			6	121				
12:45		5	224	24	885	6	124	20	486	44	1371
01:00		2	181			2	115				
01:15		1	209			3	142				
01:30		2	211			1	123				
01:45		6	190	11	791	0	117	6	497	17	1288
02:00		3	210			4	117				
02:15		0	213			1	139				
02:30		1	217			3	147				
02:45		0	210	4	850	1	152	9	555	13	1405
03:00		2	188			3	167				
03:15		1	223			1	149				
03:30		4	235			2	131				
03:45		4	254	11	900	2	167	8	614	19	1514
04:00		4	228			3	155				
04:15		6	249			3	164				
04:30		4	240			10	144				
04:45		11	293	25	1010	13	164	29	627	54	1637
05:00		15	286			13	186				
05:15		31	311			25	145				
05:30		52	292			19	144				
05:45		57	334	155	1223	24	149	81	624	236	1847
06:00		98	303			39	123				
06:15		137	300			56	157				
06:30		171	277			74	117				
06:45		224	244	630	1124	112	143	281	540	911	1664
07:00		212	200			96	100				
07:15		254	148			149	96				
07:30		225	153			160	91				
07:45		239	161	930	662	191	87	596	374	1526	1036
08:00		219	118			201	68				
08:15		216	129			176	55				
08:30		216	90			204	45				
08:45		201	94	852	431	224	55	805	223	1657	654
09:00		195	87			162	42				
09:15		207	74			118	50				
09:30		190	49			103	38				
09:45		161	58	753	268	115	26	498	156	1251	424
10:00		176	36			122	35				
10:15		181	28			122	29				
10:30		179	22			129	33				
10:45		194	20	730	106	127	23	500	120	1230	226
11:00		192	16			107	14				
11:15		207	22			105	17				
11:30		176	18			98	12				
11:45		193	11	768	67	116	9	426	52	1194	119
Total		4893	8317			3259	4868			8152	13185
Percent		37.0%	63.0%			40.1%	59.9%			38.2%	61.8%

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA

6891VOL1

Start Time	15-Apr-15 Wed	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		12	177			12	118				
12:15		6	196			10	109				
12:30		8	201			7	125				
12:45		4	181	30	755	6	114	35	466	65	1221
01:00		6	236			8	152				
01:15		3	205			3	131				
01:30		3	249			6	134				
01:45		5	191	17	881	6	131	23	548	40	1429
02:00		2	218			3	108				
02:15		2	223			2	134				
02:30		4	217			2	142				
02:45		4	241	12	899	0	159	7	543	19	1442
03:00		2	213			5	151				
03:15		0	223			5	168				
03:30		1	247			2	131				
03:45		5	237	8	920	1	166	13	616	21	1536
04:00		4	239			0	161				
04:15		6	293			2	139				
04:30		4	258			2	147				
04:45		9	300	23	1090	9	173	13	620	36	1710
05:00		18	292			12	153				
05:15		22	308			17	162				
05:30		41	302			14	172				
05:45		53	320	134	1222	28	156	71	643	205	1865
06:00		85	297			29	154				
06:15		137	277			59	155				
06:30		175	296			70	131				
06:45		223	297	620	1167	120	123	278	563	898	1730
07:00		228	227			112	135				
07:15		280	178			138	113				
07:30		234	157			185	98				
07:45		245	132	987	694	192	99	627	445	1614	1139
08:00		228	133			191	92				
08:15		227	138			165	63				
08:30		213	126			171	70				
08:45		210	98	878	495	186	57	713	282	1591	777
09:00		185	91			146	73				
09:15		188	83			126	54				
09:30		183	57			108	56				
09:45		164	59	720	290	140	30	520	213	1240	503
10:00		202	46			129	32				
10:15		172	40			115	31				
10:30		193	33			105	40				
10:45		179	30	746	149	115	33	464	136	1210	285
11:00		196	21			89	12				
11:15		174	22			107	19				
11:30		202	29			144	16				
11:45		210	18	782	90	133	16	473	63	1255	153
Total		4957	8652			3237	5138			8194	13790
Percent		36.4%	63.6%			38.7%	61.3%			37.3%	62.7%
Grand Total		9850	16969			6496	10006			16346	26975
Percent		36.7%	63.3%			39.4%	60.6%			37.7%	62.3%
ADT	ADT 21,660		AADT 21,660								

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA

6891VOL1

Start	13-Apr-15		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	*	*	24	20	30	35	*	*	*	*	*	*	*	*	27	28
01:00	*	*	11	6	17	23	*	*	*	*	*	*	*	*	14	14
02:00	*	*	4	9	12	7	*	*	*	*	*	*	*	*	8	8
03:00	*	*	11	8	8	13	*	*	*	*	*	*	*	*	10	10
04:00	*	*	25	29	23	13	*	*	*	*	*	*	*	*	24	21
05:00	*	*	155	81	134	71	*	*	*	*	*	*	*	*	144	76
06:00	*	*	630	281	620	278	*	*	*	*	*	*	*	*	625	280
07:00	*	*	**930**	596	**987**	627	*	*	*	*	*	*	*	*	**958**	612
08:00	*	*	852	**805**	878	**713**	*	*	*	*	*	*	*	*	865	**759**
09:00	*	*	753	498	720	520	*	*	*	*	*	*	*	*	736	509
10:00	*	*	730	500	746	464	*	*	*	*	*	*	*	*	738	482
11:00	*	*	768	426	782	473	*	*	*	*	*	*	*	*	775	450
12:00 PM	*	*	885	486	755	466	*	*	*	*	*	*	*	*	820	476
01:00	*	*	791	497	881	548	*	*	*	*	*	*	*	*	836	522
02:00	*	*	850	555	899	543	*	*	*	*	*	*	*	*	874	549
03:00	*	*	900	614	920	616	*	*	*	*	*	*	*	*	910	615
04:00	*	*	1010	**627**	1090	620	*	*	*	*	*	*	*	*	1050	624
05:00	*	*	**1223**	624	**1222**	**643**	*	*	*	*	*	*	*	*	**1222**	**634**
06:00	*	*	1124	540	1167	563	*	*	*	*	*	*	*	*	1146	552
07:00	*	*	662	374	694	445	*	*	*	*	*	*	*	*	678	410
08:00	*	*	431	223	495	282	*	*	*	*	*	*	*	*	463	252
09:00	*	*	268	156	290	213	*	*	*	*	*	*	*	*	279	184
10:00	*	*	106	120	149	136	*	*	*	*	*	*	*	*	128	128
11:00	*	*	67	52	90	63	*	*	*	*	*	*	*	*	78	58
Lane	0	0	13210	8127	13609	8375	0	0	0	0	0	0	0	0	13408	8253
Day	0		21337		21984		0		0		0		0		21661	
AM Peak	-	-	07:00	08:00	07:00	08:00	-	-	-	-	-	-	-	-	07:00	08:00
Vol.	-	-	930	805	987	713	-	-	-	-	-	-	-	-	958	759
PM Peak	-	-	17:00	16:00	17:00	17:00	-	-	-	-	-	-	-	-	17:00	17:00
Vol.	-	-	1223	627	1222	643	-	-	-	-	-	-	-	-	1222	634

Comb. Total	0	21337	21984	0	0	0	0	21661

ADT	ADT 21,660	AADT 21,660

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA

6891VOL2

Start	14-Apr-15	EB		Hour Totals		WB		Hour Totals		Combined Totals	
Time	Tue	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		0	8			0	12				
12:15		0	3			0	14				
12:30		0	11			0	11				
12:45		0	8	0	30	0	10	0	47	0	77
01:00		0	15			0	6				
01:15		0	6			0	15				
01:30		0	13			0	12				
01:45		0	5	0	39	0	8	0	41	0	80
02:00		0	10			0	13				
02:15		0	7			0	7				
02:30		0	10			0	8				
02:45		0	8	0	35	0	9	0	37	0	72
03:00		0	9			0	3				
03:15		0	12			0	14				
03:30		0	10			0	8				
03:45		0	7	0	38	0	12	0	37	0	75
04:00		0	12			1	7				
04:15		0	5			0	6				
04:30		0	9			0	7				
04:45		0	11	0	37	0	21	1	41	1	78
05:00		0	5			0	13				
05:15		0	9			0	13				
05:30		2	10			0	14				
05:45		1	5	3	29	3	11	3	51	6	80
06:00		6	17			1	10				
06:15		5	12			0	11				
06:30		4	11			0	17				
06:45		6	0	21	40	1	15	2	53	23	93
07:00		13	5			7	7				
07:15		7	5			7	12				
07:30		9	6			6	4				
07:45		9	5	38	21	11	6	31	29	69	50
08:00		12	4			6	9				
08:15		10	4			4	10				
08:30		14	2			6	7				
08:45		14	3	50	13	10	5	26	31	76	44
09:00		13	3			11	4				
09:15		1	0			5	6				
09:30		10	2			4	3				
09:45		10	1	34	6	6	3	26	16	60	22
10:00		13	0			10	5				
10:15		14	2			9	1				
10:30		6	0			11	0				
10:45		11	1	44	3	9	1	39	7	83	10
11:00		7	0			7	1				
11:15		9	0			8	0				
11:30		10	0			7	0				
11:45		8	0	34	0	6	0	28	1	62	1
Total		224	291			156	391			380	682
Percent		43.5%	56.5%			28.5%	71.5%			35.8%	64.2%

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA

6891VOL2

Start Time	15-Apr-15 Wed	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		0	4			0	8				
12:15		0	10			0	8				
12:30		0	7			0	3				
12:45		0	6	0	27	0	9	0	28	0	55
01:00		0	12			0	6				
01:15		0	11			0	10				
01:30		0	10			0	13				
01:45		0	7	0	40	1	9	1	38	1	78
02:00		0	8			0	14				
02:15		0	7			0	11				
02:30		0	9			0	11				
02:45		0	12	0	36	0	9	0	45	0	81
03:00		0	11			0	4				
03:15		0	12			0	12				
03:30		0	9			0	9				
03:45		0	11	0	43	0	13	0	38	0	81
04:00		0	13			0	9				
04:15		0	7			0	9				
04:30		0	12			0	12				
04:45		0	8	0	40	0	12	0	42	0	82
05:00		0	7			0	9				
05:15		0	6			0	19				
05:30		2	11			0	16				
05:45		3	13	5	37	0	14	0	58	5	95
06:00		3	10			1	10				
06:15		4	9			1	4				
06:30		5	2			0	12				
06:45		2	6	14	27	1	16	3	42	17	69
07:00		13	13			2	10				
07:15		8	6			5	9				
07:30		7	5			6	10				
07:45		10	5	38	29	8	8	21	37	59	66
08:00		9	2			9	8				
08:15		9	4			4	10				
08:30		16	2			4	4				
08:45		14	1	48	9	4	6	21	28	69	37
09:00		5	2			6	3				
09:15		9	1			5	1				
09:30		6	1			5	0				
09:45		12	0	32	4	6	0	22	4	54	8
10:00		8	1			7	1				
10:15		16	1			8	3				
10:30		12	1			12	4				
10:45		6	0	42	3	7	1	34	9	76	12
11:00		9	0			1	0				
11:15		6	2			9	1				
11:30		13	0			11	0				
11:45		7	0	35	2	12	0	33	1	68	3
Total		214	297			135	370			349	667
Percent		41.9%	58.1%			26.7%	73.3%			34.4%	65.6%
Grand Total		438	588			291	761			729	1349
Percent		42.7%	57.3%			27.7%	72.3%			35.1%	64.9%

ADT ADT 1,039 AADT 1,039

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA

6891VOL2

Start	13-Apr-15		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	*	*	0	0	0	0	*	*	*	*	*	*	*	*	0	0
01:00	*	*	0	0	0	1	*	*	*	*	*	*	*	*	0	0
02:00	*	*	0	0	0	0	*	*	*	*	*	*	*	*	0	0
03:00	*	*	0	0	0	0	*	*	*	*	*	*	*	*	0	0
04:00	*	*	0	1	0	0	*	*	*	*	*	*	*	*	0	0
05:00	*	*	3	3	5	0	*	*	*	*	*	*	*	*	4	2
06:00	*	*	21	2	14	3	*	*	*	*	*	*	*	*	18	2
07:00	*	*	38	31	38	21	*	*	*	*	*	*	*	*	38	26
08:00	*	*	**50**	26	**48**	21	*	*	*	*	*	*	*	*	**49**	24
09:00	*	*	34	26	32	22	*	*	*	*	*	*	*	*	33	24
10:00	*	*	44	**39**	42	**34**	*	*	*	*	*	*	*	*	43	**36**
11:00	*	*	34	28	35	33	*	*	*	*	*	*	*	*	34	30
12:00 PM	*	*	30	47	27	28	*	*	*	*	*	*	*	*	28	38
01:00	*	*	39	41	40	38	*	*	*	*	*	*	*	*	**40**	40
02:00	*	*	35	37	36	45	*	*	*	*	*	*	*	*	36	41
03:00	*	*	38	37	**43**	38	*	*	*	*	*	*	*	*	40	38
04:00	*	*	37	41	40	42	*	*	*	*	*	*	*	*	38	42
05:00	*	*	29	51	37	**58**	*	*	*	*	*	*	*	*	33	**54**
06:00	*	*	**40**	**53**	27	42	*	*	*	*	*	*	*	*	34	48
07:00	*	*	21	29	29	37	*	*	*	*	*	*	*	*	25	33
08:00	*	*	13	31	9	28	*	*	*	*	*	*	*	*	11	30
09:00	*	*	6	16	4	4	*	*	*	*	*	*	*	*	5	10
10:00	*	*	3	7	3	9	*	*	*	*	*	*	*	*	3	8
11:00	*	*	0	1	2	1	*	*	*	*	*	*	*	*	1	1
Lane	0	0	515	547	511	505	0	0	0	0	0	0	0	0	513	527
Day	0		1062		1016		0		0		0		0		1040	
AM Peak	-	-	08:00	10:00	08:00	10:00	-	-	-	-	-	-	-	-	08:00	10:00
Vol.	-	-	50	39	48	34	-	-	-	-	-	-	-	-	49	36
PM Peak	-	-	18:00	18:00	15:00	17:00	-	-	-	-	-	-	-	-	13:00	17:00
Vol.	-	-	40	53	43	58	-	-	-	-	-	-	-	-	40	54

Comb. Total	0	1062	1016	0	0	0	0	1040

ADT ADT 870 AADT 870

MANUAL TURNING MOVEMENT COUNTS

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 1

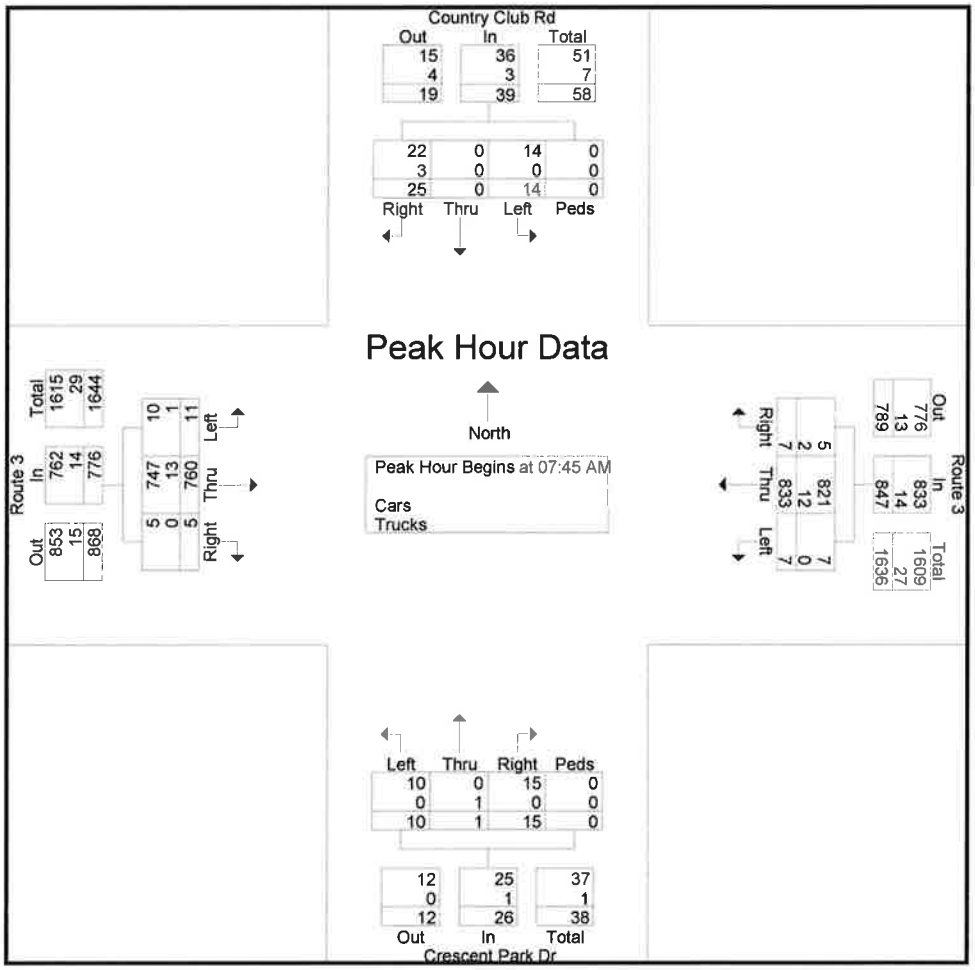
Groups Printed- Cars - Trucks

	Country Club Rd From North				Route 3 From East			Crescent Park Dr From South				Route 3 From West			
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Left	Thru	Right	Peds	Left	Thru	Right	Int. Total
07:00 AM	2	0	2	0	0	96	2	3	0	4	0	5	218	0	332
07:15 AM	4	0	5	0	0	163	4	2	0	7	0	3	197	0	385
07:30 AM	6	0	5	0	0	174	4	1	0	1	0	3	183	2	379
07:45 AM	6	0	7	0	0	187	1	1	1	0	0	3	212	0	418
Total	18	0	19	0	0	620	11	7	1	12	0	14	810	2	1514
08:00 AM	1	0	6	0	3	227	2	4	0	7	0	4	188	1	443
08:15 AM	1	0	4	0	2	192	2	3	0	3	0	1	191	1	400
08:30 AM	6	0	8	0	2	227	2	2	0	5	0	3	169	3	427
08:45 AM	3	0	1	0	3	225	2	1	0	3	0	3	154	0	395
Total	11	0	19	0	10	871	8	10	0	18	0	11	702	5	1665
Grand Total	29	0	38	0	10	1491	19	17	1	30	0	25	1512	7	3179
Apprch %	43.3	0	56.7	0	0.7	98.1	1.2	35.4	2.1	62.5	0	1.6	97.9	0.5	
Total %	0.9	0	1.2	0	0.3	46.9	0.6	0.5	0	0.9	0	0.8	47.6	0.2	
Cars	29	0	34	0	10	1467	17	17	0	30	0	22	1480	6	3112
% Cars	100	0	89.5	0	100	98.4	89.5	100	0	100	0	88	97.9	85.7	97.9
Trucks	0	0	4	0	0	24	2	0	1	0	0	3	32	1	67
% Trucks	0	0	10.5	0	0	1.6	10.5	0	100	0	0	12	2.1	14.3	2.1

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 2

	Country Club Rd From North					Route 3 From East				Crescent Park Dr From South					Route 3 From West				
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 07:45 AM																			
07:45 AM	**6**	0	7	0	13	0	187	1	188	1	**1**	0	0	2	3	**212**	0	**215**	418
08:00 AM	1	0	6	0	7	**3**	**227**	**2**	**232**	**4**	0	**7**	0	**11**	**4**	188	1	193	**443**
08:15 AM	1	0	4	0	5	2	192	2	196	3	0	3	0	6	1	191	1	193	400
08:30 AM	6	0	**8**	0	**14**	2	227	2	231	2	0	5	0	7	3	169	**3**	175	427
Total Volume	14	0	25	0	39	7	833	7	847	10	1	15	0	26	11	760	5	776	1688
% App. Total	35.9	0	64.1	0		0.8	98.3	0.8		38.5	3.8	57.7	0		1.4	97.9	0.6		
PHF	.583	.000	.781	.000	.696	.583	.917	.875	.913	.625	.250	.536	.000	.591	.688	.896	.417	.902	.953
Cars	14	0	22	0	36	7	821	5	833	10	0	15	0	25	10	747	5	762	1656
% Cars	100	0	88.0	0	92.3	100	98.6	71.4	98.3	100	0	100	0	96.2	90.9	98.3	100	98.2	98.1
Trucks	0	0	3	0	3	0	12	2	14	0	1	0	0	1	1	13	0	14	32
% Trucks	0	0	12.0	0	7.7	0	1.4	28.6	1.7	0	100	0	0	3.8	9.1	1.7	0	1.8	1.9



Accurate Counts
978-664-2565

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 1

Groups Printed- Trucks

	Country Club Rd From North				Route 3 From East			Crescent Park Dr From South				Route 3 From West			
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Left	Thru	Right	Peds	Left	Thru	Right	Int. Total
07:00 AM	0	0	0	0	0	1	0	0	0	0	0	1	5	0	7
07:15 AM	0	0	0	0	0	4	0	0	0	0	0	0	8	0	12
07:30 AM	0	0	1	0	0	3	0	0	0	0	0	1	3	1	9
07:45 AM	0	0	0	0	0	4	0	0	1	0	0	0	2	0	7
Total	0	0	1	0	0	12	0	0	1	0	0	2	18	1	35
08:00 AM	0	0	2	0	0	4	1	0	0	0	0	1	8	0	16
08:15 AM	0	0	1	0	0	3	1	0	0	0	0	0	1	0	6
08:30 AM	0	0	0	0	0	1	0	0	0	0	0	0	2	0	3
08:45 AM	0	0	0	0	0	4	0	0	0	0	0	0	3	0	7
Total	0	0	3	0	0	12	2	0	0	0	0	1	14	0	32
Grand Total	0	0	4	0	0	24	2	0	1	0	0	3	32	1	67
Apprch %	0	0	100	0	0	92.3	7.7	0	100	0	0	8.3	88.9	2.8	
Total %	0	0	6	0	0	35.8	3	0	1.5	0	0	4.5	47.8	1.5	

978-664-2565

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 1

Groups Printed- Bikes Peds

	Country Club Rd From North				Route 3 From East				Crescent Park Dr From South				Route 3 From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1
07:45 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	3	1	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	1	3
Grand Total	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	4	5	2	7
Apprch %	0	0	0		0	100	0		0	0	0		0	100	0				
Total %	0	0	0		0	50	0		0	0	0		0	50	0		71.4	28.6	

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 1

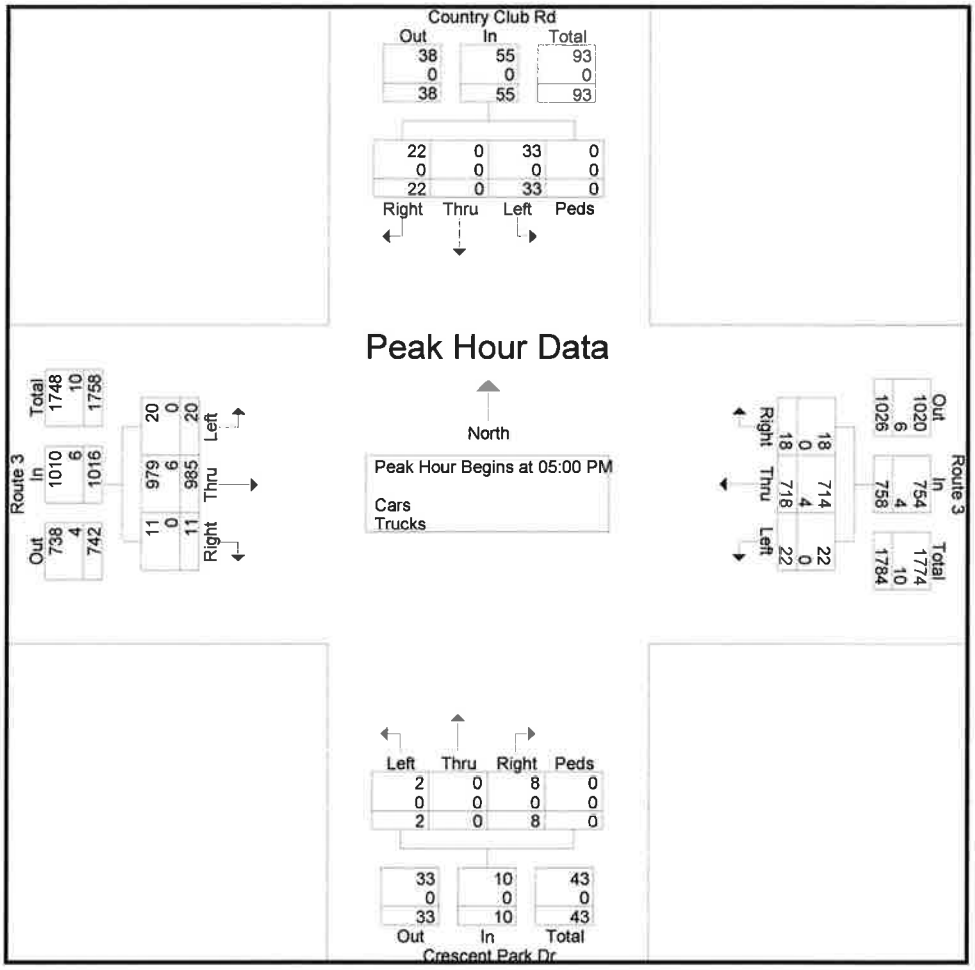
Groups Printed- Cars - Trucks

	Country Club Rd From North				Route 3 From East			Crescent Park Dr From South				Route 3 From West			
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Left	Thru	Right	Peds	Left	Thru	Right	Int. Total
04:00 PM	4	0	2	0	5	197	7	0	0	1	0	3	164	2	385
04:15 PM	4	0	6	0	6	202	6	1	0	1	0	1	189	3	419
04:30 PM	4	0	2	0	2	163	1	1	0	2	0	1	203	3	382
04:45 PM	3	0	5	0	4	203	6	2	0	4	0	4	198	2	431
Total	15	0	15	0	17	765	20	4	0	8	0	9	754	10	1617
05:00 PM	13	0	9	0	10	228	4	0	0	3	0	8	246	3	524
05:15 PM	6	0	5	0	6	172	1	0	0	0	0	5	215	2	412
05:30 PM	9	0	6	0	2	152	8	2	0	3	0	4	259	2	447
05:45 PM	5	0	2	0	4	166	5	0	0	2	0	3	265	4	456
Total	33	0	22	0	22	718	18	2	0	8	0	20	985	11	1839
Grand Total	48	0	37	0	39	1483	38	6	0	16	0	29	1739	21	3456
Apprch %	56.5	0	43.5	0	2.5	95.1	2.4	27.3	0	72.7	0	1.6	97.2	1.2	
Total %	1.4	0	1.1	0	1.1	42.9	1.1	0.2	0	0.5	0	0.8	50.3	0.6	
Cars	48	0	37	0	39	1472	38	6	0	16	0	29	1728	21	3434
% Cars	100	0	100	0	100	99.3	100	100	0	100	0	100	99.4	100	99.4
Trucks	0	0	0	0	0	11	0	0	0	0	0	0	11	0	22
% Trucks	0	0	0	0	0	0.7	0	0	0	0	0	0	0.6	0	0.6

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 2

	Country Club Rd From North					Route 3 From East				Crescent Park Dr From South					Route 3 From West				
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 05:00 PM																			
05:00 PM	**13**	0	**9**	0	**22**	**10**	**228**	4	**242**	0	0	**3**	0	3	**8**	246	3	257	**524**
05:15 PM	6	0	5	0	11	6	172	1	179	0	0	0	0	0	5	215	2	222	412
05:30 PM	9	0	6	0	15	2	152	**8**	162	**2**	0	3	0	**5**	4	259	2	265	447
05:45 PM	5	0	2	0	7	4	166	5	175	0	0	2	0	2	3	**265**	**4**	**272**	456
Total Volume	33	0	22	0	55	22	718	18	758	2	0	8	0	10	20	985	11	1016	1839
% App. Total	60	0	40	0		2.9	94.7	2.4		20	0	80	0		2	96.9	1.1		
PHF	.635	.000	.611	.000	.625	.550	.787	.563	.783	.250	.000	.667	.000	.500	.625	.929	.688	.934	.877
Cars	33	0	22	0	55	22	714	18	754	2	0	8	0	10	20	979	11	1010	1829
% Cars	100	0	100	0	100	100	99.4	100	99.5	100	0	100	0	100	100	99.4	100	99.4	99.5
Trucks	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	6	0	6	10
% Trucks	0	0	0	0	0	0	0.6	0	0.5	0	0	0	0	0	0	0.6	0	0.6	0.5



Accurate Counts
978-664-2565

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 1

Groups Printed- Trucks

	Country Club Rd From North				Route 3 From East			Crescent Park Dr From South				Route 3 From West			
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Left	Thru	Right	Peds	Left	Thru	Right	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3
04:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
04:30 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	4	0	0	0	0	0	0	1	0	5
Total	0	0	0	0	0	7	0	0	0	0	0	0	5	0	12
05:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
05:15 PM	0	0	0	0	0	2	0	0	0	0	0	0	1	0	3
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
05:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	2	0	3
Total	0	0	0	0	0	4	0	0	0	0	0	0	6	0	10
Grand Total	0	0	0	0	0	11	0	0	0	0	0	0	11	0	22
Apprch %	0	0	0	0	0	100	0	0	0	0	0	0	100	0	
Total %	0	0	0	0	0	50	0	0	0	0	0	0	50	0	

Accurate Counts
978-664-2565

N/S Street : Country Club/Crescent Park
E/W Street : Cambridge Street
City/State : Winchester, MA
Weather : Clear

File Name : 68910001
Site Code : 68910001
Start Date : 4/14/2015
Page No : 1

Groups Printed- Bikes Peds

	Country Club Rd From North				Route 3 From East				Crescent Park Dr From South				Route 3 From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	2	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3	1	4
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	5	5	3	8
Apprch %	0	0	0		0	0	0		0	0	0		0	100	0				
Total %	0	0	0		0	0	0		0	0	0		0	100	0		62.5	37.5	

N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 1

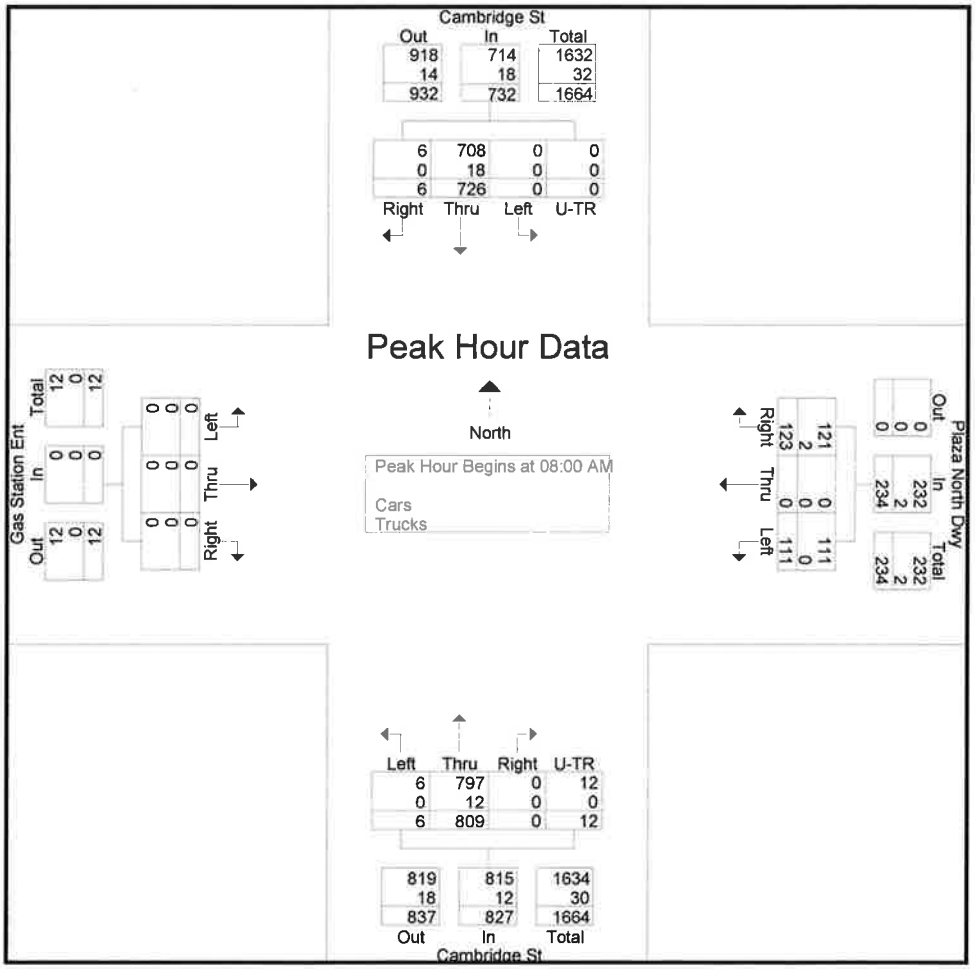
Groups Printed- Cars - Trucks

	Cambridge St From North				Plaza North Dwy From East			Cambridge St From South				Gas Station Ent From West			
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	Left	Thru	Right	U-TR	Left	Thru	Right	Int. Total
07:00 AM	0	225	3	0	25	0	16	0	83	0	1	0	0	0	353
07:15 AM	0	199	3	0	24	0	24	0	164	0	2	0	0	0	416
07:30 AM	0	183	0	0	29	1	24	0	166	0	3	0	0	0	406
07:45 AM	0	214	2	0	18	0	19	0	175	0	3	0	0	0	431
Total	0	821	8	0	96	1	83	0	588	0	9	0	0	0	1606
08:00 AM	0	198	1	0	22	0	28	0	211	0	1	0	0	0	461
08:15 AM	0	187	0	0	25	0	38	1	173	0	2	0	0	0	426
08:30 AM	0	181	2	0	30	0	28	3	205	0	2	0	0	0	451
08:45 AM	0	160	3	0	34	0	29	2	220	0	7	0	0	0	455
Total	0	726	6	0	111	0	123	6	809	0	12	0	0	0	1793
Grand Total	0	1547	14	0	207	1	206	6	1397	0	21	0	0	0	3399
Apprch %	0	99.1	0.9	0	50	0.2	49.8	0.4	98.1	0	1.5	0	0	0	
Total %	0	45.5	0.4	0	6.1	0	6.1	0.2	41.1	0	0.6	0	0	0	
Cars	0	1510	14	0	207	1	198	6	1376	0	21	0	0	0	3333
% Cars	0	97.6	100	0	100	100	96.1	100	98.5	0	100	0	0	0	98.1
Trucks	0	37	0	0	0	0	8	0	21	0	0	0	0	0	66
% Trucks	0	2.4	0	0	0	0	3.9	0	1.5	0	0	0	0	0	1.9

N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 2

	Cambridge St From North					Plaza North Dwy From East				Cambridge St From South					Gas Station Ent From West				
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 08:00 AM																			
08:00 AM	0	**198**	1	0	**199**	22	0	28	50	0	211	0	1	212	0	0	0	0	**461**
08:15 AM	0	187	0	0	187	25	0	**38**	**63**	1	173	0	2	176	0	0	0	0	426
08:30 AM	0	181	2	0	183	30	0	28	58	**3**	205	0	2	210	0	0	0	0	451
08:45 AM	0	160	**3**	0	163	**34**	0	29	63	2	**220**	0	**7**	**229**	0	0	0	0	455
Total Volume	0	726	6	0	732	111	0	123	234	6	809	0	12	827	0	0	0	0	1793
% App. Total	0	99.2	0.8	0		47.4	0	52.6		0.7	97.8	0	1.5		0	0	0		
PHF	.000	.917	.500	.000	.920	.816	.000	.809	.929	.500	.919	.000	.429	.903	.000	.000	.000	.000	.972
Cars	0	708	6	0	714	111	0	121	232	6	797	0	12	815	0	0	0	0	1761
% Cars	0	97.5	100	0	97.5	100	0	98.4	99.1	100	98.5	0	100	98.5	0	0	0	0	98.2
Trucks	0	18	0	0	18	0	0	2	2	0	12	0	0	12	0	0	0	0	32
% Trucks	0	2.5	0	0	2.5	0	0	1.6	0.9	0	1.5	0	0	1.5	0	0	0	0	1.8



N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 1

Groups Printed- Trucks

	Cambridge St From North				Plaza North Dwy From East			Cambridge St From South				Gas Station Ent From West			
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	Left	Thru	Right	U-TR	Left	Thru	Right	Int. Total
07:00 AM	0	4	0	0	0	0	0	0	1	0	0	0	0	0	5
07:15 AM	0	9	0	0	0	0	2	0	4	0	0	0	0	0	15
07:30 AM	0	4	0	0	0	0	3	0	1	0	0	0	0	0	8
07:45 AM	0	2	0	0	0	0	1	0	3	0	0	0	0	0	6
Total	0	19	0	0	0	0	6	0	9	0	0	0	0	0	34
08:00 AM	0	8	0	0	0	0	1	0	5	0	0	0	0	0	14
08:15 AM	0	2	0	0	0	0	1	0	2	0	0	0	0	0	5
08:30 AM	0	2	0	0	0	0	0	0	1	0	0	0	0	0	3
08:45 AM	0	6	0	0	0	0	0	0	4	0	0	0	0	0	10
Total	0	18	0	0	0	0	2	0	12	0	0	0	0	0	32
Grand Total	0	37	0	0	0	0	8	0	21	0	0	0	0	0	66
Apprch %	0	100	0	0	0	0	100	0	100	0	0	0	0	0	
Total %	0	56.1	0	0	0	0	12.1	0	31.8	0	0	0	0	0	

N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 1

Groups Printed- Bikes Peds

	Cambridge St From North				Plaza North Dwy From East				Cambridge St From South				Gas Station Ent From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	2
Total	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	3
Grand Total	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	3	1	4
Apprch %	0	0	0		0	0	0		0	100	0		0	0	0				
Total %	0	0	0		0	0	0		0	100	0		0	0	0		75	25	

N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 1

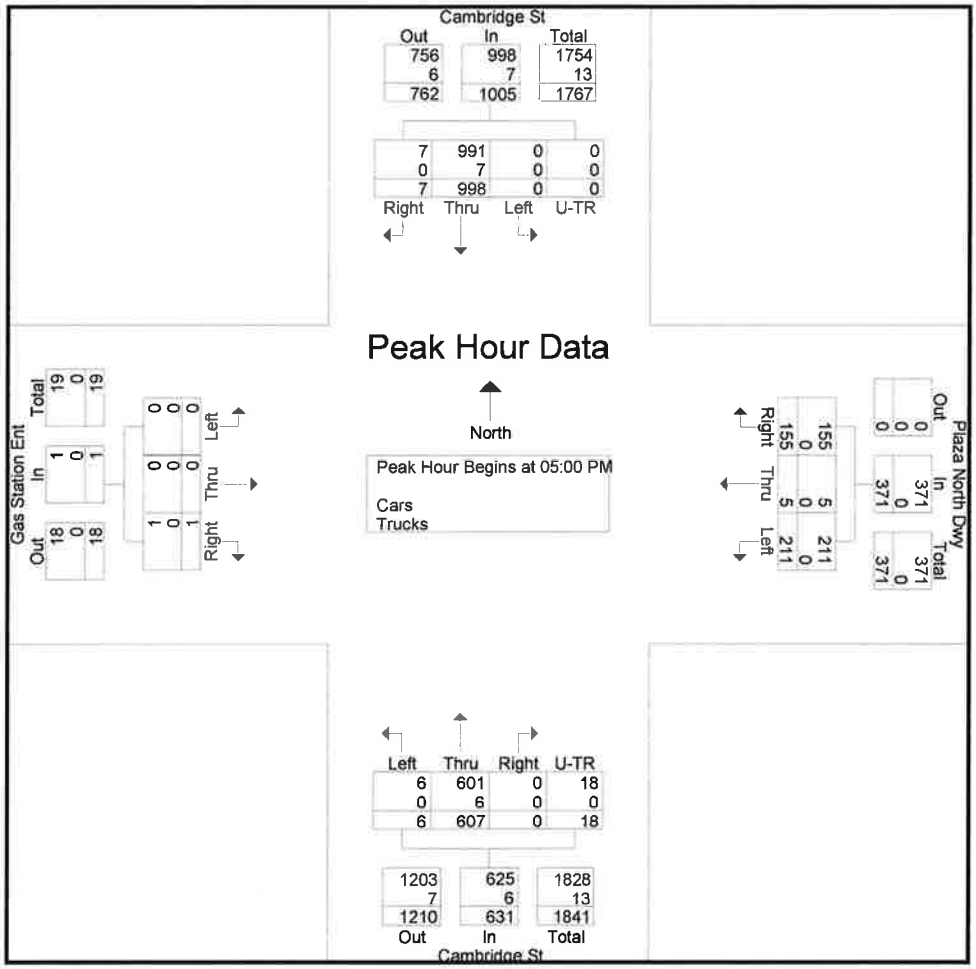
Groups Printed- Cars - Trucks

	Cambridge St From North				Plaza North Dwy From East			Cambridge St From South				Gas Station Ent From West			
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	Left	Thru	Right	U-TR	Left	Thru	Right	Int. Total
04:00 PM	0	167	3	0	44	0	37	1	154	0	1	0	0	0	407
04:15 PM	0	180	3	0	42	0	48	1	159	0	2	0	0	0	435
04:30 PM	0	199	3	0	44	2	30	1	140	0	3	0	0	0	422
04:45 PM	0	209	1	0	55	0	40	1	158	0	4	0	0	0	468
Total	0	755	10	0	185	2	155	4	611	0	10	0	0	0	1732
05:00 PM	0	244	2	0	44	2	49	1	190	0	2	0	0	0	534
05:15 PM	0	242	1	0	65	0	41	1	144	0	5	0	0	0	499
05:30 PM	0	262	2	0	48	3	24	2	140	0	7	0	0	0	488
05:45 PM	0	250	2	0	54	0	41	2	133	0	4	0	0	1	487
Total	0	998	7	0	211	5	155	6	607	0	18	0	0	1	2008
Grand Total	0	1753	17	0	396	7	310	10	1218	0	28	0	0	1	3740
Apprch %	0	99	1	0	55.5	1	43.5	0.8	97	0	2.2	0	0	100	
Total %	0	46.9	0.5	0	10.6	0.2	8.3	0.3	32.6	0	0.7	0	0	0	
Cars	0	1737	17	0	396	7	310	10	1202	0	28	0	0	1	3708
% Cars	0	99.1	100	0	100	100	100	100	98.7	0	100	0	0	100	99.1
Trucks	0	16	0	0	0	0	0	0	16	0	0	0	0	0	32
% Trucks	0	0.9	0	0	0	0	0	0	1.3	0	0	0	0	0	0.9

N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 2

	Cambridge St From North					Plaza North Dwy From East				Cambridge St From South					Gas Station Ent From West				
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 05:00 PM																			
05:00 PM	0	244	**2**	0	246	44	2	**49**	95	1	**190**	0	2	**193**	0	0	0	0	**534**
05:15 PM	0	242	1	0	243	**65**	0	41	**106**	1	144	0	5	150	0	0	0	0	499
05:30 PM	0	**262**	2	0	**264**	48	**3**	24	75	**2**	140	0	**7**	149	0	0	0	0	488
05:45 PM	0	250	2	0	252	54	0	41	95	2	133	0	4	139	0	0	**1**	**1**	487
Total Volume	0	998	7	0	1005	211	5	155	371	6	607	0	18	631	0	0	1	1	2008
% App. Total	0	99.3	0.7	0		56.9	1.3	41.8		1	96.2	0	2.9		0	0	100		
PHF	.000	.952	.875	.000	.952	.812	.417	.791	.875	.750	.799	.000	.643	.817	.000	.000	.250	.250	.940
Cars	0	991	7	0	998	211	5	155	371	6	601	0	18	625	0	0	1	1	1995
% Cars	0	99.3	100	0	99.3	100	100	100	100	100	99.0	0	100	99.0	0	0	100	100	99.4
Trucks	0	7	0	0	7	0	0	0	0	0	6	0	0	6	0	0	0	0	13
% Trucks	0	0.7	0	0	0.7	0	0	0	0	0	1.0	0	0	1.0	0	0	0	0	0.6



N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 1

Groups Printed- Trucks

	Cambridge St From North				Plaza North Dwy From East			Cambridge St From South				Gas Station Ent From West			
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	Left	Thru	Right	U-TR	Left	Thru	Right	Int. Total
04:00 PM	0	3	0	0	0	0	0	0	1	0	0	0	0	0	4
04:15 PM	0	1	0	0	0	0	0	0	3	0	0	0	0	0	4
04:30 PM	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
04:45 PM	0	5	0	0	0	0	0	0	4	0	0	0	0	0	9
Total	0	9	0	0	0	0	0	0	10	0	0	0	0	0	19
05:00 PM	0	1	0	0	0	0	0	0	2	0	0	0	0	0	3
05:15 PM	0	2	0	0	0	0	0	0	2	0	0	0	0	0	4
05:30 PM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
05:45 PM	0	2	0	0	0	0	0	0	2	0	0	0	0	0	4
Total	0	7	0	0	0	0	0	0	6	0	0	0	0	0	13
Grand Total	0	16	0	0	0	0	0	0	16	0	0	0	0	0	32
Apprch %	0	100	0	0	0	0	0	0	100	0	0	0	0	0	
Total %	0	50	0	0	0	0	0	0	50	0	0	0	0	0	

N/S Street : Cambridge Street
E/W Street : Horn Pond Plaza
City/State : Winchester, MA
Weather : Clear

File Name : 68910002
Site Code : 68910002
Start Date : 4/14/2015
Page No : 1

Groups Printed- Bikes Peds

	Cambridge St From North				Plaza North Dwy From East				Cambridge St From South				Gas Station Ent From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
04:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
04:45 PM	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3
Total	0	1	0	4	0	0	0	0	0	0	0	1	0	0	0	0	5	1	6
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	3
Total	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	3
Grand Total	0	2	0	4	0	0	0	0	0	0	1	2	0	0	0	0	6	3	9
Apprch %	0	100	0		0	0	0		0	0	100		0	0	0				
Total %	0	66.7	0		0	0	0		0	0	33.3		0	0	0		66.7	33.3	

Accurate Counts
978-664-2565

N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 1

Groups Printed- Cars - Trucks

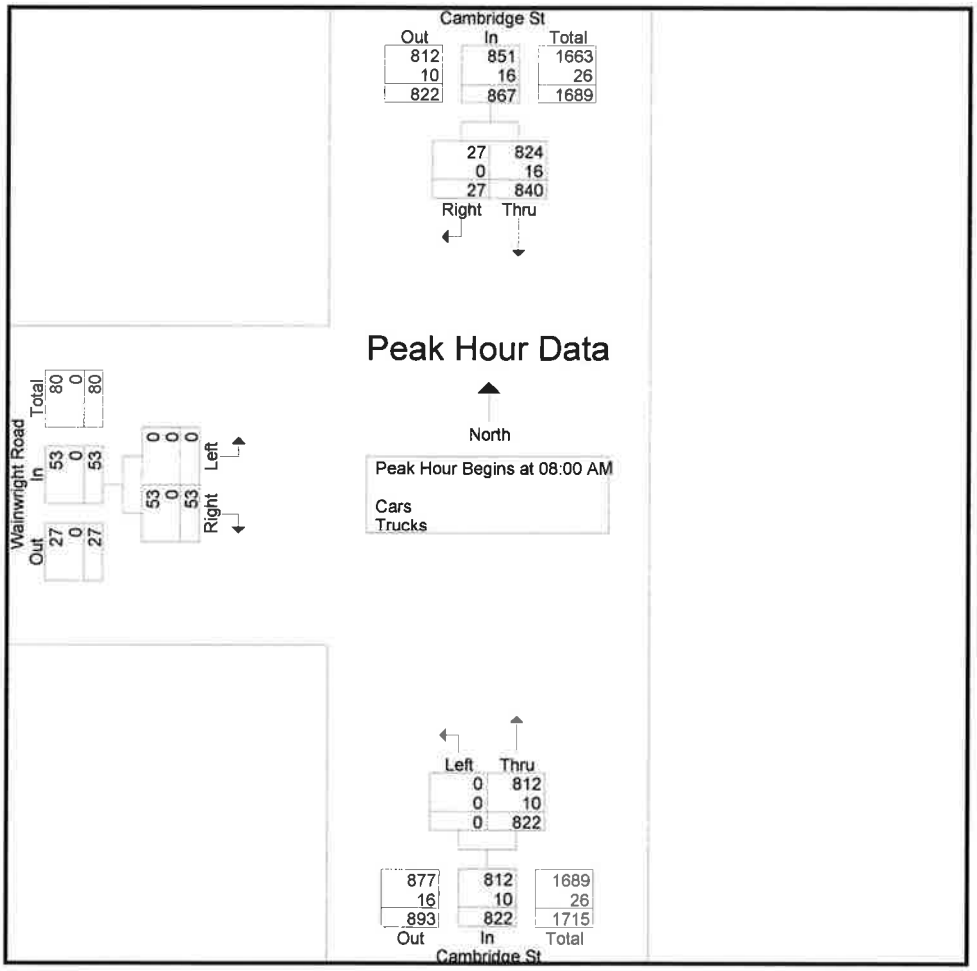
	Cambridge St From North		Cambridge St From South		Wainwright Road From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	244	6	0	87	0	14	351
07:15 AM	222	6	0	162	0	11	401
07:30 AM	217	7	0	171	0	6	401
07:45 AM	215	10	0	178	0	9	412
Total	898	29	0	598	0	40	1565
08:00 AM	233	3	0	203	0	14	453
08:15 AM	194	4	0	179	0	11	388
08:30 AM	223	7	0	219	0	15	464
08:45 AM	190	13	0	221	0	13	437
Total	840	27	0	822	0	53	1742
Grand Total	1738	56	0	1420	0	93	3307
Apprch %	96.9	3.1	0	100	0	100	
Total %	52.6	1.7	0	42.9	0	2.8	
Cars	1704	56	0	1405	0	93	3258
% Cars	98	100	0	98.9	0	100	98.5
Trucks	34	0	0	15	0	0	49
% Trucks	2	0	0	1.1	0	0	1.5

978-664-2565

N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 2

	Cambridge St From North			Cambridge St From South			Wainwright Road From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	**233**	3	**236**	0	203	203	0	14	14	453
08:15 AM	194	4	198	0	179	179	0	11	11	388
08:30 AM	223	7	230	0	219	219	0	**15**	**15**	**464**
08:45 AM	190	**13**	203	0	**221**	**221**	0	13	13	437
Total Volume	840	27	867	0	822	822	0	53	53	1742
% App. Total	96.9	3.1		0	100		0	100		
PHF	.901	.519	.918	.000	.930	.930	.000	.883	.883	.939
Cars	824	27	851	0	812	812	0	53	53	1716
% Cars	98.1	100	98.2	0	98.8	98.8	0	100	100	98.5
Trucks	16	0	16	0	10	10	0	0	0	26
% Trucks	1.9	0	1.8	0	1.2	1.2	0	0	0	1.5



N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 7

Groups Printed- Trucks

	Cambridge St From North		Cambridge St From South		Wainwright Road From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	5	0	0	1	0	0	6
07:15 AM	9	0	0	2	0	0	11
07:30 AM	2	0	0	2	0	0	4
07:45 AM	2	0	0	0	0	0	2
Total	18	0	0	5	0	0	23
08:00 AM	8	0	0	2	0	0	10
08:15 AM	2	0	0	3	0	0	5
08:30 AM	2	0	0	1	0	0	3
08:45 AM	4	0	0	4	0	0	8
Total	16	0	0	10	0	0	26
Grand Total	34	0	0	15	0	0	49
Apprch %	100	0	0	100	0	0	
Total %	69.4	0	0	30.6	0	0	

N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 10

Groups Printed- Bikes Peds

	Cambridge St From North			Cambridge St From South			Wainwright Road From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	1	0	1	0	0	0	0	1	1	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	1	0	0	0	0	1	1	2
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	1	0	1	0	0	0	0	1	1	2
Apprch %	0	0		0	100		0	0				
Total %	0	0		0	100		0	0		50	50	

N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 1

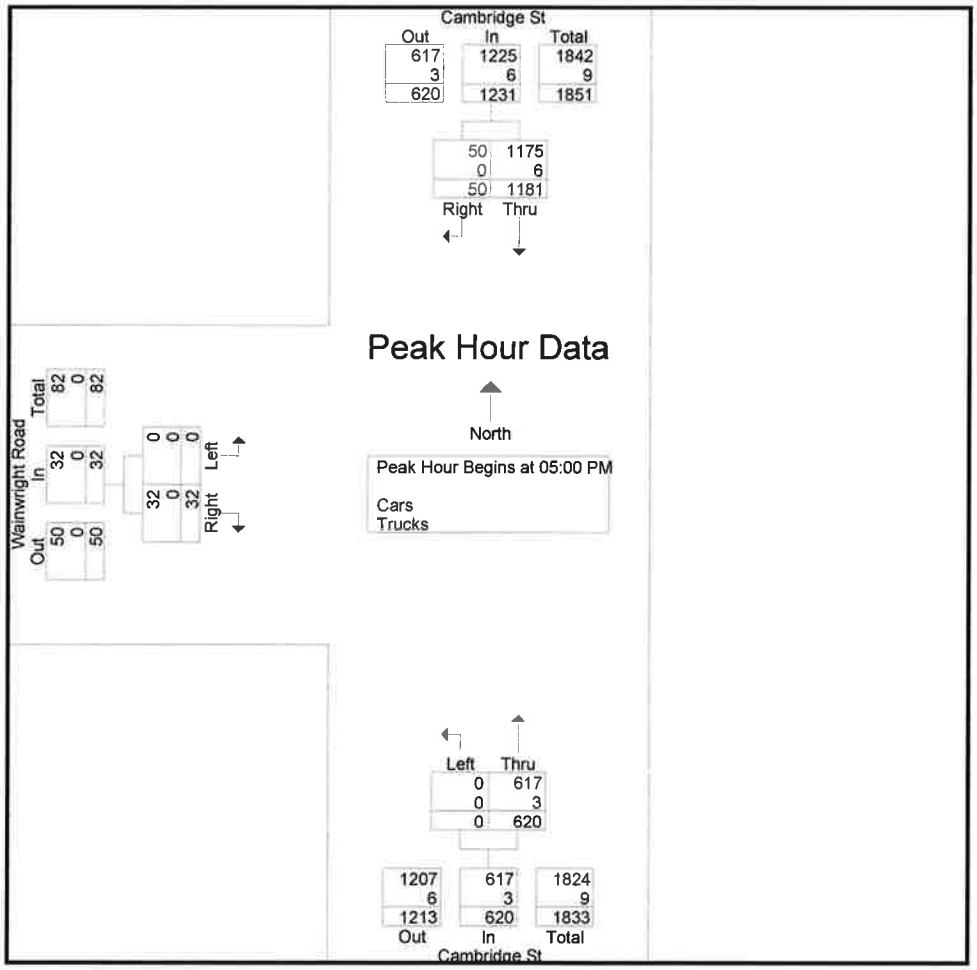
Groups Printed- Cars - Trucks

	Cambridge St From North		Cambridge St From South		Wainwright Road From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	211	9	0	152	0	12	384
04:15 PM	217	4	0	160	0	5	386
04:30 PM	244	8	0	146	0	10	408
04:45 PM	243	25	0	171	0	10	449
Total	915	46	0	629	0	37	1627
05:00 PM	282	9	0	189	0	7	487
05:15 PM	291	17	0	149	0	7	464
05:30 PM	310	12	0	144	0	11	477
05:45 PM	298	12	0	138	0	7	455
Total	1181	50	0	620	0	32	1883
Grand Total	2096	96	0	1249	0	69	3510
Apprch %	95.6	4.4	0	100	0	100	
Total %	59.7	2.7	0	35.6	0	2	
Cars	2084	96	0	1238	0	69	3487
% Cars	99.4	100	0	99.1	0	100	99.3
Trucks	12	0	0	11	0	0	23
% Trucks	0.6	0	0	0.9	0	0	0.7

N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 2

	Cambridge St From North			Cambridge St From South			Wainwright Road From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	**282**	9	291	0	**189**	**189**	0	7	7	**487**
05:15 PM	291	**17**	308	0	149	149	0	7	7	464
05:30 PM	**310**	12	**322**	0	144	144	0	**11**	**11**	477
05:45 PM	298	12	310	0	138	138	0	7	7	455
Total Volume	1181	50	1231	0	620	620	0	32	32	1883
% App. Total	95.9	4.1		0	100		0	100		
PHF	.952	.735	.956	.000	.820	.820	.000	.727	.727	.967
Cars	1175	50	1225	0	617	617	0	32	32	1874
% Cars	99.5	100	99.5	0	99.5	99.5	0	100	100	99.5
Trucks	6	0	6	0	3	3	0	0	0	9
% Trucks	0.5	0	0.5	0	0.5	0.5	0	0	0	0.5



N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 7

Groups Printed- Trucks

	Cambridge St From North		Cambridge St From South		Wainwright Road From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	3	0	0	0	0	0	3
04:15 PM	1	0	0	0	0	0	1
04:30 PM	0	0	0	4	0	0	4
04:45 PM	2	0	0	4	0	0	6
Total	6	0	0	8	0	0	14
05:00 PM	1	0	0	1	0	0	2
05:15 PM	1	0	0	1	0	0	2
05:30 PM	3	0	0	1	0	0	4
05:45 PM	1	0	0	0	0	0	1
Total	6	0	0	3	0	0	9
Grand Total	12	0	0	11	0	0	23
Apprch %	100	0	0	100	0	0	
Total %	52.2	0	0	47.8	0	0	

N/S Street : Cambridge Street
E/W Street : Wainwright Road
City/State : Winchester, MA
Weather : Clear

File Name : 68910003
Site Code : 68910003
Start Date : 4/14/2015
Page No : 10

Groups Printed- Bikes Peds

	Cambridge St From North			Cambridge St From South			Wainwright Road From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	2	0	0	0	0	0	0	0	0	0	2	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	0	0	0	0	0	0	2	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	1	0	0	0	0	0	0	0	0	0	1	1
Total	1	0	0	0	0	0	0	0	0	0	1	1
Grand Total	3	0	0	0	0	0	0	0	0	0	3	3
Apprch %	100	0		0	0		0	0				
Total %	100	0		0	0		0	0		0	100	

Accurate Counts
978-664-2565

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 1

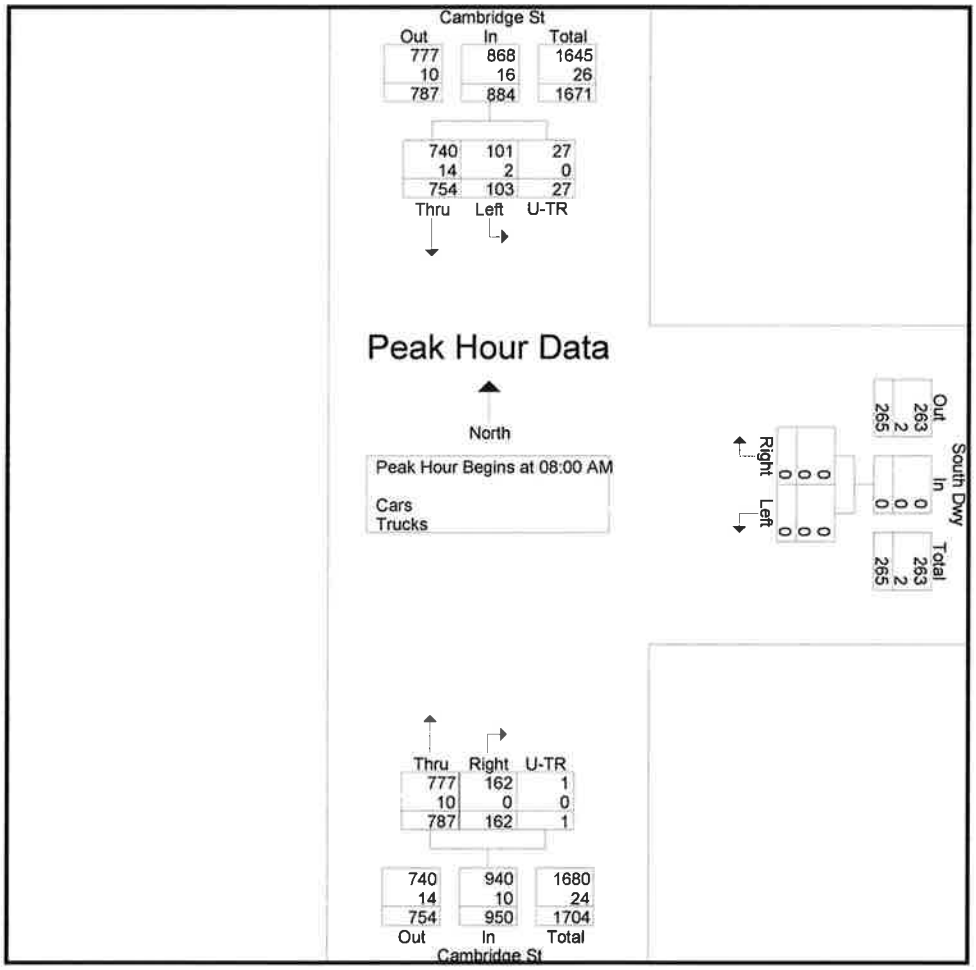
Groups Printed- Cars - Trucks

	Cambridge St From North			South Dwy From East		Cambridge St From South			
Start Time	Left	Thru	U-TR	Left	Right	Thru	Right	U-TR	Int. Total
07:00 AM	15	221	16	0	0	74	21	0	347
07:15 AM	16	215	7	0	0	147	26	0	411
07:30 AM	27	191	4	0	0	169	22	0	413
07:45 AM	19	208	10	0	0	172	26	0	435
Total	77	835	37	0	0	562	95	0	1606
08:00 AM	20	210	3	0	0	187	28	0	448
08:15 AM	22	187	7	0	0	177	43	0	436
08:30 AM	36	182	10	0	0	212	38	0	478
08:45 AM	25	175	7	0	0	211	53	1	472
Total	103	754	27	0	0	787	162	1	1834
Grand Total	180	1589	64	0	0	1349	257	1	3440
Apprch %	9.8	86.7	3.5	0	0	83.9	16	0.1	
Total %	5.2	46.2	1.9	0	0	39.2	7.5	0	
Cars	175	1560	64	0	0	1334	254	1	3388
% Cars	97.2	98.2	100	0	0	98.9	98.8	100	98.5
Trucks	5	29	0	0	0	15	3	0	52
% Trucks	2.8	1.8	0	0	0	1.1	1.2	0	1.5

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 2

	Cambridge St From North				South Dwy From East			Cambridge St From South				
Start Time	Left	Thru	U-TR	App. Total	Left	Right	App. Total	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 08:00 AM												
08:00 AM	20	**210**	3	**233**	0	0	0	187	28	0	215	448
08:15 AM	22	187	7	216	0	0	0	177	43	0	220	436
08:30 AM	**36**	182	**10**	228	0	0	0	**212**	38	0	250	**478**
08:45 AM	25	175	7	207	0	0	0	211	**53**	**1**	**265**	472
Total Volume	103	754	27	884	0	0	0	787	162	1	950	1834
% App. Total	11.7	85.3	3.1		0	0		82.8	17.1	0.1		
PHF	.715	.898	.675	.948	.000	.000	.000	.928	.764	.250	.896	.959
Cars	101	740	27	868	0	0	0	777	162	1	940	1808
% Cars	98.1	98.1	100	98.2	0	0	0	98.7	100	100	98.9	98.6
Trucks	2	14	0	16	0	0	0	10	0	0	10	26
% Trucks	1.9	1.9	0	1.8	0	0	0	1.3	0	0	1.1	1.4



Accurate Counts
978-664-2565

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 1

Groups Printed- Trucks

	Cambridge St From North			South Dwy From East		Cambridge St From South			
Start Time	Left	Thru	U-TR	Left	Right	Thru	Right	U-TR	Int. Total
07:00 AM	2	3	0	0	0	1	0	0	6
07:15 AM	0	9	0	0	0	2	0	0	11
07:30 AM	1	1	0	0	0	2	3	0	7
07:45 AM	0	2	0	0	0	0	0	0	2
Total	3	15	0	0	0	5	3	0	26
08:00 AM	0	7	0	0	0	2	0	0	9
08:15 AM	0	3	0	0	0	4	0	0	7
08:30 AM	2	2	0	0	0	3	0	0	7
08:45 AM	0	2	0	0	0	1	0	0	3
Total	2	14	0	0	0	10	0	0	26
Grand Total	5	29	0	0	0	15	3	0	52
Apprch %	14.7	85.3	0	0	0	83.3	16.7	0	
Total %	9.6	55.8	0	0	0	28.8	5.8	0	

Accurate Counts
978-664-2565

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 1

Groups Printed- Bikes Peds

	Cambridge St From North			South Dwy From East			Cambridge St From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	1	0	0	0	0	0	0	0	0	1	1
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	1	0	0	0	0	1	0	0	0	2	2
Total	0	2	0	0	0	0	1	0	0	0	3	3
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	2	0	0	0	0	1	0	0	0	3	3
Apprch %	0	100		0	0		100	0				
Total %	0	66.7		0	0		33.3	0		0	100	

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 1

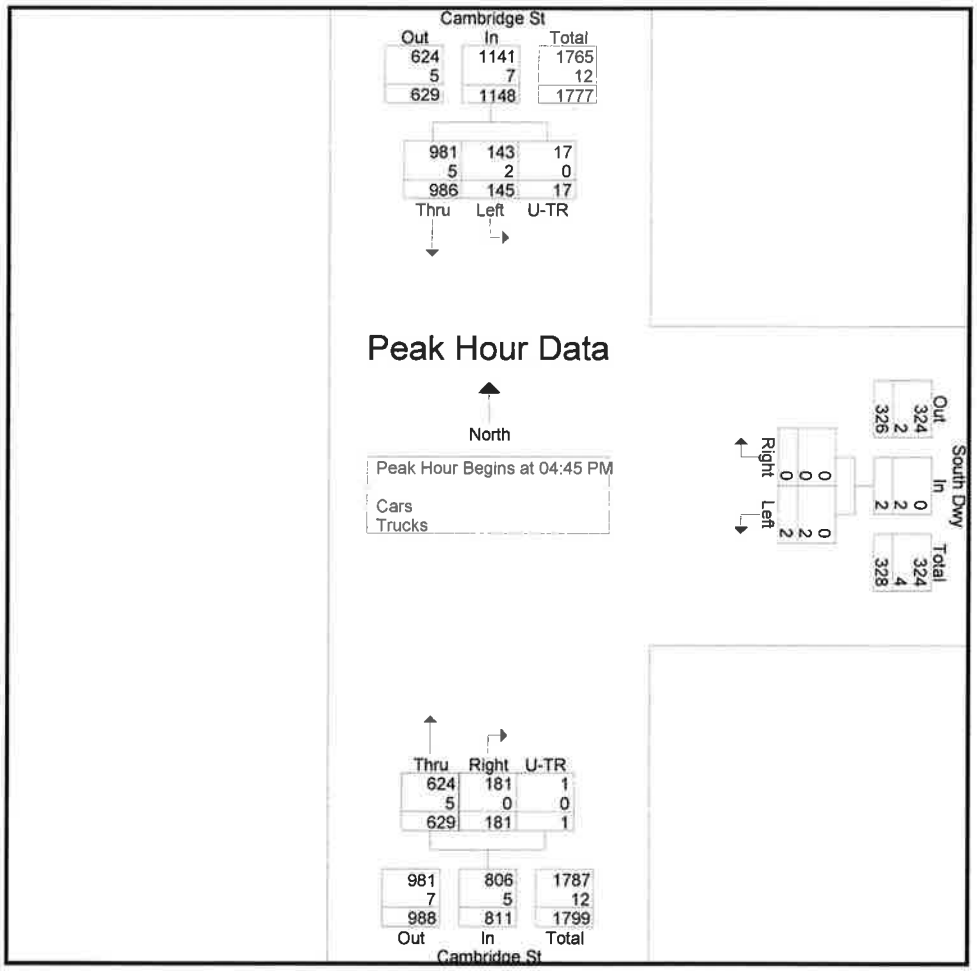
Groups Printed- Cars - Trucks

	Cambridge St From North			South Dwy From East		Cambridge St From South			
Start Time	Left	Thru	U-TR	Left	Right	Thru	Right	U-TR	Int. Total
04:00 PM	29	190	9	0	1	144	57	0	430
04:15 PM	31	184	9	0	2	155	58	0	439
04:30 PM	35	207	4	1	1	143	52	0	443
04:45 PM	38	202	4	0	0	158	54	1	457
Total	133	783	26	1	4	600	221	1	1769
05:00 PM	31	258	2	0	0	188	46	0	525
05:15 PM	42	253	5	2	0	147	44	0	493
05:30 PM	34	273	6	0	0	136	37	0	486
05:45 PM	36	271	4	0	0	138	0	0	449
Total	143	1055	17	2	0	609	127	0	1953
Grand Total	276	1838	43	3	4	1209	348	1	3722
Apprch %	12.8	85.2	2	42.9	57.1	77.6	22.3	0.1	
Total %	7.4	49.4	1.2	0.1	0.1	32.5	9.3	0	
Cars	274	1827	43	1	4	1197	348	1	3695
% Cars	99.3	99.4	100	33.3	100	99	100	100	99.3
Trucks	2	11	0	2	0	12	0	0	27
% Trucks	0.7	0.6	0	66.7	0	1	0	0	0.7

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 2

	Cambridge St From North				South Dwy From East			Cambridge St From South				
Start Time	Left	Thru	U-TR	App. Total	Left	Right	App. Total	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 04:45 PM												
04:45 PM	38	202	4	244	0	0	0	158	**54**	**1**	213	457
05:00 PM	31	258	2	291	0	0	0	**188**	46	0	**234**	**525**
05:15 PM	**42**	253	5	300	**2**	0	**2**	147	44	0	191	493
05:30 PM	34	**273**	**6**	**313**	0	0	0	136	37	0	173	486
Total Volume	145	986	17	1148	2	0	2	629	181	1	811	1961
% App. Total	12.6	85.9	1.5		100	0		77.6	22.3	0.1		
PHF	.863	.903	.708	.917	.250	.000	.250	.836	.838	.250	.866	.934
Cars	143	981	17	1141	0	0	0	624	181	1	806	1947
% Cars	98.6	99.5	100	99.4	0	0	0	99.2	100	100	99.4	99.3
Trucks	2	5	0	7	2	0	2	5	0	0	5	14
% Trucks	1.4	0.5	0	0.6	100	0	100	0.8	0	0	0.6	0.7



Accurate Counts
978-664-2565

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 1

Groups Printed- Trucks

	Cambridge St From North			South Dwy From East		Cambridge St From South			
Start Time	Left	Thru	U-TR	Left	Right	Thru	Right	U-TR	Int. Total
04:00 PM	0	3	0	0	0	2	0	0	5
04:15 PM	0	1	0	0	0	1	0	0	2
04:30 PM	0	1	0	0	0	4	0	0	5
04:45 PM	0	1	0	0	0	2	0	0	3
Total	0	6	0	0	0	9	0	0	15
05:00 PM	2	0	0	0	0	1	0	0	3
05:15 PM	0	2	0	2	0	1	0	0	5
05:30 PM	0	2	0	0	0	1	0	0	3
05:45 PM	0	1	0	0	0	0	0	0	1
Total	2	5	0	2	0	3	0	0	12
Grand Total	2	11	0	2	0	12	0	0	27
Apprch %	15.4	84.6	0	100	0	100	0	0	
Total %	7.4	40.7	0	7.4	0	44.4	0	0	

Accurate Counts
978-664-2565

N/S Street : Cambridge Street
E/W Street : South Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910004
Site Code : 68910004
Start Date : 4/14/2015
Page No : 1

Groups Printed- Bikes Peds

	Cambridge St From North			South Dwy From East			Cambridge St From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	1	0	0	0	0	0	0	0	0	1	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	0	1	1
05:00 PM	0	0	0	0	0	1	0	0	0	1	0	1
05:15 PM	0	1	0	0	0	0	0	0	0	0	1	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	1	0	0	0	1	1	2
Grand Total	0	2	0	0	0	1	0	0	0	1	2	3
Apprch %	0	100		0	0		0	0				
Total %	0	100		0	0		0	0		33.3	66.7	

Accurate Counts
978-664-2565

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 1

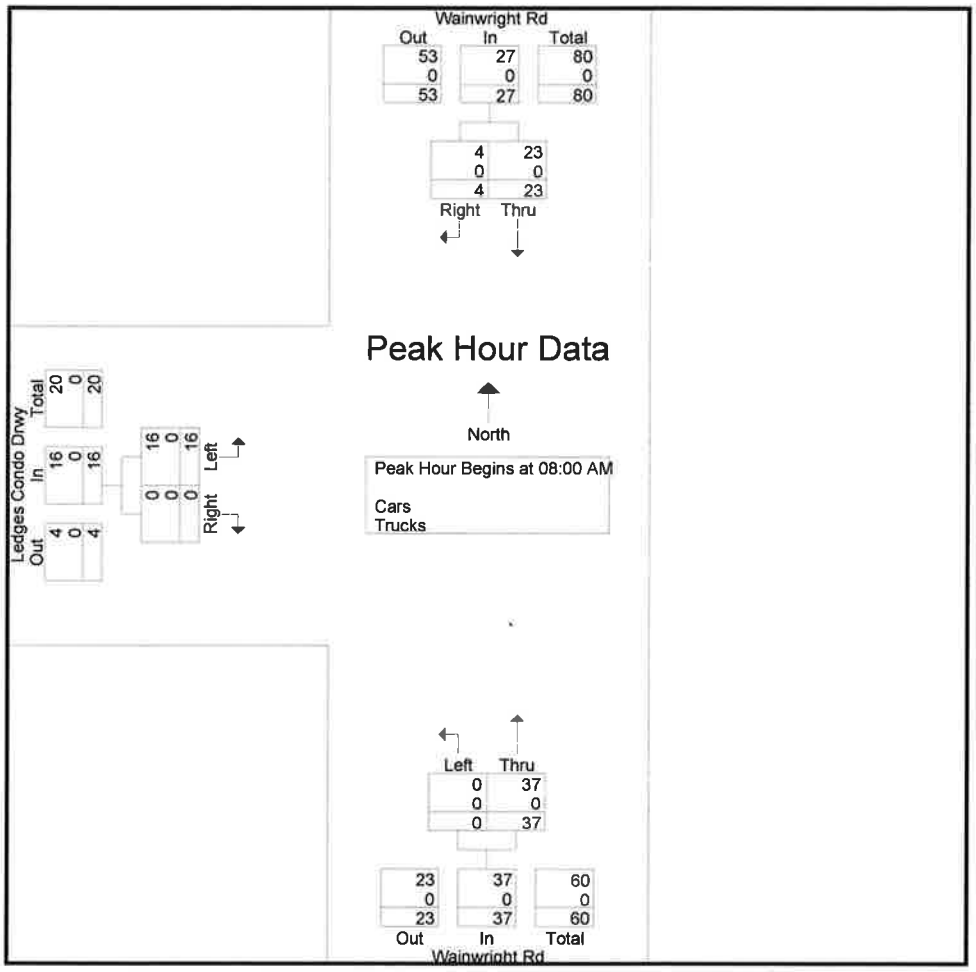
Groups Printed- Cars - Trucks

	Wainwright Rd From North		Wainwright Rd From South		Ledges Condo Drwy From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	7	1	0	12	2	0	22
07:15 AM	7	0	0	4	4	0	15
07:30 AM	7	0	0	6	3	0	16
07:45 AM	8	2	0	8	0	0	18
Total	29	3	0	30	9	0	71
08:00 AM	2	2	0	8	5	0	17
08:15 AM	4	0	0	7	4	0	15
08:30 AM	5	1	0	10	4	0	20
08:45 AM	12	1	0	12	3	0	28
Total	23	4	0	37	16	0	80
Grand Total	52	7	0	67	25	0	151
Apprch %	88.1	11.9	0	100	100	0	
Total %	34.4	4.6	0	44.4	16.6	0	
Cars	52	7	0	67	25	0	151
% Cars	100	100	0	100	100	0	100
Trucks	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 2

	Wainwright Rd From North			Wainwright Rd From South			Ledges Condo Drwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	2	**2**	4	0	8	8	**5**	0	**5**	17
08:15 AM	4	0	4	0	7	7	4	0	4	15
08:30 AM	5	1	6	0	10	10	4	0	4	20
08:45 AM	**12**	1	**13**	0	**12**	**12**	3	0	3	**28**
Total Volume	23	4	27	0	37	37	16	0	16	80
% App. Total	85.2	14.8		0	100		100	0		
PHF	.479	.500	.519	.000	.771	.771	.800	.000	.800	.714
Cars	23	4	27	0	37	37	16	0	16	80
% Cars	100	100	100	0	100	100	100	0	100	100
Trucks	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0



Accurate Counts
978-664-2565

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 7

Groups Printed- Trucks

	Wainwright Rd From North		Wainwright Rd From South		Ledges Condo Drwy From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	
Total %							

Accurate Counts
978-664-2565

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 10

Groups Printed- Bikes Peds

	Wainwright Rd From North			Wainwright Rd From South			Ledges Condo Drwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0		0	0		0	0				
Total %										0	0	

Accurate Counts
978-664-2565

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 1

Groups Printed- Cars - Trucks

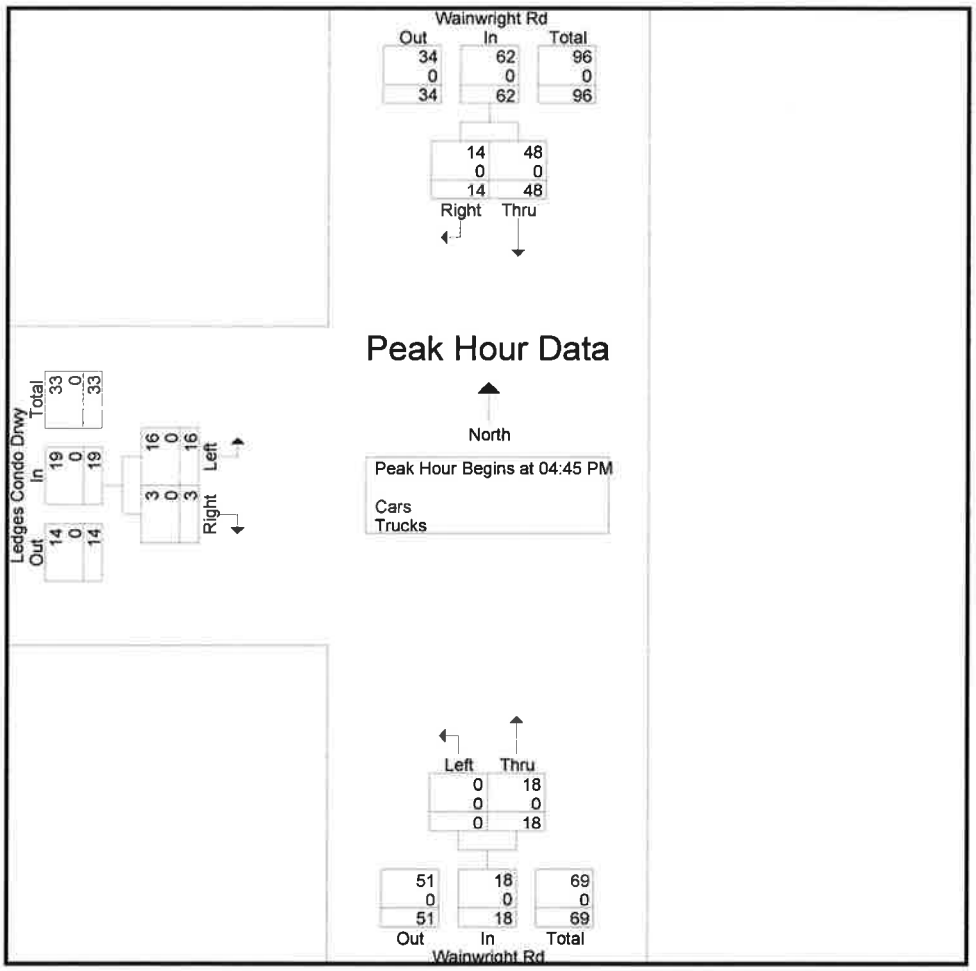
	Wainwright Rd From North		Wainwright Rd From South		Ledges Condo Drwy From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	3	4	2	8	4	0	21
04:15 PM	4	2	1	4	1	0	12
04:30 PM	6	2	0	5	5	0	18
04:45 PM	16	5	0	5	5	1	32
Total	29	13	3	22	15	1	83
05:00 PM	9	3	0	3	3	1	19
05:15 PM	13	3	0	3	4	1	24
05:30 PM	10	3	0	7	4	0	24
05:45 PM	8	1	0	4	2	0	15
Total	40	10	0	17	13	2	82
Grand Total	69	23	3	39	28	3	165
Apprch %	75	25	7.1	92.9	90.3	9.7	
Total %	41.8	13.9	1.8	23.6	17	1.8	
Cars	69	23	3	39	28	3	165
% Cars	100	100	100	100	100	100	100
Trucks	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0

Accurate Counts
978-664-2565

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 2

	Wainwright Rd From North			Wainwright Rd From South			Ledges Condo Drwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	**16**	**5**	**21**	0	5	5	**5**	**1**	**6**	**32**
05:00 PM	9	3	12	0	3	3	3	1	4	19
05:15 PM	13	3	16	0	3	3	4	1	5	24
05:30 PM	10	3	13	0	7	7	4	0	4	24
Total Volume	48	14	62	0	18	18	16	3	19	99
% App. Total	77.4	22.6		0	100		84.2	15.8		
PHF	.750	.700	.738	.000	.643	.643	.800	.750	.792	.773
Cars	48	14	62	0	18	18	16	3	19	99
% Cars	100	100	100	0	100	100	100	100	100	100
Trucks	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0



Accurate Counts
978-664-2565

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 7

Groups Printed- Trucks

	Wainwright Rd From North		Wainwright Rd From South		Ledges Condo Drwy From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	
Total %							

Accurate Counts
978-664-2565

N/S Street : Wainwright Road
E/W Street : Ledges Condo Driveway
City/State : Winchester, MA
Weather : Clear

File Name : 68910005
Site Code : 68910005
Start Date : 4/14/2015
Page No : 10

Groups Printed- Bikes Peds

	Wainwright Rd From North			Wainwright Rd From South			Ledges Condo Drwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0		0	0		0	0				
Total %										0	0	

SEASONAL ADJUSTMENT DATA

MASSACHUSETTS HIGHWAY DEPARTMENT - STATEWIDE TRAFFIC DATA COLLECTION

2011 WEEKDAY SEASONAL FACTORS *

* Note: These are weekday factors. The average of the factors for the year will not equal 1, as weekend data are not considered.

FACTOR GROUP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GROUP 1 - WEST INTERSTATE	0.98	0.93	0.90	0.89	0.90	0.88	0.91	0.90	0.89	0.89	0.93	0.95
Use group 2 for R5, R6, & R0 GROUP 2 - RURAL MAJOR COLLECTOR (R-5)	1.12	1.12	1.07	0.99	0.91	0.90	0.86	0.86	0.92	0.93	1.01	1.05
GROUP 3A - RECREATIONAL **(1-4) See below	1.26	1.25	1.20	1.06	0.96	0.89	0.76	0.76	0.92	0.99	1.08	1.14
GROUP 3B - RECREATIONAL ***(5) See below	1.22	1.26	1.22	1.06	0.96	0.90	0.72	0.74	0.97	1.02	1.14	1.15
GROUP 4 - I-495 INTERSTATE	1.02	1.00	1.00	0.96	0.92	0.89	0.85	0.83	0.93	0.96	1.01	1.03
GROUP 5 - EAST INTERSTATE	1.04	1.00	0.96	0.93	0.92	0.91	0.91	0.89	0.93	0.93	0.96	1.01
Use group 6 for U2, U3, U5, U6, U0, R2, & R3 GROUP 6 - URBAN ARTERIALS, COLLECTORS & RURAL ARTERIALS (R-2, R-3)	1.03	1.01	0.96	0.92	0.91	0.90	0.92	0.92	0.93	0.92	0.97	0.97
GROUP 7 - I-84 PROXIMITY (STAS. 17,3921)	1.24	1.24	1.15	1.04	0.99	1.00	0.93	0.89	1.05	1.05	1.05	1.12
GROUP 8 - I-295 PROXIMITY (STA. 6590)	1.00	0.99	0.95	0.92	0.94	0.91	0.93	0.92	0.95	0.94	0.97	0.95
GROUP 9 - I-195 PROXIMITY (STA. 7)	1.13	1.05	1.03	0.95	0.89	0.87	0.86	0.79	0.88	0.91	0.99	1.03

RECREATIONAL: (ALL YEARS)

****GROUP 3A:**

1. CAPE COD (ALL TOWNS)
2. PLYMOUTH(SOUTH OF RTE.3A)

7014, 7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108,7178

3. MARTHA'S VINEYARD
4. NANTUCKET

*****GROUP 3B:**

5. PERMANENTS 2 & 189

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,
1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,
1105,1106,1107,1108,1113,1114,1116,2196,2197,2198

2011 AXLE CORRECTION FACTORS

ROAD INVENTORY FUNCTIONAL CLASSIFICATION	AXLE CORRECTION FACTOR
RURAL	
1	0.95
2	0.97
3	0.98
0,5,6	0.98
URBAN	
1	0.96
2	0.98
3	0.98
5	0.98
0,6	0.99
I-84	0.90

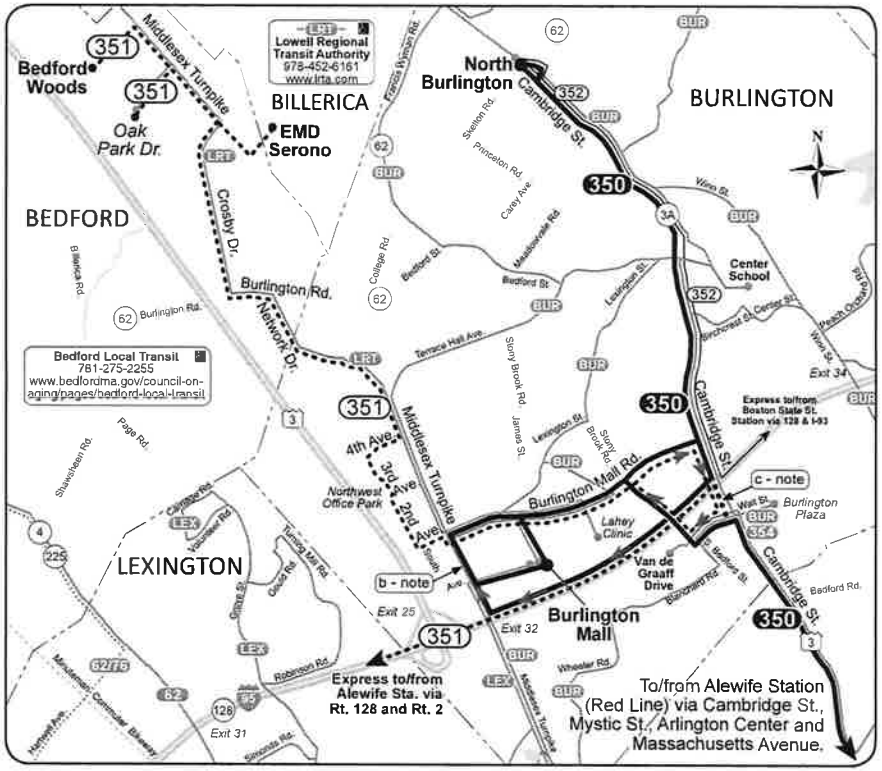
Apply I-84 factor to stations: 3290,3929

ROUND OFF

0 - 999.....10
> 1,000.....100

PUBLIC TRANSPORTATION SCHEDULES

Route 350 North Burlington - Alewife Station
Route 351 EMD Serono/Bedford Woods - Alewife Station



schedule change

350•351

Spring March 21, 2015 - June 19, 2015

350 North Burlington-Alewife Station

351 EMD Serono/Bedford Woods-Alewife Station

Serving

- Burlington Mall
- Oak Park
- Lahey Clinic
- Crosby Corporation Park
- Northwest Park
- Red Line

Massachusetts Bay Transportation Authority

massDOT

Information 617-222-3200 • 1-800-392-6100
(TTY) 617-222-5146 • www.mbta.com

350 & 351 Weekday

Inbound

Leave Bedford Woods	Arrive Chestnut & Cambridge	Arrive Burlington Mall	Lv/Arrive Woburn/ Burl. Line	Arrive Arlington Center	Arrive Alewife Station
.....	c 6:04A	.....	6:13A	6:34A	6:46A
.....	c 6:36	.....	6:45	7:06	7:18
.....	sc 6:52	.....	6:59	7:20	.....
.....	c 6:55	.....	7:04	7:25	7:41
.....	c 7:15	.....	7:24	7:45	8:01
.....	c 7:35	.....	7:50	8:10	8:26
.....	c 7:55	.....	8:15	8:35	8:51
.....	8:20	8:32A	8:43	9:03	9:14
.....	8:50	9:02	9:11	9:27	9:38
.....	9:20	9:30	9:39	9:55	10:06
.....	10:20	10:30	10:39	10:55	11:06
.....	11:20	11:30	11:39	11:55	12:04P
.....	12:20P	12:32P	12:45P	1:02P	1:11P
.....	1:20	1:32	1:45	2:02	2:11
.....	2:20	2:32	2:45	3:02	3:11
.....	3:20	3:32	3:45	4:02	4:11
3:20P	.....	.....	.....	.....	4:12
.....	3:45	3:57	4:10	4:27	4:36
4:20	.....	.....	.....	.....	5:12
.....	4:20	4:32	4:45	5:03	5:15
.....	5:05	5:17	5:34	5:53	6:02
5:20	.....	.....	.....	.....	6:12
.....	5:25	5:37	5:54	6:12	6:21
.....	5:40	5:52	6:05	6:24	6:33
.....	6:00	6:11	6:21	6:40	6:49
.....	6:20	6:31	6:41	7:00	7:10
6:20	.....	.....	.....	.....	7:12
.....	6:40	6:51	7:01	7:16	7:26
.....	7:00	7:10	7:19	7:34	7:44
.....	7:25	7:35	7:44	7:59	8:09
.....	7:50	8:00	8:09	8:24	8:34
.....	8:20	8:30	8:39	8:54	9:01
.....	9:20	9:30	9:38	9:50	9:56
.....	10:20	10:30	10:38	10:50	10:56

Outbound

Leave Alewife Station	Lv/Arrive Arlington Center	Arrive Woburn/ Burl. Line	Arrive Burlington Mall	Arrive Chestnut & Cambridge	Arrive EMD Serono
6:15A	.....	.....	.....	.....	7:01A
b 6:20	6:26A	6:40A	.....	7:04A	.....
b 6:42	6:48	7:02	.....	7:26	.....
b 6:58	7:06	7:22	.....	7:46	.....
7:05	.....	.....	.....	.....	7:54
b 7:22	7:30	7:46	.....	8:11	.....
7:46	7:54	8:12	8:24A	8:42	.....
7:55	.....	.....	.....	.....	8:44
8:15	8:23	8:41	8:53	9:11	.....
8:45	.....	.....	.....	.....	9:30
8:50	8:58	9:13	9:23	.....	.....
9:20	9:28	9:42	9:54	10:12	.....
10:15	10:22	10:36	10:48	11:05	.....
11:15	11:22	11:38	11:50	12:10P	.....
12:15P	12:22P	12:38P	12:50P	1:10P	.....
1:15	1:22	1:38	1:50	2:10	.....
.....	sc 2:25	2:41	.....	3:07	.....
2:20	2:27	2:44	2:54	3:09	.....
2:50	2:58	3:15	3:25	3:40	.....
3:20	3:28	3:45	3:55	4:10	.....
4:00	4:08	4:25	4:34	4:54	.....
4:20	4:28	4:46	4:54	5:14	.....
c 4:40	4:48	5:05	.....	5:30	.....
c 5:00	5:08	5:25	.....	5:50	.....
c 5:20	5:28	5:45	.....	6:10	.....
c 5:40	5:48	6:05	.....	6:30	.....
c 6:00	6:08	6:25	.....	6:50	.....
6:20	6:35	6:52	7:00	7:15	.....
6:45	6:57	7:14	7:22	7:37	.....
7:20	7:32	7:49	7:57	8:12	.....
8:20	8:30	8:43	8:51	9:02	.....
9:20	9:25	9:38	9:46	9:57	.....
c 10:20	10:25	10:39	.....	11:00	.....

Route 351 indicated by shaded areas

ROUTE 350 FARES

Fare	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	$1.60	$1.60	$2.10	$2.10
CharlieTicket	$2.10	$2.10	$2.65	$4.75
Cash-on-Board	$2.10	$4.20	$2.65	$4.75
Student CharlieCard*	$0.80	$0.80	$1.05	$1.05
Senior/TAP CharlieCard**	$0.80	$0.80	$1.05	$1.05

VALID PASSES: LinkPass ($75/mo.) ~~; Monthly Local Bus ($50/mo.)~~; *StudentPass ($26.00/Month for 5-Day validity ~~Mon-Fri or 7-Day validity on all days~~); **Senior/TAP Pass ($29/mo.), and express bus, commuter rail, and boat passes.
FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.
* Requires Student CharlieCard, available to students through participating middle schools and high schools.
** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities

ROUTE 351 FARES

Fare	Local Bus	Inner Express Bus + Local Bus Trip	Inner Express Bus + Local Bus Trip	Inner Express Bus + Subway Trip
CharlieCard	$1.60	$3.65	$3.65	$3.65
CharlieTicket	$2.10	$4.75	$6.85	$7.40
Cash-on-Board	$2.10	$4.75	$6.85	$7.40
Student CharlieCard*	$0.80	$2.35	$2.35	$2.35
Senior/TAP CharlieCard**	$0.80	$2.35	$2.35	$2.35

VALID PASSES: Inner Express Bus ($115/mo.) Outer Express Bus ($168/mo.) commuter rail, and boat passes.
FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.
* Requires Student CharlieCard, available to students through participating middle schools and high schools.
** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

350 Saturday

Inbound

Leave Chestnut & Cambridge	Arrive Burlington Mall	Arrive Alewife Station
c 7:10A	.....	7:38A
c 7:50	.....	8:18
8:30	8:38A	9:07
9:30	9:38	10:11
10:30	10:38	11:11
11:30	11:41	12:14P
12:30P	12:41P	1:15P
1:30	1:42	2:19
2:30	2:42	3:19
3:30	3:42	4:19
4:30	4:42	5:19
5:30	5:41	6:15
6:30	6:40	7:13
7:20	7:30	8:00
8:10	8:19	8:49
9:00	9:09	9:38
9:50	9:59	10:28

Outbound

Leave Alewife Station	Arrive Burlington Mall	Arrive Chestnut & Cambridge
b 6:25A	.....	7:03A
b 7:05	.....	7:43
b 7:45	.....	8:23
8:30	8:59A	9:16
9:30	10:01	10:18
10:30	11:01	11:18
11:30	12:01P	12:18P
12:30P	1:01P	1:19P
1:30	2:05	2:23
2:30	3:03	3:21
3:30	4:03	4:21
4:30	5:04	5:19
5:30	6:02	6:18
6:30	7:00	7:16
7:20	7:50	8:06
8:10	8:38	8:51
9:00	9:27	9:40
c 9:50	.....	10:17
c10:40	.....	11:07

350 Sunday

Inbound

Leave Chestnut & Cambridge	Arrive Burlington Mall	Arrive Alewife Station
c 7:50A	.....	8:17A
c 9:10	.....	9:37
c 10:30	.....	10:57
12:10P	12:20P	12:55P
1:05	1:15	1:50
2:00	2:10	2:45
2:55	3:05	3:40
3:50	4:00	4:35
4:45	4:55	5:27
5:40	5:49	6:21
6:50	6:59	7:31

Outbound

Leave Alewife Station	Arrive Burlington Mall	Arrive Chestnut & Cambridge
7:05A	7:30A	7:46A
8:20	8:45	9:01
9:40	10:05	10:21
11:00	11:25	11:41
12:10P	12:38P	12:58P
1:05	1:33	1:53
2:00	2:28	2:48
2:55	3:21	3:39
3:50	4:17	4:35
4:45	5:12	5:30
5:40	6:07	6:25
c 6:50	.....	7:20

Spring 2015 Holidays
April 20: see Weekday **May 25: see Sunday**

NOTE:
Route 351 Alewife service operates via Berth 8

No Route 351 service on weekends

b - Mall Road ONLY, bus does not enter mall
c - Omits Mall Road
s - Does NOT run during school vacation

All buses are accessible to persons with disabilities

Route 350 North Burlington-Alewife Station

Route 351 EMD Serono/ Bedford Woods-Alewife Station

VEHICLE TRAVEL SPEED DATA

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA
SB

6891SPD1

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/14/15	0	0	0	4	7	6	5	1	1	0	0	0	0	0	24	43	49
01:00	0	0	0	1	3	5	1	1	0	0	0	0	0	0	11	41	47
02:00	0	0	2	0	0	2	0	0	0	0	0	0	0	0	4	38	39
03:00	0	0	0	0	1	4	3	2	1	0	0	0	0	0	11	48	52
04:00	0	1	1	5	4	6	5	3	0	0	0	0	0	0	25	44	47
05:00	1	2	2	5	24	60	48	8	5	0	0	0	0	0	155	43	48
06:00	2	0	0	24	92	229	209	**64**	7	2	**1**	0	0	0	630	44	48
07:00	3	24	11	36	172	**392**	**227**	49	**13**	3	0	0	0	0	**930**	43	46
08:00	3	21	11	54	230	351	146	27	5	**4**	0	0	0	0	852	41	44
09:00	**5**	21	12	54	217	292	129	18	5	0	0	0	0	0	753	41	44
10:00	4	**32**	**15**	60	230	256	101	30	2	0	0	0	0	0	730	41	44
11:00	4	22	14	**68**	**247**	294	102	17	0	0	0	0	0	0	768	40	43
12 PM	**10**	34	**20**	**117**	291	302	95	13	3	0	0	0	0	0	885	39	43
13:00	1	31	18	76	275	279	94	12	4	1	0	0	0	0	791	39	43
14:00	5	27	18	80	260	331	109	17	3	0	0	0	0	0	850	40	43
15:00	0	32	15	90	262	343	131	25	2	0	0	0	0	0	900	40	44
16:00	3	30	13	58	267	411	175	42	**9**	**2**	0	0	0	0	1010	42	45
17:00	4	**36**	19	69	280	**504**	**251**	**54**	5	1	0	0	0	0	**1223**	42	44
18:00	4	30	10	55	**318**	443	219	36	9	0	0	0	0	0	1124	42	44
19:00	4	25	5	59	218	236	96	15	3	1	0	0	0	0	662	40	44
20:00	10	16	5	41	157	154	42	5	1	0	0	0	0	0	431	39	43
21:00	1	15	4	15	88	91	44	8	1	1	0	0	0	0	268	41	44
22:00	1	5	2	2	19	51	23	3	0	0	0	0	0	0	106	42	44
23:00	0	2	0	5	11	29	17	2	1	0	0	0	0	0	67	42	44
Total	65	406	197	978	3673	5071	2272	452	80	15	1	0	0	0	13210		
Percent	0.5%	3.1%	1.5%	7.4%	27.8%	38.4%	17.2%	3.4%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	10:00	10:00	11:00	11:00	07:00	07:00	06:00	07:00	08:00	06:00				07:00		
Vol.	5	32	15	68	247	392	227	64	13	4	1				930		
PM Peak	12:00	17:00	12:00	12:00	18:00	17:00	17:00	17:00	16:00	16:00					17:00		
Vol.	10	36	20	117	318	504	251	54	9	2					1223		

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA
SB

6891SPD1

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/15/15	0	0	0	5	4	11	7	3	0	0	0	0	0	0	30	43	47
01:00	0	0	0	1	4	3	9	0	0	0	0	0	0	0	17	43	44
02:00	0	0	0	1	4	5	1	1	0	0	0	0	0	0	12	40	46
03:00	0	0	0	0	1	4	0	2	1	0	0	0	0	0	8	49	53
04:00	0	0	0	0	5	3	10	3	2	0	0	0	0	0	23	47	52
05:00	0	0	0	12	20	36	48	15	3	0	0	0	0	0	134	44	48
06:00	1	1	2	9	77	210	226	72	21	1	0	0	0	0	620	45	49
07:00	3	14	5	21	132	315	**373**	**96**	**22**	**5**	**1**	0	0	0	**987**	44	48
08:00	2	21	6	24	154	**366**	233	54	16	2	0	0	0	0	878	43	47
09:00	1	17	14	61	182	298	117	25	5	0	0	0	0	0	720	41	44
10:00	**4**	24	9	**73**	222	308	83	20	3	0	0	0	0	0	746	39	44
11:00	4	**26**	**19**	60	**247**	307	104	15	0	0	0	0	0	0	782	40	43
12 PM	1	21	16	46	207	310	133	19	2	0	0	0	0	0	755	41	44
13:00	1	26	17	79	270	325	144	16	3	0	0	0	0	0	881	41	44
14:00	2	26	8	84	292	357	103	25	2	0	0	0	0	0	899	39	44
15:00	1	35	**22**	69	278	350	134	26	4	0	**1**	0	0	0	920	41	44
16:00	3	33	19	76	278	456	192	24	9	0	0	0	0	0	1090	41	44
17:00	4	36	5	**88**	**309**	478	**226**	**63**	**10**	**2**	1	0	0	0	**1222**	42	46
18:00	5	**39**	14	78	290	**498**	191	47	5	0	0	0	0	0	1167	41	44
19:00	**8**	28	9	62	207	250	103	21	6	0	0	0	0	0	694	41	44
20:00	6	27	11	51	162	167	62	7	1	1	0	0	0	0	495	39	43
21:00	4	10	0	22	91	110	44	6	1	2	0	0	0	0	290	41	44
22:00	1	7	1	7	29	63	35	4	2	0	0	0	0	0	149	42	44
23:00	0	3	2	3	19	32	25	6	0	0	0	0	0	0	90	43	46
Total	51	394	179	932	3484	5262	2603	570	118	13	3	0	0	0	13609		
Percent	0.4%	2.9%	1.3%	6.8%	25.6%	38.7%	19.1%	4.2%	0.9%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	11:00	11:00	10:00	11:00	08:00	07:00	07:00	07:00	07:00	07:00				07:00		
Vol.	4	26	19	73	247	366	373	96	22	5	1				987		
PM Peak	19:00	18:00	15:00	17:00	17:00	18:00	17:00	17:00	17:00	17:00	15:00				17:00		
Vol.	8	39	22	88	309	498	226	63	10	2	1				1222		
Grand Total	116	800	376	1910	7157	10333	4875	1022	198	28	4	0	0	0	26819		
Percent	0.4%	3.0%	1.4%	7.1%	26.7%	38.5%	18.2%	3.8%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	30 MPH
50th Percentile :	36 MPH
85th Percentile :	42 MPH
95th Percentile :	44 MPH

Statistics

10 MPH Pace Speed :	31-40 MPH
Number in Pace :	17490
Percent in Pace :	65.2%
Number of Vehicles > 35 MPH :	16460
Percent of Vehicles > 35 MPH :	61.4%
Mean Speed(Average) :	36 MPH

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA
NB

6891SPD1

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/14/15	0	0	1	1	6	5	6	1	0	0	0	0	0	0	20	43	45
01:00	0	0	0	0	0	2	2	1	1	0	0	0	0	0	6	50	53
02:00	0	0	0	0	2	1	5	1	0	0	0	0	0	0	9	44	47
03:00	0	0	0	0	1	4	0	2	1	0	0	0	0	0	8	49	53
04:00	0	0	0	0	8	7	9	4	1	0	0	0	0	0	29	45	49
05:00	0	1	2	4	11	32	24	7	0	0	0	0	0	0	81	43	47
06:00	0	**3**	1	20	38	88	92	34	5	0	0	0	0	0	281	44	48
07:00	0	0	3	28	91	239	189	39	6	**1**	0	0	0	0	596	43	47
08:00	0	0	5	31	120	**335**	**251**	**56**	**7**	0	0	0	0	0	**805**	43	47
09:00	0	1	6	46	106	180	128	29	2	0	0	0	0	0	498	43	46
10:00	0	0	**11**	**47**	**138**	197	92	13	2	0	0	0	0	0	500	41	44
11:00	0	0	7	37	115	165	93	8	1	0	0	0	0	0	426	42	44
12 PM	0	1	**11**	31	**125**	222	77	16	3	0	0	0	0	0	486	41	44
13:00	0	0	3	**42**	117	196	113	24	2	0	0	0	0	0	497	42	45
14:00	0	**2**	11	42	100	234	137	26	1	**1**	1	0	0	0	555	43	45
15:00	0	2	4	41	108	**251**	170	34	4	0	0	0	0	0	614	43	46
16:00	0	0	1	31	111	247	186	41	**7**	1	**2**	0	0	0	**627**	43	47
17:00	0	2	4	11	107	245	**207**	**42**	6	0	0	0	0	0	624	43	47
18:00	0	0	4	35	124	200	142	29	5	1	0	0	0	0	540	43	46
19:00	0	0	1	22	79	159	86	23	3	1	0	0	0	0	374	43	46
20:00	0	2	0	19	43	84	62	13	0	0	0	0	0	0	223	43	45
21:00	0	0	3	5	18	61	53	14	2	0	0	0	0	0	156	44	47
22:00	0	0	0	1	19	56	37	7	0	0	0	0	0	0	120	43	45
23:00	0	0	0	4	6	25	14	1	2	0	0	0	0	0	52	43	47
Total	0	14	78	498	1593	3235	2175	465	61	5	3	0	0	0	8127		
Percent	0.0%	0.2%	1.0%	6.1%	19.6%	39.8%	26.8%	5.7%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak		06:00	10:00	10:00	10:00	08:00	08:00	08:00	08:00	07:00					08:00		
Vol.		3	11	47	138	335	251	56	7	1					805		
PM Peak		14:00	12:00	13:00	12:00	15:00	17:00	17:00	16:00	14:00	16:00				16:00		
Vol.		2	11	42	125	251	207	42	7	1	2				627		

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA
NB

6891SPD1

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/15/15	0	0	0	1	6	13	10	4	0	0	1	0	0	0	35	44	49
01:00	0	0	0	0	6	7	5	4	0	1	0	0	0	0	23	46	49
02:00	0	0	1	0	3	1	2	0	0	0	0	0	0	0	7	42	44
03:00	0	0	1	0	1	3	6	0	2	0	0	0	0	0	13	50	53
04:00	0	0	0	0	1	7	3	0	1	1	0	0	0	0	13	50	56
05:00	0	0	1	1	8	25	26	8	2	0	0	0	0	0	71	44	49
06:00	0	0	2	13	43	81	101	34	3	0	1	0	0	0	278	44	48
07:00	0	0	4	15	70	185	254	**81**	**15**	2	0	**1**	0	0	627	45	49
08:00	0	0	3	17	99	**256**	**270**	63	3	1	0	1	0	0	**713**	44	47
09:00	0	**1**	**12**	34	71	203	148	35	11	**3**	**2**	0	0	0	520	44	48
10:00	0	0	2	30	102	192	118	17	3	0	0	0	0	0	464	42	44
11:00	0	0	5	**43**	**131**	183	96	11	4	0	0	0	0	0	473	42	44
12 PM	0	0	6	42	116	182	110	7	3	0	0	0	0	0	466	42	44
13:00	**1**	1	8	**52**	**146**	228	98	13	1	0	0	0	0	0	548	41	44
14:00	0	**2**	8	41	132	214	118	25	3	0	0	0	0	0	543	42	45
15:00	0	2	4	41	115	270	148	**35**	0	**1**	0	0	0	0	616	43	45
16:00	0	0	**9**	24	102	264	185	31	**5**	0	0	0	0	0	620	43	45
17:00	0	1	1	30	115	**272**	**188**	33	3	0	0	0	0	0	**643**	43	45
18:00	0	0	6	26	109	248	149	24	1	0	0	0	0	0	563	43	44
19:00	0	0	4	26	89	192	117	14	2	1	0	0	0	0	445	42	44
20:00	0	0	4	12	71	121	62	10	1	1	0	0	0	0	282	42	44
21:00	0	0	1	10	37	92	61	10	2	0	0	0	0	0	213	43	45
22:00	0	1	0	4	18	59	40	12	1	0	**1**	0	0	0	136	44	47
23:00	0	0	0	1	13	27	16	4	2	0	0	0	0	0	63	43	48
Total	1	8	82	463	1604	3325	2331	475	68	11	5	2	0	0	8375		
Percent	0.0%	0.1%	1.0%	5.5%	19.2%	39.7%	27.8%	5.7%	0.8%	0.1%	0.1%	0.0%	0.0%	0.0%			
AM Peak		09:00	09:00	11:00	11:00	08:00	08:00	07:00	07:00	09:00	09:00	07:00			08:00		
Vol.		1	12	43	131	256	270	81	15	3	2	1			713		
PM Peak	13:00	14:00	16:00	13:00	13:00	17:00	17:00	15:00	16:00	15:00	22:00				17:00		
Vol.	1	2	9	52	146	272	188	35	5	1	1				643		
Grand Total	1	22	160	961	3197	6560	4506	940	129	16	8	2	0	0	16502		
Percent	0.0%	0.1%	1.0%	5.8%	19.4%	39.8%	27.3%	5.7%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	32 MPH
50th Percentile :	37 MPH
85th Percentile :	43 MPH
95th Percentile :	46 MPH

Statistics

10 MPH Pace Speed :	36-45 MPH
Number in Pace :	11066
Percent in Pace :	67.1%
Number of Vehicles > 35 MPH :	12161
Percent of Vehicles > 35 MPH :	73.7%
Mean Speed(Average) :	38 MPH

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA
SB, NB

6891SPD1

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/14/15	0	0	1	5	13	11	11	2	1	0	0	0	0	0	44	43	47
01:00	0	0	0	1	3	7	3	2	1	0	0	0	0	0	17	46	50
02:00	0	0	2	0	2	3	5	1	0	0	0	0	0	0	13	44	46
03:00	0	0	0	0	2	8	3	4	2	0	0	0	0	0	19	48	52
04:00	0	1	1	5	12	13	14	7	1	0	0	0	0	0	54	44	48
05:00	1	3	4	9	35	92	72	15	5	0	0	0	0	0	236	43	47
06:00	2	3	1	44	130	317	301	**98**	12	2	**1**	0	0	0	911	44	48
07:00	3	24	14	64	263	631	**416**	88	**19**	**4**	0	0	0	0	1526	43	46
08:00	3	21	16	85	350	**686**	397	83	12	4	0	0	0	0	**1657**	43	45
09:00	**5**	22	18	100	323	472	257	47	7	0	0	0	0	0	1251	42	44
10:00	4	**32**	**26**	**107**	**368**	453	193	43	4	0	0	0	0	0	1230	41	44
11:00	4	22	21	105	362	459	195	25	1	0	0	0	0	0	1194	41	44
12 PM	**10**	35	**31**	**148**	416	524	172	29	6	0	0	0	0	0	1371	40	44
13:00	1	31	21	118	392	475	207	36	6	1	0	0	0	0	1288	41	44
14:00	5	29	29	122	360	565	246	43	4	1	1	0	0	0	1405	41	44
15:00	0	34	19	131	370	594	301	59	6	0	0	0	0	0	1514	42	44
16:00	3	30	14	89	378	658	361	83	**16**	**3**	**2**	0	0	0	1637	43	46
17:00	4	**38**	23	80	387	**749**	**458**	**96**	11	1	0	0	0	0	**1847**	43	45
18:00	4	30	14	90	**442**	643	361	65	14	1	0	0	0	0	1664	42	44
19:00	4	25	6	81	297	395	182	38	6	2	0	0	0	0	1036	41	44
20:00	10	18	5	60	200	238	104	18	1	0	0	0	0	0	654	41	44
21:00	1	15	7	20	106	152	97	22	3	1	0	0	0	0	424	43	46
22:00	1	5	2	3	38	107	60	10	0	0	0	0	0	0	226	43	44
23:00	0	2	0	9	17	54	31	3	3	0	0	0	0	0	119	43	45
Total	65	420	275	1476	5266	8306	4447	917	141	20	4	0	0	0	21337		
Percent	0.3%	2.0%	1.3%	6.9%	24.7%	38.9%	20.8%	4.3%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	10:00	10:00	10:00	10:00	08:00	07:00	06:00	07:00	07:00	06:00				08:00		
Vol.	5	32	26	107	368	686	416	98	19	4	1				1657		
PM Peak	12:00	17:00	12:00	12:00	18:00	17:00	17:00	17:00	16:00	16:00	16:00				17:00		
Vol.	10	38	31	148	442	749	458	96	16	3	2				1847		

Accurate Counts
978-664-2565

Location : Cambridge Street
Location : North of Wainwright Road
City/State: Winchester, MA
SB, NB

6891SPD1

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/15/15	0	0	0	6	10	24	17	7	0	0	1	0	0	0	65	44	48
01:00	0	0	0	1	10	10	14	4	0	1	0	0	0	0	40	44	48
02:00	0	0	1	1	7	6	3	1	0	0	0	0	0	0	19	41	45
03:00	0	0	1	0	2	7	6	2	3	0	0	0	0	0	21	49	53
04:00	0	0	0	0	6	10	13	3	3	1	0	0	0	0	36	47	53
05:00	0	0	1	13	28	61	74	23	5	0	0	0	0	0	205	44	48
06:00	1	1	4	22	120	291	327	106	24	1	1	0	0	0	898	44	49
07:00	3	14	9	36	202	500	**627**	**177**	**37**	**7**	1	**1**	0	0	**1614**	44	49
08:00	2	21	9	41	253	**622**	503	117	19	3	0	1	0	0	1591	44	47
09:00	1	18	**26**	95	253	501	265	60	16	3	**2**	0	0	0	1240	43	46
10:00	**4**	24	11	**103**	324	500	201	37	6	0	0	0	0	0	1210	41	44
11:00	4	**26**	24	103	**378**	490	200	26	4	0	0	0	0	0	1255	41	44
12 PM	1	21	22	88	323	492	243	26	5	0	0	0	0	0	1221	41	44
13:00	2	27	25	**131**	416	553	242	29	4	0	0	0	0	0	1429	41	44
14:00	2	28	16	125	**424**	571	221	50	5	0	0	0	0	0	1442	41	44
15:00	1	37	26	110	393	620	282	61	4	1	**1**	0	0	0	1536	42	44
16:00	3	33	**28**	100	380	720	377	55	**14**	0	0	0	0	0	1710	42	44
17:00	4	37	6	118	424	**750**	**414**	**96**	13	**2**	1	0	0	0	**1865**	42	45
18:00	5	**39**	20	104	399	746	340	71	6	0	0	0	0	0	1730	42	44
19:00	**8**	28	13	88	296	442	220	35	8	1	0	0	0	0	1139	42	44
20:00	6	27	15	63	233	288	124	17	2	2	0	0	0	0	777	41	44
21:00	4	10	1	32	128	202	105	16	3	2	0	0	0	0	503	42	44
22:00	1	8	1	11	47	122	75	16	3	0	1	0	0	0	285	43	46
23:00	0	3	2	4	32	59	41	10	2	0	0	0	0	0	153	43	47
Total	52	402	261	1395	5088	8587	4934	1045	186	24	8	2	0	0	21984		
Percent	0.2%	1.8%	1.2%	6.3%	23.1%	39.1%	22.4%	4.8%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	11:00	09:00	10:00	11:00	08:00	07:00	07:00	07:00	07:00	09:00	07:00			07:00		
Vol.	4	26	26	103	378	622	627	177	37	7	2	1			1614		
PM Peak	19:00	18:00	16:00	13:00	14:00	17:00	17:00	17:00	16:00	17:00	15:00				17:00		
Vol.	8	39	28	131	424	750	414	96	14	2	1				1865		
Grand Total	117	822	536	2871	10354	16893	9381	1962	327	44	12	2	0	0	43321		
Percent	0.3%	1.9%	1.2%	6.6%	23.9%	39.0%	21.7%	4.5%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	31 MPH
50th Percentile :	37 MPH
85th Percentile :	42 MPH
95th Percentile :	45 MPH

Statistics

10 MPH Pace Speed :	31-40 MPH
Number in Pace :	27247
Percent in Pace :	62.9%
Number of Vehicles > 35 MPH :	28621
Percent of Vehicles > 35 MPH :	66.1%
Mean Speed(Average) :	37 MPH

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA
EB

6891SPD2

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/14/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3	28	29
06:00	**1**	1	7	10	2	0	0	0	0	0	0	0	0	0	21	29	32
07:00	0	1	11	22	**4**	0	0	0	0	0	0	0	0	0	38	29	32
08:00	0	2	**16**	**29**	3	0	0	0	0	0	0	0	0	0	**50**	29	30
09:00	0	2	14	17	1	0	0	0	0	0	0	0	0	0	34	28	29
10:00	0	3	11	26	4	0	0	0	0	0	0	0	0	0	44	29	32
11:00	1	**4**	9	17	3	0	0	0	0	0	0	0	0	0	34	29	32
12 PM	0	2	15	10	2	**1**	0	0	0	0	0	0	0	0	30	29	33
13:00	1	2	16	16	3	1	0	0	0	0	0	0	0	0	39	29	33
14:00	**2**	2	11	16	**4**	0	0	0	0	0	0	0	0	0	35	29	32
15:00	0	2	**24**	10	2	0	0	0	0	0	0	0	0	0	38	28	30
16:00	0	1	11	23	2	0	0	0	0	0	0	0	0	0	37	29	30
17:00	0	**3**	10	16	0	0	0	0	0	0	0	0	0	0	29	28	29
18:00	0	3	7	**28**	2	0	0	0	0	0	0	0	0	0	**40**	29	30
19:00	0	3	11	5	2	0	0	0	0	0	0	0	0	0	21	28	32
20:00	0	2	5	6	0	0	0	0	0	0	0	0	0	0	13	28	29
21:00	0	2	3	1	0	0	0	0	0	0	0	0	0	0	6	25	28
22:00	0	0	2	1	0	0	0	0	0	0	0	0	0	0	3	27	29
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
Total	5	35	184	255	34	2	0	0	0	0	0	0	0	0	515		
Percent	1.0%	6.8%	35.7%	49.5%	6.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	11:00	08:00	08:00	07:00										08:00		
Vol.	1	4	16	29	4										50		
PM Peak	14:00	17:00	15:00	18:00	14:00	12:00									18:00		
Vol.	2	3	24	28	4	1									40		

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA
EB

6891SPD2

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/15/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	4	1	0	0	0	0	0	0	0	0	0	5	31	33
06:00	0	0	1	11	2	0	0	0	0	0	0	0	0	0	14	29	33
07:00	0	3	11	17	**7**	0	0	0	0	0	0	0	0	0	38	30	33
08:00	0	2	**15**	**26**	5	0	0	0	0	0	0	0	0	0	**48**	29	32
09:00	0	0	13	18	1	0	0	0	0	0	0	0	0	0	32	28	29
10:00	0	1	15	25	1	0	0	0	0	0	0	0	0	0	42	28	29
11:00	**1**	**4**	15	12	2	**1**	0	0	0	0	0	0	0	0	35	29	33
12 PM	0	2	8	16	0	**1**	0	0	0	0	0	0	0	0	27	29	29
13:00	1	2	17	16	3	1	0	0	0	0	0	0	0	0	40	29	33
14:00	**2**	3	12	15	4	0	0	0	0	0	0	0	0	0	36	29	32
15:00	0	3	**27**	10	3	0	0	0	0	0	0	0	0	0	**43**	28	31
16:00	0	**4**	13	18	**5**	0	0	0	0	0	0	0	0	0	40	29	33
17:00	1	0	12	**21**	3	0	0	0	0	0	0	0	0	0	37	29	31
18:00	1	0	7	18	1	0	0	0	0	0	0	0	0	0	27	29	29
19:00	2	2	10	13	2	0	0	0	0	0	0	0	0	0	29	29	31
20:00	0	0	6	3	0	0	0	0	0	0	0	0	0	0	9	27	29
21:00	0	0	3	1	0	0	0	0	0	0	0	0	0	0	4	27	28
22:00	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3	28	29
23:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	29	29
Total	8	26	186	248	40	3	0	0	0	0	0	0	0	0	511		
Percent	1.6%	5.1%	36.4%	48.5%	7.8%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	11:00	08:00	08:00	07:00	11:00									08:00		
Vol.	1	4	15	26	7	1									48		
PM Peak	14:00	16:00	15:00	17:00	16:00	12:00									15:00		
Vol.	2	4	27	21	5	1									43		
Grand Total	13	61	370	503	74	5	0	0	0	0	0	0	0	0	1026		
Percent	1.3%	5.9%	36.1%	49.0%	7.2%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	21 MPH
50th Percentile :	25 MPH
85th Percentile :	29 MPH
95th Percentile :	31 MPH

Statistics

10 MPH Pace Speed :	21-30 MPH
Number in Pace :	873
Percent in Pace :	85.1%
Number of Vehicles > 25 MPH :	582
Percent of Vehicles > 25 MPH :	56.7%
Mean Speed(Average) :	26 MPH

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA
WB

6891SPD2

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/14/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	1	39	39
05:00	**1**	1	0	1	0	0	0	0	0	0	0	0	0	0	3	27	29
06:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	23	24
07:00	1	5	16	9	0	0	0	0	0	0	0	0	0	0	31	27	29
08:00	0	7	10	7	**2**	0	0	0	0	0	0	0	0	0	26	28	31
09:00	0	7	12	7	0	0	0	0	0	0	0	0	0	0	26	27	29
10:00	0	**8**	**18**	**12**	1	0	0	0	0	0	0	0	0	0	**39**	27	29
11:00	1	4	14	8	1	0	0	0	0	0	0	0	0	0	28	28	29
12 PM	0	**14**	21	10	2	0	0	0	0	0	0	0	0	0	47	27	29
13:00	1	5	19	15	1	0	0	0	0	0	0	0	0	0	41	28	29
14:00	0	3	19	13	2	0	0	0	0	0	0	0	0	0	37	28	30
15:00	0	6	20	10	1	0	0	0	0	0	0	0	0	0	37	27	29
16:00	0	6	17	17	1	0	0	0	0	0	0	0	0	0	41	28	29
17:00	0	6	20	**24**	0	**1**	0	0	0	0	0	0	0	0	51	28	29
18:00	1	8	**24**	17	**3**	0	0	0	0	0	0	0	0	0	**53**	28	30
19:00	1	5	13	10	0	0	0	0	0	0	0	0	0	0	29	27	29
20:00	**2**	8	20	1	0	0	0	0	0	0	0	0	0	0	31	24	24
21:00	0	3	9	4	0	0	0	0	0	0	0	0	0	0	16	27	29
22:00	0	2	2	3	0	0	0	0	0	0	0	0	0	0	7	28	29
23:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
Total	9	98	256	168	14	2	0	0	0	0	0	0	0	0	547		
Percent	1.6%	17.9%	46.8%	30.7%	2.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	05:00	10:00	10:00	10:00	08:00	04:00									10:00		
Vol.	1	8	18	12	2	1									39		
PM Peak	20:00	12:00	18:00	17:00	18:00	17:00									18:00		
Vol.	2	14	24	24	3	1									53		

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA
WB

6891SPD2

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/15/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	0	0	2	0	1	0	0	0	0	0	0	0	0	0	3	32	34
07:00	0	6	4	9	**2**	0	0	0	0	0	0	0	0	0	21	29	32
08:00	1	2	11	7	0	0	0	0	0	0	0	0	0	0	21	27	29
09:00	0	3	13	5	1	0	0	0	0	0	0	0	0	0	22	27	29
10:00	0	3	**19**	**10**	2	0	0	0	0	0	0	0	0	0	**34**	28	30
11:00	**5**	**9**	9	10	0	0	0	0	0	0	0	0	0	0	33	27	29
12 PM	0	2	16	9	1	0	0	0	0	0	0	0	0	0	28	28	29
13:00	0	4	21	13	0	0	0	0	0	0	0	0	0	0	38	27	29
14:00	1	4	20	16	**4**	0	0	0	0	0	0	0	0	0	45	29	32
15:00	1	6	22	9	0	0	0	0	0	0	0	0	0	0	38	26	28
16:00	0	2	19	20	1	0	0	0	0	0	0	0	0	0	42	28	29
17:00	0	**8**	23	**25**	2	0	0	0	0	0	0	0	0	0	**58**	28	29
18:00	**2**	2	**27**	11	0	0	0	0	0	0	0	0	0	0	42	27	29
19:00	0	8	21	8	0	0	0	0	0	0	0	0	0	0	37	26	28
20:00	1	4	17	5	1	0	0	0	0	0	0	0	0	0	28	26	29
21:00	0	0	2	1	1	0	0	0	0	0	0	0	0	0	4	32	33
22:00	0	2	5	2	0	0	0	0	0	0	0	0	0	0	9	26	28
23:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29	29
Total	11	65	252	161	16	0	0	0	0	0	0	0	0	0	505		
Percent	2.2%	12.9%	49.9%	31.9%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	11:00	10:00	10:00	07:00										10:00		
Vol.	5	9	19	10	2										34		
PM Peak	18:00	17:00	18:00	17:00	14:00										17:00		
Vol.	2	8	27	25	4										58		
Grand Total	20	163	508	329	30	2	0	0	0	0	0	0	0	0	1052		
Percent	1.9%	15.5%	48.3%	31.3%	2.9%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	19 MPH
50th Percentile :	23 MPH
85th Percentile :	28 MPH
95th Percentile :	29 MPH

Statistics

10 MPH Pace Speed :	21-30 MPH
Number in Pace :	837
Percent in Pace :	79.6%
Number of Vehicles > 25 MPH :	361
Percent of Vehicles > 25 MPH :	34.3%
Mean Speed(Average) :	24 MPH

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA
EB, WB

6891SPD2

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/14/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	1	39	39
05:00	1	1	1	3	0	0	0	0	0	0	0	0	0	0	6	28	29
06:00	**2**	1	8	10	2	0	0	0	0	0	0	0	0	0	23	29	32
07:00	1	6	27	31	4	0	0	0	0	0	0	0	0	0	69	28	30
08:00	0	9	26	36	**5**	0	0	0	0	0	0	0	0	0	76	29	31
09:00	0	9	26	24	1	0	0	0	0	0	0	0	0	0	60	28	29
10:00	0	**11**	**29**	**38**	5	0	0	0	0	0	0	0	0	0	**83**	29	30
11:00	2	8	23	25	4	0	0	0	0	0	0	0	0	0	62	28	31
12 PM	0	**16**	36	20	4	**1**	0	0	0	0	0	0	0	0	77	28	31
13:00	**2**	7	35	31	4	1	0	0	0	0	0	0	0	0	80	28	31
14:00	2	5	30	29	**6**	0	0	0	0	0	0	0	0	0	72	29	31
15:00	0	8	**44**	20	3	0	0	0	0	0	0	0	0	0	75	27	29
16:00	0	7	28	40	3	0	0	0	0	0	0	0	0	0	78	28	29
17:00	0	9	30	40	0	1	0	0	0	0	0	0	0	0	80	28	29
18:00	1	11	31	**45**	5	0	0	0	0	0	0	0	0	0	**93**	29	30
19:00	1	8	24	15	2	0	0	0	0	0	0	0	0	0	50	28	29
20:00	2	10	25	7	0	0	0	0	0	0	0	0	0	0	44	25	28
21:00	0	5	12	5	0	0	0	0	0	0	0	0	0	0	22	26	28
22:00	0	2	4	4	0	0	0	0	0	0	0	0	0	0	10	28	29
23:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
Total	14	133	440	423	48	4	0	0	0	0	0	0	0	0	1062		
Percent	1.3%	12.5%	41.4%	39.8%	4.5%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	10:00	10:00	10:00	08:00	04:00									10:00		
Vol.	2	11	29	38	5	1									83		
PM Peak	13:00	12:00	15:00	18:00	14:00	12:00									18:00		
Vol.	2	16	44	45	6	1									93		

Accurate Counts
978-664-2565

Location : Wainwright Road
Location : West of Cambridge Street
City/State: Winchester, MA
EB, WB

6891SPD2

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/15/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	4	1	0	0	0	0	0	0	0	0	0	5	31	33
06:00	0	0	3	11	3	0	0	0	0	0	0	0	0	0	17	30	33
07:00	0	9	15	26	**9**	0	0	0	0	0	0	0	0	0	59	30	33
08:00	1	4	26	33	5	0	0	0	0	0	0	0	0	0	69	29	31
09:00	0	3	26	23	2	0	0	0	0	0	0	0	0	0	54	28	29
10:00	0	4	**34**	**35**	3	0	0	0	0	0	0	0	0	0	**76**	28	29
11:00	**6**	**13**	24	22	2	**1**	0	0	0	0	0	0	0	0	68	28	29
12 PM	0	4	24	25	1	**1**	0	0	0	0	0	0	0	0	55	28	29
13:00	1	6	38	29	3	1	0	0	0	0	0	0	0	0	78	28	30
14:00	**3**	7	32	31	**8**	0	0	0	0	0	0	0	0	0	81	29	32
15:00	1	9	**49**	19	3	0	0	0	0	0	0	0	0	0	81	27	29
16:00	0	6	32	38	6	0	0	0	0	0	0	0	0	0	82	29	31
17:00	1	8	35	**46**	5	0	0	0	0	0	0	0	0	0	**95**	28	30
18:00	3	2	34	29	1	0	0	0	0	0	0	0	0	0	69	28	29
19:00	2	**10**	31	21	2	0	0	0	0	0	0	0	0	0	66	28	29
20:00	1	4	23	8	1	0	0	0	0	0	0	0	0	0	37	27	29
21:00	0	0	5	2	1	0	0	0	0	0	0	0	0	0	8	29	32
22:00	0	2	6	4	0	0	0	0	0	0	0	0	0	0	12	27	29
23:00	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	29	29
Total	19	91	438	409	56	3	0	0	0	0	0	0	0	0	1016		
Percent	1.9%	9.0%	43.1%	40.3%	5.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	11:00	10:00	10:00	07:00	11:00									10:00		
Vol.	6	13	34	35	9	1									76		
PM Peak	14:00	19:00	15:00	17:00	14:00	12:00									17:00		
Vol.	3	10	49	46	8	1									95		
Grand Total	33	224	878	832	104	7	0	0	0	0	0	0	0	0	2078		
Percent	1.6%	10.8%	42.3%	40.0%	5.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	20 MPH
50th Percentile :	24 MPH
85th Percentile :	28 MPH
95th Percentile :	30 MPH

Statistics

10 MPH Pace Speed :	21-30 MPH
Number in Pace :	1710
Percent in Pace :	82.3%
Number of Vehicles > 25 MPH :	943
Percent of Vehicles > 25 MPH :	45.4%
Mean Speed(Average) :	25 MPH

MASSDOT CRASH RATE WORKSHEETS

MassDOT

CRASH RATE WORKSHEET

CITY/TOWN : Woburn COUNT DATE : 2015

DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : Yes

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Cambridge Road (Route 3) ST #

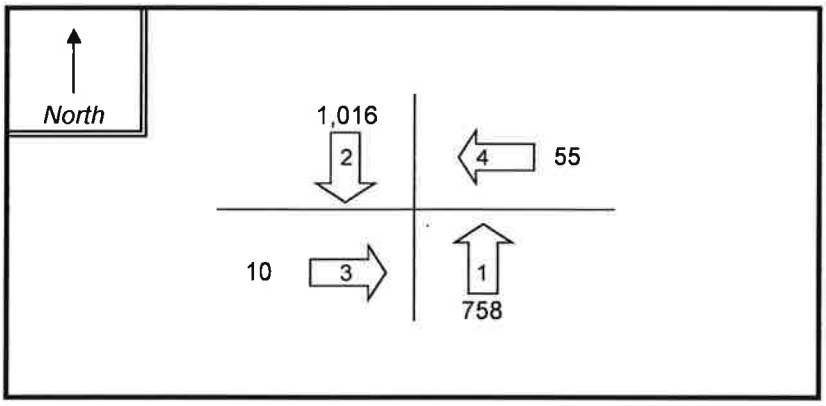
MINOR STREET(S) : Country Club Road ST #

Crescent Park Drive ST #

ST #

ST #

INTERSECTION DIAGRAM (Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (AM/**PM**) :	758	1,016	10	55		**1,839**

" K " FACTOR : **0.090** APPROACH ADT : **20,433** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 12 # OF YEARS : 5 AVERAGE # OF ACCIDENTS (**A**) : **2.40**

CRASH RATE CALCULATION : 0.32

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(ADT * 365)}$$

Comments : Crash rate is significant if > 0.58 crashes per mev for an unsignalized intersection and >0.77 crashes per mev for a signalized intersection for MassDOT District 4.

CRASH RATE WORKSHEET

CITY/TOWN : Woburn COUNT DATE : 2015

DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : Yes

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Cambridge Road (Route 3) ST #

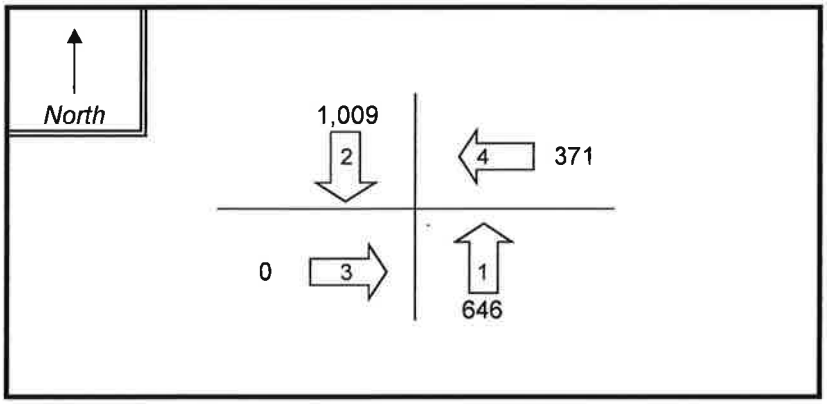
MINOR STREET(S) : Horn Pond Plaza North Driveway ST #

Gas Station Driveway ST #

ST #

ST #

INTERSECTION DIAGRAM
(Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (AM/**PM**) :	646	1,009	0	371		**2,026**

" K " FACTOR : **0.090** APPROACH ADT : **22,511** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 8 # OF YEARS : 5 AVERAGE # OF ACCIDENTS (**A**) : **1.60**

CRASH RATE CALCULATION : 0.19

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(ADT * 365)}$$

Comments : Crash rate is significant if > 0.58 crashes per mev for an unsignalized intersection and >0.77 crashes per mev for a signalized intersection for MassDOT District 4.

CRASH RATE WORKSHEET

CITY/TOWN : Winchester COUNT DATE : 2015

DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : Yes

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Cambridge Road (Route 3) ST #

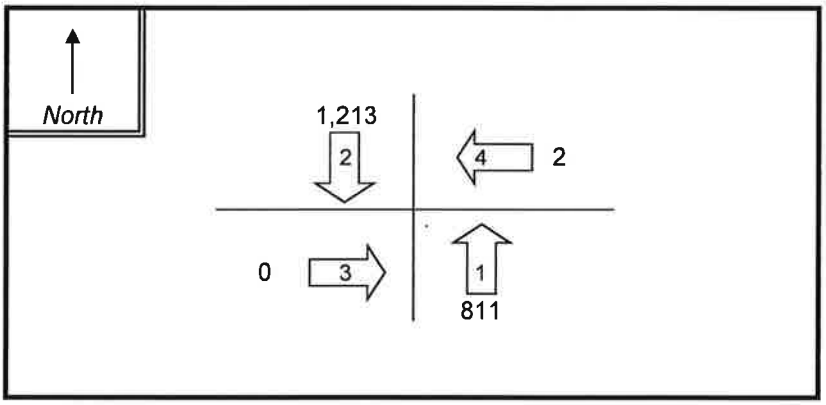
MINOR STREET(S) : Horn Pond Plaza South Driveway ST #

ST #

ST #

ST #

INTERSECTION DIAGRAM
(Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (AM/**PM**) :	811	1,213	0	2		**2,026**

" K " FACTOR : **0.090** APPROACH ADT : **22,511** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 1 # OF YEARS : 5 AVERAGE # OF ACCIDENTS (**A**) : **0.20**

CRASH RATE CALCULATION : **0.02**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(ADT * 365)}$$

Comments : Crash rate is significant if > 0.58 crashes per mev for an unsignalized intersection and >0.77 crashes per mev for a signalized intersection for MassDOT District 4.

GENERAL BACKGROUND TRAFFIC GROWTH

General Background Traffic Growth

STA.	CITY/TOWN	ROUTE/STREET	LOCATION	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Annual Growth
4127	WOBURN	CAMBRIDGE STREET	NORTH OF DAY CIRCLE		21,700								22,000	0.17%

TRIP-GENERATION CALCULATIONS

Institute of Transportation Engineers (ITE)
Trip Generation, 9 th Edition
Land Use Code (LUC) 220 - Apartment

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 96

AVERAGE WEEKDAY DAILY

T = 6.06 * (X) + 123.56
T = 6.06 * 96 + (123.56)
T = 705.32
T = 706 vehicle trips
with 50% (353 vpd) entering and 50% (353 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.49 * (X) + 3.73
T = 0.49 * 96 + (3.73)
T = 50.77
T = 51 vehicle trips
with 20% (10 vph) entering and 80% (41 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.55 * (X) + 17.65
T = 0.55 * 96 + (17.65)
T = 70.45
T = 70 vehicle trips
with 65% (46 vph) entering and 35% (24 vph) exiting.

JOURNEY TO WORK DATA

Residence MCD/County to Workplace MCD/County Flows for Massachusetts: 200(
Sorted by Residence State-County, or State-County-County Subdivision (in 12 stat
WINCHESTER

Workplace State-County-MCD Name	Count	Percent
To/From the South via Route 3		
Fall River city Bristol Co. MA	6	0.1%
Somerset town Bristol Co. MA	6	0.1%
Winchester town Middlesex Co. MA	1804	18.1%
Cambridge city Middlesex Co. MA	800	8.0%
Medford city Middlesex Co. MA	306	3.1%
Somerville city Middlesex Co. MA	219	2.2%
Malden city Middlesex Co. MA	138	1.4%
Arlington town Middlesex Co. MA	95	1.0%
Everett city Middlesex Co. MA	92	0.9%
Stoneham town Middlesex Co. MA	92	0.9%
Melrose city Middlesex Co. MA	46	0.5%
Boston city Suffolk Co. MA	2646	26.5%
Chelsea city Suffolk Co. MA	77	0.8%
Revere city Suffolk Co. MA	11	0.1%
Winthrop town Suffolk Co. MA	8	0.1%
Carver town Plymouth Co. MA	5	0.1%
West Bridgewater town Plymouth Co. MA	5	0.1%
Wellesley town Norfolk Co. MA	84	0.8%
Needham town Norfolk Co. MA	57	0.6%
Brookline town Norfolk Co. MA	41	0.4%
Quincy city Norfolk Co. MA	33	0.3%
Dedham town Norfolk Co. MA	32	0.3%
Norwood town Norfolk Co. MA	26	0.3%
Braintree town Norfolk Co. MA	14	0.1%
Canton town Norfolk Co. MA	10	0.1%
Weymouth town Norfolk Co. MA	9	0.1%
Stoughton town Norfolk Co. MA	8	0.1%
Westwood town Norfolk Co. MA	6	0.1%
Foxbor. town Norfolk Co. MA	4	0.0%
Milton town Norfolk Co. MA	4	0.0%
		66.9%

Residence MCD/County to Workplace MCD/County Flows for Mas
Sorted by Residence State-County, or State-County-County Subd
WOBURN

Workplace State-County-MCD Name	Count	Percent
To/From the South via Route 3		
New Bedford city Bristol Co. MA	12	0.1%
Taunton city Bristol Co. MA	7	0.0%
Cambridge city Middlesex Co. MA	875	4.4%
Winchester town Middlesex Co. MA	761	3.8%
Medford city Middlesex Co. MA	450	2.3%
Stoneham town Middlesex Co. MA	355	1.8%
Somerville city Middlesex Co. MA	260	1.3%
Malden city Middlesex Co. MA	182	0.9%
Arlington town Middlesex Co. MA	172	0.9%
Everett city Middlesex Co. MA	108	0.5%
Norwood town Norfolk Co. MA	72	0.4%
Needham town Norfolk Co. MA	61	0.3%
Braintree town Norfolk Co. MA	43	0.2%
Quincy city Norfolk Co. MA	39	0.2%
Weymouth town Norfolk Co. MA	39	0.2%
Dedham town Norfolk Co. MA	37	0.2%
Wellesley town Norfolk Co. MA	36	0.2%
Brookline town Norfolk Co. MA	33	0.2%
Westwood town Norfolk Co. MA	22	0.1%
Stoughton town Norfolk Co. MA	13	0.1%
Foxbor. town Norfolk Co. MA	12	0.1%
Medway town Norfolk Co. MA	12	0.1%
Avon town Norfolk Co. MA	7	0.0%
Sharon town Norfolk Co. MA	7	0.0%
Walpole town Norfolk Co. MA	7	0.0%
Norfolk town Norfolk Co. MA	6	0.0%
Canton town Norfolk Co. MA	5	0.0%
Plymouth town Plymouth Co. MA	11	0.1%
Middlebor. town Plymouth Co. MA	10	0.1%
East Bridgewater town Plymouth Co. MA	6	0.0%
West Bridgewater town Plymouth Co. MA	6	0.0%
Boston city Suffolk Co. MA	2280	11.4%
Chelsea city Suffolk Co. MA	40	0.2%
Revere city Suffolk Co. MA	38	0.2%
Winthrop town Suffolk Co. MA	16	0.1%
		30.2%

WINCHESTER

To the South via Route 3/From the North via Route 3

Beverly city Essex Co. MA	67	0.7%
Peabody city Essex Co. MA	64	0.6%
Andover town Essex Co. MA	50	0.5%
Danvers town Essex Co. MA	47	0.5%
Lawrence city Essex Co. MA	40	0.4%
Salem city Essex Co. MA	28	0.3%
Marblehead town Essex Co. MA	25	0.3%
North Andover town Essex Co. MA	23	0.2%
Lynn city Essex Co. MA	16	0.2%
Saugus town Essex Co. MA	13	0.1%
Haverhill city Essex Co. MA	12	0.1%
Manchester-by-the-Sea town Essex Co. MA	11	0.1%
Middleton town Essex Co. MA	9	0.1%
Methuen city Essex Co. MA	8	0.1%
Lynnfield town Essex Co. MA	6	0.1%
Merrimac town Essex Co. MA	2	0.0%
Wakefield town Middlesex Co. MA	115	1.2%
Belmont town Middlesex Co. MA	87	0.9%
Reading town Middlesex Co. MA	58	0.6%
North Reading town Middlesex Co. MA	34	0.3%
	715	**7.2%**

WOBURN

To the South via Route 3/From the North via Route 3

Andover town Essex Co. MA	196	1.0%
Lynn city Essex Co. MA	122	0.6%
Beverly city Essex Co. MA	108	0.5%
Danvers town Essex Co. MA	104	0.5%
Peabody city Essex Co. MA	102	0.5%
North Andover town Essex Co. MA	84	0.4%
Lynnfield town Essex Co. MA	53	0.3%
Methuen city Essex Co. MA	48	0.2%
Salem city Essex Co. MA	41	0.2%
Lawrence city Essex Co. MA	39	0.2%
Gloucester city Essex Co. MA	30	0.2%
Swampscott town Essex Co. MA	29	0.1%
Georgetown town Essex Co. MA	25	0.1%
Middleton town Essex Co. MA	24	0.1%
Saugus town Essex Co. MA	12	0.1%
Ipswich town Essex Co. MA	7	0.0%
Salisbury town Essex Co. MA	7	0.0%
Essex town Essex Co. MA	6	0.0%
Newburyport city Essex Co. MA	6	0.0%
Haverhill city Essex Co. MA	5	0.0%
Marblehead town Essex Co. MA	5	0.0%
Reading town Middlesex Co. MA	290	1.5%
Wakefield town Middlesex Co. MA	235	1.2%
North Reading town Middlesex Co. MA	186	0.9%
Belmont town Middlesex Co. MA	159	0.8%
		9.6%

WINCHESTER

To/From the North via Route 3

Woburn city Middlesex Co. MA	580	5.8%
Burlington town Middlesex Co. MA	382	3.8%
Lexington town Middlesex Co. MA	237	2.4%
Waltham city Middlesex Co. MA	186	1.9%
Bedford town Middlesex Co. MA	167	1.7%
Wilmington town Middlesex Co. MA	113	1.1%
Billerica town Middlesex Co. MA	95	1.0%
Newton city Middlesex Co. MA	86	0.9%
Watertown city Middlesex Co. MA	58	0.6%
Framingham town Middlesex Co. MA	50	0.5%
Weston town Middlesex Co. MA	34	0.3%
Concord town Middlesex Co. MA	25	0.3%
Stow town Middlesex Co. MA	22	0.2%
Sudbury town Middlesex Co. MA	18	0.2%
Tyngsbor. town Middlesex Co. MA	18	0.2%
Lincoln town Middlesex Co. MA	14	0.1%
Wayland town Middlesex Co. MA	14	0.1%
Maynard town Middlesex Co. MA	11	0.1%
Holliston town Middlesex Co. MA	8	0.1%
Westford town Middlesex Co. MA	8	0.1%
Dracut town Middlesex Co. MA	7	0.1%
Ashby town Middlesex Co. MA	5	0.1%
Boxbor. town Middlesex Co. MA	5	0.1%
Acton town Middlesex Co. MA	4	0.0%
Springfield city Hampden Co. MA	3	0.0%
Cranston city Providence Co. RI	6	0.1%
Providence city Providence Co. RI	6	0.1%
	10276	**21.6%**

To/From the west via Wainwright Road

Westbor. town Worcester Co. MA	18	0.2%
Worcester city Worcester Co. MA	14	0.1%
Athol town Worcester Co. MA	7	0.1%
Southbor. town Worcester Co. MA	7	0.1%
Fitchburg city Worcester Co. MA	6	0.1%
Harvard town Worcester Co. MA	6	0.1%
Northbor. town Worcester Co. MA	6	0.1%
Auburn town Worcester Co. MA	5	0.1%
Southbridge town Worcester Co. MA	5	0.1%
Winchendon town Worcester Co. MA	5	0.1%
Brookline town Hillsborough Co. NH	7	0.1%
Salem town Rockingham Co. NH	25	0.3%
Portsmouth city Rockingham Co. NH	7	0.1%
Atkinson town Rockingham Co. NH	6	0.1%
Lowell city Middlesex Co. MA	77	0.8%
Chelmsford town Middlesex Co. MA	53	0.5%
Tewksbury town Middlesex Co. MA	45	0.5%
Marlbor. city Middlesex Co. MA	101	1.0%
Littleton town Middlesex Co. MA	27	0.3%
	427	**4.3%**

WOBURN

To/From the North via Route 3

Chester town Hampden Co. MA	9	0.0%
Springfield city Hampden Co. MA	4	0.0%
Woburn city Middlesex Co. MA	5017	25.1%
Burlington town Middlesex Co. MA	1805	9.0%
Waltham city Middlesex Co. MA	705	3.5%
Wilmington town Middlesex Co. MA	592	3.0%
Lexington town Middlesex Co. MA	515	2.6%
Bedford town Middlesex Co. MA	474	2.4%
Billerica town Middlesex Co. MA	324	1.6%
Framingham town Middlesex Co. MA	202	1.0%
Newton city Middlesex Co. MA	200	1.0%
Watertown city Middlesex Co. MA	199	1.0%
Melrose city Middlesex Co. MA	162	0.8%
Concord town Middlesex Co. MA	158	0.8%
Marlbor. city Middlesex Co. MA	116	0.6%
Weston town Middlesex Co. MA	91	0.5%
Westford town Middlesex Co. MA	90	0.5%
Natick town Middlesex Co. MA	86	0.4%
Acton town Middlesex Co. MA	76	0.4%
Sudbury town Middlesex Co. MA	47	0.2%
Wayland town Middlesex Co. MA	32	0.2%
Stow town Middlesex Co. MA	29	0.1%
Hudson town Middlesex Co. MA	28	0.1%
Hopkinton town Middlesex Co. MA	27	0.1%
Holliston town Middlesex Co. MA	19	0.1%
Dracut town Middlesex Co. MA	16	0.1%
Littleton town Middlesex Co. MA	16	0.1%
Ashland town Middlesex Co. MA	15	0.1%
Maynard town Middlesex Co. MA	10	0.1%
Tyngsbor. town Middlesex Co. MA	10	0.1%
Ayer town Middlesex Co. MA	9	0.0%
Lincoln town Middlesex Co. MA	7	0.0%
Groton town Middlesex Co. MA	4	0.0%
Townsend town Middlesex Co. MA	3	0.0%
East Greenwich town Kent Co. RI	9	0.0%
West Warwick town Kent Co. RI	7	0.0%
		55.6%

WOBURN

To/From the west via Wainwright Road

Worcester city Worcester Co. MA	37	0.2%
Harvard town Worcester Co. MA	29	0.1%
Southbor. town Worcester Co. MA	25	0.1%
Westbor. town Worcester Co. MA	22	0.1%
Millbury town Worcester Co. MA	18	0.1%
Shrewsbury town Worcester Co. MA	16	0.1%
Auburn town Worcester Co. MA	10	0.1%
Gardner city Worcester Co. MA	9	0.0%
Spencer town Worcester Co. MA	9	0.0%
Westminster town Worcester Co. MA	9	0.0%
Grafton town Worcester Co. MA	8	0.0%
Milford town Worcester Co. MA	3	0.0%
Chelmsford town Middlesex Co. MA	195	1.0%
Lowell city Middlesex Co. MA	183	0.9%
Tewksbury town Middlesex Co. MA	163	0.8%
Marlbor. city Middlesex Co. MA	116	0.6%
Littleton town Middlesex Co. MA	16	0.1%
Meredith town Belknap Co. NH	6	0.0%
Nashua city Hillsborough Co. NH	46	0.2%
Manchester city Hillsborough Co. NH	15	0.1%
Merrimack town Hillsborough Co. NH	15	0.1%
Pelham town Hillsborough Co. NH	7	0.0%
Hudson town Hillsborough Co. NH	6	0.0%
Concord city Merrimack Co. NH	10	0.1%
Hooksett town Merrimack Co. NH	8	0.0%
Portsmouth city Rockingham Co. NH	19	0.1%
Salem town Rockingham Co. NH	14	0.1%
Hampton town Rockingham Co. NH	11	0.1%
Londonderry town Rockingham Co. NH	2	0.0%
	1027	**5.1%**

CAPACITY ANALYSIS WORKSHEETS

Cambridge Street at Country Club Road and Crescent Park Drive
Cambridge Street at the Horn Pond Plaza north driveway
Cambridge Street at Wainwright Road
Cambridge Street at the Horn Pond Plaza south driveway
Wainwright Road at the Ledges residential community driveway
Wainwright Road at the Project Site Driveway

Cambridge Street at Country Club Road and Crescent Park Drive

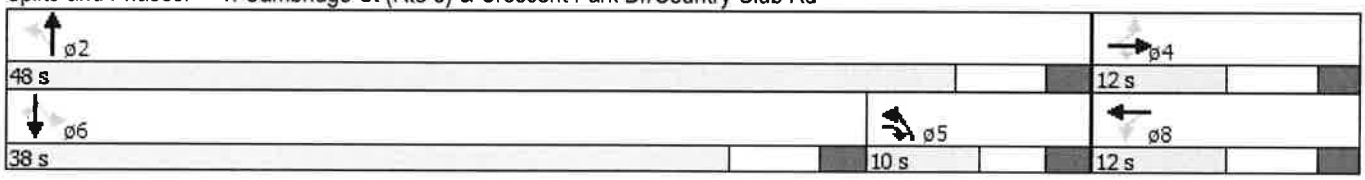
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	1	15	14	0	25	7	833	7	11	760	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	14	14	14	11	12	12	12	12	10
Storage Length (ft)	0		100	0		0	0		0	0		110
Storage Lanes	0		1	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt			0.850		0.913			0.999				0.850
Flt Protected		0.957			0.982		0.950				0.999	
Satd. Flow (prot)	0	1864	1830	0	1817	0	1745	3562	0	0	3532	1507
Flt Permitted		0.997			0.874		0.310				0.940	
Satd. Flow (perm)	0	1942	1830	0	1617	0	569	3562	0	0	3324	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55		164			4				164
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		385			315			550			313	
Travel Time (s)		8.8			7.2			12.5			7.1	
Peak Hour Factor	0.59	0.59	0.59	0.70	0.70	0.70	0.91	0.91	0.91	0.90	0.90	0.90
Heavy Vehicles (%)	0%	100%	0%	0%	0%	0%	0%	1%	29%	9%	2%	0%
Adj. Flow (vph)	17	2	25	20	0	36	8	915	8	12	844	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	19	25	0	56	0	8	923	0	0	856	6
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	5	8	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	16.0		16.0	16.0	16.0
Total Split (s)	12.0	12.0	10.0	12.0	12.0		10.0	48.0		38.0	38.0	38.0
Total Split (%)	20.0%	20.0%	16.7%	20.0%	20.0%		16.7%	80.0%		63.3%	63.3%	63.3%
Maximum Green (s)	6.0	6.0	5.0	6.0	6.0		5.0	42.0		32.0	32.0	32.0
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)		4.0	3.0		4.0		3.0	4.0			4.0	4.0
Lead/Lag			Lag				Lag			Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min		Min	Min	Min
Act Effct Green (s)		8.3	11.1		8.1		34.3	35.8			32.7	32.7
Actuated g/C Ratio		0.20	0.27		0.20		0.84	0.88			0.80	0.80
v/c Ratio		0.05	0.05		0.12		0.01	0.29			0.32	0.00
Control Delay		18.8	1.9		0.6		2.0	2.0			5.1	0.0
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay		18.8	1.9		0.6		2.0	2.0			5.1	0.0
LOS		B	A		A		A	A			A	A
Approach Delay		9.2			0.6			2.0			5.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	
Queue Length 50th (ft)		3	0		0		0	0			0	0
Queue Length 95th (ft)		14	0		0		m3	63			123	0
Internal Link Dist (ft)		305			235			470			233	
Turn Bay Length (ft)			100									110
Base Capacity (vph)		406	540		467		695	3318			2845	1314
Starvation Cap Reductn		0	0		0		0	0			0	0
Spillback Cap Reductn		0	0		0		0	0			0	0
Storage Cap Reductn		0	0		0		0	0			0	0
Reduced v/c Ratio		0.05	0.05		0.12		0.01	0.28			0.30	0.00

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 40.7
Natural Cycle: 40
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.32
Intersection Signal Delay: 3.5 Intersection LOS: A
Intersection Capacity Utilization 45.7% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Cambridge St (Rte 3) & Crescent Park Dr/Country Club Rd



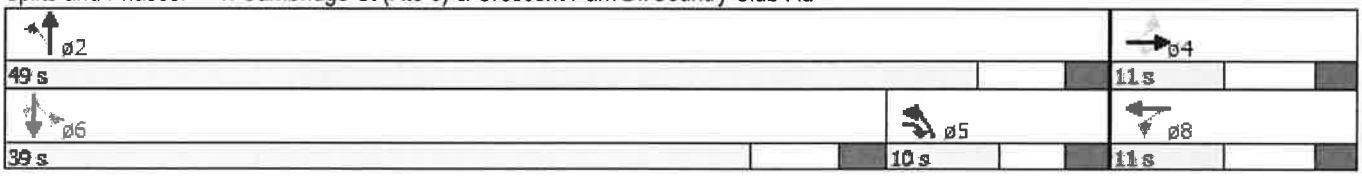
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	0	8	33	0	22	22	718	18	20	985	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	14	14	14	11	12	12	12	12	10
Storage Length (ft)	0		100	0		0	0		0	0		110
Storage Lanes	0		1	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt			0.850		0.946			0.996				0.850
Flt Protected		0.950			0.971		0.950				0.999	
Satd. Flow (prot)	0	2046	1830	0	1862	0	1745	3561	0	0	3571	1507
Flt Permitted		0.885			0.815		0.228				0.928	
Satd. Flow (perm)	0	1906	1830	0	1563	0	419	3561	0	0	3318	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55		164			12				164
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		385			315			550			313	
Travel Time (s)		8.8			7.2			12.5			7.1	
Peak Hour Factor	0.50	0.50	0.50	0.63	0.63	0.63	0.78	0.78	0.78	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	4	0	16	52	0	35	28	921	23	22	1059	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	4	16	0	87	0	28	944	0	0	1081	12
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	5	8	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	16.0		16.0	16.0	16.0
Total Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	49.0		39.0	39.0	39.0
Total Split (%)	18.3%	18.3%	16.7%	18.3%	18.3%		16.7%	81.7%		65.0%	65.0%	65.0%
Maximum Green (s)	5.0	5.0	5.0	5.0	5.0		5.0	43.0		33.0	33.0	33.0
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)		4.0	3.0		4.0		3.0	4.0			4.0	4.0
Lead/Lag			Lag				Lag			Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min		Min	Min	Min
Act Effct Green (s)		7.5	11.1		7.5		37.3	36.6			33.6	33.6
Actuated g/C Ratio		0.17	0.25		0.17		0.83	0.82			0.75	0.75
v/c Ratio		0.01	0.03		0.22		0.05	0.32			0.44	0.01
Control Delay		22.0	0.2		2.1		1.9	2.5			5.9	0.0
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay		22.0	0.2		2.1		1.9	2.5			5.9	0.0
LOS		C	A		A		A	A			A	A
Approach Delay		4.6			2.1			2.5			5.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	
Queue Length 50th (ft)		1	0		0		1	42			52	0
Queue Length 95th (ft)		5	0		0		m4	46			158	0
Internal Link Dist (ft)		305			235			470			233	
Turn Bay Length (ft)			100									110
Base Capacity (vph)		317	493		396		569	3239			2681	1249
Starvation Cap Reductn		0	0		0		0	0			0	0
Spillback Cap Reductn		0	0		0		0	0			0	0
Storage Cap Reductn		0	0		0		0	0			0	0
Reduced v/c Ratio		0.01	0.03		0.22		0.05	0.29			0.40	0.01

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 44.8
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.44
Intersection Signal Delay: 4.2 Intersection LOS: A
Intersection Capacity Utilization 58.0% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Cambridge St (Rte 3) & Crescent Park Dr/Country Club Rd



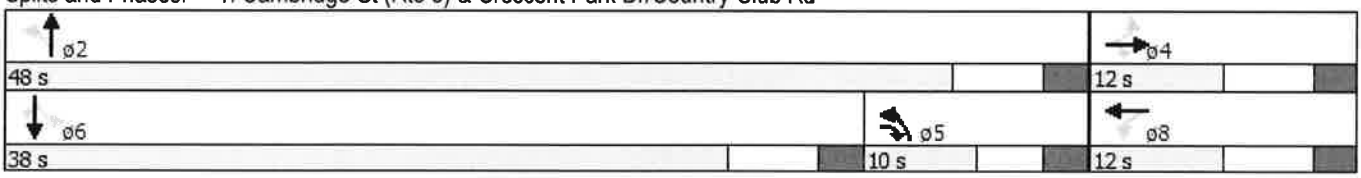
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	1	16	15	0	27	8	893	8	12	815	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	14	14	14	11	12	12	12	12	10
Storage Length (ft)	0		100	0		0	0		0	0		110
Storage Lanes	0		1	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt			0.850		0.912			0.999				0.850
Flt Protected		0.957			0.983		0.950				0.999	
Satd. Flow (prot)	0	1882	1830	0	1817	0	1745	3562	0	0	3532	1507
Flt Permitted					0.875		0.286				0.938	
Satd. Flow (perm)	0	1966	1830	0	1617	0	525	3562	0	0	3317	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55		164			4				164
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		385			315			550			313	
Travel Time (s)		8.8			7.2			12.5			7.1	
Peak Hour Factor	0.59	0.59	0.59	0.70	0.70	0.70	0.91	0.91	0.91	0.90	0.90	0.90
Heavy Vehicles (%)	0%	100%	0%	0%	0%	0%	0%	1%	29%	9%	2%	0%
Adj. Flow (vph)	19	2	27	21	0	39	9	981	9	13	906	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	21	27	0	60	0	9	990	0	0	919	6
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	5	8	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	16.0		16.0	16.0	16.0
Total Split (s)	12.0	12.0	10.0	12.0	12.0		10.0	48.0		38.0	38.0	38.0
Total Split (%)	20.0%	20.0%	16.7%	20.0%	20.0%		16.7%	80.0%		63.3%	63.3%	63.3%
Maximum Green (s)	6.0	6.0	5.0	6.0	6.0		5.0	42.0		32.0	32.0	32.0
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)		4.0	3.0		4.0		3.0	4.0			4.0	4.0
Lead/Lag			Lag				Lag			Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min		Min	Min	Min
Act Effct Green (s)		8.3	11.1		8.2		34.8	36.8			33.8	33.8
Actuated g/C Ratio		0.20	0.27		0.20		0.84	0.88			0.81	0.81
v/c Ratio		0.05	0.05		0.13		0.01	0.31			0.34	0.00
Control Delay		19.8	2.3		0.6		1.9	1.9			5.0	0.0
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay		19.8	2.3		0.6		1.9	1.9			5.0	0.0
LOS		B	A		A		A	A			A	A
Approach Delay		10.0			0.6			1.9			5.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	
Queue Length 50th (ft)		3	0		0		0	0			0	0
Queue Length 95th (ft)		15	0		0		m3	68			133	0
Internal Link Dist (ft)		305			235			470			233	
Turn Bay Length (ft)			100									110
Base Capacity (vph)		407	530		465		660	3265			2802	1298
Starvation Cap Reductn		0	0		0		0	0			0	0
Spillback Cap Reductn		0	0		0		0	0			0	0
Storage Cap Reductn		0	0		0		0	0			0	0
Reduced v/c Ratio		0.05	0.05		0.13		0.01	0.30			0.33	0.00

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 41.6
Natural Cycle: 40
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.34
Intersection Signal Delay: 3.5 Intersection LOS: A
Intersection Capacity Utilization 47.4% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Cambridge St (Rte 3) & Crescent Park Dr/Country Club Rd



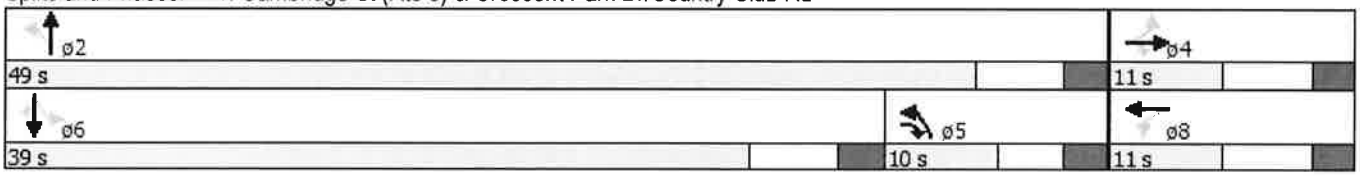
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	0	9	35	0	24	24	770	19	21	1056	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	14	14	14	11	12	12	12	12	10
Storage Length (ft)	0		100	0		0	0		0	0		110
Storage Lanes	0		1	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt			0.850		0.945			0.996				0.850
Flt Protected		0.950			0.971		0.950				0.999	
Satd. Flow (prot)	0	2046	1830	0	1860	0	1745	3561	0	0	3571	1507
Flt Permitted		0.811			0.815		0.200				0.925	
Satd. Flow (perm)	0	1746	1830	0	1561	0	367	3561	0	0	3307	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55		164			11				164
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		385			315			550			313	
Travel Time (s)		8.8			7.2			12.5			7.1	
Peak Hour Factor	0.50	0.50	0.50	0.63	0.63	0.63	0.78	0.78	0.78	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	4	0	18	56	0	38	31	987	24	23	1135	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	4	18	0	94	0	31	1011	0	0	1158	13
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	5	8	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	16.0		16.0	16.0	16.0
Total Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	49.0		39.0	39.0	39.0
Total Split (%)	18.3%	18.3%	16.7%	18.3%	18.3%		16.7%	81.7%		65.0%	65.0%	65.0%
Maximum Green (s)	5.0	5.0	5.0	5.0	5.0		5.0	43.0		33.0	33.0	33.0
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)		4.0	3.0		4.0		3.0	4.0			4.0	4.0
Lead/Lag			Lag				Lag			Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min		Min	Min	Min
Act Effct Green (s)		7.4	13.4		7.4		42.0	40.8			35.5	35.5
Actuated g/C Ratio		0.14	0.26		0.14		0.81	0.79			0.69	0.69
v/c Ratio		0.02	0.03		0.26		0.06	0.36			0.51	0.01
Control Delay		23.5	0.8		3.1		2.2	2.8			7.6	0.0
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay		23.5	0.8		3.1		2.2	2.8			7.6	0.0
LOS		C	A		A		A	A			A	A
Approach Delay		4.9			3.1			2.8			7.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	
Queue Length 50th (ft)		1	0		0		2	44			123	0
Queue Length 95th (ft)		5	0		0		m5	51			176	0
Internal Link Dist (ft)		305			235			470			233	
Turn Bay Length (ft)			100									110
Base Capacity (vph)		248	515		362		493	2986			2318	1105
Starvation Cap Reductn		0	0		0		0	0			0	0
Spillback Cap Reductn		0	0		0		0	0			0	0
Storage Cap Reductn		0	0		0		0	0			0	0
Reduced v/c Ratio		0.02	0.03		0.26		0.06	0.34			0.50	0.01

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51.8
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 5.2 Intersection LOS: A
Intersection Capacity Utilization 60.9% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Cambridge St (Rte 3) & Crescent Park Dr/Country Club Rd



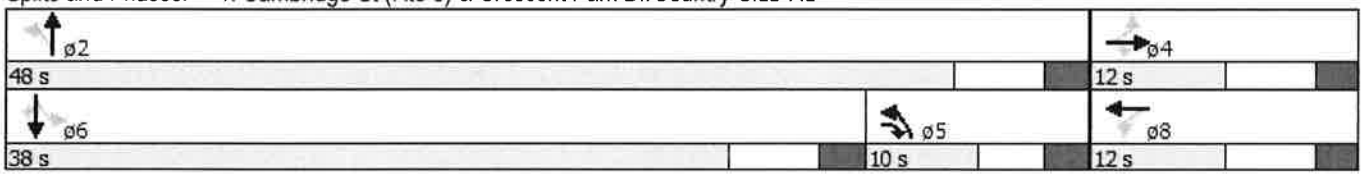
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	1	16	15	0	27	8	908	8	12	820	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	14	14	14	11	12	12	12	12	10
Storage Length (ft)	0		100	0		0	0		0	0		110
Storage Lanes	0		1	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt			0.850		0.912			0.999				0.850
Flt Protected		0.957			0.983		0.950				0.999	
Satd. Flow (prot)	0	1882	1830	0	1817	0	1745	3562	0	0	3532	1507
Flt Permitted					0.875		0.284				0.938	
Satd. Flow (perm)	0	1966	1830	0	1617	0	522	3562	0	0	3317	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55		164			4				164
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		385			315			550			313	
Travel Time (s)		8.8			7.2			12.5			7.1	
Peak Hour Factor	0.59	0.59	0.59	0.70	0.70	0.70	0.91	0.91	0.91	0.90	0.90	0.90
Heavy Vehicles (%)	0%	100%	0%	0%	0%	0%	0%	1%	29%	9%	2%	0%
Adj. Flow (vph)	19	2	27	21	0	39	9	998	9	13	911	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	21	27	0	60	0	9	1007	0	0	924	6
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	5	8	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	16.0		16.0	16.0	16.0
Total Split (s)	12.0	12.0	10.0	12.0	12.0		10.0	48.0		38.0	38.0	38.0
Total Split (%)	20.0%	20.0%	16.7%	20.0%	20.0%		16.7%	80.0%		63.3%	63.3%	63.3%
Maximum Green (s)	6.0	6.0	5.0	6.0	6.0		5.0	42.0		32.0	32.0	32.0
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)		4.0	3.0		4.0		3.0	4.0			4.0	4.0
Lead/Lag			Lag				Lag			Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min		Min	Min	Min
Act Effct Green (s)		8.3	11.1		8.2		35.3	37.0			34.0	34.0
Actuated g/C Ratio		0.20	0.27		0.20		0.84	0.89			0.81	0.81
v/c Ratio		0.05	0.05		0.13		0.01	0.32			0.34	0.00
Control Delay		20.0	2.3		0.6		1.9	1.9			5.0	0.0
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay		20.0	2.3		0.6		1.9	1.9			5.0	0.0
LOS		B	A		A		A	A			A	A
Approach Delay		10.1			0.6			1.9			4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			A			A			A	
Queue Length 50th (ft)		3	0		0		0	0			0	0
Queue Length 95th (ft)		15	0		0		m3	68			134	0
Internal Link Dist (ft)		305			235			470			233	
Turn Bay Length (ft)			100									110
Base Capacity (vph)		404	527		462		660	3261			2799	1297
Starvation Cap Reductn		0	0		0		0	0			0	0
Spillback Cap Reductn		0	0		0		0	0			0	0
Storage Cap Reductn		0	0		0		0	0			0	0
Reduced v/c Ratio		0.05	0.05		0.13		0.01	0.31			0.33	0.00

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 41.8
Natural Cycle: 40
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.34
Intersection Signal Delay: 3.5 Intersection LOS: A
Intersection Capacity Utilization 47.9% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Cambridge St (Rte 3) & Crescent Park Dr/Country Club Rd



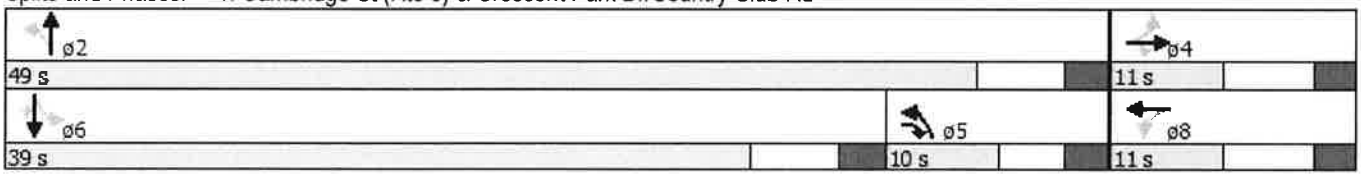
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	0	9	35	0	24	24	779	19	21	1078	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	14	14	14	11	12	12	12	12	10
Storage Length (ft)	0		100	0		0	0		0	0		110
Storage Lanes	0		1	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt			0.850		0.945			0.996				0.850
Flt Protected		0.950			0.971		0.950				0.999	
Satd. Flow (prot)	0	2046	1830	0	1860	0	1745	3561	0	0	3571	1507
Flt Permitted		0.810			0.815		0.193				0.925	
Satd. Flow (perm)	0	1744	1830	0	1561	0	354	3561	0	0	3307	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55		164			11				164
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		385			315			550			313	
Travel Time (s)		8.8			7.2			12.5			7.1	
Peak Hour Factor	0.50	0.50	0.50	0.63	0.63	0.63	0.78	0.78	0.78	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	4	0	18	56	0	38	31	999	24	23	1159	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	4	18	0	94	0	31	1023	0	0	1182	13
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	5	8	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	16.0		16.0	16.0	16.0
Total Split (s)	11.0	11.0	10.0	11.0	11.0		10.0	49.0		39.0	39.0	39.0
Total Split (%)	18.3%	18.3%	16.7%	18.3%	18.3%		16.7%	81.7%		65.0%	65.0%	65.0%
Maximum Green (s)	5.0	5.0	5.0	5.0	5.0		5.0	43.0		33.0	33.0	33.0
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)		4.0	3.0		4.0		3.0	4.0			4.0	4.0
Lead/Lag			Lag				Lag			Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min		Min	Min	Min
Act Effct Green (s)		7.4	13.4		7.4		42.2	41.0			35.6	35.6
Actuated g/C Ratio		0.14	0.26		0.14		0.81	0.79			0.68	0.68
v/c Ratio		0.02	0.04		0.26		0.06	0.36			0.52	0.01
Control Delay		23.5	0.8		3.1		2.2	2.8			7.7	0.0
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay		23.5	0.8		3.1		2.2	2.8			7.7	0.0
LOS		C	A		A		A	A			A	A
Approach Delay		4.9			3.1			2.8			7.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	
Queue Length 50th (ft)		1	0		0		2	45			127	0
Queue Length 95th (ft)		5	0		0		m5	51			181	0
Internal Link Dist (ft)		305			235			470			233	
Turn Bay Length (ft)			100									110
Base Capacity (vph)		247	513		361		484	2979			2315	1104
Starvation Cap Reductn		0	0		0		0	0			0	0
Spillback Cap Reductn		0	0		0		0	0			0	0
Storage Cap Reductn		0	0		0		0	0			0	0
Reduced v/c Ratio		0.02	0.04		0.26		0.06	0.34			0.51	0.01

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 5.2 Intersection LOS: A
Intersection Capacity Utilization 61.5% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Cambridge St (Rte 3) & Crescent Park Dr/Country Club Rd



Cambridge Street at the Horn Pond Plaza north driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	111	0	123	18	809	0	0	744	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	15	15	12	12	12	14	14	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95
Frt						0.850					0.999	
Flt Protected					0.950			0.999				
Satd. Flow (prot)	0	0	0	0	1986	1742	0	3571	0	0	3772	0
Flt Permitted					0.950			0.999				
Satd. Flow (perm)	0	0	0	0	1986	1742	0	3571	0	0	3772	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			283			527			550	
Travel Time (s)		3.8			6.4			12.0			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	0%	0%	2%	0%	1%	0%	0%	2%	0%
Adj. Flow (vph)	0	0	0	119	0	132	20	899	0	0	809	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	119	132	0	919	0	0	816	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 48.0% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	111	0	123	18	809	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	93	93	93	90	90	90
Heavy Vehicles, %	2	2	2	0	0	2	0	1	0
Mvmt Flow	0	0	0	119	0	132	20	899	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	1343	1754	449	815	0	0
Stage 1	939	939	-	-	-	-
Stage 2	404	815	-	-	-	-
Critical Hdwy	6.8	6.5	6.94	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.8	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.32	2.2	-	-
Pot Cap-1 Maneuver	146	86	557	821	-	-
Stage 1	346	345	-	-	-	-
Stage 2	649	394	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	139	0	557	821	-	-
Mov Cap-2 Maneuver	139	0	-	-	-	-
Stage 1	329	0	-	-	-	-
Stage 2	649	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	56.5	0.4
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	821	-	-	139	557	764	-	-
HCM Lane V/C Ratio	0.024	-	-	0.859	0.237	-	-	-
HCM Control Delay (s)	9.5	0.2	-	104.1	13.5	0	-	-
HCM Lane LOS	A	A	-	F	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	5.6	0.9	0	-	-

Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	0	744	6
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	92	92	92
Heavy Vehicles, %	0	2	0
Mvmt Flow	0	809	7

Major/Minor	Major2		
Conflicting Flow All	899	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	764	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	764	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	211	5	155	24	622	0	0	1002	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	15	15	12	12	12	14	14	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95
Frt						0.850					0.999	
Flt Protected					0.953			0.998				
Satd. Flow (prot)	0	0	0	0	1992	1777	0	3568	0	0	3809	0
Flt Permitted					0.953			0.998				
Satd. Flow (perm)	0	0	0	0	1992	1777	0	3568	0	0	3809	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			283			527			550	
Travel Time (s)		3.8			6.4			12.0			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.82	0.82	0.82	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	0	0	0	240	6	176	29	759	0	0	1055	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	246	176	0	788	0	0	1062	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 53.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	50.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	211	5	155	24	622	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	88	88	88	82	82	82
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0
Mvmt Flow	0	0	0	240	6	176	29	759	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	1344	1879	379	1062	0	0
Stage 1	817	817	-	-	-	-
Stage 2	527	1062	-	-	-	-
Critical Hdwy	6.8	6.5	6.9	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.8	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	~ 146	72	625	664	-	-
Stage 1	400	393	-	-	-	-
Stage 2	562	303	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	~ 135	0	625	664	-	-
Mov Cap-2 Maneuver	~ 135	0	-	-	-	-
Stage 1	370	0	-	-	-	-
Stage 2	562	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	268.5	0.8
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	664	-	-	135	625	862	-	-
HCM Lane V/C Ratio	0.044	-	-	1.818	0.282	-	-	-
HCM Control Delay (s)	10.7	0.4	-	$ 451.8	13	0	-	-
HCM Lane LOS	B	A	-	F	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	18.7	1.2	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	0	1002	7
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	0	1	0
Mvmt Flow	0	1055	7

Major/Minor	Major2		
Conflicting Flow All	759	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	862	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	862	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	111	0	123	19	868	0	0	806	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	15	15	12	12	12	14	14	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95
Frt						0.850					0.999	
Flt Protected					0.950			0.999				
Satd. Flow (prot)	0	0	0	0	1986	1742	0	3571	0	0	3772	0
Flt Permitted					0.950			0.999				
Satd. Flow (perm)	0	0	0	0	1986	1742	0	3571	0	0	3772	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			283			527			550	
Travel Time (s)		3.8			6.4			12.0			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	0%	0%	2%	0%	1%	0%	0%	2%	0%
Adj. Flow (vph)	0	0	0	119	0	132	21	964	0	0	876	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	119	132	0	985	0	0	883	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 50.4% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	9.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	111	0	123	19	868	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	93	93	93	90	90	90
Heavy Vehicles, %	2	2	2	0	0	2	0	1	0
Mvmt Flow	0	0	0	119	0	132	21	964	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	1445	1890	482	883	0	0
Stage 1	1007	1007	-	-	-	-
Stage 2	438	883	-	-	-	-
Critical Hdwy	6.8	6.5	6.94	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.8	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.32	2.2	-	-
Pot Cap-1 Maneuver	125	71	530	775	-	-
Stage 1	318	321	-	-	-	-
Stage 2	624	367	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	~ 118	0	530	775	-	-
Mov Cap-2 Maneuver	~ 118	0	-	-	-	-
Stage 1	300	0	-	-	-	-
Stage 2	624	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	81.4	0.5
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	775	-	-	118	530	722	-	-
HCM Lane V/C Ratio	0.027	-	-	1.011	0.25	-	-	-
HCM Control Delay (s)	9.8	0.3	-	156	14	0	-	-
HCM Lane LOS	A	A	-	F	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	6.8	1	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	0	806	6
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	92	92	92
Heavy Vehicles, %	0	2	0
Mvmt Flow	0	876	7

Major/Minor	Major2		
Conflicting Flow All	964	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	722	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	722	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	211	5	155	25	668	0	0	1090	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	15	15	12	12	12	14	14	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95
Frt						0.850					0.999	
Flt Protected					0.953			0.998				
Satd. Flow (prot)	0	0	0	0	1992	1777	0	3568	0	0	3809	0
Flt Permitted					0.953			0.998				
Satd. Flow (perm)	0	0	0	0	1992	1777	0	3568	0	0	3809	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			283			527			550	
Travel Time (s)		3.8			6.4			12.0			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.82	0.82	0.82	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	0	0	0	240	6	176	30	815	0	0	1147	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	246	176	0	845	0	0	1154	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 55.3% ICU Level of Service B
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	63.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	211	5	155	25	668	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	88	88	88	82	82	82
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0
Mvmt Flow	0	0	0	240	6	176	30	815	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	1450	2031	407	1155	0	0
Stage 1	876	876	-	-	-	-
Stage 2	574	1155	-	-	-	-
Critical Hdwy	6.8	6.5	6.9	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.8	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	~ 124	58	599	612	-	-
Stage 1	373	369	-	-	-	-
Stage 2	532	274	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	~ 113	0	599	612	-	-
Mov Cap-2 Maneuver	~ 113	0	-	-	-	-
Stage 1	339	0	-	-	-	-
Stage 2	532	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	$ 365.4	0.9
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	612	-	-	113	599	821	-	-
HCM Lane V/C Ratio	0.05	-	-	2.172	0.294	-	-	-
HCM Control Delay (s)	11.2	0.5	-	$ 617.9	13.5	0	-	-
HCM Lane LOS	B	A	-	F	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	20.9	1.2	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	0	1090	7
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	0	1	0
Mvmt Flow	0	1147	7

Major/Minor	Major2		
Conflicting Flow All	815	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	821	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	821	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	111	0	123	24	883	0	0	811	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	15	15	12	12	12	14	14	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95
Frt						0.850					0.999	
Flt Protected					0.950			0.999				
Satd. Flow (prot)	0	0	0	0	1986	1742	0	3572	0	0	3772	0
Flt Permitted					0.950			0.999				
Satd. Flow (perm)	0	0	0	0	1986	1742	0	3572	0	0	3772	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			283			527			550	
Travel Time (s)		3.8			6.4			12.0			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	0%	0%	2%	0%	1%	0%	0%	2%	0%
Adj. Flow (vph)	0	0	0	119	0	132	27	981	0	0	882	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	119	132	0	1008	0	0	889	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 54.5% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	11.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	111	0	123	24	883	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	93	93	93	90	90	90
Heavy Vehicles, %	2	2	2	0	0	2	0	1	0
Mvmt Flow	0	0	0	119	0	132	27	981	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	1475	1922	491	888	0	0
Stage 1	1034	1034	-	-	-	-
Stage 2	441	888	-	-	-	-
Critical Hdwy	6.8	6.5	6.94	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.8	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.32	2.2	-	-
Pot Cap-1 Maneuver	~ 119	68	523	771	-	-
Stage 1	308	312	-	-	-	-
Stage 2	622	365	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	~ 110	0	523	771	-	-
Mov Cap-2 Maneuver	~ 110	0	-	-	-	-
Stage 1	284	0	-	-	-	-
Stage 2	622	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	95.1	0.6
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	771	-	-	110	523	712	-	-
HCM Lane V/C Ratio	0.035	-	-	1.085	0.253	-	-	-
HCM Control Delay (s)	9.8	0.4	-	184.7	14.2	0	-	-
HCM Lane LOS	A	A	-	F	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	7.3	1	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	0	811	6
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	92	92	92
Heavy Vehicles, %	0	2	0
Mvmt Flow	0	882	7

Major/Minor	Major2		
Conflicting Flow All	981	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	712	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	712	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	211	5	155	47	677	0	0	1112	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	15	15	12	12	12	14	14	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95
Frt						0.850					0.999	
Flt Protected					0.953			0.997				
Satd. Flow (prot)	0	0	0	0	1992	1777	0	3566	0	0	3809	0
Flt Permitted					0.953			0.997				
Satd. Flow (perm)	0	0	0	0	1992	1777	0	3566	0	0	3809	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			283			527			550	
Travel Time (s)		3.8			6.4			12.0			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.82	0.82	0.82	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	0	0	0	240	6	176	57	826	0	0	1171	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	246	176	0	883	0	0	1178	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 72.9% ICU Level of Service C
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	85.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	211	5	155	47	677	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	88	88	88	82	82	82
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0
Mvmt Flow	0	0	0	240	6	176	57	826	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	1525	2118	413	1178	0	0
Stage 1	940	940	-	-	-	-
Stage 2	585	1178	-	-	-	-
Critical Hdwy	6.8	6.5	6.9	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.8	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	~ 111	51	594	600	-	-
Stage 1	345	345	-	-	-	-
Stage 2	526	267	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	~ 92	0	594	600	-	-
Mov Cap-2 Maneuver	~ 92	0	-	-	-	-
Stage 1	285	0	-	-	-	-
Stage 2	526	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	$ 502.2	1.6
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	600	-	-	92	594	813	-	-
HCM Lane V/C Ratio	0.096	-	-	2.668	0.297	-	-	-
HCM Control Delay (s)	11.6	0.9	-	$ 852.8	13.6	0	-	-
HCM Lane LOS	B	A	-	F	B	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-	23.2	1.2	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	0	1112	7
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	0	1	0
Mvmt Flow	0	1171	7

Major/Minor	Major2		
Conflicting Flow All	826	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	813	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	813	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

Cambridge Street at Wainwright Road

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	53	0	827	840	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	13	13	13	13
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.995	
Flt Protected						
Satd. Flow (prot)	0	1753	0	3693	3641	0
Flt Permitted						
Satd. Flow (perm)	0	1753	0	3693	3641	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	590			248	527	
Travel Time (s)	13.4			5.6	12.0	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	1%	2%	0%
Adj. Flow (vph)	0	60	0	889	913	29
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	60	0	889	942	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 34.1% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	53	0	827	840	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	93	93	92	92
Heavy Vehicles, %	0	0	0	1	2	0
Mvmt Flow	0	60	0	889	913	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1373	471	942	0	-	0
Stage 1	928	-	-	-	-	-
Stage 2	445	-	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	139	545	736	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	619	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	139	545	736	-	-	-
Mov Cap-2 Maneuver	139	-	-	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	619	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	736	-	545	-	-
HCM Lane V/C Ratio	-	-	0.111	-	-
HCM Control Delay (s)	0	-	12.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	32	0	646	1181	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	13	13	13	13
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.994	
Flt Protected						
Satd. Flow (prot)	0	1753	0	3693	3673	0
Flt Permitted						
Satd. Flow (perm)	0	1753	0	3693	3673	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	590			248	527	
Travel Time (s)	13.4			5.6	12.0	
Peak Hour Factor	0.73	0.73	0.82	0.82	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	0	44	0	788	1230	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	44	0	788	1282	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 44.2% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	32	0	646	1181	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	82	82	96	96
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	44	0	788	1230	52

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1650	641	1282	0	-	0
Stage 1	1256	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	91	422	548	-	-	-
Stage 1	235	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	91	422	548	-	-	-
Mov Cap-2 Maneuver	91	-	-	-	-	-
Stage 1	235	-	-	-	-	-
Stage 2	656	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	548	-	422	-	-
HCM Lane V/C Ratio	-	-	0.104	-	-
HCM Control Delay (s)	0	-	14.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	57	0	887	901	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	13	13	13	13
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.995	
Flt Protected						
Satd. Flow (prot)	0	1753	0	3693	3641	0
Flt Permitted						
Satd. Flow (perm)	0	1753	0	3693	3641	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	590			248	527	
Travel Time (s)	13.4			5.6	12.0	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	1%	2%	0%
Adj. Flow (vph)	0	65	0	954	979	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	65	0	954	1011	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 36.0% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	57	0	887	901	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	93	93	92	92
Heavy Vehicles, %	0	0	0	1	2	0
Mvmt Flow	0	65	0	954	979	32

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1472	505	1011	0	-	0
Stage 1	995	-	-	-	-	-
Stage 2	477	-	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	120	518	694	-	-	-
Stage 1	323	-	-	-	-	-
Stage 2	596	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	120	518	694	-	-	-
Mov Cap-2 Maneuver	120	-	-	-	-	-
Stage 1	323	-	-	-	-	-
Stage 2	596	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	694	-	518	-	-
HCM Lane V/C Ratio	-	-	0.125	-	-
HCM Control Delay (s)	0	-	12.9	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	34	0	693	1266	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	13	13	13	13
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.994	
Flt Protected						
Satd. Flow (prot)	0	1753	0	3693	3673	0
Flt Permitted						
Satd. Flow (perm)	0	1753	0	3693	3673	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	590			248	527	
Travel Time (s)	13.4			5.6	12.0	
Peak Hour Factor	0.73	0.73	0.82	0.82	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	0	47	0	845	1319	56
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	47	0	845	1375	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 46.7% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	34	0	693	1266	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	82	82	96	96
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	47	0	845	1319	56

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1770	688	1375	0	-	0
Stage 1	1347	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	76	393	505	-	-	-
Stage 1	211	-	-	-	-	-
Stage 2	635	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	76	393	505	-	-	-
Mov Cap-2 Maneuver	76	-	-	-	-	-
Stage 1	211	-	-	-	-	-
Stage 2	635	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.4	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	505	-	393	-	-
HCM Lane V/C Ratio	-	-	0.119	-	-
HCM Control Delay (s)	0	-	15.4	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	96	0	907	901	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	13	13	13	13
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.994	
Flt Protected						
Satd. Flow (prot)	0	1753	0	3693	3638	0
Flt Permitted						
Satd. Flow (perm)	0	1753	0	3693	3638	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	420			248	527	
Travel Time (s)	9.5			5.6	12.0	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	1%	2%	0%
Adj. Flow (vph)	0	109	0	975	979	42
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	109	0	975	1021	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 38.8% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	96	0	907	901	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	93	93	92	92
Heavy Vehicles, %	0	0	0	1	2	0
Mvmt Flow	0	109	0	975	979	42

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1489	511	1022	0	-	0
Stage 1	1001	-	-	-	-	-
Stage 2	488	-	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	117	513	687	-	-	-
Stage 1	321	-	-	-	-	-
Stage 2	588	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	117	513	687	-	-	-
Mov Cap-2 Maneuver	117	-	-	-	-	-
Stage 1	321	-	-	-	-	-
Stage 2	588	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	687	-	513	-	-
HCM Lane V/C Ratio	-	-	0.213	-	-
HCM Control Delay (s)	0	-	13.9	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.8	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	57	0	724	1266	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	13	13	13	13
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.989	
Flt Protected						
Satd. Flow (prot)	0	1753	0	3693	3655	0
Flt Permitted						
Satd. Flow (perm)	0	1753	0	3693	3655	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	440			248	527	
Travel Time (s)	10.0			5.6	12.0	
Peak Hour Factor	0.73	0.73	0.82	0.82	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	0	78	0	883	1319	102
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	78	0	883	1421	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 48.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	57	0	724	1266	98
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	82	82	96	96
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	78	0	883	1319	102

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1811	710	1421	0	-	0
Stage 1	1370	-	-	-	-	-
Stage 2	441	-	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	71	381	485	-	-	-
Stage 1	205	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	71	381	485	-	-	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	205	-	-	-	-	-
Stage 2	622	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.9	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	485	-	381	-	-
HCM Lane V/C Ratio	-	-	0.205	-	-
HCM Control Delay (s)	0	-	16.9	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.8	-	-

Cambridge Street at the Horn Pond Plaza south driveway

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	801	162	27	103	763
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	13	13	11	11	14
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	1.00	0.95
Frt			0.975				
Flt Protected						0.950	
Satd. Flow (prot)	1900	0	3607	0	0	1718	3775
Flt Permitted						0.950	
Satd. Flow (perm)	1900	0	3607	0	0	1718	3775
Link Speed (mph)	30		30				30
Link Distance (ft)	288		292				248
Travel Time (s)	6.5		6.6				5.6
Peak Hour Factor	0.92	0.92	0.90	0.90	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	1%	0%	0%	2%	2%
Adj. Flow (vph)	0	0	890	180	28	108	803
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	1070	0	0	136	803
Sign Control	Stop		Free				Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 41.2% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Vol, veh/h	0	0	801	162	27	103	763
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	-	0
Grade, %	0	-	0	-	-	-	0
Peak Hour Factor	92	92	90	90	95	95	95
Heavy Vehicles, %	0	0	1	0	0	2	2
Mvmt Flow	0	0	890	180	28	108	803

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	1655	535	0	0	1070	1070	0
Stage 1	980	-	-	-	-	-	-
Stage 2	675	-	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	6.4	4.14	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.5	2.22	-
Pot Cap-1 Maneuver	91	495	-	-	305	647	-
Stage 1	329	-	-	-	-	-	-
Stage 2	473	-	-	-	-	-	-
Platoon blocked, %			-	-			-
Mov Cap-1 Maneuver	91	495	-	-	525	525	-
Mov Cap-2 Maneuver	91	-	-	-	-	-	-
Stage 1	329	-	-	-	-	-	-
Stage 2	473	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	2.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	525	-
HCM Lane V/C Ratio	-	-	-	0.261	-
HCM Control Delay (s)	-	-	0	14.3	-
HCM Lane LOS	-	-	A	B	-
HCM 95th %tile Q(veh)	-	-	-	1	-

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	630	181	17	145	1051
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	13	13	11	11	14
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	1.00	0.95
Frt			0.967				
Flt Protected						0.950	
Satd. Flow (prot)	950	0	3579	0	0	1729	3813
Flt Permitted						0.950	
Satd. Flow (perm)	950	0	3579	0	0	1729	3813
Link Speed (mph)	30		30				30
Link Distance (ft)	288		292				248
Travel Time (s)	6.5		6.6				5.6
Peak Hour Factor	0.25	0.25	0.87	0.87	0.92	0.92	0.92
Heavy Vehicles (%)	100%	0%	1%	0%	0%	1%	1%
Adj. Flow (vph)	0	0	724	208	18	158	1142
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	932	0	0	176	1142
Sign Control	Stop		Free				Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 38.8% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Vol, veh/h	0	0	630	181	17	145	1051
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	-	0
Grade, %	0	-	0	-	-	-	0
Peak Hour Factor	25	25	87	87	92	92	92
Heavy Vehicles, %	100	0	1	0	0	1	1
Mvmt Flow	0	0	724	208	18	158	1142

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	1751	466	0	0	932	932	0
Stage 1	828	-	-	-	-	-	-
Stage 2	923	-	-	-	-	-	-
Critical Hdwy	8.8	6.9	-	-	6.4	4.12	-
Critical Hdwy Stg 1	7.8	-	-	-	-	-	-
Critical Hdwy Stg 2	7.8	-	-	-	-	-	-
Follow-up Hdwy	4.5	3.3	-	-	2.5	2.21	-
Pot Cap-1 Maneuver	27	549	-	-	373	736	-
Stage 1	214	-	-	-	-	-	-
Stage 2	183	-	-	-	-	-	-
Platoon blocked, %			-	-			-
Mov Cap-1 Maneuver	27	549	-	-	668	668	-
Mov Cap-2 Maneuver	27	-	-	-	-	-	-
Stage 1	214	-	-	-	-	-	-
Stage 2	183	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	668	-
HCM Lane V/C Ratio	-	-	-	0.264	-
HCM Control Delay (s)	-	-	0	12.3	-
HCM Lane LOS	-	-	A	B	-
HCM 95th %tile Q(veh)	-	-	-	1.1	-

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	859	162	29	103	826
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	13	13	11	11	14
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	1.00	0.95
Frt			0.976				
Flt Protected						0.950	
Satd. Flow (prot)	1900	0	3610	0	0	1718	3775
Flt Permitted						0.950	
Satd. Flow (perm)	1900	0	3610	0	0	1718	3775
Link Speed (mph)	30		30				30
Link Distance (ft)	288		292				248
Travel Time (s)	6.5		6.6				5.6
Peak Hour Factor	0.92	0.92	0.90	0.90	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	1%	0%	0%	2%	2%
Adj. Flow (vph)	0	0	954	180	31	108	869
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	1134	0	0	139	869
Sign Control	Stop		Free				Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 42.9% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Vol, veh/h	0	0	859	162	29	103	826
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	-	0
Grade, %	0	-	0	-	-	-	0
Peak Hour Factor	92	92	90	90	95	95	95
Heavy Vehicles, %	0	0	1	0	0	2	2
Mvmt Flow	0	0	954	180	31	108	869

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	1757	567	0	0	1134	1134	0
Stage 1	1044	-	-	-	-	-	-
Stage 2	713	-	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	6.4	4.14	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.5	2.22	-
Pot Cap-1 Maneuver	78	472	-	-	277	612	-
Stage 1	305	-	-	-	-	-	-
Stage 2	452	-	-	-	-	-	-
Platoon blocked, %			-	-			-
Mov Cap-1 Maneuver	78	472	-	-	484	484	-
Mov Cap-2 Maneuver	78	-	-	-	-	-	-
Stage 1	305	-	-	-	-	-	-
Stage 2	452	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	2.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	484	-
HCM Lane V/C Ratio	-	-	-	0.287	-
HCM Control Delay (s)	-	-	0	15.4	-
HCM Lane LOS	-	-	A	C	-
HCM 95th %tile Q(veh)	-	-	-	1.2	-

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	676	181	18	145	1137
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	13	13	11	11	14
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	1.00	0.95
Frt			0.968				
Flt Protected						0.950	
Satd. Flow (prot)	950	0	3583	0	0	1729	3813
Flt Permitted						0.950	
Satd. Flow (perm)	950	0	3583	0	0	1729	3813
Link Speed (mph)	30		30				30
Link Distance (ft)	288		292				248
Travel Time (s)	6.5		6.6				5.6
Peak Hour Factor	0.25	0.25	0.87	0.87	0.92	0.92	0.92
Heavy Vehicles (%)	100%	0%	1%	0%	0%	1%	1%
Adj. Flow (vph)	0	0	777	208	20	158	1236
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	985	0	0	178	1236
Sign Control	Stop		Free				Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 40.2% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Vol, veh/h	0	0	676	181	18	145	1137
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	-	0
Grade, %	0	-	0	-	-	-	0
Peak Hour Factor	25	25	87	87	92	92	92
Heavy Vehicles, %	100	0	1	0	0	1	1
Mvmt Flow	0	0	777	208	20	158	1236

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	1853	493	0	0	985	985	0
Stage 1	881	-	-	-	-	-	-
Stage 2	972	-	-	-	-	-	-
Critical Hdwy	8.8	6.9	-	-	6.4	4.12	-
Critical Hdwy Stg 1	7.8	-	-	-	-	-	-
Critical Hdwy Stg 2	7.8	-	-	-	-	-	-
Follow-up Hdwy	4.5	3.3	-	-	2.5	2.21	-
Pot Cap-1 Maneuver	22	527	-	-	345	703	-
Stage 1	196	-	-	-	-	-	-
Stage 2	168	-	-	-	-	-	-
Platoon blocked, %			-	-			-
Mov Cap-1 Maneuver	22	527	-	-	631	631	-
Mov Cap-2 Maneuver	22	-	-	-	-	-	-
Stage 1	196	-	-	-	-	-	-
Stage 2	168	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	631	-
HCM Lane V/C Ratio	-	-	-	0.281	-
HCM Control Delay (s)	-	-	0	12.9	-
HCM Lane LOS	-	-	A	B	-
HCM 95th %tile Q(veh)	-	-	-	1.1	-

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	864	162	44	103	850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	13	13	11	11	14
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	1.00	0.95
Frt			0.976				
Flt Protected						0.950	
Satd. Flow (prot)	1900	0	3610	0	0	1721	3775
Flt Permitted						0.950	
Satd. Flow (perm)	1900	0	3610	0	0	1721	3775
Link Speed (mph)	30		30				30
Link Distance (ft)	288		292				248
Travel Time (s)	6.5		6.6				5.6
Peak Hour Factor	0.92	0.92	0.90	0.90	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	1%	0%	0%	2%	2%
Adj. Flow (vph)	0	0	960	180	46	108	895
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	1140	0	0	154	895
Sign Control	Stop		Free				Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 43.9% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Vol, veh/h	0	0	864	162	44	103	850
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	-	0
Grade, %	0	-	0	-	-	-	0
Peak Hour Factor	92	92	90	90	95	95	95
Heavy Vehicles, %	0	0	1	0	0	2	2
Mvmt Flow	0	0	960	180	46	108	895

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	1807	570	0	0	1140	1140	0
Stage 1	1050	-	-	-	-	-	-
Stage 2	757	-	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	6.4	4.14	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.5	2.22	-
Pot Cap-1 Maneuver	72	470	-	-	275	609	-
Stage 1	302	-	-	-	-	-	-
Stage 2	429	-	-	-	-	-	-
Platoon blocked, %			-	-			-
Mov Cap-1 Maneuver	72	470	-	-	447	447	-
Mov Cap-2 Maneuver	72	-	-	-	-	-	-
Stage 1	302	-	-	-	-	-	-
Stage 2	429	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	2.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	447	-
HCM Lane V/C Ratio	-	-	-	0.346	-
HCM Control Delay (s)	-	-	0	17.3	-
HCM Lane LOS	-	-	A	C	-
HCM 95th %tile Q(veh)	-	-	-	1.5	-

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	698	181	27	145	1151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	13	13	11	11	14
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	1.00	0.95
Frt			0.969				
Flt Protected						0.950	
Satd. Flow (prot)	950	0	3586	0	0	1730	3813
Flt Permitted						0.950	
Satd. Flow (perm)	950	0	3586	0	0	1730	3813
Link Speed (mph)	30		30				30
Link Distance (ft)	288		292				248
Travel Time (s)	6.5		6.6				5.6
Peak Hour Factor	0.25	0.25	0.87	0.87	0.92	0.92	0.92
Heavy Vehicles (%)	100%	0%	1%	0%	0%	1%	1%
Adj. Flow (vph)	0	0	802	208	29	158	1251
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	1010	0	0	187	1251
Sign Control	Stop		Free				Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 41.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Vol, veh/h	0	0	698	181	27	145	1151
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	-	0
Grade, %	0	-	0	-	-	-	0
Peak Hour Factor	25	25	87	87	92	92	92
Heavy Vehicles, %	100	0	1	0	0	1	1
Mvmt Flow	0	0	802	208	29	158	1251

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	1905	505	0	0	1010	1010	0
Stage 1	906	-	-	-	-	-	-
Stage 2	999	-	-	-	-	-	-
Critical Hdwy	8.8	6.9	-	-	6.4	4.12	-
Critical Hdwy Stg 1	7.8	-	-	-	-	-	-
Critical Hdwy Stg 2	7.8	-	-	-	-	-	-
Follow-up Hdwy	4.5	3.3	-	-	2.5	2.21	-
Pot Cap-1 Maneuver	20	518	-	-	333	688	-
Stage 1	188	-	-	-	-	-	-
Stage 2	161	-	-	-	-	-	-
Platoon blocked, %			-	-			-
Mov Cap-1 Maneuver	20	518	-	-	589	589	-
Mov Cap-2 Maneuver	20	-	-	-	-	-	-
Stage 1	188	-	-	-	-	-	-
Stage 2	161	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	1.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	589	-
HCM Lane V/C Ratio	-	-	-	0.317	-
HCM Control Delay (s)	-	-	0	13.9	-
HCM Lane LOS	-	-	A	B	-
HCM 95th %tile Q(veh)	-	-	-	1.4	-

Wainwright Road at the Ledges residential community driveway

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	37	23	4	16	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	16	16	13	13
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.979			
Flt Protected					0.950	
Satd. Flow (prot)	0	2090	2108	0	1865	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	2090	2108	0	1865	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		262	590		182	
Travel Time (s)		6.0	13.4		4.1	
Peak Hour Factor	0.77	0.77	0.52	0.52	0.80	0.80
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	48	44	8	20	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	48	52	0	20	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 13.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	37	23	4	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	52	52	80	80
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	48	44	8	20	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	52	0	-	0	96	48
Stage 1	-	-	-	-	48	-
Stage 2	-	-	-	-	48	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1567	-	-	-	908	1027
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1567	-	-	-	908	1027
Mov Cap-2 Maneuver	-	-	-	-	908	-
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	980	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1567	-	-	-	908
HCM Lane V/C Ratio	-	-	-	-	0.022
HCM Control Delay (s)	0	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	18	48	14	16	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	16	16	13	13
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.969		0.977	
Flt Protected					0.960	
Satd. Flow (prot)	0	2090	2087	0	1841	0
Flt Permitted					0.960	
Satd. Flow (perm)	0	2090	2087	0	1841	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		262	590		182	
Travel Time (s)		6.0	13.4		4.1	
Peak Hour Factor	0.64	0.64	0.74	0.74	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	28	65	19	20	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	28	84	0	24	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 13.4% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	18	48	14	16	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	64	64	74	74	79	79
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	28	65	19	20	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	84	0	-	0	102	74
Stage 1	-	-	-	-	74	-
Stage 2	-	-	-	-	28	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1526	-	-	-	901	993
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	1000	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1526	-	-	-	901	993
Mov Cap-2 Maneuver	-	-	-	-	901	-
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	1000	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1526	-	-	-	914
HCM Lane V/C Ratio	-	-	-	-	0.026
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	40	25	4	16	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	16	16	13	13
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.981			
Flt Protected					0.950	
Satd. Flow (prot)	0	2090	2112	0	1865	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	2090	2112	0	1865	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		262	590		182	
Travel Time (s)		6.0	13.4		4.1	
Peak Hour Factor	0.77	0.77	0.52	0.52	0.80	0.80
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	52	48	8	20	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	52	56	0	20	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 13.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	40	25	4	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	52	52	80	80
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	52	48	8	20	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	56	0	-	0	104	52
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1562	-	-	-	899	1021
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1562	-	-	-	899	1021
Mov Cap-2 Maneuver	-	-	-	-	899	-
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	976	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1562	-	-	-	899
HCM Lane V/C Ratio	-	-	-	-	0.022
HCM Control Delay (s)	0	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	19	51	14	16	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	16	16	13	13
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.971		0.977	
Flt Protected					0.960	
Satd. Flow (prot)	0	2090	2091	0	1841	0
Flt Permitted					0.960	
Satd. Flow (perm)	0	2090	2091	0	1841	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		262	590		182	
Travel Time (s)		6.0	13.4		4.1	
Peak Hour Factor	0.64	0.64	0.74	0.74	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	30	69	19	20	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	30	88	0	24	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 13.5% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	19	51	14	16	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	64	64	74	74	79	79
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	30	69	19	20	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	88	0	-	0	108	78
Stage 1	-	-	-	-	78	-
Stage 2	-	-	-	-	30	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1520	-	-	-	894	988
Stage 1	-	-	-	-	950	-
Stage 2	-	-	-	-	998	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1520	-	-	-	894	988
Mov Cap-2 Maneuver	-	-	-	-	894	-
Stage 1	-	-	-	-	950	-
Stage 2	-	-	-	-	998	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1520	-	-	-	908
HCM Lane V/C Ratio	-	-	-	-	0.026
HCM Control Delay (s)	0	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	40	27	4	16	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	16	16	13	13
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.982			
Flt Protected					0.950	
Satd. Flow (prot)	0	2090	2115	0	1865	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	2090	2115	0	1865	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		262	170		182	
Travel Time (s)		6.0	3.9		4.1	
Peak Hour Factor	0.77	0.77	0.52	0.52	0.80	0.80
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	52	52	8	20	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	52	60	0	20	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 13.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	40	27	4	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	52	52	80	80
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	52	52	8	20	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	60	0	-	0	108	56
Stage 1	-	-	-	-	56	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1556	-	-	-	894	1016
Stage 1	-	-	-	-	972	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1556	-	-	-	894	1016
Mov Cap-2 Maneuver	-	-	-	-	894	-
Stage 1	-	-	-	-	972	-
Stage 2	-	-	-	-	976	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1556	-	-	-	894
HCM Lane V/C Ratio	-	-	-	-	0.022
HCM Control Delay (s)	0	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	21	52	14	16	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	16	16	13	13
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.971		0.977	
Flt Protected					0.960	
Satd. Flow (prot)	0	2090	2091	0	1841	0
Flt Permitted					0.960	
Satd. Flow (perm)	0	2090	2091	0	1841	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		262	150		182	
Travel Time (s)		6.0	3.4		4.1	
Peak Hour Factor	0.64	0.64	0.74	0.74	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	33	70	19	20	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	33	89	0	24	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 13.6% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	21	52	14	16	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	64	64	74	74	79	79
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	33	70	19	20	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	89	0	-	0	113	80
Stage 1	-	-	-	-	80	-
Stage 2	-	-	-	-	33	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1519	-	-	-	888	986
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	995	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1519	-	-	-	888	986
Mov Cap-2 Maneuver	-	-	-	-	888	-
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	995	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1519	-	-	-	902
HCM Lane V/C Ratio	-	-	-	-	0.027
HCM Control Delay (s)	0	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Wainwright Road at the Project Site Driveway

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	57	29	10	39	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.965		0.994	
Flt Protected					0.954	
Satd. Flow (prot)	0	1863	1798	0	1766	0
Flt Permitted					0.954	
Satd. Flow (perm)	0	1863	1798	0	1766	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		170	420		147	
Travel Time (s)		3.9	9.5		3.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	62	32	11	42	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	62	43	0	44	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 13.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	57	29	10	39	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	62	32	11	42	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	42	0	-	0	99	37
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	62	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1567	-	-	-	900	1035
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	961	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1567	-	-	-	900	1035
Mov Cap-2 Maneuver	-	-	-	-	900	-
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	961	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1567	-	-	-	906
HCM Lane V/C Ratio	-	-	-	-	0.049
HCM Control Delay (s)	0	-	-	-	9.2
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	2	34	54	44	23	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.939		0.995	
Flt Protected		0.997			0.954	
Satd. Flow (prot)	0	1857	1749	0	1768	0
Flt Permitted		0.997			0.954	
Satd. Flow (perm)	0	1857	1749	0	1768	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		150	440		172	
Travel Time (s)		3.4	10.0		3.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	37	59	48	25	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	39	107	0	26	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 15.5% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	2	34	54	44	23	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	37	59	48	25	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	107	0	-	0	124	83
Stage 1	-	-	-	-	83	-
Stage 2	-	-	-	-	41	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1484	-	-	-	871	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	981	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1484	-	-	-	870	976
Mov Cap-2 Maneuver	-	-	-	-	870	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	980	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1484	-	-	-	874
HCM Lane V/C Ratio	0.001	-	-	-	0.03
HCM Control Delay (s)	7.4	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

SITE DEVELOPMENT PLANS

FOR:

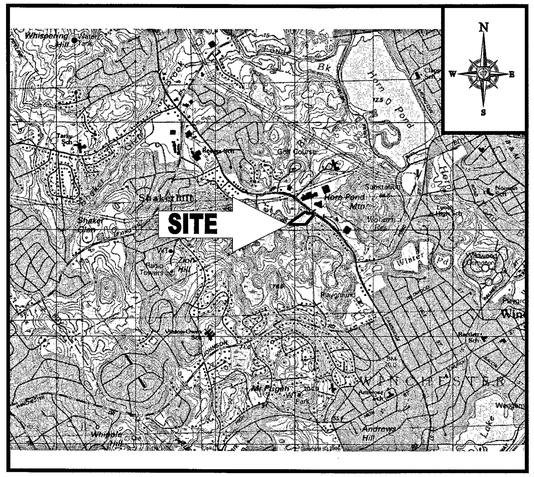
PROPOSED

WINCHESTER NORTH

LOCATION OF SITE:

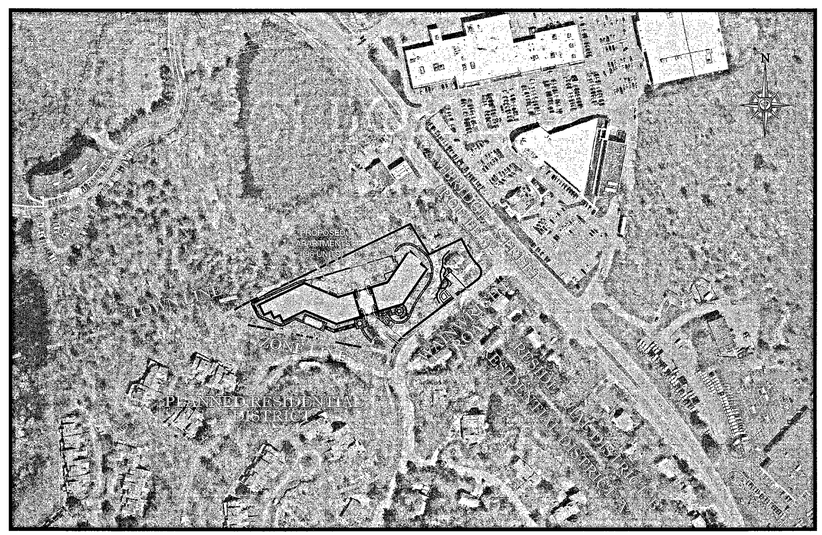
416 CAMBRIDGE STREET
TOWN OF WINCHESTER &
CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)



LOCATION MAP

SCALE: 1"=2000'
PLAN REFERENCE: BOSTON NORTH USGS QUADRANGLE



AREA PLAN

SCALE: 1"=200'

SHEET TITLE	*SHEET NUMBER*
COVER SHEET	1 OF 14
GENERAL NOTES SHEET	2 OF 14
DEMOLITION PLAN	3 OF 14
SITE PLAN	4 OF 14
GRADING & DRAINAGE PLAN	5 OF 14
UTILITY PLAN	6 OF 14
SOIL EROSION & SEDIMENT CONTROL PLAN	7 OF 14
SOIL EROSION CONTROL NOTES & DETAILS SHEET	8 OF 14
LANDSCAPE PLAN	9 OF 14
LANDSCAPE NOTES & DETAILS SHEET	10 OF 14
CONSTRUCTION DETAIL SHEET	11 OF 14
CONSTRUCTION DETAIL SHEET	12 OF 14
CONSTRUCTION DETAIL SHEET	13 OF 14
CONSTRUCTION DETAIL SHEET	14 OF 14
ALTA / ACSM SURVEY (BY OTHERS)	1 OF 1

SHEET INDEX

PREPARED BY

BOHLER ENGINEERING

OWNER/APPLICANT:

FX WINCHESTER, LLC
C/O PX INVESTMENTS, LLC
263 HUNTINGTON AVE, #174
BOSTON, MA 02115

BOHLER™ ENGINEERING

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING — LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN — TRANSPORTATION SERVICES
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- UPSTATE NEW YORK
- BOSTON, MA
- NEW YORK METRO
- PHILADELPHIA/SOUTHERN NJ
- LEHIGH VALLEY, PA
- SOUTHEASTERN, PA
- BALTIMORE, MD
- SOUTHERN MARYLAND
- NORTHERN VIRGINIA
- DELAWARE
- CENTRAL VIRGINIA
- CHARLOTTE, NC
- RALEIGH, NC

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REVISIONS

REV	DATE	COMMENT	BY
1			
2			
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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:

SITE DEVELOPMENT PLANS
FOR
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER &
CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

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J.A. KUCKICH
PROFESSIONAL ENGINEER

SHEET TITLE:

COVER SHEET

SHEET NUMBER:

1

OF 14

REV 0 - 07/06/2015

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GENERAL NOTES

CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE WITH THE NOTES AND SPECIFICATIONS CONTAINED HEREIN. CONTRACTOR IS RESPONSIBLE TO ENSURE THAT ALL SUBCONTRACTORS FULLY AND COMPLETELY CONFORM TO AND COMPLY WITH THESE REQUIREMENTS.

1. THE FOLLOWING DOCUMENTS ARE INCORPORATED BY REFERENCE AS PART OF THIS SITE PLAN:

   - SURVEY - "BOUNDARY & TOPOGRAPHIC SURVEY, SEB, LLC, 416 CAMBRIDGE STREET", BY CONTROL POINT ASSOCIATES, INC. REVISED 6-22-15.
   - ARCHITECTURAL PLAN BY GRAZADO VELLECO ARCHITECTS, LATEST EDITION.

   PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST VERIFY THAT HE/SHE HAS THE LATEST EDITION OF THE DOCUMENTS REFERENCED ABOVE. THIS IS CONTRACTOR'S RESPONSIBILITY.

2. ALL ACCESSIBLE (A/K/A ADA) PARKING SPACES MUST BE CONSTRUCTED TO MEET, AT A MINIMUM, THE MORE STRINGENT OF THE REQUIREMENTS OF THE "AMERICANS WITH DISABILITIES ACT" (ADA) CODE (42 U.S.C. § 12101 et seq. AND 42 U.S.C. § 4151 et seq.) OR THE REQUIREMENTS OF THE JURISDICTION WHERE THE PROJECT IS TO BE CONSTRUCTED, AND ANY AND ALL AMENDMENTS TO BOTH WHICH ARE IN EFFECT WHEN THESE PLANS ARE COMPLETED.
3. PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT ALL REQUIRED PERMITS AND APPROVALS HAVE BEEN OBTAINED. NO CONSTRUCTION OR FABRICATION SHALL BEGIN UNTIL THE CONTRACTOR HAS RECEIVED AND THOROUGHLY REVIEWED THE COMMENTS TO ALL PLANS AND OTHER DOCUMENTS REVIEWED AND APPROVED BY THE PERMITTING AUTHORITIES AND CONFIRMED THAT ALL NECESSARY OR REQUIRED PERMITS HAVE BEEN OBTAINED. CONTRACTOR MUST HAVE COPIES OF ALL PERMITS AND APPROVALS ON SITE AT ALL TIMES.
4. THE OWNER/CONTRACTOR MUST BE FAMILIAR WITH AND RESPONSIBLE FOR THE PROCUREMENT OF ANY AND ALL CERTIFICATIONS REQUIRED FOR THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY.
5. ALL WORK MUST BE PERFORMED IN ACCORDANCE WITH THESE PLANS, SPECIFICATIONS AND CONDITIONS OF APPROVAL, AND ALL APPLICABLE REQUIREMENTS, RULES, REGULATIONS, STATUTORY REQUIREMENTS, CODES, LAWS AND STANDARDS OF ALL GOVERNMENTAL ENTITIES WITH JURISDICTION OVER THIS PROJECT.
6. THE GEOTECHNICAL REPORT AND RECOMMENDATIONS SET FORTH HEREIN ARE A PART OF THE REQUIRED CONSTRUCTION DOCUMENTS AND, IN CASE OF CONFLICT, DISCREPANCY OR AMBIGUITY, THE MORE STRINGENT REQUIREMENTS AND/OR RECOMMENDATIONS CONTAINED IN THE PLANS AND THE GEOTECHNICAL REPORT AND RECOMMENDATIONS SHALL TAKE PRECEDENCE UNLESS SPECIFICALLY NOTED OTHERWISE ON THE PLANS. THE CONTRACTOR MUST NOTIFY THE ENGINEER, IN WRITING, OF ANY SUCH CONFLICT, DISCREPANCY OR AMBIGUITY BETWEEN THE GEOTECHNICAL REPORTS AND PLANS AND SPECIFICATIONS PRIOR TO PROCEEDING WITH ANY FURTHER WORK.
7. THESE PLANS ARE BASED ON INFORMATION PROVIDED TO BOHLER ENGINEERING BY THE OWNER AND OTHERS PRIOR TO THE TIME OF PLAN PREPARATION. CONTRACTOR MUST FIELD VERIFY EXISTING CONDITIONS AND NOTIFY BOHLER ENGINEERING, IN WRITING, IMMEDIATELY IF ACTUAL SITE CONDITIONS DIFFER FROM THOSE SHOWN ON THE PLAN, OR IF THE PROPOSED WORK CONFLICTS WITH ANY OTHER SITE FEATURES.
8. ALL DIMENSIONS SHOWN ON THE PLANS MUST BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR MUST NOTIFY ENGINEER, IN WRITING, IF ANY CONFLICTS, DISCREPANCIES, OR AMBIGUITIES EXIST PRIOR TO PROCEEDING WITH CONSTRUCTION. NO EXTRA COMPENSATION WILL BE PAID TO THE CONTRACTOR FOR WORK WHICH HAS TO BE REDONE OR REPAIRED DUE TO DIMENSIONS OR GRADES SHOWN INCORRECTLY ON THESE PLANS PRIOR TO CONTRACTOR GIVING ENGINEER WRITTEN NOTIFICATION OF SAME AND ENGINEER, THEREAFTER, PROVIDING CONTRACTOR WITH WRITTEN AUTHORIZATION TO PROCEED WITH SUCH ADDITIONAL WORK.
9. CONTRACTOR MUST REFER TO THE ARCHITECTURAL/BUILDING PLANS "OF RECORD" FOR EXACT LOCATIONS AND DIMENSIONS OF ENTRY/EXIT POINTS, ELEVATIONS, PRECISE BUILDING DIMENSIONS, AND EXACT BUILDING UTILITY LOCATIONS.
10. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST COORDINATE THE BUILDING LAYOUT BY CAREFUL REVIEW OF THE ENTIRE SITE PLAN AND THE LATEST ARCHITECTURAL PLANS (INCLUDING, BUT NOT LIMITED TO, STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND FIRE SUPPRESSION PLAN, WHERE APPLICABLE). CONTRACTOR MUST IMMEDIATELY NOTIFY OWNER, ARCHITECT AND SITE ENGINEER, IN WRITING, OF ANY CONFLICTS, DISCREPANCIES OR AMBIGUITIES WHICH EXIST.
11. DEBRIS MUST NOT BE BURIED ON THE SUBJECT SITE AND ALL UNSUITABLE EXCAVATED MATERIAL AND DEBRIS (SOLID WASTE) MUST BE DISPOSED OF IN ACCORDANCE WITH THE REQUIREMENTS OF ANY AND ALL GOVERNMENTAL AUTHORITIES WHICH HAVE JURISDICTION OVER THIS PROJECT OR OVER CONTRACTOR.
12. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING WHEN SHORING IS REQUIRED AND FOR INSTALLING ALL SHORING REQUIRED DURING EXCAVATION (TO BE PERFORMED IN ACCORDANCE WITH CURRENT OSHA STANDARDS) AND ANY ADDITIONAL PRECAUTIONS TO BE TAKEN TO ASSURE THE STABILITY OF ADJACENT, NEARBY AND CONTIGUOUS STRUCTURES AND PROPERTIES.
13. THE CONTRACTOR IS TO EXERCISE EXTREME CARE WHEN PERFORMING ANY WORK ACTIVITIES ADJACENT TO PAVEMENT, STRUCTURES, ETC. WHICH ARE TO REMAIN EITHER FOR AN INITIAL PHASE OF THE PROJECT OR AS PART OF THE FINAL CONDITION. CONTRACTOR IS RESPONSIBLE FOR TAKING ALL APPROPRIATE MEASURES REQUIRED TO ENSURE THE STRUCTURAL STABILITY OF SIDEWALKS AND PAVEMENT, UTILITIES, BUILDINGS, AND INFRASTRUCTURE WHICH ARE TO REMAIN, AND TO PROVIDE A SAFE WORK AREA FOR THIRD PARTIES, PEDESTRIANS AND ANYONE INVOLVED WITH THE PROJECT.
14. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE DONE TO ANY NEW OR EXISTING CONSTRUCTION OR PROPERTY DURING THE COURSE OF CONSTRUCTION, INCLUDING BUT NOT LIMITED TO DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURB, ETC. AND SHALL BEAR ALL COSTS ASSOCIATED WITH SAME TO INCLUDE, BUT NOT BE LIMITED TO, REDESIGN, RE-SURVEY, RE-PERMITTING AND CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR AND MUST REPLACE ALL SIGNAL INTERCONNECTION CABLE, WIRING CONDUITS, AND ANY UNDERGROUND ACCESSORY EQUIPMENT DAMAGED DURING CONSTRUCTION AND MUST BEAR ALL COSTS ASSOCIATED WITH SAME. THE REPAIR OF ANY SUCH NEW OR EXISTING CONSTRUCTION OR PROPERTY MUST RESTORE SUCH CONSTRUCTION OR PROPERTY TO A CONDITION EQUIVALENT TO OR BETTER THAN THE CONDITIONS PRIOR TO COMMENCEMENT OF THE CONSTRUCTION, AND IN CONFORMANCE WITH APPLICABLE CODES, LAWS RULES, REGULATIONS, STATUTORY REQUIREMENTS AND STATUTES. CONTRACTOR MUST BEAR ALL COSTS ASSOCIATED WITH SAME. CONTRACTOR IS RESPONSIBLE TO DOCUMENT ALL EXISTING DAMAGE AND TO NOTIFY THE OWNER AND THE CONSTRUCTION MANAGER PRIOR TO THE START OF CONSTRUCTION.
15. ALL CONCRETE MUST BE AIR ENTRAINED AND HAVE THE MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS UNLESS OTHERWISE NOTED ON THE PLANS, DETAILS AND/OR GEOTECHNICAL REPORT.
16. THE ENGINEER IS NOT RESPONSIBLE FOR CONSTRUCTION METHODS, MEANS, TECHNIQUES OR PROCEDURES, GENERALLY OR FOR THE CONSTRUCTION MEAN, METHODS, TECHNIQUES OR PROCEDURES FOR COMPLETION OF THE WORK DEPICTED BOTH ON THESE PLANS, AND FOR ANY CONFLICTS/SCOPE REVISIONS WHICH RESULT FROM SAME. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE METHODS/MEANS FOR COMPLETION OF THE WORK PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
17. THE ENGINEER OF RECORD IS NOT RESPONSIBLE FOR JOB SITE SAFETY. THE ENGINEER OF RECORD HAS NOT BEEN RETAINED TO PERFORM OR BE RESPONSIBLE FOR JOB SITE SAFETY, SAME BEING WHOLLY OUTSIDE OF ENGINEER'S SERVICES AS RELATED TO THE PROJECT. THE ENGINEER OF RECORD IS NOT RESPONSIBLE TO IDENTIFY OR REPORT ANY JOB SITE SAFETY ISSUES, AT ANY TIME.
18. ALL CONTRACTORS MUST CARRY THE SPECIFIED STATUTORY WORKER'S COMPENSATION INSURANCE, EMPLOYER'S LIABILITY INSURANCE AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE (CGL). ALL CONTRACTORS MUST HAVE THEIR CGL POLICIES ENDORSED TO NAME BOHLER ENGINEERING, AND ITS PAST, PRESENT AND FUTURE OWNERS, OFFICERS, DIRECTORS, PARTNERS, SHAREHOLDERS, MEMBERS, PRINCIPALS, COMMISSIONERS, AGENTS, SERVANTS, EMPLOYEES, AFFILIATES, SUBSIDIARIES, AND RELATED ENTITIES, AND ITS SUBCONTRACTORS AND SUBCONSULTANTS AS ADDITIONAL NAMED INSURED AND TO PROVIDE CONTRACTUAL LIABILITY COVERAGE SUFFICIENT TO INSURE THIS HOLD HARMLESS AND INDEMNITY OBLIGATIONS ASSUMED BY THE CONTRACTORS. ALL CONTRACTORS MUST FURNISH BOHLER ENGINEERING WITH CERTIFICATIONS OF INSURANCE AS EVIDENCE OF THE REQUIRED INSURANCE PRIOR TO COMMENCING WORK AND UPON RENEWAL OF EACH POLICY DURING THE ENTIRE PERIOD OF CONSTRUCTION AND FOR ONE YEAR AFTER THE COMPLETION OF CONSTRUCTION. IN ADDITION, ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED UNDER THE LAW, INDEMNIFY, DEFEND AND HOLD HARMLESS BOHLER ENGINEERING AND ITS PAST, PRESENT AND FUTURE OWNERS, OFFICERS, DIRECTORS, PARTNERS, SHAREHOLDERS, MEMBERS, PRINCIPALS, COMMISSIONERS, AGENTS, SERVANTS, EMPLOYEES, AFFILIATES, SUBSIDIARIES, AND RELATED ENTITIES, AND ITS SUBCONTRACTORS AND SUBCONSULTANTS FROM AND AGAINST ANY DAMAGES, INJURIES, CLAIMS, ACTIONS, PENALTIES, EXPENSES, PUNITIVE DAMAGES, TORT DAMAGES, STATUTORY CLAIMS, STATUTORY CAUSES OF ACTION, LOSSES, CAUSES OF ACTION, LIABILITIES OR COSTS, INCLUDING, BUT NOT LIMITED TO, REASONABLE ATTORNEYS' FEES AND DEFENSE COSTS, ARISING OUT OF OR IN ANY WAY CONNECTED WITH OR TO THE PROJECT, INCLUDING ALL CLAIMS BY EMPLOYEES OF THE CONTRACTORS, ALL CLAIMS BY THIRD PARTIES AND ALL CLAIMS RELATED TO THE PROJECT. CONTRACTOR MUST NOTIFY ENGINEER, IN WRITING, AT LEAST THIRTY (30) DAYS PRIOR TO ANY TERMINATION, SUSPENSION OR CHANGE OF ITS INSURANCE HEREUNDER.
19. BOHLER ENGINEERING WILL REVIEW OR TAKE OTHER APPROPRIATE ACTION ON THE CONTRACTOR SUBMITTALS, SUCH AS SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND OTHER DATA, WHICH THE CONTRACTOR IS REQUIRED TO SUBMIT, BUT ONLY FOR THE LIMITED PURPOSE OF CHECKING FOR CONFORMANCE WITH THE DESIGN INTENT AND THE INFORMATION SHOWN IN THE CONSTRUCTION CONTRACT DOCUMENTS. CONSTRUCTION MEANS AND/OR METHODS AND/OR TECHNIQUES OR PROCEDURES, COORDINATION OF THE WORK WITH OTHER TRADES, AND CONSTRUCTION SAFETY PRECAUTIONS ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND BOHLER HAS NO RESPONSIBILITY OR LIABILITY FOR SAME HEREUNDER. BOHLER ENGINEERING'S SHOP DRAWING REVIEW WILL BE CONDUCTED WITH REASONABLE PROMPTNESS WHILE ALLOWING SUFFICIENT TIME TO PERMIT ADEQUATE REVIEW. REVIEW OF A SPECIFIC ITEM MUST NOT INDICATE THAT BOHLER ENGINEERING HAS REVIEWED THE ENTIRE ASSEMBLY OF WHICH THE ITEM IS A COMPONENT. BOHLER ENGINEERING WILL NOT BE RESPONSIBLE FOR ANY DEVIATIONS FROM THE CONSTRUCTION DOCUMENTS NOT PROMPTLY AND IMMEDIATELY BROUGHT TO ITS ATTENTION, IN WRITING, BY THE CONTRACTOR. BOHLER ENGINEERING WILL NOT BE REQUIRED TO REVIEW PARTIAL SUBMISSIONS OR THOSE FOR WHICH SUBMISSIONS OF CORRELATED ITEMS HAVE NOT BEEN RECEIVED.
20. NEITHER THE PROFESSIONAL ACTIVITIES OF BOHLER ENGINEERING, NOR THE PRESENCE OF BOHLER ENGINEERING AND/OR ITS PAST, PRESENT AND FUTURE OWNERS, OFFICERS, DIRECTORS, PARTNERS, SHAREHOLDERS, MEMBERS, PRINCIPALS, COMMISSIONERS, AGENTS, SERVANTS, EMPLOYEES, AFFILIATES, SUBSIDIARIES, AND RELATED ENTITIES, AND ITS SUBCONTRACTORS AND SUBCONSULTANTS AT A CONSTRUCTION/PROJECT SITE, SHALL RELIEVE THE GENERAL CONTRACTOR OF ITS OBLIGATIONS, DUTIES AND RESPONSIBILITIES INCLUDING, BUT NOT LIMITED TO, CONSTRUCTION MEANS, METHODS, SEQUENCE, TECHNIQUES OR PROCEDURES NECESSARY FOR PERFORMING, OVERSEEING, SUPERINTENDING AND COORDINATING THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND COMPLIANCE WITH ANY HEALTH OR SAFETY PRECAUTIONS REQUIRED BY ANY REGULATORY AGENCIES WITH JURISDICTION OVER THE PROJECT AND/OR PROPERTY. BOHLER ENGINEERING AND ITS PERSONNEL HAVE NO AUTHORITY TO EXERCISE ANY CONTROL OVER ANY CONSTRUCTION CONTRACTOR OR ITS EMPLOYEES IN CONNECTION WITH THEIR WORK OR ANY HEALTH OR SAFETY PROGRAMS OR PROCEDURES. THE GENERAL CONTRACTOR IS SOLELY RESPONSIBLE FOR JOB SITE SAFETY. BOHLER ENGINEERING SHALL BE INDEMNIFIED BY THE GENERAL CONTRACTOR AND MUST BE NAMED AN ADDITIONAL INSURED UNDER THE GENERAL CONTRACTOR'S POLICIES OF GENERAL LIABILITY INSURANCE AS DESCRIBED ABOVE IN NOTE 19 FOR JOB SITE SAFETY.
21. IF THE CONTRACTOR DEVIATES FROM THE PLANS AND SPECIFICATIONS, INCLUDING THE NOTES CONTAINED HEREIN, WITHOUT FIRST OBTAINING THE PRIOR WRITTEN AUTHORIZATION OF THE ENGINEER FOR SUCH DEVIATIONS, THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE PAYMENT OF ALL COSTS INCURRED IN CORRECTING ANY WORK DONE WHICH DEVIATES FROM THE PLANS, ALL FINES AND/OR PENALTIES ASSESSED WITH RESPECT THERETO AND ALL COMPENSATORY OR PUNITIVE DAMAGES RESULTING THEREFROM AND, FURTHER, SHALL DEFEND, INDEMNIFY AND HOLD HARMLESS THE ENGINEER, TO THE FULLEST EXTENT PERMITTED UNDER THE LAW, IN ACCORDANCE WITH PARAGRAPH 19 HEREIN, FOR AND FROM ALL FEES, ATTORNEYS' FEES, DAMAGES, COSTS, JUDGMENTS, PENALTIES AND THE LIKE RELATED TO SAME.
22. CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE AND PROTECTION OF TRAFFIC PLAN FOR ALL WORK THAT AFFECTS PUBLIC TRAVEL EITHER IN THE R.O.W. OR ON SITE. THE COST FOR THIS ITEM MUST BE INCLUDED IN THE CONTRACTOR'S PRICE.
23. ALL SIGNING AND PAVEMENT STRIPING MUST CONFORM TO MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES OR LOCALLY APPROVED SUPPLEMENT.
24. ENGINEER IS NOT RESPONSIBLE FOR ANY INJURY OR DAMAGES RESULTING FROM CONTRACTOR'S FAILURE TO BUILD OR CONSTRUCT IN STRICT ACCORDANCE WITH THE APPROVED PLANS. IF CONTRACTOR AND/OR OWNER FAIL BUILD OR CONSTRUCT IN STRICT ACCORDANCE WITH APPROVED PLANS, THEY AGREE TO JOINTLY AND SEVERALLY INDEMNIFY AND HOLD ENGINEER HARMLESS FOR ALL INJURIES AND DAMAGES THAT ENGINEER SUFFERS AND COSTS THAT ENGINEER INCURS.
25. OWNER MUST MAINTAIN AND PRESERVE ALL PHYSICAL SITE FEATURES AND DESIGN FEATURES DEPICTED ON THE PLANS AND RELATED DOCUMENTS, IN STRICT ACCORDANCE WITH THE APPROVED PLAN(S) AND DESIGN AND, FURTHER ENGINEER IS NOT RESPONSIBLE FOR ANY FAILURE TO SO MAINTAIN OR PRESERVE SITE AND/OR DESIGN FEATURES. IF OWNER FAILS TO MAINTAIN AND/OR PRESERVE ALL PHYSICAL SITE FEATURES AND/OR DESIGN FEATURES DEPICTED ON THE PLANS AND RELATED DOCUMENTS, OWNER AGREES TO INDEMNIFY AND HOLD ENGINEER HARMLESS FOR ALL INJURIES AND DAMAGES THAT ENGINEER SUFFERS AND COSTS THAT ENGINEER INCURS AS A RESULT OF SAID FAILURE.
26. ALL DIMENSIONS MUST BE TO FACE OF CURB, EDGE OF PAVEMENT, OR EDGE OF BUILDING, UNLESS NOTED OTHERWISE.
27. ALL CONSTRUCTION AND MATERIALS MUST COMPLY WITH AND CONFORM TO APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS, LAWS, ORDINANCES, RULES AND CODES, AND ALL APPLICABLE OSHA REQUIREMENTS.
28. CONTRACTOR AND OWNER MUST INSTALL ALL ELEMENTS AND COMPONENTS IN STRICT COMPLIANCE WITH AND ACCORDANCE WITH MANUFACTURER'S STANDARDS AND RECOMMENDED INSTALLATION CRITERIA AND SPECIFICATIONS. IF CONTRACTOR AND/OR OWNER FAIL TO DO SO, THEY AGREE TO JOINTLY AND SEVERALLY INDEMNIFY AND HOLD ENGINEER HARMLESS FOR ALL INJURIES AND DAMAGES THAT ENGINEER SUFFERS AND COSTS THAT ENGINEER INCURS AS A RESULT OF SAID FAILURE.
29. CONTRACTOR IS RESPONSIBLE TO MAINTAIN ON-SITE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IN COMPLIANCE WITH EPA REQUIREMENTS FOR SITES WHERE ONE (1) ACRE OR MORE (UNLESS THE LOCAL JURISDICTION REQUIRES FEWER) IS DISTURBED BY CONSTRUCTION ACTIVITIES. CONTRACTOR IS RESPONSIBLE TO ENSURE THAT ALL ACTIVITIES, INCLUDING THOSE OF SUBCONTRACTORS, ARE IN COMPLIANCE WITH THE SWPPP, INCLUDING BUT NOT LIMITED TO LOGGING ACTIVITIES (MINIMUM ONCE PER WEEK AND AFTER RAINFALL EVENTS) AND CORRECTIVE MEASURES, AS APPROPRIATE.
30. AS CONTAINED IN THESE DRAWINGS AND ASSOCIATED APPLICATION DOCUMENTS PREPARED BY THE SIGNATORY PROFESSIONAL ENGINEER, THE USE OF THE WORDS CERTIFY OR CERTIFICATION CONSTITUTES AN EXPRESSION OF "PROFESSIONAL OPINION" REGARDING THE INFORMATION WHICH IS THE SUBJECT OF THE UNDERSIGNED PROFESSIONAL KNOWLEDGE OR BELIEF AND IN ACCORDANCE WITH COMMON ACCEPTED PROCEDURE CONSISTENT WITH THE APPLICABLE STANDARDS OF PRACTICE, AND DOES NOT CONSTITUTE A WARRANTY OR GUARANTEE, EITHER EXPRESSED OR IMPLIED.

GENERAL GRADING & UTILITY PLAN NOTES

1. LOCATIONS OF ALL EXISTING AND PROPOSED SERVICES ARE APPROXIMATE AND MUST BE INDEPENDENTLY CONFIRMED WITH LOCAL UTILITY COMPANIES PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION. SANITARY SEWER AND ALL OTHER UTILITY SERVICE CONNECTION POINTS MUST BE INDEPENDENTLY CONFIRMED BY THE CONTRACTOR IN THE FIELD PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. ALL DISCREPANCIES MUST IMMEDIATELY BE REPORTED, IN WRITING, TO THE ENGINEER. CONSTRUCTION MUST COMMENCE BEGINNING AT THE LOWEST INVERT (POINT OF CONNECTION) AND PROGRESS UP GRADIENT. PROPOSED INTERFACE POINTS (CROSSINGS) WITH EXISTING UNDERGROUND UTILITIES SHALL BE FIELD VERIFIED BY TEST PIT PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. CONTRACTOR MUST VERTICALLY AND HORIZONTALLY LOCATE ALL UTILITIES AND SERVICES INCLUDING, BUT NOT LIMITED TO, GAS, WATER, ELECTRIC, SANITARY AND STORM SEWER, TELEPHONE, CABLE, FIBER OPTIC CABLE, ETC. WITHIN THE LIMITS OF DISTURBANCE OR WORK SPACE, WHICHEVER IS GREATER. THE CONTRACTOR MUST USE, REFER TO, AND COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE UTILITY NOTIFICATION SYSTEM TO LOCATE ALL THE UNDERGROUND UTILITIES. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ALL DAMAGE TO ANY EXISTING UTILITIES DURING CONSTRUCTION, AT NO COST TO THE OWNER. CONTRACTOR SHALL BEAR ALL COSTS ASSOCIATED WITH DAMAGE TO ANY EXISTING UTILITIES DURING CONSTRUCTION.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL CONSTRUCTION CONTRACT DOCUMENTS INCLUDING, BUT NOT LIMITED TO, ALL OF THE DRAWINGS AND SPECIFICATIONS ASSOCIATED WITH THE PROJECT WORK SCOPE PRIOR TO THE INITIATION AND COMMENCEMENT OF CONSTRUCTION. SHOULD THE CONTRACTOR FIND A CONFLICT AND/OR DISCREPANCY BETWEEN THE DOCUMENTS RELATIVE TO THE SPECIFICATIONS OR THE RELATIVE OR APPLICABLE CODES, REGULATIONS, LAWS, RULES, STATUTES AND/OR ORDINANCES, IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO NOTIFY THE PROJECT ENGINEER OF RECORD, IN WRITING, OF SAID CONFLICT AND/OR DISCREPANCY PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR'S FAILURE TO NOTIFY THE PROJECT ENGINEER SHALL CONSTITUTE CONTRACTOR'S FULL AND COMPLETE ACCEPTANCE OF ALL RESPONSIBILITY TO COMPLETE THE SCOPE OF WORK AS DEFINED BY THE DRAWINGS AND IN FULL COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS, LAWS, STATUTES, ORDINANCES AND CODES AND, FURTHER, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH SAME.
4. THE CONTRACTOR MUST LOCATE AND CLEARLY AND UNAMBIGUOUSLY DEFINE VERTICALLY AND HORIZONTALLY ALL ACTIVE AND INACTIVE UTILITY AND/OR SERVICE SYSTEMS THAT ARE TO BE REMOVED. THE CONTRACTOR IS RESPONSIBLE TO PROTECT AND MAINTAIN ALL ACTIVE AND INACTIVE SYSTEMS THAT ARE NOT BEING REMOVED/RELOCATED DURING SITE ACTIVITY.
5. THE CONTRACTOR MUST FAMILIARIZE ITSELF WITH THE APPLICABLE UTILITY SERVICE PROVIDER REQUIREMENTS AND IS RESPONSIBLE FOR ALL COORDINATION REGARDING UTILITY DEMOLITION AS IDENTIFIED OR REQUIRED FOR THE PROJECT. THE CONTRACTOR MUST PROVIDE THE OWNER WITH WRITTEN NOTIFICATION THAT THE EXISTING UTILITIES AND SERVICES HAVE BEEN TERMINATED AND ABANDONED IN ACCORDANCE WITH THE JURISDICTION AND UTILITY COMPANY REQUIREMENTS AND ALL OTHER APPLICABLE REQUIREMENTS, RULES, STATUTES, LAWS, ORDINANCES AND CODES.
6. THE CONTRACTOR MUST INSTALL ALL STORM SEWER AND SANITARY SEWER COMPONENTS WHICH FUNCTION BY GRAVITY PRIOR TO THE INSTALLATION OF ALL OTHER UTILITIES.
7. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF SITE PLAN DOCUMENTS AND ARCHITECTURAL DESIGN FOR EXACT BUILDING UTILITY CONNECTION LOCATIONS, GREASE TRAP REQUIREMENTS/DETAILS, DOOR ACCESS, AND EXTERIOR GRADING. THE ARCHITECT WILL DETERMINE THE UTILITY SERVICE SIZES. THE CONTRACTOR MUST COORDINATE INSTALLATION OF UTILITIES/SERVICES WITH THE INDIVIDUAL COMPANIES, TO AVOID CONFLICTS AND TO ENSURE THAT PROPER DEPTHS ARE ACHIEVED. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT INSTALLATION OF ALL IMPROVEMENTS COMPLIES WITH ALL UTILITY REQUIREMENTS WITH JURISDICTION AND/OR CONTROL OF THE SITE, AND ALL OTHER APPLICABLE REQUIREMENTS, RULES, STATUTES, LAWS, ORDINANCES AND CODES AND, FURTHER, IS RESPONSIBLE FOR COORDINATING THE UTILITY TIE-INS/CONNECTIONS PRIOR TO CONNECTING TO THE EXISTING UTILITY/SERVICE. WHERE A CONFLICT(S) EXISTS BETWEEN THESE SITE PLANS AND THE ARCHITECTURAL PLANS, OR WHERE ARCHITECTURAL PLAN UTILITY CONNECTION POINTS DIFFER, THE CONTRACTOR MUST IMMEDIATELY NOTIFY THE ENGINEER, IN WRITING, AND PRIOR TO CONSTRUCTION, RESOLVE SAME.
8. WATER SERVICE MATERIALS, BURIAL DEPTH, AND COVER REQUIREMENTS MUST BE SPECIFIED BY THE LOCAL UTILITY COMPANY. CONTRACTOR'S PRICE FOR WATER SERVICE MUST INCLUDE ALL FEES, COSTS AND APPURTENANCES REQUIRED BY THE UTILITY TO PROVIDE FULL AND COMPLETE WORKING SERVICE. CONTRACTOR MUST CONTACT THE APPLICABLE MUNICIPALITY TO CONFIRM THE PROPER WATER METER AND VAULT, PRIOR TO COMMENCING CONSTRUCTION.
9. ALL NEW UTILITIES/SERVICES, INCLUDING ELECTRIC, TELEPHONE, CABLE TV, ETC. ARE TO BE INSTALLED UNDERGROUND. ALL NEW UTILITIES/SERVICES MUST BE INSTALLED IN ACCORDANCE WITH THE UTILITY/SERVICE PROVIDER INSTALLATION SPECIFICATIONS AND STANDARDS.
10. SITE GRADING MUST BE PERFORMED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS AND THE RECOMMENDATIONS SET FORTH IN THE GEOTECHNICAL REPORT REFERENCED IN THIS PLAN SET. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING AND REPLACING UNSUITABLE MATERIALS WITH SUITABLE MATERIALS AS SPECIFIED IN THE GEOTECHNICAL REPORT. ALL EXCAVATED OR FILLED AREAS MUST BE COMPACTED AS OUTLINED IN THE GEOTECHNICAL REPORT. MOISTURE CONTENT AT TIME OF PLACEMENT MUST BE SUBMITTED IN A COMPACTION REPORT PREPARED BY A QUALIFIED GEOTECHNICAL ENGINEER, REGISTERED WITH THE STATE WHERE THE WORK IS PERFORMED, VERIFYING THAT ALL FILLED AREAS AND SUBGRADE AREAS WITHIN THE BUILDING PAD AREA AND AREAS TO BE PAVED HAVE BEEN COMPACTED IN ACCORDANCE WITH THESE PLANS, SPECIFICATIONS AND THE RECOMMENDATIONS SET FORTH IN THE GEOTECHNICAL REPORT AND ALL APPLICABLE REQUIREMENTS, RULES, STATUTES, LAWS, ORDINANCES AND CODES. SUBBASE MATERIAL FOR SIDEWALKS, CURB, OR ASPHALT MUST BE FREE OF ORGANICS AND OTHER UNSUITABLE MATERIALS. SHOULD SUBBASE BE DEEMED UNSUITABLE BY OWNER/DEVELOPER, OR OWNER/DEVELOPER'S REPRESENTATIVE, SUBBASE IS TO BE REMOVED AND FILLED WITH APPROVED FILL MATERIAL COMPACTED AS DIRECTED BY THE GEOTECHNICAL REPORT. EARTHWORK ACTIVITIES INCLUDING, BUT NOT LIMITED TO, EXCAVATION, BACKFILL, AND COMPACTING MUST COMPLY WITH THE RECOMMENDATIONS IN THE GEOTECHNICAL REPORT AND ALL APPLICABLE REQUIREMENTS, RULES, STATUTES, LAWS, ORDINANCES AND CODES. EARTHWORK ACTIVITIES MUST COMPLY WITH THE STANDARD STATE DOT SPECIFICATIONS FOR ROADWAY CONSTRUCTION (LATEST EDITION) AND ANY AMENDMENTS OR REVISIONS THERETO.
11. ALL FILL, COMPACTION, AND BACKFILL MATERIALS REQUIRED FOR UTILITY INSTALLATION MUST BE AS PER THE RECOMMENDATIONS PROVIDED IN THE GEOTECHNICAL REPORT AND MUST BE COORDINATED WITH THE APPLICABLE UTILITY COMPANY SPECIFICATIONS. WHEN THE PROJECT DOES NOT HAVE GEOTECHNICAL RECOMMENDATIONS, FILL AND COMPACTION MUST, AT A MINIMUM, COMPLY WITH THE STATE DOT REQUIREMENTS AND SPECIFICATIONS AND CONSULTANT SHALL HAVE NO LIABILITY OR RESPONSIBILITY FOR OR AS RELATED TO FILL, COMPACTION AND BACKFILL. FURTHER, CONTRACTOR IS FULLY RESPONSIBLE FOR EARTHWORK BALANCE.
12. THE CONTRACTOR MUST COMPLY, TO THE FULLEST EXTENT, WITH THE LATEST OSHA STANDARDS AND REGULATIONS, AND/OR ANY OTHER AGENCY WITH JURISDICTION FOR EXCAVATION AND TRENCHING PROCEDURES. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE "MEANS AND METHODS" REQUIRED TO MEET THE INTENT AND PERFORMANCE CRITERIA OF OSHA, AS WELL AS ANY OTHER ENTITY THAT HAS JURISDICTION FOR EXCAVATION AND/OR TRENCHING PROCEDURES AND CONSULTANT SHALL HAVE NO RESPONSIBILITY FOR OR AS RELATED TO EXCAVATION AND TRENCHING PROCEDURES.
13. PAVEMENT MUST BE SAW CUT IN STRAIGHT LINES, AND EXCEPT FOR EDGE OF BUTT JOINTS, MUST EXTEND TO THE FULL DEPTH OF THE EXISTING PAVEMENT. ALL DEBRIS FROM REMOVAL OPERATIONS MUST BE REMOVED FROM THE SITE AT THE TIME OF EXCAVATION. STOCKPILING OF DEBRIS WILL NOT BE PERMITTED.
14. THE TOPS OF EXISTING MANHOLES, INLET STRUCTURES, AND SANITARY CLEANOUT TOPS MUST BE ADJUSTED, AS NECESSARY, TO MATCH PROPOSED GRADES IN ACCORDANCE WITH ALL APPLICABLE STANDARDS, REQUIREMENTS, RULES, STATUTES, LAWS, ORDINANCES AND CODES.
15. DURING THE INSTALLATION OF SANITARY SEWER, STORM SEWER, AND ALL UTILITIES, THE CONTRACTOR MUST MAINTAIN A CONTEMPORANEOUS AND THOROUGH RECORD OF CONSTRUCTION TO IDENTIFY THE AS-INSTALLED LOCATIONS OF ALL UNDERGROUND INFRASTRUCTURE. THE CONTRACTOR MUST CAREFULLY NOTE ANY INSTALLATIONS THAT DEVIATE FROM THE INFORMATION CONTAINED IN THE UTILITY PLAN. THIS RECORD MUST BE KEPT ON A CLEAN COPY OF THE DRAINAGE OR UTILITY PLAN, WHICH CONTRACTOR MUST PROMPTLY PROVIDE TO THE OWNER AT THE COMPLETION OF WORK.
16. WHEN THE SITE IMPROVEMENT PLANS INVOLVE MULTIPLE BUILDINGS, SOME OF WHICH MAY BE BUILT AT A LATER DATE, THE CONTRACTOR MUST EXTEND ALL LINES, INCLUDING BUT NOT LIMITED TO STORM SEWER, SANITARY SEWER, UTILITIES, AND IRRIGATION LINE, TO A POINT AT LEAST FIVE (5) FEET BEYOND THE PAVED AREAS FOR WHICH THE CONTRACTOR IS RESPONSIBLE. CONTRACTOR MUST CAP ENDS AS APPROPRIATE, MARK LOCATIONS WITH A 2X4, AND MUST NOTE THE LOCATION OF ALL OF THE ABOVE ON A CLEAN COPY OF THE DRAINAGE OR UTILITY PLAN, WHICH CONTRACTOR MUST PROMPTLY PROVIDE TO THE OWNER UPON COMPLETION OF THE WORK.
17. THE CONTRACTOR IS FULLY RESPONSIBLE FOR VERIFICATION OF EXISTING TOPOGRAPHIC INFORMATION AND UTILITY INVERT ELEVATIONS PRIOR TO COMMENCING ANY CONSTRUCTION. CONTRACTOR MUST CONFIRM AND ENSURE 0.75% MINIMUM SLOPE AGAINST ALL ISLANDS, GUTTERS, AND CURBS; 1.0% ON ALL CONCRETE SURFACES; AND 1.5% MINIMUM ON ASPHALT (EXCEPT WHERE ADA REQUIREMENTS OR EXISTING TOPOGRAPHY LIMIT GRADES), TO PREVENT PONDING. CONTRACTOR MUST IMMEDIATELY IDENTIFY, IN WRITING TO THE ENGINEER, ANY DISCREPANCIES THAT MAY OR COULD AFFECT THE PUBLIC SAFETY, HEALTH OR GENERAL WELFARE, OR PROJECT COST. IF CONTRACTOR PROCEEDS WITH CONSTRUCTION WITHOUT PROVIDING PROPER NOTIFICATION, MUST BE AT THE CONTRACTOR'S OWN RISK AND, FURTHER, CONTRACTOR SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS THE DESIGN ENGINEER FOR ANY DAMAGES, COSTS, INJURIES, ATTORNEY'S FEES AND THE LIKE WHICH RESULT FROM SAME.
18. PROPOSED TOP OF CURB ELEVATIONS ARE GENERALLY 6" ABOVE EXISTING LOCAL ASPHALT GRADE UNLESS OTHERWISE NOTED. FIELD ADJUST TO CREATE A MINIMUM OF .075% GUTTER GRADE ALONG CURB FACE. IT IS CONTRACTOR'S OBLIGATION TO ENSURE THAT DESIGN ENGINEER APPROVES FINAL CURBING CUT SHEETS PRIOR TO INSTALLATION OF SAME.
19. REFER TO THIS SHEET FOR ADDITIONAL NOTES.
20. IN THE EVENT OF DISCREPANCIES AND/OR CONFLICTS BETWEEN PLANS OR RELATIVE TO OTHER PLANS, THE SITE PLAN WILL TAKE PRECEDENCE AND CONTROL. CONTRACTOR MUST IMMEDIATELY NOTIFY THE DESIGN ENGINEER, IN WRITING, OF ANY DISCREPANCIES AND/OR CONFLICTS.
21. CONTRACTOR IS REQUIRED TO SECURE ALL NECESSARY AND/OR REQUIRED PERMITS AND APPROVALS FOR ALL OFF SITE MATERIAL SOURCES AND DISPOSAL FACILITIES. CONTRACTOR MUST SUPPLY A COPY OF APPROVALS TO ENGINEER AND OWNER PRIOR TO INITIATING WORK ANY WORK.
22. WHERE RETAINING WALLS (WHETHER OR NOT THEY MEET THE JURISDICTIONAL DEFINITION) ARE IDENTIFIED ON PLANS, ELEVATIONS IDENTIFIED ARE FOR THE EXPOSED PORTION OF THE WALL. WALL FOOTINGS/FOUNDATION ELEVATIONS ARE NOT IDENTIFIED HEREIN AND ARE TO BE SET/DETERMINED BY THE CONTRACTOR BASED ON FINAL STRUCTURAL DESIGN SHOP DRAWINGS PREPARED BY THE APPROPRIATE PROFESSIONAL LICENSED IN THE STATE WHERE THE CONSTRUCTION OCCURS.
23. STORM DRAINAGE PIPE:UNLESS INDICATED OTHERWISE, ALL STORM SEWER PIPE MUST BE REINFORCED CONCRETE PIPE (RCP) CLASS III WITH SILT TIGHT JOINTS. WHEN HIGH-DENSITY POLYETHYLENE PIPE (HDPE) IS CALLED FOR ON THE PLANS, IT MUST CONFORM TO AASHTO M294 AND TYPE S (SMOOTH INTERIOR WITH ANGULAR CORRUGATIONS) WITH GASKET FOR SILT TIGHT JOINT. PVC PIPE FOR ROOF DRAIN CONNECTION MUST BE SDR 26 OR SCHEDULE 40 UNLESS INDICATED OTHERWISE.
24. SANITARY SEWER PIPE MUST BE POLYVINYL CHLORIDE (PVC) SDR 35 EXCEPT WHERE INDICATED OTHERWISE. SANITARY LATERAL MUST BE PVC SCHEDULE 40 OR PVC SDR 26 UNLESS INDICATED, IN WRITING, OTHERWISE.
25. STORM AND SANITARY SEWER PIPE LENGTHS INDICATED ARE NOMINAL AND MEASURED CENTER OF INLET AND/OR MANHOLES STRUCTURE TO CENTER OF STRUCTURE.
26. STORMWATER ROOF DRAIN LOCATIONS ARE BASED ON PRELIMINARY ARCHITECTURAL PLANS. CONTRACTOR IS RESPONSIBLE TO AND FOR VERIFYING LOCATIONS OF SAME BASED ON FINAL ARCHITECTURAL PLANS.
27. SEWERS CROSSING STREAMS AND/OR LOCATION WITHIN 10 FEET OF THE STREAM EMBANKMENT, OR WHERE SITE CONDITIONS SO INDICATE, MUST BE CONSTRUCTED OF STEEL, REINFORCED CONCRETE, DUCTILE IRON OR OTHER SUITABLE MATERIAL.

    SEWERS CONVEYING SANITARY FLOW COMBINED SANITARY AND STORMWATER FLOW OR INDUSTRIAL FLOW MUST BE SEPARATED FROM WATER MAINS BY A DISTANCE OF AT LEAST 10 FEET HORIZONTALLY. IF SUCH LATERAL SEPARATION IS NOT POSSIBLE, THE PIPES MUST BE IN SEPARATE TRENCHES WITH THE SEWER AT LEAST 18 INCHES BELOW THE BOTTOM OF THE WATER MAIN, OR SUCH OTHER SEPARATION AS APPROVED BY THE GOVERNMENT AGENCY WITH JURISDICTION OVER SAME.

    - WHERE APPROPRIATE SEPARATION FROM A WATER MAIN IS NOT POSSIBLE, THE SEWER MUST BE ENCASED IN CONCRETE, OR CONSTRUCTED OF DUCTILE IRON PIPE USING MECHANICAL OR SLIP-ON JOINTS FOR A DISTANCE OF AT LEAST 10 FEET ON EITHER SIDE OF THE CROSSING. IN ADDITION, ONE FULL LENGTH OF SEWER PIPE SHOULD BE LOCATED SO BOTH JOINTS WILL BE AS FAR FROM THE WATER LINE AS POSSIBLE. WHERE A WATER MAIN CROSSES UNDER A SEWER, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWER MUST BE PROVIDED.

28. WATER MAIN PIPING MUST BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS AND SPECIFICATIONS OF THE LOCAL WATER PURVEYOR. IN THE ABSENCE OF SUCH REQUIREMENTS, WATER MAIN PIPING MUST BE CEMENT-LINED DUCTILE IRON (DIP) MINIMUM CLASS 52 THICKNESS. ALL PIPE AND APPURTENANCES MUST COMPLY WITH THE APPLICABLE AWWA STANDARDS IN EFFECT AT THE TIME OF APPLICATION.
29. CONTRACTOR MUST ENSURE THAT ALL UTILITY TRENCHES LOCATED IN EXISTING PAVED ROADWAYS INCLUDING SEWER, WATER AND STORM SYSTEMS, MUST BE REPAIRED IN ACCORDANCE WITH REFERENCED MUNICIPAL, COUNTY AND/OR DOT DETAILS AS APPLICABLE. CONTRACTOR MUST COORDINATE INSPECTION AND APPROVAL OF COMPLETED WORK WITH THE AGENCY WITH JURISDICTION OVER SAME.
30. WHERE BASEMENTS ARE TO BE PROVIDED FOR PROPOSED DWELLING UNITS, THE DEVELOPER SHALL, BY BORING OR BY TEST PIT, DETERMINE THE DEPTH TO GROUNDWATER AT THE LOCATION OF THE PROPOSED DWELLINGS. WHERE GROUNDWATER IS ENCOUNTERED IN THE BASEMENT AREA, BASEMENTS WILL NOT BE INSTALLED UNLESS SPECIAL CONSTRUCTION METHODS ARE UTILIZED, TO BE REVIEWED AND APPROVED BY THE MUNICIPAL CONSTRUCTION CODE OFFICIAL. IF AND WHERE SUMP PUMPS ARE INSTALLED, ALL DISCHARGES MUST BE CONNECTED TO THE STORM SEWER. A CLEANOUT MUST BE PROVIDED PRIOR TO THE CONNECTION TO THE STORM DRAIN IN ORDER THAT BLOCKAGES CAN BE ADDRESSED.
31. LOCATION OF PROPOSED UTILITY POLE RELOCATION IS AT THE SOLE DISCRETION OF UTILITY COMPANY.
32. CONSULTANT IS NEITHER LIABLE NOR RESPONSIBLE FOR ANY SUBSURFACE CONDITIONS AND FURTHER, SHALL HAVE NO LIABILITY FOR ANY HAZARDOUS MATERIALS, HAZARDOUS SUBSTANCES, OR POLLUTANTS ON, ABOUT OR UNDER THE PROPERTY.

GENERAL DEMOLITION NOTES

1. THIS PLAN REFERENCES DOCUMENTS AND INFORMATION BY:

   BOUNDARY & TOPOGRAPHIC SURVEY, SEB, LLC,
   416 CAMBRIDGE STREET
   TOWN OF WINCHESTER AND CITY OF WOBURN
   MIDDLESEX COUNTY, COMMONWEALTH OF MASSACHUSETTS
   PREPARED BY:CONTROL POINT ASSOCIATES, INC.
   SOUTHBOROUGH, MA
   REVISED 6-22-15

2. CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970, (29 U.S.C. 651 et seq.), AS AMENDED AND ANY MODIFICATIONS, AMENDMENTS OR REVISIONS TO SAME.
3. BOHLER ENGINEERING HAS NO CONTRACTUAL, LEGAL, OR OTHER RESPONSIBILITY FOR JOB SITE SAFETY OR JOB SITE SUPERVISION, OR ANYTHING RELATED TO SAME.
4. THE DEMOLITION PLAN IS INTENDED TO PROVIDE GENERAL INFORMATION, ONLY, REGARDING ITEMS TO BE DEMOLISHED AND/OR REMOVED. THE CONTRACTOR MUST ALSO REVIEW THE OTHER SITE PLAN DRAWINGS AND INCLUDE IN DEMOLITION ACTIVITIES ALL INCIDENTAL WORK NECESSARY FOR THE CONSTRUCTION OF THE NEW SITE IMPROVEMENTS.
5. CONTRACTOR MUST RAISE ANY QUESTIONS CONCERNING THE ACCURACY OR INTENT OF THESE PLANS OR SPECIFICATIONS, CONCERNS REGARDING THE APPLICABLE SAFETY STANDARDS, OR THE SAFETY OF THE CONTRACTOR OR THIRD PARTIES IN PERFORMING THE WORK ON THIS PROJECT, WITH BOHLER ENGINEERING, IN WRITING, AND RESPONDED TO BY BOHLER, IN WRITING, PRIOR TO THE INITIATION OF ANY SITE ACTIVITY AND ANY DEMOLITION ACTIVITY. ALL DEMOLITION ACTIVITIES MUST BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THESE PLANS AND SPECIFICATIONS AND ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS, RULES, REQUIREMENTS, STATUTES, ORDINANCES AND CODES.
6. PRIOR TO STARTING ANY DEMOLITION, CONTRACTOR IS RESPONSIBLE FOR/TO:

   A. OBTAINING ALL REQUIRED PERMITS AND MAINTAINING THE SAME ON SITE FOR REVIEW BY THE ENGINEER AND OTHER PUBLIC AGENCIES WITH JURISDICTION THROUGHOUT THE DURATION OF THE PROJECT, SITE WORK, AND DEMOLITION WORK.

   B. NOTIFYING, AT A MINIMUM, THE MUNICIPAL ENGINEER, DESIGN ENGINEER, AND LOCAL SOIL CONSERVATION DISTRICT, 72 HOURS PRIOR TO THE START OF WORK.

   C. INSTALLING THE REQUIRED SOIL EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO SITE DISTURBANCE.

   D. IN ACCORDANCE WITH STATE LAW, THE CONTRACTOR MUST CALL THE STATE ONE-CALL DAMAGE PROTECTION SYSTEM FOR UTILITY MARKOUT, IN ADVANCE OF ANY EXCAVATION.

   E. LOCATING AND PROTECTING ALL UTILITIES AND SERVICES, INCLUDING BUT NOT LIMITED TO GAS, WATER, ELECTRIC, SANITARY AND STORM SEWER, TELEPHONE, CABLE, FIBER OPTIC CABLE, ETC. WITHIN AND ADJACENT TO THE LIMITS OF PROJECT ACTIVITIES. THE CONTRACTOR MUST USE AND COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE UTILITY NOTIFICATION SYSTEM TO LOCATE ALL THE UNDERGROUND UTILITIES.

   F. PROTECTING AND MAINTAINING IN OPERATION, ALL ACTIVE UTILITIES AND SYSTEMS THAT ARE NOT BEING REMOVED DURING ALL DEMOLITION ACTIVITIES.

   G. ARRANGING FOR AND COORDINATING WITH THE APPLICABLE UTILITY SERVICE PROVIDER(S) FOR THE TEMPORARY OR PERMANENT TERMINATION OF SERVICE REQUIRED BY THE PROJECT PLANS AND SPECIFICATIONS. THE CONTRACTOR MUST PROVIDE THE UTILITY ENGINEER AND OWNER WRITTEN NOTIFICATION THAT THE EXISTING UTILITIES AND SERVICES HAVE BEEN TERMINATED AND ABANDONED IN ACCORDANCE WITH JURISDICTIONAL AND UTILITY COMPANY REQUIREMENTS.

   H. COORDINATION WITH UTILITY COMPANIES REGARDING WORKING "OFF-PEAK" HOURS OR ON WEEKENDS AS MAY BE REQUIRED TO MINIMIZE THE IMPACT ON THE AFFECTED PARTIES. WORK REQUIRED TO BE DONE "OFF-PEAK" IS TO BE DONE AT NO ADDITIONAL COST TO THE OWNER.

   I. IN THE EVENT THE CONTRACTOR DISCOVERS ANY HAZARDOUS MATERIAL, THE REMOVAL OF WHICH IS NOT ADDRESSED IN THE PROJECT PLANS AND SPECIFICATIONS, THE CONTRACTOR MUST IMMEDIATELY CEASE ALL WORK AND IMMEDIATELY NOTIFY THE OWNER AND ENGINEER OF THE DISCOVERY OF SUCH MATERIALS.

7. THE FIRM OR ENGINEER OF RECORD IS NOT RESPONSIBLE FOR JOB SITE SAFETY OR SUPERVISION. CONTRACTOR MUST PROCEED WITH THE DEMOLITION IN A SYSTEMATIC AND SAFE MANNER, FOLLOWING ALL THE OSHA REQUIREMENTS, TO ENSURE PUBLIC AND CONTRACTOR SAFETY.
8. THE CONTRACTOR MUST PROVIDE ALL "MEANS AND METHODS" NECESSARY TO PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF EXISTING STRUCTURES, AND ANY OTHER IMPROVEMENTS THAT ARE REMAINING ON OR OFF SITE. THE CONTRACTOR IS RESPONSIBLE FOR ALL REPAIRS OF DAMAGE TO ALL ITEMS THAT ARE TO REMAIN. CONTRACTOR MUST USE NEW MATERIAL FOR ALL REPAIRS. CONTRACTOR'S REPAIR MUST INCLUDE THE RESTORATION OF ANY ITEMS REPAIRED TO THE PRE-DEMOLITION CONDITION, OR BETTER. CONTRACTOR SHALL PERFORM ALL REPAIRS AT THE CONTRACTOR'S SOLE EXPENSE.
9. THE CONTRACTOR MUST NOT PERFORM ANY EARTH MOVEMENT ACTIVITIES, DEMOLITION OR REMOVAL OF FOUNDATION WALLS, FOOTINGS, OR OTHER MATERIALS WITHIN THE LIMITS OF DISTURBANCE UNLESS SAME IS IN STRICT ACCORDANCE AND CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, AND/OR UNDER THE WRITTEN DIRECTION OF THE OWNER'S STRUCTURAL OR GEOTECHNICAL ENGINEER.
10. CONTRACTOR MUST BACKFILL ALL EXCAVATION RESULTING FROM, OR INCIDENTAL TO, DEMOLITION ACTIVITIES. BACKFILL MUST BE ACCOMPLISHED WITH APPROVED BACKFILL MATERIALS, AND MUST BE SUFFICIENTLY COMPACTED TO SUPPORT NEW IMPROVEMENTS AND PERFORMED IN COMPLIANCE WITH THE RECOMMENDATIONS AND GUIDANCE IN THE GEOTECHNICAL REPORT. BACKFILLING MUST OCCUR IMMEDIATELY AFTER DEMOLITION ACTIVITIES, AND MUST BE DONE SO AS TO PREVENT WATER ENTERING THE EXCAVATION. FINISHED SURFACES MUST BE GRADED TO PROMOTE POSITIVE DRAINAGE.
11. EXPLOSIVES MUST NOT BE USED WITHOUT PRIOR WRITTEN CONSENT OF BOTH THE OWNER AND ALL APPLICABLE GOVERNMENTAL AUTHORITIES. ALL THE REQUIRED PERMITS AND EXPLOSIVE CONTROL MEASURES THAT ARE REQUIRED BY THE FEDERAL, STATE, AND LOCAL GOVERNMENTS MUST BE IN PLACE PRIOR TO CONTRACTOR STARTING AN EXPLOSIVE PROGRAM AND/OR ANY DEMOLITION. THE CONTRACTOR IS ALSO RESPONSIBLE FOR ALL INSPECTION AND SEISMIC VIBRATION TESTING THAT IS REQUIRED TO MONITOR THE EFFECTS ON ALL LOCAL STRUCTURES.
12. CONTRACTOR MUST PROVIDE TRAFFIC CONTROL AND GENERALLY ACCEPTED SAFE PRACTICES IN CONFORMANCE WITH THE CURRENT FHWA "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD), AND THE FEDERAL, STATE, AND LOCAL REGULATIONS WHEN DEMOLITION RELATED ACTIVITIES IMPACT ROADWAYS AND/OR ROADWAY RIGHT-OF-WAY.
13. CONTRACTOR MUST CONDUCT DEMOLITION ACTIVITIES IN SUCH A MANNER TO ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, SIDEWALKS, WALKWAYS, AND OTHER ADJACENT FACILITIES. STREET CLOSURE PERMITS MUST BE RECEIVED FROM THE APPROPRIATE GOVERNMENTAL AUTHORITY PRIOR TO THE COMMENCEMENT OF ANY ROAD OPENING OR DEMOLITION ACTIVITIES IN OR ADJACENT TO THE RIGHT-OF-WAY.
14. DEMOLITION ACTIVITIES AND EQUIPMENT MUST NOT USE AREAS OUTSIDE THE DEFINED PROJECT LIMIT LINE, WITHOUT WRITTEN PERMISSION OF THE OWNER AND ALL GOVERNMENTAL AGENCIES WITH JURISDICTION.
15. THE CONTRACTOR MUST USE DUST CONTROL MEASURES TO LIMIT AIRBORNE DUST AND DIRT RISING AND SCATTERING IN THE AIR IN ACCORDANCE WITH FEDERAL, STATE, AND/OR LOCAL STANDARDS. AFTER THE DEMOLITION IS COMPLETE, CONTRACTOR MUST CLEAN ALL ADJACENT STRUCTURES AND IMPROVEMENTS TO REMOVE ALL DUST AND DEBRIS CAUSED BY THE DEMOLITION OPERATIONS. THE CONTRACTOR IS RESPONSIBLE FOR RETURNING ALL ADJACENT AREAS TO THEIR "PRE-DEMOLITION" CONDITION.
16. CONTRACTOR IS RESPONSIBLE TO SAFEGUARD THE SITE AS NECESSARY TO PERFORM THE DEMOLITION IN SUCH A MANNER AS TO PREVENT THE ENTRY OF UNAUTHORIZED PERSONS AT ANY TIME.
17. CONTRACTOR IS RESPONSIBLE FOR SITE JOB SAFETY, WHICH MUST INCLUDE, BUT NOT BE LIMITED TO, THE INSTALLATION AND MAINTENANCE OF BARRIERS, FENCING AND OTHER APPROPRIATE SAFETY ITEMS NECESSARY TO PROTECT THE PUBLIC FROM AREAS OF CONSTRUCTION AND CONSTRUCTION ACTIVITY.
18. THIS DEMOLITION PLAN IS INTENDED TO IDENTIFY THOSE EXISTING ITEMS/CONDITIONS WHICH ARE TO BE REMOVED. IT IS NOT INTENDED TO PROVIDE DIRECTION AS TO THE MEANS, METHODS, SEQUENCING, TECHNIQUES AND PROCEDURES TO BE USED TO ACCOMPLISH THAT WORK. ALL MEANS, METHODS, SEQUENCING, TECHNIQUES AND PROCEDURES TO BE USED MUST BE IN STRICT ACCORDANCE WITH ALL STATE, FEDERAL, LOCAL, AND JURISDICTIONAL REQUIREMENTS. THE CONTRACTOR MUST COMPLY WITH ALL OSHA AND OTHER SAFETY PRECAUTIONS NECESSARY TO PROVIDE A SAFE WORK SITE.
19. DEBRIS MUST NOT BE BURIED ON THE SUBJECT SITE. ALL DEMOLITION WASTES AND DEBRIS (SOLID WASTE) MUST BE DISPOSED OF IN ACCORDANCE WITH ALL MUNICIPAL, COUNTY, STATE, AND FEDERAL LAWS AND APPLICABLE CODES. THE CONTRACTOR MUST MAINTAIN RECORDS TO DEMONSTRATE PROPER DISPOSAL ACTIVITIES, TO BE PROMPTLY PROVIDED TO THE OWNER UPON REQUEST.
20. CONTRACTOR MUST MAINTAIN A RECORD SET OF PLANS UPON WHICH IS INDICATED THE LOCATION OF EXISTING UTILITIES THAT ARE CAPPED, ABANDONED IN PLACE, OR RELOCATED DUE TO DEMOLITION ACTIVITIES. THIS RECORD DOCUMENT MUST BE PREPARED IN A NEAT AND WORKMAN-LIKE MANNER, AND TURNED OVER TO THE OWNER/DEVELOPER UPON COMPLETION OF THE WORK.

ADA INSTRUCTIONS TO CONTRACTOR:

CONTRACTORS MUST EXERCISE APPROPRIATE CARE AND PRECISION IN CONSTRUCTION OF ADA (HANDICAP) ACCESSIBLE COMPONENTS AND ACCESS ROUTES FOR THE SITE. THESE COMPONENTS, AS CONSTRUCTED, MUST COMPLY WITH ALL APPLICABLE STATE AND LOCAL ACCESSIBILITY LAWS AND REGULATIONS AND THE CURRENT ADA AND/OR STATE ARCHITECTURAL ACCESS BOARD STANDARDS AND REGULATIONS' BARRIER FREE ACCESS AND ANY MODIFICATIONS, REVISIONS OR UPDATES TO SAME. FINISHED SURFACES ALONG THE ACCESSIBLE ROUTE OF TRAVEL FROM PARKING SPACE, PUBLIC TRANSPORTATION, PEDESTRIAN ACCESS, INTER-BUILDING ACCESS, TO POINTS OF ACCESSIBLE BUILDING ENTRANCE/EXIT, MUST COMPLY WITH THESE ADA AND/OR ARCHITECTURAL ACCESS BOARD CODE REQUIREMENTS. THESE INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING:

- PARKING SPACES AND PARKING AISLES - SLOPE SHALL NOT EXCEED 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) IN ANY DIRECTION.
- CURB RAMPS - SLOPE MUST NOT EXCEED 1:12 (8.3%) FOR A MAXIMUM OF SIX (6) FEET.
- LANDINGS - MUST BE PROVIDED AT EACH END OF RAMPS, MUST PROVIDE POSITIVE DRAINAGE, AND MUST NOT EXCEED 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) IN ANY DIRECTION.
- PATH OF TRAVEL ALONG ACCESSIBLE ROUTE - MUST PROVIDE A 36-INCH OR GREATER UNOBSTRUCTED WIDTH OF TRAVEL (CAR OVERHANGS AND/OR HANDRAILS CANNOT REDUCE THIS MINIMUM WIDTH). THE SLOPE MUST BE NO GREATER THAN 1:20 (5.0%) IN THE DIRECTION OF TRAVEL, AND MUST NOT EXCEED 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) IN CROSS SLOPE. WHERE PATH OF TRAVEL WILL BE GREATER THAN 1:20 (5.0%), ADA RAMP MUST BE ADHERED TO. A MAXIMUM SLOPE OF 1:12 (8.3%), FOR A MAXIMUM RISE OF 2.5 FEET, MUST BE PROVIDED. THE RAMP MUST HAVE ADA HAND RAILS AND "LEVEL" LANDINGS ON EACH END THAT ARE CROSS SLOPED NO MORE THAN 1:50 IN ANY DIRECTION (1/4" PER FOOT OR NOMINALLY 2.0%) FOR POSITIVE DRAINAGE.
- DOORWAYS - MUST HAVE A "LEVEL" LANDING AREA ON THE EXTERIOR SIDE OF THE DOOR THAT IS SLOPED AWAY FROM THE DOOR NO MORE THAN 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) FOR POSITIVE DRAINAGE. THIS LANDING AREA MUST BE NO LESS THAN 60 INCHES (5 FEET) LONG, EXCEPT WHERE OTHERWISE PERMITTED BY ADA STANDARDS FOR ALTERNATIVE DOORWAY OPENING CONDITIONS. (SEE ICC/ANSI A117.1-2003 AND OTHER REFERENCED INCORPORATED BY CODE.)
- WHEN THE PROPOSED CONSTRUCTION INVOLVES RECONSTRUCTION, MODIFICATION, REVISION OR EXTENSION OF OR TO ADA COMPONENTS FROM EXISTING DOORWAYS OR SURFACES, CONTRACTOR MUST VERIFY EXISTING ELEVATIONS SHOWN ON THE PLAN. NOTE THAT TABLE 405.2 OF THE DEPARTMENT OF JUSTICE'S ADA STANDARDS FOR ACCESSIBLE DESIGN ALLOWS FOR STEEPER RAMP SLOPES, IN RARE CIRCUMSTANCES. THE CONTRACTOR MUST IMMEDIATELY NOTIFY THE DESIGN ENGINEER OF ANY DISCREPANCIES AND/OR FIELD CONDITIONS THAT DIFFER IN ANY WAY OR ANY RESPECT FROM WHAT IS SHOWN ON THE PLANS, IN WRITING, BEFORE COMMENCEMENT OF WORK. CONSTRUCTED IMPROVEMENTS MUST FALL WITHIN THE MAXIMUM AND MINIMUM LIMITATIONS IMPOSED BY THE BARRIER FREE REGULATIONS AND THE ADA REQUIREMENTS.
- THE CONTRACTOR MUST VERIFY THE SLOPES OF CONTRACTOR'S FORMS PRIOR TO POURING CONCRETE. IF ANY NON-CONFORMANCE IS OBSERVED OR EXISTS, CONTRACTOR MUST IMMEDIATELY NOTIFY THE ENGINEER PRIOR TO POURING CONCRETE. CONTRACTOR IS RESPONSIBLE FOR ALL COSTS TO REMOVE, REPAIR AND REPLACE NON-CONFORMING CONCRETE.

IT IS STRONGLY RECOMMENDED THAT THE CONTRACTOR REVIEW THE INTENDED CONSTRUCTION WITH THE LOCAL BUILDING CODE PRIOR TO COMMENCEMENT OF CONSTRUCTION.

TYPICAL ABBREVIATIONS

KEY	DESCRIPTION	KEY	DESCRIPTION
BC	BOTTOM CURB	PROP.	PROPOSED
TC	TOP CURB	TBR/R	TO BE REMOVED AND REPLACED
BOC	BACK OF CURB	TBR	TO BE REMOVED
BW	BOTTOM OF WALL GRADE	TPF	TREE PROTECTION FENCE
TW	TOP OF WALL	BLDG.	BUILDING
EXIST.	EXISTING	SF	SQUARE FEET
BM.	BENCHMARK	SMH	SEWER MANHOLE
EOP	EDGE OF PAVEMENT	DMH	DRAIN MANHOLE
℄	CENTERLINE	STM.	STORM
FF.	FINISHED FLOOR	SAN.	SANITARY
V.I.F.	VERIFY IN FIELD	CONC.	CONCRETE
GC	GENERAL CONTRACTOR	ARCH.	ARCHITECTURAL
HP.	HIGH POINT	DEP.	DEPRESSED
LP.	LOW POINT	H'CAP.	HANDICAP
TYP.	TYPICAL	MIN.	MINIMUM
INT.	INTERSECTION	MAX.	MAXIMUM
PC.	POINT OF CURVATURE	No. / #	NUMBER
PT.	POINT OF TANGENCY	W.	WIDE
PI.	POINT OF INTERSECTION	DEC.	DECORATIVE
PVI.	POINT OF VERTICAL INTERSECTION	ELEV.	ELEVATION
STA.	STATION	UNG.	UNDERGROUND
GRT	GRATE	R.O.W.	RIGHT OF WAY
INV.	INVERT	LF	LINEAR FOOT
DIP	DUCTILE IRON PIPE	LOD	LIMIT OF DISTURBANCE
PVC	POLYVINYL CHLORIDE PIPE	LOW	LIMIT OF WORK
HDPE.	HIGH DENSITY POLYETHYLENE PIPE	L.S.A.	LANDSCAPED AREA
RCP	REINFORCED CONCRETE PIPE	±	PLUS OR MINUS
S	SLOPE	°	DEGREE
ME	MEET EXISTING	Ø / DIA.	DIAMETER
		R	RADIUS

TYPICAL LEGEND

EXISTING		PROPOSED
	PROPERTY LINE	
	SETBACK	
	EASEMENT	
	CURB	
	STORM MANHOLE	
	SEWER MANHOLE	
	CATCH BASIN	
WF#5	WETLAND FLAG	
	WETLAND LINE	
× 54.83	SPOT ELEVATION	53.52
× TC 54.58 G 53.78	TOP & BOTTOM OF CURB	TC=54.32 BC=53.82
53	CONTOUR	50
	FLOW ARROW	5%
	PAINTED ARROW	
	RIDGE LINE	
G G	GAS LINE	G G
T T	TELEPHONE LINE	T T
E E	ELECTRIC LINE	E E
W W	WATER LINE	W W
OH OH	OVERHEAD WIRE	OH OH
	STORM PIPE	
	SANITARY LINE	S S
10	PARKING COUNT	3
	SIGN	
	LIGHT POLE	
	GUIDE RAIL	
	UTILITY POLE	

REFER TO SITE PLAN FOR ZONING ANALYSIS TABLE AND LAND USE/ ZONING INFORMATION & NOTES

REFER TO SOIL EROSION CONTROL NOTES & DETAILS FOR TYPICAL EROSION NOTES AND DETAILS

REFER TO LANDSCAPE NOTES & DETAILS FOR TYPICAL LANDSCAPE NOTES AND DETAILS

REFER TO LIGHTING PLAN PLAN FOR TYPICAL LIGHTING NOTES AND TABLES

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CHECKED BY:	JAK
DATE:	07/06/15
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CAD I.D.:	W141161SS0

PROJECT:

SITE DEVELOPMENT PLANS
—FOR—
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER &
CITY OF WOBURN
MIDDLESEX COUNTY
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J.A. KUCICH
PROFESSIONAL ENGINEER
JOHN A. KUCICH CIVIL No. 41530

SHEET TITLE:

GENERAL NOTES SHEET

SHEET NUMBER:

2

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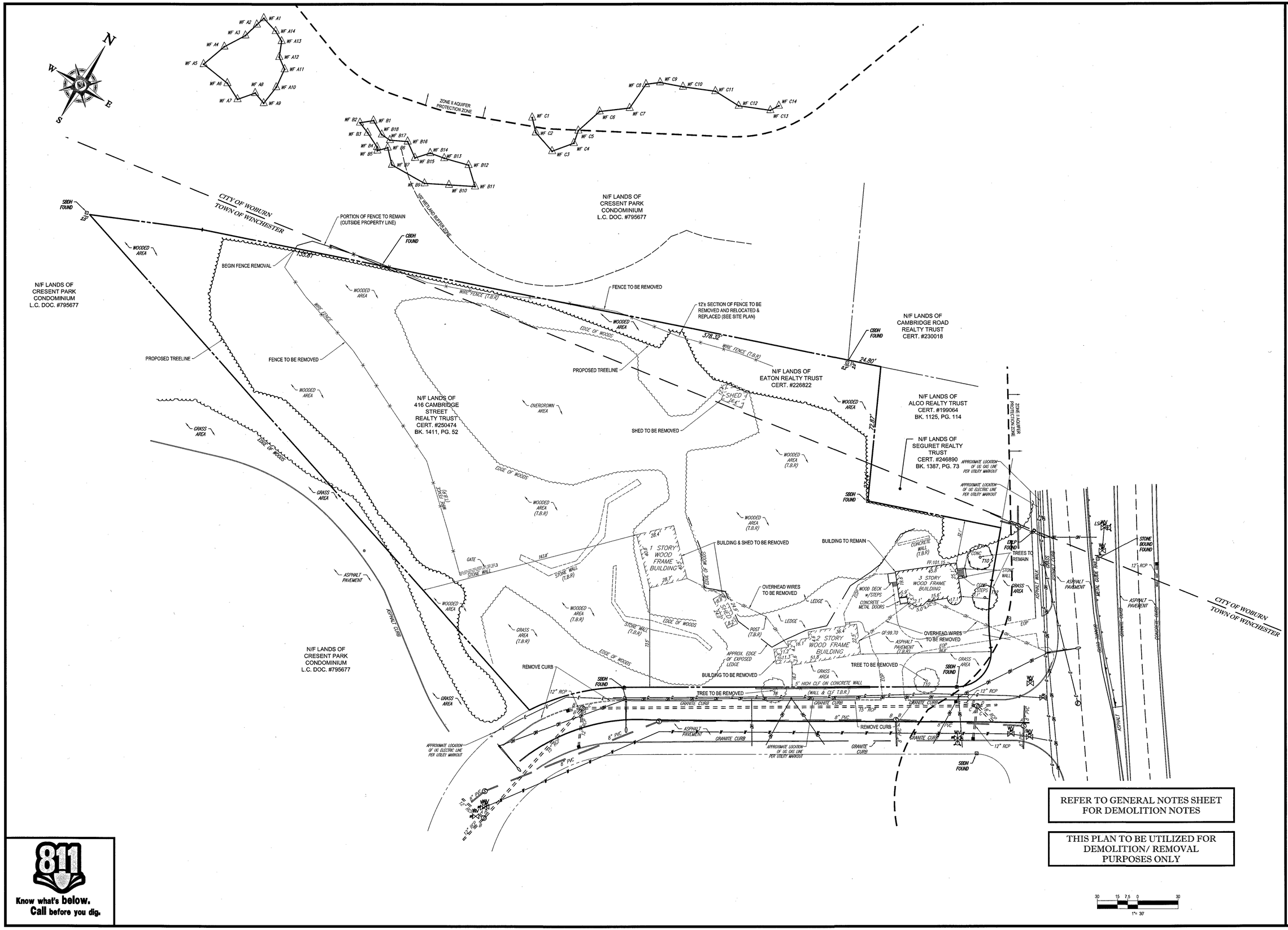

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SITE DEVELOPMENT PLANS

FOR

FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

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J. ALAN KUCICH
COMMONWEALTH OF MASSACHUSETTS
JOHN A. KUCICH
No. 41530
CIVIL
PROFESSIONAL ENGINEER
COMMONWEALTH OF PENNSYLVANIA No. 72553

SHEET TITLE:

DEMOLITION PLAN

SHEET NUMBER:
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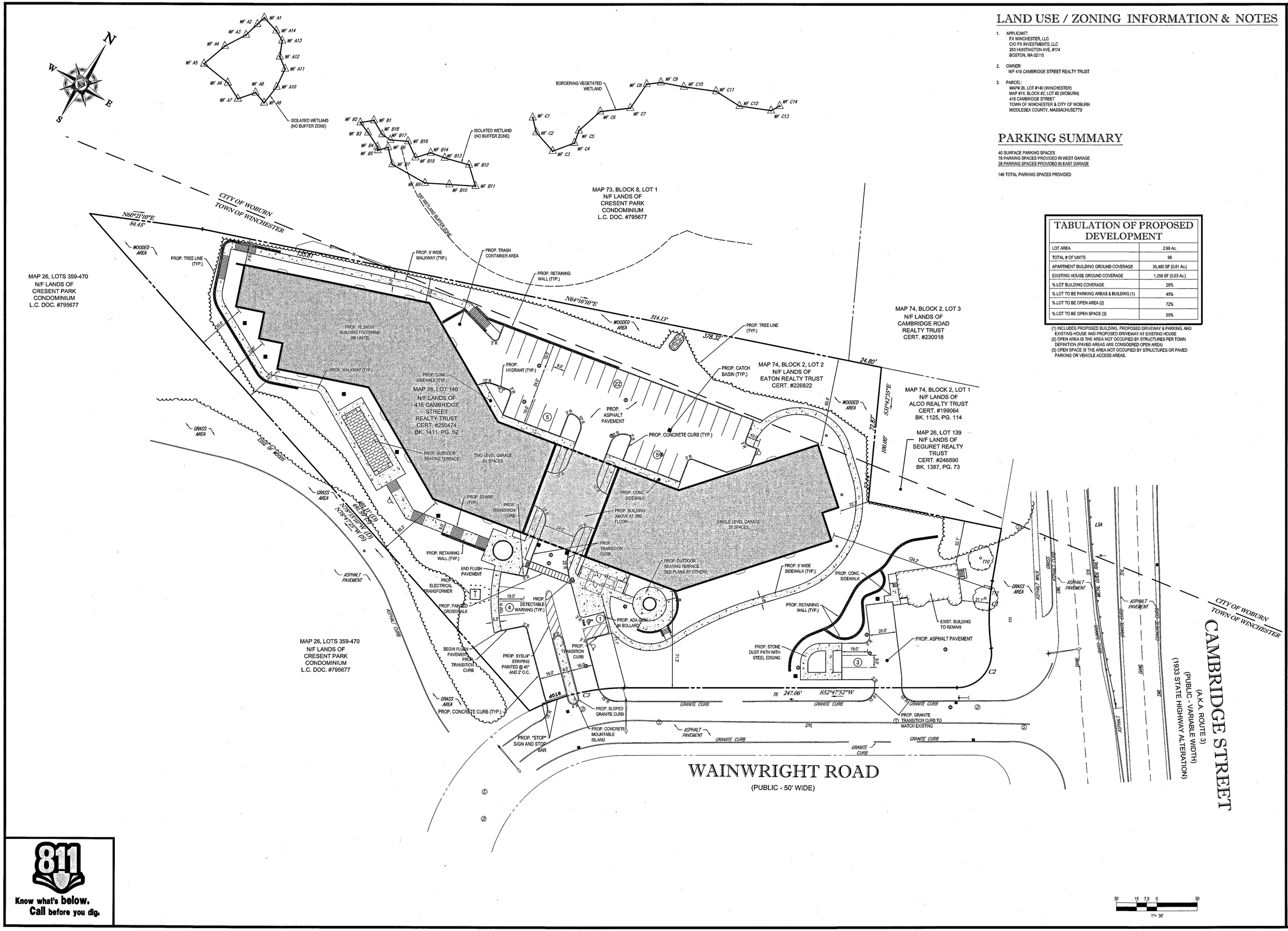

LAND USE / ZONING INFORMATION & NOTES

1. APPLICANT:
   FX WINCHESTER, LLC
   C/O PX INVESTMENTS, LLC
   263 HUNTINGTON AVE, #174
   BOSTON, MA 02115
2. OWNER:
   N/F 416 CAMBRIDGE STREET REALTY TRUST
3. PARCEL:
   MAP# 26, LOT #140 (WINCHESTER)
   MAP #74, BLOCK #2, LOT #2 (WOBURN)
   416 CAMBRIDGE STREET
   TOWN OF WINCHESTER & CITY OF WOBURN
   MIDDLESEX COUNTY, MASSACHUSETTS

PARKING SUMMARY

40 SURFACE PARKING SPACES
78 PARKING SPACES PROVIDED IN WEST GARAGE
28 PARKING SPACES PROVIDED IN EAST GARAGE

146 TOTAL PARKING SPACES PROVIDED

TABULATION OF PROPOSED DEVELOPMENT

LOT AREA	2.99 Ac.
TOTAL # OF UNITS	96
APARTMENT BUILDING GROUND COVERAGE	35,490 SF (0.81 Ac.)
EXISTING HOUSE GROUND COVERAGE	1,259 SF (0.03 Ac.)
% LOT BUILDING COVERAGE	28%
% LOT TO BE PARKING AREAS & BUILDING (1)	45%
% LOT TO BE OPEN AREA (2)	72%
% LOT TO BE OPEN SPACE (3)	55%

(1) INCLUDES PROPOSED BUILDING, PROPOSED DRIVEWAY & PARKING, AND EXISTING HOUSE AND PROPOSED DRIVEWAY AT EXISTING HOUSE
(2) OPEN AREA IS THE AREA NOT OCCUPIED BY STRUCTURES PER TOWN DEFINITION (PAVED AREAS ARE CONSIDERED OPEN AREA)
(3) OPEN SPACE IS THE AREA NOT OCCUPIED BY STRUCTURES OR PAVED PARKING OR VEHICLE ACCESS AREAS.

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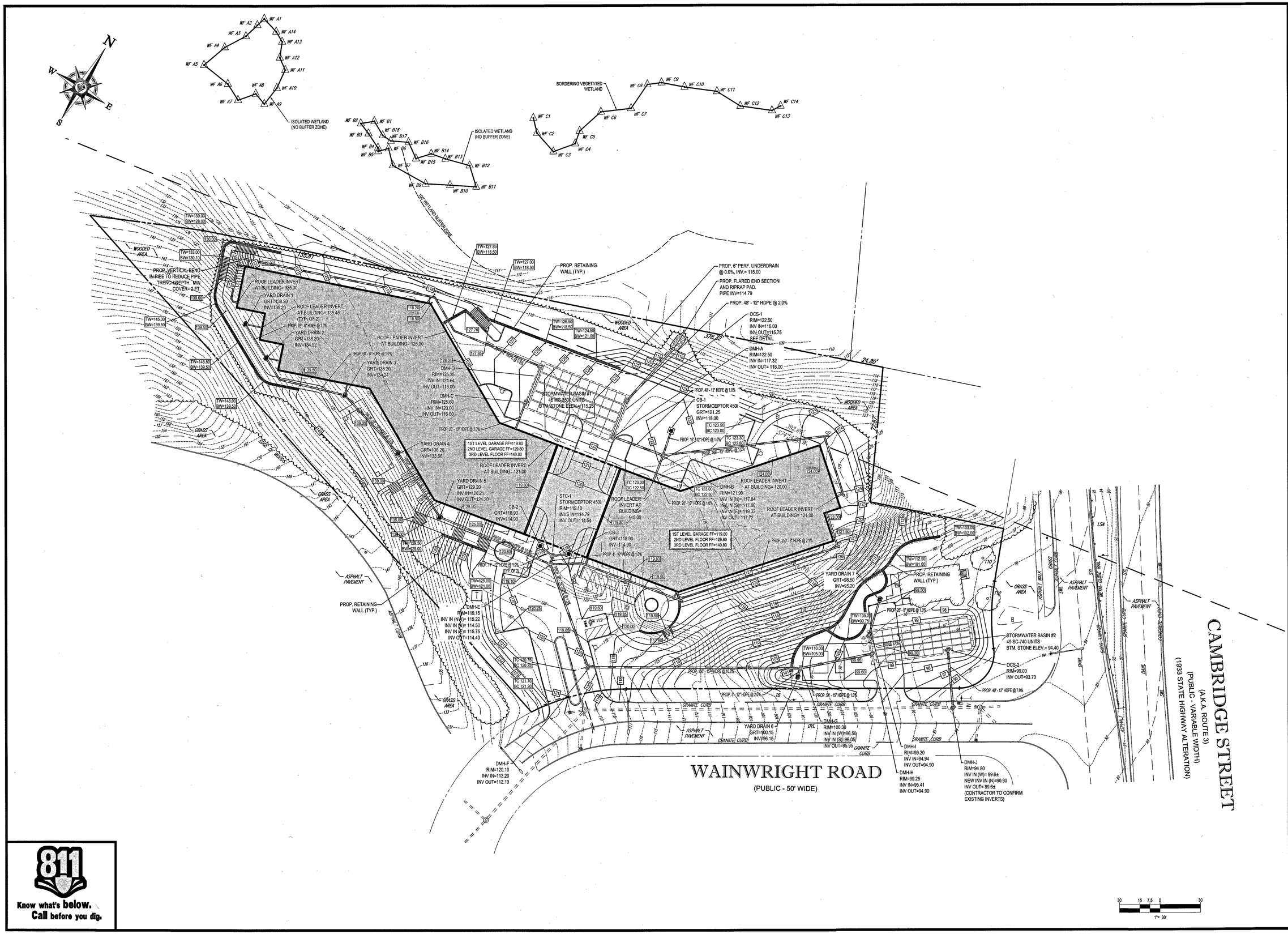

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J.A. JAKUCICH
PROFESSIONAL ENGINEER

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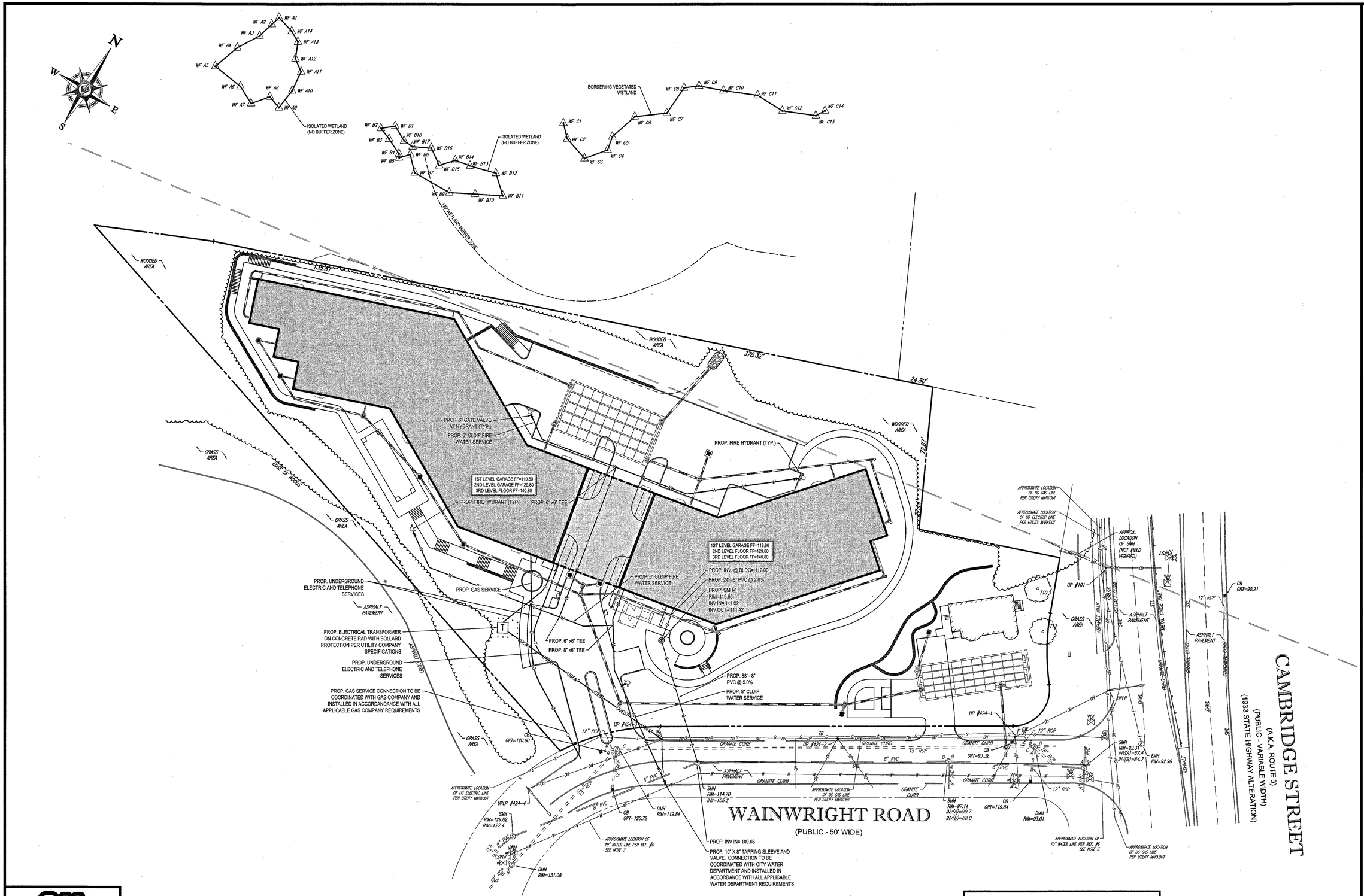

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No. 41530
COMMONWEALTH OF MASSACHUSETTS

SHEET TITLE:

UTILITY PLAN

SHEET NUMBER:
6
OF 14

REV 0 - 07/06/2015

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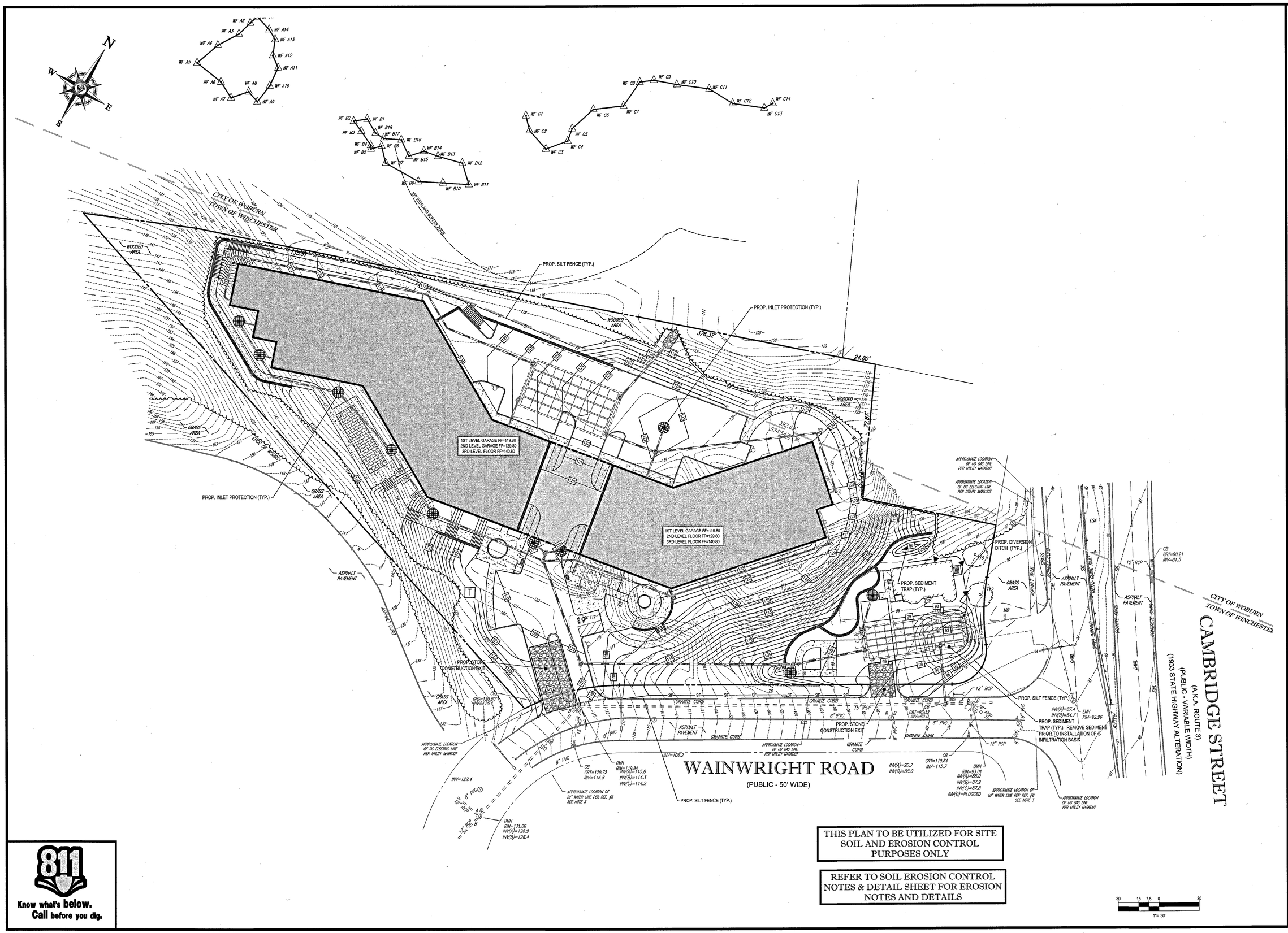

THIS PLAN TO BE UTILIZED FOR SITE SOIL AND EROSION CONTROL PURPOSES ONLY

REFER TO SOIL EROSION CONTROL NOTES & DETAIL SHEET FOR EROSION NOTES AND DETAILS

811 Know what's below. Call before you dig.

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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:

SITE DEVELOPMENT PLANS
FOR
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

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J.A. KUCICH
JOHN A. KUCICH
CIVIL
No. 41630
FIRST LICENSED
COMMONWEALTH OF MASSACHUSETTS
PROFESSIONAL ENGINEER

SHEET TITLE:

SOIL EROSION & SEDIMENT CONTROL PLAN

SHEET NUMBER:
7
OF 14

REV 0 - 07/06/2015

EROSION & SEDIMENT CONTROL NOTES

1. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE AS SET FORTH IN THE MOST CURRENT STATE SEDIMENT AND EROSION CONTROL MANUAL.
2. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION WILL BE LEFT IN AN UNTREATED OR UNVEGETATED CONDITION FOR A MINIMUM TIME. AREAS SHALL BE PERMANENTLY STABILIZED WITHIN 7 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 30 DAYS OF INITIAL DISTURBANCE.
3. SEDIMENT BARRIERS (SILT FENCE, STRAW BARRIERS, ETC.) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF THE CONTRIBUTING DRAINAGE AREA ABOVE THEM. MULCH NETTING SHALL BE USED TO ANCHOR MULCH IN ALL AREAS WITH SLOPES GREATER THAN 15%. AFTER OCTOBER 1ST THE SAME APPLIES FOR ALL SLOPES GREATER THAN 8%.
4. INSTALL SILT FENCE AT TOE OF SLOPE TO FILTER SILT FROM RUNOFF. SEE SILT FENCE DETAIL FOR PROPER INSTALLATION. SILT FENCE WILL REMAIN IN PLACE PER NOTE #5.
5. ALL EROSION CONTROL STRUCTURES WILL BE INSPECTED, REPLACED AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY FOLLOWING ANY SIGNIFICANT RAINFALL OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSURE. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE HALF THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE STABILIZED BY TURF.
6. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL BE STEEPER THAN TWO TO ONE (2:1).
7. IF FINAL SEEDING OF THE DISTURBED AREAS IS NOT COMPLETED 45 DAYS PRIOR TO THE FIRST KILLING FROST, USE TEMPORARY MULCH (DORMANT SEEDING MAY BE ATTEMPTED AS WELL) TO PROTECT THE SITE AND DELAY SEEDING UNTIL THE NEXT RECOMMENDED SEEDING PERIOD.
8. TEMPORARY SEEDING OF DISTURBED AREAS THAT HAVE NOT BEEN FINAL GRADED SHALL BE COMPLETED 45 DAYS PRIOR TO THE FIRST KILLING FROST TO PROTECT FROM SPRING RUNOFF PROBLEMS.
9. DURING THE CONSTRUCTION PHASE, INTERCEPTED SEDIMENT WILL BE RETURNED TO THE SITE AND REGRADED ONTO OPEN AREAS.
10. REVEGETATION MEASURES WILL COMMENCE UPON COMPLETION OF CONSTRUCTION EXCEPT AS NOTED ABOVE. ALL DISTURBED AREAS NOT OTHERWISE STABILIZED WILL BE GRADED, SMOOTHED, AND PREPARED FOR FINAL SEEDING AS FOLLOWS:
    - 10.1. SIX INCHES OF LOAM WILL BE SPREAD OVER DISTURBED AREAS AND SMOOTHED TO A UNIFORM SURFACE.
    - 10.2. APPLY LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST. IF SOIL TESTING IS NOT FEASIBLE ON SMALL OR VARIABLE SITES, OR WHERE TIMING IS CRITICAL, FERTILIZER MAY BE APPLIED AT THE RATE OF 800 LB PER ACRE OR 18.4 LB PER 1,000 SF USING 10-20-20 OR EQUIVALENT. APPLY GROUND LIMESTONE (EQUIVALENT TO 50% CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS PER ACRE (138 LB PER1,000 SF).
    - 10.3. FOLLOWING SEED BED PREPARATION, DITCHES AND BACK SLOPES WILL BE SEEDED TO A MIXTURE OF 47% CREEPING RED FESCUE, 5% REDTOP, AND 48% TALL FESCUE. THE LAWN AREAS WILL BE SEEDED TO A PREMIUM TURF MIXTURE OF 44% KENTUCKY BLUE-GRASS, 44% CREEPING RED FESCUE, AND 12% PERENNIAL RYEGRASS: SEEDING RATE IS 1.03 LBS PER 1,000 SF OF LAWN. QUALITY SOD MAY BE SUBSTITUTED FOR SEED.
    - 10.4. STRAW MULCH AT THE RATE OF 70-90 LBS PER 1,000 SF. A HYDRO-APPLICATION OF WOOD OR PAPER FIBER SHALL BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SUCH AS CURASOL OR RMB PLUS WILL BE USED ON STRAW MULCH FOR WIND CONTROL.
11. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED ONCE THE SITE IS STABILIZED.
12. WETLANDS WILL BE PROTECTED WITH STRAWBALES AND/OR SILT FENCE INSTALLED AT THE EDGE OF THE WETLAND OR THE BOUNDARY OF WETLAND DISTURBANCE.
13. ALL AREAS WITHIN 100 FEET OF A FLAGGED WETLAND OR STREAM SHALL HAVE AN EXPOSURE WINDOW OF NOT MORE THAN 7 DAYS.
14. ALL AREAS WITHIN 100 FEET OF A FLAGGED WETLAND OR STREAM SHALL FOLLOW APPROPRIATE EROSION CONTROL MEASURES PRIOR TO EACH STORM IF NOT BEING ACTIVELY WORKED,

MULCH

LOCATION	MULCH	RATE (1000 SF)
PROTECT AREA	STRAW OR STRAW	100 POUNDS
WINDY AREA	SHREDDED OR CHOPPED CORNSTALKS STRAW OR STRAW (ANCHORED)*	185-275 POUNDS 100 POUNDS
MODERATE TO HIGH VELOCITY AREAS OR STEEP SLOPES GREATER THAN 3:1	JUTE MESH OR EXCELSIOR MAT	AS REQUIRED
GREATER THAN 3:1	(REFER TO GEOTECHNICAL REPORT FOR FINAL DESIGN REQUIREMENT)	

* A HYDRO-APPLICATION OF WOOD, OR PAPER FIBER MAY BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SUCH AS CURASOL OR RMB PLUS SHALL BE USED ON STRAW MULCH FOR WIND CONTROL.

MULCH ANCHORING
ANCHOR MULCH WITH PEG AND TWINE (1 SQ. YD/BLOCK); MULCH NETTING (AS PER MANUFACTURER); WOOD CELLULOSE FIBER (750 LBS/ACRE); OR CHEMICAL TACK (AS PER MANUFACTURER'S SPECIFICATIONS). USE OF A SERRATED STRAIGHT DISK AND WETTING FOR SMALL AREAS AND ROAD DITCHES MAY BE PERMITTED.

EROSION CONTROL NOTES DURING WINTER CONSTRUCTION

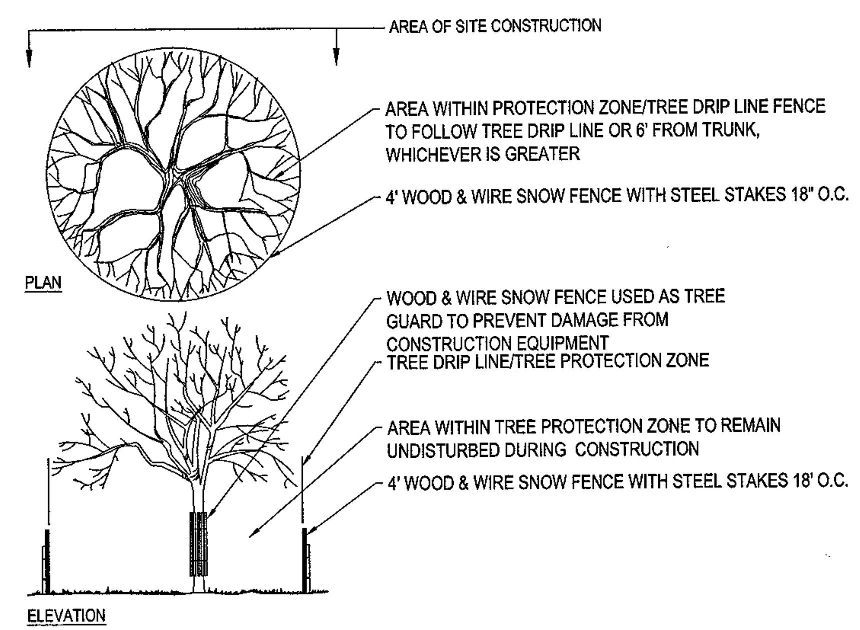
1. WINTER CONSTRUCTION PERIOD: NOVEMBER 1 THROUGH APRIL 15.
2. WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE SITE IS WITHOUT STABILIZATION AT ANY ONE TIME.
3. EXPOSED AREA SHOULD BE LIMITED TO THAT CAN BE MULCHED IN ONE DAY PRIOR TO ANY SNOW EVENT.
4. CONTINUATION OF EARTHWORK OPERATION ON ADDITIONAL AREAS SHALL NOT BEGIN UNTIL THE EXPOSED SOIL SURFACE ON THE AREA BEING WORKED HAS BEEN STABILIZED SUCH THAT NO LARGER AREA OF THE SITE IS WITHOUT EROSION CONTROL PROTECTION AS LISTED IN ITEM 2 ABOVE.
5. AN AREA SHALL BE CONSIDERED TO HAVE BEEN STABILIZED WHEN EXPOSED SURFACES HAVE BEEN EITHER MULCHED WITH STRAW OR STRAW AT A RATE OF 100 LB. PER 1,000 SQUARE FEET (WITH OR WITHOUT SEEDING) OR DORMANT SEEDED, MULCHED AND ADEQUATELY ANCHORED BY AN APPROVED ANCHORING TECHNIQUE.
6. BETWEEN THE DATES OF OCTOBER 15 AND APRIL 1ST, LOAM OR SEED WILL NOT BE REQUIRED. DURING PERIODS OF ABOVE FREEZING TEMPERATURES THE SLOPES SHALL BE FINE GRADED AND EITHER PROTECTED WITH MULCH OR TEMPORARILY SEEDED AND MULCHED UNTIL SUCH TIME AS THE FINAL TREATMENT CAN BE APPLIED. IF THE DATE IS AFTER NOVEMBER 1ST AND IF THE EXPOSED AREA HAS BEEN LOAMED, FINAL GRADED AND IS SMOOTH, THEN THE AREA MAY BE DORMANT SEEDED AT A RATE OF 200 - 300% HIGHER THAN SPECIFIED FOR PERMANENT SEED AND THEN MULCHED. IF CONSTRUCTION CONTINUES DURING FREEZING WEATHER, ALL EXPOSED AREAS SHALL BE CONTINUOUSLY GRADED BEFORE FREEZING AND THE SURFACE TEMPORARILY PROTECTED FROM EROSION BY THE APPLICATION OF MULCH. SLOPES SHALL NOT BE LEFT UNEXPOSED OVER THE WINTER OR ANY OTHER EXTENDED TIME OF WORK SUSPENSION UNLESS TREATED IN THE ABOVE MANNER. UNTIL SUCH TIME AS WEATHER CONDITIONS ALLOW DITCHES TO BE FINISHED WITH THE PERMANENT SURFACE TREATMENT, EROSION SHALL BE CONTROLLED BY THE INSTALLATION OF BALES OF STRAW OR STONE CHECK DAMS IN ACCORDANCE WITH THE STANDARD DETAILS.
7. MULCHING REQUIREMENTS:
    - 7.1. BETWEEN THE DATES OF NOVEMBER 1ST AND APRIL 15TH ALL MULCH SHALL BE ANCHORED BY EITHER PEG LINE, MULCH NETTING OR WOOD CELLULOSE FIBER.
    - 7.2. MULCH NETTING SHALL BE USED TO ANCHOR MULCH IN ALL DRAINAGE WAYS WITH A SLOPE GREATER THAN 3% FOR SLOPE EXPOSED TO DIRECT WINDS AND FOR ALL OTHER SLOPES GREATER THAN 8%.
    - 7.3. MULCH NETTING SHALL BE USED TO ANCHOR MULCH IN ALL AREAS WITH SLOPES GREATER THAN 15% AFTER OCTOBER 1ST. THE SAME APPLIES FOR ALL SLOPES GREATER THAN 8%.
8. AFTER NOVEMBER 1ST THE CONTRACTOR SHALL APPLY DORMANT SEEDING OR MULCH AND ANCHORING ON ALL BARE EARTH AT THE END OF EACH WORKING DAY.
9. DURING THE WINTER CONSTRUCTION PERIOD ALL SNOW SHALL BE REMOVED FROM AREAS OF SEEDING AND MULCHING PRIOR TO PLACEMENT.
10. STOCKPILING OF MATERIALS (DIRT, WOOD, CONSTRUCTION MATERIALS, ETC.) MUST REMAIN COVERED AT ALL TIMES TO MINIMIZE ANY DUST PROBLEMS THAT MAY OCCUR WITH ADJACENT PROPERTIES AND TO PROVIDE MAXIMUM PROTECTION AGAINST EROSION RUNOFF.
11. EXISTING CATCH BASIN STRUCTURES SHALL BE PROTECTED UNTIL SUCH TIME AS THEY ARE REMOVED.

Know what's below. Call before you dig.

CONSTRUCTION SEQUENCE

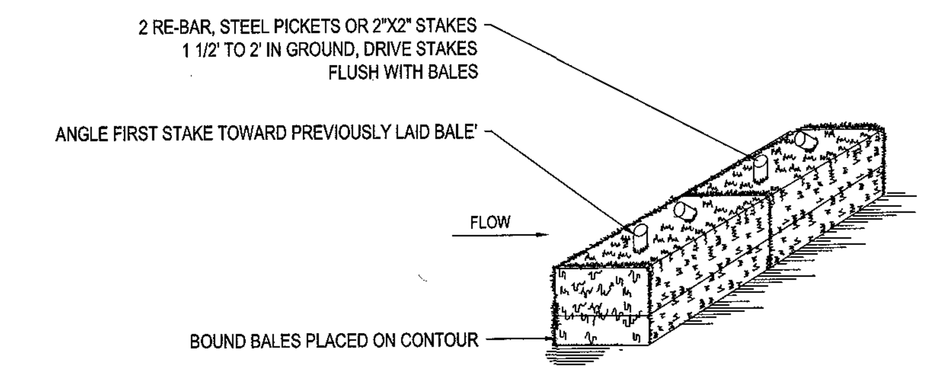
THE FOLLOWING CONSTRUCTION SEQUENCE IS RECOMMENDED:

- -INSTALLATION OF STABILIZED CONSTRUCTION ENTRANCE/EXIT (AS SHOWN)
- -INSTALLATION OF EROSION CONTROL BARRIER (SILT FENCE, AS SHOWN)
- -INSTALLATION OF INLET PROTECTION (AS SHOWN)
- -DEMOLITION OF EXISTING SITE STRUCTURES (SEE DEMOLITION PLAN)
- -DEMOLITION OF EXISTING SITE PAVEMENT AND AMENITIES (SEE DEMOLITION PLAN)
- -CLEARING AND GRUBBING
- -INSTALLATION OF TEMPORARY SWALES AND SEDIMENT TRAPS
- -EARTHWORK AND EXCAVATION/FILLING AS NECESSARY
- -CONSTRUCTION OF UTILITIES
- -CONSTRUCTION OF BUILDING
- -STABILIZE PERMANENT LAWN AREAS AND SLOPES WITH TEMPORARY SEEDING
- -INSTALLATION OF INLET PROTECTION ON DRAINAGE STRUCTURES AS THEY ARE INSTALLED (AS SHOWN)
- -CONSTRUCTION OF ALL CURBING AND LANDSCAPE ISLANDS AS INDICATED ON THE PLANS
- -SPREAD TOPSOIL ON SLOPED AREAS AND SEED AND MULCH
- -FINAL GRADING OF ALL SLOPED AREAS
- -PLACE 6" TOPSOIL ON SLOPES AFTER FINAL GRADING COMPLETED. FERTILIZE, SEED, AND MULCH.
- -REMOVE THE TEMPORARY SEDIMENT TRAP
- -PAVE PARKING LOT
- -LANDSCAPING PER LANDSCAPING PLAN
- -REMOVE EROSION CONTROLS AS DISTURBED AREAS BECOME STABILIZED TO 70% STABILIZATION OR GREATER AFTER RECEIVING CONCURRENCE FROM THE CIVIL ENGINEER AND TOWN CONSERVATION COMMISSION AGENT
- -FILE NOT
- -RETAIN RECORDS FOR 3 YEARS AFTER FILING NOT.



TREE PROTECTION DURING CONSTRUCTION

N.T.S.



DRAINAGE AREA NO MORE THAN 1/4 AC. PER 100 FEET OF STRAW BALE DIKE FOR SLOPES LESS THAN 25%

NOTES:
1. BALES SHALL BE PLACED AT THE TOP OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

STRAW BALE DETAIL

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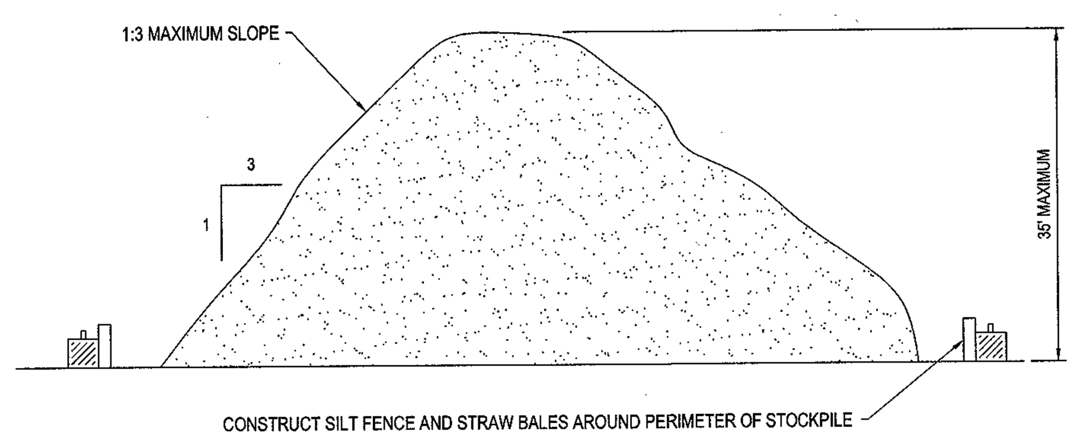
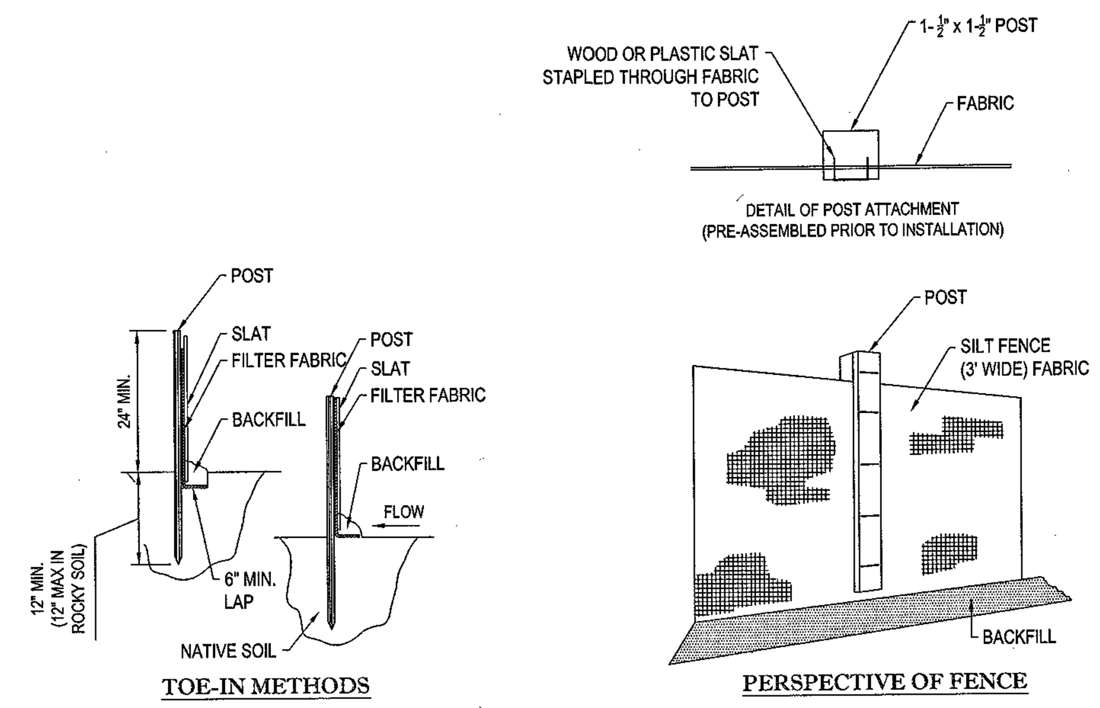


TEMPORARY STOCKPILE DETAIL

N.T.S.

INSTALLATION:
1. EXCAVATE A 6"x 6" TRENCH ALONG THE LINE OF EROSION CONTROL OF THE SITE.
2. UNROLL SILTATION FENCE AND POSITION THE POSTS AGAINST THE BACK (DOWNSTREAM) WALL OF THE TRENCH (NET SIDE AWAY FROM FLOW DIRECTION).
3. DRIVE THE POST INTO THE GROUND UNTIL THE NETTING IS LAYING ACROSS THE TRENCH BOTTOM.
4. LAY THE TOE-IN FLAP OF THE FABRIC ONTO THE UNDISTURBED BOTTOM OF THE TRENCH, BACKFILL THE TRENCH AND TAMP THE SOIL. TOE-IN CAN ALSO BE ACCOMPLISHED BY LAYING FABRIC FLAP ON UNDISTURBED GROUND AND PILING & TAMP- ING FILL AT THE BASE.



TYP. SILTATION FENCE DETAIL

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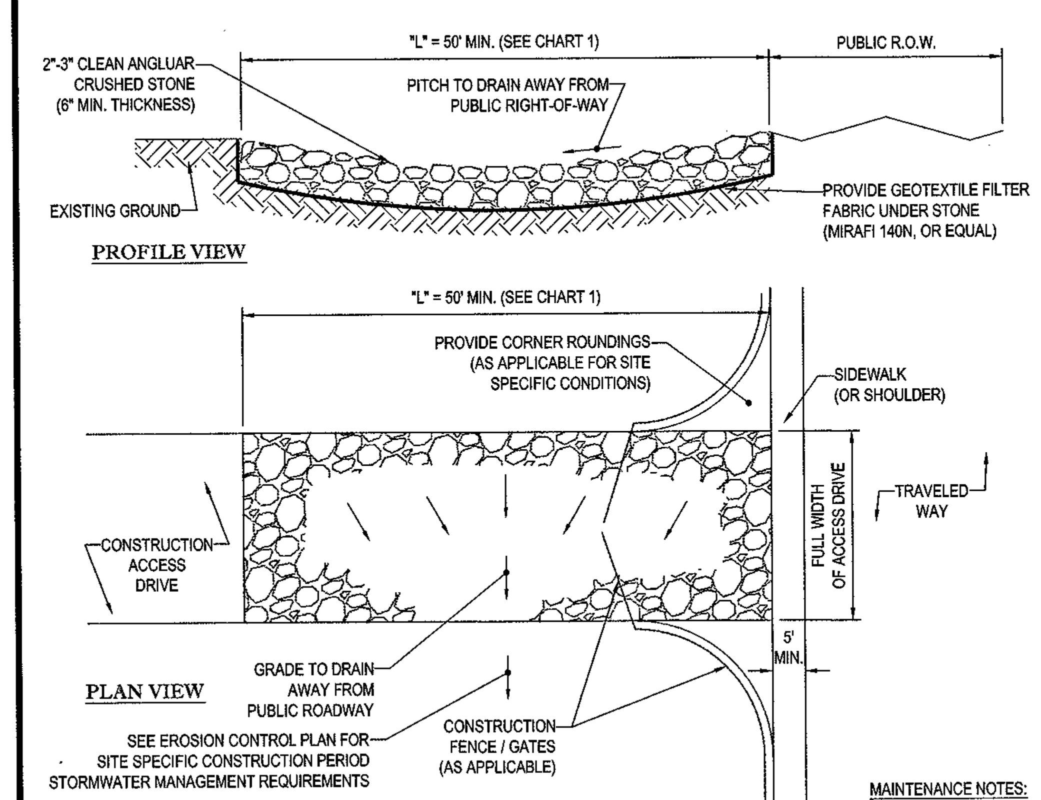

SEE EROSION CONTROL PLAN FOR SITE SPECIFIC CONSTRUCTION PERIOD STORMWATER MANAGEMENT REQUIREMENTS

CHART 1

PERCENT SLOPE OF ROADWAY	LENGTH OF STONE REQUIRED	
	COARSE GRAINED SOILS	FINE GRAINED SOILS
0 TO 2%	50 FT	100 FT
2% TO 5%	100 FT	200FT
>5%	ENTIRE ENTRANCE STABILIZED WITH FABC BASE COURSE (1)	

(1) AS PRESCRIBED BY LOCAL ORDINANCE OR OTHER GOVERNING AUTHORITY.

MAINTENANCE NOTES:
1. INSPECT STABILIZED CONSTRUCTION ENTRANCE / ANTI-TRACKING PAD AND SEDIMENT DISPOSAL AREA WEEKLY OF AFTER EVERY MAJOR RAIN STORM EVENT.
2. WASH WATER (IF USED) SHALL BE DIRECTED TOWARD A SEDIMENT TRAP, SUFFICIENTLY SIZED FOR SPECIFIC SITE CONDITIONS.
3. EXCESSIVELY MUD-CLOGGED STONE SHALL BE REMOVED AND REPLACED, AS NEEDED.

STABILIZED CONSTRUCTION EXIT

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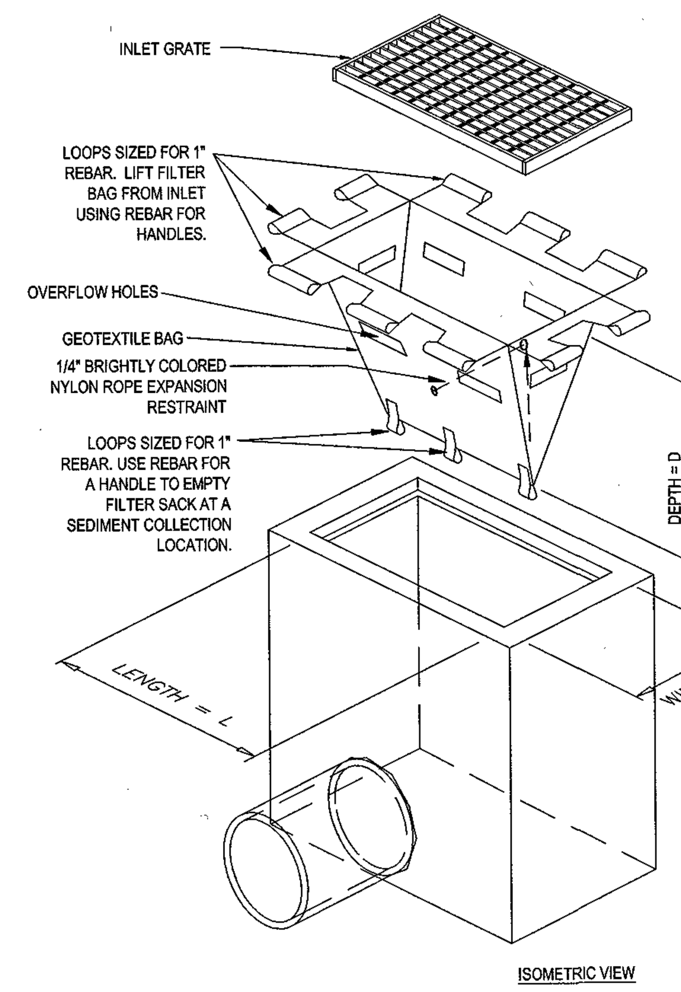

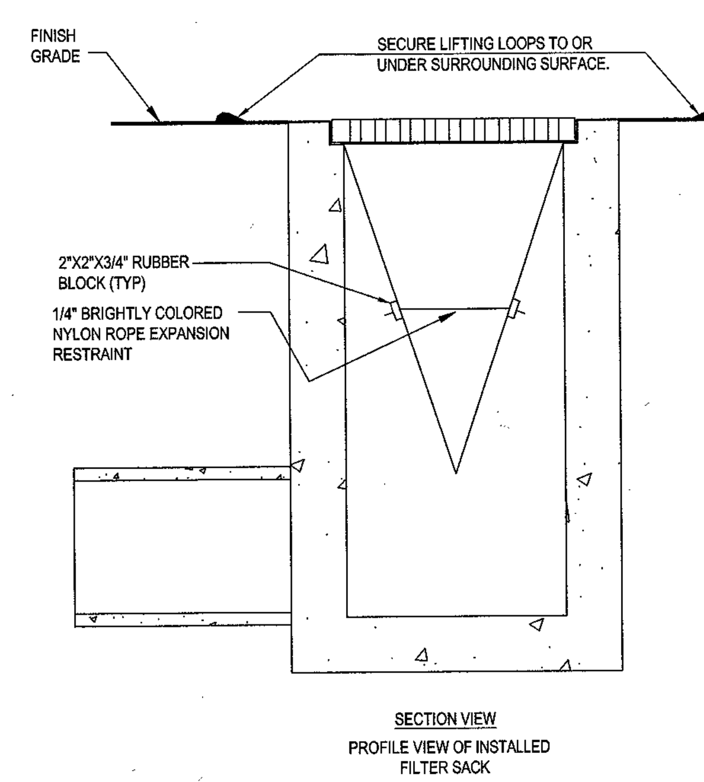

LOW TO MODERATE FLOW GEOTEXTILE FABRIC SPECIFICATION TABLE

PROPERTIES	TEST METHOD	UNITS
GRAB TENSILE STRENGTH	ASTM D-4632	300 LBS
GRAB TENSILE ELONGATION	ASTM D-4632	20 %
PUNCTURE	ASTM D-4833	120 LBS
MULLEN BURST	ASTM D-3786	800 PSI
TRAPEZOID TEAR	ASTM D-4533	120 LBS
UV RESISTANCE	ASTM D-4355	80 %
APPARENT OPENING SIZE	ASTM D-4751	40 US SIEVE
FLOW RATE	ASTM D-4491	40 GAL/MIN/SQ FT
PERMITTIVITY	ASTM D-4491	0.55 SEC -1

MODERATE TO HIGH FLOW GEOTEXTILE FABRIC SPECIFICATION TABLE

PROPERTIES	TEST METHOD	UNITS
GRAB TENSILE STRENGTH	ASTM D-4632	265 LBS
GRAB TENSILE ELONGATION	ASTM D-4632	20 %
PUNCTURE	ASTM D-4833	135 LBS
MULLEN BURST	ASTM D-3786	420 PSI
TRAPEZOID TEAR	ASTM D-4533	45 LBS
UV RESISTANCE	ASTM D-4355	90 %
APPARENT OPENING SIZE	ASTM D-4751	20 US SIEVE
FLOW RATE	ASTM D-4491	200 GAL/MIN/SQ FT
PERMITTIVITY	ASTM D-4491	1.5 SEC -1

1. REMOVE TRAPPED SEDIMENT WHEN BRIGHTLY COLORED EXPANSION RESTRAINT CAN NO LONGER BE SEEN.
2. GEOTEXTILE SHALL BE A WOVEN POLYPROPYLENE FABRIC THAT MEETS OR EXCEEDS REQUIREMENTS IN THE SPECIFICATIONS TABLE.
3. PLACE AN OIL ABSORBENT PAD OR PILLOW OVER INLET GRATE WHEN OIL SPILLS ARE A CONCERN.
4. INSPECT PER REGULATORY REQUIREMENTS.
5. THE WIDTH, "W", OF THE FILTER SACK SHALL MATCH THE INSIDE WIDTH OF THE GRATED INLET BOX.
6. THE DEPTH, "D", OF THE FILTER SACK SHALL BE BETWEEN 18 INCHES AND 36 INCHES
7. THE LENGTH, "L", OF THE FILTER SACK SHALL MATCH THE INSIDE LENGTH OF THE GRATED INLET BOX.

DO NOT USE IN PAVED AREAS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.

TO BE USED IN EXISTING RIGHT OF WAY

FILTER SACKS (GRATED INLETS)

N.T.S.

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◆ WARREN, NJ ◆ UPSTATE NEW YORK ◆ BOSTON, MA ◆ NEW YORK METRO ◆ PHILADELPHIA/SOUTHERN NJ ◆ LEHIGH VALLEY, PA ◆ SOUTHEASTERN, PA ◆ BALTIMORE, MD ◆ SOUTHERN MARYLAND ◆ NORTHERN VIRGINIA ◆ DELAWARE ◆ CENTRAL VIRGINIA ◆ CHARLOTTE, NC ◆ RALEIGH, NC

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PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
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SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:

SITE DEVELOPMENT PLANS
—FOR—
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

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J.A. KUCICH
PROFESSIONAL ENGINEER
JOHN A. KUCICH CIVIL

SHEET TITLE:
SOIL EROSION CONTROL NOTES & DETAILS SHEET

SHEET NUMBER:
8 OF 14

REV 0 - 07/06/2015

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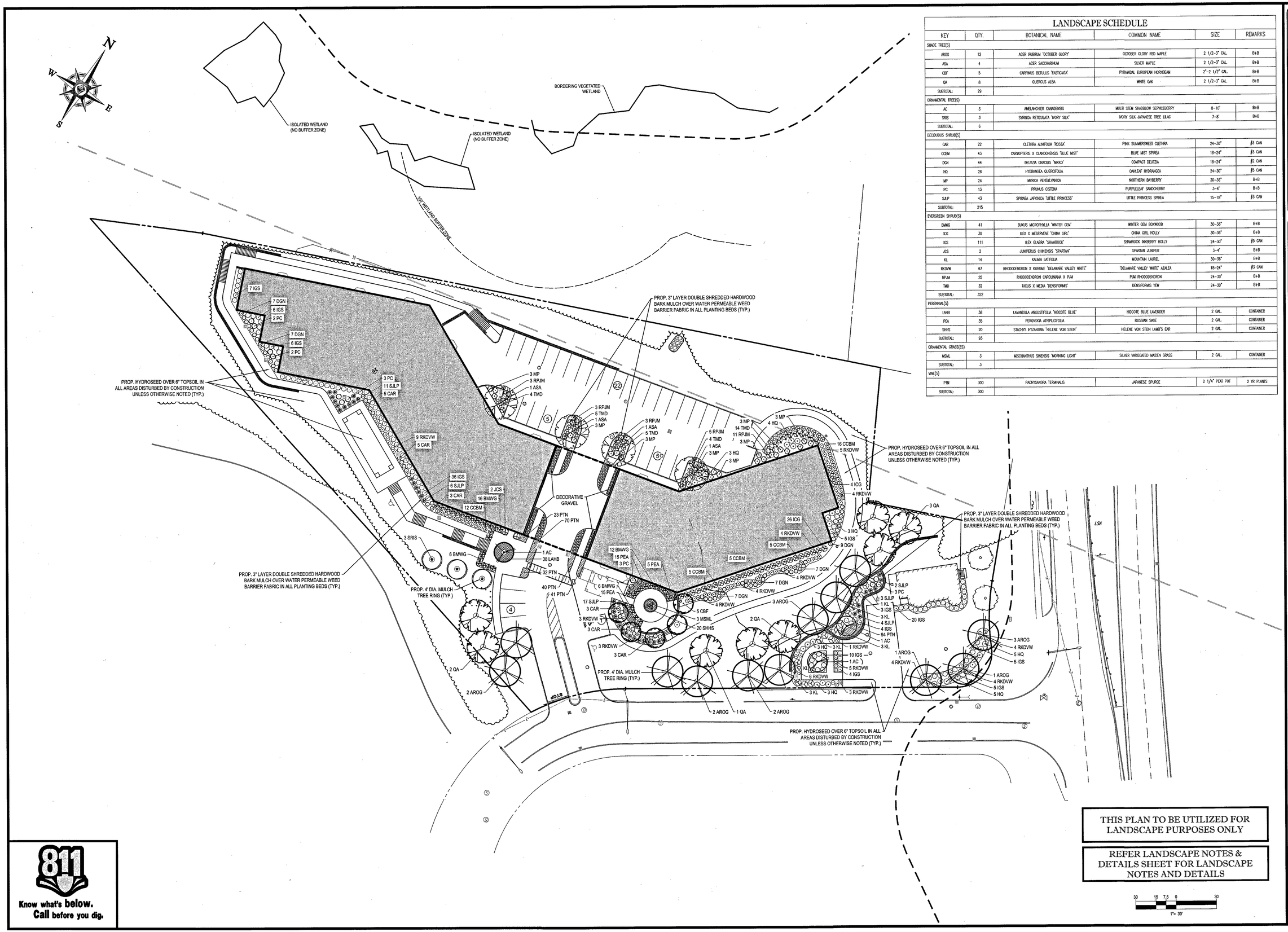

LANDSCAPE SCHEDULE

KEY	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS
SHADE TREE(S)					
AROG	12	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	2 1/2-3" CAL.	B+B
ASA	4	ACER SACCHARINUM	SILVER MAPLE	2 1/2-3" CAL.	B+B
CBF	5	CARPINUS BETULUS 'FASTIGIATA'	PYRAMIDAL EUROPEAN HORNBEAM	2"-2 1/2" CAL.	B+B
QA	8	QUERCUS ALBA	WHITE OAK	2 1/2-3" CAL.	B+B
SUBTOTAL:	29				
ORNAMENTAL TREE(S)					
AC	3	AMELANCHIER CANADENSIS	MULTI STEM SHADBLOW SERVICEBERRY	8-10'	B+B
SRIS	3	SYRINGA RETICULATA 'IVORY SILK'	IVORY SILK JAPANESE TREE LILAC	7-8'	B+B
SUBTOTAL:	6				
DECIDUOUS SHRUB(S)					
CAR	22	CLETHRA ALNIFOLIA 'ROSEA'	PINK SUMMERSWEET CLETHRA	24-30"	#3 CAN
CCBM	43	CARYOPTERIS X CLANDONENSIS 'BLUE MIST'	BLUE MIST SPIREA	18-24"	#3 CAN
DGN	44	DEUTZIA GRACILIS 'NIKKO'	COMPACT DEUTZIA	18-24"	#2 CAN
HQ	26	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	24-30"	#5 CAN
MP	24	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	30-36"	B+B
PC	13	PRUNUS CISTENA	PURPLELEAF SANDCHERRY	3-4'	B+B
SJLP	43	SPIRAEA JAPONICA 'LITTLE PRINCESS'	LITTLE PRINCESS SPIREA	15-18"	#3 CAN
SUBTOTAL:	215				
EVERGREEN SHRUB(S)					
BMWG	41	BUXUS MICROPHYLLA 'WINTER GEM'	WINTER GEM BOXWOOD	30-36"	B+B
ICG	30	ILEX X MESERVEAE 'CHINA GIRL'	CHINA GIRL HOLLY	30-36"	B+B
IGS	111	ILEX GLABRA 'SHAMROCK'	SHAMROCK INKBERRY HOLLY	24-30"	#5 CAN
JCS	2	JUNIPERUS CHINENSIS 'SPARTAN'	SPARTAN JUNIPER	3-4'	B+B
KL	14	KALMIA LATIFOLIA	MOUNTAIN LAUREL	30-36"	B+B
RKDVW	67	RHODODENDRON X KURIUME 'DELAWARE VALLEY WHITE'	'DELAWARE VALLEY WHITE' AZALEA	18-24"	#3 CAN
RPJM	25	RHODODENDRON CAROLINIANA X PJM	PJM RHODODENDRON	24-30"	B+B
TMD	32	TAXUS X MEDIA 'DENSIFORMIS'	DENSIFORMIS YEW	24-30"	B+B
SUBTOTAL:	322				
PERENNIAL(S)					
LAHB	38	LAVANDULA ANGUSTIFOLIA 'HIDCOTE BLUE'	HIDCOTE BLUE LAVENDER	2 GAL.	CONTAINER
PEA	35	PEROVSKIA ATRIPLICIFOLIA	RUSSIAN SAGE	2 GAL.	CONTAINER
SHHS	20	STACHYS BYZANTINA 'HELENE VON STEIN'	HELENE VON STEIN LAMB'S EAR	2 GAL.	CONTAINER
SUBTOTAL:	93				
ORNAMENTAL GRASS(ES)					
MSML	3	MISCHANTHUS SINENSIS 'MORNING LIGHT'	SILVER VARIEGATED MAIDEN GRASS	2 GAL.	CONTAINER
SUBTOTAL:	3				
VINE(S)					
PTN	300	PACHYSANDRA TERMINALIS	JAPANESE SPURGE	2 1/4" PEAT POT	2 YR PLANTS
SUBTOTAL:	300				

THIS PLAN TO BE UTILIZED FOR LANDSCAPE PURPOSES ONLY

REFER LANDSCAPE NOTES & DETAILS SHEET FOR LANDSCAPE NOTES AND DETAILS

30 15 7.5 0 30
1"= 30'

811 Know what's below. Call before you dig.

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REVISIONS

REV	DATE	COMMENT	BY
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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:

SITE DEVELOPMENT PLANS

FOR

FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
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REGISTERED LANDSCAPE ARCHITECT
MASSACHUSETTS No. 1217
RHODE ISLAND No. 419
NEW YORK No. 002359
NEW HAMPSHIRE No. 109

SHEET TITLE:

LANDSCAPE PLAN

SHEET NUMBER:

9

OF 14

REV 0 - 07/06/2015

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LANDSCAPE SPECIFICATIONS

1. SCOPE OF WORK:
THE LANDSCAPE CONTRACTOR SHALL BE REQUIRED TO PERFORM ALL CLEARING, FINISHED GRADING, SOIL PREPARATION, PERMANENT SEEDING OR SODDING, PLANTING AND MULCHING INCLUDING ALL LABOR, MATERIALS, TOOLS AND EQUIPMENT NECESSARY FOR THE COMPLETION OF THIS PROJECT, UNLESS OTHERWISE CONTRACTED BY THE GENERAL CONTRACTOR.

2. MATERIALS
A. GENERAL - ALL HARDSCAPE MATERIALS SHALL MEET OR EXCEED SPECIFICATIONS AS OUTLINED IN THE STATE DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.

B. TOPSOIL - NATURAL, FRIABLE, LOAMY SILT SOIL HAVING AN ORGANIC CONTENT NOT LESS THAN 5%, A PH RANGE BETWEEN 4.5-7.0. IT SHALL BE FREE OF DEBRIS, ROCKS LARGER THAN ONE INCH (1"), WOOD, ROOTS, VEGETABLE MATTER AND CLAY CLODS.

C. LAWN - ALL DISTURBED AREAS ARE TO BE TREATED WITH A MINIMUM 6" THICK LAYER OF TOPSOIL, OR AS DIRECTED BY THE LOCAL ORDINANCE OR CLIENT, AND SEEDED OR SODDED IN ACCORDANCE WITH THE PERMANENT STABILIZATION METHODS INDICATED ON THE LANDSCAPE PLAN
I. LAWN SEED MIXTURE SHALL BE FRESH, CLEAN NEW CROP SEED.
II. SOD SHALL BE STRONGLY ROOTED, WEED AND DISEASE/PEST FREE WITH A UNIFORM THICKNESS. SOD INSTALLED ON SLOPES GREATER THAN 4:1 SHALL BE PEGGED TO HOLD SOD IN PLACE.

D. MULCH - ALL PLANTING BEDS SHALL BE MULCHED WITH A 3" THICK LAYER OF DOUBLE SHREDDED HARDWOOD BARK MULCH, UNLESS OTHERWISE STATED ON THE LANDSCAPE PLAN AND/OR LANDSCAPE PLAN NOTES /DETAILS.

E. FERTILIZER
I. FERTILIZER SHALL BE DELIVERED TO THE SITE MIXED AS SPECIFIED IN THE ORIGINAL UNOPENED STANDARD BAGS SHOWING WEIGHT, ANALYSIS AND NAME OF MANUFACTURER.
FERTILIZER SHALL BE STORED IN A WEATHERPROOF PLACE SO THAT IT CAN BE KEPT DRY PRIOR TO USE.
II. FOR THE PURPOSE OF BIDDING, ASSUME THAT FERTILIZER SHALL BE 10% NITROGEN, 6% PHOSPHORUS AND 4% POTASSIUM BY WEIGHT. A FERTILIZER SHOULD NOT BE SELECTED WITHOUT A SOIL TEST PERFORMED BY A CERTIFIED SOIL LABORATORY.

F. PLANT MATERIAL
I. ALL PLANTS SHALL IN ALL CASES CONFORM TO THE REQUIREMENTS OF THE "AMERICAN STANDARD FOR NURSERY STOCK" (ANSI Z60.1), LATEST EDITION, AS PUBLISHED BY THE AMERICAN NURSERY & LANDSCAPE ASSOCIATION (FORMERLY THE AMERICAN ASSOCIATION OF NURSERYMEN).
II. IN ALL CASES, BOTANICAL NAMES SHALL TAKE PRECEDENCE OVER COMMON NAMES FOR ANY AND ALL PLANT MATERIAL.
III. PLANTS SHALL BE LEGIBLY TAGGED WITH THE PROPER NAME AND SIZE. TAGS ARE TO REMAIN ON AT LEAST ONE PLANT OF EACH SPECIES FOR VERIFICATION PURPOSES DURING THE FINAL INSPECTION.
IV. TREES WITH ABRASION OF THE BARK, SUN SCALDS, DISFIGURATION OR FRESH CUTS OF LIMBS OVER 1¼", WHICH HAVE NOT BEEN COMPLETELY CALLUSED, SHALL BE REJECTED.
PLANTS SHALL NOT BE BOUND WITH WIRE OR ROPE AT ANY TIME SO AS TO DAMAGE THE BARK OR BREAK BRANCHES.
V. ALL PLANTS SHALL BE TYPICAL OF THEIR SPECIES OR VARIETY AND SHALL HAVE A NORMAL HABIT OF GROWTH: WELL DEVELOPED BRANCHES, DENSELY FOLIATED, VIGOROUS ROOT SYSTEMS AND BE FREE OF DISEASE, INSECTS, PESTS, EGGS OR LARVAE.
VI. CALIPER MEASUREMENTS OF NURSERY GROWN TREES SHALL BE TAKEN AT A POINT ON THE TRUNK SIX INCHES (6") ABOVE THE NATURAL GRADE FOR TREES UP TO AND INCLUDING A FOUR INCH (4") CALIPER SIZE. IF THE CALIPER AT SIX INCHES (6") ABOVE THE GROUND EXCEEDS FOUR INCHES (4") IN CALIPER, THE CALIPER SHOULD BE MEASURED AT A POINT 12" ABOVE THE NATURAL GRADE.
VII. SHRUBS SHALL BE MEASURED TO THE AVERAGE HEIGHT OR SPREAD OF THE SHRUB, AND NOT TO THE LONGEST BRANCH.
VIII. TREES AND SHRUBS SHALL BE HANDLED WITH CARE BY THE ROOT BALL.

3. GENERAL WORK PROCEDURES
A. CONTRACTOR TO UTILIZE WORKMANLIKE INDUSTRY STANDARDS IN PERFORMING ALL LANDSCAPE CONSTRUCTION. THE SITE IS TO BE LEFT IN A CLEAN STATE AT THE END OF EACH WORKDAY. ALL DEBRIS, MATERIALS AND TOOLS SHALL BE PROPERLY STORED, STOCKPILED OR DISPOSED OF.

B. WASTE MATERIALS AND DEBRIS SHALL BE COMPLETELY DISPOSED OF AT THE CONTRACTOR'S EXPENSE. DEBRIS SHALL NOT BE BURIED, INCLUDING ORGANIC MATERIALS, BUT SHALL BE REMOVED COMPLETELY FROM THE SITE.

4. SITE PREPARATIONS
A. BEFORE AND DURING PRELIMINARY GRADING AND FINISHED GRADING, ALL WEEDS AND GRASSES SHALL BE DUG OUT BY THE ROOTS AND DISPOSED OF IN ACCORDANCE WITH GENERAL WORK PROCEDURES OUTLINED HEREIN.

B. ALL EXISTING TREES TO REMAIN SHALL BE PRUNED TO REMOVE ANY DAMAGED BRANCHES. THE ENTIRE LIMB OF ANY DAMAGED BRANCH SHALL BE CUT OFF AT THE BRANCH COLLAR. CONTRACTOR SHALL ENSURE THAT CUTS ARE SMOOTH AND STRAIGHT. ANY EXPOSED ROOTS SHALL BE CUT BACK WITH CLEAN, SHARP TOOLS AND TOPSOIL SHALL BE PLACED AROUND THE REMAINDER OF THE ROOTS. EXISTING TREES SHALL BE MONITORED ON A REGULAR BASIS FOR ADDITIONAL ROOT OR BRANCH DAMAGE AS A RESULT OF CONSTRUCTION. ROOTS SHALL NOT BE LEFT EXPOSED FOR MORE THAN ONE (1) DAY. CONTRACTOR SHALL WATER EXISTING TREES AS NEEDED TO PREVENT SHOCK OR DECLINE.

C. CONTRACTOR SHALL ARRANGE TO HAVE A UTILITY STAKE-OUT TO LOCATE ALL UNDERGROUND UTILITIES PRIOR TO INSTALLATION OF ANY LANDSCAPE MATERIAL. UTILITY COMPANIES SHALL BE CONTACTED THREE (3) DAYS PRIOR TO THE BEGINNING OF WORK.

5. TREE PROTECTION
A. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING TREES TO REMAIN. A TREE PROTECTION ZONE SHALL BE ESTABLISHED AT THE DRIP LINE OR AT THE LIMIT OF CONSTRUCTION DISTURBANCE, WHICHEVER IS GREATER. LOCAL STANDARDS THAT MAY REQUIRE A MORE STRICT TREE PROTECTION ZONE SHALL BE HONORED.

B. A FORTY-EIGHT INCH (48") HIGH WOODEN SNOW FENCE OR ORANGE COLORED HIGH-DENSITY 'VISI-FENCE', OR APPROVED EQUAL, MOUNTED ON STEEL POSTS SHALL BE PLACED ALONG THE BOUNDARY OF THE TREE PROTECTION ZONE. POSTS SHALL BE LOCATED AT A MAXIMUM OF EIGHT FEET (8') ON CENTER OR AS INDICATED WITHIN THE TREE PROTECTION DETAIL.

C. WHEN THE TREE PROTECTION FENCING HAS BEEN INSTALLED, IT SHALL BE INSPECTED BY THE APPROVING AGENCY PRIOR TO DEMOLITION, GRADING, TREE CLEARING OR ANY OTHER CONSTRUCTION. THE FENCING ALONG THE TREE PROTECTION ZONE SHALL BE REGULARLY INSPECTED BY THE LANDSCAPE CONTRACTOR AND MAINTAINED UNTIL ALL CONSTRUCTION ACTIVITY HAS BEEN COMPLETED.

D. AT NO TIME SHALL MACHINERY, DEBRIS, FALLEN TREES OR OTHER MATERIALS BE PLACED, STOCKPILED OR LEFT STANDING IN THE TREE PROTECTION ZONE.

6. SOIL MODIFICATIONS
A. CONTRACTOR SHALL ATTAIN A SOIL TEST FOR ALL AREAS OF THE SITE PRIOR TO CONDUCTING ANY PLANTING. SOIL TESTS SHALL BE PERFORMED BY A CERTIFIED SOIL LABORATORY.

B. LANDSCAPE CONTRACTOR SHALL REPORT ANY SOIL OR DRAINAGE CONDITIONS CONSIDERED DETRIMENTAL TO THE GROWTH OF PLANT MATERIAL. SOIL MODIFICATIONS, AS SPECIFIED HEREIN, MAY NEED TO BE CONDUCTED BY THE LANDSCAPE CONTRACTOR DEPENDING ON SITE CONDITIONS.

C. THE FOLLOWING AMENDMENTS AND QUANTITIES ARE APPROXIMATE AND ARE FOR BIDDING PURPOSES ONLY. COMPOSITION OF AMENDMENTS SHOULD BE REVISED DEPENDING ON THE OUTCOME OF A TOPSOIL ANALYSIS PERFORMED BY A CERTIFIED SOIL LABORATORY.
I. TO INCREASE A SANDY SOIL'S ABILITY TO RETAIN WATER AND NUTRIENTS, THOROUGHLY TILL ORGANIC MATTER INTO THE TOP 6-12". USE COMPOSTED BARK, COMPOSTED LEAF MULCH OR PEAT MOSS. ALL PRODUCTS SHOULD BE COMPOSTED TO A DARK COLOR AND BE FREE OF PIECES WITH IDENTIFIABLE LEAF OR WOOD STRUCTURE. AVOID MATERIAL WITH A PH HIGHER THAN 7.5.
II. TO INCREASE DRAINAGE, MODIFY HEAVY CLAY OR SILT (MORE THAN 40% CLAY OR SILT) BY ADDING COMPOSTED PINE BARK (UP TO 30% BY VOLUME) AND/OR AGRICULTURAL GYPSUM.
COARSE SAND MAY BE USED IF ENOUGH IS ADDED TO BRING THE SAND CONTENT TO MORE THAN 60% OF THE TOTAL MIX. SUBSURFACE DRAINAGE LINES MAY NEED TO BE ADDED TO INCREASE DRAINAGE.
III. MODIFY EXTREMELY SANDY SOILS (MORE THAN 85%) BY ADDING ORGANIC MATTER AND/OR DRY, SHREDDED CLAY LOAM UP TO 30% OF THE TOTAL MIX.

7. FINISHED GRADING
A. UNLESS OTHERWISE CONTRACTED, THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF TOPSOIL AND THE ESTABLISHMENT OF FINE-GRADING WITHIN THE DISTURBANCE AREA OF THE SITE.

B. LANDSCAPE CONTRACTOR SHALL VERIFY THAT SUBGRADE FOR INSTALLATION OF TOPSOIL HAS BEEN ESTABLISHED. THE SUBGRADE OF THE SITE MUST MEET THE FINISHED GRADE LESS THE REQUIRED TOPSOIL THICKNESS (1"±).

C. ALL LAWN AND PLANTING AREAS SHALL BE GRADED TO A SMOOTH, EVEN AND UNIFORM PLANE WITH NO ABRUPT CHANGE OF SURFACE AS DEPICTED WITHIN THIS SET OF CONSTRUCTION PLANS, UNLESS OTHERWISE DIRECTED BY THE PROJECT ENGINEER OR LANDSCAPE ARCHITECT.

D. ALL PLANTING AREAS SHALL BE GRADED AND MAINTAINED TO ALLOW FREE FLOW OF SURFACE WATER IN AND AROUND THE PLANTING BEDS. STANDING WATER SHALL NOT BE PERMITTED IN PLANTING BEDS.

8. TOPSOILING
A. CONTRACTOR SHALL PROVIDE A 6" THICK MINIMUM LAYER OF TOPSOIL, OR AS DIRECTED BY THE LOCAL ORDINANCE OR CLIENT, IN ALL PLANTING AREAS. TOPSOIL SHOULD BE SPREAD OVER A PREPARED SURFACE IN A UNIFORM LAYER TO ACHIEVE THE DESIRED COMPACTED THICKNESS.
B. ON-SITE TOPSOIL MAY BE USED TO SUPPLEMENT THE TOTAL AMOUNT REQUIRED. TOPSOIL FROM THE SITE MAY BE REJECTED IF IT HAS NOT BEEN PROPERLY REMOVED, STORED AND PROTECTED PRIOR TO CONSTRUCTION.
C. CONTRACTOR SHALL FURNISH TO THE APPROVING AGENCY AN ANALYSIS OF BOTH IMPORTED AND ON-SITE TOPSOIL TO BE UTILIZED IN ALL PLANTING AREAS. THE PH AND NUTRIENT LEVELS MAY NEED TO BE ADJUSTED THROUGH SOIL MODIFICATIONS AS NEEDED TO ACHIEVE THE REQUIRED LEVELS AS SPECIFIED IN THE MATERIALS SECTION ABOVE.

D. ALL LAWN AREAS ARE TO BE CULTIVATED TO A DEPTH OF SIX INCHES (6"). ALL DEBRIS EXPOSED FROM EXCAVATION AND CULTIVATION SHALL BE DISPOSED OF IN ACCORDANCE WITH GENERAL WORK PROCEDURES SECTION ABOVE. THE FOLLOWING SHALL BE TILLED INTO THE TOP FOUR INCHES (4") IN TWO DIRECTIONS (QUANTITIES BASED ON A 1,000 SQUARE FOOT AREA - FOR BID PURPOSES ONLY [SEE SPECIFICATION 6.A.]):
I. 20 POUNDS 'GRO-POWER' OR APPROVED SOIL CONDITIONER/FERTILIZER
II. 20 POUNDS NITRO-FORM (COURSE) 38-0-0 BLUE CHIP OR APPROVED NITROGEN FERTILIZER

E. THE SPREADING OF TOPSOIL SHALL NOT BE CONDUCTED UNDER MUDDY OR FROZEN CONDITIONS.

9. PLANTING
A. INSOFAR THAT IT IS FEASIBLE, PLANT MATERIAL SHALL BE PLANTED ON THE DAY OF DELIVERY. IN THE EVENT THAT THIS IS NOT POSSIBLE, LANDSCAPE CONTRACTOR SHALL PROTECT UNINSTALLED PLANT MATERIAL. PLANTS SHALL NOT REMAIN UNPLANTED FOR LONGER THAN A THREE DAY PERIOD AFTER DELIVERY. PLANTS THAT WILL NOT BE PLANTED FOR A PERIOD OF TIME GREATER THAN THREE DAYS SHALL BE HEALED IN WITH TOPSOIL OR MULCH TO HELP PRESERVE ROOT MOISTURE.

B. PLANTING OPERATIONS SHALL BE PERFORMED DURING PERIODS WITHIN THE PLANTING SEASON WHEN WEATHER AND SOIL CONDITIONS ARE SUITABLE AND IN ACCORDANCE WITH ACCEPTED LOCAL PRACTICE. PLANTS SHALL NOT BE INSTALLED IN TOPSOIL THAT IS IN A MUDDY OR FROZEN CONDITION.

C. ANY INJURED ROOTS OR BRANCHES SHALL BE PRUNED TO MAKE CLEAN-CUT ENDS PRIOR TO PLANTING UTILIZING CLEAN, SHARP TOOLS. ONLY INJURED OR DISEASED BRANCHING SHALL BE REMOVED.

D. ALL PLANTING CONTAINERS, BASKETS AND NON-BIODEGRADABLE MATERIALS SHALL BE REMOVED FROM ROOT BALLS DURING PLANTING. NATURAL FIBER BURLAP MUST BE CUT FROM AROUND THE TRUNK OF THE TREE AND FOLDED DOWN AGAINST THE ROOT BALL PRIOR TO BACKFILLING.

E. POSITION TREES AND SHRUBS AT THEIR INTENDED LOCATIONS AS PER THE PLANS AND SECURE THE APPROVAL OF THE LANDSCAPE ARCHITECT PRIOR TO EXCAVATING PITS, MAKING NECESSARY ADJUSTMENTS AS DIRECTED.

F. PRIOR TO THE ISSUANCE OF ANY CERTIFICATE OF OCCUPANCY, THE PROPOSED LANDSCAPE, AS SHOWN ON THE APPROVED LANDSCAPE PLAN, MUST BE INSTALLED, INSPECTED AND APPROVED BY THE APPROVING AGENCY. THE APPROVING AGENCY SHALL TAKE INTO ACCOUNT SEASONAL CONSIDERATIONS IN THIS REGARD AS FOLLOWS. THE PLANTING OF TREES, SHRUBS, VINES OR GROUND COVER SHALL OCCUR ONLY DURING THE FOLLOWING PLANTING SEASONS:
I. PLANTS: MARCH 15 TO DECEMBER 15
II. LAWN: MARCH 15 TO JUNE 15 OR SEPT. 1 TO DECEMBER 1

PLANTINGS REQUIRED FOR A CERTIFICATE OF OCCUPANCY SHALL BE PROVIDED DURING THE NEXT APPROPRIATE SEASON AT THE MUNICIPALITY'S DISCRETION. CONTRACTOR SHOULD CONTACT APPROVING AGENCY FOR POTENTIAL SUBSTITUTIONS.

G. FURTHERMORE, THE FOLLOWING TREE VARIETIES ARE UNUSUALLY SUSCEPTIBLE TO WINTER DAMAGE. WITH TRANSPLANT SHOCK AND THE SEASONAL LACK OF NITROGEN AVAILABILITY, THE RISK OF PLANT DEATH IS GREATLY INCREASED. IT IS NOT RECOMMENDED THAT THESE SPECIES BE PLANTED DURING THE FALL PLANTING SEASON:

ACER RUBRUM	PLATANUS X ACERIFOLIA
BETULA VARIETIES	POPULUS VARIETIES
CARPINUS VARIETIES	PRUNUS VARIETIES
CRATAEGUS VARIETIES	PYRUS VARIETIES
KOELREUTERIA	QUERCUS VARIETIES
LIQUIDAMBAR STYRACIFLUA	TILIA TOMENTOSA
LIRIODENDRON TULIPIFERA	ZELKOVA VARIETIES

H. PLANTING PITS SHALL BE DUG WITH LEVEL BOTTOMS, WITH THE WIDTH TWICE THE DIAMETER OF ROOT BALL. THE ROOT BALL SHALL REST ON UNDISTURBED GRADE. EACH PLANT PIT SHALL BE BACKFILLED IN LAYERS WITH THE FOLLOWING PREPARED SOIL MIXED THOROUGHLY:
I. 1 PART PEAT MOSS
II. 1 PART COMPOSTED COW MANURE BY VOLUME
III. 3 PARTS TOPSOIL BY VOLUME
IV. 21 GRAMS 'AGRIFORM' PLANTING TABLETS (OR APPROVED EQUAL) AS FOLLOWS:
A) 2 TABLETS PER 1 GALLON PLANT
B) 3 TABLETS PER 5 GALLON PLANT
C) 4 TABLETS PER 15 GALLON PLANT
D) LARGER PLANTS: 2 TABLETS PER ½" CALIPER OF TRUNK

I. FILL PREPARED SOIL AROUND BALL OF PLANT HALF-WAY AND INSERT PLANT TABLETS. COMPLETE BACKFILL AND WATER THOROUGHLY.

J. ALL PLANTS SHALL BE PLANTED SO THAT THE TOP OF THE ROOT BALL, THE POINT AT WHICH THE ROOT FLARE BEGINS, IS SET AT GROUND LEVEL AND IN THE CENTER OF THE PIT. NO SOIL IS TO BE PLACED DIRECTLY ON TOP OF THE ROOT BALL.

K. ALL PROPOSED TREES DIRECTLY ADJACENT TO WALKWAYS OR DRIVEWAYS SHALL BE PRUNED AND MAINTAINED TO A MINIMUM BRANCHING HEIGHT OF 7' FROM GRADE.

L. GROUND COVER AREAS SHALL RECEIVE A ¼" LAYER OF HUMUS RAKED INTO THE TOP 1" OF PREPARED SOIL PRIOR TO PLANTING. ALL GROUND COVER AREAS SHALL BE WEEDED AND TREATED WITH A PRE-EMERGENT CHEMICAL AS PER MANUFACTURER'S RECOMMENDATION.

M. NO PLANT, EXCEPT GROUND COVERS, GRASSES OR VINES, SHALL BE PLANTED LESS THAN TWO FEET (2') FROM EXISTING STRUCTURES AND SIDEWALKS.

N. ALL PLANTING AREAS AND PLANTING PITS SHALL BE MULCHED AS SPECIFIED HEREIN TO FILL THE ENTIRE BED AREA OR SAUCER. NO MULCH IS TO TOUCH THE TRUNK OF THE TREE OR SHRUB.

O. ALL PLANTING AREAS SHALL BE WATERED IMMEDIATELY UPON INSTALLATION IN ACCORDANCE WITH THE WATERING SPECIFICATIONS AS LISTED HEREIN.

10. TRANSPLANTING (WHEN REQUIRED)
A. ALL TRANSPLANTS SHALL BE DUG WITH INTACT ROOT BALLS CAPABLE OF SUSTAINING THE PLANT.

B. IF PLANTS ARE TO BE STOCKPILED BEFORE REPLANTING, THEY SHALL BE HEALED IN WITH MULCH OR SOIL, ADEQUATELY WATERED AND PROTECTED FROM EXTREME HEAT, SUN AND WIND.

C. PLANTS SHALL NOT BE DUG FOR TRANSPLANTING BETWEEN APRIL 10 AND JUNE 30.

D. UPON REPLANTING, BACKFILL SOIL SHALL BE AMENDED WITH FERTILIZER AND ROOT GROWTH HORMONE.

E. TRANSPLANTS SHALL BE GUARANTEED FOR THE LENGTH OF THE GUARANTEE PERIOD SPECIFIED HEREIN.

F. IF TRANSPLANTS DIE, SHRUBS AND TREES LESS THAN SIX INCHES (6") DBH SHALL BE REPLACED IN KIND. TREES GREATER THAN SIX INCHES (6") DBH MAY BE REQUIRED TO BE REPLACED IN ACCORDANCE WITH THE MUNICIPALITY'S TREE REPLACEMENT GUIDELINES.

11. WATERING
A. NEW PLANTINGS OR LAWN AREAS SHALL BE ADEQUATELY IRRIGATED BEGINNING IMMEDIATELY AFTER PLANTING. WATER SHALL BE APPLIED TO EACH TREE AND SHRUB IN SUCH MANNER AS NOT TO DISTURB BACKFILL AND TO THE EXTENT THAT ALL MATERIALS IN THE PLANTING HOLE ARE THOROUGHLY SATURATED. WATERING SHALL CONTINUE AT LEAST UNTIL PLANTS ARE ESTABLISHED.

B. SITE OWNER SHALL PROVIDE WATER IF AVAILABLE ON SITE AT TIME OF PLANTING. IF WATER IS NOT AVAILABLE ON SITE, CONTRACTOR SHALL SUPPLY ALL NECESSARY WATER. THE USE OF WATERING BAGS IS RECOMMENDED FOR ALL NEWLY PLANTED TREES.

C. IF AN IRRIGATION SYSTEM HAS BEEN INSTALLED ON THE SITE, IT SHALL BE USED TO WATER PROPOSED PLANT MATERIAL, BUT ANY FAILURE OF THE SYSTEM DOES NOT ELIMINATE THE CONTRACTOR'S RESPONSIBILITY OF MAINTAINING THE DESIRED MOISTURE LEVEL FOR VIGOROUS, HEALTHY GROWTH.

12. GUARANTEE
A. THE LANDSCAPE CONTRACTOR SHALL GUARANTEE ALL PLANTS FOR A PERIOD OF 1 YEAR FROM APPROVAL OF LANDSCAPE INSTALLATION BY THE APPROVING AGENCY. CONTRACTOR SHALL SUPPLY THE OWNER WITH A MAINTENANCE BOND FOR TEN PERCENT (10%) OF THE VALUE OF THE LANDSCAPE INSTALLATION WHICH WILL BE RELEASED AT THE CONCLUSION OF THE GUARANTEE PERIOD AND WHEN A FINAL INSPECTION HAS BEEN COMPLETED AND APPROVED BY THE OWNER OR AUTHORIZED REPRESENTATIVE.

B. ANY DEAD OR DYING PLANT MATERIAL SHALL BE REPLACED FOR THE LENGTH OF THE GUARANTEE PERIOD. REPLACEMENT OF PLANT MATERIAL SHALL BE CONDUCTED AT THE FIRST SUCCEEDING PLANTING SEASON. ANY DEBRIS SHALL BE DISPOSED OF OFF-SITE, WITHOUT EXCEPTION.

C. TREES AND SHRUBS SHALL BE MAINTAINED BY THE CONTRACTOR DURING CONSTRUCTION AND THROUGHOUT THE 90 DAY MAINTENANCE PERIOD AS SPECIFIED HEREIN. CULTIVATION, WEEDING, WATERING AND THE PREVENTATIVE TREATMENTS SHALL BE PERFORMED AS NECESSARY TO KEEP PLANT MATERIAL IN GOOD CONDITION AND FREE OF INSECTS AND DISEASE.

D. LAWNS SHALL BE MAINTAINED THROUGH WATERING, FERTILIZING, WEEDING, MOWING, TRIMMING AND OTHER OPERATIONS SUCH AS ROLLING, REGARDING AND REPLANTING AS REQUIRED TO ESTABLISH A SMOOTH, ACCEPTABLE LAWN, FREE OF ERODED OR BARE AREAS.

13. CLEANUP
A. UPON THE COMPLETION OF ALL LANDSCAPE INSTALLATION AND BEFORE THE FINAL ACCEPTANCE, THE CONTRACTOR SHALL REMOVE ALL UNUSED MATERIALS, EQUIPMENT AND DEBRIS FROM THE SITE. ALL PAVED AREAS ARE TO BE CLEANED.

B. THE SITE SHALL BE CLEANED AND LEFT IN A NEAT AND ACCEPTABLE CONDITION AS APPROVED BY THE OWNER OR AUTHORIZED REPRESENTATIVE.

14. MAINTENANCE (ALTERNATIVE BID):
A 90 DAY MAINTENANCE PERIOD SHALL COMMENCE AT THE END OF ALL LANDSCAPE INSTALLATION OPERATIONS. THE 90 DAY MAINTENANCE PERIOD ENSURES TO THE OWNER/OPERATOR THAT THE NEWLY INSTALLED LANDSCAPING HAS BEEN MAINTAINED AS SPECIFIED ON THE APPROVED LANDSCAPE PLAN. ONCE THE INITIAL 90 DAY MAINTENANCE PERIOD HAS EXPIRED, THE OWNER/OPERATOR MAY REQUEST THAT BIDDERS SUBMIT AN ALTERNATE MAINTENANCE BID FOR A MONTHLY MAINTENANCE CONTRACT. THE ALTERNATE MAINTENANCE CONTRACT WILL ENCOMPASS ANY WORK THAT IS CONSIDERED APPROPRIATE TO ENSURE THAT PLANT AND LAWN AREAS ARE HEALTHY AND MANICURED TO THE APPROVAL OF THE OWNER/OPERATOR.

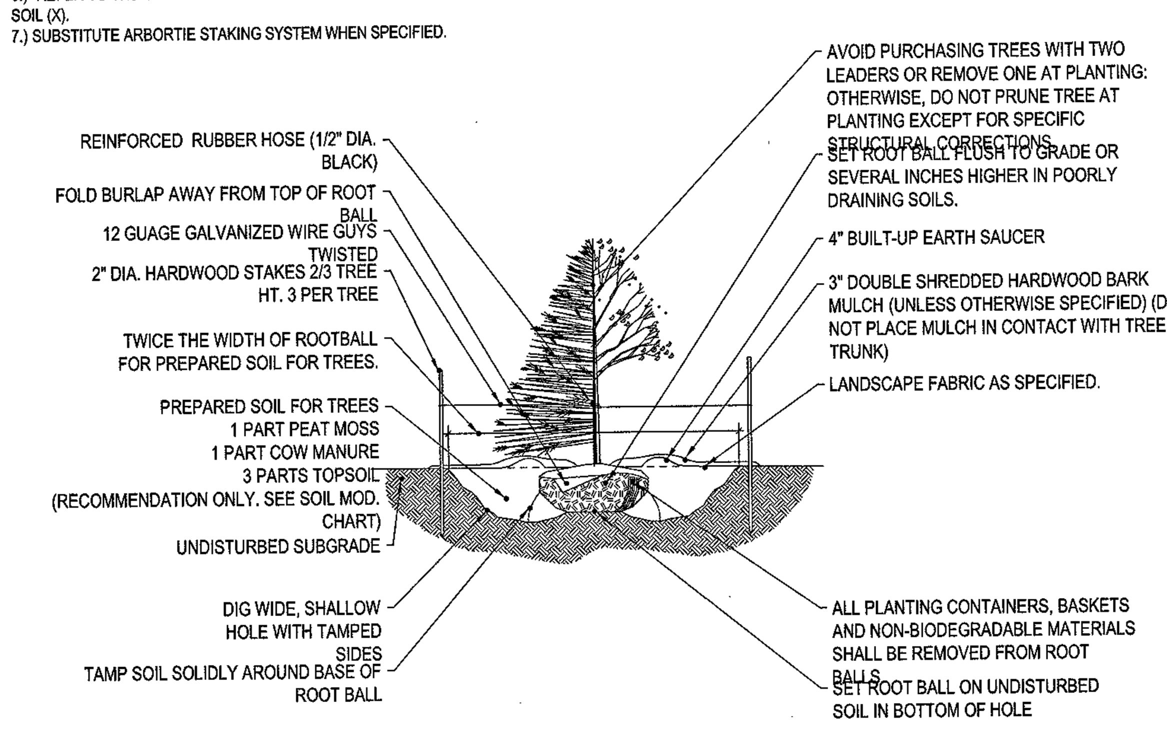
HYDROSEED SPECIFICATIONS

1. PRIOR TO SEEDING, AREA IS TO BE TOPSOILED, FINE GRADED, AND RAKED OF ALL DEBRIS LARGER THAN 2" DIAMETER.
2. PRIOR TO SEEDING, CONSULT MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS.
3. SEEDING RATES:

• PERENNIAL RYEGRASS	1/2 LB/1000 SQ FT
• KENTUCKY BLUEGRASS	1 LB/1000 SQ FT
• RED FESCUE	1/2 LB/1000 SQ FT
• SPREADING FESCUE	1/2 LB/1000 SQ FT
• FERTILIZER (16.32.16)	2 LB/1000 SQ FT
• LIQUID LIME	1 GAL/800 GAL.
• TANK TACKIFIER	35 LB/800 GAL.
• TANK FIBER MULCH	30 LB/1000 SQ FT

4. GERMINATION RATES WILL VARY AS TO TIME OF YEAR FOR SOWING. CONTRACTOR TO IRRIGATE SEEDED AREA UNTIL AN ACCEPTABLE STAND OF COVER IS ESTABLISHED BY OWNER.

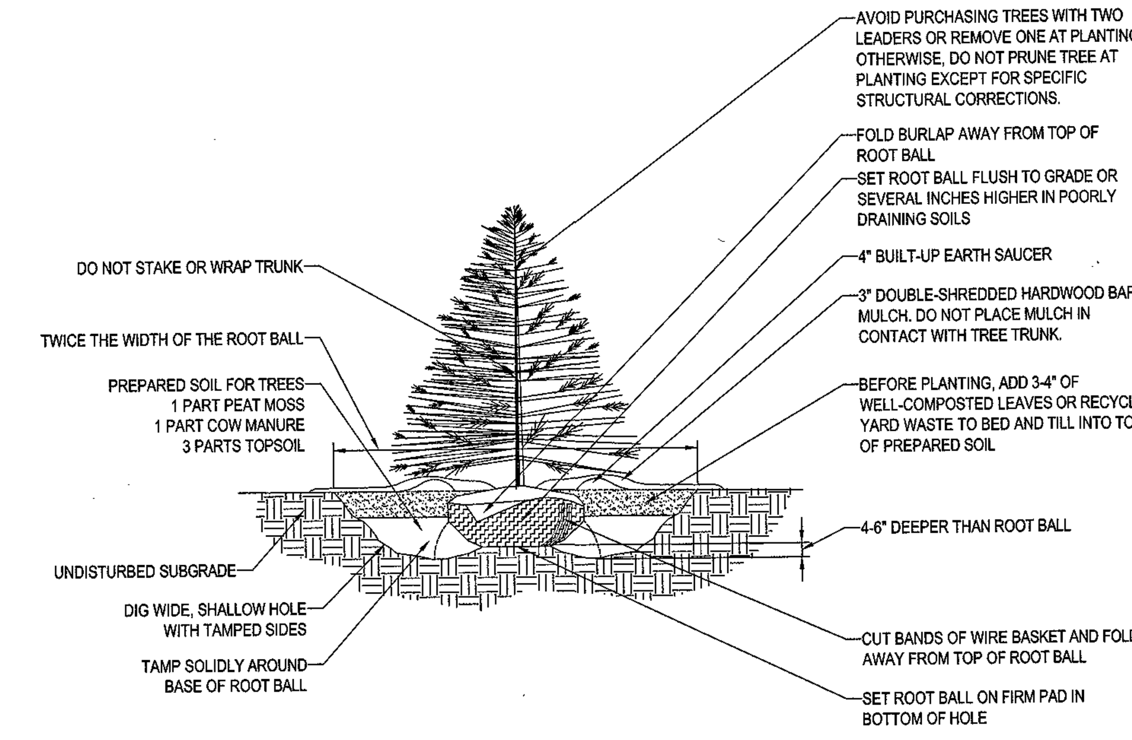
NOTES:
1.) NO SOIL OR MULCH SHALL BE PLACED AGAINST ROOT COLLAR OF PLANT.
2.) REMOVE ALL NON-BIODEGRADABLE MATERIAL AND ROPE FROM TRUNK & TOP OF ROOT BALL. FOLD BURLAP BACK 1/3 FROM ROOT BALL.
3.) PLANTING DEPTH SHALL BE THE SAME AS GROWN IN NURSERY.
4.) THOROUGHLY SOAK THE TREE ROOT BALL AND ADJACENT PREPARED SOIL SEVERAL TIMES DURING THE FIRST MONTH AFTER PLANTING AND REGULARLY THROUGHOUT THE FOLLOWING TWO SUMMERS.
5.) THE BOTTOM OF PLANTING PIT EXCAVATIONS SHOULD BE ROUGH TO AVOID MATTING OF SOIL LAYERS AS NEW SOIL IS ADDED. IT IS PREFERABLE TO TILL THE FIRST LIFT (2 TO 3 IN.) OF PLANTING SOIL INTO THE SUBSOIL.
6.) REFER TO THE CHART "GENERAL RANGE OF SOIL MODIFICATIONS & VOLUMES FOR VARIOUS SOIL CONDITIONS" TO DETERMINE MINIMUM WIDTH OF PREPARED SOIL (X).
7.) SUBSTITUTE ARBORTIE STAKING SYSTEM WHEN SPECIFIED.



TREE PLANTING DETAIL

N.T.S.

NOTES:
1. NO SOIL OR MULCH SHALL BE PLACED AGAINST ROOT COLLAR OF PLANT.
2. REMOVE ALL ROPE FROM TRUNK & TOP OF ROOT BALL. FOLD BURLAP BACK 1/3 FROM TOP OF ROOT BALL.
3. PLANTING DEPTH SHALL BE THE SAME AS GROWN IN NURSERY.
4. THOROUGHLY SOAK THE TREE ROOT BALL AND ADJACENT PREPARED SOIL SEVERAL TIMES DURING THE FIRST MONTH AFTER PLANTING AND REGULARLY THROUGHOUT THE FOLLOWING TWO SUMMERS.
5. THE BOTTOM OF PLANTING PIT EXCAVATIONS SHOULD BE ROUGH TO AVOID MATTING OF SOIL LAYERS AS NEW SOIL IS ADDED. IT IS PREFERABLE TO TILL THE FIRST LIFT (2 -3 IN.) OF PLANTING SOIL INTO THE SUBSOIL.

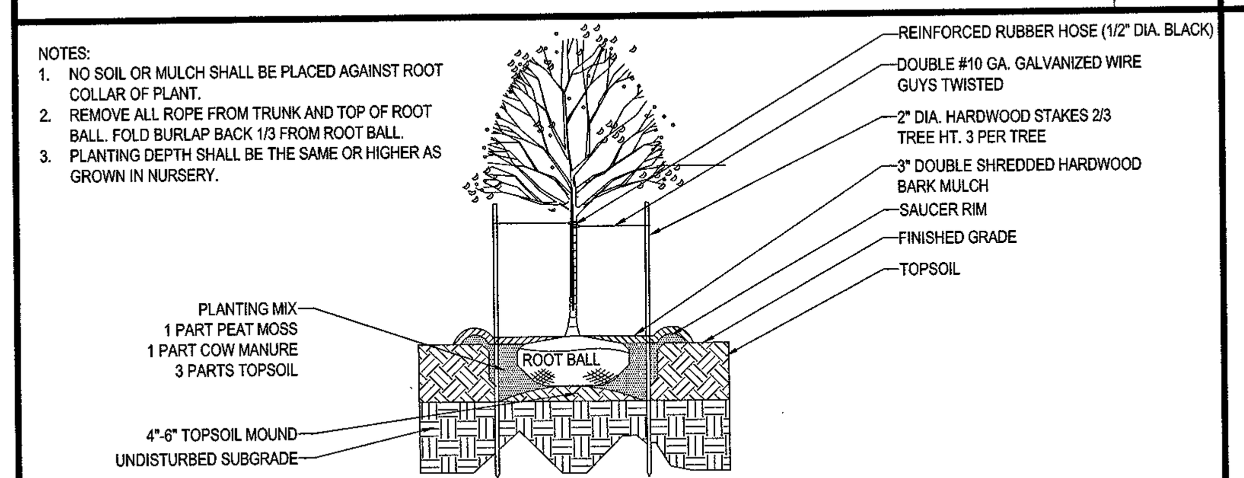


REFERENCE: ARCHITECTURAL GRAPHIC STANDARDS 1998 CUMULATIVE SUPPLEMENT

EVERGREEN TREE PLANTING DETAIL

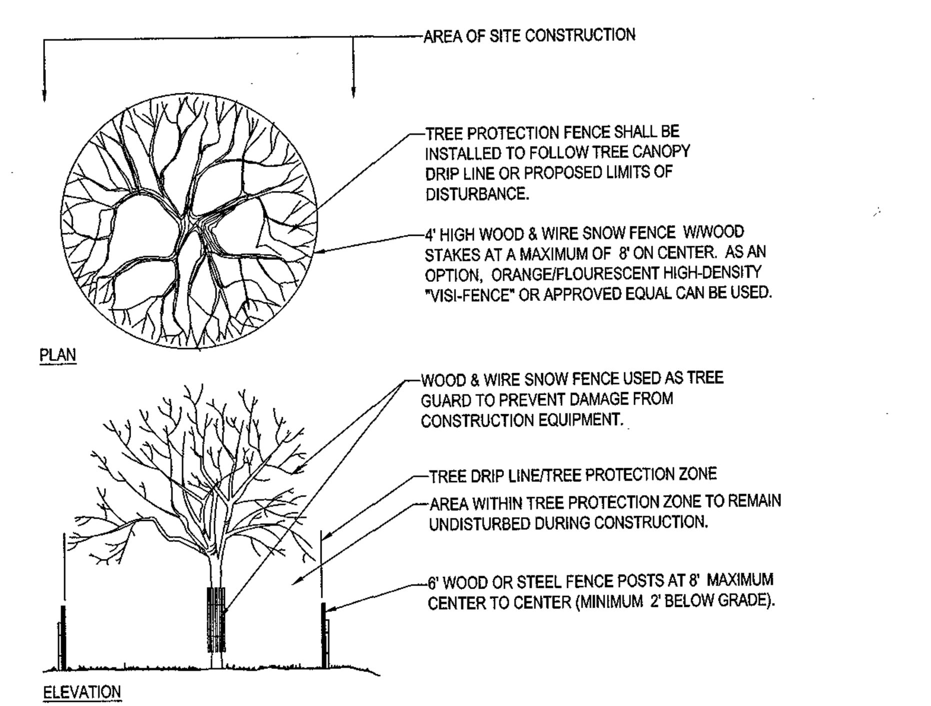
N.T.S.

NOTES:
1. NO SOIL OR MULCH SHALL BE PLACED AGAINST ROOT COLLAR OF PLANT.
2. REMOVE ALL ROPE FROM TRUNK AND TOP OF ROOT BALL. FOLD BURLAP BACK 1/3 FROM ROOT BALL.
3. PLANTING DEPTH SHALL BE THE SAME OR HIGHER AS GROWN IN NURSERY.



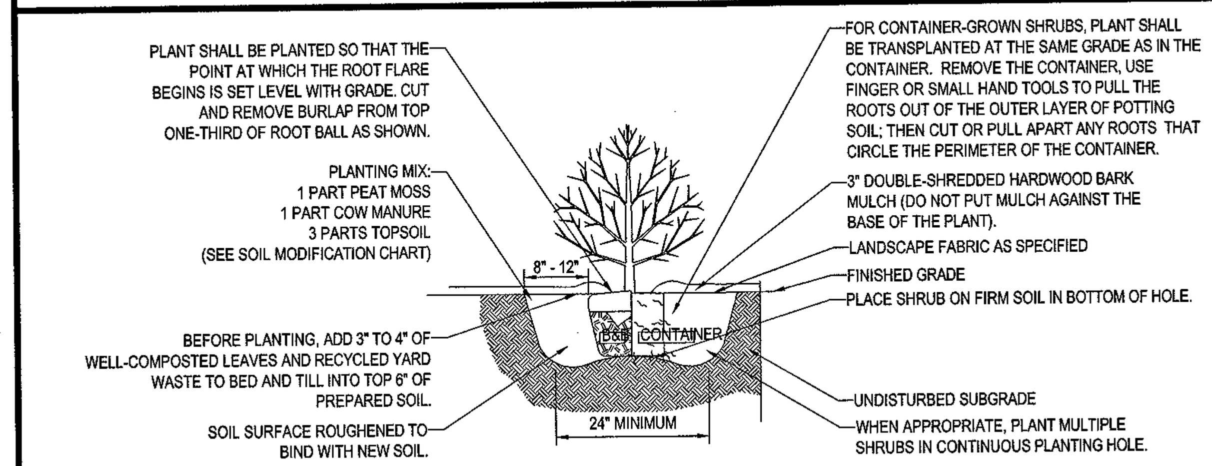
DECIDUOUS TREE PLANTING DETAIL

N.T.S.



TREE PROTECTION DURING SITE CONSTRUCTION

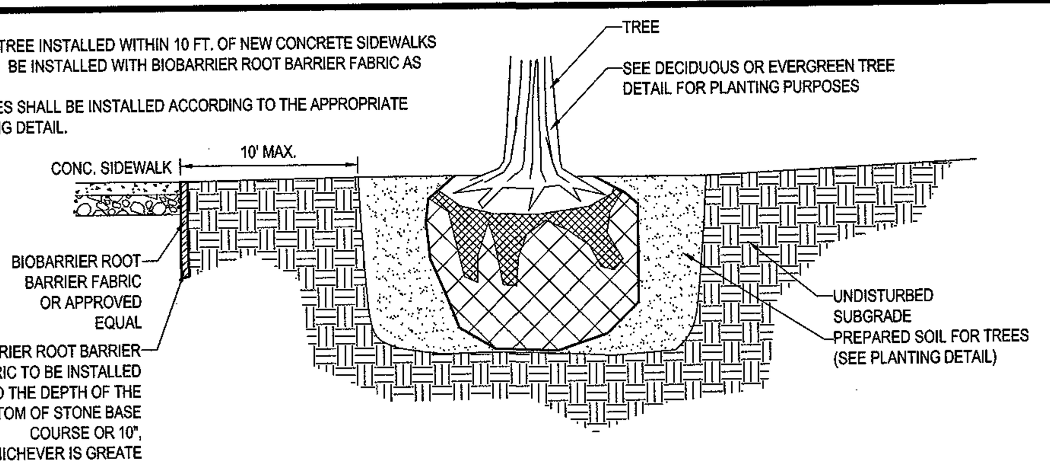
N.T.S.



SHRUB PLANTING DETAIL

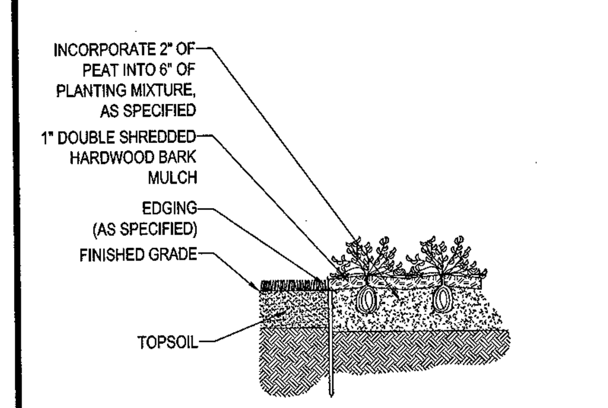
N.T.S.

NOTES:
1. ANY TREE INSTALLED WITHIN 10 FT. OF NEW CONCRETE SIDEWALKS SHOULD BE INSTALLED WITH BIOBARRIER ROOT BARRIER FABRIC AS SHOWN
2. TREES SHALL BE INSTALLED ACCORDING TO THE APPROPRIATE PLANTING DETAIL.



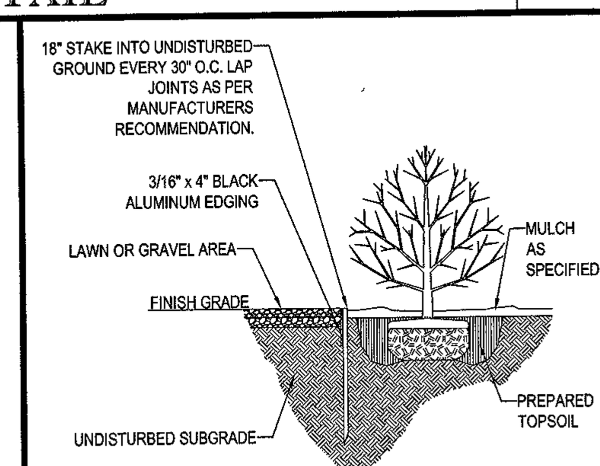
BI0BARRIER ROOT BARRIER DETAIL

N.T.S.



GROUNDCOVER PLANTING

N.T.S.



BLACK ALUMINUM EDGING

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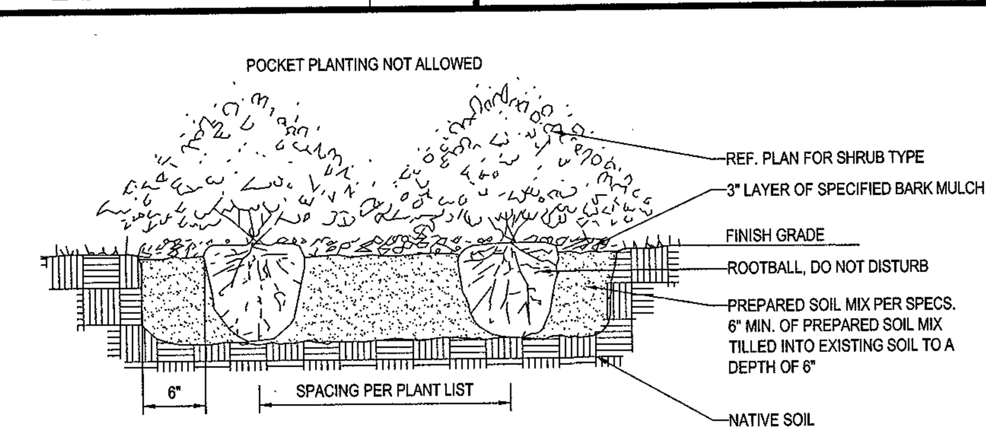
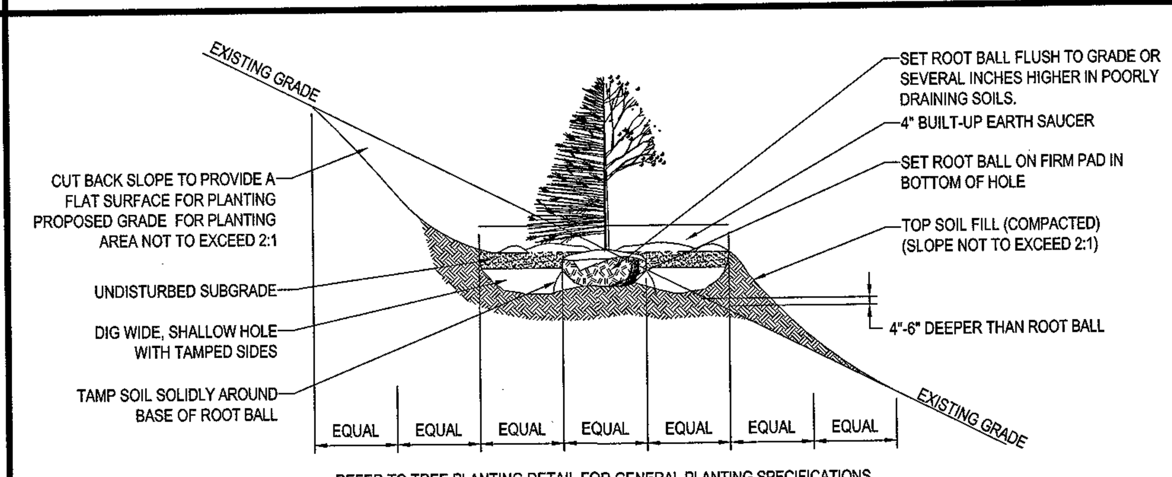


SHRUB/GROUNDCOVER DETAIL

N.T.S.



REFER TO TREE PLANTING DETAIL FOR GENERAL PLANTING SPECIFICATIONS

TREE PLANTING DETAIL - ON SLOPE

N.T.S.

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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:
SITE DEVELOPMENT PLANS
—FOR—
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
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MASSACHUSETTS No. 1211
RHODE ISLAND No.
NEW YORK No. 002559
NEW HAMPSHIRE No. 109

SHEET TITLE:
LANDSCAPE NOTES & DETAILS SHEET

SHEET NUMBER:
10
OF 14

REV 0 - 07/06/2015

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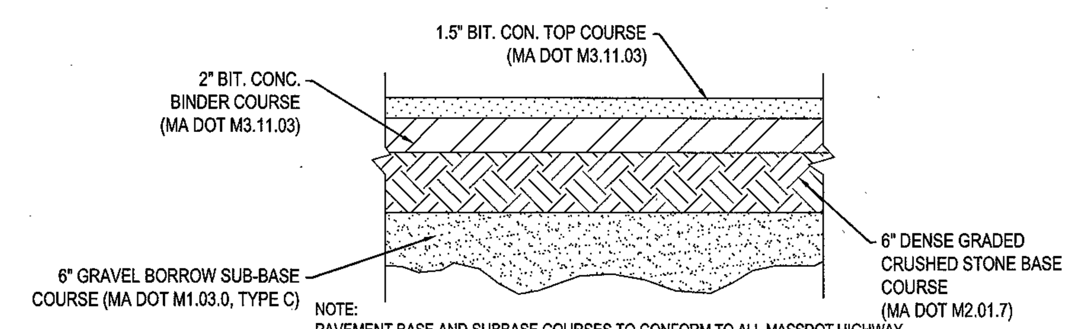
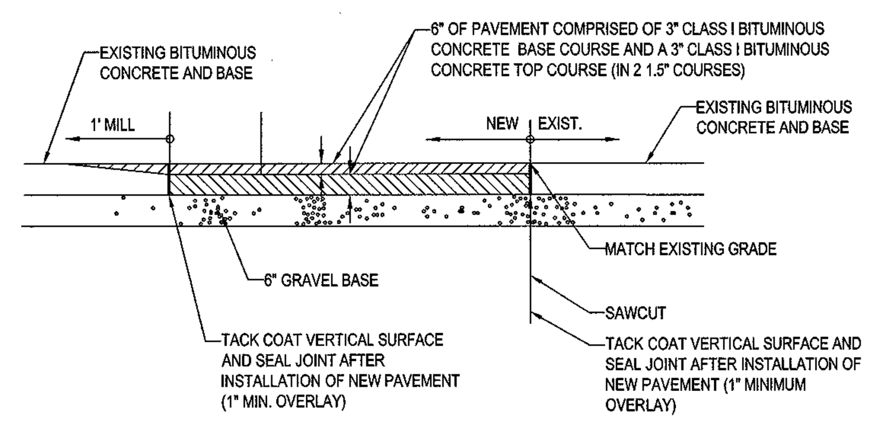
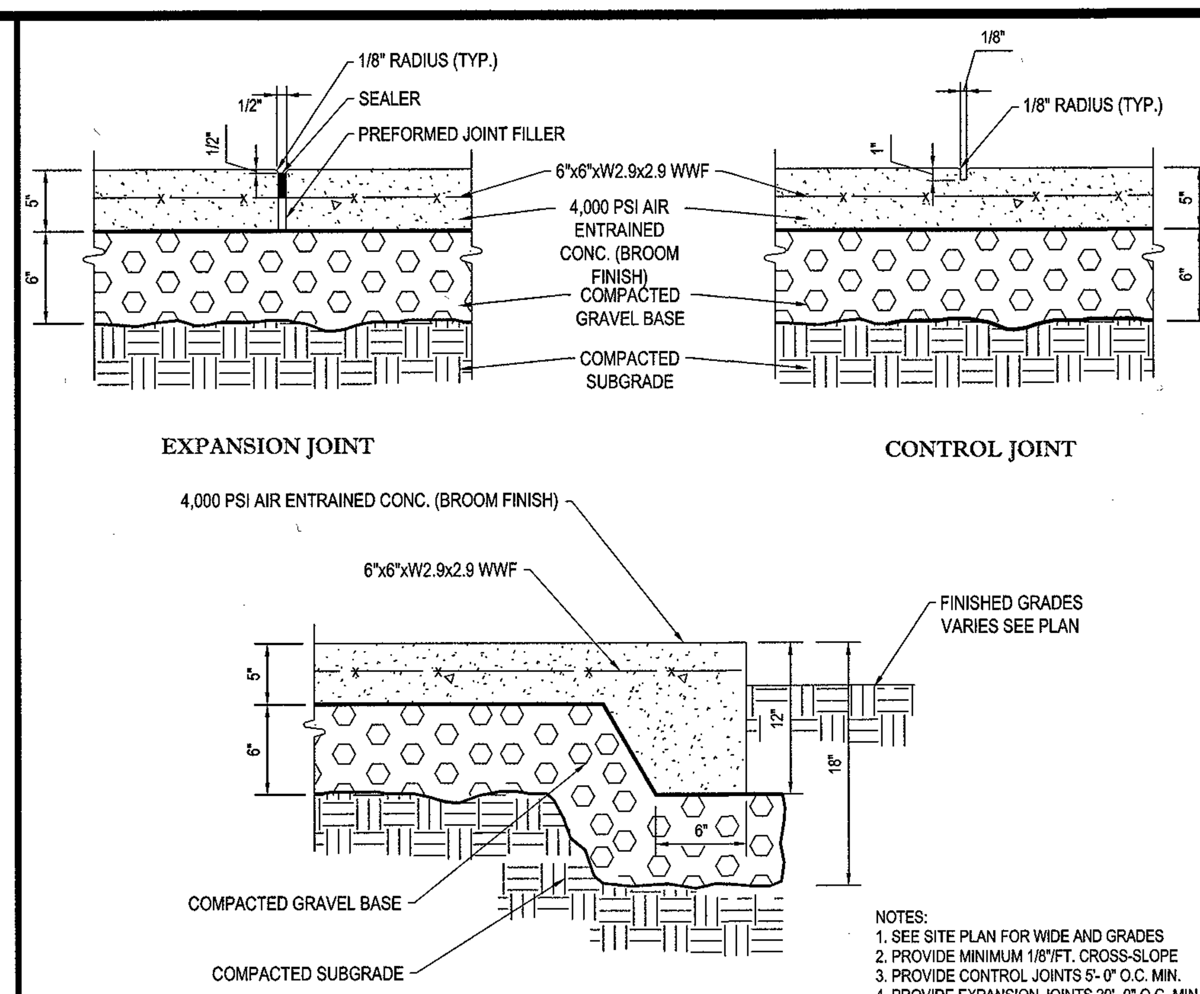


NOTE:
PAVEMENT BASE AND SUBBASE COURSES TO CONFORM TO ALL MASSDOT HIGHWAY DIVISION SPECIFICATIONS. GC TO REFER TO GEOTECHNICAL REPORT PREPARED BY TERRACON CONSULTANTS, INV. DATED 10/22/10 FOR PAVEMENT SPECIFICATIONS.

TYPICAL PAVEMENT SECTION
N.T.S.



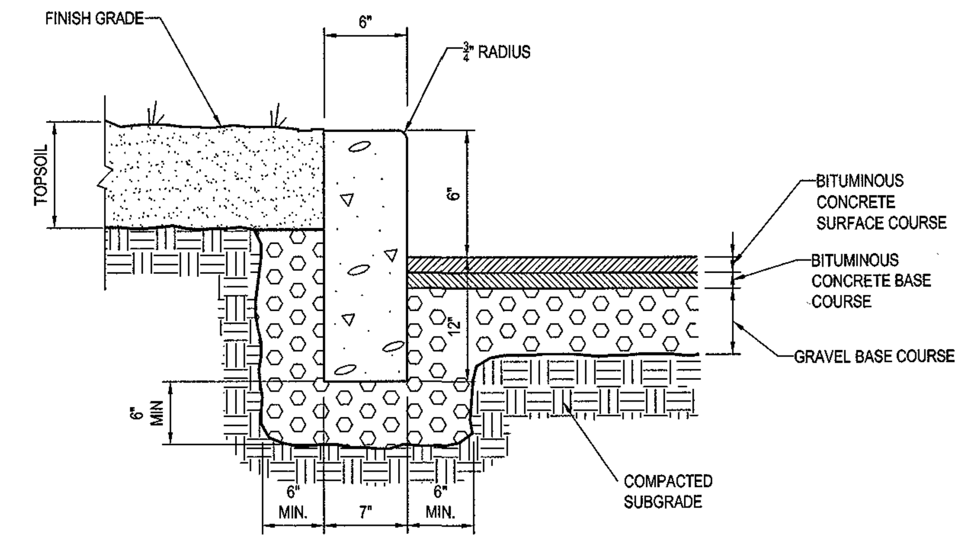
ROADWAY PATCHING DETAIL
N.T.S.



NOTES:
1. SEE SITE PLAN FOR WIDE AND GRADES
2. PROVIDE MINIMUM 1/8"/FT. CROSS-SLOPE
3. PROVIDE CONTROL JOINTS 5'- 0" O.C. MIN.
4. PROVIDE EXPANSION JOINTS 20'- 0" O.C. MIN.

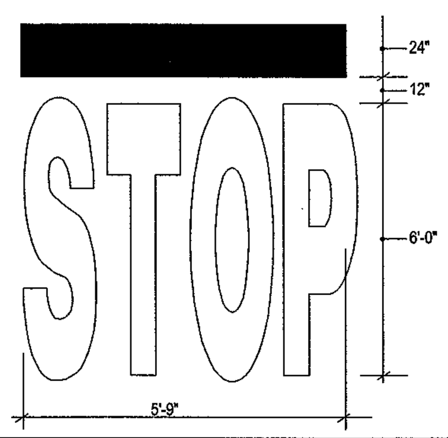
TO BE USED FOR BUILDING SURROUND AND OTHER CONCRETE WALKS.
USE CHAIRS TO SUPPORT REINFORCING STEEL DURING POUR.

MONOLITHIC CONC. SIDEWALK DETAILS
N.T.S.

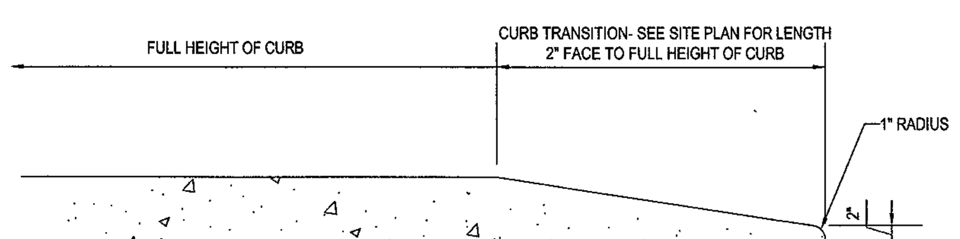


NOTE:
1. CURB SHALL CONSIST OF 4,000 PSI AIR ENTRAINED CONCRETE, EXPOSED EDGES TO HAVE RUBBED FINISH AND SURFACE SHALL BE TREATED WITH A CONCRETE PENETRANT/SEALER.
2. THE ENDS OF CURB SECTIONS SHALL BE CHAMFERED 1/4 INCH.
3. THE CORNERS OF CURB SECTIONS SHALL MATCH THE ADJACENT CURB IN SIZE, COLOR AND FINISH.
4. CURBS, CURB CORNERS OR EDGING SHALL BE FITTED TOGETHER AS CLOSELY AS POSSIBLE.
5. EXPANSION JOINTS SHALL BE INSTALLED AT A MAXIMUM OF TWENTY FEET (20') ON CENTER USING PREFORMED EXPANSION JOINT FILLER HAVING A THICKNESS OF 1/2 INCH.

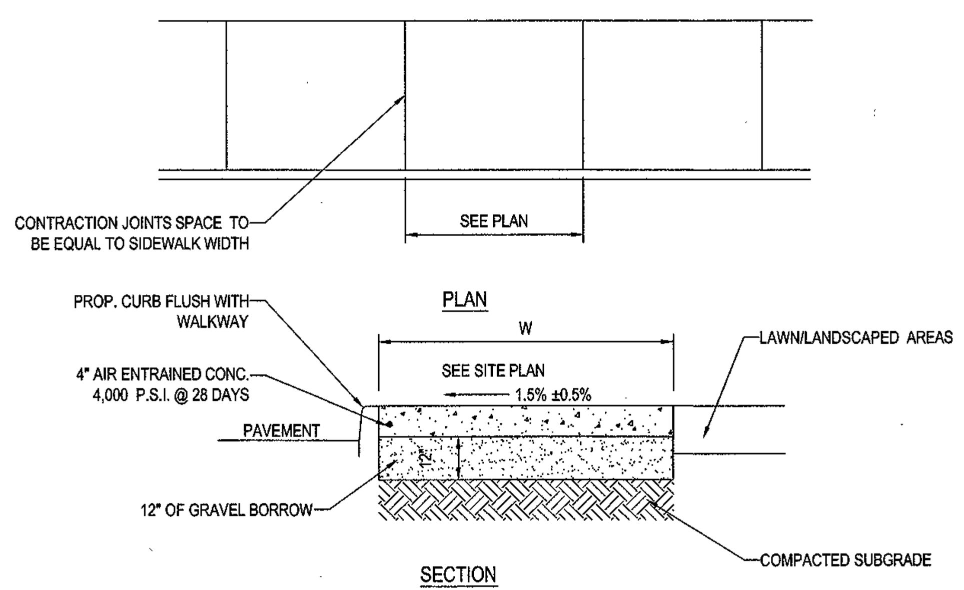
PRECAST CONCRETE CURB DETAIL
N.T.S.



'STOP' BAR DETAIL
N.T.S.

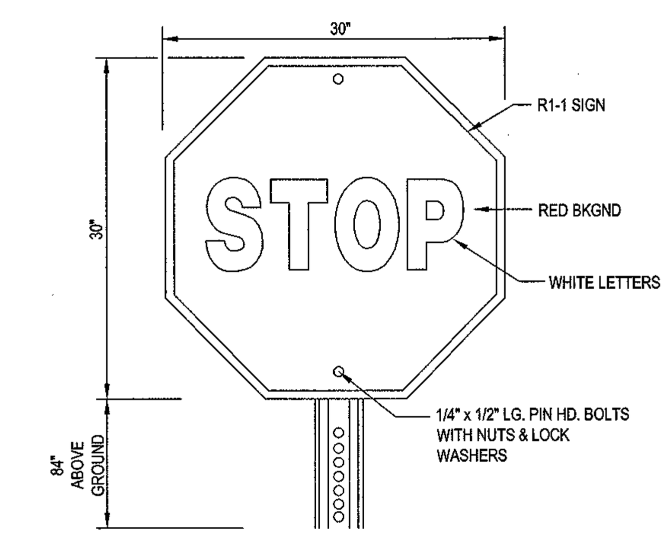


TRANSITION CURB DETAIL
N.T.S.

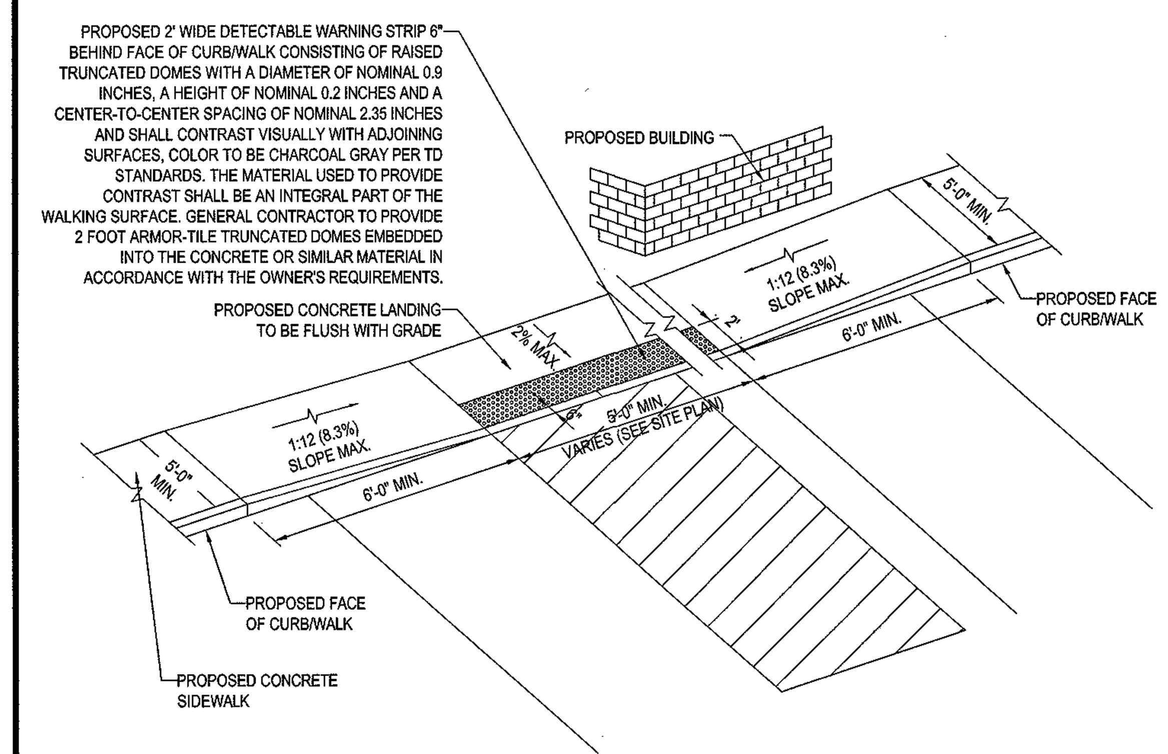


NOTE:
1. PROVIDE 1/2" PREMOLDED BITUMINOUS EXPANSION JOINT AT 20' O.C.
2. ALL JOINTS SEALED PER SPECIFICATIONS.

SIDEWALK DETAIL
N.T.S.



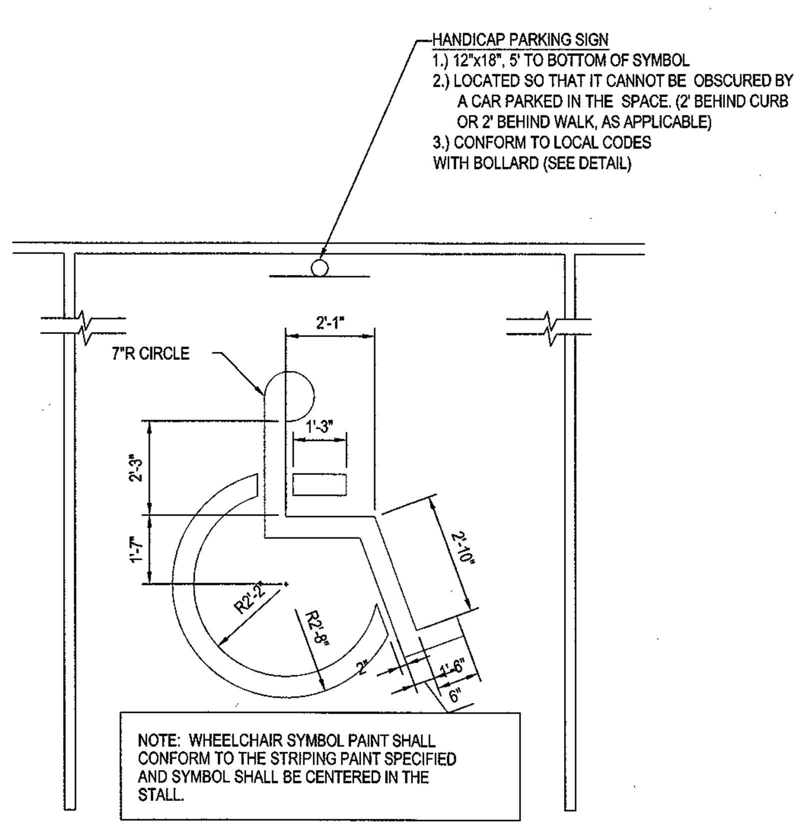
'STOP' SIGN
N.T.S.



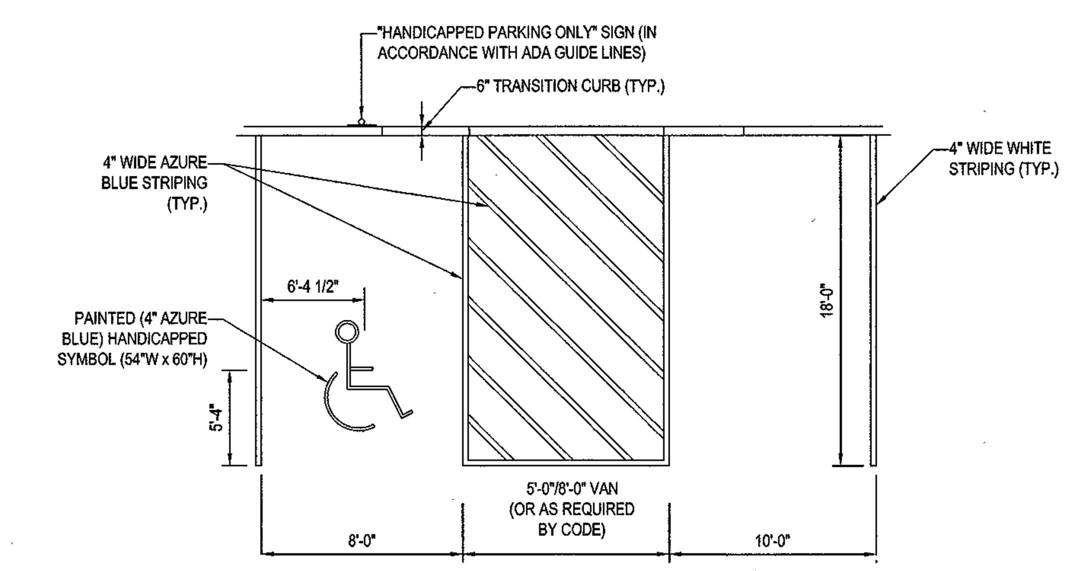
(FOR SIDEWALK SLOPES LESS THAN 1:20 (5.0%) MAX.)

NOTE: SLOPES OF ACCESSIBLE PARKING SPACES AND PARKING ACCESS AISLES SHALL NOT EXCEED 1:50 (2.0%) MAX. IN ANY DIRECTION.

SLOPED WALK DETAIL
N.T.S.

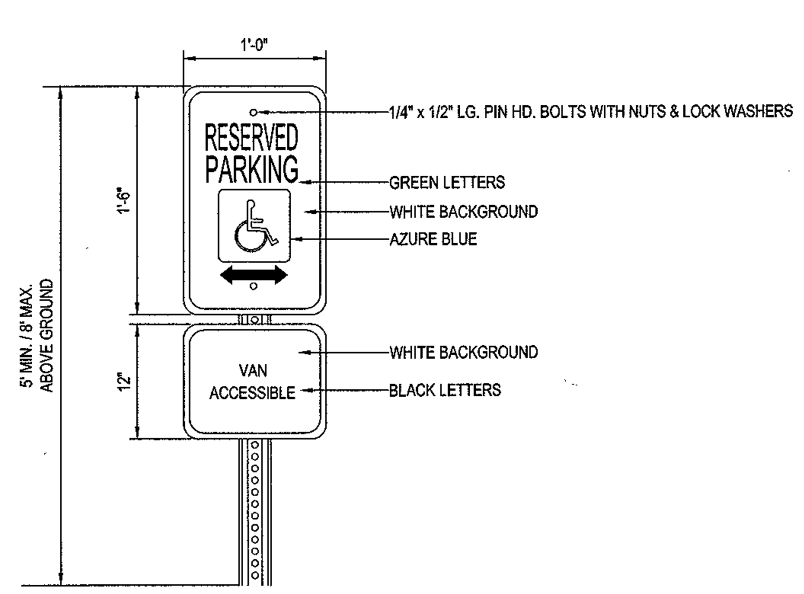


HANDICAP PARKING STALL PAINTING DETAIL
N.T.S.



NOTE: ALL PAVEMENT STRIPING AND MARKINGS SHALL CONSIST OF CHLORINATED RUBBER PAINT APPLIED TO A DRY SURFACE WHEN THE TEMPERATURE IS GREATER THAN 40°F. PAINT SHALL BE APPLIED AT A MINIMUM OF 0.015" (15 MIL) FILM THICKNESS

HANDICAPPED STALL MARKINGS & PARKING LOT STRIPING DETAIL
N.T.S.



HANDICAP PARKING SIGN DETAIL
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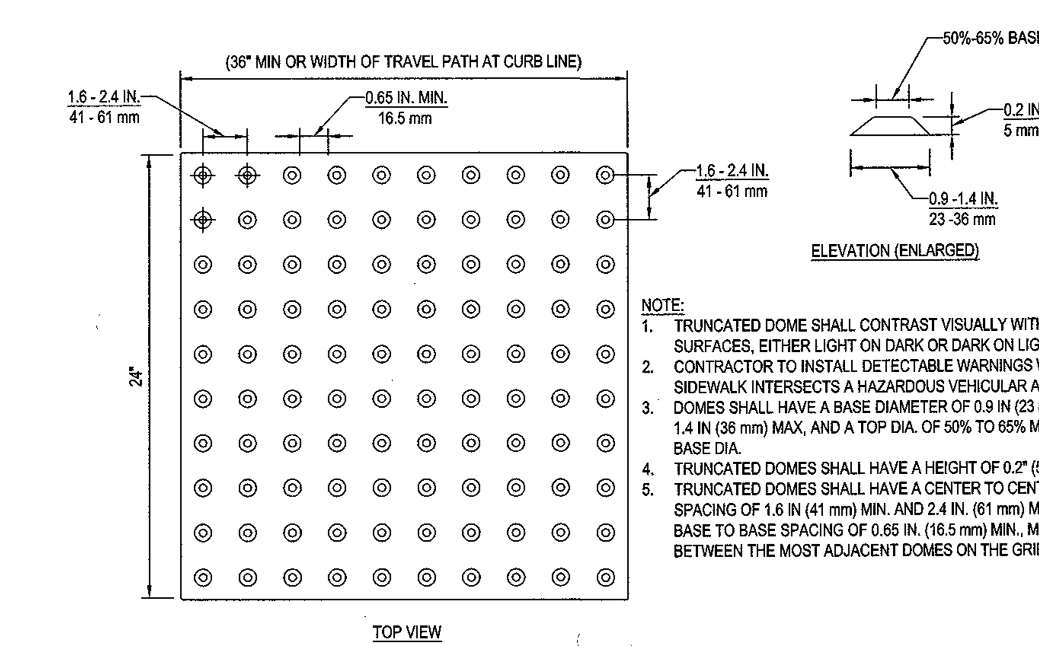

NOTE:
1. TRUNCATED DOME SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT ON DARK OR DARK ON LIGHT.
2. CONTRACTOR TO INSTALL DETECTABLE WARNINGS WHEN SIDEWALK INTERSECTS A HAZARDOUS VEHICULAR AREA.
3. DOMES SHALL HAVE A BASE DIAMETER OF 0.9 IN (23 mm) MIN. TO 1.4 IN (36 mm) MAX, AND A TOP DIA. OF 50% TO 65% MAX. OF THE BASE DIA.
4. TRUNCATED DOMES SHALL HAVE A HEIGHT OF 0.2" (5.1 mm).
5. TRUNCATED DOMES SHALL HAVE A CENTER TO CENTER SPACING OF 1.6 IN (41 mm) MIN. AND 2.4 IN. (61 mm) MAX. AND A BASE TO BASE SPACING OF 0.65 IN. (16.5 mm) MIN., MEASURED BETWEEN THE MOST ADJACENT DOMES ON THE GRID.

NOTE TO DESIGNER:
IF A WALK CROSSES OR ADJOINS A VEHICULAR WAY WHERE THE WALKING SURFACE AND PAVEMENT ARE NOT SEPERATED BY CURBS, RAILING OR OTHER ELEMENTS, THE BOUNDARY BETWEEN THE AREA SHALL BE DEFINED BY A CONTINUOUS DETECTABLE WARNING WHICH IS MIN. 36" WIDE (ADA ACCESSIBLE GUIDELINES PRINTED 11-4-06) AND MIN. 24" DEPTH.

TRUNCATED DOME PATTERN
N.T.S.

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PRELIMINARY
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PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:
SITE DEVELOPMENT PLANS
FOR
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
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J.A. KUCICH
PROFESSIONAL ENGINEER
JOHN A. KUCICH CIVIL No. 41530

SHEET TITLE:
CONSTRUCTION

SHEET NUMBER:
11
OF 14

REV 0 - 07/06/2015

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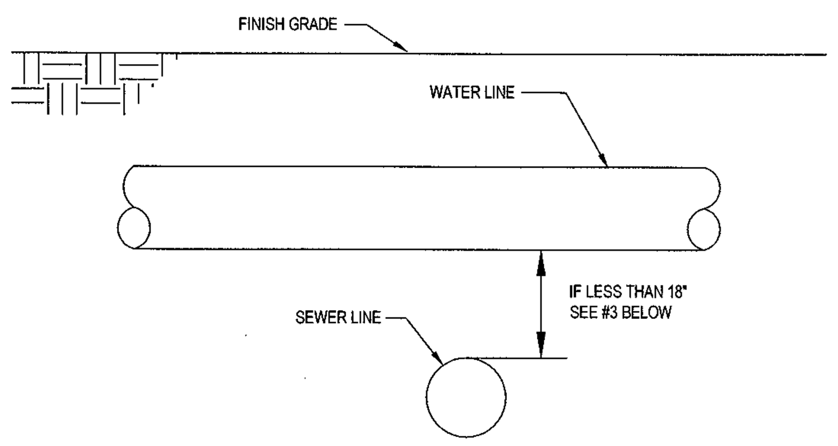


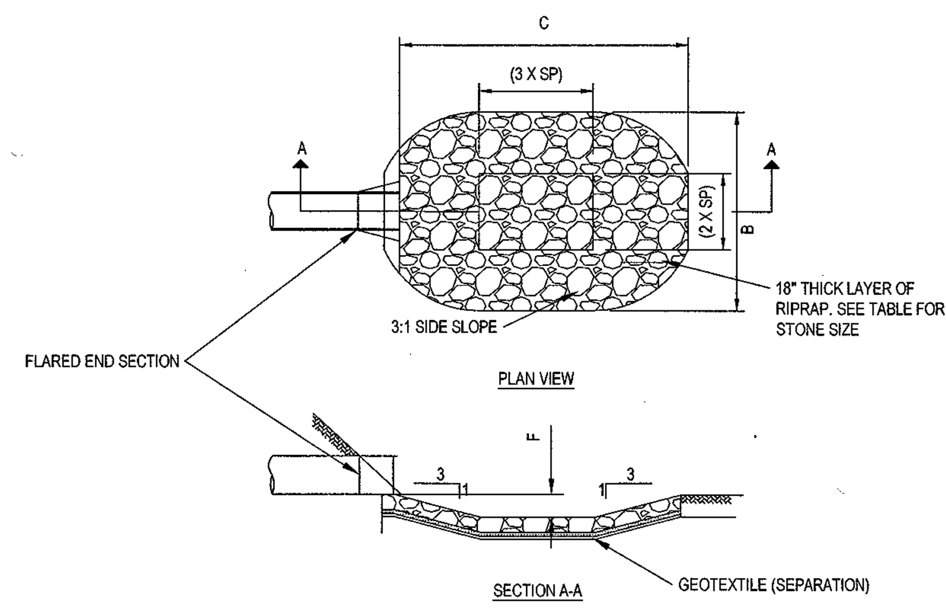
NOTES:
1. THE VERTICAL SEPARATION BETWEEN THE WATER MAIN AND THE SEWER LINE SHALL BE A MINIMUM OF 18 INCHES.
2. THE HORIZONTAL SEPARATION BETWEEN THE WATER MAIN AND THE SEWER LINE SHALL BE A MINIMUM OF 10 FEET.
3. IF 1 OR 2 CANNOT BE MAINTAINED EITHER:
A. WATER MAIN IS TO BE RE-LOCATED OR RE-CONSTRUCTED USING MECHANICAL JOINTS DUCTILE IRON PIPE FOR A DISTANCE OF 10 FEET ON EITHER SIDE OF THE CROSSING. CENTER WATER MAIN LENGTH OF PIPE SO THAT CENTER OF PIPE SECTION IS OVER SEWER. CENTER LENGTH OF SEWER PIPE UNDER CENTER OF WATER MAIN SO THAT JOINTS ARE THE MAXIMUM DISTANCE POSSIBLE APART.
B. WATER AND SEWER LINES SHALL BE CONCRETE ENCASED PER DETAIL.

WHERE 10' HORIZONTAL SEPARATION
OR 18" VERTICAL SEPARATION CANNOT BE ACHIEVED

WATER MAIN CROSSING

N.T.S.

SCOUR HOLE DIMENSIONS (FT.)					AVG. STONE SIZE
FES #	B	C	Sp	F	
1	5	6	1	0.5	8"



RIPRAP OUTLET PROTECTION

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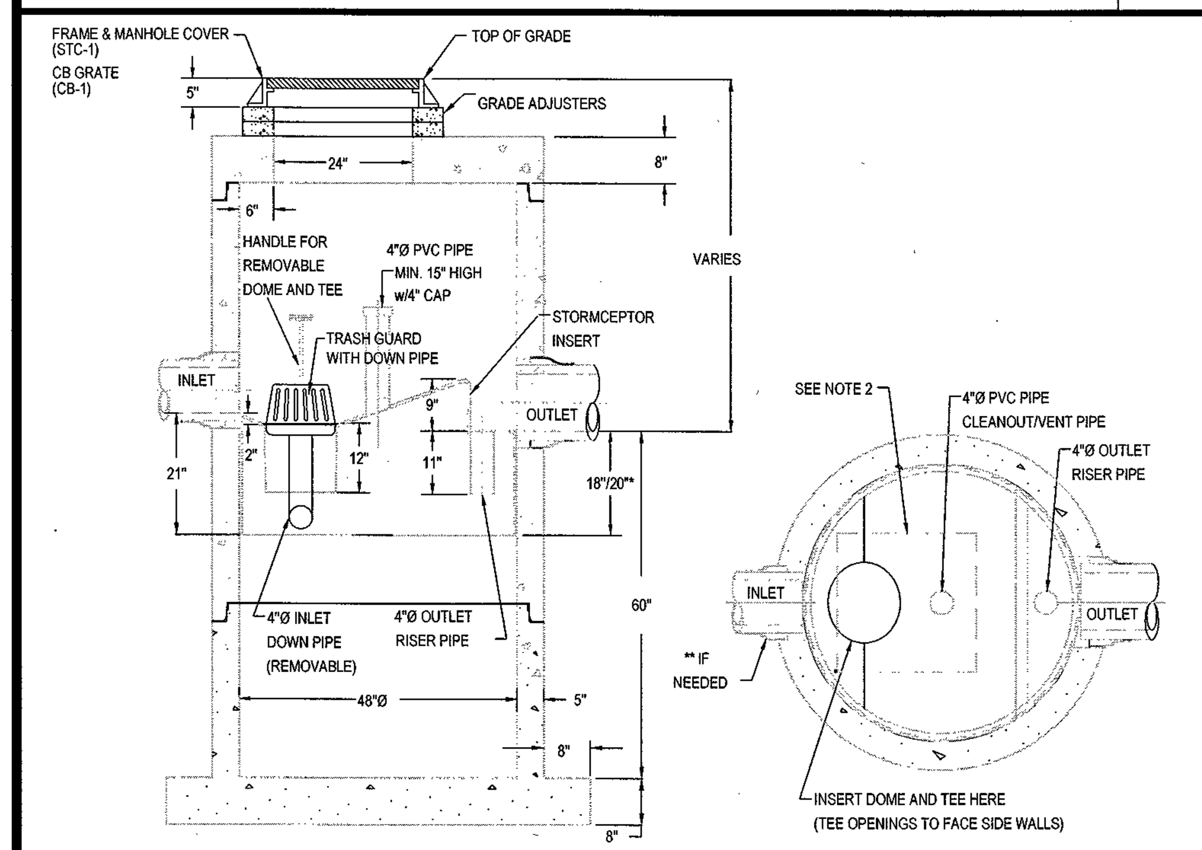
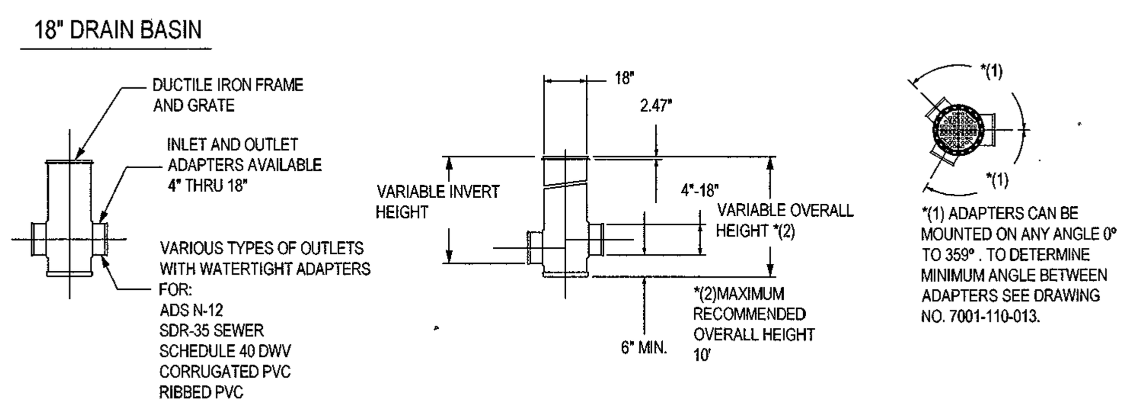


NOTE : 1. THE USE OF FLEXIBLE CONNECTIONS IS RECOMMENDED AT THE OUTLET WHERE APPLICABLE.
2. THE COVER SHOULD BE POSITIONED OVER THE 4"Ø CLEANOUT/VENT PIPE AND THE 4"Ø INLET DOWN PIPE.
3. THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OFF THE FOLLOWING U.S. PATENTS: #4985148, #5498331, #5725760, #5753115, #5849181, #6068765, AND #6371690.
4. CONTRACTOR TO PROVIDE CRANE TO SET UNIT (HEAVIEST SECTION WEIGHS 5000 LB)

* FOR UNITS WITH ONE INLET THE INVERT DROP MAY BE 1" PER STORMCEPTOR TECHNICAL MANUAL. SEE PLANS FOR ELEVATIONS.

STORMCEPTOR MODEL 450i (OR APPROVED EQUAL)

N.T.S.



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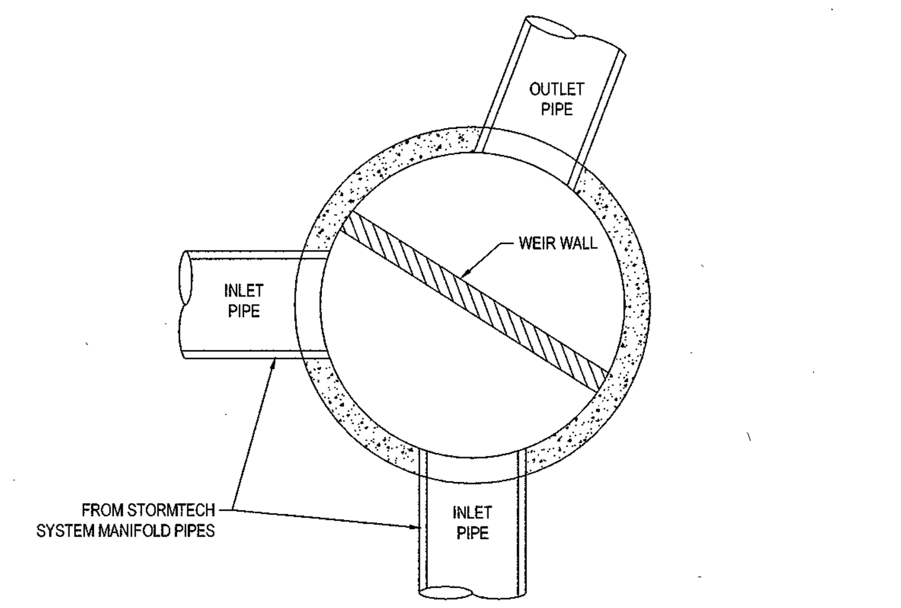
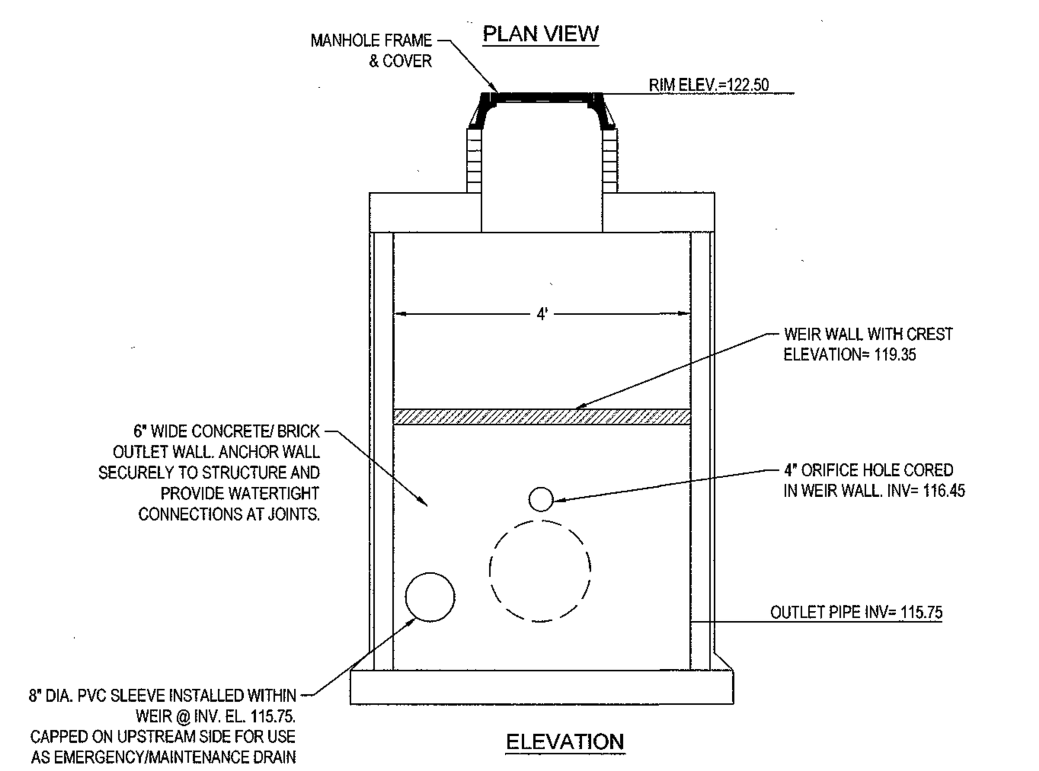
	APPD BY CJA; DATE 10AUG00	PROJECT NO./NAME DRAIN BASIN	TITLE 18" & 24" DESIGN DETAILS
	DWG SIZE A	SCALE 1:100 SHEET 1 OF 1	DWG NO. 7001-110-044 REV B

YARD DRAIN DETAIL

N.T.S.





BASIN #1 OUTLET CONTROL STRUCTURE (OSC-1)

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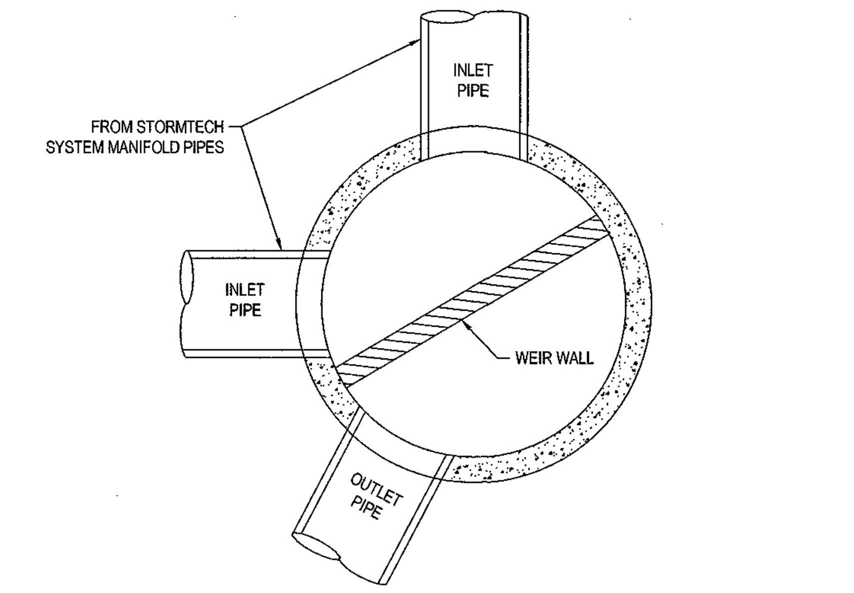

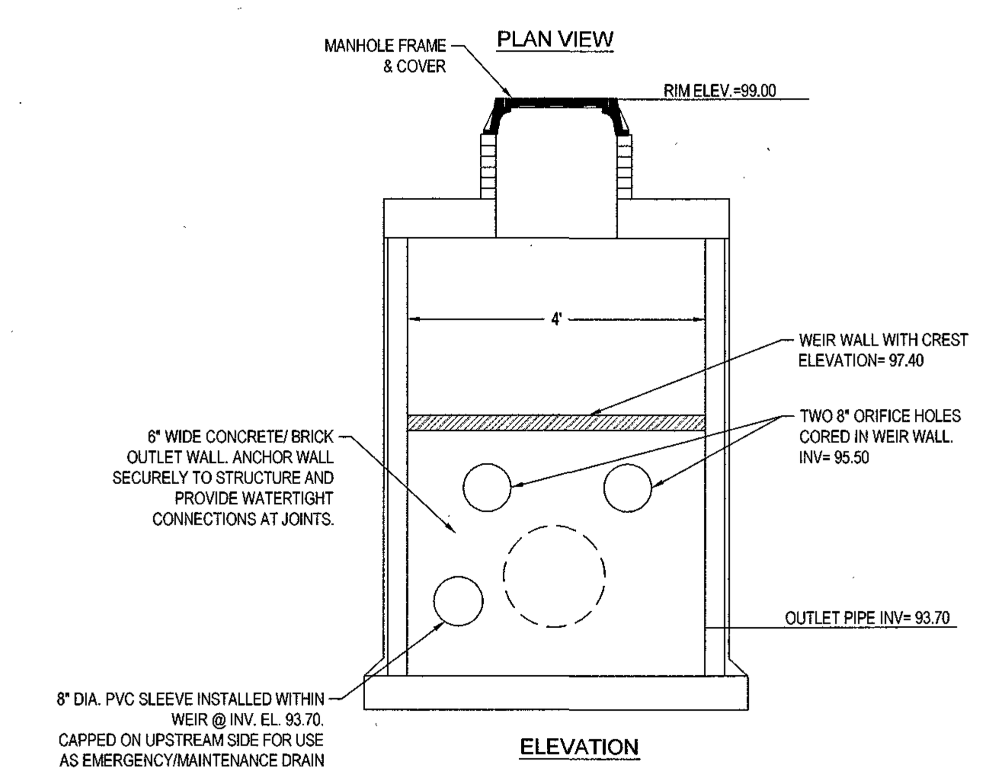

BASIN #2 OUTLET CONTROL STRUCTURE (OCS-2)

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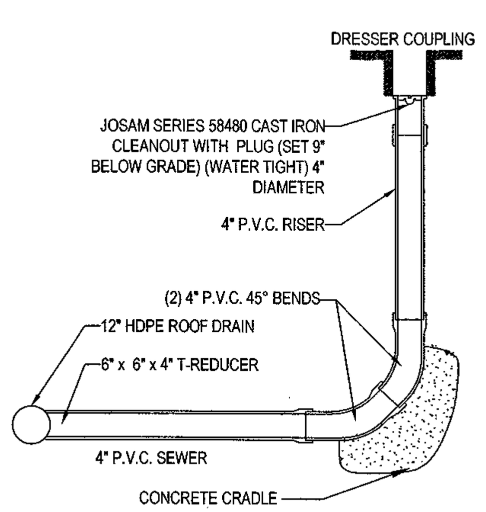

CLEANOUT DETAIL

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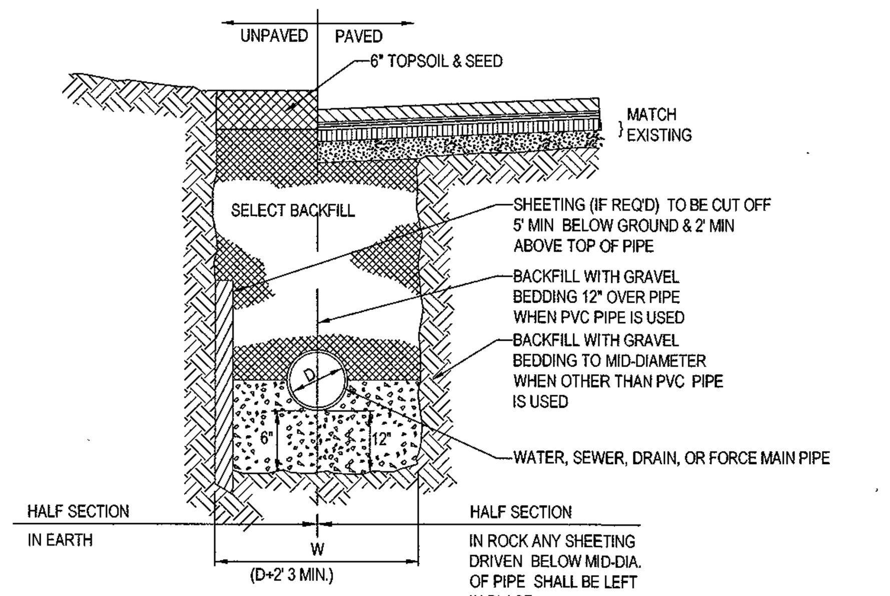

TYPICAL UTILITY TRENCH

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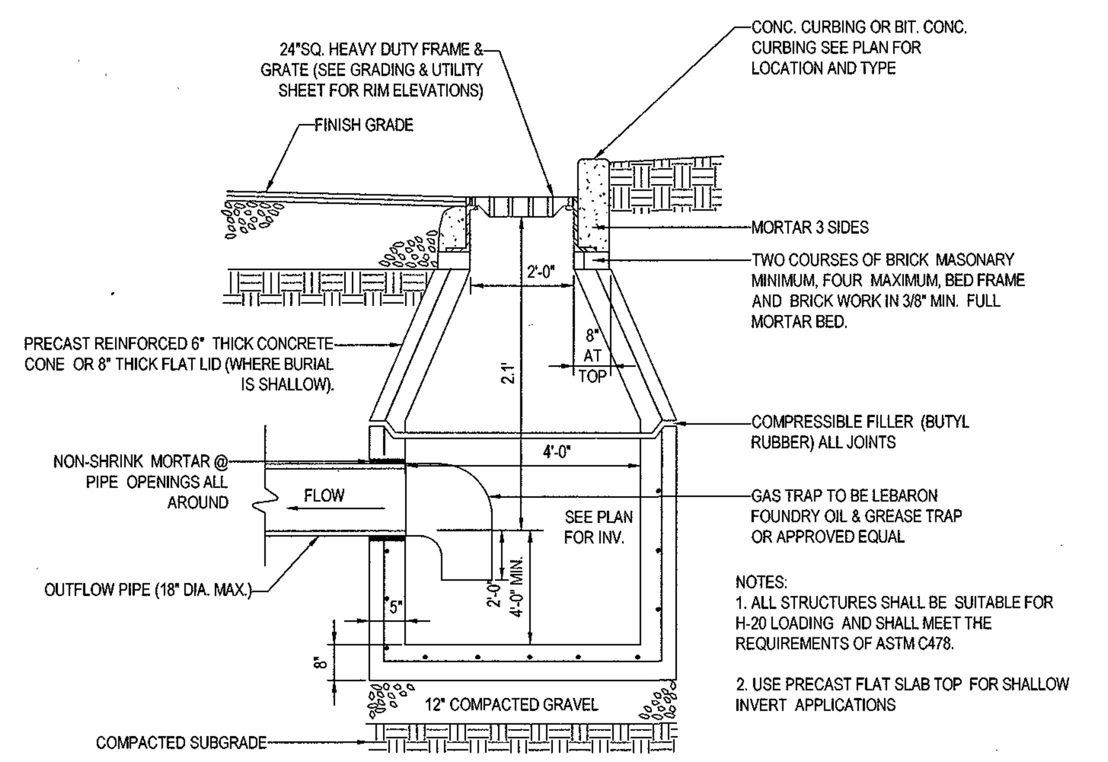

NOTES:
1. ALL STRUCTURES SHALL BE SUITABLE FOR H-20 LOADING AND SHALL MEET THE REQUIREMENTS OF ASTM C478.
2. USE PRECAST FLAT SLAB TOP FOR SHALLOW INVERT APPLICATIONS

PRECAST CONCRETE DEEP SUMP CATCH BASIN DETAIL

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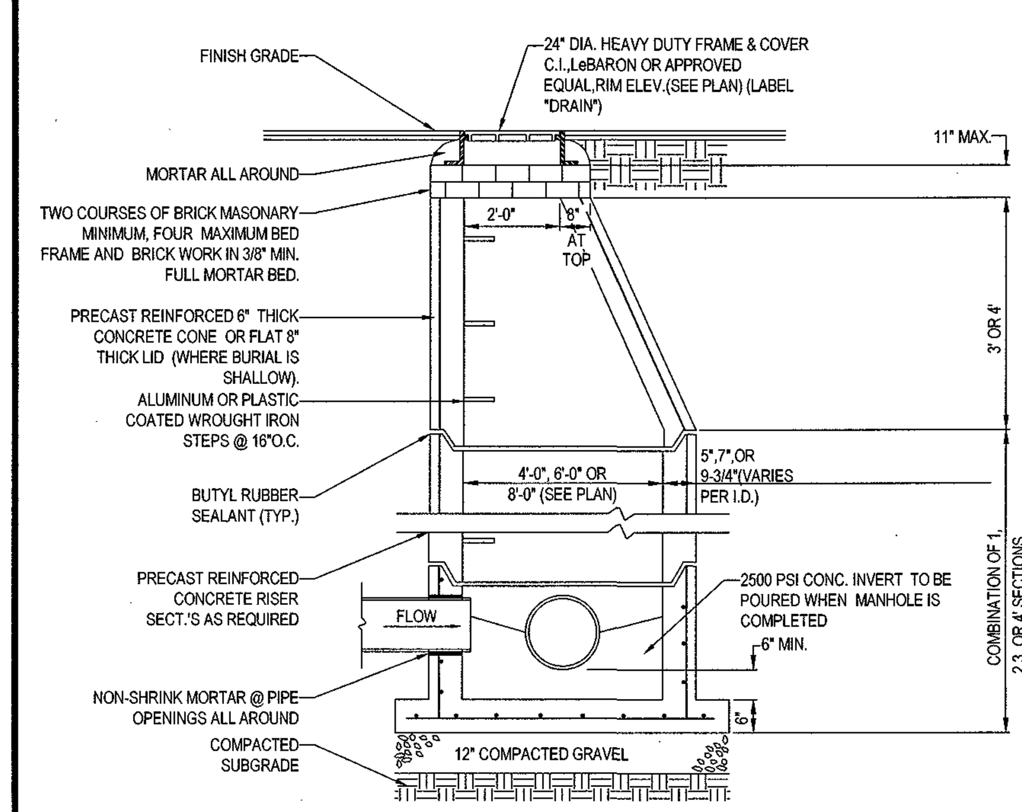

NOTE:
ALL STRUCTURES SHALL BE SUITABLE FOR H-20 LOADING AND SHALL MEET THE REQUIREMENTS OF ASTM C478.

TYP. PRECAST CONCRETE MANHOLE STORM DRAIN

N.T.S.

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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:
SITE DEVELOPMENT PLANS
—FOR—
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140
(WINCHESTER)
MAP 74, BLOCK 2, LOT 2
(WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER &
CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
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J.A. KUCICH
PROFESSIONAL ENGINEER

SHEET TITLE:
CONSTRUCTION

SHEET NUMBER:
12
OF 14

REV 0 - 07/06/2015

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PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	ROB LEMIRE 860-964-1010 ROB.LEMIRE@ADS-PIPE.COM
ADS SALES REP:	SALES SALES2 SALES3
PROJECT NO:	PROJECT#

ADVANCED DRAINAGE SYSTEMS, INC.

STORMWATER CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

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STORMWATER CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING..
10. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

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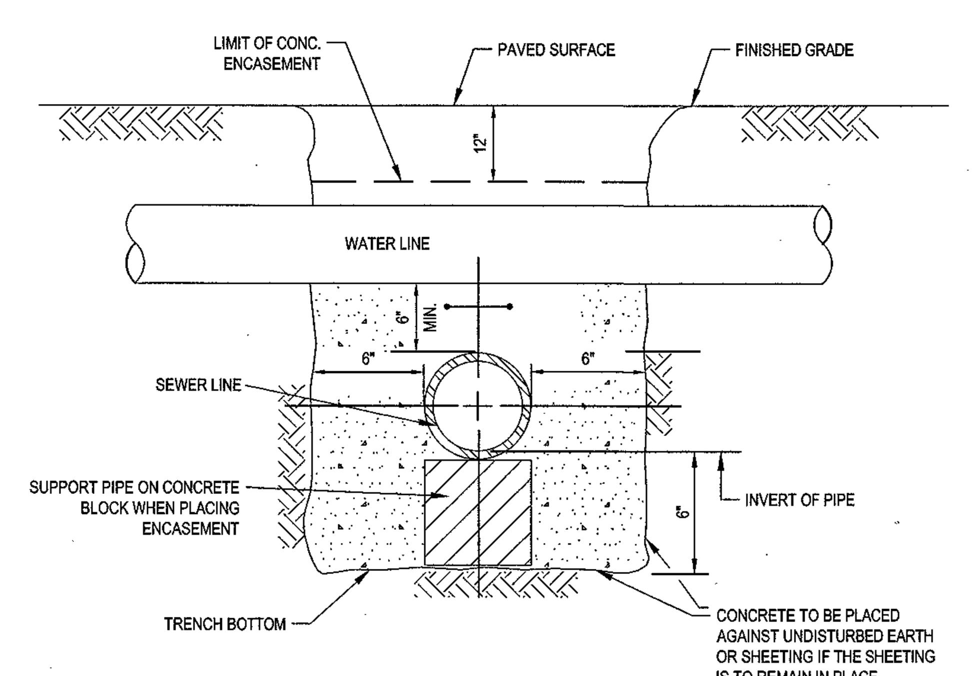
NOTES:
1. PIPE MUST BE BRACED VERTICALLY & HORIZONTALLY TO PREVENT FLOATATION DURING PLACEMENT OF CONCRETE
2. ALL CONCRETE ENCASEMENT SHALL BE KEPT 12" BELOW THE BOTTOM OF ASPHALT PAVEMENT



CONCRETE ENCASEMENT DETAIL | N.T.S.

PROPOSED LAYOUT: SYSTEM 1

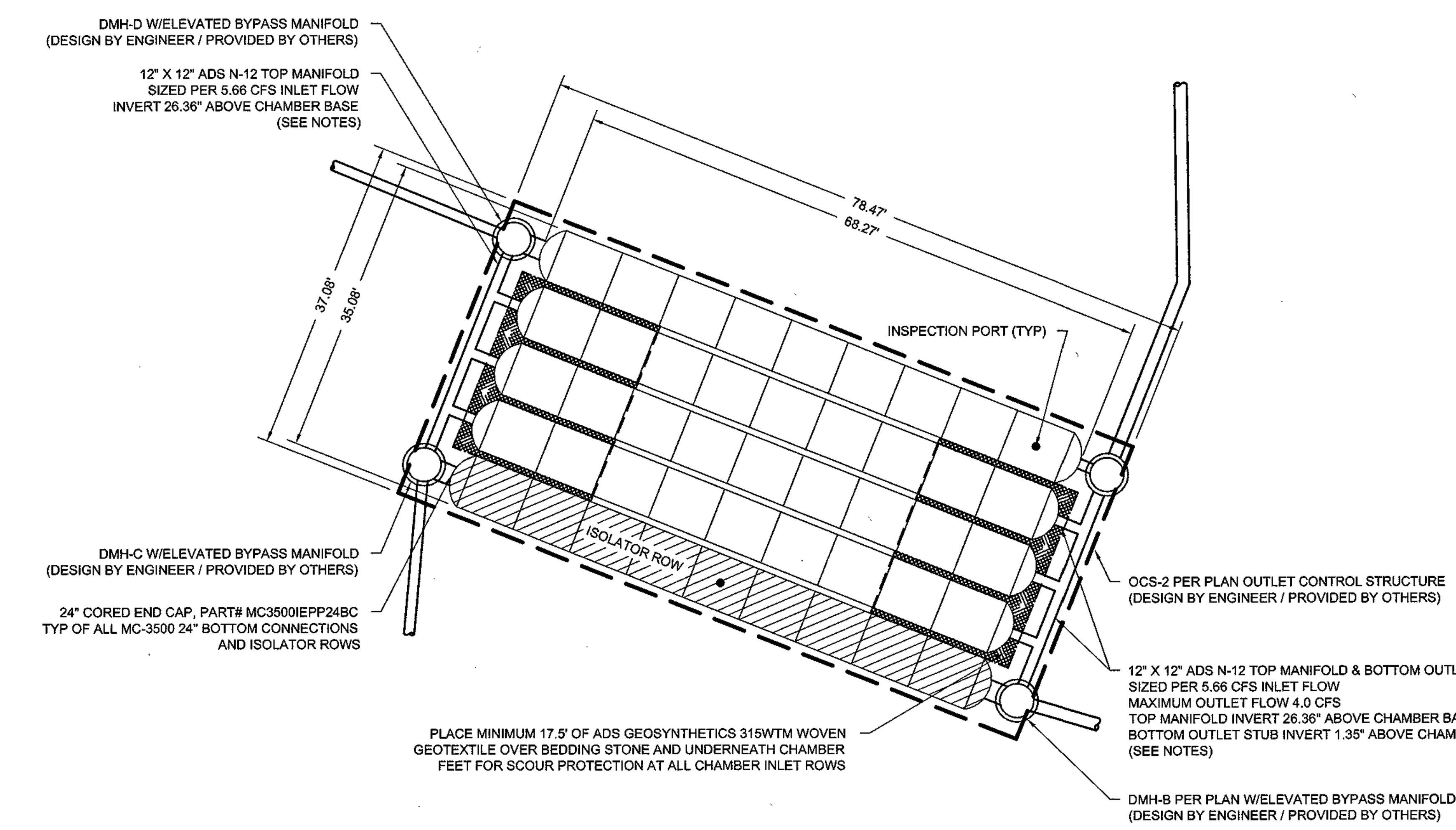
(45) STORMTECH MC-3500 CHAMBERS
(10) STORMTECH MC-3500 END CAPS
INSTALLED WITH 12" COVER STONE, 9 BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 9,193 CF
AREA OF SYSTEM: 2,909 FT²
PERIMETER OF SYSTEM: 232 FT

PROPOSED ELEVATIONS: SYSTEM 1

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	127.75
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	122.25
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	121.75
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	121.75
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	121.75
TOP OF STONE:	120.75
TOP OF CHAMBER:	119.75
12" TOP MANIFOLD INVERT:	118.20
24" ISOLATOR ROW INVERT:	116.17
12" BOTTOM MANIFOLD INVERT:	116.11
BOTTOM OF CHAMBER:	116.00
BOTTOM OF STONE:	115.25

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH SHEET #7 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THE SITE DESIGN ENGINEER MUST REVIEW THE PROXIMITY OF THE CHAMBERS TO THE RETAINING WALL AND CONSIDER EFFECTS OF POSSIBLE SATURATED SOILS ON THE RETAINING WALL'S INTEGRITY.
- THE SITE DESIGN ENGINEER MUST REVIEW THE PROXIMITY OF THE CHAMBERS TO THE SLOPE AND CONSIDER EFFECTS OF POSSIBLE SATURATED SOILS ON THE SLOPE'S INTEGRITY.
- THE SITE DESIGN ENGINEER MUST REVIEW THE PROXIMITY OF THE CHAMBERS TO THE BUILDING/STRUCTURE. NO FOUNDATION LOADS SHALL BE TRANSMITTED TO THE CHAMBERS. THE SITE DESIGN ENGINEER MUST CONSIDER EFFECTS OF POSSIBLE SATURATED SOILS ON BEARING CAPACITY OF SOILS AND SEEPAGE INTO BASEMENTS.



PROPOSED LAYOUT: SYSTEM 2

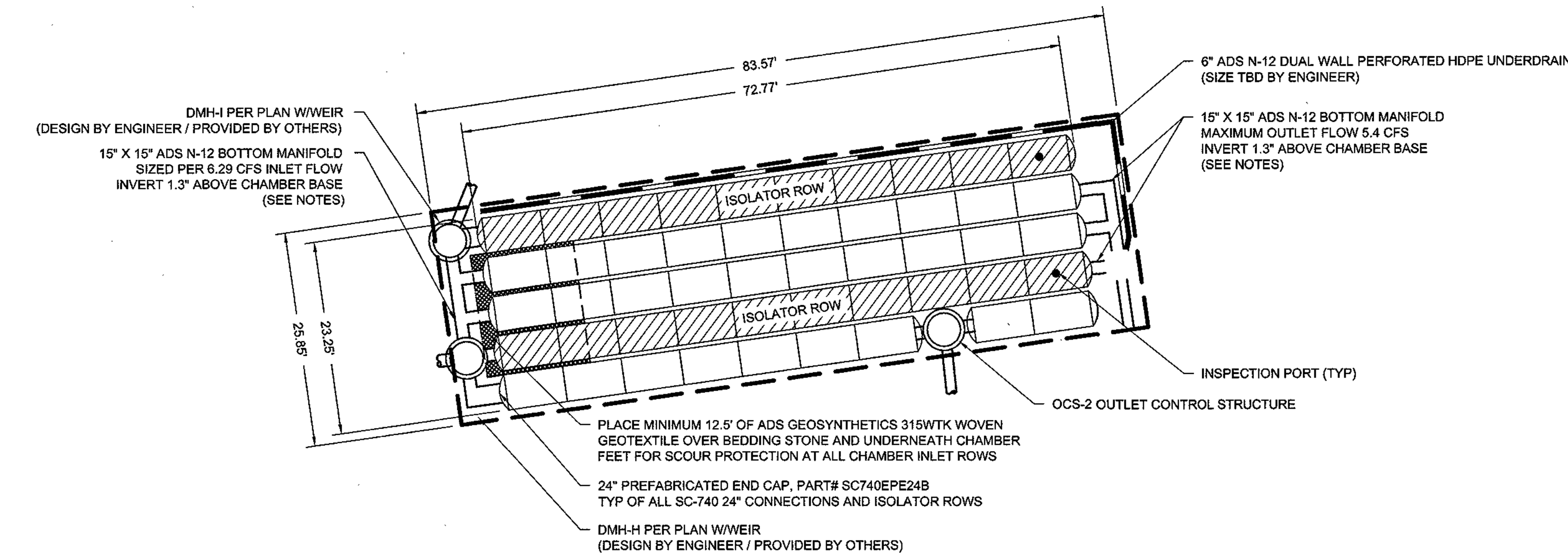
(49) STORMTECH SC-740 CHAMBERS
(12) STORMTECH SC-740 END CAPS
INSTALLED WITH 6" COVER STONE, 6" BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 4,405 CF
AREA OF SYSTEM: 2,160 FT²
PERIMETER OF SYSTEM: 218 FT

PROPOSED ELEVATIONS: SYSTEM 2

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	105.40
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	99.40
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	98.90
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	98.90
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	98.90
TOP OF STONE:	97.90
TOP OF CHAMBER:	97.40
15" BOTTOM MANIFOLD INVERT:	95.01
24" ISOLATOR ROW INVERT:	94.91
BOTTOM OF CHAMBER:	94.90
UNDERDRAIN INVERT:	94.40
BOTTOM OF STONE:	94.40

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH SHEET #7 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THE SITE DESIGN ENGINEER MUST REVIEW THE PROXIMITY OF THE CHAMBERS TO THE RETAINING WALL AND CONSIDER EFFECTS OF POSSIBLE SATURATED SOILS ON THE RETAINING WALL'S INTEGRITY.
- THE SITE DESIGN ENGINEER MUST REVIEW THE PROXIMITY OF THE CHAMBERS TO THE SLOPE AND CONSIDER EFFECTS OF POSSIBLE SATURATED SOILS ON THE SLOPE'S INTEGRITY.
- THE SITE DESIGN ENGINEER MUST REVIEW THE PROXIMITY OF THE CHAMBERS TO THE BUILDING/STRUCTURE. NO FOUNDATION LOADS SHALL BE TRANSMITTED TO THE CHAMBERS. THE SITE DESIGN ENGINEER MUST CONSIDER EFFECTS OF POSSIBLE SATURATED SOILS ON BEARING CAPACITY OF SOILS AND SEEPAGE INTO BASEMENTS.



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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:

SITE DEVELOPMENT PLANS
FOR
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

J.A. KUCICH
PROFESSIONAL ENGINEER
JOHN A. KUCICH CIVIL No. 41530

SHEET TITLE:
CONSTRUCTION DETAIL SHEET

SHEET NUMBER:
13 OF 14

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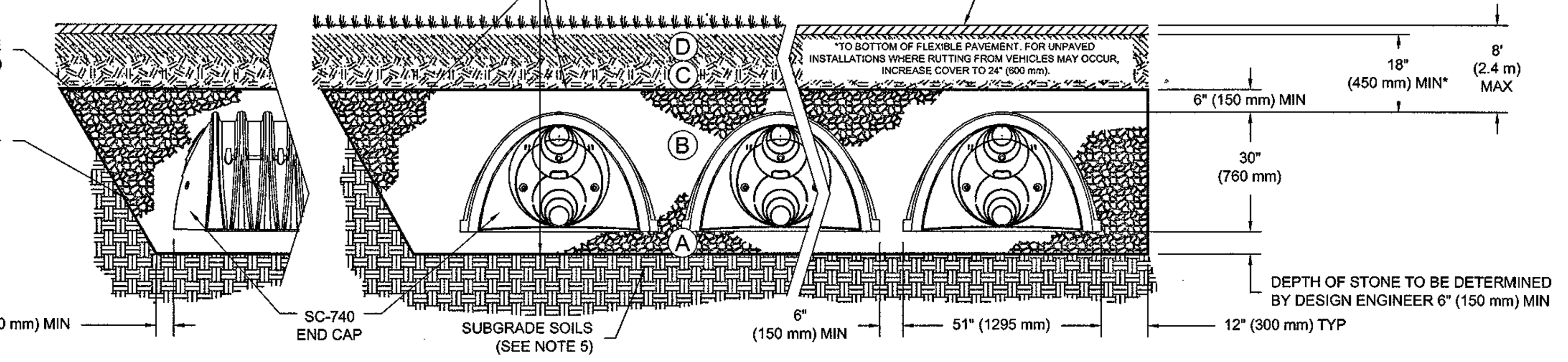
ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

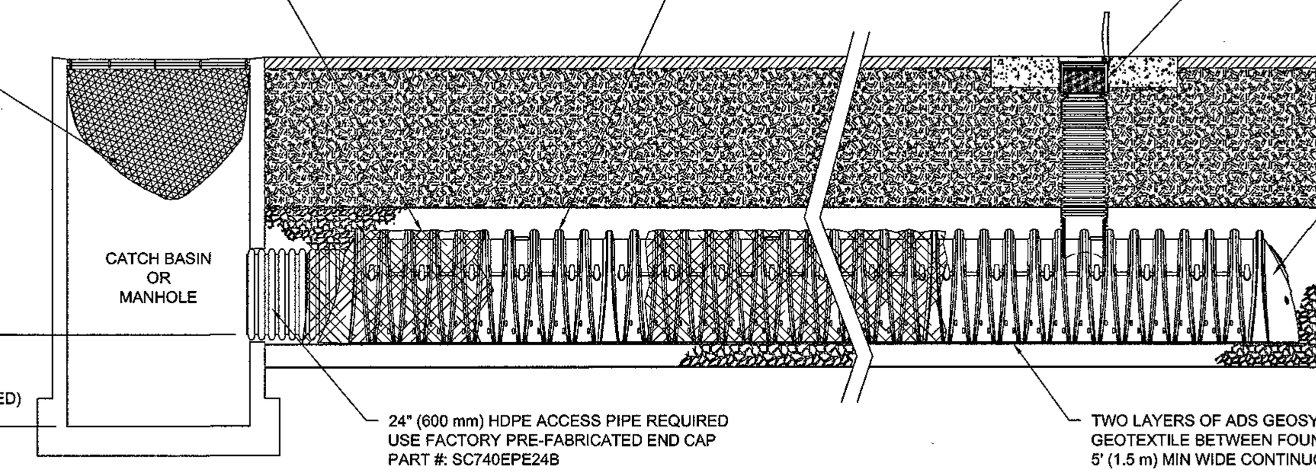
	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



SC-740 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

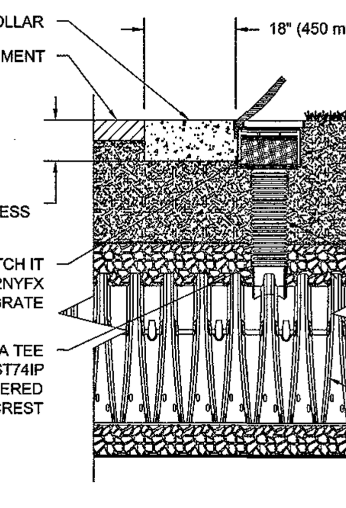
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

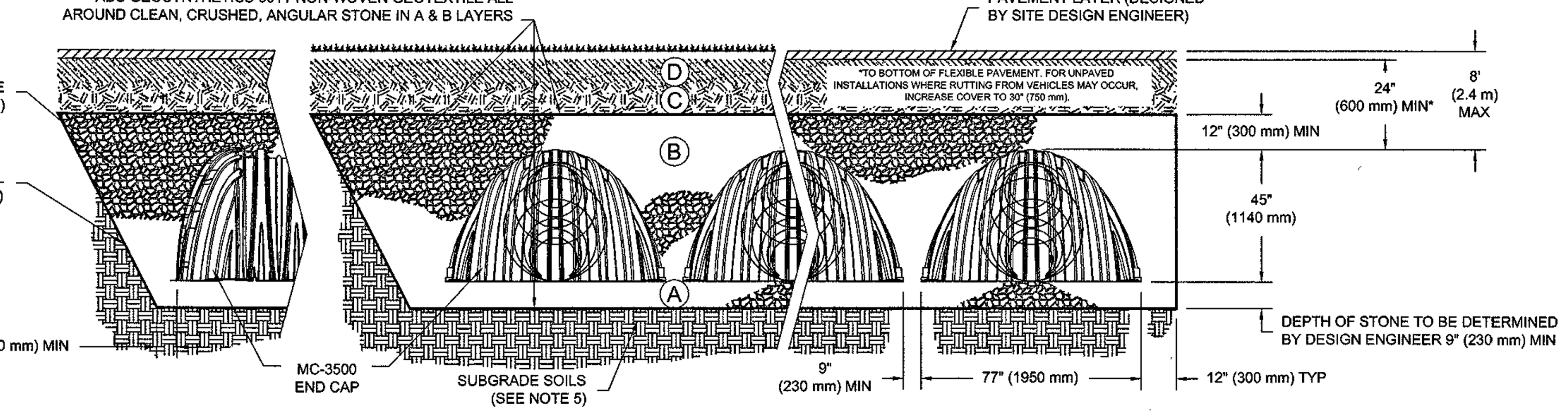


SC-740 6" INSPECTION PORT DETAIL
NTS

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
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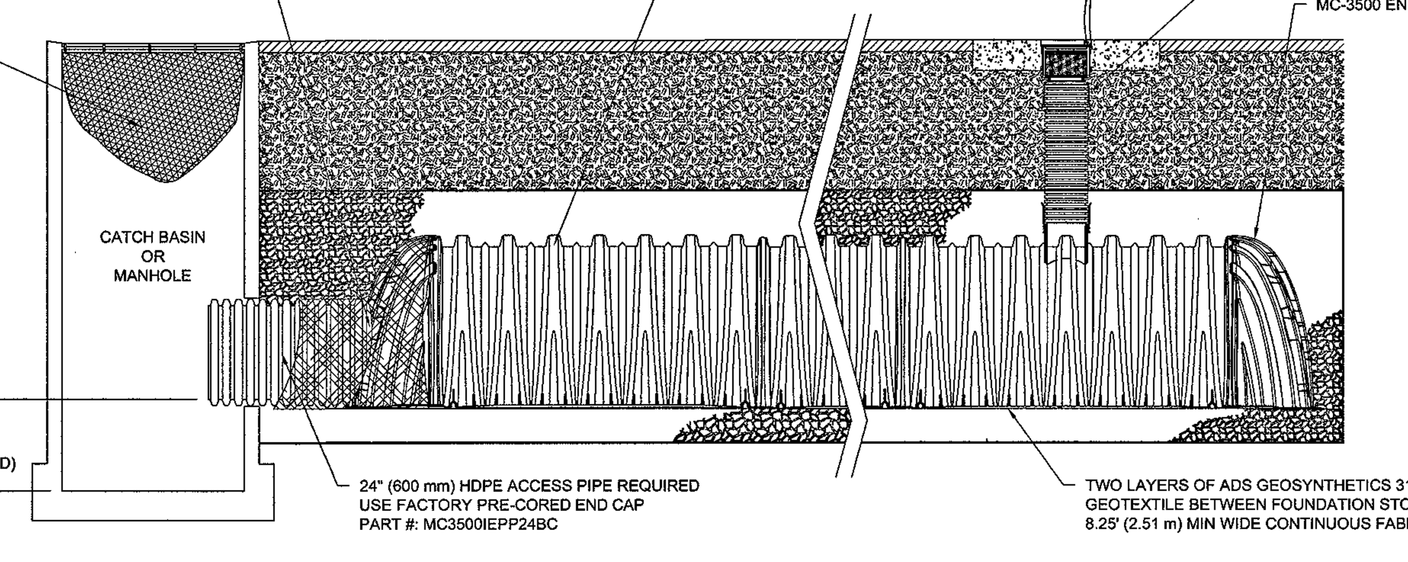
   PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
6. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



MC-3500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

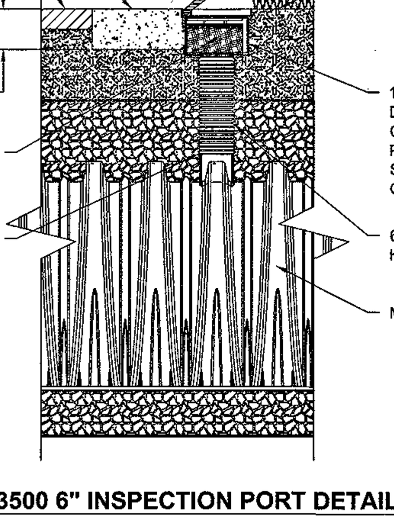
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-3500 6" INSPECTION PORT DETAIL
NTS

BOHLER ENGINEERING™
SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING PROGRAM MANAGEMENT LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN PERMITTING SERVICES TRANSPORTATION SERVICES
◆ WARREN, NJ ◆ UPSTATE NEW YORK ◆ BOSTON, MA ◆ NEW YORK METRO ◆ PHILADELPHIA/SOUTHERN NJ ◆ LEHIGH VALLEY, PA ◆ SOUTHEASTERN, PA
◆ BALTIMORE, MD ◆ SOUTHERN MARYLAND ◆ NORTHERN VIRGINIA ◆ DELAWARE ◆ CENTRAL VIRGINIA ◆ CHARLOTTE, NC ◆ RALEIGH, NC

THE INFORMATION, DESIGN AND CONTENT OF THIS PLAN ARE PROPRIETARY AND SHALL NOT BE COPIED OR USED FOR ANY PURPOSE WITHOUT PRIOR WRITTEN AUTHORIZATION FROM BOHLER ENGINEERING. ONLY APPROVED, SIGNED AND SEALED PLANS SHALL BE UTILIZED FOR CONSTRUCTION PURPOSES © 2008 BOHLER ENGINEERING.

REVISIONS

REV	DATE	COMMENT	BY
1			
2			
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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.:	W141161
DRAWN BY:	NEM/AWP
CHECKED BY:	JAK
DATE:	07/06/15
SCALE:	AS NOTED
CAD I.D.:	W141161SS0

PROJECT:

SITE DEVELOPMENT PLANS
—FOR—
FX WINCHESTER, LLC

ASSESSOR'S MAP 26, LOT 140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
416 CAMBRIDGE STREET
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

J.A. KUCICH
PROFESSIONAL ENGINEER
JOHN A. KUCICH CIVIL No. 41530

SHEET TITLE:

CONSTRUCTION DETAIL SHEET

SHEET NUMBER:

14 OF 14

REV 0 - 07/06/2015

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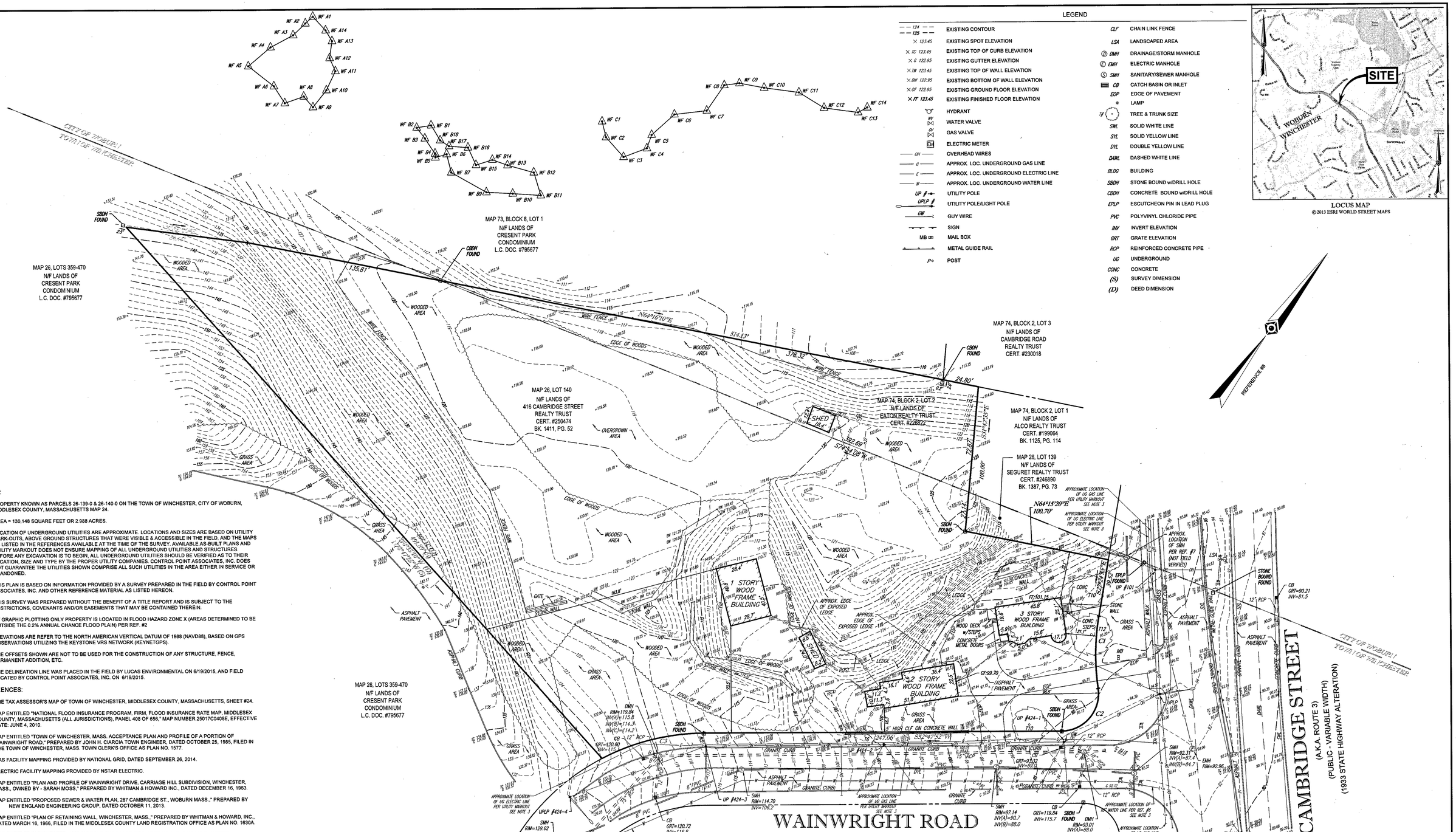


LOCUS MAP
©2013 ESRI WORLD STREET MAPS

LEGEND

124 / 125	EXISTING CONTOUR	CLF	CHAIN LINK FENCE
× 123.45	EXISTING SPOT ELEVATION	LSA	LANDSCAPED AREA
× TC 123.45	EXISTING TOP OF CURB ELEVATION	DMH	DRAINAGE/STORM MANHOLE
× G 122.95	EXISTING GUTTER ELEVATION	EMH	ELECTRIC MANHOLE
× TW 123.45	EXISTING TOP OF WALL ELEVATION	SMH	SANITARY/SEWER MANHOLE
× BW 122.95	EXISTING BOTTOM OF WALL ELEVATION	CB	CATCH BASIN OR INLET
× GF 122.95	EXISTING GROUND FLOOR ELEVATION	EOP	EDGE OF PAVEMENT
× FF 123.45	EXISTING FINISHED FLOOR ELEVATION		LAMP
	HYDRANT	TR	TREE & TRUNK SIZE
WV	WATER VALVE	SWL	SOLID WHITE LINE
GV	GAS VALVE	SYL	SOLID YELLOW LINE
EM	ELECTRIC METER	DYL	DOUBLE YELLOW LINE
OH	OVERHEAD WIRES	DAWL	DASHED WHITE LINE
G	APPROX. LOC. UNDERGROUND GAS LINE	BLDG	BUILDING
E	APPROX. LOC. UNDERGROUND ELECTRIC LINE	SBDH	STONE BOUND w/DRILL HOLE
W	APPROX. LOC. UNDERGROUND WATER LINE	CBDH	CONCRETE BOUND w/DRILL HOLE
UP	UTILITY POLE	EPLP	ESCUTCHEON PIN IN LEAD PLUG
UPLP	UTILITY POLE/LIGHT POLE	PVC	POLYVINYL CHLORIDE PIPE
GW	GUY WIRE	INV	INVERT ELEVATION
	SIGN	GRT	GRATE ELEVATION
MB	MAIL BOX	RCP	REINFORCED CONCRETE PIPE
	METAL GUIDE RAIL	UG	UNDERGROUND
	POST	CONC	CONCRETE
		(S)	SURVEY DIMENSION
		(D)	DEED DIMENSION

NOTES:

1. PROPERTY KNOWN AS PARCELS 26-139-0 & 26-140-0 ON THE TOWN OF WINCHESTER, CITY OF WOBURN, MIDDLESEX COUNTY, MASSACHUSETTS MAP 24.
2. AREA = 130,148 SQUARE FEET OR 2.988 ACRES.
3. LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE. LOCATIONS AND SIZES ARE BASED ON UTILITY MARK-OUTS, ABOVE GROUND STRUCTURES THAT WERE VISIBLE & ACCESSIBLE IN THE FIELD, AND THE MAPS AS LISTED IN THE REFERENCES AVAILABLE AT THE TIME OF THE SURVEY. AVAILABLE AS-BUILT PLANS AND UTILITY MARKOUT DOES NOT ENSURE MAPPING OF ALL UNDERGROUND UTILITIES AND STRUCTURES. BEFORE ANY EXCAVATION IS TO BEGIN, ALL UNDERGROUND UTILITIES SHOULD BE VERIFIED AS TO THEIR LOCATION, SIZE AND TYPE BY THE PROPER UTILITY COMPANIES. CONTROL POINT ASSOCIATES, INC. DOES NOT GUARANTEE THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED.
4. THIS PLAN IS BASED ON INFORMATION PROVIDED BY A SURVEY PREPARED IN THE FIELD BY CONTROL POINT ASSOCIATES, INC. AND OTHER REFERENCE MATERIAL AS LISTED HEREON.
5. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND IS SUBJECT TO THE RESTRICTIONS, COVENANTS AND/OR EASEMENTS THAT MAY BE CONTAINED THEREIN.
6. BY GRAPHIC PLOTTING ONLY PROPERTY IS LOCATED IN FLOOD HAZARD ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN) PER REF. #2
7. ELEVATIONS ARE REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON GPS OBSERVATIONS UTILIZING THE KEYSTONE VRS NETWORK (KEYNETGPS).
8. THE OFFSETS SHOWN ARE NOT TO BE USED FOR THE CONSTRUCTION OF ANY STRUCTURE, FENCE, PERMANENT ADDITION, ETC.
9. THE DELINEATION LINE WAS PLACED IN THE FIELD BY LUCAS ENVIRONMENTAL ON 6/19/2015, AND FIELD LOCATED BY CONTROL POINT ASSOCIATES, INC. ON 6/19/2015.

REFERENCES:

1. THE TAX ASSESSOR'S MAP OF TOWN OF WINCHESTER, MIDDLESEX COUNTY, MASSACHUSETTS, SHEET #24.
2. MAP ENTITLED "NATIONAL FLOOD INSURANCE PROGRAM, FIRM, FLOOD INSURANCE RATE MAP, MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS), PANEL 408 OF 656," MAP NUMBER 25017C0408E, EFFECTIVE DATE: JUNE 4, 2010.
3. MAP ENTITLED "TOWN OF WINCHESTER, MASS. ACCEPTANCE PLAN AND PROFILE OF A PORTION OF WAINWRIGHT ROAD," PREPARED BY JOHN H. CIARCIA TOWN ENGINEER, DATED OCTOBER 25, 1985, FILED IN THE TOWN OF WINCHESTER, MASS. TOWN CLERK'S OFFICE AS PLAN NO. 1577.
4. GAS FACILITY MAPPING PROVIDED BY NATIONAL GRID, DATED SEPTEMBER 26, 2014.
5. ELECTRIC FACILITY MAPPING PROVIDED BY NSTAR ELECTRIC.
6. MAP ENTITLED "PLAN AND PROFILE OF WAINWRIGHT DRIVE, CARRIAGE HILL SUBDIVISION, WINCHESTER, MASS., OWNED BY - SARAH MOSS," PREPARED BY WHITMAN & HOWARD INC., DATED DECEMBER 16, 1983.
7. MAP ENTITLED "PROPOSED SEWER & WATER PLAN, 287 CAMBRIDGE ST., WOBURN MASS.," PREPARED BY NEW ENGLAND ENGINEERING GROUP, DATED OCTOBER 11, 2013.
8. MAP ENTITLED "PLAN OF RETAINING WALL, WINCHESTER, MASS.," PREPARED BY WHITMAN & HOWARD, INC., DATED MARCH 16, 1966, FILED IN THE MIDDLESEX COUNTY LAND REGISTRATION OFFICE AS PLAN NO. 1630A.
9. MAP ENTITLED "WINCHESTER, 1933 ALTERATION," DATED 1933, FILED WITH THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION AS PLAN NO. 3166.

UTILITIES:

THE FOLLOWING COMPANIES WERE NOTIFIED BY MASSACHUSETTS ONE-CALL SYSTEM (1-888-344-7233) AND REQUESTED TO MARK OUT UNDERGROUND FACILITIES AFFECTING AND SERVICING THIS SITE. THE UNDERGROUND UTILITY INFORMATION SHOWN HEREON IS BASED UPON THE UTILITY COMPANIES RESPONSE TO THIS REQUEST.
SERIAL NUMBER(S): 20143906403

UTILITY COMPANY	PHONE NUMBER
COMCAST - PEMBROKE	617-564-3959
VERIZON	855-242-1849
NSTAR ELECTRIC	617-424-2000
NATIONAL GRID GAS - BOSTON	800-233-5325
ON TARGET LOCATING	800-877-4646
INNOVATIVE DATA MANAGEMENT	508-429-1022

STOP - CALL BEFORE YOU DIG!

THE COMMONWEALTH OF MASSACHUSETTS REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE COMMONWEALTH.

CURVE DATA TABLE

#	RADIUS	DELTA	LENGTH	CHORD BEARING	CHORD LENGTH
C1	160.96'	17°47'28"	49.98'	S36° 18' 39"E	49.78
C2	25.63'	98°00'15"	43.84'	S03° 47' 44"W	38.69
C3	153.00'	27°20'14"	73.00'	S39° 07' 45"W	72.31

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

THIS SURVEY HAS BEEN PERFORMED IN THE FIELD UNDER MY SUPERVISION, AND TO THE BEST OF MY KNOWLEDGE, BELIEF, AND INFORMATION, THIS SURVEY HAS BEEN PERFORMED IN ACCORDANCE WITH CURRENTLY ACCEPTED ACCURACY STANDARDS.

NOT A VALID ORIGINAL DOCUMENT UNLESS EMBOSSED WITH RAISED IMPRESSION OR STAMPED WITH A BLUE INK SEAL

COMMONWEALTH OF MASSACHUSETTS
GERRY L. HOLDRIGHT
NO. 49211
REGISTERED PROFESSIONAL LAND SURVEYOR

GERRY L. HOLDRIGHT
MASSACHUSETTS PROFESSIONAL LAND SURVEYOR #49211

6-22-15
DATE

No.	DESCRIPTION OF REVISION	FIELD CREW	DRAWN:	APPROVED:	DATE
1	LOCATED WETLANDS	S.P.P.	J.M.B.	G.L.H.	6-22-15

FIELD DATE	9-26-14
FIELD BOOK NO.	14-04MA
FIELD BOOK PG.	88-91
FIELD CREW	T.M./S.P.P.
DRAWN:	IND-SND
REVIEWED:	J.L.S.
APPROVED:	A.J.L.
DATE	10-10-14
SCALE	1"=30'
FILE NO.	CM14178
DWG. NO.	1 OF 1

BOUNDARY & TOPOGRAPHIC SURVEY
SEB, LLC
416 CAMBRIDGE STREET
MAP 26, LOT140 (WINCHESTER)
MAP 74, BLOCK 2, LOT 2 (WOBURN)
TOWN OF WINCHESTER & CITY OF WOBURN
MIDDLESEX COUNTY, COMMONWEALTH OF MASSACHUSETTS

CONTROL POINT ASSOCIATES, INC.
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
508.948.3000 - 508.948.3003 FAX
WARREN, NJ 908.668.0099
CHALFONT, PA 215.712.9800

CONTROL POINT ASSOCIATES, INC. - ALL RIGHTS RESERVED
THIS DOCUMENT IS THE PROPERTY OF CONTROL POINT ASSOCIATES, INC. IS ORIGINAL PROJECT OR THE PURPOSE ORIGINALLY INTENDED, WITHOUT THE WRITTEN PERMISSION OF CONTROL POINT ASSOCIATES, INC. IS PROHIBITED.

Existing Conditions

The Applicant is providing a brief summary of the existing conditions in conjunction with the plans and reports submitted by the Applicant's civil engineering firm Bohler Engineering.

Existing Conditions

The subject site consists of 130,148 square feet (2.988 acres) of land located at 416 Cambridge Street in the Town of Winchester, MA ("Site"). The majority of the site lies within the Town of Winchester with the exception of a small portion (13,712 square feet) along the northern property line which lies within the City of Woburn. The property is further identified as Map #26, Lot #40 on the Town of Winchester Tax Assessor's Maps and Map #74, Block #2, Lot #2 on the City of Woburn Tax Assessor's Maps.

The Site is situated at the northwesterly corner of the intersection of Wainwright Road and Cambridge Street and currently contains five (5) existing buildings, a paved driveway and utilities associated with a residential use. The remaining portions of the property are undeveloped and consist of wooded areas.

The Site is bordered by Wainwright Road to the south and Cambridge Street to the east. The Site is bordered by two (2) separate properties to the northeast. The first property is owned by by Alco Realty Trust and Seguret Realty Trust and utilized for a residential use. The second property is owned by Cambridge Road Realty Trust and currently contains an existing "Shell" gas station (commercial use). The property is also bordered on the north and west by a property owned by Crescent Park Condominium, LC (residential use). The abutting land immediately to the north is wooded while the abutting land immediately to the west contains the driveway entrance for the residential complex.

The Site topography consists of slopes ranging from 2% up to 50% with onsite elevations ranging from 95 at the intersection of Wainwright Road and Cambridge Street to 163 at the western property line. In general, the northern half of the Site drains overland to the abutting property to the north owned by Crescent Park Condominium, LC while the southern half drains overland to the existing municipal drainage system in Wainwright Road and Cambridge Street.

Approximately 6% of the existing site consists of impervious areas. The remaining 94% consists of landscaped and wooded areas.

The existing residential use is serviced by municipal water and sewer. The electric, cable and telephone services are from aboveground utilities along Cambridge Street. There is an existing gas main within Cambridge Street; however, it is unknown at this time whether there is a gas service to the site.

WINCHESTER NORTH

416 CAMBRIDGE STREET
WINCHESTER, MASSACHUSETTS

ARCHITECTURAL SET 7.6.15

OWNER
FX Winchester, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

CIVIL ENGINEER AND LANDSCAPE ARCHITECT
Bohler Engineering
352 Turnpike Road
Southborough, MA 01772

TRANSPORTATION CONSULTANT
Vanasse & Associates, Inc.
35 New England Business Center Drive
Suite 140
Andover, MA 01810

List of Drawings

1 Cover
2 Level 1
3 Level 2
4 Level 3
5 Level 4
6 Level 5
7 Unit Plans
8 Elevations
9 Sketch 1
10 Sketch 2

REGISTERED ARCHITECT
JAMES A. VELLECO
No. 3379
MARBLEHEAD
MA
COMMONWEALTH OF MASSACHUSETTS

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX WINCHESTER, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

COVER

DATE: 7.6.15
SCALE:

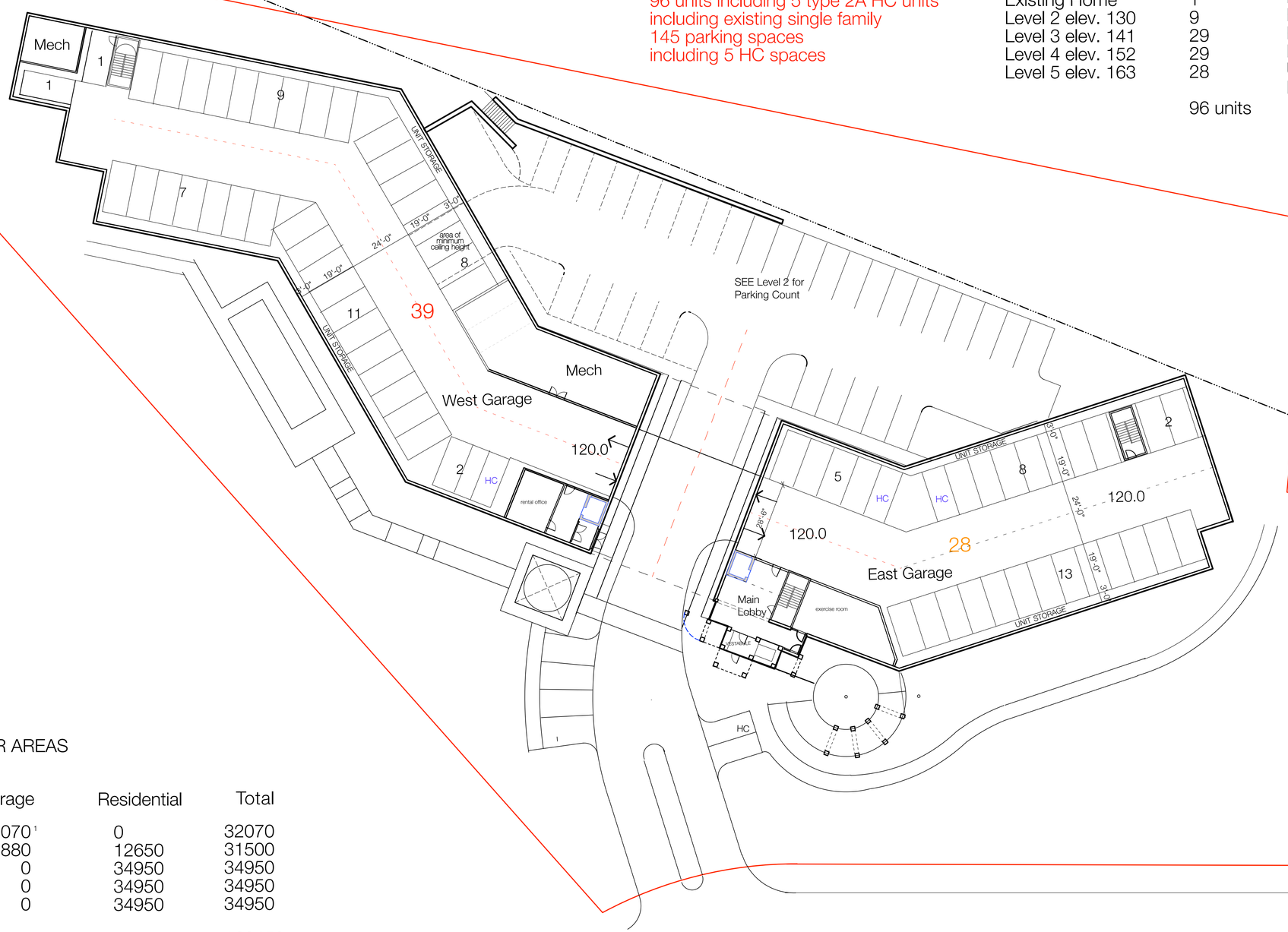
REV.
REV.
REV.
REV.

Preliminqry Summary

96 units including 5 type 2A HC units
including existing single family
145 parking spaces
including 5 HC spaces

RESIDENTIAL	
Existing Home	1
Level 2 elev. 130	9
Level 3 elev. 141	29
Level 4 elev. 152	29
Level 5 elev. 163	28
	96 units

PARKING	
Existing Home	3
Entry Circle	5
Rear Surface Parking	32
Lower West Level	39
Upper West Level	39
Lower East Level	28
	146



EXISTING HOUSE
FLOOR AREAS

1	1260
2	1126
Total	2385

FLOOR AREAS

	Garage	Residential	Total
1	32070 [1]	0	32070
2	18880	12650	31500
3	0	34950	34950
4	0	34950	34950
5	0	34950	34950
Total	50950	117500	168450

1 includes lobbies

LEVEL 1

0 5' 10' 20' 40'

REGISTERED ARCHITECT JAMES A. VELLECO No. 3379 MARBLEHEAD MA COMMONWEALTH OF MASSACHUSETTS

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX Winchester, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

LEVEL 1
PRELIMINARY FLOOR PLAN

DATE: 7.6.15
SCALE: 1"=20'-0"

REV
REV
REV
REV
REV

2
of 10

Preliminqry Summary

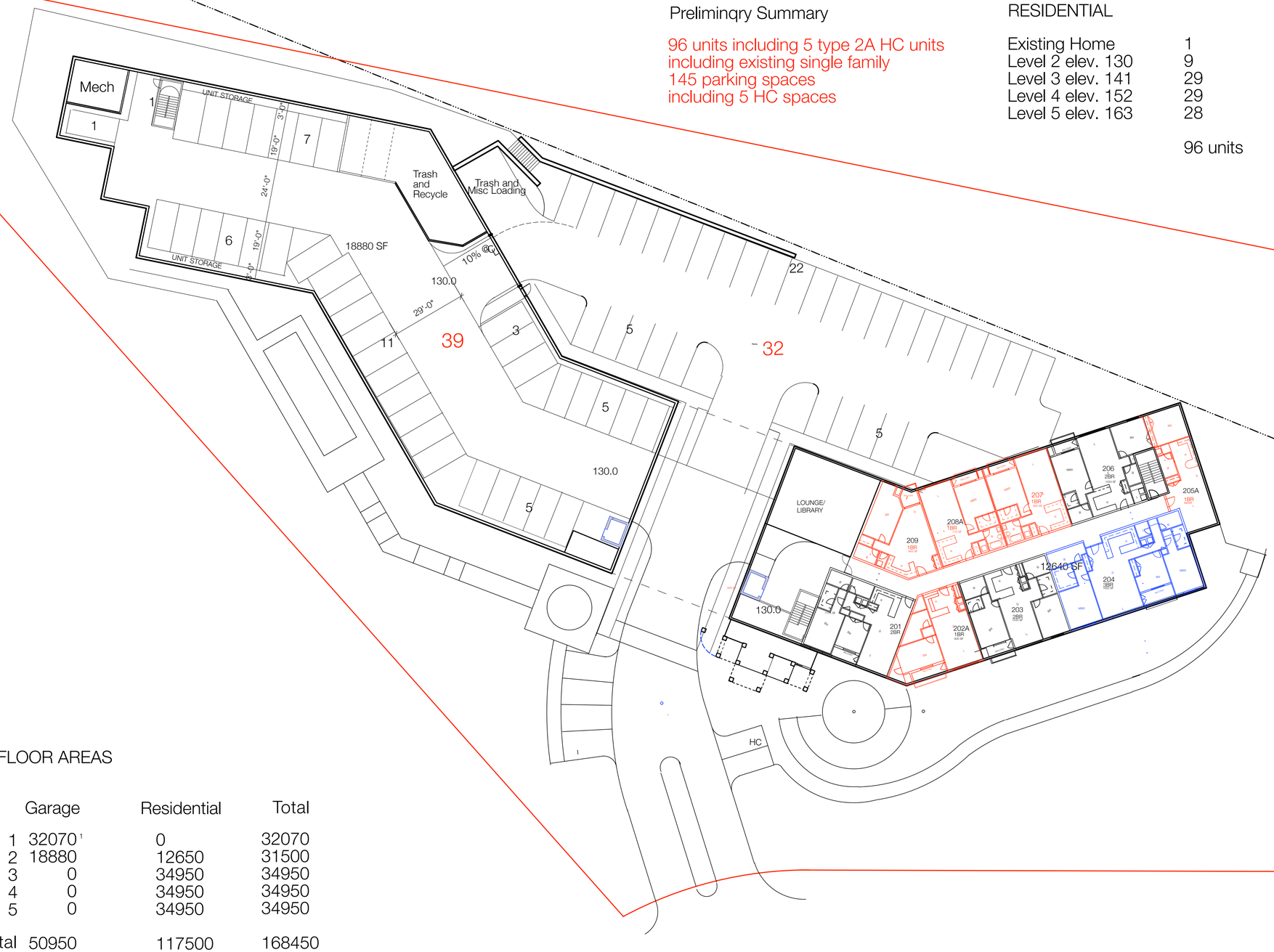
96 units including 5 type 2A HC units
including existing single family
145 parking spaces
including 5 HC spaces

RESIDENTIAL

Existing Home	1
Level 2 elev. 130	9
Level 3 elev. 141	29
Level 4 elev. 152	29
Level 5 elev. 163	28
	96 units

PARKING

Existing Home	3
Entry Circle	5
Rear Surface Parking	32
Lower West Level	39
Upper West Level	39
Lower East Level	28
	146



FLOOR AREAS

	Garage	Residential	Total
1	32070 [1]	0	32070
2	18880	12650	31500
3	0	34950	34950
4	0	34950	34950
5	0	34950	34950
Total	50950	117500	168450

1 includes lobbies

EXISTING HOUSE FLOOR AREAS

1	1260
2	1126
Total	2385

LEVEL 2

0 5' 10' 20' 40'

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX Winchester, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

LEVEL 2
PRELIMINARY FLOOR PLAN

DATE: 7.6.15
SCALE: 1"=20'-0"

Preliminqry Summary

96 units including 5 type 2A HC units
including existing single family
145 parking spaces
including 5 HC spaces

RESIDENTIAL

Existing Home	1
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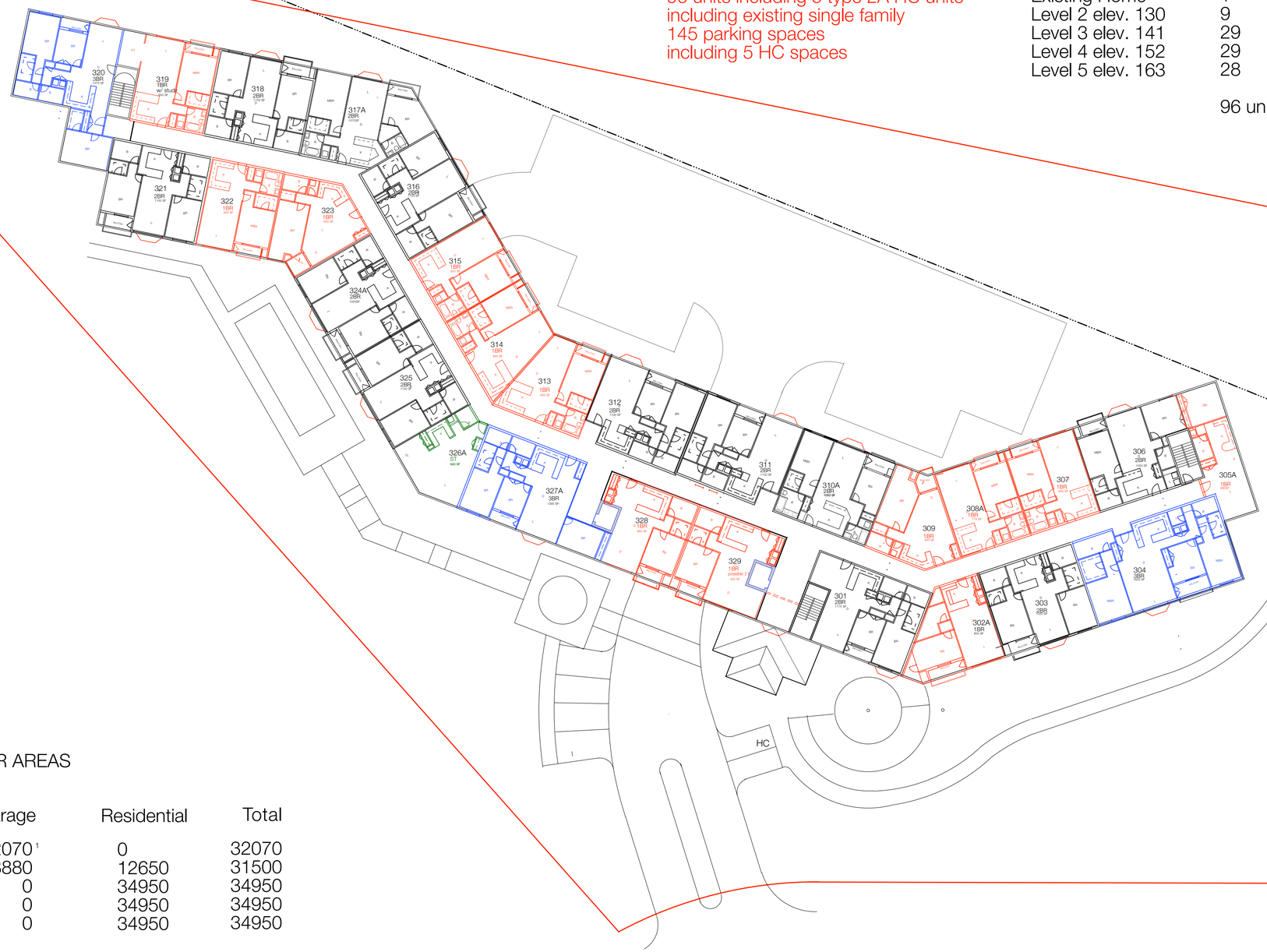
Level 4 elev. 152	29
Level 5 elev. 163	28
	96 units

PARKING

Existing Home	3
Entry Circle	5
Rear Surface Parking	32
Lower West Level	39
Upper West Level	39
Lower East Level	28
	146



FLOOR AREAS

	Garage	Residential	Total
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2	18880	12650	31500
3	0	34950	34950
4	0	34950	34950
5	0	34950	34950
Total	50950	117500	168450

1 includes lobbies

LEVEL 3

0 5' 10' 20' 40'

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX Winchester, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

LEVEL 3
PRELIMINARY FLOOR PLAN

DATE: 7.6.15
SCALE: 1"=20'-0"

Preliminqry Summary

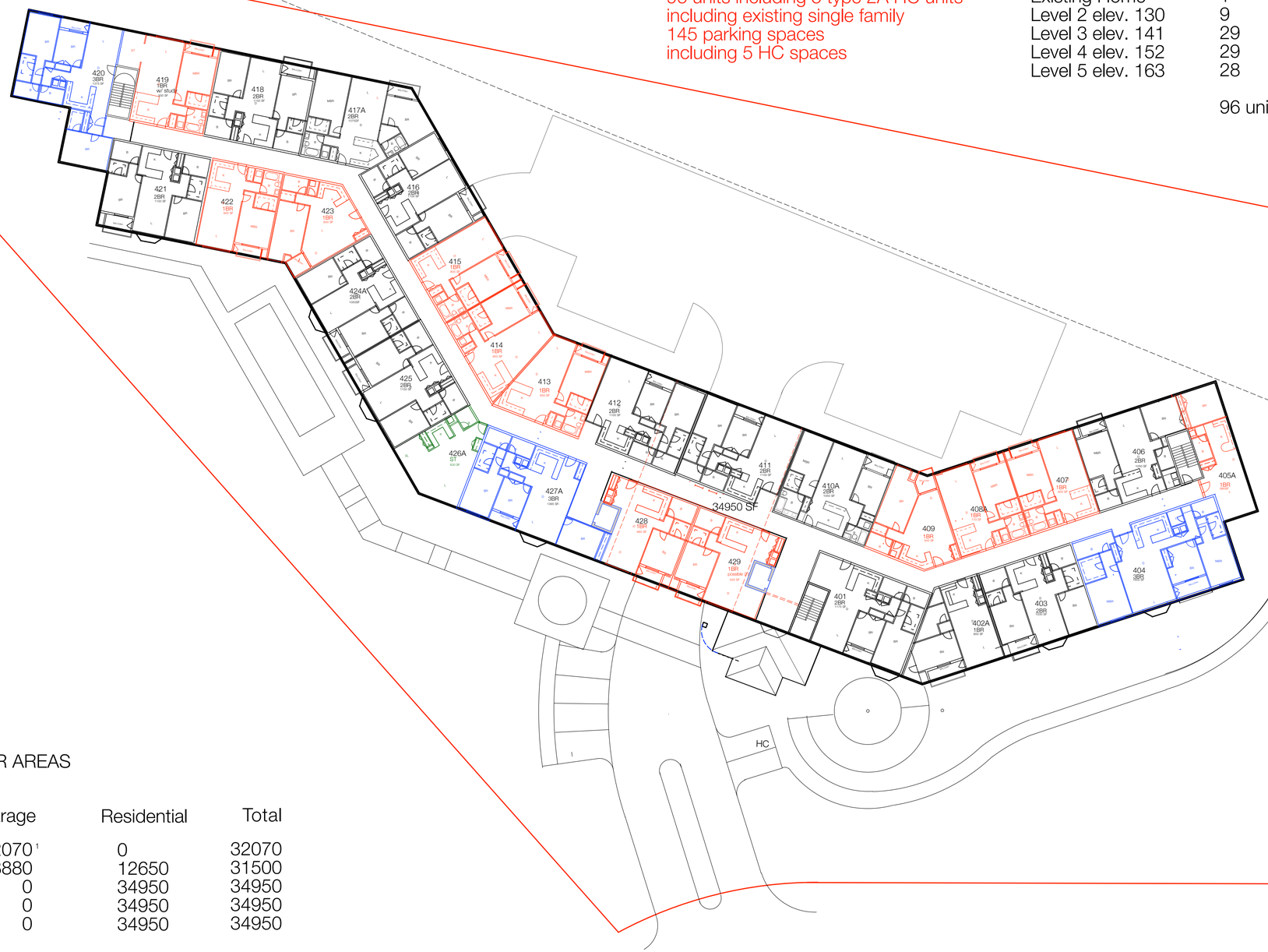
96 units including 5 type 2A HC units
including existing single family
145 parking spaces
including 5 HC spaces

RESIDENTIAL

Existing Home	1
Level 2 elev. 130	9
Level 3 elev. 141	29
Level 4 elev. 152	29
Level 5 elev. 163	28
	96 units

PARKING

Existing Home	3
Entry Circle	5
Rear Surface Parking	32
Lower West Level	39
Upper West Level	39
Lower East Level	28
	146



FLOOR AREAS

	Garage	Residential	Total
1	32070 [1]	0	32070
2	18880	12650	31500
3	0	34950	34950
4	0	34950	34950
5	0	34950	34950
Total	50950	117500	168450

1 includes lobbies

LEVEL 4

0 5' 10' 20' 40'

JAMES A. VELLECO REGISTERED ARCHITECT No. 3379 MARBLEHEAD MA COMMONWEALTH OF MASSACHUSETTS

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX Winchester, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

LEVEL 4
PRELIMINARY FLOOR PLAN

DATE: 7.6.15
SCALE: 1"=20'-0"

REV.
REV.
REV.
REV.

Preliminqry Summary

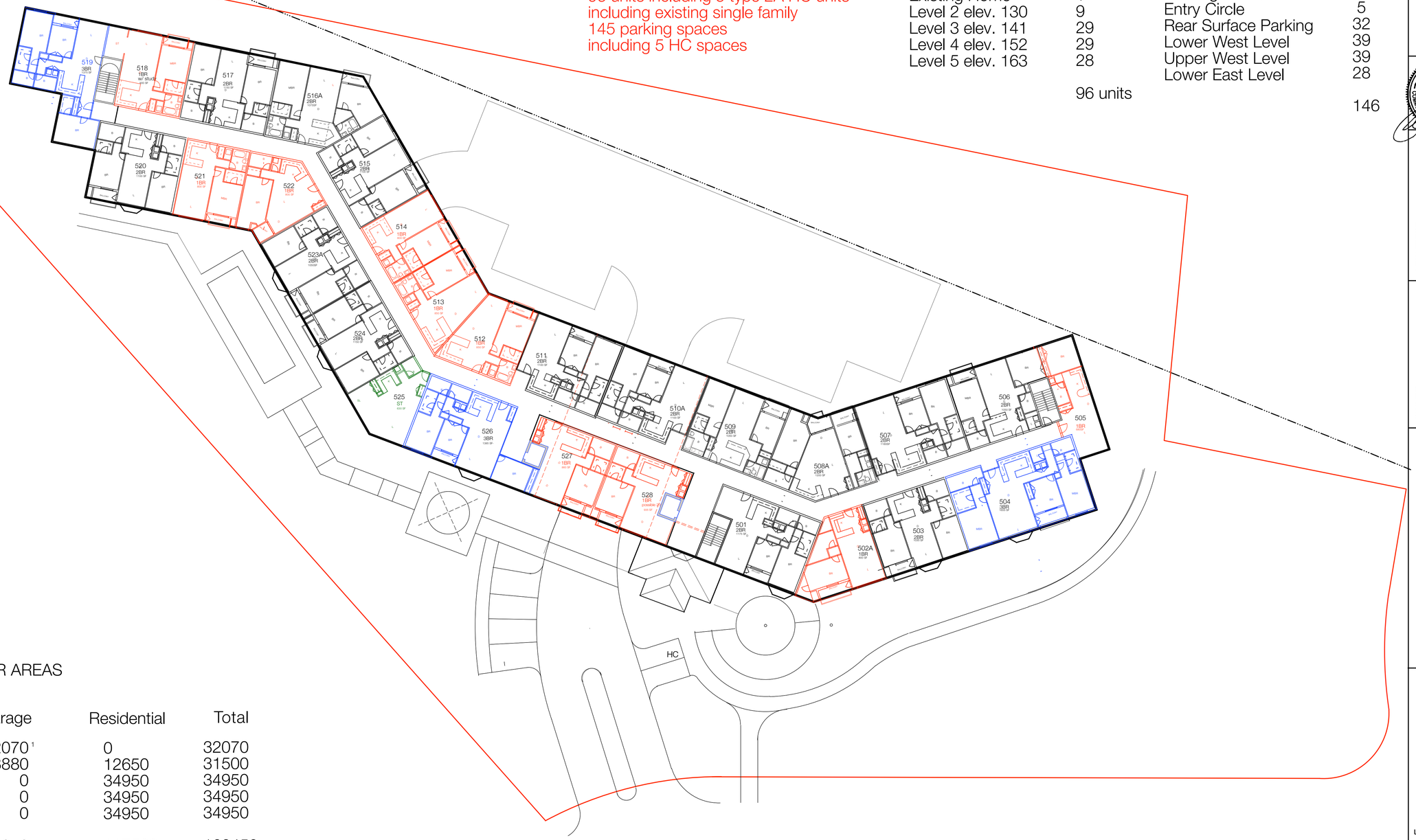
96 units including 5 type 2A HC units
including existing single family
145 parking spaces
including 5 HC spaces

RESIDENTIAL

Existing Home	1
Level 2 elev. 130	9
Level 3 elev. 141	29
Level 4 elev. 152	29
Level 5 elev. 163	28
	96 units

PARKING

Existing Home	3
Entry Circle	5
Rear Surface Parking	32
Lower West Level	39
Upper West Level	39
Lower East Level	28
	146



FLOOR AREAS

	Garage	Residential	Total
1	32070 [1]	0	32070
2	18880	12650	31500
3	0	34950	34950
4	0	34950	34950
5	0	34950	34950
Total	50950	117500	168450

1 includes lobbies

LEVEL 5

0 5' 10' 20' 40'

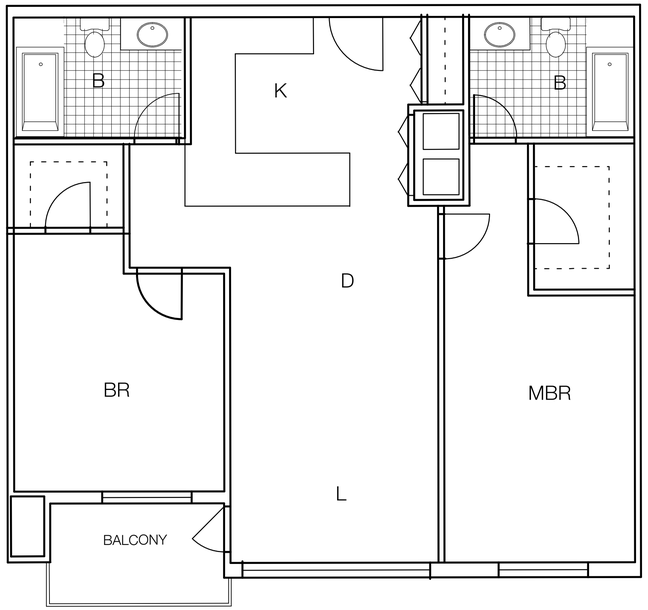
ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX Winchester, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

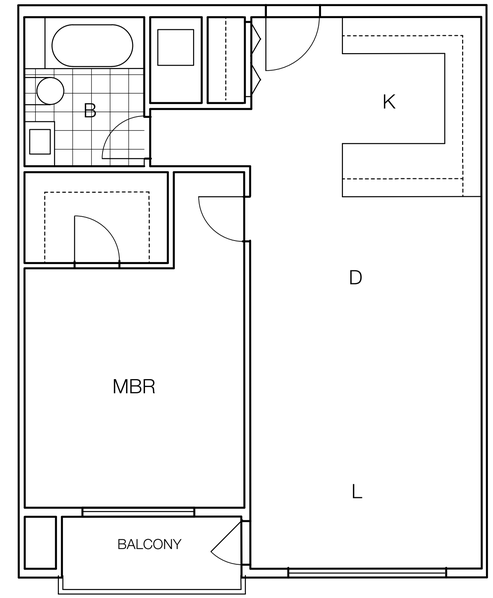
WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

LEVEL 5
PRELIMINARY FLOOR PLAN

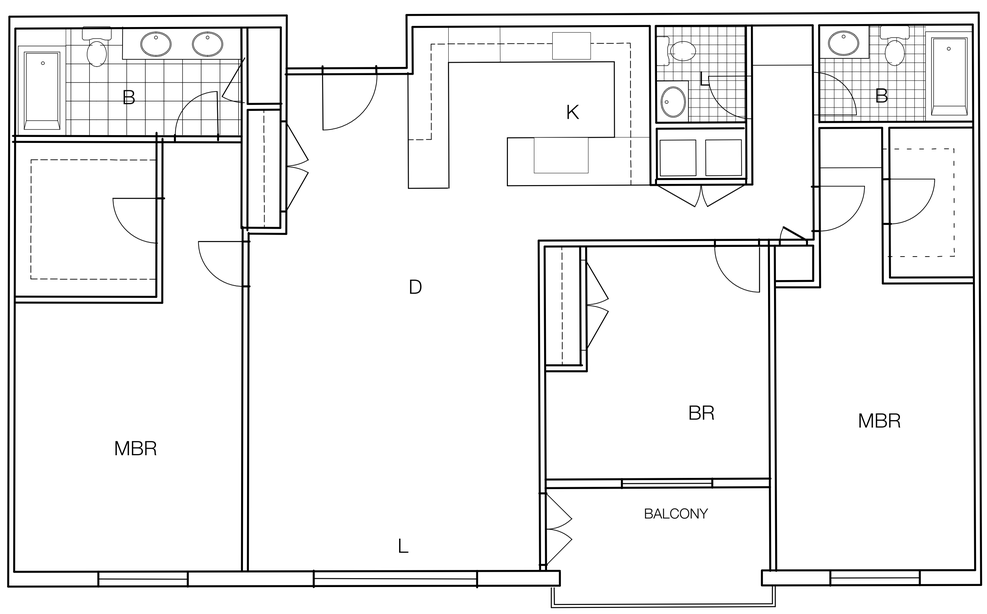
DATE: 7.6.15
SCALE: 1"=20'-0"



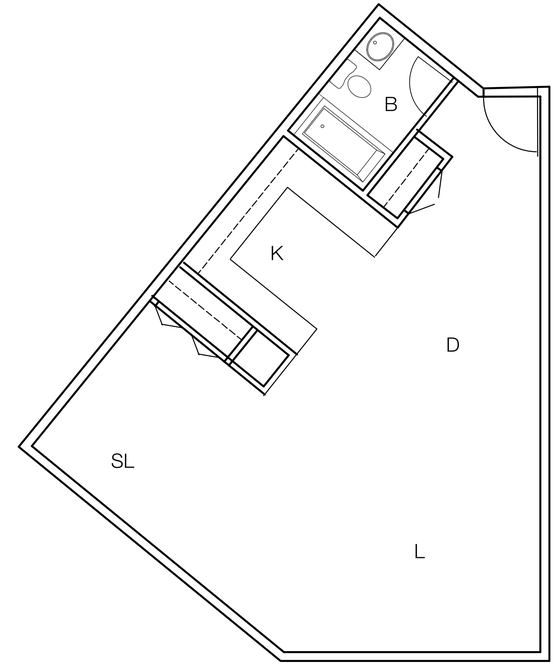
TWO BEDROOM



ONE BEDROOM



THREE BEDROOM



STUDIO

0 4' 8' 12' 16'

UNIT PLANS FOR LAYOUT ONLY, SEE BUILDING PLANS FOR LOCATION AND SIZE

REGISTERED ARCHITECT
JAMES A. VELLECO
No. 3379
MARBLEHEAD
MA
COMMONWEALTH OF MASSACHUSETTS

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX Winchester LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

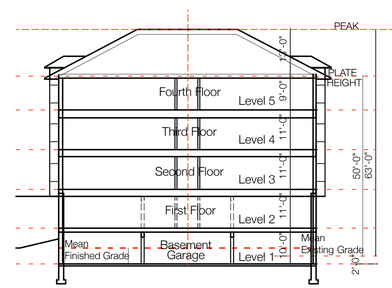
PRELIMINARY TYPICAL UNIT PLANS

DATE: 7.6.15
SCALE: 1/4"=1'-0"

REV
REV
REV
REV
REV

WEST ELEVATION

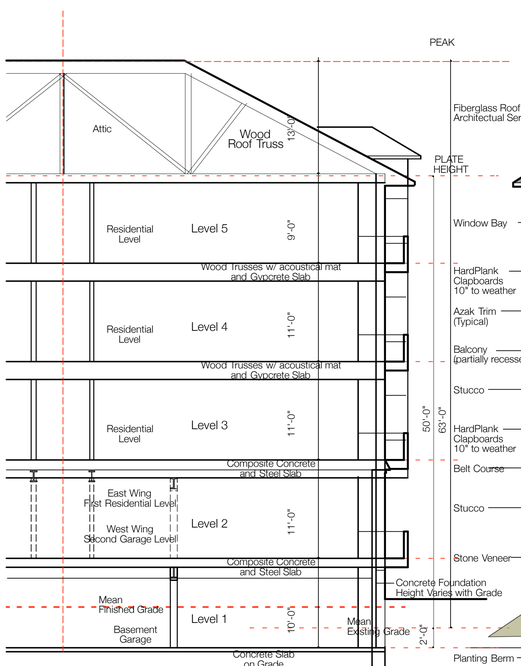
EAST ELEVATION



TYPICAL SECTION

WAINWRIGHT ELEVATION

FRONT ENTRY ELEVATION



Construction Section
1/8"=1'-0"

Partial Elevation
with Materials
1/8"=1'-0"

0 2' 4' 8' 16'

0 5' 10' 20' 40'

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX WINCHESTER, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

PRELIMINARY EXTERIOR
ELEVATIONS

DATE: 7.6.15
SCALE: 1"=20'-0"

VIEW AT ENTRY

REGISTERED ARCHITECT
JAMES A. VELLECO
No. 3379
MARBLEHEAD
MA
COMMONWEALTH OF MASSACHUSETTS

ARCHITECT
Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER
FX WINCHESTER, ,LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

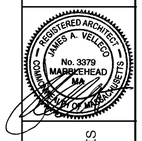
WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

PRELIMINARY SKETCH ONE

DATE: 7.6.15
SCALE:

REV
REV
REV
REV

VIEW UP WAINWRIGHT STREET



ARCHITECT

Grazado Velleco Architects
Little Harbor
Marblehead, MA 01945

OWNER

FX WINCHESTER, LLC
165 Chestnut Hill Ave. #2
Brighton, MA 02135

WINCHESTER NORTH
416 CAMBRIDGE STREET
WINCHESTER, MA

PRELIMINARY SKETCH 2

DATE: 7.6.15
SCALE:

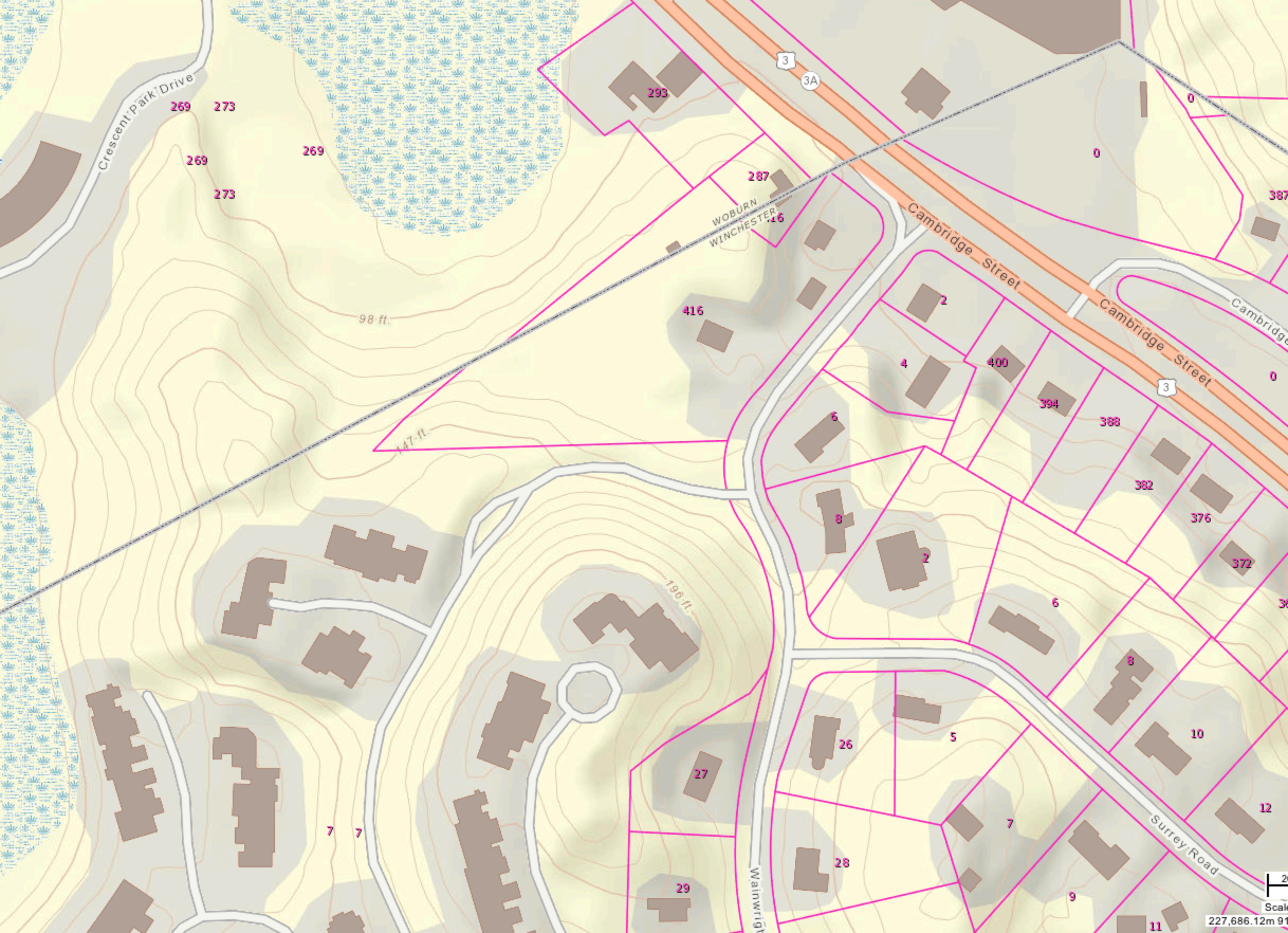
REV
REV
REV
REV

269
273
269
269
273
293
287
416
416
0
0
387
375
2
4
400
394
388
382
376
372
366
360
354
6
8
2
6
8
10
12
26
5
27
7
7
7

AERIAL OVERLAY EXHIBIT

416 CAMBRIDGE STREET
WINCHESTER, MASSACHUSETTS
SCALE:1"=100'
DATE:04/13/15

PREPARED BY
BOHLER ENGINEERING


Crescent Park Drive
269
273
269
269
273
293
287
WOBURN
WINCHESTER
416
98 ft.
147 ft.
196 ft.
3
3A
Cambridge Street
Cambridge Street
Cambridge
0
0
387
2
4
400
394
388
382
376
372
6
8
2
6
8
10
12
5
26
27
28
29
7
9
11
7
7
Wainwright
Surrey Road
Scale
227,686.12m

	Level Two					Level Three					Level Four					Level Five		
	Unit #	Type	Gross			Unit #	Type	Gross			Unit #	Type	Gross			Unit #	Type	Gross
			Area					Area					Area					Area
	201	2BR/2Bath	1175			301	2BR/2Bath	1175			401	2BR/2Bath	1175			501	2BR/2Bath	1175
A	202	1BR/1Bath	800		A	302	1BR/1Bath	800		A	402	1BR/1Bath	800		A	502	1BR/1Bath	800
	203	2BR/2Bath	1000			303	2BR/2Bath	1030			403	2BR/2Bath	1030			503	2BR/2Bath	1030
	204	3BR/2 1/2Bath	1655			304	3BR/2 1/2Bath	1655			404	3BR/2 1/2Bath	1655			504	3BR/2 1/2Bath	1655
A	205	1BR/1Bath	680		A	305	1BR/1Bath	680		A	405	1BR/1Bath	680			505	1BR/1Bath	680
	206	2BR/2Bath	1050			306	2BR/2Bath	1050			406	2BR/2Bath	1050			506	2BR/2Bath	1050
	207	1BR/1Bath	800			307	1BR/1Bath	800			407	1BR/1Bath	800			507	1BR/1Bath	1180
A	208	1BR/1Bath	770		A	308	1BR/1Bath	770		A	408	1BR/1Bath	770		A	508	1BR/1Bath	1200
	209	1BR/1Bath	845			309	1BR/1Bath	845			409	1BR/1Bath	845			509	2BR/2Bath	1050
					A	310	2BR/2Bath	1050		A	410	2BR/2Bath	1050		A	510	2BR/2Bath	1100
						311	2BR/2Bath	1100			411	2BR/2Bath	1100			511	2BR/2Bath	1100
						312	2BR/2Bath	1100			412	2BR/2Bath	1100			512	1BR/1Bath	850
						313	1BR/1Bath	850			413	1BR/1Bath	850			513	1BR/1Bath	850
						314	1BR/1Bath	850			414	1BR/1Bath	850			514	1BR/1Bath	800
						315	1BR/1Bath	800			415	1BR/1Bath	800			515	2BR/2Bath	1100
						316	2BR/2Bath	1100			416	2BR/2Bath	1100		A	516	2BR/2Bath	1075
					A	317	2BR/2Bath	1075		A	417	2BR/2Bath	1075			517	2BR/2Bath	1100
						318	2BR/2Bath	1150			418	2BR/2Bath	1150			518	1BR/1Bath	900
						319	1BR/1Bath	900			419	1BR/1Bath	900			519	3BR/2 Bath	1375
						320	3BR/2 Bath	1375			420	3BR/2 Bath	1375			520	2BR/2Bath	1100
						321	2BR/2Bath	1100			421	2BR/2Bath	1100			521	1BR/1Bath	800
						322	1BR/1Bath	800			422	1BR/1Bath	800			522	1BR/1Bath	800
						323	1BR/1Bath	800			423	1BR/1Bath	800		A	523	2BR/2Bath	1050
	Existing House				A	324	2BR/2Bath	1050		A	424	2BR/2Bath	1050			524	2BR/2Bath	1150
		3BR/2 1/2Bath	2385			325	2BR/2Bath	1150			425	2BR/2Bath	1150			525	ST/1 Bath	690
					A	326	ST/1 Bath	630		A	426	ST/1 Bath	690			526	3BR/2 Bath	1385
					A	327	3BR/2 Bath	1385		A	427	3BR/2 Bath	1385			527	1BR/1Bath	850
						328	1BR/1Bath	850			428	1BR/1Bath	850			528	1BR/1Bath	935
						329	1BR/1Bath	935			429	1BR/1Bath	935					
	ST	3																
	1 BR	43																
	2 BR	39																
	3 BR	11																
	Total	96																

Fiscal Impact Analysis

Winchester North

416 Cambridge Street

Winchester Massachusetts

June 15, 2015

Prepared by

Connery Associates

Melrose Massachusetts

Table of Contents

Section	Page
1.0 Preface	1
2.0 Summary of Methodology	2
3.0 Summary of Findings	5
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5.0 Education Costs	10
6.0 Revenue Projection	13
7.0 Fiscal Profile	14
8.0 One Time Fees	15
Appendix	16

Fiscal Impact Analysis
Winchester North
416 Cambridge Street
Winchester Massachusetts

June 15, 2015

1.0 Preface

FX Winchester LLC Company of Cambridge Massachusetts is proposing to construct a 40B development consisting of 95 mixed income rental units and one single family detached home (existing residence on the site) in Winchester Massachusetts. Winchester North (the "Proposal") will be consistent with state requirements requiring that 25% of all unit types be made available for affordable housing consistent with the guidelines of MGL 40B. The proposed site is an 117,000 square foot parcel located at 416 Cambridge Street in Winchester. Approximately 17,000 square feet of the site is located in Woburn. In addition to the total of 96 dwelling units the Proposal includes exterior public assembly spaces, a fitness center lounge areas and a library. The proposed development will feature 149 on-site parking spaces both garage and surface parking configurations.

The objectives of this report are to estimate the long term fiscal profile and identify key fiscal characteristics of the Proposal. As such, it is designed to generate an estimated fiscal cost to revenue ratio at project stabilization; and to estimate the annual net fiscal benefit of the stabilized development in current dollars. These projections are made to provide the Town of Winchester with an understanding of how the Proposal will affect the local tax base over the long term. The focus of the report is designed to answer the key question; will the Proposal generate fiscal benefit or loss over the long term. The specific values used to generate various municipal cost estimates should be considered as the average annual costs; meaning that the actual overall fiscal profile and individual components may fluctuate depending on local, regional, or national economic conditions in the future.

All specific municipal cost estimates are intended to illustrate the magnitude of the financial impact on the affected municipal departments for the purpose of constructing an estimated fiscal impact and overall fiscal profile. The cost estimates are not intended as budget recommendations for an individual town department. This report recognizes that the application of current and future municipal revenues and levels of service is the purview of the local officials and Town Meeting.

Projected student enrollments and associated education costs are major components of any fiscal report analyzing residential development. This report generates an estimated education service cost based on a projection of additional school age children and the current cost per pupil. Similar to non-school cost estimates (general service costs) education cost estimates are not designed as budgetary or policy recommendations. Rather, the enrollment and cost projections should be considered as information to be used in conjunction with other school department studies and plans designed to meet future educational objectives.

The education cost estimates used in this report are intended to provide an estimate the long term cost per student. In the near term school costs, approximately one to three years after stabilization, will most likely to be lower. However, this report takes the position that the measurement of education costs, like the Proposal in general, should be considered over the long term and thus allocates school costs on the basis of actual net school spending per student which provides a more accurate estimate of long term school cost.

Table 1 below provides a more detailed review of the Proposal. Please note that the Proposal is consistent with MGL 40B regulations which require that 25% of the residential units be set aside for affordable housing use consistent with Chapter 40B requirements.

Table 1. -Proposed Multi- Family Development Program

Residential Type	Market Rate	Affordable Rate	Total	Percent (Rounded)
Studio	1	2	3	3%
One Bedroom	33	10	43	45%
Two Bedroom	29	10	39	41%
Three Bedroom	8 (1)	2	10	11%
Total	**71**	**24**	**95 (1)**	**100%**

(1) The existing three bedroom house on site which will remain as a three bedroom house; the single family house represents the 96th unit of the Proposal.

As shown in Table 1 above, the unit mix is strongly oriented towards smaller units with studio one and two bedroom units comprising 90% of the total. Further, fully 48% of the unit mix is represented by studio and one bedroom units; unit types that do not generate school aged children or associated costs.

2.0 Summary of Methodology

In considering the fiscal impacts of the Proposal, this report divides municipal service costs into two broad categories: general service costs (i.e. all non-education costs) and education costs.

As noted in the body of this report, the measurable general service costs will be primarily generated from public safety-related (police and fire services). The associated departmental cost estimates were generated by employing current operating budgets and data provided by the germane department heads.

For the Proposal education cost represents the large majority of the total estimated service costs. Education costs have been applied based on an estimate of new students at project stabilization. The estimated student generation rate has been developed by examining comparable rental developments in Winchester and as necessary using regional student generation data for analysis and context purposes.

As noted, education costs are driven by an estimate of the additional school-aged children to be enrolled in the Winchester Public School System. The basic formula for determining the local education cost estimate is (1) the actual net school spending per pupil (ANSS), as reported by the Massachusetts Department of Education for 2014, minus and (2) state aid (MGL Chapter 70), which is an annual revenue source and an adjustment factor for current building maintenance and operational costs. Actual Net School Spending (ANSS) includes all funds expended by the School Committee via the municipal budget, grants, and other funds as well as certain town expenditures including employee benefits but excluding certain types of expenditures such as transportation, adult education, and long-term debt. As such, ANSS provides an inclusive school cost estimate per net new student.

The equation for determining the Town's educational costs takes into account the fact that school costs are partially offset by Chapter 70 school aid from the Commonwealth. In order to provide an estimate of the fiscal impact of potential new school children from the Proposal at stabilization, this report assigns a Chapter 70 aid based on the current aid per student level. While it is not a prediction of future Chapter 70 aid to Winchester, we believe it is a reasonable basis on which to estimate the costs associated with students generated by the Proposal. As reported by the Massachusetts Department of Elementary and Secondary Education on its web site "Chapter 70 Trends" in May of 2015 the Town's ANSS was $11,902 with $1,760 (19.1%) of total represented by Chapter 70 state aid. From FY06 to FY14 the according to the Massachusetts Department of Elementary and Secondary Education (MAY 2015) Chapter 70 Aid has fluctuated between 13% and 19.3% of total ANSS. Therefore state aid as a percentage of ANSS is near a decade long high point.

This report does not include Chapter 70 funds as a future revenue source generated by the Proposal but rather as a method of estimating what the local tax base supports in terms of education costs. Since Chapter 70 is a revenue source, for the purposes of this report, it is subtracted from total ANSS in order to provide an estimate of the portion of education cost borne by the local tax base. Accordingly, the cost per student relative to local fiscal resources is approximately $10,142 per student $11,902 minus $1,760).

2.2 General Service Cost Estimates

For all other municipal service costs i.e. general service costs, the report employs the FY2015 operating budget of the Town of Winchester and includes those service categories that will most likely exhibit a measurable additional cost due to the Proposal. In this case, the Police, and Fire Departments. The individual departmental estimated costs are combined in the report to provide a total general service cost estimate.

It should be noted that there are municipal operational budget categories that are properly not included in general service costs for purposes of determining the fiscal impacts, such as existing debt payments, municipal services paid by enterprise or similar accounts for water and sewer services and building department reviews and inspections which are paid for directly be fees charged to the developer. In addition, Public Works' responsibilities, in this instance, such as road maintenance and plowing of existing public roadways abutting the Proposal area will not

change as a result of the Proposal. In short, the measurable potential additional general service costs will be primarily associated with police and fire services, including ambulance service.

2.3 Revenue Projection

Service costs represent only one part of the fiscal equation. To appropriately estimate the annual fiscal impact of the Proposal, the estimated annual revenue stream (income to the Town generated as a result of the Proposal) must also be determined. Given the lack of comparable development in Winchester this report employs the stabilized income method consistent with current practices and methods of the Winchester Assessor's office to derive a property tax estimate at project stabilization (current dollars).

Added to the projected property tax at project stabilization is an estimate of excise tax associated with the Proposal but not any estimate of Chapter 70 aid. Therefore, the real estate property tax at project stabilization plus the excise tax comprise the estimated annual revenue stream of the Proposal.

2.4 Fiscal Profile

The report compares the estimated total municipal service costs (both general service costs and education costs) to estimated total annual revenue to arrive at an estimated annual cost-to-revenue ratio, or annual fiscal profile. The findings are also expressed in terms of current dollars gained or lost annually commencing at project stabilization.

As noted earlier, the objective is to provide Winchester with an understanding of the long-term fiscal implications of the Proposal. Accordingly, the most important finding presented in this report is the estimated cost-to-revenue ratio at stabilization since this finding reflects the Proposal's long term fiscal profile. While the cost to revenue ratio will vary slightly from year to year due to background regional or national economic trends, it is the best measure of the long term projected fiscal performance of the Proposal.

3.0 Summary of Findings

- Winchester North has an estimated annual revenue stream of $312,300 and an estimated total annual service cost of $158,500. Accordingly, it generates a positive long term annual cost-to-revenue ratio of approximately 0.51.

- Winchester North's positive fiscal profile will be sustainable for the long term. The estimated annual fiscal benefit at stabilization is estimated at $153,800 (current dollars).

- The total assessed value of the Proposal is estimated at approximately $24,452,000 (current dollars) at project stabilization.

- One time building related building permit and related fees are estimated to be in the range of $225,000 $300,000 payable at receipt of a building permit.

- The annual average number of additional students is estimated at 11. The likely operational a range will be 8 to 14 students per year. The full enrollment is likely to occur by the 2019/20 school year.

- Winchester North's positive fiscal profile and long term sustainability provide Winchester an opportunity to address its affordable housing needs in a fiscally sound manner.

4.0. General Service Costs

This report uses the Town's FY2016 operating budget to reflect overall annual departmental costs. To estimate applicable general service costs, this report uses information provided by various Town Departments in May of 2015.

Residential Service Costs – Police Department
Our review of local data and discussions with the Police Chief indicates that in the current year The Winchester Police Department can anticipate approximately 14,500 total calls for service (all types).

It is important to note that a significant portion of the public safety calls and costs are *not* directly related to residential land uses. Office, retail, industrial land uses plus public facilities, institutional uses, recreation uses, and town wide traffic management create a significant public safety service demand. Our experience in the region indicates that residential land use can account for 15% to 40% of all service calls depending on the nature of the community. In this instance because Winchester is primarily residential community we will employ a higher end of the observed range i.e. 35% or up to 4,350 calls of the anticipated 14,500 service calls are likely be to from residential addresses.

The FY16 Police Department budget is $4,380,590. Accordingly, for fiscal estimating purposes 35% of said budget can be generally assigned to residential service calls or $1,533,207. Our review also indicates that Winchester has approximately 8,700 dwelling units. Therefore, the residential call rate in Winchester is estimated at up to 0.50 calls per dwelling unit (4,350 calls divided by 8,700 dwelling units). Accordingly the average service cost per residential service call can be estimated at $352 per call.

While the Proposal will have fewer people per unit than the predominately single family residential housing base of Winchester, and therefore somewhat likely to generate less call per unit, this report to be conservative applies the average rate of 0.50 calls per year to Proposal. Therefore the additional 95 units (not including existing single family house) generates a potential for additional 48 police service calls per year or an annual estimated cost of $16,896.

However, based on our experience, there is no accurate way to consistently indicate the cost of a police residential service call, given the wide variety of circumstances that can be encountered. To reflect this uncertainty and to reflect the reality that the cost of the "average" residential service call can vary significantly from year to year, this report increases the derived cost noted above by 25% to $21,120.

The Winchester Police also provided service call data for individual multi-family developments covering the period 2010 to 2014. While the data shown below is primarily multi-family condominium data due to the lack of significant comparable multi-family rental housing in Winchester, this report employs said data as another method of estimating the anticipated police service demand. It should be noted that the developments shown in Table 2 below represent the larger multi-family developments in Winchester.

The majority of developments listed in Table 2 are condominiums (75 Church St. is an established rental property), That being stated, Table 2 below still provides a good example of the police responses to established multi-family developments in Winchester during past five years.

Table 2. Police Service Calls- Five Year Averages

Multi-Family Development	Unit Count	Average Annual Police Calls 2010- 2014	Average Calls Per Unit
Parkview	318	143	0.45
75 Church	48	2	0.04
The Ledges Wainwright Rd.	112	52	0.46
The Village =Swanton St.	101	28	0.28
7 Conant Rd	96	21	0.22
Graystone Circle	160	20	0.13
2 Grove Pl.	80	8	0.10
7 Lewis Rd.	39	14	0.36
Totals	**952**	**288**	**0.30**

Source. WPD May 2015.

The wide range of individual site averages shown in Table 2 above illustrates the point of how difficult it can be to specifically assign an estimate of police service calls to residential land uses. However, Table 2 does show an average call rate per dwelling unit lower than determined by the town wide per dwelling unit approach i.e. 0.30 per dwelling units versus 0.50. Again, it is likely that a good portion of the difference is due to the lower population per unit in multi-family vs. the town wide housing stock. However, to maintain a conservative position this report will employ the higher rate of 0.50 calls per dwelling unit.

Therefore, this report estimates that the 95 new dwelling units may generate up to 48 additional police service calls. Further, using 125% of average cost factor the annual estimated police service cost is $21,120.

Table 3. Summary of Police Service Costs

Department	FY 2014 Budget	Residential Cost Factor 35%	Cost / Call @125%	Number of New Calls	Estimated Annual Cost
Police Dept.	$4,380,590,5	$1,533,207	$440	48	$21,120

Residential Service Cost –Fire Department
The Winchester Fire Department has provided detailed fire related and emergency medical data for the same list of multi-family comparables as discussed regarding the police department. Table 3 below illustrates the average fire related and emergency medical services (EMS) calls on for past five years.

Table 2. Police Service Calls- Five Year Averages 2010-2014

Multi-Family Development	Unit Count	Average Annual Fire Calls	Avg. Calls Per Unit	Average EMS Calls	Average EMS Calls Per Unit
Parkview	318	8	0.025	46	0.15
75 Church	48	1	0.020	1	0.02
The Ledges Wainwright Rd.	112	7	0.063	12	0.10
The Village =Swanton St.	101	4	0.039	11	0.11
7 Conant Rd	96	2	0.020	10	0.11
Graystone Circle	160	4	0.025	3	0.02
2 Grove Pl.	80	3	0.038	3	0.04
7 Lewis Rd.	39	2	0.051	5	0.13
Totals	**952**	**31**	**0.032**	**91**	**0.29**

Combined the Fire and EMS calls for 952 multi-family units shown above generate an annual average of 122 service calls or a ratio of 0.128 per multi family unit. Applying this finding to the 95 multi-family units of the Proposal (95 units X 0.128) generates a combined estimate of 12 additional fire service and ambulance calls.

Winchester operates advanced life care service; as such it receives insurance reimbursements for ambulance service calls. Based on the analysis in Table 3 above, we estimate that of the 12 additional service calls related to the Proposal 10 will be EMS oriented and all should qualify for insurance reimbursement. If from time to time some calls are not reimbursable the number will be small and fiscal impact de minimus.

Another method of estimating service calls is to examine town wide data. Based on data from recent years we estimate that the fire department will have approximately 6,000 service calls of all types in 2015 of which approximately half (3,000) will non-EMS calls. Based on our experience, in any given year, suburban fire departments generate approximately 60% to 80% of all non-EMS service calls from residential addresses. To be conservative we will employ the higher 80% value for this report.

Assuming 3,000 non-EMS calls per year and 8,700 dwelling units equates to an average of 0.34 calls per dwelling unit per year. Applying this value to the proposed 95 multi-family units generates an estimate of 32 additional calls per year. This value is significantly higher than the 12 calls per year generated by the multi-family data shown in Table 3. Given that fire service

calls, like police calls can vary considerably, this report will use the average of the two estimating approaches i.e. 22 additional calls for service.

We note that the FY16 Fire Department Budget is $4,380,590. Making a conservative (high) assumption that 80% of all calls were are residentially oriented (minus commercial service calls, institutional calls, car fires, false alarms , good intention calls etc) the amount of the budget assigned to residential uses can be estimated at $3,504,500. Given 8,700 dwelling units this equates to $1,168 per dwelling unit. Assuming 22 additional calls for service we can estimate an additional fire service cost of approximately $25,700 per year.

Table 3 Service Costs –Fire Department

Department	FY 2015 Budget	Residential Cost Factor 80%	Cost per Call	Number of New Calls	Additional Cost
Fire Department	$ 4,380,590	$3,504,500	$1,168	22	$25,700

(1) $1,767,514 divided by 1,010 residential calls.

Other General Service Costs

Water and sewer costs for the Proposal will be addressed via enterprise accounts for said services established by the Town of Winchester. Similarly, building department costs will be covered by the required permit fees. The additional population should not require additional staffing for general government services such as Town Clerk, Treasurer, and Selectman; or for services such as libraries or recreation. Further, budget items like current municipal debt are not applicable since they pre-date the Proposal. Accordingly, municipal the departments that will experience measurable additional costs are Police, Fire and the Health Department.

Total General Service Costs

Table 4 below summarizes the total estimated annual general service costs (current dollars) associated with the Proposal with an understanding that it any given year costs could be higher or lower.

Table 4. Total General Service Costs

Department	Annual Cost
Police	$21,120
Fire	$25,700
Total	**$46,820 ($47,000)**

5.0 Education Costs

5.1 Student Projections

Winchester does not have comparable rental developments that can be directly used to estimate the number of school aged children that will likely be generated by the Proposal, except for the older development at 75 Church Street / Lewis Rd. However, the Town does have a number of multi-family condominium developments that can be used as a proxy given that they have one, two and three bedroom units and in many instances are of similar unit size and monthly service cost.

However, it is important to note that student generation rates are usually affected by monthly housing costs; specifically, the higher the monthly cost in a condominium or rental unit the lower the number of school aged children (SAC). In our experience we have found that similar sized condominium units can generate 10% to 15% less students per unit type than their lower monthly cost rental equivalents. Therefore for the purposes of this report since the majority of the current mutli-family student enrollments are from condominiums, the derived SAC rate will be increased by 15%.

The impact on SAC rates of monthly housing cost levels is made clear in Winchester when reviewing the two bedroom condominium units of Parkview. Specifically, the 318 condominiums at Parkview have 60 two bedroom units generating 43 school aged children for a two bedroom rate of 0.72 per unit (the remaining 256 one bedroom units do not generate school aged children in any sustainable manner or amount). Our regional experience indicates that this rate is approximately four times the regional rate for two bedroom market condominiums. However, in this instance the average assessed value of the two bedroom condominiums at Parkview is only $188,000. This value, while accurate, is at or near the low end of condominium values for market two bedroom units in the region.

Given the low assessed value valuation, the purchase of a two bedroom unit assuming a 20% higher than assessed value sale price and financed with 5% / 30 year mortgage and a 20% down payment generates monthly mortgage cost between $800 and $850 per month; and adding local taxes brings the monthly payments approximately $1,000-$1,100 per month. In comparison the affordable two bedroom units of the Winchester North will rent for an average of $1,373 per month. In effect the two bedroom market units at Parkview have a significantly lower monthly cost than what is required for an affordable two bedroom unit in 40B development.

For the reason of low monthly housing costs which are significantly below 40B monthly payment ceilings, Parkview is not a logical comparable for SAC purposes. Specifically, affordable two bedroom units generate at least three times the SAC rate of market rate units and in this instance we have the anomaly of the two bedroom *market rate* units in Parkview having monthly costs below the 40B affordable units. In effect, one hundred percent (100%) of the two bedroom units at Parkview provide a form of affordable housing ownership option that is significant below 40B thresholds. This characteristic makes Parkview an inappropriate SAC analysis comparable.

To further illustrate the point of monthly payment impact on SAC rates in Winchester we can examine the 112 condominiums at 7 Wainwright (The Ledges), a development abutting the Proposal. The Ledges has 70 three bedroom and 42 two bedroom units a unit mix much more oriented to family use than what is proposed for Winchester North and while in the past it did generate a small number of school aged children it currently generates none. The primary reason for this result is the assessed valuations i.e. a range from $786,000 to $1,043,000.

The Ledges represent the other end of the monthly cost spectrum for multi-family development in Winchester and while some units at the Ledges likely have monthly costs closer to the Proposal's monthly cost of $3,750 for the three bedroom units, the Ledges will also not be employed as a SAC comparable.

Table 5 below illustrates the SAC rate from comparable developments in Winchester and as noted has been increased by15% to reflect SAC rates of similar apartment units.

Table 5. School Age Student in Comparable Developments

Comparable	Total Units (1)	Students (2)	SAC Rate	SAC Rate @115%
75 Church St (rental)	36	2	0.055	0.063
Village 171 Swanton St.	101	16	0.158	0.182
22 Grove Place	80	3	0.038	0.043
7 Conant Rd.	96	17	0.177	0.203
Grayson Circle	160	4	0.025	0.029
Total	**473**	**42**	**0.089**	**0.102**

(1) Total units minus one bedroom units which do not generate SAC.
(2) As reported by Winchester School Dept. May 2015

Based on the data shown in Table 5 above this report will assign a SAC rate of 0.102 for the aggregate two and three bedroom market units of the Proposal. However, since there is no 40B development in Winchester the report will assign the high end of the regional averages for affordable two and three bedroom units i.e. 0.45 and 1.2 respectively.

Table 6 below illustrates the SAC projection for Winchester North.

Table 6. Average Annual Projected School Aged Children

Unit Type	Number	SAC Rate	Students
Studio Mkt	1	0.00	0
Studio Aff.	2	0.00	0
1 Bedroom Mkt	33	0.00	0
1 Bedroom Aff.	10	0.00	0
2 Bedroom Aff	10	0.45	4.5
3 Bedroom Aff	2	1.20	2.4
2 and 3 bedroom Aggregate Mkt	37	0.102	3.8
Totals	**95**	**0.115**	**10.7 (11)**
Two and Three Bedroom only	**49**	**0.224**	**11**

As shown above in Table 6, as a whole Winchester North will have an SAC rate of 0.115 per unit. However, since one bedroom units do not generate school aged children in any measureable amount for any length of time Table 6 also illustrates the SAC rate of the 49 units that will generate school aged students in a measurable and sustained manner i.e. 0.224.

As shown, Winchester North is projected to average 11 students per year at project stabilization likely in the 2019/2020 school year. Regional patterns indicate that approximately 60% of the new students (7 students) will enroll in the various grade levels grades K; and that40% or 4 students will enroll in the various grade levels 7-12. While the annual average is projected to be 11 students per year, the operational reality is likely to be between 8 and 14 students in any given year.

5.2 Projected Annual Education Cost

As noted in Section 2 after deducting for state chapter 70 aid (a revenue source) the Winchester tax base absorbs 10,142 per student in 2015. **Appling the average of 11 students per year to the estimated per student cost generates an education cost of $111,562 (current dollars).**

5.3 Projected Total Service Cost

Table 7 below provides a summary of the total estimated service cost at stabilization (current dollars).

Table 7. Total Projected Service Costs

Department	Costs
Police	$ 21,120
Fire	$ 25,700
Schools	$111,562
Total	$158,382 **($158,500)**

6.0 Revenue Projection

6.1 Estimated Revenue-Residential Component

For the purpose of generating a revenue estimate, this report applies the stabilized income method consistent with the approach used by the Town of Winchester's Assessor's Office as May 2015. Based on an internal market analysis and examination of required affordable housing rents the following represent the estimated aggregate monthly rent for market rate and affordable units by unit type as estimated by the applicant.

Estimated Rents per Unit Type
+

- 1 market studio $2,145
- 2 affordable studios $1,094
- 33 market one bedrooms $2,500
- 10 affordable one bedroom $1,172
- 29 market two bedroom $3,300
- 10 affordable two bedroom $1,373
- 8 market three bedroom $3,750
- 2 affordable three bedroom $1,573

Applied Income Method Metrics

- 10% vacancy deduction,
- 25% operation and maintenance deduction
- Cap rate of 8.0%

Accordingly, it is estimated that at stabilization the assessed value of the 95 multi-family units will be approximately $24,452,000 (current dollars). Applying the current residential tax rate of $12.14 will generate approximately $296,847 in annual property taxes (current dollars).

6.2 Annual Revenue Stream at Stabilization in Current Dollars

It is estimated that there will be on average 140 vehicles paying local excise taxes on an annual basis. Based on a review of current excise tax collections the current Town wide average is approximately $125 per vehicle. However, considering that 25% of the units are households at 70% to 80% of the area median income, this report reduces the aggregate value excise tax to $110 per vehicle. Accordingly, the estimated 140 tax paying vehicles will generate approximately $15,400 annually.

Combined, the excise tax ($15,400) and property taxes ($296,487) will generate an estimated annual revenue stream of approximately $311,900 at project stabilization (current dollars).

Please see Table 5 below for the projected revenue summary *at stabilization (current dollars).*

Table 8. Summary of Annual Revenue

Proposal	Assessed Value (1)	Annual Property Tax	Annual Excise Tax	Annual Revenue Stream (2)
95 Rental Apartments (1)	$24,452,000	$296,900	$15,400	$312,300

(1) Not including existing single family house.
(2) At stabilization (current dollars)

7.0 Estimated Long Term Fiscal Profile

With the annual revenue stream estimated at $312,300 at stabilization (current dollars) and total annual service cost of approximately $158,500 Winchester North will have a cost-to-revenue ratio of approximately 0.51 and in current dollar terms generate an annual fiscal benefit (at stabilization) of approximately $153,800,000 per year (in current dollars).

Table 9. Summary of Fiscal Profile

Proposal	Annual Revenue	Annual Cost	Cost to Revenue Ratio	Annual Benefit (loss)
95 Residences	$312,300	$158,500	0.51	$153,800

The report finds that the Proposal generates a strong positive fiscal profile and has a likely long term cost to revenue ratio of 0.51. Further, given the permitting process associated with the proposal of the Proposal, a positive cost to revenue ratio will be sustainable for the long term.

The Proposal's strong positive fiscal profile is driven by the two characteristics; one, approximately half of the proposed units are studio and one bedroom units that will not generate any school aged children i.e. school cost but will generate significant annual revenue; and two, Winchester commands significantly higher than average rents rates than the region as a whole and therefore apartments generate more tax revenue. Combined these two characteristics generate a strong and sustainable positive fiscal profile.

8.0 One Time Fees

Given the current requirement of a construction related permit fee of $15.00 per square foot this report estimates that one time building permit and related fees paid to the general fund will be between $225,000 and $300,000 depending on final design. This sum, after deducting Building Department construction monitoring costs, will likely generate a significant one time fiscal benefit for Winchester.

Appendix 1. Percentage of Non-Residential Costs by Broad Municipal Category

The following data was derived from Exhibit 6-4 Typical Impact of Commercial Uses on Various Public Service Categories: Fiscal Impact Handbook Burchell and Listokin, Chapter 6 Proportional Valuation Fiscal Impact Method. The table below indicates the percentage of service cost attributed to non-residential use and thus the balance represents residential use. The wide range is an expression of the variety of communities, i.e. from essentially bedroom communities, to communities with office parks, active centers, through to industrial commercial oriented communities.

Service Category	Percent Range	Mid-Point, %
General Government	4 to 6	6
Public Safety	40 to 90	75
Public Works	10 to 20	15
Health and Welfare	1 to 3	2
Recreation and Culture	1 to 3	2

In the report, the public safety category was composed of two categories: police services and fire services. It is important to note that in the above referenced handbook, commercial development is divided into two major categories with retail uses generating as much as three times the cost per square foot as office / research use. This factor in conjunction with community type results in a broad percent range of service costs associated with public safety.

For this report, the allocation of service cost was projected based on local departmental data. The above table is presented for purposes of context i.e. national averages.

STORMWATER DRAINAGE REPORT

for

WINCHESTER NORTH

416 Cambridge Street (Route 3)
Assessors Map #26, Lot 140
Town of Winchester &
Assessor's Map #74 Block 2, Lot 2
City of Woburn
Massachusetts
Middlesex County

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July 20, 2015

#W141161

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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of construction of a 95-unit apartment building at 416 Cambridge Street (MA Route 3) and Wainwright Road in Winchester and Woburn, Massachusetts. More specifically, the site is known as tax map #26, lot 140 in Winchester and tax map #74, block 2, lot 2 in Woburn. The site area is approximately 2.99 acres containing mostly wooded area, areas of ledge, and three buildings and two sheds. The house on the property is to remain.

The project falls under M.G.L. Chapter 40B for affordable housing and therefore local bylaws can be waived as part of the Chapter 40B process as long as state regulations are met. Although a small portion of the project could be considered a redevelopment, the entire project will meet the Massachusetts Stormwater Handbook requirements for new developments. Runoff will be treated by hydrodynamic water quality units before discharging to one of two proposed underground infiltration basins. The site drains in two directions; to off-site wetlands to the north and to Cambridge Street to the east. Post-redevelopment runoff rates to the two analyzed points of interest will be less than existing as shown in the below tables. Note that the project will have a beneficial impact on the Wainwright Road / Cambridge Street storm sewer systems by decreasing the peak rate of runoff for all design storms, and the runoff volume for the more frequent storms (2 year and less).

Table 1 - Stormwater Runoff Rates to Off-Site Wetlands to North

Storm Frequency	Existing Flow (CFS)	Proposed Flow (CFS)	Change (CFS)
2 year	0.51	0.46	-0.05
10 year	1.83	1.13	-0.70
25 year	2.78	1.59	-1.19
100 year	4.34	3.20	-1.14

Table 2 - Stormwater Runoff Rates to Wainwright Rd./Cambridge St.

Storm Frequency	Existing Flow (CFS)	Proposed Flow (CFS)	Change (CFS)
2 year	1.60	0.79	-0.81
10 year	3.19	2.87	-0.32
25 year	4.17	3.84	-0.33
100 year	5.67	5.19	-0.48

The total runoff volumes will decrease for more frequent rainfalls having a frequency of 2 years or less as shown in the following tables.

Table 3 - Stormwater Runoff Volumes to Off-Site Wetlands to North

Storm Frequency	Existing Volume (ac-ft)	Proposed Volume (ac-ft)	Change (ac-ft)
2 year	0.060	0.099	0.048
10 year	0.161	0.224	0.074
25 year	0.231	0.303	0.085
100 year	0.350	0.430	0.094

Table 4 - Stormwater Runoff Volumes to Wainwright Rd./Cambridge St.

Storm Frequency	Existing Volume (ac-ft)	Proposed Volume (ac-ft)	Change (ac-ft)
2 year	0.138	0.078	-0.052
10 year	0.271	0.221	-0.039
25 year	0.354	0.316	-0.026
100 year	0.485	0.468	-0.004

Table 5 – Total Stormwater Runoff Volumes from site

Storm Frequency	Existing Volume (ac-ft)	Proposed Volume (ac-ft)	Change (ac-ft)
2 year	0.198	0.177	-0.021
10 year	0.432	0.445	0.013
25 year	0.585	0.619	0.034
100 year	0.835	0.898	0.063

Water quality for the developed site will meet or exceed the State's standards by the use of Best Management Practices (BMP's) including deep sump, hooded catch basins, stormwater quality units (Stormceptor or approved equal), and infiltration basins. These treatments will exceed the 80% total suspended solids requirement by the state's stormwater management regulations.

II. EXISTING SITE CONDITIONS

The subject site is a 2.99 acre area on the west side of Cambridge Street (Route 3) and the north side of Wainwright Road. The site drains generally from high points along the west to low points either in a northeasterly direction to off-site wetlands, or in a southeasterly direction toward Cambridge Street.

The existing conditions drainage analysis contains two drainage areas (see Existing Drainage Tributary Map in Appendix C). The first area is 1.88 acres of grassed and wooded area with a Curve Number of 62 and time of concentration of 11.3 minutes. The second area is 1.59 acres consisting of mostly grassed and wooded area with some paved driveway areas with an overall CN of 77 and time of concentration of 13.7 minutes.

Based on site-specific geotechnical information from test pits dug within this site showing sandy loam and loamy sand within the site, the hydrologic soil type has been classified as "B", consistent with a moderately well-drained soil. Areas where ledge is apparent or close to the surface are classified as type "D" soils. Please see the test pit information contained in Appendix B and a delineation of the soil types on the pre and post development drainage area maps in Appendix C.

III. PROPOSED SITE CONDITIONS

The proposed project involves the construction of a 95 unit apartment building and associated site improvements including parking areas, landscaping, lighting, utilities and stormwater infrastructure. The existing house on the site is to remain. Proposed drainage patterns will be similar to existing with drainage flowing to the north and south. Infiltration basins are proposed to attenuate post-development flow rates to below pre-development rates.

Under post construction conditions the site is broken into six drainage areas. Area P-1 is an area that will remain mostly vegetated to the north of the building and will drain in a northerly direction unattenuated to the wetlands to the north. The CN for this 0.66 acre area is 61 and will have the minimum allowable time of concentration of 6 minutes (0.1 hr).

Area P-2 is 0.46 acres of mostly lawn area that will drain directly to Cambridge Street, similar to existing conditions. The only impervious areas in this drainage subarea will be a small portion of the main driveway near Wainwright Road, a portion of the other driveway at the existing house, and the roof of the existing house. The CN is 66 and the time of concentration is 6 minutes.

Area P-3 contains 1.20 acres of the proposed driveway, lawn, and existing woodland fringe that will drain to the proposed storm sewer system and routed to infiltration basin #2. The CN is 73 and time of concentration is 6 minutes.

Area P-4 will be 0.34 acres of the almost entirely impervious north parking lot draining to infiltration basin #1. The CN is 94 and time of concentration is 6 minutes.

Areas P-5 and P-6 represent the two roof areas and both have CNs of 98 and times of concentration of 6 minutes. Area P-6 is the majority of the roof with an area of 0.58 acres and will drain to infiltration basin #1 and ultimately the off-site wetlands to the north. Area P-5 is 0.23 acres of roof on the south side of the building that will drain to infiltration basin #2 and ultimately to the Wainwright Road drainage system.

Storm Sewer System

A storm sewer system is proposed to collect runoff from the paved, roof, and grassed areas around the proposed building. A series of roof drains will collect runoff from the hill draining toward the building from the south. Minimum pipe size will be 8 inches for roof leaders and yard drains in grass areas and 12 inches for catch basins draining paved areas. Minimum pipe slope will be 0.5%. Storm sewer sizing calculations are included in Appendix F.

Infiltration Basins

Two underground infiltration basins are proposed. The first will be located under the northern parking lot and will consist of 45 Stormtech MC-3500 prefabricated plastic storage units over a nine inch base of crushed stone and surrounded on all sides by crushed stone. The storage volume of this basin will be 9,193 cubic feet (0.21 ac-ft). The basin will outlet through a four-inch low level orifice and an upper overflow weir.

Basin #2 will consist of 49 Stormtech SC-740 plastic storage units over a six inch base of crushed stone and surrounded on all sides by crushed stone. The storage volume of this basin will be 4,405 cubic feet (0.10 ac-ft). The basin will discharge through two low-level 8-inch diameter orifices and will have an upper level overflow weir for large storms.

An infiltration rate of 1.02 inches per hour was used in the basin routing calculations based on the Rawl's rate for type B sandy loam listed in the DEP Stormwater Handbook and is consistent with the sandy loam found in test pit excavations dug in the areas of the proposed infiltration basins (see Appendix B). Test pits #'s 3,7,9 and 10 were excavated in the area of the proposed basins, and the distance to the estimated seasonal high groundwater (SHGW) is indicated on the test pit logs in Appendix B. Basin #1 is more than four feet above SHGW and Basin #2 is more than two feet above SHGW, but less than four feet, so a groundwater mounding analysis was performed for Basin #2 and can be found in Appendix I. Please note that basin #2 lies between test pits 9 and 10. Groundwater was highest to the west in test pit #9 and lower in test pit #10 to the east, but the SHGW elevation of test pit #9 was used as SHGW. In reality, the maximum SHGW under basin #2 should be an average of the SHGW found in test pits #9 and #10, so the basin will be higher above SHGW than stated in this report.

Water Quality

As outlined below, the proposed drainage system was designed in accordance with the Massachusetts Stormwater Handbook.

Standard #1 **No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

The project will not result in any direct discharge of untreated stormwater into, or cause erosion of wetlands or waters of the Commonwealth. The parking areas will be drained by a system of deep sump catch basins with trap hoods, conveying runoff to one of two infiltration basins. Infiltration basin #1 will discharge to a riprap pad and basin #2 will tie directly into the storm sewer system in Wainwright Street.

Standard #2: **Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.**

Runoff rates for the post-development conditions were calculated for the 2-year, 10-year, 25-year and 100-year 24-hour storm events. These are provided in the stormwater attenuation calculations in Appendix D. As summarized in Section I of this report, post-development peak discharge rates will be less than existing rates.

Standard #3: **Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance.**

There will be an increase in impervious area of 1.282 acres as a result of the proposed construction. Although there are type D soils present, the recharge calculations contained in Appendix E assume that the site contains 100% type B soil to be conservative. This results in 1,629 cubic feet of required recharge volume. Approximately 3,344 cubic feet of groundwater recharge is provided.

Standard #4: **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS)**

The proposed Best Management Practices (BMPs) for this site will provide a weighted TSS removal of 83% percent and consists of a "process train" which includes both nonstructural and structural techniques (see Appendix E). Proposed BMPs include catch basins with deep sumps and trap hoods, Stormceptor units, and infiltration basins. The required 44% TSS removal rate prior to infiltration will be provided, as demonstrated by the TSS removal calculations in Appendix E.

Standard #5: **For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.**

The proposed project is not considered a land use with "Higher Potential Pollutant Loads (LUHPPL). Daily trips to the site will be less than 1,000 trips per day. A long-term pollution prevention plan has been developed and is included in Appendix G.

Standard #6: **Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.**

The site does not discharge to any known critical areas.

Standard #7: **A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable**

This project will meet or exceed the State's stormwater management standards for new developments.

Standard #8: **A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.**

A Stormwater Pollution Prevention Plan (SWPPP) will be integrated into the site plan design documents and will be prepared and filed with the EPA in accordance with NPDES requirements prior to construction.

Standard #9: **A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.**

An Operation and Maintenance Plan for the proposed BMP's has been developed for this project, and is included in Appendix H.

Standard #10: **All illicit discharges to the stormwater management system are prohibited.**

The Stormwater Management System has been designed such that prior to stormwater runoff discharging from the site, it is treated through a series of best management practices. To the Engineer's knowledge, there are no known or designed non-stormwater discharges that are or will be connected to the stormwater collection system that would convey pollutants directly to groundwater or surface waters.

IV. METHODOLOGY

Storm Sewer System

The storm sewer system was analyzed using Hydraflow Storm Sewers computer program by Intellisolve, which is based on the Rational Formula method. Times of concentration for all of the drainage areas were assumed to be 5 minutes, which produces the most conservative results. Runoff "C" coefficients were calculated using a value of 0.3 for grassed areas and 0.9 for impervious areas.

Stormwater Management Basins

The post development rates from the basins were computed using the Hydrocad computer program. The drainage area information, pond volume and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations. The following rainfall data was utilized in the hydrologic calculations (See Appendix D):

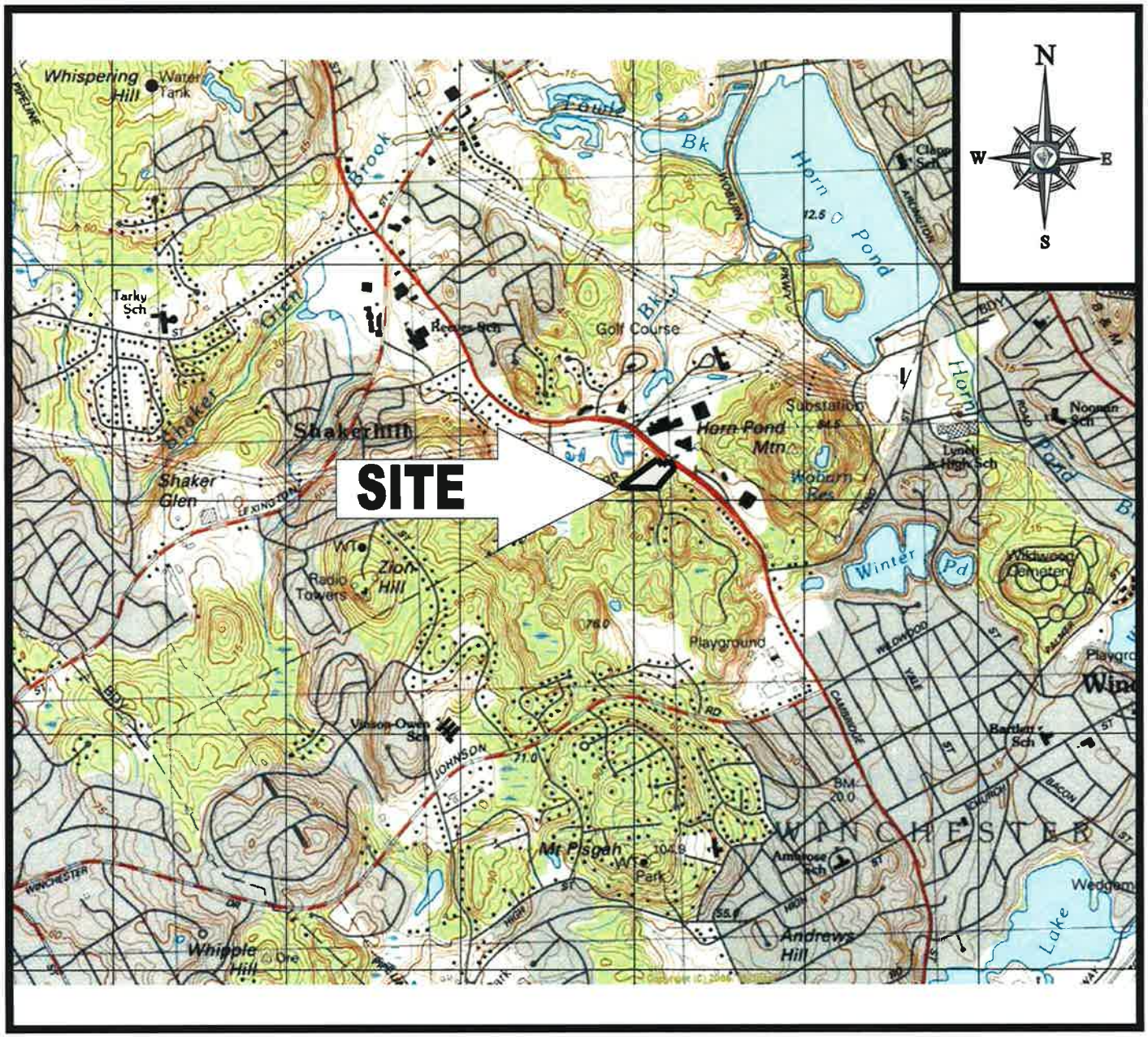
Frequency	2 year	10 year	25 year	100 year
Rainfall (inches)	3.1	4.5	5.3	6.5

V. SUMMARY

Storm runoff from the proposed development and associated parking areas and driveways will be collected by a storm sewer system with deep sump, hooded catch basins that will discharge through hydrodynamic water quality units to one of two infiltration basins. Storm events up to and including the 100 year will be the same as, or less than the pre-development rates. Runoff volumes will be decreased for the more frequently occurring storms up to the 2-year storm. Note that the project will have a beneficial impact on the Wainwright Road / Cambridge Street storm sewer systems by decreasing the peak rate of runoff for all design storms, and the runoff volume for the more frequent storms (2 year and less).

Water quality BMPs at the site will exceed the Massachusetts DEP Stormwater Management requirements, and will incorporate the use of catch basins with deep sumps and trap hoods, stormwater quality units, and two underground infiltration basins. The combination of these treatments will result in a total suspended solids removal rate of 83%, as documented in Appendix E. The project meets or exceeds the applicable stormwater management requirements, and therefore it is anticipated that this project will have no adverse impacts on the surrounding environment.

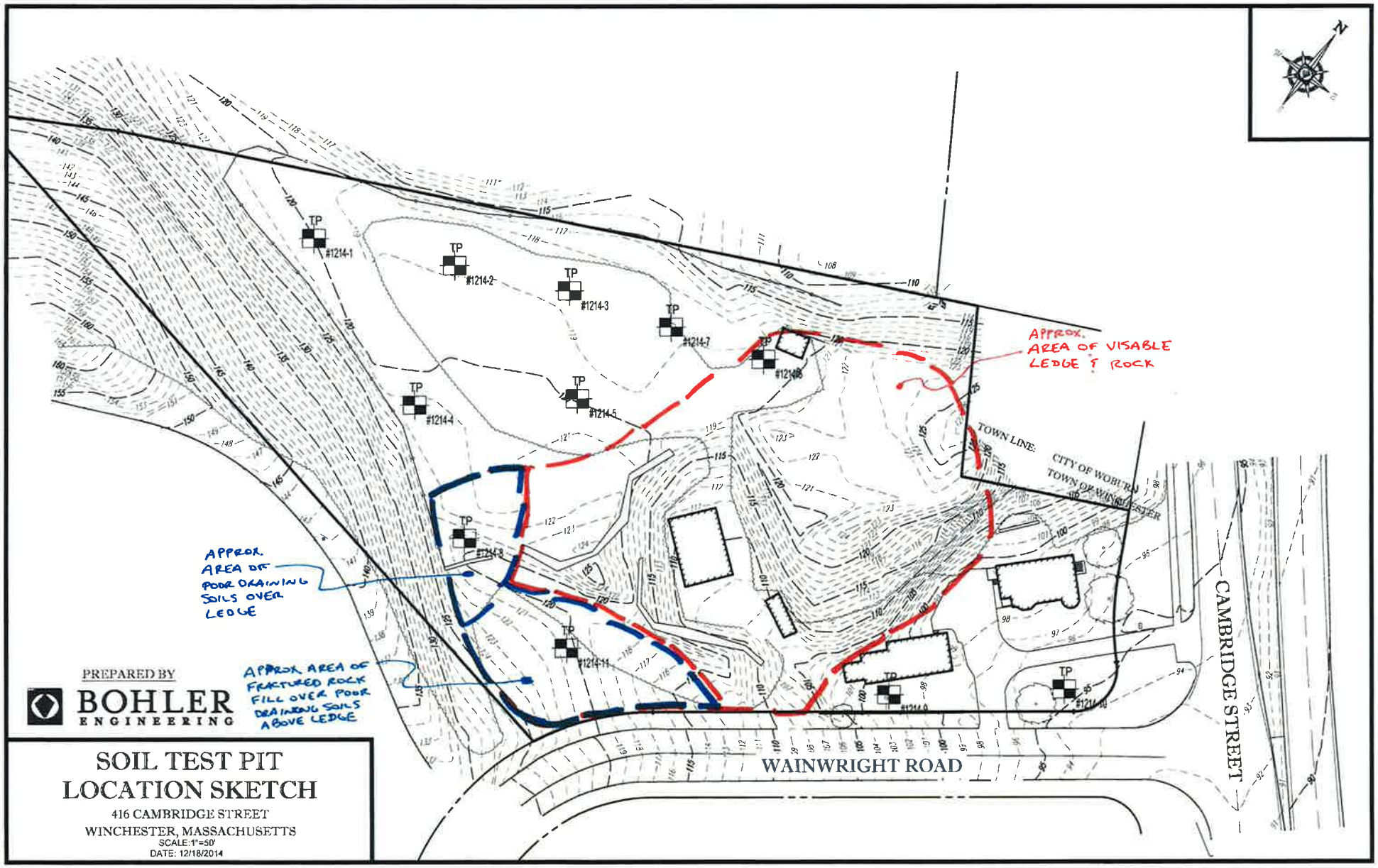
APPENDIX A
USGS MAP



LOCATION MAP

SCALE: 1"=2000'
PLAN REFERENCE: BOSTON NORTH USGS QUADRANGLE

APPENDIX B
TEST PIT SOILS INFORMATION



PREPARED BY

BOHLER ENGINEERING

SOIL TEST PIT LOCATION SKETCH

416 CAMBRIDGE STREET
WINCHESTER, MASSACHUSETTS
SCALE:1"=50'
DATE: 12/18/2014

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-1
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40 °
LOCATION: (Refer to sketch attached)		(See Attached Sketch)		
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential		Landform:	Morraine
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods		Slope:	0-5%
Stone Walls:	☒ Y ☐ N		Surface Stones:	☒ Y ☐ N

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	40± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-11	A	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
11-22	B	Sandy Loam	10YR 5/6	abk, mfr, <2% gravel
22-75	C1	Sand	2.5Y 6/6	sg, loose, <2% gravel
75-107	C2	Loamy Sand	2.5Y 6/3	m, loose, 25% gravel, 15% cobbles
107-180	C3	Loamy Sand	2.5Y 5/3	m, loose, 25% gravel, 15% cobbles

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	>180"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		101"

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			@ 101" 5Y 5/1		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-2
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40 °
LOCATION: (Refer to sketch attached)		(See Attached Sketch)		
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential		Landform:	Morraine
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods		Slope:	0-5%
Stone Walls:	☒ Y ☐ N		Surface Stones:	☒ Y ☐ N

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	40± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-9	A	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
9-24	B	Sandy Loam	10YR 5/6	abk, mfr, 5% gravel
24-102	C1	Loamy Sand	2.5Y 6/3	m, loose, 25% gravel, 15% cobbles
102-185	C2	Loamy Sand	2.5Y 5/3	m, loose, 25% gravel, 15% cobbles

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	>185"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		98"

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			@ 98" 5Y 5/1		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-3
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40 °
LOCATION: (Refer to sketch attached)	(See Attached Sketch) FL 118.5 ±			
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential	Landform:	Morraine	
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods	Slope:	0-5%	
Stone Walls:	☒ Y ☐ N	Surface Stones:	☒ Y ☐ N	

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	40± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-30	A	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
30-45	B	Sandy Loam	10YR 5/6	abk, mfr, 5% gravel
45-115	C1	Loamy Sand	2.5Y 6/3	m, loose, 20% gravel, 15% cobbles
115-175	C2	Loamy Sand	2.5Y 5/3	m, loose, 20% gravel, 20% cobbles, pockets of sand

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	>175"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		110" 109.33

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			@ 110" 5Y 5/1		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					
Notes:							

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-4
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40 °
LOCATION: (Refer to sketch attached)		(See Attached Sketch)		
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential		Landform:	Morraine
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods		Slope:	0-5%
Stone Walls:	☒ Y ☐ N		Surface Stones:	☒ Y ☐ N

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	80± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-4	A	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
4-18	B	Sandy Loam	10YR 5/6	abk, mfr, 10% gravel
18-100	C1	Loamy Sand	2.5Y 6/3	m, loose, 10% gravel, 20% cobbles, many boulders
100-135	C2	Loamy Sand	2.5Y 5/3	m, loose, 15% gravel, 10% cobbles

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	135"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		97"

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			@ 97" 5Y 5/1		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-5
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40 °
LOCATION: (Refer to sketch attached)		(See Attached Sketch)		
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential		Landform:	Morraine
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods		Slope:	0-5%
Stone Walls:	☒ Y ☐ N		Surface Stones:	☒ Y ☐ N

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	100± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-9	A	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
9-18	B	Sandy Loam	10YR 5/6	abk, mfr, 10% gravel
18-91	C1	Loamy Sand	2.5Y 6/3	m, loose, 20% gravel, 20% cobbles, many boulders
91-117	C2	Loamy Sand	2.5Y 5/3	m, loose, 20% gravel, 20% cobbles

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	117"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		88"

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			@ 88" 5Y 5/1		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-6
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40 °
LOCATION: (Refer to sketch attached)	(See Attached Sketch) EL. 119.2 ±			
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential	Landform:	Morraine	
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods	Slope:	0-5%	
Stone Walls:	☒ Y ☐ N	Surface Stones:	☒ Y ☐ N	

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	55± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-2	A	Sandy Loam	10YR 2/2	gr, mvfr, <2% gravel
	-	-		
	-	-		
	-	-		

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	12"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		N/A"

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			N/A		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-7
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40 °
LOCATION: (Refer to sketch attached)	(See Attached Sketch) EL. 118.8±			
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential	Landform:	Morraine	
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods	Slope:	0-5%	
Stone Walls:	☒ Y ☐ N	Surface Stones:	☒ Y ☐ N	
Distance From:				
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.	
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.	
Property Line:	50± ft.	Other:		

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-24	A	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
24-34	B	Sandy Loam	10YR 5/6	abk, mfr, <2% gravel
34-80	C	Sand	2.5Y 6/6	sg, loose, 5% gravel
	-	-		

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	80"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		N/A" < 112.13

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:		N/A			
		Depth to weeping from side of obs. hole:		N/A			
		Depth to soil mottles, description:		N/A			
		Groundwater adjustment:		N/A			
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					
Notes:							

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-8
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40°
LOCATION: (Refer to sketch attached)		(See Attached Sketch)		
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential		Landform:	Morraine
Vegetation:	Field Grass w/ Mixed Pines & Hardwoods		Slope:	0-5%
Stone Walls:	☒ Y ☐ N		Surface Stones:	☒ Y ☐ N

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	50± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-10	A	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
10-22	B	Sandy Loam	10YR 5/6	abk, mfr, <2% gravel
22-56	C	Silt-Loam	2.5Y 7/3	m, fr, 5% gravel

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	56"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	48"	
	Estimated Seasonal High Groundwater:		30"

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			30" 5Y 5/1		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-9
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40°
LOCATION: (Refer to sketch attached)	(See Attached Sketch) EL. 99.0±			
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential	Landform:	Morraine	
Vegetation:	Lawn	Slope:	0-5%	
Stone Walls:	☒ Y ☐ N	Surface Stones:	☒ Y ☐ N	
Distance From:				
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.	
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.	
Property Line:	10± ft.	Other:		

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-18	Fill	---	---	sand & gravel fill
18-30	Ab	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
30-45	Bb	Sandy Loam	10YR 5/6	abk, mfr, <2% gravel
45-85	C1	Med. Sand	2.5Y 6/6	sg, loose, 5% gravel
85-156	C2	LS	2.5Y 5/3	m, loose, 10% gravel, 5% cobbles

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	>156"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		80" 92.33

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:			N/A		
		Depth to weeping from side of obs. hole:			N/A		
		Depth to soil mottles, description:			80" 5Y 5/1		
		Groundwater adjustment:			N/A		
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-10
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40º
LOCATION: (Refer to sketch attached)	(See Attached Sketch) EL. 95.3			
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential	Landform:	Morraine	
Vegetation:	Lawn	Slope:	0-5%	
Stone Walls:	☒ Y ☐ N	Surface Stones:	☒ Y ☐ N	

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	10± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-12	Fill	---	---	topsoil / loam
12-24	Ab	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
24-36	Bb	Sandy Loam	10YR 5/6	abk, mfr, 5% gravel
36-136	C	Loamy Sand	2.5Y 5/3	m, loose, 15% gravel, 15% cobbles

Parent Material (geologic):	Glacial Till	Depth to Bedrock:	>136"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	N/A	
	Estimated Seasonal High Groundwater:		60" 90.3

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:		N/A			
		Depth to weeping from side of obs. hole:		N/A			
		Depth to soil mottles, description:		60" 5Y 5/1			
		Groundwater adjustment:		N/A			
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

Site Location or lot #	416 Cambridge Street, Winchester, MA			DEEP HOLE # 1214-11
Applicant/owner:	SEB, LLC			
DATE:	December 18, 2014	WEATHER:	Cloudy	TEMP: 40°
LOCATION: (Refer to sketch attached)		(See Attached Sketch)		
PERFORMED BY:	Matthew Bombaci, P.E.			
WITNESSED BY:	Sean Broderick, Winchester Engineering Department			
Land Use:	Residential		Landform:	Morraine
Vegetation:	Lawn		Slope:	0-5%
Stone Walls:	☒ Y ☐ N		Surface Stones:	☒ Y ☐ N

Distance From:			
Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	45± ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-80	Fill	---	---	fractured rock & boulders mixed w/ soil
80-86	Ab	Sandy Loam	10YR 3/3	gr, mvfr, <2% gravel
86-94	Bb	Sandy Loam	10YR 5/6	abk, mfr, 5% gravel
94-120	C	Silt-Loam	2.5Y 7/3	m, fr, 5% gravel

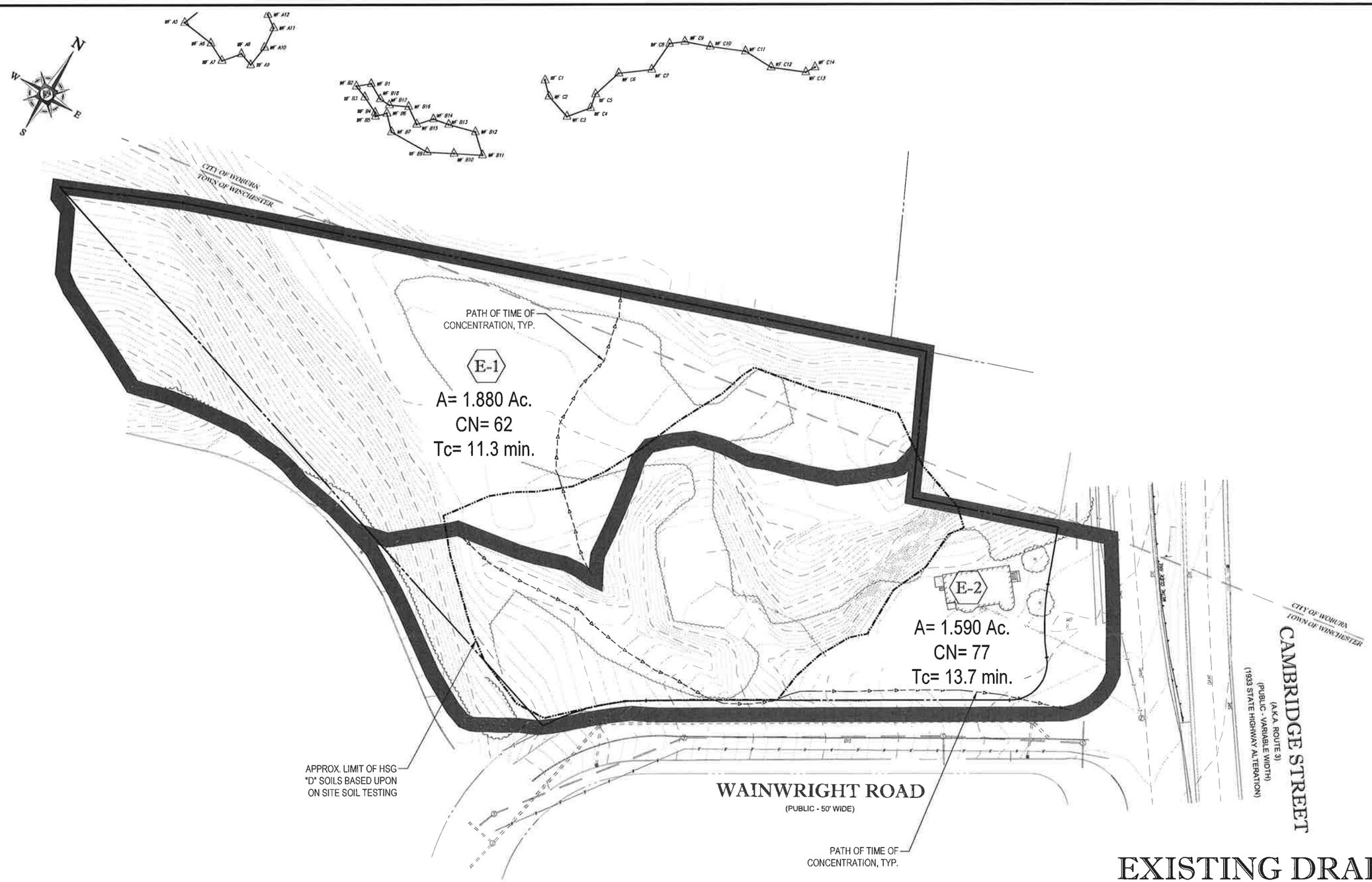
Parent Material (geologic):	Glacial Till	Depth to Bedrock:	>120"
Depth to Groundwater:	Standing Water in Hole:	N/A	
	Weeping From Pit Face:	100"	
	Estimated Seasonal High Groundwater:		92"

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:		N/A			
		Depth to weeping from side of obs. hole:		N/A			
		Depth to soil mottles, description:		92" 5Y 5/1			
		Groundwater adjustment:		N/A			
Index Well #:	N/A	Reading Date:	N/A	Index Well Level:	N/A	Adj. Factor:	N/A
Adj. ground water level:		N/A					

Notes:	

APPENDIX C
PRE AND POST-DEVELOPMENT WATERSHED MAPS

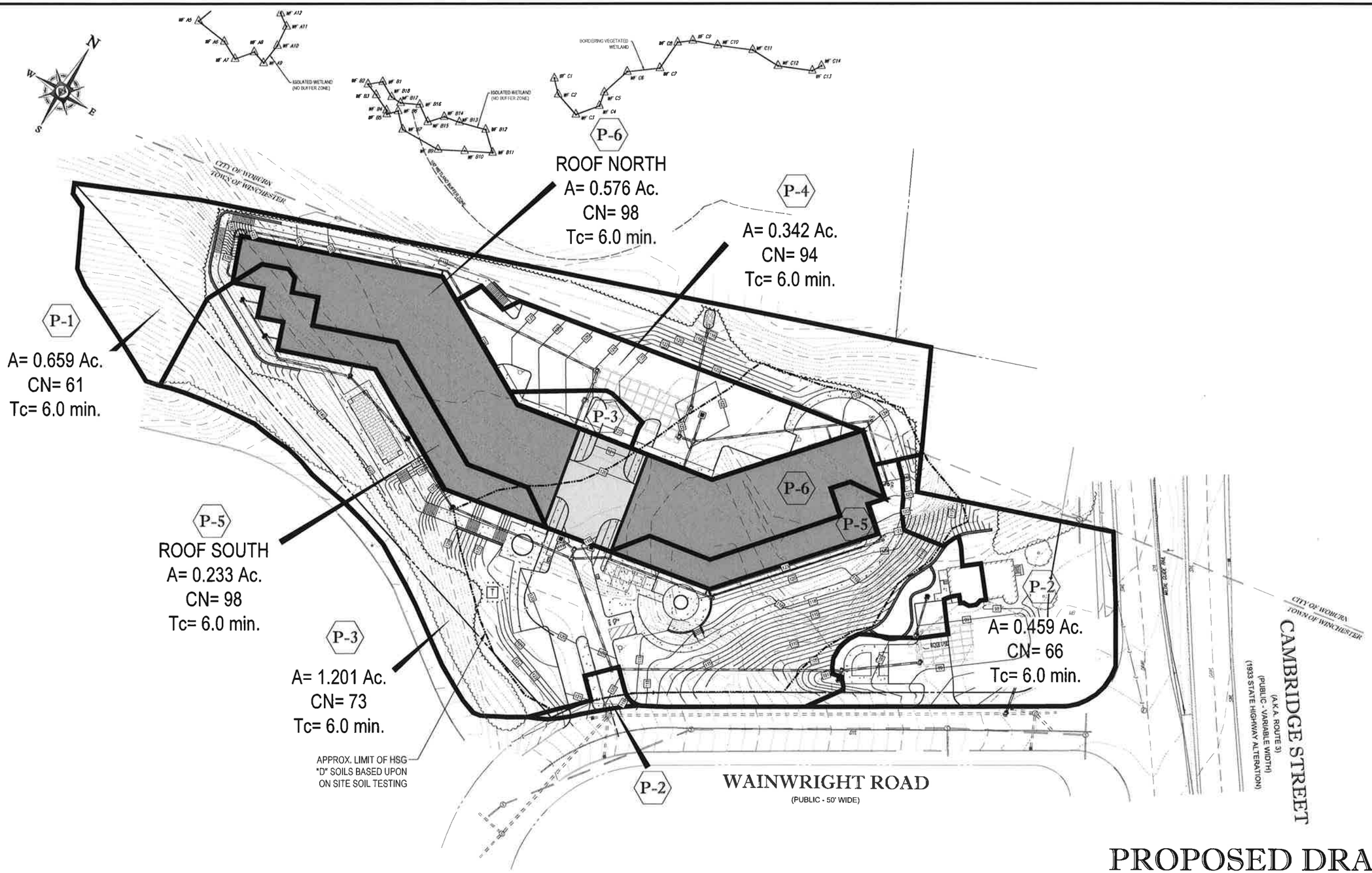


EXISTING DRAINAGE TRIBUTARY MAP

PREPARED BY

BOHLER ENGINEERING

NOT TO SCALE

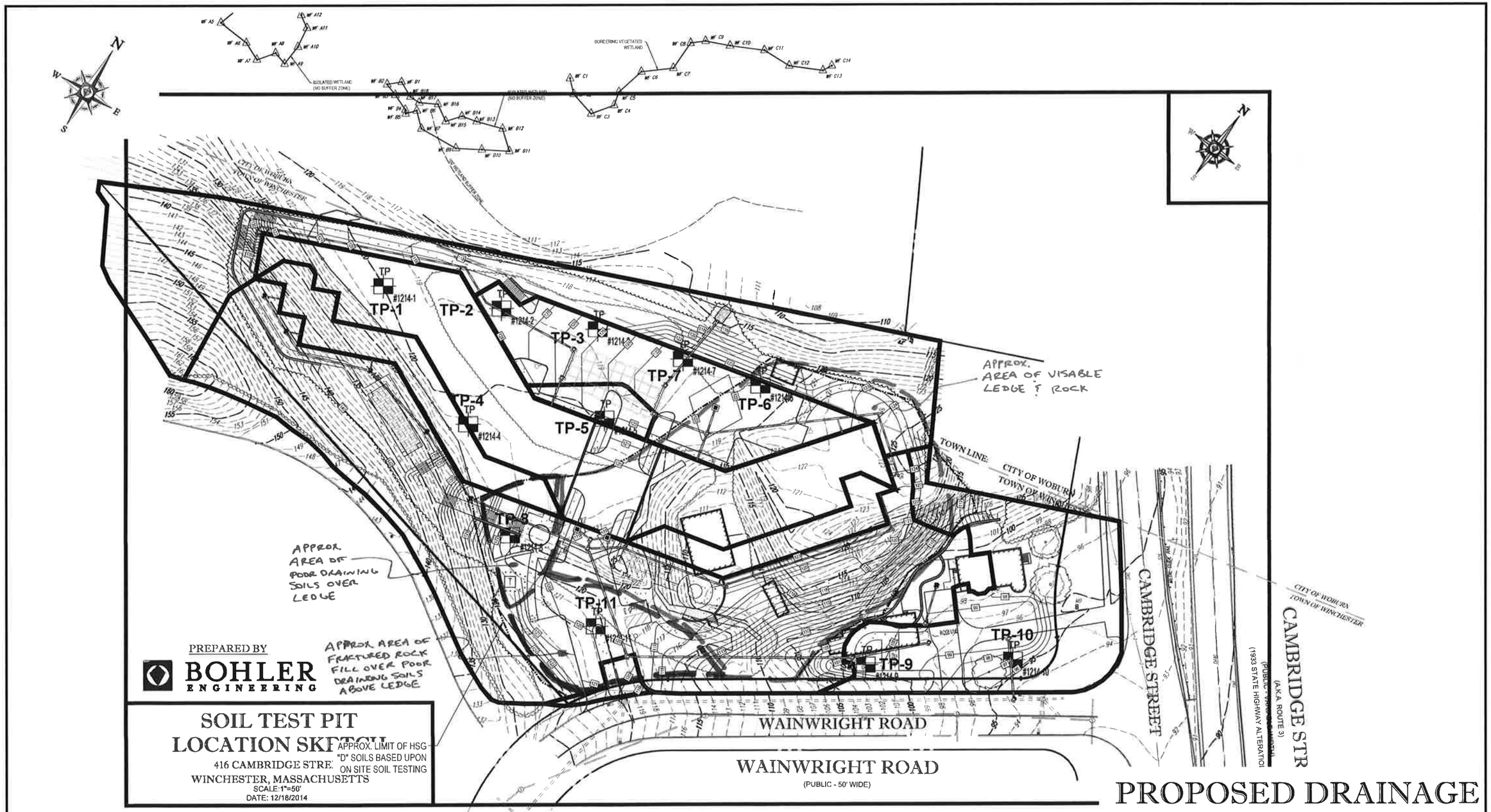


PROPOSED DRAINAGE TRIBUTARY MAP

PREPARED BY

BOHLER ENGINEERING

NOT TO SCALE



PROPOSED DRAINAGE TRIBUTARY MAP WITH TEST PITS

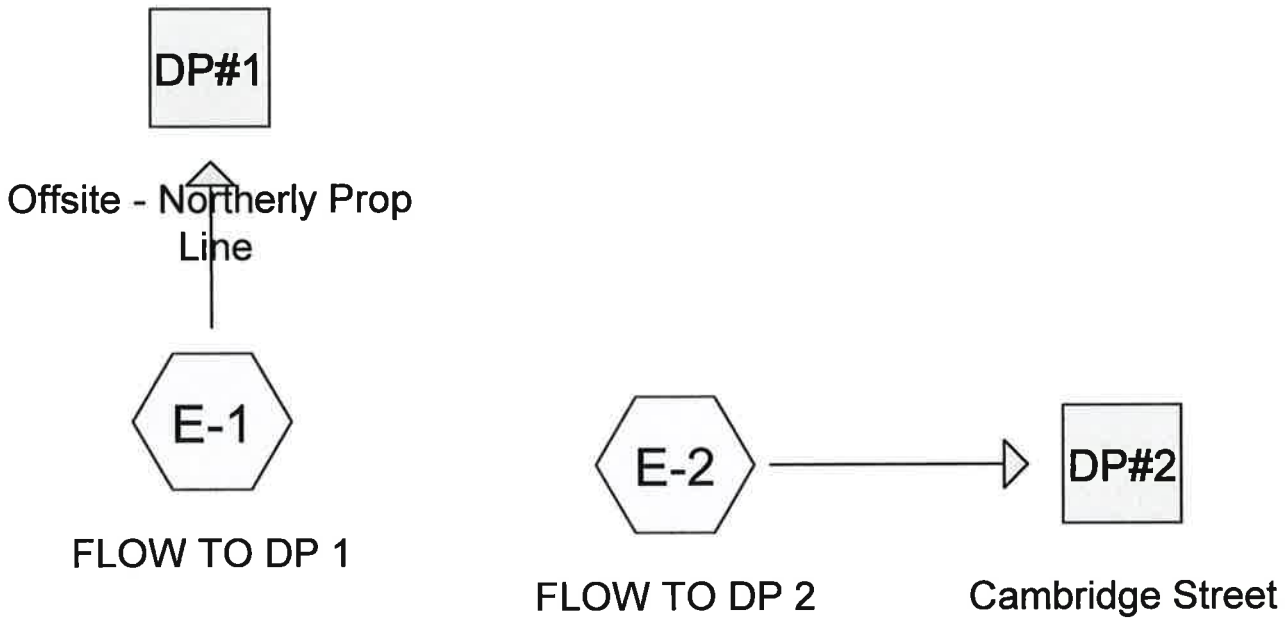
PREPARED BY

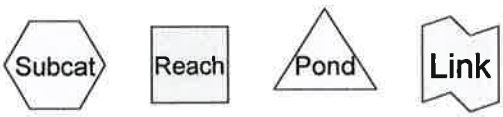
BOHLER ENGINEERING

NOT TO SCALE

APPENDIX D
PRE AND POST DEVELOPMENT HYDROLOGIC CALCULATIONS

PRE - DEVELOPMENT





Routing Diagram for W141161-PRE
Prepared by Bohler Engineering, Printed 7/10/2015
HydroCAD® 10.00 s/n 08311 © 2013 HydroCAD Software Solutions LLC

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: FLOW TO DP 1 Runoff Area=1.880 ac 0.53% Impervious Runoff Depth>0.38"
Flow Length=241' Tc=11.3 min CN=62 Runoff=0.51 cfs 0.060 af

Subcatchment E-2: FLOW TO DP 2 Runoff Area=1.590 ac 11.95% Impervious Runoff Depth>1.04"
Flow Length=455' Tc=13.7 min CN=77 Runoff=1.60 cfs 0.138 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=0.51 cfs 0.060 af
Outflow=0.51 cfs 0.060 af

Reach DP#2: Cambridge Street Inflow=1.60 cfs 0.138 af
Outflow=1.60 cfs 0.138 af

Summary for Subcatchment E-1: FLOW TO DP 1

Runoff = 0.51 cfs @ 12.22 hrs, Volume= 0.060 af, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (ac)	CN	Description
0.010	98	Paved parking, HSG D
0.420	69	50-75% Grass cover, Fair, HSG B
0.060	84	50-75% Grass cover, Fair, HSG D
1.170	55	Woods, Good, HSG B
0.220	77	Woods, Good, HSG D
1.880	62	Weighted Average
1.870		99.47% Pervious Area
0.010		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.8	54	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.6	119	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	18	0.0550	1.64		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	241	Total			

Summary for Subcatchment E-2: FLOW TO DP 2

Runoff = 1.60 cfs @ 12.20 hrs, Volume= 0.138 af, Depth> 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (ac)	CN	Description
0.150	98	Paved parking, HSG B
0.040	98	Paved parking, HSG D
0.390	69	50-75% Grass cover, Fair, HSG B
0.300	84	50-75% Grass cover, Fair, HSG D
0.120	55	Woods, Good, HSG B
0.590	77	Woods, Good, HSG D
1.590	77	Weighted Average
1.400		88.05% Pervious Area
0.190		11.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.4	152	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	152	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	83	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	455	Total			

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.880 ac, 0.53% Impervious, Inflow Depth > 0.38" for 2-year event
Inflow = 0.51 cfs @ 12.22 hrs, Volume= 0.060 af
Outflow = 0.51 cfs @ 12.22 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.590 ac, 11.95% Impervious, Inflow Depth > 1.04" for 2-year event
Inflow = 1.60 cfs @ 12.20 hrs, Volume= 0.138 af
Outflow = 1.60 cfs @ 12.20 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: FLOW TO DP 1 Runoff Area=1.880 ac 0.53% Impervious Runoff Depth>1.03"
Flow Length=241' Tc=11.3 min CN=62 Runoff=1.83 cfs 0.161 af

Subcatchment E-2: FLOW TO DP 2 Runoff Area=1.590 ac 11.95% Impervious Runoff Depth>2.05"
Flow Length=455' Tc=13.7 min CN=77 Runoff=3.19 cfs 0.271 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=1.83 cfs 0.161 af
Outflow=1.83 cfs 0.161 af

Reach DP#2: Cambridge Street Inflow=3.19 cfs 0.271 af
Outflow=3.19 cfs 0.271 af

Summary for Subcatchment E-1: FLOW TO DP 1

Runoff = 1.83 cfs @ 12.18 hrs, Volume= 0.161 af, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (ac)	CN	Description
0.010	98	Paved parking, HSG D
0.420	69	50-75% Grass cover, Fair, HSG B
0.060	84	50-75% Grass cover, Fair, HSG D
1.170	55	Woods, Good, HSG B
0.220	77	Woods, Good, HSG D
1.880	62	Weighted Average
1.870		99.47% Pervious Area
0.010		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.8	54	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.6	119	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	18	0.0550	1.64		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	241	Total			

Summary for Subcatchment E-2: FLOW TO DP 2

Runoff = 3.19 cfs @ 12.20 hrs, Volume= 0.271 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (ac)	CN	Description
0.150	98	Paved parking, HSG B
0.040	98	Paved parking, HSG D
0.390	69	50-75% Grass cover, Fair, HSG B
0.300	84	50-75% Grass cover, Fair, HSG D
0.120	55	Woods, Good, HSG B
0.590	77	Woods, Good, HSG D
1.590	77	Weighted Average
1.400		88.05% Pervious Area
0.190		11.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.4	152	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	152	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	83	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	455	Total			

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.880 ac, 0.53% Impervious, Inflow Depth > 1.03" for 10-year event
Inflow = 1.83 cfs @ 12.18 hrs, Volume= 0.161 af
Outflow = 1.83 cfs @ 12.18 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.590 ac, 11.95% Impervious, Inflow Depth > 2.05" for 10-year event
Inflow = 3.19 cfs @ 12.20 hrs, Volume= 0.271 af
Outflow = 3.19 cfs @ 12.20 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: FLOW TO DP 1 Runoff Area=1.880 ac 0.53% Impervious Runoff Depth>1.48"
Flow Length=241' Tc=11.3 min CN=62 Runoff=2.78 cfs 0.231 af

Subcatchment E-2: FLOW TO DP 2 Runoff Area=1.590 ac 11.95% Impervious Runoff Depth>2.67"
Flow Length=455' Tc=13.7 min CN=77 Runoff=4.17 cfs 0.354 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=2.78 cfs 0.231 af
Outflow=2.78 cfs 0.231 af

Reach DP#2: Cambridge Street Inflow=4.17 cfs 0.354 af
Outflow=4.17 cfs 0.354 af

Summary for Subcatchment E-1: FLOW TO DP 1

Runoff = 2.78 cfs @ 12.17 hrs, Volume= 0.231 af, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

Area (ac)	CN	Description
0.010	98	Paved parking, HSG D
0.420	69	50-75% Grass cover, Fair, HSG B
0.060	84	50-75% Grass cover, Fair, HSG D
1.170	55	Woods, Good, HSG B
0.220	77	Woods, Good, HSG D
1.880	62	Weighted Average
1.870		99.47% Pervious Area
0.010		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.8	54	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.6	119	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	18	0.0550	1.64		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	241	Total			

Summary for Subcatchment E-2: FLOW TO DP 2

Runoff = 4.17 cfs @ 12.19 hrs, Volume= 0.354 af, Depth> 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

Area (ac)	CN	Description
0.150	98	Paved parking, HSG B
0.040	98	Paved parking, HSG D
0.390	69	50-75% Grass cover, Fair, HSG B
0.300	84	50-75% Grass cover, Fair, HSG D
0.120	55	Woods, Good, HSG B
0.590	77	Woods, Good, HSG D
1.590	77	Weighted Average
1.400		88.05% Pervious Area
0.190		11.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.4	152	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	152	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	83	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	455	Total			

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.880 ac, 0.53% Impervious, Inflow Depth > 1.48" for 25-year event
Inflow = 2.78 cfs @ 12.17 hrs, Volume= 0.231 af
Outflow = 2.78 cfs @ 12.17 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.590 ac, 11.95% Impervious, Inflow Depth > 2.67" for 25-year event
Inflow = 4.17 cfs @ 12.19 hrs, Volume= 0.354 af
Outflow = 4.17 cfs @ 12.19 hrs, Volume= 0.354 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: FLOW TO DP 1 Runoff Area=1.880 ac 0.53% Impervious Runoff Depth>2.23"
Flow Length=241' Tc=11.3 min CN=62 Runoff=4.34 cfs 0.350 af

Subcatchment E-2: FLOW TO DP 2 Runoff Area=1.590 ac 11.95% Impervious Runoff Depth>3.66"
Flow Length=455' Tc=13.7 min CN=77 Runoff=5.67 cfs 0.485 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=4.34 cfs 0.350 af
Outflow=4.34 cfs 0.350 af

Reach DP#2: Cambridge Street Inflow=5.67 cfs 0.485 af
Outflow=5.67 cfs 0.485 af

Summary for Subcatchment E-1: FLOW TO DP 1

Runoff = 4.34 cfs @ 12.17 hrs, Volume= 0.350 af, Depth> 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (ac)	CN	Description
0.010	98	Paved parking, HSG D
0.420	69	50-75% Grass cover, Fair, HSG B
0.060	84	50-75% Grass cover, Fair, HSG D
1.170	55	Woods, Good, HSG B
0.220	77	Woods, Good, HSG D
1.880	62	Weighted Average
1.870		99.47% Pervious Area
0.010		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.8	54	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.6	119	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	18	0.0550	1.64		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	241	Total			

Summary for Subcatchment E-2: FLOW TO DP 2

Runoff = 5.67 cfs @ 12.19 hrs, Volume= 0.485 af, Depth> 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (ac)	CN	Description
0.150	98	Paved parking, HSG B
0.040	98	Paved parking, HSG D
0.390	69	50-75% Grass cover, Fair, HSG B
0.300	84	50-75% Grass cover, Fair, HSG D
0.120	55	Woods, Good, HSG B
0.590	77	Woods, Good, HSG D
1.590	77	Weighted Average
1.400		88.05% Pervious Area
0.190		11.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.4	152	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	152	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	83	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	455	Total			

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.880 ac, 0.53% Impervious, Inflow Depth > 2.23" for 100-year event
Inflow = 4.34 cfs @ 12.17 hrs, Volume= 0.350 af
Outflow = 4.34 cfs @ 12.17 hrs, Volume= 0.350 af, Atten= 0%, Lag= 0.0 min

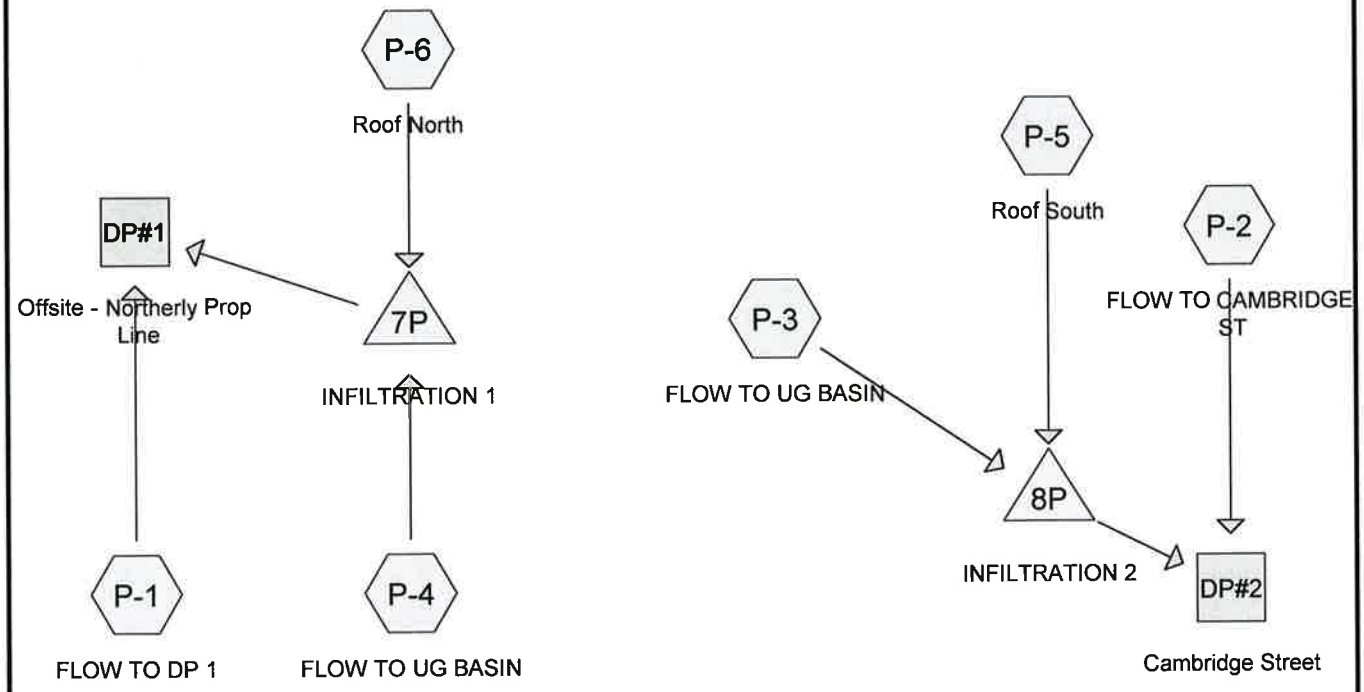
Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

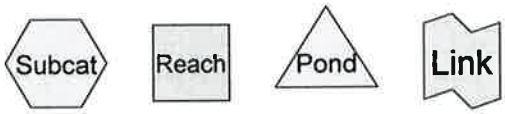
Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.590 ac, 11.95% Impervious, Inflow Depth > 3.66" for 100-year event
Inflow = 5.67 cfs @ 12.19 hrs, Volume= 0.485 af
Outflow = 5.67 cfs @ 12.19 hrs, Volume= 0.485 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

POST-DEVELOPMENT





Routing Diagram for W141161-POST
Prepared by Bohler Engineering, Printed 7/20/2015
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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: FLOW TO DP 1 Runoff Area=0.659 ac 4.55% Impervious Runoff Depth=0.40"
Flow Length=122' Slope=0.2900 '/' Tc=6.0 min CN=61 Runoff=0.18 cfs 0.022 af

Subcatchment P-2: FLOW TO CAMBRIDGE Runoff Area=0.459 ac 14.16% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=66 Runoff=0.25 cfs 0.023 af

Subcatchment P-3: FLOW TO UG BASIN Runoff Area=1.201 ac 20.15% Impervious Runoff Depth=0.92"
Tc=6.0 min CN=73 Runoff=1.18 cfs 0.092 af

Subcatchment P-4: FLOW TO UG BASIN Runoff Area=0.342 ac 90.06% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=94 Runoff=0.92 cfs 0.070 af

Subcatchment P-5: Roof South Runoff Area=0.233 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.68 cfs 0.056 af

Subcatchment P-6: Roof North Runoff Area=0.576 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=1.69 cfs 0.138 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=0.46 cfs 0.099 af
Outflow=0.46 cfs 0.099 af

Reach DP#2: Cambridge Street Inflow=0.79 cfs 0.078 af
Outflow=0.79 cfs 0.078 af

Pond 7P: INFILTRATION 1 Peak Elev=117.31' Storage=3,885 cf Inflow=2.61 cfs 0.207 af
Discarded=0.07 cfs 0.131 af Primary=0.35 cfs 0.077 af Outflow=0.42 cfs 0.208 af

Pond 8P: INFILTRATION 2 Peak Elev=95.83' Storage=1,930 cf Inflow=1.86 cfs 0.148 af
Discarded=0.05 cfs 0.092 af Primary=0.66 cfs 0.056 af Outflow=0.71 cfs 0.148 af

Summary for Subcatchment P-1: FLOW TO DP 1

Runoff = 0.18 cfs @ 12.14 hrs, Volume= 0.022 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (ac)	CN	Description
0.181	61	>75% Grass cover, Good, HSG B
0.058	80	>75% Grass cover, Good, HSG D
0.390	55	Woods, Good, HSG B
0.030	98	Paved parking, HSG B
0.659	61	Weighted Average
0.629		95.45% Pervious Area
0.030		4.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.2900	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.4	72	0.2900	2.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3					**Direct Entry, To make min. allowable**
6.0	122	Total			

Summary for Subcatchment P-2: FLOW TO CAMBRIDGE ST

Runoff = 0.25 cfs @ 12.11 hrs, Volume= 0.023 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (ac)	CN	Description
0.065	98	Paved parking, HSG D
0.376	61	>75% Grass cover, Good, HSG B
0.018	55	Woods, Good, HSG B
0.459	66	Weighted Average
0.394		85.84% Pervious Area
0.065		14.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-3: FLOW TO UG BASIN

Runoff = 1.18 cfs @ 12.10 hrs, Volume= 0.092 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (ac)	CN	Description
0.369	80	>75% Grass cover, Good, HSG D
0.242	98	Paved parking, HSG D
0.226	55	Woods, Good, HSG B
0.364	61	>75% Grass cover, Good, HSG B
1.201	73	Weighted Average
0.959		79.85% Pervious Area
0.242		20.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-4: FLOW TO UG BASIN

Runoff = 0.92 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (ac)	CN	Description
	0.034	61	>75% Grass cover, Good, HSG B
*	0.308	98	Paved parking
	0.342	94	Weighted Average
	0.034		9.94% Pervious Area
	0.308		90.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-5: Roof South

Runoff = 0.68 cfs @ 12.09 hrs, Volume= 0.056 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (ac)	CN	Description
0.233	98	Roofs, HSG B
0.233		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Subcatchment P-6: Roof North

Runoff = 1.69 cfs @ 12.09 hrs, Volume= 0.138 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (ac)	CN	Description
0.576	98	Roofs, HSG B
0.576		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.577 ac, 57.96% Impervious, Inflow Depth = 0.75" for 2-year event
Inflow = 0.46 cfs @ 12.37 hrs, Volume= 0.099 af
Outflow = 0.46 cfs @ 12.37 hrs, Volume= 0.099 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.893 ac, 28.53% Impervious, Inflow Depth = 0.50" for 2-year event
Inflow = 0.79 cfs @ 12.38 hrs, Volume= 0.078 af
Outflow = 0.79 cfs @ 12.38 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: INFILTRATION 1

Inflow Area = 0.918 ac, 96.30% Impervious, Inflow Depth = 2.71" for 2-year event
Inflow = 2.61 cfs @ 12.09 hrs, Volume= 0.207 af
Outflow = 0.42 cfs @ 12.57 hrs, Volume= 0.208 af, Atten= 84%, Lag= 28.8 min
Discarded = 0.07 cfs @ 9.70 hrs, Volume= 0.131 af
Primary = 0.35 cfs @ 12.57 hrs, Volume= 0.077 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 117.31' @ 12.57 hrs Surf.Area= 2,910 sf Storage= 3,885 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 208.3 min (975.8 - 767.5)

Volume	Invert	Avail.Storage	Storage Description
#1	115.25'	4,016 cf	**37.08'W x 78.47'L x 5.25'H Prismatoid** 15,276 cf Overall - 5,235 cf Embedded = 10,041 cf x 40.0% Voids
#2	116.00'	5,235 cf	**ADS_StormTech MC-3500 c +Cap @ 68.27' L** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 68.27'L = 1,046.9 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
		9,251 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	115.75'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.75' / 114.79' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	116.45'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	119.35'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	115.25'	**1.020 in/hr Exfiltration Loamy Sand Rawl's Rate over Surface area**

Discarded OutFlow Max=0.07 cfs @ 9.70 hrs HW=115.30' (Free Discharge)
└─**4=Exfiltration Loamy Sand Rawl's Rate** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.35 cfs @ 12.57 hrs HW=117.31' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.35 cfs of 3.89 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.35 cfs @ 4.00 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8P: INFILTRATION 2

Inflow Area =	1.434 ac,	33.12% Impervious,	Inflow Depth =	1.24"	for 2-year event
Inflow =	1.86 cfs @	12.10 hrs,	Volume=	0.148 af	
Outflow =	0.71 cfs @	12.40 hrs,	Volume=	0.148 af,	Atten= 62%, Lag= 18.2 min
Discarded =	0.05 cfs @	11.45 hrs,	Volume=	0.092 af	
Primary =	0.66 cfs @	12.40 hrs,	Volume=	0.056 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 95.83' @ 12.40 hrs Surf.Area= 2,160 sf Storage= 1,930 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 197.9 min (1,023.8 - 825.9)

Volume	Invert	Avail.Storage	Storage Description
#1	94.40'	2,104 cf	**25.85'W x 83.57'L x 3.50'H Prismatoid** 7,561 cf Overall - 2,302 cf Embedded = 5,259 cf x 40.0% Voids
#2	94.90'	1,878 cf	**ADS_StormTech SC-740 @ 72.77' L** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 72.77'L = 469.5 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	94.90'	424 cf	**ADS_StormTech SC-740 @ 65.65' L** Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 65.65'L = 423.6 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		4,405 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	93.70'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.70' / 90.90' S= 0.0700 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	95.50'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	97.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	94.40'	**1.020 in/hr Exfiltration- Sandy Loam Rawls Rate over Surface area**

Discarded OutFlow Max=0.05 cfs @ 11.45 hrs HW=94.44' (Free Discharge)
└─**4=Exfiltration- Sandy Loam Rawls Rate** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.66 cfs @ 12.40 hrs HW=95.83' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.66 cfs of 4.82 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.66 cfs @ 1.94 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: FLOW TO DP 1 Runoff Area=0.659 ac 4.55% Impervious Runoff Depth=1.08"
Flow Length=122' Slope=0.2900 '/' Tc=6.0 min CN=61 Runoff=0.72 cfs 0.059 af

Subcatchment P-2: FLOW TO CAMBRIDGE Runoff Area=0.459 ac 14.16% Impervious Runoff Depth=1.40"
Tc=6.0 min CN=66 Runoff=0.69 cfs 0.053 af

Subcatchment P-3: FLOW TO UG BASIN Runoff Area=1.201 ac 20.15% Impervious Runoff Depth=1.90"
Tc=6.0 min CN=73 Runoff=2.58 cfs 0.190 af

Subcatchment P-4: FLOW TO UG BASIN Runoff Area=0.342 ac 90.06% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=94 Runoff=1.40 cfs 0.109 af

Subcatchment P-5: Roof South Runoff Area=0.233 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.00 cfs 0.083 af

Subcatchment P-6: Roof North Runoff Area=0.576 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=2.47 cfs 0.205 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=1.13 cfs 0.224 af
Outflow=1.13 cfs 0.224 af

Reach DP#2: Cambridge Street Inflow=2.87 cfs 0.221 af
Outflow=2.87 cfs 0.221 af

Pond 7P: INFILTRATION 1 Peak Elev=118.36' Storage=6,118 cf Inflow=3.87 cfs 0.313 af
Discarded=0.07 cfs 0.149 af Primary=0.56 cfs 0.165 af Outflow=0.62 cfs 0.314 af

Pond 8P: INFILTRATION 2 Peak Elev=96.31' Storage=2,662 cf Inflow=3.58 cfs 0.273 af
Discarded=0.05 cfs 0.105 af Primary=2.33 cfs 0.168 af Outflow=2.38 cfs 0.273 af

Summary for Subcatchment P-1: FLOW TO DP 1

Runoff = 0.72 cfs @ 12.11 hrs, Volume= 0.059 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (ac)	CN	Description
0.181	61	>75% Grass cover, Good, HSG B
0.058	80	>75% Grass cover, Good, HSG D
0.390	55	Woods, Good, HSG B
0.030	98	Paved parking, HSG B
0.659	61	Weighted Average
0.629		95.45% Pervious Area
0.030		4.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.2900	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.4	72	0.2900	2.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3					**Direct Entry, To make min. allowable**
6.0	122	Total			

Summary for Subcatchment P-2: FLOW TO CAMBRIDGE ST

Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.053 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (ac)	CN	Description
0.065	98	Paved parking, HSG D
0.376	61	>75% Grass cover, Good, HSG B
0.018	55	Woods, Good, HSG B
0.459	66	Weighted Average
0.394		85.84% Pervious Area
0.065		14.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-3: FLOW TO UG BASIN

Runoff = 2.58 cfs @ 12.10 hrs, Volume= 0.190 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (ac)	CN	Description
0.369	80	>75% Grass cover, Good, HSG D
0.242	98	Paved parking, HSG D
0.226	55	Woods, Good, HSG B
0.364	61	>75% Grass cover, Good, HSG B
1.201	73	Weighted Average
0.959		79.85% Pervious Area
0.242		20.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-4: FLOW TO UG BASIN

Runoff = 1.40 cfs @ 12.09 hrs, Volume= 0.109 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

	Area (ac)	CN	Description
	0.034	61	>75% Grass cover, Good, HSG B
*	0.308	98	Paved parking
	0.342	94	Weighted Average
	0.034		9.94% Pervious Area
	0.308		90.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-5: Roof South

Runoff = 1.00 cfs @ 12.09 hrs, Volume= 0.083 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (ac)	CN	Description
0.233	98	Roofs, HSG B
0.233		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Subcatchment P-6: Roof North

Runoff = 2.47 cfs @ 12.09 hrs, Volume= 0.205 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.50"

Area (ac)	CN	Description
0.576	98	Roofs, HSG B
0.576		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.577 ac, 57.96% Impervious, Inflow Depth = 1.70" for 10-year event
Inflow = 1.13 cfs @ 12.12 hrs, Volume= 0.224 af
Outflow = 1.13 cfs @ 12.12 hrs, Volume= 0.224 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.893 ac, 28.53% Impervious, Inflow Depth = 1.40" for 10-year event
Inflow = 2.87 cfs @ 12.17 hrs, Volume= 0.221 af
Outflow = 2.87 cfs @ 12.17 hrs, Volume= 0.221 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: INFILTRATION 1

Inflow Area = 0.918 ac, 96.30% Impervious, Inflow Depth = 4.10" for 10-year event
Inflow = 3.87 cfs @ 12.09 hrs, Volume= 0.313 af
Outflow = 0.62 cfs @ 12.56 hrs, Volume= 0.314 af, Atten= 84%, Lag= 28.7 min
Discarded = 0.07 cfs @ 8.50 hrs, Volume= 0.149 af
Primary = 0.56 cfs @ 12.56 hrs, Volume= 0.165 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 118.36' @ 12.56 hrs Surf.Area= 2,910 sf Storage= 6,118 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 193.9 min (953.0 - 759.1)

Volume	Invert	Avail.Storage	Storage Description
#1	115.25'	4,016 cf	**37.08'W x 78.47'L x 5.25'H Prismatoid** 15,276 cf Overall - 5,235 cf Embedded = 10,041 cf x 40.0% Voids
#2	116.00'	5,235 cf	**ADS_StormTech MC-3500 c +Cap @ 68.27' L** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 68.27'L = 1,046.9 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
		9,251 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	115.75'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.75' / 114.79' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	116.45'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	119.35'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	115.25'	**1.020 in/hr Exfiltration Loamy Sand Rawl's Rate over Surface area**

Discarded OutFlow Max=0.07 cfs @ 8.50 hrs HW=115.31' (Free Discharge)
└─**4=Exfiltration Loamy Sand Rawl's Rate** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.56 cfs @ 12.56 hrs HW=118.36' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.56 cfs of 5.50 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.56 cfs @ 6.36 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8P: INFILTRATION 2

Inflow Area =	1.434 ac, 33.12% Impervious, Inflow Depth = 2.28" for 10-year event				
Inflow =	3.58 cfs @	12.09 hrs,	Volume=	0.273 af	
Outflow =	2.38 cfs @	12.20 hrs,	Volume=	0.273 af,	Atten= 34%, Lag= 6.2 min
Discarded =	0.05 cfs @	10.40 hrs,	Volume=	0.105 af	
Primary =	2.33 cfs @	12.20 hrs,	Volume=	0.168 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 96.31' @ 12.20 hrs Surf.Area= 2,160 sf Storage= 2,662 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 129.2 min (945.6 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1	94.40'	2,104 cf	**25.85'W x 83.57'L x 3.50'H Prismatoid** 7,561 cf Overall - 2,302 cf Embedded = 5,259 cf x 40.0% Voids
#2	94.90'	1,878 cf	**ADS_StormTech SC-740 @ 72.77' L** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 72.77'L = 469.5 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	94.90'	424 cf	**ADS_StormTech SC-740 @ 65.65' L** Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 65.65'L = 423.6 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		4,405 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	93.70'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.70' / 90.90' S= 0.0700 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	95.50'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	97.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	94.40'	**1.020 in/hr Exfiltration- Sandy Loam Rawls Rate over Surface area**

Discarded OutFlow Max=0.05 cfs @ 10.40 hrs HW=94.44' (Free Discharge)
└─**4=Exfiltration- Sandy Loam Rawls Rate** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=2.32 cfs @ 12.20 hrs HW=96.31' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.32 cfs of 5.49 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.32 cfs @ 3.33 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: FLOW TO DP 1 Runoff Area=0.659 ac 4.55% Impervious Runoff Depth=1.55"
Flow Length=122' Slope=0.2900 '/' Tc=6.0 min CN=61 Runoff=1.09 cfs 0.085 af

Subcatchment P-2: FLOW TO CAMBRIDGE Runoff Area=0.459 ac 14.16% Impervious Runoff Depth=1.94"
Tc=6.0 min CN=66 Runoff=0.99 cfs 0.074 af

Subcatchment P-3: FLOW TO UG BASIN Runoff Area=1.201 ac 20.15% Impervious Runoff Depth=2.52"
Tc=6.0 min CN=73 Runoff=3.46 cfs 0.252 af

Subcatchment P-4: FLOW TO UG BASIN Runoff Area=0.342 ac 90.06% Impervious Runoff Depth=4.60"
Tc=6.0 min CN=94 Runoff=1.67 cfs 0.131 af

Subcatchment P-5: Roof South Runoff Area=0.233 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=1.18 cfs 0.098 af

Subcatchment P-6: Roof North Runoff Area=0.576 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=2.92 cfs 0.243 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=1.59 cfs 0.303 af
Outflow=1.59 cfs 0.303 af

Reach DP#2: Cambridge Street Inflow=3.84 cfs 0.316 af
Outflow=3.84 cfs 0.316 af

Pond 7P: INFILTRATION 1 Peak Elev=119.06' Storage=7,413 cf Inflow=4.59 cfs 0.374 af
Discarded=0.07 cfs 0.156 af Primary=0.66 cfs 0.218 af Outflow=0.73 cfs 0.374 af

Pond 8P: INFILTRATION 2 Peak Elev=96.66' Storage=3,153 cf Inflow=4.64 cfs 0.350 af
Discarded=0.05 cfs 0.108 af Primary=3.06 cfs 0.242 af Outflow=3.12 cfs 0.350 af

Summary for Subcatchment P-1: FLOW TO DP 1

Runoff = 1.09 cfs @ 12.10 hrs, Volume= 0.085 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

Area (ac)	CN	Description
0.181	61	>75% Grass cover, Good, HSG B
0.058	80	>75% Grass cover, Good, HSG D
0.390	55	Woods, Good, HSG B
0.030	98	Paved parking, HSG B
0.659	61	Weighted Average
0.629		95.45% Pervious Area
0.030		4.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.2900	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.4	72	0.2900	2.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3					**Direct Entry, To make min. allowable**
6.0	122	Total			

Summary for Subcatchment P-2: FLOW TO CAMBRIDGE ST

Runoff = 0.99 cfs @ 12.10 hrs, Volume= 0.074 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

Area (ac)	CN	Description
0.065	98	Paved parking, HSG D
0.376	61	>75% Grass cover, Good, HSG B
0.018	55	Woods, Good, HSG B
0.459	66	Weighted Average
0.394		85.84% Pervious Area
0.065		14.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-3: FLOW TO UG BASIN

Runoff = 3.46 cfs @ 12.09 hrs, Volume= 0.252 af, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

Area (ac)	CN	Description
0.369	80	>75% Grass cover, Good, HSG D
0.242	98	Paved parking, HSG D
0.226	55	Woods, Good, HSG B
0.364	61	>75% Grass cover, Good, HSG B
1.201	73	Weighted Average
0.959		79.85% Pervious Area
0.242		20.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-4: FLOW TO UG BASIN

Runoff = 1.67 cfs @ 12.09 hrs, Volume= 0.131 af, Depth= 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

	Area (ac)	CN	Description
	0.034	61	>75% Grass cover, Good, HSG B
*	0.308	98	Paved parking
	0.342	94	Weighted Average
	0.034		9.94% Pervious Area
	0.308		90.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-5: Roof South

Runoff = 1.18 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

Area (ac)	CN	Description
0.233	98	Roofs, HSG B
0.233		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Subcatchment P-6: Roof North

Runoff = 2.92 cfs @ 12.09 hrs, Volume= 0.243 af, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.30"

Area (ac)	CN	Description
0.576	98	Roofs, HSG B
0.576		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.577 ac, 57.96% Impervious, Inflow Depth = 2.31" for 25-year event
Inflow = 1.59 cfs @ 12.11 hrs, Volume= 0.303 af
Outflow = 1.59 cfs @ 12.11 hrs, Volume= 0.303 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.893 ac, 28.53% Impervious, Inflow Depth = 2.00" for 25-year event
Inflow = 3.84 cfs @ 12.15 hrs, Volume= 0.316 af
Outflow = 3.84 cfs @ 12.15 hrs, Volume= 0.316 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: INFILTRATION 1

Inflow Area = 0.918 ac, 96.30% Impervious, Inflow Depth = 4.89" for 25-year event
Inflow = 4.59 cfs @ 12.09 hrs, Volume= 0.374 af
Outflow = 0.73 cfs @ 12.57 hrs, Volume= 0.374 af, Atten= 84%, Lag= 28.9 min
Discarded = 0.07 cfs @ 7.80 hrs, Volume= 0.156 af
Primary = 0.66 cfs @ 12.57 hrs, Volume= 0.218 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 119.06' @ 12.57 hrs Surf.Area= 2,910 sf Storage= 7,413 cf

Plug-Flow detention time= 190.6 min calculated for 0.374 af (100% of inflow)
Center-of-Mass det. time= 191.1 min (946.9 - 755.8)

Volume	Invert	Avail.Storage	Storage Description
#1	115.25'	4,016 cf	**37.08'W x 78.47'L x 5.25'H Prismatoid** 15,276 cf Overall - 5,235 cf Embedded = 10,041 cf x 40.0% Voids
#2	116.00'	5,235 cf	**ADS_StormTech MC-3500 c +Cap @ 68.27' L** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 68.27'L = 1,046.9 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
		9,251 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	115.75'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.75' / 114.79' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	116.45'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	119.35'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	115.25'	**1.020 in/hr Exfiltration Loamy Sand Rawl's Rate over Surface area**

Discarded OutFlow Max=0.07 cfs @ 7.80 hrs HW=115.30' (Free Discharge)
└─**4=Exfiltration Loamy Sand Rawl's Rate** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.66 cfs @ 12.57 hrs HW=119.06' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.66 cfs of 6.34 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.66 cfs @ 7.53 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8P: INFILTRATION 2

Inflow Area =	1.434 ac,	33.12% Impervious,	Inflow Depth =	2.93"	for 25-year event
Inflow =	4.64 cfs @	12.09 hrs,	Volume=	0.350 af	
Outflow =	3.12 cfs @	12.19 hrs,	Volume=	0.350 af,	Atten= 33%, Lag= 5.9 min
Discarded =	0.05 cfs @	9.75 hrs,	Volume=	0.108 af	
Primary =	3.06 cfs @	12.19 hrs,	Volume=	0.242 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 96.66' @ 12.19 hrs Surf.Area= 2,160 sf Storage= 3,153 cf

Plug-Flow detention time= 105.7 min calculated for 0.350 af (100% of inflow)
Center-of-Mass det. time= 106.3 min (918.1 - 811.8)

Volume	Invert	Avail.Storage	Storage Description
#1	94.40'	2,104 cf	**25.85'W x 83.57'L x 3.50'H Prismatoid** 7,561 cf Overall - 2,302 cf Embedded = 5,259 cf x 40.0% Voids
#2	94.90'	1,878 cf	**ADS_StormTech SC-740 @ 72.77' L** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 72.77'L = 469.5 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	94.90'	424 cf	**ADS_StormTech SC-740 @ 65.65' L** Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 65.65'L = 423.6 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		4,405 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	93.70'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.70' / 90.90' S= 0.0700 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	95.50'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	97.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	94.40'	**1.020 in/hr Exfiltration- Sandy Loam Rawls Rate over Surface area**

Discarded OutFlow Max=0.05 cfs @ 9.75 hrs HW=94.44' (Free Discharge)
└─**4=Exfiltration- Sandy Loam Rawls Rate** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=3.05 cfs @ 12.19 hrs HW=96.66' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.05 cfs of 5.93 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.05 cfs @ 4.37 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: FLOW TO DP 1 Runoff Area=0.659 ac 4.55% Impervious Runoff Depth=2.35"
Flow Length=122' Slope=0.2900 '/' Tc=6.0 min CN=61 Runoff=1.72 cfs 0.129 af

Subcatchment P-2: FLOW TO CAMBRIDGE Runoff Area=0.459 ac 14.16% Impervious Runoff Depth=2.82"
Tc=6.0 min CN=66 Runoff=1.47 cfs 0.108 af

Subcatchment P-3: FLOW TO UG BASIN Runoff Area=1.201 ac 20.15% Impervious Runoff Depth=3.51"
Tc=6.0 min CN=73 Runoff=4.84 cfs 0.351 af

Subcatchment P-4: FLOW TO UG BASIN Runoff Area=0.342 ac 90.06% Impervious Runoff Depth=5.79"
Tc=6.0 min CN=94 Runoff=2.07 cfs 0.165 af

Subcatchment P-5: Roof South Runoff Area=0.233 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=1.45 cfs 0.122 af

Subcatchment P-6: Roof North Runoff Area=0.576 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=3.58 cfs 0.301 af

Reach DP#1: Offsite - Northerly Prop Line Inflow=3.20 cfs 0.430 af
Outflow=3.20 cfs 0.430 af

Reach DP#2: Cambridge Street Inflow=5.19 cfs 0.468 af
Outflow=5.19 cfs 0.468 af

Pond 7P: INFILTRATION 1 Peak Elev=119.60' Storage=8,198 cf Inflow=5.66 cfs 0.466 af
Discarded=0.07 cfs 0.165 af Primary=2.34 cfs 0.301 af Outflow=2.41 cfs 0.466 af

Pond 8P: INFILTRATION 2 Peak Elev=97.30' Storage=3,887 cf Inflow=6.29 cfs 0.473 af
Discarded=0.05 cfs 0.112 af Primary=4.08 cfs 0.361 af Outflow=4.13 cfs 0.473 af

Summary for Subcatchment P-1: FLOW TO DP 1

Runoff = 1.72 cfs @ 12.10 hrs, Volume= 0.129 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (ac)	CN	Description
0.181	61	>75% Grass cover, Good, HSG B
0.058	80	>75% Grass cover, Good, HSG D
0.390	55	Woods, Good, HSG B
0.030	98	Paved parking, HSG B
0.659	61	Weighted Average
0.629		95.45% Pervious Area
0.030		4.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.2900	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.4	72	0.2900	2.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3					**Direct Entry, To make min. allowable**
6.0	122	Total			

Summary for Subcatchment P-2: FLOW TO CAMBRIDGE ST

Runoff = 1.47 cfs @ 12.10 hrs, Volume= 0.108 af, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (ac)	CN	Description
0.065	98	Paved parking, HSG D
0.376	61	>75% Grass cover, Good, HSG B
0.018	55	Woods, Good, HSG B
0.459	66	Weighted Average
0.394		85.84% Pervious Area
0.065		14.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-3: FLOW TO UG BASIN

Runoff = 4.84 cfs @ 12.09 hrs, Volume= 0.351 af, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (ac)	CN	Description
0.369	80	>75% Grass cover, Good, HSG D
0.242	98	Paved parking, HSG D
0.226	55	Woods, Good, HSG B
0.364	61	>75% Grass cover, Good, HSG B
1.201	73	Weighted Average
0.959		79.85% Pervious Area
0.242		20.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-4: FLOW TO UG BASIN

Runoff = 2.07 cfs @ 12.09 hrs, Volume= 0.165 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

	Area (ac)	CN	Description
	0.034	61	>75% Grass cover, Good, HSG B
*	0.308	98	Paved parking
	0.342	94	Weighted Average
	0.034		9.94% Pervious Area
	0.308		90.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-5: Roof South

Runoff = 1.45 cfs @ 12.09 hrs, Volume= 0.122 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (ac)	CN	Description
0.233	98	Roofs, HSG B
0.233		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Subcatchment P-6: Roof North

Runoff = 3.58 cfs @ 12.09 hrs, Volume= 0.301 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (ac)	CN	Description
0.576	98	Roofs, HSG B
0.576		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. allowed**

Summary for Reach DP#1: Offsite - Northerly Prop Line

Inflow Area = 1.577 ac, 57.96% Impervious, Inflow Depth = 3.27" for 100-year event
Inflow = 3.20 cfs @ 12.29 hrs, Volume= 0.430 af
Outflow = 3.20 cfs @ 12.29 hrs, Volume= 0.430 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach DP#2: Cambridge Street

Inflow Area = 1.893 ac, 28.53% Impervious, Inflow Depth = 2.97" for 100-year event
Inflow = 5.19 cfs @ 12.15 hrs, Volume= 0.468 af
Outflow = 5.19 cfs @ 12.15 hrs, Volume= 0.468 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: INFILTRATION 1

Inflow Area = 0.918 ac, 96.30% Impervious, Inflow Depth = 6.09" for 100-year event
Inflow = 5.66 cfs @ 12.09 hrs, Volume= 0.466 af
Outflow = 2.41 cfs @ 12.30 hrs, Volume= 0.466 af, Atten= 57%, Lag= 12.9 min
Discarded = 0.07 cfs @ 6.95 hrs, Volume= 0.165 af
Primary = 2.34 cfs @ 12.30 hrs, Volume= 0.301 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 119.60' @ 12.30 hrs Surf.Area= 2,910 sf Storage= 8,198 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 175.6 min (927.6 - 751.9)

Volume	Invert	Avail.Storage	Storage Description
#1	115.25'	4,016 cf	**37.08'W x 78.47'L x 5.25'H Prismatoid** 15,276 cf Overall - 5,235 cf Embedded = 10,041 cf x 40.0% Voids
#2	116.00'	5,235 cf	**ADS_StormTech MC-3500 c +Cap @ 68.27' L** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 68.27'L = 1,046.9 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
		9,251 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	115.75'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.75' / 114.79' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	116.45'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	119.35'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	115.25'	**1.020 in/hr Exfiltration Loamy Sand Rawl's Rate over Surface area**

Discarded OutFlow Max=0.07 cfs @ 6.95 hrs HW=115.30' (Free Discharge)
└─**4=Exfiltration Loamy Sand Rawl's Rate** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.33 cfs @ 12.30 hrs HW=119.60' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.33 cfs of 6.92 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.73 cfs @ 8.32 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.61 cfs @ 1.63 fps)

Summary for Pond 8P: INFILTRATION 2

Inflow Area =	1.434 ac, 33.12% Impervious, Inflow Depth = 3.96" for 100-year event			
Inflow =	6.29 cfs @	12.09 hrs, Volume=	0.473 af	
Outflow =	4.13 cfs @	12.19 hrs, Volume=	0.473 af, Atten= 34%, Lag= 6.2 min	
Discarded =	0.05 cfs @	9.05 hrs, Volume=	0.112 af	
Primary =	4.08 cfs @	12.19 hrs, Volume=	0.361 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 97.30' @ 12.19 hrs Surf.Area= 2,160 sf Storage= 3,887 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 84.8 min (890.9 - 806.0)

Volume	Invert	Avail.Storage	Storage Description
#1	94.40'	2,104 cf	**25.85'W x 83.57'L x 3.50'H Prismatoid** 7,561 cf Overall - 2,302 cf Embedded = 5,259 cf x 40.0% Voids
#2	94.90'	1,878 cf	**ADS_StormTech SC-740 @ 72.77' L** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 72.77'L = 469.5 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	94.90'	424 cf	**ADS_StormTech SC-740 @ 65.65' L** Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 65.65'L = 423.6 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		4,405 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	93.70'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.70' / 90.90' S= 0.0700 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	95.50'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	97.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	94.40'	**1.020 in/hr Exfiltration- Sandy Loam Rawls Rate over Surface area**

Discarded OutFlow Max=0.05 cfs @ 9.05 hrs HW=94.44' (Free Discharge)
└─**4=Exfiltration- Sandy Loam Rawls Rate** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=4.06 cfs @ 12.19 hrs HW=97.29' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.06 cfs of 6.65 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 4.06 cfs @ 5.82 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

APPENDIX E
WATER QUALITY CALCULATIONS

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Driveways and parking lot

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice	**0.65**	**1.00**	**0.65**	**0.35**
Infiltration Basin	**0.80**	**0.35**	**0.28**	**0.07**
	0.00	**0.07**	**0.00**	**0.07**
	0.00	**0.07**	**0.00**	**0.07**
	0.00	**0.07**	**0.00**	**0.07**

Total TSS Removal = **93%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: W141161
Prepared By: AWP
Date: 7/10/2015

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

W141161
Calculated by AWP
Date: 7/10/15

Water Quality Flow (Drainage to proposed CB-1)

Impervious area draining to hydrodynamic separator= 13,416 sf (0.308 Ac.)

Time of concentration= 5 min. (0.16 hr)

$Q_{0.5} = (qu)(A)(WQV)$ $\quad A = 13{,}416\ SF \times \frac{1\ Ac}{43{,}560\ SF} \times \frac{1\ mi^2}{640\ Ac} = 0.000481\ Ac$

WQV = 1/2" qu = 773

$Q_{0.5} = 773 \times 0.000481 \times 0.5$

$Q_{0.5} = 0.37$ cfs

Water Quality Flow (Drainage to proposed STC-1)

Impervious area draining to hydrodynamic separator= 8,663 sf (0.199 Ac.)

Time of concentration= 5 min. (0.16 hr)

$Q_{0.5} = (qu)(A)(WQV)$ $\quad A = 8{,}663\ SF \times \frac{1\ Ac}{43{,}560\ SF} \times \frac{1\ mi^2}{640\ Ac} = 0.000311\ Ac$

WQV = 1/2" qu = 773

$Q_{0.5} = 773 \times 0.000311 \times 0.5$

$Q_{0.5} = 0.12$ cfs

Groundwater Recharge Required

Existing Impervious Area= 0.20 Ac.

Proposed Impervious Area=1.482 Ac.

Increase in Impervious Area= 1.282 Ac. (55,844 sf)

Impervious area to be infiltrated= 1.359 Ac. (59,198 sf)

1.359/1.482 = 92%, >65%, no infiltration adjustment factor required

Use type B soils to be conservative (ignore D soils, which have a lower recharge rate requirement)

0.35 inch x 55,844 sf / 12 in/ft = 1,629 cf required

3,344 cf provided (see next pages)

Water Quality Volume Calculations

Proposed impervious area to Design Point #1 (off-site wetlands to the north) = 0.914 Ac.

Proposed impervious area to Design Point #2 (Cambridge St / Wainwright Rd) = 0.540 Ac.

WQV at D.P. #1 = 0.914 x 43,560 sf/ac x 0.5 in / 12 in/ft = 1,659 cf

WQV at D.P. #2 = 0.540 x 43,560 sf/ac x 0.5 in / 12 in/ft = 980 cf

See next pages demonstrating that the required WQVs are provided within the infiltration basins

Basin Drawdown Times

Basin #1: Storage below lowest outlet= 1,929 cf

Bottom area= 2,910 sf

Infiltration rate= 1.02 in/hr

Drawdown time= 1,929 / 2,910 x 12 in/ft / 1.02 in/hr = 8 hrs

Basin #2: Storage below lowest outlet= 1,415 cf

Bottom area= 2,160 sf

Infiltration rate= 1.02 in/hr

Drawdown time= 1,415 / 2,160 x 12 in/ft / 1.02 in/hr = 8 hrs

Weighted TSS Removal Rate:

TSS removal rates are for driveway and parking lot impervious areas only and exclude roofs and sidewalks in lawn areas.

$$\frac{(0.308 + 0.242) \times 0.93 + 0.065 \times 0.00}{(0.308+0.242+0.065)} = \mathbf{83.0\%}$$

Stage-Area-Storage for Pond 7P: INFILTRATION 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
115.25	**2,910**	0
115.35	2,910	116
115.45	2,910	233
115.55	2,910	349
115.65	2,910	466
115.75	2,910	582
115.85	2,910	698
115.95	2,910	815
116.05	2,910	991
116.15	2,910	1,227
116.25	2,910	1,462
116.35	2,910	1,696
116.45	2,910	1,929
116.55	2,910	2,162
116.65	2,910	2,393
116.75	2,910	2,623
116.85	2,910	2,852
116.95	2,910	3,080
117.05	2,910	3,307
117.15	2,910	3,532
117.25	2,910	3,756
117.35	2,910	3,978
117.45	2,910	4,199
117.55	2,910	4,418
117.65	2,910	4,635
117.75	2,910	4,850
117.85	2,910	5,063
117.95	2,910	5,274
118.05	2,910	5,483
118.15	2,910	5,689
118.25	2,910	5,892
118.35	2,910	6,092
118.45	2,910	6,290
118.55	2,910	6,484
118.65	2,910	6,674
118.75	2,910	6,861
118.85	2,910	7,043
118.95	2,910	7,221
119.05	2,910	7,394
119.15	2,910	7,560
119.25	2,910	7,719
119.35	2,910	7,869
119.45	2,910	8,007
119.55	2,910	8,135
119.65	2,910	8,259
119.75	2,910	8,378
119.85	2,910	8,495
119.95	2,910	8,611
120.05	2,910	8,727
120.15	2,910	8,844
120.25	2,910	8,960
120.35	2,910	9,076
120.45	2,910	**9,193**

LOWEST OUTLET ELEV.

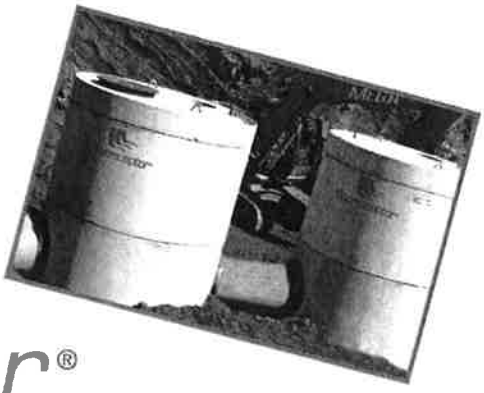
GW Recharge:

1,929
+ 1,415
3,344 cf

Stage-Area-Storage for Pond 8P: INFILTRATION 2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.40	**2,160**	0
94.45	2,160	43
94.50	2,160	86
94.55	2,160	130
94.60	2,160	173
94.65	2,160	216
94.70	2,160	259
94.75	2,160	302
94.80	2,160	346
94.85	2,160	389
94.90	2,160	432
94.95	2,160	515
95.00	2,160	598
95.05	2,160	681
95.10	2,160	763
95.15	2,160	846
95.20	2,160	928
95.25	2,160	1,010
95.30	2,160	1,092
95.35	2,160	1,173
95.40	2,160	1,254
95.45	2,160	1,335
95.50	2,160	1,415
95.55	2,160	1,495
95.60	2,160	1,575
95.65	2,160	1,654
95.70	2,160	1,733
95.75	2,160	1,812
95.80	2,160	1,890
95.85	2,160	1,967
95.90	2,160	2,045
95.95	2,160	2,121
96.00	2,160	2,198
96.05	2,160	2,273
96.10	2,160	2,349
96.15	2,160	2,423
96.20	2,160	2,497
96.25	2,160	2,571
96.30	2,160	2,644
96.35	2,160	2,716
96.40	2,160	2,787
96.45	2,160	2,858
96.50	2,160	2,928
96.55	2,160	2,998
96.60	2,160	3,066
96.65	2,160	3,133
96.70	2,160	3,200
96.75	2,160	3,265
96.80	2,160	3,329
96.85	2,160	3,393
96.90	2,160	3,455
96.95	2,160	3,516
97.00	2,160	3,575
97.05	2,160	3,632
97.10	2,160	3,688
97.15	2,160	3,741
97.20	2,160	3,791
97.25	2,160	3,838
97.30	2,160	3,885
97.35	2,160	3,930
97.40	2,160	3,973
97.45	2,160	4,017
97.50	2,160	4,060
97.55	2,160	4,103
97.60	2,160	4,146
97.65	2,160	4,189
97.70	2,160	4,233
97.75	2,160	4,276
97.80	2,160	4,319
97.85	2,160	4,362
97.90	2,160	**4,405**

LOWEST OUTLET ELEV.



Stormceptor® STC

Stormceptor® is an underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention. With thousands of systems operating worldwide, Stormceptor delivers protection every day in every storm.

With patented technology, optimal treatment occurs by allowing free oil to rise and sediment to settle. The Stormceptor design prohibits scour and release of previously captured pollutants, ensuring superior treatment and protection during even the most extreme storm events.

Stormceptor is very easy to design and provides flexibility under varying site constraints such as tight right-of-ways, zero lot lines and retrofit projects. Design flexibility allows for a cost-effective approach to stormwater treatment. Stormceptor has proven performance backed by the longest record of lab and field verification in the industry.

Tested Performance

- Fine particle capture
- Prevents scour or release
- 95%+ Oil removal

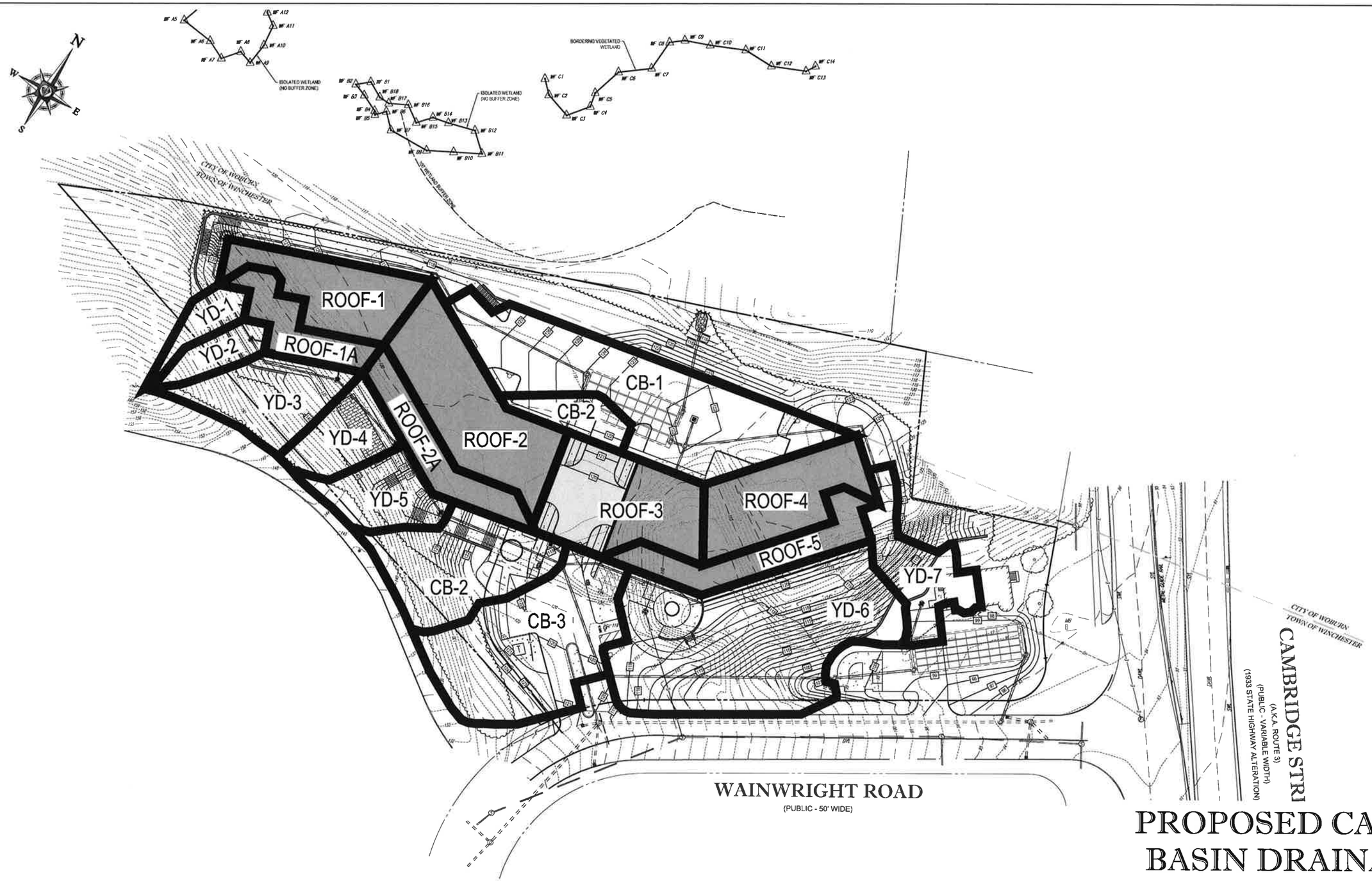
Massachusetts – Water Quality (Q) Flow Rate

Stormceptor STC Model	Inside Diameter (ft)	Typical Depth Below Inlet Pipe Invert [1] (in)	Water Quality Flow Rate Q [2] (cfs)	Peak Conveyance Flow Rate [3] (cfs)	Hydrocarbon Capacity [4] (Gallons)	Maximum Sediment Capacity [4] (ft^3)
STC 450i	4	68	0.40	5.5	86	46
STC 900	6	63	0.89	22	251	89
STC 2400	8	104	1.58	22	840	205
STC 4800	10	140	2.47	22	909	543
STC 7200	12	148	3.56	22	1,059	839
STC 11000	2 x 10	142	4.94	48	2,792	1,086
STC 16000	2 x 12	148	7.12	48	3,055	1,677

[1] Depth Below Pipe Inlet Invert to the Bottom of Base Slab, and Maximum Sediment Capacity can vary to accommodate specific site designs and pollutant loads. Depths can vary to accommodate special designs or site conditions. Contact your local representative for assistance.
[2] Water Quality Flow Rate (Q) is based on 80% annual average TSS removal of the OK110 particle size distribution.
[3] Peak Conveyance Flow Rate is based upon ideal velocity of 3 feet per second and outlet pipe diameters of 18-inch, 36-inch, and 54-inch diameters.
[4] Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.

Rinker MATERIALS™
www.rinkerstormceptor.com
Manufacturing Plant: Westfield, MA
Phone: (413) 562-3647
11-22-13-R13-802 MDEP

APPENDIX F
STORM SEWER CALCULATIONS



PROPOSED CATCH BASIN DRAINAGE TRIBUTARY MAP

PREPARED BY

BOHLER ENGINEERING

NOT TO SCALE

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Sys (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)
1	MHG-MHH	0.0	9.7	4.98	0.00	0.00	0.99	0.00	54.00	1.00	15	5.96	6.46	5.77	95.95	95.41	100.30	96.93
2	MHF-MHG	0.0	9.1	5.09	0.00	0.00	0.85	0.00	156.00	10.00	15	5.07	20.42	4.77	112.10	96.50	120.10	113.00
3	MHE-MHF	0.0	8.8	5.15	0.00	0.00	0.85	0.00	80.00	1.50	15	5.07	7.91	6.08	114.40	113.20	119.15	115.30
4	YD6-MHG	5.0	5.0	6.00	0.37	0.40	0.15	0.00	5.00	2.00	8	0.89	1.71	2.54	96.15	96.05	100.15	97.89
5	RF5-MHE	5.0	5.0	6.00	0.09	0.90	0.08	0.00	250.00	2.10	8	0.49	1.75	3.55	121.00	115.75	123.00	121.33
6	STC1-MHE	0.0	5.2	5.96	0.00	0.00	0.49	0.00	4.00	1.00	12	2.95	3.56	3.75	114.54	114.50	119.10	115.54
7	CB3-STC1	5.0	5.0	6.00	0.24	0.61	0.15	0.00	11.00	1.00	12	0.88	3.56	1.12	114.90	114.79	118.89	115.96
8	CB2-STC1	5.0	5.0	6.00	0.46	0.75	0.35	0.00	11.00	1.00	12	2.07	3.56	2.64	114.90	114.79	118.90	115.88
9	YD5-MHE	5.0	8.1	5.29	0.08	0.56	0.27	0.00	88.00	10.20	12	1.64	11.38	4.20	124.20	115.22	129.20	124.74
10	YD4-YD5	5.0	7.6	5.40	0.07	0.55	0.23	0.00	56.00	13.30	12	1.37	12.99	7.11	133.66	126.21	138.20	134.16
11	YD3-YD4	5.0	6.5	5.63	0.11	0.35	0.12	0.00	58.00	1.00	12	0.70	3.56	2.03	134.24	133.66	138.20	134.60
12	YD2-YD3	5.0	5.6	5.83	0.04	0.35	0.08	0.00	68.00	1.00	8	0.47	1.21	2.35	134.92	134.24	138.20	135.24
13	YD1-YD2	5.0	5.2	5.94	0.03	0.36	0.06	0.00	28.00	1.00	8	0.39	1.21	2.13	135.20	134.92	138.20	135.49
14	RF1A-YD1	5.0	5.0	6.00	0.06	0.90	0.05	0.00	12.00	2.08	8	0.32	1.74	2.00	135.45	135.20	140.00	135.72
15	RF2A-YD3	5.0	5.0	6.00	0.08	0.90	0.07	0.00	12.00	2.00	8	0.43	1.71	3.38	134.48	134.24	140.00	134.79
16	YD7-MHI	5.0	5.0	6.00	0.09	0.41	0.04	0.00	26.00	1.00	8	0.22	1.21	0.63	95.20	94.94	98.50	120.51
17	RF1-MHD	5.0	5.0	6.00	0.11	0.90	0.10	0.00	304.00	0.50	12	0.59	2.52	2.62	123.16	121.64	140.00	123.49
18	RF2-MHC	5.0	5.0	6.00	0.18	0.90	0.16	0.00	20.00	5.00	12	0.97	7.96	3.11	121.00	120.00	124.00	121.42
19	MHB-MHA	0.0	6.4	5.65	0.00	0.00	0.53	0.00	8.00	1.25	12	3.17	3.98	4.03	117.72	117.62	121.90	119.24
20	RF3-MHB	5.0	5.0	6.00	0.16	0.90	0.14	0.00	18.00	1.00	8	0.86	1.21	2.48	118.00	117.82	121.00	119.75
21	CB1-MHB	5.0	5.0	6.00	0.30	0.89	0.27	0.00	16.00	1.00	12	1.60	3.56	2.04	118.00	117.84	121.25	119.72

Project File: W141161.stm | Number of lines: 22 | Date: 07-20-2015

NOTES: Intensity = 45.72 / (Inlet time + 11.30) ^ 0.73 -- Return period = 25 Yrs. ; ** Critical depth ; System flows limited to inlet captured flows.

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Sys (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)
22	RF4-MHB	5.0	5.0	6.00	0.13	0.90	0.12	0.00	168.00	1.00	8	0.70	1.21	3.42	121.00	119.32	124.00	121.39

Project File: W141161.stm | Number of lines: 22 | Date: 07-20-2015

NOTES: Intensity = 45.72 / (Inlet time + 11.30) ^ 0.73 -- Return period = 25 Yrs. ; ** Critical depth ; System flows limited to inlet captured flows.

CATCH BASIN DRAINAGE AREA SUMMARY
Proposed Apartments
Winchester, MA

c coefficient, grass=	0.30
c coefficient, impervious=	0.90

Drainage Area Name	Total Area (sf)	Grassed Area (sf)	"C"	Total Area (Ac.)
CB-1	13,078	198	0.89	0.30
CB-2	20,000	4,995	0.75	0.46
CB-3	10,559	5,095	0.61	0.24
YD-1	1,518	1,356	0.36	0.03
YD-2	1,702	1,550	0.35	0.04
YD-3	4,696	4,321	0.35	0.11
YD-4	3,079	1,777	0.55	0.07
YD-5	3,371	1,886	0.56	0.08
YD-6	16,285	13,621	0.40	0.37
YD-7	3,962	3,248	0.41	0.09
Roof-1	4,812	0	0.90	0.11
Roof-1A	2,792	0	0.90	0.06
Roof-2	7,818	0	0.90	0.18
Roof-2A	3,390	0	0.90	0.08
Roof-3	6,787	0	0.90	0.16
Roof-4	5,545	0	0.90	0.13
Roof-5	3,922	0	0.90	0.09

Empirical Preformed Scour Hole Equations:

Type 1: Scour Hole Depression = one-half pipe rise, m (ft)

$$d_{50} = (0.0276\ R_p^2\ /TW)\ (Q/R_p^{2.5})^{1.333} \qquad (\ d_{50} = (0.0125R_p^2/TW)\ (Q/R_p^{2.5})^{1.333}\ ) \qquad \textbf{(11.35)}$$

Type 2: Scour Hole Depression = full pipe rise, m (ft)

$$d_{50} = (0.0181\ R_p^2\ /TW)\ (Q/R_p^{2.5})^{1.333} \qquad (\ d_{50} = (0.0082R_p^2/TW)\ (Q/R_p^{2.5})^{1.333}) \qquad \textbf{(11.36)}$$

d_{50} = median stone size required, m (ft)

For variables S_p, R_p, TW and Q, see Section 11.13.5.

Type 1 and 2 preformed scour hole dimensions (See Figure 11-15)

$C = 3S_p + 6F$	Basin Length m (ft)	
$B = 2S_p + 6F$	Basin Inlet and Outlet Width m (ft)	**(11.37)**
$F = 0.5R_p$ (Type 1) or R_p (Type 2)	Basin Depression m (ft)	

Table 11-14 solves the above set of equations for Type 1 and 2 preformed scour holes for various pipe sizes.

The type of riprap required is as follows:

Modified	$d_{50} < 0.13$m (0.42 ft)
Intermediate	0.13m (0.42 ft) $< d_{50} <$ 0.20m (0.67 ft)
Standard	0.20m (0.67 ft) $< d_{50} <$ 0.38m (1.25 ft)
Special Design	0.38m (1.25 ft) $< d_{50}$

Reference: Report No. FHWA-RD-75-508 ("Culvert Outlet Protection Design: Computer Program Documentation")

OUTLET PROTECTION
OUTLET VELOCITY > 14 feet/sec or Length of Apron exceeds limits shown on Tables 11-12.1 and 11-13.1

Preformed Scour Hole										
(See Figure 11-15)	PIPE DIAMETER OR SPAN (in)									
	12	15	18	24	30	36	42	48	54	60
Type 1										
B	5	6	8	10	13	15	18	20	23	25
C	6	8	9	12	15	18	21	24	27	30
d	Depends on riprap type(see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = 0.5\ S_p$	0.5	0.625	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Type 2										
B	8	10	12	16	20	24	28	32	36	40
C	9	11	14	18	23	27	32	36	41	45
d	Depends on riprap size (see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = S_p$	1.0	1.3	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Table 11-14.1 - Dimensions of Preformed Scour Hole (Feet)

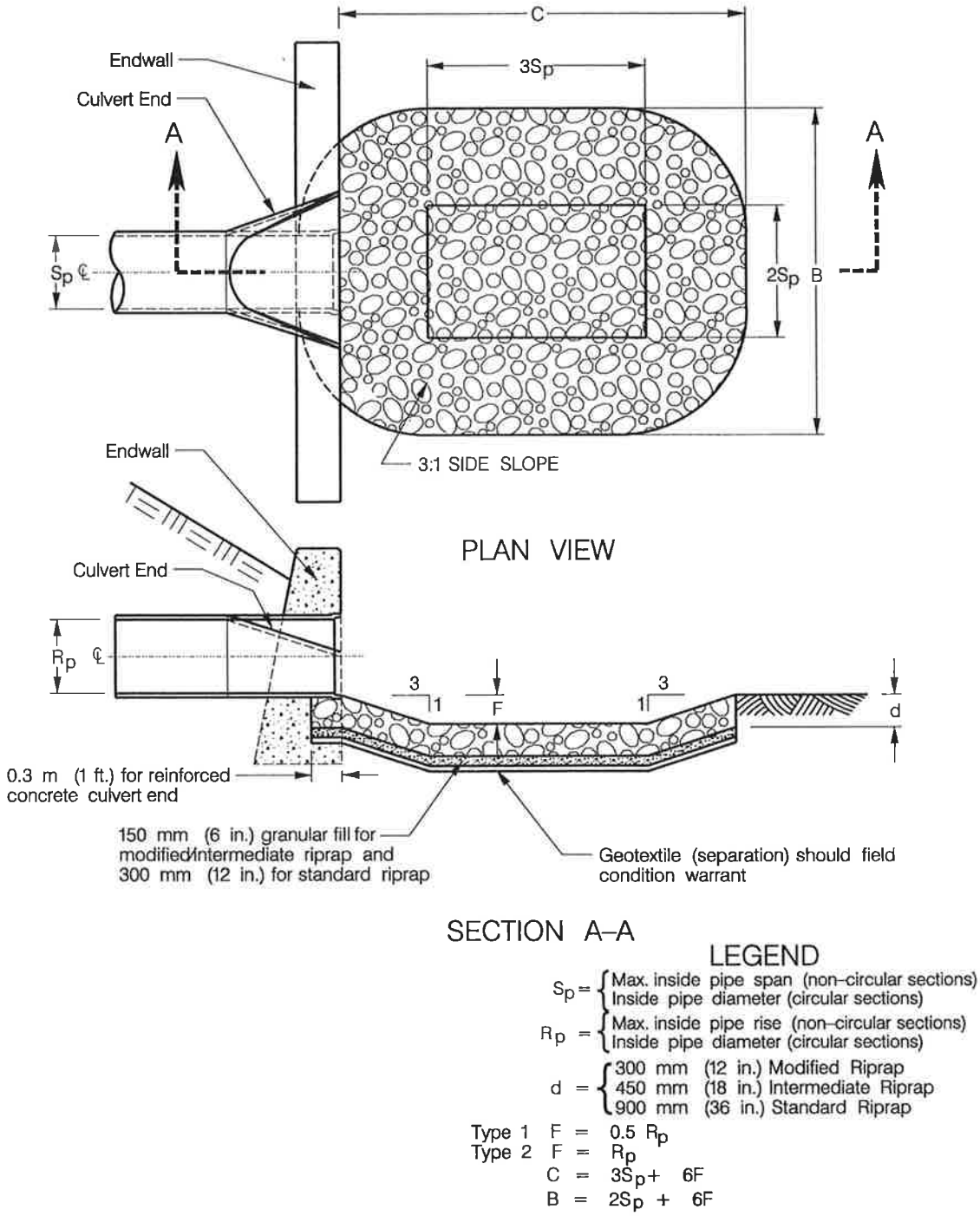


Figure 11-15 Preformed Scour Hole Type 1 and Type 2

Preformed Scour Hole
Riprap Sizing
25 Year Storm
Based on Eq. 11.35 of ConnDOT Drainage Manual
for Type 1 Scour Holes

FES #	Pipe Size (ft)	Q (cfs)	TW (ft)	D_{50} (ft)
FES-1	1	0.79	0.3	**0.03**

* Assume 0.3' (4") tailwater at all FES

APPENDIX G
LONG-TERM POLLUTION PREVENTION PLAN

Long-Term Pollution Prevention Plan

Winchester North

416 Cambridge Street

Winchester, Massachusetts

1. Good Housekeeping Practices

The Owner/Operator shall use good housekeeping practices by following the Operation and Maintenance plans as provided within this report.

2. Provisions for storing materials and waste products inside or under cover

Hazardous materials or wastes are not expected to be stored at the site. Any such materials or wastes will be stored and handled in accordance with all applicable local, state, and federal regulations. In the event of a significant spill of any hazardous material or waste, emergency contact numbers are listed below.

3. Vehicle washing controls

Vehicle washing is not anticipated to occur at this site.

4. Requirements for routine inspections and maintenance of stormwater BMPs

The Owner/Operator shall maintain the BMP's by following the Operation and Maintenance Plan.

5. Spill prevention and response plan

There is very limited risk of significant spills at this site. Any spill requiring action would most likely be associated with motor vehicles. In the event of a large spill contact the following:

Mass DEP 24 hour Spill Emergency Response Notification line: 888-304-1133.

Regulatory Contacts

Contact information for reporting oil and hazardous materials releases to the EPA, DEP, and local agencies are provided below.

Agency	Telephone
Fire Department	911 / (781) 729-1802
Massachusetts Department Of Environmental Protection	888-304-1133
United States Environmental Protection Agency	(617) 918-1279

6. Provisions for maintenance of lawns, gardens, and other landscaped areas

The use of chemical fertilizers shall be minimized or avoided where possible.

7. Requirements for storage and use of fertilizers, herbicides, and pesticides

Fertilizers, herbicides, and pesticides will not be stored outdoors at the site.

8. Provisions for solid waste management

All solid waste management systems shall be inspected and maintained in accordance with all local, state and federal requirements.

APPENDIX H
OPERATION AND MAINTENANCE PLAN

LONG-TERM STORMWATER SYSTEM OPERATION AND MAINTENANCE PLAN

The Stormwater Management Standards

Standard 9: A Long-term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Long-term Operation and Maintenance Plan shall at a minimum identify:

1. Stormwater management system(s) owners;
2. The party or parties responsible for operation and maintenance, including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;
3. The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
4. Plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
5. Description and delineation of public safety features; and
6. Estimated operations and maintenance budget.

The Operation and Maintenance Plan shall identify best management practices for implementing maintenance activities in a manner that minimizes impacts to wetland resource areas.

The Proposal is for a private development.

Stormwater Management System

Owner: FX Winchester, LLC

General Contractor: TBD

The General Contractor shall have all logs and reports as stated within the Stormwater Pollution Prevention Plan readily available at all times for inspection by the Town.

Method of recording for future Owners

☐ Deed
☐ Order of Conditions
☒ Other: _Site Plan Approval_____

DRAINAGE SYSTEM

COMPONENT: Stormwater Quality Unit (Stormceptor)

RESPONSIBILITY:
During Construction: General Contractor - TBD
Post Construction: Owner

ACTION: Inspection / cleaning

FREQUENCY: Per Manufacturer's Maintenance Guidelines or at least once per six months whichever is more restrictive depending on the rate of sediment accumulation.

DESCRIPTION: See attached Manufacturer's Maintenance Guidelines. All accumulated materials shall be disposed of in accordance with DEP regulations.

BUDGET: Inspection/cleaning- $1,000/ yr based on inspections and cleanings of twice a year.

COMPONENT: Infiltration Basins

RESPONSIBILITY:
During Construction: General Contractor - TBD
Post Construction: Owner

ACTION: Preventative Maintenance, Inspection & Mowing

FREQUENCY:
During Construction

1. Cleaning – As needed during construction or whenever the sediment depth is 6" deep.
2. Inspection – As needed during construction but once a month at a minimum.

Post Construction

1. Preventative Maintenance- Two times per year
2. Inspection to ensure proper functioning – After every major storm during the first 3 months of operation and twice a year thereafter.
3. Inspect and clean pretreatment devices- After every major storm during the first 3 months of operation and twice a year thereafter.

DESCRIPTION: The Infiltration basins shall be inspected a minimum of two times per year to ensure that they are operating as intended and that all components are stable and in working order. Inspections shall be by qualified personnel. The inlet to the basins shall be inspected for erosion and sedimentation, and shall be promptly repaired as needed. Sediment collecting in the basin bottom shall be inspected four times annually, and removal shall commence any time the sediment reaches a depth of six inches anywhere in the basin. Any sediments removed shall be disposed of in accordance with the latest DEP guidelines for stormwater sediment disposal.

Inspections:

- Inlet and Outlet condition
- Sediment Accumulation
- Oil/Gas Sheen in water
- General Inspection of basin

BUDGET: Inspection & Cleanings - $2500/ yr based on semi-annual inspections & cleanings

COMPONENT: Deep sump catch basins

RESPONSIBILITY:
During Construction: General Contractor - TBD
Post Construction: Owner

ACTION: Cleaning (Sediment removal / sump cleaning) and Inspection

FREQUENCY:
During Construction

1. Cleaning – As needed during construction or whenever the depth of deposits is greater than or equal to one half the depth from the bottom invert of the lowest pipe.
2. Inspection – Weekly during construction

Post Construction

1. Cleaning – Twice a year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom invert of the lowest pipe in the basin.
2. Inspection – Twice a year

DESCRIPTION: Basins are to be cleaned twice per year. The General Contractor will monitor sumps and remove sediments as necessary. The Lessee will monitor sumps post construction on an as needed basis. Precautions shall take place to maintain the integrity of the oil trapping hoods during cleaning. The hoods shall be inspected and repaired as necessary. Accumulated Hydrocarbon shall be collected separately from accumulated sediment. All material shall be disposed of in accordance with DEP regulations.

Inspections:

- Frame and Grate
- Inlet and Outlet condition
- Cracks and settlement & joint failure & leaking
- Sediment Accumulation
- Oil/Gas Sheen in water
- Condition of hood
- General Inspection of structure

BUDGET: Inspection/cleaning- $2500/ per basin per yr based on inspections and cleanings twice a year.

SAMPLE STORMWATER OPERATION & MAINTAINENCE ACTIVITY FORM

NOTE: The owner is responsible for maintaining an accurate and complete log of inspection & maintenance activities, including but not limited to, inspections, cleanings & repairs.

Inspection / Maintenance Activity	Contractor Name	Date	Observation / Action

APPENDIX I
GROUNDWATER MOUNDING ANALYSIS

AQTESOLV™
Developed and Sold by HydroSOLVE, Inc.
Advanced Software for
Pumping Tests
Slug Tests
Constant-Head Tests
The World's LEADING Aquifer Test Analysis Software Since 1989!

Groundwater Mound Beneath Rectangular Recharge Area

by Glenn M. Duffield, President, HydroSOLVE, Inc.

Share

Hantush (1967) presented the following equations for predicting the maximum height of the water table beneath a rectangular recharge area:

$$h_m^2 - h_i^2 = Z_m(t) = (2w/K)vtS^*(0.5A/(4vt)^{1/2},0.5B/(4vt)^{1/2}) \quad . . . . . (1)$$

$$v = K\bar{b}/\varepsilon \quad . . . . . (2)$$

$$\bar{b} = 0.5[h_i(0) + h(t)] \quad . . . . . (3)$$

where h_m is maximum height of mound above aquifer base (i.e., maximum saturated thickness of aquifer beneath recharge area); h_i is initial height of water table above aquifer base (i.e., initial saturated thickness of aquifer); K and ε are hydraulic conductivity and storativity (specific yield) of aquifer, respectively; w is constant rate of percolation from rectangular recharge area of length A and width B; $\bar{b}$ is a constant of linearization; and the function S* is an integral expression (see Hantush 1967). The aquifer is unconfined and assumed to have infinite extent.

If infiltration ends at time $t=t_0$, Hantush (1967) applied the principle of superposition to compute the decay of the mound as follows:

$$h_m^2 - h_i^2 = Z_m(t) - Z_m(t-t_0) \quad . . . . . (4)$$

Equation (1) is nonlinear owing to the definition of $\bar{b}$ in Equation (3); however, the solution is readily obtained by successive approximation.

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\bar{b}$	h_m*	% Change
1	15	15.2808315045333	1.87221003022213
2	15.140415752266	15.2816427463044	5.30888499634674E-03
3	15.140821373152	15.2816450742958	1.52339078463015E-05

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
.09	.28	15	79	25	.25	72	15.2816450742958

maximum water-table rise (h_m - h_i) at time t = 72 is 0.281645074295755

decay of mound computed after time t = 1

Return to Groundwater Mounding Calculator

Click here for a benchmark for this calculator.

Hantush mounding calculations with contouring now available in AQTESOLV.

AQTESOLV
Celebrating 25 years!
1989 - 2014

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+ Derivative Analysis
+ Leaky Aquifers
+ Skin Effect
+ Recovery Tests
+ Step-Drawdown Tests
- Slug Tests
- Tidal Effects
» Calculators
- Radius of Influence
- Specific Capacity to T (Approx.)
- Specific Capacity to T (Exact)
- Circular Mound
- Rectangular Mound
» Contact

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Follow Follow

GROUNDWATER MOUNDING ANALYSIS PARAMETERS
PROPOSED APARTMENTS
WINCHESTER, MA

Basin #	Basin Btm. Elev. (ft)	GW Elev. (ft)	Depth to GW (ft)	Mounding Analysis Needed?	Basin Length A (ft)	Basin Width B (ft)	Basin Btm. Area (sf)	10 yr storm vol. (cf)	Time to 0 discharge (hr)	w (ft/hr)	Computed Mound (ft)	Distance from Btm. Of BMP to top of mound (ft)
1	115.25	109.33	5.92	NO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	94.4	92.33	2.07	YES	79	25	1,975	11,892	24	0.25	0.282	1.788

Notes
1. 10 yr storm volume from HydroCAD analysis converted from ac-ft to cf
2. Time to 0 discharge is from HydroCAD hydrographs, first time of 0 discharge
3. 72 hour calculation time based on DEP requirement to drain BMP in 72 hours
4. Hydraulic Conductivity = 0.9 ft/hr, converted from Rawls rate of 1.02 inches/hr
5. Specific yield for medium sand = 0.28
6. Initial Saturated Thickness Assumed to be a minimum of 15 feet based on test pit information

Summary for Pond 8P: UG SYSTEM 2

Inflow Area =	1.434 ac,	33.12% Impervious,	Inflow Depth =	2.28"	for 10-year event
Inflow =	3.58 cfs @	12.09 hrs,	Volume=	0.273 af	
Outflow =	2.50 cfs @	12.18 hrs,	Volume=	0.273 af,	Atten= 30%, Lag= 5.5 min
Discarded =	0.04 cfs @	10.20 hrs,	Volume=	0.094 af	
Primary =	2.45 cfs @	12.18 hrs,	Volume=	0.179 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 96.37' @ 12.19 hrs Surf.Area= 1,859 sf Storage= 2,506 cf

Plug-Flow detention time= 120.8 min calculated for 0.272 af (100% of inflow)
Center-of-Mass det. time= 121.5 min (937.8 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	94.40'	1,679 cf	**25.25'W x 73.64'L x 3.50'H Field A** 6,508 cf Overall - 2,311 cf Embedded = 4,197 cf x 40.0% Voids
#2A	94.90'	2,311 cf	**ADS_StormTech SC-740** x 50 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
		3,990 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.70'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.70' / 91.78' S= 0.0400 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	95.50'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	97.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	94.40'	**1.020 in/hr Exfiltration- Sandy Loam Rawls Rate over Surface area**

Discarded OutFlow Max=0.04 cfs @ 10.20 hrs HW=94.44' (Free Discharge)
└─**4=Exfiltration- Sandy Loam Rawls Rate** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=2.44 cfs @ 12.18 hrs HW=96.36' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.44 cfs of 5.56 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.44 cfs @ 3.49 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Hydrograph for Pond 8P: UG SYSTEM 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	
0.00	0.00	0	94.40	0.00	0.00	0.00	
1.00	0.00	0	94.40	0.00	0.00	0.00	
2.00	0.00	0	94.40	0.00	0.00	0.00	
3.00	0.01	0	94.40	0.01	0.01	0.00	
4.00	0.01	0	94.40	0.01	0.01	0.00	
5.00	0.01	0	94.40	0.01	0.01	0.00	
6.00	0.01	0	94.40	0.01	0.01	0.00	
7.00	0.02	0	94.40	0.02	0.02	0.00	
8.00	0.02	0	94.40	0.02	0.02	0.00	
9.00	0.04	0	94.40	0.04	0.04	0.00	
10.00	0.06	13	94.42	0.04	**0.04**	0.00	
11.00	0.14	198	94.67	0.04	**0.04**	0.00	
12.00	**2.10**	**1,742**	**95.81**	**0.66**	0.04	**0.61**	
13.00	**0.38**	**1,646**	**95.75**	**0.44**	0.04	**0.40**	
14.00	0.25	1,550	95.68	0.26	0.04	0.22	
15.00	0.19	1,506	95.65	0.20	0.04	0.16	
16.00	0.13	1,464	95.62	0.15	0.04	0.10	
17.00	0.11	1,432	95.60	0.11	0.04	0.07	
18.00	0.08	1,405	95.58	0.09	0.04	0.05	
19.00	0.07	1,386	95.57	0.08	0.04	0.03	
20.00	0.07	1,374	95.56	0.07	0.04	0.03	
21.00	0.06	1,363	95.55	0.06	0.04	0.02	
22.00	0.06	1,352	95.55	0.06	0.04	0.02	
23.00	0.05	1,340	95.54	0.05	0.04	0.01	
24.00	0.04	1,324	95.53	0.05	0.04	0.01	TIME TO ZERO DISCHARGE
25.00	0.00	1,178	95.43	0.04	0.04	0.00	
26.00	0.00	1,020	95.32	0.04	0.04	0.00	
27.00	0.00	862	95.22	0.04	0.04	0.00	
28.00	0.00	704	95.12	0.04	0.04	0.00	
29.00	0.00	546	95.01	0.04	0.04	0.00	
30.00	0.00	388	94.91	0.04	0.04	0.00	
31.00	0.00	230	94.71	0.04	0.04	0.00	
32.00	0.00	72	94.50	0.04	0.04	0.00	
33.00	0.00	0	94.40	0.00	0.00	0.00	
34.00	0.00	0	94.40	0.00	0.00	0.00	
35.00	0.00	0	94.40	0.00	0.00	0.00	
36.00	0.00	0	94.40	0.00	0.00	0.00	