



October 6, 2025

Jonathan D. Tamkin, Chair
Zoning Board of Appeals
1471 Highland Avenue
Needham, MA 02492

RE: Charles River Heights - Application for Comprehensive Permit

Dear Chair Tamkin and other Board Members:

On behalf of the Planning Office for Urban Affairs (POUA), I am pleased to submit the enclosed Comprehensive Permit Application, along with supporting documentation, for the Charles River Heights project. The Applicant, Charles River Heights LLC, a single purpose entity controlled by POUA and Charles River Center, proposes to develop 86 units of affordable rental housing in Needham. The site is located adjacent to Charles River Center's headquarters and will continue to be owned by Charles River Center, with development occurring under a long-term ground lease.

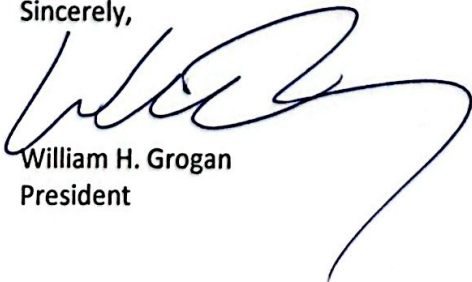
POUA and Charles River Center have worked collaboratively with the Town Planning Board, Select Board, Community Preservation Committee, Design Review Board, and Commission on Disabilities to develop a site plan and building design that responds to the existing terrain, is harmonious with the surrounding neighborhood, and aligns with both the Town's Community Preservation Plan and Climate Action Roadmap.

Town of Needham officials with whom we have communicated have expressed support for the Project. The Project received a Community Preservation Act funding commitment of \$2,840,223, approved by Annual Town Meeting in May 2025, and has secured a state appropriation in the amount of \$5,000,000.

On behalf of POUA, Charles River Center, and the project team, we look forward to working with the Zoning Board of Appeals, other Town officials, and the public throughout the review process for this application.

Thank you in advance for reviewing our application.

Sincerely,



William H. Grogan
President

Cc: Katie King, Town Manager
Heidi Frail, Chair, Select Board
Louise L. Miller, JD, Town Clerk



Comprehensive Permit Application

Filed Pursuant to M.G.L. c.40B, §§ 20-23, and 760 CMR 56.00 et seq:

Charles River Heights 59 East Militia Heights Drive

Submitted By:
Charles River Heights LLC (the “Applicant”)
October 6, 2025

Charles River Heights

59 East Milita Heights Drive

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I. APPLICATION

Enclosed herewith is the Town of Needham Zoning Board of Appeals Application for Hearing, along with other materials filed in support of this Application for Comprehensive Permit. A list of required materials submitted with this application are below in satisfaction of the criteria set forth in Section 1(a)(i)-(viii) of the Comprehensive Permit Rules of the Board of Appeals.

Required Materials

- (i) Report on Existing Site Conditions: A report on and summary of existing site conditions

Please find a narrative description of the existing site conditions in **Section IV**.

- (ii) Preliminary Site Development Plans: A set of preliminary site development plans showing the locations and outlines of proposed buildings; the proposed locations, general dimensions and materials for streets, drives, parking areas, walks and paved areas; open areas within the site; and other improvements. The plans shall also have a north point, names of streets, zoning districts, property lines, dimensions of the subject lot, rights of way and easements and names of abutting property owners. An applicant proposing to construct or rehabilitate four (4) or fewer units may submit a sketch of the foregoing, which need not bear an architect's signature and seal. All projects of five (5) or more units must have site development plans signed and sealed by a registered architect or engineer.

Preliminary site development plans are within **Section V.A**.

- (iii) Preliminary, Scaled Architectural Drawings: A set of preliminary, scaled architectural drawings for each building, which shall be prepared by a registered architect and, for projects of five (5) or more units, sealed by said architect. Said drawings shall include typical floor plans, typical elevations and sections, and shall identify construction type and exterior finishes.

Preliminary, Scaled Architectural Drawings are within **Section V.A**.

- (iv) Tabulation of Proposed Buildings: A tabulation of proposed buildings by type, size (e.g. number of bedrooms, floor area) and ground coverage, and a summary showing the percentage of the site to be occupied by buildings, by parking and other paved vehicular areas, by open areas and by other improvements.

A tabulation of the proposed buildings is within **Section V.B**.

- (v) Preliminary Subdivision Plan: A preliminary subdivision plan, but only where a subdivision of land is involved under G.L. c. 41, § 81K.

This information is not applicable.

- (vi) Utilities Plan: A preliminary utilities plan showing the proposed location and types of sewage, drainage and water facilities, including hydrants.

A utilities plan is within **Section V.A.**

- (vii) (vii) Application for Project Eligibility & Project Eligibility Letter: A copy of the application for project eligibility submitted to the subsidizing agency, as well as the written determination of project eligibility by said subsidizing agency containing all of the findings required by 760 C:MR 56.04(4).

The Project Eligibility Letter application and a copy of the Project Eligibility Letter are included in **Section V.E.**

- (viii) List of Requested Exceptions to Local Requirements & Regulations: A detailed list of requested exceptions to local requirements and regulations, which shall include an analysis of each requirement or regulation for which an exception is sought, the location on the plans for which the exception is sought (if applicable) and an explanation of why the exception is required.

A list of Requested Exceptions to Local Requirements and Regulations are within **Section V.F.**

Additional materials not required but anticipated to be requested by the Board are as follows:

- (i) Environmental Impact Analysis: An "Environmental Impact Analysis" prepared by a qualified environmental scientist, professional wetland scientist (PWS), certified soil scientist, botanist, hydro geologist and/ or other scientific professional with demonstrated qualifications (e.g. education, training, or demonstrated experience) provided to the Board. The Environmental Impact Analysis shall assess the impact of development on the environment within the development and adjacent thereto. Such analysis shall include, but shall not be limited to, an evaluation of pre-development conditions and post-development impacts. Such analysis shall include proposed mitigation of any identified post-development impacts. Mitigation measures requiring continuing or periodic maintenance shall be identified and a proposed maintenance plan shall be included with the Environmental Impact Analysis.

A stormwater management memorandum is within **Section V.H.**

- (ii) Traffic Impact Report: A Traffic Impact Report prepared by a registered professional engineer qualified in the field of traffic engineering, analyzing the proposed project's impact on the congestion, safety and overall convenience of the roadway system providing access to the proposed project. Impacts on both vehicular and pedestrian travel shall be addressed. Road intersections to be studied shall be mutually agreed upon by the Board, its consultants and the applicant.

A Traffic Report is within **Section V.I.**

- (iii) Long-Term Monitoring: A long-term monitoring plan identifying the governmental agency or other entity which shall be responsible for project monitoring for the duration of the

project's affordability. A cost estimate to implement the long-term monitoring plan shall be submitted.

A narrative description of a long-term monitoring plan is contained within **Section V.K.**

- (iv) Tenant/Owner Selection: A plan identifying the governmental agency or other entity that will be responsible for the marketing of the project and the selection of tenants or owners.

A tenant selection narrative is within **Section V.J.**

- (v) Landscape: A preliminary plan of proposed landscaping of the project site. The Board will normally include a condition in a comprehensive permit requiring approval of a definite landscaping plan prior to issuance of a building permit and maintenance of the landscaping by the owner(s) of the project.

A preliminary landscape plan is contained within **Section V.A.**



ZBA Application For Hearing

Applicants must consult with the Building Inspector prior to filing this Application. Failure to do so will delay the scheduling of the hearing.

Applicant Information

Applicant Name	Charles River Heights LLC	Date:	10/6/25
Applicant Address	10 Post Office Square, Suite 1310, Boston, MA 02109		
Phone	617- 350- 8885 ext. 116	email	whg@poua.org
Applicant is ☐ Owner; ☐ Tenant; ☐ Purchaser; ☒ Other Affiliate entity of owner If not the owner, a letter from the owner certifying authorization to apply must be included			
Representative Name	William H. Grogan, President		
Address	10 Post Office Square, Suite 1310, Boston, MA 02109		
Phone	617- 350- 8885 ext. 116	email	whg@poua.org
Representative is ☐ Attorney; ☐ Contractor; ☐ Architect; ☒ Other Authorized person _____			
Contact ☐ Me ☒ Representative in connection with this application.			

Subject Property Information

Property Address	59 East Militia Heights Drive		
Map/Parcel Number	199/309.0-0010	Zone of Property	SRA
Is property within 100 feet of wetlands, 200 feet of stream or in flood Plain? ☒ Yes ☐ No			
Is property ☒ Residential or ☐ Commercial			
If residential renovation, will renovation constitute "new construction"? ☒ Yes ☐ No			
If commercial, does the number of parking spaces meet the By-Law requirement? ☐ Yes ☐ No N/A			
Do the spaces meet design requirements? ☐ Yes ☐ No N/A			
Application Type (select one): ☐ Special Permit ☐ Variance ☒ Comprehensive Permit ☐ Amendment ☐ Appeal Building Inspector Decision			



ZBA Application For Hearing

Existing Conditions:

Site is currently vacant land and was the site of 12 single family homes that have since been demolished.

Statement of Relief Sought:

Relief is sought through a comprehensive permit to enable the construction of an 100% affordable 86 unit apartment community with 61 parking spaces, onsite management offices, and common amenity spaces.

Applicable Section(s) of the Zoning By-Law:

Please see list of requested waivers in Section V.F of the comprehensive permit application dated October 6, 2025.

If application under Zoning Section 1.4 above, list non-conformities:

	Existing Conditions	Proposed Conditions
Use	Vacant	Multifamily
# Dwelling Units		86
Lot Area (square feet)	43,560 sf	152,850 sf
Front Setback (feet)	35 ft	9.7 ft
Rear Setback (feet)	25 ft	83.2 ft
Left Setback (feet)	25 ft	23.5 ft
Right Setback (feet)	25 ft	23.5 ft
Frontage (feet)	43,560 sf	348.3
Lot Coverage (%)	15%	23%
FAR (Floor area divided by the lot area)		0.52
Numbers must match those on the certified plot plan and supporting materials		



ZBA Application For Hearing

Date Structure Constructed including additions:

N/A

Date Lot was created:

August 29, 1957 & June 26, 1959

Submission Materials	Provided
Certified Signed Plot Plan of Existing and Proposed Conditions <i>(Required)</i>	X
Application Fee, check made payable to the Town of Needham Check holders name, address, and phone number to appear on check and in the Memo line state: "ZBA Fee – Address of Subject Property" <i>(Required)</i>	X
If applicant is tenant, letter of authorization from owner <i>(Required)</i>	X
Electronic submission of the complete application with attachments <i>(Required)</i>	X
Elevations of Proposed Conditions <i>(when necessary)</i>	X
Floor Plans of Proposed Conditions <i>(when necessary)</i>	X

Feel free to attach any additional information relative to the application.
Additional information may be requested by the Board at any time during the
application or hearing process.



I hereby request a hearing before the Needham Zoning Board of Appeals. I have
reviewed the Board Rules and instructions.

I certify that I have consulted with the Building Inspector May 19, 2025 as part of all hands
meeting with Town Staff.
date of consult

Date: 10/06/2025 Applicant Signature 

*An application must be submitted to the Town Clerk's Office at
townclerk@needhamma.gov and the ZBA Office at dcollins@needhamma.gov*

II. SUMMARY OF THE APPLICANT, PROJECT PROPOSAL, LOCAL NEED AND PERMIT REQUEST

A. Description of Applicant

Charles River Heights LLC is the Applicant and is a single purpose limited liability company controlled by the Planning Office for Urban Affairs, Inc. and the Charles River Association for Retarded Citizens, Inc. (d/b/a Charles River Center). An organizational chart is attached in **Section V.D.**

Charles River Center

The Charles River Center is dedicated to empowering and supporting individuals with developmental disabilities by providing high-quality, individualized opportunities that promote independence and foster community inclusion.

Founded in 1956 as a preschool, the Charles River Center has grown into one of Massachusetts' leading agencies in the field, recognized for its commitment to excellence and high standards of care. Today, the organization operates with a \$43 million budget, funded through the Department of Developmental Services, MassHealth, the Massachusetts Commission for the Blind, the Massachusetts Rehabilitation Commission, and private pay. With more than 500 full- and part-time staff members, the Center serves over 500 individuals each day and more than 1,000 individuals and families annually. Notably, 89 cents of every dollar is directed toward programs and services. The organization is accredited by the Massachusetts Department of Developmental Services and the Commission for the Accreditation of Rehabilitation Facilities (CARF), and maintains affiliations with The Arc of Massachusetts, the Association of Developmental Disabilities Providers, Advocates for Autism of Massachusetts, and the Autism Coalition of Massachusetts.

Charles River Center's services are comprehensive and tailored to meet the needs of individuals and families at all stages of life. Its Day Services include Day Habilitation programs, serving 96 adults ages 22 and older, and Employment Services, which provide job training, placement, and skill-building for independence to 136 adults.

Through Residential Services, the organization operates 32 homes and 22 apartments across Norfolk, Middlesex, Bristol, and Plymouth counties. These residences provide varying levels of support—ranging from 15 hours per day to 24/7 care—to 138 adults with developmental disabilities.

The Center also offers a wide array of Family and In-Home Support Services, designed to enhance independence and provide relief for families. These services include in-home supports for 22 adults, weekend respite programs, after-school and after-work programs, in-home behavioral services, vacation-week programs for children, and educational seminars for family members. In total, 375 children and adults benefit from these supports each year. Additionally, the Adult Family Care program assists families caring for a loved one with disabilities in their own home, serving 42 adults.

In 2011, Charles River Center launched *Wings for Autism*®, a pioneering program that helps children with autism and their families navigate the challenges of air travel by providing practice experiences at local airports—a model now adopted nationally.

Through this comprehensive array of programs, services, and partnerships, the Charles River Center continues to uphold its mission to create opportunities, foster inclusion, and ensure that individuals with developmental disabilities are supported in leading fulfilling and independent lives.

Planning Office for Urban Affairs, Inc.

The Planning Office for Urban Affairs is a foremost non-profit housing developer in the Northeast whose mission is to serve as a catalyst for social justice through its work in housing development, neighborhood revitalization and affordable housing advocacy. Since its inception in 1969, the Planning Office has developed over 3,100 units of elderly, family, mixed income and special needs housing, channeling nearly \$725 million of investment into developments throughout metropolitan Boston, and POUA currently has over 1,100 additional housing units, across several properties, under active development. The emphasis of the Office, though, is not on numbers, but on having a qualitative impact on the harsh reality of housing deprivation for families, middle-income people, the elderly and disabled persons.

This means producing high quality residential developments; forming strong communities characterized by economic, racial, and ethnic diversity for people of all ages and abilities; providing both affordable rental and homeownership opportunities; and undertaking development efforts that address the needs of a wide-ranging population including the most vulnerable among us, as well as those of moderate means.

The Office has also been a leading advocate for affordable housing and strong communities over the years, providing leadership in the development of high quality affordable and mixed-income housing; the creation of affordable homeownership opportunities; building permanent supportive housing for the homeless and underserved, at-risk populations; the preservation of existing affordable housing; the protection of homeowners and tenants in foreclosure; the creation of additional programs and resources to support affordable housing; and the continued integrity and strength of the State's inclusionary zoning law, Chapter 40B, to help all cities and towns provide housing for our neighbors in need.

Having developed in more than 20 cities and towns across Massachusetts, the properties developed by the Planning Office for Urban Affairs demonstrate the capacity, drive, knowledge and commitment to social justice that enables the Office to succeed in undertaking complex, mixed-income residential developments that create strong, diverse, and healthy communities. We are most grateful to our development and finance partners with whom we share this success, for their tremendous support over the years.

POUA, as the Applicant, will form a single purpose entity controlled by the Applicant which will be subject to the limited dividend requirements, and is qualified to undertake the planning and development of multifamily housing under Chapter 40B in Needham. POUA is led by William Grogan, its President, and the project lead will be Philip Crean, its Project Manager, as well as support from staff. POUA has extensive experience developing multifamily housing throughout Massachusetts. For our proposed Charles River Heights project, POUA has assembled a strong team with extensive experience in multifamily and 40B housing development. Our architect, landscape architect, and civil engineer have recent experience developing in Needham.

B. General Project Overview

The Charles River Heights project (the “Heights” or the “Project”) is a proposed redevelopment of approximately 3.5 acres of land located at 59 East Militia Heights Drive in Needham (the “Property”). The Project is being advanced by Charles River Heights LLC, an affiliate entity of the Charles River Center (“CRC”) and the Planning Office for Urban Affairs (“POUA”), a nonprofit housing developer and affiliate of the Archdiocese of Boston. The goal of this initiative is to create an innovative and inclusive apartment community where adults with intellectual and developmental disabilities can live side by side with households without disabilities, fostering an integrated and supportive neighborhood.

Charles River Heights will provide a total of 86 rental apartments, all restricted to households earning between 30% and 80% of Area Median Income (AMI). Approximately half of these apartments will be reserved through a closed referral system for individuals with autism or intellectual and developmental disabilities, as well as CRC staff. CRC will deliver comprehensive onsite and coordinated support services for these residents, including:

- Remote overnight monitoring and assistance
- Clinical supports addressing health, safety, and medical needs
- Educational and college navigation services
- Employment and career exploration, job training, and placement
- Peer and adult companion supports
- Transportation coordination

The remaining apartments will be available to income-eligible households within the same AMI range but will not be restricted to individuals with disabilities. This integration of adults with disabilities and those without is a central principle of the Project, ensuring compliance with federal and state requirements for inclusive housing and advancing CRC’s mission of community integration. Charles River Heights has been designed to offer residents not only high-quality housing but also a range of amenities that foster well-being, connection, and community life. The development will include community rooms, living rooms, indoor and outdoor bicycle storage, a staffed management office, and on-site laundry facilities.

The primary multistory building will feature two programmed outdoor areas—a central courtyard and a patio—designed to accommodate strolling, gardening, therapeutic activities, resident gatherings, and guest events. Each of the single-story buildings will also include its own patio and dedicated outdoor space for yard games and informal recreation.

The landscape design emphasizes sustainability, accessibility, and compatibility with the surrounding neighborhood. Plantings will prioritize native, naturalized, and drought-tolerant species, with strategic screening provided along street frontages and adjacent residential properties. Existing wooded areas on the Property will be preserved to the greatest extent feasible, offering both a natural backdrop and opportunities for walking paths. These trails will connect with the broader network of pathways and open space in the North Hill area, expanding opportunities for passive recreation and community integration.

The Project will be constructed in accordance with a coordinated set of site plans and design documents (collectively, the “Site Plans”). These include:

- **Civil Plans:** Three sheets entitled “*Charles River Heights, East Militia Heights Drive, Needham*” dated October 6, 2025, prepared by VHB, Inc.
- **Architectural Plans:** Eighteen sheets entitled “*Charles River Heights, East Militia Heights Drive, Needham*” dated October 6, 2025, prepared by The Architectural Team, Inc. (attached as Exhibit V.A.).
- **Landscape Plans:** Four sheets entitled “*Charles River Heights, East Militia Heights Drive, Needham*” dated October 6, 2025, prepared by RBLA Design, LLC.

Together, these documents present the comprehensive vision for the Project’s civil engineering, architectural design, and landscape architecture.

Upon completion, Charles River Heights will represent a model of inclusive housing that combines affordability, accessibility, and integration. By fostering opportunities for shared living, learning, and participation, the Project will provide residents with a supportive yet typical neighborhood environment. The Heights will stand as a demonstration project for communities across Massachusetts and beyond, illustrating how nonprofit partnerships and thoughtful design can respond to urgent housing needs while advancing principles of dignity, independence, and inclusion.

C. Local Need

According to the most recent Subsidized Housing Inventory (“SHI”) published by the Massachusetts Executive Office of Housing and Livable Communities (“EOHLC”), dated June 29, 2023, the Town of Needham has 1,404 units of low- or moderate-income housing, representing 11.9% of the Town’s total housing stock. This percentage exceeds the 10% statutory threshold established under Chapter 40B and 760 CMR 56.03(3)(a).

While Needham meets the statutory threshold, the Town has identified ongoing housing needs through its *Community Preservation Plan*, amended and adopted in March 2023. The Plan highlights the following priorities:

- Expanding affordable rental housing opportunities for households with limited incomes.
- Addressing gaps in affordability and access to homeownership opportunities.
- Creating special needs housing, including handicapped-accessible units and supportive services.

Charles River Heights directly responds to these priorities by introducing 86 new, permanently affordable rental apartments. Units will be offered at varying affordability levels 30%, 60%, and 80% of Area Median Income (AMI) to serve a range of income-qualified households and address gaps in affordability within the Town’s housing market.

The Project will also provide special needs housing for up to 38 households with intellectual and developmental disabilities. These units will be filled through a referral system in partnership with the Massachusetts Department of Developmental Services, ensuring access to supportive services and integration into the broader community.

Beyond addressing local priorities, Charles River Heights will contribute 86 units to Needham's SHI, reinforcing the Town's position above the statutory 10% threshold under Chapter 40B. In doing so, the Project not only sustains compliance but also broadens the depth of affordability by offering subsidies and supportive housing options that are not typically available through the Chapter 40B process. In addition to its housing benefits, the Project has been designed to promote environmental sustainability in alignment with the objectives outlined in the *Needham Climate Action Roadmap*. Specific measures include minimizing impervious surfaces, maximizing building energy efficiency, and increasing density to limit land disturbance. Together, these strategies ensure that Charles River Heights contributes positively to the Town's long-term goals for climate resilience and sustainable growth.

D. Proposed Findings of Fact

The Applicant respectfully requests the Zoning Board of Appeals (the Board or ZBA) to make the following proposed findings of fact in connection with this Application:

1. The Applicant is eligible to receive a Subsidy from a Subsidizing Agency (Federal Low Income Housing Tax Credit Program administered through the EOHLC) after a Comprehensive Permit has been issued and which, unless otherwise governed by a federal act or regulation, complies with the requirements of the Subsidizing Agency (EOHLC) relative to a reasonable return for the Project. The Applicant intends to assign the Comprehensive Permit Decision issued to it to an affiliated single purpose entity in order to facilitate the Applicant's receipt of Project subsidy, including but not limited to, Federal Low Income Housing Tax Credit funding.
2. The Project is fundable by a Subsidizing Agency within the meaning of Section 56.04(1)(b) of the Chapter 40B Regulations since the Subsidizing Agency, EOHLC, issued a written Determination of Project Eligibility under a low to moderate income Housing subsidy program.
3. The EOHLC will be the Subsidizing Agency within the meaning of Section 56.02 of the Chapter 40B Regulations (760 CMR §56.02);
4. The Applicant controls the site sufficient to qualify it as a recipient of a Comprehensive Permit for this Project since a related entity owns the site and has such other interest in the site as is deemed by the Subsidizing Agency to be sufficient to control the site as required under Section 56.04(1)(c) of the Chapter 40B Regulations; and,
5. The Project as proposed in the Application and other supporting documentation is "Consistent With Local Needs" within the meaning of Massachusetts General Laws, Chapter 40B, Section 20, and Section 56.02 of the Chapter 40B Regulations (760 CMR §56.02).

E. Request for Comprehensive Permit

The Applicant, the Property and the Project are more particularly described in the plans, drawings and other exhibits included with this Application, and also submitted under separate cover with this Application, and which may be supplemented by the Applicant during the hearing process, all of which are incorporated herein by reference and constitute the documents required to be submitted by the 40B Regulations (760 CMR § 56.05), as well as the requirements of the Town of Needham Zoning Board of Appeals.

For the reasons presented in this Application, and the additional reasons that the Applicant will present at the scheduled public hearing on the Application, the Applicant respectfully requests that the Zoning Board of Appeals, after complying with the procedures as required by law, including G.L. c.40B, §§20-23, and 760 CMR 56.00 et seq. vote to make the Findings of Fact set forth in Section I.D above, and issue a Comprehensive Permit to the Applicant for the proposed Project.

Respectfully submitted,
Charles River Heights LLC



By: William H. Grogan
Its: Authorized Person, duly authorized.

II. JURISDICTIONAL REQUIREMENTS

A. The Applicant

Charles River Heights LLC, a Massachusetts limited liability company, is the Applicant and an affiliate entity of the Charles River Center and the Planning Office for Urban Affairs. The Charles River Center (“CRC”), established in 1956, empowers individuals with developmental disabilities by providing high-quality, individualized services that promote independence and community inclusion. Today, the organization serves more than 1,000 children, adults, and families each year through day, residential, employment, and family support programs. With a \$43 million operating budget, more than 500 staff, and accreditations from the Massachusetts Department of Developmental Services and CARF, the Center is recognized as a leader in the field. Established in 1969 by the Roman Catholic Archdiocese of Boston, the Planning Office for Urban Affairs, Inc. (“POUA”) is a non-profit social justice ministry that strives to create vibrant communities through the development of high quality affordable and mixed income housing, where people of modest means can live with dignity and respect in homes they can afford. With respect to the Project proposed herein, CRC and POUA agrees to abide by the terms and conditions imposed upon it under M.G.L. c.40B, its Regulations and to conform to the requirements of the subsidy, the Low-Income Housing Tax Credit Program as administered by the EOHLC. In that regard, CRC and POUA, through an affiliated single purpose entity will enter into a Regulatory Agreement with EOHLC, which will be finalized, signed and resubmitted to the Zoning Board of Appeals as part of Final Approval after the issuance of a Comprehensive Permit, but prior to the commencement of construction, as required by Section 56.04(7) of the 40B Regulations.

B. Site Control

The Applicant’s control of the Property within the meaning of 760 CMR 56.04(1)(c) of the 40B Regulations, is evidenced by the EOHLC’s issuance of a written determination of Project Eligibility, and is further evidenced by the fact that Charles River Center, , owns the Site to be sufficient to control the Site as required under Section 56.04(1)(c) of the Chapter 40B Regulations. A copy of the deeds to the Property are attached hereto in **Section V.D.**

C. Project Eligibility

As evidenced by the written determination of Project Eligibility, dated October 2, 2025, issued by the EOHLC pursuant to 760 CMR § 56.04(7), the Project is presumed fundable under the Federal Low Income Housing Tax Credit Program administered through the EOHLC. A copy of the EOHLC Project Eligibility Letter is attached in **Section V.E** herein.

III. SITE/EXISTING CONDITIONS REPORT

A. Site Location, Access and Topography

The Project is located at 59 East Militia Heights Drive, approximately 1.5 miles northwest of Needham Town Center and immediately adjacent to the Charles River Center’s headquarters. The Property comprises roughly 3.5 acres and was formerly improved with 12 single-family homes constructed as housing for active-duty military personnel. Following the acquisition of the Property by the Charles River Center, the homes were removed, leaving only the existing driveway and a small children’s playground. Today, the site remains largely undeveloped and is used on a limited basis for overflow parking associated with CRC operations.

The Property benefits from strong natural features, including mature tree coverage and dense wooded buffers that provide a natural separation from neighboring residential areas. To the west, the site is bordered by North Hill Avenue, and to the east by Sunrise Terrace. Surrounding land uses include single-family residences, the North Hill Retirement Community, and the Charles River Center's main offices. Babson College, located approximately 0.5 miles away, is also accessible via East Militia Heights Drive. The location offers convenient access to a variety of community resources. The site is within walking distance of recreational facilities, religious institutions, and a neighborhood grocery store. Additional retail, restaurants, libraries, and educational amenities are located within 1.5 miles of the Property. Public transportation is also readily available, with the MBTA commuter rail accessible at Needham Center Station (1.3 miles away) and Needham Heights Station (1.5 miles away), both offering direct service to South Station in Boston.

The Property is situated within the Single Residence (40,000 sq. ft.) Zoning District, where multifamily residential use is not a permitted use under Needham Zoning Bylaw. To proceed with the development, the Applicant has requested relief from certain provisions of the Zoning Code, as well as other local requirements, as outlined in Section V.F. With the exception of the specific waivers requested, the Project will comply with all applicable local bylaws and regulations, and it will remain subject to all relevant state and federal laws, regulations, and policies.

B. Utilities.

The Property is currently served by public water, sewer, natural gas, and electrical utilities from Dwight Road. As part of the Project, new water, sewer, and electrical connections will be extended to the site from Dwight Road to ensure reliable service for future residents. The development will not utilize natural gas, consistent with contemporary sustainability and energy efficiency practices.

C. Stormwater Management

A Stormwater Management Memorandum was also commissioned and completed on October 2025, by VHB, Inc., a copy of which is attached in **Section V.H.** The Project will be designed in compliance with the Massachusetts stormwater management standards in accordance with 310 CMR 10.05(6)(k) through (q) and defined in detail in the Mass. DEP Stormwater Management Handbook. The stormwater management system incorporates Best Management Practices to facilitate Total Suspended Solids (TSS) removal and detention of stormwater flows. Stormwater shall be managed in accordance with the Massachusetts Stormwater Management requirements contained within 310 CMR 10.00, as well as the Wetlands Order of Conditions to be issued by the Needham Conservation Commission."

D. Traffic and Parking

A Transportation Impact and Study analysis dated August 11, 2025, was prepared by VHB (the "Traffic Report"), a copy of which is attached in **Section V.J.** As further described in the Traffic Report, the analysis was conducted to determine the potential impacts on the transportation infrastructure associated with the construction of the project. The Traffic Report evaluated the project's access

requirements, potential off-site improvements, and safety considerations. The Traffic Report was performed in accordance with MassDOT's Transportation Impact Assessment Guidelines and the standards of the Traffic Engineering and Transportation Planning professions. The analysis was conducted in two phases; the first stage was an assessment of existing conditions in the study area, and the second stage was to project future traffic demand using a seven-year time horizon. The study found the Project is expected to generate approximately 378 vehicle trips on an average weekday. Of which, 32 total trips during morning rush hour and 39 total trips during evening rush hour.

Based upon the analysis of the Project by VHB, the Traffic Report made the following findings:

- The Project's additional trips generated to and from the Project Site are not expected to generate any traffic operational impacts on the surrounding streets.
- Because of the low number of expected trips generated during the weekday AM and PM peak hours, the local street network can accommodate the added Project-generated trips.
- The Project's loading/service operations will be handled internal to the Project site and will not impact traffic operations or pedestrian flows on Militia Heights Drive or Dwight Road.
- The Charles River Center will provide shuttle bus service to area destinations and nearby public transportation nodes (commuter rail stations).

E. Approach to Site and Building Design

The site plan has been carefully designed to balance residential density, accessibility, and open space. The development will consist of four residential structures, a total of 61 parking spaces, and significant outdoor areas programmed for recreational and therapeutic uses.

Buildings B, C, and D will be single-story residences, each containing six studio apartments reserved for individuals with disabilities. These buildings will also feature a centrally located communal area, complete with a lounge and kitchenette, designed to encourage social interaction and community building. Each will open onto a dedicated patio space to provide residents with direct access to outdoor amenities.

Building A will serve as the anchor of the community. This three-story elevator building will contain 68 housing units alongside shared amenity spaces, including a community room, resident living room, staffed management office, fitness center, and on-site laundry facilities. Of particular note, the first-floor community room will be made available for use by the broader Needham community, reinforcing the Project's role as an inclusive neighborhood resource.

The design approach emphasizes contextual integration with the surrounding neighborhood. The architectural character draws on traditional New England forms while incorporating contemporary detailing. Building exteriors will feature durable, high-quality materials such as cement fiber clapboard and panel siding. Casement-style windows, lap siding, and patio spaces will further highlight the residential nature of the development while maintaining a modern but context-sensitive aesthetic.

Massing is carefully articulated to reduce visual impacts, with a landscaped resident courtyard introduced to break up the scale of the larger building and provide a tranquil, communal outdoor space.

The Project has been designed to minimize its environmental footprint through both siting and construction practices. Buildings have been positioned to preserve existing grades and tree lines, reducing site disturbance. All structures will be built to achieve Passive House certification, incorporating high-performance envelopes, superior insulation, advanced windows, efficient water management systems, and low-VOC materials.

Consistent with the Commonwealth's climate goals and the Town of Needham's Climate Action Roadmap, the Project will operate entirely on electricity, eliminating the use of natural gas. Energy-efficient systems and Energy Star-rated appliances will be installed throughout, and the site will incorporate renewable energy sources. At least 20 percent of parking spaces will be equipped for electric vehicle charging, and additional provisions will include secured bicycle parking and a shuttle bus service to promote alternative modes of transportation.

Vehicular access to the community will be provided at the intersection of East Militia Heights Drive and Dwight Road, via a two-way driveway. A dedicated drop-off loop will serve the front entrance of Building A, with additional parking and loading spaces nearby. A total of 29 parking spaces will be located behind Building A, with one-way circulation around the building to enhance both safety and access control.

Parking for Buildings B and D will be accommodated through two dedicated banks of six spaces each, while an additional eight spaces situated between Buildings A and C will serve residents of both structures. Pedestrian safety will be reinforced throughout the site with the installation of speed tables at key crossing points.

IV. NARRATIVES AND EXHIBITS

A. Preliminary Site Civil, Architectural and Landscape Plans

As required under Section 56.05(2)(a) and (2)(f) of the 40B Regulations, attached are preliminary site development plans showing the locations and outlines of proposed buildings; the lot division; the proposed locations, general dimensions and materials for drives, parking areas, walks and paved areas, and proposed landscaping, prepared by a registered architect or engineer. As required under Section 56.05(2)(c) of the Chapter 40B Regulations, also attached are preliminary, scaled, architectural drawings. The drawings for the Building have been prepared by a registered architect and include typical floor plans, typical elevations, and sections, and identify construction type and exterior finishes as required under the Chapter 40B Regulations.

CHARLES RIVER HEIGHTS

EAST MILITIA HEIGHTS DR NEEDHAM, MA



SUBMISSIONS :

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Key Plan:

Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

PROJECT COVER

Project Number:

23032

Issue Date:

OCTOBER 06, 2025

Sheet Number:

T0.01

LOCUS MAP :



DRAWING LIST	
SHEET NUMBER	SHEET NAME
T0.01	PROJECT COVER
T0.02	DRAWING LIST
T0.03	PROJECT INFORMATION
C.102	LAYOUT & MATERIALS PLAN
C.103	GRADING & DRAINAGE PLAN
C.104	UTILITIES PLAN
L0.00	LANDSCAPE NOTES AND PLANT SCHEDULE
L0.01	TREE REMOVAL AND PROTECTION PLAN
L1.00	CONCEPTUAL LANDSCAPE PLAN
L1.01	LIGHTING AND PHOTOMETRICS PLAN
A0.01	ARCHITECTURAL SITE PLAN
A1.01	OVERALL PLAN - LEVEL 1
A1.02	OVERALL PLAN - LEVEL 2
A1.03	OVERALL PLAN - LEVEL 3
A1.04	OVERALL PLAN - ROOF
A2.01	BUILDING A - ENLARGED PLAN - LEVEL 1
A2.02	BUILDING A - ENLARGED PLAN - LEVEL 2
A2.03	BUILDING A - ENLARGED PLAN - LEVEL 3
A2.04	BUILDING A - ENLARGED PLAN - ROOF
A2.05	BUILDING B, C & D - ENLARGED PLANS - LEVEL 1 & ROOF
A4.01	BUILDING A - EXTERIOR ELEVATIONS
A4.02	BUILDING A - EXTERIOR ELEVATIONS
A4.03	BUILDING B, C & D - EXTERIOR ELEVATIONS
A5.01	BUILDING A - SECTIONS
A5.02	BUILDING B, C & D - SECTIONS
A5.03	RENDERINGS
A5.04	RENDERINGS
A5.05	RENDERINGS



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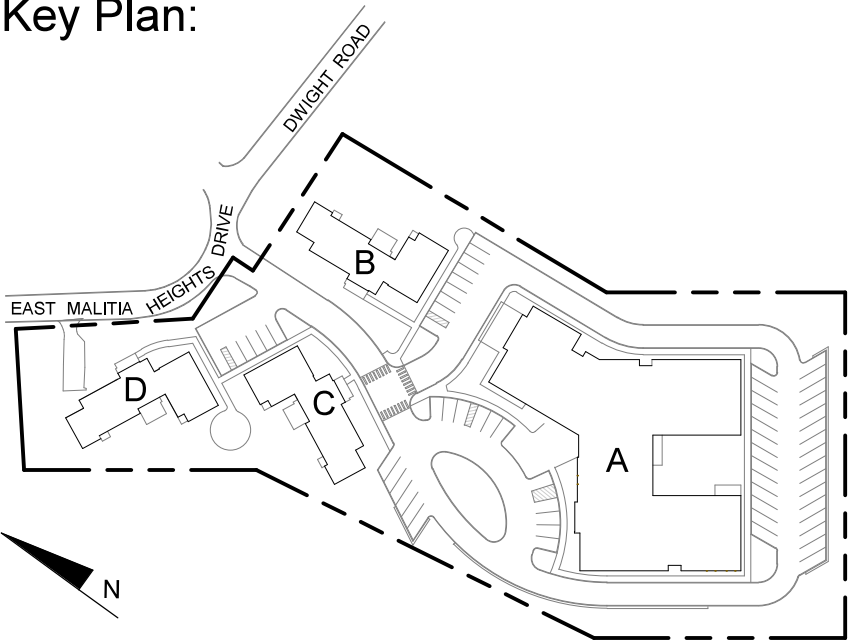


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Scale:

Key Plan:



Project Name:

CHARLES RIVER HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

DRAWING LIST

Project Number:

23032

Issue Date:

OCTOBER 06, 2025

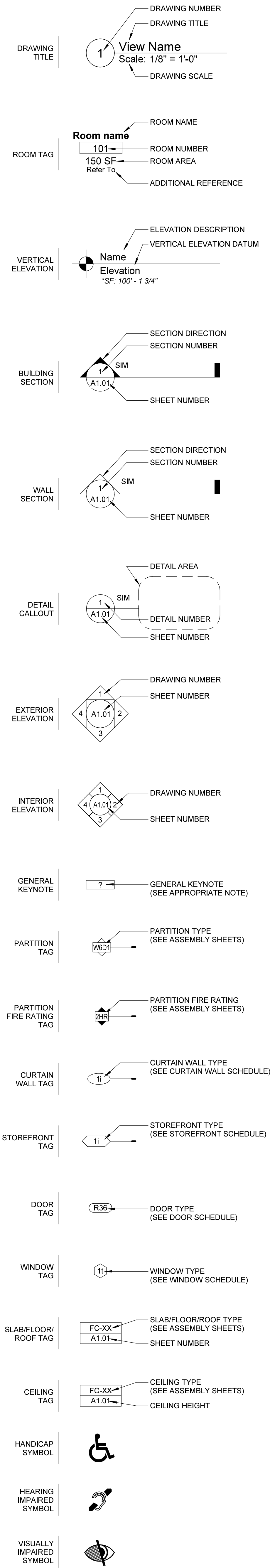
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TYPICAL ABBREVIATIONS :

AFF	ABOVE FINISH FLOOR	MFR	MANUFACTURER
ASL	ACOUSTIC SEALANT	MAT	MATERIAL
ACT	ACOUSTICAL CEILING TILE	MO	MASONRY OPENING
ALUM	ALUMINUM	MAX	MAXIMUM
ALT	ALTERNATE	MECH	MECHANICAL
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE	MED	MEDIUM
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	MTL	METAL
APPROX	APPROXIMATE	MSDG	METAL SIDING
AV	AUDIO VISUAL FIRE ALARM	MIL	MILLIMETER
AUTO	AUTOMATIC DOOR	MIN	MINIMUM
AS	AS SPECIFIED	MISC	MISCELLANEOUS
		MUL	MULLION
BR	BACKER ROD	NEC	NATIONAL ELECTRIC CODE
BD	BOARD	NOM	NOMINAL
BLDG	BUILDING	N	NORTH
BYOT	BY OTHERS	NIC	NOT IN CONTRACT
		NO	NUMBER
CR	CARD READER	OC	ON CENTER
CPT	CARPET	OPNG	OPENING
C	CAULKING	OP	OPERABLE
CLG	CEILING	OPP	OPOSITE
C OR CL	CENTER LINE		
CT	CERAMIC TILE		
CLR	CLEAR	PTD	PAINTED
COL	COLUMN	PH	PHONE
CONC	CONCRETE	PL	PLATE / PROPERTY LINE
CMU	CONCRETE MASONRY UNIT	PLUMB	PLUMBING
CONT	CONTINUOUS	PLYWD	PLYWOOD
CB	CORNER BEAD	RSP	POUNDS PER SQUARE FOOT
CSK	COUNTERSINK	PF	PRE OR FACTORY FINISH
		PT	PRESSURE TREATED
DTL	DETAIL	R	RADIUS OR RISER
DA	DIAMETER	RECP	RECEPTACLE
DIM	DIMENSION	RCP	REFLECTED CEILING PLAN
DW	DISH WASHER	REFR	REFRIGERATOR
DV	DIVIDED (DIVISION)	REQD	REQUIRED
DN	DOWN	RD	ROAD
DS	DOWNSPOUT	RUF	ROLL-UP FIRE DOOR
DSL	DOWNSPOUT LEADER	RO	ROUGH OPENING
DWG	DRAWING		
D	DRYER		
EA	EACH	SCH	SCHEDULE
E	EAST	SL	SEALANT
EOD	EDGE OR DECK	SECT	SECTIONAL
EOS	EDGE OF SLAB	SHT	SHEET
ELEC	ELECTRICAL	SIM	SIMILAR
EL	ELEVATION	SOL	SINGLE SHELF
ELEV	ELEVATOR	SLDS	SOLID SURFACE
ENCL	ENCLOSURE	S	SOUTH
ENT	ENTRANCE	SPEC	SPECIFICATION
EP	EPOXY PAINT (SEE SPECS)	SF	SQUARE FEET
EQ	EQUAL	SS	STAINLESS STEEL
EQUIP	EQUIPMENT	STD	STANDARD
EX	EXISTING	STL	STEEL
ETW	EXPOSED TO THE WEATHER	ST	STREET
EXT	EXTERIOR	STRUCT	STRUCTURAL
FOF	FACE OF FINISH	TEL	TELEPHONE
FOS	FACE OF STUD	TEMP	TEMPERATURE
FRP	FIBERGLASS REINFORCED PLASTIC	TST	THERMOSTAT
FIN	FINISH	T&G	TONGUE AND GROOVE
FAPS	FIRE ALARM PULL SYSTEM	TS	TRANSITION STRIP
FP	FIRE PROTECTION	T	TREAD OR TAPE
FRT	FIRE RETARDANT	TYP	TYPICAL
FLR	FLOOR		
FD	FLOOR DRAIN	UON	UNLESS OTHERWISE NOTED
FLUOR	FLUORESCENT		
FT	FOOT	VB	VAPOR BARRIER
FTG	FOOTING	VENT	VENTILATION
		VERT	VERTICAL
GALV	GALVANIZED	W	WASHER
GA	GAUGE	WD	WASHER DRYER
GL	GLASS	WP	WATERPROOFING
GFRC	GLASS FIBER REINFORCED CONCRETE	WRB	WEATHER RESISTANT BARRIER
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	W	WEST
GYP	GYP SUM	WD	WOOD
GWB	GYP SUM WALL BOARD		
HGT	HEIGHT		
HP	HIGH POINT OR HANDICAP		
HB	HOSE BIB		
HR	HOUR		
IN	INCH		
ID	INSIDE DIAMETER		
IC	INTERCOM		
INT	INTERIOR		
INTP	INTERMEDIATE POINT		
JB	J-BEAD		
JT	JOINT		
LAM	LAMINATED SAFETY GLASS		
LDG	LANDING		
LA	LANDSCAPE		
L	LENGTH		
LGM	LIGHT GAUGE METAL		
LS	LINEN SHELVES		
LP	LOW POINT		
LB	POUND		

TYPICAL ANNOTATIONS :



BUILDING CODE SUMMARY :

ZONING CODE SUMMARY :

BUILDING INFORMATION :

BUILDING A									
LEVEL	RESIDENTIAL	AMENITY	CIRCULATION	MECH./ SERVICES	RESIDENT SERVICES	GSF	STUDIO	1BR	2BR
BLDG A - LEVEL 1	11,287 SF	5,582 SF	3,765 SF	1,221 SF	945 SF	22,800 SF	5	11	2
BLDG A - LEVEL 2	16,657 SF	1,244 SF	3,171 SF	1,364 SF	-	22,436 SF	5	16	4
BLDG A - LEVEL 3	16,657 SF	1,244 SF	3,171 SF	1,364 SF	-	22,436 SF	5	16	4
TOTAL	44,601 SF	8,070 SF	10,107 SF	3,949 SF	945 SF	67,672 SF	15	43	10

BUILDING B					
LEVEL	RESIDENTIAL	AMENITY	CIRCULATION	GSF	STUDIO
BLDG B - LEVEL 1	2,626 SF	978 SF	420 SF	4,024 SF	6
TOTAL	2,626 SF	978 SF	420 SF	4,024 SF	6

BUILDING C					
LEVEL	RESIDENTIAL	AMENITY	CIRCULATION	GSF	STUDIO
BLDG C - LEVEL 1	2,626 SF	978 SF	420 SF	4,024 SF	6
TOTAL	2,626 SF	978 SF	420 SF	4,024 SF	6

BUILDING D					
LEVEL	RESIDENTIAL	AMENITY	CIRCULATION	GSF	STUDIO
BLDG D - LEVEL 1	2,626 SF	978 SF	420 SF	4,024 SF	6
TOTAL	2,626 SF	978 SF	420 SF	4,024 SF	6



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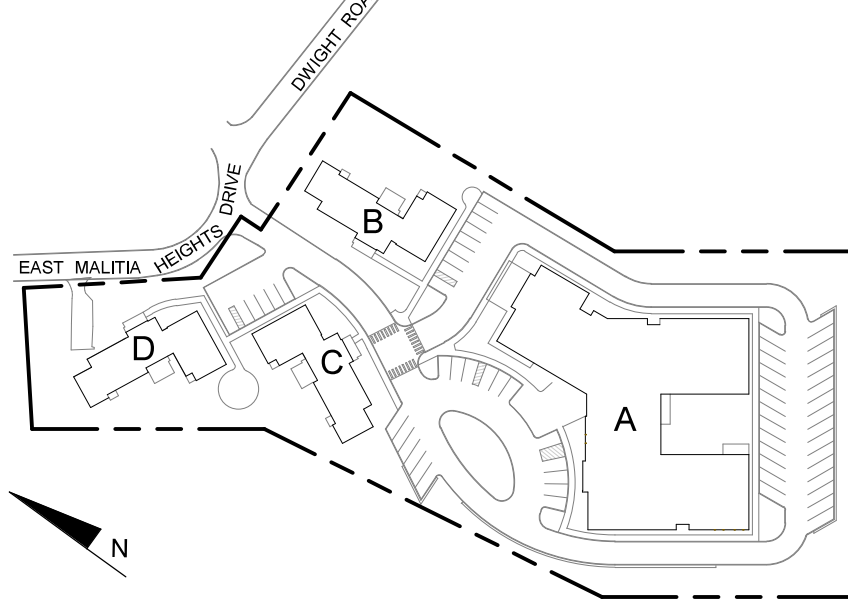


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Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

PROJECT INFORMATION

Project Number:

23032

Issue Date:

OCTOBER 06, 2025

Sheet Number:

T0.03

Zoning Summary Chart

Zoning District(S):	Single Residence A (SRA)**	
Overlay District(S):	None	
Zoning Regulation Requirements	Required*	Provided
MINIMUM LOT AREA	43,560 SF	152,850+ SF
FRONTAGE	150.0 Feet	348.3 Feet
FRONT YARD SETBACK	35.0 Feet	9.7 Feet
SIDE YARD SETBACK	25.0 Feet	23.5 Feet
REAR YARD SETBACK	25.0 Feet	83.2 Feet
MINIMUM LOT WIDTH	120 Feet	> 120 Feet
MAXIMUM BUILDING HEIGHT	35 Feet	-
MAXIMUM BUILDING COVERAGE	15.0 %	23.0 %
INTERIOR PARKING LANDSCAPING PERCENTAGE	10.0 %	> 10 %

* Zoning regulation requirements as specified in the Zoning Bylaw of the Town of Needham, dated June, 2004.
** Dimensional requirements listed are for institutional uses in the SRA district per Table 4.2.4 in the zoning bylaw.

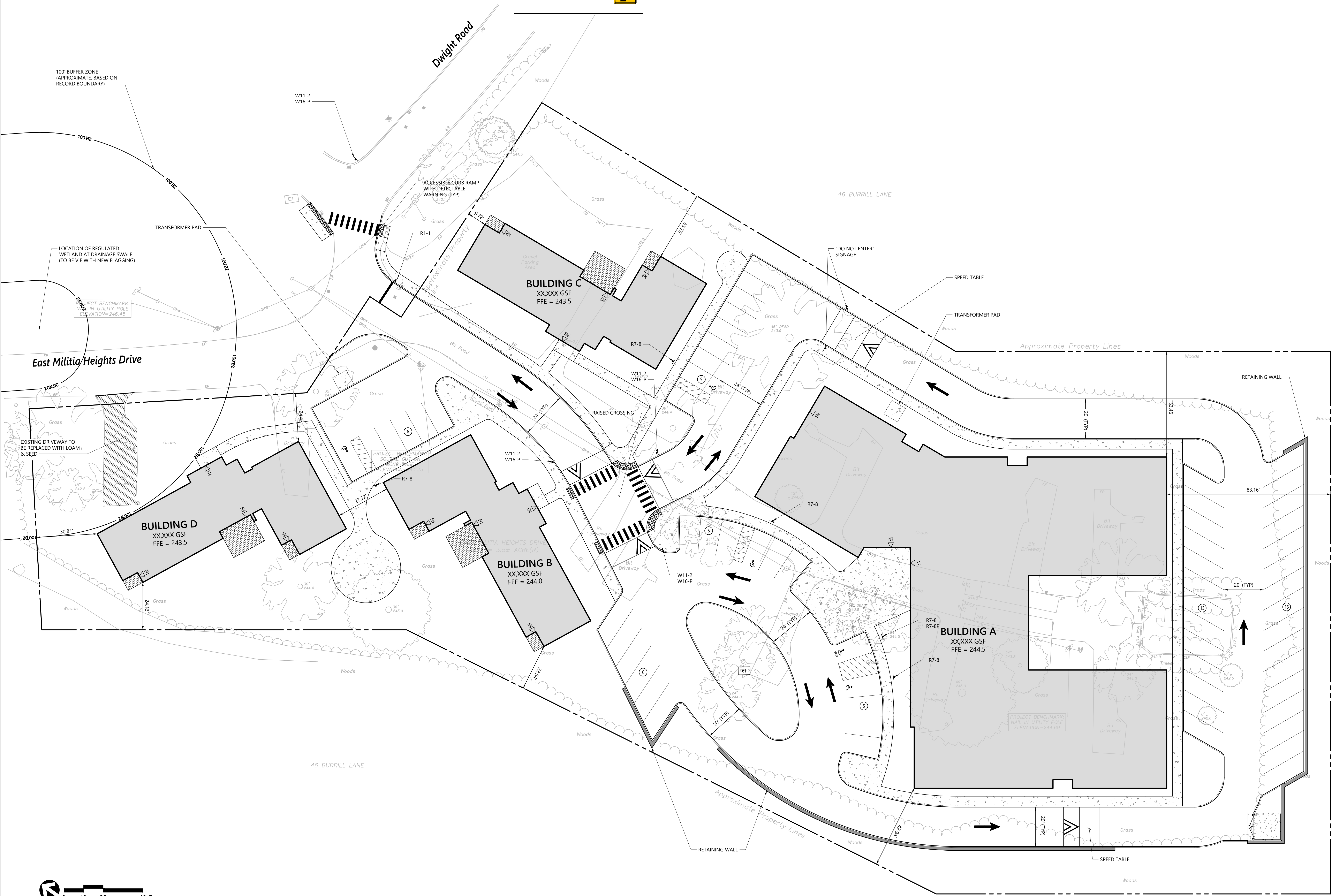
Parking Summary Chart

Description	Size		Spaces	
	Required	Provided	Required	Provided
STANDARD SPACES	9 x 18.5	9 x 18.5	125	57
PARALLEL SPACES	7x22	7x22	-	0
STANDARD ACCESSIBLE SPACES *	9 x 18.5	9 x 18.5	3	3
VAN ACCESSIBLE SPACES	9 x 18.5	9 x 18.5	1	1
TOTAL SPACES			129	61
LOADING BAYS			0	0

* ADA/STATE/LOCAL REQUIREMENTS
** 86 UNITS x 1.5 SPACES PER UNIT = 129 TOTAL SPACES PER NEEDHAM ZONING BYLAW SECTION 5.1.4
*** PER SECTION 5.1.4 IF A MULTIFAMILY STRUCTURE IS RESERVED FOR SPECIAL OCCUPANCIES, THE BOARD OF APPEALS MAY AUTHORIZE A SMALLER NUMBER OF SPACES BY SPECIAL PERMIT

Sign Summary

M.U.T.C.D. Number	Specification Width	Specification Height	Desc.
R1-1	30"	30"	STOP
R5-1	30"	30"	DO NOT ENTER
R7-8	12"	18"	RESERVED PARKING
R7-8P	12"	6"	TRUCK
W11-2	30"	30"	WALK
W16-7P	24"	12"	RIGHT TURN



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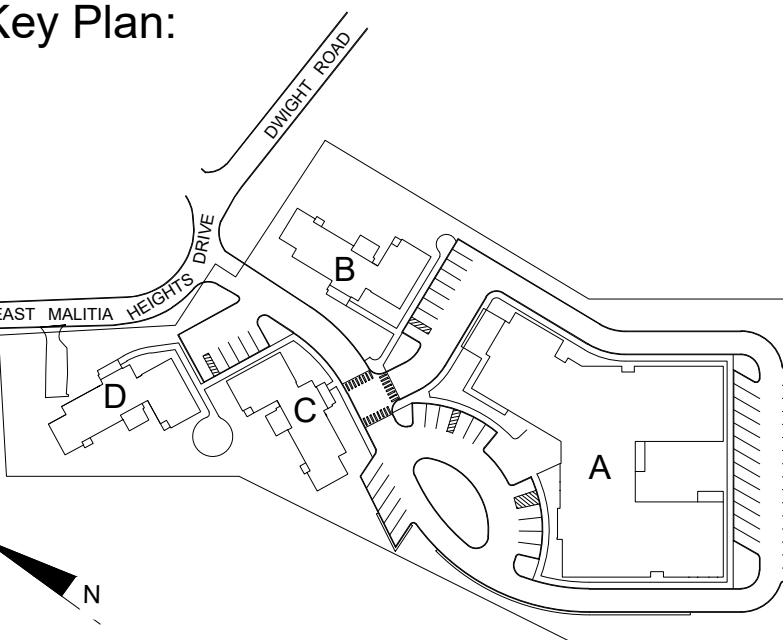
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Engineer of Record:
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CIVIL
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REGISTERED PROFESSIONAL ENGINEER
SCA

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Checked: JVC
Scale: 1"=20'
Key Plan:



Project Name:
CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:
LAYOUT &
MATERIALS PLAN

Project Number:
16594

Issue Date:
OCTOBER 06, 2025

Sheet Number:
C.102



Consultant:



Revision:

Engineer of Record:

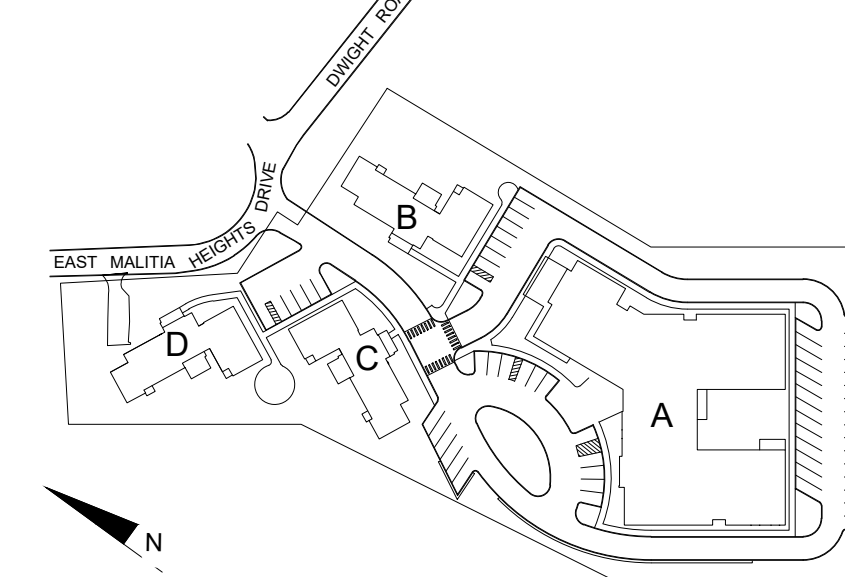


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Checked: JVC

Scale: 1"=20'

Key Plan:



Project Name:

CHARLES RIVER HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

GRADING & DRAINAGE PLAN

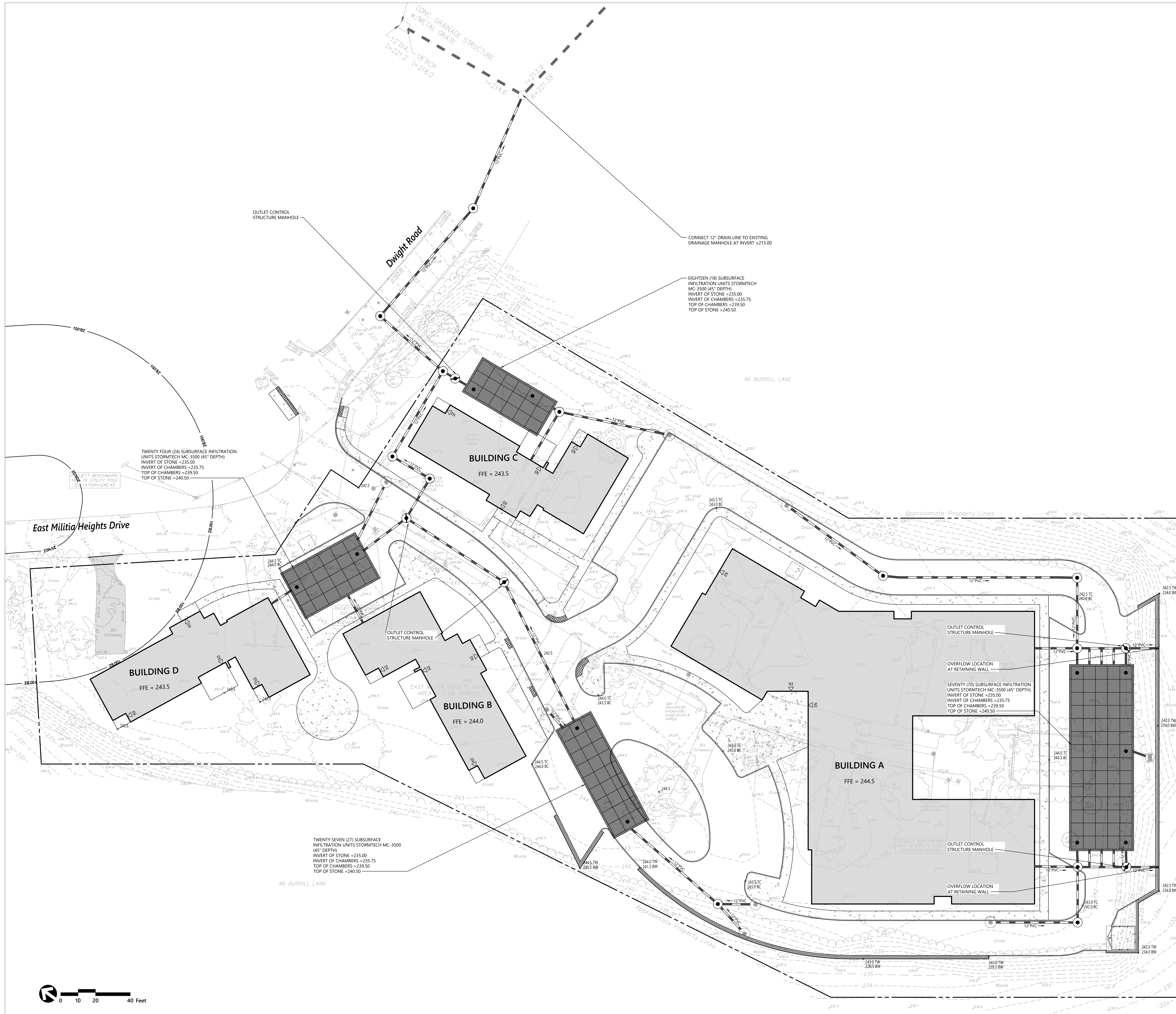
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16594

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Sheet Number:

C.103



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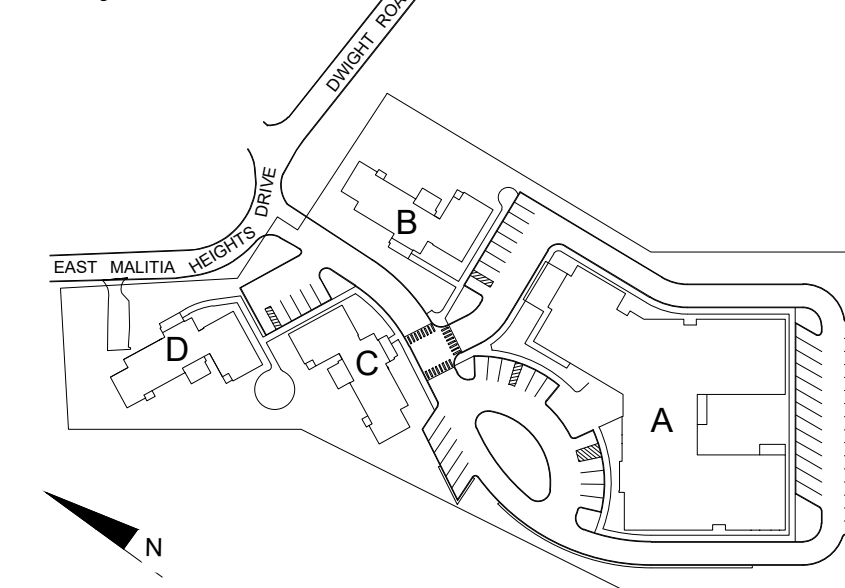


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Key Plan:



Project Name:
CHARLES RIVER HEIGHTS

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

UTILITIES PLAN

Project Number:

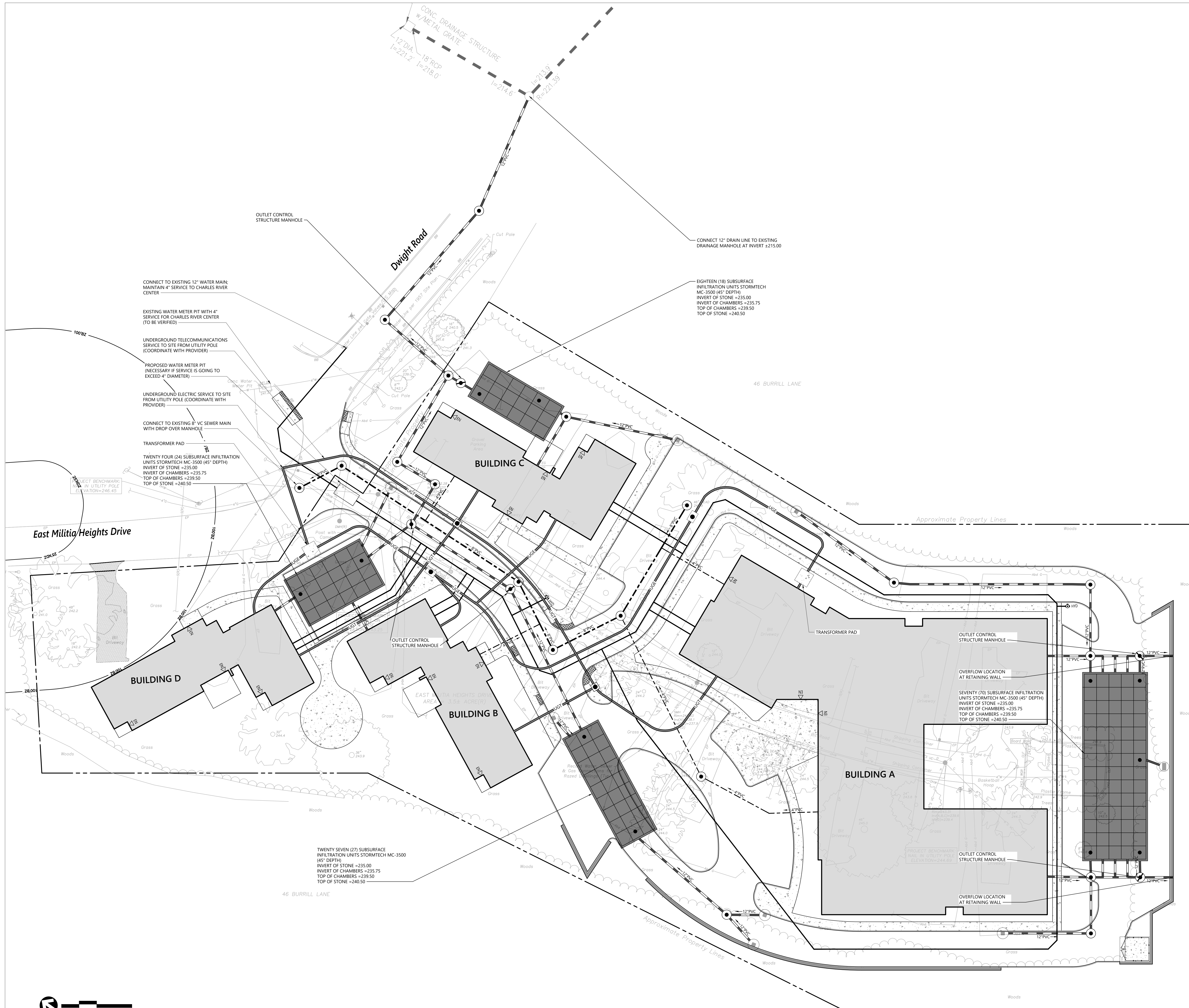
16594

Issue Date:

OCTOBER 06, 2025

Sheet Number:

C.104



Tree Protection Specifications

Section 01 56 39

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. ATTENTION IS DIRECTED TO THE CONTRACT AND GENERAL CONDITIONS AND ALL SECTIONS WITHIN DIVISION 01 - GENERAL REQUIREMENTS, WHICH ARE HEREBY MADE A PART OF THIS SECTION OF THE SPECIFICATIONS.

B. CONTRACTOR SHALL COMPLY WITH THESE SPECIFICATIONS ICITY OF CAMBRIDGE SPECIFICATION 00910 SHALL TAKE PRECEDENCE OVER THESE SPECIFICATIONS.

1.02 DESCRIPTION OF WORK

A. WORK INCLUDES: PROVIDE LABOR, MATERIALS AND EQUIPMENT NECESSARY TO COMPLETE THE WORK OF THIS SECTION, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- PROTECTION OF EXISTING TREES.
- SELECTIVE THINNING AND PRUNING.

1.03 QUALITY ASSURANCE

A. PRUNING OF EXISTING TREES SHALL BE DONE BY A CERTIFIED ARBORIST AS APPROVED BY THE OWNER'S REPRESENTATIVE.

PART 2 - MATERIALS

2.01 TREE PROTECTION MATERIALS

A. TREE PROTECTION FENCING SHALL CONSIST OF 1-1/2" O.D. STEEL PIPE, 2-0' LENGTH, AND 4-0' TOTAL HEIGHT. SNOW FENCING FORMING AN ENCLOSURE AROUND TREES TO BE PROTECTED AS DESIGNATED ON CONTRACT DRAWINGS AT THE CANOPY LINE OR DRIP LINE OF EACH TREE.

B. TREE PROTECTION SHALL CONSIST OF 8-0" HIGH CONSTRUCTION FENCE, FORMING AN ENCLOSURE AROUND TREES TO BE PROTECTED AS DESIGNATED ON CONTRACT DRAWINGS AT THE CANOPY LINE OR DRIP LINE OF EACH TREE.

C. TRUNK PROTECTION SHALL CONSIST OF BURLAP AND STANDARD SNOW FENCE, SECURED WITH WIRE.

D. THE OWNER'S REPRESENTATIVE SHALL APPROVE THE TREE PROTECTION LOCATIONS AND INSTALLATION BEFORE ANY CONSTRUCTION OR DEMOLITION CAN BEGIN.

E. WOOD CHIP MULCH SHALL BE AGED SIX MONTHS MINIMUM.

F. WATER SHALL BE PORTABLE AND SUITABLE FOR USE ON PLANTS.

G. SLOW RELEASE FERTILIZER SHALL BE REVIEWED AND APPROVED BY THE OWNER'S REPRESENTATIVE, PRIOR TO USE.

PART 3 - EXECUTION

3.01 GENERAL PROVISION

A. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL ARRANGE A CONFERENCE ON THE SITE WITH THE OWNER'S REPRESENTATIVE AND THE OWNER TO IDENTIFY TREES TO BE PROTECTED.

3.02 TREE PROTECTION

A. FENCING SHALL BE ERRECTED BEFORE SITE DEMOLITION ACTIVITY OF ANY KIND BEGINS. FENCING SHALL BE SECURELY ERRECTED, BE VERTICALLY PLUMB, BE MAINTAINED UNTIL DIRECTED FOR REMOVAL BY THE OWNER'S REPRESENTATIVE, AND SHALL PROTECT INDIVIDUAL TREES OR SHRUBS OR GROUPS OF TREES OR SHRUBS.

B. TREE PROTECTION FENCING SHALL BE LOCATED BELOW THE DRIPLINE OF THE TREE OR AROUND SHRUBS.

C. DAMAGE: NO TREES TO REMAIN BY BURNING, BY PUMPING OF WATER, BY CUTTING OF LIVE ROOTS OR BRANCHES, OR BY ANY OTHER MEANS. NO TREES TO BE SAVED SHALL BE USED FOR CRANE STAYS, GUYS OR OTHER FASTENINGS. VEHICLES SHALL NOT BE PARKED WHERE DAMAGE MAY RESULT TO TREES TO BE SAVED. I.E. UNDER THE CANOPY OF THE EXISTING TREES, CONSTRUCTION MATERIALS SHALL NOT BE STORED BENEATH TREES TO BE SAVED.

D. THE CONTRACTOR SHALL BE LIABLE FOR ALL DAMAGE AND/OR DISTURBANCE TO EXISTING TREES, ACTUAL PRIVATES FOR DAMAGE TO PLANTS SHALL BE IN ACCORDANCE WITH THE SCHEDULES DEFINED HEREIN, WITH ASSESSED DAMAGES TO BE DEDUCTED FROM SUMS PAYABLE UNDER THE CONSTRUCTION CONTRACT.

E. EXISTING TREES WHICH, IN THE OPINION OF THE OWNER'S REPRESENTATIVE, HAVE BECOME DAMAGED AS A RESULT OF THE CONTRACTOR'S OPERATIONS SHALL BE ASSESSED AT FULL REPLACEMENT COSTS, OR IF NOT APPLICABLE AS DETERMINED BY THE OWNER'S REPRESENTATIVE. AT A MINIMUM COST OF ONE HUNDRED AND FIFTY DOLLARS (\$150.00) PER CALIPER INCH, OR GREATER, IN ACCORDANCE WITH THE "GUIDE FOR ESTABLISHING VALUES OF TREES AND OTHER PLANTS", LATEST EDITION, AS PUBLISHED BY THE INTERNATIONAL SOCIETY OF ARBORICULTURE, URBANA, ILLINOIS.

F. DURING DEMOLITION OPERATIONS, THE TRUNKS OF THE TREES SHALL BE EFFECTIVELY PROTECTED BURLAP AND SNOW FENCING PLACED AS PROTECTIVE HOUSING. PARTICULAR CARE SHALL BE TAKEN IN THE USE OF HEAVY MACHINERY DURING DEMOLITION OPERATIONS TO PREVENT INJURY TO ROOTS AND BRANCHES.

3.03 TREE ROOT PROTECTION

A. THE CONTRACTOR SHALL ASSUME THAT THE MAJORITY OF TREE ROOTS EXTEND TO THE TREE DRIPLINE OR EDGE OF CANOPY. ANY DISTURBANCE WITHIN THIS ZONE SHALL RESULT IN ROOT REDUCTION. IN CERTAIN INSTANCES, DEMOLITION MAY NEED TO OCCUR WITHIN THIS ZONE. TREE PROTECTION FENCING SHALL BE LOCATED AT THE TREE'S DRIPLINE, OR AS INDICATED ON THE DRAWINGS. THE ROOTS SHALL BE FIRST CUT BY A TRENCHEER AND ROOTS OVER 2 INCHES IN DIAMETER SHALL BE HAND TRIMMED, DIGGING BY BACKHOE AT TREE ROOTS UNDER CANOPY IS NOT PERMITTED UNTIL TRENCHEER HAS BEEN THROUGH FIRST AND SHALL BE GROUNDS FOR ASSESSING TREE DAMAGE.

3.04 WATERING / INSECT AND DISEASE CONTROL

A. THE TREES WHICH HAVE ROOTS THAT ARE OVER 20% AFFECTED BY DEMOLITION, AS DETERMINED BY A CERTIFIED ARBORIST AND REVIEWED BY THE OWNER'S REPRESENTATIVE, SHALL BE DEEP ROOT WATERED DURING THE GROWING SEASON AS MUCH AS REQUIRED (AT LEAST ONCE), AND DEEP ROOT FERTILIZED WITH A SLOW RELEASE FERTILIZER BETWEEN NOVEMBER AND APRIL UNDER THE DIRECTION OF A CERTIFIED ARBORIST. THE ARBORIST SHALL ALSO RECOMMEND ANY REMEDIAL INSECT OR DISEASE CONTROL MEASURES THAT MAY BE REQUIRED FOR TREES AND SHRUBS TO REMAIN.

3.05 ROOT COVERING

A. TREE ROOTS THAT ARE EXPOSED DURING THE GROWING SEASON FOR MORE THAN TWO WEEKS SHALL BE COVERED WITH FILTER FABRIC STAKED SECURELY OR COVERED WITH AGED WOODCHIPS TO A MINIMUM DEPTH OF 3 INCHES.

B. TREES THAT HAVE OVER A 30% ROOT ZONE LOSS DUE TO DEMOLITION SHALL HAVE THEIR ENTIRE REMAINING ROOT ZONE COVERED BY AGED WOOD CHIPS TO A MINIMUM DEPTH OF 3 INCHES.

3.06 TREE PRUNING

A. NO PRUNING OF EXISTING TREES SHALL TAKE PLACE WITHOUT WRITTEN APPROVAL FROM THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL ENGAGE CERTIFIED ARBORISTS WHO SHALL BE RESPONSIBLE TO PERFORM ALL WORK OF TREE PRUNING ONLY AFTER HAVING BEEN APPROVED BY THE OWNER'S REPRESENTATIVE AND THE CITY OR TOWN ARBORIST.

B. TREE PRUNING SHALL INCLUDE THE FOLLOWING MINIMUM WORK REQUIREMENTS:

- ALL DEAD WOOD OR SUCKERS AND ALL BROKEN OR BADLY BRUISED BRANCHES SHALL BE REMOVED. IN ADDITION, SELECTIVE PRUNING SHALL BE UNDERTAKEN AS NECESSARY TO IMPROVE THE APPEARANCE OF EACH TREE AND TO ALLOW ADDITIONAL LIGHT TO REACH LAWN AREAS.
- TREE PRUNING SHALL APPLY TO THE FULL HEIGHT OF TREES.
- DURING THE LENGTH OF CONSTRUCTION AND TREE DAMAGED BY WIND OR OTHER CAUSES SHALL BE PRUNED INITIALLY IN ACCORDANCE WITH THE CLASS II NATIONAL ARBORIST ASSOCIATION STANDARDS TO PRESERVE THE NATURAL CHARACTER OF THE PLANT, UPON THE APPROVAL OR DIRECTION OF THE OWNER'S REPRESENTATIVE.
- TREES WITH A LOSS OF ROOT SYSTEMS OF OVER 20% DUE TO DEMOLITION OPERATIONS SHALL BE CONSTRUCTION PRUNED. IN ADDITION TO CLASS II PRUNING, THE TREE CANOPY SHALL BE PRUNED IN PROPORTION TO THE AMOUNT OF ROOT ZONE LOST TO THE DEMOLITION OPERATIONS. ALL PRUNING SHALL INCLUDE COLLAR CUTS. NO FLUSH CUTS ARE PERMITTED.

C. ALL TREE PRUNING WORK MUST BE APPROVED BY THE OWNER'S REPRESENTATIVE AND THE CITY OR TOWN ARBORIST BEFORE FINAL PAYMENT IS MADE.

D. ANY DAMAGE DONE TO EXISTING TREE CROWNS OR ROOT SYSTEMS, INCLUDING COMPENSATORY PRUNING FOR ROOT LOSS, SHALL BE REPAIRED IMMEDIATELY BY AN APPROVED TREE SURGEON UNDER OBSERVATION BY THE OWNER'S REPRESENTATIVE AT NO COST TO THE OWNER.

E. ANY ACCIDENTAL INJURIES TO THE BARK, TRUNK AND BRANCHES SHALL BE REPAIRED IMMEDIATELY BY PRUNING AND TRACE CUTTING WITH A CLEAN, SHARP KNIFE, AS REQUIRED.

F. WITHIN THE BRANCH SPREAD OF TREES, THE CONTRACTOR WILL NOT EXCAVATE OR FILL MORE THAN TWO INCHES UNLESS DIRECTED TO DO SO BY THE OWNER'S REPRESENTATIVE.

3.07 DISPOSAL OF CLEARED AND GRUBBED MATERIAL/PROJECT CLOSE-OUT

A. UPON COMPLETION OF THE OPERATIONS, ALL DEBRIS SHALL BE REMOVED WITHIN THE LIMIT OF WORK INCLUDING CLIPPINGS AND DEBRIS WITHIN THE PROTECTED ROOT ZONES OF TREES AND SHRUBS TO REMAIN.

B. AT THE COMPLETION OF OPERATIONS, CONTRACTOR SHALL SUBMIT TO THE OWNER'S REPRESENTATIVE A REQUEST TO VISIT THE SITE TO REVIEW WITH THE CERTIFIED ARBORIST, THE OVERALL HEALTH AND MAINTENANCE REQUIREMENTS OF THE PLANT MATERIAL TO REMAIN AND TO BE PROTECTED WITHIN THE TREE PROTECTION FENCING, AS SHOWN ON THE PLANS OR AMENDED IN THE FIELD AS A CONDITION OF FINAL ACCEPTANCE.

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
DIVISION OF URBAN FORESTRY

PUBLIC TREES ARE PROTECTED BY MASSACHUSETTS STATE LAW, CHAPTER 87, SECTION 12 STATES THAT A FINE OF UP TO FIVE HUNDRED DOLLARS, (\$500.00) PER INCIDENT OF DAMAGE TO PUBLIC SHADE TREES CAN BE LEVIED. EACH BRANCH, BROKEN OR IMPROPERLY PRUNED, EACH IMPROPER WOUNDING OF THE TRUNKS OF THE TREES, AND EACH ROOT IMPROPERLY PRUNED SHALL CONSTITUTE AN INFRACTION. SECTION 12 FURTHER PROVIDES THAT ANYONE WHO NEGLIGENTLY OR WILLFULLY DAMAGES A TREE WILL BE LIABLE TO THE CITY FOR ALL DAMAGES.

DURING ALL CONSTRUCTION PROJECTS, THE UTMOST CARE SHALL BE TAKEN BY THE CONTRACTOR TO AVOID UNAUTHORIZED, UNNECESSARY OR IMPROPER WOUNDING OF PUBLIC OR PRIVATE SHADE TREES, PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE A TREE PROTECTION PLAN AND WORK SCHEDULE. A MASSACHUSETTS OR INTERNATIONAL CERTIFIED ARBORIST SHALL BE SUB-CONTRACTED BY THE CONTRACTOR TO PROVIDE A PROTECTION PLAN AND, PERFORM SPECIFIED WORK.

ALL PLANS AND SCHEDULES SHALL BE SUBJECT TO REVIEW AND APPROVAL BY THE CITY TREE WARDEN.

INFRACTION OF MASSACHUSETTS STATE LAW CHAPTER 87 OR FAILURE TO PROVIDE A PROTECTION PLAN AND WORK SCHEDULE WILL RESULT IN FINES OR THE IMMEDIATE CANCELLATION OF THE CONTRACT.

PRE-CONSTRUCTION TREE PROTECTION MEASURES SHALL INCLUDE THE FOLLOWING:

11. WRAPPING THE TRUNKS OF TREES WITH A DIAMETER AT BREAST HEIGHT (DBH) OF 6" OR GREATER WITH A DURABLE MATERIAL SUCH AS TWO BY FOUR LUMBER SUFFICIENT TO PROTECT TREE TRUNKS FROM MECHANICAL DAMAGE. REMOVAL OF PROTECTIVE WRAPPING SHALL BE DONE BY THE CONTRACTOR AFTER CONSTRUCTION IS COMPLETE.

12. THE PROPER PRUNING (GRADE PRUNING) OF LOW BRANCHES TO A HEIGHT NO GREATER THAN FOURTEEN FEET (14') ABOVE THE ROADWAY AND EIGHT FEET (8') ABOVE THE SIDEWALK. THIS INCLUDES TREES ENDANGERED BY TRAFFIC RE-ROUTING AS THE RESULT OF CONSTRUCTIO OPERATIONS.

13. TRAFFIC CONTROL PLANS SHALL BE DESIGNED IN SUCH A WAY AS TO DIRECT TRAFFIC AWAY FROM TREE TRUNKS AND BRANCHES.

14. TUNNELING SHALL BE THE PREFERRED METHOD OF EXCAVATION ADJACENT TO TREE ROOTS TO AVOID ROOT PRUNING. IF ROOT PRUNING IS UNAVOIDABLE, CERTIFIED PERSONNEL SHALL EXECUTE THE OPERATION WITH SUFFICIENTLY SHARPENED HAND TOOLS AND IN SUCH A FASHION S TO HAVE MINIMUM NEGATIVE IMPACT ON TREE HEALTH AND SAFETY.

15. TRUCKS AND HEAVY EQUIPMENT SHALL NOT PASS OVER OR PARK ON ROOTS OF PUBLIC SHADE TREES. A PROTECTION ZONE SHALL BE ESTABLISHED BY ERRECTING A RIDGED FENCE OUTSIDE THE PERIMETER OF THE DRIPLINE OF THE TREE. FOR OCCASIONAL OR ONE TIME ACCESS OVER ROOTS, 3/4" PLYWOOD OVERLAPPED MAY BE USED. PERMEABLE MATERIALS SUCH AS GRAVEL OR WOOD CHIPS SHALL BE PLACED OVER ROOT SYSTEMS OF TREES WHICH ARE NOT COVERED BY HARDSCAPE AND OVER WHICH TRUCKS AND HEAVY EQUIPMENT MUST TRAVEL DURING CONSTRUCTION OPERATIONS, WHEN SUCH TRAVEL IS UNAVOIDABLE, TO PREVENT SOIL COMPACTION AND ROOT DAMAGE. MATERIAL SHALL BE REPLACED AS NEEDED.

16. ALL TREE PROTECTION MEASURES AND OPERATIONS SHALL BE SUBJECT TO REVIEW, APPROVAL OR CHANGE BY THE CITY TREE WARDEN.

END OF TECHNICAL SPECIFICATIONS FOR TREE PLANTING 00910

Tree Protection Notes

- REFER TO NOTES 1-9, BELOW FOR GENERAL PROJECT REQUIREMENTS.
- THE PROJECT TREE PROTECTION AND REMOVAL PLAN SHALL BE COORDINATED WITH THE EFFORTS OF THE PROJECT ARBORIST. PRIOR TO CONSTRUCTION START, THE CONTRACTOR SHALL REFER TO THE PROJECT'S ARBORIST REPORT REGARDING EXISTING TREES ON SITE AND TREES IN THE PUBLIC WAY OR ON ADJACENT PROPERTIES THAT MAY BE IMPACTED BY THE CONSTRUCTION.
- CONTRACTOR SHALL REFER TO ARBORIST'S REPORT FOR ADDITIONAL RECOMMENDATIONS FOR PROTECTION, PRUNING, AND/OR TREATMENT OF TREES TO REMAIN PRE-CONSTRUCTION, DURING CONSTRUCTION, AND POST-CONSTRUCTION.
- CONTRACTOR SHALL VERIFY ALL TREE REMOVALS AND/OR TRANSPLANTS WITH OWNER'S REPRESENTATIVE TO CONSTRUCTION START.
- TREE PROTECTION SHALL BE IN CONFORMANCE WITH THE SPECIFICATION SECTION 015639, (LEFT).

General Landscape Notes

- DO NOT SCALE DRAWINGS.
- SCREENED IMAGES SHOW EXISTING CONDITIONS, WHERE EXISTING CONDITIONS LIE UNDER OR ARE IMPINGED UPON BY PROPOSED BUILDINGS AND/OR SITE ELEMENTS, THE EXISTING CONDITION WILL BE REMOVED, ABANDONED AND/OR CAPPED OR DEMOLISHED AS REQUIRED.
- EXISTING CONDITIONS INFORMATION IS REPRODUCED FROM THE TOPOGRAPHIC PLAN OF LAND PREPARED BY SAMIOTES CONSULTANTS INC. OF FRAMINGHAM, MA, DATED 3-19-2025.
- THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MAY BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ALL UNDERGROUND UTILITIES.
- CONTRACTOR(S) SHALL THOROUGHLY FAMILIARIZE THEMSELVES WITH ALL CONSTRUCTION DOCUMENTS, SPECIFICATIONS, CONSERVATION COMMISSION NOTICE OF INTENT, AND SITE CONDITIONS, AND CONFIRM ALL DIMENSIONS AND QUANTITIES SHOWN PRIOR TO BIDDING AND PRIOR TO CONSTRUCTION.
- CONTRACTOR(S) SHALL REPORT ANY DISCREPANCIES BETWEEN DRAWINGS, SPECIFICATIONS, FIELD MEASUREMENTS, AND/OR SITE CONDITIONS IMMEDIATELY TO THE OWNER'S REPRESENTATIVE FOR CLARIFICATION AND RESOLUTION PRIOR TO BIDDING OR CONSTRUCTION.
- THIS OFFICE SHALL NOT BE HELD RESPONSIBLE FOR CONTRACTOR'S MEANS AND METHODS, INCLUDING THE FAILURE TO PROPERLY MEASURE AND/OR CALCULATE REQUIRED QUANTITIES.
- ALL WORK CONDUCTED WITHIN PUBLIC RIGHTS-OF-WAY SHALL CONFORM TO THE REQUIREMENTS AND SPECIFICATIONS OF THE MUNICIPAL HIGHWAY DEPARTMENT AND DEPARTMENT OF PUBLIC WORKS STANDARDS.
- PRIOR TO THE START OF ANY EXCAVATION FOR THE PROJECT, BOTH ON AND OFF THE SITE, THE CONTRACTOR SHALL NOTIFY DIGSAFE AND BE PROVIDED WITH A DIGSAFE NUMBER INDICATING THAT ALL EXISTING UTILITIES HAVE BEEN LOCATED AND MARKED.
- OWNER'S REPRESENTATIVE TO FLAG ALL TREES TO BE TRANSPLANTED PRIOR TO CONSTRUCTION START.
- CONTRACTOR SHALL VERIFY ALL TREE REMOVALS AND/OR TRANSPLANTS WITH OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION START.
- CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AWAY FROM ALL BUILDING FOUNDATIONS, STRUCTURES, AND PLANTING BEDS.
- MAXIMUM SLOPE WITHIN DISTURBED AREAS SHALL NOT EXCEED 3:1, UNLESS OTHERWISE NOTED.
- THE LANDSCAPE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN QUANTITIES SUFFICIENT TO COMPLETE ALL PLANTINGS SHOWN ON THIS DRAWING.
- ALL MATERIALS SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION.
- ALL PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISH GRADE AS TO ORIGINAL GRADES BEFORE DIGGING.

Suggested Plant Schedule

BOTANICAL NAME	COMMON NAME	SIZE	QTY	QUALITY	SYMBOL
DECIDUOUS TREES					
<i>Betula populifolia</i> 'Whitespire'	Whitespire Gray Birch	8'10" CLUMP	4	I *	
<i>Celtis occidentalis</i>	Hackberry	3-3 1/2" CAL	3	I *	
<i>Halesia carolina (tetraptera)</i>	Silverbell	6/8" CLUMP	3	I *	
<i>Ostrya virginiana</i>	American Hop Hornbeam	3-3 1/2" CAL	3	I *	
<i>Liquidambar styraciflua</i>	American Sweetgum	3-3 1/2" CAL	7	I *	
<i>Quercus alba</i>	White Oak	3-3 1/2" CAL	3	I *	
<i>Quercus coccinea</i>	Scarlet Oak	3-3 1/2" CAL	3	I *	
EVERGREEN TREES					
<i>Juniperus virginiana</i>	Red Cedar	3-3 1/2" CAL	6	I *	
<i>Pinus strobus</i>	White Pine	3-3 1/2" CAL	3	I *	
PLANT SUBSTITUTIONS					
In conformance with MA EOHLC Appendix N: all new plantings shall be native, low maintenance, drought tolerant, and non-invasive.				Legend	
If making substitutions on plant selections, care shall be taken to match the qualities shown in note section, as described to the right.				Shade Tolerant * part Shade Tolerant *	
Plant qualities noted are based on local extension services resources and nursery catalogs.				Full Sun Tolerant * Inundation Tolerant *	
Designer Source for Plant Qualities: Native Plant Trust, Framingham, MA				Evergreen *	

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RBLA Design LLC
rbladesign.com
781.686.4486

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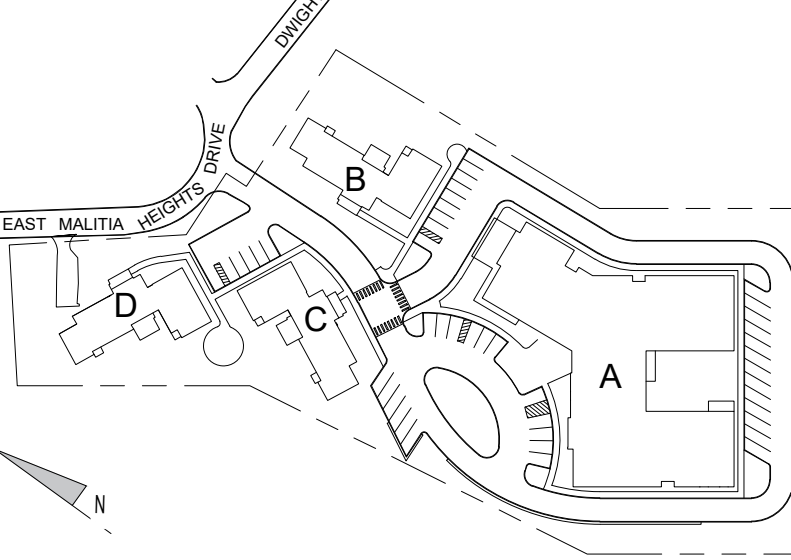
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Project Name:

CHARLES RIVER HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

LANDSCAPE
NOTES AND
PLANT SCHEDULE

Project Number:

23032 | rbla 2504

Issue Date:

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Sheet Number:

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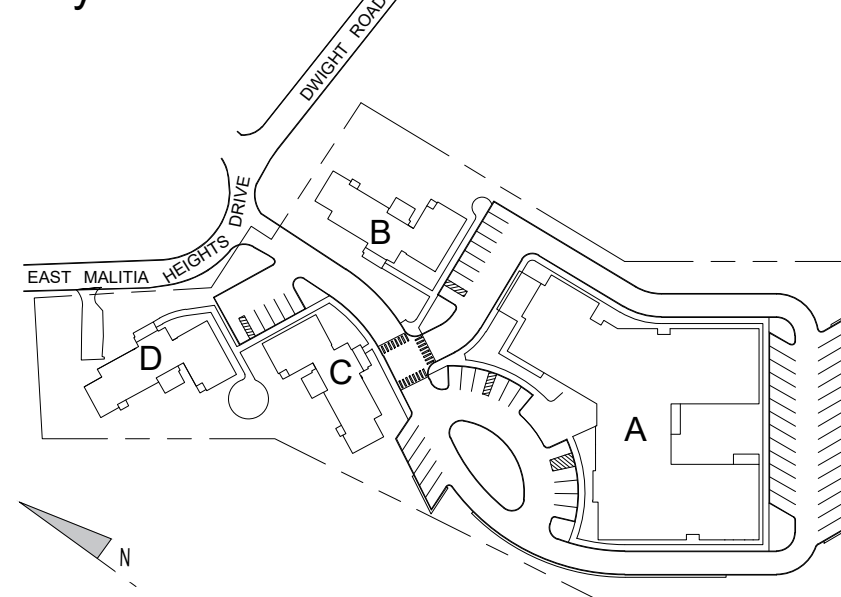


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Key Plan:



Project Name:

**CHARLES RIVER
HEIGHTS**

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

**TREE REMOVAL
AND PROTECTION
PLAN**

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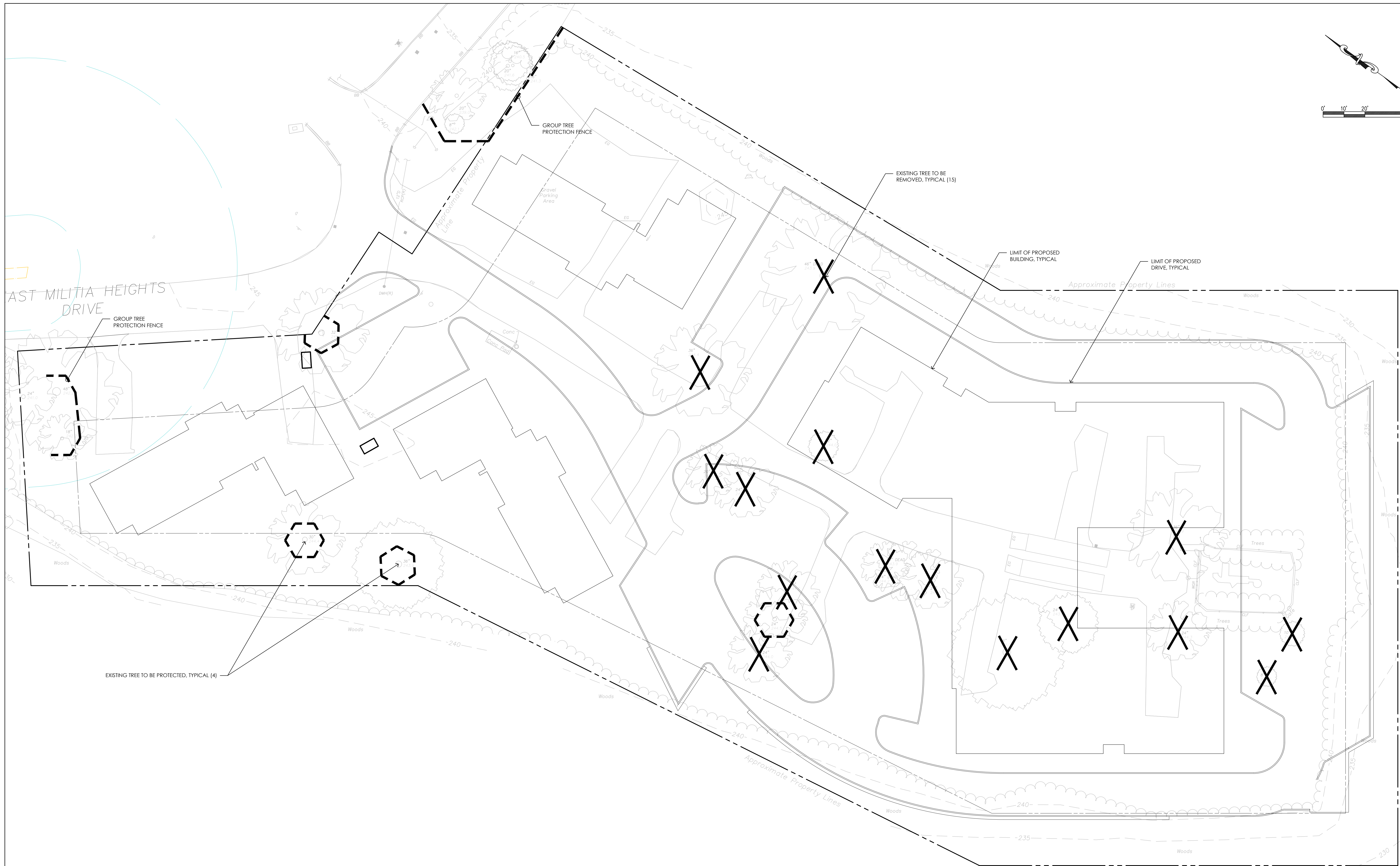
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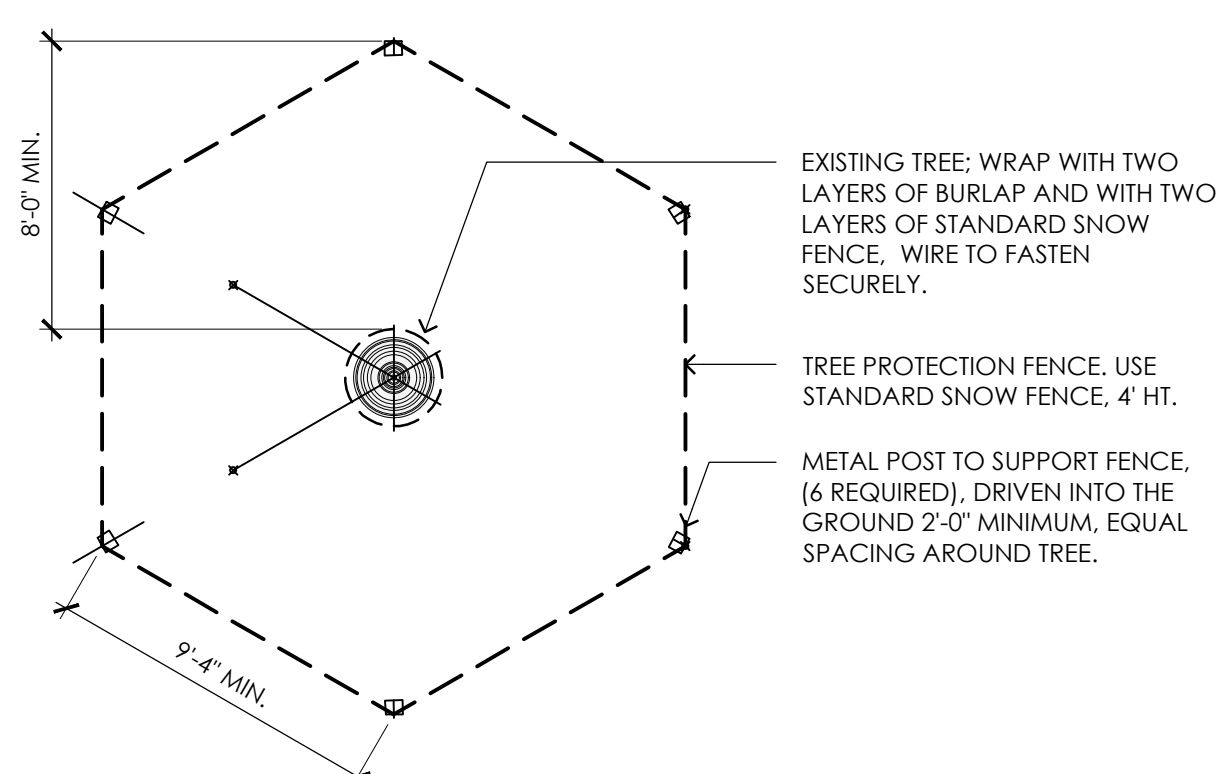
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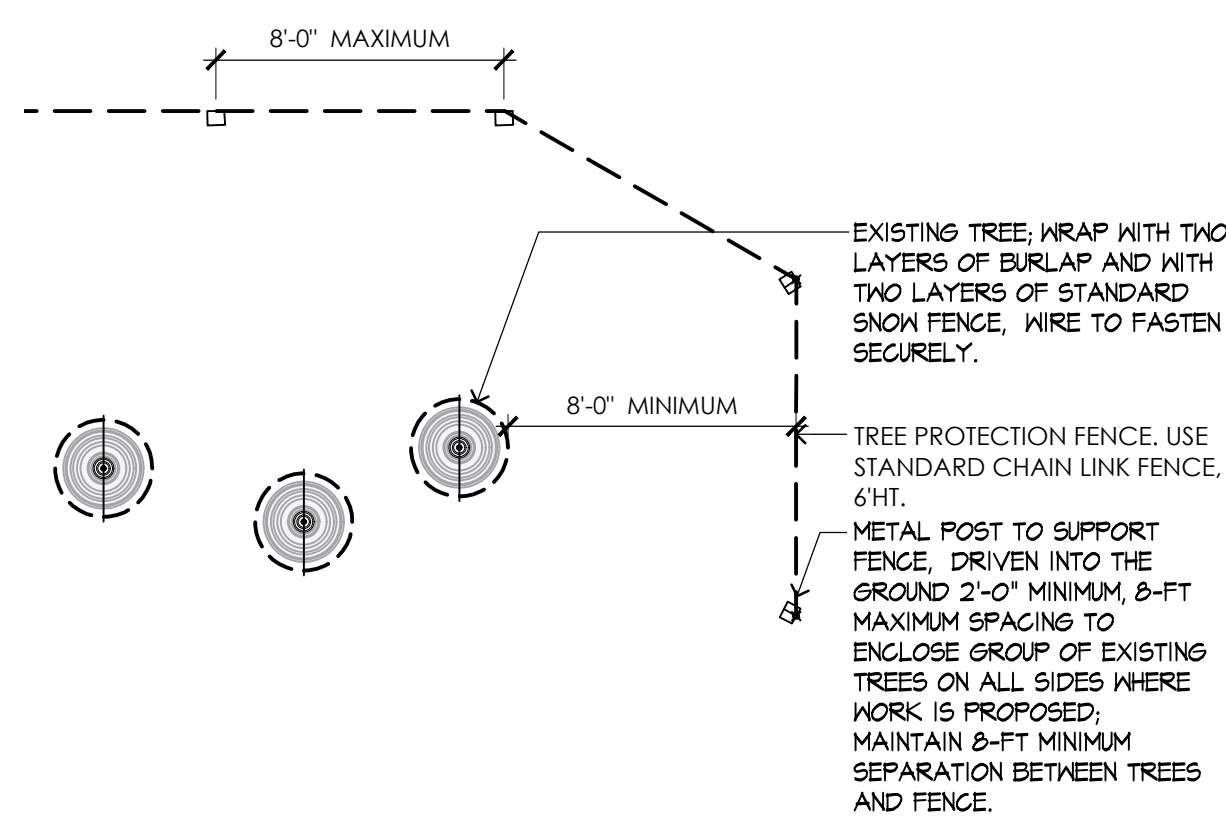
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REFER TO SHEET L1.00 FOR PROJECT NOTES
AND TREE PROTECTION SPECIFICATIONS



1 SINGLE TREE PROTECTION



2 GROUP TREE PROTECTION

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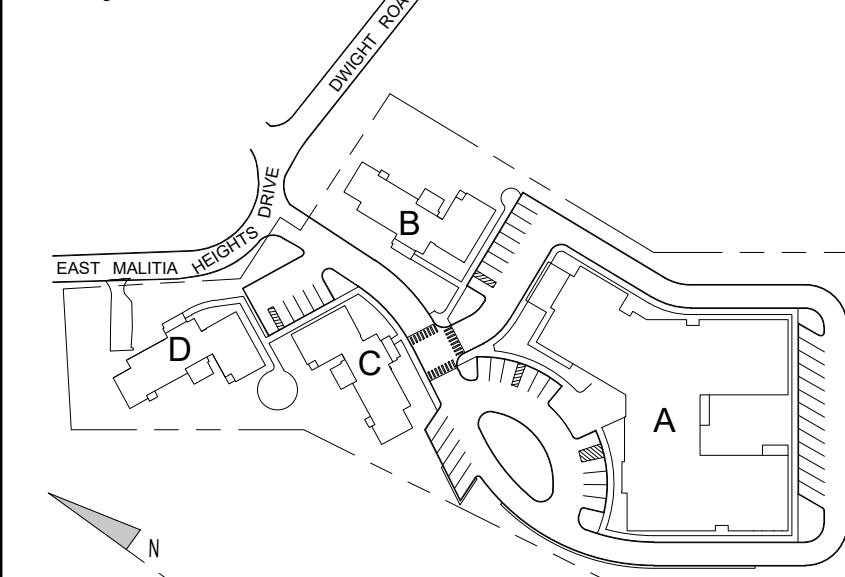


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Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

CONCEPTUAL
LANDSCAPE PLAN

Project Number:

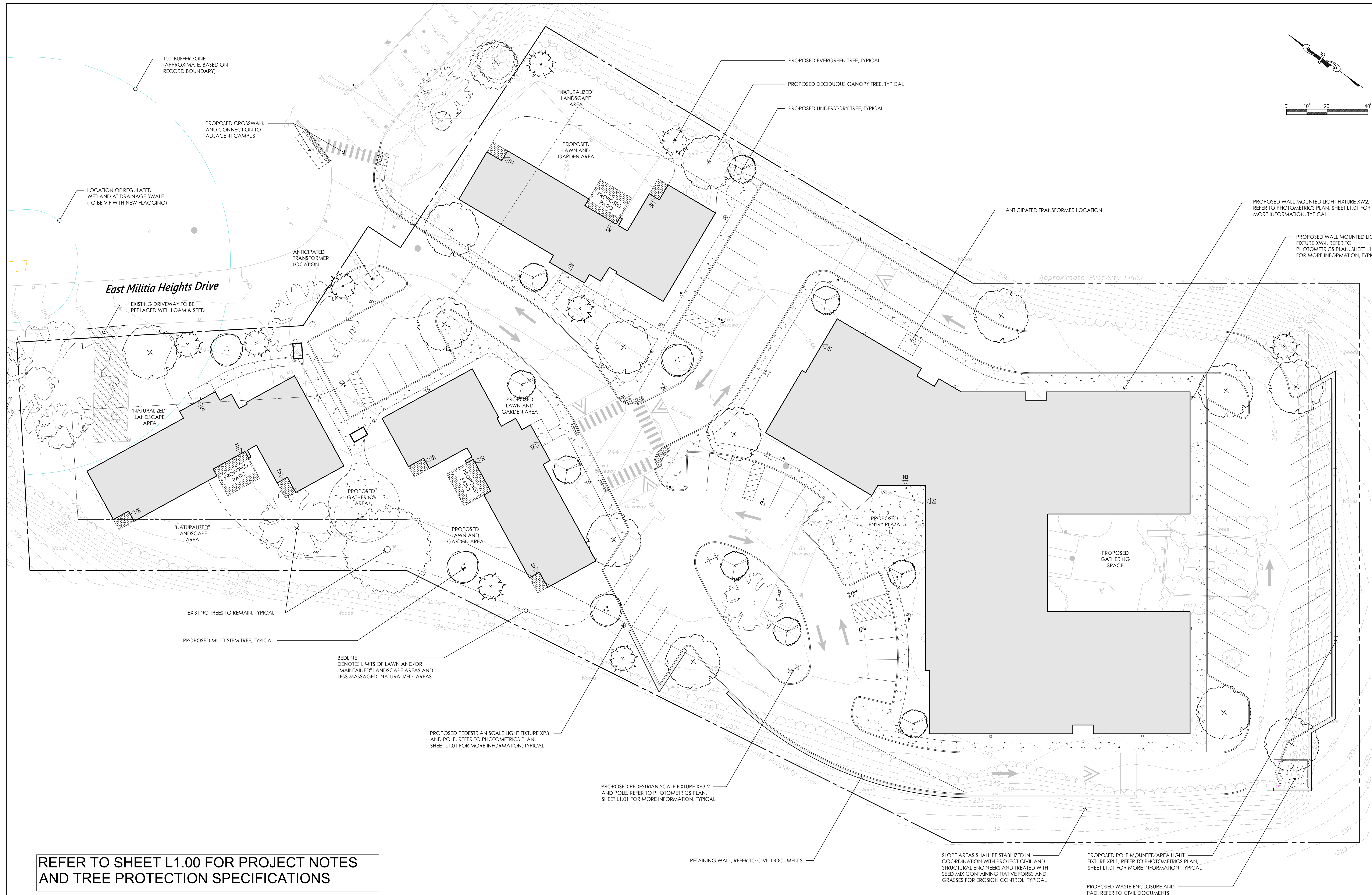
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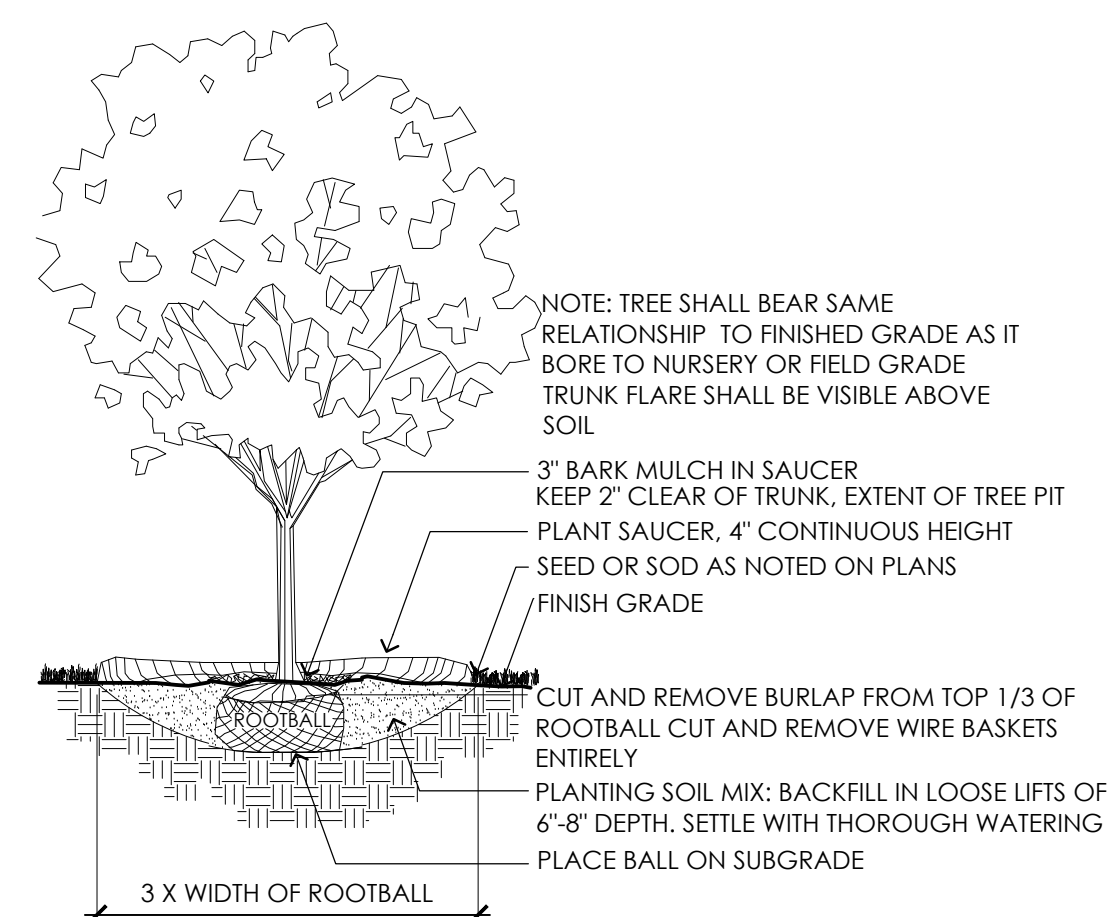
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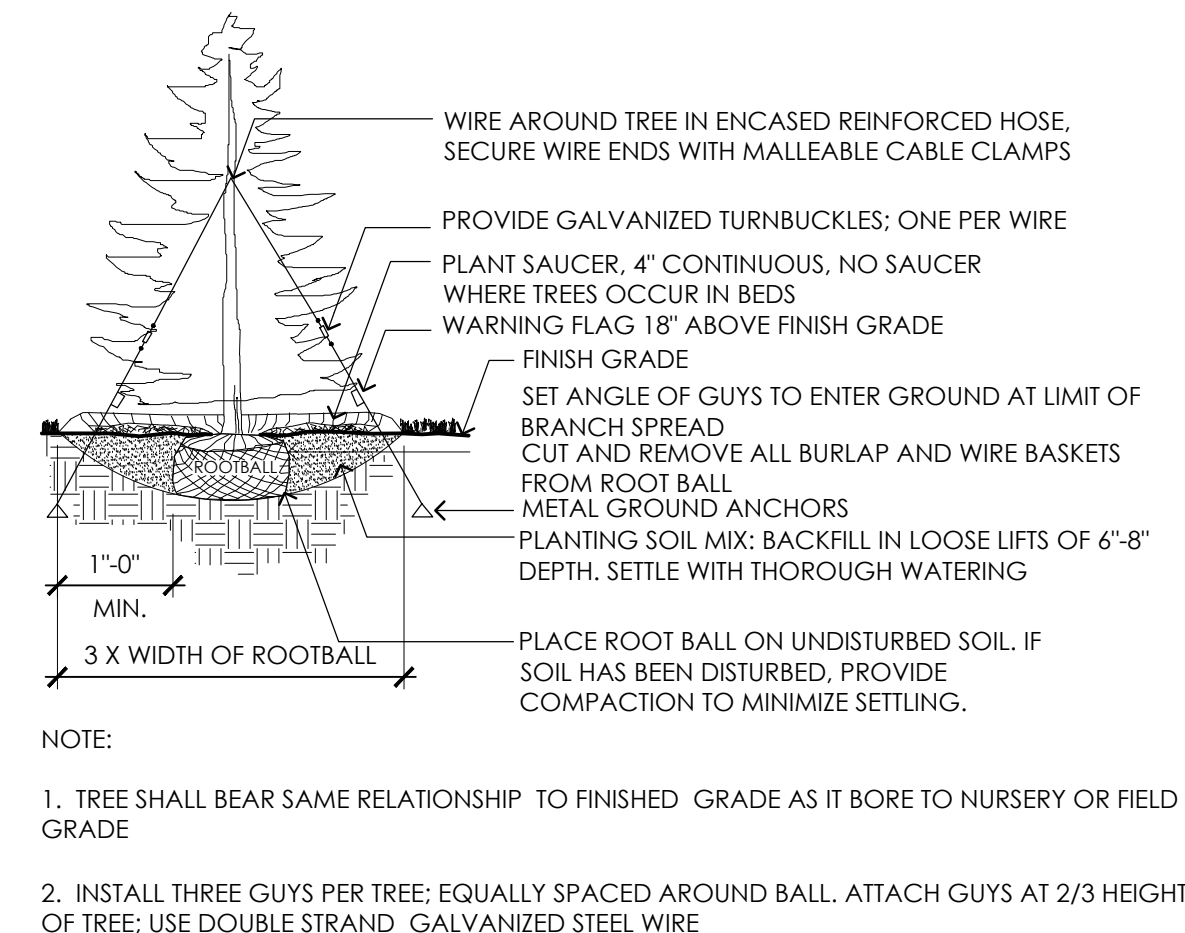
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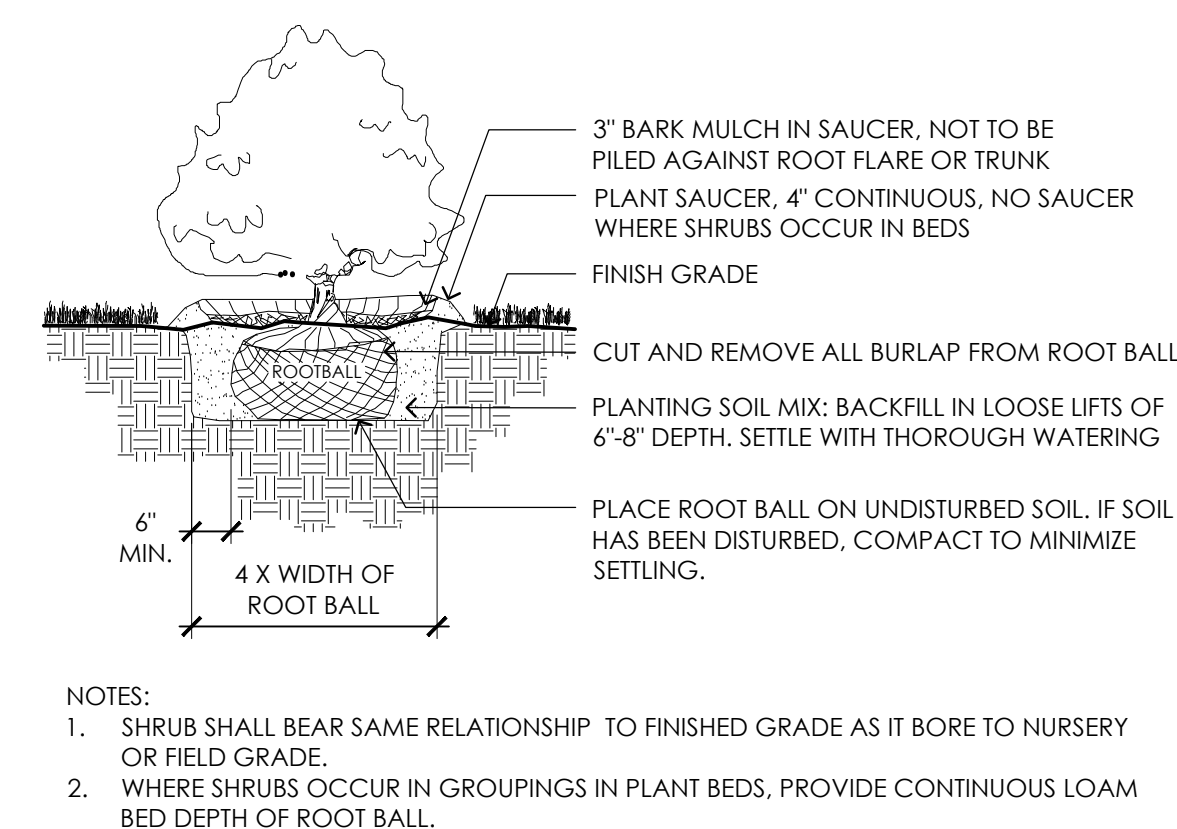
REFER TO SHEET L1.00 FOR PROJECT NOTES
AND TREE PROTECTION SPECIFICATIONS



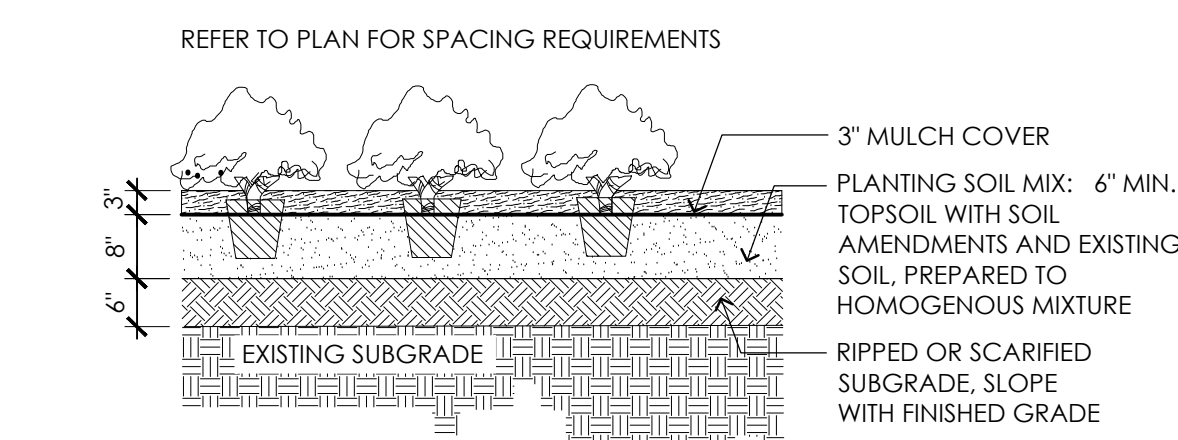
1 TYPICAL DECIDUOUS TREE PLANTING



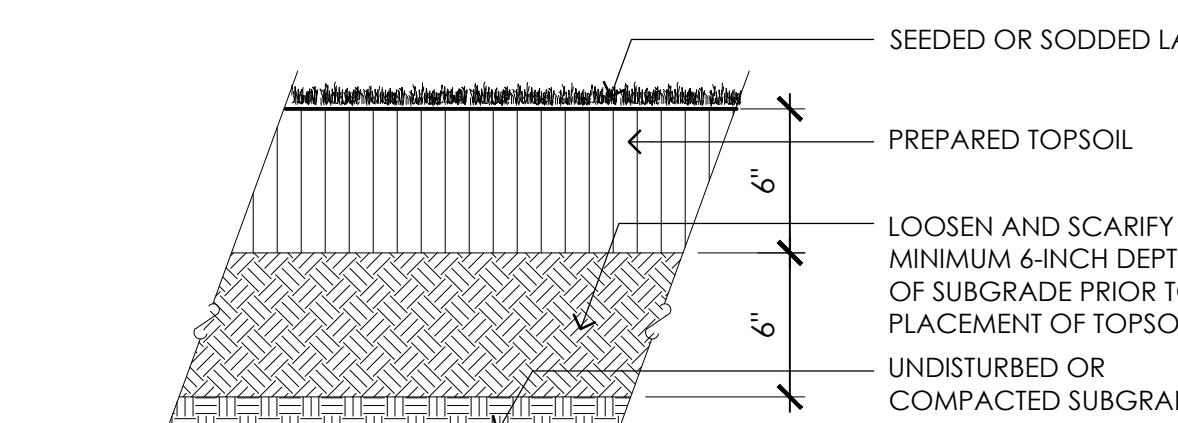
2 TYPICAL EVERGREEN TREE PLANTING



3 TYPICAL SHRUB PLANTING



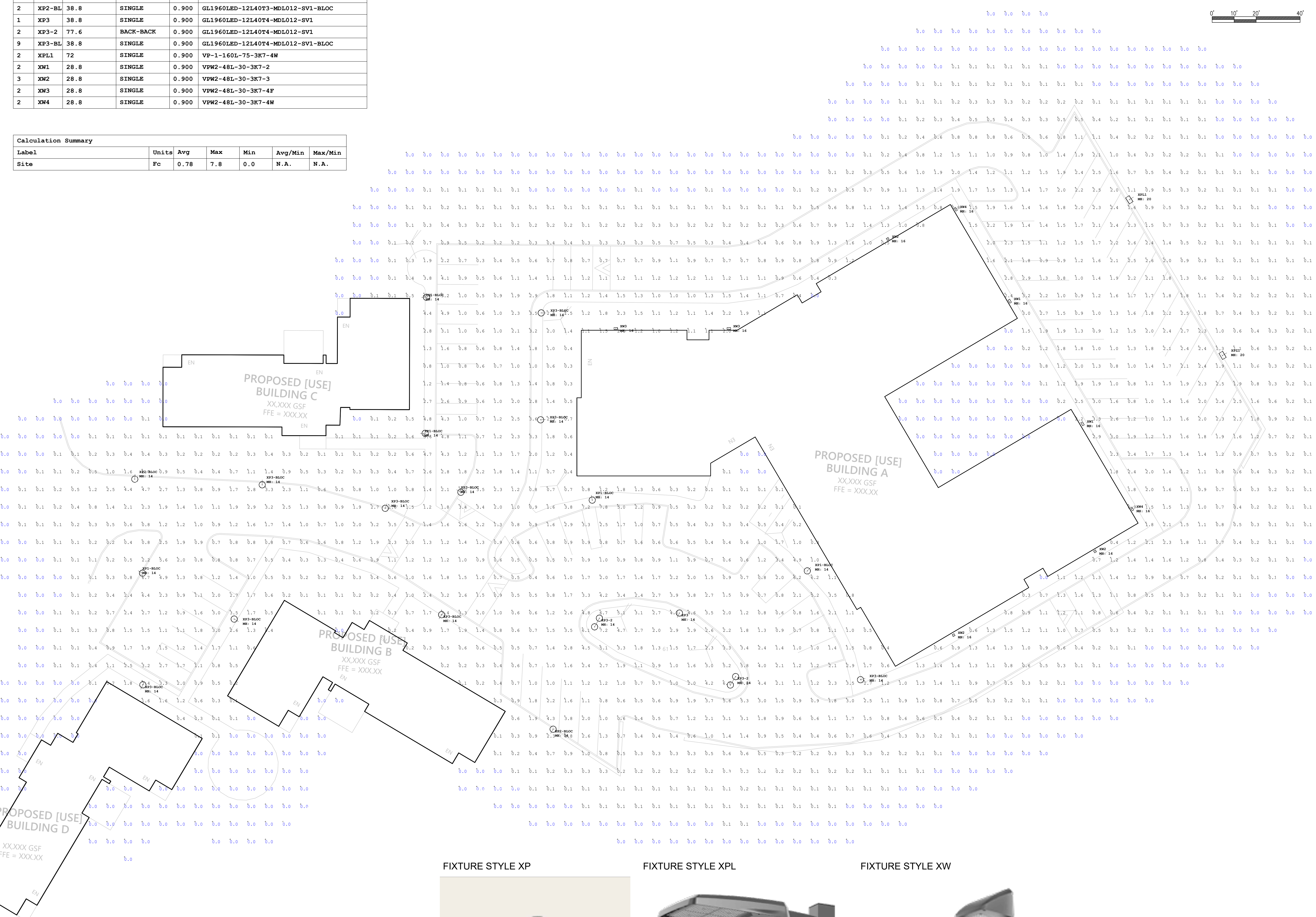
4 TYPICAL GROUNDCOVER PLANTING



5 TYPICAL LAWN INSTALLATION

Luminaire Schedule					
Qty	Label	Arr. Watts	Arrangement	LLF	Description
5	XP1-BL	38.8	SINGLE	0.900	GL1960LED-12L40T2-MDL012-SV1-BLOC
2	XP2-BL	38.8	SINGLE	0.900	GL1960LED-12L40T3-MDL012-SV1-BLOC
1	XP3	38.8	SINGLE	0.900	GL1960LED-12L40T4-MDL012-SV1
2	XP3-2	77.6	BACK-BACK	0.900	GL1960LED-12L40T4-MDL012-SV1
9	XP3-BL	38.8	SINGLE	0.900	GL1960LED-12L40T4-MDL012-SV1-BLOC
2	XPL1	72	SINGLE	0.900	VP-1-160L-75-3K7-4W
2	XW1	28.8	SINGLE	0.900	VPW2-48L-30-3K7-2
3	XW2	28.8	SINGLE	0.900	VPW2-48L-30-3K7-3
2	XW3	28.8	SINGLE	0.900	VPW2-48L-30-3K7-4F
2	XW4	28.8	SINGLE	0.900	VPW2-48L-30-3K7-4W

Calculation Summary						
Label	Units	Avg	Max	Min	Avg/Min	Max/Min
Site	Fc	0.78	7.8	0.0	N.A.	N.A.



FIXTURE STYLE XP



FIXTURE STYLE XPL



FIXTURE STYLE XW



Project: 59 East Militia Heights Road - Site	
Contact: Sean Goulding Specification Sales (781) 272-2300 X211 sgoulding@omnilite.com	Detail: Photometric Calculation Date: 08/06/2025 Revision: --- Scale: 1" = 20'-0" Drawn By: SHJ
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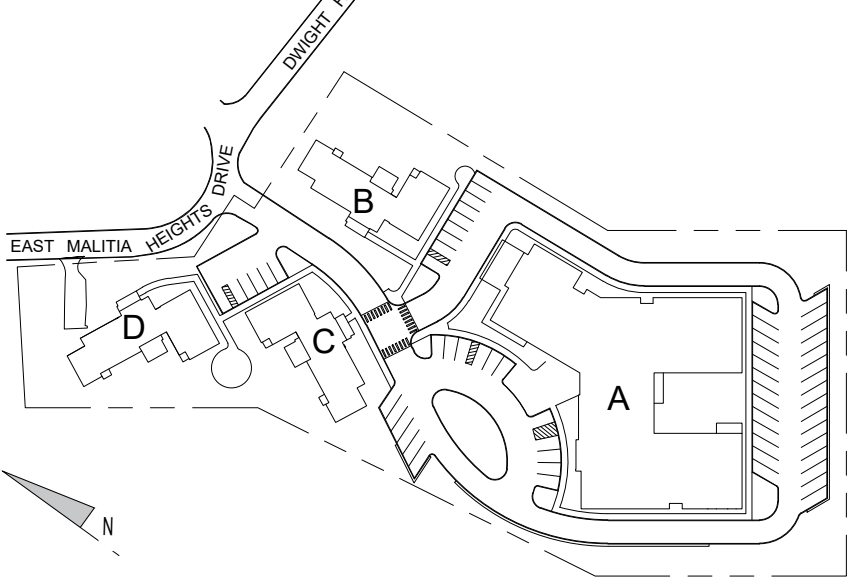
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Project Name:
**CHARLES RIVER
HEIGHTS**

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

**LIGHTING AND
PHOTOMETRICS PLAN**

Project Number:

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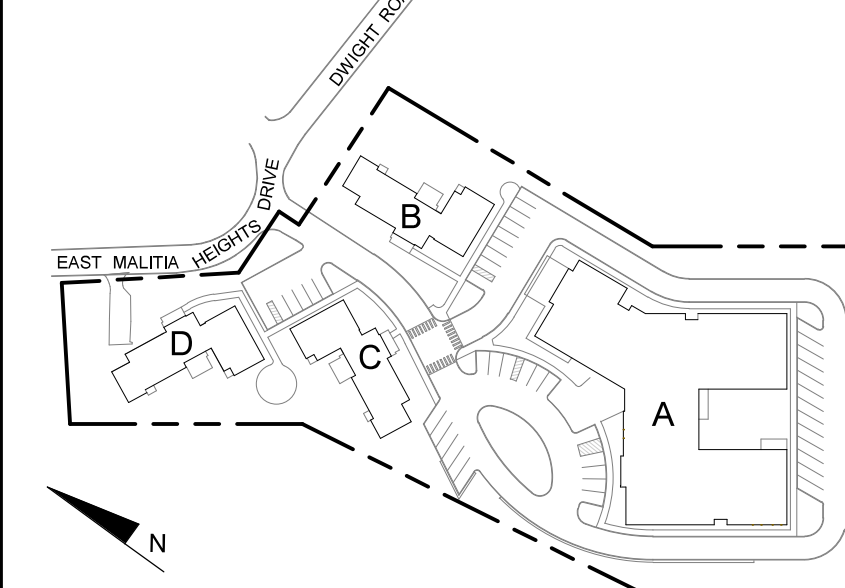


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Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
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ARCHITECTURAL SITE
PLAN

Project Number:

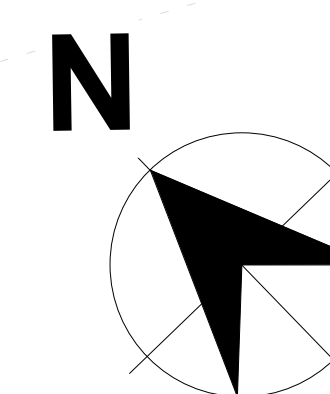
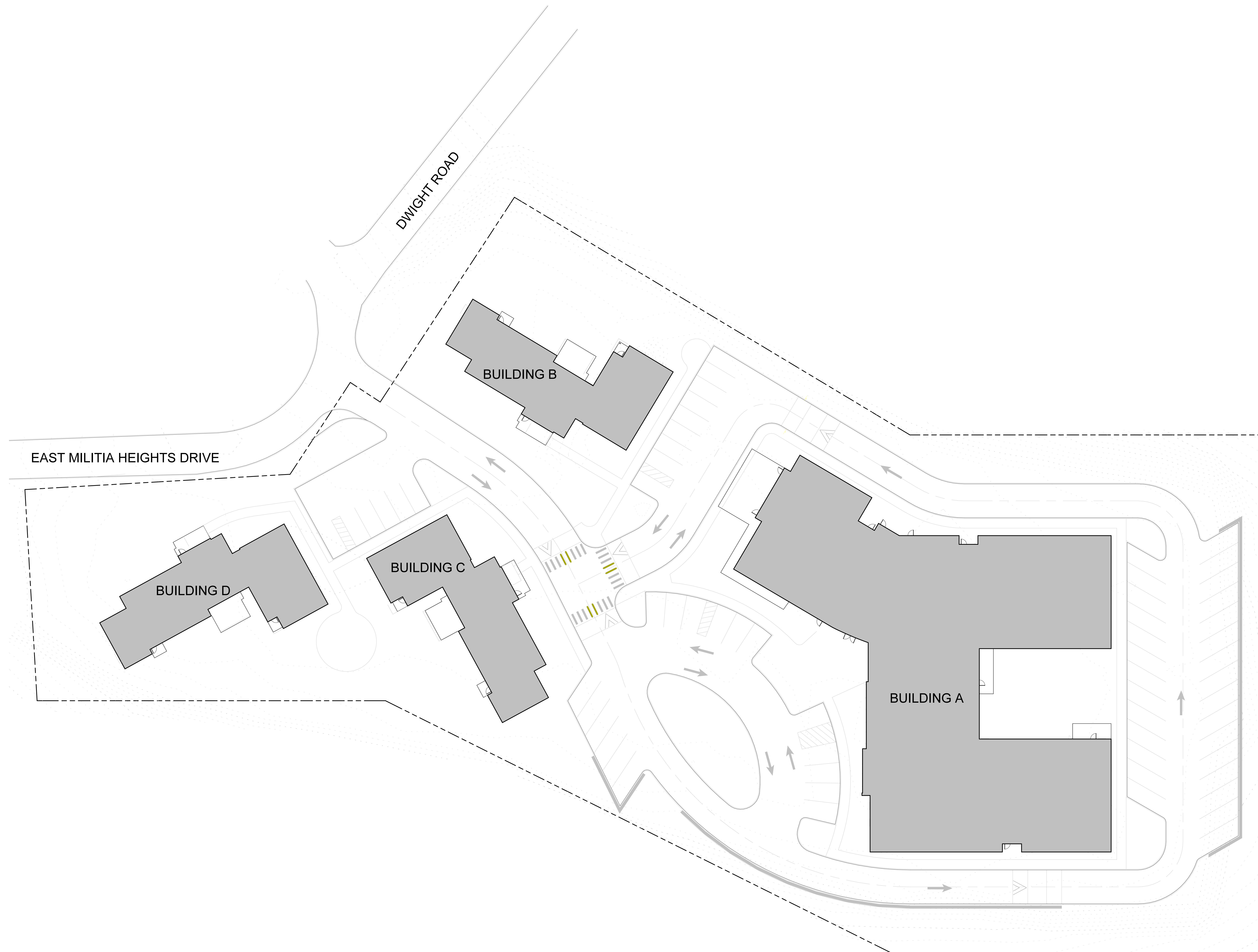
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- LEGEND
- STUDIO
 - 1 BEDROOM
 - 2 BEDROOM
 - CORRIDOR
 - STAIRS / ELEVATORS
 - AMENITY
 - SERVICES
 - OFFICE



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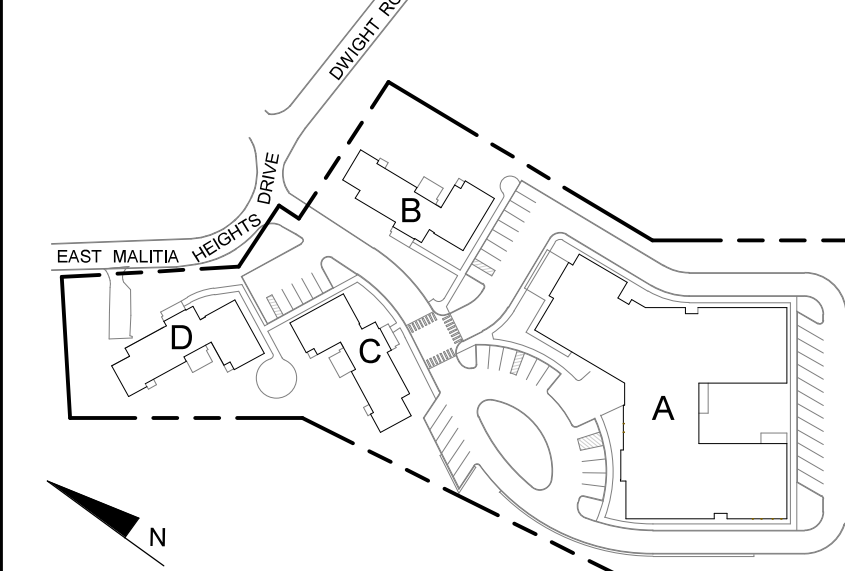


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Project Name:
CHARLES RIVER HEIGHTS

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

OVERALL PLAN - LEVEL 1

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23032

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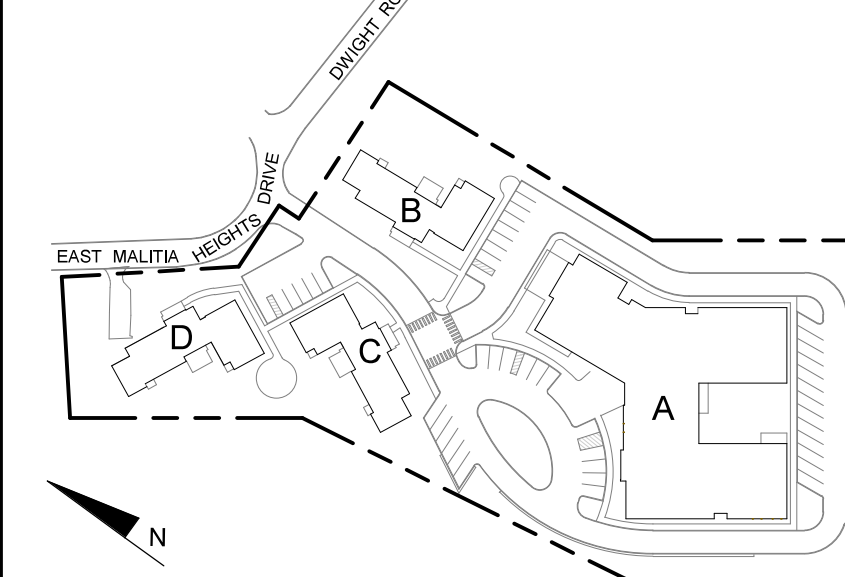


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CHARLES RIVER HEIGHTS

**EAST MILITIA HEIGHTS DR
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OVERALL PLAN - LEVEL 2

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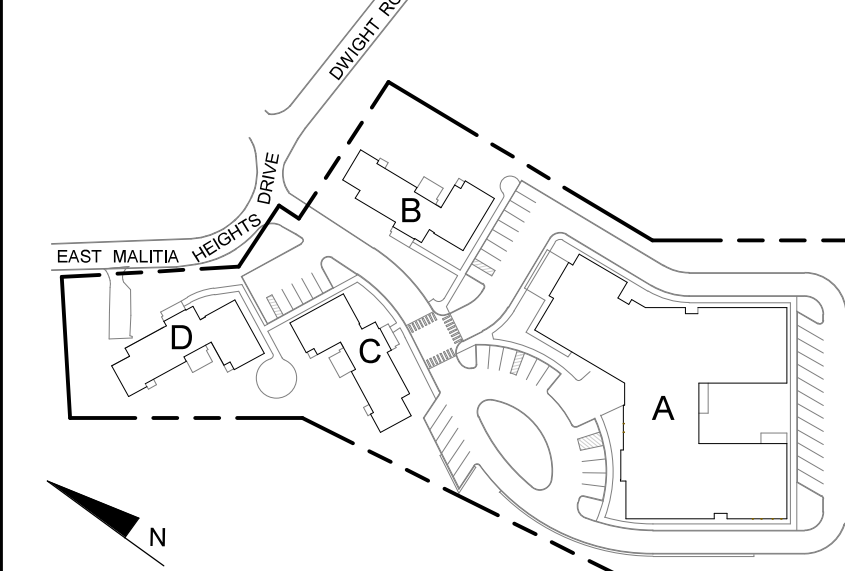


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Project Name:
CHARLES RIVER HEIGHTS

**EAST MILITIA HEIGHTS DR
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OVERALL PLAN - LEVEL 3

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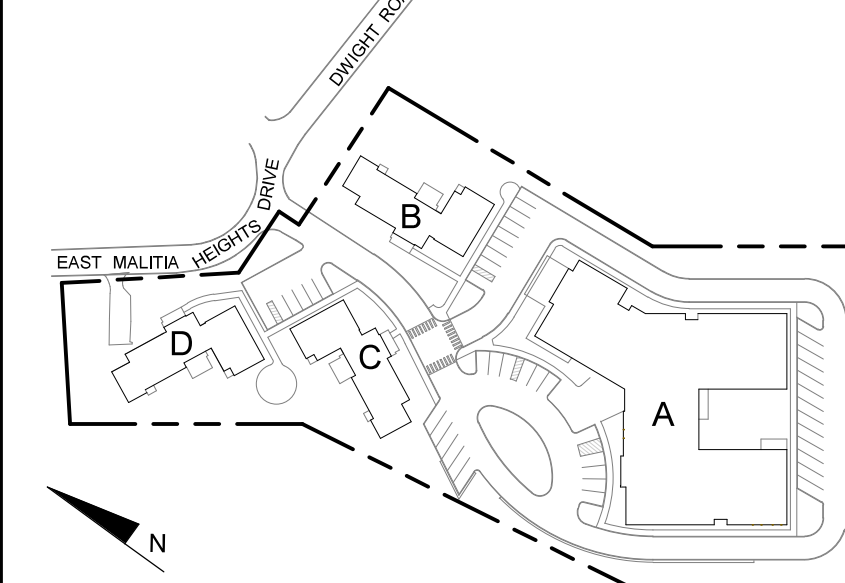


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EAST MILITIA HEIGHTS DR
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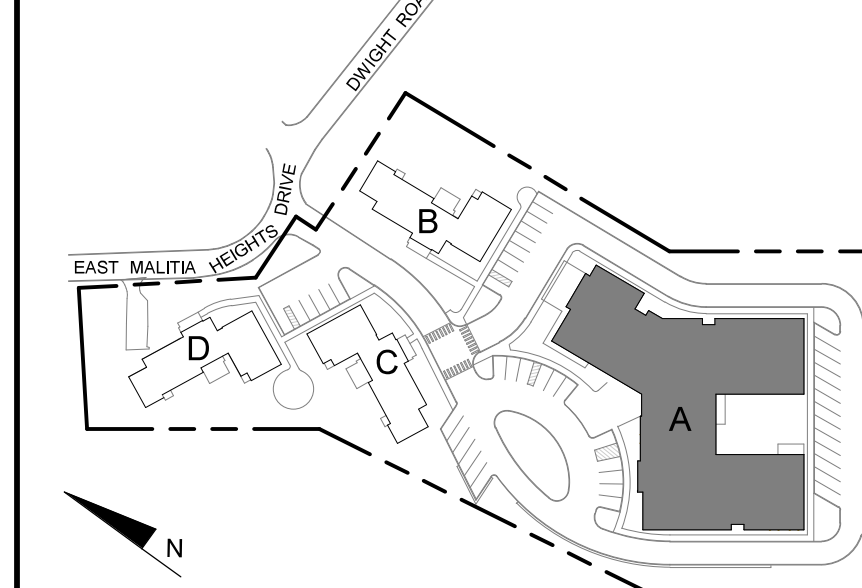


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**CHARLES RIVER
HEIGHTS**

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

**BUILDING A - ENLARGED
PLAN - LEVEL 1**

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10 BUILDING A - ENLARGED PLAN - LEVEL 1
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Revision:

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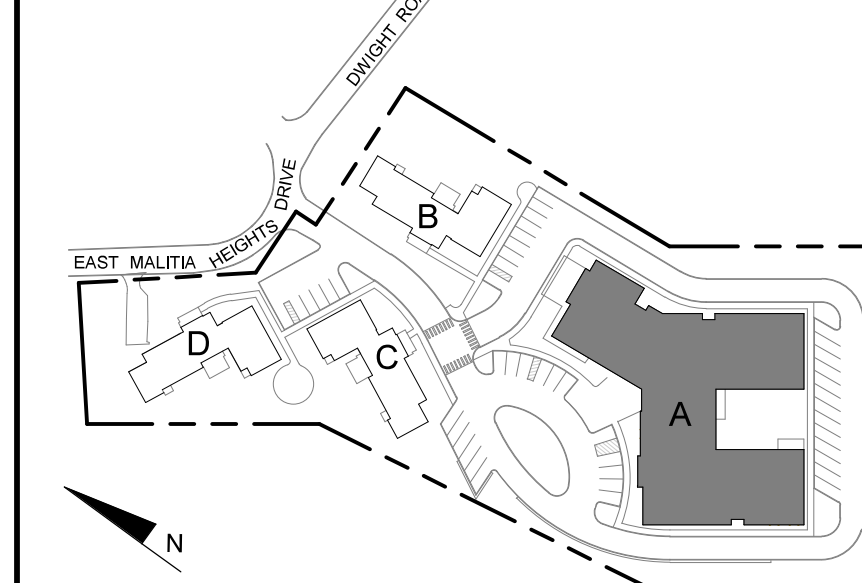


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Checked: JS

Scale: 1/8" = 1'-0"

Key Plan:



Project Name:

**CHARLES RIVER
HEIGHTS**

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

**BUILDING A - ENLARGED
PLAN - LEVEL 2**

Project Number:

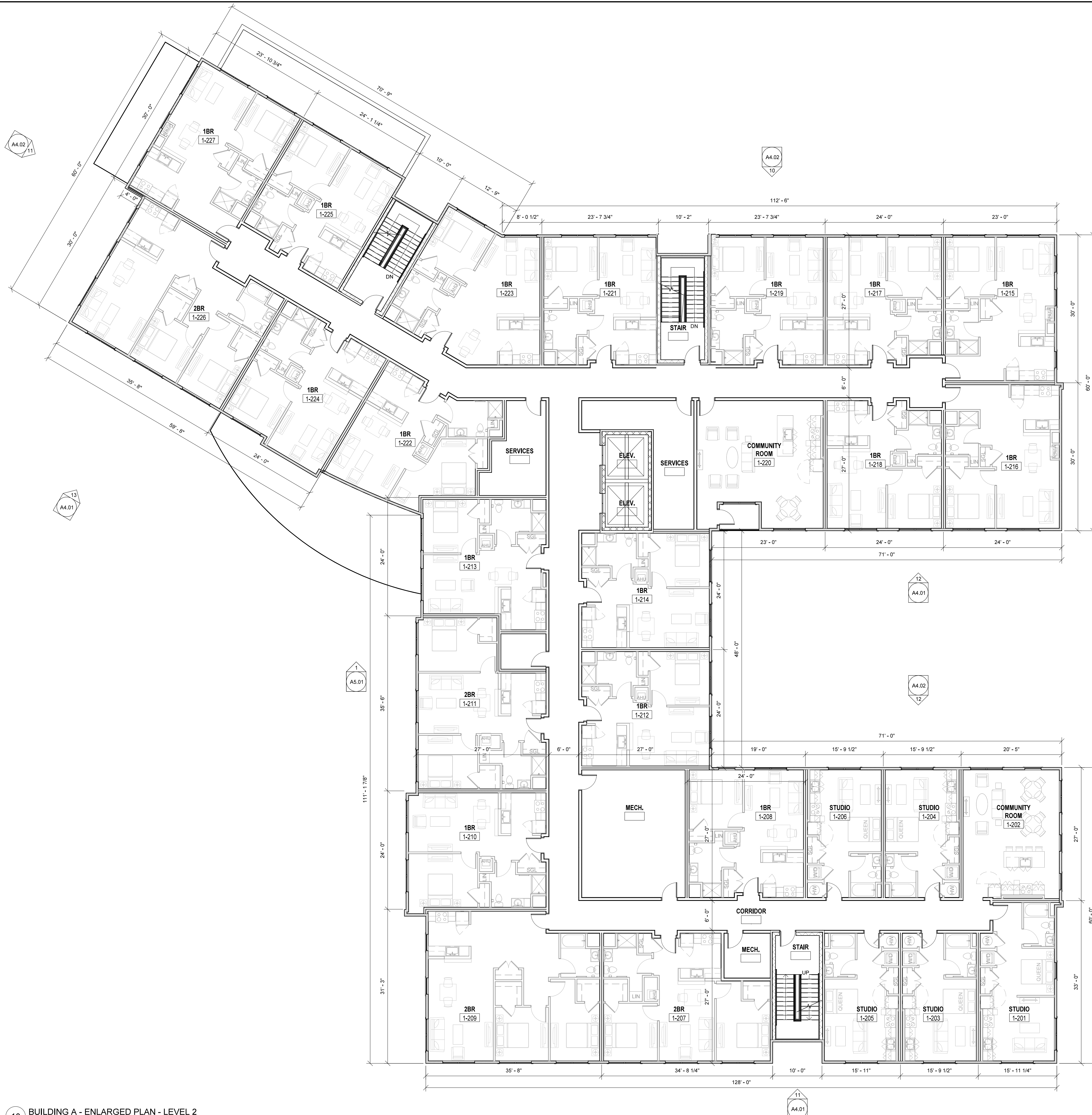
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Issue Date:

OCTOBER 06, 2025

Sheet Number:

A2.02



10 BUILDING A - ENLARGED PLAN - LEVEL 2
Scale: 1/8" = 1'-0"

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Revision:

Architect of Record:

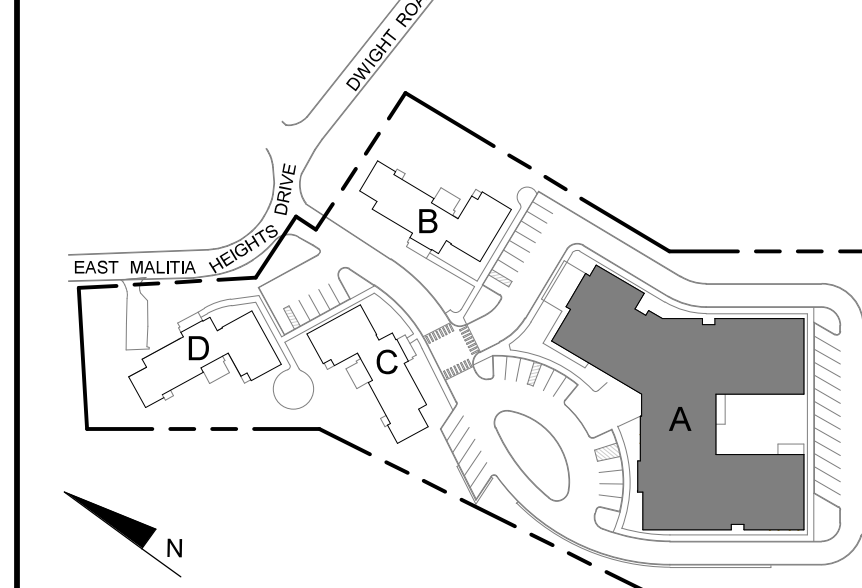


Drawn: RP

Checked: JS

Scale: 1/8" = 1'-0"

Key Plan:



Project Name:

**CHARLES RIVER
HEIGHTS**

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

**BUILDING A - ENLARGED
PLAN - LEVEL 3**

Project Number:

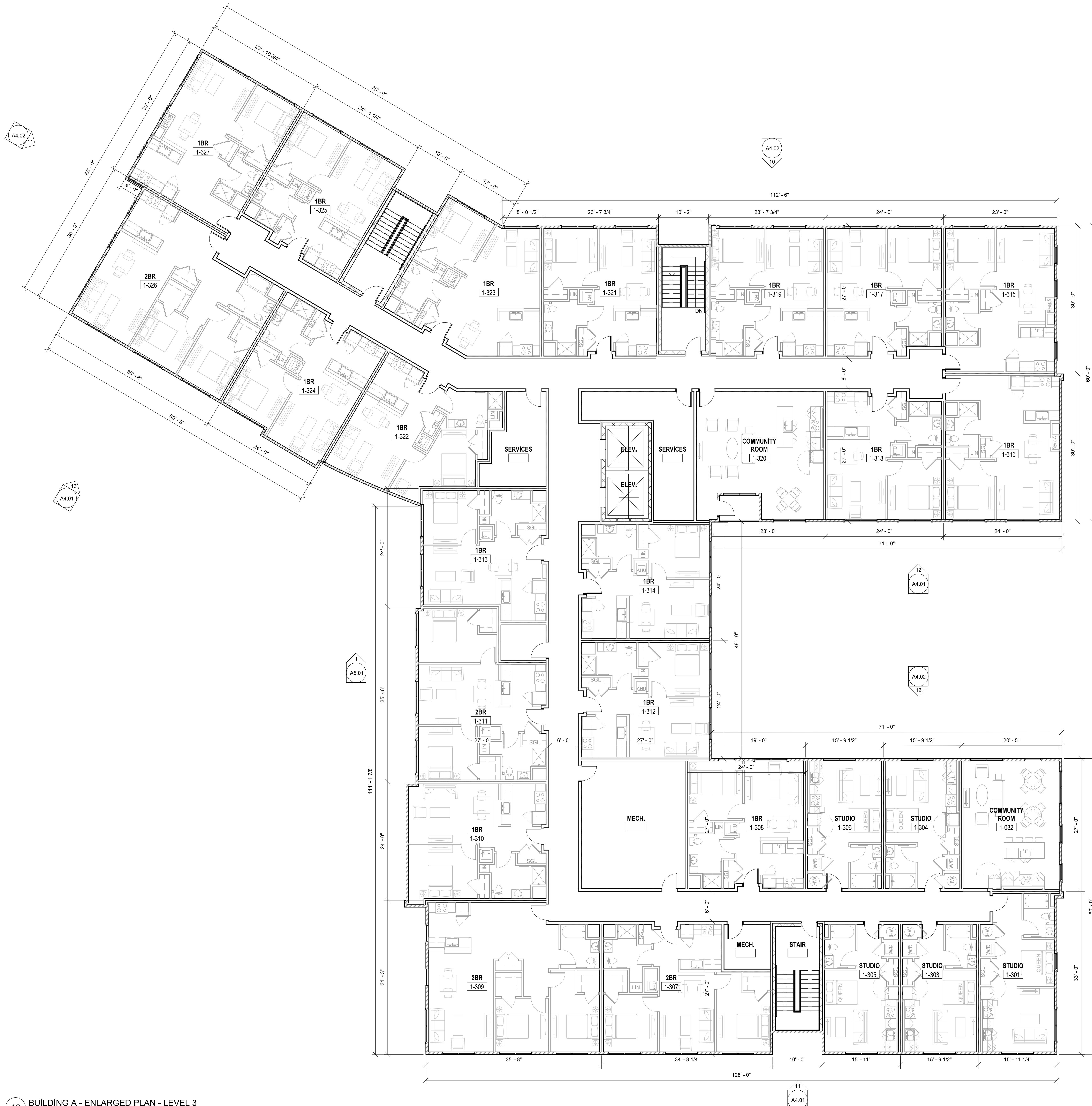
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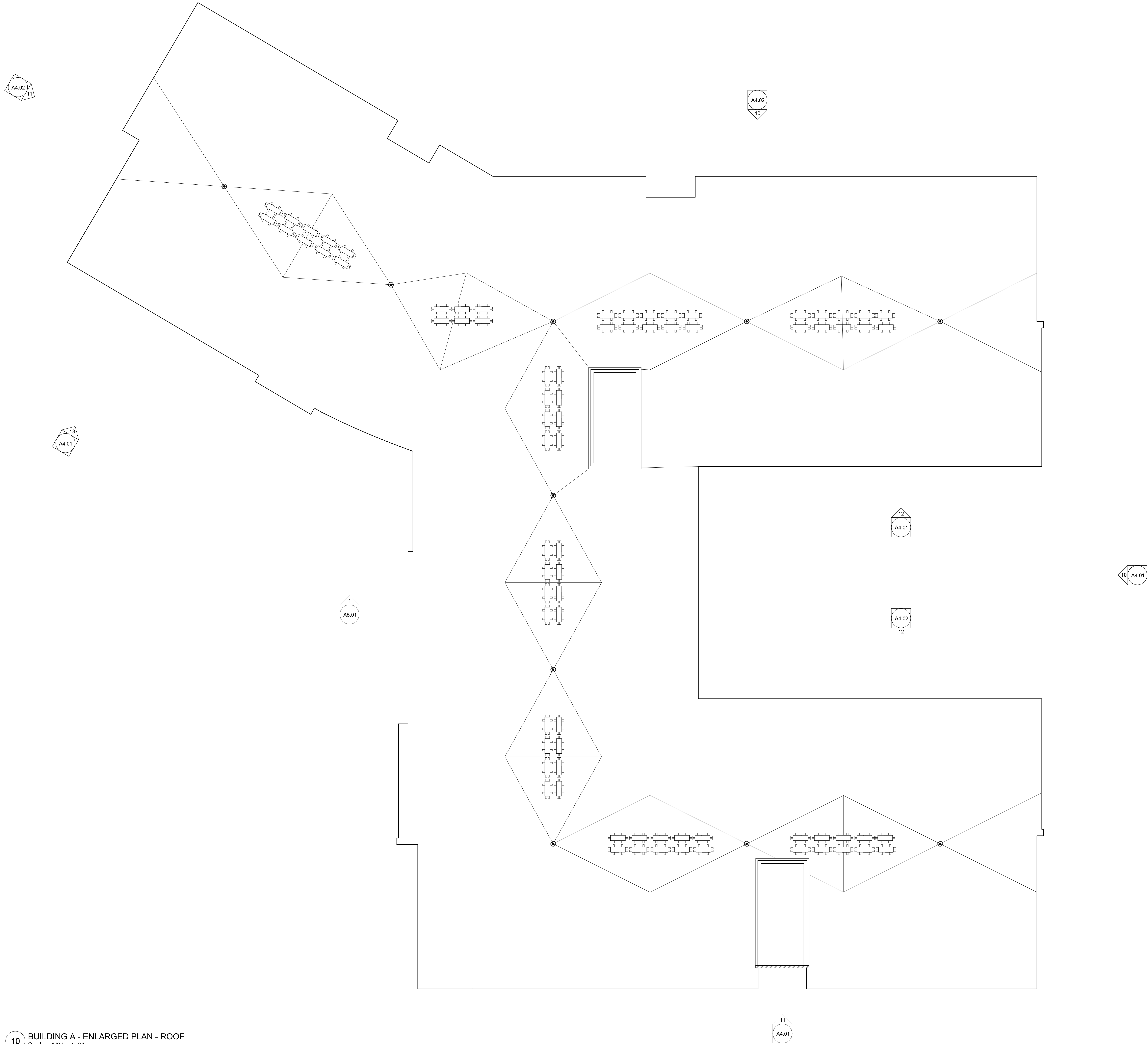
OCTOBER 06, 2025

Sheet Number:

A2.03



10 **BUILDING A - ENLARGED PLAN - LEVEL 3**
Scale: 1/8" = 1'-0"



10 BUILDING A - ENLARGED PLAN - ROOF
Scale: 1/8" = 1'-0"

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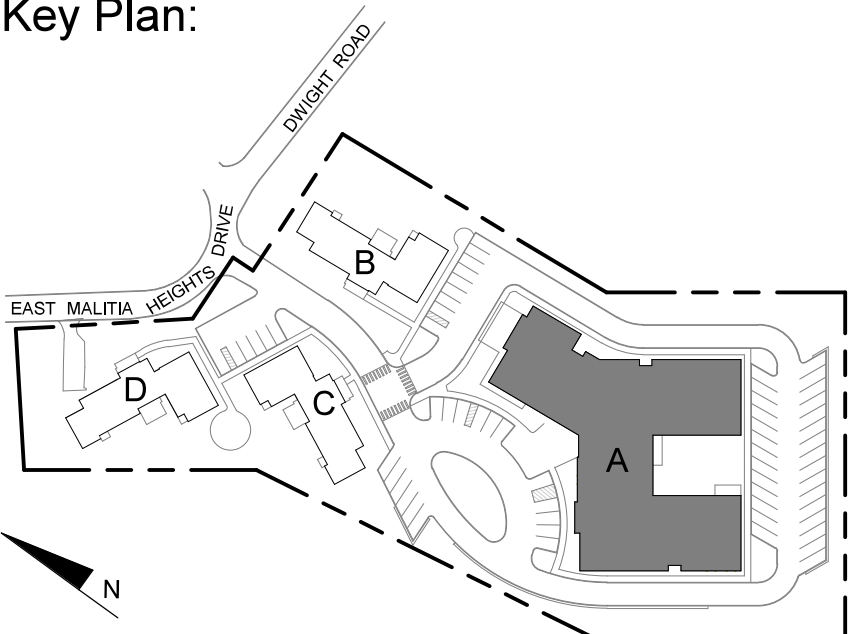


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Scale: 1/8" = 1'-0"

Key Plan:



Project Name:

CHARLES RIVER HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

BUILDING A - ENLARGED
PLAN - ROOF

Project Number:

23032

Issue Date:

OCTOBER 06, 2025

Sheet Number:

A2.04

Consultant:

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Architect of Record:

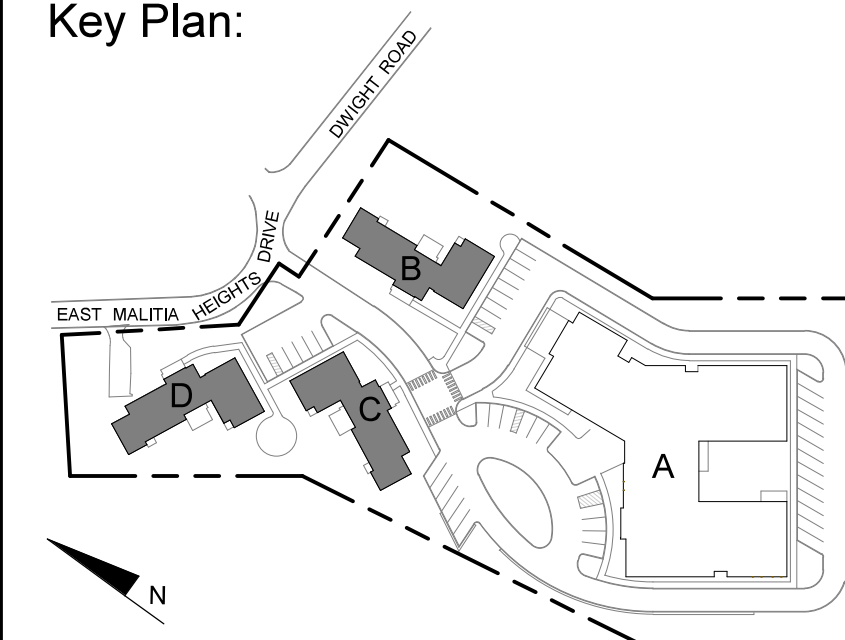


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Key Plan:



Project Name:

**CHARLES RIVER
HEIGHTS**

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

**BUILDING B, C & D -
ENLARGED PLANS -
LEVEL 1 & ROOF**

Project Number:

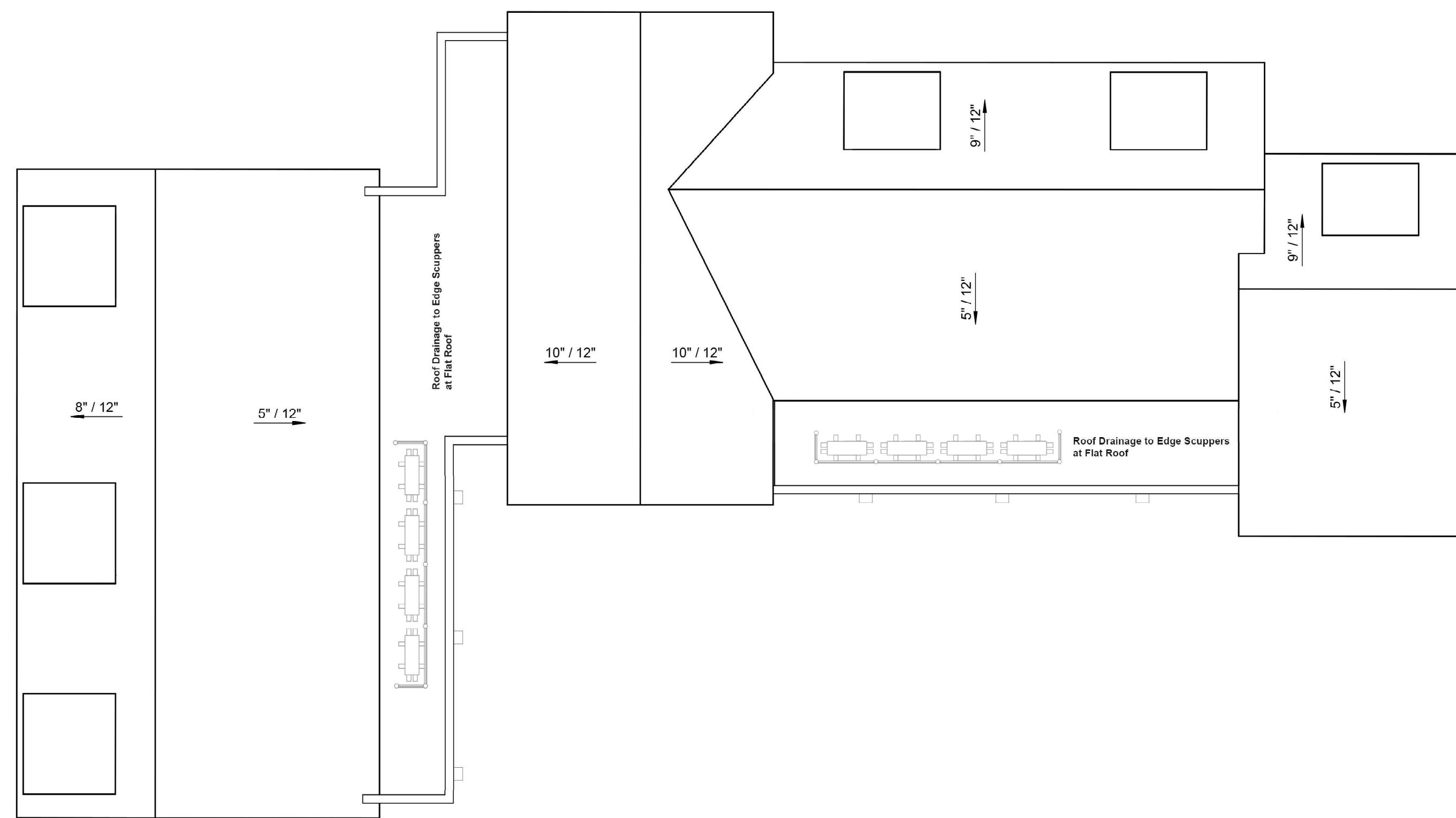
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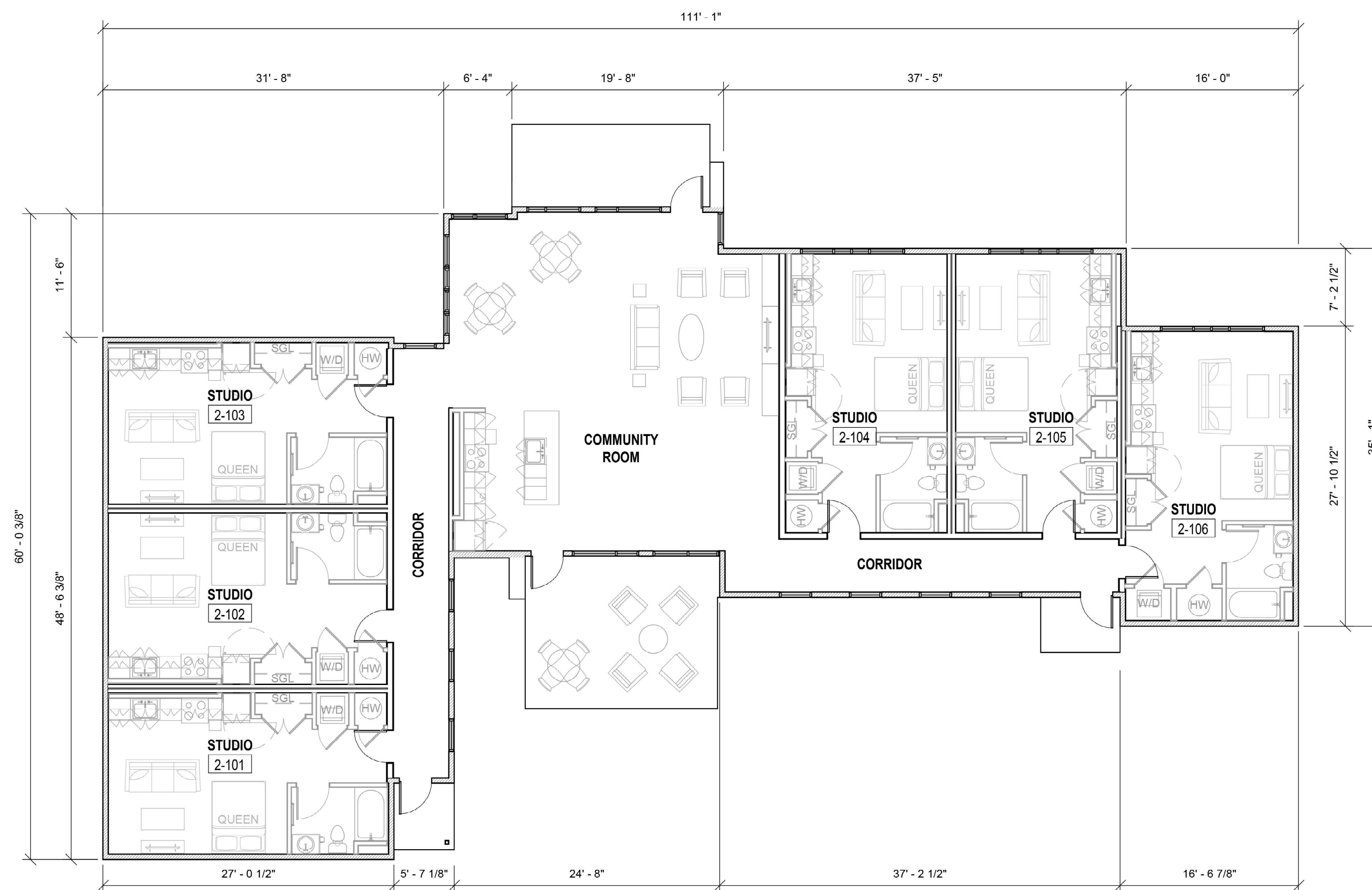
OCTOBER 06, 2025

Sheet Number:

A2.05



11 BUILDING B, C & D - ENLARGED PLAN - ROOF
Scale: 1/8" = 1'-0"



10 BUILDING B, C & D - ENLARGED PLAN - LEVEL 1
Scale: 1/8" = 1'-0"



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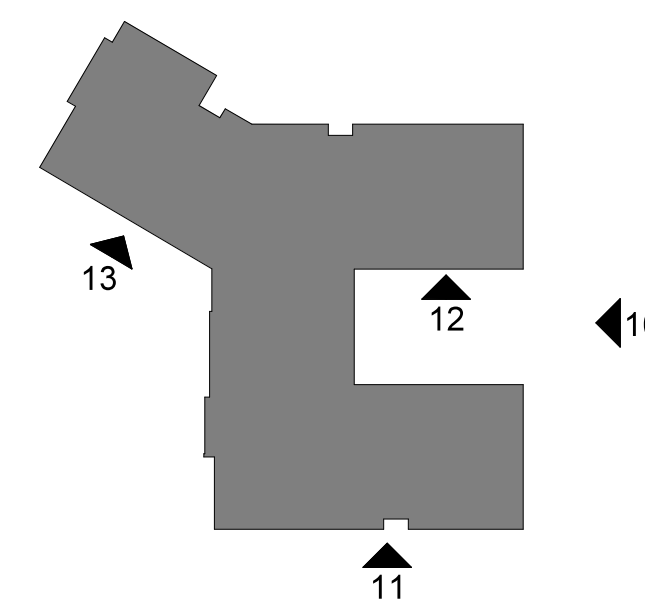


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Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

BUILDING A - EXTERIOR
ELEVATIONS

Project Number:

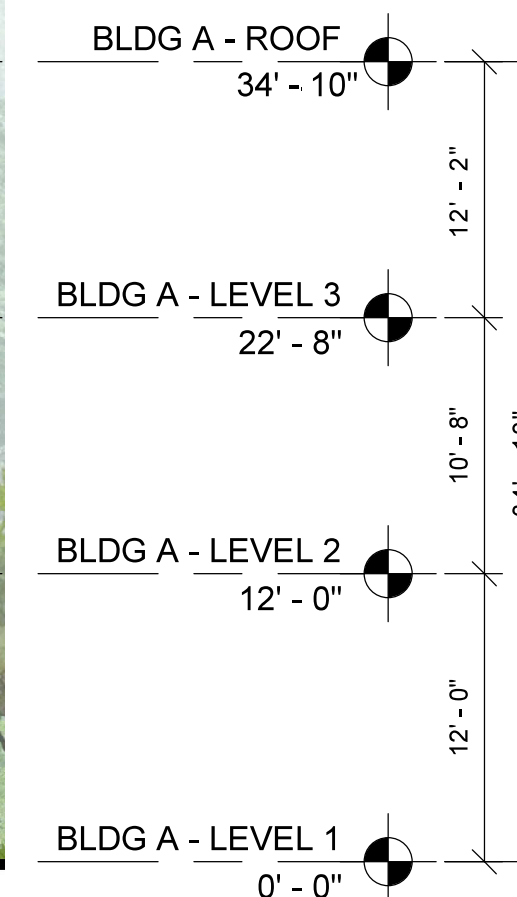
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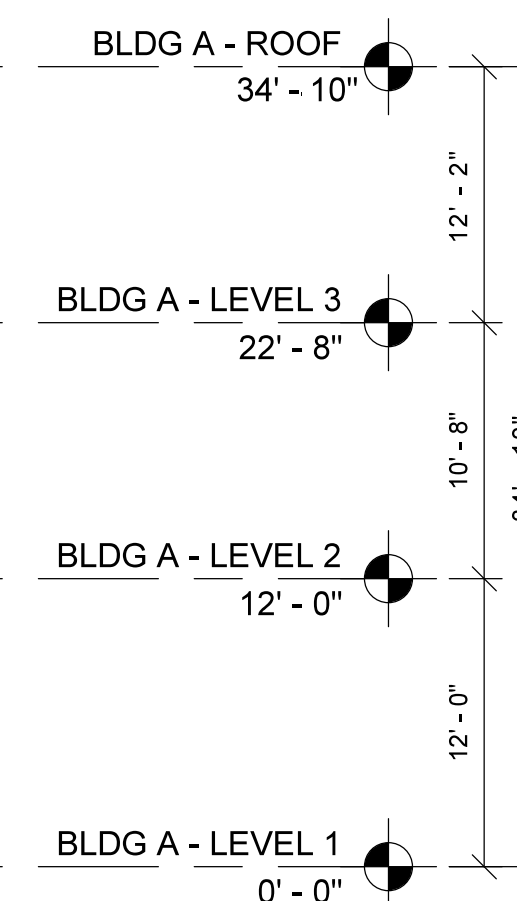
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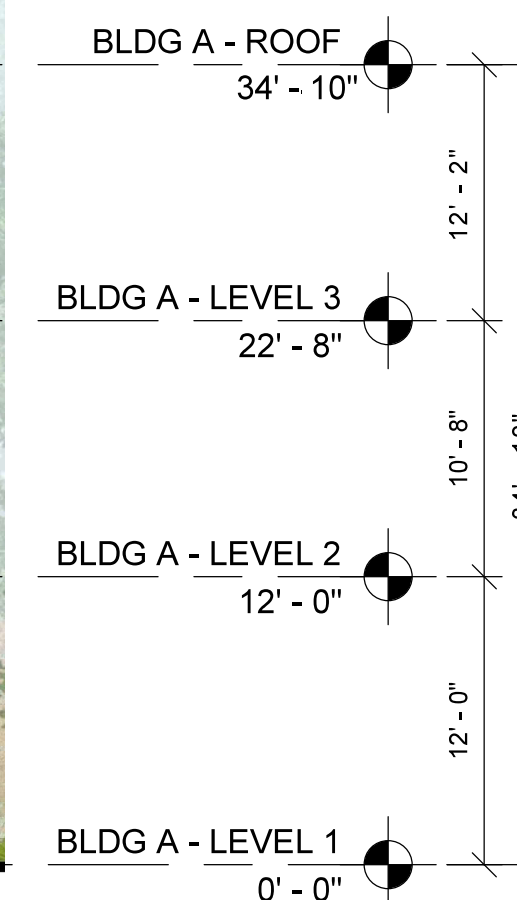
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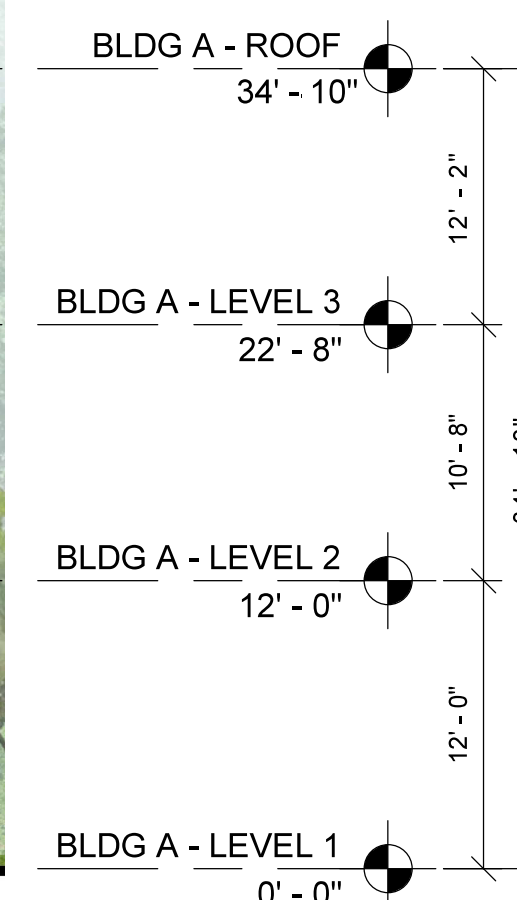
13 BUILDING A - ELEVATION 4
Scale: 1/8" = 1'-0"



12 BUILDING A - ELEVATION 3
Scale: 1/8" = 1'-0"



11 BUILDING A - ELEVATION 2
Scale: 1/8" = 1'-0"



10 BUILDING A - ELEVATION 1
Scale: 1/8" = 1'-0"

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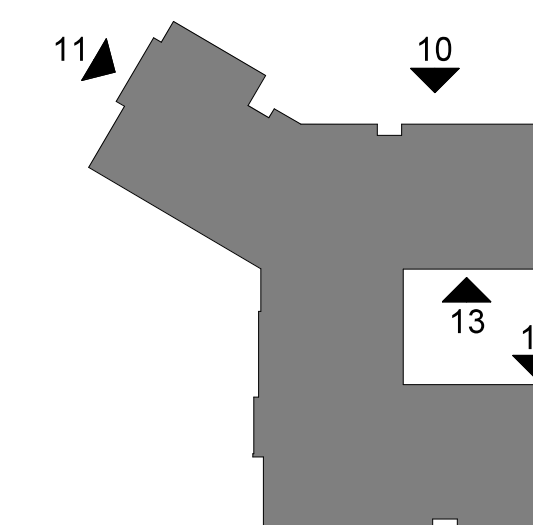


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Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

BUILDING A - EXTERIOR
ELEVATIONS

Project Number:

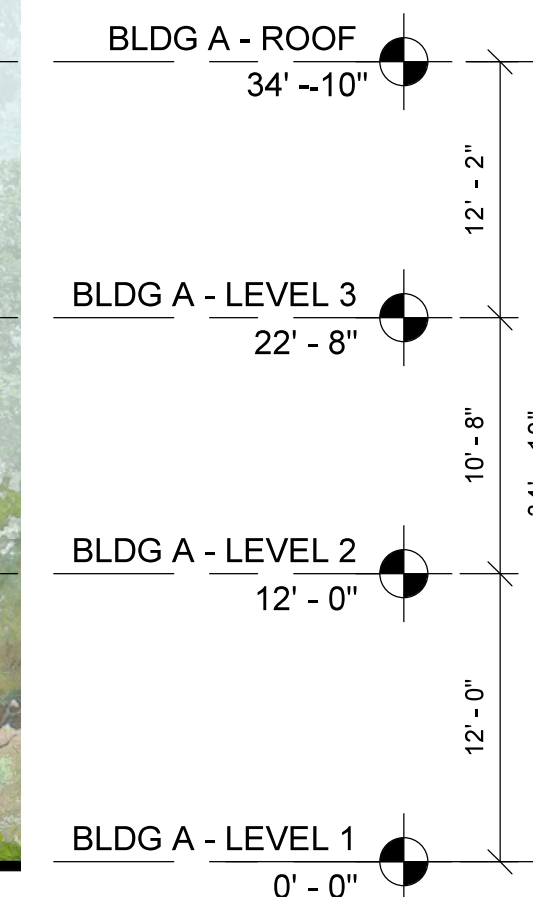
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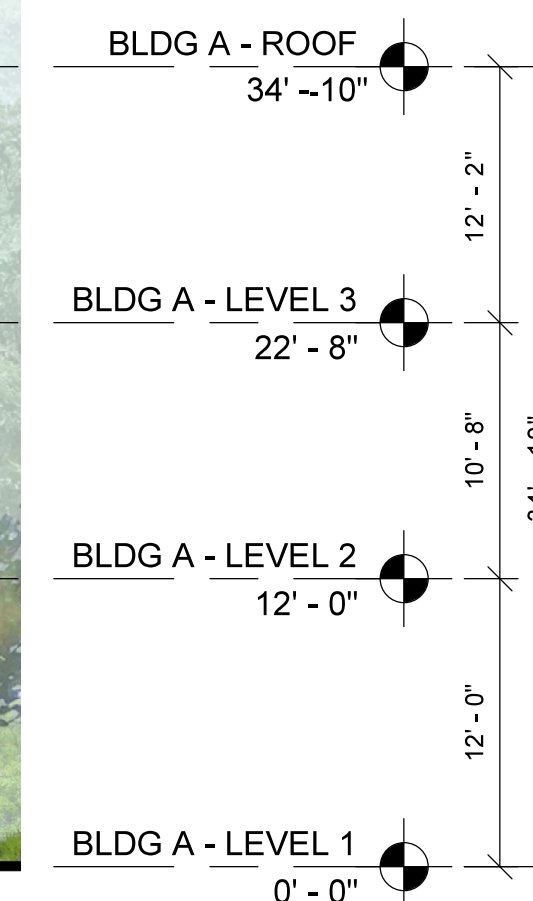
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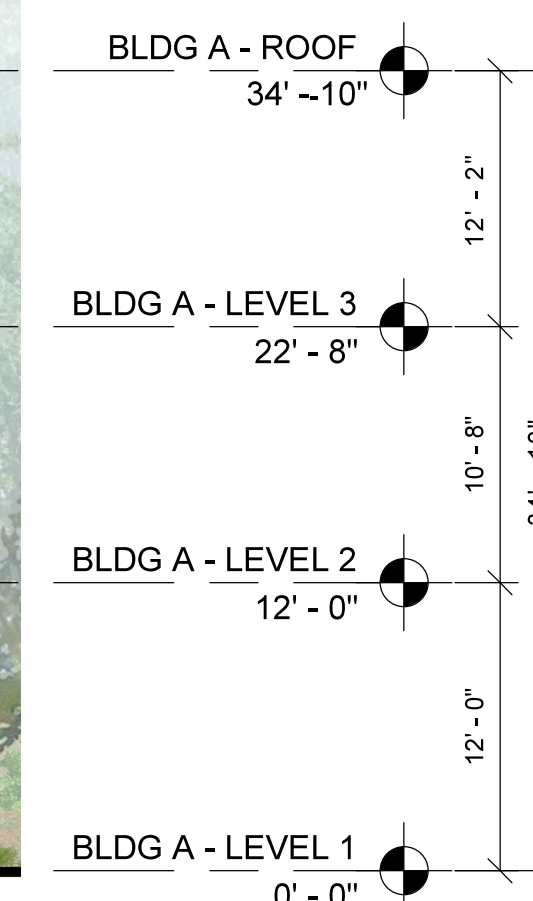
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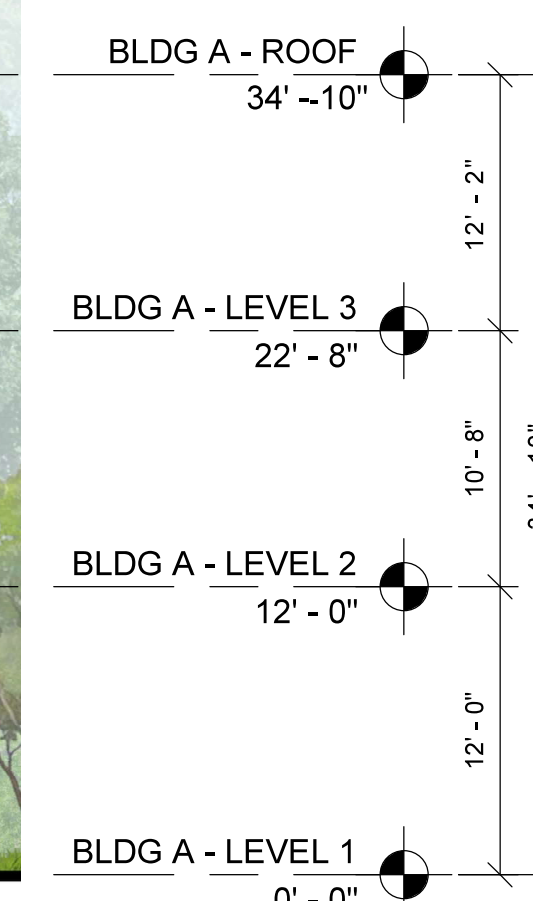
13 BUILDING A - ELEVATION 8
Scale: 1/8" = 1'-0"



12 BUILDING A - ELEVATION 7
Scale: 1/8" = 1'-0"



11 BUILDING A - ELEVATION 6
Scale: 1/8" = 1'-0"



10 BUILDING A - ELEVATION 5
Scale: 1/8" = 1'-0"

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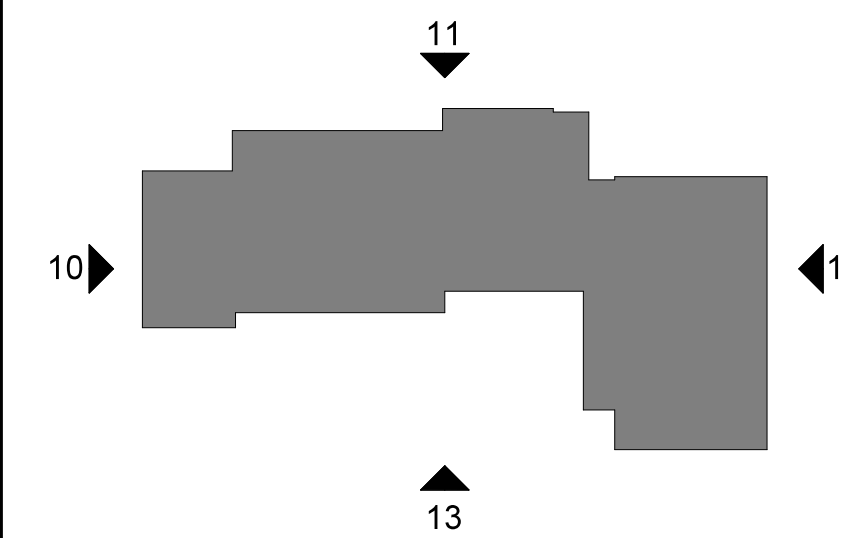


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Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

BUILDING B, C & D -
EXTERIOR ELEVATIONS

Project Number:

23032

Issue Date:

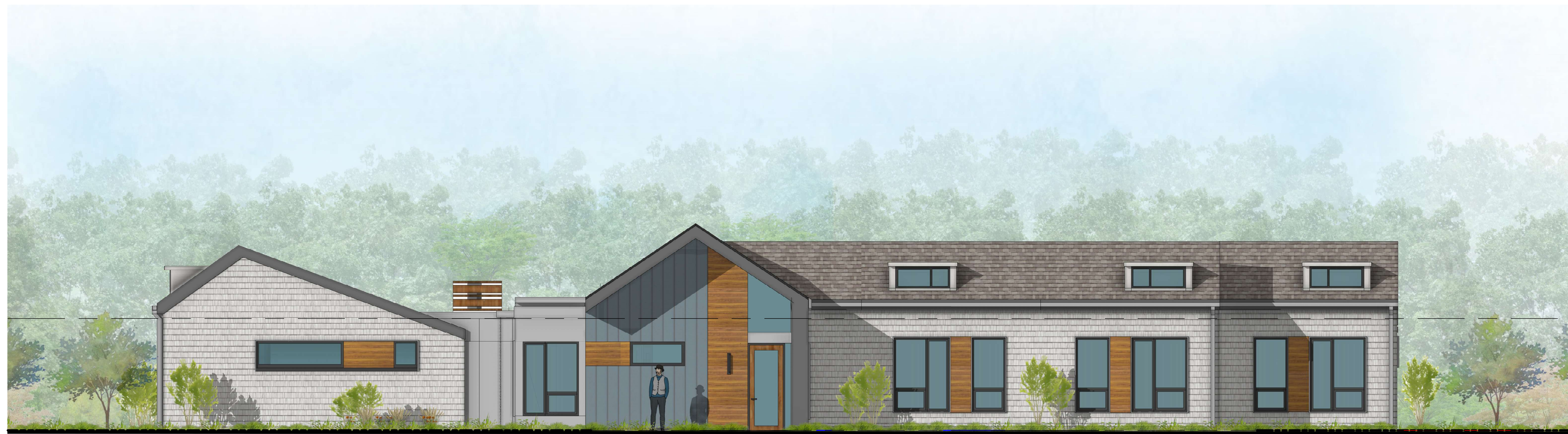
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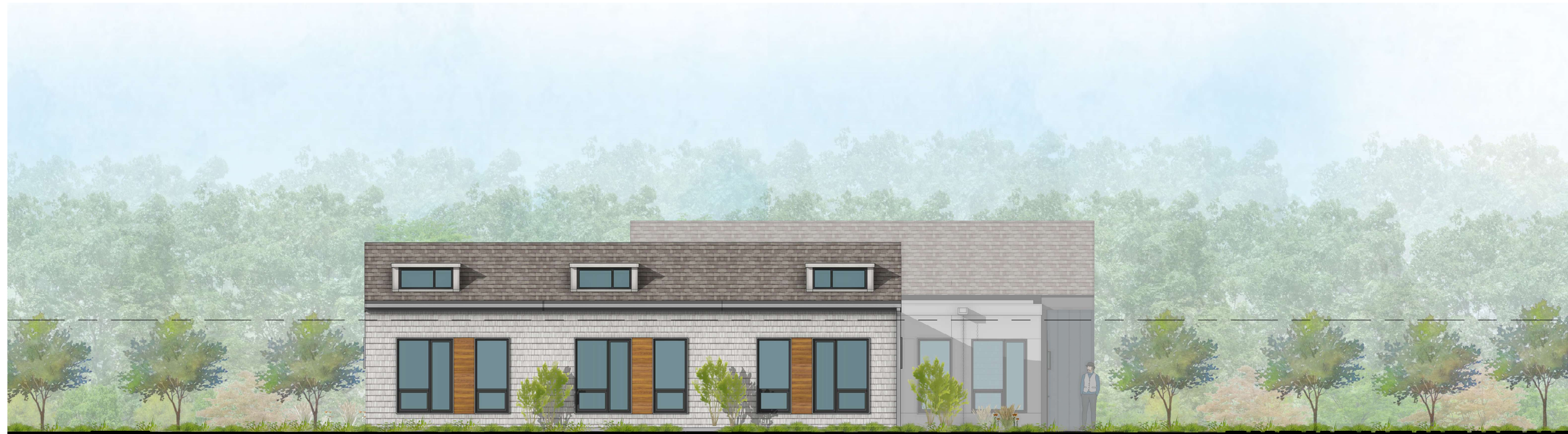
A4.03



13 BUILDING B, C & D - ELEVATION 4
Scale: 1/8" = 1'-0"



12 BUILDING B, C & D - ELEVATION 3
Scale: 1/8" = 1'-0"



11 BUILDING B, C & D - ELEVATION 2
Scale: 1/8" = 1'-0"



10 BUILDING B, C & D - ELEVATION 1
Scale: 1/8" = 1'-0"

Consultant:

Revision:

Architect of Record:

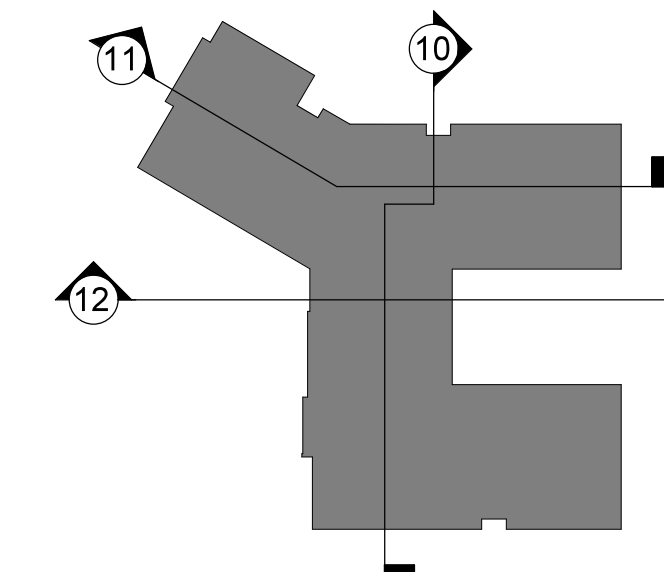


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Key Plan:



Project Name:

CHARLES RIVER HEIGHTS

**EAST MILITIA HEIGHTS DR
NEEDHAM, MA**

Sheet Name:

BUILDING A - SECTIONS

Project Number:

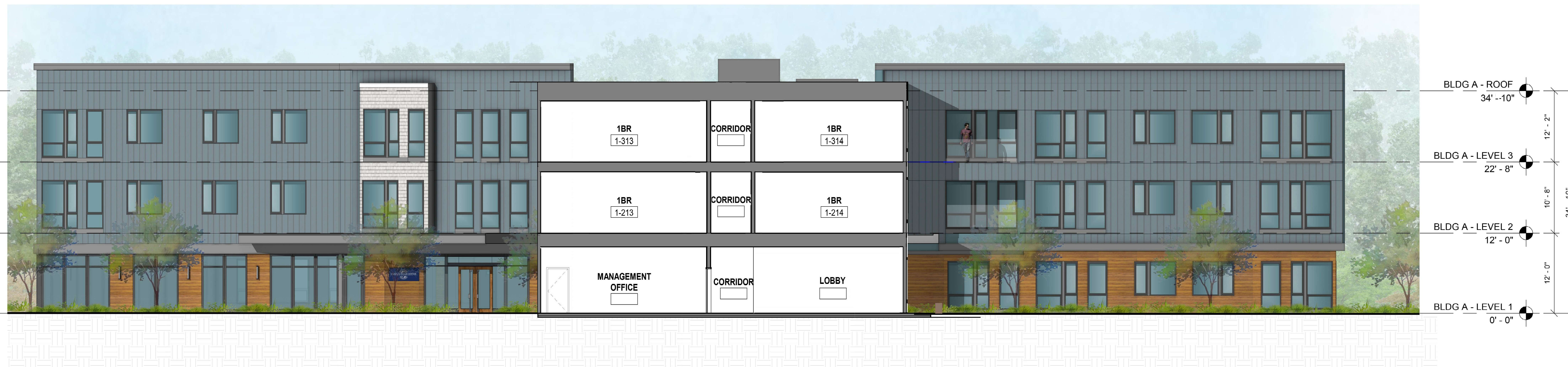
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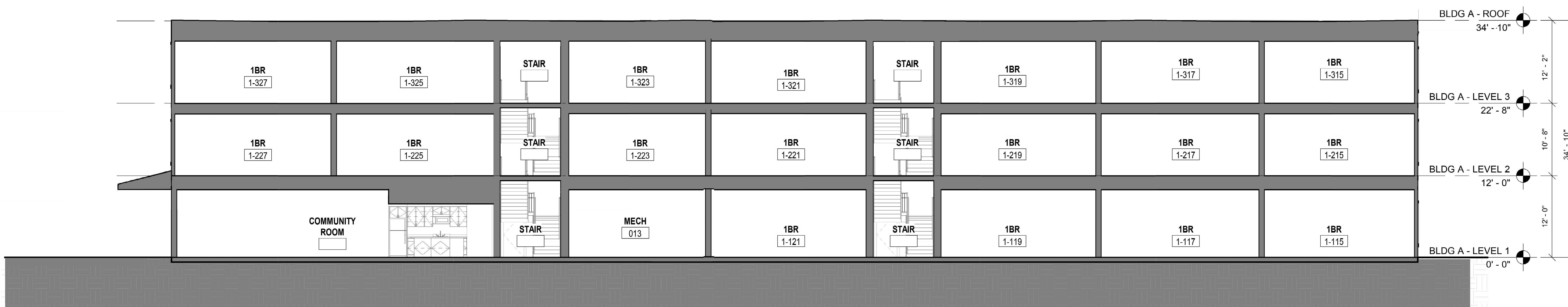
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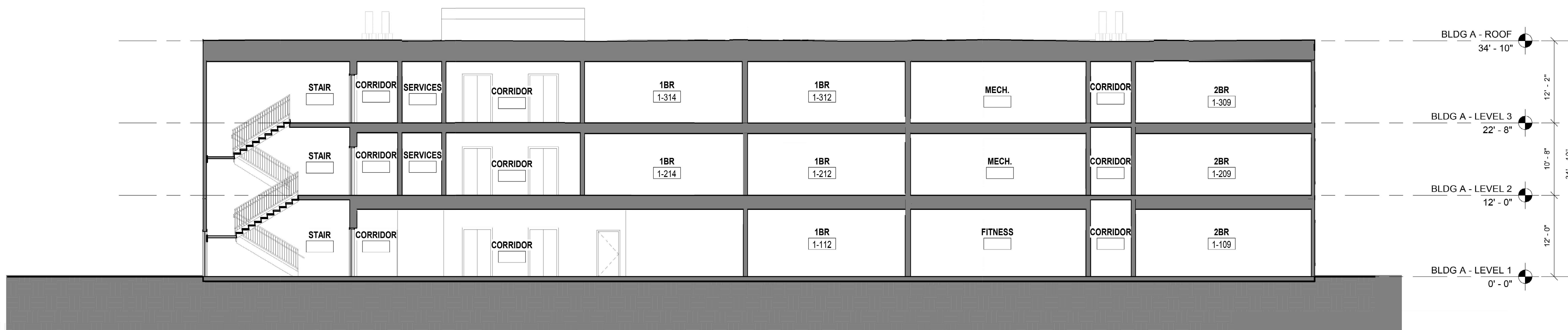
A5.01



13 BUILDING A - SECTION 3
Scale: 1/8" = 1'-0"



11 BUILDING A - SECTION 2
Scale: 1/8" = 1'-0"



10 BUILDING A - SECTION 1
Scale: 1/8" = 1'-0"

Consultant:

Revision:

Architect of Record:

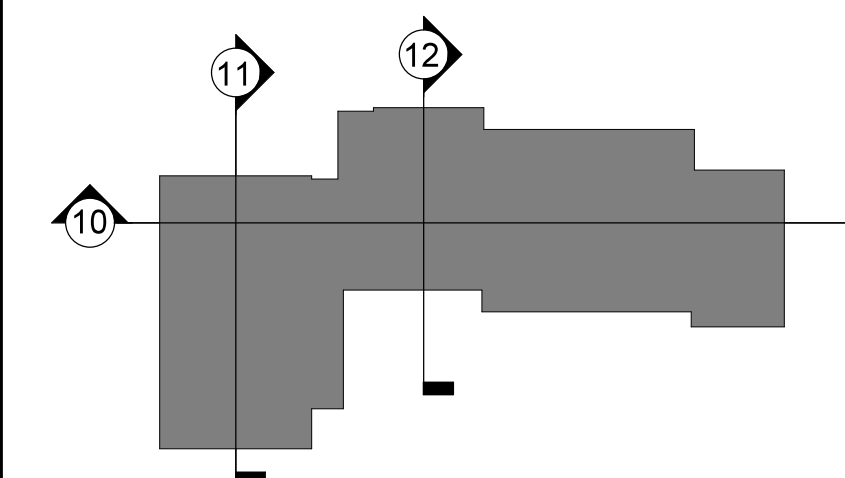


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Scale: 1/8" = 1'-0"

Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

BUILDING B, C & D -
SECTIONS

Project Number:

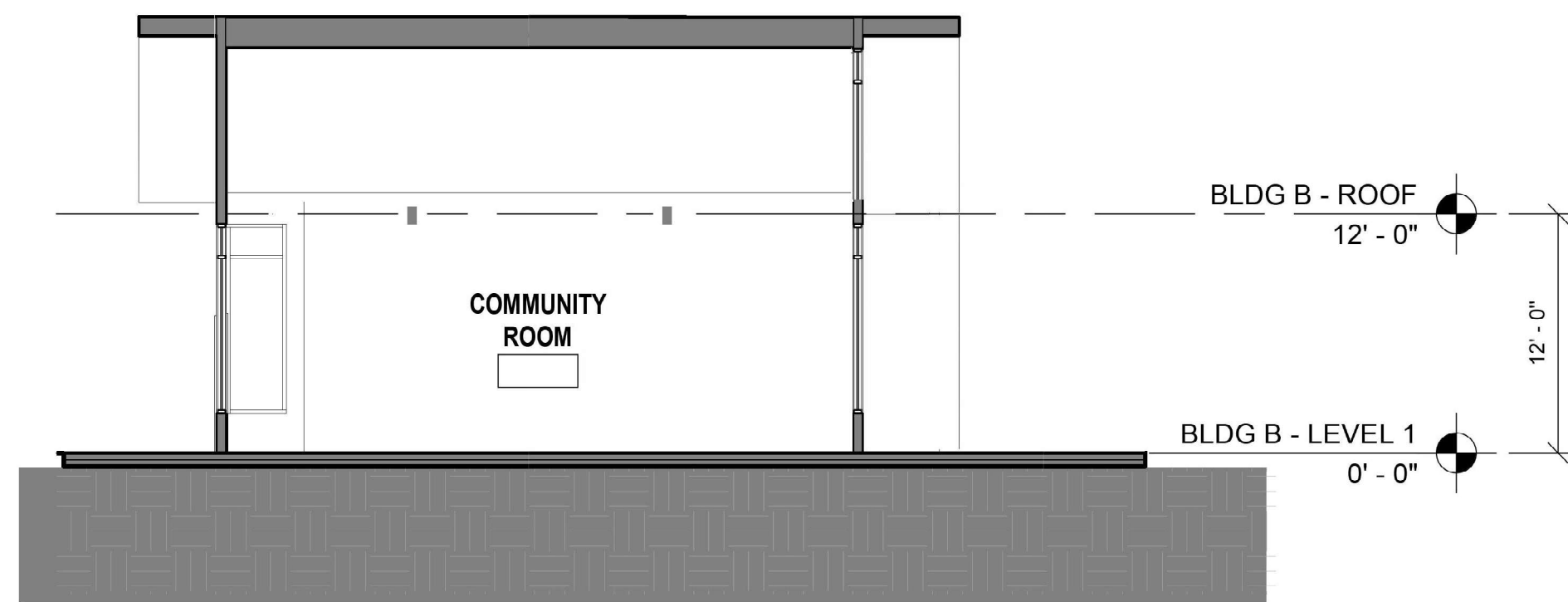
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Issue Date:

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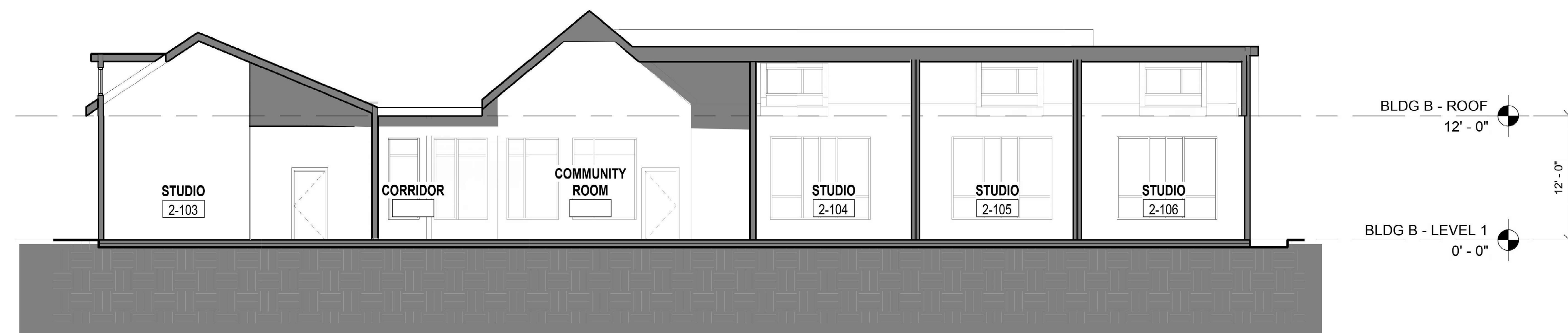
A5.02



12 BUILDING B - SECTION 3
Scale: 1/8" = 1'-0"



11 BUILDING B - SECTION 2
Scale: 1/8" = 1'-0"



10 BUILDING B - SECTION 1
Scale: 1/8" = 1'-0"

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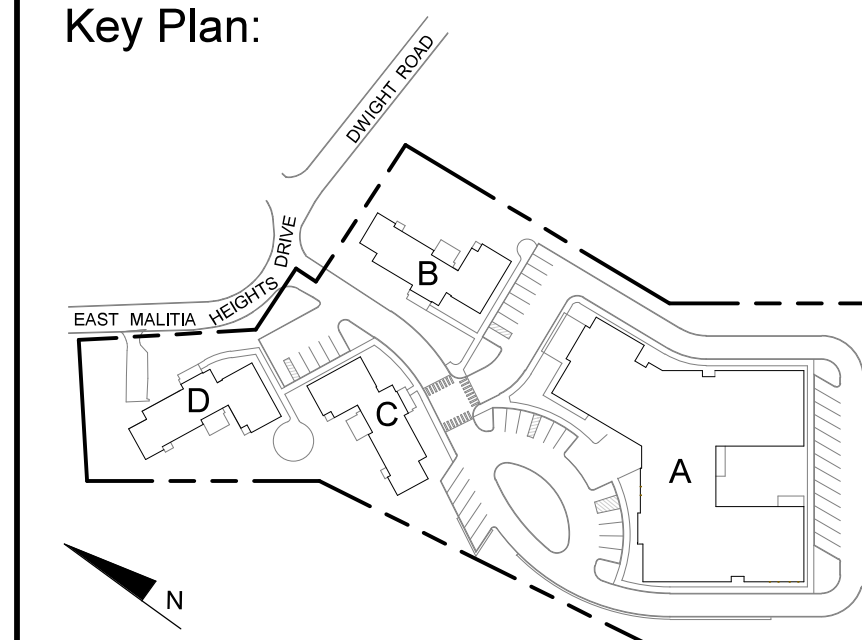


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Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

RENDERINGS

Project Number:

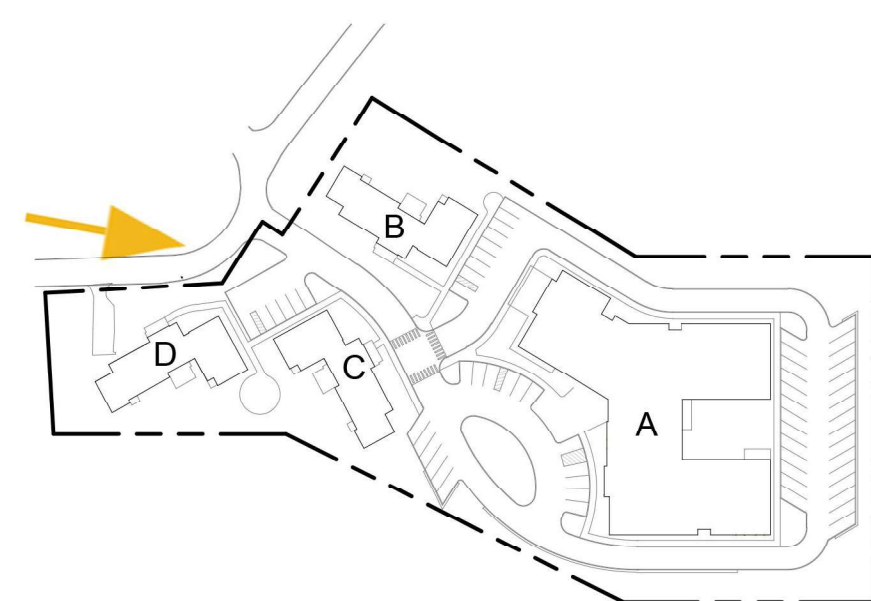
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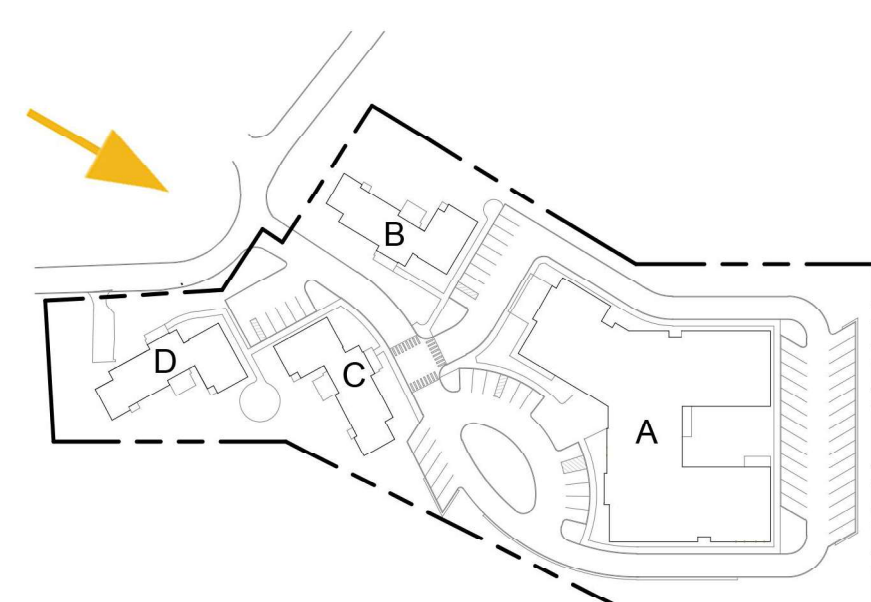
OCTOBER 06, 2025

Sheet Number:

A5.03



View at East Militia Heights Drive



Aerial View Looking South East

Consultant:

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Architect of Record:

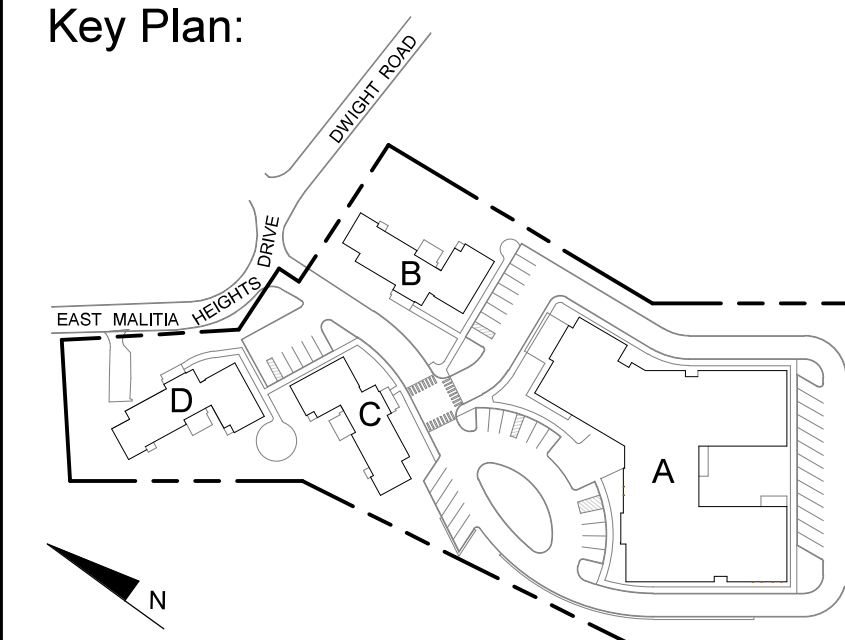


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Scale:

Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

RENDERINGS

Project Number:

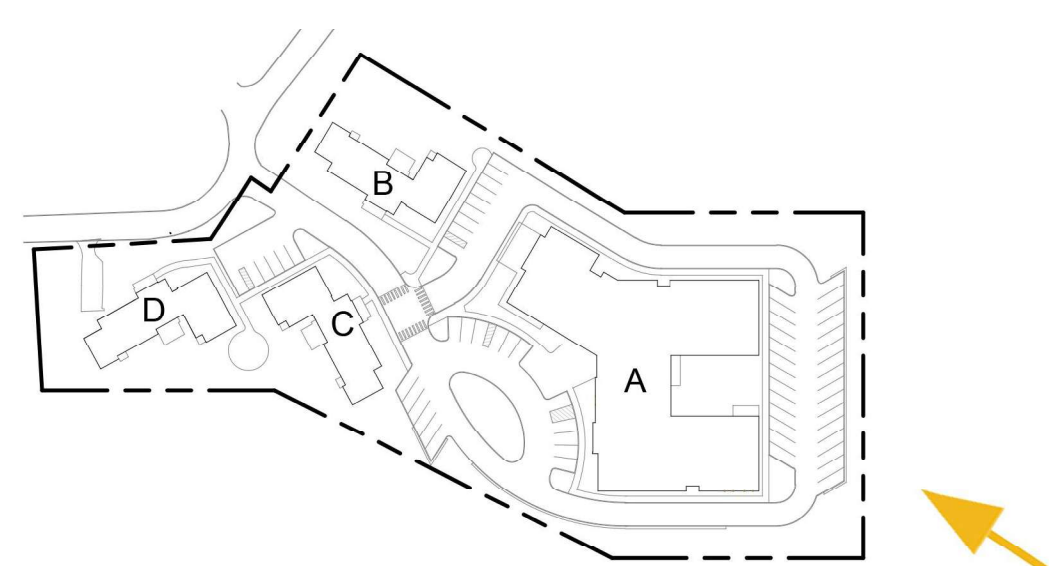
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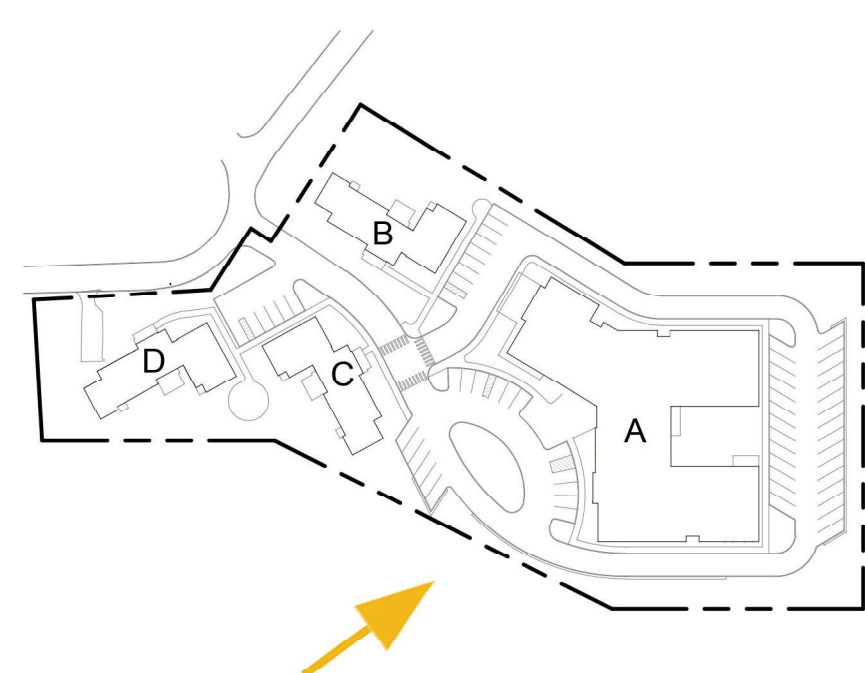
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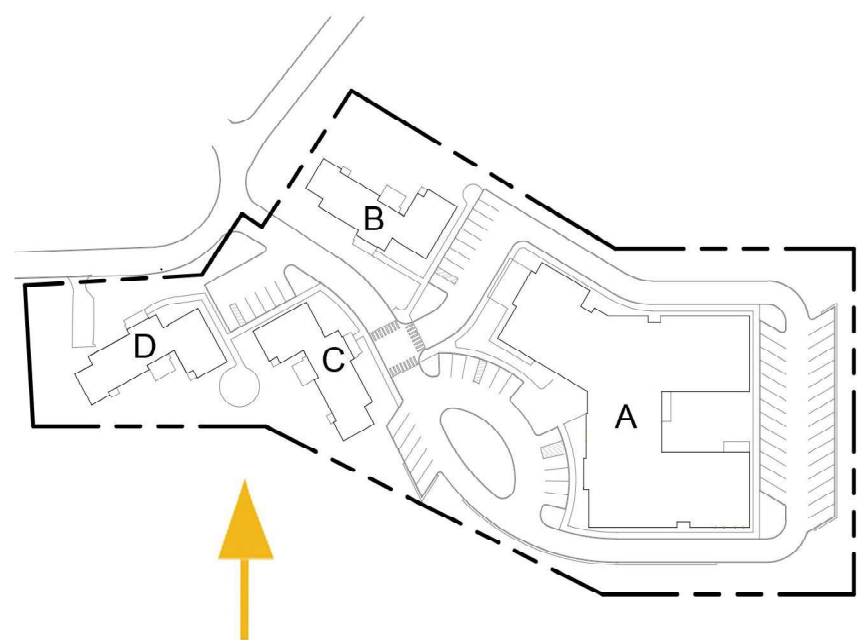
A5.04



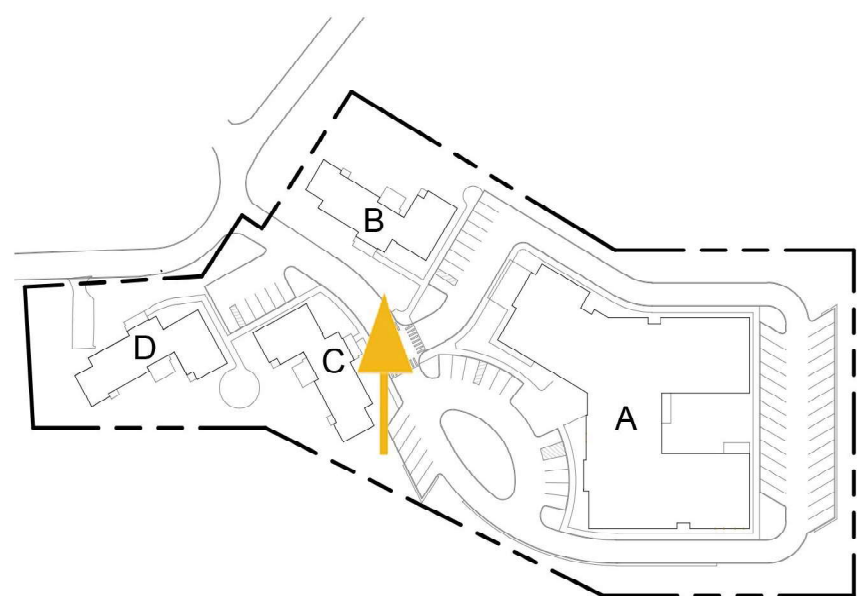
View Looking To Building A
South Residential Entry



View Looking To Building A
North Residential Entry



Rear View at Buildings C, D
Group Cottage



Front View at Building B
Group Cottage



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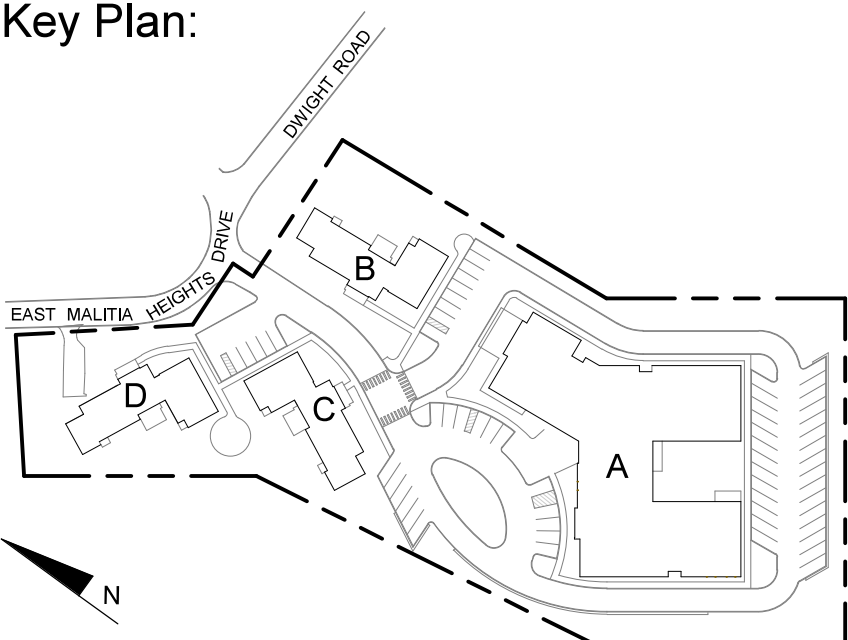


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Checked: JS

Scale:

Key Plan:



Project Name:

CHARLES RIVER
HEIGHTS

EAST MILITIA HEIGHTS DR
NEEDHAM, MA

Sheet Name:

RENDERINGS

Project Number:

23032

Issue Date:

OCTOBER 06, 2025

Sheet Number:

A5.05

B. Tabulation Data

A summary and tabulation of the proposed building program for the Project is below:

Tabulation of Existing Parcels:

Location	Parcel ID	Land Value	Building	Other	Total Value	Land Area
59 East Militia Heights Drive, Needham, MA	199/309.0-0010	\$1,011,842	\$0	N/A	\$1,011,842	3.5 acres

Tabulation of Proposed Building:

Address	Lot Size	Gross Building Area	# of Rental Units	Unit Size	Accessible Units
59 East Militia Heights Drive, Needham, MA	3.5 acres	79,744 sf	86	400 – 850 sf	43
Building A	-	67,672 sf	68	400 – 850 sf	25
Building B	-	4,024 sf	6	432 sf	6
Building C	-	4,024 sf	6	432 sf	6
Building D	-	4,024 sf	6	432 sf	6

Unit Summary

Overall	Affordable CRC	Affordable Sec. 8/MRVP	Affordable 60% AMI, LIHTC	Affordable 80% AMI	CRC Staff	TOTAL
Studio	33	0	0	0	0	33
1 Bedroom	5	0	30	3	5	43
2 Bedroom	0	7	1	2	0	10
Total	38	7	31	5	5	86

Building A	Affordable CRC	Affordable Sec. 8/MRVP	Affordable 60% AMI, LIHTC	Affordable 80% AMI	CRC Staff	TOTAL
Studio	15	0	0	0	0	15
1 Bedroom	5	0	30	3	5	43
2 Bedroom	0	7	1	2	0	10
Total	20	7	31	5	5	68

Building B, C, D	Affordable CRC	Affordable Sec. 8/MRVP	Affordable 60% AMI, LIHTC	Affordable 80% AMI	CRC Staff	TOTAL
Studio	18	0	0	0	0	18
Total	18	0	0	0	0	18

C. Applicant Entity Information

Although Section 56.04(6) of the 40B Regulations states that the issuance of a Determination of Project Eligibility shall be considered Board as conclusive evidence that the Project and the Applicant have satisfied the Project Eligibility requirements of 760 CMR 56.04(1).

Charles River Heights LLC, the applicant, is controlled by Charles River Heights MM LLC, its managing member. Charles River POUA, as , is requesting the Board to include as a condition within the Decision, to allow the Applicant to assign all rights under the Comprehensive Permit Decision to a single purpose entity in order to facilitate the Applicant's receipt of Project funding, including but not limited to Low Income Housing Tax Credit funding, which should not be considered a "substantial change" within the meaning of 760 CMR 56.05(12)(b), provided that the Applicant maintains a relationship with the new entity to be formed. It is anticipated that the new entity will be formed prior to submission of financing or transfer of the Property, and prior to closing on any financing and prior to construction. The entity will be compliant as a limited dividend organization as required by 760 CMR 56.04.

D. Evidence of Site Control

Although Section 56.04(6) of the 40B Regulations states that the issuance of a Determination of Project Eligibility shall be considered by the Zoning Board of Appeals as conclusive evidence that the Project and the Applicant have satisfied the Project Eligibility requirements of 760 CMR 56.04(1), Charles River Heights LLC has attached deeds evidencing ownership of the property by Charles River Center. POUA and Charles River Center have entered a joint venture to develop the Property.

After recording, return to:

Meredith Sterritt
ROPES & GRAY LLP
Prudential Tower, 800 Boylston Street
Boston, MA 02199-3600

Exemption from taxation is claimed under M.G.L. Chapter 64D, Section 1

Reviewed by Todd E. Waldman, Assistant District Counsel, U.S. Army Corps of Engineers,
Norfolk District, 803 Front Street, Norfolk, Virginia 23510-1096.

Property Address: Forest Street, Needham, MA

**QUITCLAIM DEED
NATICK SOLDIER SYSTEMS CENTER
NEEDHAM HOUSING SITE
NEEDHAM, MASSACHUSETTS**

THIS QUITCLAIM DEED, (hereinafter referred to as the "Deed") by and between the **UNITED STATES OF AMERICA** (hereinafter referred to as the "Grantor"), acting by and through the Interim Director of Real Estate, Headquarters, United States Army Corps of Engineers, pursuant to a delegation of authority from the Deputy Assistant Secretary of the Army (Installations, Housing and Partnerships), under the authority of section 2844 of Public Law 115-91, whose address is U.S. Army Engineer District, Norfolk, 803 Front Street, Norfolk, VA 23510-1011, and the **CHARLES RIVER ASSOCIATION FOR RETARDED CITIZENS, INC.** (hereinafter referred to as the "Grantee"), a nonprofit corporation duly organized and existing under the laws of the State of Massachusetts, whose address is 59 East Militia Heights Drive, Needham, Massachusetts 02492.

WITNESSETH THAT:

THE GRANTOR, for and in consideration of FIVE MILLION FIVE HUNDRED THIRTY EIGHT THOUSAND AND NO/100 DOLLARS (\$5,538,000.00), the receipt of which is hereby acknowledged, does hereby remise, release and forever quitclaim unto the Grantee, its successors and assigns, all its right, title and interest in and to eleven parcels of land situated, lying, and being in the Town of Needham, County of Norfolk, Commonwealth of Massachusetts, identified as Tract A, Tract BE-1, Tract BE-2, Tract BE-3, Tract BE-4, Tract BE-5, Tract BE-6, Tract BE-7, Tract BE-8, Tract BE-9, and Tract BE-10, containing 5.4 acres in total, more or less, ("Property") and being the same premises conveyed to the Grantor, as follows:

Tract A – Parcel One as set forth in Deed from Babson Institute dated August 29, 1957 and recorded with the Norfolk County Registry of Deeds in Book 3590, Page 336

Tract BE-1 – Parcel Two as set forth in Deed from Babson Institute dated August 29, 1957 and recorded with the Norfolk County Registry of Deeds in Book 3590, Page 336

Tract BE-2 – Parcel Three as set forth in Deed from Babson Institute dated August 29, 1957 and recorded with the Norfolk County Registry of Deeds in Book 3590, Page 336

Tract BE-3 – Grant of easement from Babson Institute dated November 14, 1956 and recorded with the Norfolk County Registry of Deeds in Book 3522, Page 149

Tract BE-4 – Grant of easement from Arthur Millette and Corinne M. Millette dated November 14, 1956 and recorded with the Norfolk County Registry of Deeds in Book 3522, Page 147

Tract BE-5 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 48507 as Document No. 209491

Tract BE-6 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 51958 as Document No. 209491

Tract BE-7 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 54761 as Document No. 209491

Tract BE-8 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title Nos. 35720 and 41558 as Document No. 209491

Tract BE-9 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 48507 as Document No. 209491

Tract BE-10 – Right of Way Easement in Deed from Babson Institute dated December 17, 1954 and recorded with the Norfolk County Registry of Deeds in Book 3328, Page 106

SUBJECT TO all valid and existing restrictions, reservations, covenants, conditions, and easements including, but not limited to, rights-of-way for railroads, highways, pipelines and public utilities, if any.

TO HAVE AND TO HOLD the Property granted herein to the Grantee, its successors and assigns, together with all and singular the appurtenances, rights, powers, and privileges thereunto belonging or in anywise appertaining, and all the estate, right, title, interest, or claim whatsoever of the Grantor, either in law or in equity, and subject to the reservations, covenants, conditions, and restrictions hereinafter set forth in this Deed.

AND IT IS FURTHER AGREED AND UNDERSTOOD by and between the parties hereto that the Grantee, by its acceptance of this Deed and as part of the consideration for this Deed, covenants and agrees for itself, its successors and assigns, forever, that this Deed is made and accepted upon each of the following covenants, conditions, and restrictions which shall be binding upon and enforceable against the Grantee, its successors and assigns in perpetuity by the Grantor and other interested parties as may be allowed by law; that the covenants, conditions, and restrictions set forth herein are a binding servitude on the Property and shall be deemed to run with the land in perpetuity; and that the failure to include the covenants, conditions, and restrictions in subsequent conveyances of the Property does not abrogate their status as binding upon the Grantor and the Grantee, its successors and assigns.

1. NOTIFICATION OF PETROLEUM OR PETROLEUM PRODUCT STORAGE, RELEASE OR DISPOSAL

The Grantee is hereby provided the summary of the storage, release, or disposal of petroleum or petroleum products on the Property attached hereto as Exhibit A and made a part hereof. Said summary is based on the best information available to the Department of the Army and believed to be correct but no warranty as to completeness or accuracy is provided with respect thereto.

2. "AS IS" CONDITION OF PROPERTY

The Grantee acknowledges that it has inspected, or has had the opportunity to inspect, the Property and accepts the condition and state of repair of the Property. The Grantee understands and agrees that the Property is conveyed "AS IS" without any representation, warranty, or guaranty by the Grantor as to quantity, quality, title, character, condition, size, or kind, or that the same is in condition or fit to be used for the purposes intended by the Grantee, and no claim for allowance or deduction upon such grounds will be considered.

No warranties, either express or implied, are given with regard to the condition of the Property including, without limitation, whether the Property does or does not contain asbestos or lead-based paint. The Grantee shall be deemed to have relied solely on its own judgment in assessing the condition of the Property including, without limitation, any asbestos, lead-based paint, or other conditions on the Property. The failure of the Grantee to inspect or to exercise due diligence to be fully informed as to the condition of the Property will not constitute grounds for any claim or demand against the Grantor.

Nothing in this provision will be construed to modify or negate any of the Grantor's statutory obligations.

3. INDEMNITY AND HOLD HARMLESS

To the extent authorized by law, the Grantee, for itself, its successors and assigns, covenants and agrees to indemnify and hold harmless the Grantor, its officers, agents, and employees from (1) any and all claims, damages, judgments, losses, and costs, including fines and penalties, arising out of the violation of the covenants, conditions, and restrictions in this Deed by the Grantee, its successors and assigns, and (2) any and all claims, damages, and judgments arising out of, or in any manner predicated upon, exposure to asbestos, lead-based paint, or other condition on any portion of the Property after the date of this Deed.

The Grantee, for itself, its successors and assigns, covenants and agrees that the Grantor shall not be responsible for any costs associated with modification or termination of the covenants, conditions, and restrictions in this Deed including, without limitation, any costs associated with additional investigation or remediation of asbestos, lead-based paint, or other condition on the Property.

Nothing in this provision will be construed to modify or negate any of the Grantor's statutory obligations.

4. POST-TRANSFER DISCOVERY OF CONTAMINATION

If a release or threatened release of a hazardous substance is discovered on the Property after the date of this Deed, the Grantee, its successors or assigns, shall be responsible for such newly discovered release or threatened release of a hazardous substance unless the Grantee is able to demonstrate that such release or threatened release of a hazardous substance was due to the Grantor's activities, use, or ownership of the Property. If the Grantee, or its successors or assigns believe the newly discovered hazardous substance is due to the Grantor's activities, use or ownership of the Property, the Grantee or its successors or assigns shall immediately secure the site and notify the Grantor of the existence of the release or threatened release of the hazardous substance and the Grantee or its successors or assigns shall not further disturb or allow the disturbance of such hazardous substance without the prior written permission of the Grantor.

The Grantee, for itself, its successors and assigns, as part of the consideration for the conveyance of the Property, hereby releases the Grantor from any liability or responsibility for any claims arising solely out of the release or threatened release of any hazardous substance on the Property occurring after the date of this Deed where such hazardous substance was placed on the Property by the Grantee, or its successors, assigns, employees, invitees, agents, contractors, or any person other than the Grantor after the date of this Deed.

5. ENVIRONMENTAL PROTECTION PROVISIONS

The Grantee shall neither transfer the Property, lease the Property, nor grant any interest, privilege, or license whatsoever in connection with the Property without including the environmental protection provisions set forth in Exhibit B, attached hereto and made a part hereof, and shall require the said provisions be included in all subsequent deeds, easements, transfers, leases, or grant of any interest, privilege, or license in, of, on, or to the Property or any portion thereof.

6. ANTI-DEFICIENCY ACT

The Grantor's obligation to pay or reimburse any money under this Deed is subject to the availability of funds appropriated for this purpose to the Department of the Army and nothing in this Deed shall be interpreted to require obligations or payments by the Grantor in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341.

7. NO WAIVER

The failure of the Grantor to insist in any one or more instances upon timely or complete performance of any obligation of the Grantee, or its successors or assigns required by the covenants, conditions, or restrictions set forth in this Deed shall not be construed as a waiver or a relinquishment of the Grantor's right to future performance of any such obligation of the Grantee or its successors or assigns in accordance with the said covenants, conditions, and restrictions, and all such obligations of the Grantee, its successors and assigns shall continue in full force and effect.

SIGNATURE PAGES FOLLOW

IN WITNESS WHEREOF, the Grantor has caused this Deed to be executed in its name by the Interim Director of Real Estate, Headquarters, U.S. Army Corps of Engineers, this 25th day of February, 2023.

UNITED STATES OF AMERICA

By: Paula S. Johnson-Muic
 Paula S. Johnson-Muic
 Interim Director of Real Estate
 Headquarters, U.S. Army Corps of
 Engineers

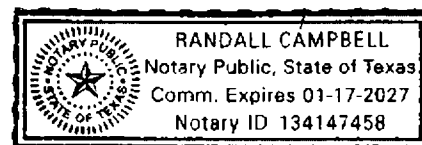
ACKNOWLEDGMENT

STATE OF TEXAS)
) ss
 COUNTY OF Collin)

I, Randall Campbell, a Notary Public in and for the State of Texas, do hereby certify that this 25 day of February, 2023, Paula S. Johnson-Muic, Interim Director of Real Estate, Headquarters, U.S. Army Corps of Engineers, known to me or proven through satisfactory evidence of identity to be the person whose name is subscribed to the foregoing document, appeared in person and acknowledged before me that the signature on the document was voluntarily affixed by her for the purposes therein stated and that she had due authority to sign the document in the capacity therein stated.

Randall Campbell
 NOTARY PUBLIC

My commission expires the 4th day of January, 2027



ACCEPTANCE BY GRANTEE

IN WITNESS WHEREOF, the Grantee hereby accepts the conveyance herein subject to the covenants, conditions, and restrictions contained therein, this 8th day of March, 2023.

**CHARLES RIVER
ASSOCIATION FOR
RETARDED CITIZENS, INC.**

By: Anne-Marie Bajwa
Anne-Marie Bajwa
President

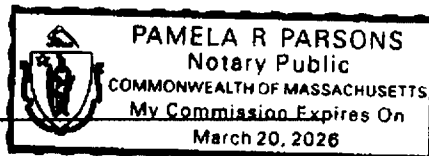
ACKNOWLEDGMENT

COMMONWEALTH OF MASSACHUSETTS)
) ss
COUNTY OF ~~NORFOLK~~ Suffolk)

I, Pamela R. Parsons, a Notary Public in and for the Commonwealth of Massachusetts, do hereby certify that this 8th day of March, 2023, Anne-Marie Bajwa, President, Charles River Association for Retarded Citizens, Inc., known to me or proven through satisfactory evidence of identity to be the person whose name is subscribed to the foregoing document, appeared in person and acknowledged before me that the signature on the document was voluntarily affixed by him for the purposes therein stated and that he had due authority to sign the document in the capacity therein stated.

Pamela R. Parsons
Notary Public

My Commission Expires: _____



CERTIFICATE OF AUTHORITY

*ALICE TAYLOR**Chairman*

DO
WMA
I, ~~Raymond Brassard~~, certify that I am the ~~Clerk~~ of the Charles River Association for Retarded Citizens, Inc. , and that Anne-Marie Bajwa, who signed the foregoing instrument on behalf on the Grantee, was then the President of the said nonprofit corporation. I further certify that the said officer was acting within the scope of powers delegated to this officer by the governing body of the Grantee in executing said instrument.

Date: March 8, 2023Signed: *Alice Taylor*

EXHIBIT A**Notification of Petroleum Product Storage, Release, or Disposal****No. 2 Fuel Oil Underground Storage Tanks Installed in 1958**

Address	Removal / Replace Date	Replacement Tank	Comments at Time of Removal
1 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
2 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
3 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
4 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
5 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
6 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
7 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
8 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
9 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
10 EMH	Sep/Oct 1987	300 gal. single wall steel UST	Oil release and soil contamination noted. UST, its contents, and an unspecified quantity of impacted soil removed/disposed. Incident closed from regulatory perspective (USACE, 2019)
11 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
12 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
EMH = East Militia Heights Road Tanks installed in 1958 were 275-gallon single-walled steel USTs			

No. 2 Fuel Oil Underground Storage Tanks Removed in 2004 (see table above for UST type/capacity)

Address	Removal Date	Comments at Time of Removal
1 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
2 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
3 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
4 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
5 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
6 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
7 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
8 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
9 EMH	October 2004	Petroleum-related soil contamination above Mass DEP cleanup standards noted. Limited Removal Action implemented. 10 cy of impacted soil removed. Regulatory closure with Mass DEP. No further action required (USACE, 2019; Nobis, 2005a; Nobis, 2005b)
10 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
11 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
12 EMH	October 2004	Petroleum-related soil contamination above Mass DEP cleanup standards noted. Limited Removal Action implemented. 10 cy of impacted soil removed. Regulatory closure with Mass DEP. No further action required. (USACE, 2019; Nobis, 2005a; Nobis, 2005c)

EMH = East Militia Heights Road

USTs were removed in October 2004 were not replaced as natural gas became available to the housing area.

EXHIBIT B**Environmental Protection Provisions****1. NOTICE OF THE PRESENCE OF ASBESTOS AND COVENANT**

- a. The Grantee is hereby informed and does acknowledge that non-friable asbestos or asbestos-containing material ("ACM") has been found on the Property. The Property may contain improvements, such as buildings, facilities, equipment, and pipelines, above and below the ground, that contain non-friable asbestos or ACM. The Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency have determined that such unprotected or unregulated exposure to airborne asbestos fibers increases the risk of asbestos-related diseases, including certain cancers that can result in disability or death.
- b. The Grantee covenants and agrees that its use and occupancy of the Property will be in compliance with all applicable laws relating to asbestos. The Grantee agrees to be responsible for any remediation or abatement of asbestos found to be necessary on the Property to include ACM in or on buried pipelines that may be required under applicable law or regulation.
- c. The Grantee acknowledges that it has inspected or has had the opportunity to inspect the Property as to its asbestos and ACM condition and any hazardous or environmental conditions relating thereto. The Grantee shall be deemed to have relied solely on its own judgment in assessing the overall condition of all or any portion of the Property, including, without limitation, any asbestos or ACM hazards or concerns.

2. NOTICE OF THE PRESENCE OF LEAD-BASED PAINT (LBP) AND COVENANT AGAINST THE USE OF THE PROPERTY FOR RESIDENTIAL PURPOSE

- a. The Grantee is hereby informed and does acknowledge that all buildings on the Property, which were constructed or rehabilitated prior to 1978, are presumed to contain lead-based paint. Lead from paint, paint chips, and dust can pose health hazards if not managed properly. Every purchaser of any interest in Residential Real Property on which a residential dwelling was built prior to 1978 is notified that there is a risk of exposure to lead from lead-based paint that may place young children at risk of developing lead poisoning.
- b. Available information concerning known lead-based paint and/or lead-based paint hazards, the location of lead-based paint and/or lead-based paint hazards, and the condition of painted surfaces is contained in the

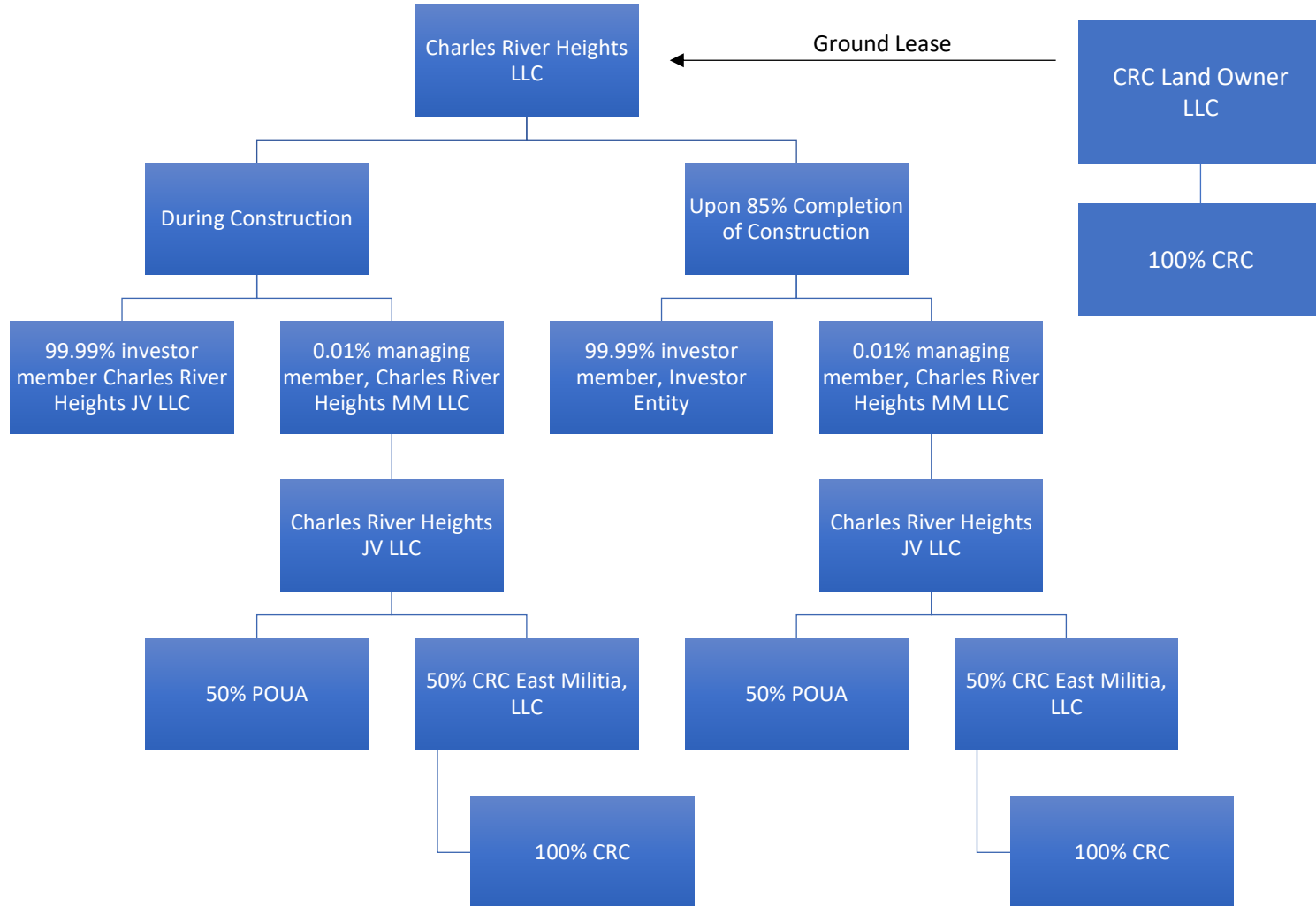
Environmental Condition of Property (ECP) report (USACE, 2019) and in the Lead Paint Compliance Information provided as provided in Appendix I of said report, and in the January 2020 technical memorandum addendum to said report (USACE 2020). The Grantee has been provided with the federally approved pamphlet on lead poisoning prevention. The Grantee hereby acknowledges receipt of all of the information described in this subparagraph.

- c. The Grantee covenants and agrees that it shall not permit the occupancy or use of any buildings or structures on the Property as Residential Property, as defined under 24 Code of Federal Regulations Part 35, without complying with this section and all applicable federal, state, and local laws and regulations pertaining to lead-based paint and/or lead-based paint hazards. Prior to permitting the occupancy of the Property where its use subsequent to sale is intended for residential habitation, the Grantee specifically agrees to perform, at its sole expense, the Army's abatement requirements under Title X of the Housing and Community Development Act of 1992 (Residential Lead-Based Paint Hazard Reduction Act of 1992).
- d. The Grantee acknowledges that it has inspected or has had the opportunity to inspect the Property as to its lead-based paint content and condition and any hazardous or environmental conditions relating thereto. The Grantee shall be deemed to have relied solely on its own judgment in assessing the overall condition of all or any portion of the Property, including, without limitation, any lead-based paint hazards or concerns.

3. PESTICIDE NOTICE AND COVENANT

- a. The Grantee is hereby notified and acknowledges that registered pesticides have been applied to the Property conveyed herein and may continue to be present thereon. The Grantee and Grantor know of no use of any registered pesticide in a manner (1) inconsistent with its labeling or with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)(7 U.S.C. § 136, et seq.) and other applicable laws and regulations, or (2) not in accordance with its intended purpose.
- b. The Grantee, for itself, its successors and assigns hereby covenants and agrees that if the Grantee takes any action with regard to the Property, including demolition of structures or any disturbance or removal of soil that may expose, or cause a release of, a threatened release of, or an exposure to, any such pesticide, Grantee assumes all responsibility and liability therefor.

Charles River Village



E. Determination of Project Eligibility

See attached Project Eligibility Letter application, dated July 3, 2025, and Project Eligibility Letter issued by EOHL, dated October 2, 2025.



July 3, 2025

Attn: Rebecca Frawley
Executive Office of Housing and Livable Communities
100 Cambridge Street, Suite 300
Boston, MA 02114

Dear Ms. Frawley:

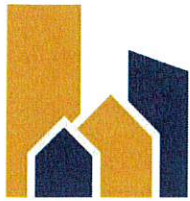
On behalf of the Charles River Center (CRC) and Planning Office for Urban Affairs (POUA), I am pleased to submit a Project Eligibility Application for the Charles River Heights project. We are proposing to develop eighty-six units of affordable housing for an innovative and inclusive community for individuals with disabilities and residents of traditional affordable housing at 59 East Militia Heights Drive, adjacent to the Charles River Center, located in the Town of Needham. The property will continue to be owned by the Charles River Center and developed under a long-term ground lease.

POUA and CRC have worked collaboratively with the Town to develop a site plan and building design that conforms to the site's existing terrain, is harmonious with the surrounding neighborhood, and is consistent with both the Town's Housing Production Plan and Community Preservation Committee's goals. The site plan will consist of the following:

- A three-story elevator building that will contain 68 units. The first floor of the building will feature community and common space in addition to seventeen studio, one, and two-bedroom apartments. The second and third floors will be served by two elevators, and each will feature twenty-five and twenty-six additional studio, one, and two-bedroom apartments. Given the focus of this project on integrated, supportive housing and the populations being served, we believe that limiting the unit mix to studio, one and two-bedroom units is appropriate and consistent with other similar projects.
- Three single story buildings that will each feature six studio apartments with a community room and kitchenette.
- Sixty-one surface parking spots are on site.
- A walking trail/path throughout the site.

Of the eighty-six units being created in total, thirty-eight of the units will be for households at or below 30% of AMI, seven of the units will be for households at or below 50% of AMI, thirty-one of the units will be for households at or below 60% of AMI for, and five units will be for households at or below 80% of AMI. The remaining five units will be set aside for CRC staff.

The Town of Needham is in full support of the project as evidenced by a commitment of \$2.8 million in CPA funding approved by Town Meeting in May and a letter of support from the Select



Planning Office for Urban Affairs

ARCHDIOCESE OF BOSTON

Board. Additionally, we have received positive comments in presentations to the Planning Board, Design Review Board, and Community Preservation Committee. We anticipate applying for a Comprehensive Permit immediately upon receipt of the PEL, which we anticipate will be approved prior to the 2026 Winter Funding Round.

Thank you in advance for reviewing our application. If you have any questions or comments, please feel free to contact me.

Sincerely,

William H. Grogan
President

Cc: Kate Racer, Undersecretary EOHLC

POUA HOLDINGS LLC
C/O PLANNING OFFICE FOR URBAN AFFAIRS, INC.
84 STATE STREET
BOSTON, MA 02109

Bank of America
Massachusetts
5-13/110

1224

6/25/2025

PAY TO THE ORDER OF Massachusetts Housing Partnership

\$ **5,300.00

Five Thousand Three Hundred and 00/100 ***** DOLLARS

ATTN: Emma McGurren
Massachusetts Housing Partnership
160 Federal Street
Boston, MA 02110



MEMO

AUTHORIZED SIGNATURE

40B Fee - Charles River Heights

POUA HOLDINGS LLC
C/O PLANNING OFFICE FOR URBAN AFFAIRS, INC.
Massachusetts Housing Partnership

1224

6/25/2025

40B Fee - Charles River Heights

5,300.00

Bank of America ...63 40B Fee - Charles River Heights

5,300.00

POUA HOLDINGS LLC
C/O PLANNING OFFICE FOR URBAN AFFAIRS, INC.
Massachusetts Housing Partnership

1224

6/25/2025

40B Fee - Charles River Heights

5,300.00

Bank of America ...63 40B Fee - Charles River Heights

5,300.00



Project Eligibility Application Charles River Heights Needham, MA

Submitted By:
Planning Office for Urban Affairs, Inc.
July 3, 2025

Name and Address of applicant:

Planning Office for Urban Affairs, Inc.
10 Post Office Square, Suite 1310
Boston, MA 02109

Charles River Center
59 East Militia Heights Drive
Needham, MA 02492

Project team:

Owner:	Current Owner: Charles River Center Proposed Owner: Charles River Heights LLC
Developer / Sponsor:	The Planning Office for Urban Affairs (POUA)
Architect:	The Architectural Team (TAT)
Engineers:	VHB (Civil Engineering, Traffic)
Legal Counsel:	Goulston and Storrs

Address and Site Description:

Located at 59 East Militia Heights Drive, the site is approximately 1.5 miles northwest of Needham Center. Charles River Center purchased the property from the United States Army in 2023. Previously, the site consisted of single-family homes for active-duty military personnel. The single-family homes were demolished in 2024, and the site is currently used as overflow parking for Charles River Center. The property is 3.5 acres and is at the top of a steep hill. The site has excellent tree coverage and dense wooded areas separate the site from its closest abutters to the west North Hill Avenue and to the east on Sunrise Terrance. The surrounding land uses include single family homes, a large retirement community (north Hill Retirement Community), and Charles River Center’s main offices. Babson College is approximately 0.5 miles from the site and own East Militia Heights Drive.

Th site is a short walk from recreational opportunities, religious institutions, and a local grocery store. The proposed project will be within 1.5 miles of retail, restaurants, groceries, library, and educational opportunities. The nearest public transportation to the site is commuter rail stops at Needham Center (1.3 miles) and Needham Heights (1.5 miles) which terminate at South Station in Boston.

Tabulation of Existing Parcels:

Location	Parcel ID	Land Value	Building	Other	Total Value	Land Area
59 East Militia Heights Drive, Needham, MA	199/309.0-0010	\$1,011,842	\$0	N/A	\$1,011,842	3.5 acres

Location Map:

See Attachment 1

Tabulation of Proposed Building:

Address	Lot Size	Gross Building Area	# of Rental Units	Unit Size	Accessible Units
59 East Militia Heights Drive, Needham, MA	3.5 acres	79,135 sf	86	400 – 850 sf	43
Building A	-	67,000 sf	68	400 – 850 sf	25
Building B	-	4,045 sf	6	432 sf	6
Building C	-	4,045 sf	6	432 sf	6
Building D	-	4,045 sf	6	432 sf	6

Name of housing program under which project eligibility is sought:

Low Income Housing Tax Credit Program (LIHTC)

Relevant project details:

Charles River Heights (the “Heights”) is a project proposed by the Charles River Center (“CRC”) to redevelop 3.5 acres of land at 59 East Militia Heights Drive in Needham (the “Property”) to serve as an integrated housing and education complex where adults with intellectual and mental disabilities can live side by side with people without intellectual disabilities.

By way of background, CRC was established in 1956 to empower and support people with developmental disabilities by offering high-quality, individualized opportunities that foster independence and community inclusion. Programs that CRC currently offers include day, residential, family, and in-home support services. Day services include community-based day support, employment, and day rehabilitation (?). Residential services include 32 group homes in 10 communities. Family and in-home support services include respite services, after work programs, in-home behavioral services, vacation programming for school-aged children, educational training, family, navigation of services, and individual support and adult family care.

In 2023, CRC acquired the Property in hopes of addressing the unmet housing need for individuals with autism and intellectual disabilities. In 2024, CRC partnered with the Planning Office for Urban Affairs (“POUA”), a nonprofit housing developer and affiliate of the Archdiocese of Boston, on the Project to create an inclusive and vibrant community that provides an innovative and integrated housing model to address this urgent need for housing.

The Heights will entail 86 units of housing for households earning at or below 30% to 80% of Area Median Income. Of which, 38 units in the Project will be available through a closed referral system for people with disabilities. 5 units will also be set aside for CRC staff. CRC will provide a comprehensive network of support and services alongside educational opportunities within the Project, including remote support for monitoring overnight, clinical support including medical, health and safety, college navigation, employment and career exploration, training and job support, adult companion and peer support and transportation services.

As part of the CRC’s educational model, the remaining units in the Project will be available to households earning at or below 30% to 80% of Area Median Income. The integration of adults with disabilities and adults without disabilities is a critical component of the CRC model and is mandated by both federal and state law, which require such individuals to have access to the greater community, and receive support in the least restrictive, and most typical setting possible. When complete, the Project will provide a creative model of an inclusive community for

other cities and towns across the state and beyond.

The Project has received substantial support from the Town of Needham, which has obtained safe harbor under Chapter 40B with a Subsidized Housing Inventory of 11.85%. The site plan, building design, and unit mix were thoughtfully designed in close coordination with the Town. At Annual Town Meeting, the Project was awarded approximately \$2.8 million in Community Preservation Act funds. After a presentation in May, the Select Board voted to officially support Charles River Heights. Additionally, we have met with the Planning Board and Design Review Board to informally present the Project and solicit any initial feedback and comments. The project was well-received by both boards and comments received were related to stormwater management, traffic, and site lighting. In addition to the local funding award, the project has received appropriation in the Economic Development Bond Bill of \$5 million specifically for this project.

Conceptual Design Drawings:

See Attachment 2

Narrative description of building sites:

The site plan will feature 4 residential structures, 61 parking spaces, and ample outdoor space to be programmed for recreational and therapeutic uses. Buildings B, C, and D are single story buildings which will contain 6 studio apartments as well as a central communal area. Each building will have a patio space off the back entrance. A common area will be central to each single-story building which will include a lounge area as well as a kitchenette for communal gatherings. Each single-story building will contain 6 studio apartments set aside for individuals with disabilities. Building A is a 3-story elevator building that will contain 68 units of housing as well as the community's amenity spaces. Site amenities will include a community room, living room, staffed management office, fitness center on-site laundry. Of note, the main community room on the first floor will be available for use by the broader Needham community.

The building was designed and sited to make the best use of the existing grades and natural features to reduce the impact on the environment. The buildings were placed in locations that will minimize disturbance to the surrounding tree line. All buildings will be designed to achieve Passive House standards and will be certified post-construction. Some of the features of a Passive House building that will be included in this project include a super insulated building enclosure, high-performance windows, effective water management details, effective and efficient delivery of domestic hot water, and minimal use of volatile organic compounds (VOCs) in building materials and finishes. All residential and common area appliances will be electric. The site will also feature on-site renewable energy and 20% of the parking spaces will be reserved for electric vehicles.

The egress into the site is located at the intersection of East Militia Heights Drive and Dwight Road. The site driveway is a two-way entrance. Moving into the site there is a dedicated drop-off loop at the front of Building A, with loading, visitor, and parking spaces in as well as 29 parking spaces to the rear of Building A. The circulation around the larger building A is one-way for safety and access control. The vehicle circulation features speed tables at critical junctures to prioritize pedestrian safety. Buildings B and D each have a parking bank in proximity with 6 spaces per bank, and there are another 8 parking spaces between buildings A and C that are designed to serve both buildings.

Unit Summary

<u>Overall</u>	Affordable CRC (4)	Affordable Sec. 8/MRVP (4)	Affordable 60% AMI, LIHTC (1)	Affordable 80% AMI	CRC Staff	TOTAL
Studio	33	0	0	0	0	33
1 Bedroom	5	0	30	3	5	43
2 Bedroom	0	7	1	2	0	10
Total	38	7	31	5	5	86

<u>Building A</u>	Affordable CRC (4)	Affordable Sec. 8/MRVP (4)	Affordable 60% AMI, LIHTC (1)	Affordable 80% AMI	CRC Staff	TOTAL
Studio	15	0	0	0	0	15
1 Bedroom	5	0	30	3	5	43
2 Bedroom	0	7	1	2	0	10
Total	20	7	31	5	5	68

<u>Building B, C, D</u>	Affordable CRC (4)	Affordable Sec. 8/MRVP (4)	Affordable 60% AMI, LIHTC (1)	Affordable 80% AMI	CRC Staff	TOTAL
Studio	18	0	0	0	0	18
Total	18	0	0	0	0	18

Financial Summary

The Project is contemplated to be financed with equity from the sale of Federal and State Low-Income Housing Tax Credits, permanent and subordinate financing from MassHousing, state subordinate financing, Town of Needham Funds, an appropriation from the 2024 Economic Development Bond Bill, and subordinate financing and sustainability funds from DOER and MassSaves. A One Stop has been submitted separately, and a summary is below:

SOURCES	Total	Supportive Housing units	Traditional Affordable and Workforce Housing
Federal 4% LIHTC	\$ 13,167,701	\$ 6,583,851	\$ 6,583,851
State LIHTC	4,000,000	2,000,000	2,000,000
EOLHC- NHT	1,750,000		1,750,000
EOLHC- AHTF	1,000,000	-	1,000,000
EOHLC- HIF	500,000	-	500,000
EOHLC- HSF	750,000	-	750,000
EOHLC- FCF	3,000,000	3,000,000	-
Town of Needham	2,840,223	1,420,112	1,420,112
TE Permanent Loan	12,157,664	6,078,832	6,078,832
2024 EcDev Bill for Special Needs	5,000,000	5,000,000	-
MassHousing Workforce OF	500,000	-	500,000
DOER and MassSaves Incentives	1,218,720	609,360	609,360
TOTAL SOURCES	\$ 45,884,309	\$ 24,692,154	\$ 21,192,154

USES	Total		
Acquisition	\$ 600,000		
Construction	31,699,918		
Soft Costs	6,971,685		
Developer Fee/Overhead	3,193,236		
Project Reserves	3,419,470		
TOTAL USES	\$ 45,884,309		
TDC per unit	\$ 533,538.47		

Narrative description of Supportive Services

Massachusetts offers home and community-based services (HCBS) waiver programs to support adults with intellectual disabilities. These waiver programs provide ongoing services and support to help participants live in community settings. Charles River Center is an approved HCBS provider for the adult supports waiver program. Waiver participants live independently and do not require 24-hour care and will receive services through the waiver that are needed to remain safely in the community.

Each waiver participant, with their Department of Developmental Services (DDS) Service Coordinator, chooses services aligned with their waiver-approved plan. DDS Service Coordinators identify provider(s) based on a participant's individualized plan. A provider agency, Charles River Center is chosen or recommended, based on availability, service type, geographic area, and fit. The Service Coordinator refers their participant directly to the agency. Charles River Center ensure compliance with any licensing or certification standards for the services provided.

Under the adult supports waiver program, Charles River Center will be providing an array of services. These services include the following:

Individualized Home Supports consists of services and supports in a variety of activities that may be provided regularly but that are less than 24 hours. These services assist and support the waiver participant and may include teaching and fostering acquisition, retention or improvement of skills related to personal finance, health, shopping, use of community resources, community safety, and other social and adaptive skills to live in the community, specified in the Plan of Care.

Individual Supported Employment Services consist of ongoing support that enable a participant, for whom competitive employment at or above the minimum wage is unlikely absent the provision of support, and who, because of his/her disabilities, need support to perform in a regular work setting.

Adult Companion consists of non-medical care, supervision and socialization provided to an adult. Services may include assistance with meals and basic activities of daily living such as shopping, laundry, meal preparation, routine household care incidental to the support and supervision of the individual.

Transportation Services under the waiver are offered in accordance with the participants' service plan. Whenever possible, family, neighbors, friends, or community agencies which can provide this service without charge are utilized.

Behavioral Supports and Consultation is available to participants, to unpaid caregivers, and or paid staff in carrying out individual support plans which are designed to remediate identified challenging behaviors or to acquire socially appropriate behaviors.

Community Peer Supports is designed to provide training, instruction and mentoring to individuals about self-advocacy, participant direction, civic participation, leadership, benefits, and participation in the community.

Autism Spectrum Disorder (ASD) Coaching, Pre-Engagement and College Navigation

Depending on the support needs identified, these services may be provided by individual support workers or more skilled “clinical” support workers.

Remote Supports and Monitoring uses two-way communication in real time, including home based sensors, and other devices, to provide a less invasive means of providing instruction/guidance monitoring and responding to the needs of individuals living in the community.

Zoning Analysis, 59 East Militia Heights Drive, Needham, MA

Zoning District: Single Residence District- A (SRA)

	Required	Proposed	Waiver Required?
Minimum lot area	43,560	152,850	No
Minimum frontage	150'	348.3'	No
Minimum front yard set back	35'	9.7'	Yes
Minimum side yard set back	25'	12.7'	Yes
Minimum rear yard set back	25'	83.2'	no
Maximum height	lesser of 2.5 stories or 35' from av. grade	34'-10"	Yes
Maximum building coverage	15%	22.7%	Yes
Interior Parking Landscaping Percentage	10%	<10%	Yes
Parking	129	61	Yes

Evidence of Site Control:

59 East Militia Heights Drive is owned by Charles River Center. It will be developed by POUA. The Ownership entity will enter into a long-term ground lease with a single purpose LLC wholly owned by the Charles River Center, the terms of which are currently being negotiated. A copy of the deed is included here. Also included is a copy of the joint venture agreement between POUA and Charles River Center. *See Attachment 3a and 3b*

Evidence of Local Support:

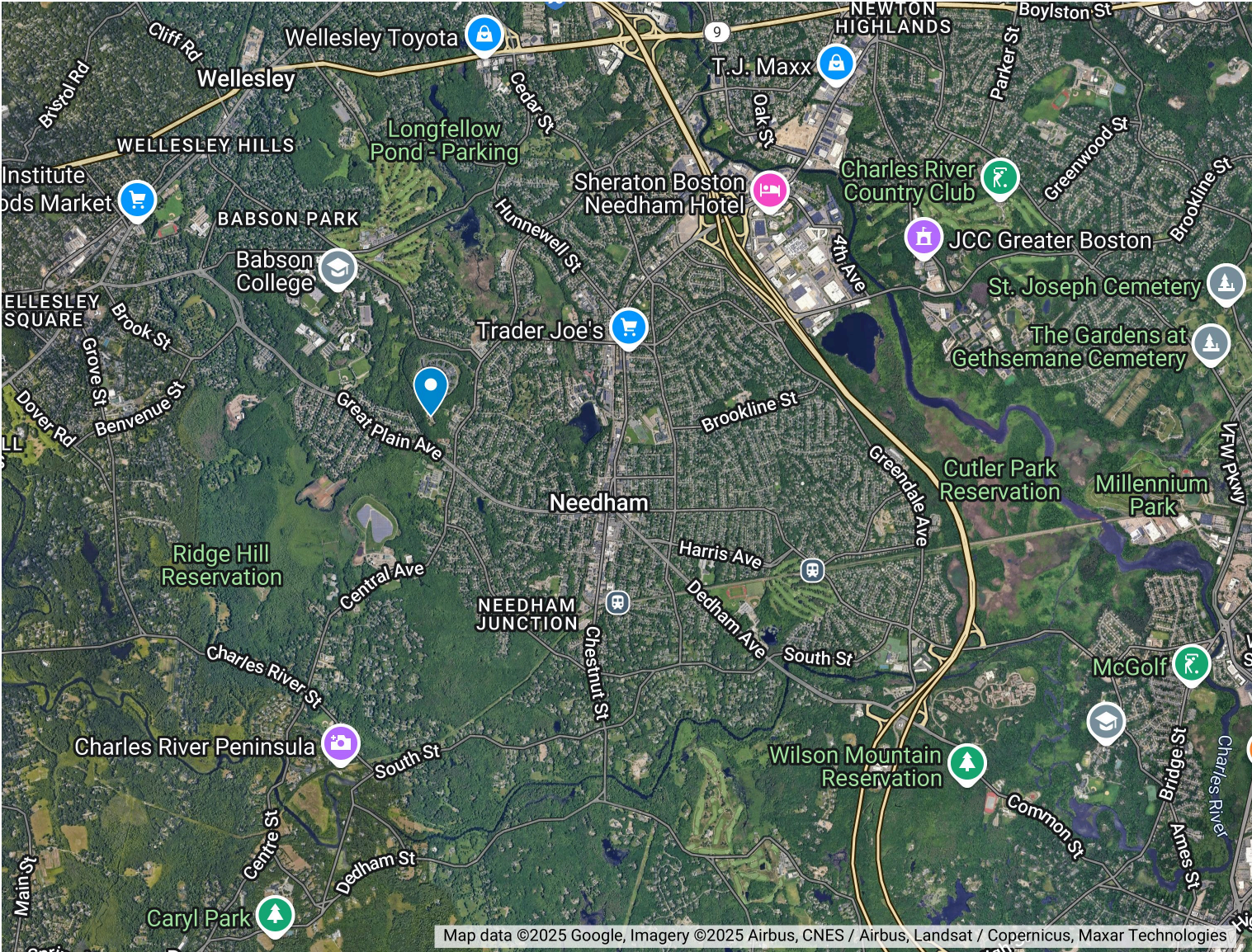
See Attachment 4

- a) *Letter of Support from Needham Select Board (sent directly by the Select Board under separate cover)*
- b) *\$2.8M in Community Preservation Acts funds award by the Needham Community Preservation Committee and approved by Town Meeting on May 7, 2025.*

Attachment 1: Location Map

Locus Map

Charles River Heights





Attachment 2:

Please use the attached link to download the architectural plans:

<https://poua.sharefile.com/public/share/web-sd49f4963f6eb4189a9c330553eadf2ed>

Attachment 3a: Evidence of Site Control

After recording, return to:

Meredith Sterritt
ROPES & GRAY LLP
Prudential Tower, 800 Boylston Street
Boston, MA 02199-3600

Exemption from taxation is claimed under M.G.L. Chapter 64D, Section 1

Reviewed by Todd E. Waldman, Assistant District Counsel, U.S. Army Corps of Engineers,
Norfolk District, 803 Front Street, Norfolk, Virginia 23510-1096.

Property Address: Forest Street, Needham, MA

**QUITCLAIM DEED
NATICK SOLDIER SYSTEMS CENTER
NEEDHAM HOUSING SITE
NEEDHAM, MASSACHUSETTS**

THIS QUITCLAIM DEED, (hereinafter referred to as the "Deed") by and between the **UNITED STATES OF AMERICA** (hereinafter referred to as the "Grantor"), acting by and through the Interim Director of Real Estate, Headquarters, United States Army Corps of Engineers, pursuant to a delegation of authority from the Deputy Assistant Secretary of the Army (Installations, Housing and Partnerships), under the authority of section 2844 of Public Law 115-91, whose address is U.S. Army Engineer District, Norfolk, 803 Front Street, Norfolk, VA 23510-1011, and the **CHARLES RIVER ASSOCIATION FOR RETARDED CITIZENS, INC.** (hereinafter referred to as the "Grantee"), a nonprofit corporation duly organized and existing under the laws of the State of Massachusetts, whose address is 59 East Militia Heights Drive, Needham, Massachusetts 02492.

WITNESSETH THAT:

THE GRANTOR, for and in consideration of FIVE MILLION FIVE HUNDRED THIRTY EIGHT THOUSAND AND NO/100 DOLLARS (\$5,538,000.00), the receipt of which is hereby acknowledged, does hereby remise, release and forever quitclaim unto the Grantee, its successors and assigns, all its right, title and interest in and to eleven parcels of land situated, lying, and being in the Town of Needham, County of Norfolk, Commonwealth of Massachusetts, identified as Tract A, Tract BE-1, Tract BE-2, Tract BE-3, Tract BE-4, Tract BE-5, Tract BE-6, Tract BE-7, Tract BE-8, Tract BE-9, and Tract BE-10, containing 5.4 acres in total, more or less, ("Property") and being the same premises conveyed to the Grantor, as follows:

Tract A – Parcel One as set forth in Deed from Babson Institute dated August 29, 1957 and recorded with the Norfolk County Registry of Deeds in Book 3590, Page 336

Tract BE-1 – Parcel Two as set forth in Deed from Babson Institute dated August 29, 1957 and recorded with the Norfolk County Registry of Deeds in Book 3590, Page 336

Tract BE-2 – Parcel Three as set forth in Deed from Babson Institute dated August 29, 1957 and recorded with the Norfolk County Registry of Deeds in Book 3590, Page 336

Tract BE-3 – Grant of easement from Babson Institute dated November 14, 1956 and recorded with the Norfolk County Registry of Deeds in Book 3522, Page 149

Tract BE-4 – Grant of easement from Arthur Millette and Corinne M. Millette dated November 14, 1956 and recorded with the Norfolk County Registry of Deeds in Book 3522, Page 147

Tract BE-5 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 48507 as Document No. 209491

Tract BE-6 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 51958 as Document No. 209491

Tract BE-7 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 54761 as Document No. 209491

Tract BE-8 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title Nos. 35720 and 41558 as Document No. 209491

Tract BE-9 – Judgment on the Declaration of Taking dated June 26, 1959 and filed with the Norfolk County Registry District of the Land Court in Certificate of Title No. 48507 as Document No. 209491

Tract BE-10 – Right of Way Easement in Deed from Babson Institute dated December 17, 1954 and recorded with the Norfolk County Registry of Deeds in Book 3328, Page 106

SUBJECT TO all valid and existing restrictions, reservations, covenants, conditions, and easements including, but not limited to, rights-of-way for railroads, highways, pipelines and public utilities, if any.

TO HAVE AND TO HOLD the Property granted herein to the Grantee, its successors and assigns, together with all and singular the appurtenances, rights, powers, and privileges thereunto belonging or in anywise appertaining, and all the estate, right, title, interest, or claim whatsoever of the Grantor, either in law or in equity, and subject to the reservations, covenants, conditions, and restrictions hereinafter set forth in this Deed.

AND IT IS FURTHER AGREED AND UNDERSTOOD by and between the parties hereto that the Grantee, by its acceptance of this Deed and as part of the consideration for this Deed, covenants and agrees for itself, its successors and assigns, forever, that this Deed is made and accepted upon each of the following covenants, conditions, and restrictions which shall be binding upon and enforceable against the Grantee, its successors and assigns in perpetuity by the Grantor and other interested parties as may be allowed by law; that the covenants, conditions, and restrictions set forth herein are a binding servitude on the Property and shall be deemed to run with the land in perpetuity; and that the failure to include the covenants, conditions, and restrictions in subsequent conveyances of the Property does not abrogate their status as binding upon the Grantor and the Grantee, its successors and assigns.

1. NOTIFICATION OF PETROLEUM OR PETROLEUM PRODUCT STORAGE, RELEASE OR DISPOSAL

The Grantee is hereby provided the summary of the storage, release, or disposal of petroleum or petroleum products on the Property attached hereto as Exhibit A and made a part hereof. Said summary is based on the best information available to the Department of the Army and believed to be correct but no warranty as to completeness or accuracy is provided with respect thereto.

2. "AS IS" CONDITION OF PROPERTY

The Grantee acknowledges that it has inspected, or has had the opportunity to inspect, the Property and accepts the condition and state of repair of the Property. The Grantee understands and agrees that the Property is conveyed "AS IS" without any representation, warranty, or guaranty by the Grantor as to quantity, quality, title, character, condition, size, or kind, or that the same is in condition or fit to be used for the purposes intended by the Grantee, and no claim for allowance or deduction upon such grounds will be considered.

No warranties, either express or implied, are given with regard to the condition of the Property including, without limitation, whether the Property does or does not contain asbestos or lead-based paint. The Grantee shall be deemed to have relied solely on its own judgment in assessing the condition of the Property including, without limitation, any asbestos, lead-based paint, or other conditions on the Property. The failure of the Grantee to inspect or to exercise due diligence to be fully informed as to the condition of the Property will not constitute grounds for any claim or demand against the Grantor.

Nothing in this provision will be construed to modify or negate any of the Grantor's statutory obligations.

3. INDEMNITY AND HOLD HARMLESS

To the extent authorized by law, the Grantee, for itself, its successors and assigns, covenants and agrees to indemnify and hold harmless the Grantor, its officers, agents, and employees from (1) any and all claims, damages, judgments, losses, and costs, including fines and penalties, arising out of the violation of the covenants, conditions, and restrictions in this Deed by the Grantee, its successors and assigns, and (2) any and all claims, damages, and judgments arising out of, or in any manner predicated upon, exposure to asbestos, lead-based paint, or other condition on any portion of the Property after the date of this Deed.

The Grantee, for itself, its successors and assigns, covenants and agrees that the Grantor shall not be responsible for any costs associated with modification or termination of the covenants, conditions, and restrictions in this Deed including, without limitation, any costs associated with additional investigation or remediation of asbestos, lead-based paint, or other condition on the Property.

Nothing in this provision will be construed to modify or negate any of the Grantor's statutory obligations.

4. POST-TRANSFER DISCOVERY OF CONTAMINATION

If a release or threatened release of a hazardous substance is discovered on the Property after the date of this Deed, the Grantee, its successors or assigns, shall be responsible for such newly discovered release or threatened release of a hazardous substance unless the Grantee is able to demonstrate that such release or threatened release of a hazardous substance was due to the Grantor's activities, use, or ownership of the Property. If the Grantee, or its successors or assigns believe the newly discovered hazardous substance is due to the Grantor's activities, use or ownership of the Property, the Grantee or its successors or assigns shall immediately secure the site and notify the Grantor of the existence of the release or threatened release of the hazardous substance and the Grantee or its successors or assigns shall not further disturb or allow the disturbance of such hazardous substance without the prior written permission of the Grantor.

The Grantee, for itself, its successors and assigns, as part of the consideration for the conveyance of the Property, hereby releases the Grantor from any liability or responsibility for any claims arising solely out of the release or threatened release of any hazardous substance on the Property occurring after the date of this Deed where such hazardous substance was placed on the Property by the Grantee, or its successors, assigns, employees, invitees, agents, contractors, or any person other than the Grantor after the date of this Deed.

5. ENVIRONMENTAL PROTECTION PROVISIONS

The Grantee shall neither transfer the Property, lease the Property, nor grant any interest, privilege, or license whatsoever in connection with the Property without including the environmental protection provisions set forth in Exhibit B, attached hereto and made a part hereof, and shall require the said provisions be included in all subsequent deeds, easements, transfers, leases, or grant of any interest, privilege, or license in, of, on, or to the Property or any portion thereof.

6. ANTI-DEFICIENCY ACT

The Grantor's obligation to pay or reimburse any money under this Deed is subject to the availability of funds appropriated for this purpose to the Department of the Army and nothing in this Deed shall be interpreted to require obligations or payments by the Grantor in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341.

7. NO WAIVER

The failure of the Grantor to insist in any one or more instances upon timely or complete performance of any obligation of the Grantee, or its successors or assigns required by the covenants, conditions, or restrictions set forth in this Deed shall not be construed as a waiver or a relinquishment of the Grantor's right to future performance of any such obligation of the Grantee or its successors or assigns in accordance with the said covenants, conditions, and restrictions, and all such obligations of the Grantee, its successors and assigns shall continue in full force and effect.

SIGNATURE PAGES FOLLOW

IN WITNESS WHEREOF, the Grantor has caused this Deed to be executed in its name by the Interim Director of Real Estate, Headquarters, U.S. Army Corps of Engineers, this 25th day of February, 2023.

UNITED STATES OF AMERICA

By: Paula S. Johnson-Muic
 Paula S. Johnson-Muic
 Interim Director of Real Estate
 Headquarters, U.S. Army Corps of
 Engineers

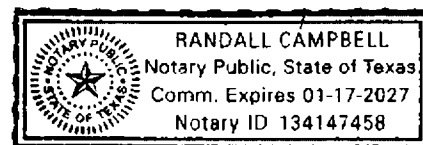
ACKNOWLEDGMENT

STATE OF TEXAS)
) ss
 COUNTY OF Collin)

I, Randall Campbell, a Notary Public in and for the State of Texas, do hereby certify that this 25 day of February, 2023, Paula S. Johnson-Muic, Interim Director of Real Estate, Headquarters, U.S. Army Corps of Engineers, known to me or proven through satisfactory evidence of identity to be the person whose name is subscribed to the foregoing document, appeared in person and acknowledged before me that the signature on the document was voluntarily affixed by her for the purposes therein stated and that she had due authority to sign the document in the capacity therein stated.

Randall Campbell
 NOTARY PUBLIC

My commission expires the 4th day of January, 2027



ACCEPTANCE BY GRANTEE

IN WITNESS WHEREOF, the Grantee hereby accepts the conveyance herein subject to the covenants, conditions, and restrictions contained therein, this 8th day of March, 2023.

**CHARLES RIVER
ASSOCIATION FOR
RETARDED CITIZENS, INC.**

By: Anne-Marie Bajwa
Anne-Marie Bajwa
President

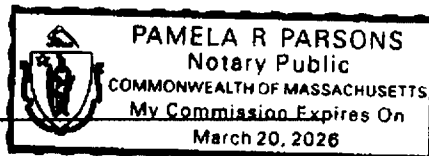
ACKNOWLEDGMENT

COMMONWEALTH OF MASSACHUSETTS)
) ss
COUNTY OF ~~NORFOLK~~ Suffolk)

I, Pamela R. Parsons, a Notary Public in and for the Commonwealth of Massachusetts, do hereby certify that this 8th day of March, 2023, Anne-Marie Bajwa, President, Charles River Association for Retarded Citizens, Inc., known to me or proven through satisfactory evidence of identity to be the person whose name is subscribed to the foregoing document, appeared in person and acknowledged before me that the signature on the document was voluntarily affixed by him for the purposes therein stated and that he had due authority to sign the document in the capacity therein stated.

Pamela R. Parsons
Notary Public

My Commission Expires: _____



CERTIFICATE OF AUTHORITY

*ALICE TAYLOR**Chairman*

DOB
WMA
I, ~~Raymond Brassard~~, certify that I am the ~~Clerk~~ of the Charles River Association for Retarded Citizens, Inc. , and that Anne-Marie Bajwa, who signed the foregoing instrument on behalf on the Grantee, was then the President of the said nonprofit corporation. I further certify that the said officer was acting within the scope of powers delegated to this officer by the governing body of the Grantee in executing said instrument.

Date: March 8, 2023Signed: *Alice Taylor*

EXHIBIT A**Notification of Petroleum Product Storage, Release, or Disposal****No. 2 Fuel Oil Underground Storage Tanks Installed in 1958**

Address	Removal / Replace Date	Replacement Tank	Comments at Time of Removal
1 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
2 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
3 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
4 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
5 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
6 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
7 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
8 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
9 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
10 EMH	Sep/Oct 1987	300 gal. single wall steel UST	Oil release and soil contamination noted. UST, its contents, and an unspecified quantity of impacted soil removed/disposed. Incident closed from regulatory perspective (USACE, 2019)
11 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
12 EMH	Apr/May 1989	550 gal. double wall steel UST	No release or soil contamination noted
EMH = East Militia Heights Road Tanks installed in 1958 were 275-gallon single-walled steel USTs			

No. 2 Fuel Oil Underground Storage Tanks Removed in 2004 (see table above for UST type/capacity)

Address	Removal Date	Comments at Time of Removal
1 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
2 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
3 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
4 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
5 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
6 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
7 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
8 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
9 EMH	October 2004	Petroleum-related soil contamination above Mass DEP cleanup standards noted. Limited Removal Action implemented. 10 cy of impacted soil removed. Regulatory closure with Mass DEP. No further action required (USACE, 2019; Nobis, 2005a; Nobis, 2005b)
10 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
11 EMH	October 2004	No release or soil contamination above Mass DEP cleanup stds. noted (USACE, 2019)
12 EMH	October 2004	Petroleum-related soil contamination above Mass DEP cleanup standards noted. Limited Removal Action implemented. 10 cy of impacted soil removed. Regulatory closure with Mass DEP. No further action required. (USACE, 2019; Nobis, 2005a; Nobis, 2005c)

EMH = East Militia Heights Road

USTs were removed in October 2004 were not replaced as natural gas became available to the housing area.

EXHIBIT B**Environmental Protection Provisions****1. NOTICE OF THE PRESENCE OF ASBESTOS AND COVENANT**

- a. The Grantee is hereby informed and does acknowledge that non-friable asbestos or asbestos-containing material ("ACM") has been found on the Property. The Property may contain improvements, such as buildings, facilities, equipment, and pipelines, above and below the ground, that contain non-friable asbestos or ACM. The Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency have determined that such unprotected or unregulated exposure to airborne asbestos fibers increases the risk of asbestos-related diseases, including certain cancers that can result in disability or death.
- b. The Grantee covenants and agrees that its use and occupancy of the Property will be in compliance with all applicable laws relating to asbestos. The Grantee agrees to be responsible for any remediation or abatement of asbestos found to be necessary on the Property to include ACM in or on buried pipelines that may be required under applicable law or regulation.
- c. The Grantee acknowledges that it has inspected or has had the opportunity to inspect the Property as to its asbestos and ACM condition and any hazardous or environmental conditions relating thereto. The Grantee shall be deemed to have relied solely on its own judgment in assessing the overall condition of all or any portion of the Property, including, without limitation, any asbestos or ACM hazards or concerns.

2. NOTICE OF THE PRESENCE OF LEAD-BASED PAINT (LBP) AND COVENANT AGAINST THE USE OF THE PROPERTY FOR RESIDENTIAL PURPOSE

- a. The Grantee is hereby informed and does acknowledge that all buildings on the Property, which were constructed or rehabilitated prior to 1978, are presumed to contain lead-based paint. Lead from paint, paint chips, and dust can pose health hazards if not managed properly. Every purchaser of any interest in Residential Real Property on which a residential dwelling was built prior to 1978 is notified that there is a risk of exposure to lead from lead-based paint that may place young children at risk of developing lead poisoning.
- b. Available information concerning known lead-based paint and/or lead-based paint hazards, the location of lead-based paint and/or lead-based paint hazards, and the condition of painted surfaces is contained in the

Environmental Condition of Property (ECP) report (USACE, 2019) and in the Lead Paint Compliance Information provided as provided in Appendix I of said report, and in the January 2020 technical memorandum addendum to said report (USACE 2020). The Grantee has been provided with the federally approved pamphlet on lead poisoning prevention. The Grantee hereby acknowledges receipt of all of the information described in this subparagraph.

- c. The Grantee covenants and agrees that it shall not permit the occupancy or use of any buildings or structures on the Property as Residential Property, as defined under 24 Code of Federal Regulations Part 35, without complying with this section and all applicable federal, state, and local laws and regulations pertaining to lead-based paint and/or lead-based paint hazards. Prior to permitting the occupancy of the Property where its use subsequent to sale is intended for residential habitation, the Grantee specifically agrees to perform, at its sole expense, the Army's abatement requirements under Title X of the Housing and Community Development Act of 1992 (Residential Lead-Based Paint Hazard Reduction Act of 1992).
- d. The Grantee acknowledges that it has inspected or has had the opportunity to inspect the Property as to its lead-based paint content and condition and any hazardous or environmental conditions relating thereto. The Grantee shall be deemed to have relied solely on its own judgment in assessing the overall condition of all or any portion of the Property, including, without limitation, any lead-based paint hazards or concerns.

3. PESTICIDE NOTICE AND COVENANT

- a. The Grantee is hereby notified and acknowledges that registered pesticides have been applied to the Property conveyed herein and may continue to be present thereon. The Grantee and Grantor know of no use of any registered pesticide in a manner (1) inconsistent with its labeling or with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)(7 U.S.C. § 136, et seq.) and other applicable laws and regulations, or (2) not in accordance with its intended purpose.
- b. The Grantee, for itself, its successors and assigns hereby covenants and agrees that if the Grantee takes any action with regard to the Property, including demolition of structures or any disturbance or removal of soil that may expose, or cause a release of, a threatened release of, or an exposure to, any such pesticide, Grantee assumes all responsibility and liability therefor.

Attachment 3b: Joint Venture Agreement

CHARLES RIVER HEIGHTS JV LLC

LIMITED LIABILITY COMPANY OPERATING AGREEMENT

THIS LIMITED LIABILITY COMPANY OPERATING AGREEMENT (this “Agreement”), dated as of June 26, 2025 (the “Effective Date”) of Charles River Heights JV LLC (the “Company”) is by and between CRC East Militia, LLC (“CRC”) and Planning Office for Urban Affairs, Inc. (“POUA”), each either a Massachusetts non-profit corporation or whose sole member is a Massachusetts non-profit corporation, organized under G.L. c. 180 (together with any individuals or entities who become members of the Company (as defined below) subsequent to the date hereof, the “Members”).

BACKGROUND

A. The Members, or Affiliates (as hereinafter defined) thereof entered into that certain Memorandum of Understanding (“MOU”), dated September 6, 2023, to set forth the basic terms for a joint venture agreement (a “JVA”) to work towards the ground lease, predevelopment, development, capitalization, ownership, and operation of Charles River Village, an approximately 86-unit development providing a mix of affordable housing available to the general public, supportive housing for adults with disabilities and amenity space (the “Project”) on certain real estate located on East Militia Heights Drive at the Dwight Road Junction in Needham, Massachusetts (the “Land”);

B. Fee title to the Land upon which the Project is envisioned to be developed is owned by CRC Land Owner LLC, a Massachusetts limited liability company (“Land Owner”), an Affiliate of CRC, and is intended to be ground leased to the Owner under a long-term ground lease (the “Ground Lease”); and for the avoidance of doubt only the ground tenant’s interest under the Ground Lease shall be part of the Project;

C. In accordance with the provisions of the Massachusetts Limited Liability Company Act, Chapter 156C of the Massachusetts General Laws (the “Act”), the Members formed (i) Charles River Heights LLC, a Massachusetts limited liability company (the “Owner”), to act as the ground tenant of the Land under the Ground Lease by filing a Certificate of Organization with the Massachusetts Secretary of the Commonwealth (the “Secretary”) on January 17, 2025; and formed Charles River Heights MM LLC, a Massachusetts limited liability company (the “MM”), to act as a member and manager of the Owner by filing a Certificate of Organization with the Secretary on January 17, 2025; and (iii) Charles River Heights JV LLC, as Massachusetts limited liability company (the “Company”), to act as the sole member of MM by filing a Certificate of Organization with the Secretary on January 17, 2025.

D. The Members desire to enter into a development services agreement (the “Development Services Agreement”) with the Owner for the purpose of rendering development services to the Owner and being remunerated for such services, substantially in the form attached hereto as Exhibit D; and

E. The Members desire to enter into this JVA to set forth their agreements with respect to the internal governance and management of the Company, which agreement will delineate the various powers, authorities, and rights of each Member to act on the Company's behalf and will delineate the obligations and responsibilities of each Member in managing the Company's internal affairs; and

F. Attached hereto as Exhibit E and incorporated herein by reference is an organizational chart for the Project, reflecting the anticipated ownership structure for the Project.

AGREEMENTS

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Members do hereby enter into this Agreement to serve as the operating agreement of the Company on the following terms:

1. Company Name; Registered Office and Agent. The name of the Company is Charles River Heights JV LLC. The initial address of the Company's registered office is c/o Planning Office for Urban Affairs, Inc., 10 Post Office Square, Suite 1310, Boston, MA 02109. The name of the Company's registered agent at such address is Planning Office of Urban Affairs, Inc.

2. Purposes and Powers. The purposes of the Company are (i) to acquire, hold, invest in, develop, operate, lease, sell, exchange, transfer or otherwise deal in and with all kinds of property, whether real, personal or mixed and wherever located, including certain property in Needham, Massachusetts, directly or in joint venture with other entities, for operation of residential dwelling units, commercial space, and related facilities, (ii) to act as the sole member of Charles River Heights MM LLC or any other limited liability company formed for the foregoing purposes, (iii) to engage in any and all activities related to or useful in connection with the foregoing purposes, and (iv) to engage in any other business that a limited liability company may carry on under the laws of Massachusetts.

The parties acknowledge that each Member is an exempt organization under Section 501(c)(3) of the Internal Revenue Code, as amended (the "Code"), engaged in providing housing to low-income or disabled individuals. The parties acknowledge that the Owner will operate housing that it owns in a manner that furthers the charitable purpose of each Member by providing decent, safe, sanitary and affordable housing for low-income or disabled persons and families. In the event of a conflict between (i) the obligations of the Managers (hereafter defined) under this Agreement to operate the Company in a manner consistent with the charitable purpose set forth above, and (ii) any duty to maximize profits for the Members, the conflict shall be resolved in a manner consistent with the Members' charitable purpose as set forth above.

Notwithstanding the foregoing, the Partnership Representative (hereafter defined) in its sole discretion is authorized to and may make such elections pursuant to Section 168(h)(6)(F)(ii) of the Internal Revenue Code (the "Section 168(h)(6) Election") at the time and in such manner as the Partnership Representative determines is necessary to carry out of the Project. In the event the Company makes a Section 168(h)(6) Election, each Member agrees to attach a copy of such

Section 168(h)(6) Election to its IRS Form 990 for the tax year such election is to be first effective. It is also acknowledged and agreed that the Company (but not its Members) is, or will elect to be, classified as an association taxable as a corporation for federal income tax purposes.

3. Members. The name and business address or place of residence of each Member are:

Member Name	Address	Percentage Interest
CRC East Militia LLC	59 East Militia Heights Drive, Needham, MA 02492	50%
Planning Office for Urban Affairs, Inc.	10 Post Office Square, Suite 1310, Boston, MA 02109	50%

For the avoidance of doubt, in the event the Company makes an election to be taxed as a corporation for federal income tax purposes, each of the Members shall be treated as having not less than 50% of the “stock” of the Company as a Percentage Interest and not less than 50% of the “stock” of the Company by vote.

4. Term. The Company shall have perpetual existence from the date of filing of its Certificate of Organization, unless sooner dissolved by agreement of the Members or by operation of law.

5. Capital.

(a) A separate capital account (“Capital Account”) shall be established for each Member on the books of the Company reflecting an amount equal to such Member’s capital contributions. As of the Effective Date, the Members have contributed to the capital of the Company in cash the amounts set forth opposite their names as follows:

CRC East Militia LLC	\$50.00
Planning Office for Urban Affairs, Inc.	\$50.00

The Members shall not be required to make any additional capital contributions to the Company, except as set forth in subparagraph (b) below, nor shall any Member be required to pay to the Company or to any other Member any deficit or negative balance which may exist from time to time in the Member’s Capital Account.

(a) Initial Capital Contributions. To the extent not funded by third-party predevelopment loan(s), the Members shall make capital contributions to the Company to fund all predevelopment costs and expenses of the Project, *pari passu* in accordance with their respective Percentage Interests, and as more particularly set forth on the Predevelopment Budget attached hereto as Exhibit “C” and incorporated herein by reference (each being a “Capital Call”), at such time and in such amounts as may be called by a Member. Initial Capital Contributions shall be due and payable within twenty (20) days of a Capital Call.

(b) Additional Capital Contribution. Notwithstanding the foregoing, if a Member reasonably

determines that the Company needs funds to cover costs (other than Development Fees or Overhead) in connection with the Project in excess of Initial Capital Contribution Commitments, except for any Guaranty obligation of POUA in the development of the Project (which shall be borne exclusively by POUA), such Member shall so inform the other Member and such funds shall be provided by the Members in proportion to their Percentage Interests. In the event one of the Members does not provide its portion of such additional funds within forty-five (45) days after the written request from the other Member (unless such notice indicates that the need for additional funds is an emergency, in which case such time period may be shortened in the written request, but not below fifteen (15) days), then the other Member may provide one hundred percent (100%) of such required funds. All funds provided pursuant to this Article 5 in excess of such Member's Percentage Interest share, and interest accrued thereon, shall constitute loans (each, a "Member Loan"). In addition, to the extent that either Member directly funds costs that are not reimbursed by development or other sources, such funding shall be considered a Member Loan. Member Loans shall accrue interest at an annual rate of the Prime Rate (at the time the Member Loan is made) plus three percent (3%) to the extent such loans have been made by the Members in proportion to their Percentage Interests, and at an annual rate equal to the Prime Rate (at the time the Member Loan was made) plus eight percent (8%) with respect to any excess loan amount made by one Member, in all cases compounded annually, and shall be repayable in accordance with the provisions of clause (g) of Article 6. For purposes of the foregoing, "Prime Rate" shall mean the rate published from time to time in the *Wall Street Journal* as the Prime Rate. By way of example, if the Prime Rate is five percent (5%) and one Member has made loans pursuant to this Article 5 in the aggregate amount of Four Hundred Thousand Dollars (\$400,000) and the other Member has made loans in the amount of One Hundred Thousand Dollars (\$100,000) at a time when the Percentage Interests are equal, then the Member Loans in the amount of One Hundred Thousand Dollars (\$100,000) made by each Member shall accrue interest at eight percent (8%) and the Member Loan made by one of the Members in the amount of Three Hundred Thousand Dollars (\$300,000) shall accrue interest at thirteen percent (13%). Any payments of Developer Fee or other fees or amounts received by the Company shall first be used by the Company to return capital contributions made by the Members and then to repay Member Loans. If a Member receives a payment of Developer Fee or other fees related to the Project at a time when the other Member has an excess of capital contributions or Member Loans (e.g. the other Member has contributed or loaned more than its Percentage Interest of the total required amount), the Member receiving such payment shall make a capital contribution or loan to the Company up to the amount necessary to bring the Members into parity.

(c) If a Member (the "Funding Member") funds an amount in excess of the other Member (the "Non-Funding Member") under this Article 5 or under Article 6(j) below and the Non-Funding Member does not make a Member Loan to cover such excess or otherwise reimburse the Funding Member for such excess within 60 days of the funding of the excess by the Funding Member, then the Funding Member shall have the election, exercisable by written notice to the Non-Funding Member, to convert its Member Loan for the excess amount into a capital contribution and to adjust each Member's Membership Interest in proportion to the resulting Capital Accounts. From and after the conversion of the excess amount into a capital contribution, (i) such excess amount shall no longer bear interest and (ii) any future requirements for additional funding shall be allocated between the Members in accordance with the modified Percentage Interests. The foregoing conversion/dilution election shall not affect existing Member Loans that have

theretofore been funded equally by the Members.

6. Capital Accounts, Tax Matters, Distributions and Responsibilities.

(a) The Company shall maintain a separate Capital Account for each Member pursuant to the principles of this section and applicable Treasury Regulations promulgated under the Code, as amended from time to time ("Treasury Regulations"). The initial capital account of each Member, which shall be the Member's initial capital contribution, shall be increased by the amount of such Member's subsequent capital contributions and by such Member's allocable share of Company income ("Company Income") as hereinafter provided, and each Member's capital account shall be decreased by the amount of cash distributed to the Member by the Company and by such Member's allocable share of Company losses ("Company Losses") as hereinafter provided.

(b) The Company Income and Company Losses for each fiscal year shall be determined as of the end of each fiscal year and shall be allocated in proportion to each Member's Capital Account. Unless otherwise mutually agreed by the Members, any Massachusetts state low-income housing tax credits allocated by the Owner to the Company shall be allocated to CRC and POUA in accordance with their respective Capital Account.

(c) Prior to the making of the election to be taxable as a corporation, each Member hereby recognizes that the Company will be subject to all provisions of Subchapter K of the Code. The provisions of this Agreement relating to the proper maintenance of capital accounts and allocation of income, gains, deductions, and losses are designed to cause the overall allocations of items to have substantial economic effect and are intended to comply with, and to be interpreted and applied in a manner consistent with the requirements of Treasury Regulations, Sections 1.704-1(b) and 1.704(2). The Members are authorized to modify the manner in which the Capital Accounts are maintained and items of income, gain, deductions, and losses are allocated if they determine that such modification is required or prudent to comply with the Treasury Regulations, and is not likely to have a material effect on the amounts distributable to any Member upon dissolution of the Company.

(d) The Partnership Representative shall cause the Company to file all tax returns required to be filed for the Company for each fiscal year or part thereof and shall, at the time of such filing, provide each person who at any time during the fiscal year was a Member with an annual statement (including a copy of Schedule K-1 to Internal Revenue Service Form 1065) indicating such Member's share of the Company's income, loss, gain, expense and other items relevant for income tax purposes. Such annual statement need not be audited, but in the event of an audit of the Company, any such audit shall be provided to the Members.

(e) POUA is hereby designated as the "Partnership Representative" under Section 6223 of the Code (as in effect pursuant to the Bipartisan Budget Act of 2015, the "2015 Budget Act") and shall take any action required under the Code or Treasury Regulations to designate itself the Partnership Representative. Each Member hereby consents to such designation and agrees that, upon the request of POUA, such Member shall execute, certify, acknowledge, deliver, swear to, file and record at the appropriate public offices such documents as may be necessary or appropriate to evidence such consent. Further, each Member shall respond to reasonable requests to amend this Agreement if another Member determines that an amendment is required after promulgation of

additional or revised Treasury Regulations implementing Subchapter 63C of the Code (as amended by the 2015 Budget Act, the Protecting Americans from Tax Hikes Act of 2015, P.L. 114-113, and the Consolidated Appropriations Act of 2018, P.L. 115-141, the “Revised Partnership Audit Rules”) to maintain the intent of the parties with respect to the obligations and limitations of the Partnership Representative. The Partnership Representative shall designate the “designated individual” (as such term is defined Treas. Reg. Sec. 301.6223-1(b)(3)) (the “Designated Individual”) when such designation is required by the Treasury Regulations. The Partnership Representative shall have the final decision with respect to all Federal and state income tax matters involving the Company, and shall represent the Company in connection with all examinations of the Company’s affairs by tax authorities, including administrative and judicial proceedings. The Members agree to cooperate with the Partnership Representative and do or refrain from doing any and all things reasonably required by the Partnership Representative to conduct such proceedings. The Partnership Representative is authorized to expend Company funds for professional services and costs associated with tax matters. Any direct out-of-pocket expense incurred by the Partnership Representative and/or the Designated Individual in carrying out its respective obligations hereunder shall be reimbursed by the Company. In the event of any final partnership adjustment occurring under the Revised Partnership Audit Rules, the Company shall elect to utilize the alternative procedure described in Section 6226 of the Code, and the Partnership Representative shall provide the Internal Revenue Service and each affected Member with such information as required by such Section 6226 and any Treasury Regulations promulgated thereunder. Each Member agrees to cooperate with the Company in utilizing the procedures under Section 6226 of the Code, whether or not such person is a Member at the time of a final partnership adjustment. The provisions of this Section 6(e) shall also apply to state and local income tax matters affecting the Company to the extent the terms and conditions have any application to audit procedures at the state and local level.

(f) No Member shall have the right to withdraw any part of its capital contribution or to receive any return on any portion of its capital contribution, except as may be otherwise specifically provided in this Agreement. Under circumstances involving a return of any capital contribution, no Member shall have the right to receive property other than cash. No Member shall have priority over any other Member either as to the return of capital contributions or as to net income, net losses or distributions; provided that this subsection shall not apply to Member Loans.

(g) Distributable Cash and other property at such times and in such amounts as may be determined, shall be distributed first to repay any Member Loans and thereafter in proportion to each Member’s Membership Interest. “Distributable Cash” means, with respect to the Company for a particular period of time, all funds of the Company which, in the commercially reasonable discretion of POUA, are available for distribution to Members after provision has been made for payment of all operating expenses and of all outstanding and unpaid current obligations of the Company as of such time, including any unpaid Developer Fee, and for such reserves as the Members deem appropriate or necessary for working capital for the immediate operating costs subsequent fiscal year, in accordance with sound accounting and cash flow principles. No distribution shall be declared and paid if payment of such distribution would cause the Company to violate any limitation on distributions provided in the Act.

(h) The responsibilities of the Company shall be carried out in accordance with the matrix

delineating such responsibilities attached hereto as Exhibit A. (the “Responsibility Matrix”), and in accordance with the processes set forth in this Agreement relative to Major Decisions and the Steering Committee. The Members agree that the development of the Project shall be in accordance with the development plan described in Exhibit B attached hereto (the “Development Plan”), the and Predevelopment Budget attached hereto as Exhibit C (the “Predevelopment Budget”), and that the Managers shall carry out their respective responsibilities in a manner consistent with the Development Plan, the Predevelopment Budget, the Development Budget, and the Operating Budget, as each may be amended from time to time by Major Decision agreement of the Members

(i) POUA shall execute any and all construction completion, repayment, operating, and tax recapture guaranties required by any lender or investor providing debt or equity capitalization to the development and operation of the Project (each, a “Guaranty”). If POUA shall be required to pay any amount or amounts under a Guaranty, the aggregate amount so to be paid, plus the expenses incurred in defending and settling any claim made in connection therewith (a “Guaranty Payment”) shall be borne by POUA. If POUA becomes liable under a Guaranty due to the gross negligence or willful misconduct of CRC, CRC shall indemnify POUA and hold POUA harmless from and against any such liability.

(j) Under the Development Services Agreement, the Owner shall pay to the Members a development fee (“Developer Fee”) and an overhead reimbursement (“Overhead”) in an amount to be agreed upon by the Owner and the Members, which will be subject to the requirements of the Massachusetts Executive Office of Housing and Livable Communities. The Developer Fee shall be allocated 100% to POUA. The Overhead shall be allocated 65% to POUA and 35% to CRC. The total Developer Fee and Overhead shall be as set forth in the final Development Budget and in documents entered into at the closing on the financing for the construction of the Project (the “Construction Loan Closing”). The Developer Fee and Overhead shall be paid pursuant to the Development Services Agreement.

(k) Under the Ground Lease, the Owner shall pay to the Land Owner ground rent based on costs and expenses relating to the purchase and acquisition of the Land, including reasonable costs, fees and expenses relating to: (i) the initial purchase price for the Land which was \$5,538,000, (ii) site surveys, (iii) attorneys’, architects’ and accountants’ fees; (iv) demolition of various buildings and structures on the Land; and (v) remediation and site clean up of the Land following such demolition (collectively, the “Ground Rent”). The Members intend for there to be an upfront payment of a portion of the Ground Rent upon execution of the Ground Lease and for the Ground Rent payment structure to provide for the payment of the entire Ground Rent over the shortest term possible, with amounts unpaid remaining a current liability of the Owner, accruing at an annual interest rate of not less than the Long Term Applicable Federal Rate then in effect. The Ground Rent Payment structure shall be subject to the reasonable underwriting requirements of the low income housing tax credit investor(s) member and institutional lender(s) of and to the Project, shall be set forth in the Ground Lease, and shall be an obligation of the Owner not POUA or CRC.

7. Management.

(a) Equal Management. The management, operation and policies of the Company are equally vested in CRC and POUA (the “Managers”), and unless allocated expressly to one Member or Manager, shall be considered and decided through the Steering Committee (as hereinafter defined). The Managers shall have the power on behalf of and in the name of the Company to carry out and to implement any and all of the purposes of the Company. In furtherance of their authority, the Managers are authorized and empowered to perform any and all acts customary or incident to the management of the Company’s business. The Managers hereby authorize William H. Grogan and Anne-Marie Bajwa (i) to execute and file the Certificate of Organization of the Company as well as any amendments thereto with the Secretary of the Commonwealth of Massachusetts on their behalf; (ii) to execute, acknowledge, deliver and record any recordable instrument on behalf of the Company purporting to affect an interest in real property, whether to be recorded with a registry of deeds or a registry district office of the Land Court; and (iii) to execute any other document, instrument or contract on behalf of the Company.

(b) Major Decisions. Notwithstanding anything to the contrary contained in this Agreement, the following actions shall be deemed “Major Decisions” and shall be considered and resolved by and within the structure of the Steering Committee of the Company, as more particularly set forth in Section 15, or Section 16 if applicable, of this Agreement. In the event of any need for approval of any Major Decision, the Member seeking such determination shall make such request of the other Member(s) in writing, together with any information reasonably necessary for such Member to make an informed decision. The Member to whom a request is directed shall have seven (7) business days to respond. If that Member does not provide a response within such seven (7) business day period, the Member seeking response shall send a second written request with a subject line in all capital letters “CONSENT IS REQUESTED UNDER SECTION 7(b) OF THE LIMITED LIABILITY COMPANY OPERATING AGREEMENT OF CHARLES RIVER HEIGHTS JV LLC” and if the Member does not respond to the second request within five (5) business days, then the Member receiving the request for approval shall be deemed to have approved the applicable Major Decision. The following Major Decisions shall require the unanimous approval of all Members:

- (i) Taking any act that would make it impossible to carry on the ordinary business of the Company, MM, or Owner, except as otherwise provided in this Agreement;
- (ii) Admitting new members to the Company or MM;
- (iii) Causing the Company to enter into any line of business other than the sole member of the MM and the initial investor member of the Owner, or MM to enter into any line of business other than the managing member of the Company, or for the Owner to enter into any line of business other than for the development and operation of the Project;
- (iv) Dissolving, terminating or liquidating the Company, MM, or the Owner or causing the Company, MM, or the Owner to redeem or repurchase all or any of the interest

of any member;

- (v) Merging, consolidating, or combining the Company or MM with any other entity;
- (vi) Selling or otherwise disposing of all or substantially all of the Company's, MM's, or the Owner's assets except by the Owner to the Managers or an affiliate thereof pursuant to a right of first refusal or purchase option entered into as part of the low income housing tax credit financing for the Project, and as more particularly described in Section 14, or as otherwise specifically contemplated herein or in the Owner's operating agreement;
- (vii) A declaration of bankruptcy, assignment for the benefit of general creditors or similar act by any of the Company, the MM, or the Owner.
- (viii) Modifying or amending in any material way the Development Plan or the purposes of the Company or making any material change in the plans and specifications for any construction at the Project;
- (ix) Causing the Company, MM, and the Owner to negotiate a Ground Rent payment structure with the Land Owner that is reasonably satisfactory to CRC and POUA and satisfies any reasonable underwriting requirements of any low income housing tax credit investor member or institutional lender of and to the Company;
- (x) Causing the Company, MM, and the Owner to negotiate a Ground Lease term with the Land Owner that is reasonably satisfactory to CRC and POUA and satisfies any reasonable underwriting requirements of any low income housing tax credit investor member or institutional lender of and to the Company, it being agreed that a term no greater than fifty (50) years is satisfactory to CRC and POUA;
- (xi) Modifying or amending in any material way the Ground Rent and/or the Ground Rent payment structure set forth in the Ground Lease;
- (xii) Applying for a change in zoning or zoning relief or for any other permits or approvals in connection with the development of the Project, other than those consistent with and necessary to the implementation of the Development Plan;
- (xiii) Borrowing from the Company or commingling Company funds with funds of any other entity or person;
- (xiv) Constructing any new or replacement capital improvements on the Land or to the Project, except as already contemplated in a budget approved by both Managers;
- (xv) Causing the Owner, MM, or the Company to acquire any real property other than the Owner's leasehold interest under the Ground Lease;
- (xvi) Engaging additional or replacement counsel to advise the Company, MM or the

Owner on any matter, or to engage additional or replacement auditors or accounting firms, except to the extent required by the tax credit investor member(s) of the Owner under the Owner's operating agreement;

- (xvii) Changing the property manager for the Project, except in the case of a termination of the property manager for cause or if such termination is pursuant to a provision of any loan document, in which case only the selection of the new property manager shall require unanimous consent of the Managers, subject to the provisions of any loan document and/or provisions of the Owner's operating agreement;
- (xviii) Amending or failing to obtain any insurance coverage required by the Company's or the Owner's lenders and/or investors;
- (xix) Changing the Company's, the MM's or the Owner's accounting method, either for financial or tax reporting purposes, or causing the Company to be taxed other than as a partnership for federal income tax purposes;
- (xx) Modifying in any material respect the form of lease used for leasing space at the Project;
- (xxi) Entering into transactions with managers, officers, employees or affiliates of a Member except with respect to the Ground Lease or as otherwise specifically contemplated herein;
- (xxii) Amending or modifying any of the Predevelopment Budget, Development Budget, or Operating Budget other than in accordance with the provisions of Section 7(c) below, or incurring any expense on behalf of the Owner, MM or the Company that is not set forth in the subject approved Budget or changing the debt or equity capitalization or rental subsidy arrangements for the Project in a manner that would materially impact the operation or management of the Project or Ground Lease in any material respect;
- (xxiii) Debt or equity financings, re-financings, or recapitalizations of any of the Project, the Owner, MM or the Company, including but not limited to borrowing money and issuing evidences of indebtedness or securing the same by mortgage, pledge or other lien on any assets of the Owner, MM or the Company, pledging or suffering to exist any other liens or encumbrances on any asset of the Owner, MM, or Company or guarantying the obligations of any other party;
- (xxiv) Increasing, decreasing, prepaying, amending or modifying the terms of any financing or refinancing any loan secured by the assets of the Company, MM or Owner or any other financing incurred by the Owner, MM, or Company or making elections with respect to interest periods, interest rates, prepayment or other material provisions under any financing;
- (xxv) Requiring additional contributions or loans from a Member, other than as

authorized in Article 5 above;

- (xxvi) Incurring any material obligation of the Company, MM, or the Owner, including entering into any construction contract, architect contract, property management agreement, development agreement or other material agreement or contract;
- (xxvii) Entering into any agreements or contracts that cannot be terminated upon 30 days' notice (without any penalty or acceleration of payment) or that has an aggregate payment in any 12-month period in excess of \$50,000;
- (xxviii) Subjecting all or any portion of the Project to a condominium regime;
- (xxix) Rebuilding or reconstructing the improvements on the Land if they are substantially damaged by a fire or other casualty;
- (xxx) Doing any act required to be approved or ratified by all Members under the Act or under this Agreement or taking any other action that materially affects the Company, MM, the Owner, the Project or the Ground Lease or taking any other action which in itself, or when combined with other factors known to either Member, will increase the likelihood that the Members will be required to make capital contributions or Member Loans pursuant to Article 5;
- (xxxi) Filing or defending lawsuits or other proceedings on behalf of the Company, MM, or the Owner, except for the defense by insurers of insured claims
- (xxxii) Causing the Company, MM or the Owner to settle, compromise, mediate or otherwise relinquish any claim (actual or prospective), or releasing, waiving or diminishing any material rights in any litigation or arbitration matter involving a claim in excess of \$20,000; and
- (xxxiii) Issuing any press release or other announcements by or on behalf of Owner, MM, or Company, or with respect to the Project to the public media or outside parties;
- (xxxiv) Approving or to entering into any agreement to do any of the foregoing or causing the Owner to do any of the foregoing.

(c) Preparation of Budgets. POUA shall be responsible for the preparation of a Predevelopment Budget, a Development Budget and an Operating Budget for the Project, as set forth in this Section 7(c), approval of which shall all be Major Decisions.

(i) Predevelopment Budget

- a. The predevelopment budget shall cover the time period from the date hereof until the construction loan closing (the "Predevelopment Budget"). The initial Approved Predevelopment Budget is attached hereto as Exhibit C. If POUA seeks to amend or modify the Predevelopment Budget, the same shall be promptly presented to CRC for review and approval. The time frames and

process for review and approval of the Predevelopment Budget shall be the same as with any other Major Decision. Once approved by CRC, deemed approved pursuant to Section 7(c)(i)(b), or modified as provided in Section 7(c)(i)(b), shall be referred to herein as the “Approved Predevelopment Budget”. Except as otherwise provided in this Agreement, the Managers shall be authorized to make only those expenditures and take only those actions which are included in, or contemplated by, the Approved Predevelopment Budget; provided, however, that the Managers shall also be authorized to make any additional expenditures under circumstances which, in such Manager’s reasonable judgment, constitute an event or condition requiring prompt action (a) for protection of the Project or the Land from imminent danger, damage or destruction, (b) for compliance with applicable law, or (c) for the avoidance of a significant risk of personal injury or property damage to occupants, tenants or other persons (each of the circumstances in the preceding subclauses (a) through (c), an “Emergency”), and, provided further, that the Managers may with prior written notice to all Members (x) incur expenditures for the Project which exceed the amounts set forth in the Approved Predevelopment Budget by up to ten percent (10%) with respect to any individual line item (but in no event more than the lesser of four percent (4%) of the aggregate Approved Predevelopment Budget amount or Twenty-Five Thousand Dollars (\$25,000.00), and (y) apply actual cost savings in any line item in the Approved Predevelopment Budget to anticipated or actual cost overruns in another line item. With respect to expenditures made pursuant to an Emergency, the Manager making such expenditure shall notify the other Manager prior to or promptly after making or incurring such an expenditure.

- b. CRC shall, within ten (10) business days after receipt of a Predevelopment Budget either (a) approve the Predevelopment Budget or (b) advise POUA in writing of, and/or discuss at a Steering Committee meeting, CRC’s specific reasonable objections thereto. If CRC has objections to the Predevelopment Budget, POUA shall revise the Predevelopment Budget in a good faith effort to address such objections, and shall then resubmit the same to CRC in writing within ten (10) business days after its receipt of the objections thereto, whereupon the process set forth above shall be utilized again (except that CRC shall respond to any revised Predevelopment Budget in writing within ten (10) business days), until a Predevelopment Budget has been approved. In addition, at any time after an Approved Predevelopment Budget has been approved by CRC, POUA shall have the right to submit a revised or amended Predevelopment Budget in writing to CRC for approval, and if CRC has objections to such revisions or amendments, CRC shall advise POUA in writing of its specific reasonable objections within ten (10) business days of receipt thereof. CRC’s failure to respond within any of the aforementioned time periods shall be deemed approval of the submitted Predevelopment Budget or revisions or amendment thereto.

(ii) Development Budget

- a. POUA shall provide CRC with the final proposed development budget not earlier than twenty (20) days no later than ten (10) days before the anticipated construction loan closing date (the “Development Budget”). The Development Budget, once approved by CRC, deemed approved pursuant to Section 7(c)(ii)(b), or modified as provided in Section 7(c)(ii)(b), shall be referred to herein as the “Approved Development Budget”. Except as otherwise provided in this Agreement, POUA shall be authorized to make only those expenditures and take only those actions which are included in, or contemplated by, the Approved Development Budget; provided, however, that POUA shall also be authorized to make any additional expenditures under circumstances which, in POUA’s reasonable judgment, constitute an Emergency and, provided further, that POUA may (x) incur expenditures for the Project which exceed the amounts set forth in the Approved Development Budget to the extent approved by the institutional lenders and tax credit investor(s) of the Project, and (y) apply anticipated or actual cost savings in any hard cost line item in the Approved Development Budget to anticipated or actual cost overruns in another hard costs line item. With respect to expenditures made pursuant to an Emergency, POUA shall notify CRC prior to or promptly after making such an expenditure. After the approval of the Development Budget and the closing of the construction financing for the Project, no modifications to the Approved Development Budget shall be considered a Major Decision unless such modification would materially change the square footage of the buildings to be built or the number of units and unit mix by more than ten percent (10%). Any change to the Approved Development Budget shall be subject to the review and approval of the institutional lenders and tax credit investor(s) of the Project, which POUA must seek if required. POUA shall provide CRC with the modified Development Budget no later than five (5) business days following its adoption.
- b. CRC shall, within fifteen (15) business days after receipt of the Development Budget either (a) approve the Development Budget or (b) advise POUA in writing of, or discuss at a Steering Committee meeting, CRC’s specific reasonable objections thereto. If CRC has objections to the Development Budget, POUA shall revise the Development Budget in a good faith effort to address such objections, and shall then resubmit the same to CRC in writing within ten (10) business days after its receipt of the objections thereto, whereupon the process set forth above shall be utilized again (except that CRC shall respond to any revised Development Budget in writing within seven (7) business days), until a Development Budget has been approved, it being understood that it will be a condition of the construction loan closing for the Project that a Development Budget be in place. In addition, at any time after an Approved Development Budget has been approved by CRC, POUA shall have the right to submit a revised or amended Development Budget in writing to CRC for approval, if required, and if CRC has objections to such revisions or amendments, CRC shall advise POUA in writing of its specific reasonable

objections within ten (10) business days of receipt thereof. CRC's failure to respond within any of the aforementioned time periods shall be deemed approval of the submitted Development Budget or revisions or amendment thereto.

(iii) Operating Budget

- a. POUA shall prepare a detailed annual operating budget for the Company and the Project (the "Operating Budget"). The time frames and process for review and approval of the Operating Budget shall be the same as with any other Major Decision. The Operating Budget, once approved by CRC, deemed approved pursuant to Section 7(c)(iii)(b), or modified as provided in Section 7(c)(iii)(b), shall be referred to herein as the "Approved Operating Budget". After the approval of the Operating Budget, no modifications to the Approved Operating Budget shall be considered a Major Decision. Any change to the Approved Operating Budget shall be subject to the review and approval of the institutional lenders and tax credit investor(s) of the Project only, which POUA must seek if required. POUA shall provide CRC with the modified Operating Budget no later than five (5) business days following its adoption.
- b. POUA shall submit the Operating Budget on or before the date that is forty-five (45) days prior to the end of each fiscal year for the immediately following fiscal year and shall use all commercially reasonable efforts to deliver an Approved Operating Budget no later than ten (10) business days after the commencement of each such fiscal year. Each year, CRC shall, within fifteen (15) business days after receipt of the Operating Budget either (a) approve the Operating Budget or (b) advise POUA in writing of, or discuss at a Steering Committee meeting, CRC's specific reasonable objections thereto. If CRC has objections to the Operating Budget, POUA shall revise the Operating Budget in a good faith effort to address such objections, and shall then resubmit the same to CRC in writing within seven (7) business days after its receipt of the objections thereto, whereupon the process set forth above shall be utilized again (except that CRC shall respond to any revised Operating Budget in writing within seven (7) business days), until an Operating Budget has been approved.

(d) Intentionally Omitted.

(e) Intentionally Omitted.

(f) Unauthorized Action; Limitation on Delegation. A Manager who takes any unauthorized action purportedly on behalf of the Company, MM, or Owner shall indemnify and hold the Company and the Members harmless from any costs or damages incurred by the Company or the Members as a result thereof. Unless authorized to do so by this Agreement or by the Managers, no attorney-in-fact, employee or other agent of the Company shall have any power or authority to bind the Company in any way, to pledge its credit or to render it financially liable for any purpose.

(g) Fiduciary Duty; Devotion of Time; Compensation. Each Manager shall exercise its powers

and discharge its duties in good faith with a view to the interests of the Company and its co-managers with that degree of diligence, care and skill that ordinarily prudent persons would exercise under similar circumstances in like position. Each Manager shall devote so much of its time to the business of the Company as the requirements of such business may dictate from time to time.

(h) Termination of the MOU and Term Sheet. The Memorandum of Understanding, dated as of September 6, 2023 and the Term Sheet, both by and between POUA and an affiliate of CRC, are hereby terminated and of no further force and effect.

8. Tax Matters. At such time as the Managers deem appropriate, the Company (i) shall elect to be taxed as a corporation by filing IRS Form 8832, Entity Classification Election, and (ii) shall make an election under Section 168(h)(6)(F)(ii) of the Code.

9. Dissolution of the Company; Redemption of Interest.

(a) Dissolution. The Company shall be dissolved upon the affirmative vote or written consent of both Members or if the Company is unable timely to redeem a Member's Membership Interest in accordance with Article 9(b) below. The death, retirement, resignation, expulsion, bankruptcy or dissolution of any Member or the occurrence of any event that terminates the membership of any Member in the Company shall not cause the Company to be dissolved or its affairs to be wound up, and upon the occurrence of any such event, the Company shall be continued without dissolution. Upon dissolution, the assets of the Company shall be paid in the following order: first, to discharge all debts and liabilities of the Company, including any Member Loans, but excepting those to Members on account of their capital contributions; second to the Members in accordance with their positive capital account balances (after taking into account the allocations made pursuant to Article 6(b) above). Distributions in liquidation shall be made by the end of the Company's fiscal year in which liquidation occurs or, if later, within 90 days of the liquidation event and shall otherwise comply with Section 1.704-1(b) of the Treasury Regulations.

(b) Redemption. Notwithstanding anything to the contrary set forth herein, but subject to the terms of the Operating Agreement of the Owner, each Member shall have the right, exercised by giving written notice to the Company (a "Redemption Notice") at any time following the expiration of the 15-year compliance period for the Owner's low income housing tax credits, as defined under Internal Revenue Code Section 42(j)(1), as amended (the "Compliance Period"), to require the Company to redeem its Membership Interest for a redemption price equal to the sum of (x) of \$10 plus (y) all outstanding Member Loans (and outstanding interest thereon) made by such Member plus (z) unreturned Capital Contributions of such Member (such sum, the "Redemption Amount"), and the Company shall promptly so redeem such Membership Interest, whereupon said Member shall cease to be a Member and shall have no further rights, duties or obligations with respect to the Company or any of the other Members. If the Company has insufficient resources to redeem a Member's Membership Interest within 150 days after the giving of a Redemption Notice, the Company shall be dissolved in accordance with the provisions of Article 9(a).

(c) No Kick-Out Rights. For the avoidance of doubt, neither Member shall have so-called "kick-

out” rights, as defined by GAAP, that may be exercised for the expulsion of the other Member and redemption of its membership interests. The Members shall, however, have the call rights described in Article 13 below.

10. Amendments. The terms and provisions of this Agreement may be modified or amended at any time and from time to time only with the written consent of all Members.

11. Limitation of Liability; Indemnification.

(a) Limitation of Liability. No Manager of the Company shall be liable to the Company or its Members for monetary damages for any act or omission in such person’s capacity as a Manager, except as provided in the Act. If the Act is amended to authorize action further eliminating or limiting the liability of Managers, then the liability of a Manager shall be eliminated or limited to the fullest extent permitted by the Act as amended. Any repeal or modification of this section shall not adversely affect the right or protection of a Manager existing at the time of such repeal or modification. No constituent member in, or agent of, either Member, nor any advisor, trustee, director, officer, member, employee, beneficiary, shareholder, participant, representative or agent of any Member or constituent entity of a Member, shall have any personal liability in connection with this Agreement and the Members shall look solely to the other Member’s assets for the payment of any claim or for any performance. The provisions of this Section shall survive the termination of this Agreement.

(b) Indemnification. The Company shall indemnify the Managers and Members to the fullest extent permitted or required by the Act, and shall also indemnify the officers, employees, directors, and other agents of each Manager and Member acting within the scope of their authority to the fullest extent permitted by applicable law. The Company may advance expenses incurred by a Manager upon the approval of the other Manager, provided such Manager agrees to reimburse the Company unless it is finally determined that such Manager is entitled to be indemnified by the Company against such expenses. The Company may also indemnify its officers, employees and other agents acting within the scope of their authority to the fullest extent permitted by applicable law. The indemnification provided herein shall not be deemed exclusive of any other rights to which a person seeking indemnification may otherwise be entitled, shall continue as to a person who ceases to be a Manager, shall inure to the benefit of the estate, heirs, personal representatives or other successors of the indemnitee, and shall not be deemed to create any rights for the benefit of any other person or entity. A Manager agrees to defend, indemnify and hold harmless the other Manager from and against any damages, liabilities, losses and expenses, including reasonable attorney fees of any kind or nature whatsoever, which may be sustained or suffered by such Manager based upon a breach of any representation, warranty or covenant made by the other Manager in this Agreement or by reason of any claim, action or proceeding asserted or instituted out of any matter covered by such representations, warranties or covenants.

12. Competing Business. Neither the Members nor their shareholders, directors, officers, employees, partners, agents, family members or affiliates, shall be prohibited or restricted from investing in or conducting, either directly or indirectly, businesses of any nature whatsoever, including the ownership and operation of real property in the same geographical area as that held by the Company; and any investment in or conduct of any such businesses by any such person or

entity shall not give rise to any claim for an accounting by any Member or the Company or any right to claim any interest therein or the profits therefrom.

13. Call Right.

(a) General. In the event that either Member desires to acquire the other Member's Membership Interest in the Company after the end of the Compliance Period, then the provisions of this Article 13 shall apply. Under these circumstances, a Member (the "Exercising Member") shall have the right to purchase the other Member's entire Membership Interest for a purchase price (the "Call Price") equal to the greater of (x) the Redemption Amount (as defined in Article 9(b)) with respect to the other Member (the "Non-Exercising Member") and (y) the fair market value of the Non-Exercising Member's Membership Interest. Once a Member has duly exercised this Call Right, the other Member shall have no right to do so unless and until such initial exercise has not closed as and when required hereunder.

(b) Price Determination. An Exercising Member's written notice exercising the foregoing option (a "Call Notice") shall include the Member's good faith estimate of the fair market value of the other Member's Membership Interest (the "FMV Estimate") with a reasonably detailed written explanation of such estimate and shall propose a closing date, which date shall be not less than ninety (90) days or more than one hundred eighty (180) days after the date of the Call Notice (the "Closing Date"). A Member receiving a Call Notice shall have the option, exercisable by written notice given to the Exercising Member within thirty (30) days after receipt of the Call Notice, to either sell its Membership Interest to the Exercising Member for the FMV Estimate, or to purchase the Membership Interest of the Exercising Member at a purchase price (the "Counter Price") equal to the greater of (x) the Redemption Amount (as defined in Article 9(b)) with respect to the Exercising Member and (y) the FMV Estimate. A failure to respond to a Call Notice as and when required hereby shall be deemed an election to sell the Membership Interest. Once the Call Process has been initiated, the Members shall be contractually obligated to perform pursuant hereto, and such obligation is specifically enforceable for both the selling and purchasing Member.

(c) Closing. The entire Call Price or Counter Price, as the case may be, shall be paid on the Closing Date. Each Member shall be responsible for its own attorneys' fees incurred in connection with the closing. All other costs shall be paid by the Members in accordance with customary practice in the jurisdiction in which the Project is located. At the closing, the Member whose interest is being purchased shall assign its Membership Interest free and clear of any and all liens and other encumbrances of such Membership Interest (as distinct from those of the Company), and the Members shall execute and deliver any and all documents reasonably required by either of them to effectuate such conveyance.

14. Option and Right of First Refusal Agreement. The Members expect to enter into an Option and Right of First Refusal Agreement with the Owner (the “ROFR”) granting an option and right of first refusal to purchase the lessee’s interest under the Ground Lease in the Land and in the Project and/or the interest of the Owner’s tax credit investor member. POUA shall be the primary holder of the ROFR (the “Primary Holder”) and CRC shall be the secondary holder of the ROFR (the “Secondary Holder”), then if POUA exercises the ROFR, CRC shall have the option to require the POUA to convey the lessee’s interest under the Ground Lease in the Land and in the Project, or the tax credit investor member’s interest to the Company. If POUA does not timely exercise its rights under the ROFR, CRC may thereafter exercise its rights under the ROFR, but POUA shall not have an option to require CRC to convey lessee’s interest under the Ground Lease in the Land and in the Project, or the tax credit investor member’s interest to the Company.

15. Formation of Steering Committee. As promptly as practicable, but in no event more than thirty (30) days after the Effective Date, the Members shall create a joint steering committee (the “Steering Committee”), and each of the Members shall appoint two representatives with the requisite experience and seniority to enable them to make decisions with respect to the Project on behalf of each Member, and one of POUA’s representatives shall serve as the chairperson of the Steering Committee. A Member may change or replace its representatives on the Steering Committee as it deems appropriate, by prompt written notice to the other Member. Each Member may, in its sole discretion, invite other non-voting representatives of such Member to attend a Steering Committee meeting, limited to no more than one (1) per Member (unless otherwise permitted by the other Member).

(a) Steering Committee Responsibilities. The Steering Committee shall, in addition to its other responsibilities described in this Agreement: (a) provide oversight of the Project, including the development, construction, financing, completion, ownership, operation, and maintenance of the Project, and evaluate the work performed thereunder relative to the objectives set forth in this Agreement, the Exhibits, the Development Services Agreement and the Project, and all other aspects of the Project which might require daily, weekly or monthly supervision or implementation; (b) prepare and, as necessary amend, and all other aspects of the Project, coordinate the activities of the Members under this Agreement and the implementation, performance, completion and monitoring of the Members’ activities under the Project; (c) consider all Major Decisions; (d) confer regarding the terms of the Ground Lease, including the determination of the Ground Rent; (e) consider modifications to Budgets; and (f) take such other actions or activities as the Steering Committee may agree.

(b) Meetings of the Steering Committee. The Steering Committee shall hold regular meetings at such times and places agreed to by the members of the Steering Committee. The meetings of the Steering Committee shall be held no less frequently than (i) on a weekly basis during the predevelopment stage of the Project, (ii) on a monthly basis during construction of the Project until the construction of the Project is complete, and (iii) on a quarterly basis following completion of construction of the Project and its placement in service, unless otherwise mutually agreed upon by the members of the Steering Committee. In addition, either Member may request that an *ad hoc* meeting of the Steering Committee be held at any time upon giving reasonable advance notice to the other Member, but with not less than three (3) business days’ prior notice. The Steering Committee meetings may be held in person or by telephone or video conference. The Steering

Committee shall prepare written minutes that shall reflect, in a summary manner, the status reports given and decisions taken at the meetings. Such minutes shall be circulated to the Steering Committee for review and approval within one week after each meeting.

(c) Decision Making. At each Steering Committee meeting, one (1) representative from both Members appointed to the Steering Committee and present in person or by telephone (or other electronic meeting forum, such as Zoom) shall constitute a quorum, and decisions shall be made by majority vote (other than Major Decisions which require unanimity) after an open discussion of the matters as to which decisions are being made. Notwithstanding the foregoing to the contrary, if all of the representatives of a Member fail or refuse to attend a regularly scheduled or duly called meeting, such Member's representative(s) shall be disregarded for the purposes of establishing a quorum, to prevent so-called "quorum blocking". Each Steering Committee member shall have one (1) vote on all matters before the Steering Committee. Notwithstanding the foregoing, the objective of the Members is that decisions of the Steering Committee shall be made by unanimous vote. If no unanimous agreement can be reached, then except with respect to Major Decisions, the chairperson shall have the right to make final determinations, but only to the extent consistent with the express terms and provisions of the Project, this Agreement, the Exhibits, and the Development Services Agreement, as applicable.

(d) Limitations of Powers of the Steering Committee. The Steering Committee shall have only such powers as are expressly delegated to it in this Agreement. The Steering Committee is not a substitute for the rights or the obligations of the Members and, *inter alia*, shall not have the authority to amend, modify, terminate or waive compliance with the material terms of this Agreement, any of the Exhibits, or the Development Services Agreement.

16. Alternative Dispute Resolution Procedures

(a) Preliminary Negotiations between Executive Officers. In the event of any dispute or disagreement between the Members as to a Major Decision during the predevelopment or operation phase of the Project (collectively or individually a "Dispute"), the matter under Dispute, upon written request of either Party, shall be referred to a senior executive representative of each Member for resolution, each Member being represented by an executive officer with authority to make decisions on behalf of the subject Member. The executive officers shall promptly meet in a good faith effort to resolve the Dispute. The Parties shall negotiate in good faith for a thirty-day period to come to an agreement on the decision or resolution of the dispute, including at least one (1) meeting (in-person or via videoconference or teleconference) of the executive officers within ten (10) business days after such referral. If the executive officers do not agree upon a decision within thirty (30) calendar days after reference of the matter to them, each of the Members shall be free to exercise the remedies available to it under paragraph (b) below. Each Member may extend the period of time for negotiation among the executive officers for an additional period of fourteen (14) calendar days on one occasion per any Dispute.

(b) Submission to Non-Binding Mediation with Expert Advisor. If the Members are unable to resolve such Dispute above, within forty-five (45) days after the executive officers first met, either Member may refer the matter under the Dispute to non-binding mediation, and with a mediator who is neutral, independent and disinterested and who has industry experience with a business mediator with relevant industry or commercial experience in affordable housing or tax credit

housing projects, or with a nonprofit community development corporation, or a development consultant or advisor whose primary clients include nonprofit community development corporations (an “Expert Advisor”) The Members shall use commercially reasonable best efforts to conduct at least three (3) mediation sessions within thirty (30) days after a Member’s request for mediation. If the Member’s do not agree upon a resolution within thirty (30) days of referral to non-binding mediation, and conditioned on the requirement that the Members shall convene at least three (3) mediation sessions during such thirty (30) day period, each of the Members shall be free to exercise the other remedies available to it under paragraph (c) below. The mediator shall confer with the executive officers of the Members to design procedures to conclude the mediation within forty-five (45) days after initiation. Each Member agrees not to use the period or pendency of the mediation to disadvantage the other Member procedurally, commercially, financially or otherwise. No statements made by either Member during the mediation process may be used by the other Member or referred to during any subsequent proceedings.

(c) Submission of a Dispute to Binding Arbitration. If the Members are unable to resolve such Dispute pursuant to paragraphs (a) and (b) above, the Dispute shall be submitted to final and binding arbitration (without any recourse to the federal or state courts except to enforce any arbitral award) in accordance with the rules of JAMS/End Dispute (“JAMS”) then in force (except as expressly modified below), and the arbitration hearings shall be held before a single arbitrator (“Arbitrator”) in Boston. The Members agree to appoint an Arbitrator who has the qualifications of an Expert Advisor (as defined above in paragraph (b)). If the Members cannot agree upon an Arbitrator within ten (10) business days after a demand for arbitration has been filed with JAMS by either of them, either or both Members may request the JAMS to name a panel of five (5) candidates to serve as Arbitrator. The Members shall each, in successive rounds (with the Member demanding the arbitration having the first chance to strike a name), strike one name off this list until only one name remains, and such last-named Person shall be the Arbitrator (with the qualifications, to the extent possible, of an Expert Advisor).

(d) Conduct of Arbitration. The Arbitrator shall be required to (a) follow the substantive rules of the applicable law, (b) require all testimony to be transcribed, and (c) accompany his or her award with findings of fact and a statement of reasons for the decision. The Arbitrator shall have the authority to permit discovery for no more than thirty (30) days, to the extent deemed appropriate by the Arbitrator, upon reasonable request of a Member. The Arbitrator shall have no power or authority to (i) add to or detract from the written agreement of the Members set forth herein or in any Exhibit, (ii) modify or disregard any provision of this Agreement or any of the other related documents, or (iii) address or resolve any issue not submitted by the Members. The Arbitrator shall hold proceedings during a period of not longer than forty-five (45) calendar days promptly following conclusion of discovery, and the Arbitrator shall render a final and binding decision within thirty (30) days following conclusion of the hearings. The Arbitrator shall have the power to grant temporary injunctive relief (without the necessity of a Member posting a bond), but shall have no power to award punitive and/or exemplary damages in the event of a breach. In the event of any conflict between the commercial arbitration rules of JAMMS then in effect and the provisions of this Agreement, the provisions of this Agreement shall prevail and be controlling.

(e) Costs of Arbitration. Each Member shall share in the actual and direct costs of the engagement of the Arbitrator, but the prevailing Member in the arbitration shall be reimbursed by the non-prevailing party for the prevailing Member’s fees and costs of arbitration (e.g., the costs, fees and expenses of outside experts and counsel retained by the prevailing party). If one Member

is not deemed by the Arbitrator to be the primary prevailing party, then each party will pay its own fees and expenses.

17. Notice. All notices, demands, or requests provided for or permitted to be given pursuant to this Agreement must be in writing. All notices, demands, and requests to be sent to any Member or Manager pursuant to this Agreement shall be deemed to have been properly given or served if addressed to such person at the address as it appears on the Company records and personally delivered, deposited for next day delivery by an overnight courier service, or transmitted via electronic mail, telecopier or other similar device to the attention of such person with receipt acknowledged. All such notices, requests and other communications shall be deemed to have been sufficiently given for all purposes on the date delivered or refused, if personally delivered; or the next business day after delivery to an overnight delivery service for prepaid overnight delivery. Notices may also be sent by electronic mail of a .pdf or similar file during regular business hours and shall be deemed to have been given on the business day so sent provided that an additional copy is concurrently sent by one of the other means set forth above; provided however, if such electronic notice is sent after 5:00 p.m. prevailing time in Boston, Massachusetts, notice shall be deemed given on the next successive business day. The Members and Managers shall have the right, at any time during the term of this Agreement, to change their respective addresses by delivering to the other Member and Manager written notice of such change. Notices to each of the Members and Managers shall be delivered at the following addresses until changed as aforesaid:

CRC:

Charles River Center
59 East Militia Heights Drive
Needham, MA 02492
Attn:

POUA:

Planning Office for Urban Affairs, Inc.
10 Post Office Square, Suite 1310
Boston, MA 02109
Attn: William H. Grogan, President

18. Counterparts. This Agreement or any amendment hereto may be executed in one or more counterparts, each of which shall be an original, but all of which taken together shall constitute one Agreement (or amendment, as the case may be). This Agreement (or amendment, as the case may be) may be executed by electronic signature, which shall be considered as an original signature for all purposes, shall be binding on the parties and shall have the same force and effect, for all purposes, as an original signature. Without limitation, in addition to electronically produced signatures, “electronic signature” shall include faxed versions of an original signature or electronically scanned and transmitted versions (e.g., via pdf) of an original signature.

19. Applicable Law; Severability. This Agreement shall be construed in accordance with the laws of The Commonwealth of Massachusetts, and any provision of this Agreement which is unenforceable or is invalid or contrary to the law of the Commonwealth of Massachusetts, shall

be of no effect and in such case, all the remaining terms and provisions of this Agreement shall be fully effective according to the tenor of this Agreement, the same as though no such invalid portion had ever been included.

20. Integration. This Agreement contains the entire agreement between the Members and there are no other terms, obligations, covenants, representations, statements or conditions, oral or otherwise of any kind with respect to the Project.

21. Time of the Essence; Business Days. The parties hereto agree that time is of the essence of this Agreement. Unless otherwise specified, in computing any period of time described in this Agreement, if any period of time ends, or if any act is required to be performed, on a day other than a business day, then the date required for performance of the appropriate obligation shall be deemed to be extended to the next business day following the applicable date of performance.

22. Authority/Enforceability. The person executing any instruments for or on behalf of CRC and POUA is fully authorized to act on behalf of such Member and this Agreement is valid and enforceable against each Member in accordance with its terms and each instrument to be executed by a Member pursuant hereto or in connection therewith will, when executed, be valid and enforceable against such Member in accordance with its terms.

[Balance of Page Intentionally Blank.]

IN WITNESS HEREOF, the undersigned has executed this Agreement as of the day and year first above written.

MEMBERS:

CRC East Militia LLC.

By: _____

Anne-Marie Bajwa, Authorized Signatory

Planning Office of Urban Affairs, Inc.

By: _____

William H. Grogan, President

IN WITNESS HEREOF, the undersigned has executed this Agreement as of the day and year first above written.

MEMBERS:

CRC East Militia LLC.

By: _____
Anne-Marie Bajwa, Authorized Signatory

Planning Office of Urban Affairs, Inc.

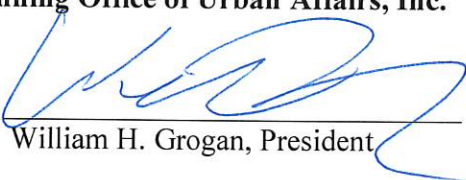
By:  _____
William H. Grogan, President

EXHIBIT A
RESPONSIBILITY MATRIX

Function	Joint	POUA	CRC	Notes
Development Team Selection				
Design/Engineering/Survey	X			
Legal	X			
Other sub-contractors	X			
Design & Programming Decisions				
Design	X			POUA and CRC will jointly agree to develop the building's design with regard to affordability matrix, tenant population, and overall program of the building, with the need to have the design be consistent with permitting agencies and lenders. Once an agreement has been reached on a design, it will be subject to review and approval by permitting and financing sources and any required changes shall be mutually acceptable to the parties. POUA shall be responsible for the unit layout and interiors of the rental building.
Program	X			POUA and CRC will jointly agree to develop the building's program with regard to affordability matrix, tenant population, and overall program of the building, with the need to have the program be consistent with permitting agencies and lenders. Once an agreement has been reached on a program, it will be subject to review and approval by permitting and financing sources and any required changes shall be mutually acceptable to the parties.
Financing	X			POUA and CRC will review potential funding sources to support the development plan. As a part of this process, there will be an evaluation of different financing structures and programmatic options to support recoupment of CRC's investment in the property and its ongoing expenses incurred in the evaluation of the property program, design and financing.
Detail/Options/Add Alternates	X			POUA and CRC will jointly agree to detailed features of the design of the building, such as design aesthetic, building amenities and programable space, and potential green features, subject to review and approval by permitting and funding agencies. Once an agreement has been reached on a program, and notwithstanding required changes by the Town or State, the design features shall not materially change.
Predevelopment				
Design/Engineering		X		

	Zoning/Land Use	X			
	Public Outreach/Community Process			X	
	Public Funders/Financing		X		
Financing Selection					
	Acquisition/Predevelopment Lender		X		
	Equity Investor		X		
	Construction Lender		X		
	Permanent Lender		X		
Development					
	Design/Engineering		X		
	Construction		X		
	Construction Administration and monitoring		X		
	Marketing & Lease-up of Rental Units		X		
	Marketing & Lease-up of CRC Units			X	
Development Risk					
	Advancing project pre-development costs	X			To be shared 50/50
	Priority of payback of each	X			
	Development guarantees		X		
	Operating guarantees		X		
	Net worth requirement		X		
Reward					
	Repayment of Acquisition Price				See development budget
	Split of developer fee		X		POUA
	Split of developer overhead	X			To be split 65% (POUA)/35% (CRC)
	Other Cash Flow	X			To be shared 50/50 after repayment of any developer fee/OH loans
Post Construction/Stabilization/Operations					
	Property Management of Common Areas		X		Third party property manager to be hired.
	Property Management of CRC Units		X		Third party property manager to be hired.
	Property Management of Rental Units		X		Third party property manager to be hired.

EXHIBIT B
DEVELOPMENT PLAN

The development of an approximately 86-unit development that will provide housing for individuals with autism integrated with traditional affordable housing in four buildings on the Land. Approximately 43 units in the development will be available through a closed referral system for people with autism and intellectual and developmental disabilities and CRC staff. CRC will provide a comprehensive network of support and services alongside educational opportunities within the development, including remote support for monitoring overnight, clinical support including medical, health and safety, college navigation, employment and career exploration, training and job support, adult companion and peer support and transportation services.

As part of the CRC's educational model, the remainder of the units in the Project will be available to households earning at or below 30% to 80% of Area Median Income but will not be restricted to individuals with autism and intellectual and developmental disabilities. The integration of adults with disabilities and adults without disabilities is a critical component of the CRC model and is mandated by both federal and state law, which require such individuals to have access to the greater community, and receive support in the least restrictive, and most typical setting possible. Included in the development will be indoor resident amenity spaces typical of traditional multifamily housing, approximately 60-70 parking spaces, and connection to outdoor walking trails.

EXHIBIT C

PREDEVELOPMENT BUDGET

[See Attached]

PreDevelopment Budget:

	<i>Total</i>	<i>Residential</i>	<i>Commercial</i>	<i>Comments</i>
161 . Acquisition: Land	\$0			Capitalized Ground Rent payment
162 . Acquisition: Building	\$0			
163 . Acquisition Subtotal	\$0	\$0	\$0	
164 . Direct Construction Budget				(from line 159)
165 . Construction Contingency				0% of construction
166 . Subtotal: Construction	\$0	\$0	\$0	

General Development Costs:

167 . Architecture & Engineering	\$1,216,422	\$1,216,422		
168 . Survey and Permits	\$249,442	\$249,442		
169 . Clerk of the Works	\$129,000	\$129,000		
170 . Environmental Engineer	\$80,000	\$80,000		
171 . Bond Premium	\$0	\$0		
172 . Legal	\$273,750	\$273,750		
173 . Title and Recording	\$44,454	\$44,454		
174 . Accounting & Cost Cert.	\$25,350	\$25,350		
175 . Marketing and Rent Up	\$0	\$0		
176 . Real Estate Taxes	\$0	\$0		
177 . Insurance	\$0	\$0		
178 . Relocation	\$0	\$0		
179 . Appraisal	\$24,000	\$24,000		
180 . Security	\$0	\$0		
181 . Construction Loan Interest	\$53,341	\$53,341		Application fee plus third party reports
182 . Inspecting Engineer	\$0	\$0		
183 . Fees to: Predev Interest	\$60,000	\$60,000		
184 . Fees to: Perm loan fees	\$0	\$0		
185 . MIP	\$0	\$0		And misc financing fees
186 . Credit Enhancement Fees	\$0	\$0		
187 . Letter of Credit Fees	\$0	\$0		
188 . Other Financing Fees	\$69,868	\$69,868		HLC
189 . Development Consultant	\$0	\$0		
190 . Other: FF&E	\$0	\$0		
191 . Other: Syndication	\$0	\$0		
192 . Soft Cost Contingency	\$0	\$0		0.0% of soft costs
193 . Subtotal: Gen. Dev.	\$2,225,628	\$2,225,628	\$0	
194 . Subtotal: Acquis., Const. and Gen. Dev.	\$2,225,628	\$2,225,628	\$0	
195 . Capitalized Reserves	\$0	\$0		
196 . Developer Overhead	\$0	\$0		
197 . Developer Fee	\$0	\$0		
198 . Total Development Cost	\$2,225,628	\$2,225,628	\$0	TDC per unit \$25,879
199 . TDC, Net	\$2,225,628	\$2,225,628	\$0	TDC, Net per unit \$25,879

EXHIBIT D

DEVELOPMENT AGREEMENT

[See Attached]

DEVELOPMENT SERVICES AGREEMENT

DEVELOPMENT SERVICES AGREEMENT made as of [] (this “**Agreement**”) by and among CHARLES RIVER HEIGHTS LLC, a Massachusetts limited liability company (the “**Company**”) PLANNING OFFICE FOR URBAN AFFAIRS, INC., a Massachusetts non profit corporation (“**POUA**”) and CRC EAST MILITIA, LLC, a Massachusetts limited liability company (“**CRC**” and collectively with POUA, the “**Developer**”).

Recitals

A. The Company was formed to acquire, construct, develop, improve, maintain, own, operate, lease, dispose of and otherwise deal with an [86]-unit apartment project located on a parcel of land on East Militia Heights Drive in Needham, Massachusetts (the “**Project**”).

B. The Project, following the completion of construction, is expected to constitute a “qualified low-income housing project” (as defined in Section 42(g)(1) of the Code).

C. The Developer will provide certain services with respect to the Project during the development and construction thereof.

D. In consideration for such services, the Company has agreed to pay to the Developer certain fees computed in the manner stated herein.

E. Capitalized terms used herein and not otherwise defined shall have the meanings set forth in the [Amended and Restated Operating Agreement] of the Company (the “**Operating Agreement**”), [to be entered into by and among all of the Members of the Company which is attached as an exhibit to the [Investment Agreement]].

NOW, THEREFORE, in consideration of the mutual covenants and conditions set forth herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

Section 1. Development Services

A. The Developer shall oversee the development and construction of the Project, and shall perform the services and carry out the responsibilities with respect to the Project as are set forth herein, and such additional duties and responsibilities as are reasonably within the general scope of such services and responsibilities and are designated from time to time by the Managing Member.

B. The Developer’s services shall be performed in the name and on behalf of the Company and shall consist of the duties set forth in the following subparagraphs of this Section 1.B and as provided elsewhere in this Agreement; provided, however, that if the performance of any duty of the Developer set forth in this Agreement is beyond the reasonable control of the Developer, the Developer shall nonetheless be obligated to (i) use its best efforts to perform such

duty and (ii) promptly notify the Managing Member that the performance of such duty is beyond its reasonable control. The Developer has performed or shall perform the following:

(i) Negotiate and cause to be executed in the name and on behalf of the Company agreements for architectural, engineering, testing or consulting services for the Project, and any agreements for the construction of any improvements or tenant improvements to be constructed or installed by the Company or the furnishing of any supplies, materials, machinery or equipment therefor, or any amendments thereof, provided that no agreement shall be executed nor binding commitment made until the terms and conditions thereof and the party with whom the agreement is to be made have been approved by the Managing Member unless the terms, conditions, and parties comply with guidelines issued by the Managing Member concerning such agreements;

(ii) Assist the Company in dealing with neighborhood groups, local organizations, abutters and other parties interested in the development of the Project.

(iii) Establish and implement appropriate administrative and financial controls for the design and construction of the Project, including but not limited to:

- coordination and administration of the Project architect, the general contractor, and other contractors, professionals and consultants employed in connection with the design or construction of the Project;
- administration of any construction contracts on behalf of the Company;
- participation in conferences and the rendering of such advice and assistance as will aid in developing economical, efficient and desirable design and construction procedures;
- the rendering of advice and recommendations as to the selection procedures for and selection of subcontractors and suppliers;
- the review and submission to the Managing Member for approval of all requests for payments under any architectural agreement, general contractor's agreement, or any loan agreements with any lending institutions providing funds for the benefit of the Company for the design or construction of any improvements;
- the submission of any suggestions or requests for changes which could in any reasonable manner improve the design, efficiency or cost of the Project;

- applying for and maintaining in full force and effect any and all governmental permits and approvals required for the lawful construction of the Project;
- compliance with all terms and conditions applicable to the Company or the Project contained in any governmental permit or approval required or obtained for the lawful construction of the Project, or in any insurance policy affecting or covering the Project, or in any surety bond obtained in connection with the Project;
- furnishing such consultation and advice relating to the Project as may be reasonably requested from time to time by the Managing Member;
- keeping the Managing Member fully informed on a regular basis of the progress of the design and construction of the Project, including the preparation of such reports as are provided for herein or as may reasonably be requested by the Managing Member;
- giving or making the Company's instructions, requirements, approvals and payments provided for in the agreements with the Project architect, general contractor, and other contractors, professionals and consultants retained for the Project; and
- at the Company's expense, filing on behalf of and as the attorney-in-fact for the Company any notices of completion required or permitted to be filed upon the completion of any improvement(s) and taking such actions as may be required to obtain any certificates of occupancy or equivalent documents required to permit the occupancy of dwelling units and other space in the Project.

(iv) Inspect the progress of the course of construction of the Project, including verification of the materials and labor being furnished to and on such construction so as to be fully competent to approve or disapprove requests for payment made by the Project architect and the general contractor, or by any other parties with respect to the design and construction of the Project, and in addition to verify that the same is being carried out substantially in accordance with the plans and specifications approved by the Managing Member or, in the event that the same is not being so carried out, to promptly so notify the Managing Member.

(v) If requested to do so by the Managing Member, perform on behalf of the Company all obligations of the Company with respect to the design and construction of the Project contained in any loan agreement or security agreement

entered into in connection with any financing for the Project, or in any lease or rental agreement relating to space in the Project, or in any agreement entered into with any governmental body or agency relating to the terms and conditions of such construction, provided that copies of such agreements have been provided by the Company to the Developer or the Company has otherwise notified the Developer in writing of such obligations.

(vi) To the extent requested to do so by the Managing Member, prepare and distribute to the Managing Member a critical path schedule, and periodic updates thereto as necessary to reflect any material changes, but in any event not less frequently than quarterly, other design or construction cost estimates as required by the Managing Member, and financial accounting reports, including monthly progress reports on the quality, progress and cost of construction and recommendations as to the drawing of funds from any loans arranged by the Company to cover the cost of design and construction of the Project.

(vii) Assist the Company in obtaining and maintaining insurance coverage for the Project, the Company and its employees during the development phase of the Project, in accordance with an insurance schedule approved by the Managing Member, which insurance shall include general public liability insurance covering claims for personal injury, including but not limited to bodily injury, or property damage, occurring in or upon the Property or the streets, passageways, curbs and vaults adjoining the Property. Such insurance shall be in a liability amount approved by the Managing Member and in accordance with the requirements of the Operating Agreement.

(viii) Comply with all applicable present and future laws, ordinances, orders, rules, regulations and requirements (hereinafter called "laws") of all Federal, state and municipal governments, courts, departments, commissions, boards and offices, any national or local Board of Fire Underwriters or Insurance Services Offices having jurisdiction in the county in which the Project is located or any other body exercising functions similar to those of any of the foregoing, or any insurance carriers providing any insurance coverage for the Company or the Project, which may be applicable to the Project or any part thereof. Any such compliance undertaken by the Developer on behalf of and in the name of the Company, in accordance with the provisions of this Agreement, shall be at the Company's expense. The Developer shall likewise ensure that all agreements between the Company and independent contractors comply with all such applicable laws.

(ix) Assemble and retain all contracts, agreements and other records and data as may be necessary to carry out the Developer's functions hereunder. Without limiting the foregoing, the Developer will prepare, accumulate and furnish to the Managing Member and the appropriate governmental authorities, as necessary, data and information sufficient to identify the market value of improvements in place as of each real property tax lien date, and will make application for appropriate

exclusions from the capital costs of the Project for purposes of real property ad valorem taxes.

(x) Coordinate and administer the design and construction of all interior tenant improvements to the extent required under any leases or other occupancy agreements to be constructed or furnished by the Company with respect to the initial leasing of space in the Project, whether involving building standard or non-building standard work.

(xi) Use its best efforts to accomplish the timely completion of the Project in accordance with the approved plans and specifications and the time schedules for such completion approved by the Managing Member.

(xii) At the direction of the Managing Member, implement any decisions of the Managing Member made in connection with the design, development and construction of the Project or any policies and procedures relating thereto, exclusive of leasing activities.

(xiii) Perform and administer any and all other services and responsibilities of the Developer which are set forth in any other provisions of this Agreement, or which are requested to be performed by the Managing Member and are within the general scope of the services described herein.

Section 2. Duties and Responsibilities of Developer

In consideration of the performance by the Developer of the development services described herein, the Company shall pay to the Developer an amount (the “**Development Amount**”) set forth in Section 5. Developer shall not be compensated for, and no portion of the Development Amount shall apply to, services in connection with the development of any nonresidential improvements, the organization or syndication of the Company, obtaining an allocation of Tax Credits or securing Project financing other than construction financing, it being the understanding between the parties hereto that all such listed activities and services are the exclusive responsibility of the Company, the Managing Member and/or consultants or others engaged by the Company. The Developer’s responsibilities shall be allocated between POUA and CRC as set forth in the attached Exhibit A and/or specified herein.

Section 3. Limitations and Restrictions

Notwithstanding any provisions of this Agreement, the Developer shall not take any action, expend any sum, make any decision, give any consent, approval or authorization, or incur any obligation with respects to any of the following matters unless and until the same has been approved by the Managing Members:

(i) Approval of all construction and architectural contracts and all architectural plans, specifications and drawings prior to the construction and/or alteration of any improvements contemplated thereby, except for such matters as may be expressly delegated in writing to the Developer by the Managing Members;

(ii) Any proposed change in the work of the construction of the Project, or in the plans and specifications therefor as previously approved by the Managing Members, or in the cost thereof, or any other change which would affect the design, cost, value or quality of the Project, except for such matters as may be expressly delegated in writing to the Developer by the Managing Members; or

(iii) Expending more than what the Developer in good faith believes to be the fair and reasonable market value at the time and place of contracting for any goods purchased or leased or services engaged on behalf of the Company or otherwise in connection with the Project.

Section 4. Accounts and Records

A. POUA, on behalf of the Company, shall keep such books of account and other records as may be required and approved by the Managing Member, including, but not limited to, records relating to the costs for which construction advances have been requested and/or received. POUA shall keep vouchers, statements, receipted bills and invoices and all other records, in the form approved by the Managing Member, covering all collections, if any, disbursements and other data in connection with the Project prior to final completion of construction. All accounts and records relating to the Project, including all correspondence, shall be surrendered to the Company upon demand without charge therefor.

B. POUA shall cooperate with the Management Agent to facilitate the timely preparation by the Management Agent of such reports and financial statements as the Management Agent is required to furnish pursuant to the Management Agreement.

C. All books and records prepared or maintained by POUA shall be kept and maintained at all times at the place or places approved by the Managing Member, and shall be available for and subject to audit, inspection and copying by the Management Agent, the Managing Member or any representative or auditor therefor or supervisory or regulatory authority, at the times and in the manner set forth in the Operating Agreement.

Section 5. Compensation

A. For its services in connection with the development of the Project and the supervision of the construction of the Improvements, the Company shall (x) reimburse Developer for up to \$1,596,618 of its reasonable out-of-pocket costs and expenses incurred in connection with the Project (the "**Overhead**") and (y) pay POUA a development fee in the amount of \$1,596,618 (the "**Development Fee**"). A portion of the Development Fee in the amount of \$798,309 shall be deemed to have been earned as of the date hereof, and the balance of the Development Fee shall be deemed to have been earned pro rata based on the percentage of completion of construction of the Project. Fifty percent (50%) of the Overhead shall be reimbursed on the date hereof and the balance shall be reimbursed in equal monthly installments during the construction period. POUA shall receive 100% of the Development Fee. POUA shall receive 65% and CRC shall receive 35% of the Overhead.

B. The Development Fee shall be paid (i) from and to the extent of Designated Proceeds available therefor from time to time as follows:

(a) \$798,309 of the Development Fee may be paid at the time of closing of the Construction Loan;

(b) Up to \$798,309 of the Development Fee shall be payable during the construction period in accordance with draw requests submitted to and approved by the Construction Lender; and

(c) Up to \$1,596,618 of the Development Fee may be paid at the time of the [Fifth Installment].

and (ii) the outstanding balance in the anticipated amount of \$0 (the “**Deferred Development Fee**”) shall be paid from [the proceeds of certain Capital Contributions and from distributions of Cash Flow or the proceeds of Capital Transactions in accordance with the provisions of Section ____ of the Operating Agreement]; *provided, however*, that the Company shall be obligated to pay any outstanding balance of the Deferred Development Fee on the earlier to occur of the thirteenth (13th) anniversary of the Completion Date or the date of liquidation of the Company. The Deferred Development Fee shall not bear interest. The obligation to pay the Deferred Development Fee shall be evidenced by a promissory note in the form attached hereto as Exhibit A. [Payment of the Development Amount shall also be subject to all applicable provisions of Section ____ of the Operating Agreement].

C. In the event there shall be Designated Proceeds remaining after application thereof to effect payment of the entire Development Amount and to effect payment of all other Development Costs, such excess shall be paid to the Developer as an incentive development fee, subject to any Requisite Approvals.

D. The payment of the Development Amount shall be a nonrecourse obligation of the Company.

Section 6. Amendment

This Agreement may be amended only in a writing executed by the parties hereto; provided, however, that no such amendment shall be effective without the Consent of the Investor Member.

Section 7. Default and Remedies

A. If the Developer shall default in the performance of any of its covenants or obligations under this Agreement and such default shall continue unremedied for a period of thirty (30) days after written notice thereof from the Company to the Developer, the Company may exercise one or more of the following rights and remedies, provided, however, if the default is of such a nature that it cannot be cured within the 30-day period, and the Developer has commenced to cure each default within the 30-day period, the Developer shall have an additional thirty (30) days in which to cure said default provided it acts in good faith and with due diligence to cure the same (all of which shall be cumulative):

(i) Terminate this Agreement.

(ii) Enforce the provisions of this Agreement by legal proceedings for the specific performance of any covenant or agreement contained herein or for the enforcement of any other appropriate legal or equitable remedy and recover damages caused by any breach by the Developer of the provisions of this Agreement, including court costs, reasonable attorneys' fees and other expenses incurred in the enforcement of the obligations of the Developer hereunder.

(iii) Exercise any and all rights and remedies which the Company (or its Members) may have under applicable law.

B. In addition to any rights now or hereafter granted under applicable law and not by way of limitation of any such rights, upon the occurrence of any event of default hereunder which is not cured within the time period specified in Section 7.A above, the Company is authorized to set off and to apply any amounts payable to the Developer hereunder, or to the Developer or any Affiliate thereof under the Operating Agreement or any Project Document against and on account of the obligations of the Developer to the Company hereunder.

Section 8. Applicable Law

This Agreement, and the application or interpretation hereof, shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts.

Section 9. Binding Agreement

Subject to the following sentence, this Agreement shall be binding on the parties hereto, their heirs, executors, personal representatives, successors and assigns. The Developer may not assign any of its rights (including rights to payment) or obligations hereunder without the prior written consent and approval of the Investor Member.

Section 10. Headings

All section headings in this Agreement are for convenience of reference only and are not intended to qualify the meaning of any section.

Section 11. Terminology

All personal pronouns used in this Agreement, whether used in the masculine, feminine or neuter gender, shall include all other genders, the singular shall include the plural, and vice versa as the context may require.

Section 12. Benefit of Agreement

The obligations and undertakings of the Developer set forth in this Agreement are made for the benefit of the Company and its Members and shall not inure to the benefit of any creditor of the Company other than a Member, notwithstanding any pledge or assignment by the Company of this Agreement or any rights hereunder.

Section 13. Notices

Except as otherwise specifically provided herein, all notices, demands or other communications hereunder shall be in writing and shall be deemed to have been given and received (i) two (2) business days after being deposited in the United States mail and sent by certified or registered mail, postage prepaid, (ii) one (1) business day after being delivered to a nationally recognized overnight delivery service, (iii) on the day sent by telecopier or other facsimile transmission, answer back requested, or (iv) on the day delivered personally, in each case, to the parties at the addresses set forth below or at such other addresses as such parties may designate by notice to the other party:

A. If to the Company, at the principal office of the Company set forth in [Section ____ of the Operating Agreement]; and

B. If to the Developer, to Planning Office for Urban Affairs, Inc., 10 Post Office Square, Suite 1310, Boston, MA 02109, Attention: William Grogan;

in either case, with a copy to Nolan Sheehan Patten LLP, 84 State Street, Suite 940, Boston, MA 02109, Attention: Hannah L. Kilson, Esq.

Section 14. Relationship of the Parties

Nothing contained in this Agreement shall be construed to constitute the Developer as a member, employee or agent of the Company, nor shall the Developer (in its capacity as such and not as a Managing Member) hold itself out as such. Except as specifically set forth herein, the Developer (in its capacity as such and not as a Managing Member) has no right or authority to incur, assume or create, in writing or otherwise, any liability or obligation of any kind, express or implied, in the name or on behalf of the Company, it being intended by the parties that the Developer (in its capacity as such and not as a Managing Member) be and remain an independent contractor responsible for its own actions.

Section 15. Termination

This Agreement shall be subject to termination as provided in Section 7A hereof [and as provided in Section ____ of the Operating Agreement].

Section 16. RCAB Provision

Notwithstanding any provision herein to the contrary or future amendments or superseding provisions thereto, neither the Roman Catholic Archdiocese of Boston, a public juridic person under the Code of Canon Law of the Roman Catholic Church (the “**Archdiocese**”), the Roman Catholic Archbishop of Boston and/or the duly appointed administrator of the Archdiocese of Boston (“**Archbishop**”), the Roman Catholic Archbishop of Boston, a Corporation Sole, a Massachusetts charitable corporation established pursuant to Chapter 506 of the Acts of 1897 (“**RCAB**”), nor their respective officers, directors, agents, servants, employees, parent organizations or affiliated organizations, subsidiaries, attorneys, nor any other individuals or entities (other than the Company) associated or affiliated with the Archdiocese, the Archbishop or RCAB, in any manner whatsoever and each of their successors and assigns or heirs, individually

or joint, or in any capacity whatsoever, shall have any responsibility or obligation of any nature hereunder, nor shall there be any recourse against said entities or individuals for breach or default of any obligation, responsibility or provision hereof.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed as of the date and year first above written.

COMPANY:

CHARLES RIVER HEIGHTS LLC, a Massachusetts
limited liability company

By:

William H. Grogan, Authorized Signatory

DEVELOPER:

CHARLES RIVER HEIGHTS JV LLC, a
Massachusetts limited liability company

By:

William H. Grogan, Authorized Signatory

[Note: This note should not be executed and delivered until the Development Obligation Date]

EXHIBIT A

DEFERRED DEVELOPMENT FEE NOTE

\$ _____
_____, 20__

FOR VALUE RECEIVED, CHARLES RIVER HEIGHTS LLC, a Massachusetts limited liability company (the “**Company**”) promises to pay the order of CHARLES RIVER HEIGHTS JV LLC, a Massachusetts non-profit corporation (the “**Developer**”) the principal sum of _____ AND _____/100 DOLLARS (\$ _____), without interest, on or before the earlier to occur of the thirteenth (13th) anniversary of the Completion Date or the date of liquidation of the Company (the “**Maturity Date**”), in accordance with that certain Development Agreement by and between the Company and the Developer, dated as of [] (the “**Development Agreement**”).

This Note evidences the obligation of the Company to pay the Developer a Deferred Development Fee pursuant to the Development Agreement. The Deferred Development Fee is payable from [the proceeds of certain Capital Contributions and from distributions of Cash Flow or the proceeds of Capital Transactions in accordance with the provisions of Sections ____ and ____ of the Amended and Restated Operating Agreement of the Company dated as of [____], 20[____]] (the “**Operating Agreement**”), the provisions of which are specifically incorporated herein by this reference. Capitalized terms used herein and not otherwise defined shall have the meanings set forth in the Operating Agreement.

The outstanding principal balance of this Note shall unconditionally be due and payable on the Maturity Date.

The Company may, at its election, from time to time prior to maturity, prepay without penalty all or any portion of the principal indebtedness of this Note.

Demand for payment shall be presumed to have been issued and the entire unpaid principal sum of this Note, together with accrued interest thereon, if any, shall become immediately due in the event of the occurrence of any one or more of the following: default in the payment of any installment due hereunder continuing for a period in excess of ten (10) days after written notice from the Developer to the Company; the filing by the Company of a voluntary petition in bankruptcy; or the failure by the Company within ninety (90) days thereof to lift any filing against the Company of any involuntary petition, execution, or attachment; or the adjudication of the Company as bankrupt; or any assignment by the Company of all or substantially all of its assets for the benefit of its creditors; or the invalidity or illegality of any portion of this Note by reason of any act or omission by the Company.

Except as may be specifically required under the provisions of Section 5 of the Development Agreement, this Note shall not be assigned, hypothecated, pledged, sold, or

otherwise transferred without the prior written consent of the Company, and any such other transfer without the Company's consent shall be null and void.

Notwithstanding any provision herein to the contrary or future amendments or superseding provisions thereto, neither the Roman Catholic Archdiocese of Boston, a public juridic person under the Code of Canon Law of the Roman Catholic Church (the "**Archdiocese**"), the Roman Catholic Archbishop of Boston and/or the duly appointed administrator of the Archdiocese of Boston ("**Archbishop**"), the Roman Catholic Archbishop of Boston, a Corporation Sole, a Massachusetts charitable corporation established pursuant to Chapter 506 of the Acts of 1897 ("**RCAB**"), nor their respective officers, directors, agents, servants, employees, parent organizations or affiliated organizations, subsidiaries, attorneys, nor any other individuals or entities (other than the Company) associated or affiliated with the Archdiocese, the Archbishop or RCAB, in any manner whatsoever and each of their successors and assigns or heirs, individually or joint, or in any capacity whatsoever, shall have any responsibility or obligation of any nature hereunder, nor shall there be any recourse against said entities or individuals for breach or default of any obligation, responsibility or provision hereof.

The payment of this Note shall be a nonrecourse obligation of the Company.

This Note shall be governed by and construed in accordance with the internal laws of the Commonwealth of Massachusetts.

IN WITNESS WHEREOF, the Company has executed this Note as of the date written above.

CHARLES RIVER HEIGHTS LLC, a
Massachusetts limited liability company

By: _____
William H. Grogan, Authorized Signatory
PLANNING OFFICE FOR URBAN AFFAIRS,
INC., a Massachusetts nonprofit corporation

By: _____
William H. Grogan, President
CRC EAST MILITIA, LLC, a Massachusetts
limited liability company

By: **Charles River Association for Retarded
Citizens, Inc.**

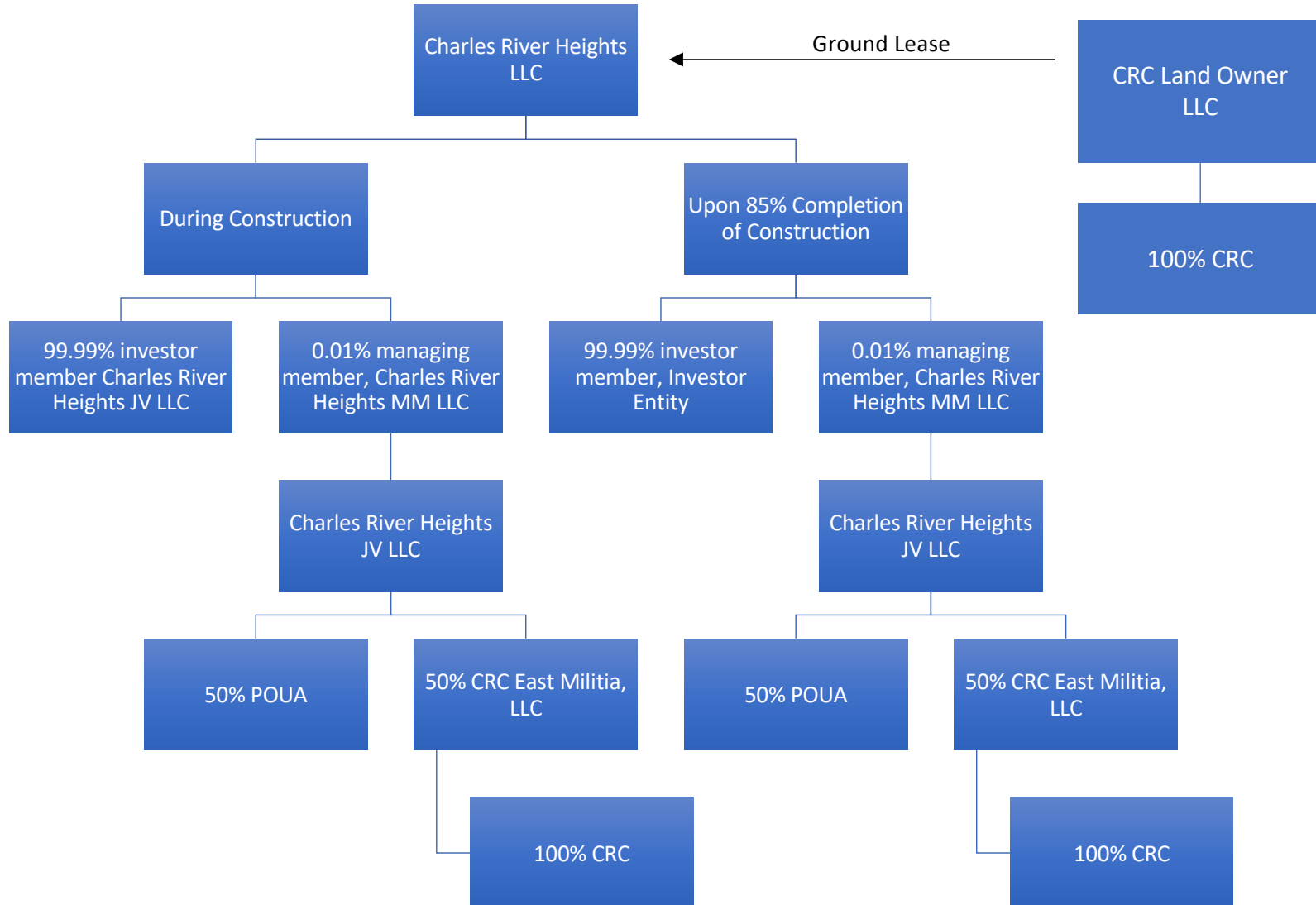
By: _____
Anne-Marie Bajwa, President & CEO

EXHIBIT E

ORGANIZATIONAL CHART

[See Attached]

Charles River Village



Attachment 4: Evidence of Local Support



Office of the Town Manager
1471 Highland Avenue
Needham, MA 02492
781-455-7500
www.needhamma.gov

June 3, 2025

Edward Augustus, Secretary
Executive Office of Housing and Livable Communities
100 Cambridge Street, Suite 300
Boston, MA 02114

Re: Letter of Support from the Town of Needham/Charles River Heights Project, 59 East
Militia Heights Road

Dear Secretary Augustus:

At its meeting on May 27, 2025, the Needham Select Board voted to support the Charles River Center's Charles River Heights project at 59 East Militia Heights Road as a "friendly 40B."

For this project, the Charles River Center (CRC) is partnering with the nonprofit developer Planning Office for Urban Affairs (POUA). POUA has a strong track record, having developed over 3,000 units of affordable, workforce, and mixed-income housing in the greater Boston area.

Charles River Heights will include 86 units of housing for households earning at or below 30% to 80% of Area Median Income (AMI). Approximately half of these units will be available through a closed referral system for people with autism or intellectual and developmental disabilities, as well as CRC staff. CRC will provide a comprehensive network of support and services to these residents, alongside educational opportunities. Programming will include remote support for overnight monitoring, clinical support (including medical, health and safety), college navigation, employment and career exploration, training and job support, adult companion and peer support, and transportation services.

The remainder of the units in the project will be available to households earning at or below 30% to 80% of AMI but will not be restricted to individuals with autism or intellectual and developmental disabilities. The integration of adults with autism and intellectual and developmental disabilities alongside adults without disabilities is a critical component of the CRC model. When complete, the project will provide a creative model of an inclusive community for other communities across the Commonwealth and beyond.

Public benefits of the project include:

- a community center and green outdoor space that is accessible to the surrounding neighborhood and open to the greater Needham community;
- an increase in affordable housing units in Needham, including those for individuals with disabilities – a goal articulated in the Town’s Housing Plan; and
- preference to Needham residents at initial lease-up, to the extent permitted by EOHL.

The 2025 Annual Town Meeting voted to appropriate \$2,840,223 from Community Preservation Act funds to support the funding strategy for this project. Based on the foregoing, the Town believes that this project will be beneficial both to current Needham residents and those who will move to Needham to live in this truly inclusive community.

If you have any questions or need additional information, please feel free to contact me.

Very truly yours,

A handwritten signature in cursive script, appearing to read "Kate Fitzpatrick".

Kate Fitzpatrick
Town Manager

cc: Select Board
 Zoning Board of Appeals
 Anne-Marie Bajwa, Charles River Center
 Chris Heep, Town Counsel
 Katie King, Deputy Town Manager
 Lee Newman, Director of Planning & Community Development
 Alison Steinfeld, Community Housing Specialist

May 2025 Annual Town Meeting

2025 Annual Town Meeting

Monday, May 5, 2025

7:30 pm

JAMES HUGH POWERS HALL, NEEDHAM TOWN HALL

1471 HIGHLAND AVENUE

Key Documents

[2025 Annual Town Meeting Warrant](#)

[Moderator's 2025 Memorandum - Procedural Information for Town Meeting Members](#)

[Moderator's 2025 Annual Town Meeting Memorandum to Town Meeting Members](#)

[Town Meeting Material Distribution Guidance](#)

[Select Board Positions](#)

[Finance Committee Recommendations](#)

[Community Preservation Committee Report to Town Meeting](#)

[Town Manager Report to Town Meeting](#)

Article Listing and Supporting Documents

Select Language ▼

1. ANNUAL TOWN ELECTION

2. COMMITTEE AND OFFICER REPORTS

1. Planning Board Report on Article 44 of the 2024 Annual Town Meeting

3. ESTABLISH ELECTED OFFICIALS' SALARIES – Adopted

4. APPROVE COLLECTIVE BARGAINING AGREEMENT – NEEDHAM POLICE UNION – Withdrawn

5. FUND COLLECTIVE BARGAINING AGREEMENT – POLICE SUPERIOR OFFICERS ASSOCIATION – Withdrawn

6. APPROPRIATE FOR CLASSIFICATION AND COMPENSATION STUDY – Adopted

7. APPROPRIATE FOR NEEDHAM PROPERTY TAX ASSISTANCE PROGRAM – Adopted

8. APPROPRIATE FOR PUBLIC FACILITIES MAINTENANCE PROGRAM – Adopted

9. APPROPRIATE FOR FORESTRY MANAGEMENT – Adopted

10. APPROPRIATE FOR CLIMATE ACTION PROGRAM INITIATIVES – Adopted

1. Article 10 FAQs

11. APPROPRIATE FOR FINANCIAL APPLICATION SOFTWARE – Adopted

1. Article 11 FAQs

12. APPROPRIATE FOR OPIOID PROGRAMMING – Adopted

1. Memorandum to Select Board on Opioid Programming

13. APPROPRIATE THE FY2026 OPERATING BUDGET – Adopted

1. Letter from Library Board of Trustees in Support of Library Budget Requests
2. Letter and Budget Information Slides from Minuteman School

14. APPROPRIATE THE FY2026 SEWER ENTERPRISE FUND BUDGET – Adopted

15. APPROPRIATE THE FY2026 WATER ENTERPRISE FUND BUDGET – Adopted

16. SET THE ANNUAL DEPARTMENT REVOLVING FUND SPENDING LIMITS – Adopted

17. AUTHORIZATION TO EXPEND STATE FUNDS FOR PUBLIC WAYS – Adopted

1. Motion to Amend Submitted by Robert Dangel, Town Meeting Member (Withdrawn on Floor)

18. AMEND ZONING BY-LAW – MULTI-FAMILY OVERLAY DISTRICT (THE “BASE COMPLIANCE PLAN”) – Adopted

1. Planning Board Presentation Relative to Articles 18-19
2. Zoning Map Relative to Articles 18-19
3. MBTA Communities Act FAQ
4. Memo Relative to Capital Impacts Assessment of Proposed MBTA Communities Act Zoning
5. Memo Relative to MBTA Communities Act Zoning Proposal School Enrollment Analysis
6. Fiscal Impact Analysis Relative to Articles 18-19 (Prepared in 2024)
7. Traffic Impact Assessment and Mitigation Strategies Relative to Articles 18-19 (Prepared in 2024)

8. [Memo Relative to MBTA Communities Act and Funding At Risk](#)

19. AMEND ZONING BY-LAW – MAP CHANGE FOR MULTI-FAMILY OVERLAY DISTRICT (THE “BASE COMPLIANCE PLAN”) – Adopted

1. [Planning Board Presentation Relative to Articles 18-19](#)

2. [Zoning Map Relative to Articles 18-19](#)

3. [MBTA Communities Act FAQ](#)

4. [Memo Relative to Capital Impacts Assessment of Proposed MBTA Communities Act Zoning](#)

5. [Memo Relative to MBTA Communities Act Zoning Proposal School Enrollment Analysis](#)

6. [Fiscal Impact Analysis Relative to Articles 18-19 \(Prepared in 2024\)](#)

7. [Traffic Impact Assessment and Mitigation Strategies Relative to Articles 18-19 \(Prepared in 2024\)](#)

8. [Memo Relative to MBTA Communities Act and Funding At Risk](#)

20. APPROPRIATE FOR ON-GOING COLLECTIONS STORAGE UPGRADES/NEEDHAM HISTORY CENTER & MUSEUM - Adopted

1. [Community Preservation Committee Report to Town Meeting](#)

21. NEEDHAM TRAIL SIGNAGE IMPROVEMENTS – Adopted

1. [Community Preservation Committee Report to Town Meeting](#)

22. APPROPRIATE FOR EAST MILITIA HEIGHTS DEVELOPMENT – CHARLES RIVER CENTER – Adopted

1. [Community Preservation Committee Report to Town Meeting](#)

2. [Article 22 FAQs](#)

3. [Article 22 FAQs Provided by the Charles River Center](#)

4. [Project Summary Provided by the Charles River Center](#)

5. [Memorandum from the Community Preservation Committee to the Finance Committee Relative to Ar](#)

23. APPROPRIATE FOR PRESERVATION OF SEABEDS WAY – Adopted

1. [Community Preservation Committee Report to Town Meeting](#)

2. [Article 23 FAQs](#)

24. ACTION PARK & PICKLEBALL COURTS DESIGN – Adopted

1. [Community Preservation Committee Report to Town Meeting](#)

2. [Article 24 FAQs](#)

25. APPROPRIATE FOR ELIOT SCHOOL GROUNDS RENOVATION (DESIGN) – Adopted

1. [Community Preservation Committee Report to Town Meeting](#)

26. APPROPRIATE FY2026 CPA BUDGET AND RESERVES – Adopted

1. [Community Preservation Committee Report to Town Meeting](#)



27. APPROPRIATE FOR GENERAL FUND CASH CAPITAL – Adopted

1. Letter from Library Board of Trustees in Support of Library Budget Requests

28. APPROPRIATE FOR ELIOT SCHOOL BOILER REPLACEMENT – Adopted

29. APPROPRIATE FOR LIBRARY RENOVATION – Adopted

1. Letter from Library Board of Trustees in Support of Library Budget Requests
2. Article 29 FAQs
3. Proposed Design for Renovated Areas

30. APPROPRIATE FOR NEEDHAM HIGH SCHOOL STAIR REPAIR – Adopted with Emergency Preamble

31. NEWMAN SCHOOL THEATRICAL LIGHTING, SOUND, AND RIGGING REPAIRS – Adopted

32. CENTER AT THE HEIGHTS RENOVATION DESIGN – Adopted

1. Article 31 FAQs Provided by the Council on Aging
2. CATH Space Use Utilization Study – Produced 2023

33. APPROPRIATE FOR PUBLIC WORKS FACILITIES IMPROVEMENTS/COGSWELL BUILDING – Adopted

1. Article 33 FAQs

34. APPROPRIATE FOR PUBLIC WORKS INFRASTRUCTURE – Adopted

35. APPROPRIATE FOR SEWER ENTERPRISE FUND CASH CAPITAL – Adopted

36. APPROPRIATE FOR INFILTRATION AND INFLOW – Adopted

37. APPROPRIATE FOR WATER ENTERPRISE FUND CASH CAPITAL – Adopted

38. APPROPRIATE FOR WATER SERVICE CONNECTIONS – Adopted

39. RESCIND DEBT AUTHORIZATIONS – Adopted

40. AMEND GENERAL BY-LAWS – CONTRACT PROCEDURES – Adopted

41. ACCEPT M.G.L. c.59, §5 CLAUSES TWENTY-SECOND I AND TWENTY-SECOND J (VETERANS' PROPERTY TAX EXEMPTIONS) – Adopted

42. INCREASE CONTRIBUTORY RETIREMENT COLA ALLOWANCE – Adopted

43. APPROPRIATE TO ATHLETIC FACILITY IMPROVEMENT FUND – Adopted

44. APPROPRIATE TO CAPITAL FACILITY FUND – Adopted

45. CITIZENS' PETITION – LEAF BLOWERS – Withdrawn

46. CITIZENS' PETITION – NUCLEAR DISARMAMENT – Adopted as Amended

1. Statement of Petitioners

47. OMNIBUS – No Submissions



Commonwealth of Massachusetts
EXECUTIVE OFFICE OF HOUSING &
LIVABLE COMMUNITIES

Maura T. Healey, Governor ♦ Kimberley Driscoll, Lieutenant Governor ♦ Edward M. Augustus, Jr., Secretary

October 2, 2025

Mr. William Grogan
The Planning Office for Urban Affairs
10 Post Office Square, Suite 1310
Boston, MA 02109

Re: Charles River Heights, Needham, MA – Project Eligibility Letter

Dear Mr. Grogan:

We are pleased to inform you that your application for project eligibility determination for the proposed Charles River Heights project located in Needham, Massachusetts, has been approved under the Low-Income Housing Tax Credit (LIHTC) program. The project is located at 59 East Militia Heights Drive in Needham, Massachusetts. This approval indicates that the proposed plan includes a total of 86 units of rental housing. The units will be rent restricted as follows: 50 units at 30% of AMI, 26 units at or below 60% of AMI, five units at or below 80% of AMI and five units at market rate.

The proposed project will consist of 33 studio units, 43 one-bedroom units and 10 two-bedroom units. The rental structure as described in the application is generally consistent with the standards for affordable housing to be included in the community's Chapter 40B affordable housing stock. This approval does not constitute a guarantee that LIHTC funds will be allocated to the Charles River Heights project. It does create a presumption of fundability under 760 CMR 56.04 and allows the Planning Office for Urban Affairs to apply to the Needham Zoning Board of Appeals for a comprehensive permit. The sponsor should note that a One Stop submission for funding must conform to all Executive Office of Housing and Livable Communities (EOHLC) program limits and requirements in effect at the time of submission.

As part of the review process, EOHLC has made the following findings:

1. The proposed project appears generally eligible under the requirements of the Low-Income Housing Tax Credit program.
2. EOHLC has performed an on-site inspection of the proposed Charles River Heights project and has determined that the proposed site is an appropriate location for the project. The housing will be located near the campus of the Charles River Center. It will be on a hill 1.3 miles away from the Needham Center commuter rail stop.
3. The proposed housing design appears appropriate for the site. The development will produce four buildings. There will be a larger three-story elevator building and three one-story buildings. The buildings will be built to passive house standards. The larger building will also include amenity and office space. The exterior space will include recreational and therapeutic uses.
4. The proposed project appears financially feasible in the context of the Needham housing market.

5. The initial proforma for the project appears financially feasible and consistent with the requirements for cost examination and limitations on profits on the basis of estimated development and operating costs. Please note again that a One Stop+ submission for funding for this project must conform to all EOHLC program limits and requirements in effect at the time of submission.
6. An appraisal has been commissioned. The Low-Income Housing Tax Credit Program Guidelines state that the allowable acquisition value of a site with a comprehensive permit must be equal to or less than the value under pre-existing zoning, plus reasonable carrying costs. If this project is submitted for funding under the Low-Income Housing Tax Credit Program, the acquisition price in the proposed budget should reflect these program guidelines.
7. The ownership entity will be a single-purpose entity controlled by the applicant, subject to limited dividend requirements. It will meet the general eligibility standards of the Low-Income Housing Tax Credit program. The applicant will need to demonstrate sufficient capacity to successfully develop the project under the Low-Income Housing Tax Credit program.
8. The applicant has a designated developer agreement with the town of Needham.
9. EOHLC has received comments from the town of Needham regarding the project.

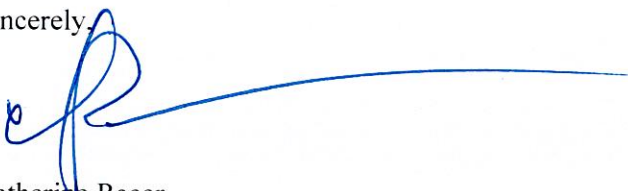
The proposed Charles River Heights project will have to comply with all state and local codes not specifically exempted by a comprehensive permit. In applying for a comprehensive permit, the project sponsor should identify all aspects of the proposal that will not comply with local requirements.

If a comprehensive permit is granted, construction of this project may not commence without EOHLC's issuance of final approval pursuant to 760 CMR 56.04 (7) and an award of LIHTC funds. This project eligibility determination letter is not transferable to any other project sponsor or housing program without the express written consent of EOHLC. When construction is complete, a Chapter 40B cost certification and an executed and recorded 40B regulatory agreement in compliance with EOHLC's requirements pertaining to Chapter 40B must be submitted and approved by EOHLC prior to the release of a Low-Income Housing Tax Credit form 8609.

This letter shall expire two years from this date, or on October 2, 2027, unless a comprehensive permit has been issued.

We congratulate you on your efforts to work with the town of Needham to increase its supply of affordable housing. If you have any questions as you proceed with the project, please feel free to call or email Rebecca Frawley Wachtel at (617) 573-1318 or at Rebecca.Frawley@mass.gov.

Sincerely,

A handwritten signature in blue ink, appearing to be 'Catherine Racer', with a long horizontal flourish extending to the right.

Catherine Racer
Undersecretary/Housing Development

cc: Heidi Frail, Chair of the Select Board of Needham, Massachusetts

F. Waivers

As required under Section 56.05(2)(h) of the 40B Regulations, attached is a list of requested Waivers to Local Requirements and Regulations, and the Applicant requests approval of the Waivers from certain local requirements of the Town of Needham, including the Needham Zoning By-Law, and other Local Requirements and Regulations as defined under Section 56.02 of the Chapter 40B Regulations, including all local legislative, regulatory, or other actions which are more restrictive than state requirements, if any, including local zoning and wetlands bylaws, and board of health rules, and other local ordinances, codes, and regulations, in each case which are in effect on the date of the Project's application to the Board. In addition to the following list of requested Waivers listed below, the Applicant requests an exception from each and every provision or requirement of all Local Requirements and Regulations issued by a "Local Board" (defined under the Chapter 40B Regulations as meaning any local board or official, including, but not limited to any board of survey; board of health; planning board; conservation commission; historical commission; water, sewer, or other commission or district; fire, police, traffic, or other department; building inspector or similar official or board; city council, as well as all boards, regardless of their geographical jurisdiction or their source of authority [that is, including boards created by special acts of the legislature or by other legislative action] if such local board perform functions usually performed by locally created boards) with which any aspect of its Comprehensive Permit application, including but not limited to its proposed site development plans and any other information hereinafter submitted to the Board, is inconsistent.

See Waiver List addendum attached hereto.

G. Applicant and Project Team

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C/O The Planning Office for Urban Affairs
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William H. Grogan, Authorized Person

The Planning Office for Urban Affairs
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Legal Counsel: *Goulston and Storrs*
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Owner's Representative Waypoint KLA
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Ray Mitrano, Principal
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(617) 875-2501

H. Stormwater Memorandum

Charles River Heights Project

59 East Militia Heights Road
Needham, Massachusetts

PREPARED FOR

Planning Office for Urban Affairs, Inc.
(POUA) on behalf of Charles River
Center
10 Post Office Square, Suite 1310
Boston, MA, 02109
617.350.8885

PREPARED BY



260 Arsenal Place #2
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October 2025

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Stormwater Narrative

This Stormwater Management Memorandum has been prepared to demonstrate compliance with the Town of Needham's Stormwater Bylaw (the Bylaw) and associated regulations for stormwater design and management. Although a small portion of the north side of the Project Site is within a Massachusetts Wetlands Protection Act (310 CMR 10.00) jurisdictional wetland, no improvements are proposed within the jurisdictional area. However, this Stormwater Management Memorandum documents the Project's intent to comply with the Massachusetts Stormwater Management Standards per the requirements of the Bylaw in the preliminary design stage.

Project Description

The Applicant, Planning Office for Urban Affairs (POUA), is proposing to construct four buildings with related site improvements to create eighty-six (86) new affordable housing units, of which about forty-three (43) will offer integrated supportive services to empower individuals with disabilities to live independently (the Project). The Applicant is representing the property owner, Charles River Center.

The Site is a previously developed property at 59 East Militia Heights Road in Needham, MA and is located across from the Charles River Center (CRC) (the Site). The Project consists of one (1), three-story, approximate 67,000 gross square foot (gsf) building and three (3), one-story approximate 4,000 gsf buildings. Associated site improvements include driveways and sixty-one (61) parking spaces for residential use and common use amenities, connections to outdoor walking trails, utilities improvements to support the proposed use, and ancillary landscape improvements.

The stormwater management design has been developed to ensure that proposed conditions do not negatively impact any onsite or neighboring areas. A new, comprehensive stormwater management system focusing on water quality treatment and infiltration has been proposed for the Project. The Project is not considered a Land Use with Higher Potential Pollutant Loads (LUHPPL).

Site Description

The Project Site is located at 59 East Militia Heights Road on approximately 3.5 acres of cleared land in Needham, Massachusetts (see Figure 1). The Site lies within the surface watershed of the Charles River. The Site is bounded by East Militia Heights Road and the Charles River Center to

the north and undeveloped wooded lots zoned within the Single Residence A use district to the west, south, and east. See Figure 1, Site Locus Map.

Existing conditions at the Site consist of a mix of impervious roadway and cleared pervious area, as the Site was previously developed. According to readily available aerial information, the Site was developed with twelve residential dwellings¹. The dwellings were reportedly institutionally owned single family structures. After acquiring the Site in 2023, Charles River Heights razed the structures and demolition debris was removed from the Site. The structures were demolished as a safety and maintenance precaution, as users at the existing Charles River Center campus can access the Site. The main driveway and residential driveway pavements exist, along with a gravel parking area at the southeast intersection of East Militia Heights Road and East Militia Heights Drive. The cleared lot is generally vegetated with fescue grass/weeds and some existing trees that remain following the demolition of the Site's dwellings.

The Site is located at the top of a ridge, but is generally flat overall. The locations of the now demolished homes generally form the highest points of the Site, with topography falling away from the homes towards the main drive and the perimeter of the overall Site. Residential pads generally range in elevation from El. 245-feet± to El. 242-feet± (NAVD88). The topography quickly falls at the east, south, and west perimeter of the Site to elevations as low as El. 225-feet±. The summit of East Militia Heights Road is located northwest of the intersection of East Militia Heights Road and the main drive, with a high point elevation of approximately El. 245-feet±. From the high point, the road slopes down to the west to an elevation of El. 241-feet± at the farthest west extent of the Site property line and to the east to an elevation of El. 232-feet± at the farthest east extent of the Site property line.

Soils Information

According to the Natural Resources Conservation Service (NRCS), surface soils on the Site are classified as Hydrologic Soil Group 'C' (HSG C) soils. HSG C classified soils include Paxton fine sandy loam (slopes 3% to 8% and slopes 15% to 25%, extremely stony). Additional soil testing will be necessary to confirm the proposed infiltration rates and estimated seasonal high groundwater (ESHGW) elevations at the proposed locations of the stormwater management systems.

Existing Drainage Conditions

Under existing conditions, the Site is a previously developed property that is now mostly cleared. Impervious areas consist of a paved main drive, residential driveway pavements, and a gravel parking area. Pervious areas primarily consist of vegetated areas of fescue grass/weeds with mature woods around the perimeter of the Site. Under existing conditions, surface runoff flows overland throughout the Site.

As shown, the project is divided into five onsite drainage subcatchments (EX-1, EX-2, EX-3, EX-4, and EX-5) that discharge to five existing design points (DP-1, DP-2, DP-3, DP-4, and DP-5). Each

¹ Google Earth applications were accessed in September 2025 to perform a desktop review of readily available aerial information.

subcatchment generally encompasses various portions of vegetated pad sites for the demolished homes, their associated paved driveway areas, and a strip of mature woods. Each design point represents a surface discharge point from the Site. For modeling purposes, Design Points DP-1 generally discharges north towards Dwight Road, DP-2 and DP-4 generally discharge west towards the woods, DP-3 generally discharges east towards the woods, and DP-5 generally discharges south towards the woods. Figure 2 illustrates the existing drainage patterns on the Site.

As a result of the demolition of the dwelling units on the Site prior to topographic survey being completed, the hydrologic analysis completed for the purposes of this memorandum includes existing conditions that are more constrained than is required. The removal of impervious roof area from the existing conditions makes meeting the Stormwater Management Standards slightly more difficult. The Project would like this to be acknowledged when this study is reviewed by the appropriate Town of Needham departments and staff.

Table 1 below provides a summary of the existing conditions hydrologic data.

Table 1 Existing Conditions Hydrologic Data

Drainage Area	Discharge Location	Design Point	Area (Acres)	Curve Number	Time of Concentration (min)
EX-1 Entry at Dwight	Overland flow direct to DP-1 (Dwight Road)	DP-1	1.14	81	5.0
EX-2 North Lawn	Overland flow direct to DP-2 (Woods North)	DP-2	0.39	75	5.0
EX-3 East Lawn	Overland flow direct to DP-3 (Woods East)	DP-3	0.38	72	5.0
EX-4 West Lawn	Overland flow direct to DP-4 (Woods West)	DP-4	0.83	73	5.0
EX-5 Driveway South	Overland flow direct to DP-5 (Woods South)	DP-5	0.76	78	5.0
Total			3.50	77	

Proposed Drainage Conditions

Figure 3 illustrates the proposed “post construction” drainage conditions for the project. As shown, the project is divided into eleven drainage subcatchments located onsite that discharge treated stormwater to the five existing Design Points. The tributary drainage areas contributing runoff to each of the five Design Points are described below, and Table 2 provides a summary of the proposed conditions hydrologic data.

Design Points

DP-1, Discharge north towards Dwight Road: The tributary subcatchment areas to DP-1 generally include impervious and pervious areas near the entrance/front of the Site. Impervious

areas contributing runoff include the roof areas from the three one-story buildings (Buildings B, C, and D) and the parking, driveway, and amenity areas north of the front of the 3-story building (Building A). Pervious areas contributing runoff generally include vegetated areas immediately adjacent to the tributary parking, driveway, and amenity areas.

Overland runoff is generally graded to flow towards the parking and driveway areas, where it will be captured in new deep sump catch basins proposed in the paved areas. From there, runoff will be collected in an underground storm drainage system and will be routed to one of three subsurface infiltration basins. Building B, C, and D roof runoff will be collected in a roof collection system and will directly connect to one of three subsurface infiltration basins. The subsurface infiltration systems will be constructed of plastic chambers surrounded by a bed of crushed stone. Runoff not infiltrated in place within the subsurface infiltration systems will be managed through construction of an outlet control structure to control peak runoff rates prior to discharging from the system. Overflow discharge from the three subsurface infiltration basins will combine into a single underground storm drain and route northeast in Dwight Road to connect to an existing underground storm drainage system located approximately 250-ft east of the Site's main driveway entrance.

DP-2, Discharge west towards Woods North: Similar to the existing conditions at DP-2, overland flows from the proposed pervious lawn west of a one-story building will sheet flow towards the woods.

DP-3, Discharge east towards Woods East: Similar to the existing conditions at DP-3, overland flows from the proposed pervious lawn east of the three-story building will sheet flow towards the woods.

DP-4, Discharge west towards Woods West: Similar to the existing conditions at DP-4, overland flows from the proposed pervious lawn west of the three-story building will sheet flow towards the woods.

DP-5, Discharge south towards Woods South: The tributary subcatchment areas to DP-5 generally include impervious and pervious areas at the back of the Site. Impervious areas contributing runoff include the roof area from the three-story Building A and the parking, driveway, and amenity areas east, west, and south of Building A. Pervious areas contributing runoff generally include vegetated areas immediately adjacent to the tributary parking, driveway, and amenity areas.

Overland runoff is generally graded to flow towards the parking and driveway areas, where it will be captured in new deep sump catch basins proposed in the paved areas. From there, runoff will be collected in an underground storm drainage system and will be routed to a subsurface infiltration basin. Building A roof runoff will be collected in a roof collection system and will directly connect to the subsurface infiltration basin. The subsurface infiltration system will be constructed of plastic chambers surrounded by a bed of crushed stone. Runoff not infiltrated in place within the subsurface infiltration system will be managed through construction of an outlet control structure to control peak runoff rates prior to discharging from the system. Overflow discharge will be routed in an underground storm drainage system that will discharge at pipe outlet(s) within a proposed retaining wall located parallel to the south property line.

Table 2 Proposed Conditions Hydrologic Data

Drainage Area	Discharge Location	Design Point	Area (Acres)	Curve Number	Time of Concentration (min)
1A C Rear Lawn	Infiltration; Overflow to DP-1 (Dwight Road)	DP-1	0.18	74	5.0
1B Building C	Infiltration; Overflow to DP-1 (Dwight Road)	DP-1	0.32	96	5.0
1C Entry & Parking	Infiltration; Overflow to DP-1 (Dwight Road)	DP-1	0.28	91	5.0
1D Building B	Infiltration; Overflow to DP-1 (Dwight Road)	DP-1	0.10	98	5.0
1E Building D	Infiltration; Overflow to DP-1 (Dwight Road)	DP-1	0.18	92	5.0
1F Drop-off Area	Infiltration; Overflow to DP-1 (Dwight Road)	DP-1	0.54	93	5.0
2A North Lawn	Overland flow direct to DP-2 (Woods North)	DP-2	0.31	75	5.0
3A East Edge	Overland flow direct to DP-3 (Woods East)	DP-3	0.13	70	5.0
4A West Edge	Overland flow direct to DP-4 (Woods West)	DP-4	0.28	73	5.0
5A Building A	Infiltration; Overflow to DP-5 (Woods South)	DP-5	1.10	95	5.0
5B South Edge	Overflow flow direct to DP-5 (Woods South)	DP-5	0.08	72	5.0
Total			3.50	88	

The site design integrates a comprehensive stormwater management system that has been developed in accordance with the Massachusetts Stormwater Handbook and Town of Needham requirements. To meet the MA Stormwater Handbook and Town of Needham requirements, design computations will reflect the proposed stormwater management system can provide the following minimum requirements. The pollutant removal calculations for Total Suspended Solids (TSS) and Total Phosphorus (TP) will be based on US EPA Region 1's BMP Accounting and Tracking Tool.

- Treatment of the one-inch Water Quality Volume
- 80% average annual load of TSS removal from the Site
- 60% average annual load of TP removal from the Site

Environmentally Sensitive and Low Impact Development (LID) Techniques

Low Impact Development (LID) techniques and stormwater Best Management Practices (BMPs) implemented into the site design include promoting water quality, pollutant reduction, and rate/volume mitigation through the installation of several high-capacity infiltration areas. Additional information regarding volume mitigation and water quality treatment can be found in sections corresponding to MassDEP Stormwater Standards 3 and 4 below.



Figure 1
Locus Map

**Charles River Heights
Needham, Massachusetts**

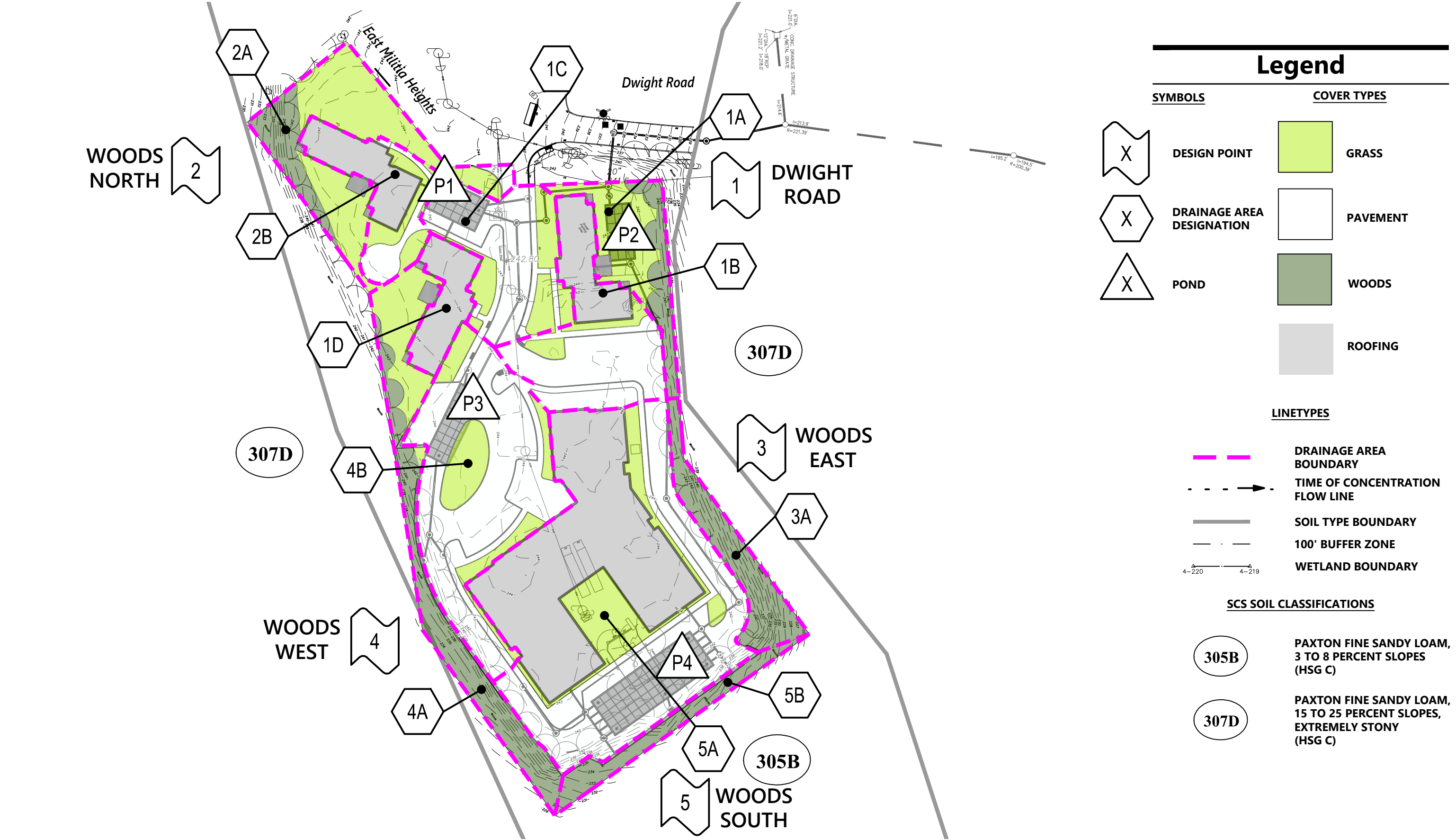


Existing Drainage Conditions

Charles River Heights
Needham, MA

Figure 2

October 2025



Proposed Drainage Conditions

Charles River Heights
Needham, MA

Figure 3

October 2025



Regulatory Compliance

Massachusetts Department of Environmental Protection (DEP) – Stormwater Management Standards

As demonstrated below, the proposed Project fully complies with the DEP Stormwater Management Standards.

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The Project has been designed to comply with Standard 1.

The Best Management Practices (BMPs) included in the proposed stormwater management system have been designed in accordance with the Massachusetts Stormwater Handbook. Supporting information and computations demonstrating that no new untreated discharges will result from the Project are presented through compliance with Standards 4 through 6.

The Project does not propose any new stormwater outlets and will not negatively impact adjacent wetland resource areas. All proposed Project stormwater outlets and conveyances have been designed to not cause erosion or scour to nearby wetlands or receiving waters. Outlets from closed-drainage systems will be designed with stone protection to dissipate discharge velocities.

Standard 2: Peak Rate Attenuation

The Project has been designed to comply with Standard 2.

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals of 2-, 10-, 25- and 100-years. The results of the analysis, as summarized in Table 3 below, indicate that there is no increase in peak discharge rates between the existing and proposed conditions for the 2-, 10-, and 25-year peak storm events. There is a decrease in peak discharge rates between the existing and proposed conditions for the 100-year peak storm event with the exception of DP-1. Despite the increase in 100-year peak discharge rate at this design point, there is no negative impact anticipated to downstream properties. The Project Team was mindful to utilize downstream closed pipe drainage system to overflow DP-1 tributary areas as to not shed runoff to surrounding properties.

Computations and supporting information regarding the hydrologic modeling are attached.

Table 3 Peak Discharge Rates (cfs*)

Design Point	2-year	10-year	25-year	100-year
DP-1: North towards Dwight Road				
Existing	1.8	3.9	5.2	7.4
Proposed	0.4	2.9	5.2	11.3
DP-2: West towards woods				
Existing	0.5	1.2	1.7	2.4
Proposed	0.4	1.0	1.3	1.9
DP-3: East towards woods				
Existing	0.4	1.1	1.5	2.2
Proposed	0.1	0.3	0.5	0.7
DP-4: West towards woods				
Existing	1.0	2.4	3.3	4.9
Proposed	0.3	0.8	1.1	1.6
DP-5: South towards woods				
Existing	1.1	2.4	3.4	4.8
Proposed	0.6	2.4	3.1	4.8

Standard 3: Stormwater Recharge

The Project has been designed to comply with Standard 3.

The Project is considered a new development as a result in an increase in impervious area when compared to the existing conditions. The Project proposes a comprehensive stormwater management system with heavy emphasis on infiltration in order to exceed the required recharge volumes for the Site. The plastic chamber and stone subsurface infiltration systems are designed using the Static Method of sizing for volumes pending confirmation of in-situ soil conditions. Each infiltration BMP is designed to drain completely within 72 hours. The infiltration systems will be designed in detail after additional soil testing is completed by the Project Team.

Standard 4: Water Quality

The Project has been designed to comply with Standard 4.

The proposed stormwater management system implements a treatment train of BMPs that has been designed to provide a minimum of 80% TSS removal of stormwater runoff from all proposed impervious surfaces. The treatment trains for the Project consist of deep-sump and hooded catch basins and storage capacities infiltrating storms that will meet the minimum water quality treatment of the 1.5-inch runoff event.

Furthermore, given the emphasis on infiltration to achieve water quality treatment, Total Phosphorus loads from the Site will be reduced by the minimum local requirement of 60% for

onsite areas. The anticipated TP removal resulting from the Project's heavy emphasis on infiltration exceeds local and state requirements.

A Long-Term Pollution Prevention Plan will be included as part of a proposed Operations and Maintenance Plan.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The Project is not considered a LUHPPL.

Standard 6: Critical Areas

The Project will not discharge stormwater near or to a critical area.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

The Project has been designed to comply with all ten of the Stormwater Management Standards.

Refer directly to each Standard for applicable computations and supporting information demonstrating compliance with each.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls

The Project will disturb greater than an acre of land and is therefore required to obtain coverage under the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP). As required under the CGP, a Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted before land disturbance begins.

Standard 9: Operation and Maintenance Plan

In compliance with Standard 9, a Post Construction Stormwater Operation and Maintenance (O&M) Plan will be developed for the Project.

Standard 10: Prohibition of Illicit Discharges

Sanitary sewer and storm drainage structures which were part of the previous development on this site will be removed during the site redevelopment. The design plans submitted with this memorandum have been designed in full compliance with current standards. The Long-Term Pollution Prevention Plan will include measures to prevent illicit discharges.

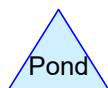
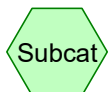
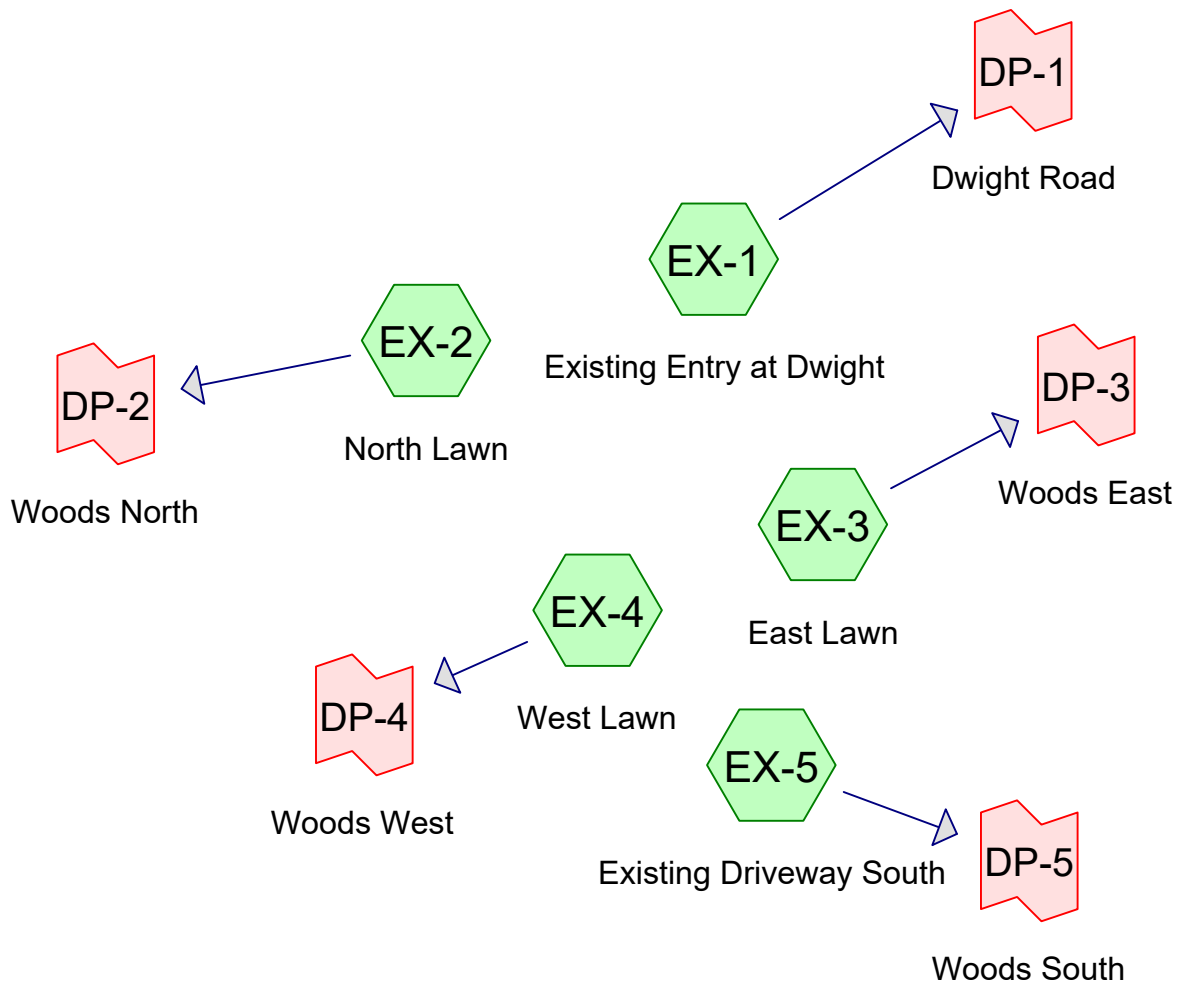
Town of Needham Stormwater Bylaw and Regulations

In accordance with the Town of Needham Stormwater Bylaw, the Project has been designed in accordance with the Town's regulations for stormwater management. In addition to meeting the MassDEP Stormwater Management Standards (as outlined previously herein), the following highlights are included in the analysis and associated design:

- The stormwater management system has been designed to reduce stormwater volumes and peak discharge rates for the 2-year, 10-year, and 25-year design storms when comparing the post-development conditions to the pre-development conditions and pollutant loading was reduced through the use of stormwater infiltration mechanisms.
- A combined volumetric capacity is provided to recharge a minimum of 1.5-inch of rainfall depth over the total proposed impervious area of the property.
- The proposed stormwater management system implements a treatment train of BMPs that has been designed to provide 80% TSS removal for stormwater runoff from all proposed impervious surfaces.
- The proposed stormwater management system is designed to remove a minimum of 60% of the average annual load of Total Phosphorous (TP) generated from the post-construction impervious surface areas and pathogens.
- The bottom of stormwater infiltration systems shall be a minimum of 2-feet above the estimated seasonal high groundwater elevation pending confirmation of soil investigations.
- All infiltration systems are designed to drain within 72 hours

As outlined through information included within this Stormwater Memorandum, the Project is expected to comply fully with the Town of Needham's requirements for stormwater management. A full Stormwater Management Report with supporting calculations and product information will be provided for review to the Conservation Commission and other necessary agency as the design progresses.

Attachments



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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.32	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.21	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.38	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.19	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.097	74	>75% Grass cover, Good, HSG C (EX-1, EX-2, EX-3, EX-4, EX-5)
0.140	96	Gravel, HSG C (EX-1)
0.403	98	Paved parking, HSG C (EX-1, EX-2, EX-3, EX-4, EX-5)
0.869	70	Woods, Good, HSG C (EX-1, EX-2, EX-3, EX-4, EX-5)
3.509	77	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.509	HSG C	EX-1, EX-2, EX-3, EX-4, EX-5
0.000	HSG D	
0.000	Other	
3.509		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	2.097	0.000	0.000	2.097	>75% Grass cover, Good	EX-1, EX-2, EX-3, EX-4, EX-5
0.000	0.000	0.140	0.000	0.000	0.140	Gravel	EX-1
0.000	0.000	0.403	0.000	0.000	0.403	Paved parking	EX-1, EX-2, EX-3, EX-4, EX-5
0.000	0.000	0.869	0.000	0.000	0.869	Woods, Good	EX-1, EX-2, EX-3, EX-4, EX-5
0.000	0.000	3.509	0.000	0.000	3.509	TOTAL AREA	

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Charles River Heights
Type III 24-hr 2-Year Rainfall=3.32"

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Existing Entry at	Runoff Area=49,858 sf 18.95% Impervious Runoff Depth=1.56" Tc=5.0 min CN=81 Runoff=2.09 cfs 0.149 af
SubcatchmentEX-2: North Lawn	Runoff Area=16,963 sf 7.60% Impervious Runoff Depth=1.18" Tc=5.0 min CN=75 Runoff=0.52 cfs 0.038 af
SubcatchmentEX-3: East Lawn	Runoff Area=16,569 sf 0.43% Impervious Runoff Depth=1.00" Tc=5.0 min CN=72 Runoff=0.42 cfs 0.032 af
SubcatchmentEX-4: West Lawn	Runoff Area=36,334 sf 1.03% Impervious Runoff Depth=1.06" Tc=5.0 min CN=73 Runoff=0.99 cfs 0.074 af
SubcatchmentEX-5: Existing Driveway	Runoff Area=33,127 sf 19.17% Impervious Runoff Depth=1.30" Tc=5.0 min CN=77 Runoff=1.14 cfs 0.082 af
Link DP-1: Dwight Road	Inflow=2.09 cfs 0.149 af Primary=2.09 cfs 0.149 af
Link DP-2: Woods North	Inflow=0.52 cfs 0.038 af Primary=0.52 cfs 0.038 af
Link DP-3: Woods East	Inflow=0.42 cfs 0.032 af Primary=0.42 cfs 0.032 af
Link DP-4: Woods West	Inflow=0.99 cfs 0.074 af Primary=0.99 cfs 0.074 af
Link DP-5: Woods South	Inflow=1.14 cfs 0.082 af Primary=1.14 cfs 0.082 af

Total Runoff Area = 3.509 ac Runoff Volume = 0.375 af Average Runoff Depth = 1.28"
88.53% Pervious = 3.106 ac 11.47% Impervious = 0.403 ac

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Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment EX-1: Existing Entry at Dwight

[49] Hint: $T_c < 2dt$ may require smaller dt

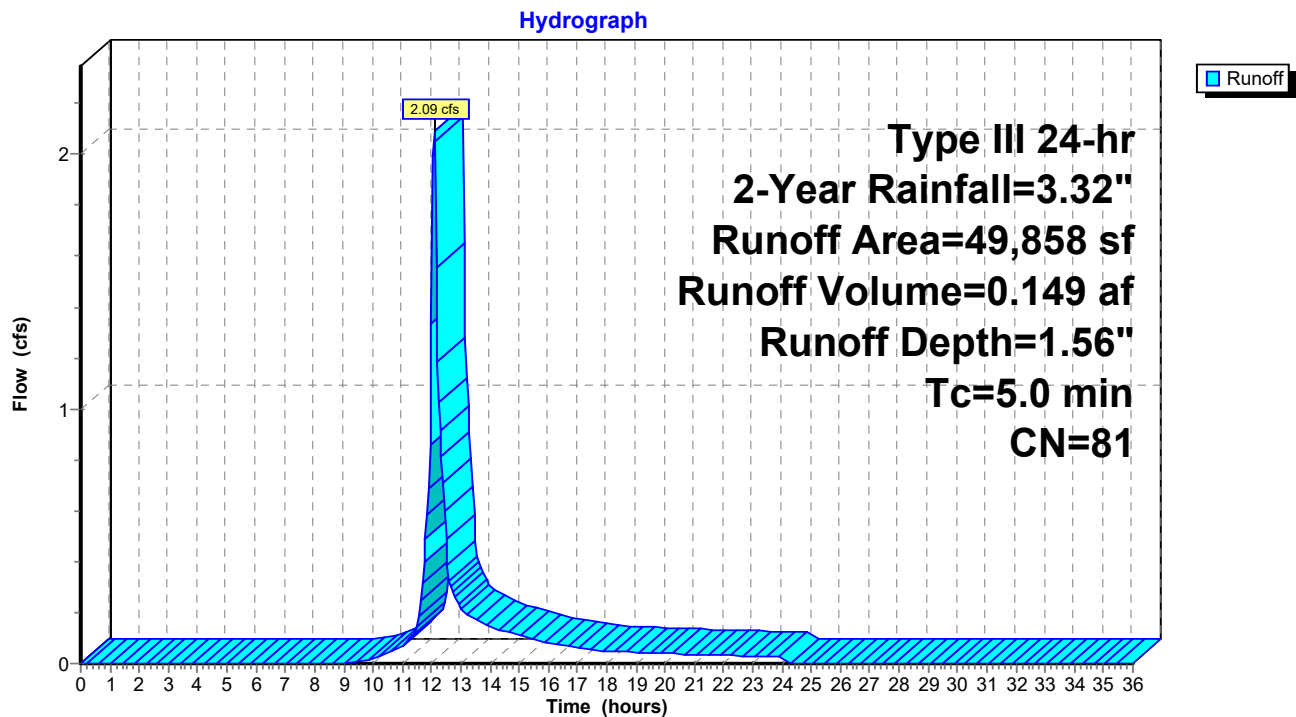
Runoff = 2.09 cfs @ 12.08 hrs, Volume= 0.149 af, Depth= 1.56"
Routed to Link DP-1 : Dwight Road

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=3.32"

Area (sf)	CN	Description
29,964	74	>75% Grass cover, Good, HSG C
9,447	98	Paved parking, HSG C
4,331	70	Woods, Good, HSG C
* 6,116	96	Gravel, HSG C
49,858	81	Weighted Average
40,411		81.05% Pervious Area
9,447		18.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-1: Existing Entry at Dwight



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Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment EX-2: North Lawn[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 0.038 af, Depth= 1.18"
Routed to Link DP-2 : Woods North

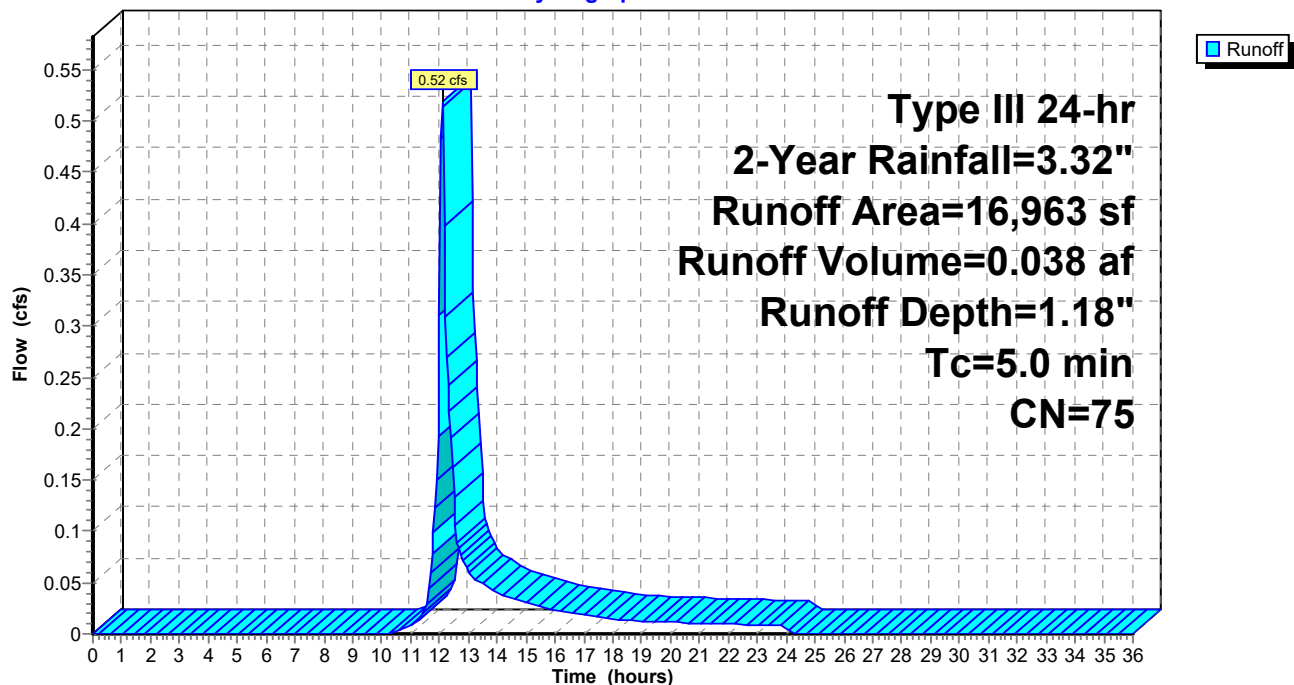
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
12,977	74	>75% Grass cover, Good, HSG C
1,290	98	Paved parking, HSG C
2,696	70	Woods, Good, HSG C
16,963	75	Weighted Average
15,673		92.40% Pervious Area
1,290		7.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-2: North Lawn

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment EX-3: East Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.42 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 1.00"
Routed to Link DP-3 : Woods East

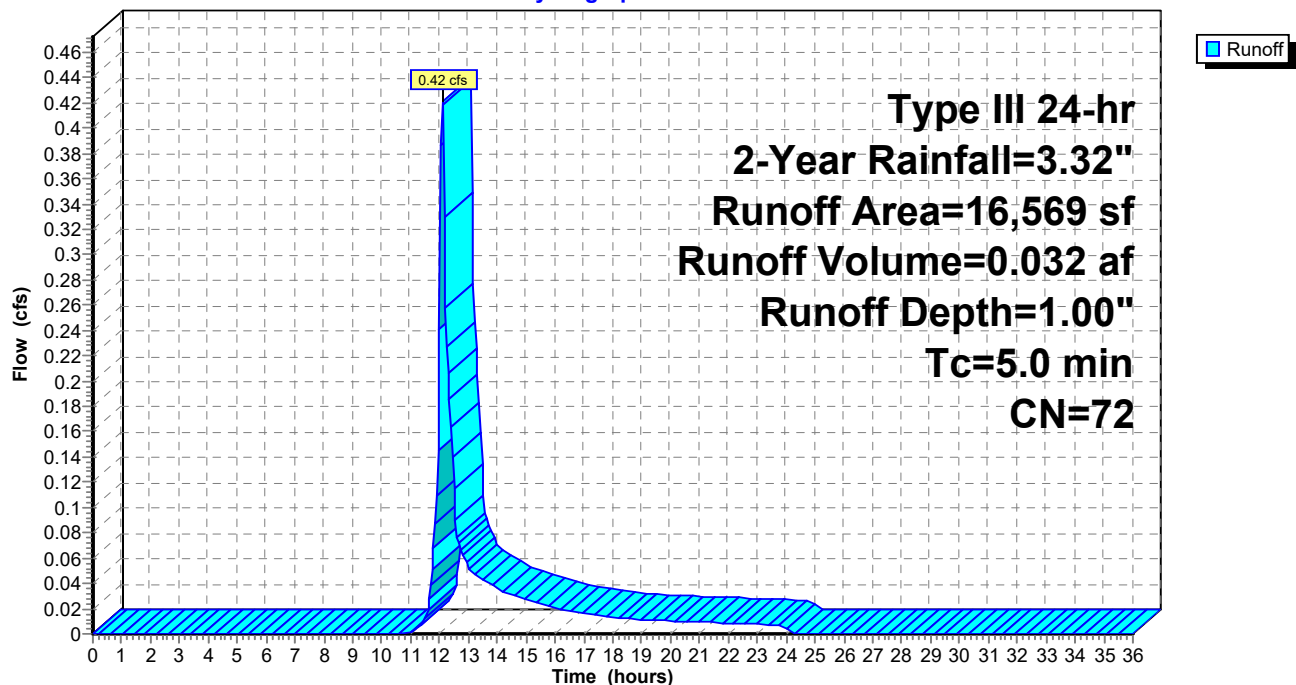
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
8,580	74	>75% Grass cover, Good, HSG C
71	98	Paved parking, HSG C
7,918	70	Woods, Good, HSG C
16,569	72	Weighted Average
16,498		99.57% Pervious Area
71		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-3: East Lawn

Hydrograph



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Charles River Heights

Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment EX-4: West Lawn[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.99 cfs @ 12.09 hrs, Volume= 0.074 af, Depth= 1.06"
Routed to Link DP-4 : Woods West

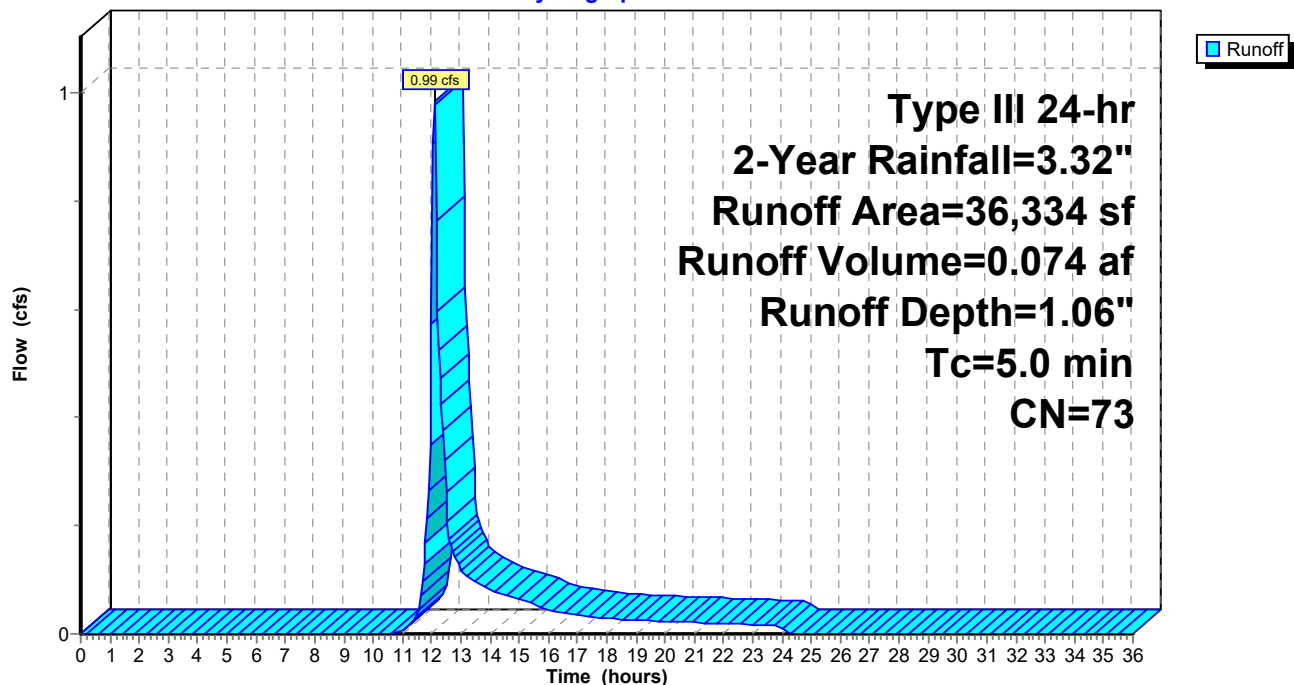
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
22,240	74	>75% Grass cover, Good, HSG C
376	98	Paved parking, HSG C
13,718	70	Woods, Good, HSG C
36,334	73	Weighted Average
35,958		98.97% Pervious Area
376		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-4: West Lawn

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment EX-5: Existing Driveway South

[49] Hint: $T_c < 2dt$ may require smaller dt

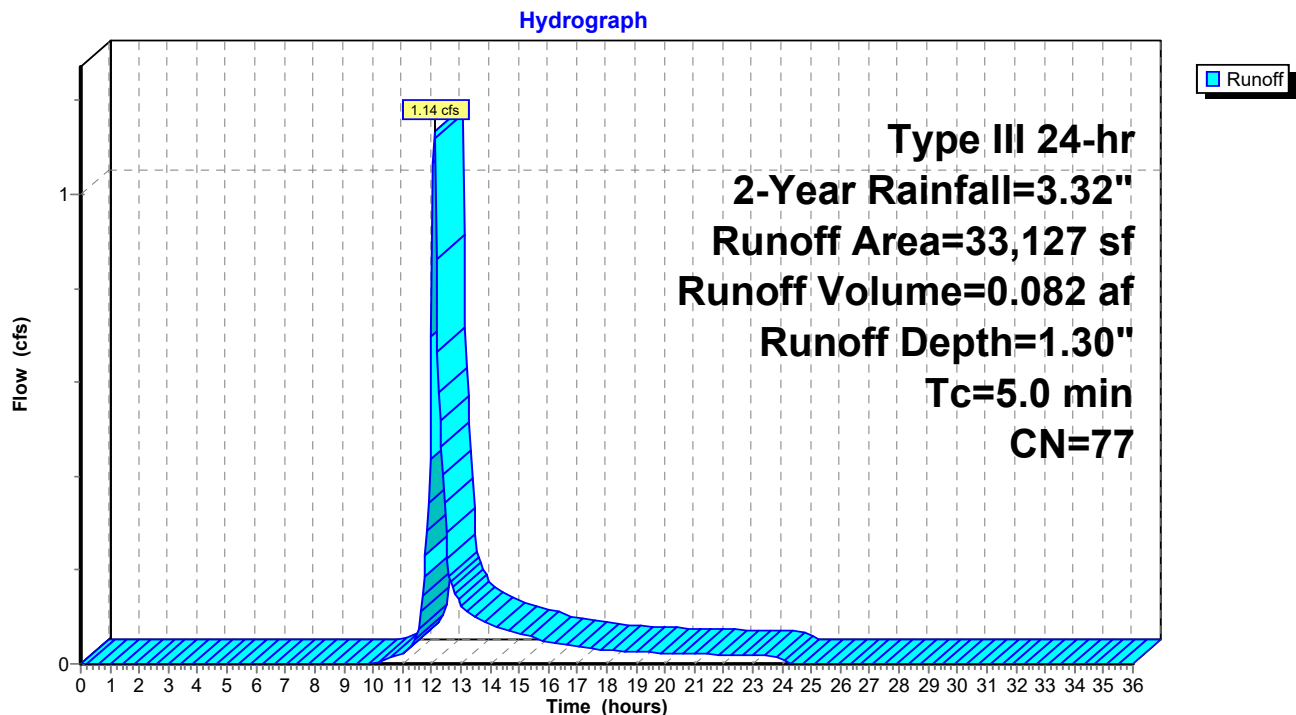
Runoff = 1.14 cfs @ 12.08 hrs, Volume= 0.082 af, Depth= 1.30"
Routed to Link DP-5 : Woods South

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=3.32"

Area (sf)	CN	Description
17,569	74	>75% Grass cover, Good, HSG C
6,352	98	Paved parking, HSG C
9,206	70	Woods, Good, HSG C
33,127	77	Weighted Average
26,775		80.83% Pervious Area
6,352		19.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-5: Existing Driveway South



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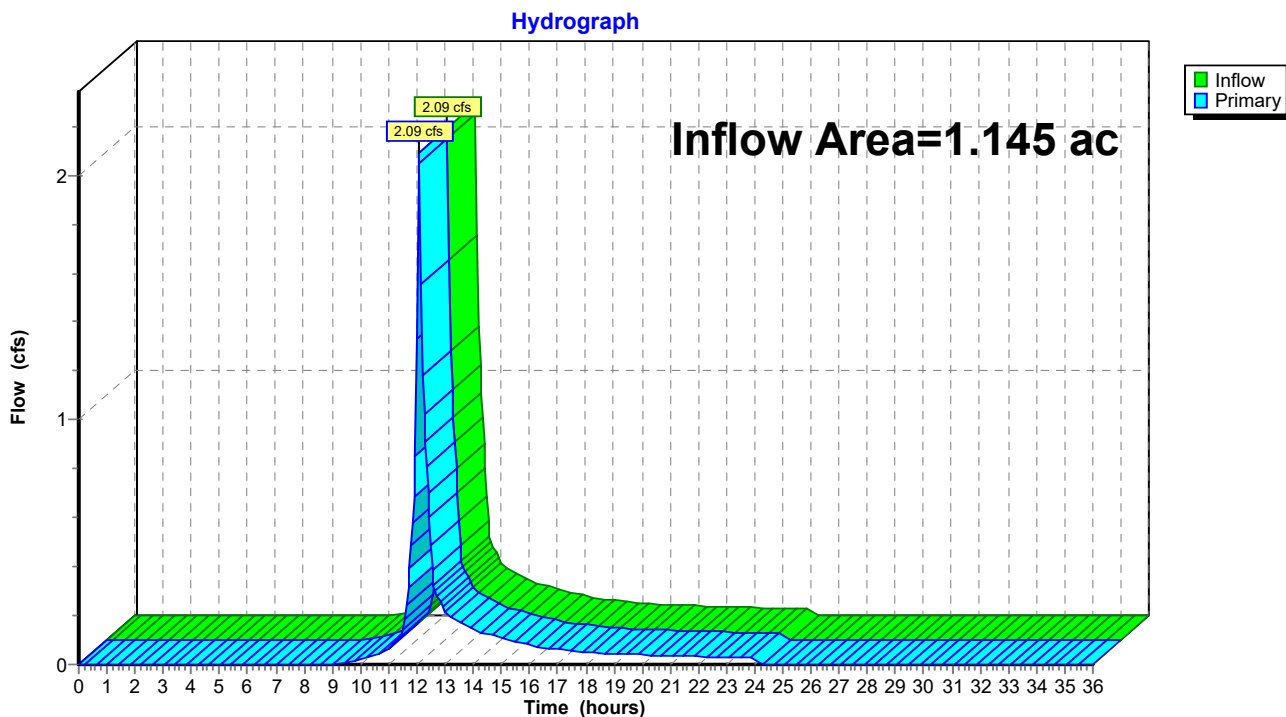
Page 12

Summary for Link DP-1: Dwight Road

Inflow Area = 1.145 ac, 18.95% Impervious, Inflow Depth = 1.56" for 2-Year event
Inflow = 2.09 cfs @ 12.08 hrs, Volume= 0.149 af
Primary = 2.09 cfs @ 12.08 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road



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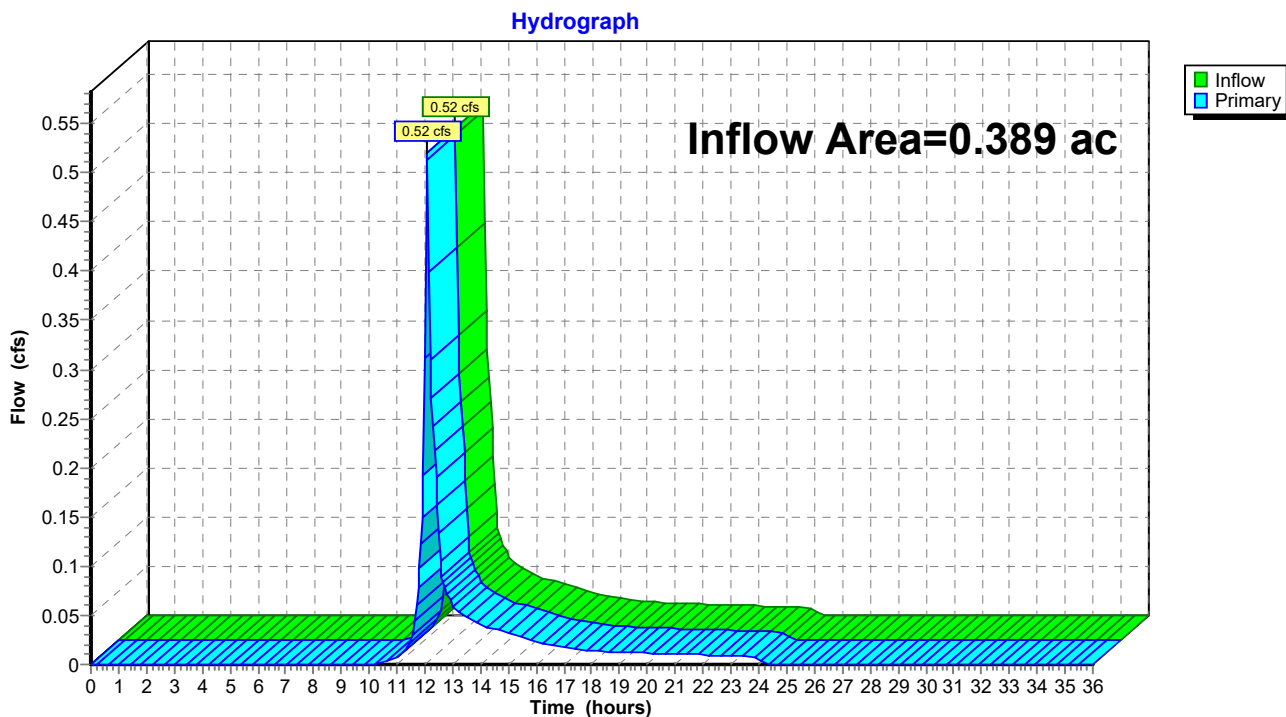
Page 13

Summary for Link DP-2: Woods North

Inflow Area = 0.389 ac, 7.60% Impervious, Inflow Depth = 1.18" for 2-Year event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 0.038 af
Primary = 0.52 cfs @ 12.09 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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Type III 24-hr 2-Year Rainfall=3.32"

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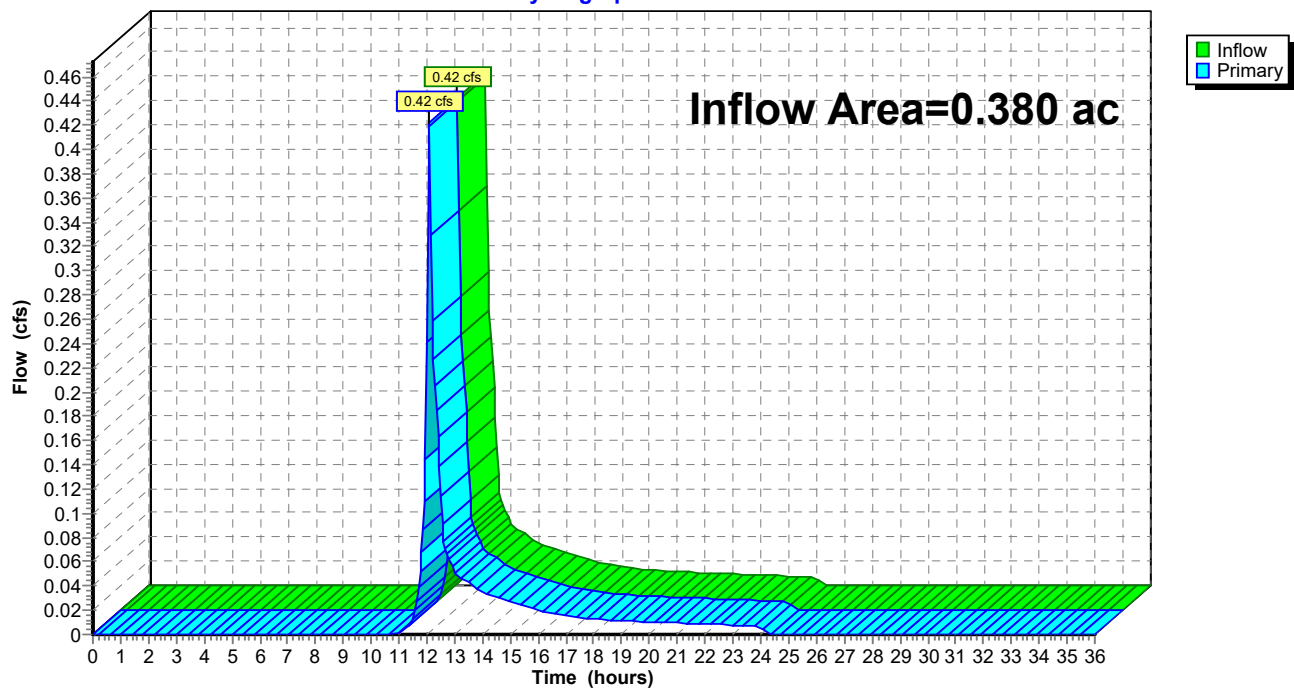
Summary for Link DP-3: Woods East

Inflow Area = 0.380 ac, 0.43% Impervious, Inflow Depth = 1.00" for 2-Year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 0.032 af
Primary = 0.42 cfs @ 12.09 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East

Hydrograph



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Charles River Heights
Type III 24-hr 2-Year Rainfall=3.32"

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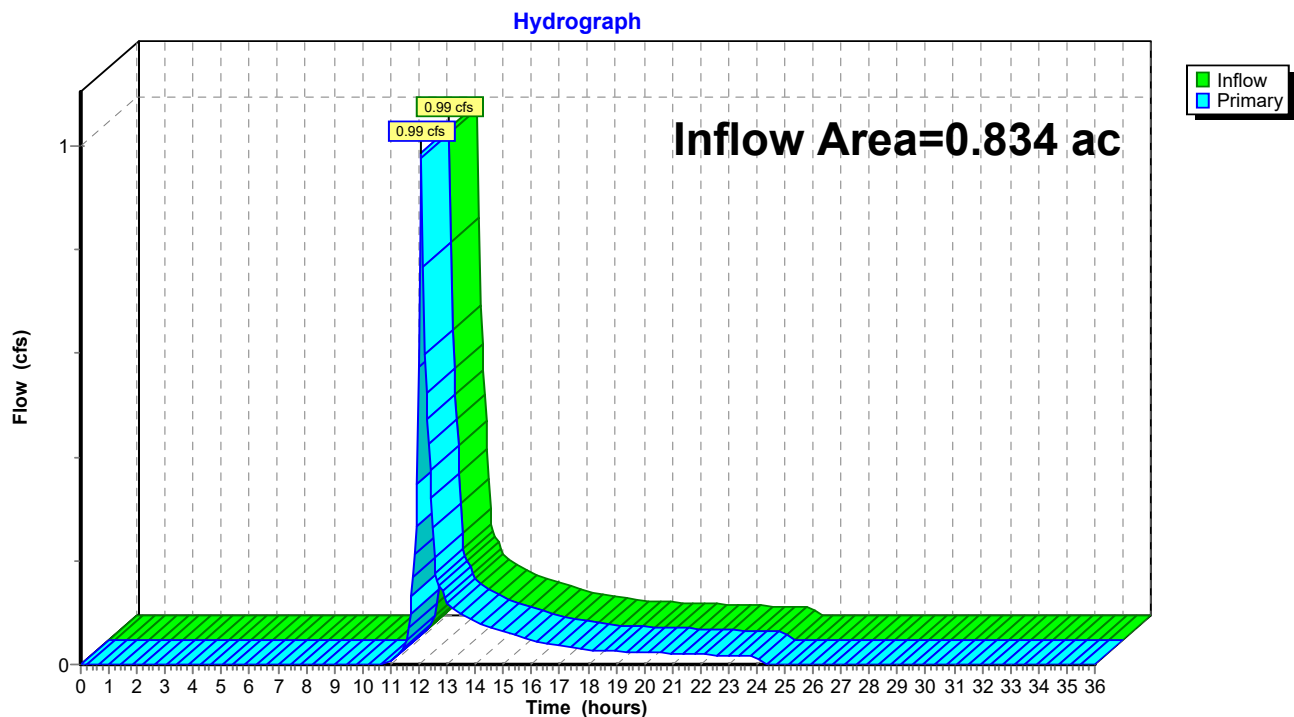
Page 15

Summary for Link DP-4: Woods West

Inflow Area = 0.834 ac, 1.03% Impervious, Inflow Depth = 1.06" for 2-Year event
Inflow = 0.99 cfs @ 12.09 hrs, Volume= 0.074 af
Primary = 0.99 cfs @ 12.09 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West



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Type III 24-hr 2-Year Rainfall=3.32"

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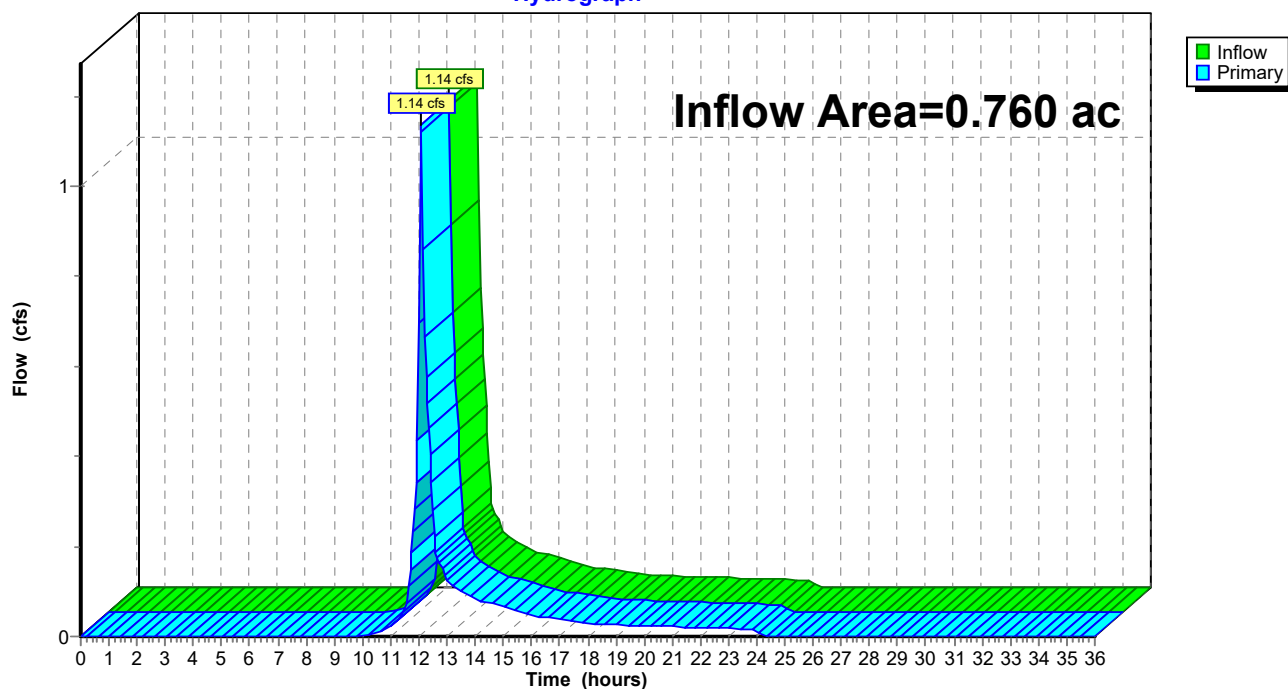
Summary for Link DP-5: Woods South

Inflow Area = 0.760 ac, 19.17% Impervious, Inflow Depth = 1.30" for 2-Year event
Inflow = 1.14 cfs @ 12.08 hrs, Volume= 0.082 af
Primary = 1.14 cfs @ 12.08 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South

Hydrograph



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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Existing Entry at	Runoff Area=49,858 sf 18.95% Impervious Runoff Depth=3.17" Tc=5.0 min CN=81 Runoff=4.25 cfs 0.303 af
SubcatchmentEX-2: North Lawn	Runoff Area=16,963 sf 7.60% Impervious Runoff Depth=2.62" Tc=5.0 min CN=75 Runoff=1.20 cfs 0.085 af
SubcatchmentEX-3: East Lawn	Runoff Area=16,569 sf 0.43% Impervious Runoff Depth=2.36" Tc=5.0 min CN=72 Runoff=1.05 cfs 0.075 af
SubcatchmentEX-4: West Lawn	Runoff Area=36,334 sf 1.03% Impervious Runoff Depth=2.45" Tc=5.0 min CN=73 Runoff=2.39 cfs 0.170 af
SubcatchmentEX-5: Existing Driveway	Runoff Area=33,127 sf 19.17% Impervious Runoff Depth=2.80" Tc=5.0 min CN=77 Runoff=2.50 cfs 0.177 af
Link DP-1: Dwight Road	Inflow=4.25 cfs 0.303 af Primary=4.25 cfs 0.303 af
Link DP-2: Woods North	Inflow=1.20 cfs 0.085 af Primary=1.20 cfs 0.085 af
Link DP-3: Woods East	Inflow=1.05 cfs 0.075 af Primary=1.05 cfs 0.075 af
Link DP-4: Woods West	Inflow=2.39 cfs 0.170 af Primary=2.39 cfs 0.170 af
Link DP-5: Woods South	Inflow=2.50 cfs 0.177 af Primary=2.50 cfs 0.177 af

Total Runoff Area = 3.509 ac Runoff Volume = 0.810 af Average Runoff Depth = 2.77"
88.53% Pervious = 3.106 ac 11.47% Impervious = 0.403 ac

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Type III 24-hr 10-Year Rainfall=5.21"

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Summary for Subcatchment EX-1: Existing Entry at Dwight

[49] Hint: $T_c < 2dt$ may require smaller dt

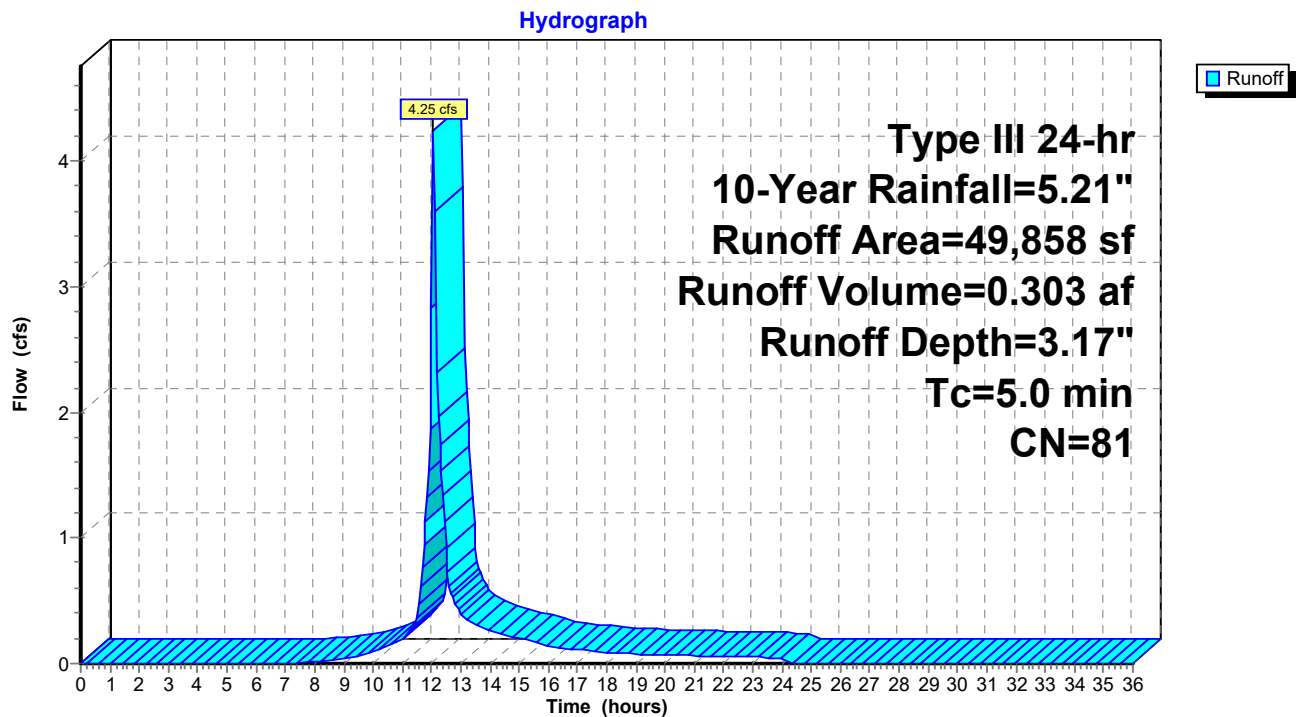
Runoff = 4.25 cfs @ 12.08 hrs, Volume= 0.303 af, Depth= 3.17"
Routed to Link DP-1 : Dwight Road

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=5.21"

Area (sf)	CN	Description
29,964	74	>75% Grass cover, Good, HSG C
9,447	98	Paved parking, HSG C
4,331	70	Woods, Good, HSG C
* 6,116	96	Gravel, HSG C
49,858	81	Weighted Average
40,411		81.05% Pervious Area
9,447		18.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-1: Existing Entry at Dwight



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Type III 24-hr 10-Year Rainfall=5.21"

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Summary for Subcatchment EX-2: North Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

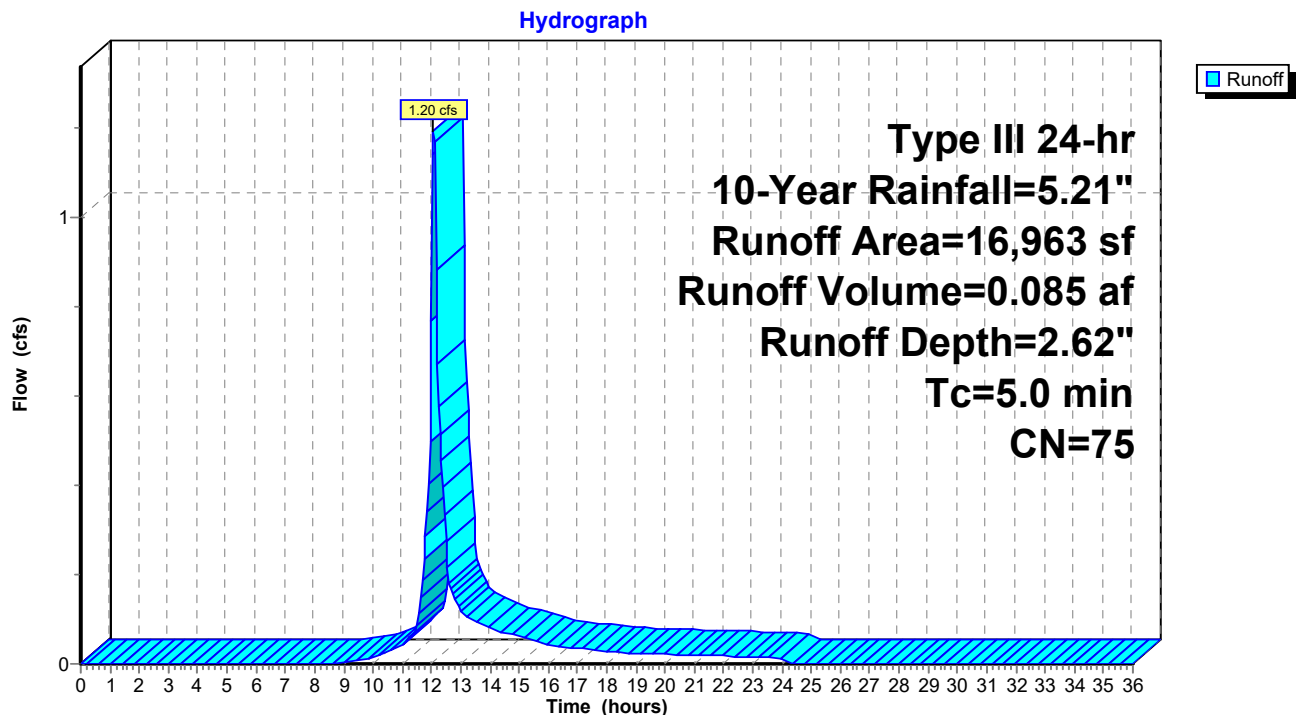
Runoff = 1.20 cfs @ 12.08 hrs, Volume= 0.085 af, Depth= 2.62"
Routed to Link DP-2 : Woods North

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=5.21"

Area (sf)	CN	Description
12,977	74	>75% Grass cover, Good, HSG C
1,290	98	Paved parking, HSG C
2,696	70	Woods, Good, HSG C
16,963	75	Weighted Average
15,673		92.40% Pervious Area
1,290		7.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-2: North Lawn



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Type III 24-hr 10-Year Rainfall=5.21"

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Summary for Subcatchment EX-3: East Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

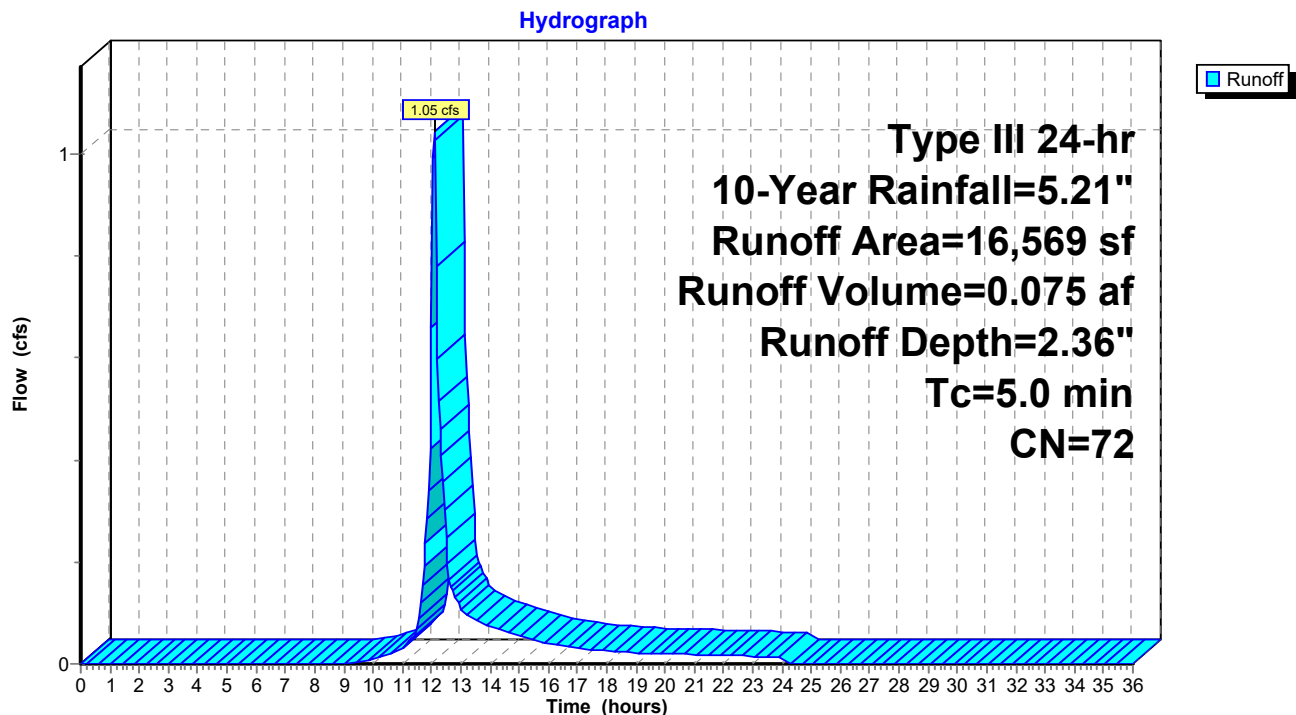
Runoff = 1.05 cfs @ 12.08 hrs, Volume= 0.075 af, Depth= 2.36"
Routed to Link DP-3 : Woods East

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=5.21"

Area (sf)	CN	Description
8,580	74	>75% Grass cover, Good, HSG C
71	98	Paved parking, HSG C
7,918	70	Woods, Good, HSG C
16,569	72	Weighted Average
16,498		99.57% Pervious Area
71		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-3: East Lawn



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Type III 24-hr 10-Year Rainfall=5.21"

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Summary for Subcatchment EX-4: West Lawn[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 2.39 cfs @ 12.08 hrs, Volume= 0.170 af, Depth= 2.45"
Routed to Link DP-4 : Woods West

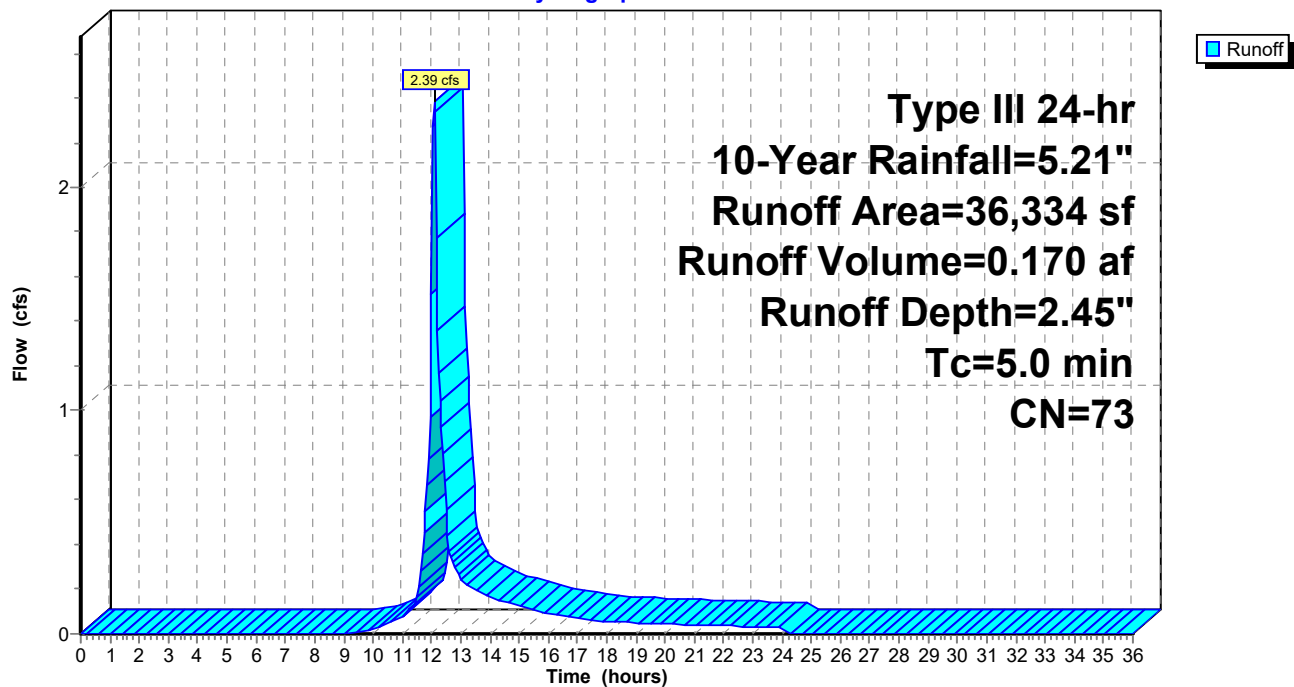
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
22,240	74	>75% Grass cover, Good, HSG C
376	98	Paved parking, HSG C
13,718	70	Woods, Good, HSG C
36,334	73	Weighted Average
35,958		98.97% Pervious Area
376		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-4: West Lawn

Hydrograph



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Charles River Heights

Type III 24-hr 10-Year Rainfall=5.21"

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Summary for Subcatchment EX-5: Existing Driveway South

[49] Hint: $T_c < 2dt$ may require smaller dt

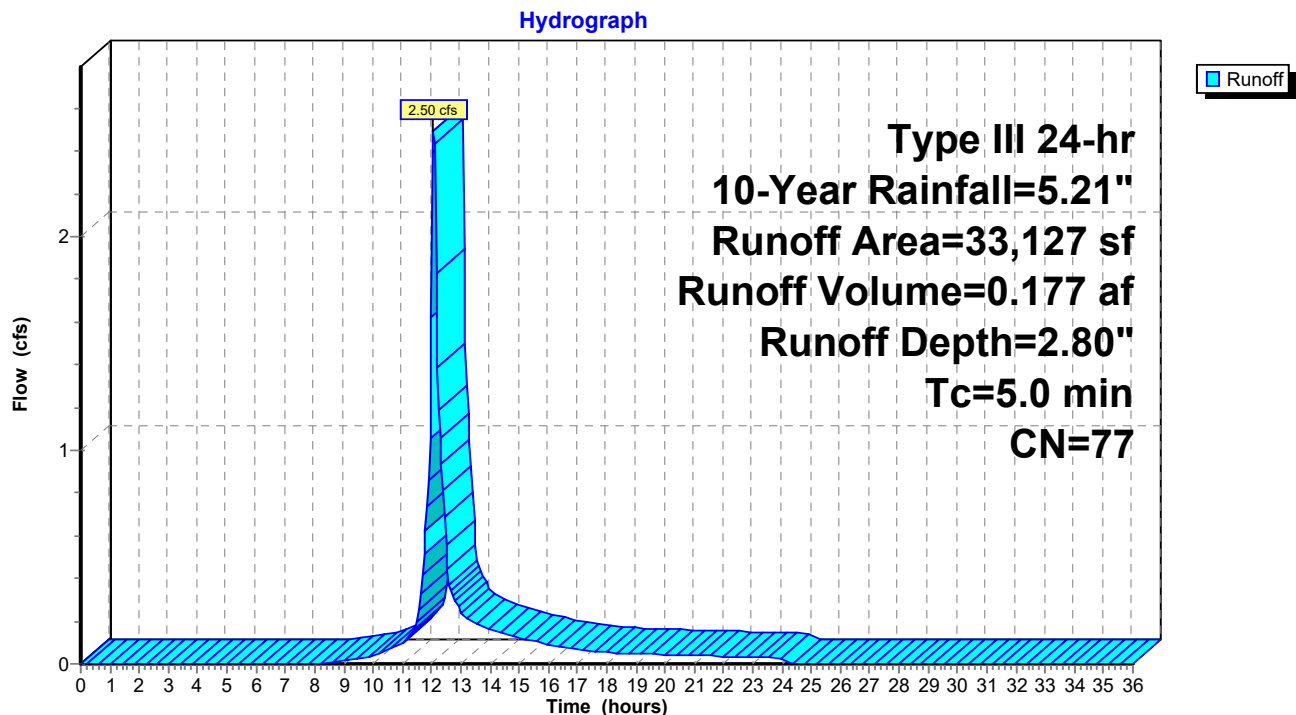
Runoff = 2.50 cfs @ 12.08 hrs, Volume= 0.177 af, Depth= 2.80"
Routed to Link DP-5 : Woods South

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=5.21"

Area (sf)	CN	Description
17,569	74	>75% Grass cover, Good, HSG C
6,352	98	Paved parking, HSG C
9,206	70	Woods, Good, HSG C
33,127	77	Weighted Average
26,775		80.83% Pervious Area
6,352		19.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-5: Existing Driveway South



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Charles River Heights
Type III 24-hr 10-Year Rainfall=5.21"

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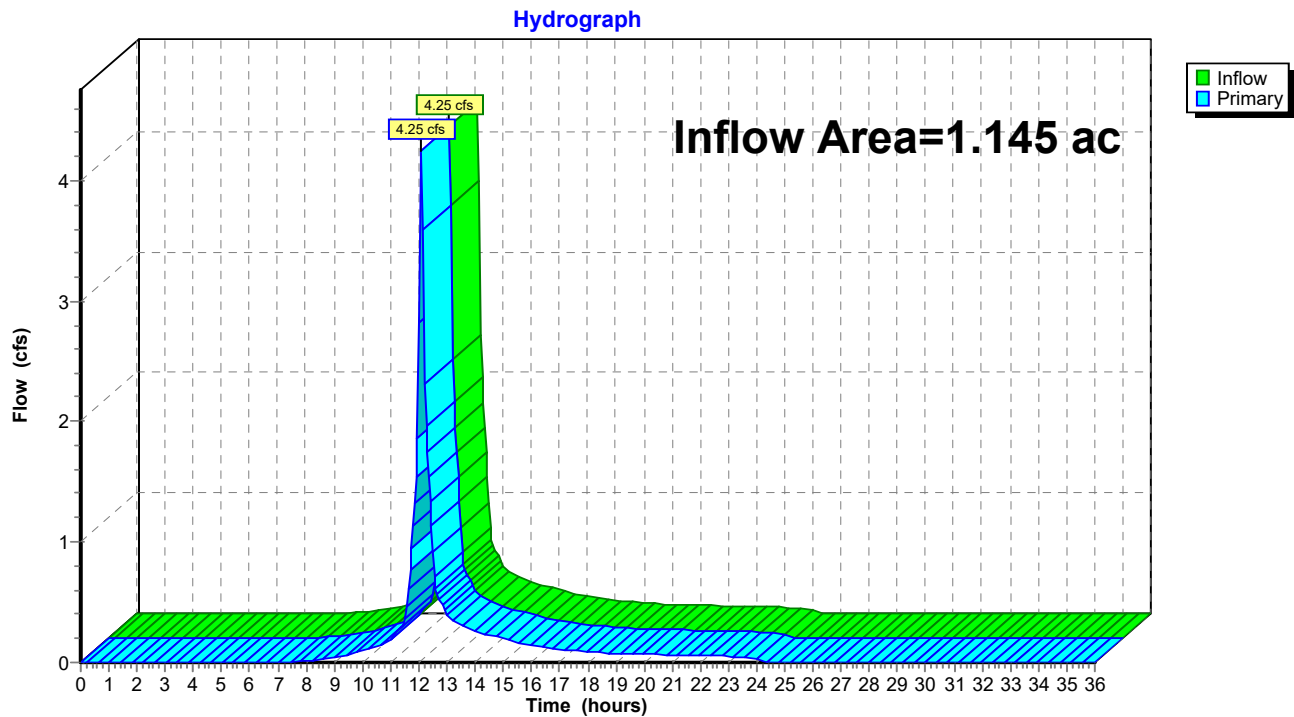
Page 23

Summary for Link DP-1: Dwight Road

Inflow Area = 1.145 ac, 18.95% Impervious, Inflow Depth = 3.17" for 10-Year event
Inflow = 4.25 cfs @ 12.08 hrs, Volume= 0.303 af
Primary = 4.25 cfs @ 12.08 hrs, Volume= 0.303 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road



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Charles River Heights
Type III 24-hr 10-Year Rainfall=5.21"

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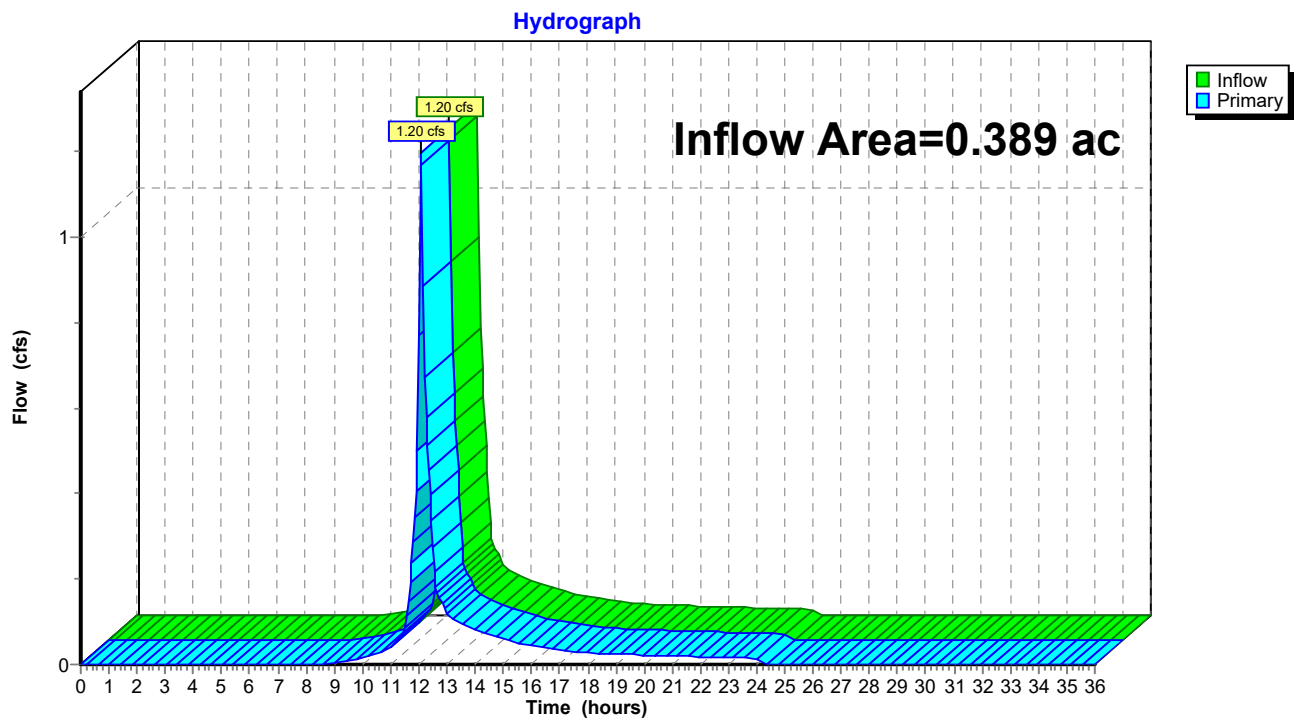
Page 24

Summary for Link DP-2: Woods North

Inflow Area = 0.389 ac, 7.60% Impervious, Inflow Depth = 2.62" for 10-Year event
Inflow = 1.20 cfs @ 12.08 hrs, Volume= 0.085 af
Primary = 1.20 cfs @ 12.08 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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Type III 24-hr 10-Year Rainfall=5.21"

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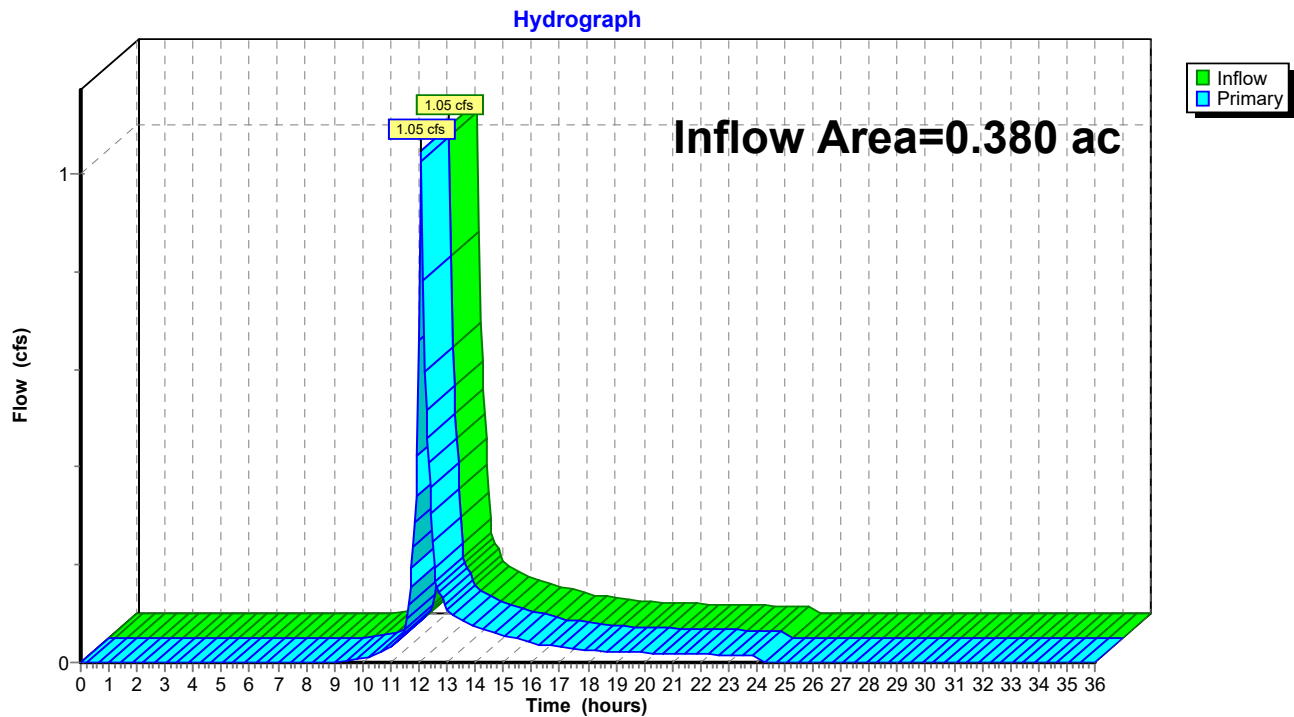
Page 25

Summary for Link DP-3: Woods East

Inflow Area = 0.380 ac, 0.43% Impervious, Inflow Depth = 2.36" for 10-Year event
Inflow = 1.05 cfs @ 12.08 hrs, Volume= 0.075 af
Primary = 1.05 cfs @ 12.08 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East



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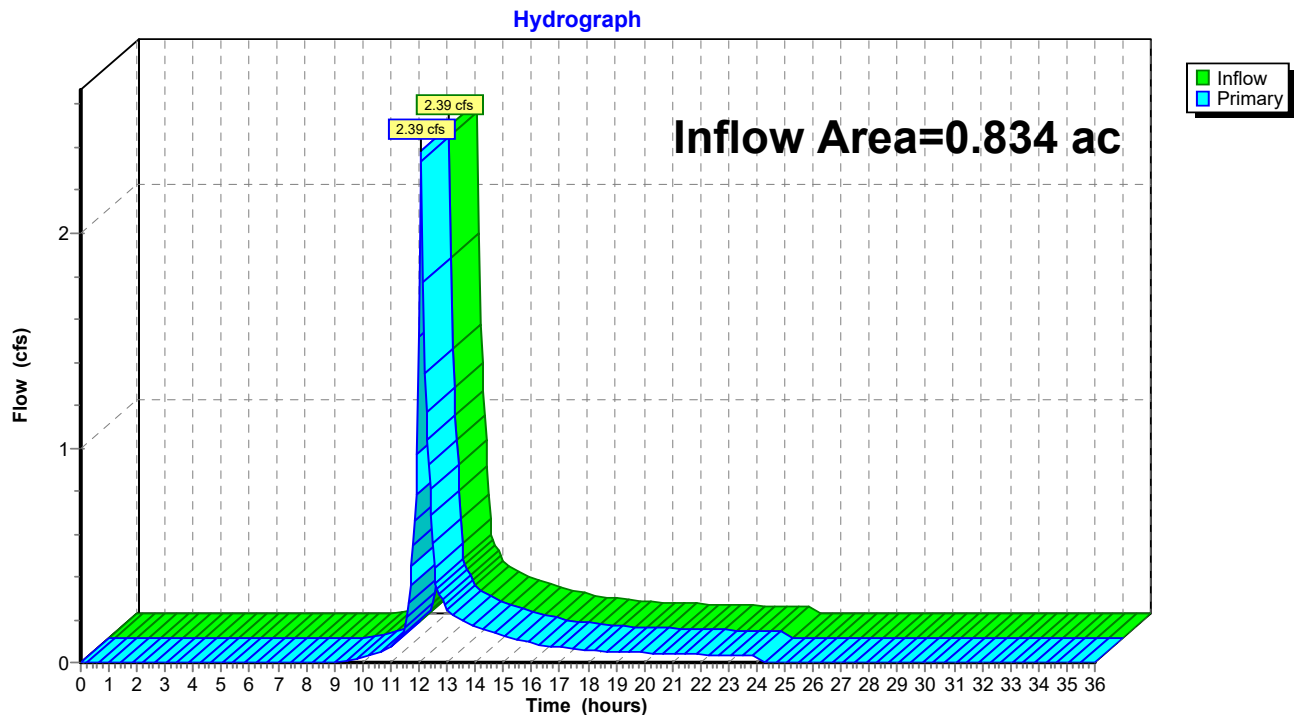
Page 26

Summary for Link DP-4: Woods West

Inflow Area = 0.834 ac, 1.03% Impervious, Inflow Depth = 2.45" for 10-Year event
Inflow = 2.39 cfs @ 12.08 hrs, Volume= 0.170 af
Primary = 2.39 cfs @ 12.08 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West



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Type III 24-hr 10-Year Rainfall=5.21"

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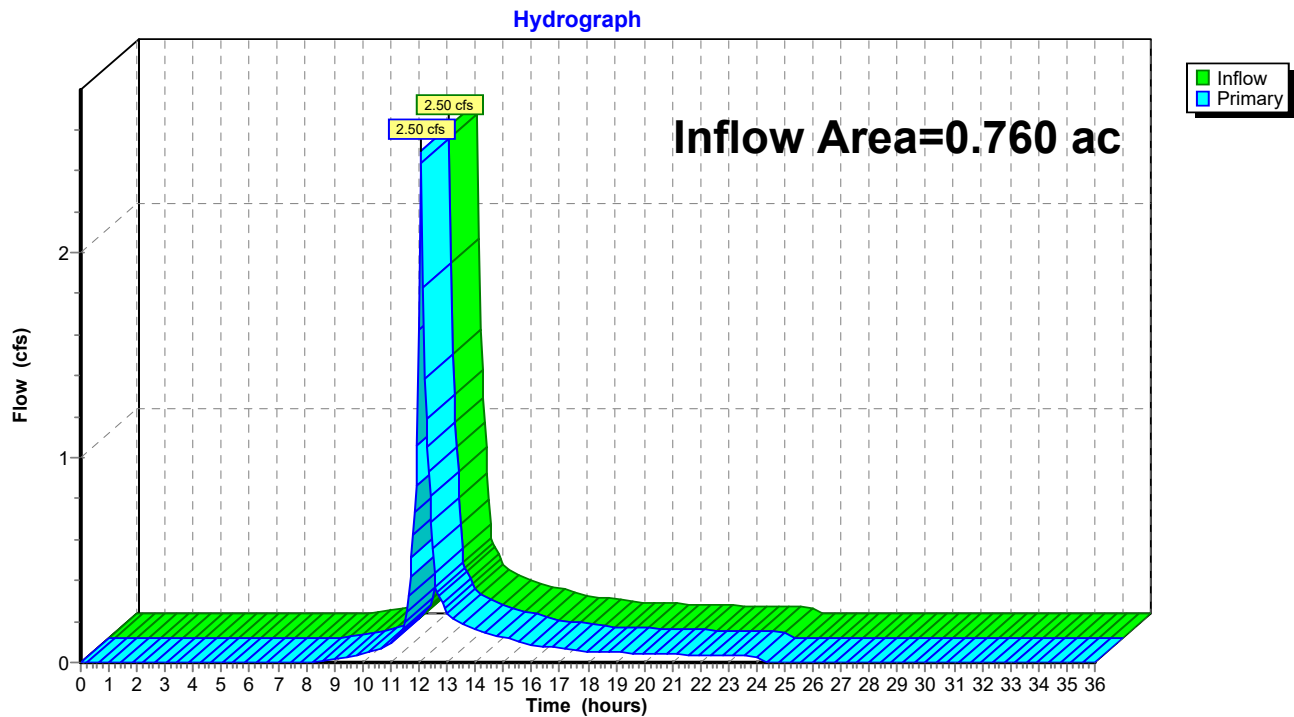
Page 27

Summary for Link DP-5: Woods South

Inflow Area = 0.760 ac, 19.17% Impervious, Inflow Depth = 2.80" for 10-Year event
Inflow = 2.50 cfs @ 12.08 hrs, Volume= 0.177 af
Primary = 2.50 cfs @ 12.08 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South



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Type III 24-hr 25-Year Rainfall=6.38"

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Existing Entry at	Runoff Area=49,858 sf 18.95% Impervious Runoff Depth=4.23" Tc=5.0 min CN=81 Runoff=5.66 cfs 0.404 af
SubcatchmentEX-2: North Lawn	Runoff Area=16,963 sf 7.60% Impervious Runoff Depth=3.61" Tc=5.0 min CN=75 Runoff=1.65 cfs 0.117 af
SubcatchmentEX-3: East Lawn	Runoff Area=16,569 sf 0.43% Impervious Runoff Depth=3.31" Tc=5.0 min CN=72 Runoff=1.48 cfs 0.105 af
SubcatchmentEX-4: West Lawn	Runoff Area=36,334 sf 1.03% Impervious Runoff Depth=3.41" Tc=5.0 min CN=73 Runoff=3.33 cfs 0.237 af
SubcatchmentEX-5: Existing Driveway	Runoff Area=33,127 sf 19.17% Impervious Runoff Depth=3.81" Tc=5.0 min CN=77 Runoff=3.40 cfs 0.242 af
Link DP-1: Dwight Road	Inflow=5.66 cfs 0.404 af Primary=5.66 cfs 0.404 af
Link DP-2: Woods North	Inflow=1.65 cfs 0.117 af Primary=1.65 cfs 0.117 af
Link DP-3: Woods East	Inflow=1.48 cfs 0.105 af Primary=1.48 cfs 0.105 af
Link DP-4: Woods West	Inflow=3.33 cfs 0.237 af Primary=3.33 cfs 0.237 af
Link DP-5: Woods South	Inflow=3.40 cfs 0.242 af Primary=3.40 cfs 0.242 af

Total Runoff Area = 3.509 ac Runoff Volume = 1.104 af Average Runoff Depth = 3.78"
88.53% Pervious = 3.106 ac 11.47% Impervious = 0.403 ac

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Type III 24-hr 25-Year Rainfall=6.38"

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Summary for Subcatchment EX-1: Existing Entry at Dwight

[49] Hint: $T_c < 2dt$ may require smaller dt

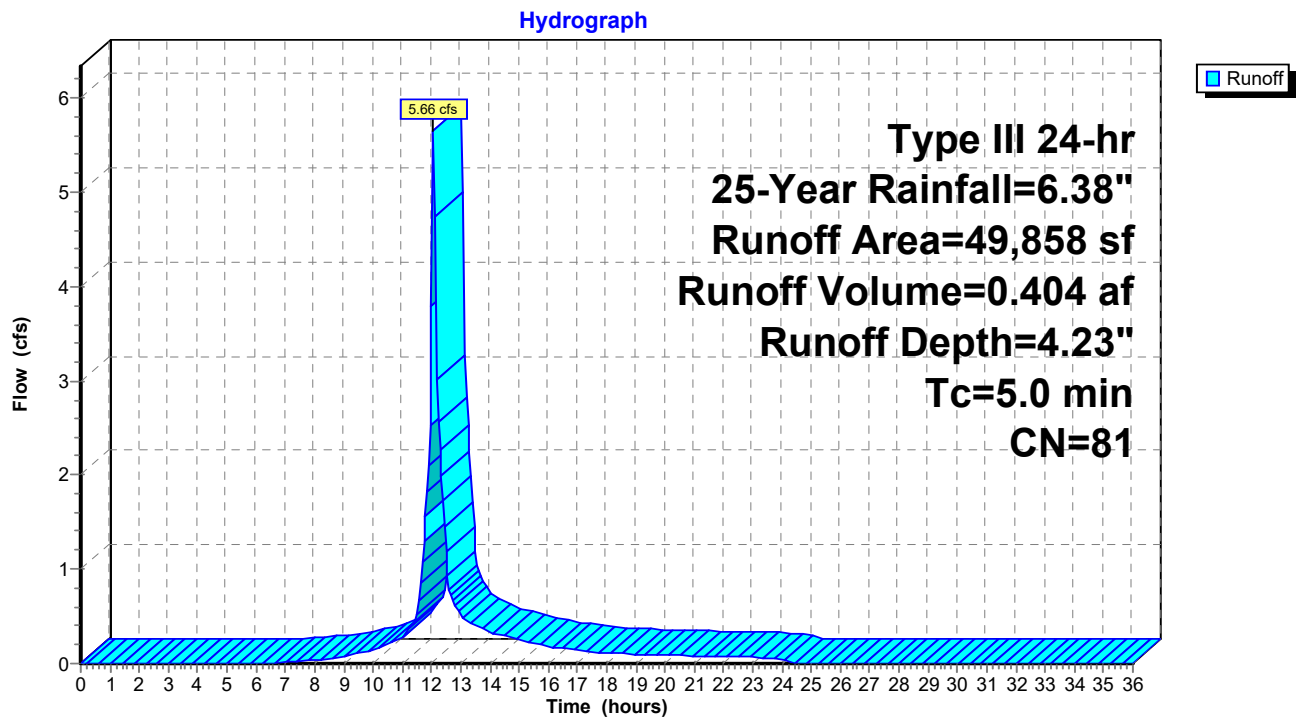
Runoff = 5.66 cfs @ 12.07 hrs, Volume= 0.404 af, Depth= 4.23"
Routed to Link DP-1 : Dwight Road

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=6.38"

Area (sf)	CN	Description
29,964	74	>75% Grass cover, Good, HSG C
9,447	98	Paved parking, HSG C
4,331	70	Woods, Good, HSG C
* 6,116	96	Gravel, HSG C
49,858	81	Weighted Average
40,411		81.05% Pervious Area
9,447		18.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-1: Existing Entry at Dwight



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Summary for Subcatchment EX-2: North Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

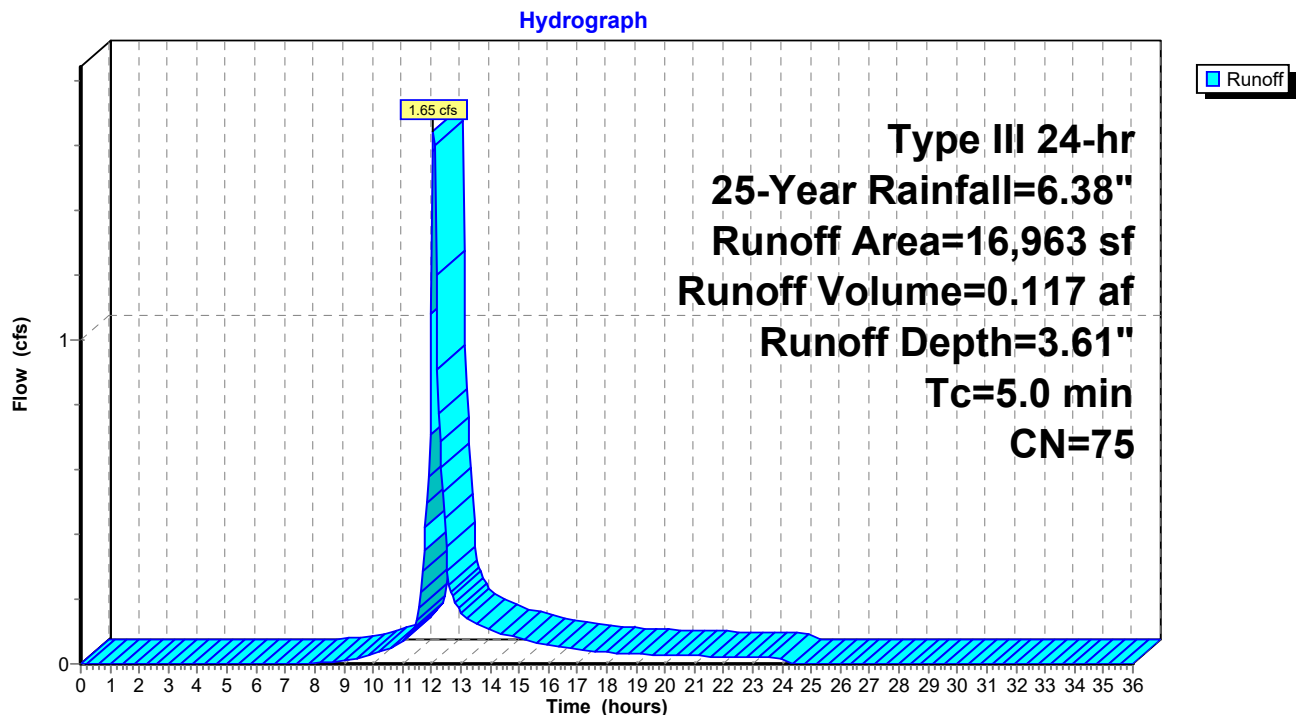
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 0.117 af, Depth= 3.61"
Routed to Link DP-2 : Woods North

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=6.38"

Area (sf)	CN	Description
12,977	74	>75% Grass cover, Good, HSG C
1,290	98	Paved parking, HSG C
2,696	70	Woods, Good, HSG C
16,963	75	Weighted Average
15,673		92.40% Pervious Area
1,290		7.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-2: North Lawn



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Summary for Subcatchment EX-3: East Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

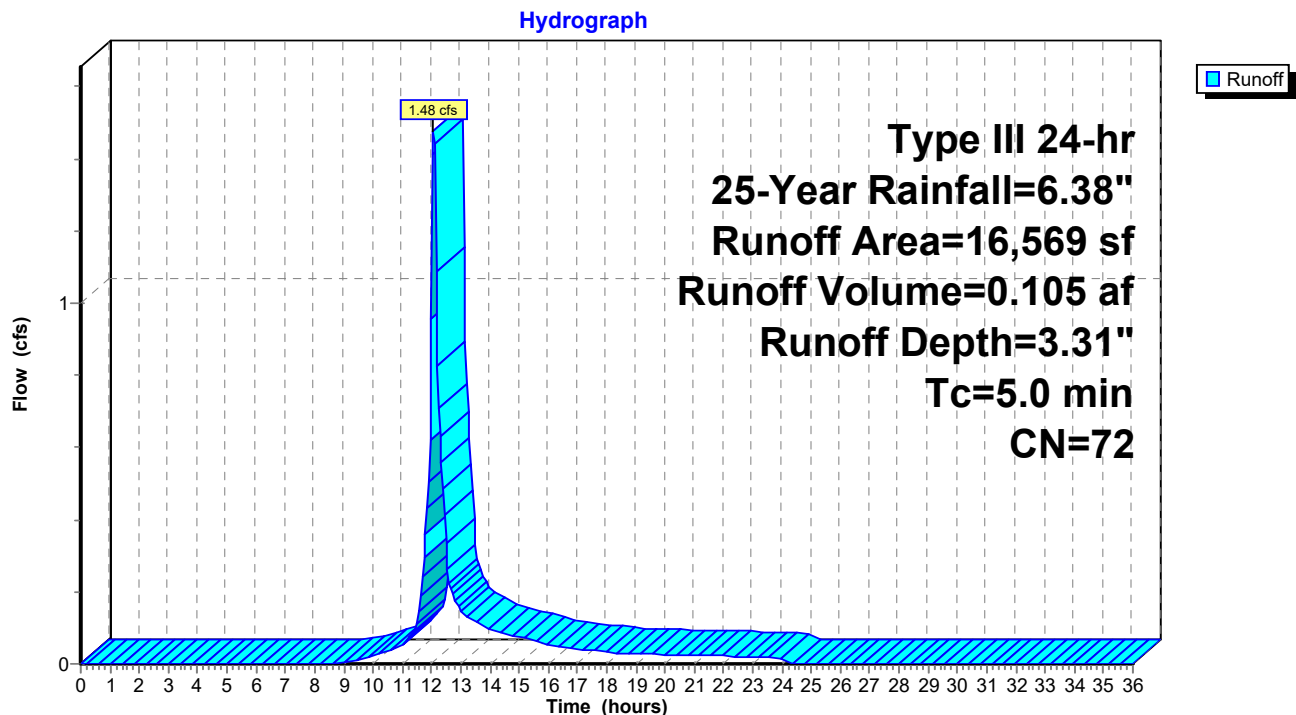
Runoff = 1.48 cfs @ 12.08 hrs, Volume= 0.105 af, Depth= 3.31"
Routed to Link DP-3 : Woods East

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=6.38"

Area (sf)	CN	Description
8,580	74	>75% Grass cover, Good, HSG C
71	98	Paved parking, HSG C
7,918	70	Woods, Good, HSG C
16,569	72	Weighted Average
16,498		99.57% Pervious Area
71		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-3: East Lawn



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Summary for Subcatchment EX-4: West Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

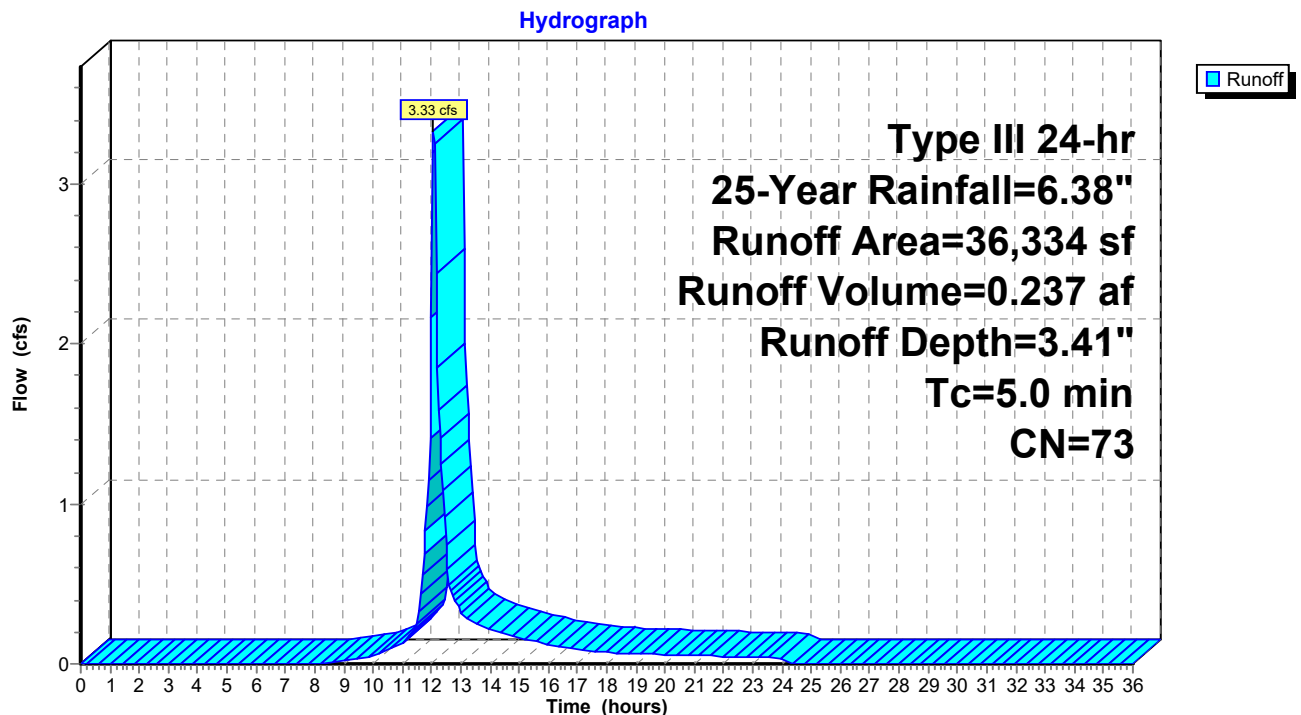
Runoff = 3.33 cfs @ 12.08 hrs, Volume= 0.237 af, Depth= 3.41"
Routed to Link DP-4 : Woods West

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=6.38"

Area (sf)	CN	Description
22,240	74	>75% Grass cover, Good, HSG C
376	98	Paved parking, HSG C
13,718	70	Woods, Good, HSG C
36,334	73	Weighted Average
35,958		98.97% Pervious Area
376		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-4: West Lawn



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Type III 24-hr 25-Year Rainfall=6.38"

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Summary for Subcatchment EX-5: Existing Driveway South

[49] Hint: $T_c < 2dt$ may require smaller dt

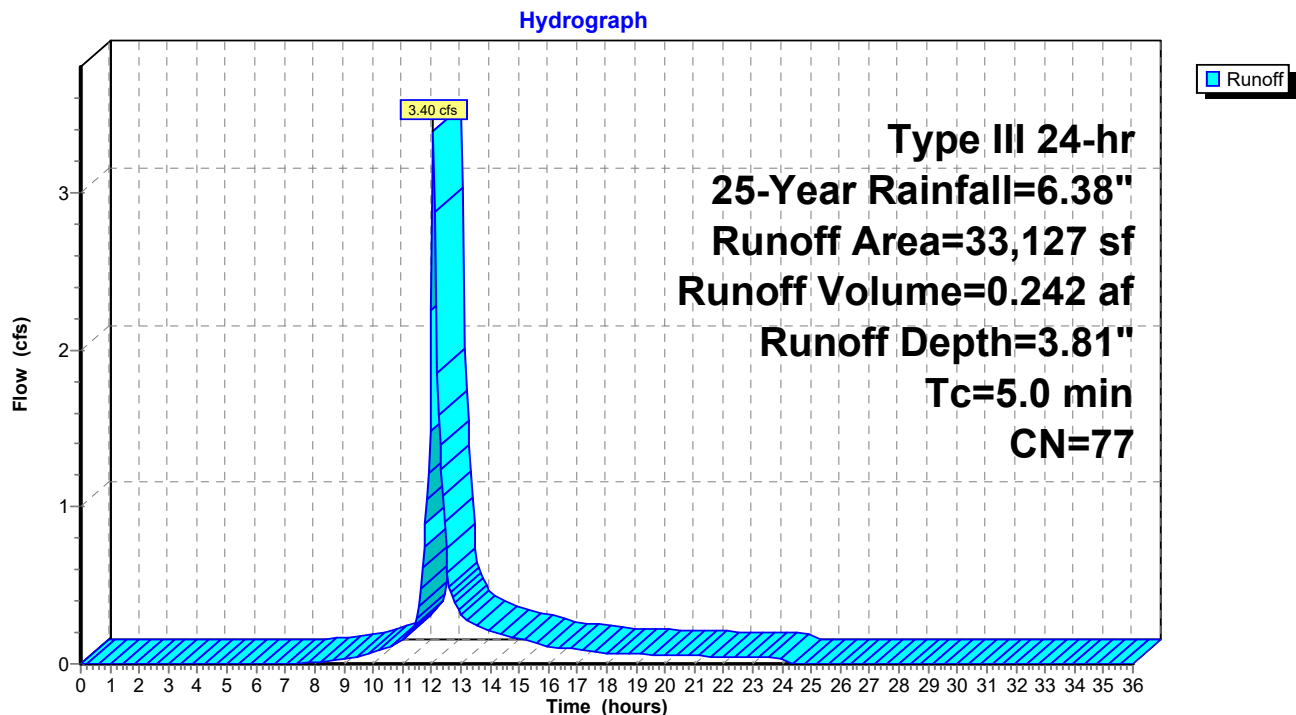
Runoff = 3.40 cfs @ 12.08 hrs, Volume= 0.242 af, Depth= 3.81"
Routed to Link DP-5 : Woods South

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=6.38"

Area (sf)	CN	Description
17,569	74	>75% Grass cover, Good, HSG C
6,352	98	Paved parking, HSG C
9,206	70	Woods, Good, HSG C
33,127	77	Weighted Average
26,775		80.83% Pervious Area
6,352		19.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-5: Existing Driveway South



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Type III 24-hr 25-Year Rainfall=6.38"

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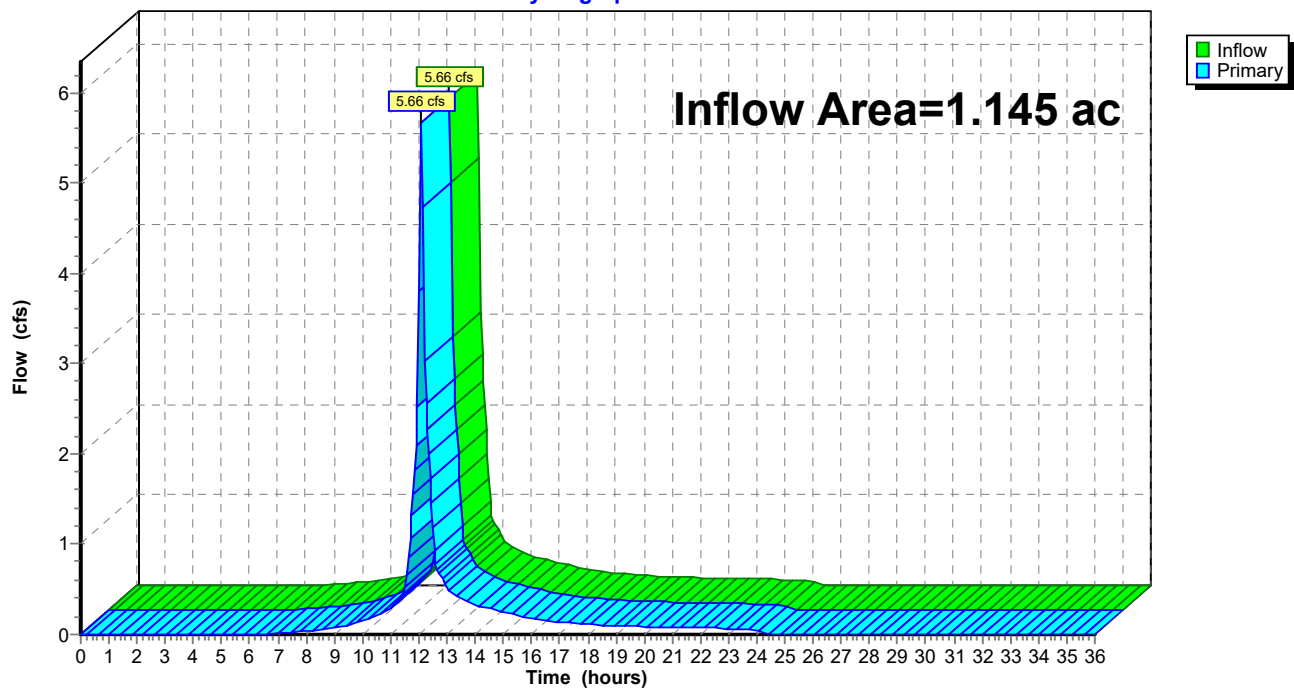
Summary for Link DP-1: Dwight Road

Inflow Area = 1.145 ac, 18.95% Impervious, Inflow Depth = 4.23" for 25-Year event
Inflow = 5.66 cfs @ 12.07 hrs, Volume= 0.404 af
Primary = 5.66 cfs @ 12.07 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.38"

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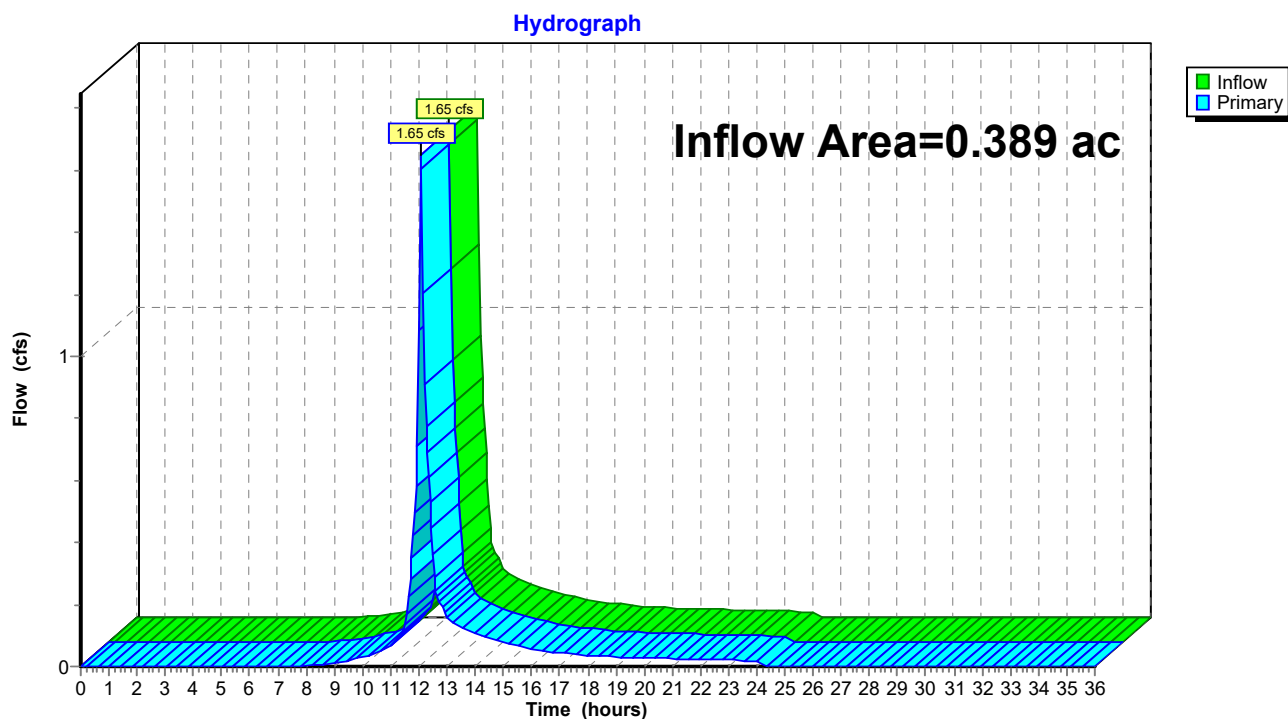
Page 35

Summary for Link DP-2: Woods North

Inflow Area = 0.389 ac, 7.60% Impervious, Inflow Depth = 3.61" for 25-Year event
Inflow = 1.65 cfs @ 12.08 hrs, Volume= 0.117 af
Primary = 1.65 cfs @ 12.08 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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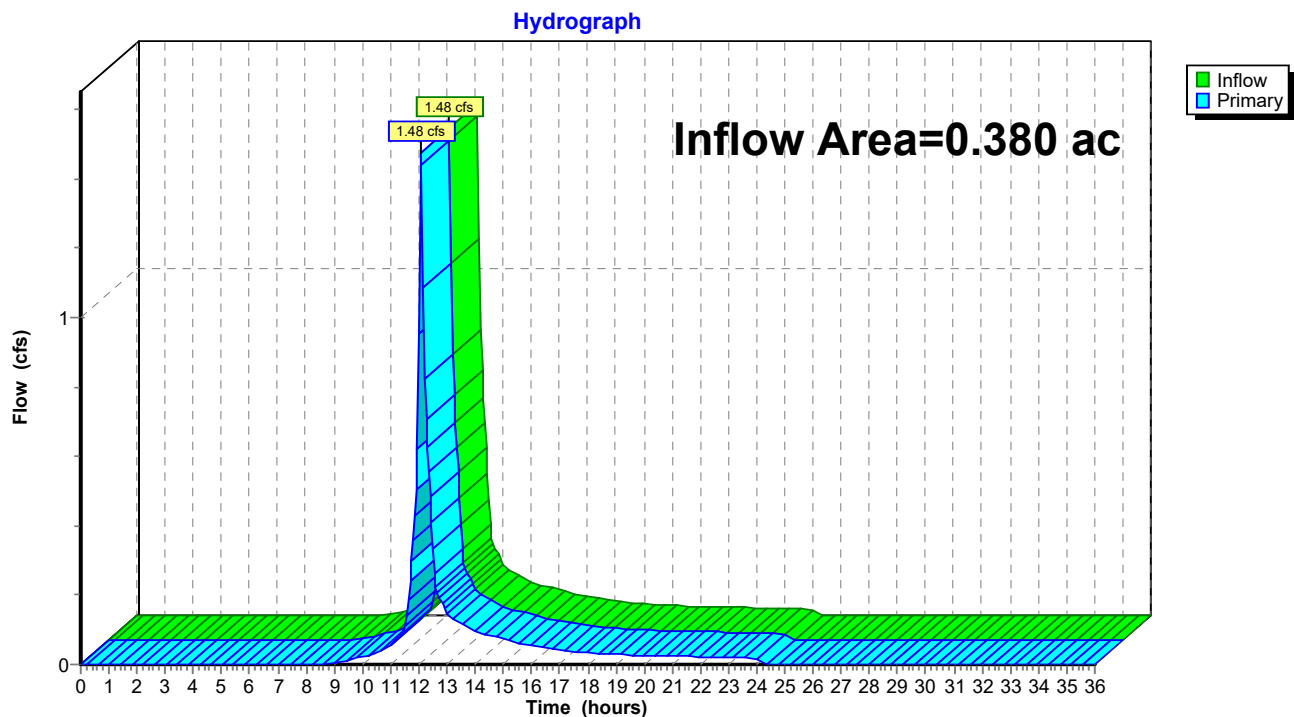
Page 36

Summary for Link DP-3: Woods East

Inflow Area = 0.380 ac, 0.43% Impervious, Inflow Depth = 3.31" for 25-Year event
Inflow = 1.48 cfs @ 12.08 hrs, Volume= 0.105 af
Primary = 1.48 cfs @ 12.08 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East



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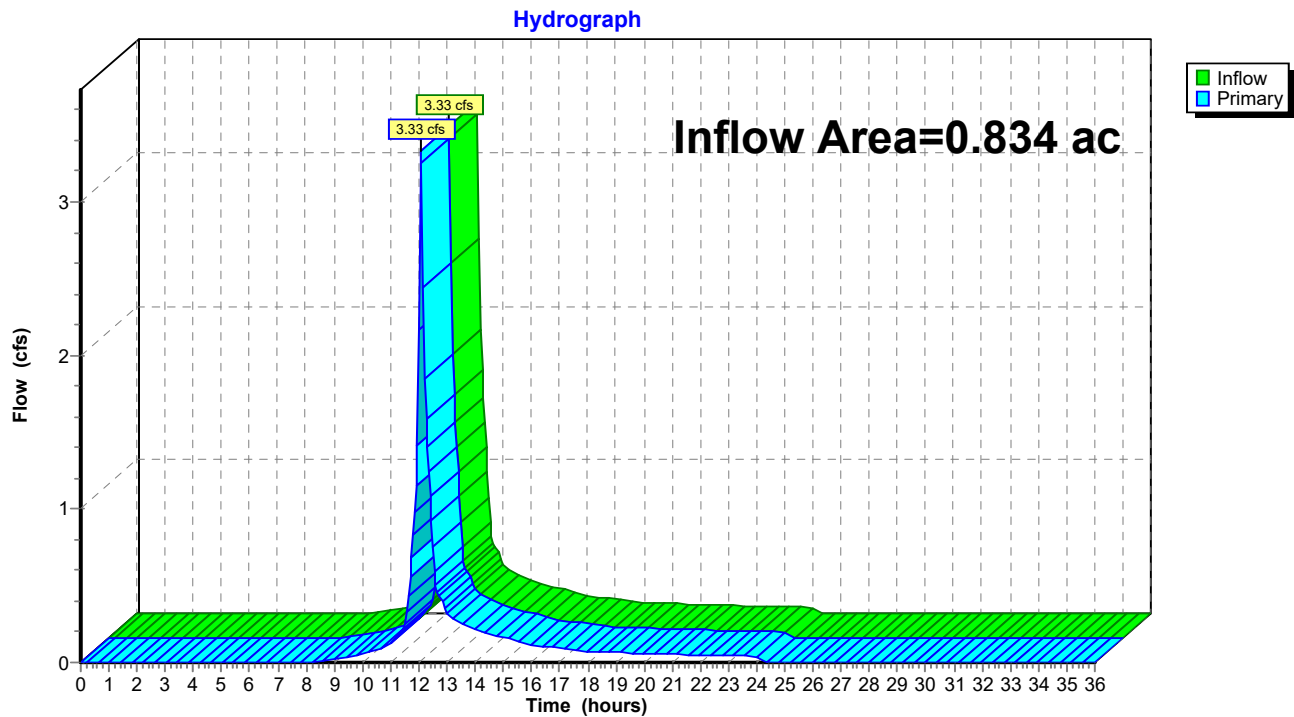
Page 37

Summary for Link DP-4: Woods West

Inflow Area = 0.834 ac, 1.03% Impervious, Inflow Depth = 3.41" for 25-Year event
Inflow = 3.33 cfs @ 12.08 hrs, Volume= 0.237 af
Primary = 3.33 cfs @ 12.08 hrs, Volume= 0.237 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West



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Type III 24-hr 25-Year Rainfall=6.38"

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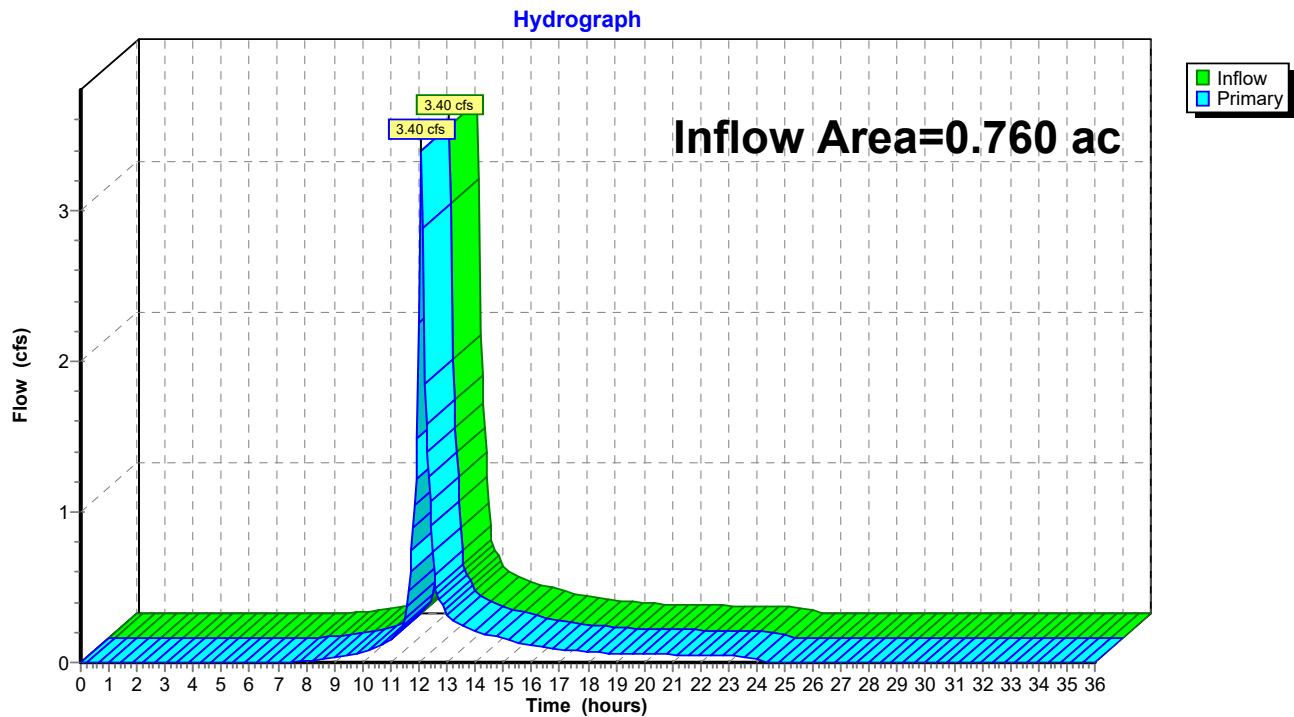
Page 38

Summary for Link DP-5: Woods South

Inflow Area = 0.760 ac, 19.17% Impervious, Inflow Depth = 3.81" for 25-Year event
Inflow = 3.40 cfs @ 12.08 hrs, Volume= 0.242 af
Primary = 3.40 cfs @ 12.08 hrs, Volume= 0.242 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South



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Type III 24-hr 100-Year Rainfall=8.19"

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Existing Entry at	Runoff Area=49,858 sf 18.95% Impervious Runoff Depth=5.92" Tc=5.0 min CN=81 Runoff=7.83 cfs 0.565 af
SubcatchmentEX-2: North Lawn	Runoff Area=16,963 sf 7.60% Impervious Runoff Depth=5.21" Tc=5.0 min CN=75 Runoff=2.37 cfs 0.169 af
SubcatchmentEX-3: East Lawn	Runoff Area=16,569 sf 0.43% Impervious Runoff Depth=4.86" Tc=5.0 min CN=72 Runoff=2.17 cfs 0.154 af
SubcatchmentEX-4: West Lawn	Runoff Area=36,334 sf 1.03% Impervious Runoff Depth=4.98" Tc=5.0 min CN=73 Runoff=4.86 cfs 0.346 af
SubcatchmentEX-5: Existing Driveway	Runoff Area=33,127 sf 19.17% Impervious Runoff Depth=5.45" Tc=5.0 min CN=77 Runoff=4.84 cfs 0.345 af
Link DP-1: Dwight Road	Inflow=7.83 cfs 0.565 af Primary=7.83 cfs 0.565 af
Link DP-2: Woods North	Inflow=2.37 cfs 0.169 af Primary=2.37 cfs 0.169 af
Link DP-3: Woods East	Inflow=2.17 cfs 0.154 af Primary=2.17 cfs 0.154 af
Link DP-4: Woods West	Inflow=4.86 cfs 0.346 af Primary=4.86 cfs 0.346 af
Link DP-5: Woods South	Inflow=4.84 cfs 0.345 af Primary=4.84 cfs 0.345 af

Total Runoff Area = 3.509 ac Runoff Volume = 1.579 af Average Runoff Depth = 5.40"
88.53% Pervious = 3.106 ac 11.47% Impervious = 0.403 ac

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Type III 24-hr 100-Year Rainfall=8.19"

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Summary for Subcatchment EX-1: Existing Entry at Dwight

[49] Hint: $T_c < 2dt$ may require smaller dt

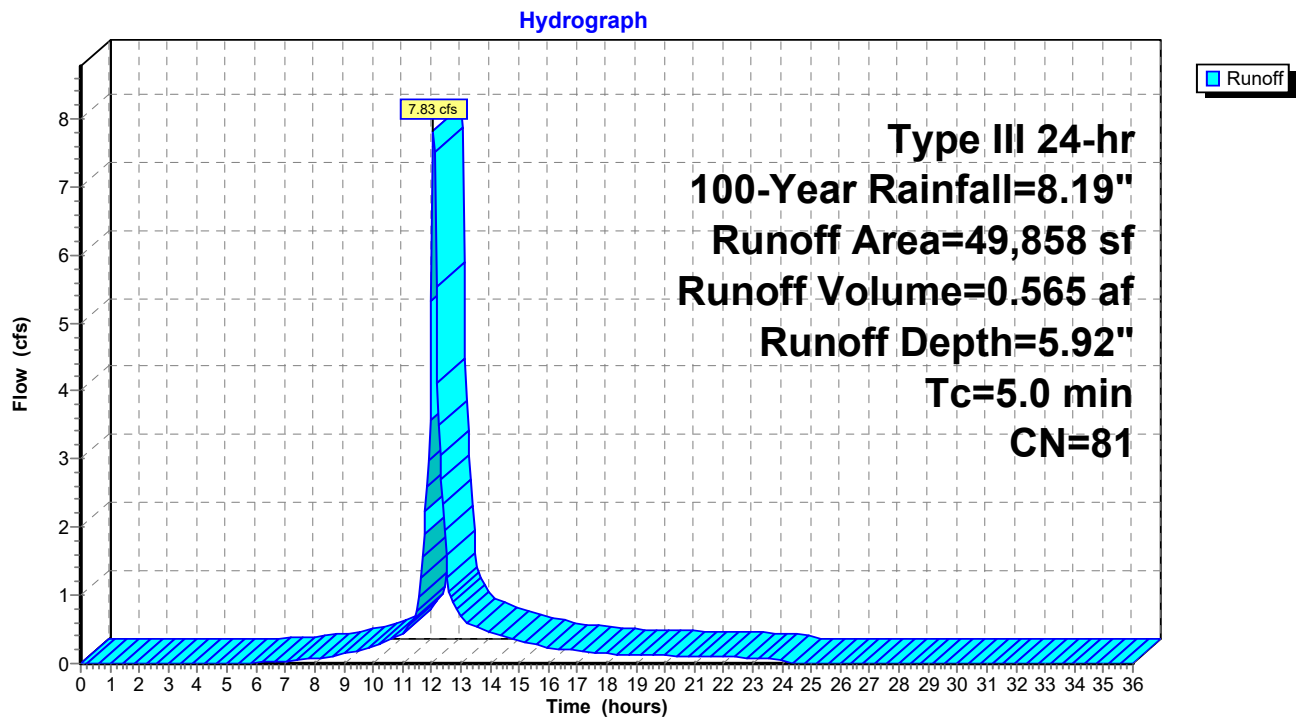
Runoff = 7.83 cfs @ 12.07 hrs, Volume= 0.565 af, Depth= 5.92"
Routed to Link DP-1 : Dwight Road

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=8.19"

Area (sf)	CN	Description
29,964	74	>75% Grass cover, Good, HSG C
9,447	98	Paved parking, HSG C
4,331	70	Woods, Good, HSG C
* 6,116	96	Gravel, HSG C
49,858	81	Weighted Average
40,411		81.05% Pervious Area
9,447		18.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-1: Existing Entry at Dwight



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Type III 24-hr 100-Year Rainfall=8.19"

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Summary for Subcatchment EX-2: North Lawn[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 2.37 cfs @ 12.08 hrs, Volume= 0.169 af, Depth= 5.21"
Routed to Link DP-2 : Woods North

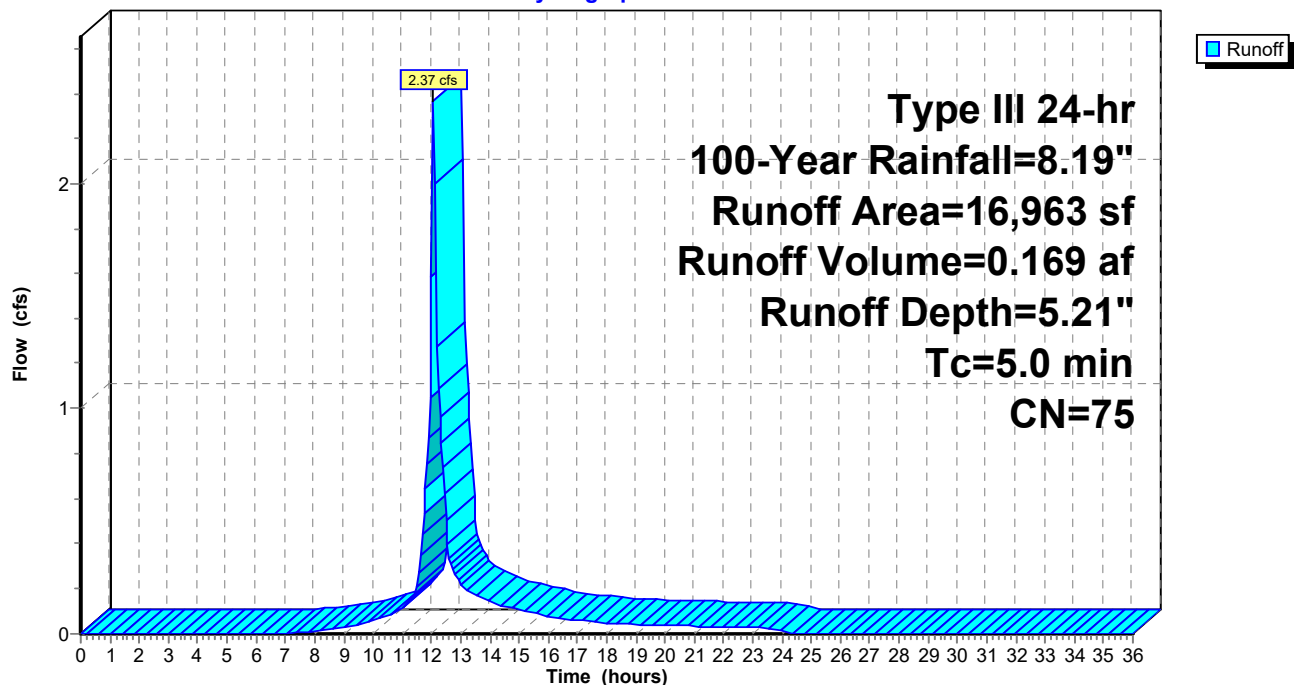
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
12,977	74	>75% Grass cover, Good, HSG C
1,290	98	Paved parking, HSG C
2,696	70	Woods, Good, HSG C
16,963	75	Weighted Average
15,673		92.40% Pervious Area
1,290		7.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-2: North Lawn

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.19"

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Summary for Subcatchment EX-3: East Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

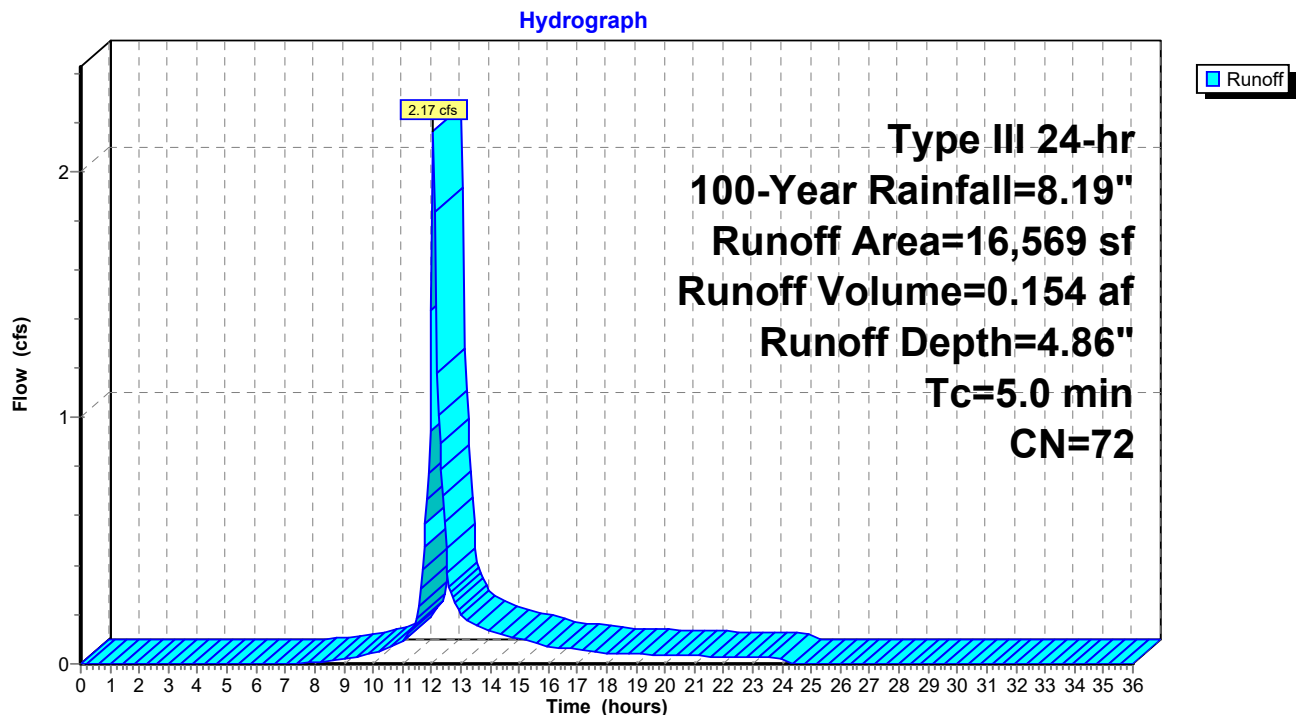
Runoff = 2.17 cfs @ 12.08 hrs, Volume= 0.154 af, Depth= 4.86"
Routed to Link DP-3 : Woods East

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=8.19"

Area (sf)	CN	Description
8,580	74	>75% Grass cover, Good, HSG C
71	98	Paved parking, HSG C
7,918	70	Woods, Good, HSG C
16,569	72	Weighted Average
16,498		99.57% Pervious Area
71		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-3: East Lawn



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Summary for Subcatchment EX-4: West Lawn[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 4.86 cfs @ 12.08 hrs, Volume= 0.346 af, Depth= 4.98"
Routed to Link DP-4 : Woods West

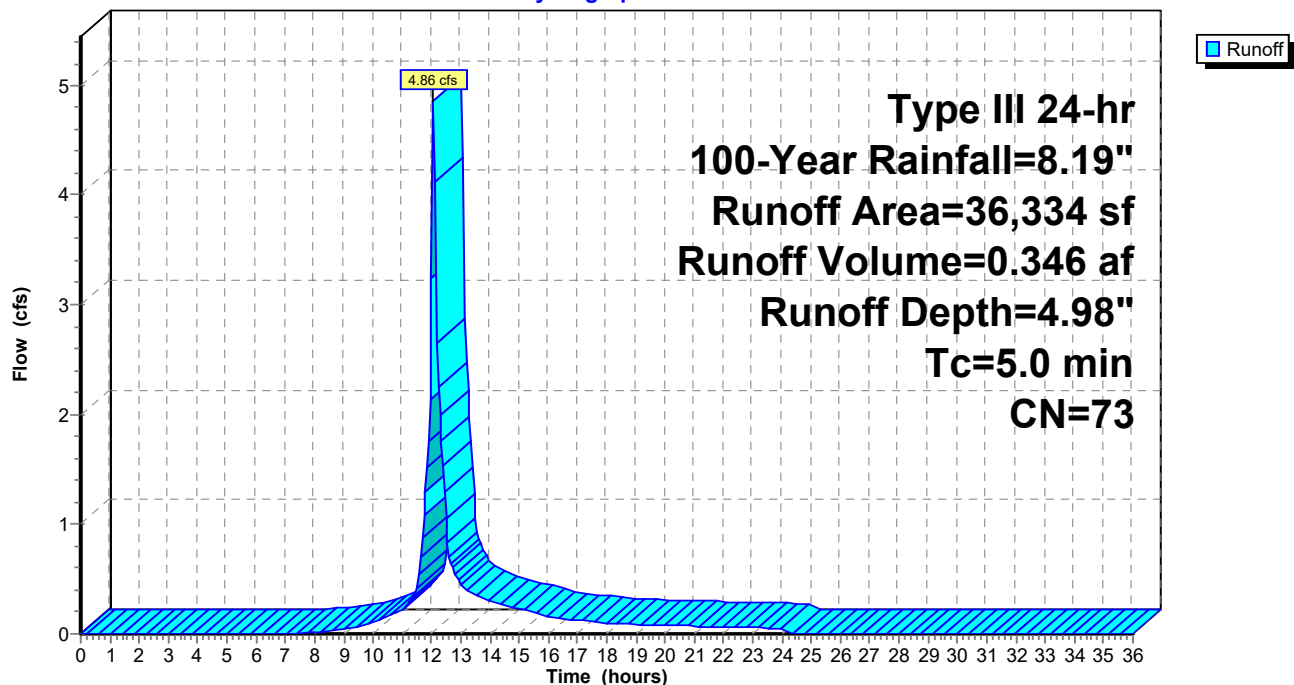
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
22,240	74	>75% Grass cover, Good, HSG C
376	98	Paved parking, HSG C
13,718	70	Woods, Good, HSG C
36,334	73	Weighted Average
35,958		98.97% Pervious Area
376		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-4: West Lawn

Hydrograph



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Summary for Subcatchment EX-5: Existing Driveway South

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 4.84 cfs @ 12.07 hrs, Volume= 0.345 af, Depth= 5.45"
Routed to Link DP-5 : Woods South

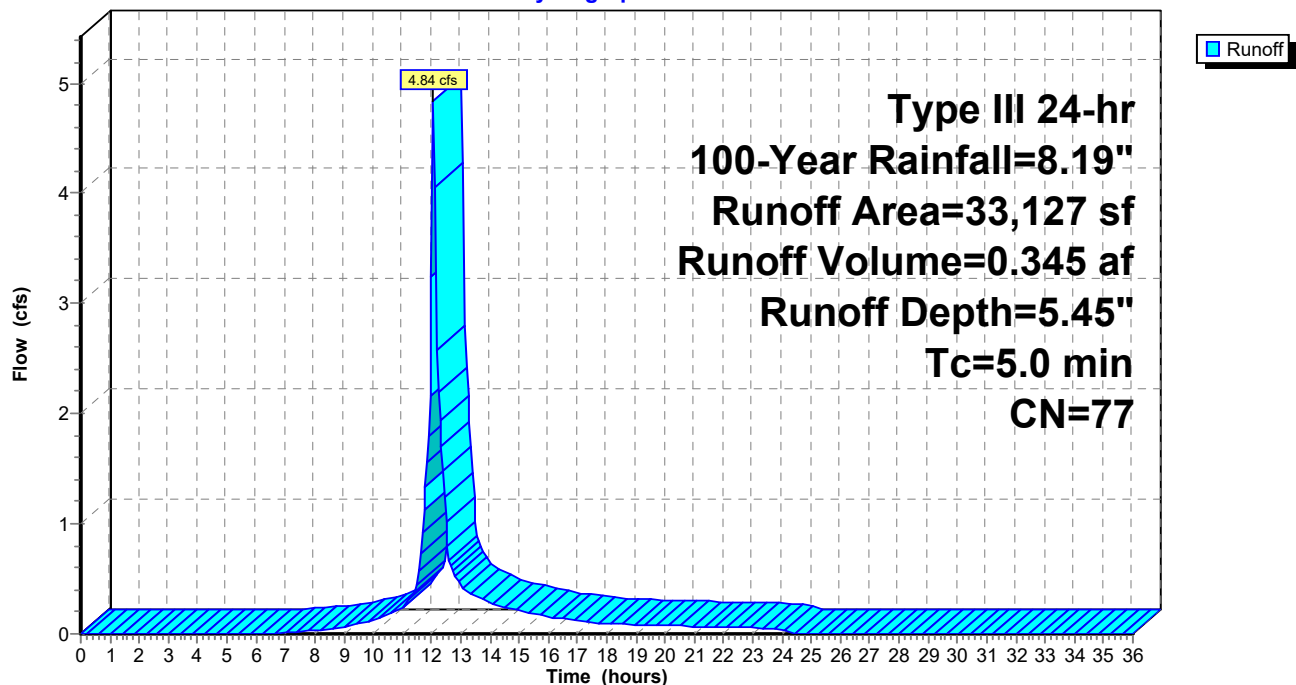
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
17,569	74	>75% Grass cover, Good, HSG C
6,352	98	Paved parking, HSG C
9,206	70	Woods, Good, HSG C
33,127	77	Weighted Average
26,775		80.83% Pervious Area
6,352		19.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment EX-5: Existing Driveway South

Hydrograph



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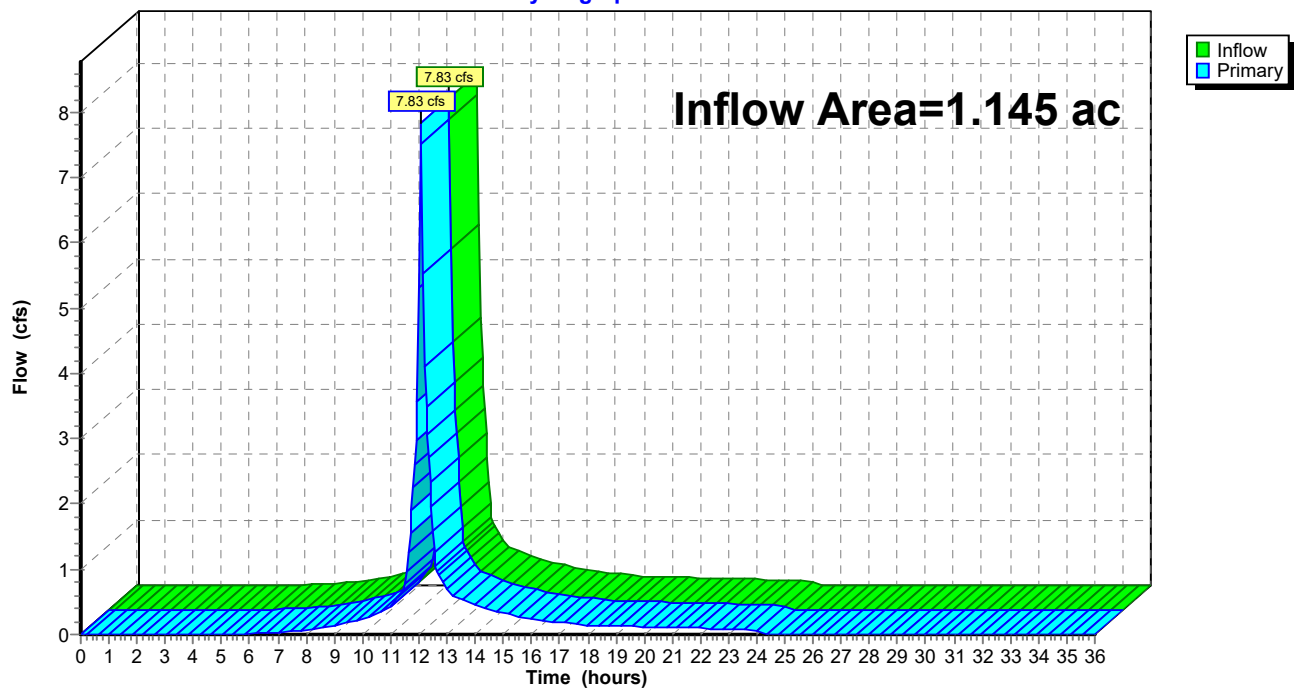
Summary for Link DP-1: Dwight Road

Inflow Area = 1.145 ac, 18.95% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 7.83 cfs @ 12.07 hrs, Volume= 0.565 af
Primary = 7.83 cfs @ 12.07 hrs, Volume= 0.565 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road

Hydrograph



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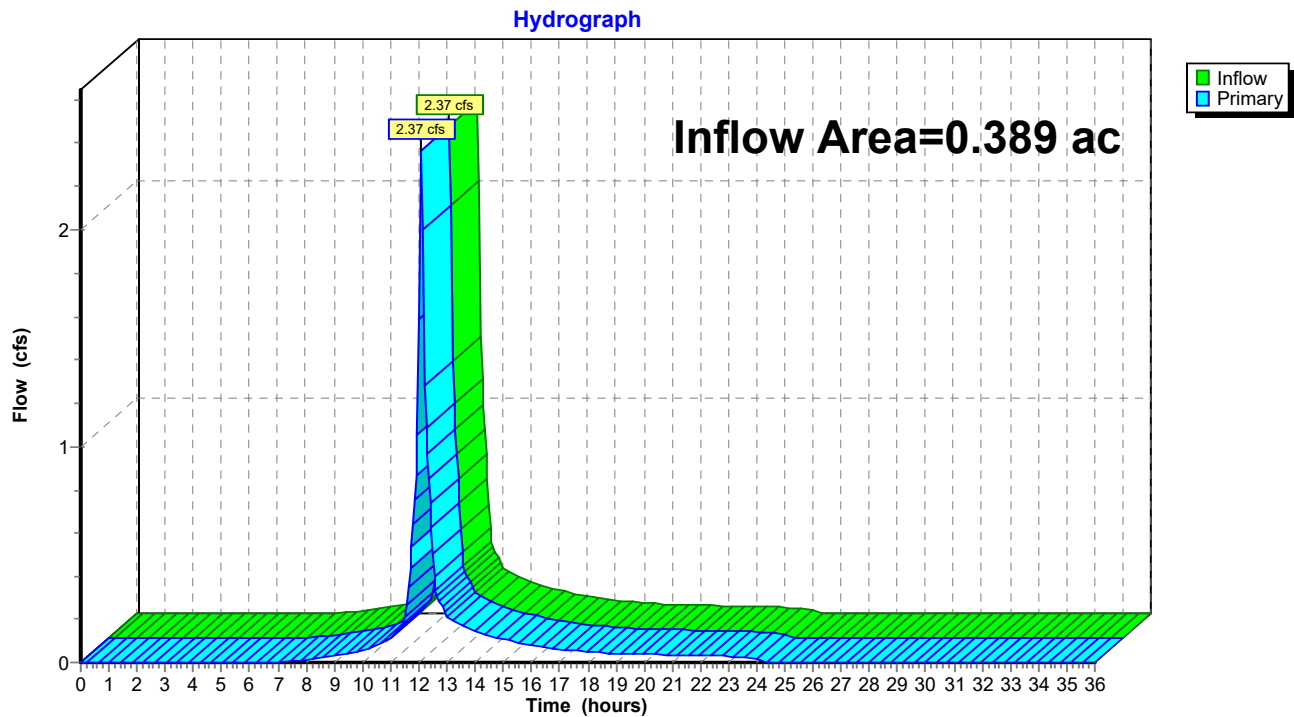
Page 46

Summary for Link DP-2: Woods North

Inflow Area = 0.389 ac, 7.60% Impervious, Inflow Depth = 5.21" for 100-Year event
Inflow = 2.37 cfs @ 12.08 hrs, Volume= 0.169 af
Primary = 2.37 cfs @ 12.08 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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Summary for Link DP-3: Woods East

Inflow Area = 0.380 ac, 0.43% Impervious, Inflow Depth = 4.86" for 100-Year event

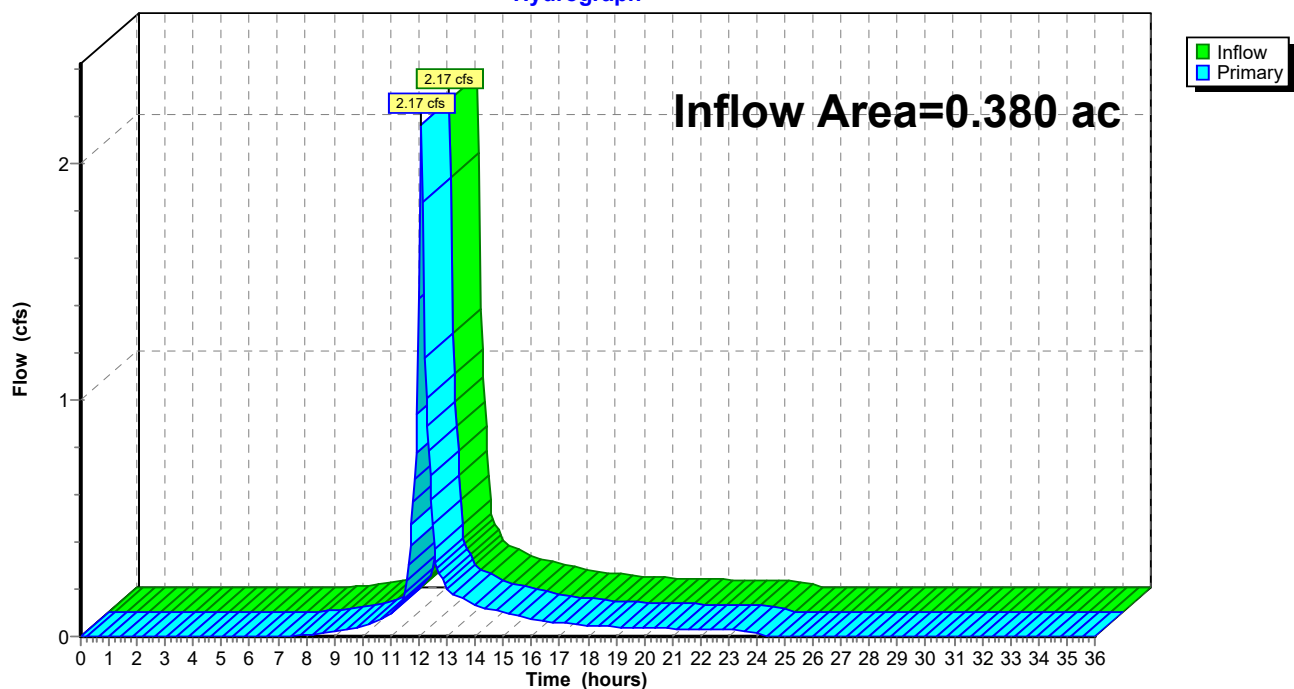
Inflow = 2.17 cfs @ 12.08 hrs, Volume= 0.154 af

Primary = 2.17 cfs @ 12.08 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East

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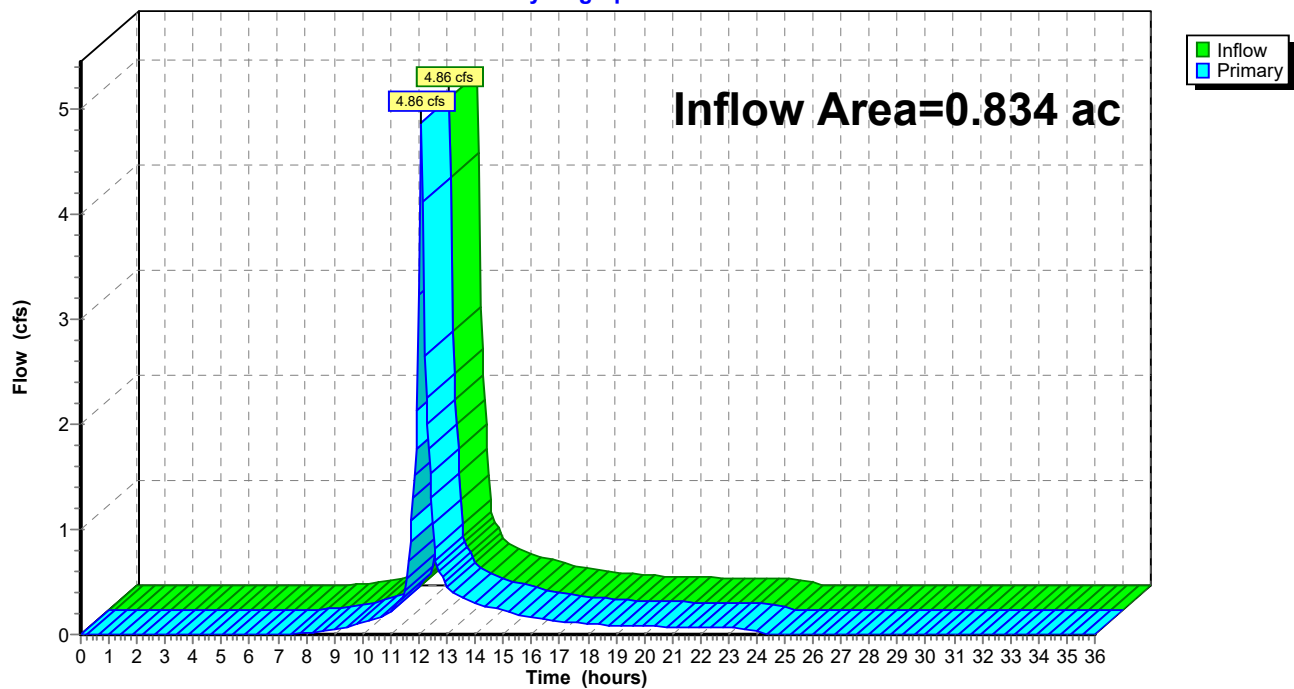
Summary for Link DP-4: Woods West

Inflow Area = 0.834 ac, 1.03% Impervious, Inflow Depth = 4.98" for 100-Year event
Inflow = 4.86 cfs @ 12.08 hrs, Volume= 0.346 af
Primary = 4.86 cfs @ 12.08 hrs, Volume= 0.346 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West

Hydrograph



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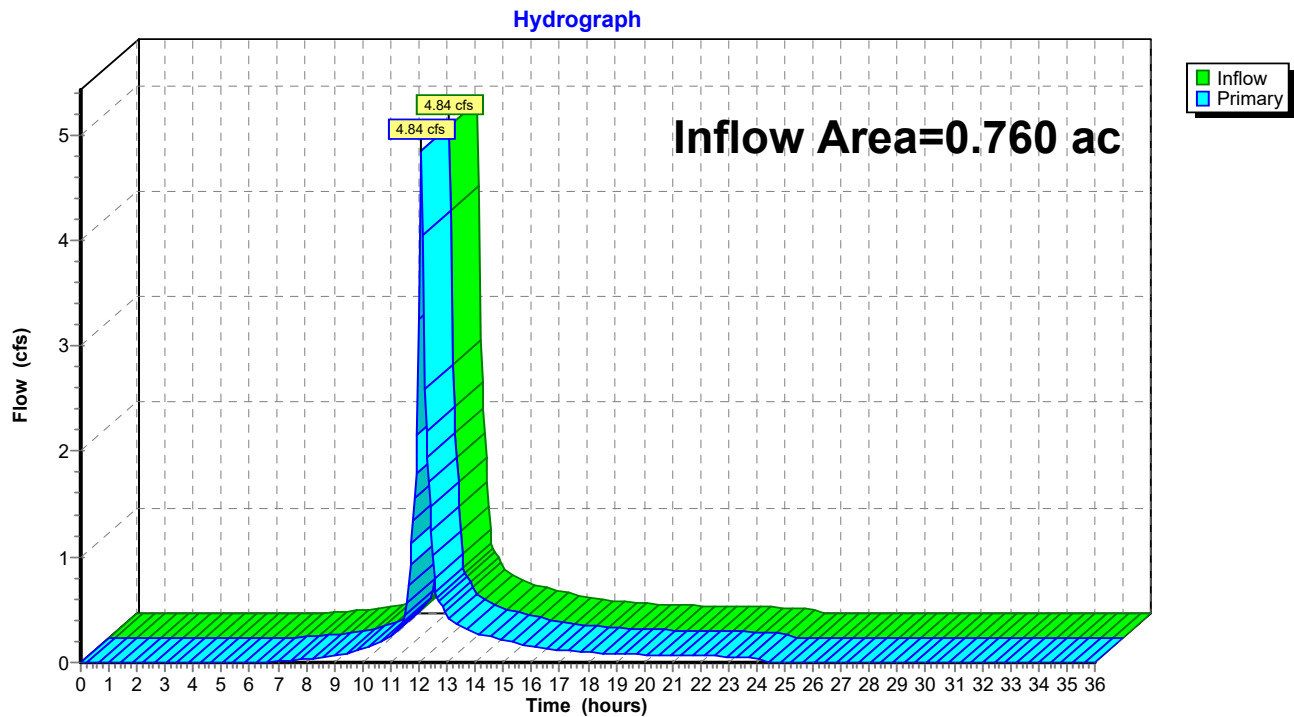
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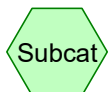
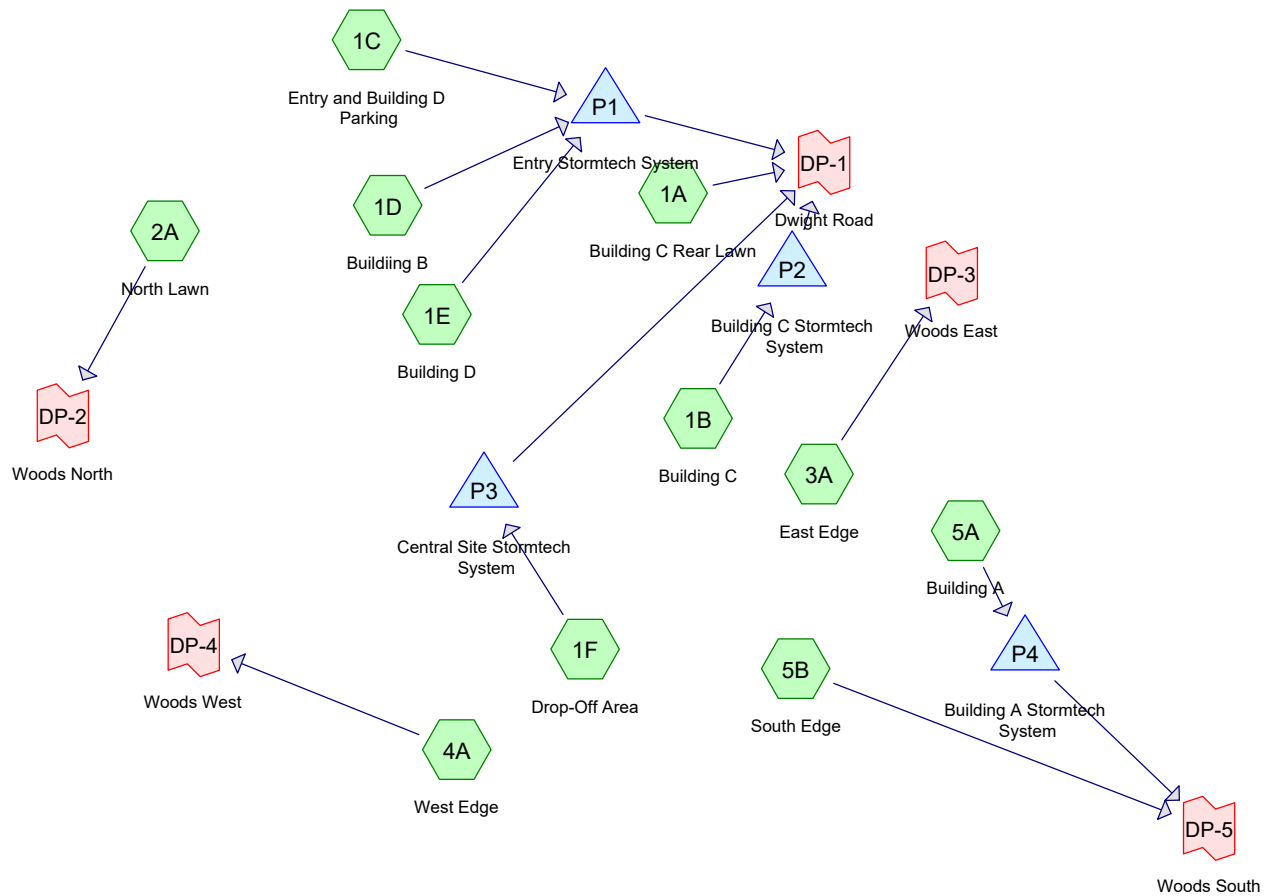
Summary for Link DP-5: Woods South

Inflow Area = 0.760 ac, 19.17% Impervious, Inflow Depth = 5.45" for 100-Year event
Inflow = 4.84 cfs @ 12.07 hrs, Volume= 0.345 af
Primary = 4.84 cfs @ 12.07 hrs, Volume= 0.345 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South

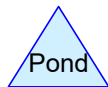




Subcat



Reach



Pond



Link

Routing Diagram for 16594.00-PR

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.32	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.21	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.38	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.19	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.832	74	>75% Grass cover, Good, HSG C (1A, 1B, 1C, 1E, 1F, 2A, 4A, 5A)
1.356	98	Paved parking, HSG C (1A, 1B, 1C, 1E, 1F, 2A, 4A, 5A, 5B)
0.808	98	Roofs, HSG C (1B, 1D, 1E, 5A)
0.513	70	Woods, Good, HSG C (1A, 2A, 3A, 4A, 5B)
3.508	88	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.508	HSG C	1A, 1B, 1C, 1D, 1E, 1F, 2A, 3A, 4A, 5A, 5B
0.000	HSG D	
0.000	Other	
3.508		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.832	0.000	0.000	0.832	>75% Grass cover, Good	1A, 1B, 1C, 1E, 1F, 2A, 4A, 5A
0.000	0.000	1.356	0.000	0.000	1.356	Paved parking	1A, 1B, 1C, 1E, 1F, 2A, 4A, 5A, 5B
0.000	0.000	0.808	0.000	0.000	0.808	Roofs	1B, 1D, 1E, 5A
0.000	0.000	0.513	0.000	0.000	0.513	Woods, Good	1A, 2A, 3A, 4A, 5B
0.000	0.000	3.508	0.000	0.000	3.508	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	P1	235.00	234.90	10.0	0.0100	0.011	0.0	10.0	0.0	
2	P2	235.00	234.90	10.0	0.0100	0.011	0.0	10.0	0.0	
3	P3	235.00	234.90	10.0	0.0100	0.011	0.0	12.0	0.0	
4	P4	235.00	234.90	10.0	0.0100	0.011	0.0	8.0	0.0	

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Type III 24-hr 2-Year Rainfall=3.32"

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Building C Rear Lawn	Runoff Area=7,765 sf 4.70% Impervious Runoff Depth=1.12" Tc=5.0 min CN=74 Runoff=0.22 cfs 0.017 af
Subcatchment1B: Building C	Runoff Area=13,724 sf 91.29% Impervious Runoff Depth=2.87" Tc=5.0 min CN=96 Runoff=0.99 cfs 0.075 af
Subcatchment1C: Entry and Building D	Runoff Area=12,250 sf 68.91% Impervious Runoff Depth=2.37" Tc=5.0 min CN=91 Runoff=0.77 cfs 0.056 af
Subcatchment1D: Building B	Runoff Area=4,139 sf 100.00% Impervious Runoff Depth=3.09" Tc=5.0 min CN=98 Runoff=0.31 cfs 0.024 af
Subcatchment1E: Building D	Runoff Area=7,885 sf 75.14% Impervious Runoff Depth=2.46" Tc=5.0 min CN=92 Runoff=0.51 cfs 0.037 af
Subcatchment1F: Drop-Off Area	Runoff Area=23,758 sf 78.57% Impervious Runoff Depth=2.56" Tc=5.0 min CN=93 Runoff=1.59 cfs 0.116 af
Subcatchment2A: North Lawn	Runoff Area=13,575 sf 5.91% Impervious Runoff Depth=1.18" Tc=5.0 min CN=75 Runoff=0.42 cfs 0.031 af
Subcatchment3A: East Edge	Runoff Area=5,730 sf 0.00% Impervious Runoff Depth=0.90" Tc=5.0 min CN=70 Runoff=0.13 cfs 0.010 af
Subcatchment4A: West Edge	Runoff Area=12,207 sf 6.50% Impervious Runoff Depth=1.06" Tc=5.0 min CN=73 Runoff=0.33 cfs 0.025 af
Subcatchment5A: Building A	Runoff Area=48,155 sf 87.77% Impervious Runoff Depth=2.76" Tc=5.0 min CN=95 Runoff=3.40 cfs 0.254 af
Subcatchment5B: South Edge	Runoff Area=3,642 sf 8.70% Impervious Runoff Depth=1.00" Tc=5.0 min CN=72 Runoff=0.09 cfs 0.007 af
Pond P1: Entry Stormtech System	Peak Elev=237.70' Storage=3,108 cf Inflow=1.59 cfs 0.117 af Discarded=0.01 cfs 0.026 af Primary=0.11 cfs 0.035 af Outflow=0.12 cfs 0.061 af
Pond P2: Building C Stormtech System	Peak Elev=237.67' Storage=2,012 cf Inflow=0.99 cfs 0.075 af Discarded=0.01 cfs 0.018 af Primary=0.08 cfs 0.021 af Outflow=0.09 cfs 0.039 af
Pond P3: Central Site Stormtech System	Peak Elev=237.68' Storage=2,948 cf Inflow=1.59 cfs 0.116 af Discarded=0.01 cfs 0.024 af Primary=0.17 cfs 0.038 af Outflow=0.18 cfs 0.063 af
Pond P4: Building A Stormtech System	Peak Elev=237.26' Storage=6,091 cf Inflow=3.40 cfs 0.254 af Discarded=0.02 cfs 0.062 af Primary=0.60 cfs 0.094 af Outflow=0.63 cfs 0.156 af
Link DP-1: Dwight Road	Inflow=0.37 cfs 0.111 af Primary=0.37 cfs 0.111 af

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Link DP-2: Woods North

Inflow=0.42 cfs 0.031 af

Primary=0.42 cfs 0.031 af

Link DP-3: Woods East

Inflow=0.13 cfs 0.010 af

Primary=0.13 cfs 0.010 af

Link DP-4: Woods West

Inflow=0.33 cfs 0.025 af

Primary=0.33 cfs 0.025 af

Link DP-5: Woods South

Inflow=0.63 cfs 0.101 af

Primary=0.63 cfs 0.101 af

Total Runoff Area = 3.508 ac Runoff Volume = 0.652 af Average Runoff Depth = 2.23"
38.34% Pervious = 1.345 ac 61.66% Impervious = 2.163 ac

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Summary for Subcatchment 1A: Building C Rear Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 1.12"
Routed to Link DP-1 : Dwight Road

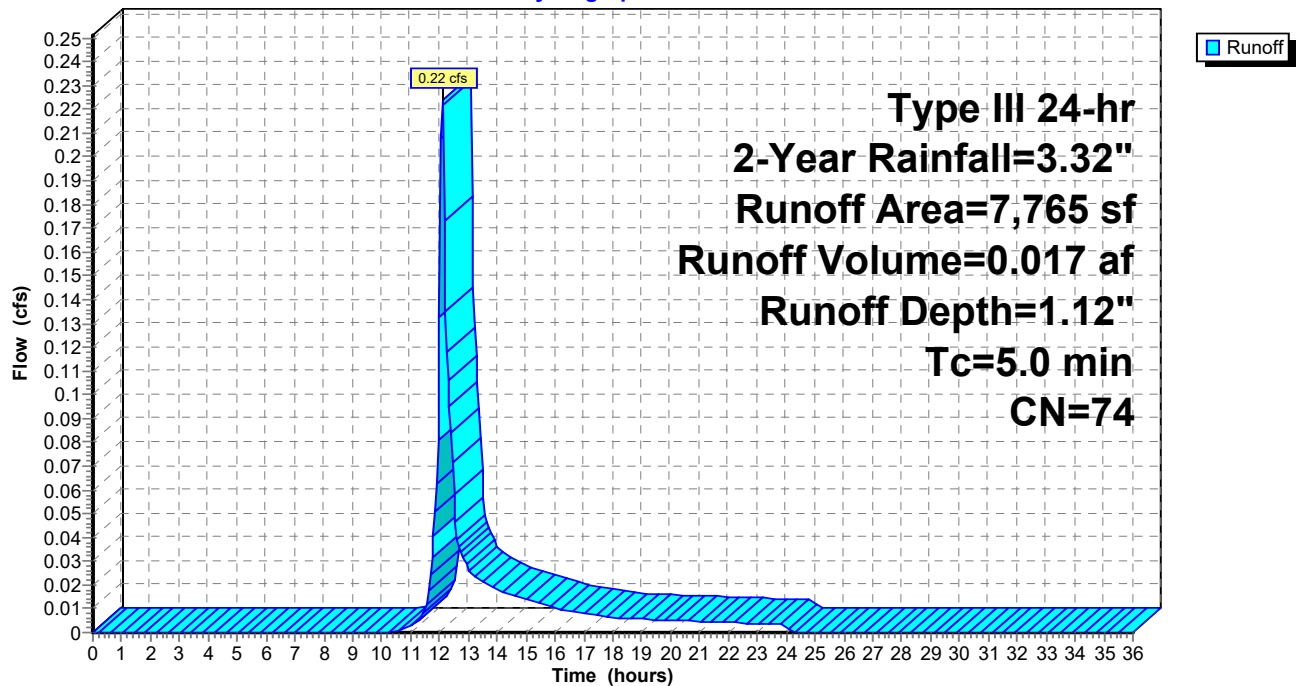
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
4,494	74	>75% Grass cover, Good, HSG C
365	98	Paved parking, HSG C
2,906	70	Woods, Good, HSG C
* 0	98	Roofs, HSG C
7,765	74	Weighted Average
7,400		95.30% Pervious Area
365		4.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1A: Building C Rear Lawn

Hydrograph



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Summary for Subcatchment 1B: Building C

[49] Hint: $T_c < 2dt$ may require smaller dt

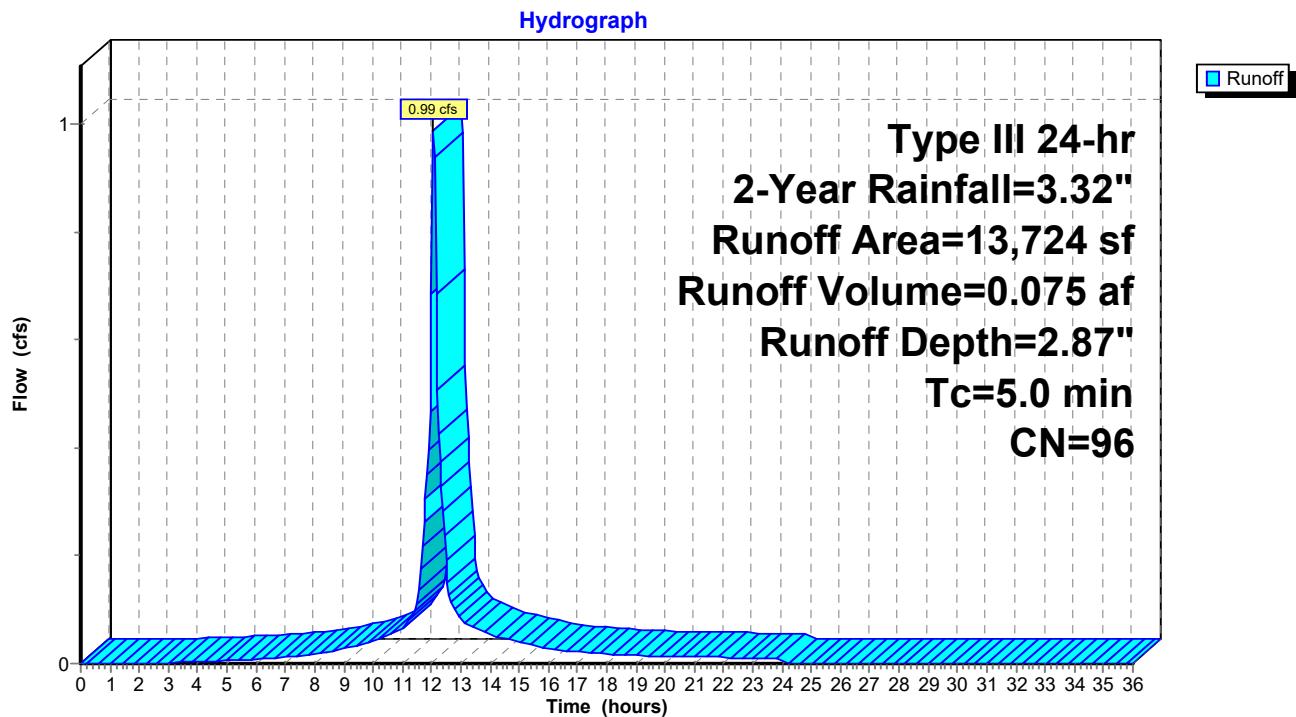
Runoff = 0.99 cfs @ 12.07 hrs, Volume= 0.075 af, Depth= 2.87"
Routed to Pond P2 : Building C Stormtech System

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=3.32"

Area (sf)	CN	Description
1,196	74	>75% Grass cover, Good, HSG C
8,381	98	Paved parking, HSG C
4,147	98	Roofs, HSG C
0	70	Woods, Good, HSG C
13,724	96	Weighted Average
1,196		8.71% Pervious Area
12,528		91.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1B: Building C



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Summary for Subcatchment 1C: Entry and Building D Parking

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.77 cfs @ 12.07 hrs, Volume= 0.056 af, Depth= 2.37"
Routed to Pond P1 : Entry Stormtech System

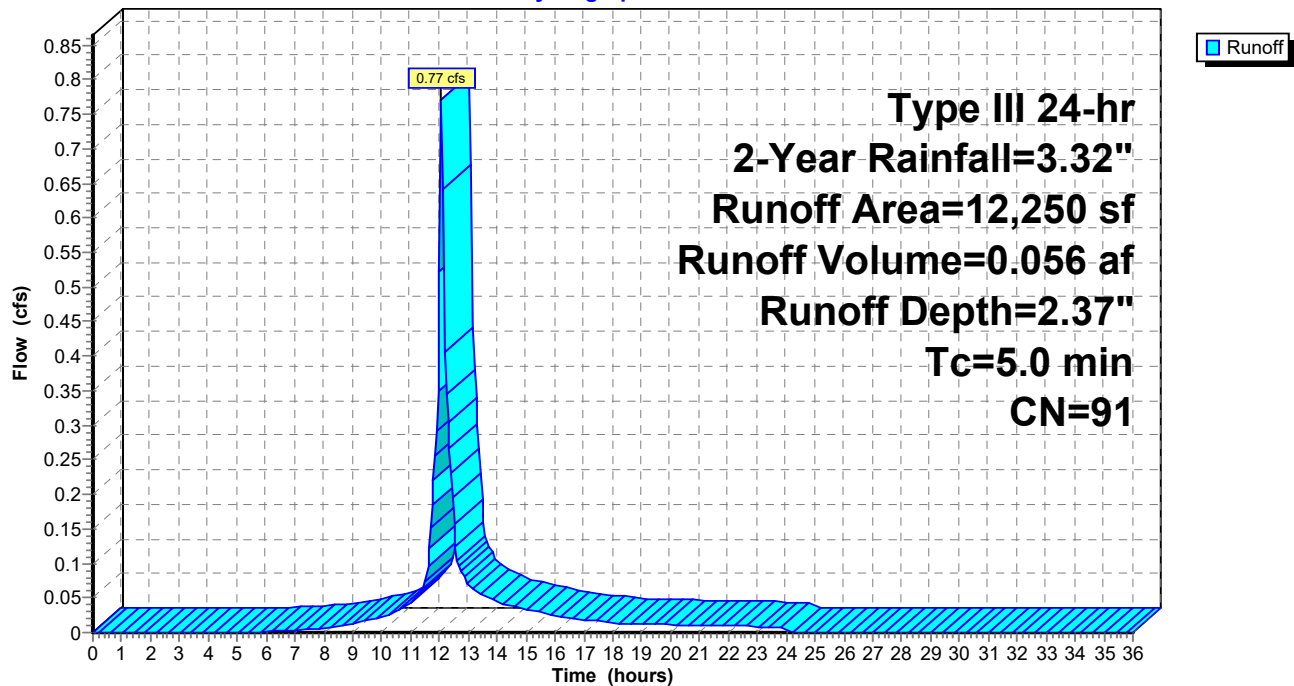
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
3,808	74	>75% Grass cover, Good, HSG C
8,442	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
12,250	91	Weighted Average
3,808		31.09% Pervious Area
8,442		68.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1C: Entry and Building D Parking

Hydrograph



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Summary for Subcatchment 1D: Building B

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.31 cfs @ 12.07 hrs, Volume= 0.024 af, Depth= 3.09"
Routed to Pond P1 : Entry Stormtech System

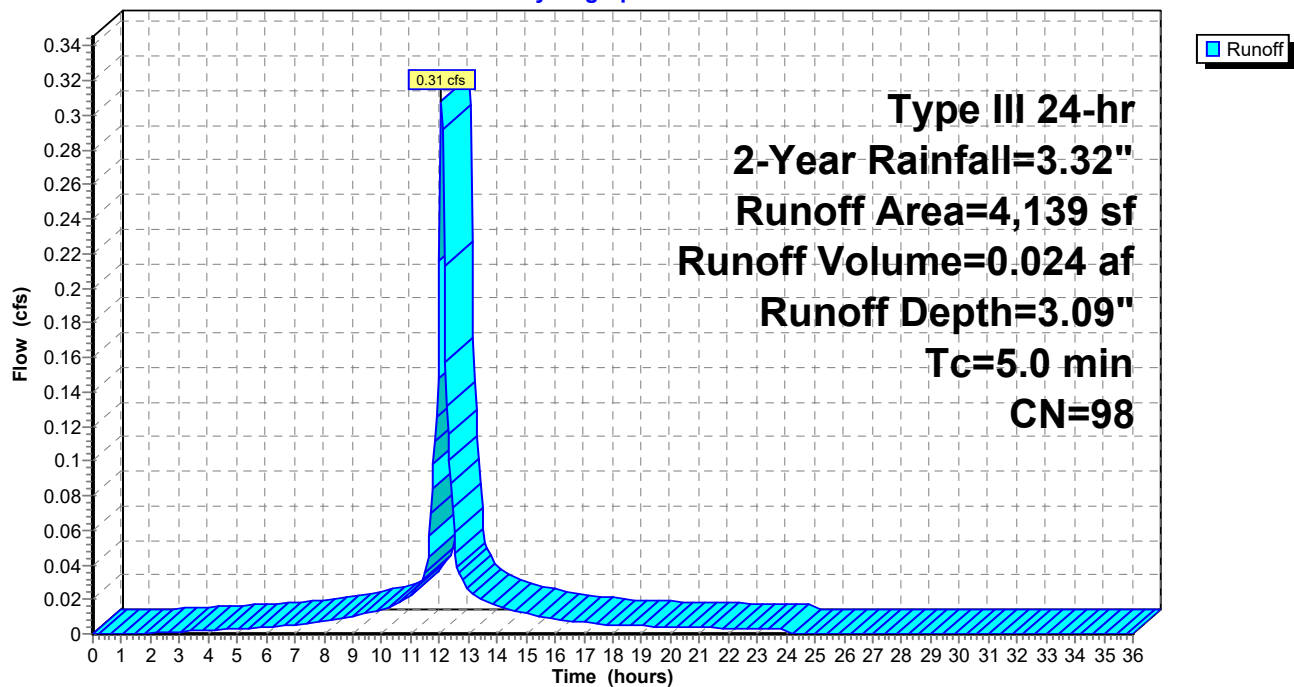
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
4,139	98	Roofs, HSG C
0	70	Woods, Good, HSG C
4,139	98	Weighted Average
4,139		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1D: Building B

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment 1E: Building D

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.51 cfs @ 12.07 hrs, Volume= 0.037 af, Depth= 2.46"
Routed to Pond P1 : Entry Stormtech System

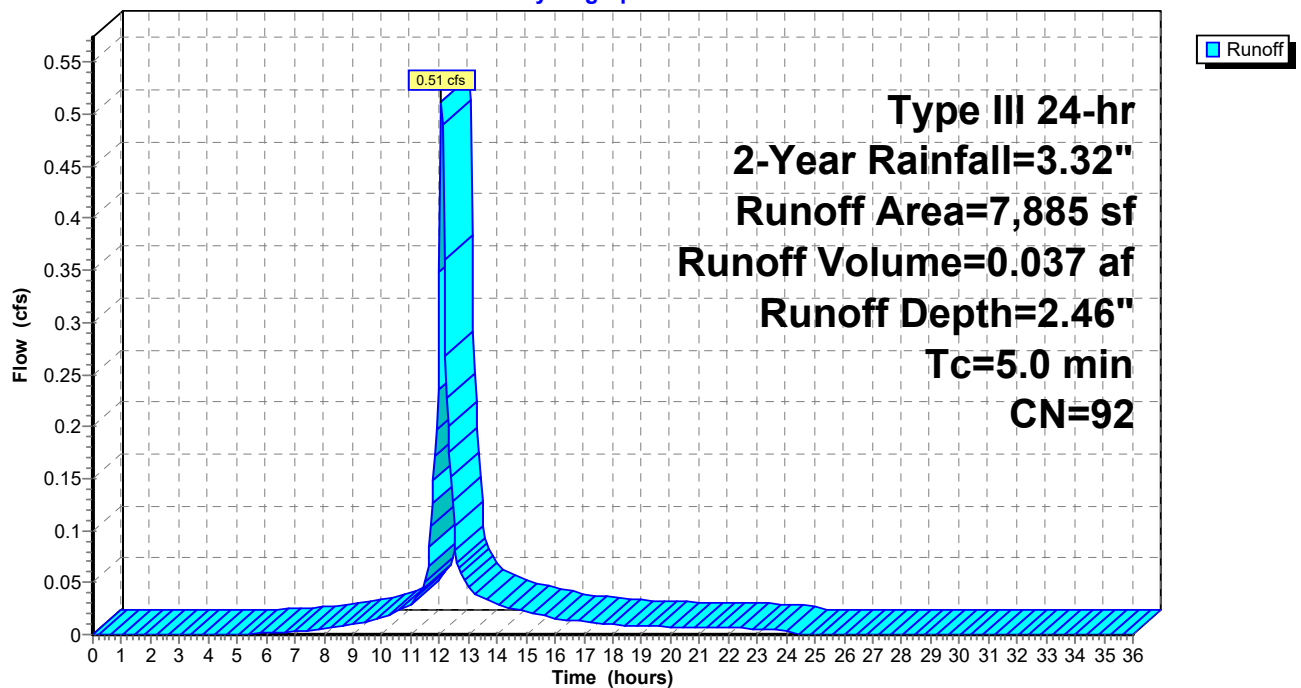
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
1,960	74	>75% Grass cover, Good, HSG C
1,785	98	Paved parking, HSG C
4,140	98	Roofs, HSG C
0	70	Woods, Good, HSG C
7,885	92	Weighted Average
1,960		24.86% Pervious Area
5,925		75.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1E: Building D

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment 1F: Drop-Off Area

[49] Hint: $T_c < 2dt$ may require smaller dt

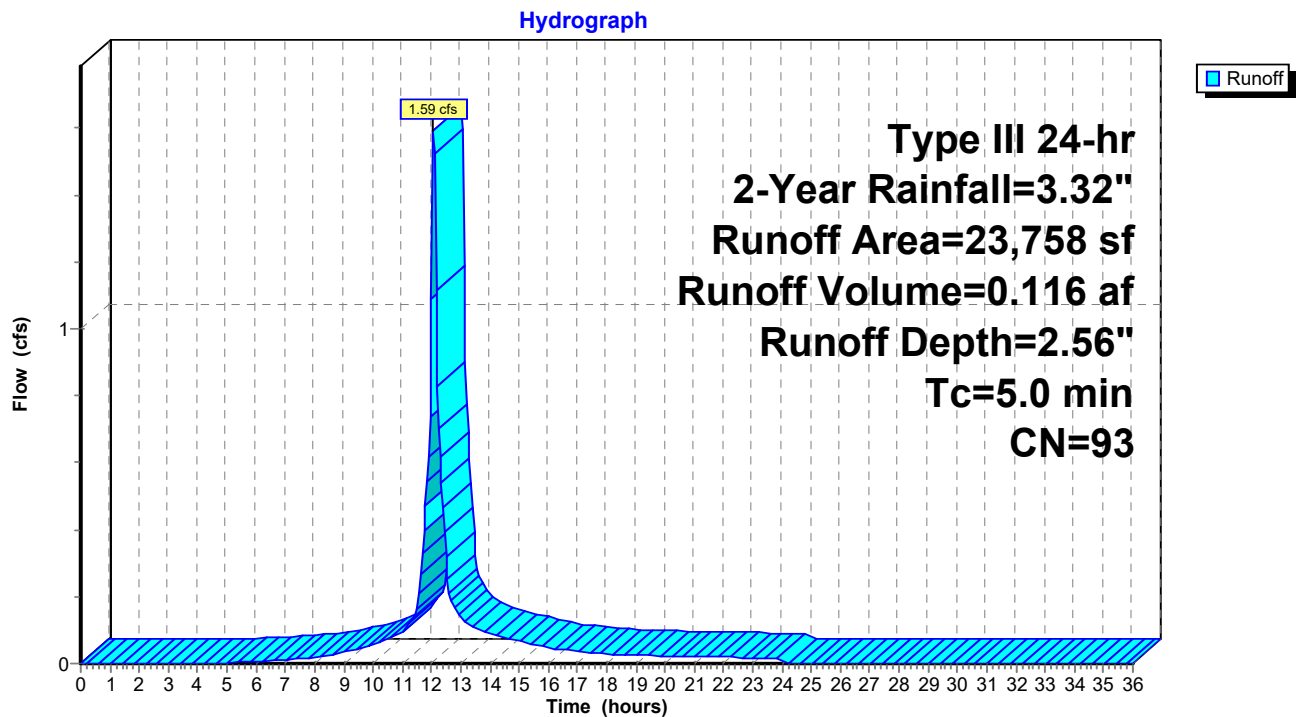
Runoff = 1.59 cfs @ 12.07 hrs, Volume= 0.116 af, Depth= 2.56"
Routed to Pond P3 : Central Site Stormtech System

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=3.32"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
18,666	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
23,758	93	Weighted Average
5,092		21.43% Pervious Area
18,666		78.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1F: Drop-Off Area



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Summary for Subcatchment 2A: North Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.42 cfs @ 12.09 hrs, Volume= 0.031 af, Depth= 1.18"
Routed to Link DP-2 : Woods North

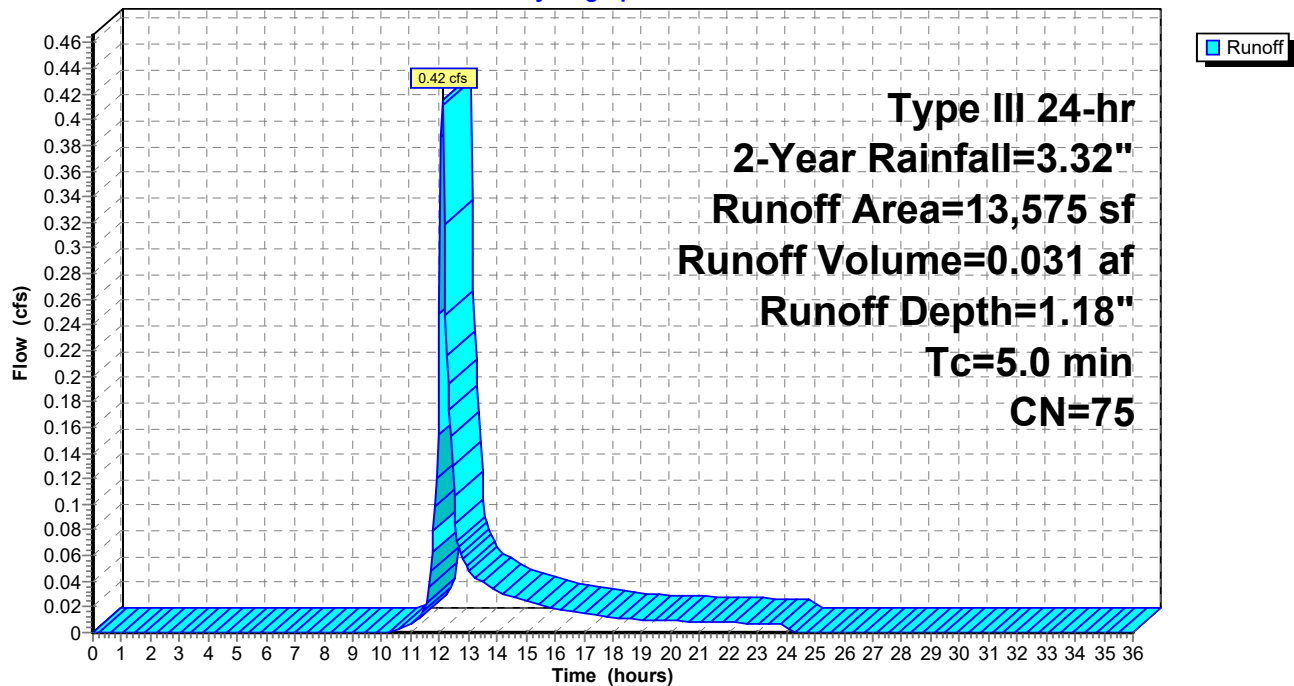
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
9,892	74	>75% Grass cover, Good, HSG C
802	98	Paved parking, HSG C
0	98	Roofs, HSG C
2,881	70	Woods, Good, HSG C
13,575	75	Weighted Average
12,773		94.09% Pervious Area
802		5.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 2A: North Lawn

Hydrograph



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Summary for Subcatchment 3A: East Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 0.90"
Routed to Link DP-3 : Woods East

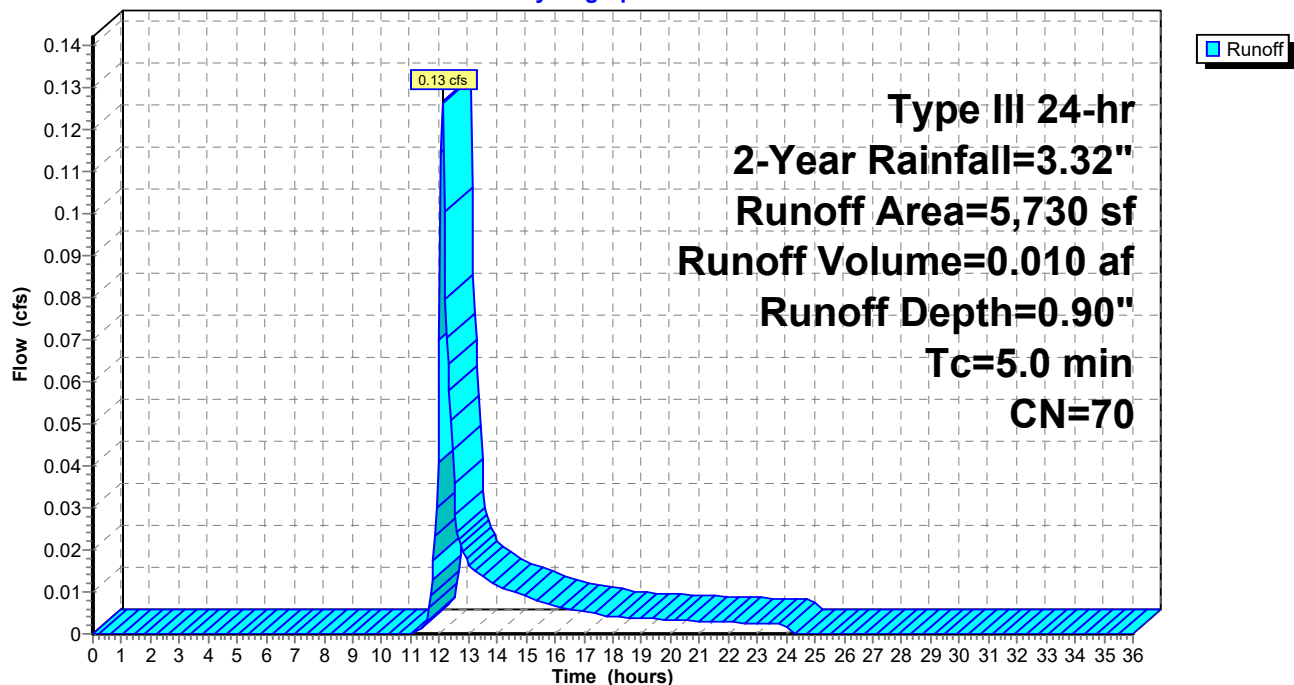
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
0	98	Roofs, HSG C
5,730	70	Woods, Good, HSG C
5,730	70	Weighted Average
5,730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 3A: East Edge

Hydrograph



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Summary for Subcatchment 4A: West Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 1.06"
Routed to Link DP-4 : Woods West

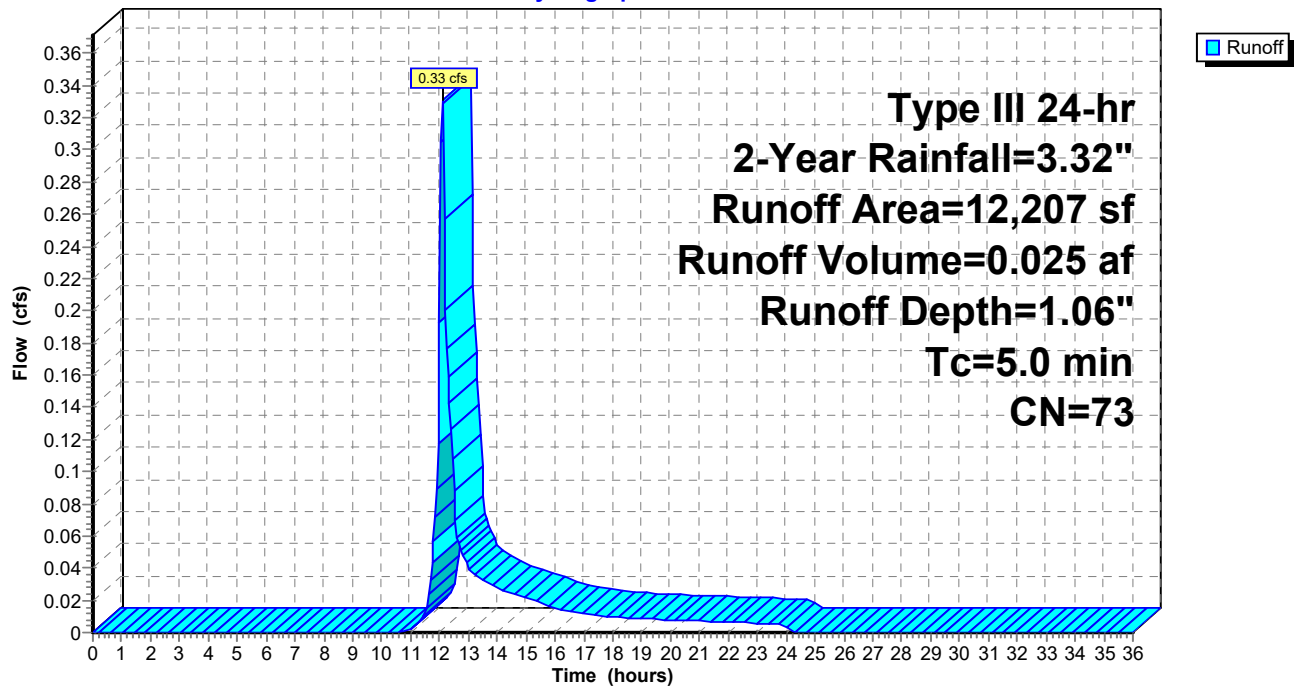
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
3,909	74	>75% Grass cover, Good, HSG C
794	98	Paved parking, HSG C
0	98	Roofs, HSG C
7,504	70	Woods, Good, HSG C
12,207	73	Weighted Average
11,413		93.50% Pervious Area
794		6.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 4A: West Edge

Hydrograph



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Summary for Subcatchment 5A: Building A

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 3.40 cfs @ 12.07 hrs, Volume= 0.254 af, Depth= 2.76"
Routed to Pond P4 : Building A Stormtech System

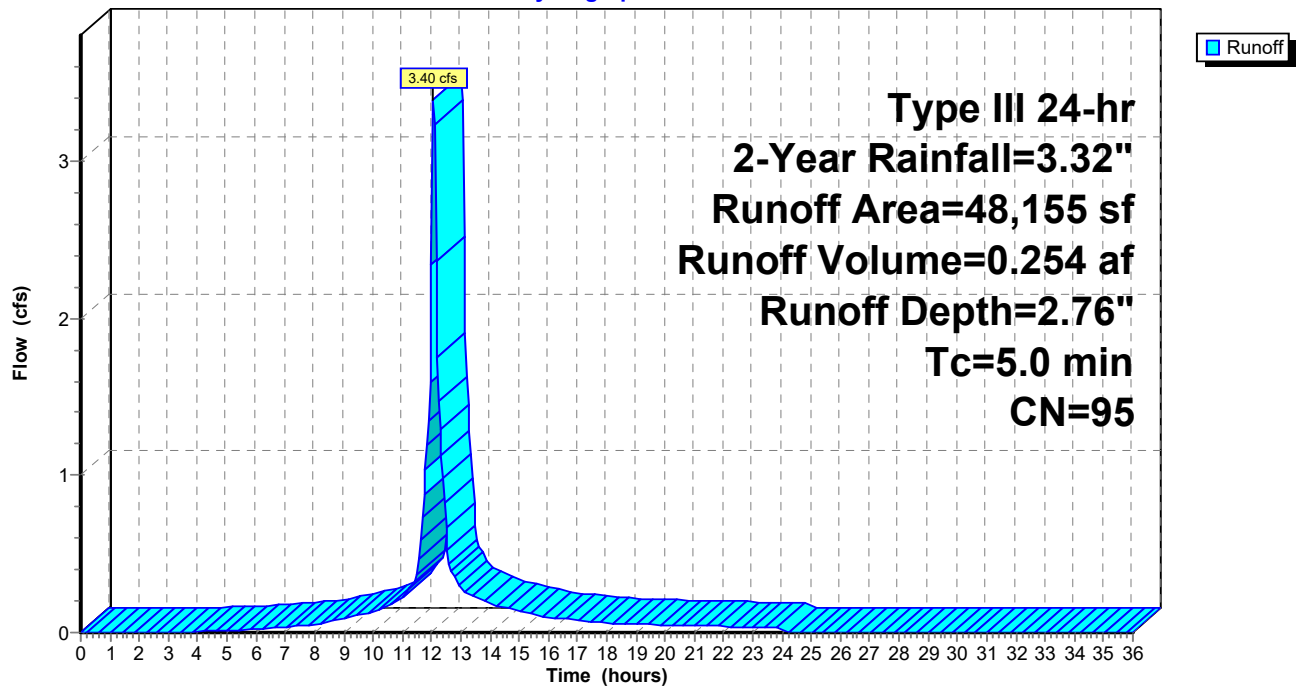
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
5,891	74	>75% Grass cover, Good, HSG C
19,506	98	Paved parking, HSG C
22,758	98	Roofs, HSG C
0	70	Woods, Good, HSG C
48,155	95	Weighted Average
5,891		12.23% Pervious Area
42,264		87.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5A: Building A

Hydrograph



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Summary for Subcatchment 5B: South Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.007 af, Depth= 1.00"
Routed to Link DP-5 : Woods South

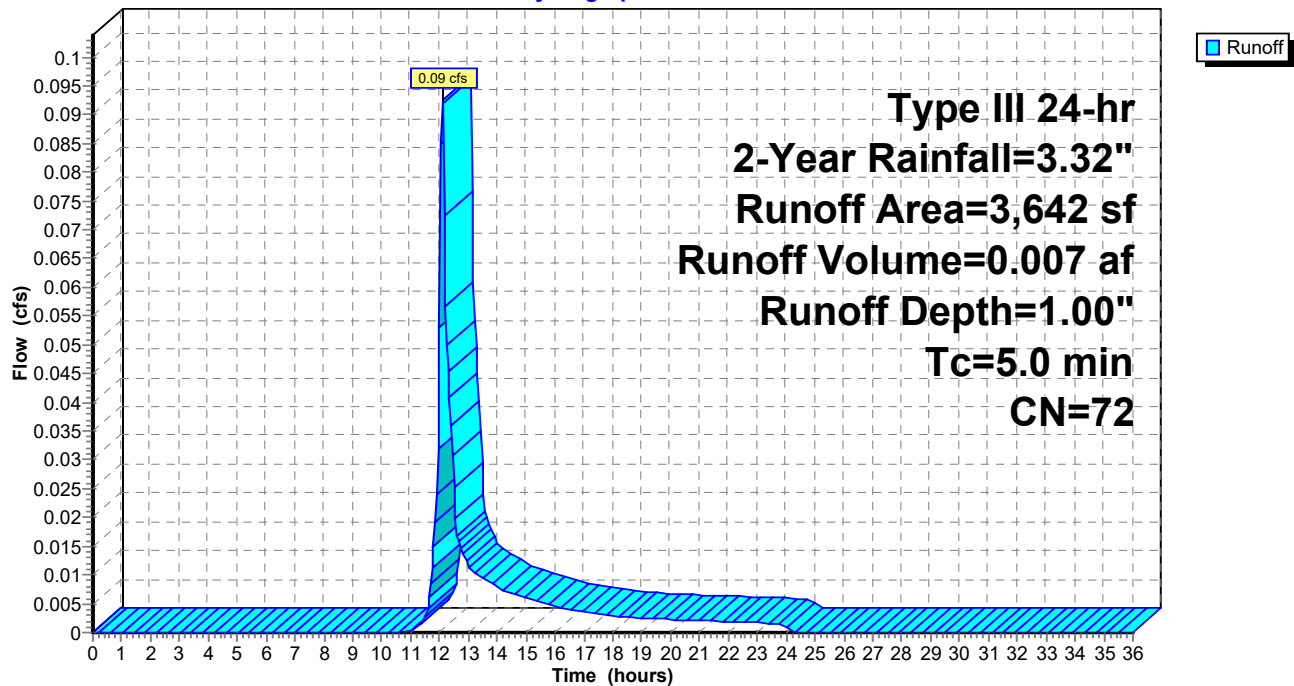
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
317	98	Paved parking, HSG C
0	98	Roofs, HSG C
3,325	70	Woods, Good, HSG C
3,642	72	Weighted Average
3,325		91.30% Pervious Area
317		8.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5B: South Edge

Hydrograph



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Summary for Pond P1: Entry Stormtech System

Inflow Area = 0.557 ac, 76.24% Impervious, Inflow Depth = 2.52" for 2-Year event
Inflow = 1.59 cfs @ 12.07 hrs, Volume= 0.117 af
Outflow = 0.12 cfs @ 13.19 hrs, Volume= 0.061 af, Atten= 92%, Lag= 67.0 min
Discarded = 0.01 cfs @ 7.70 hrs, Volume= 0.026 af
Primary = 0.11 cfs @ 13.19 hrs, Volume= 0.035 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 237.70' @ 13.19 hrs Surf.Area= 1,672 sf Storage= 3,108 cf

Plug-Flow detention time= 405.6 min calculated for 0.061 af (52% of inflow)
Center-of-Mass det. time= 292.4 min (1,081.6 - 789.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,399 cf	29.92'W x 55.89'L x 5.50'H Field A 9,196 cf Overall - 3,198 cf Embedded = 5,998 cf x 40.0% Voids
#2A	235.75'	3,198 cf	ADS_StormTech MC-3500 d +Capx 28 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 28 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
5,597 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 7.70 hrs HW=235.06' (Free Discharge)
↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.11 cfs @ 13.19 hrs HW=237.70' (Free Discharge)
↑ **2=Culvert** (Passes 0.11 cfs of 3.13 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
↑ **4=Orifice/Grate** (Orifice Controls 0.11 cfs @ 1.52 fps)

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Pond P1: Entry Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

7 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 53.89' Row Length +12.0" End Stone x 2 = 55.89' Base Length

4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

28 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 3,197.9 cf Chamber Storage

9,196.2 cf Field - 3,197.9 cf Chambers = 5,998.4 cf Stone x 40.0% Voids = 2,399.4 cf Stone Storage

Chamber Storage + Stone Storage = 5,597.2 cf = 0.128 af

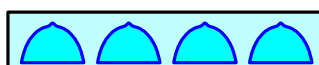
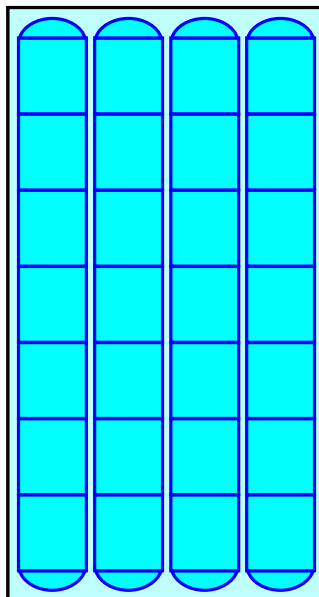
Overall Storage Efficiency = 60.9%

Overall System Size = 55.89' x 29.92' x 5.50'

28 Chambers

340.6 cy Field

222.2 cy Stone



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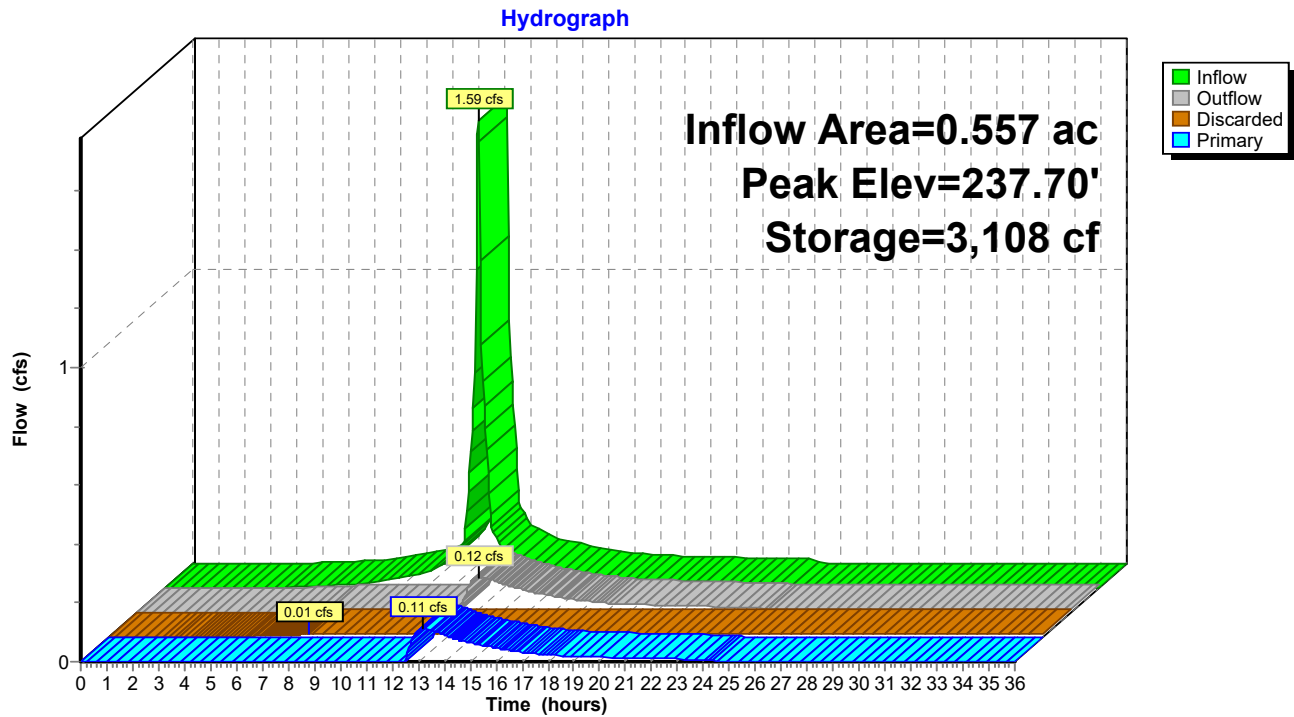
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Pond P1: Entry Stormtech System



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Summary for Pond P2: Building C Stormtech System

Inflow Area = 0.315 ac, 91.29% Impervious, Inflow Depth = 2.87" for 2-Year event
Inflow = 0.99 cfs @ 12.07 hrs, Volume= 0.075 af
Outflow = 0.09 cfs @ 12.97 hrs, Volume= 0.039 af, Atten= 91%, Lag= 53.7 min
Discarded = 0.01 cfs @ 6.55 hrs, Volume= 0.018 af
Primary = 0.08 cfs @ 12.97 hrs, Volume= 0.021 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 237.67' @ 12.97 hrs Surf.Area= 1,108 sf Storage= 2,012 cf

Plug-Flow detention time= 409.7 min calculated for 0.039 af (51% of inflow)
Center-of-Mass det. time= 295.2 min (1,067.3 - 772.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	1,611 cf	22.75'W x 48.72'L x 5.50'H Field A 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	235.75'	2,069 cf	ADS_StormTech MC-3500 d +Capx 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 6.55 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.08 cfs @ 12.97 hrs HW=237.67' (Free Discharge)

↑ **2=Culvert** (Passes 0.00 cfs of 3.11 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
↑ **4=Orifice/Grate** (Orifice Controls 0.08 cfs @ 1.39 fps)

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Pond P2: Building C Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

6 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 46.72' Row Length +12.0" End Stone x 2 = 48.72' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

18 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 2,068.5 cf Chamber Storage

6,096.1 cf Field - 2,068.5 cf Chambers = 4,027.6 cf Stone x 40.0% Voids = 1,611.0 cf Stone Storage

Chamber Storage + Stone Storage = 3,679.6 cf = 0.084 af

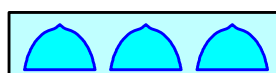
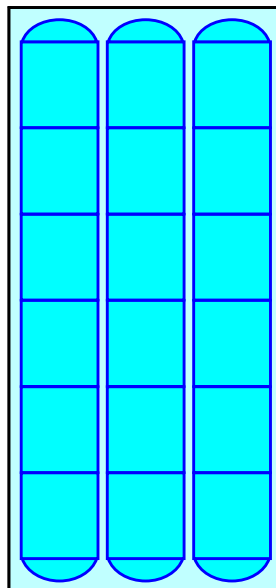
Overall Storage Efficiency = 60.4%

Overall System Size = 48.72' x 22.75' x 5.50'

18 Chambers

225.8 cy Field

149.2 cy Stone



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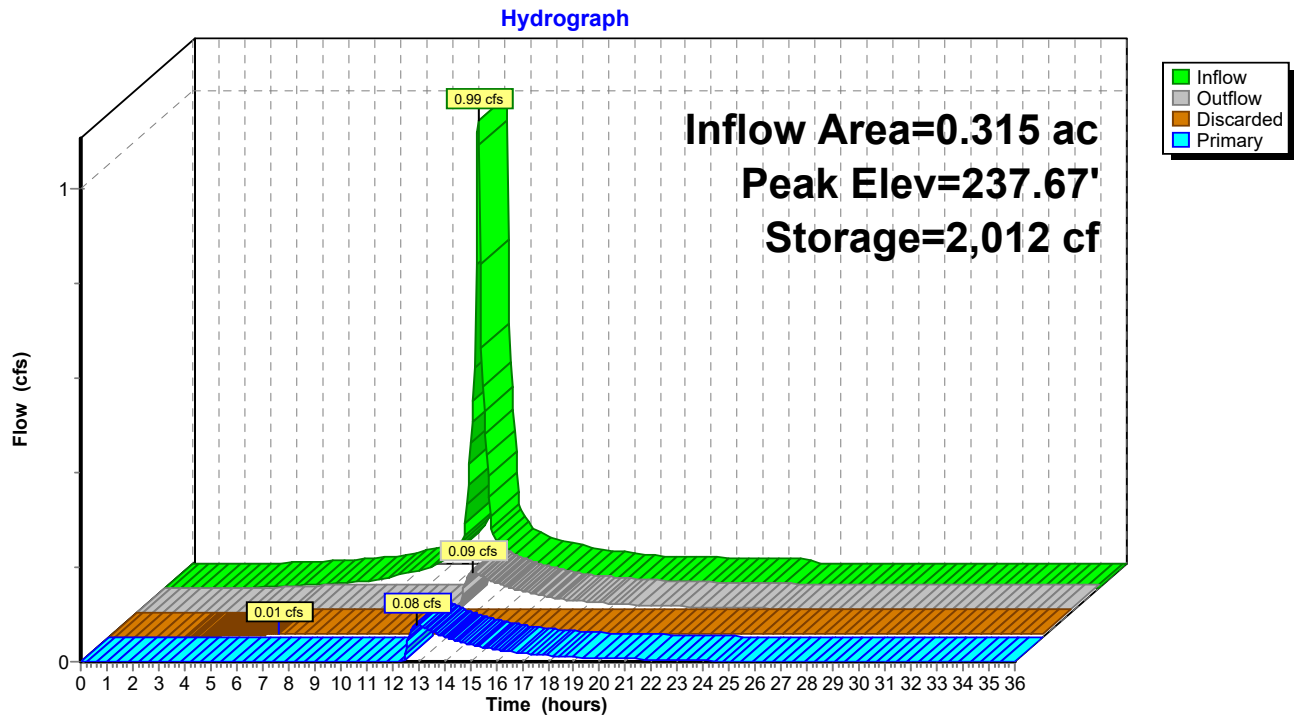
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Pond P2: Building C Stormtech System



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Summary for Pond P3: Central Site Stormtech System

Inflow Area = 0.545 ac, 78.57% Impervious, Inflow Depth = 2.56" for 2-Year event
Inflow = 1.59 cfs @ 12.07 hrs, Volume= 0.116 af
Outflow = 0.18 cfs @ 12.76 hrs, Volume= 0.063 af, Atten= 89%, Lag= 41.3 min
Discarded = 0.01 cfs @ 7.65 hrs, Volume= 0.024 af
Primary = 0.17 cfs @ 12.76 hrs, Volume= 0.038 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 237.68' @ 12.76 hrs Surf.Area= 1,598 sf Storage= 2,948 cf

Plug-Flow detention time= 378.5 min calculated for 0.063 af (54% of inflow)
Center-of-Mass det. time= 269.4 min (1,059.9 - 790.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,292 cf	22.75'W x 70.23'L x 5.50'H Field A 8,788 cf Overall - 3,058 cf Embedded = 5,729 cf x 40.0% Voids
#2A	235.75'	3,058 cf	ADS_StormTech MC-3500 d +Cap x 27 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 27 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		5,350 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 7.65 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.16 cfs @ 12.76 hrs HW=237.68' (Free Discharge)

↑ **2=Culvert** (Passes 0.00 cfs of 4.41 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
↑ **4=Orifice/Grate** (Orifice Controls 0.16 cfs @ 1.45 fps)

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Pond P3: Central Site Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

9 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 68.23' Row Length +12.0" End Stone x 2 = 70.23' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

27 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,058.1 cf Chamber Storage

8,787.5 cf Field - 3,058.1 cf Chambers = 5,729.4 cf Stone x 40.0% Voids = 2,291.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,349.9 cf = 0.123 af

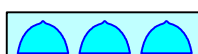
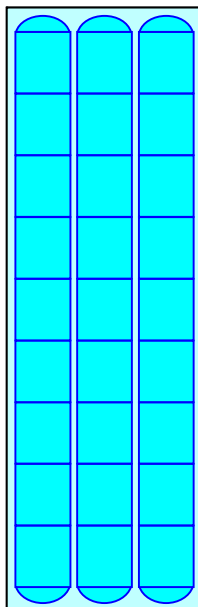
Overall Storage Efficiency = 60.9%

Overall System Size = 70.23' x 22.75' x 5.50'

27 Chambers

325.5 cy Field

212.2 cy Stone



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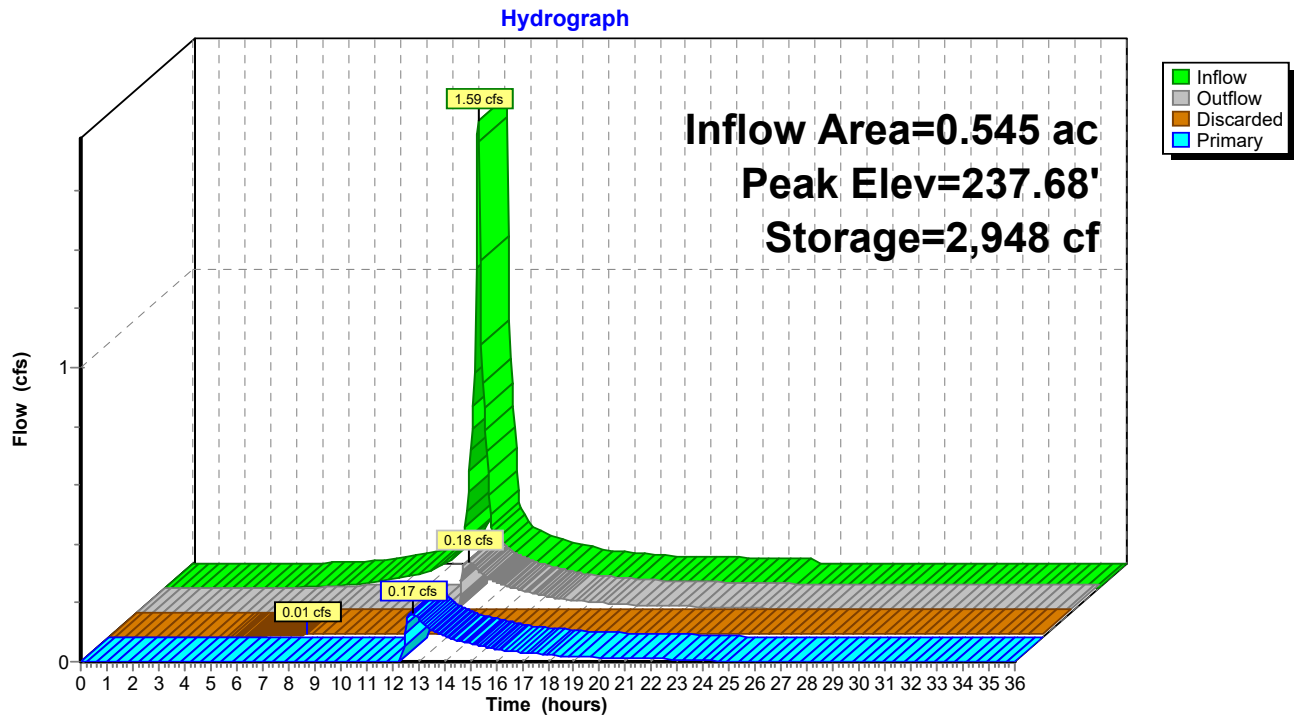
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Pond P3: Central Site Stormtech System



Summary for Pond P4: Building A Stormtech System

Inflow Area = 1.105 ac, 87.77% Impervious, Inflow Depth = 2.76" for 2-Year event
 Inflow = 3.40 cfs @ 12.07 hrs, Volume= 0.254 af
 Outflow = 0.63 cfs @ 12.52 hrs, Volume= 0.156 af, Atten= 82%, Lag= 26.6 min
 Discarded = 0.02 cfs @ 7.10 hrs, Volume= 0.062 af
 Primary = 0.60 cfs @ 12.52 hrs, Volume= 0.094 af
 Routed to Link DP-5 : Woods South

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 237.26' @ 12.52 hrs Surf.Area= 3,934 sf Storage= 6,091 cf

Plug-Flow detention time= 356.6 min calculated for 0.156 af (61% of inflow)
 Center-of-Mass det. time= 254.2 min (1,033.2 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	5,516 cf	37.08'W x 106.08'L x 5.50'H Field A 21,636 cf Overall - 7,846 cf Embedded = 13,790 cf x 40.0% Voids
#2A	235.75'	7,846 cf	ADS_StormTech MC-3500 d +Capx 70 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 70 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		13,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	8.0" Round Culvert X 4.00 L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir X 2.00 2 End Contraction(s)
#4	Primary	237.00'	5.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 7.10 hrs HW=235.06' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.60 cfs @ 12.52 hrs HW=237.25' (Free Discharge)
 ↑ **2=Culvert** (Passes 0.00 cfs of 7.36 cfs potential flow)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Orifice/Grate** (Orifice Controls 0.60 cfs @ 1.72 fps)

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Pond P4: Building A Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

70 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 7,845.6 cf Chamber Storage

21,635.9 cf Field - 7,845.6 cf Chambers = 13,790.3 cf Stone x 40.0% Voids = 5,516.1 cf Stone Storage

Chamber Storage + Stone Storage = 13,361.7 cf = 0.307 af

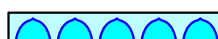
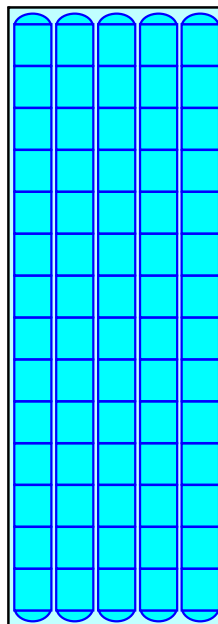
Overall Storage Efficiency = 61.8%

Overall System Size = 106.08' x 37.08' x 5.50'

70 Chambers

801.3 cy Field

510.8 cy Stone



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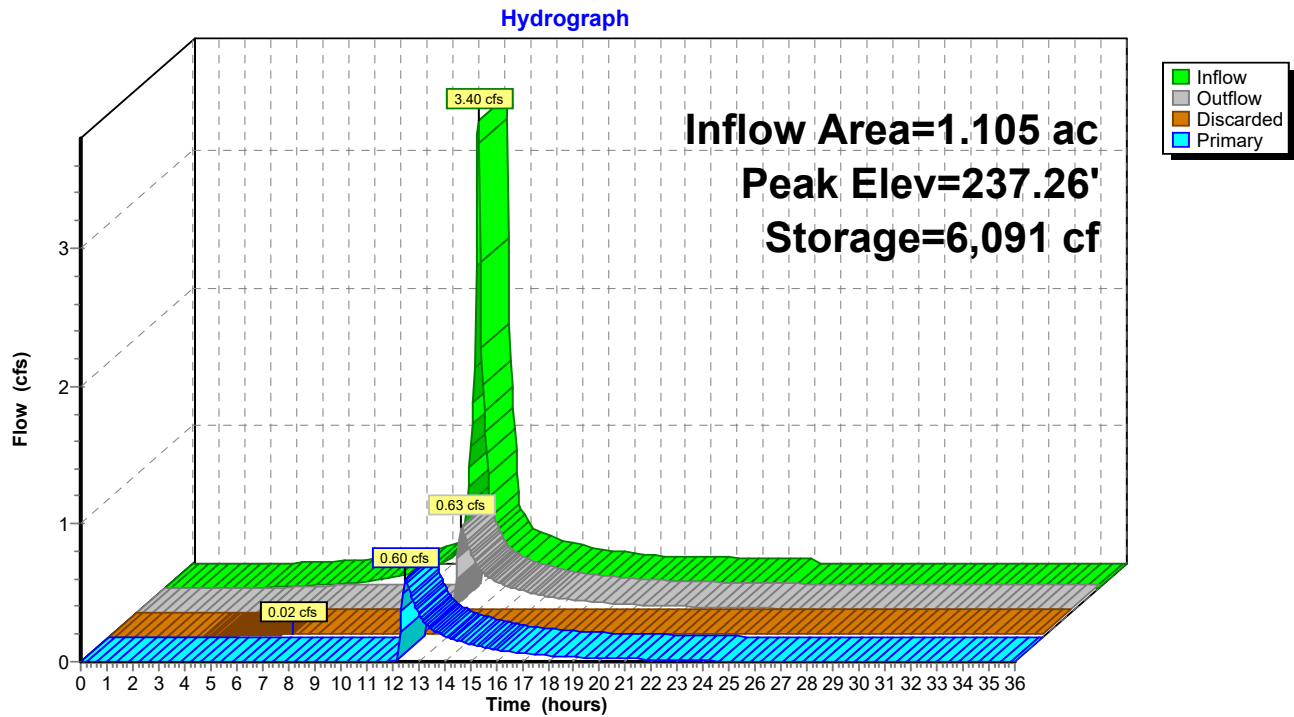
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Pond P4: Building A Stormtech System



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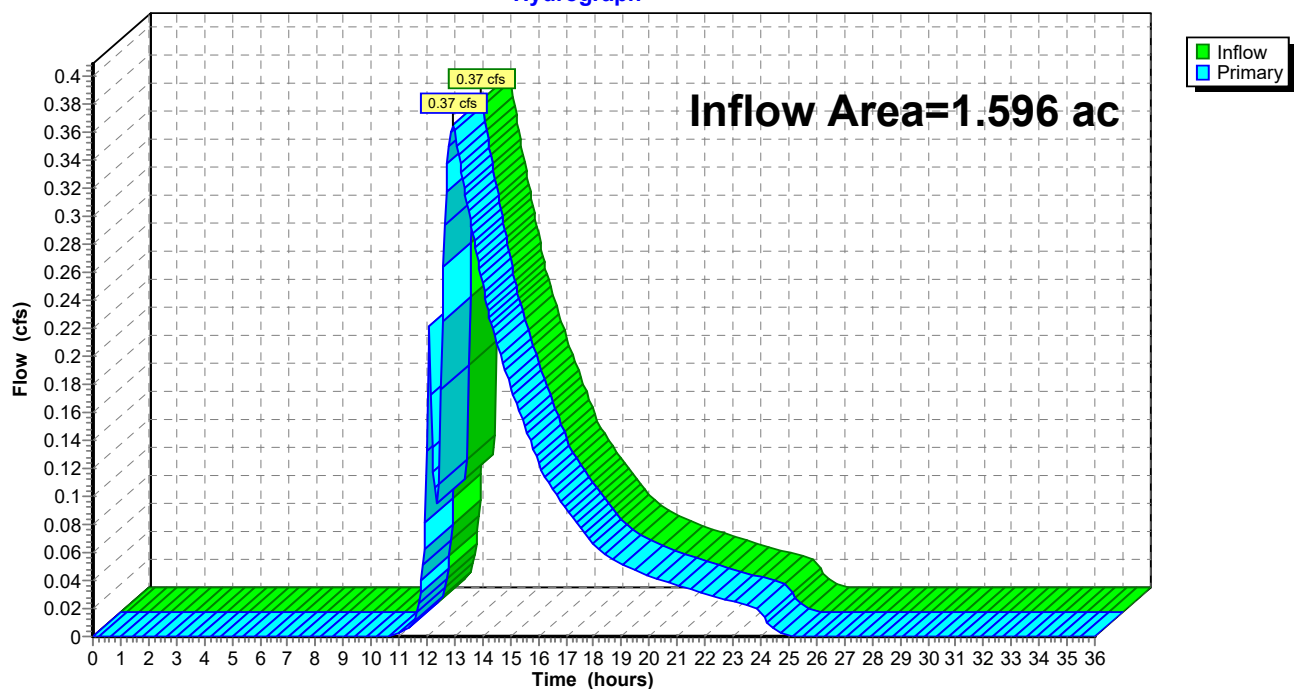
Summary for Link DP-1: Dwight Road

Inflow Area = 1.596 ac, 72.01% Impervious, Inflow Depth = 0.83" for 2-Year event
Inflow = 0.37 cfs @ 12.93 hrs, Volume= 0.111 af
Primary = 0.37 cfs @ 12.93 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road

Hydrograph



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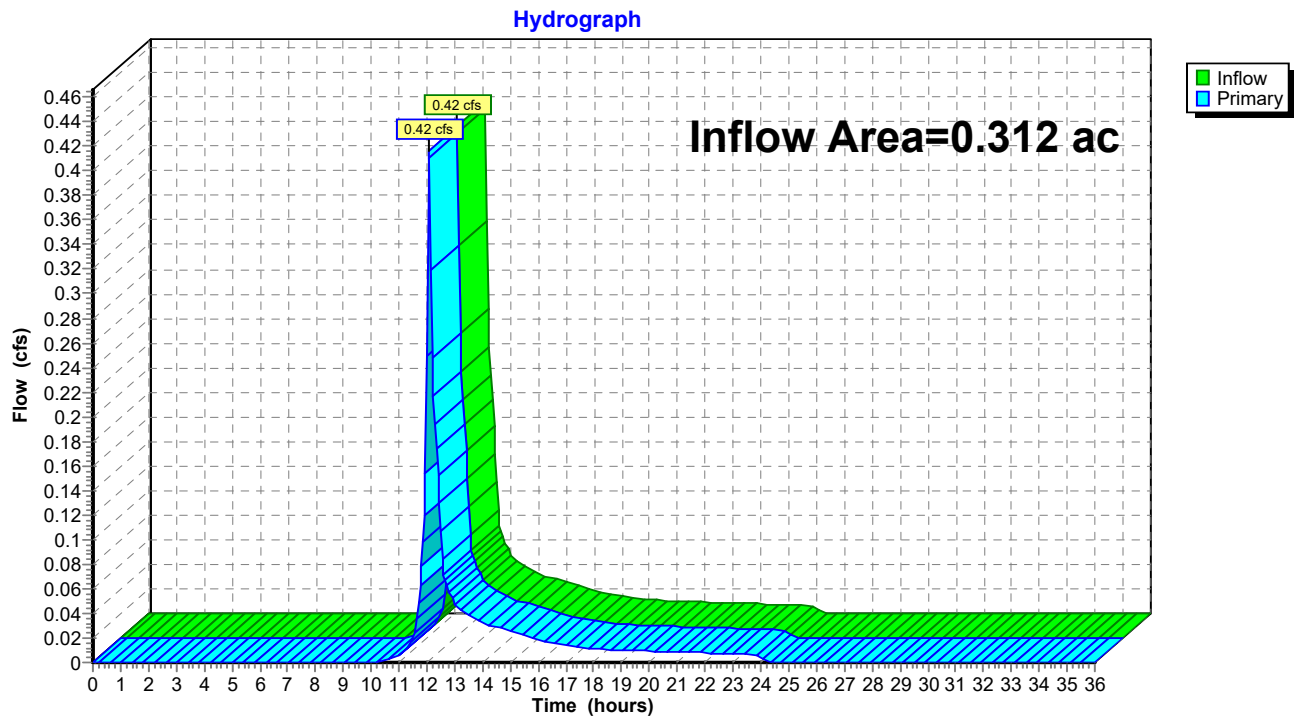
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Summary for Link DP-2: Woods North

Inflow Area = 0.312 ac, 5.91% Impervious, Inflow Depth = 1.18" for 2-Year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 0.031 af
Primary = 0.42 cfs @ 12.09 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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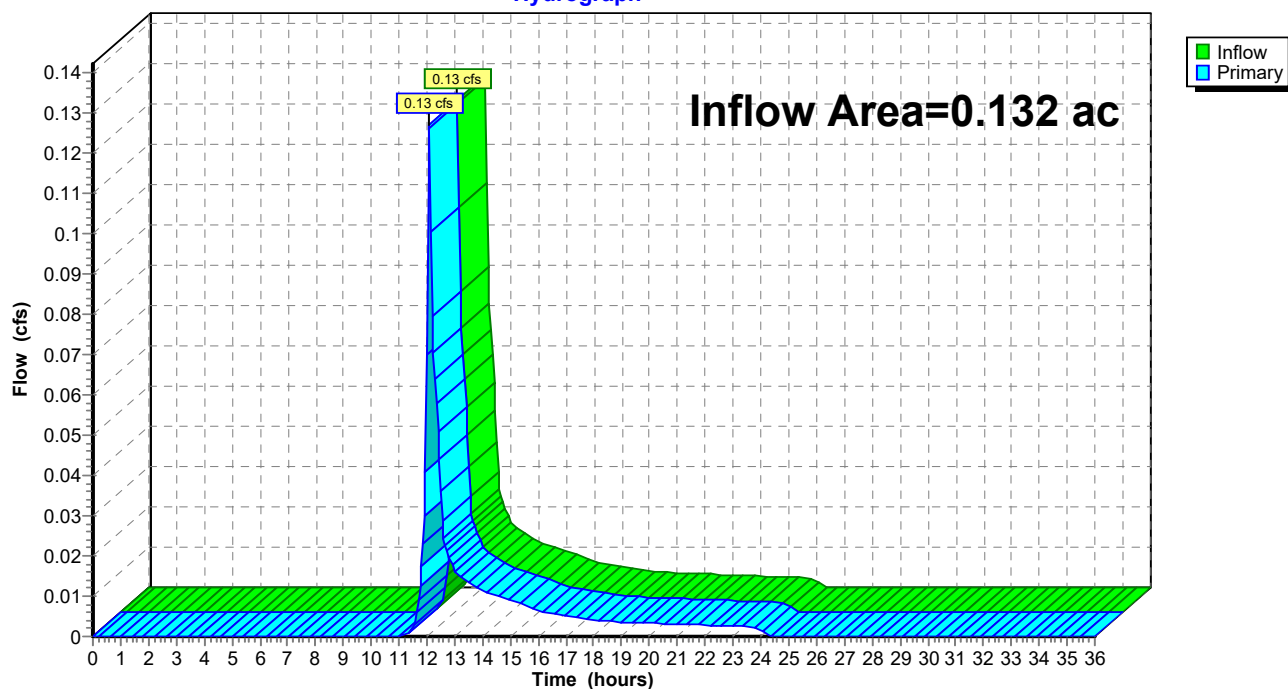
Summary for Link DP-3: Woods East

Inflow Area = 0.132 ac, 0.00% Impervious, Inflow Depth = 0.90" for 2-Year event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af
Primary = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East

Hydrograph



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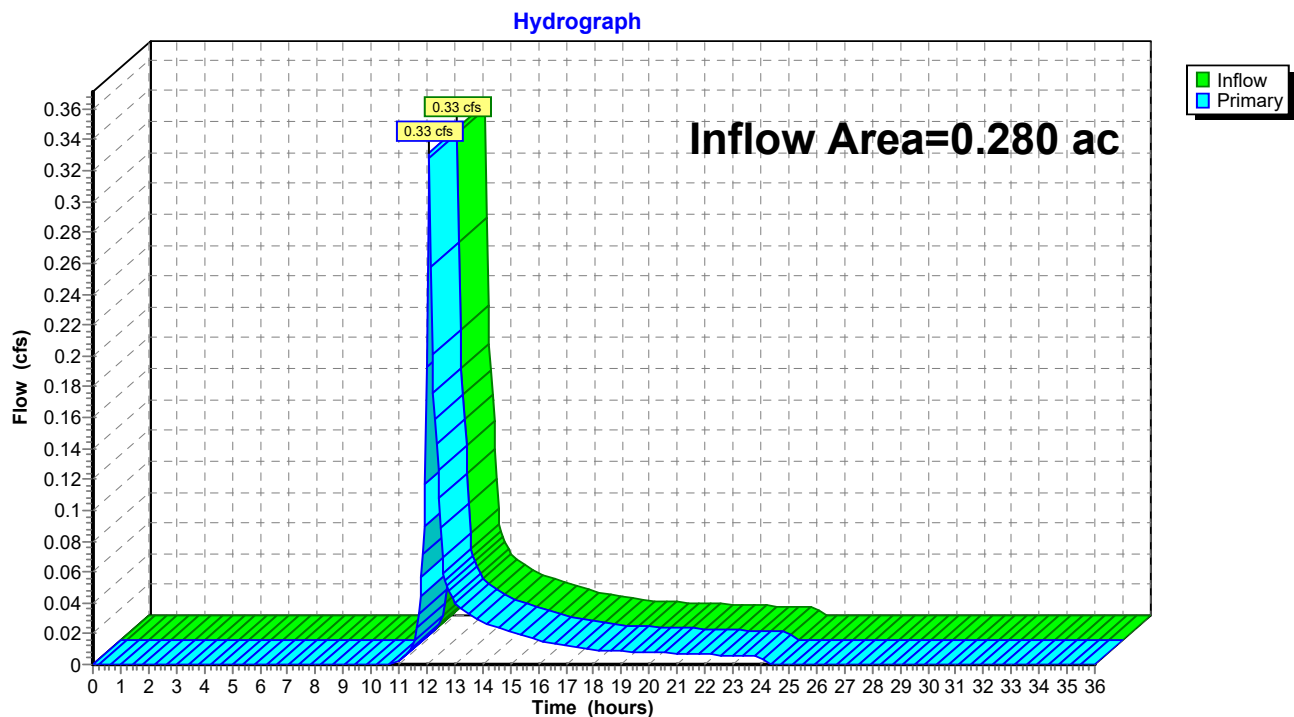
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Summary for Link DP-4: Woods West

Inflow Area = 0.280 ac, 6.50% Impervious, Inflow Depth = 1.06" for 2-Year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 0.025 af
Primary = 0.33 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West



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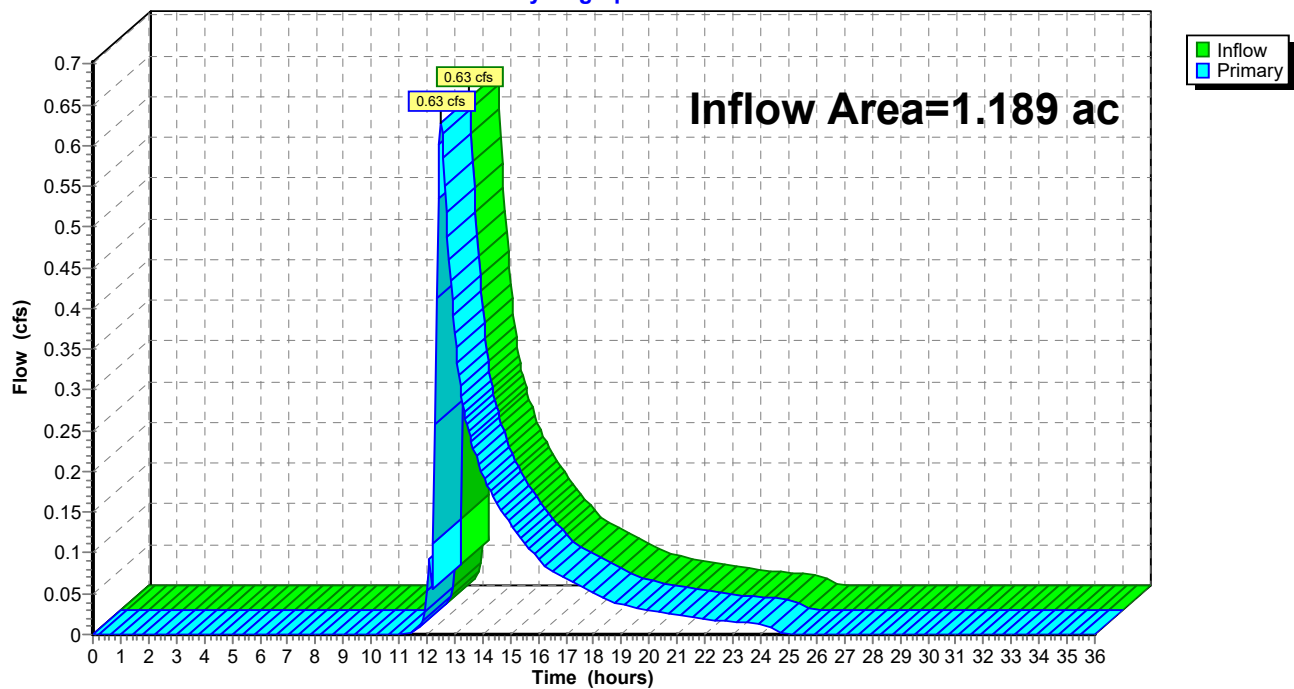
Summary for Link DP-5: Woods South

Inflow Area = 1.189 ac, 82.21% Impervious, Inflow Depth = 1.02" for 2-Year event
Inflow = 0.63 cfs @ 12.51 hrs, Volume= 0.101 af
Primary = 0.63 cfs @ 12.51 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South

Hydrograph



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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Building C Rear Lawn	Runoff Area=7,765 sf 4.70% Impervious Runoff Depth=2.53" Tc=5.0 min CN=74 Runoff=0.53 cfs 0.038 af
Subcatchment1B: Building C	Runoff Area=13,724 sf 91.29% Impervious Runoff Depth=4.74" Tc=5.0 min CN=96 Runoff=1.59 cfs 0.124 af
Subcatchment1C: Entry and Building D	Runoff Area=12,250 sf 68.91% Impervious Runoff Depth=4.19" Tc=5.0 min CN=91 Runoff=1.33 cfs 0.098 af
Subcatchment1D: Building B	Runoff Area=4,139 sf 100.00% Impervious Runoff Depth=4.97" Tc=5.0 min CN=98 Runoff=0.49 cfs 0.039 af
Subcatchment1E: Building D	Runoff Area=7,885 sf 75.14% Impervious Runoff Depth=4.29" Tc=5.0 min CN=92 Runoff=0.87 cfs 0.065 af
Subcatchment1F: Drop-Off Area	Runoff Area=23,758 sf 78.57% Impervious Runoff Depth=4.40" Tc=5.0 min CN=93 Runoff=2.66 cfs 0.200 af
Subcatchment2A: North Lawn	Runoff Area=13,575 sf 5.91% Impervious Runoff Depth=2.62" Tc=5.0 min CN=75 Runoff=0.96 cfs 0.068 af
Subcatchment3A: East Edge	Runoff Area=5,730 sf 0.00% Impervious Runoff Depth=2.19" Tc=5.0 min CN=70 Runoff=0.33 cfs 0.024 af
Subcatchment4A: West Edge	Runoff Area=12,207 sf 6.50% Impervious Runoff Depth=2.45" Tc=5.0 min CN=73 Runoff=0.80 cfs 0.057 af
Subcatchment5A: Building A	Runoff Area=48,155 sf 87.77% Impervious Runoff Depth=4.63" Tc=5.0 min CN=95 Runoff=5.53 cfs 0.426 af
Subcatchment5B: South Edge	Runoff Area=3,642 sf 8.70% Impervious Runoff Depth=2.36" Tc=5.0 min CN=72 Runoff=0.23 cfs 0.016 af
Pond P1: Entry Stormtech System	Peak Elev=238.60' Storage=4,146 cf Inflow=2.68 cfs 0.202 af Discarded=0.01 cfs 0.028 af Primary=0.87 cfs 0.118 af Outflow=0.88 cfs 0.146 af
Pond P2: Building C Stormtech System	Peak Elev=238.29' Storage=2,498 cf Inflow=1.59 cfs 0.124 af Discarded=0.01 cfs 0.019 af Primary=0.69 cfs 0.069 af Outflow=0.70 cfs 0.088 af
Pond P3: Central Site Stormtech System	Peak Elev=238.46' Storage=3,822 cf Inflow=2.66 cfs 0.200 af Discarded=0.01 cfs 0.026 af Primary=1.14 cfs 0.120 af Outflow=1.15 cfs 0.146 af
Pond P4: Building A Stormtech System	Peak Elev=237.95' Storage=8,172 cf Inflow=5.53 cfs 0.426 af Discarded=0.02 cfs 0.065 af Primary=2.26 cfs 0.261 af Outflow=2.28 cfs 0.327 af
Link DP-1: Dwight Road	Inflow=2.93 cfs 0.345 af Primary=2.93 cfs 0.345 af

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Type III 24-hr 10-Year Rainfall=5.21"

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Link DP-2: Woods North

Inflow=0.96 cfs 0.068 af

Primary=0.96 cfs 0.068 af

Link DP-3: Woods East

Inflow=0.33 cfs 0.024 af

Primary=0.33 cfs 0.024 af

Link DP-4: Woods West

Inflow=0.80 cfs 0.057 af

Primary=0.80 cfs 0.057 af

Link DP-5: Woods South

Inflow=2.37 cfs 0.278 af

Primary=2.37 cfs 0.278 af

Total Runoff Area = 3.508 ac Runoff Volume = 1.157 af Average Runoff Depth = 3.96"
38.34% Pervious = 1.345 ac 61.66% Impervious = 2.163 ac

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Summary for Subcatchment 1A: Building C Rear Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

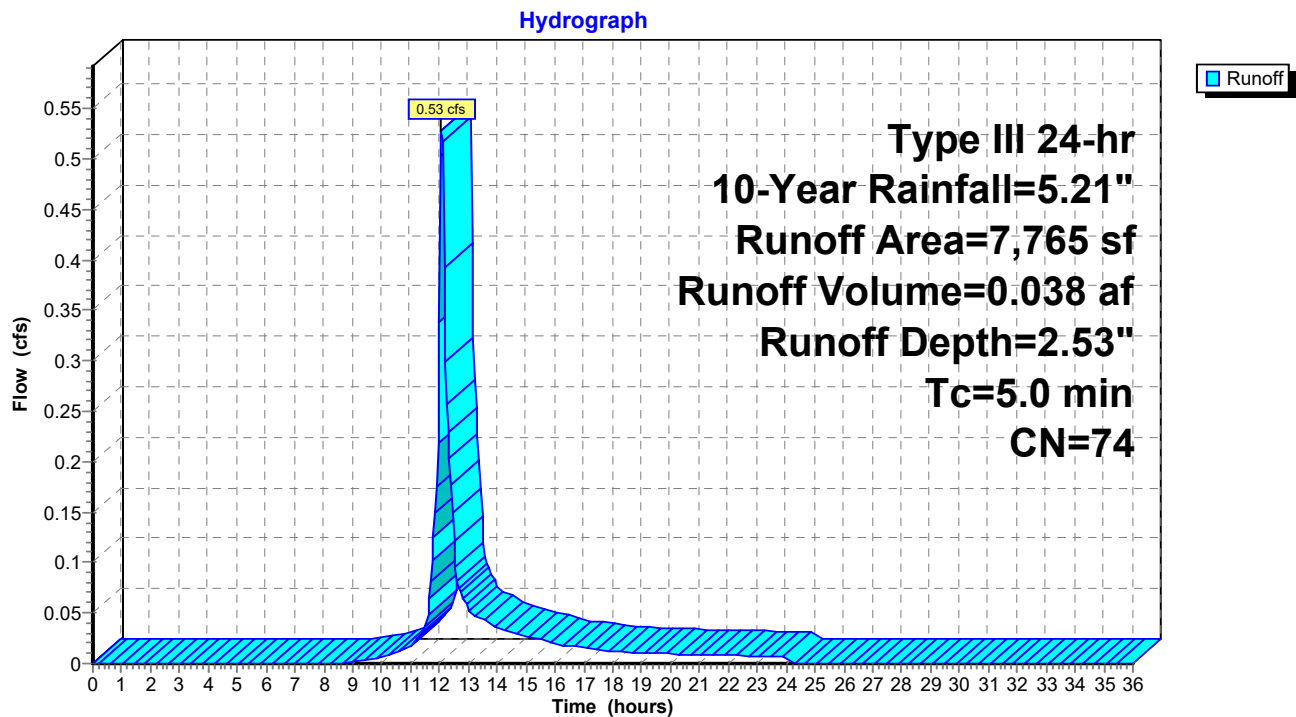
Runoff = 0.53 cfs @ 12.08 hrs, Volume= 0.038 af, Depth= 2.53"
Routed to Link DP-1 : Dwight Road

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=5.21"

Area (sf)	CN	Description
4,494	74	>75% Grass cover, Good, HSG C
365	98	Paved parking, HSG C
2,906	70	Woods, Good, HSG C
* 0	98	Roofs, HSG C
7,765	74	Weighted Average
7,400		95.30% Pervious Area
365		4.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1A: Building C Rear Lawn



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Summary for Subcatchment 1B: Building C

[49] Hint: $T_c < 2dt$ may require smaller dt

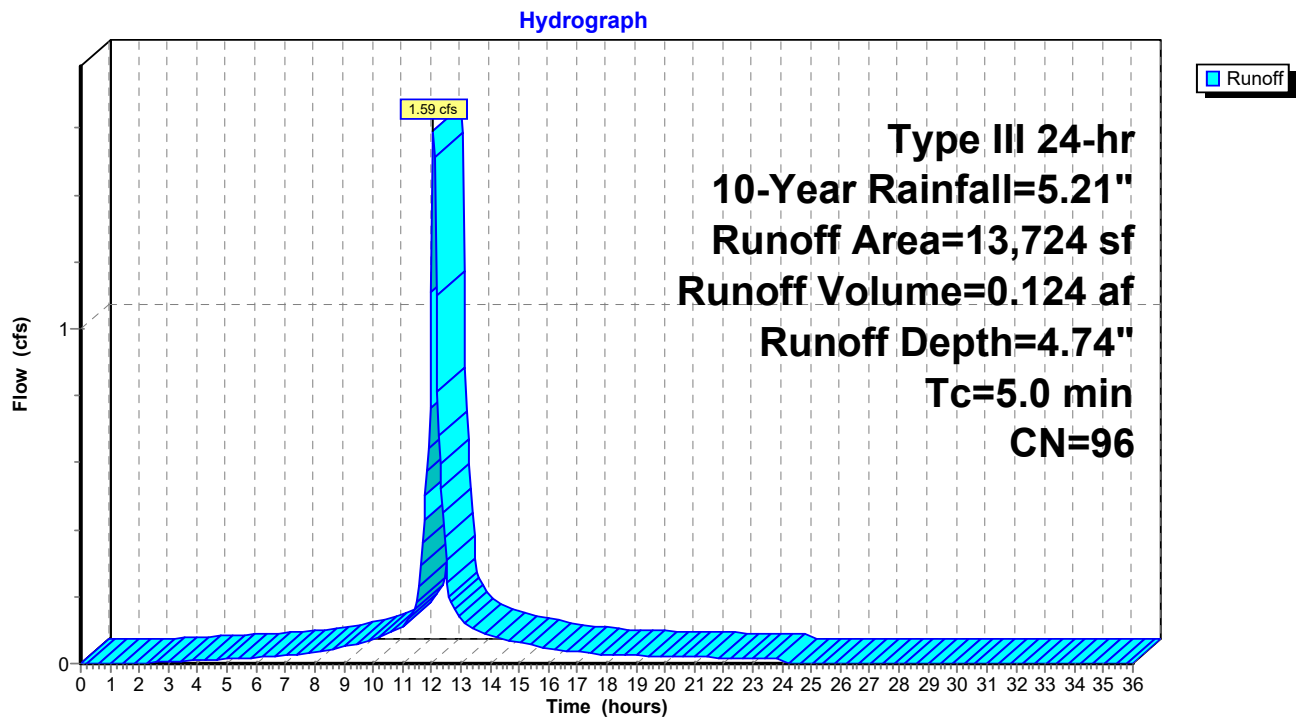
Runoff = 1.59 cfs @ 12.07 hrs, Volume= 0.124 af, Depth= 4.74"
Routed to Pond P2 : Building C Stormtech System

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=5.21"

Area (sf)	CN	Description
1,196	74	>75% Grass cover, Good, HSG C
8,381	98	Paved parking, HSG C
4,147	98	Roofs, HSG C
0	70	Woods, Good, HSG C
13,724	96	Weighted Average
1,196		8.71% Pervious Area
12,528		91.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1B: Building C



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Summary for Subcatchment 1C: Entry and Building D Parking

[49] Hint: $T_c < 2dt$ may require smaller dt

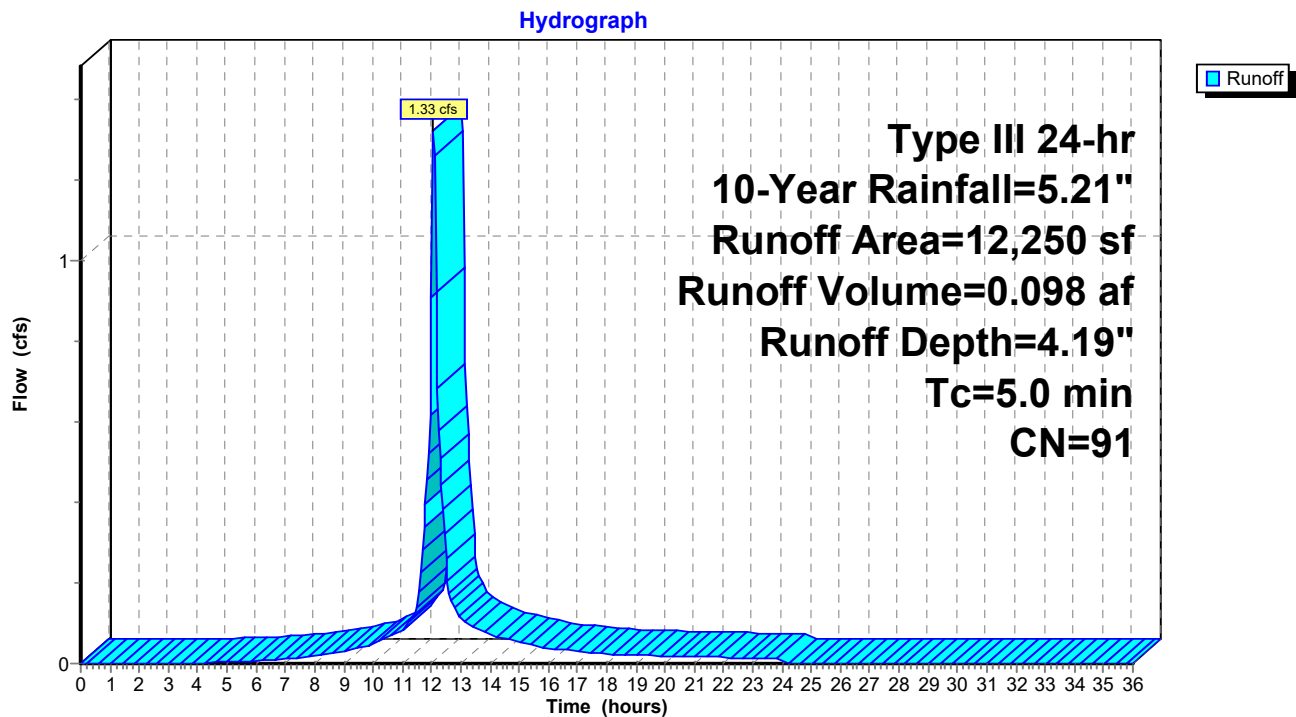
Runoff = 1.33 cfs @ 12.07 hrs, Volume= 0.098 af, Depth= 4.19"
Routed to Pond P1 : Entry Stormtech System

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=5.21"

Area (sf)	CN	Description
3,808	74	>75% Grass cover, Good, HSG C
8,442	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
12,250	91	Weighted Average
3,808		31.09% Pervious Area
8,442		68.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1C: Entry and Building D Parking



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Summary for Subcatchment 1D: Building B

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.49 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 4.97"
Routed to Pond P1 : Entry Stormtech System

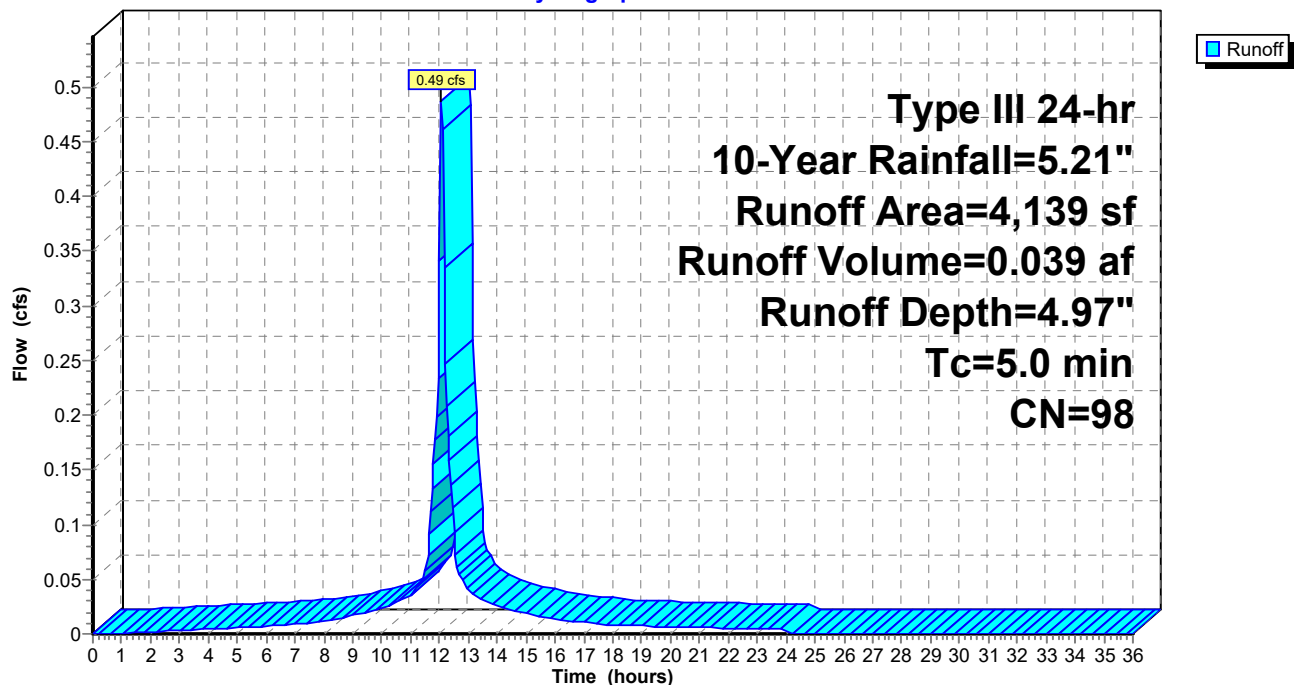
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
4,139	98	Roofs, HSG C
0	70	Woods, Good, HSG C
4,139	98	Weighted Average
4,139		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1D: Building B

Hydrograph



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Summary for Subcatchment 1E: Building D

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.87 cfs @ 12.07 hrs, Volume= 0.065 af, Depth= 4.29"
Routed to Pond P1 : Entry Stormtech System

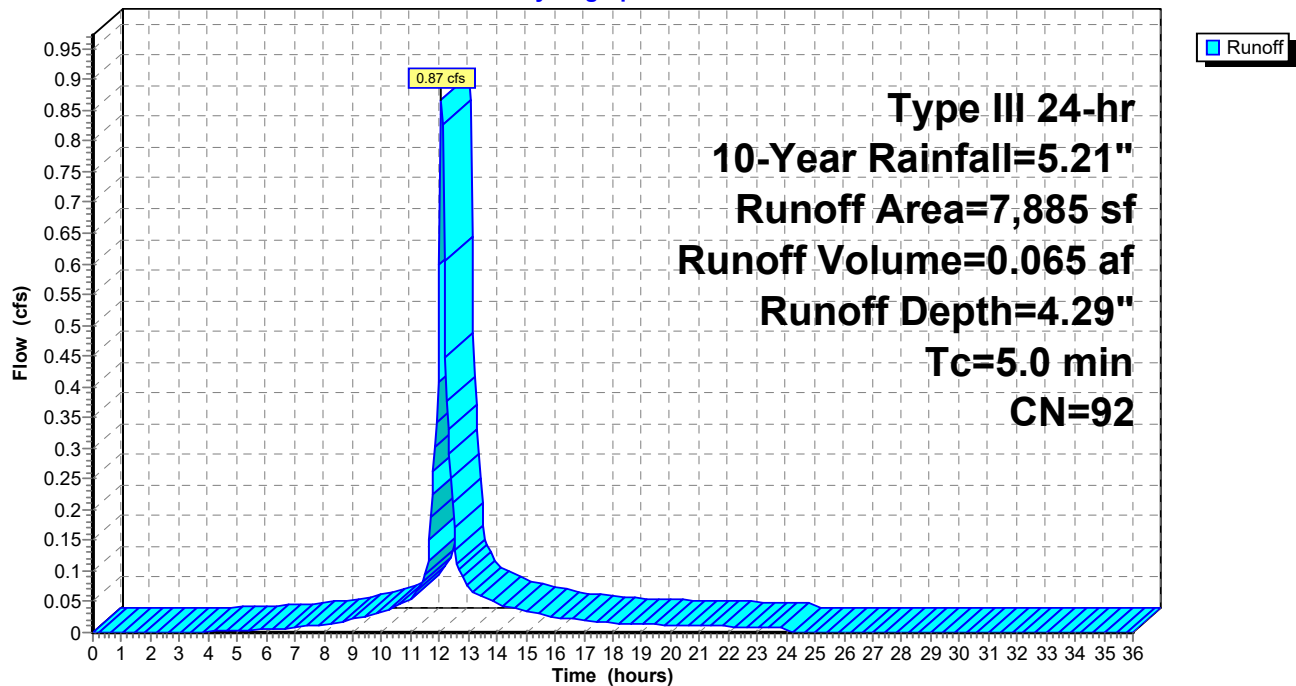
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
1,960	74	>75% Grass cover, Good, HSG C
1,785	98	Paved parking, HSG C
4,140	98	Roofs, HSG C
0	70	Woods, Good, HSG C
7,885	92	Weighted Average
1,960		24.86% Pervious Area
5,925		75.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1E: Building D

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Summary for Subcatchment 1F: Drop-Off Area

[49] Hint: $T_c < 2dt$ may require smaller dt

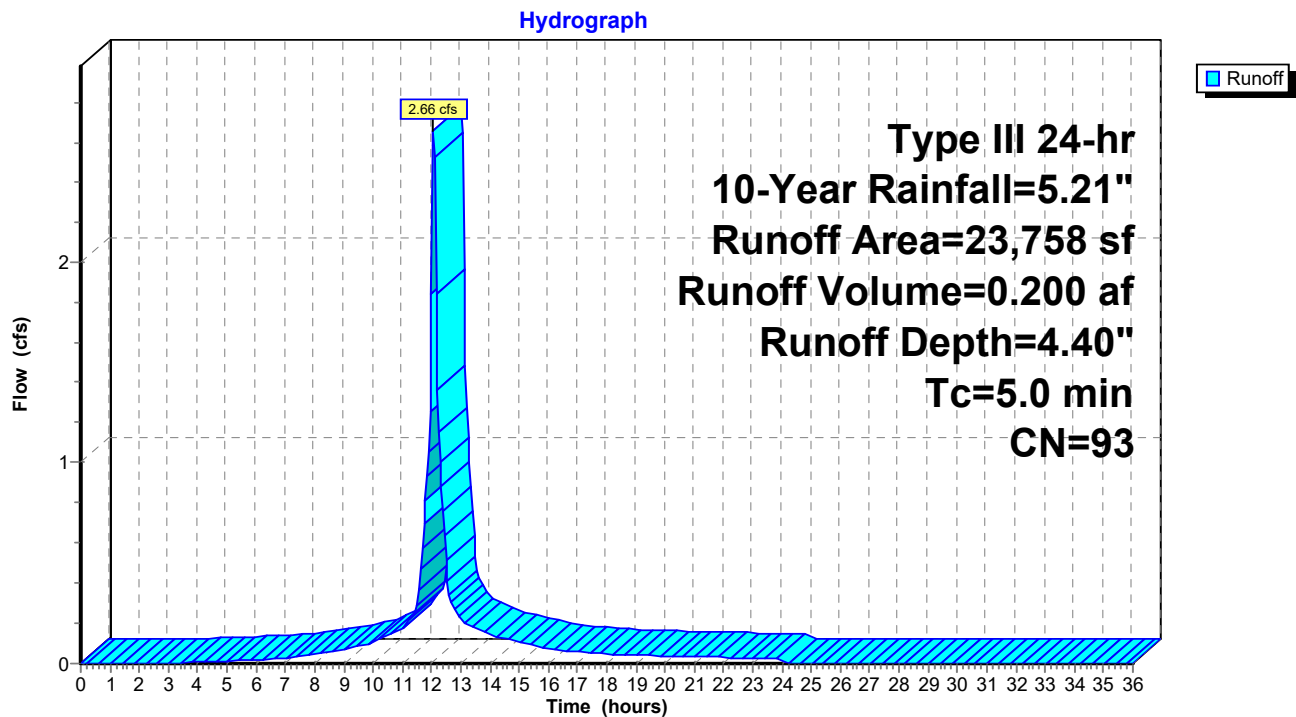
Runoff = 2.66 cfs @ 12.07 hrs, Volume= 0.200 af, Depth= 4.40"
Routed to Pond P3 : Central Site Stormtech System

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=5.21"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
18,666	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
23,758	93	Weighted Average
5,092		21.43% Pervious Area
18,666		78.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1F: Drop-Off Area



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Summary for Subcatchment 2A: North Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

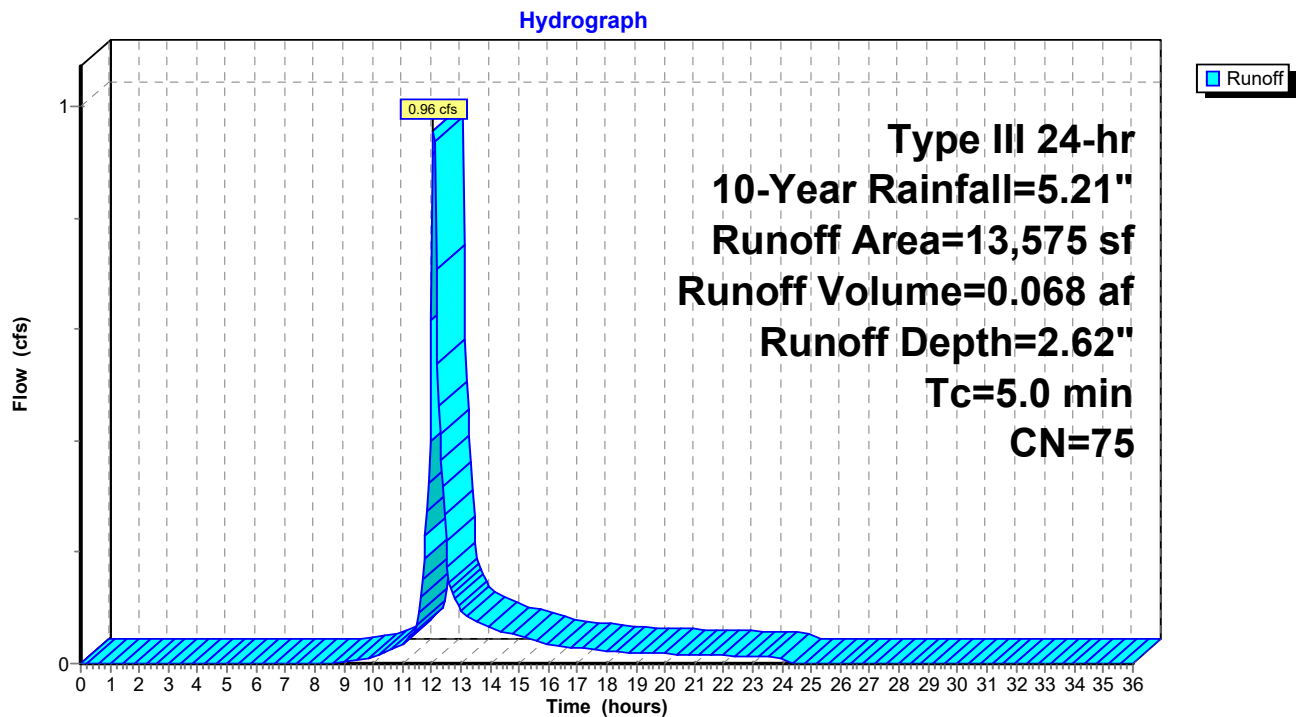
Runoff = 0.96 cfs @ 12.08 hrs, Volume= 0.068 af, Depth= 2.62"
Routed to Link DP-2 : Woods North

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=5.21"

Area (sf)	CN	Description
9,892	74	>75% Grass cover, Good, HSG C
802	98	Paved parking, HSG C
0	98	Roofs, HSG C
2,881	70	Woods, Good, HSG C
13,575	75	Weighted Average
12,773		94.09% Pervious Area
802		5.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 2A: North Lawn



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Summary for Subcatchment 3A: East Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.33 cfs @ 12.08 hrs, Volume= 0.024 af, Depth= 2.19"
Routed to Link DP-3 : Woods East

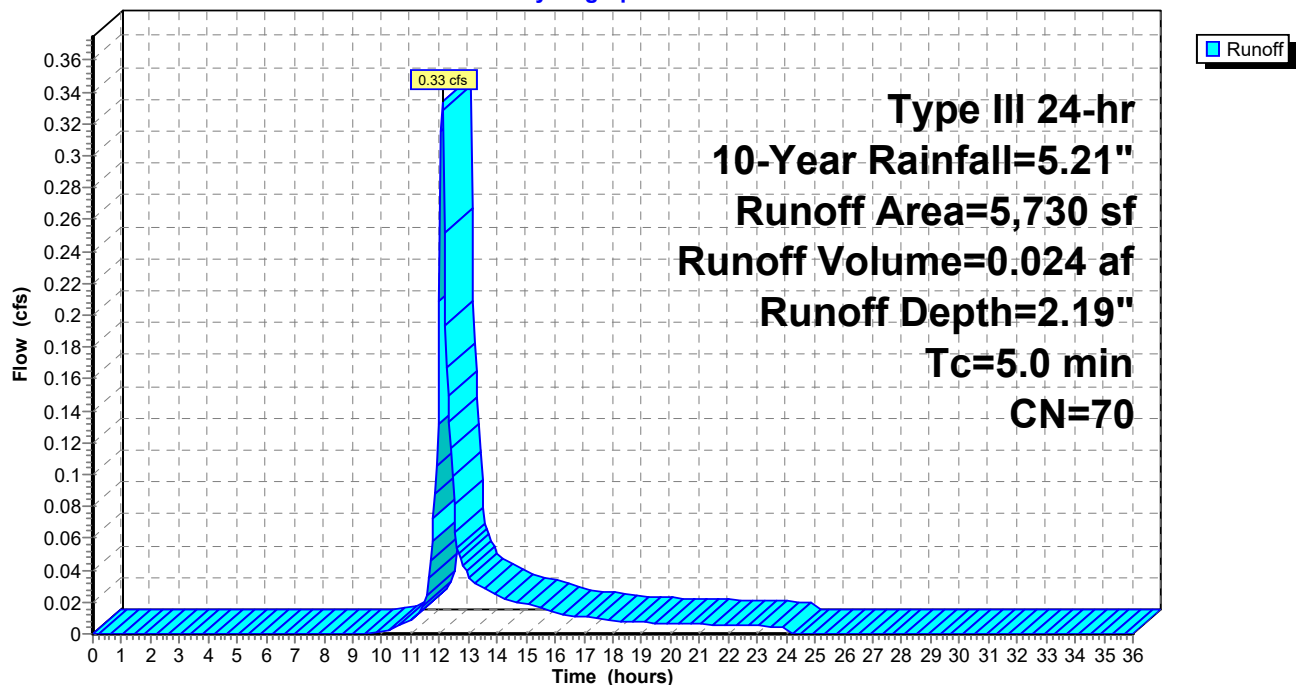
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
0	98	Roofs, HSG C
5,730	70	Woods, Good, HSG C
5,730	70	Weighted Average
5,730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 3A: East Edge

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Summary for Subcatchment 4A: West Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.80 cfs @ 12.08 hrs, Volume= 0.057 af, Depth= 2.45"
Routed to Link DP-4 : Woods West

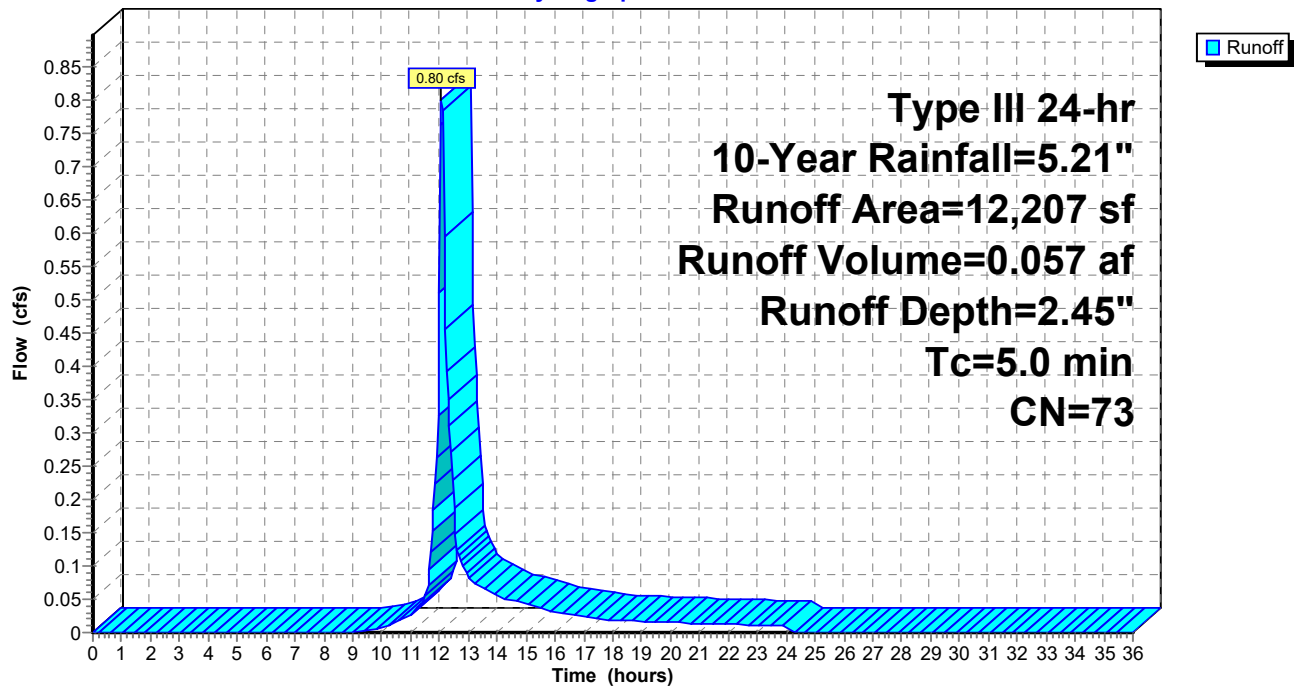
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
3,909	74	>75% Grass cover, Good, HSG C
794	98	Paved parking, HSG C
0	98	Roofs, HSG C
7,504	70	Woods, Good, HSG C
12,207	73	Weighted Average
11,413		93.50% Pervious Area
794		6.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 4A: West Edge

Hydrograph



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Summary for Subcatchment 5A: Building A

[49] Hint: $T_c < 2dt$ may require smaller dt

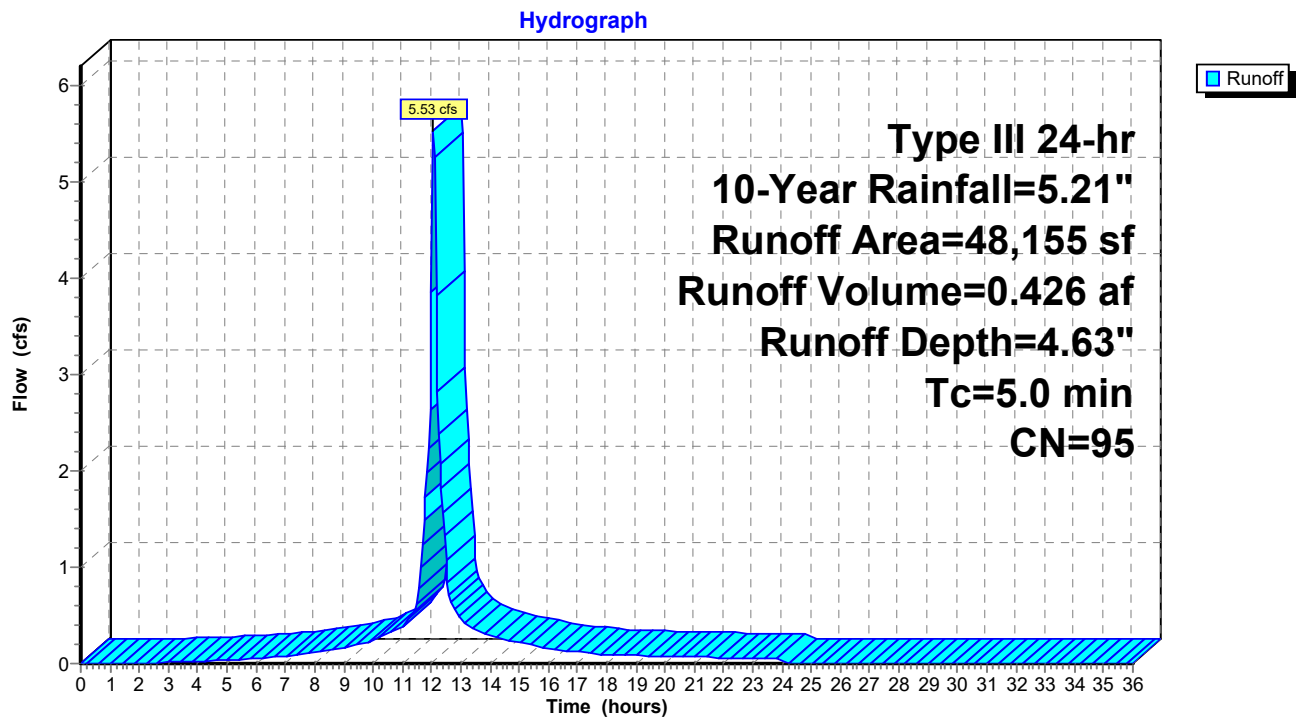
Runoff = 5.53 cfs @ 12.07 hrs, Volume= 0.426 af, Depth= 4.63"
Routed to Pond P4 : Building A Stormtech System

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=5.21"

Area (sf)	CN	Description
5,891	74	>75% Grass cover, Good, HSG C
19,506	98	Paved parking, HSG C
22,758	98	Roofs, HSG C
0	70	Woods, Good, HSG C
48,155	95	Weighted Average
5,891		12.23% Pervious Area
42,264		87.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5A: Building A



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Summary for Subcatchment 5B: South Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.23 cfs @ 12.08 hrs, Volume= 0.016 af, Depth= 2.36"
Routed to Link DP-5 : Woods South

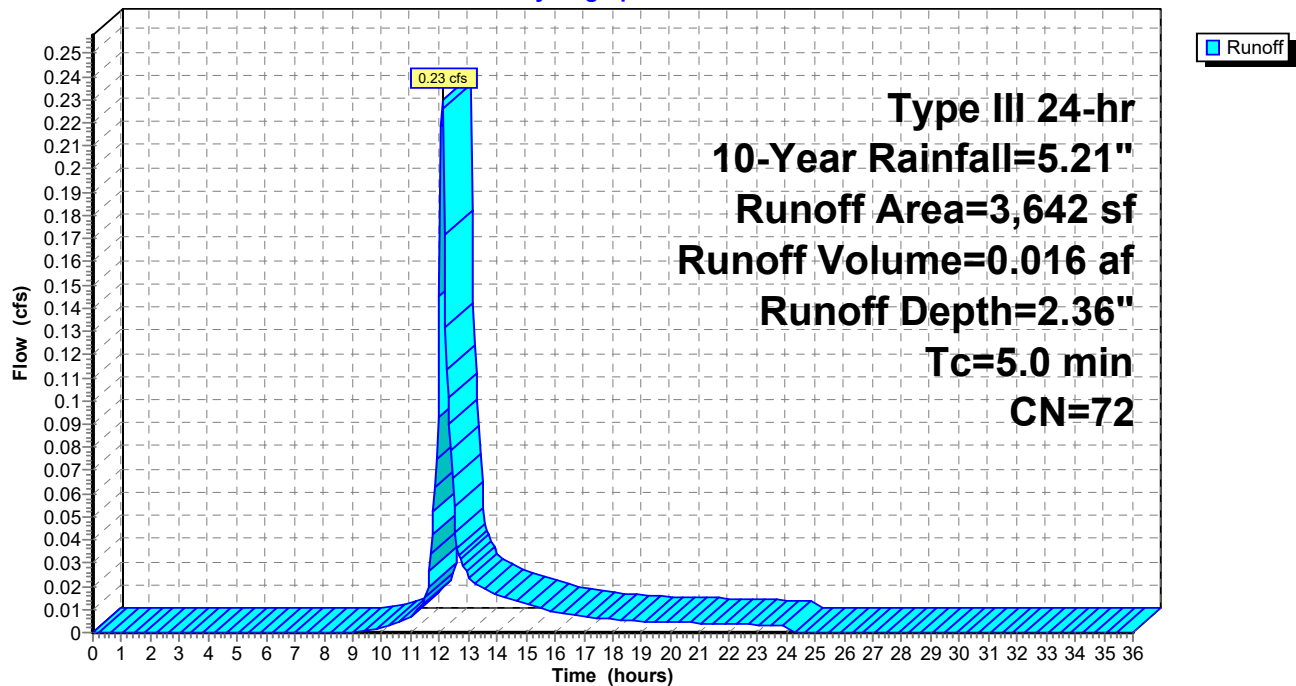
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
317	98	Paved parking, HSG C
0	98	Roofs, HSG C
3,325	70	Woods, Good, HSG C
3,642	72	Weighted Average
3,325		91.30% Pervious Area
317		8.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5B: South Edge

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.21"

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Summary for Pond P1: Entry Stormtech System

Inflow Area = 0.557 ac, 76.24% Impervious, Inflow Depth = 4.36" for 10-Year event
Inflow = 2.68 cfs @ 12.07 hrs, Volume= 0.202 af
Outflow = 0.88 cfs @ 12.36 hrs, Volume= 0.146 af, Atten= 67%, Lag= 17.1 min
Discarded = 0.01 cfs @ 5.60 hrs, Volume= 0.028 af
Primary = 0.87 cfs @ 12.36 hrs, Volume= 0.118 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 238.60' @ 12.36 hrs Surf.Area= 1,672 sf Storage= 4,146 cf

Plug-Flow detention time= 239.8 min calculated for 0.145 af (72% of inflow)
Center-of-Mass det. time= 151.5 min (927.3 - 775.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,399 cf	29.92'W x 55.89'L x 5.50'H Field A 9,196 cf Overall - 3,198 cf Embedded = 5,998 cf x 40.0% Voids
#2A	235.75'	3,198 cf	ADS_StormTech MC-3500 d +Capx 28 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 28 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
5,597 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 5.60 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.87 cfs @ 12.36 hrs HW=238.59' (Free Discharge)

↑ **2=Culvert** (Passes 0.87 cfs of 3.70 cfs potential flow)

↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

↑ **4=Orifice/Grate** (Orifice Controls 0.87 cfs @ 4.42 fps)

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Pond P1: Entry Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

7 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 53.89' Row Length +12.0" End Stone x 2 = 55.89' Base Length

4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

28 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 3,197.9 cf Chamber Storage

9,196.2 cf Field - 3,197.9 cf Chambers = 5,998.4 cf Stone x 40.0% Voids = 2,399.4 cf Stone Storage

Chamber Storage + Stone Storage = 5,597.2 cf = 0.128 af

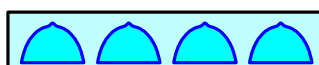
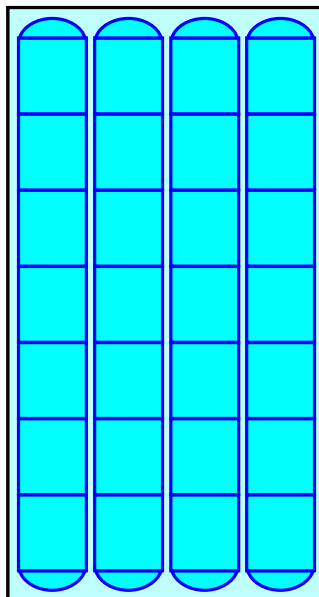
Overall Storage Efficiency = 60.9%

Overall System Size = 55.89' x 29.92' x 5.50'

28 Chambers

340.6 cy Field

222.2 cy Stone



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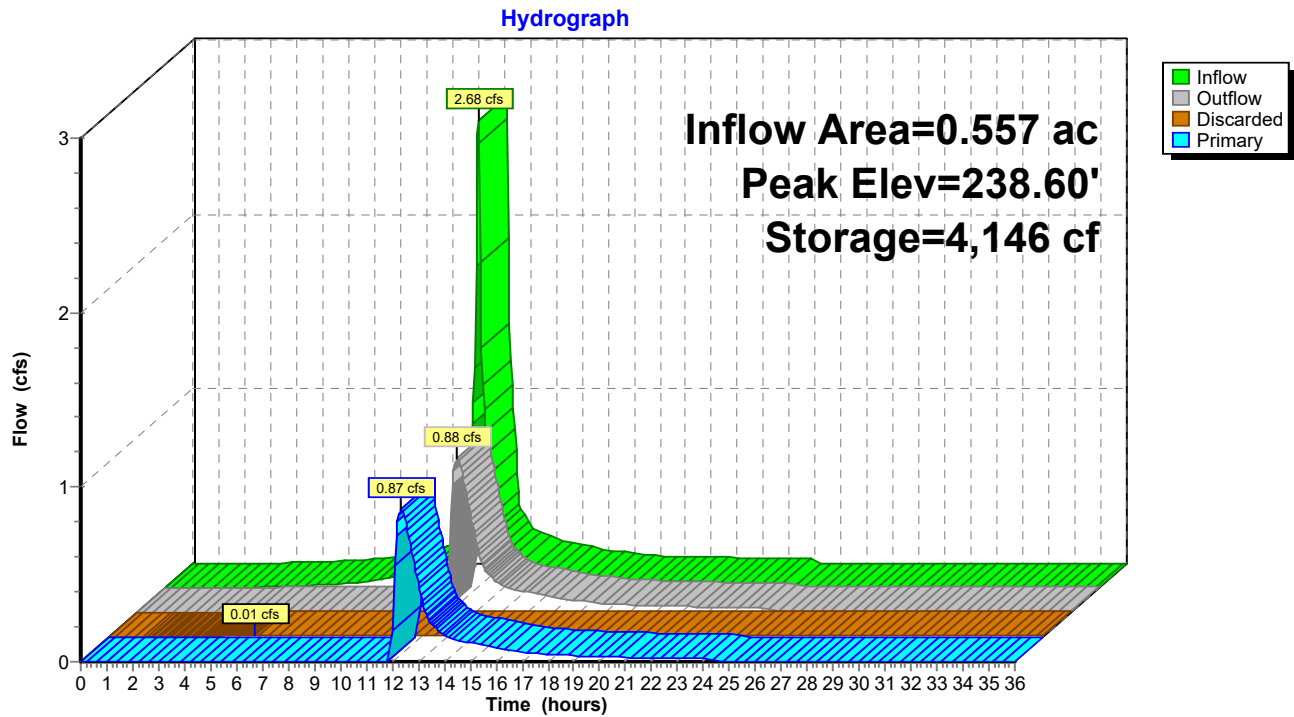
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Pond P1: Entry Stormtech System



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Summary for Pond P2: Building C Stormtech System

Inflow Area = 0.315 ac, 91.29% Impervious, Inflow Depth = 4.74" for 10-Year event
Inflow = 1.59 cfs @ 12.07 hrs, Volume= 0.124 af
Outflow = 0.70 cfs @ 12.25 hrs, Volume= 0.088 af, Atten= 56%, Lag= 10.7 min
Discarded = 0.01 cfs @ 4.35 hrs, Volume= 0.019 af
Primary = 0.69 cfs @ 12.25 hrs, Volume= 0.069 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 238.29' @ 12.25 hrs Surf.Area= 1,108 sf Storage= 2,498 cf

Plug-Flow detention time= 251.6 min calculated for 0.088 af (70% of inflow)
Center-of-Mass det. time= 160.5 min (921.0 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	1,611 cf	22.75'W x 48.72'L x 5.50'H Field A 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	235.75'	2,069 cf	ADS_StormTech MC-3500 d +Capx 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 4.35 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.69 cfs @ 12.25 hrs HW=238.29' (Free Discharge)

↑ **2=Culvert** (Passes 0.00 cfs of 3.51 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
↑ **4=Orifice/Grate** (Orifice Controls 0.69 cfs @ 3.53 fps)

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Pond P2: Building C Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

6 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 46.72' Row Length +12.0" End Stone x 2 = 48.72' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

18 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 2,068.5 cf Chamber Storage

6,096.1 cf Field - 2,068.5 cf Chambers = 4,027.6 cf Stone x 40.0% Voids = 1,611.0 cf Stone Storage

Chamber Storage + Stone Storage = 3,679.6 cf = 0.084 af

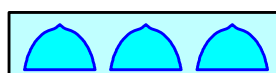
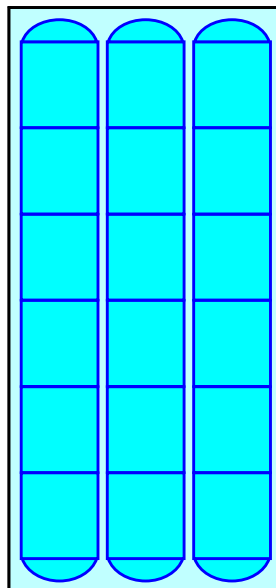
Overall Storage Efficiency = 60.4%

Overall System Size = 48.72' x 22.75' x 5.50'

18 Chambers

225.8 cy Field

149.2 cy Stone



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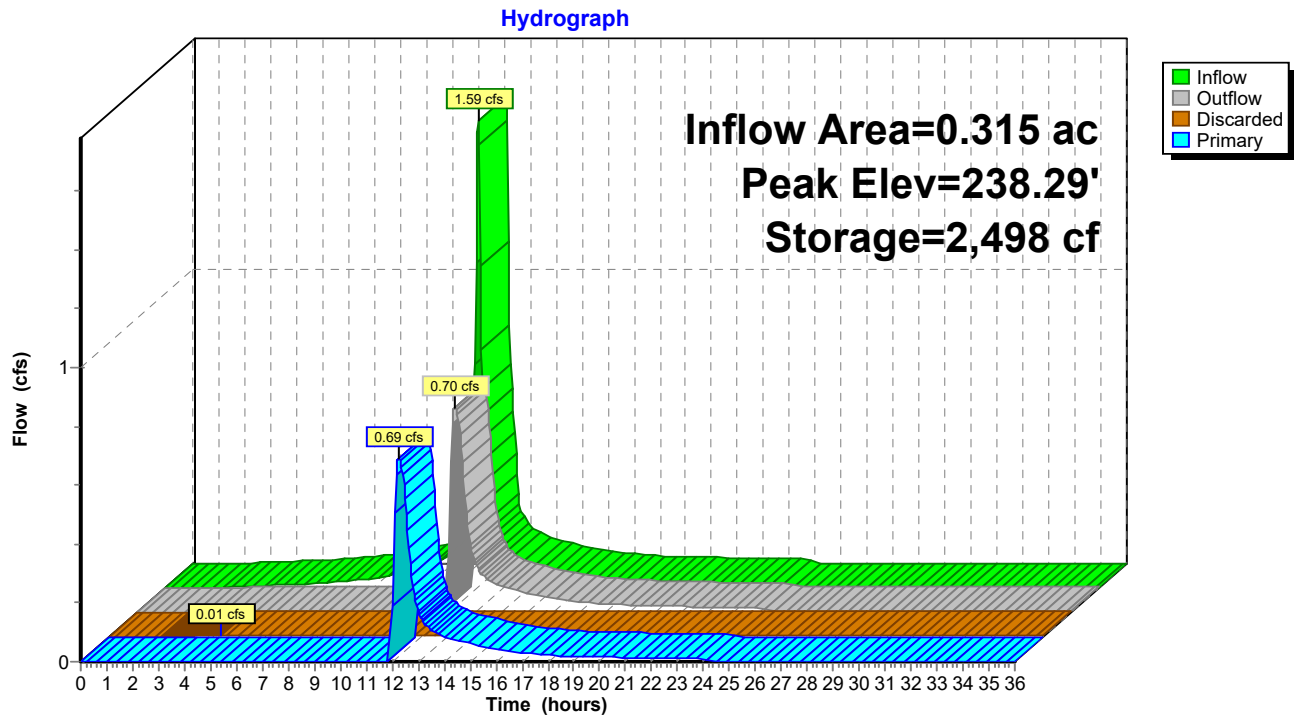
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Pond P2: Building C Stormtech System



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Summary for Pond P3: Central Site Stormtech System

Inflow Area = 0.545 ac, 78.57% Impervious, Inflow Depth = 4.40" for 10-Year event
Inflow = 2.66 cfs @ 12.07 hrs, Volume= 0.200 af
Outflow = 1.15 cfs @ 12.26 hrs, Volume= 0.146 af, Atten= 57%, Lag= 11.1 min
Discarded = 0.01 cfs @ 5.60 hrs, Volume= 0.026 af
Primary = 1.14 cfs @ 12.26 hrs, Volume= 0.120 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 238.46' @ 12.26 hrs Surf.Area= 1,598 sf Storage= 3,822 cf

Plug-Flow detention time= 228.0 min calculated for 0.146 af (73% of inflow)
Center-of-Mass det. time= 140.5 min (916.6 - 776.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,292 cf	22.75'W x 70.23'L x 5.50'H Field A 8,788 cf Overall - 3,058 cf Embedded = 5,729 cf x 40.0% Voids
#2A	235.75'	3,058 cf	ADS_StormTech MC-3500 d +Capx 27 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 27 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		5,350 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 5.60 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.14 cfs @ 12.26 hrs HW=238.46' (Free Discharge)

↑ **2=Culvert** (Passes 0.00 cfs of 5.13 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
↑ **4=Orifice/Grate** (Orifice Controls 1.14 cfs @ 4.17 fps)

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Pond P3: Central Site Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

9 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 68.23' Row Length +12.0" End Stone x 2 = 70.23' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

27 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,058.1 cf Chamber Storage

8,787.5 cf Field - 3,058.1 cf Chambers = 5,729.4 cf Stone x 40.0% Voids = 2,291.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,349.9 cf = 0.123 af

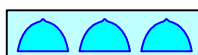
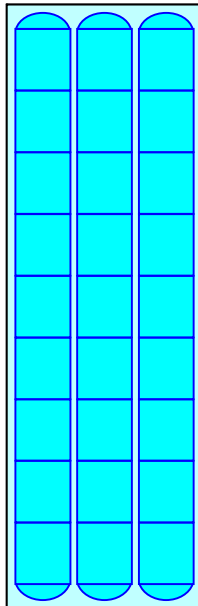
Overall Storage Efficiency = 60.9%

Overall System Size = 70.23' x 22.75' x 5.50'

27 Chambers

325.5 cy Field

212.2 cy Stone



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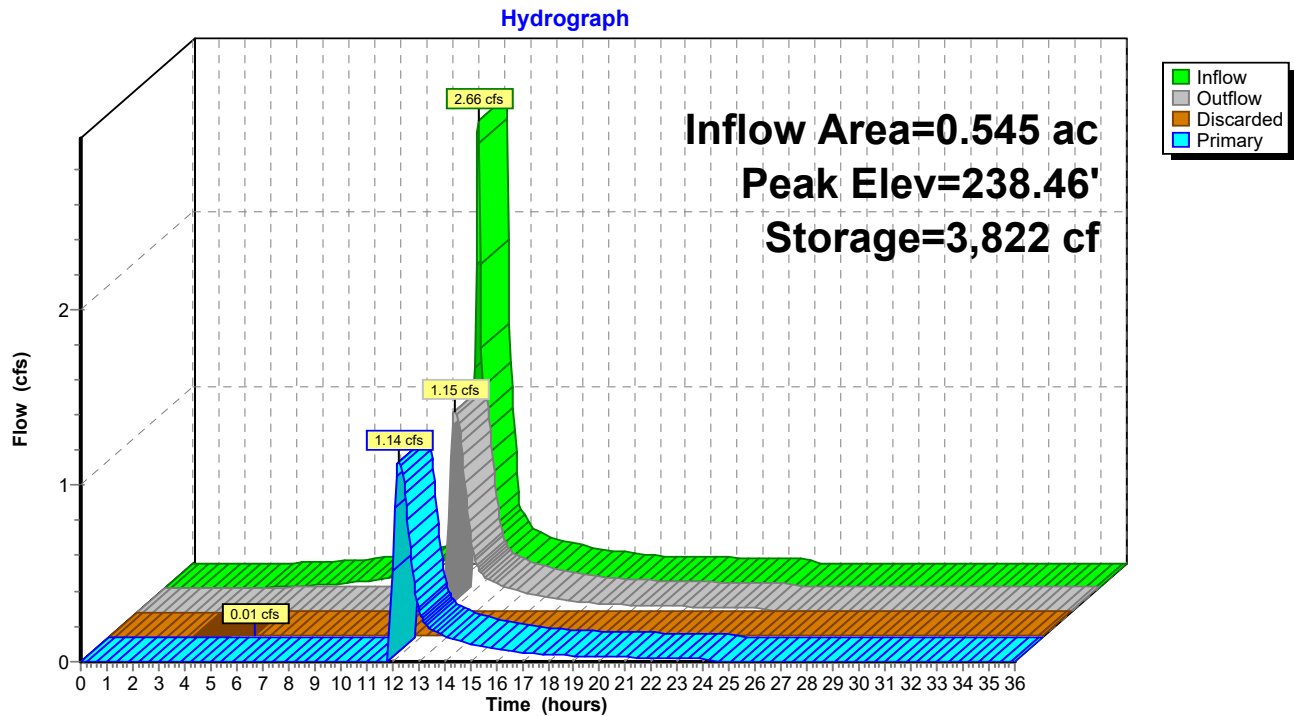
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Pond P3: Central Site Stormtech System



Summary for Pond P4: Building A Stormtech System

Inflow Area = 1.105 ac, 87.77% Impervious, Inflow Depth = 4.63" for 10-Year event
 Inflow = 5.53 cfs @ 12.07 hrs, Volume= 0.426 af
 Outflow = 2.28 cfs @ 12.27 hrs, Volume= 0.327 af, Atten= 59%, Lag= 11.8 min
 Discarded = 0.02 cfs @ 4.95 hrs, Volume= 0.065 af
 Primary = 2.26 cfs @ 12.27 hrs, Volume= 0.261 af
 Routed to Link DP-5 : Woods South

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 237.95' @ 12.27 hrs Surf.Area= 3,934 sf Storage= 8,172 cf

Plug-Flow detention time= 230.6 min calculated for 0.327 af (77% of inflow)
 Center-of-Mass det. time= 148.4 min (914.6 - 766.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	5,516 cf	37.08'W x 106.08'L x 5.50'H Field A 21,636 cf Overall - 7,846 cf Embedded = 13,790 cf x 40.0% Voids
#2A	235.75'	7,846 cf	ADS_StormTech MC-3500 d +Capx 70 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 70 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		13,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	8.0" Round Culvert X 4.00 L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 ' /' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir X 2.00 2 End Contraction(s)
#4	Primary	237.00'	5.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 4.95 hrs HW=235.06' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.26 cfs @ 12.27 hrs HW=237.95' (Free Discharge)
 ↑ **2=Culvert** (Passes 0.00 cfs of 8.58 cfs potential flow)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Orifice/Grate** (Orifice Controls 2.26 cfs @ 4.14 fps)

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Pond P4: Building A Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

70 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 7,845.6 cf Chamber Storage

21,635.9 cf Field - 7,845.6 cf Chambers = 13,790.3 cf Stone x 40.0% Voids = 5,516.1 cf Stone Storage

Chamber Storage + Stone Storage = 13,361.7 cf = 0.307 af

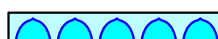
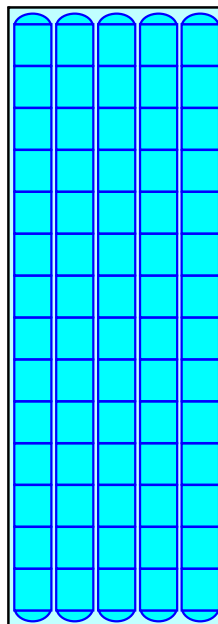
Overall Storage Efficiency = 61.8%

Overall System Size = 106.08' x 37.08' x 5.50'

70 Chambers

801.3 cy Field

510.8 cy Stone



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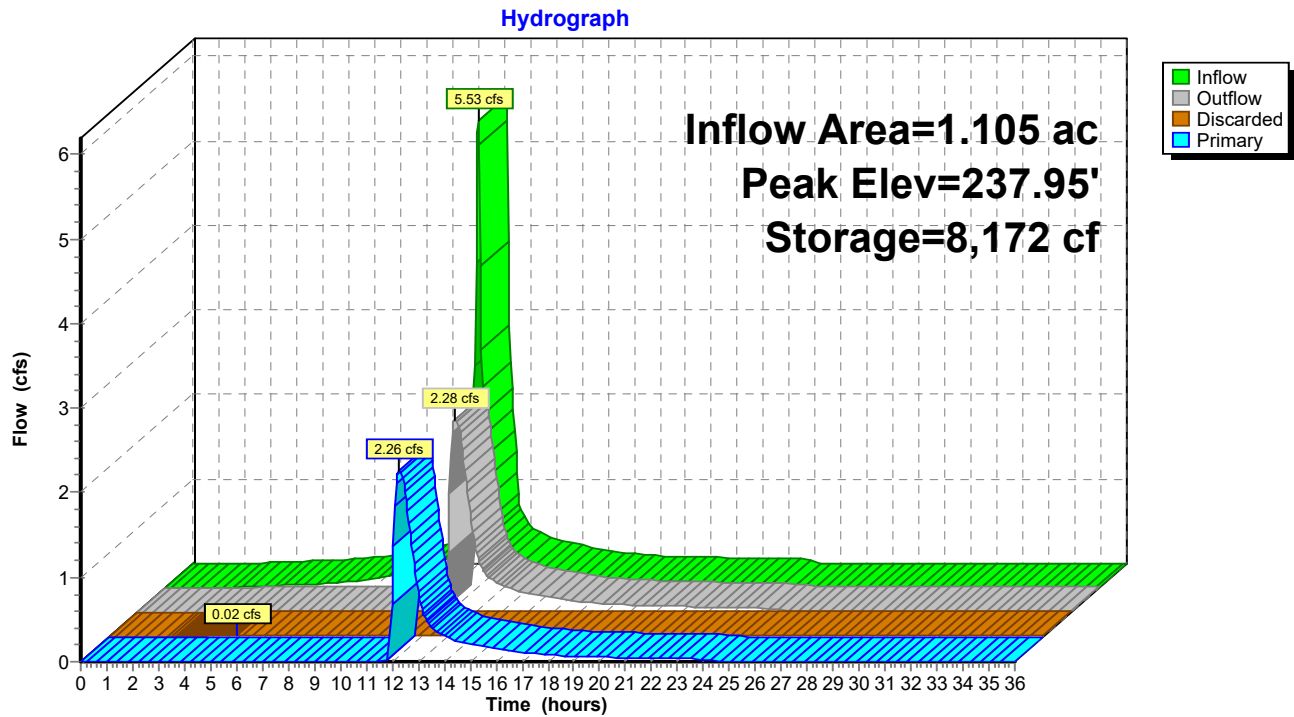
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Pond P4: Building A Stormtech System



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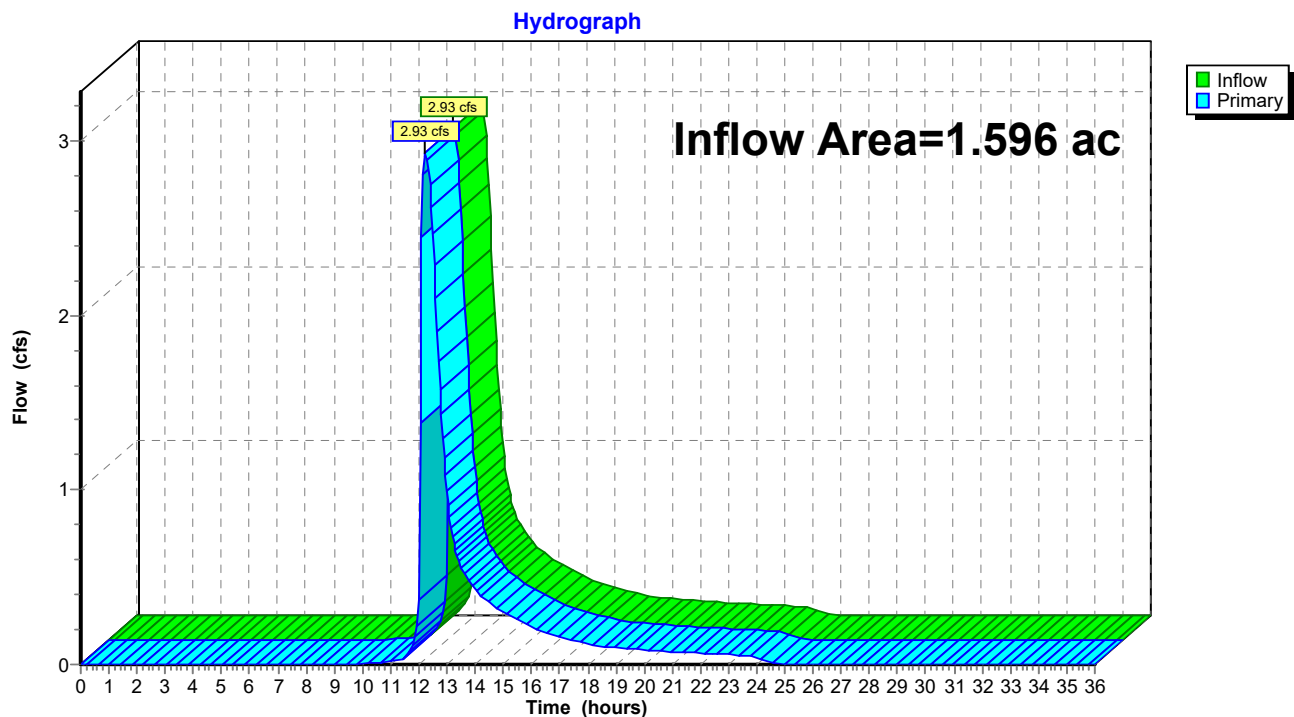
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Summary for Link DP-1: Dwight Road

Inflow Area = 1.596 ac, 72.01% Impervious, Inflow Depth = 2.59" for 10-Year event
Inflow = 2.93 cfs @ 12.25 hrs, Volume= 0.345 af
Primary = 2.93 cfs @ 12.25 hrs, Volume= 0.345 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road



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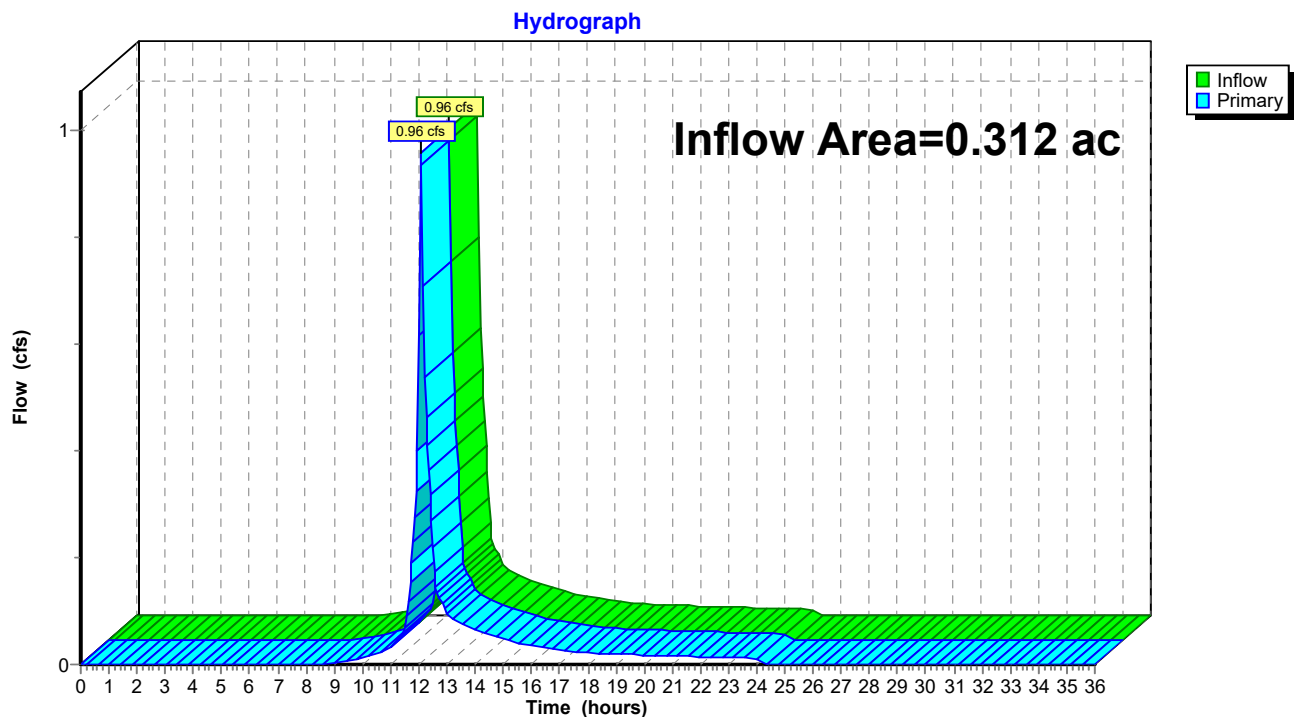
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Summary for Link DP-2: Woods North

Inflow Area = 0.312 ac, 5.91% Impervious, Inflow Depth = 2.62" for 10-Year event
Inflow = 0.96 cfs @ 12.08 hrs, Volume= 0.068 af
Primary = 0.96 cfs @ 12.08 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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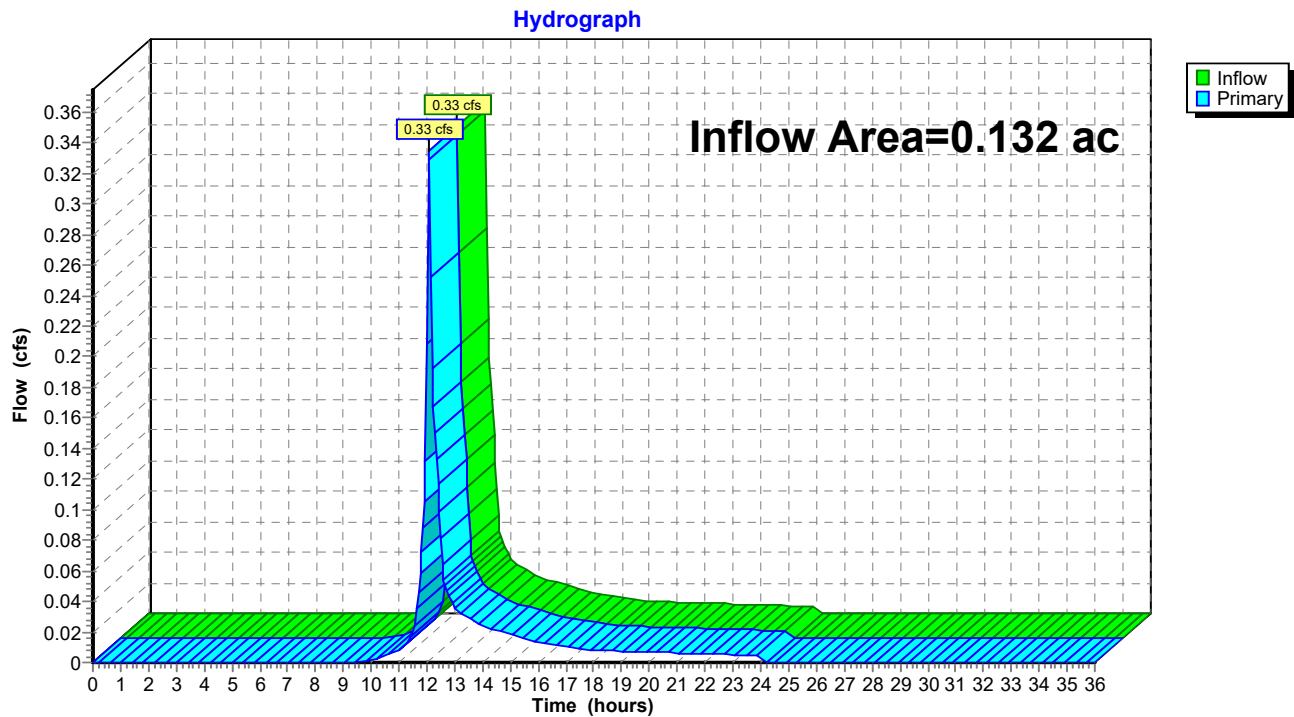
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Summary for Link DP-3: Woods East

Inflow Area = 0.132 ac, 0.00% Impervious, Inflow Depth = 2.19" for 10-Year event
Inflow = 0.33 cfs @ 12.08 hrs, Volume= 0.024 af
Primary = 0.33 cfs @ 12.08 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East



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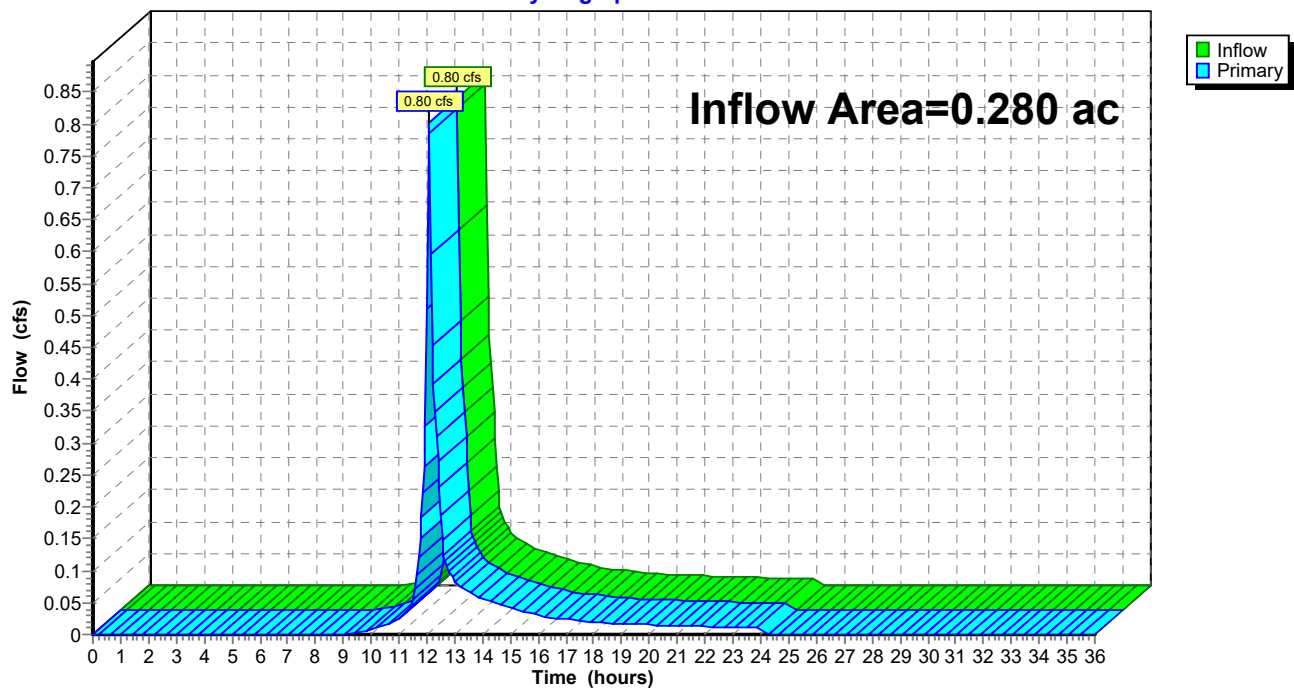
Summary for Link DP-4: Woods West

Inflow Area = 0.280 ac, 6.50% Impervious, Inflow Depth = 2.45" for 10-Year event
Inflow = 0.80 cfs @ 12.08 hrs, Volume= 0.057 af
Primary = 0.80 cfs @ 12.08 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West

Hydrograph



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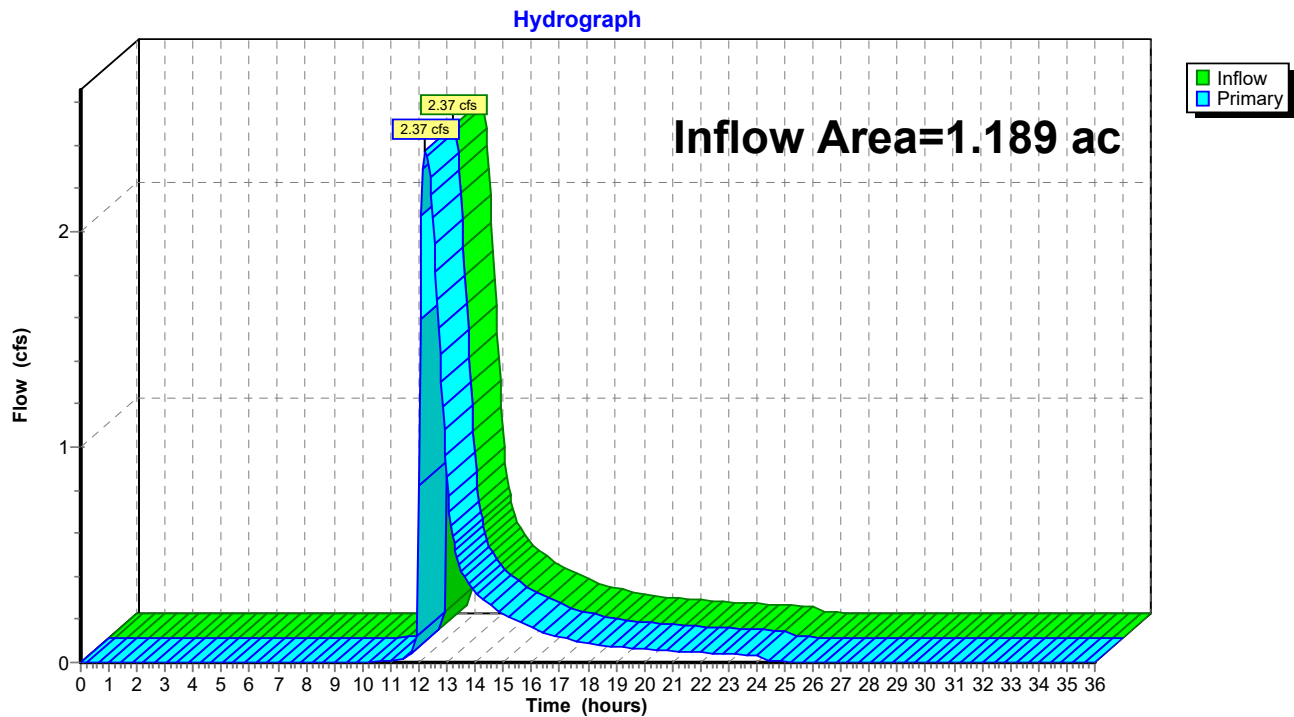
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Summary for Link DP-5: Woods South

Inflow Area = 1.189 ac, 82.21% Impervious, Inflow Depth = 2.80" for 10-Year event
Inflow = 2.37 cfs @ 12.25 hrs, Volume= 0.278 af
Primary = 2.37 cfs @ 12.25 hrs, Volume= 0.278 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South



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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Building C Rear Lawn	Runoff Area=7,765 sf 4.70% Impervious Runoff Depth=3.51" Tc=5.0 min CN=74 Runoff=0.73 cfs 0.052 af
Subcatchment1B: Building C	Runoff Area=13,724 sf 91.29% Impervious Runoff Depth=5.91" Tc=5.0 min CN=96 Runoff=1.96 cfs 0.155 af
Subcatchment1C: Entry and Building D	Runoff Area=12,250 sf 68.91% Impervious Runoff Depth=5.33" Tc=5.0 min CN=91 Runoff=1.67 cfs 0.125 af
Subcatchment1D: Building B	Runoff Area=4,139 sf 100.00% Impervious Runoff Depth=6.14" Tc=5.0 min CN=98 Runoff=0.60 cfs 0.049 af
Subcatchment1E: Building D	Runoff Area=7,885 sf 75.14% Impervious Runoff Depth=5.44" Tc=5.0 min CN=92 Runoff=1.09 cfs 0.082 af
Subcatchment1F: Drop-Off Area	Runoff Area=23,758 sf 78.57% Impervious Runoff Depth=5.56" Tc=5.0 min CN=93 Runoff=3.31 cfs 0.253 af
Subcatchment2A: North Lawn	Runoff Area=13,575 sf 5.91% Impervious Runoff Depth=3.61" Tc=5.0 min CN=75 Runoff=1.32 cfs 0.094 af
Subcatchment3A: East Edge	Runoff Area=5,730 sf 0.00% Impervious Runoff Depth=3.11" Tc=5.0 min CN=70 Runoff=0.48 cfs 0.034 af
Subcatchment4A: West Edge	Runoff Area=12,207 sf 6.50% Impervious Runoff Depth=3.41" Tc=5.0 min CN=73 Runoff=1.12 cfs 0.080 af
Subcatchment5A: Building A	Runoff Area=48,155 sf 87.77% Impervious Runoff Depth=5.79" Tc=5.0 min CN=95 Runoff=6.83 cfs 0.533 af
Subcatchment5B: South Edge	Runoff Area=3,642 sf 8.70% Impervious Runoff Depth=3.31" Tc=5.0 min CN=72 Runoff=0.32 cfs 0.023 af
Pond P1: Entry Stormtech System	Peak Elev=239.16' Storage=4,685 cf Inflow=3.35 cfs 0.256 af Discarded=0.01 cfs 0.028 af Primary=1.98 cfs 0.171 af Outflow=1.99 cfs 0.199 af
Pond P2: Building C Stormtech System	Peak Elev=238.80' Storage=2,857 cf Inflow=1.96 cfs 0.155 af Discarded=0.01 cfs 0.019 af Primary=0.97 cfs 0.099 af Outflow=0.97 cfs 0.118 af
Pond P3: Central Site Stormtech System	Peak Elev=239.08' Storage=4,413 cf Inflow=3.31 cfs 0.253 af Discarded=0.01 cfs 0.027 af Primary=1.83 cfs 0.172 af Outflow=1.84 cfs 0.199 af
Pond P4: Building A Stormtech System	Peak Elev=238.43' Storage=9,509 cf Inflow=6.83 cfs 0.533 af Discarded=0.02 cfs 0.067 af Primary=2.91 cfs 0.367 af Outflow=2.93 cfs 0.433 af
Link DP-1: Dwight Road	Inflow=5.18 cfs 0.494 af Primary=5.18 cfs 0.494 af

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Link DP-2: Woods North

Inflow=1.32 cfs 0.094 af

Primary=1.32 cfs 0.094 af

Link DP-3: Woods East

Inflow=0.48 cfs 0.034 af

Primary=0.48 cfs 0.034 af

Link DP-4: Woods West

Inflow=1.12 cfs 0.080 af

Primary=1.12 cfs 0.080 af

Link DP-5: Woods South

Inflow=3.07 cfs 0.390 af

Primary=3.07 cfs 0.390 af

Total Runoff Area = 3.508 ac Runoff Volume = 1.479 af Average Runoff Depth = 5.06"
38.34% Pervious = 1.345 ac 61.66% Impervious = 2.163 ac

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Summary for Subcatchment 1A: Building C Rear Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.73 cfs @ 12.08 hrs, Volume= 0.052 af, Depth= 3.51"
Routed to Link DP-1 : Dwight Road

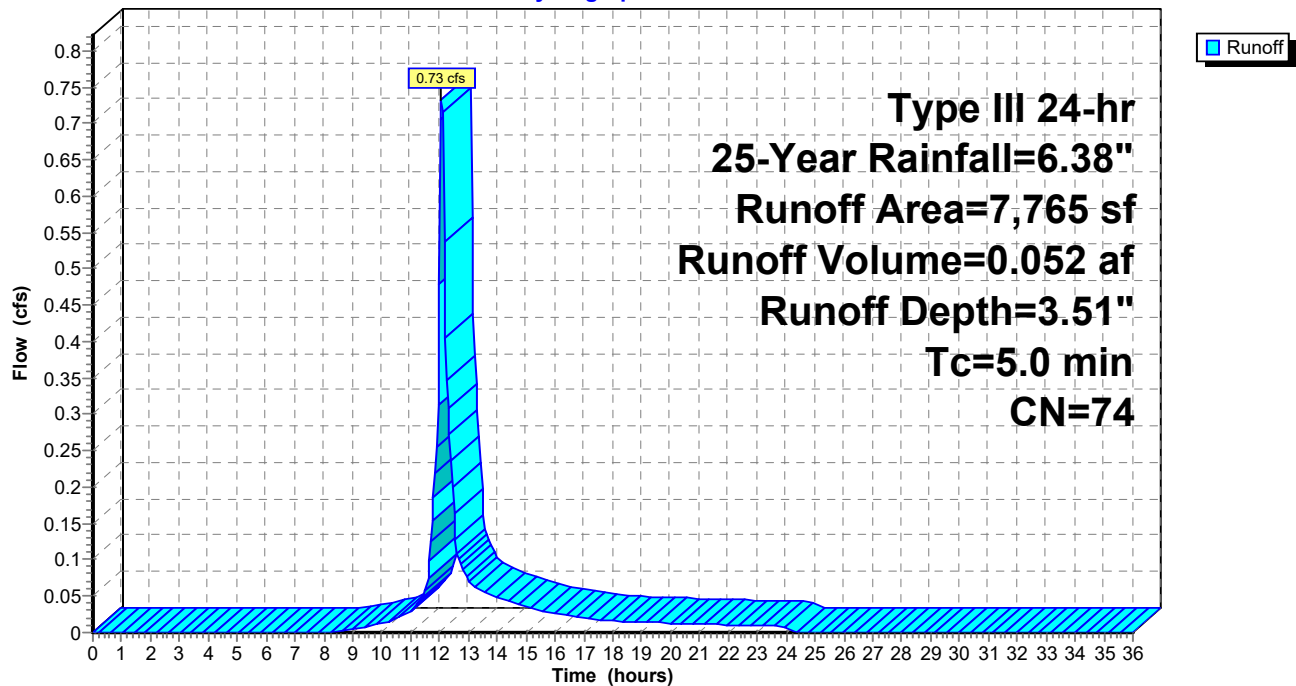
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 25-Year Rainfall=6.38"

Area (sf)	CN	Description
4,494	74	>75% Grass cover, Good, HSG C
365	98	Paved parking, HSG C
2,906	70	Woods, Good, HSG C
* 0	98	Roofs, HSG C
7,765	74	Weighted Average
7,400		95.30% Pervious Area
365		4.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1A: Building C Rear Lawn

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.38"

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Summary for Subcatchment 1B: Building C

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 1.96 cfs @ 12.07 hrs, Volume= 0.155 af, Depth= 5.91"
Routed to Pond P2 : Building C Stormtech System

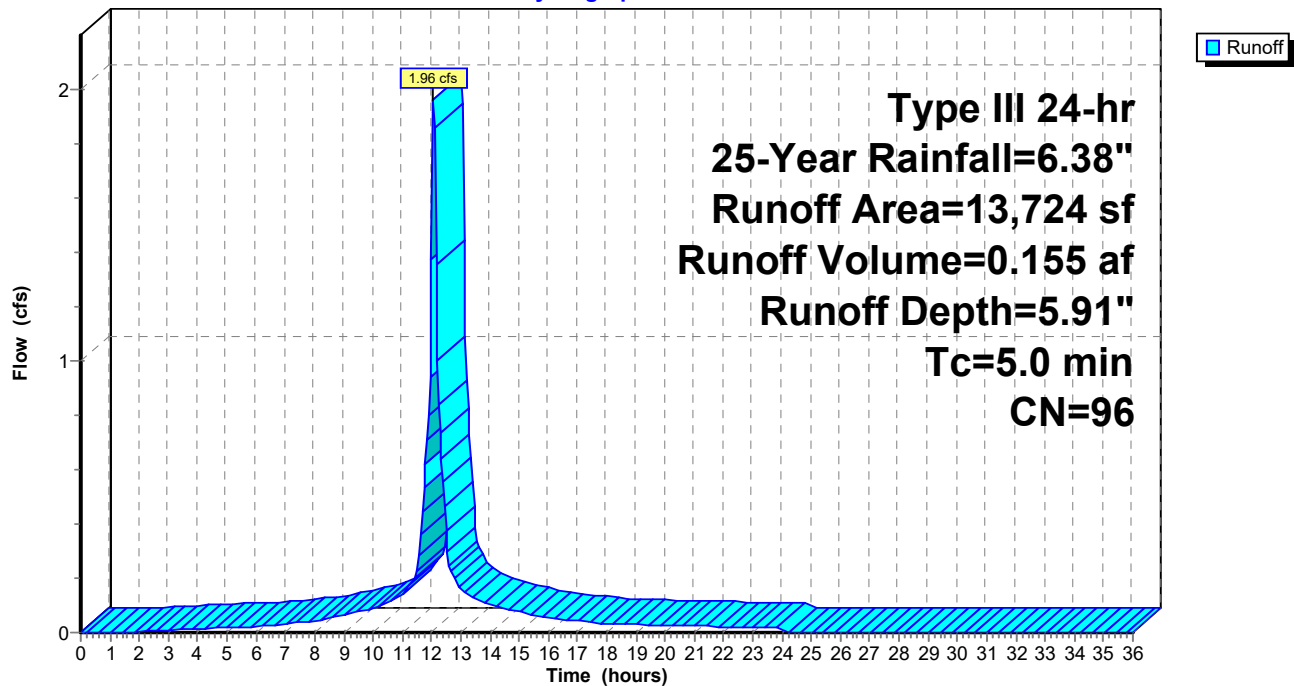
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 25-Year Rainfall=6.38"

Area (sf)	CN	Description
1,196	74	>75% Grass cover, Good, HSG C
8,381	98	Paved parking, HSG C
4,147	98	Roofs, HSG C
0	70	Woods, Good, HSG C
13,724	96	Weighted Average
1,196		8.71% Pervious Area
12,528		91.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1B: Building C

Hydrograph



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Summary for Subcatchment 1C: Entry and Building D Parking

[49] Hint: $T_c < 2dt$ may require smaller dt

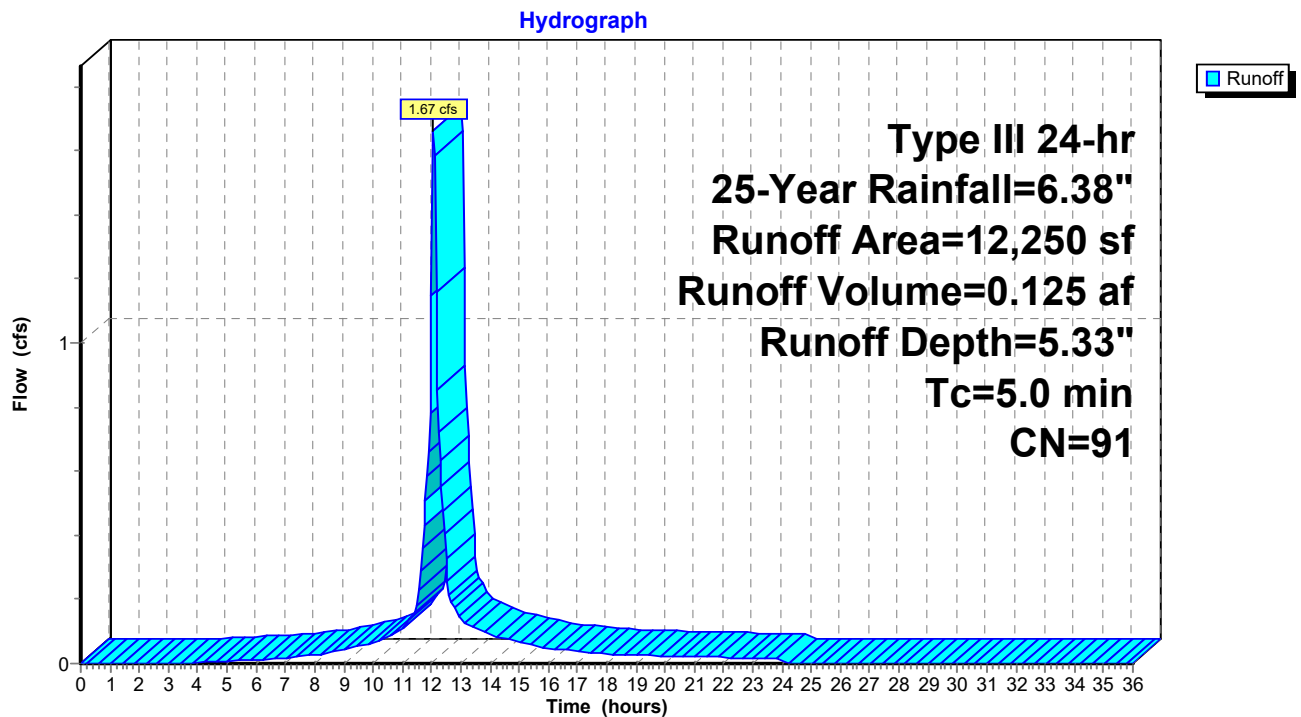
Runoff = 1.67 cfs @ 12.07 hrs, Volume= 0.125 af, Depth= 5.33"
Routed to Pond P1 : Entry Stormtech System

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=6.38"

Area (sf)	CN	Description
3,808	74	>75% Grass cover, Good, HSG C
8,442	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
12,250	91	Weighted Average
3,808		31.09% Pervious Area
8,442		68.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1C: Entry and Building D Parking



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Summary for Subcatchment 1D: Building B

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.60 cfs @ 12.07 hrs, Volume= 0.049 af, Depth= 6.14"
Routed to Pond P1 : Entry Stormtech System

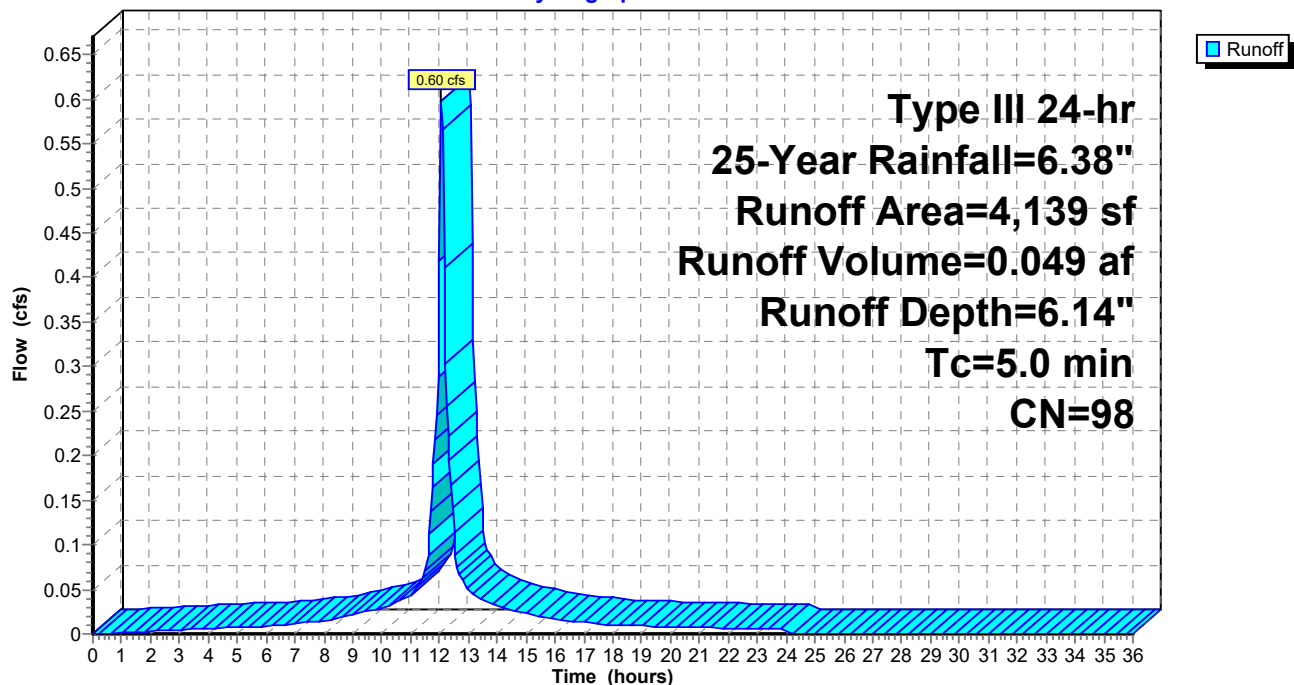
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 25-Year Rainfall=6.38"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
4,139	98	Roofs, HSG C
0	70	Woods, Good, HSG C
4,139	98	Weighted Average
4,139		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1D: Building B

Hydrograph



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Summary for Subcatchment 1E: Building D

[49] Hint: $T_c < 2dt$ may require smaller dt

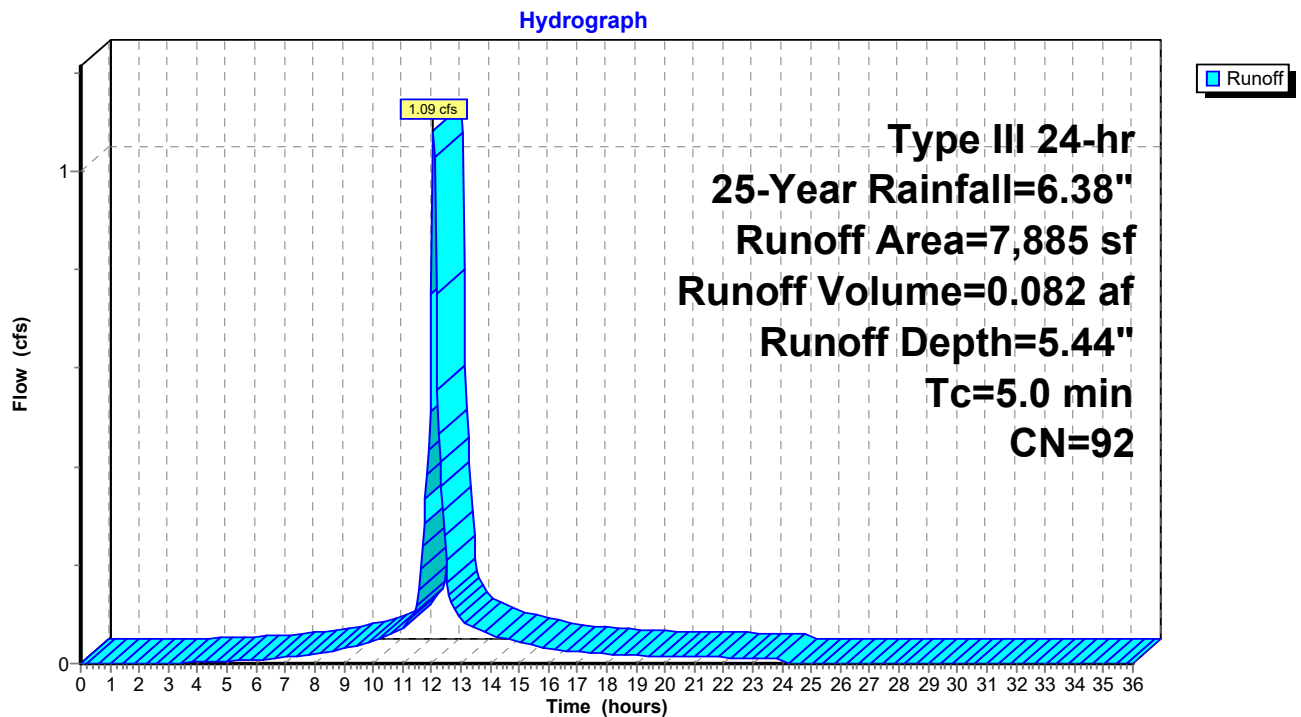
Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.082 af, Depth= 5.44"
Routed to Pond P1 : Entry Stormtech System

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=6.38"

Area (sf)	CN	Description
1,960	74	>75% Grass cover, Good, HSG C
1,785	98	Paved parking, HSG C
4,140	98	Roofs, HSG C
0	70	Woods, Good, HSG C
7,885	92	Weighted Average
1,960		24.86% Pervious Area
5,925		75.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1E: Building D



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Summary for Subcatchment 1F: Drop-Off Area

[49] Hint: $T_c < 2dt$ may require smaller dt

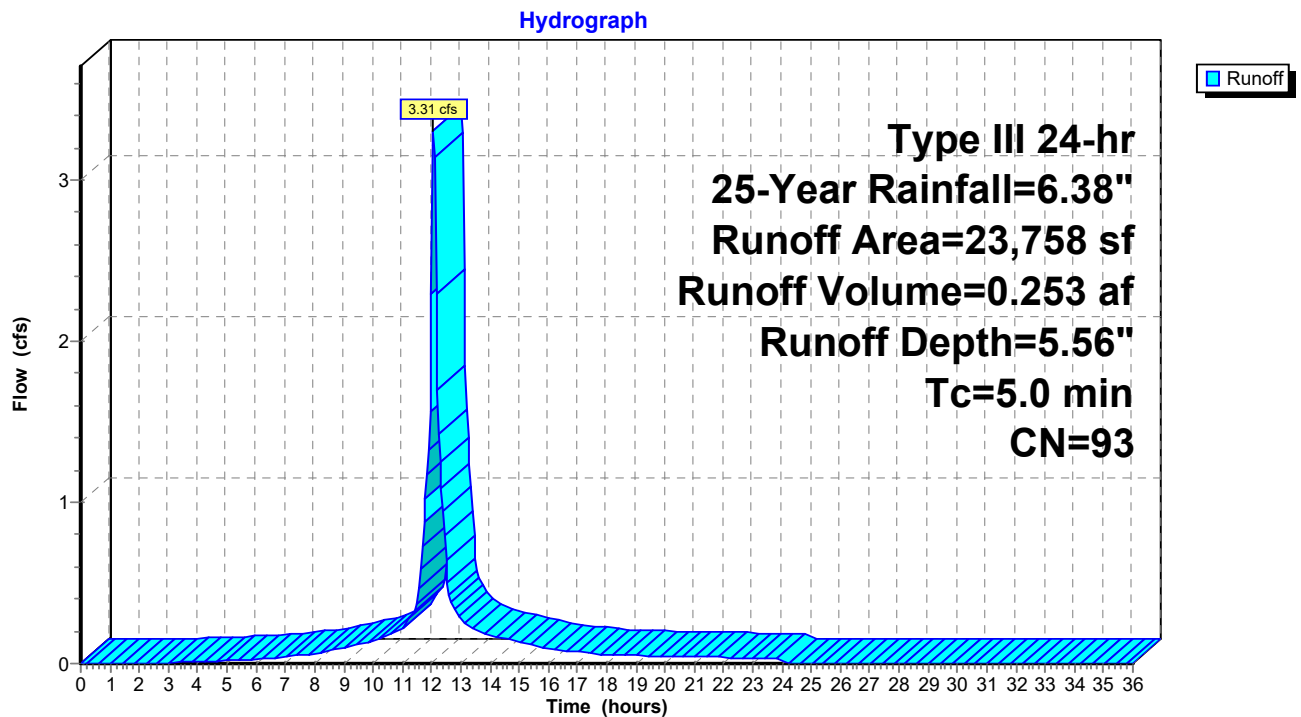
Runoff = 3.31 cfs @ 12.07 hrs, Volume= 0.253 af, Depth= 5.56"
Routed to Pond P3 : Central Site Stormtech System

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=6.38"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
18,666	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
23,758	93	Weighted Average
5,092		21.43% Pervious Area
18,666		78.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1F: Drop-Off Area



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Summary for Subcatchment 2A: North Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

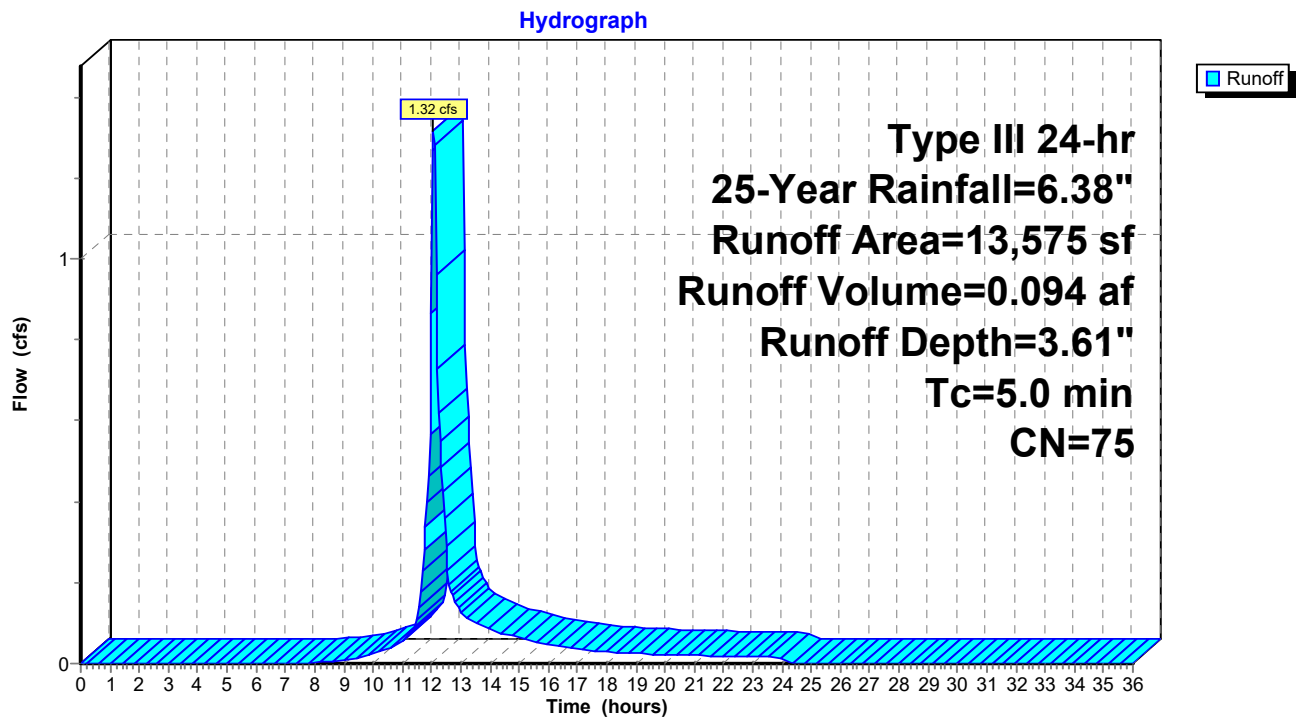
Runoff = 1.32 cfs @ 12.08 hrs, Volume= 0.094 af, Depth= 3.61"
Routed to Link DP-2 : Woods North

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=6.38"

Area (sf)	CN	Description
9,892	74	>75% Grass cover, Good, HSG C
802	98	Paved parking, HSG C
0	98	Roofs, HSG C
2,881	70	Woods, Good, HSG C
13,575	75	Weighted Average
12,773		94.09% Pervious Area
802		5.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 2A: North Lawn



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Summary for Subcatchment 3A: East Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.48 cfs @ 12.08 hrs, Volume= 0.034 af, Depth= 3.11"
Routed to Link DP-3 : Woods East

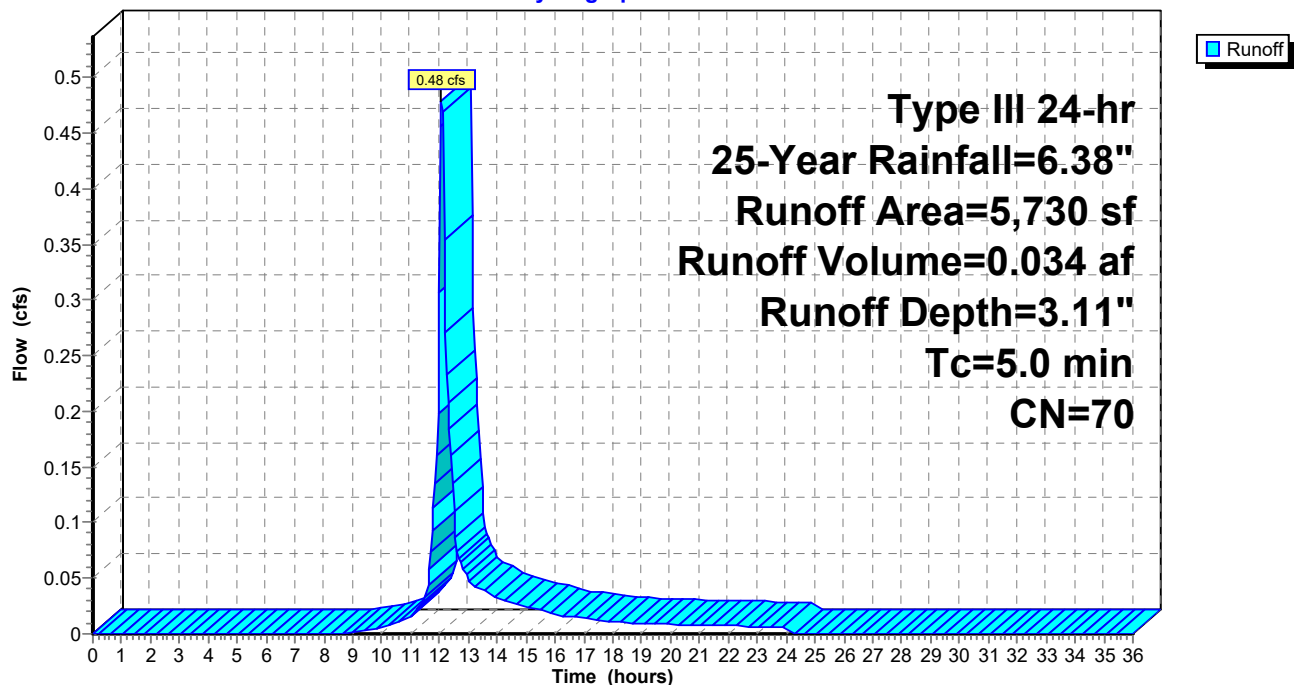
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 25-Year Rainfall=6.38"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
0	98	Roofs, HSG C
5,730	70	Woods, Good, HSG C
5,730	70	Weighted Average
5,730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 3A: East Edge

Hydrograph



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Summary for Subcatchment 4A: West Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

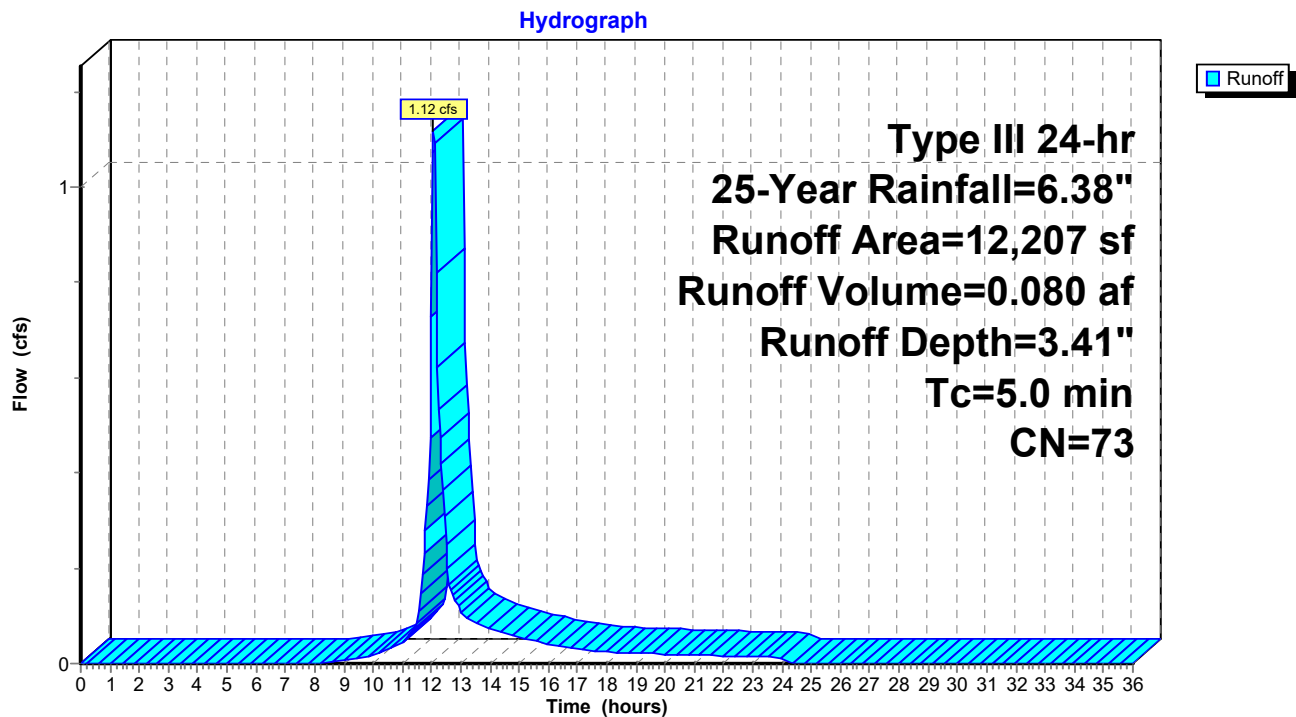
Runoff = 1.12 cfs @ 12.08 hrs, Volume= 0.080 af, Depth= 3.41"
Routed to Link DP-4 : Woods West

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=6.38"

Area (sf)	CN	Description
3,909	74	>75% Grass cover, Good, HSG C
794	98	Paved parking, HSG C
0	98	Roofs, HSG C
7,504	70	Woods, Good, HSG C
12,207	73	Weighted Average
11,413		93.50% Pervious Area
794		6.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 4A: West Edge



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Summary for Subcatchment 5A: Building A

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 6.83 cfs @ 12.07 hrs, Volume= 0.533 af, Depth= 5.79"
Routed to Pond P4 : Building A Stormtech System

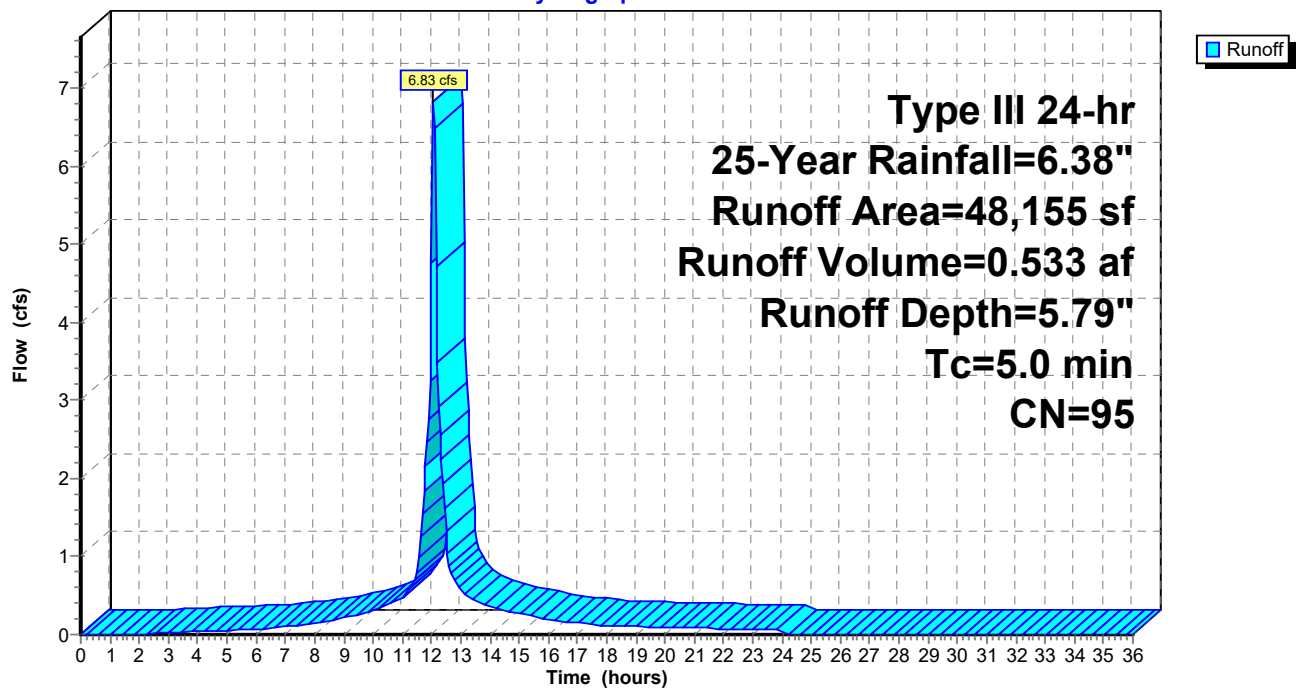
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 25-Year Rainfall=6.38"

Area (sf)	CN	Description
5,891	74	>75% Grass cover, Good, HSG C
19,506	98	Paved parking, HSG C
22,758	98	Roofs, HSG C
0	70	Woods, Good, HSG C
48,155	95	Weighted Average
5,891		12.23% Pervious Area
42,264		87.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5A: Building A

Hydrograph



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Summary for Subcatchment 5B: South Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.32 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 3.31"
Routed to Link DP-5 : Woods South

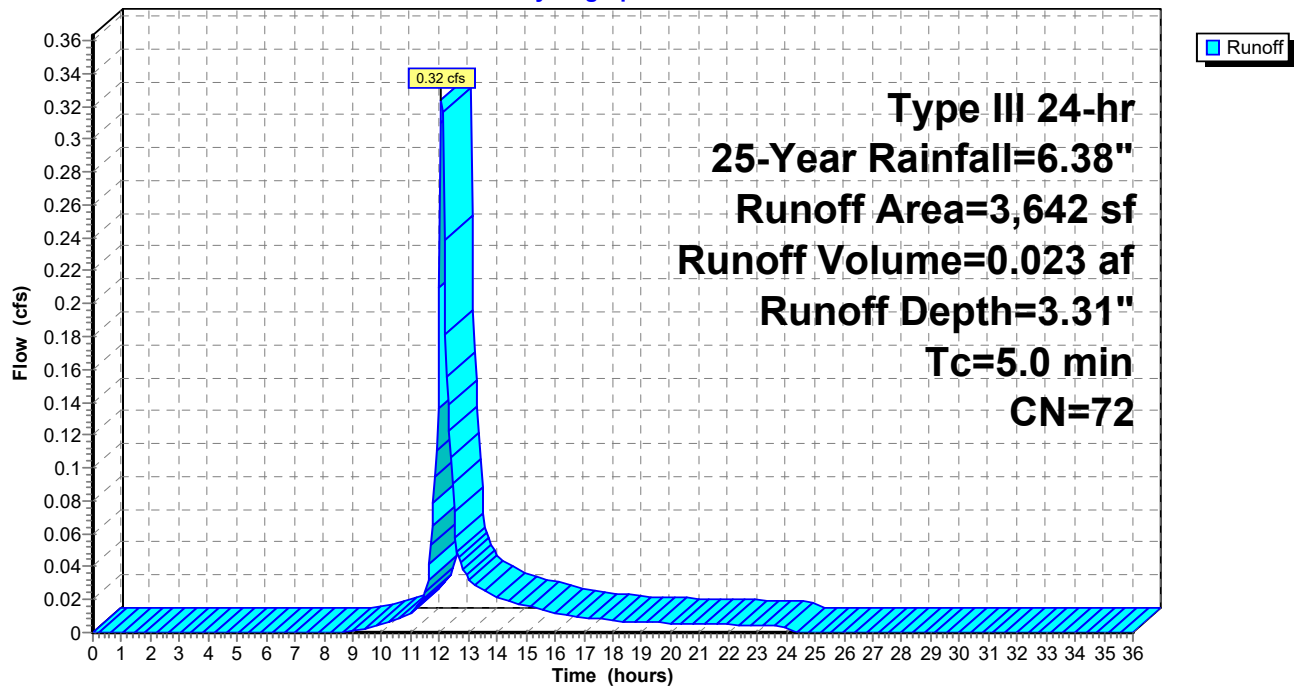
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 25-Year Rainfall=6.38"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
317	98	Paved parking, HSG C
0	98	Roofs, HSG C
3,325	70	Woods, Good, HSG C
3,642	72	Weighted Average
3,325		91.30% Pervious Area
317		8.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5B: South Edge

Hydrograph



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Summary for Pond P1: Entry Stormtech System

Inflow Area = 0.557 ac, 76.24% Impervious, Inflow Depth = 5.50" for 25-Year event
Inflow = 3.35 cfs @ 12.07 hrs, Volume= 0.256 af
Outflow = 1.99 cfs @ 12.20 hrs, Volume= 0.199 af, Atten= 41%, Lag= 7.7 min
Discarded = 0.01 cfs @ 4.65 hrs, Volume= 0.028 af
Primary = 1.98 cfs @ 12.20 hrs, Volume= 0.171 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 239.16' @ 12.20 hrs Surf.Area= 1,672 sf Storage= 4,685 cf

Plug-Flow detention time= 204.3 min calculated for 0.199 af (78% of inflow)
Center-of-Mass det. time= 125.6 min (896.0 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,399 cf	29.92'W x 55.89'L x 5.50'H Field A 9,196 cf Overall - 3,198 cf Embedded = 5,998 cf x 40.0% Voids
#2A	235.75'	3,198 cf	ADS_StormTech MC-3500 d +Capx 28 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 28 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
5,597 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 4.65 hrs HW=235.06' (Free Discharge)
↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.97 cfs @ 12.20 hrs HW=239.16' (Free Discharge)
↑ **2=Culvert** (Passes 1.97 cfs of 4.01 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.84 cfs @ 1.32 fps)
↑ **4=Orifice/Grate** (Orifice Controls 1.12 cfs @ 5.72 fps)

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Pond P1: Entry Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

7 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 53.89' Row Length +12.0" End Stone x 2 = 55.89' Base Length

4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

28 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 3,197.9 cf Chamber Storage

9,196.2 cf Field - 3,197.9 cf Chambers = 5,998.4 cf Stone x 40.0% Voids = 2,399.4 cf Stone Storage

Chamber Storage + Stone Storage = 5,597.2 cf = 0.128 af

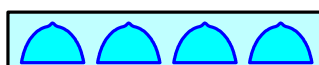
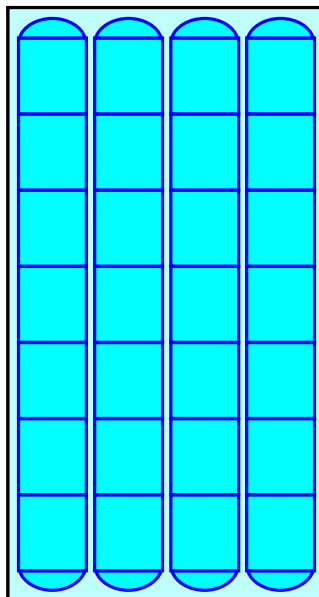
Overall Storage Efficiency = 60.9%

Overall System Size = 55.89' x 29.92' x 5.50'

28 Chambers

340.6 cy Field

222.2 cy Stone



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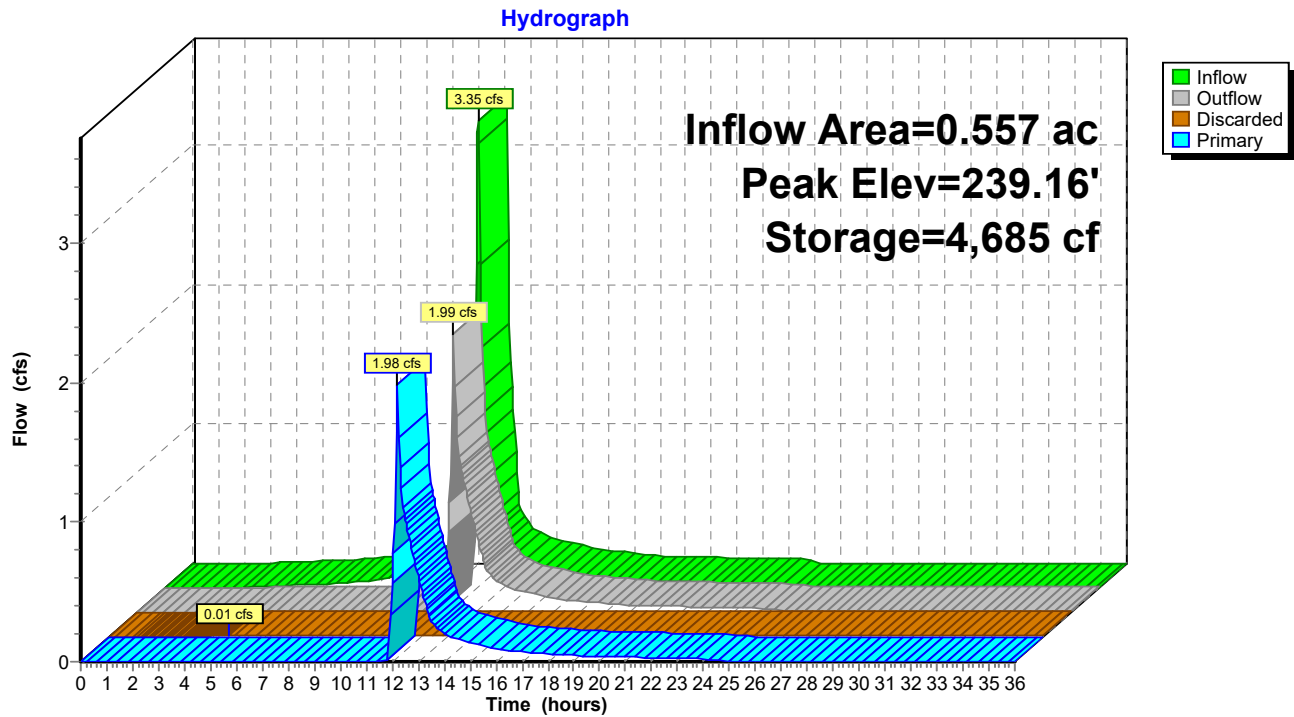
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Pond P1: Entry Stormtech System



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Summary for Pond P2: Building C Stormtech System

Inflow Area = 0.315 ac, 91.29% Impervious, Inflow Depth = 5.91" for 25-Year event
Inflow = 1.96 cfs @ 12.07 hrs, Volume= 0.155 af
Outflow = 0.97 cfs @ 12.22 hrs, Volume= 0.118 af, Atten= 50%, Lag= 8.7 min
Discarded = 0.01 cfs @ 3.60 hrs, Volume= 0.019 af
Primary = 0.97 cfs @ 12.22 hrs, Volume= 0.099 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 238.80' @ 12.22 hrs Surf.Area= 1,108 sf Storage= 2,857 cf

Plug-Flow detention time= 217.2 min calculated for 0.118 af (76% of inflow)
Center-of-Mass det. time= 134.9 min (890.9 - 756.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	1,611 cf	22.75'W x 48.72'L x 5.50'H Field A 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	235.75'	2,069 cf	ADS_StormTech MC-3500 d +Capx 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 3.60 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.96 cfs @ 12.22 hrs HW=238.79' (Free Discharge)

↑ **2=Culvert** (Passes 0.00 cfs of 3.81 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
↑ **4=Orifice/Grate** (Orifice Controls 0.96 cfs @ 4.91 fps)

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Pond P2: Building C Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

6 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 46.72' Row Length +12.0" End Stone x 2 = 48.72' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

18 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 2,068.5 cf Chamber Storage

6,096.1 cf Field - 2,068.5 cf Chambers = 4,027.6 cf Stone x 40.0% Voids = 1,611.0 cf Stone Storage

Chamber Storage + Stone Storage = 3,679.6 cf = 0.084 af

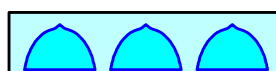
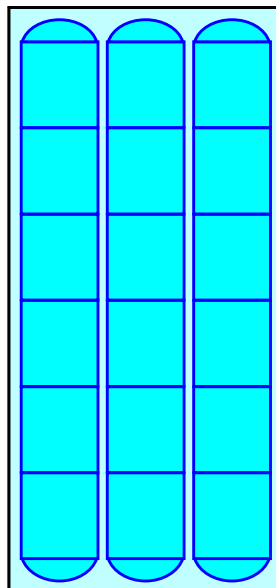
Overall Storage Efficiency = 60.4%

Overall System Size = 48.72' x 22.75' x 5.50'

18 Chambers

225.8 cy Field

149.2 cy Stone



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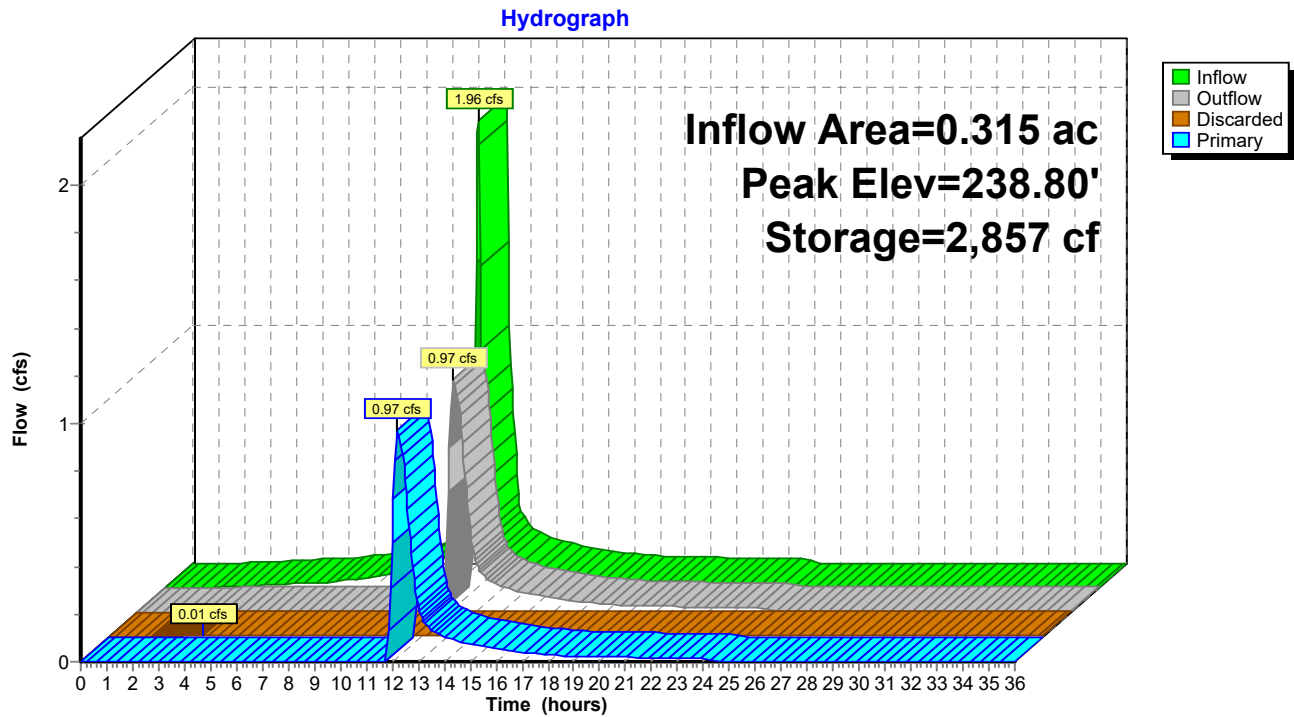
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Pond P2: Building C Stormtech System



Summary for Pond P3: Central Site Stormtech System

Inflow Area = 0.545 ac, 78.57% Impervious, Inflow Depth = 5.56" for 25-Year event
 Inflow = 3.31 cfs @ 12.07 hrs, Volume= 0.253 af
 Outflow = 1.84 cfs @ 12.21 hrs, Volume= 0.199 af, Atten= 44%, Lag= 8.1 min
 Discarded = 0.01 cfs @ 4.70 hrs, Volume= 0.027 af
 Primary = 1.83 cfs @ 12.21 hrs, Volume= 0.172 af
 Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 239.08' @ 12.21 hrs Surf.Area= 1,598 sf Storage= 4,413 cf

Plug-Flow detention time= 195.3 min calculated for 0.199 af (79% of inflow)
 Center-of-Mass det. time= 117.1 min (887.5 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,292 cf	22.75'W x 70.23'L x 5.50'H Field A 8,788 cf Overall - 3,058 cf Embedded = 5,729 cf x 40.0% Voids
#2A	235.75'	3,058 cf	ADS_StormTech MC-3500 d +Cap x 27 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 27 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		5,350 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 4.70 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.80 cfs @ 12.21 hrs HW=239.07' (Free Discharge)

↑ **2=Culvert** (Passes 0.26 cfs of 5.64 cfs potential flow)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.26 cfs @ 0.89 fps)

↑ **4=Orifice/Grate** (Orifice Controls 1.53 cfs @ 5.63 fps)

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Pond P3: Central Site Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

9 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 68.23' Row Length +12.0" End Stone x 2 = 70.23' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

27 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,058.1 cf Chamber Storage

8,787.5 cf Field - 3,058.1 cf Chambers = 5,729.4 cf Stone x 40.0% Voids = 2,291.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,349.9 cf = 0.123 af

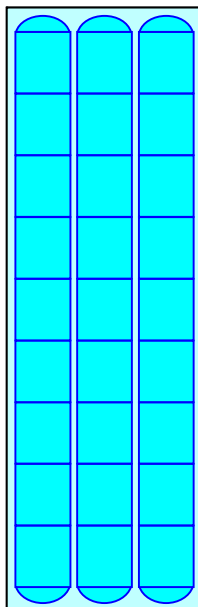
Overall Storage Efficiency = 60.9%

Overall System Size = 70.23' x 22.75' x 5.50'

27 Chambers

325.5 cy Field

212.2 cy Stone



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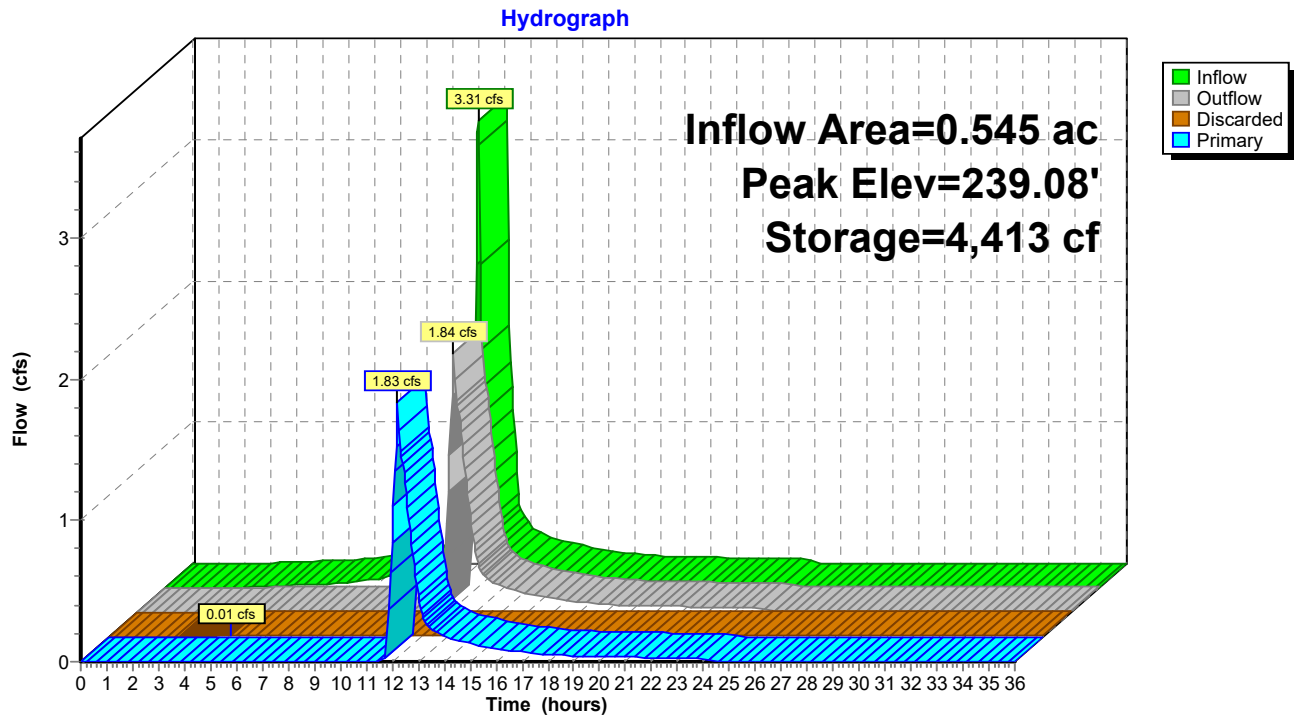
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Pond P3: Central Site Stormtech System



Summary for Pond P4: Building A Stormtech System

Inflow Area = 1.105 ac, 87.77% Impervious, Inflow Depth = 5.79" for 25-Year event
 Inflow = 6.83 cfs @ 12.07 hrs, Volume= 0.533 af
 Outflow = 2.93 cfs @ 12.26 hrs, Volume= 0.433 af, Atten= 57%, Lag= 11.1 min
 Discarded = 0.02 cfs @ 4.10 hrs, Volume= 0.067 af
 Primary = 2.91 cfs @ 12.26 hrs, Volume= 0.367 af
 Routed to Link DP-5 : Woods South

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 238.43' @ 12.26 hrs Surf.Area= 3,934 sf Storage= 9,509 cf

Plug-Flow detention time= 198.9 min calculated for 0.433 af (81% of inflow)
 Center-of-Mass det. time= 127.1 min (888.3 - 761.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	5,516 cf	37.08'W x 106.08'L x 5.50'H Field A 21,636 cf Overall - 7,846 cf Embedded = 13,790 cf x 40.0% Voids
#2A	235.75'	7,846 cf	ADS_StormTech MC-3500 d +Capx 70 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 70 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		13,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	8.0" Round Culvert X 4.00 L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir X 2.00 2 End Contraction(s)
#4	Primary	237.00'	5.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 4.10 hrs HW=235.06' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.90 cfs @ 12.26 hrs HW=238.43' (Free Discharge)
 ↑ **2=Culvert** (Passes 0.00 cfs of 9.34 cfs potential flow)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Orifice/Grate** (Orifice Controls 2.90 cfs @ 5.32 fps)

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Pond P4: Building A Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

70 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 7,845.6 cf Chamber Storage

21,635.9 cf Field - 7,845.6 cf Chambers = 13,790.3 cf Stone x 40.0% Voids = 5,516.1 cf Stone Storage

Chamber Storage + Stone Storage = 13,361.7 cf = 0.307 af

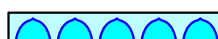
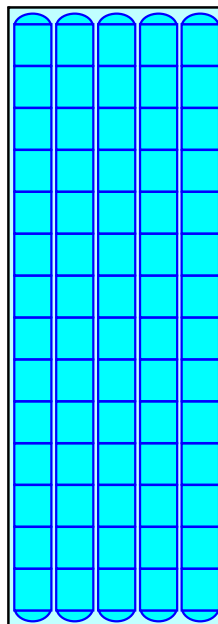
Overall Storage Efficiency = 61.8%

Overall System Size = 106.08' x 37.08' x 5.50'

70 Chambers

801.3 cy Field

510.8 cy Stone



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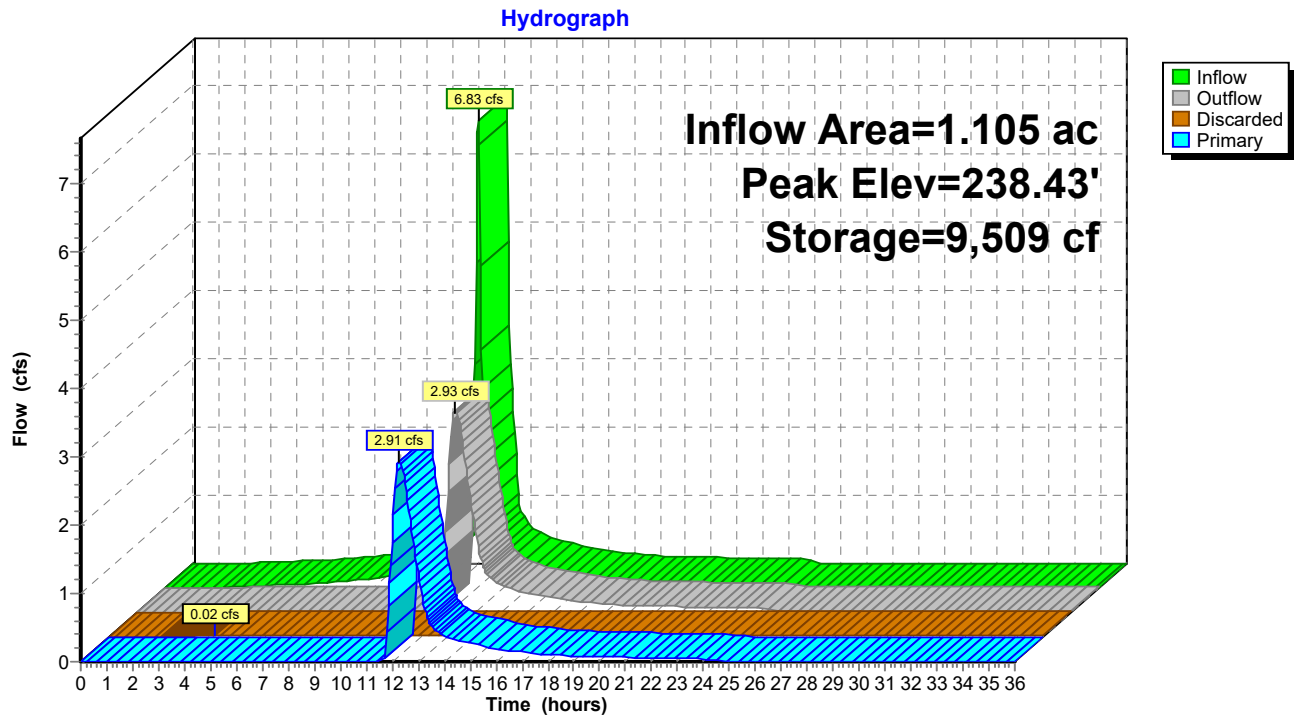
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Pond P4: Building A Stormtech System



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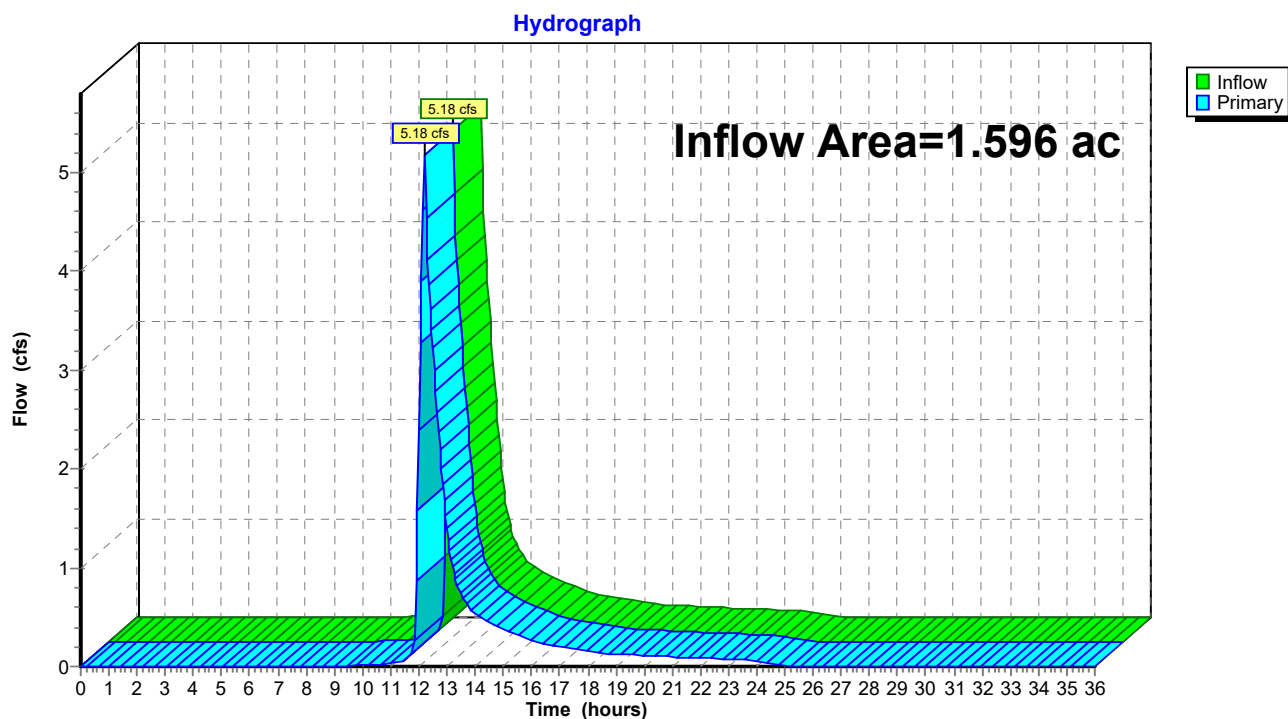
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Summary for Link DP-1: Dwight Road

Inflow Area = 1.596 ac, 72.01% Impervious, Inflow Depth = 3.71" for 25-Year event
Inflow = 5.18 cfs @ 12.20 hrs, Volume= 0.494 af
Primary = 5.18 cfs @ 12.20 hrs, Volume= 0.494 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road



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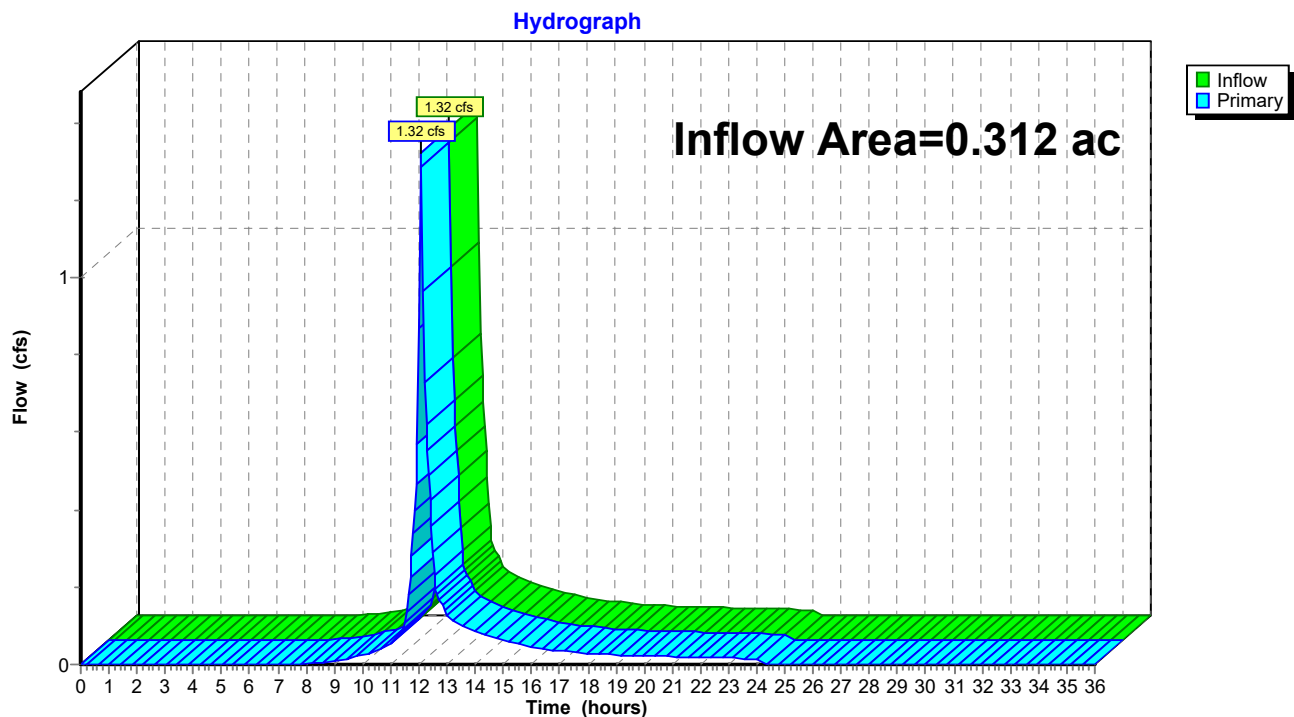
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Summary for Link DP-2: Woods North

Inflow Area = 0.312 ac, 5.91% Impervious, Inflow Depth = 3.61" for 25-Year event
Inflow = 1.32 cfs @ 12.08 hrs, Volume= 0.094 af
Primary = 1.32 cfs @ 12.08 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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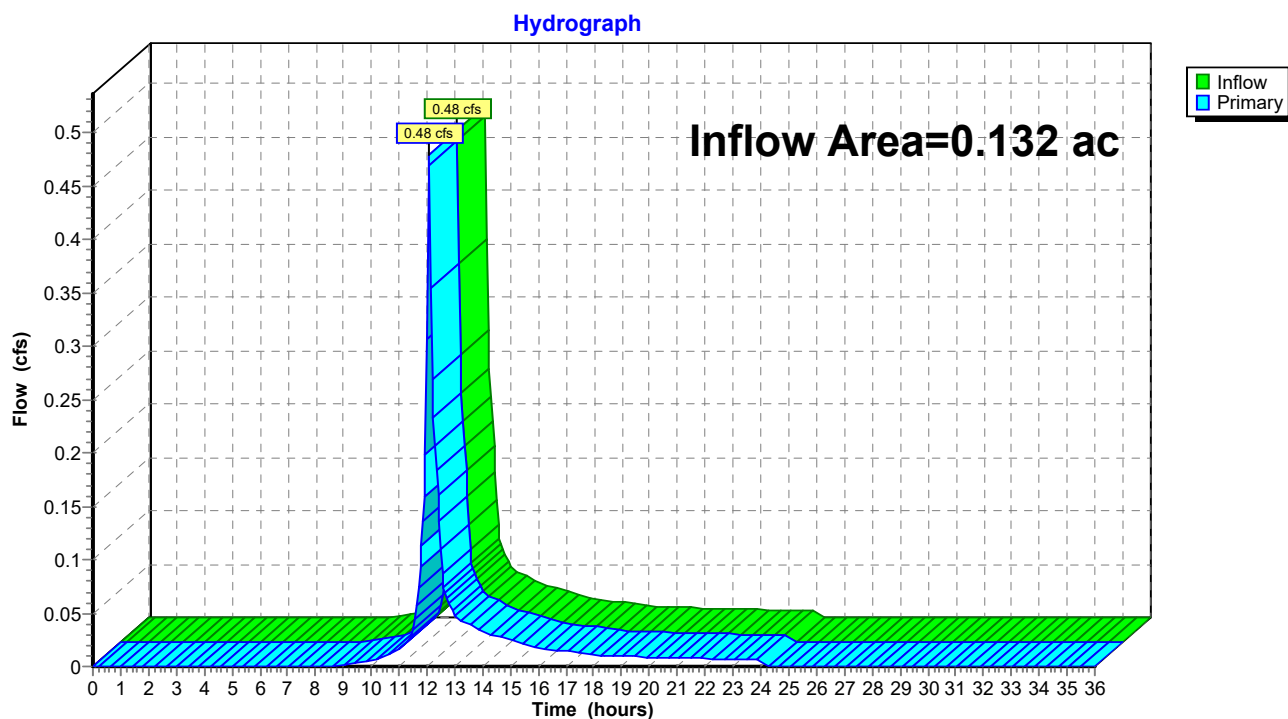
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Summary for Link DP-3: Woods East

Inflow Area = 0.132 ac, 0.00% Impervious, Inflow Depth = 3.11" for 25-Year event
Inflow = 0.48 cfs @ 12.08 hrs, Volume= 0.034 af
Primary = 0.48 cfs @ 12.08 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East



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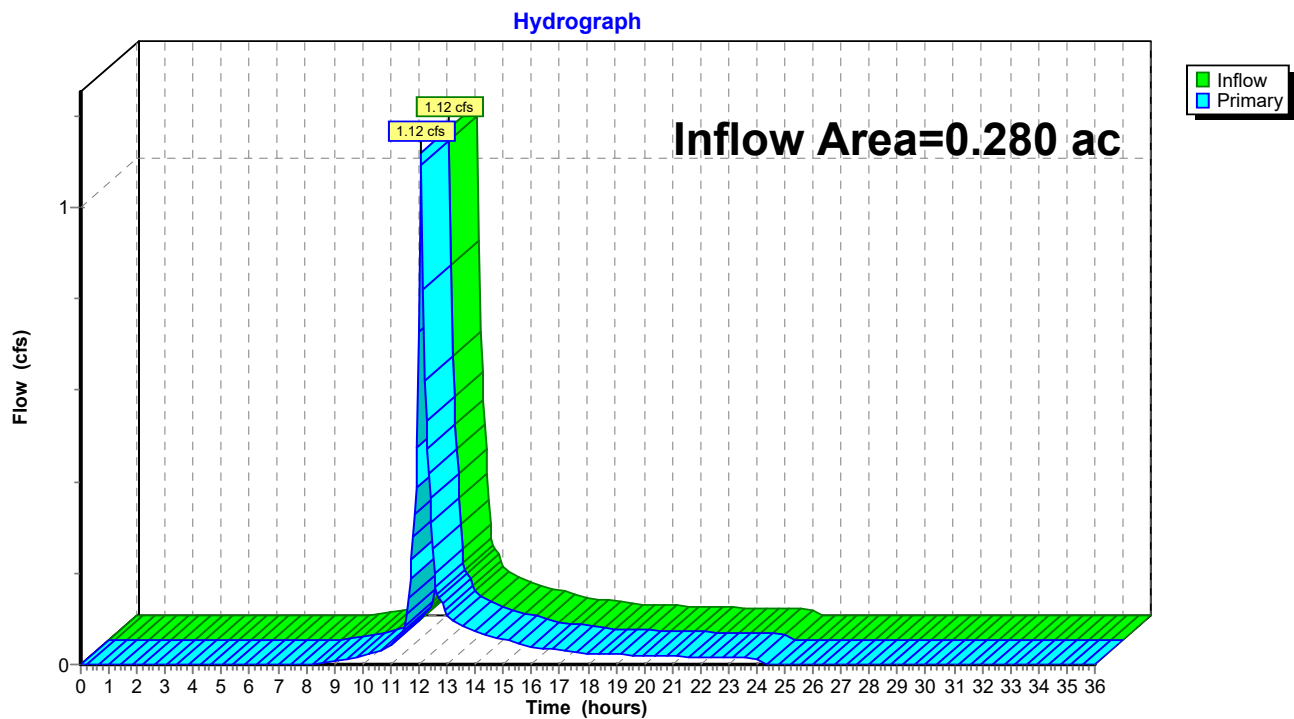
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Summary for Link DP-4: Woods West

Inflow Area = 0.280 ac, 6.50% Impervious, Inflow Depth = 3.41" for 25-Year event
Inflow = 1.12 cfs @ 12.08 hrs, Volume= 0.080 af
Primary = 1.12 cfs @ 12.08 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West



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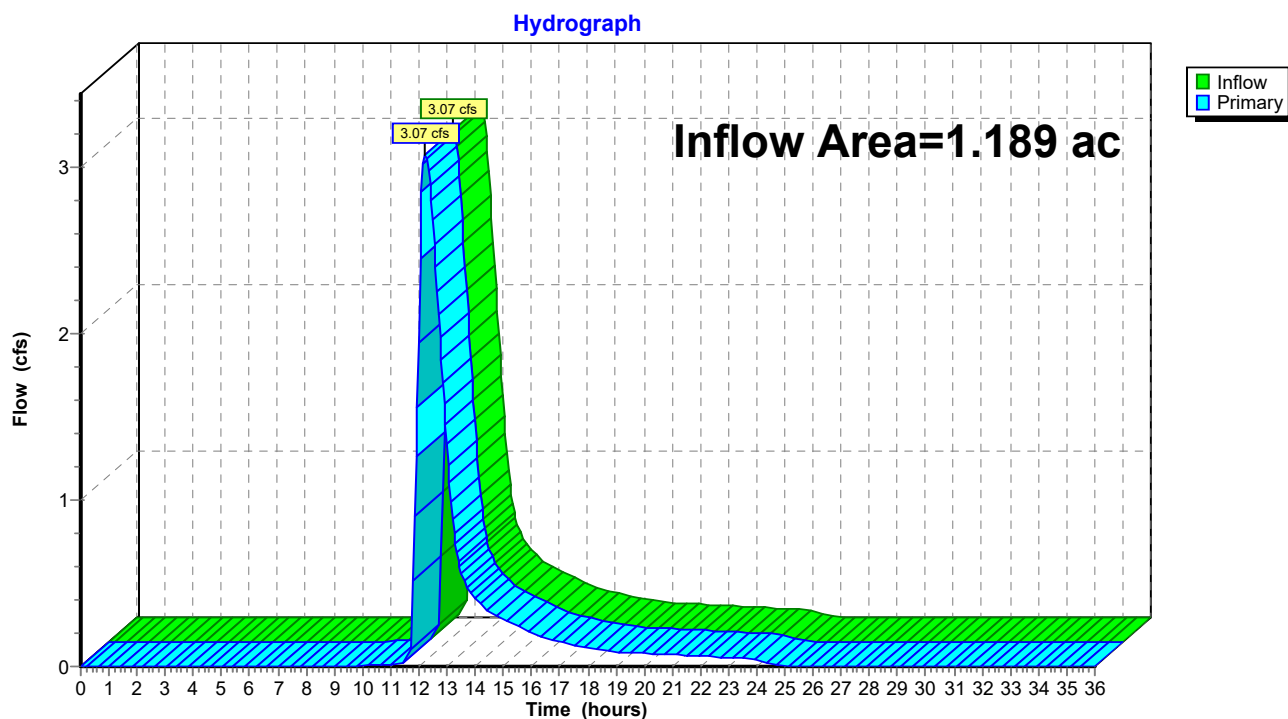
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Summary for Link DP-5: Woods South

Inflow Area = 1.189 ac, 82.21% Impervious, Inflow Depth = 3.93" for 25-Year event
Inflow = 3.07 cfs @ 12.22 hrs, Volume= 0.390 af
Primary = 3.07 cfs @ 12.22 hrs, Volume= 0.390 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South



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Type III 24-hr 100-Year Rainfall=8.19"

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Building C Rear Lawn	Runoff Area=7,765 sf 4.70% Impervious Runoff Depth=5.10" Tc=5.0 min CN=74 Runoff=1.06 cfs 0.076 af
Subcatchment1B: Building C	Runoff Area=13,724 sf 91.29% Impervious Runoff Depth=7.71" Tc=5.0 min CN=96 Runoff=2.53 cfs 0.202 af
Subcatchment1C: Entry and Building D	Runoff Area=12,250 sf 68.91% Impervious Runoff Depth=7.11" Tc=5.0 min CN=91 Runoff=2.19 cfs 0.167 af
Subcatchment1D: Building B	Runoff Area=4,139 sf 100.00% Impervious Runoff Depth=7.95" Tc=5.0 min CN=98 Runoff=0.77 cfs 0.063 af
Subcatchment1E: Building D	Runoff Area=7,885 sf 75.14% Impervious Runoff Depth=7.23" Tc=5.0 min CN=92 Runoff=1.42 cfs 0.109 af
Subcatchment1F: Drop-Off Area	Runoff Area=23,758 sf 78.57% Impervious Runoff Depth=7.35" Tc=5.0 min CN=93 Runoff=4.31 cfs 0.334 af
Subcatchment2A: North Lawn	Runoff Area=13,575 sf 5.91% Impervious Runoff Depth=5.21" Tc=5.0 min CN=75 Runoff=1.89 cfs 0.135 af
Subcatchment3A: East Edge	Runoff Area=5,730 sf 0.00% Impervious Runoff Depth=4.63" Tc=5.0 min CN=70 Runoff=0.71 cfs 0.051 af
Subcatchment4A: West Edge	Runoff Area=12,207 sf 6.50% Impervious Runoff Depth=4.98" Tc=5.0 min CN=73 Runoff=1.63 cfs 0.116 af
Subcatchment5A: Building A	Runoff Area=48,155 sf 87.77% Impervious Runoff Depth=7.59" Tc=5.0 min CN=95 Runoff=8.84 cfs 0.699 af
Subcatchment5B: South Edge	Runoff Area=3,642 sf 8.70% Impervious Runoff Depth=4.86" Tc=5.0 min CN=72 Runoff=0.48 cfs 0.034 af
Pond P1: Entry Stormtech System	Peak Elev=239.44' Storage=4,889 cf Inflow=4.37 cfs 0.339 af Discarded=0.01 cfs 0.029 af Primary=4.24 cfs 0.253 af Outflow=4.25 cfs 0.282 af
Pond P2: Building C Stormtech System	Peak Elev=239.18' Storage=3,085 cf Inflow=2.53 cfs 0.202 af Discarded=0.01 cfs 0.019 af Primary=2.13 cfs 0.146 af Outflow=2.14 cfs 0.165 af
Pond P3: Central Site Stormtech System	Peak Elev=239.35' Storage=4,613 cf Inflow=4.31 cfs 0.334 af Discarded=0.01 cfs 0.027 af Primary=4.29 cfs 0.253 af Outflow=4.30 cfs 0.280 af
Pond P4: Building A Stormtech System	Peak Elev=239.11' Storage=11,116 cf Inflow=8.84 cfs 0.699 af Discarded=0.02 cfs 0.068 af Primary=4.55 cfs 0.531 af Outflow=4.58 cfs 0.599 af
Link DP-1: Dwight Road	Inflow=11.29 cfs 0.728 af Primary=11.29 cfs 0.728 af

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Link DP-2: Woods North

Inflow=1.89 cfs 0.135 af

Primary=1.89 cfs 0.135 af

Link DP-3: Woods East

Inflow=0.71 cfs 0.051 af

Primary=0.71 cfs 0.051 af

Link DP-4: Woods West

Inflow=1.63 cfs 0.116 af

Primary=1.63 cfs 0.116 af

Link DP-5: Woods South

Inflow=4.80 cfs 0.565 af

Primary=4.80 cfs 0.565 af

Total Runoff Area = 3.508 ac Runoff Volume = 1.986 af Average Runoff Depth = 6.79"
38.34% Pervious = 1.345 ac 61.66% Impervious = 2.163 ac

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Summary for Subcatchment 1A: Building C Rear Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

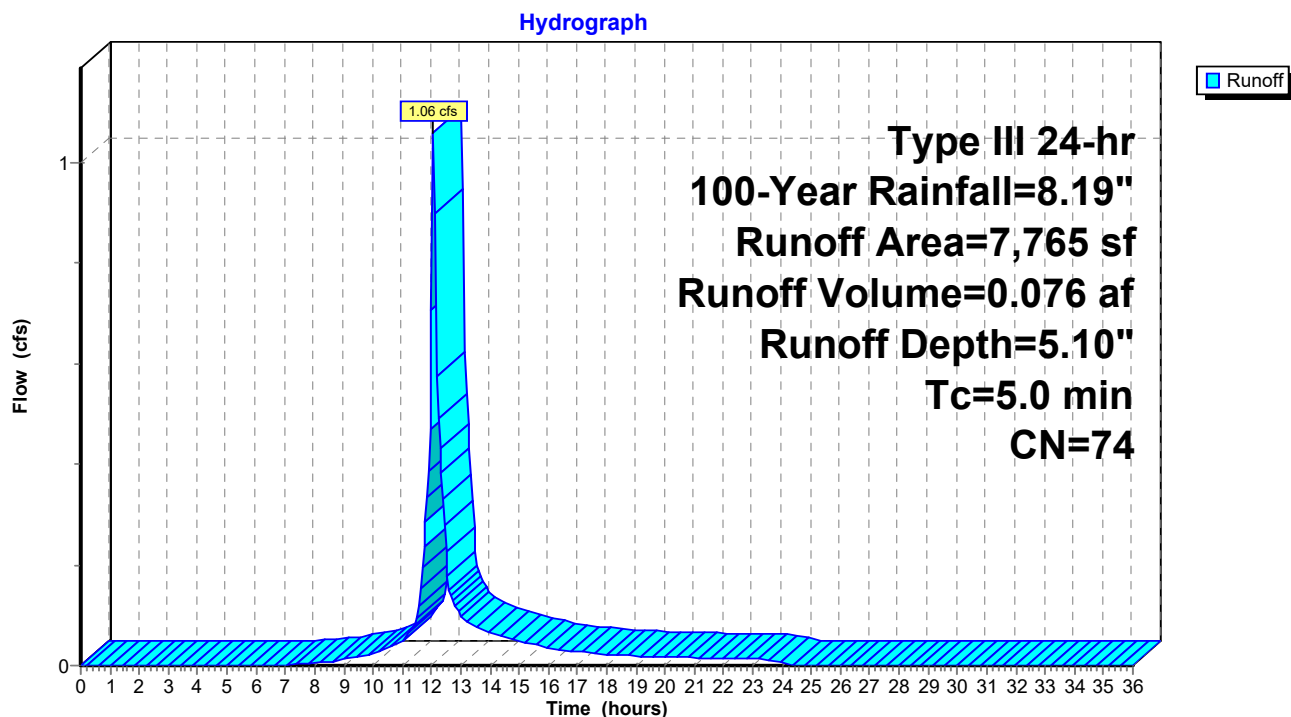
Runoff = 1.06 cfs @ 12.08 hrs, Volume= 0.076 af, Depth= 5.10"
Routed to Link DP-1 : Dwight Road

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=8.19"

Area (sf)	CN	Description
4,494	74	>75% Grass cover, Good, HSG C
365	98	Paved parking, HSG C
2,906	70	Woods, Good, HSG C
* 0	98	Roofs, HSG C
7,765	74	Weighted Average
7,400		95.30% Pervious Area
365		4.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1A: Building C Rear Lawn



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Summary for Subcatchment 1B: Building C

[49] Hint: $T_c < 2dt$ may require smaller dt

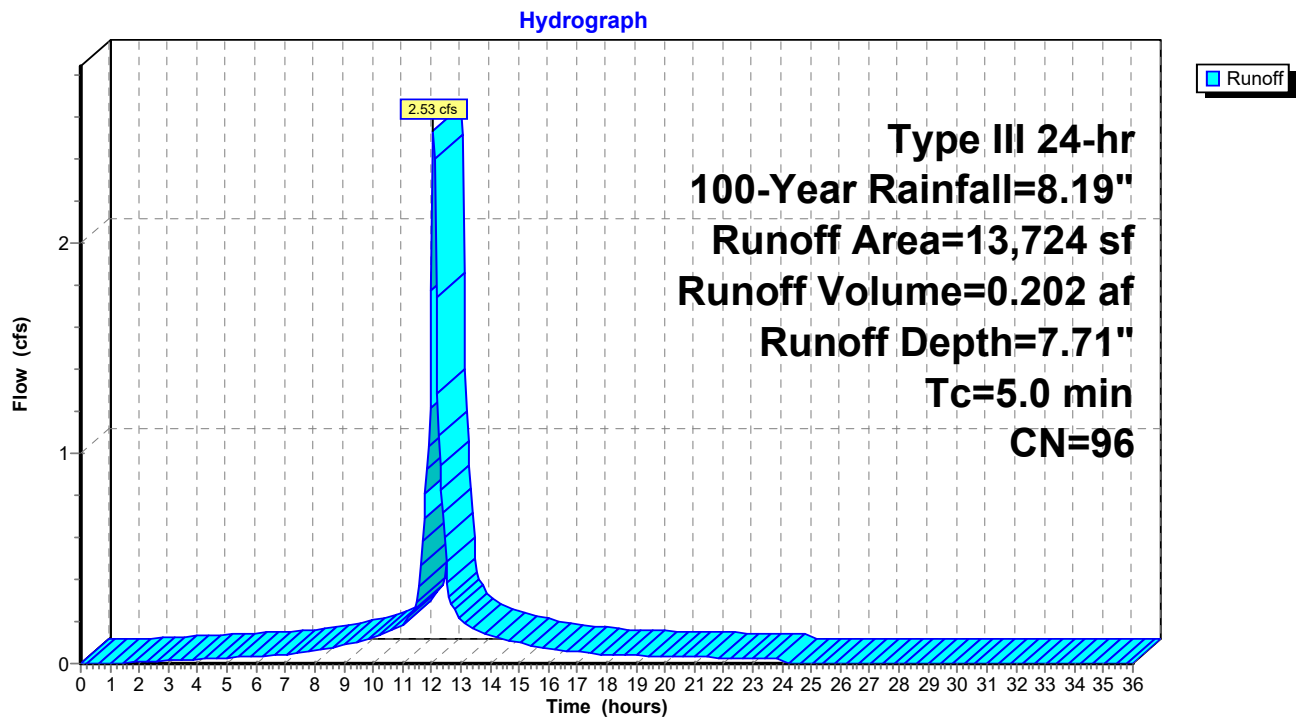
Runoff = 2.53 cfs @ 12.07 hrs, Volume= 0.202 af, Depth= 7.71"
Routed to Pond P2 : Building C Stormtech System

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=8.19"

Area (sf)	CN	Description
1,196	74	>75% Grass cover, Good, HSG C
8,381	98	Paved parking, HSG C
4,147	98	Roofs, HSG C
0	70	Woods, Good, HSG C
13,724	96	Weighted Average
1,196		8.71% Pervious Area
12,528		91.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1B: Building C



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Summary for Subcatchment 1C: Entry and Building D Parking

[49] Hint: $T_c < 2dt$ may require smaller dt

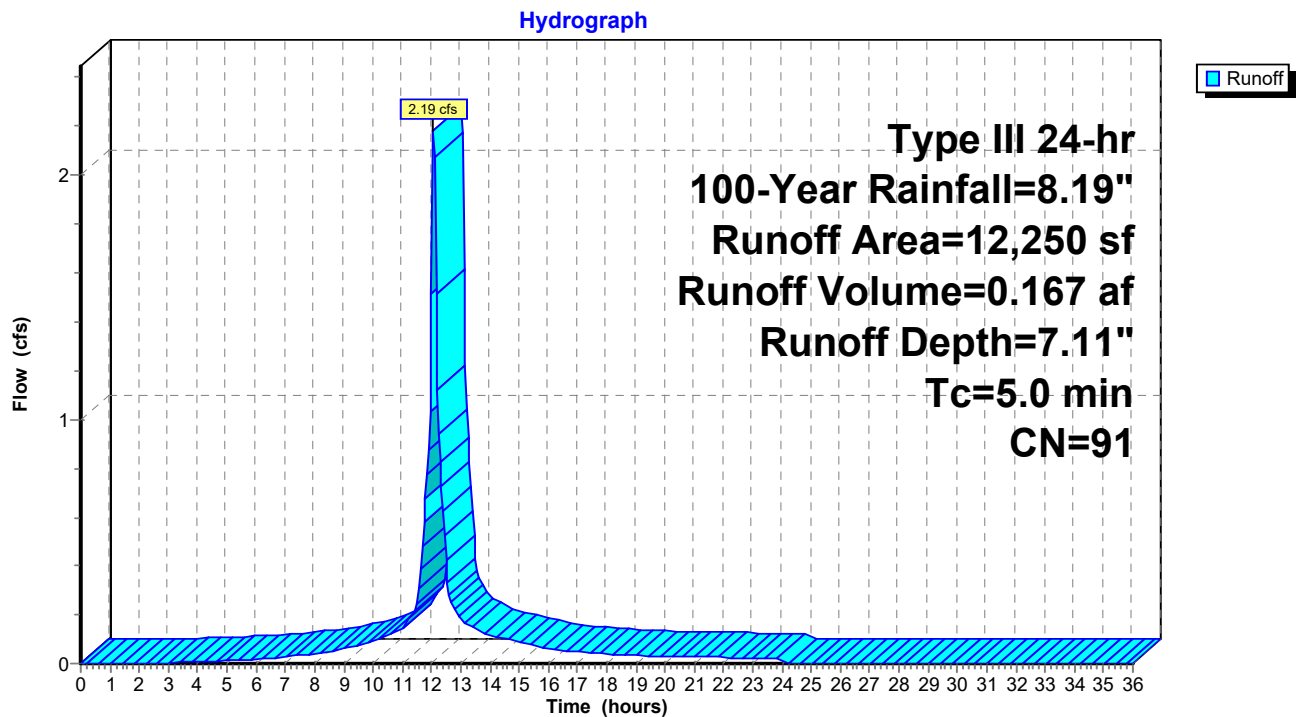
Runoff = 2.19 cfs @ 12.07 hrs, Volume= 0.167 af, Depth= 7.11"
Routed to Pond P1 : Entry Stormtech System

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=8.19"

Area (sf)	CN	Description
3,808	74	>75% Grass cover, Good, HSG C
8,442	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
12,250	91	Weighted Average
3,808		31.09% Pervious Area
8,442		68.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1C: Entry and Building D Parking



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Summary for Subcatchment 1D: Building B

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.77 cfs @ 12.07 hrs, Volume= 0.063 af, Depth= 7.95"
Routed to Pond P1 : Entry Stormtech System

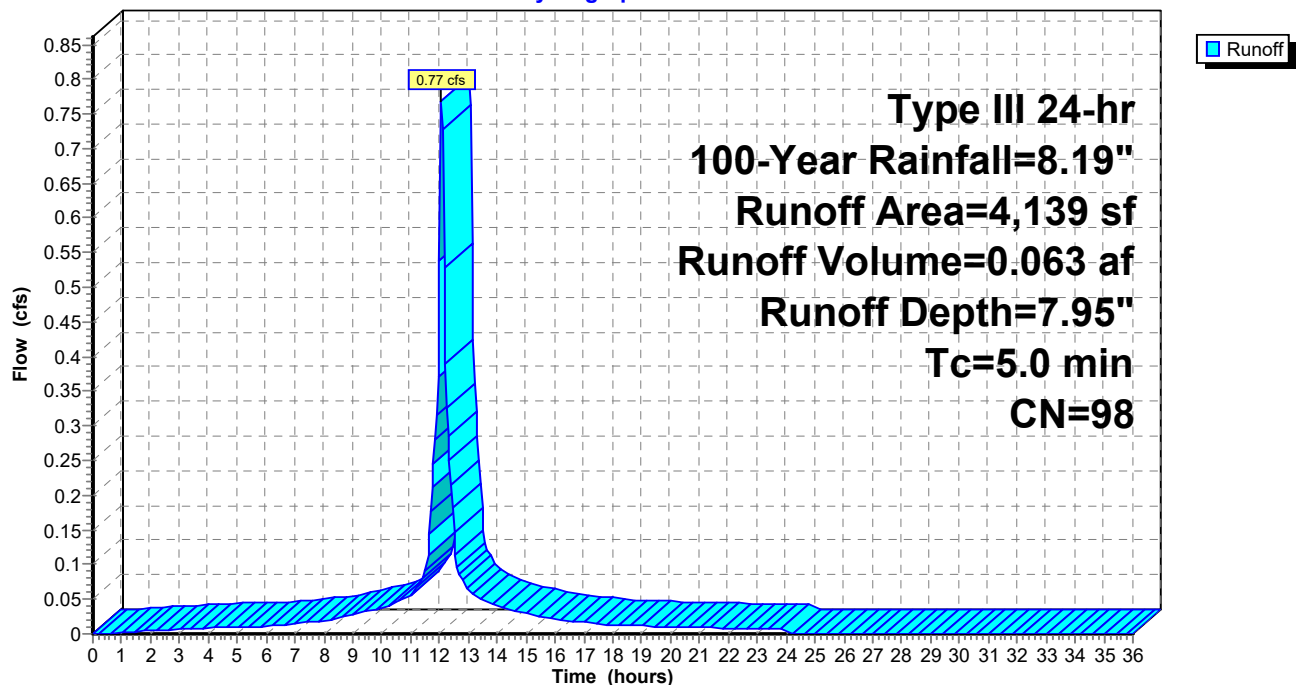
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
4,139	98	Roofs, HSG C
0	70	Woods, Good, HSG C
4,139	98	Weighted Average
4,139		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1D: Building B

Hydrograph



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Summary for Subcatchment 1E: Building D

[49] Hint: $T_c < 2dt$ may require smaller dt

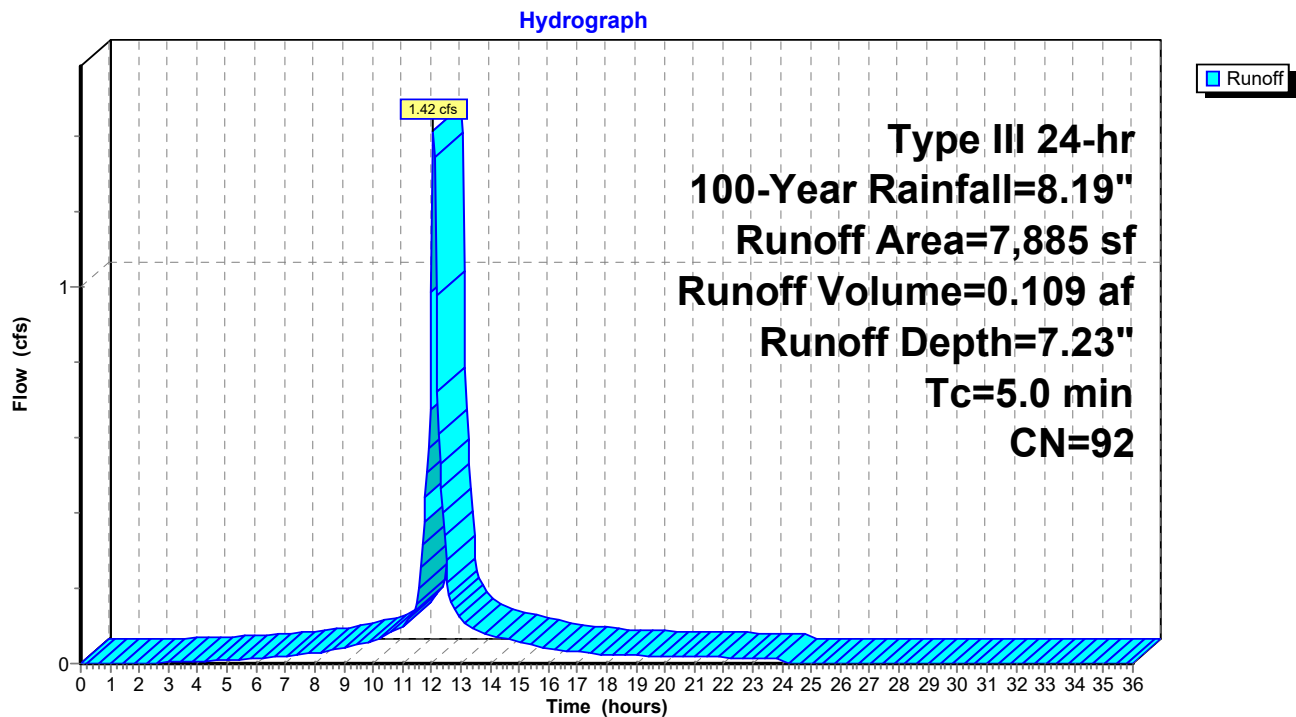
Runoff = 1.42 cfs @ 12.07 hrs, Volume= 0.109 af, Depth= 7.23"
Routed to Pond P1 : Entry Stormtech System

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=8.19"

Area (sf)	CN	Description
1,960	74	>75% Grass cover, Good, HSG C
1,785	98	Paved parking, HSG C
4,140	98	Roofs, HSG C
0	70	Woods, Good, HSG C
7,885	92	Weighted Average
1,960		24.86% Pervious Area
5,925		75.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1E: Building D



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Summary for Subcatchment 1F: Drop-Off Area

[49] Hint: $T_c < 2dt$ may require smaller dt

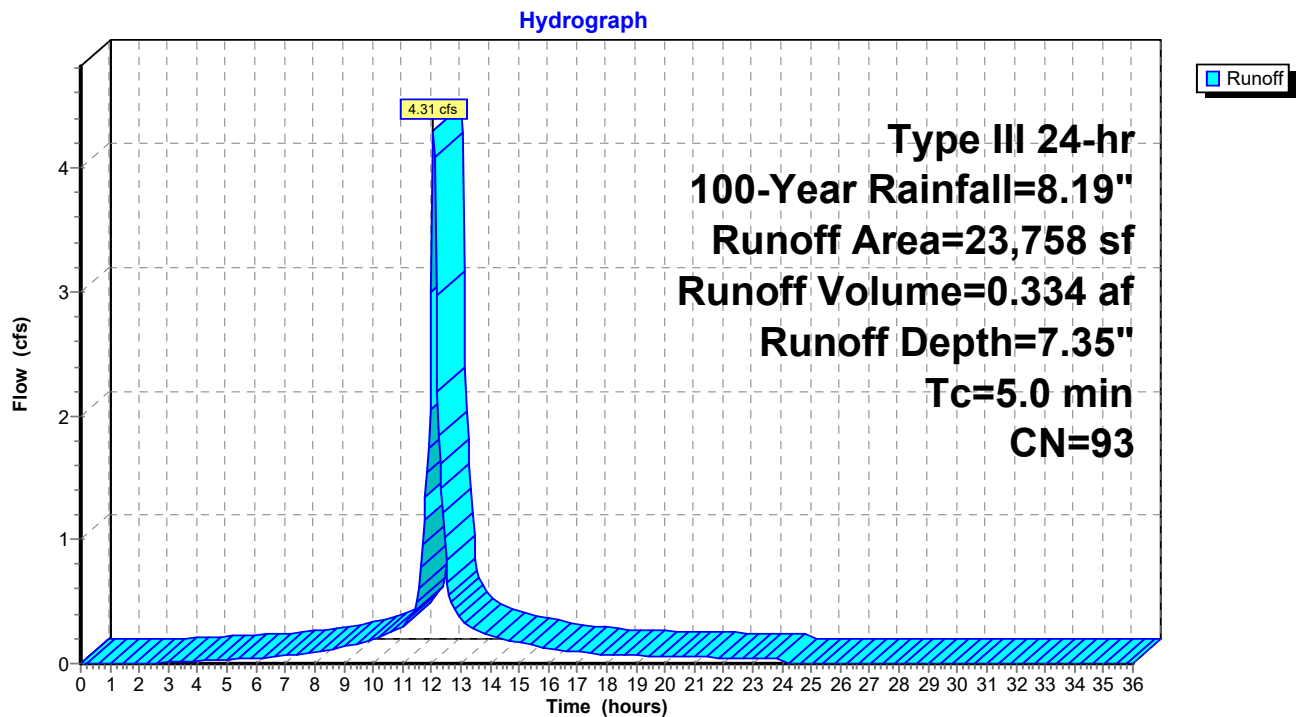
Runoff = 4.31 cfs @ 12.07 hrs, Volume= 0.334 af, Depth= 7.35"
Routed to Pond P3 : Central Site Stormtech System

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=8.19"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
18,666	98	Paved parking, HSG C
0	98	Roofs, HSG C
0	70	Woods, Good, HSG C
23,758	93	Weighted Average
5,092		21.43% Pervious Area
18,666		78.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 1F: Drop-Off Area



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Summary for Subcatchment 2A: North Lawn

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 1.89 cfs @ 12.08 hrs, Volume= 0.135 af, Depth= 5.21"
Routed to Link DP-2 : Woods North

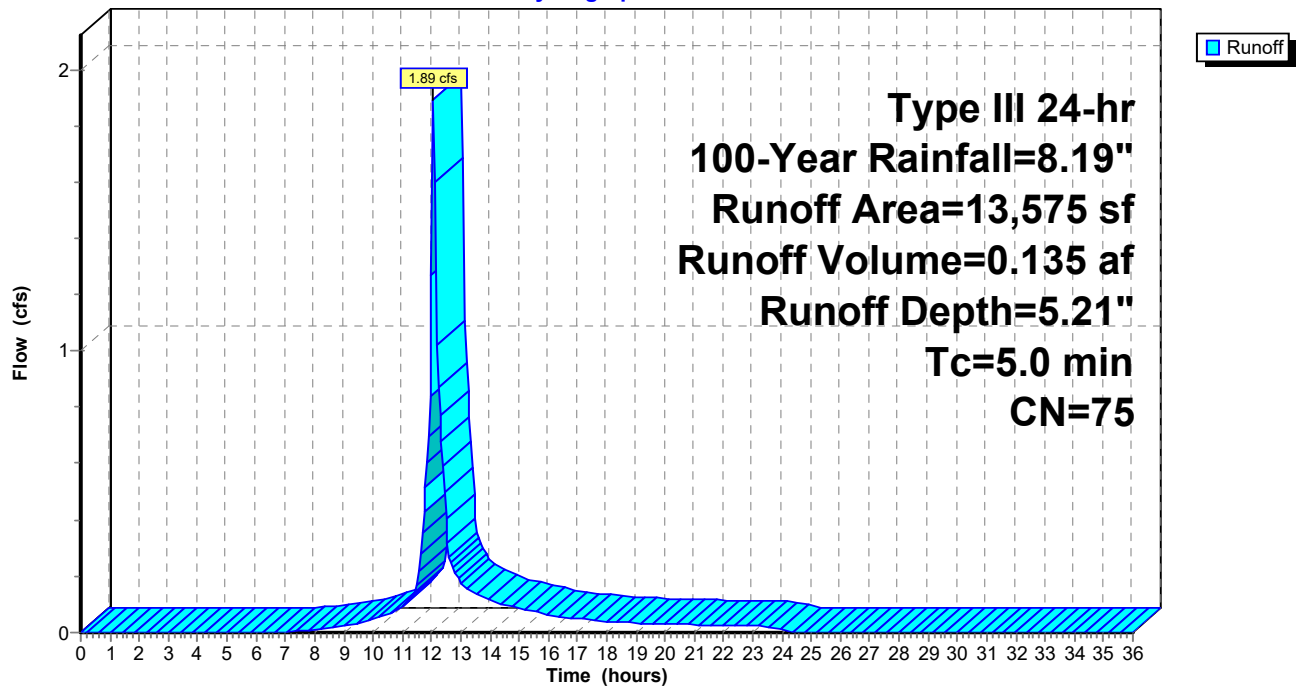
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
9,892	74	>75% Grass cover, Good, HSG C
802	98	Paved parking, HSG C
0	98	Roofs, HSG C
2,881	70	Woods, Good, HSG C
13,575	75	Weighted Average
12,773		94.09% Pervious Area
802		5.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 2A: North Lawn

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.19"

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Summary for Subcatchment 3A: East Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.71 cfs @ 12.08 hrs, Volume= 0.051 af, Depth= 4.63"
Routed to Link DP-3 : Woods East

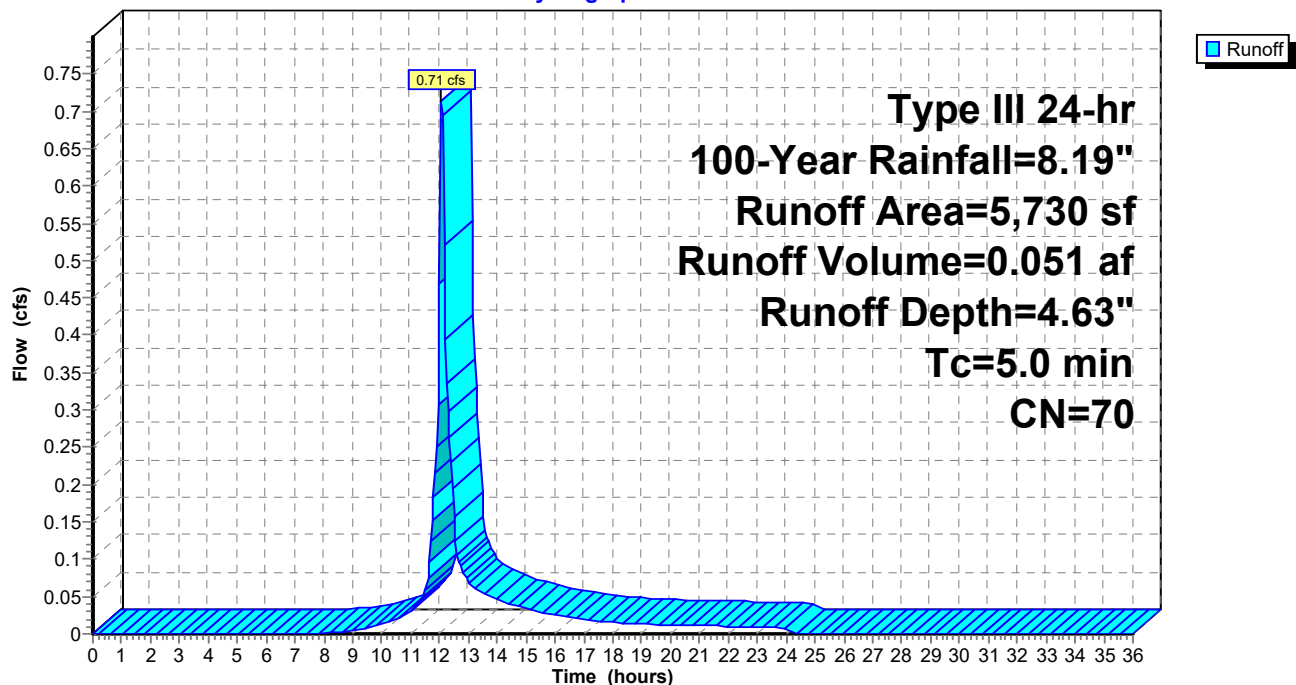
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
0	98	Roofs, HSG C
5,730	70	Woods, Good, HSG C
5,730	70	Weighted Average
5,730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 3A: East Edge

Hydrograph



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Summary for Subcatchment 4A: West Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

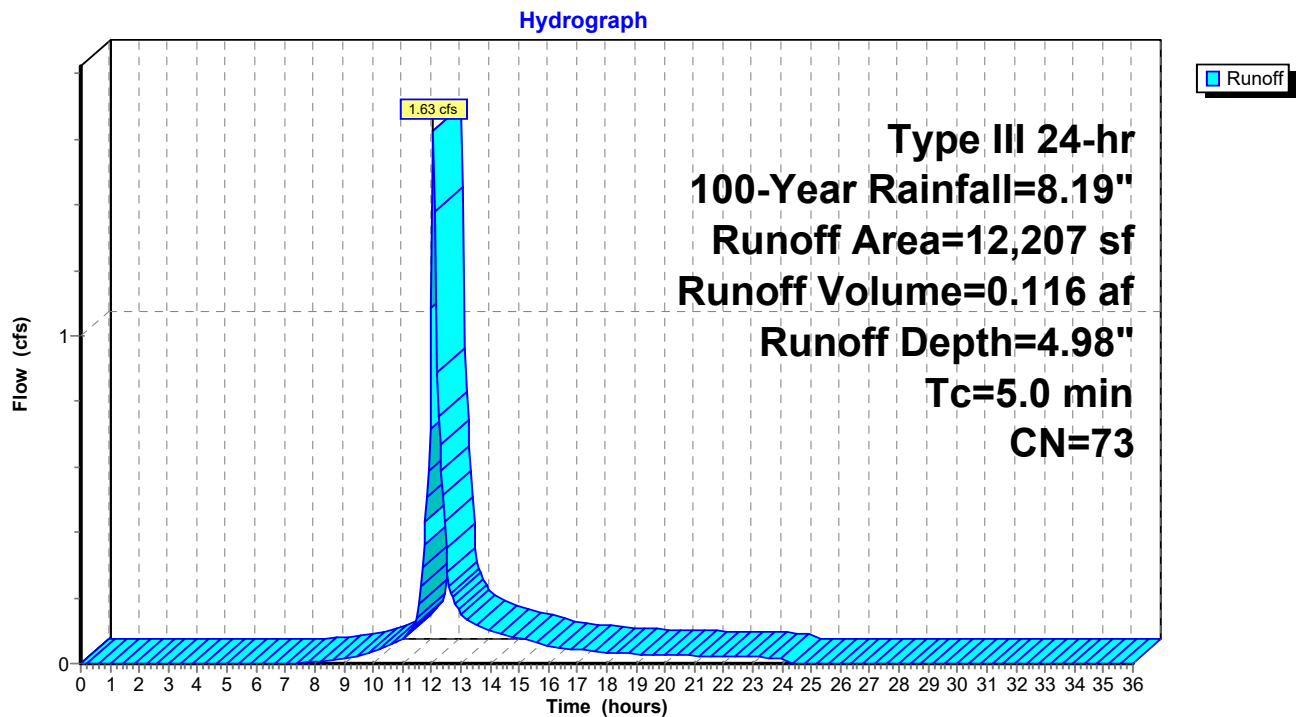
Runoff = 1.63 cfs @ 12.08 hrs, Volume= 0.116 af, Depth= 4.98"
Routed to Link DP-4 : Woods West

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=8.19"

Area (sf)	CN	Description
3,909	74	>75% Grass cover, Good, HSG C
794	98	Paved parking, HSG C
0	98	Roofs, HSG C
7,504	70	Woods, Good, HSG C
12,207	73	Weighted Average
11,413		93.50% Pervious Area
794		6.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 4A: West Edge



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Summary for Subcatchment 5A: Building A

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 8.84 cfs @ 12.07 hrs, Volume= 0.699 af, Depth= 7.59"
Routed to Pond P4 : Building A Stormtech System

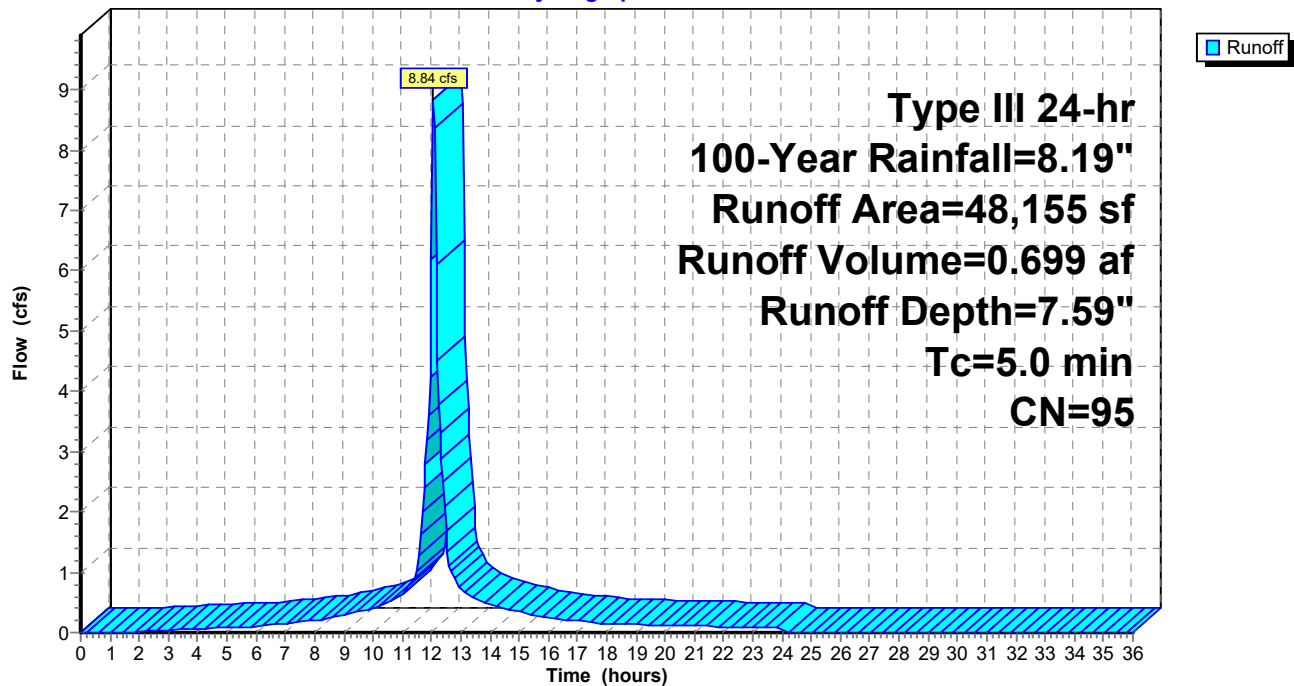
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
5,891	74	>75% Grass cover, Good, HSG C
19,506	98	Paved parking, HSG C
22,758	98	Roofs, HSG C
0	70	Woods, Good, HSG C
48,155	95	Weighted Average
5,891		12.23% Pervious Area
42,264		87.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5A: Building A

Hydrograph



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Summary for Subcatchment 5B: South Edge

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.48 cfs @ 12.08 hrs, Volume= 0.034 af, Depth= 4.86"
Routed to Link DP-5 : Woods South

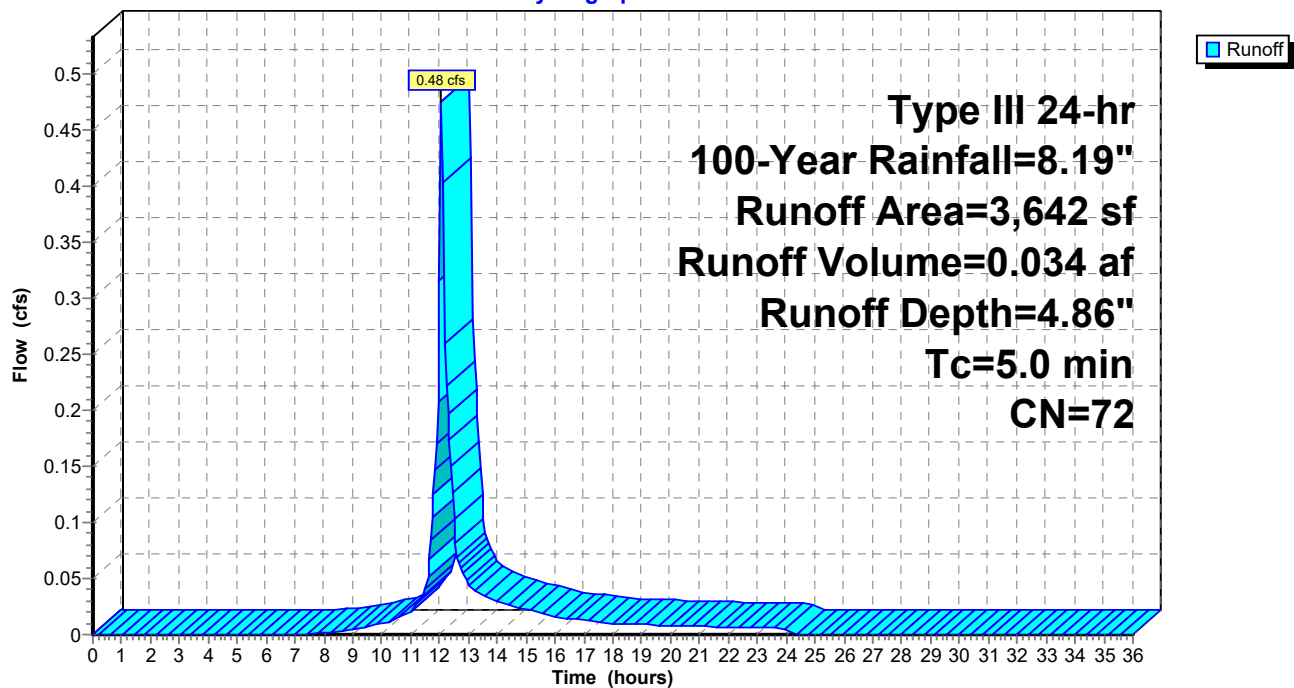
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-Year Rainfall=8.19"

Area (sf)	CN	Description
0	74	>75% Grass cover, Good, HSG C
317	98	Paved parking, HSG C
0	98	Roofs, HSG C
3,325	70	Woods, Good, HSG C
3,642	72	Weighted Average
3,325		91.30% Pervious Area
317		8.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Min.

Subcatchment 5B: South Edge

Hydrograph



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Summary for Pond P1: Entry Stormtech System

Inflow Area = 0.557 ac, 76.24% Impervious, Inflow Depth = 7.29" for 100-Year event
Inflow = 4.37 cfs @ 12.07 hrs, Volume= 0.339 af
Outflow = 4.25 cfs @ 12.11 hrs, Volume= 0.282 af, Atten= 3%, Lag= 2.6 min
Discarded = 0.01 cfs @ 3.70 hrs, Volume= 0.029 af
Primary = 4.24 cfs @ 12.11 hrs, Volume= 0.253 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 239.44' @ 12.11 hrs Surf.Area= 1,672 sf Storage= 4,889 cf

Plug-Flow detention time= 172.3 min calculated for 0.282 af (83% of inflow)
Center-of-Mass det. time= 103.5 min (867.6 - 764.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,399 cf	29.92'W x 55.89'L x 5.50'H Field A 9,196 cf Overall - 3,198 cf Embedded = 5,998 cf x 40.0% Voids
#2A	235.75'	3,198 cf	ADS_StormTech MC-3500 d +Capx 28 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 28 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
		5,597 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 3.70 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=4.14 cfs @ 12.11 hrs HW=239.41' (Free Discharge)

↑ **2=Culvert** (Inlet Controls 4.14 cfs @ 7.59 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Passes < 3.34 cfs potential flow)

↑ **4=Orifice/Grate** (Passes < 1.22 cfs potential flow)

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Type III 24-hr 100-Year Rainfall=8.19"

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Pond P1: Entry Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

7 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 53.89' Row Length +12.0" End Stone x 2 = 55.89' Base Length

4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

28 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 3,197.9 cf Chamber Storage

9,196.2 cf Field - 3,197.9 cf Chambers = 5,998.4 cf Stone x 40.0% Voids = 2,399.4 cf Stone Storage

Chamber Storage + Stone Storage = 5,597.2 cf = 0.128 af

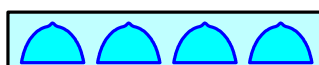
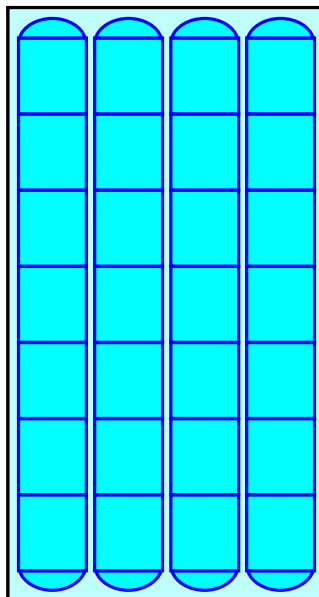
Overall Storage Efficiency = 60.9%

Overall System Size = 55.89' x 29.92' x 5.50'

28 Chambers

340.6 cy Field

222.2 cy Stone



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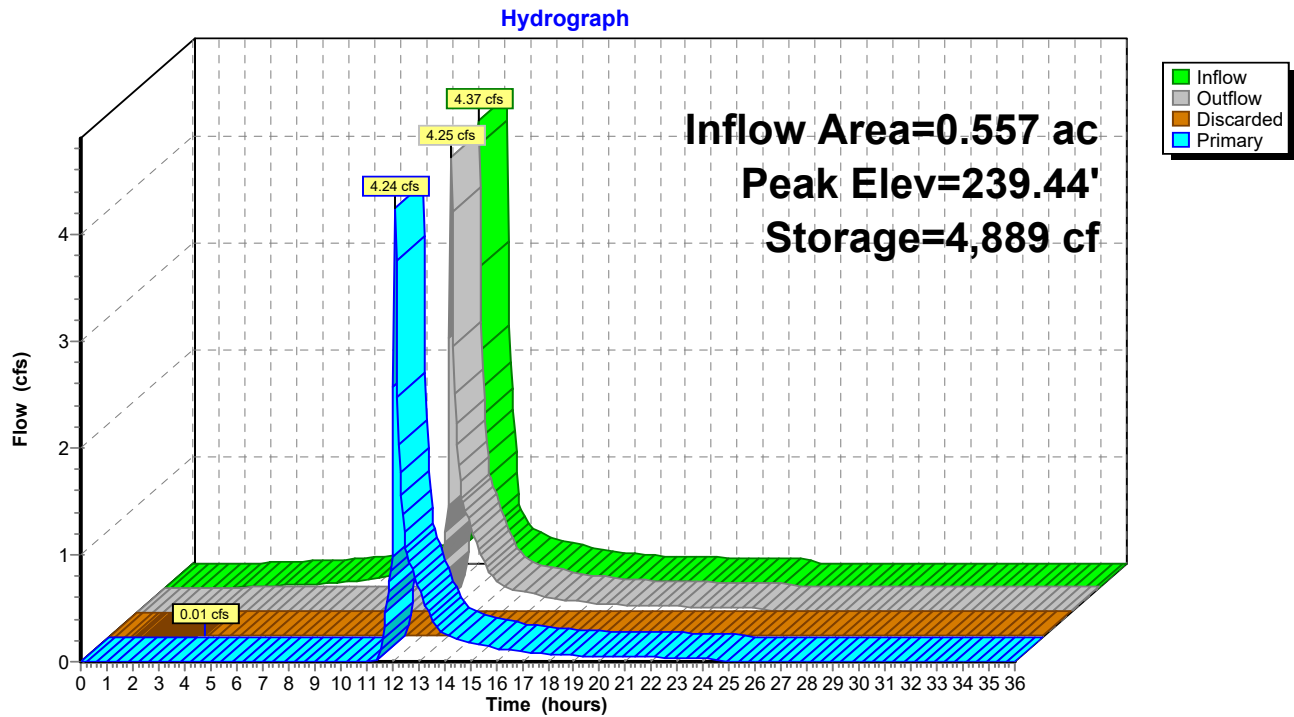
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Type III 24-hr 100-Year Rainfall=8.19"

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Pond P1: Entry Stormtech System



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Summary for Pond P2: Building C Stormtech System

Inflow Area = 0.315 ac, 91.29% Impervious, Inflow Depth = 7.71" for 100-Year event
Inflow = 2.53 cfs @ 12.07 hrs, Volume= 0.202 af
Outflow = 2.14 cfs @ 12.15 hrs, Volume= 0.165 af, Atten= 16%, Lag= 4.6 min
Discarded = 0.01 cfs @ 2.80 hrs, Volume= 0.019 af
Primary = 2.13 cfs @ 12.15 hrs, Volume= 0.146 af
Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 239.18' @ 12.15 hrs Surf.Area= 1,108 sf Storage= 3,085 cf

Plug-Flow detention time= 186.2 min calculated for 0.165 af (82% of inflow)
Center-of-Mass det. time= 113.2 min (864.2 - 751.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	1,611 cf	22.75'W x 48.72'L x 5.50'H Field A 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	235.75'	2,069 cf	ADS_StormTech MC-3500 d +Capx 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	10.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 2.80 hrs HW=235.06' (Free Discharge)
↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.08 cfs @ 12.15 hrs HW=239.18' (Free Discharge)
↑ **2=Culvert** (Passes 0.96 cfs of 4.02 cfs potential flow)
↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.96 cfs @ 1.37 fps)
↑ **4=Orifice/Grate** (Orifice Controls 1.13 cfs @ 5.75 fps)

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Pond P2: Building C Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

6 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 46.72' Row Length +12.0" End Stone x 2 = 48.72' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

18 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 2,068.5 cf Chamber Storage

6,096.1 cf Field - 2,068.5 cf Chambers = 4,027.6 cf Stone x 40.0% Voids = 1,611.0 cf Stone Storage

Chamber Storage + Stone Storage = 3,679.6 cf = 0.084 af

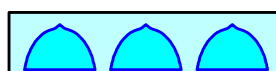
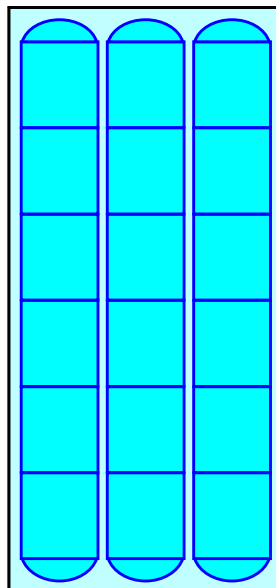
Overall Storage Efficiency = 60.4%

Overall System Size = 48.72' x 22.75' x 5.50'

18 Chambers

225.8 cy Field

149.2 cy Stone



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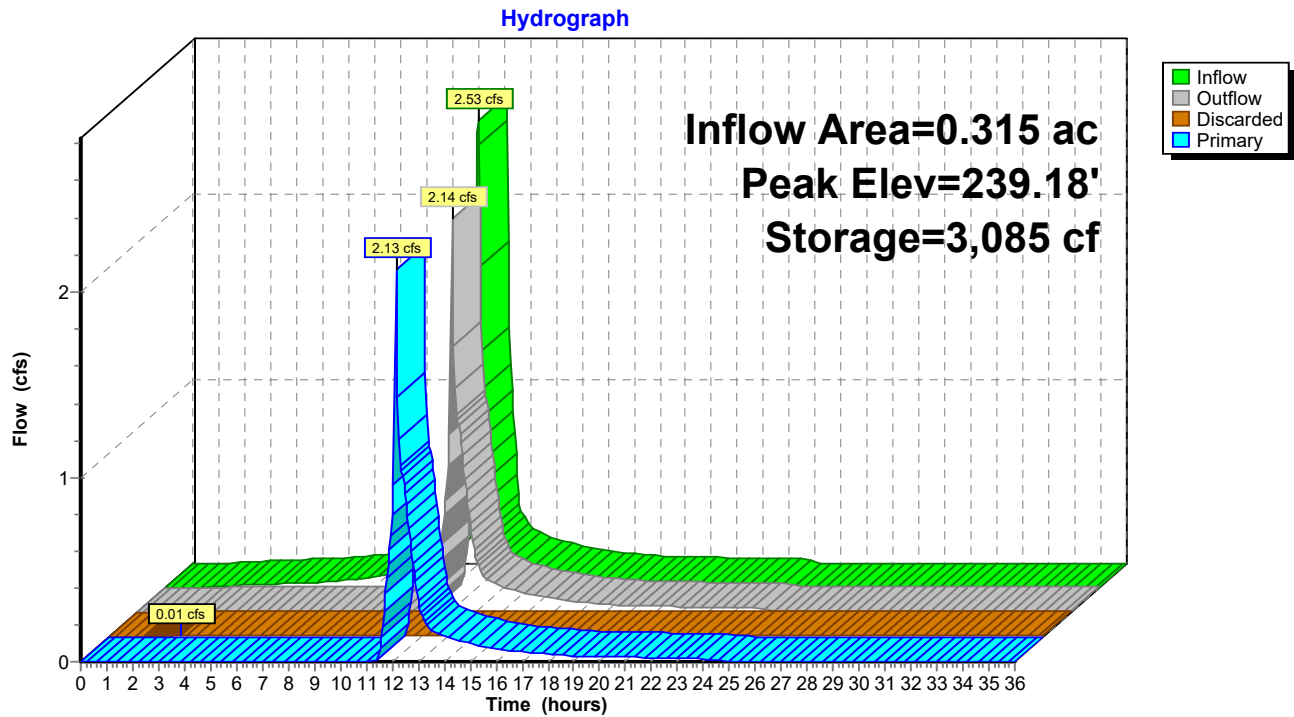
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Pond P2: Building C Stormtech System



Summary for Pond P3: Central Site Stormtech System

Inflow Area = 0.545 ac, 78.57% Impervious, Inflow Depth = 7.35" for 100-Year event
 Inflow = 4.31 cfs @ 12.07 hrs, Volume= 0.334 af
 Outflow = 4.30 cfs @ 12.11 hrs, Volume= 0.280 af, Atten= 0%, Lag= 2.6 min
 Discarded = 0.01 cfs @ 3.75 hrs, Volume= 0.027 af
 Primary = 4.29 cfs @ 12.11 hrs, Volume= 0.253 af
 Routed to Link DP-1 : Dwight Road

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 239.35' @ 12.12 hrs Surf.Area= 1,598 sf Storage= 4,613 cf

Plug-Flow detention time= 164.1 min calculated for 0.280 af (84% of inflow)
 Center-of-Mass det. time= 97.0 min (860.8 - 763.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	2,292 cf	22.75'W x 70.23'L x 5.50'H Field A 8,788 cf Overall - 3,058 cf Embedded = 5,729 cf x 40.0% Voids
#2A	235.75'	3,058 cf	ADS_StormTech MC-3500 d +Capx 27 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 27 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		5,350 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	237.50'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 3.75 hrs HW=235.06' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=3.96 cfs @ 12.11 hrs HW=239.32' (Free Discharge)

↑ **2=Culvert** (Passes 2.29 cfs of 5.83 cfs potential flow)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 2.29 cfs @ 1.84 fps)

↑ **4=Orifice/Grate** (Orifice Controls 1.67 cfs @ 6.11 fps)

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Pond P3: Central Site Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

9 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 68.23' Row Length +12.0" End Stone x 2 = 70.23' Base Length

3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

27 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,058.1 cf Chamber Storage

8,787.5 cf Field - 3,058.1 cf Chambers = 5,729.4 cf Stone x 40.0% Voids = 2,291.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,349.9 cf = 0.123 af

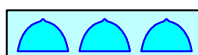
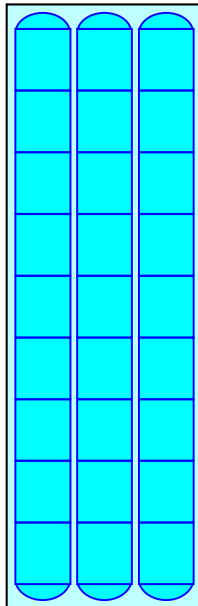
Overall Storage Efficiency = 60.9%

Overall System Size = 70.23' x 22.75' x 5.50'

27 Chambers

325.5 cy Field

212.2 cy Stone



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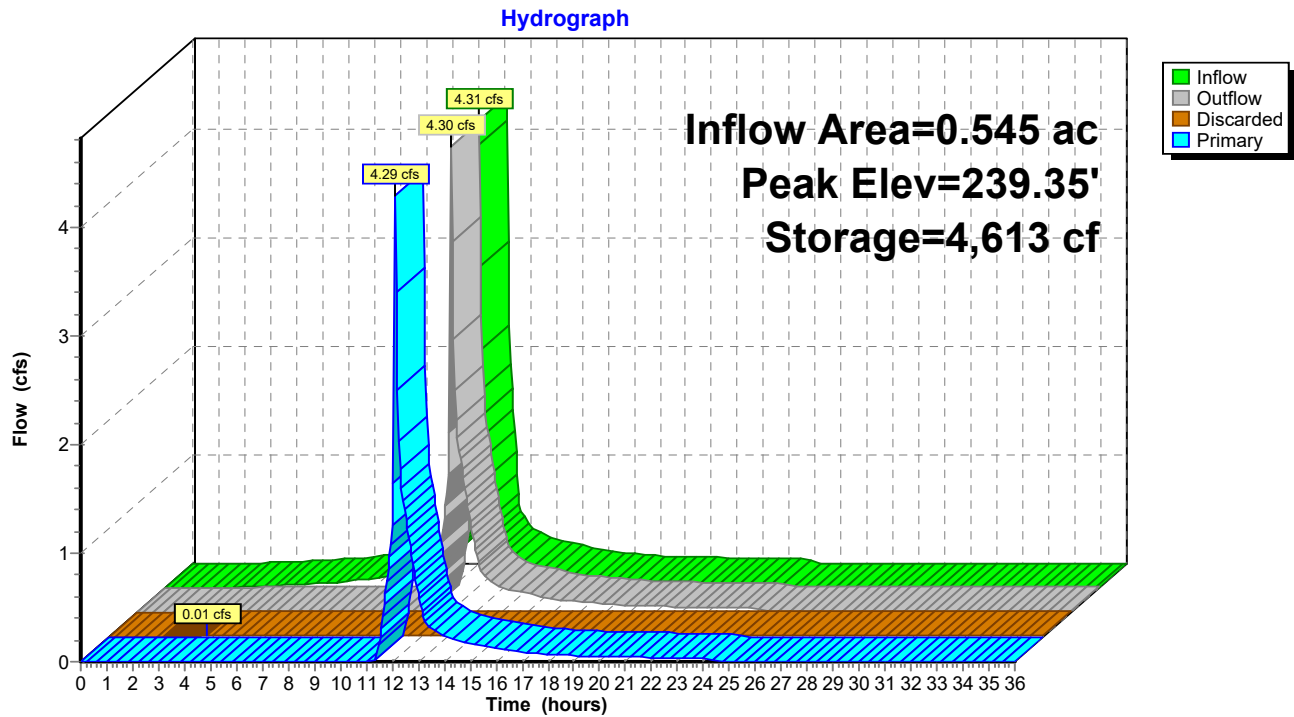
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Pond P3: Central Site Stormtech System



Summary for Pond P4: Building A Stormtech System

Inflow Area = 1.105 ac, 87.77% Impervious, Inflow Depth = 7.59" for 100-Year event
 Inflow = 8.84 cfs @ 12.07 hrs, Volume= 0.699 af
 Outflow = 4.58 cfs @ 12.21 hrs, Volume= 0.599 af, Atten= 48%, Lag= 8.6 min
 Discarded = 0.02 cfs @ 3.25 hrs, Volume= 0.068 af
 Primary = 4.55 cfs @ 12.21 hrs, Volume= 0.531 af
 Routed to Link DP-5 : Woods South

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 239.11' @ 12.22 hrs Surf.Area= 3,934 sf Storage= 11,116 cf

Plug-Flow detention time= 170.2 min calculated for 0.598 af (86% of inflow)
 Center-of-Mass det. time= 108.9 min (864.5 - 755.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	235.00'	5,516 cf	37.08'W x 106.08'L x 5.50'H Field A 21,636 cf Overall - 7,846 cf Embedded = 13,790 cf x 40.0% Voids
#2A	235.75'	7,846 cf	ADS_StormTech MC-3500 d +Capx 70 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 70 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		13,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	235.00'	8.0" Round Culvert X 4.00 L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.00' / 234.90' S= 0.0100 ' / Cc= 0.900 n= 0.011, Flow Area= 0.35 sf
#3	Device 2	239.00'	4.0' long Sharp-Crested Rectangular Weir X 2.00 2 End Contraction(s)
#4	Primary	237.00'	5.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 3.25 hrs HW=235.06' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=4.41 cfs @ 12.21 hrs HW=239.10' (Free Discharge)
 ↑ **2=Culvert** (Passes 0.80 cfs of 10.30 cfs potential flow)
 ↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.80 cfs @ 1.03 fps)
 ↑ **4=Orifice/Grate** (Orifice Controls 3.61 cfs @ 6.62 fps)

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Pond P4: Building A Stormtech System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width

9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

70 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 7,845.6 cf Chamber Storage

21,635.9 cf Field - 7,845.6 cf Chambers = 13,790.3 cf Stone x 40.0% Voids = 5,516.1 cf Stone Storage

Chamber Storage + Stone Storage = 13,361.7 cf = 0.307 af

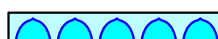
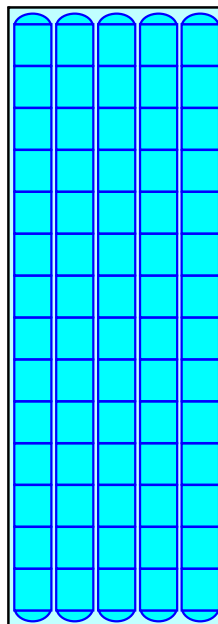
Overall Storage Efficiency = 61.8%

Overall System Size = 106.08' x 37.08' x 5.50'

70 Chambers

801.3 cy Field

510.8 cy Stone



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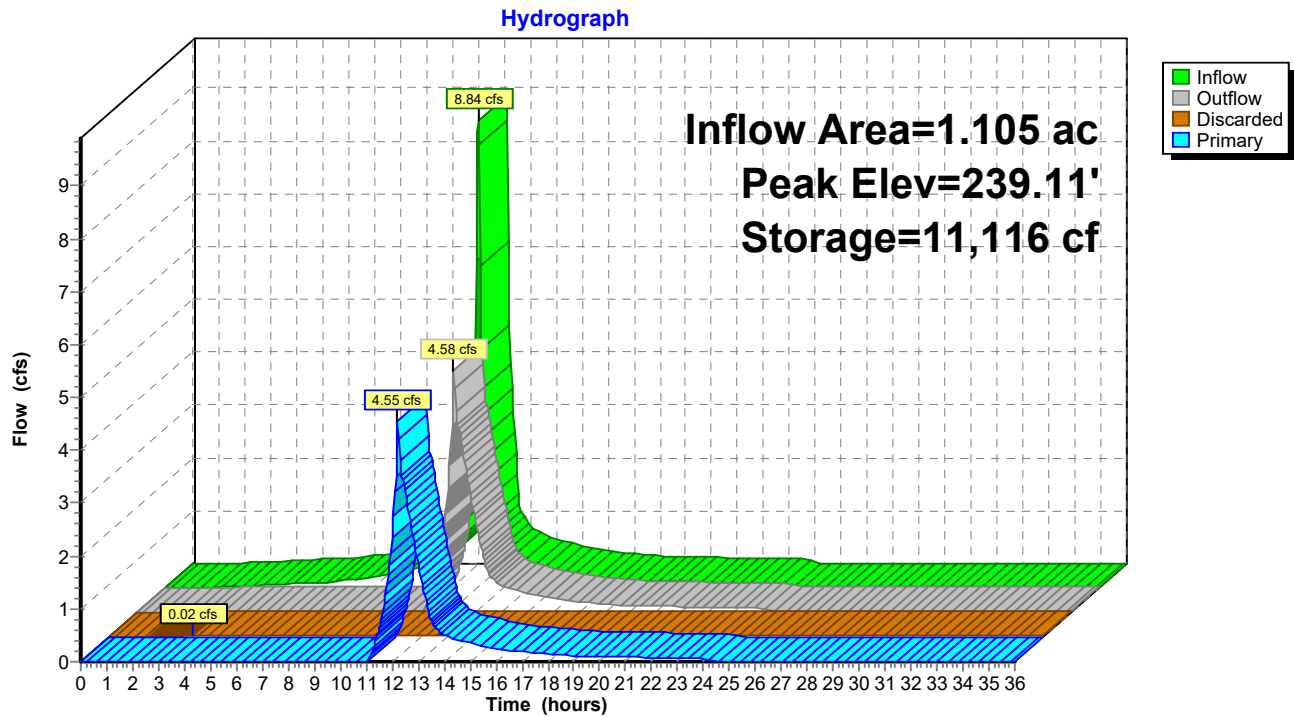
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Pond P4: Building A Stormtech System



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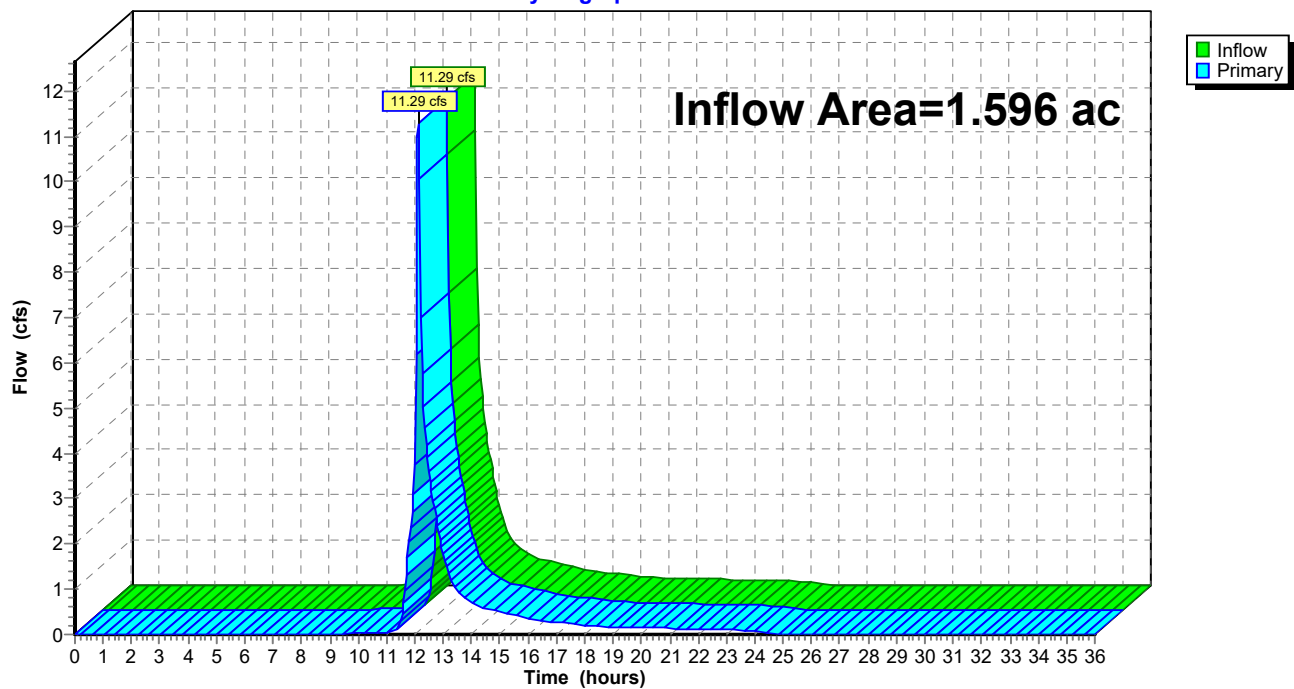
Summary for Link DP-1: Dwight Road

Inflow Area = 1.596 ac, 72.01% Impervious, Inflow Depth = 5.47" for 100-Year event
Inflow = 11.29 cfs @ 12.12 hrs, Volume= 0.728 af
Primary = 11.29 cfs @ 12.12 hrs, Volume= 0.728 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Dwight Road

Hydrograph



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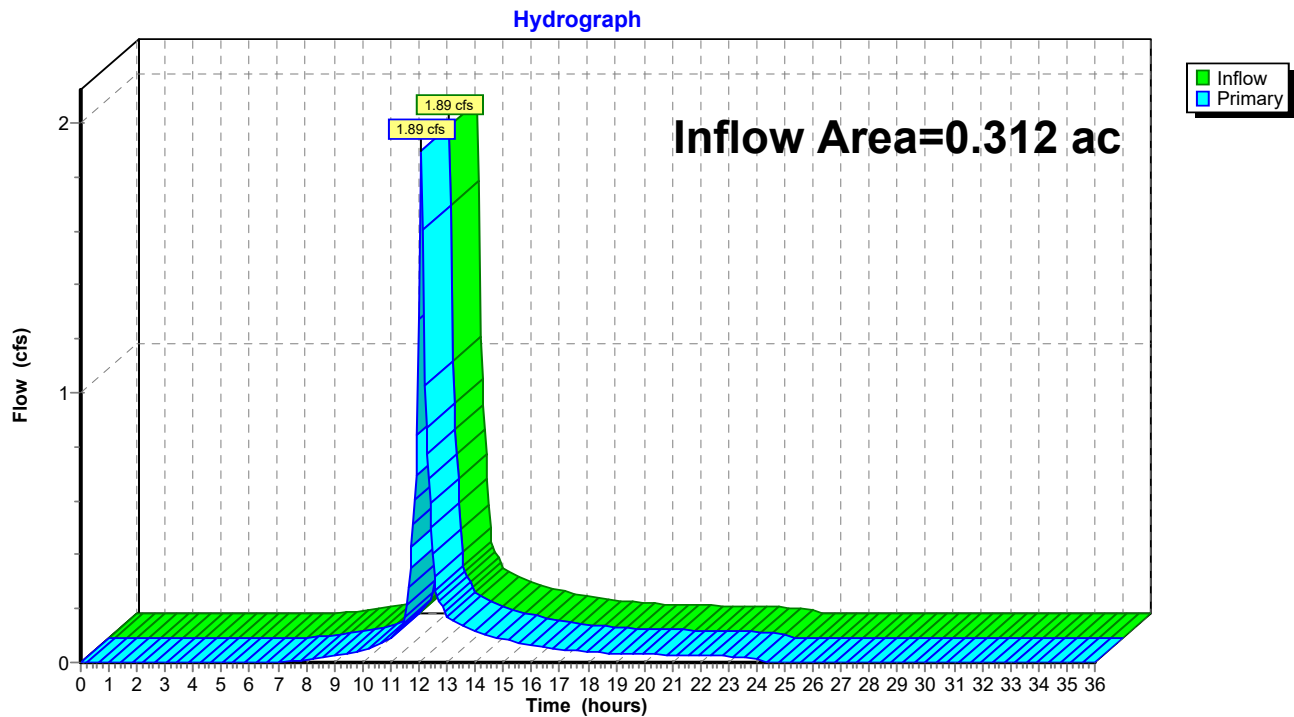
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Summary for Link DP-2: Woods North

Inflow Area = 0.312 ac, 5.91% Impervious, Inflow Depth = 5.21" for 100-Year event
Inflow = 1.89 cfs @ 12.08 hrs, Volume= 0.135 af
Primary = 1.89 cfs @ 12.08 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-2: Woods North



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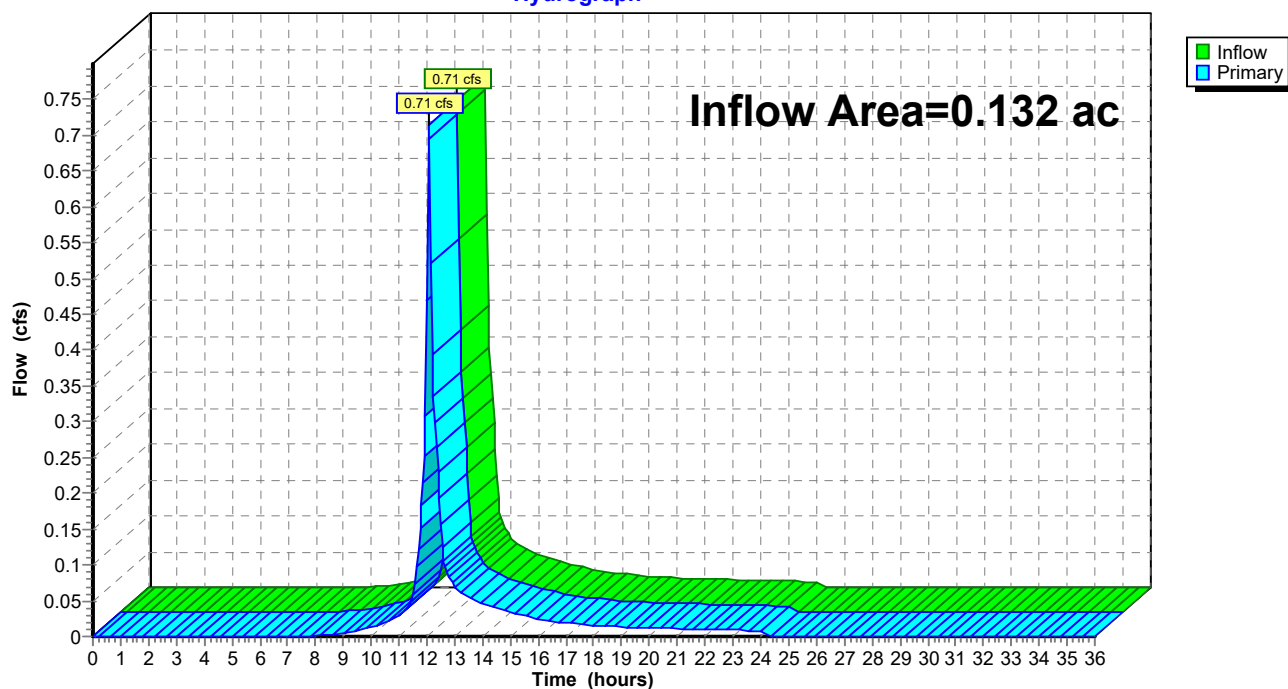
Summary for Link DP-3: Woods East

Inflow Area = 0.132 ac, 0.00% Impervious, Inflow Depth = 4.63" for 100-Year event
Inflow = 0.71 cfs @ 12.08 hrs, Volume= 0.051 af
Primary = 0.71 cfs @ 12.08 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-3: Woods East

Hydrograph



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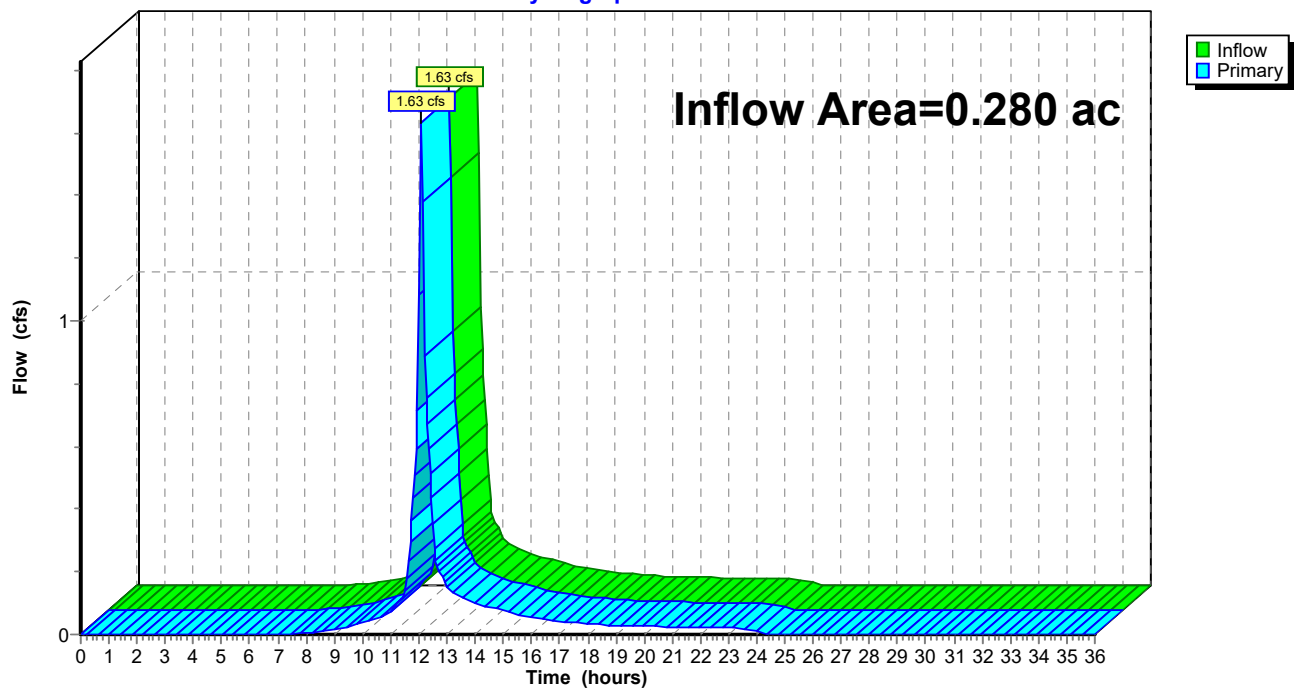
Summary for Link DP-4: Woods West

Inflow Area = 0.280 ac, 6.50% Impervious, Inflow Depth = 4.98" for 100-Year event
Inflow = 1.63 cfs @ 12.08 hrs, Volume= 0.116 af
Primary = 1.63 cfs @ 12.08 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-4: Woods West

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Summary for Link DP-5: Woods South

Inflow Area = 1.189 ac, 82.21% Impervious, Inflow Depth = 5.70" for 100-Year event

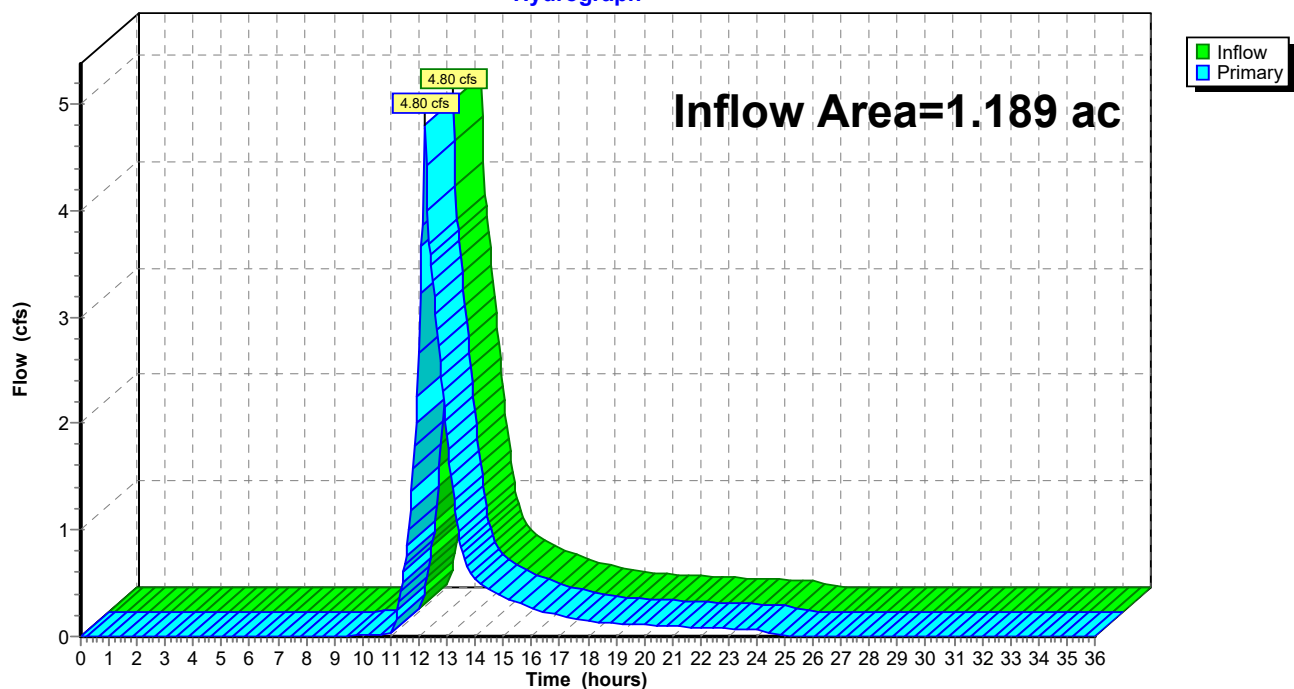
Inflow = 4.80 cfs @ 12.21 hrs, Volume= 0.565 af

Primary = 4.80 cfs @ 12.21 hrs, Volume= 0.565 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-5: Woods South

Hydrograph



I. Traffic Impact Study

59 E Militia Heights

Charles River Heights Project
Needham, Massachusetts

PREPARED FOR

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PREPARED BY



99 High Street
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08/11/2025

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1

Introduction

Vanasse Hangen Brustlin, Inc. (VHB) has performed this Transportation Impact and Access Study associated the proposed development project at 59 E. Militia Heights, in Needham, Massachusetts (the “Site”). The proposed project includes the construction of four buildings to create 86 new affordable housing units, of which about 43 will offer integrated supportive services that empower individuals with disabilities to live independently. The site is currently undeveloped and is located across from the Charles River Center (CRC).

This Transportation Impact and Access Study (TIAS) provides an evaluation and summary of the Project’s proposed transportation elements (site access and circulation, parking), quantified trip generation and associated traffic study, and assessment of the area’s transportation network.

Key findings and mitigation and improvement actions include:

- › The Project’s additional trips generated to and from the Project Site are not expected to generate any traffic operational impacts on the surrounding streets.
- › Because of the low number of expected trips generated during the weekday AM and PM peak hours, the local street network can accommodate the added Project-generated trips.
- › The Project’s loading/service operations will be handled internal to the Project site and will not impact traffic operations or pedestrian flows on Militia Heights Drive or Dwight Road.
- › The CRC will provide shuttle bus service to area destinations and nearby public transportation nodes (commuter rail stations)

2

Project Description

A detailed review of the proposed building program and site access was conducted as part of this assessment, as described in the following sections.

2.1 Building Program

The Project consists of a development proposal of four buildings, consisting of the following:

- › One three-story building (Building A) with approximately 67,000 SF:
 - 43 units of affordable housing for tenants under the care of the Charles River Center
 - 43 units of affordable housing
 - approximately 4,400 SF of community space
 - approximately 1,900 SF of lobby/amenities spaces
- › Three one-story buildings (Building B, C and D) each with 6 studio units for CRC tenants
- › 61 off-street vehicle parking spaces in surface parking lots.

The Site will have a single driveway off E. Militia Heights Drive.

Town of Needham zoning requirements for a residential care facility call for a minimum of one parking space per two beds and one space per two employees, and zoning requires one and a half space per dwelling unit. The Project Proponent anticipates that many tenants of the congregate care units will not own vehicles and can use a CRC-provided shuttle. Thus, the proposed Project will have fewer spaces than required per the zoning ordinance.

2.2 Site Access

Access to the Project site's single driveway occurs via E. Militia Heights Drive, a private road that intersects Forest Street to the north of the site, and Dwight Road, which intersects Central Avenue to the east of the site. Opposite the site driveway is the Charles River Center, while nearby is North Hill Drive, which is a private road that serves the North Hill Retirement Community.

A site location map is provided in Figure 1. Figure 2 illustrates the site plan and external access points for the Project.

Internal to the site is a driveway with curb cuts that provide access to the proposed surface parking lots. Building A will include a passenger drop-off loop off serving the main entrance and a few parking spaces.

Delivery and waste management services vehicles will access the buildings via the site's internal circulating driveway. No service/loading activities will be on local public streets.

Pedestrian Accommodations

As part of the Project, new sidewalks will be provided along the proposed internal driveway. The internal sidewalks will connect to E Militia Heights Drive and Dwight Road.

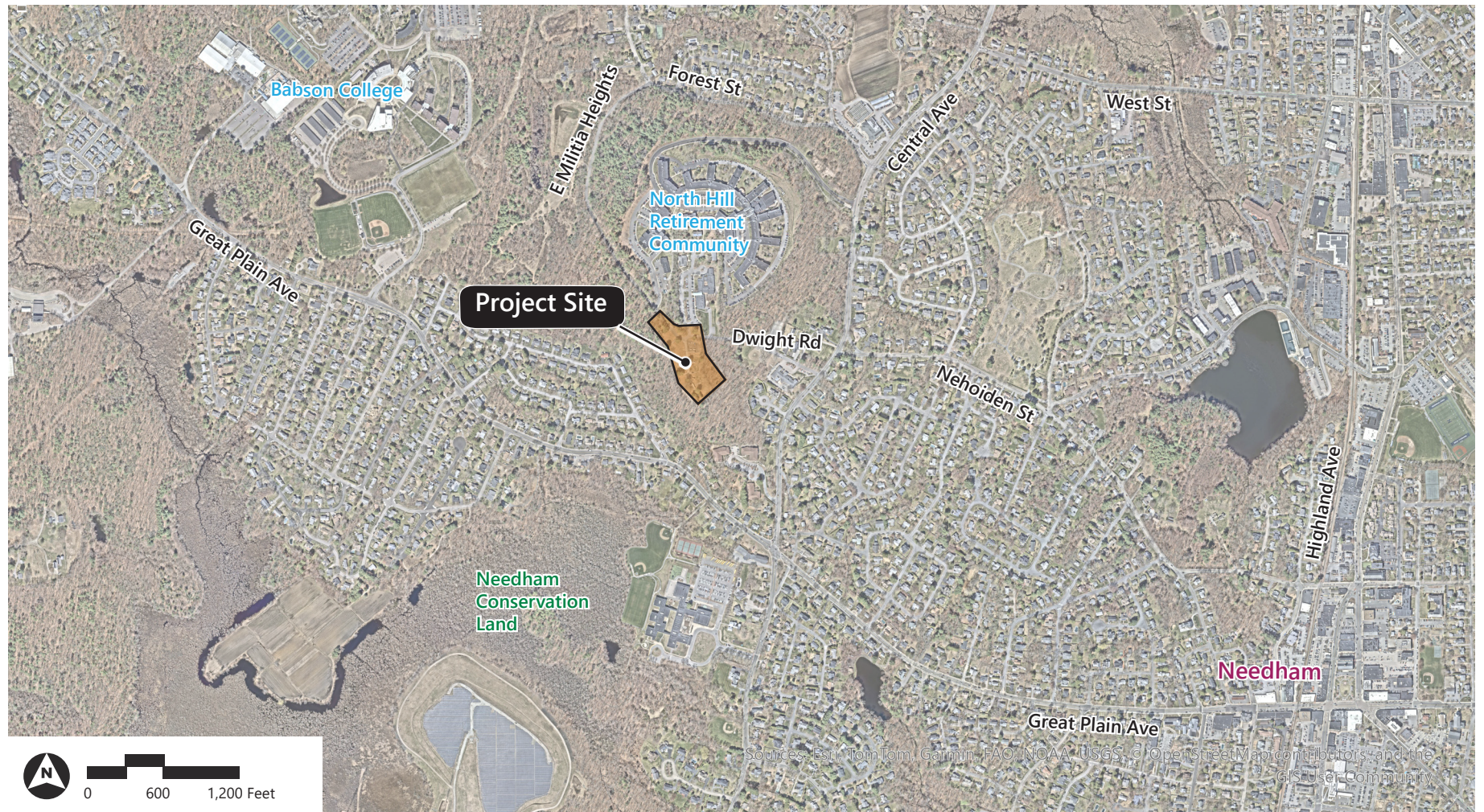
The Applicant is exploring the installation of a crosswalk across Dwight Road to connect to the existing CRC campus.

Shuttle Service

As part of the building program, Charles River Center proposes a limited, daily shuttle bus service designed to provide residents with direct access to the Needham Heights and Needham Center commuter rail stations, Needham Center, Newton-Wellesley Hospital, Beth Israel Deaconess Hospital–Needham, and other key neighborhood destinations. The primary objective of the service is to offer a safe and reliable transit option that supports and encourages the use of transit rather than driving. The proposed schedule includes multiple trips during morning and evening periods, with a minimum of one shuttle trip during each rush hour. This service is anticipated to operate in partnership with neighboring North Hill (residential community).

Figure 1: Project Site Location

Charles River Heights | E. Militia Heights Drive, Needham, MA



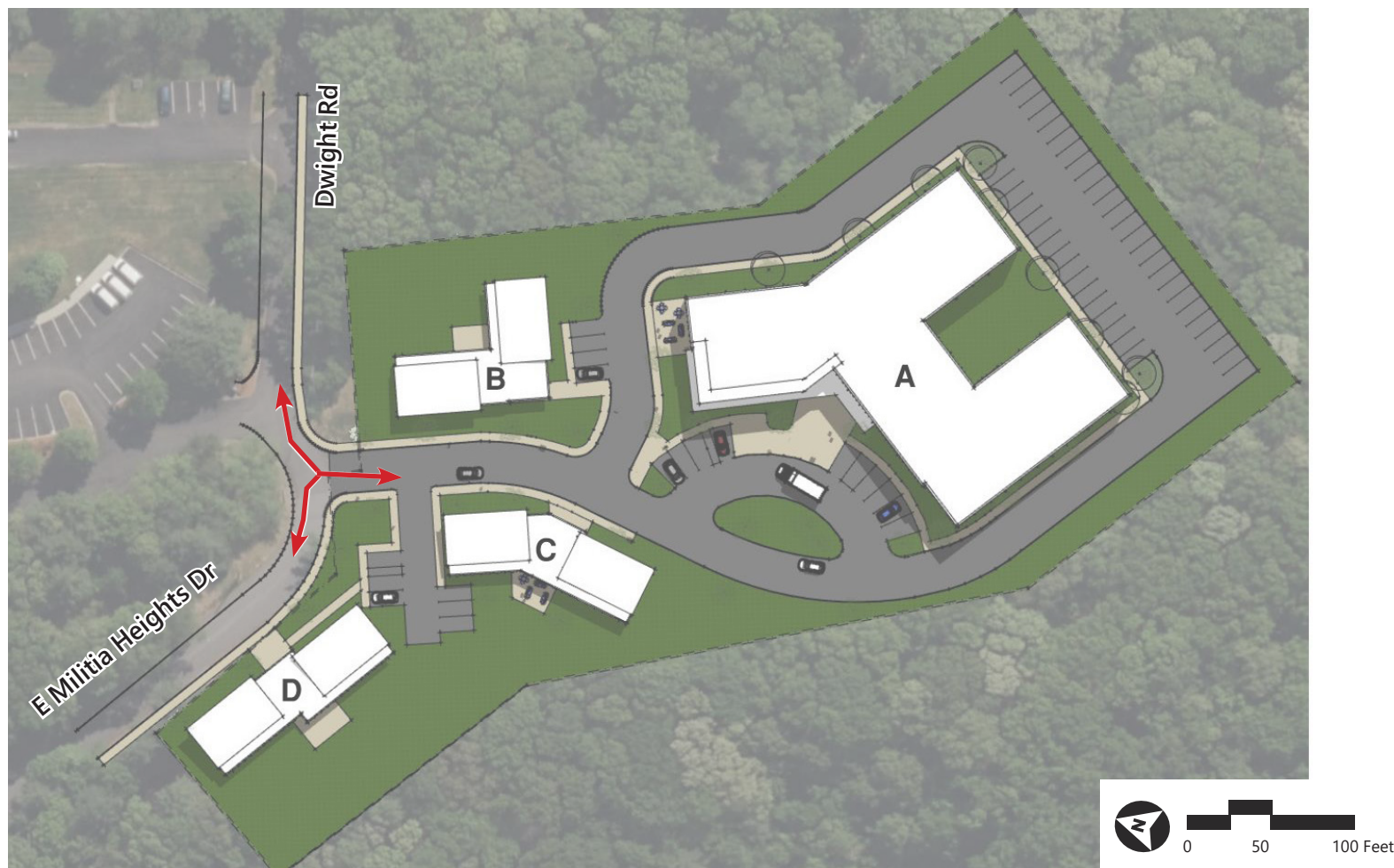
Legend:

 Project Site

Source: Nearmap aerial from 04/10/2025.

Figure 2: Project Site Plan

Charles River Heights | E. Militia Heights Drive, Needham, MA



Legend:

→ Vehicular Site Access

3

Existing Conditions: Area Transportation Context

Evaluation of the transportation impacts associated with the Project requires an understanding of the existing transportation conditions in the study area including: an inventory of the roadways and intersection traffic control; the collection of peak hour traffic volumes; a review of existing bicycle and pedestrian accommodations; a summary of public transit options; and a review of recent motor vehicle crash history. Each of these elements is provided below.

3.1 Study Area

Based on VHB's knowledge of the area's transportation network and the Project's traffic characteristics, a traffic study area comprising of the following intersections and their approach roadways were selected for review:

1. Forest Street at E Militia Heights Drive (unsignalized) (Project site access)
2. Central Avenue at West Street (unsignalized)
3. Central Avenue at Forest Street (signalized)
4. Central Avenue at Nehoiden Street (unsignalized)
5. Central Avenue at Dwight Road (unsignalized) (Project site access)

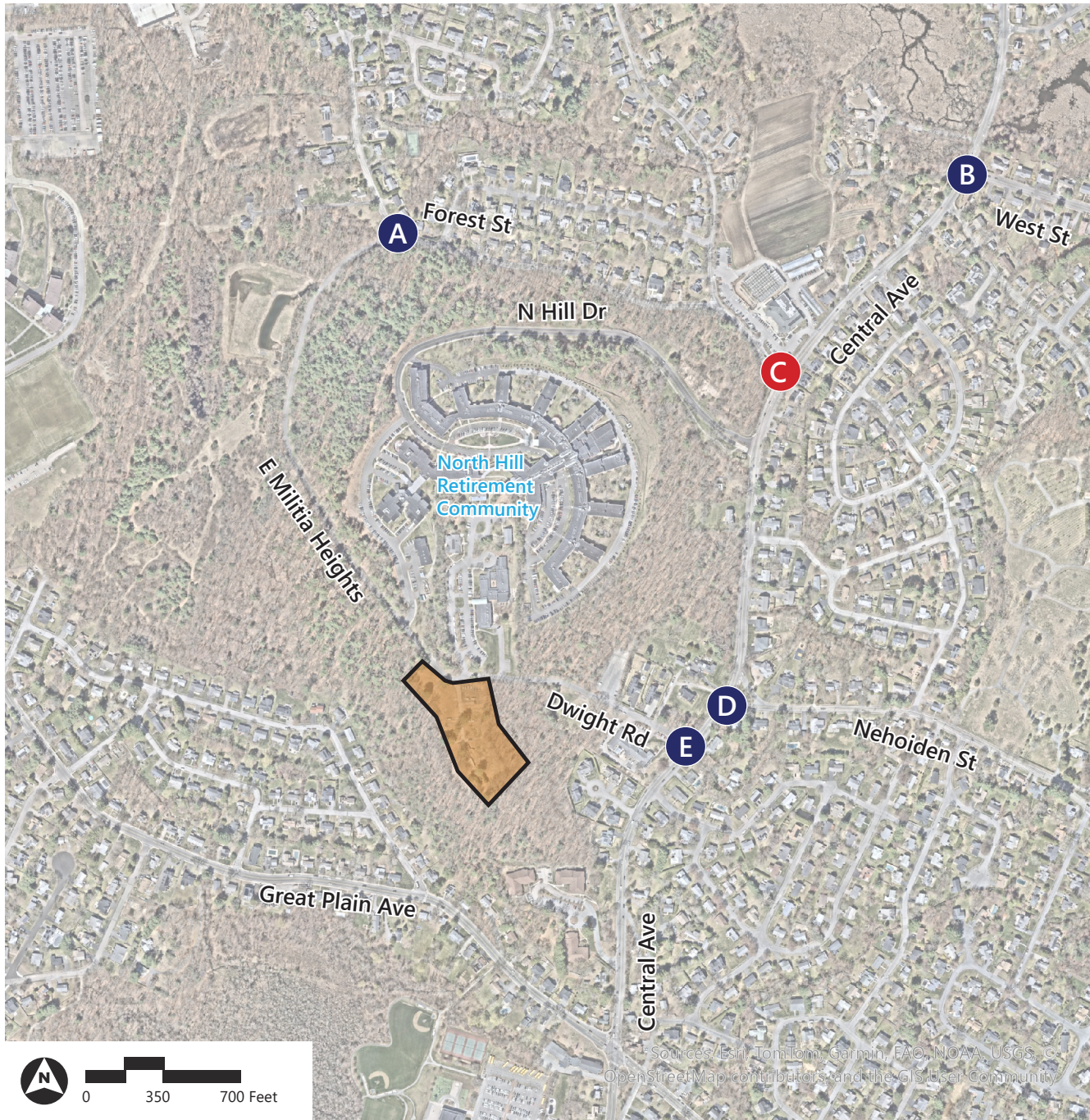
A map of the study area intersections is provided in Figure 3.

The Project Site is directly served by Dwight Road, which intersects Central Avenue, and E. Militia Heights Drive, which intersects Forest Street.

Figure 3: Study Area Intersections

Charles River Heights | E. Militia Heights Drive, Needham, MA

06/12/2025



Legend:

-  Project Site
-  Signalized
-  Unsignalized
-  A Forest St at E Militia Heights
-  B Central Ave at West St
-  C Central Ave at Forest St
-  D Central Ave at Nehoiden St
-  E Central Ave at Dwight Rd

Source: Nearmap aerial from 04/10/2025.

3.2 Roadway Network

The study area roadways and intersections are described next, including descriptions of the existing lane configurations, traffic control at the intersections, and the roadway jurisdiction.

3.2.1 Study Area Roadways

Central Avenue

Central Avenue begins at Elliot Street in Newton and terminates at North Street in Medfield. Within the study area, Central Avenue is under local jurisdiction and is classified as a minor arterial. Central Avenue is generally oriented in a north/south direction within the study area. The roadway consists of one travel lane in each direction, occasionally with exclusive turn lanes. The posted speed limit for this street in the Project area is 30 mph. Sidewalks are provided on both sides of the roadway. Near the Project site, crosswalks across Central Avenue are only provided at the intersection with Forest Street. On-street parking is prohibited near the Project site. Land use around Central Avenue is mainly residential (primarily single-family homes), except for the commercial/retail property near its intersection with Forest Street.

Forest Street

Forest Street is generally oriented in an eastbound/westbound direction, connecting Washington Street (Wellesley) in the west to Central Avenue in the east. It is classified as a major collector roadway under local jurisdiction. Forest Street consists of one travel lane in each direction. The posted speed limit on Forest Street is 30 mph, which decreases to an advisory speed of 25 mph at the roadway curves. Sidewalks are not provided along the roadway. On-street parking is prohibited near the Project site. Land use along Forest Street is primarily residential (single-family homes).

West Street

West Street is a two-way roadway, providing one lane per direction of travel, oriented in eastbound and westbound directions. It connects Central Avenue and Webster Street. It is classified as a local roadway under local jurisdiction. On-street bike lanes and sidewalks are provided on both sides of the roadway.

Nehoiden Street

Nehoiden Street is a two-way roadway, providing one lane per travel direction, connecting between Central Avenue and Great Plain Avenue. It is classified as a local roadway under local jurisdiction. Sidewalks are generally provided on both sides of the roadway. On-street parking is prohibited in the study area.

E Militia Heights Drive

E Militia Heights Drive is generally oriented northbound/southbound between Forest Street and Dwight Road (at the Project site). The roadway is one of the main access points from the local street network to the existing Charles River Center and North Hill Retirement Community. It is a

private, local road. E Militia Heights Drive consists of one lane of travel in each direction. Sidewalks are not provided along the roadway.

Dwight Road

Dwight Road is generally oriented in an eastbound/westbound direction, between E Militia Heights Drive and Central Avenue. The road is a main access point from the local street network to the existing Charles River Center. It is classified as a local road, signed as a private way. Dwight Road consists of one lane of travel in each direction. Sidewalks are not provided along the road.

3.2.2 Study Area Intersections

1: Forest Street at E Militia Heights Drive

Forest Street and E Militia Heights Drive form a three-way unsignalized intersection. E Militia Heights Drive intersects Forest Street from the south. Each approach to the intersection consists of a single general-purpose lane.

The E Militia Heights Drive northbound approach operates under STOP control while the eastbound and westbound approaches on Forest Street are free flowing. Sidewalks and crosswalks are not provided on any leg of the intersection. Land use around the intersection is residential.

2: Central Avenue at West Street

Central Avenue at West Street form a three-way unsignalized intersection. Central Avenue runs north/south and West Street intersects from a westbound approach. The Central Avenue southbound approach to the intersection consists of a through lane and an exclusive left-turn lane.

The westbound approach operates under STOP control while the northbound and southbound approaches are free flowing. Sidewalks are present on all legs of the intersection. Crosswalks are provided across West Street. Bike lanes (marked shoulder/curb side lane) are provided on both sides of West Street and Central Avenue. On Central Avenue at the intersection the bike lanes turn into sharrow markings (shared bike/vehicle lane).

3: Central Avenue at Forest Street

Central Avenue and Forest Street form a three-way signalized intersection. Central Avenue runs north/south and Forest Street intersects from an eastbound approach. The southbound approach provides a general travel lane, while the northbound approach provides a through lane and an exclusive left-turn lane. The eastbound approach provides a general travel lane, and an exclusive right turn lane.

Sidewalks are present on all sides of the intersection, except for the south side of the eastbound approach of Forest Street. Crosswalks are provided across the Central Avenue southbound approach and across the Forest Street eastbound approach. The signal operates with an exclusive pedestrian crossing phase, which is activated through push buttons.

4: Central Avenue at Nehoiden Street

The intersection of Central Avenue and Nehoiden Street forms a three-way unsignalized intersection. Central Avenue runs north/south and Nehoiden Street intersects from a westbound approach. Each approach to the intersection consists of a single general-purpose lane, with a channelized right turn lane from the westbound approach. The Nehoiden Street westbound approach operates under STOP control, while the Central Avenue northbound and southbound approaches are free flowing.

Sidewalks are provided on all sides of the roadways. A crosswalk is provided along the westbound approach, but not across Central Avenue.

5: Central Avenue at Dwight Road

The intersection of Central Avenue at Dwight Road forms a three-way unsignalized intersection. Central Avenue runs north/south, and Dwight Road intersects from an eastbound approach. Each approach to the intersection consists of a single general-purpose lane.

The Dwight Road eastbound approach operates under STOP control, while the Central Avenue northbound and southbound approaches are free flowing. Sidewalks are provided on Central Avenue. A crosswalk is provided across the Dwight Road eastbound approach.

3.3 Traffic Data

3.3.1 Existing Traffic Volumes

VHB conducted turning movement counts (TMCs) at study area intersections on Thursday, May 7, 2025, including vehicle, bicycle, and pedestrian volumes. The TMCs are used to establish the Project study area's street network peak hour volumes for a baseline conditions analysis of traffic operations. The weekday morning peak hour of traffic activity was determined to be 7:00 AM to 8:00 AM and the weekday evening peak hour from 5:00 PM to 6:00 PM. The TMCs are provided in the Appendix for reference.

MassDOT Seasonal Adjustment Rates (see Appendix) were reviewed; however, no seasonal adjustments were applied because the counts in May represent a typical high-volume condition. Therefore, the TMCs are used to represent the 2025 Existing Condition.

Figure 4: 2025 Existing Conditions - Weekday Morning Peak Hour Vehicle Volumes

Charles River Heights | E. Militia Heights Drive, Needham MA

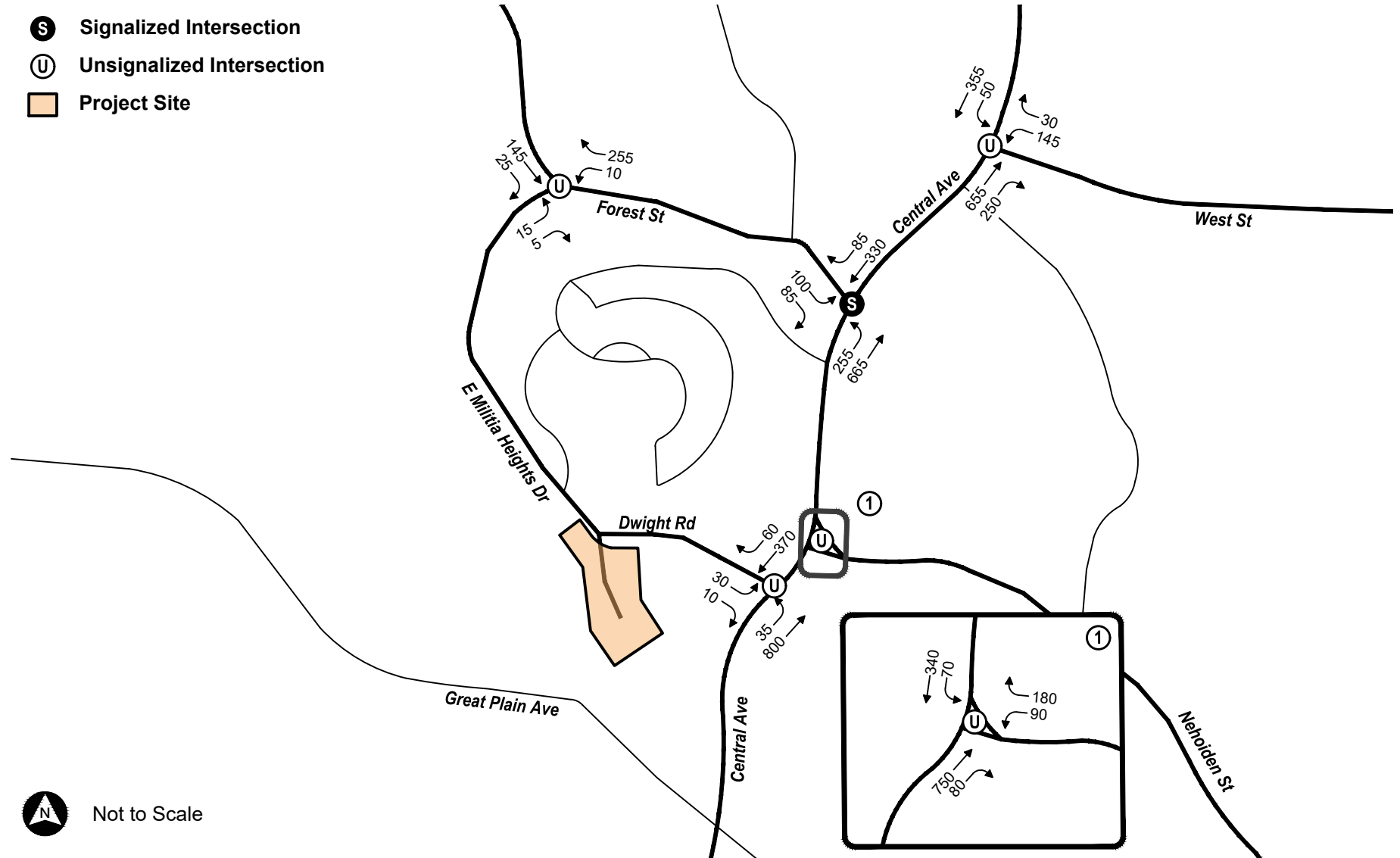
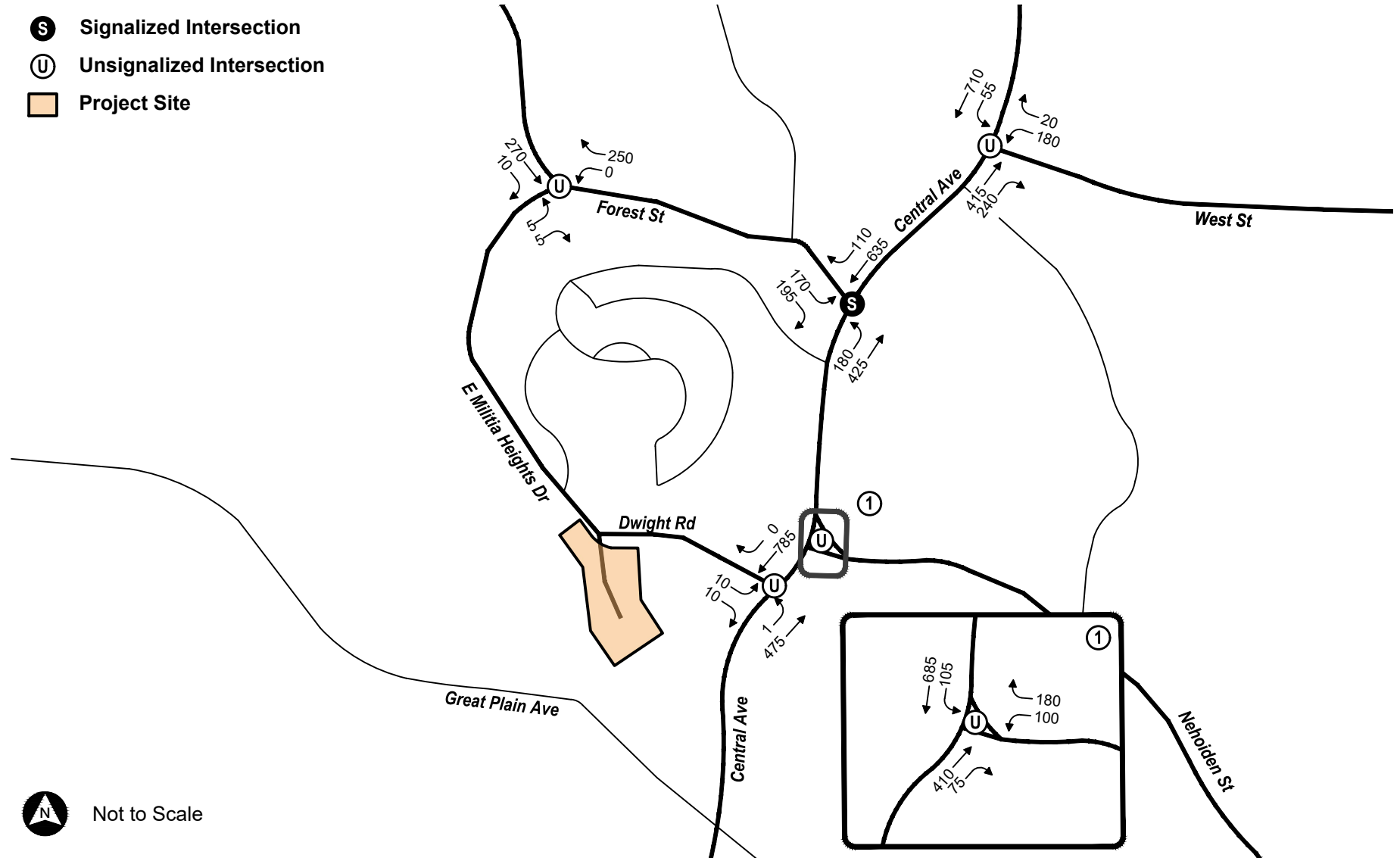


Figure 5: 2025 Existing Conditions - Weekday Evening Peak Hour Vehicle Volumes

Charles River Heights | E. Militia Heights Drive, Needham MA



3.3.2 Speed Study

VHB used radar to collect vehicle speeds for a continuous 24-hour period at two locations:

1. Central Avenue just south of Dwight Road
2. Forest Street just east of E Militia Heights Drive

Both intersections are unsignalized and serve the two access roads to the Project site area from the local street network. Forest Street has a posted speed limit of 25 miles per hour (mph), and Central Avenue has a 30-mph speed limit.

A summary of collected speed data on Wednesday, May 7, 2025 (a sunny, clear day), is presented in Table 1.

Table 1 Observed Vehicle Speed Summary at ATR Count Locations (2025)

Location	Direction	Posted Speed Limit (mph)	50 th Percentile Speed (mph)	85 th Percentile Speed (mph)	Pace (mph)	Percentage in Pace Range
Central Avenue South of Dwight Road	Northbound	30	33	37	29 – 38	82.7%
	Southbound		34	38	30 – 39	68.3%
	Combined		33	37	30 – 39	74.8%
Forest Street East of E Militia Heights Drive	Eastbound	25	29	32	25 – 34	87.9%
	Westbound		31	34	27 – 36	80.4%
	Combined		30	33	25 – 34	83.1%

Source: ATR counts conducted on Wednesday, May 7, 2025. See appendix for full details.

"Pace" denotes the 10 MPH range in which the highest number of collected speeds falls into.

On Central Avenue south of Dwight Road, most vehicles operated at speeds within 10 mph of the posted speed limit, based on the 85th percentile speed.

On Forest Street east of E Militia Heights Drive, most vehicles operate at speeds within 10 mph of the speed limit, based on the 85th percentile speed.

The 85th percentile speed is applied to a sight distance evaluation (see section 5.2).

3.4 Public Transit and Active Transportation Infrastructure

3.4.1 Public Transportation

There is no public transportation (transit) within reasonable walking distance from the Project site. The closest services are about 1.2 miles from the site, about a 25-minute walk. Needham has Massachusetts Bay Transportation Authority (MBTA) bus service, Route #59, and the Needham Line of the Commuter Rail. Descriptions of each transit service is provided below, and detailed maps and schedules can be found in the Appendix.

- › Bus Route 59 travels between Watertown Square and Needham Junction via Newton. Bus Route 59 provides connections to the D Branch of the Green Line at Newton Highlands, to the Needham Line at Needham Heights, Needham Center, and Needham Junction, and to the Worcester Line of the MBTA Commuter Rail at Newtonville. Bus Route 59 runs seven days a week and during peak periods has a frequency of approximately 30- to 40 minutes.
- › The Needham Line of the MBTA Commuter Rail travels between Needham Heights and Back Bay Station and South Station in Boston. Service is provided seven days a week, during peak periods, service is provided every 60 minutes in peak directions.
- › The MetroWest Regional Transit Authority does not operate in Needham.

3.4.2 Pedestrian Environment

Varying levels of pedestrian accommodations are provided throughout the study area and are representative of the level of pedestrian accommodations throughout Needham. Within the study area, along Central Avenue near the Project site, sidewalks are provided on both sides of the street and terminate south of Sunrise Terrace on the east of the roadway. On Nehoiden Street and West Street sidewalks are provided on both sides of the street. On Forest Street no sidewalks are provided. Neither one of the private roads, Dwight Road or E. Militia Heights Drive, has sidewalks.

Crosswalks are generally provided at the major street intersections. Crosswalk ramps are provided for some crosswalk approaches, and tactical warning strips are provided on some, but not all, crosswalk ramps. The signalized intersections with these pedestrian accommodations operate with pedestrian crossing signals at all crosswalks. Near Dwight Road, the primary access road to the Project Site, there are no crosswalks provided across Central Avenue.

3.4.3 Bicycle Amenities

On-street bicycle lanes are provided on both sides of Central Avenue north of Forest Street, which transition into a wide shoulder south of Forest Street. Additionally, on-street, curbside bike lanes are provided on West Street.

3.5 Crash History

A crash inventory was conducted to identify potential vehicle crash trends and/or roadway deficiencies in the traffic study area. The MassDOT database¹ comprises crash data from the Massachusetts Registry of Motor Vehicles (RMV) Division for use in traffic studies and safety evaluations. Some crash records may be omitted because of crashes not being reported or a municipality's crash records not being provided in a compatible format for RMV use.

The vehicle crash data for the traffic study area intersections were obtained from MassDOT for the years 2018 to 2021. (Crash records or data provided in the database for the years 2022 and later are still subject to change and may not be up-to-date or complete.) Because of Covid-19 pandemic travel disruptions, Year 2020 crash data from MassDOT are noted but excluded in the

¹ MassDOT Crash Data Query and Visualization - <https://apps.crashdata.dot.mass.gov/cdv/>

calculation of intersection crash rate. A summary of the vehicle crash history for the study area intersections is presented in Table 2; detailed crash data is provided in the Appendix.

Crash rates are calculated based on the number of crashes at an intersection and the daily volume of traffic traveling through that intersection. Rates that exceed MassDOT's district average for crashes at intersections could indicate safety or geometric issues for a particular intersection. Needham is in MassDOT's District 6, thus for the study area the calculated crash rates are compared to District 6 average. In District 6, the average crash rate is 0.71 for signalized intersections and 0.52 for unsignalized intersections. These rates imply that throughout District 6, on average, 0.71 crashes occurred per million vehicles entering signalized intersections and 0.52 crashes occurred per million vehicles entering unsignalized intersections. The locations of some crashes cannot be precisely determined from the database; these locations typically involve interchange intersections. Additionally, some crashes may not have been reported or included in the database.

As shown in Table 2, the crash data indicates that none of the study area intersections are above the crash rate threshold. Most crashes throughout the study area were angle crashes and rear-end crashes occurring on dry pavement resulting in property damage only. Based on the MassDOT records, there were no fatal crashes that occurred within the study area during the three-year period. The intersection of Central Avenue at West Street and Central Avenue at Forest Street each had a crash involving either a pedestrian or cyclist.

A review of MassDOT's Highway Safety Improvement Program (HSIP) database found that none of the study area's intersections are among the HSIP-eligible crash location clusters. An HSIP-eligible cluster is one in which the total number of "equivalent property damage only" crashes in the area falls within the top 5 percent of all crash clusters in that region.² Being HSIP-eligible makes the location eligible for FHWA and MassDOT funds to implement safety improvements at the location.

Table 2 Vehicular Crash Summary (2018-2021) at Study Area Intersections

	Forest St at E Militia Heights Dr	Central Ave at West St	Central Ave at Forest St	Central Ave at Nehoiden St	Central Ave at Dwight Rd
Signalized?	No	No	Yes	No	No
MassDOT Average Crash Rate	0.52	0.52	0.71	0.52	0.52
Calculated Crash Rate	0.15	0.36	0.34	0.16	0.09
Exceeds Average?	No	No	No	No	No
Year					
2018	0	2	1	2	0
2019	0	2	3	0	1
<u>2021</u>	1	3	3	1	0
Total	1	7	7	3	1
<i>Year 2020 (Excluded from the crash rate analysis)</i>					
2020	0	0	0	0	1

² "Equivalent property damage only" is a method of combining the number of crashes with the severity of the crashes based on a weighted scale. Crashes involving property damage only receive a lower weight, while collisions involving personal injury or fatalities are weighted more heavily.

	Forest St at E Militia Heights Dr	Central Ave at West St	Central Ave at Forest St	Central Ave at Nehoiden St	Central Ave at Dwight Rd
Collision Type					
Angle	0	6	3	0	0
Head-on	1	0	0	0	0
Rear-end	0	0	1	3	0
Rear-to-rear	0	0	0	0	0
Sideswipe, opposite direction	0	0	1	0	0
Sideswipe, same direction	0	0	1	0	0
Single Vehicle Crash	0	1	1	0	1
Unknown	0	0	0	0	0
Severity					
Fatal Injury	0	0	0	0	0
Non-Fatal Injury	0	1	2	0	0
Property Damage Only (none injured)	1	6	5	3	1
Not Reported	0	0	0	0	0
Non-Motorist (Bike, Pedestrian)	0	1	1	0	0
Time of Day					
Weekday, 7:00 AM – 9:00 AM	0	0	0	0	0
Weekday, 4:00 PM – 6:00 PM	0	0	1	0	0
Saturday 11:00 AM – 1:00 PM	0	0	0	0	0
Weekday, other time	0	4	5	3	1
Weekend, other time	1	3	1	0	0
Pavement Conditions					
Dry	0	4	4	3	0
Wet	0	1	0	0	0
Snow/Ice/Slush	1	0	0	0	0
Sand, mud, dirt, oil, gravel	0	0	1	0	0
Not reported	0	2	2	0	1

1 Crash records in the most recent full three calendar years are subject to change, and thus, not consider final. Any crash records or data provided in the database for the years 2022 and later are not to be considered up-to-date or complete.

4

Future Conditions

Future conditions reflect changes in either traffic volumes and/or anticipated/planned street network configuration/operations. Evaluating a Future No-Build Condition provides an analysis condition to assess future traffic and roadway conditions without a project's implementation. Anticipated Project site-generated traffic volumes are then added to the Future No-Build Condition volumes to reflect the Future Build Condition with the Project-generated trip activity.

4.1 Future No-Build Conditions

For this study, we apply estimated future traffic volumes to the expected year 2032 condition. (A seven-year planning horizon is recommended based on MassDOT TIA guidelines.) Because no changes to intersection operations or roadways have been identified for implementation by the year 2032, the Future conditions simply correspond to the existing network operating with additional traffic.

4.1.1 Future Traffic Volumes

Background Traffic Growth (No-Build Traffic Volumes)

Traffic growth on area roadways is a function of the expected land development, economic activity, and changes in demographics. Several methods can be used to estimate this growth. A procedure frequently employed is to estimate an annual percentage increase in traffic and apply that increase to study area traffic volumes. MassDOT traffic counts in/near Needham were used to obtain a traffic growth rate of 1.0 percent to establish the No-Build condition volumes³.

³ Traffic Volume and Classification in Massachusetts – Interactive Map, accessed June 2025.
<https://mhd.public.ms2soft.com/tcds/tsearch.asp?loc=Mhd&mod=>

Traffic volumes in the study area were projected to a seven-year traffic-planning horizon (Year 2032). Independent of the Project, volumes on the roadway network under the Future 2032 No Build condition were assumed to include existing traffic and new traffic resulting from background traffic growth. The resulting 2032 No-Build weekday morning and weekday evening peak hour traffic volume networks are illustrated in Figures 6 and 7, respectively.

4.2 Future Build Condition

Under the Future Build Condition, Project-generated traffic volumes are added to the Future No-Build volumes to reflect the Build conditions within the Project study area.

4.2.1 Project Trip Generation

Traffic generation of any proposed development is dependent upon its land use, size, and location relative to surrounding developments. The ITE *Trip Generation Manual*⁴ categorizes land uses and provides weekday daily, morning, and evening peak hour vehicle trip generation rates for each use. These rates are applied to a project to estimate its trip generation. For this Project, the proposed uses consist of ITE Land Use Codes (LUC) 223 – *Affordable Housing* and LUC 253 – *Congregate Care*. The proposed development will consist of a mix of 43 affordable housing units and 43 congregate care housing units, with supporting community and amenities space.

No adjustments are made to the site-generated traffic estimate based on internal capture rates or pass-by trips. No trip credits are taken for the existing site, which although was previously developed, is currently unoccupied. No mode share credits are applied to the trip generation estimates (i.e., ITE vehicle trip rates are used to represent the Project-generated trips by vehicles).

The resulting vehicle trip estimates for the Project are presented in Table 3. The Project is expected to generate 378 daily trips during an average weekday and 32 and 39 new vehicle trips during the respective weekday morning and weekday evening peak hours.

Table 3 Project Vehicle Trip Generation Estimate by Land Use, Weekday

	Affordable Housing ^a	Congregate Care ^b	Total Project Vehicle Trips
Daily (ins/outs combined)	300	78	378
Morning (AM Peak Hour)			
Enter	8	3	11
Exit	19	2	21
Total	27	5	32
Evening (PM Peak Hour)			
Enter	17	5	22
Exit	12	5	17
Total	29	10	39
a	Based on ITE LUC 223 (Affordable Housing) for 43 units.		
b	Based on ITE LUC 253 (Congregate Care) for 43 units.		

4 *Trip Generation Manual*, 11th Edition; Institute of Transportation Engineers, Washington, D.C., 2021.

Figure 6: 2032 No-Build Conditions - Weekday Morning Peak Hour Vehicle Volumes

Charles River Heights | E. Militia Heights Drive, Needham MA

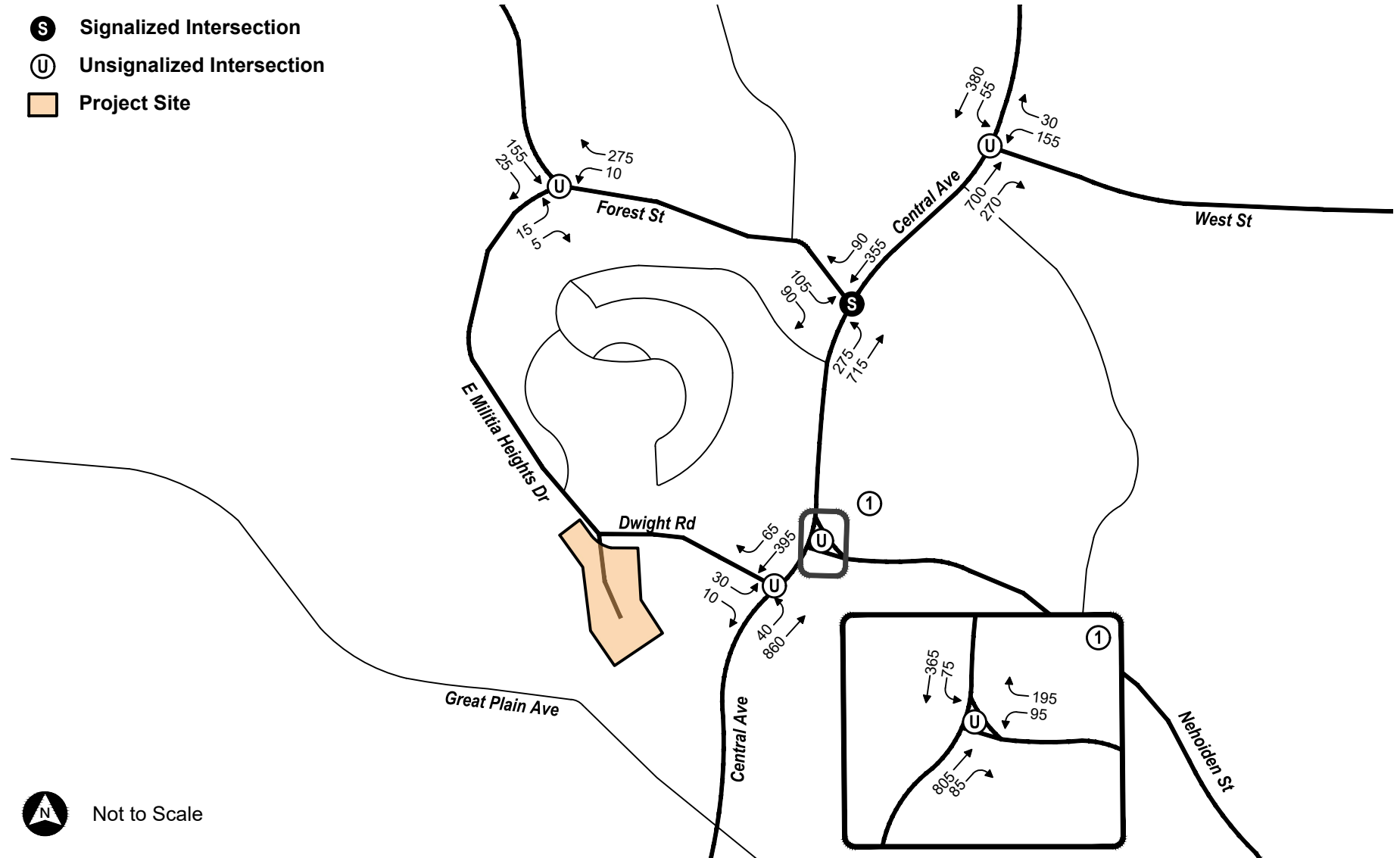
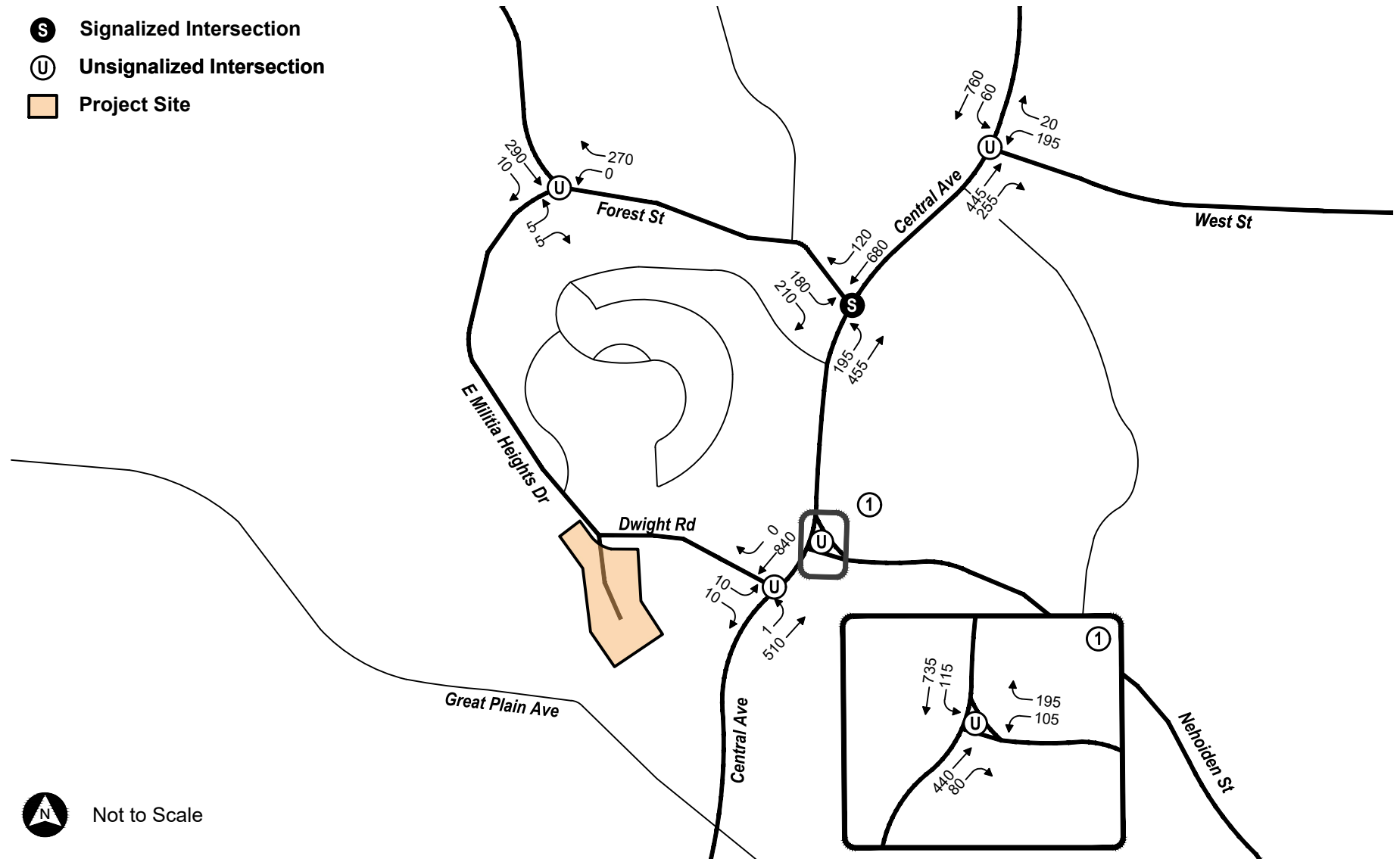


Figure 7: 2032 No-Build Conditions - Weekday Evening Peak Hour Vehicle Volumes

Charles River Heights | E. Militia Heights Drive, Needham MA



4.2.2 Project Trip Distribution and Assignment

The distribution of a project's traffic on the local street network is a function of population densities, the location of employment (job sites), existing travel patterns, and the efficiency of the roadway system. For this project, the collected traffic volumes from the TMCs are used as an indication of the expected relative use of the area's streets.

The Project-related traffic volumes for the Build Condition are assigned to the study area roadway network based on the trip distribution shown in Table 4 and illustrated in Figure 8. The Project site-generated traffic volume networks for the morning and evening peak periods are shown in Figures 9 and 10, respectively.

Table 4 Project Trip Distribution within the Study Area

Travel Route	Direction	Trips
Forest Street	From West	15%
Central Ave.	From North	16%
Central Ave.	From South	41%
West Street	From East	10%
<u>Nehoiden Street</u>	<u>From East</u>	<u>18%</u>
Total		100%

Source: Based on the share of volumes from the 2025 turning movement counts.

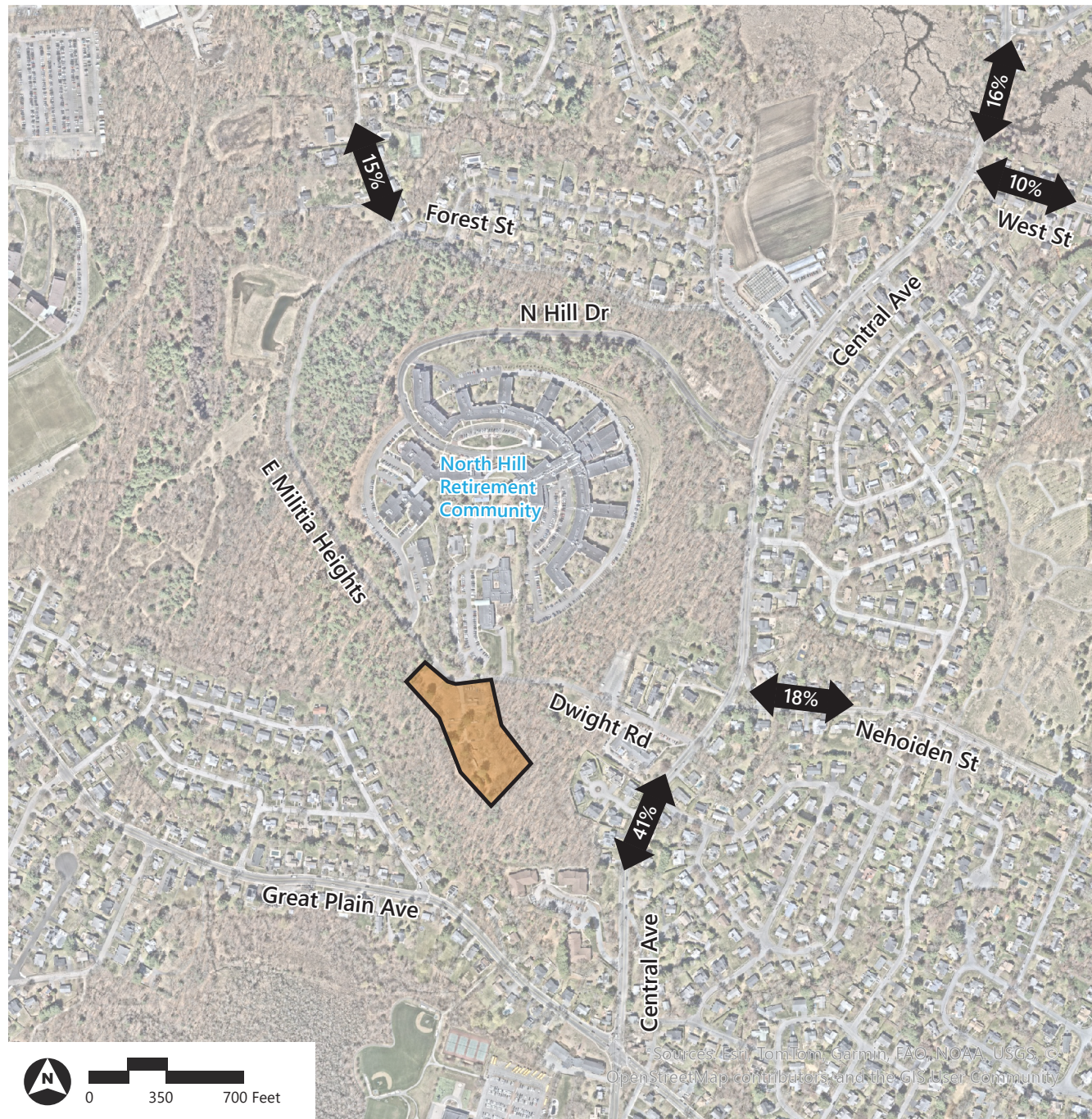
Vehicles will access the Project site area via either E Militia Heights Drive or Dwight Road. Applying the trip distribution to the Project site-generated trips, 15 percent of activity is assigned to E Militia Heights Drive and 85 percent to Dwight Road.

The assigned Project trips are added to the 2032 No-Build peak hour traffic volumes to develop the 2032 Build Condition networks for the weekday morning and weekday evening peak hours.

The resulting 2032 Build Condition traffic volumes are shown in Figures 11 and 12 for the weekday morning and weekday evening, respectively.

Figure 8: Expected Project Vehicle Trip Distribution

Charles River Heights | E. Militia Heights Drive, Needham, MA



Legend:

 Project Site

Figure 9: Project Generated Vehicle Trips - Weekday Morning Peak Hour

Charles River Heights | E. Militia Heights Drive, Needham MA

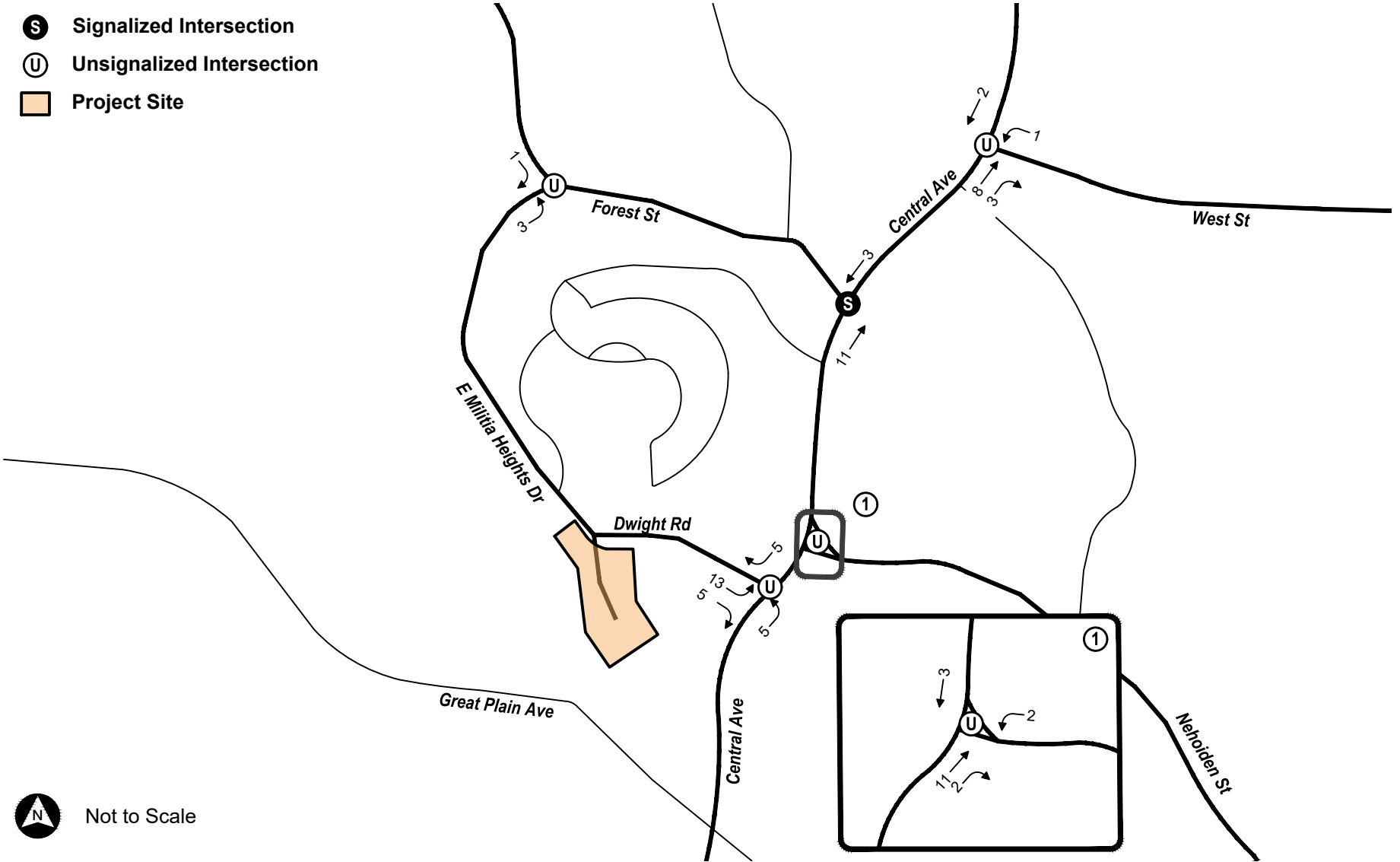


Figure 10: Project Generated Vehicle Trips - Weekday Evening Peak Hour

Charles River Heights | E. Militia Heights Drive, Needham MA

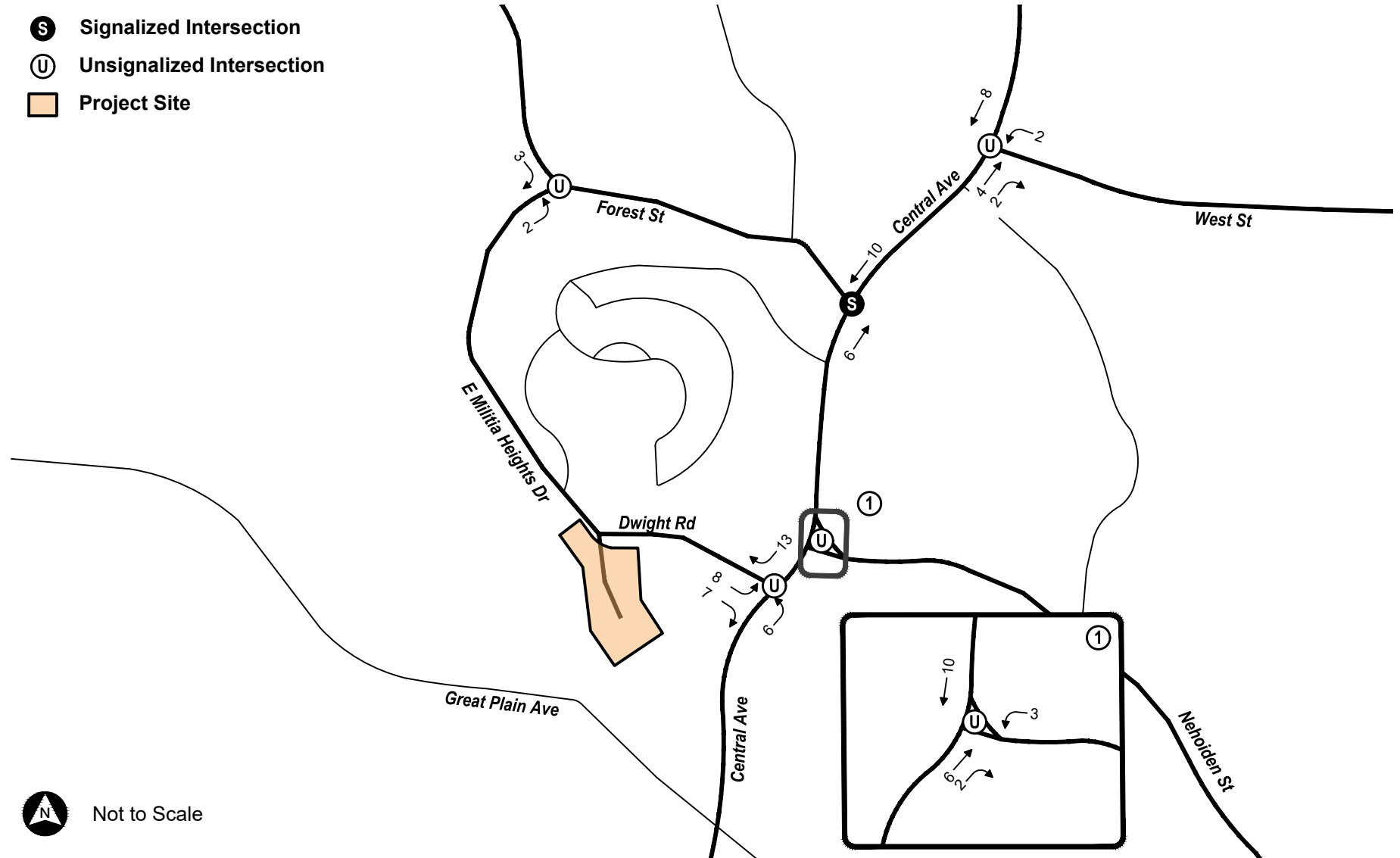


Figure 11: 2032 Build Conditions - Weekday Morning Peak Hour Vehicle Volumes

Charles River Heights | E. Militia Heights Drive, Needham MA

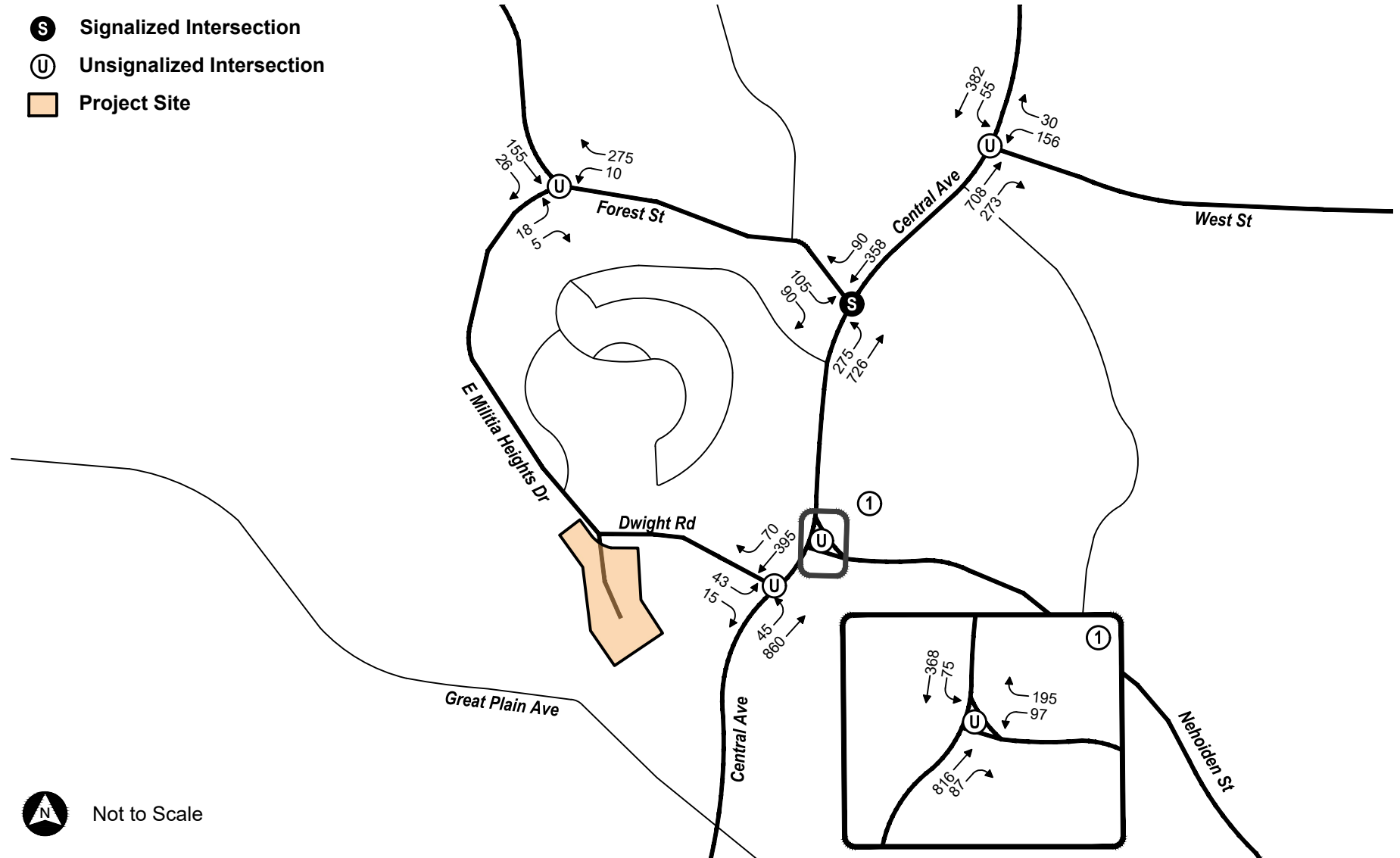
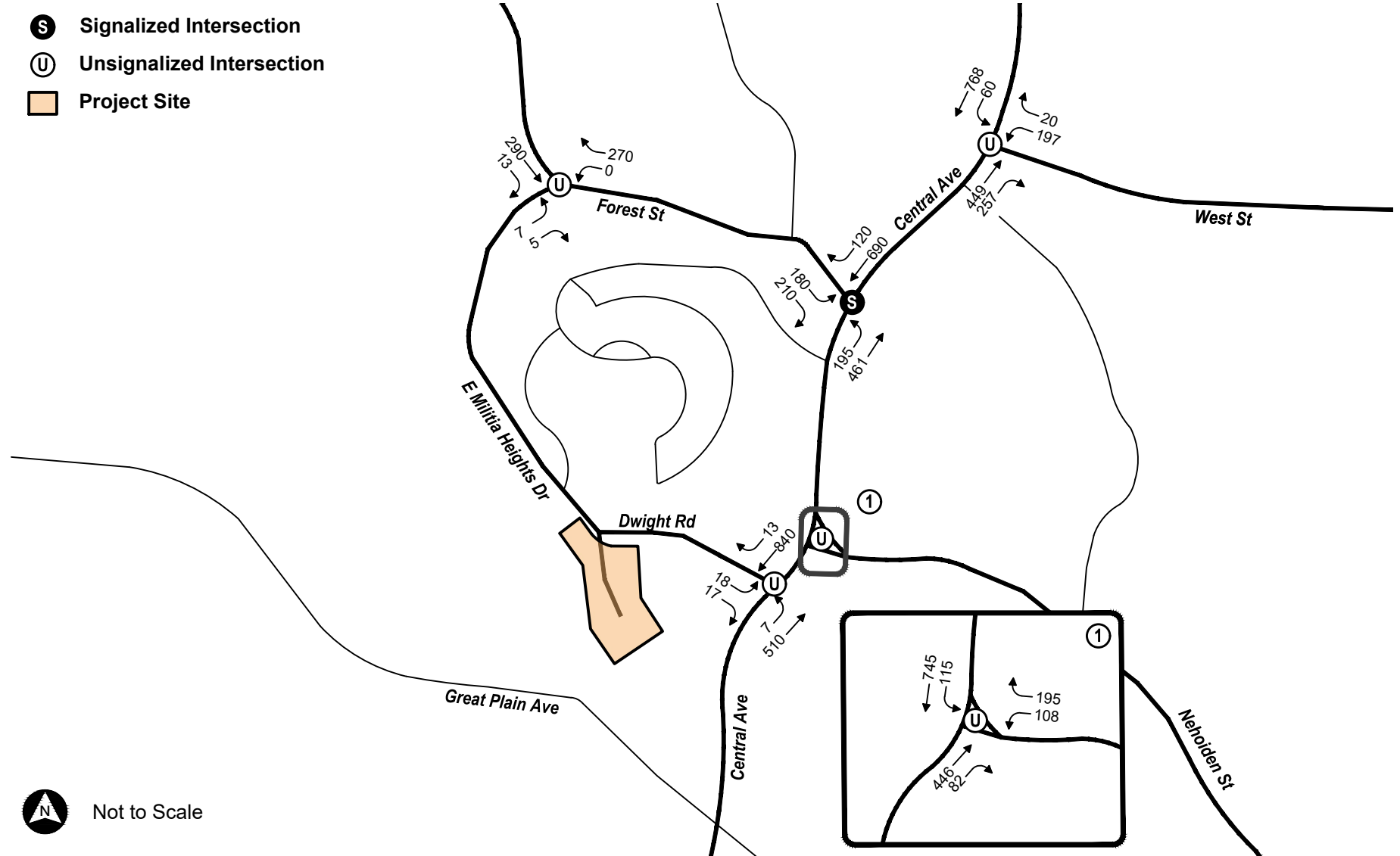


Figure 12: 2032 Build Conditions - Weekday Evening Peak Hour Vehicle Volumes

Charles River Heights | E. Militia Heights Drive, Needham MA



5

Transportation Operations Analyses

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic flow within the study area. To assess roadway capacity, analyses were conducted with respect to Existing, projected No-Build conditions, and projected Build traffic volumes for weekday morning and weekday evening peak hours. Capacity analyses provide an indication of how well the roadway facilities (intersections) can serve the traffic demands placed upon them. Roadway operating conditions are classified by calculated levels of service.

5.1 Intersection Capacity Analyses

Synchro 11 software was used to model intersection operations at each of the Study Area intersections. Both signalized and unsignalized intersection capacity analyses were conducted under 2025 Existing, 2032 No-Build, and 2032 Build conditions.

5.1.1 Level-of-Service Criteria

The evaluation criteria used to analyze area intersections in this traffic study are based on the Highway Capacity Manual (HCM).⁵ The term 'Level of Service (LOS)' denotes the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers several factors including roadway geometry, speed, travel delay, and freedom to maneuver. LOS provides an index to the operational qualities of a roadway segment or an intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

In addition to LOS, two other measures of effectiveness are typically used to quantify the traffic operations at intersections: volume-to-capacity ratio (v/c) and delay (expressed in seconds per vehicle). For example, an existing v/c ratio of 0.90 for an intersection indicates that the intersection is operating at 90 percent of its available capacity. A delay of 15 seconds for a particular vehicular movement or approach indicates that vehicles on the movement or approach will experience an average additional travel time of 15 seconds.

5 Transportation Research Board, *Highway Capacity Manual*, 6th Edition, Washington, D.C., 2016.

For a given LOS letter designation there may be a wide range of values for both v/c ratios and delay. Comparison of intersection capacity results therefore requires considering LOS and the other measures of effectiveness.

The LOS designations, which are based on delay, are reported differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of all traffic entering the intersection and the LOS designation is for overall conditions at the intersection. For unsignalized intersections, however, the analysis assumes that traffic on the main line (without stop control) is not affected by traffic on the side streets. Thus, the LOS designation applies to the critical movement exiting via the side street and for the conflicting movement on the mainline, which is generally a left turn from the mainline into a side street or driveway. Table 5 shows the LOS criteria for both signalized intersections and unsignalized intersections.

Table 5 Intersection Level-of-Service Criteria

Level of Service	Signalized Intersection Delay	Unsignalized Intersection Delay
A	0 to 10 seconds	0 to 10 seconds
B	10 to 20 seconds	10 to 15 seconds
C	20 to 35 seconds	15 to 25 seconds
D	35 to 55 seconds	25 to 35 seconds
E	55 to 80 seconds	35 to 50 seconds
F	Greater than 80 seconds	Greater than 50 seconds

Source: Highway Capacity Manual, 6th Edition.

Cautious judgment should be exercised when interpreting the capacity analysis results at unsignalized intersections. The analytical methodology for unsignalized intersections applies conservative analysis parameters, such as long critical gaps in traffic flows. Consequently, the analysis results tend to overstate the actual delays experienced in the field. Field observations often indicate that drivers on minor streets generally accept shorter gaps in traffic than those used in the analysis procedures, and therefore, experience less delay than reported by the analysis software. The analysis methodologies also do not fully account for the grouping effects (platooning of vehicles) that are often caused by nearby signalized intersections. The net effect of these analysis procedures is the over-estimation of calculated delays at unsignalized intersections.

5.1.2 Signalized Intersection Capacity Analysis

Table 6 summarizes the intersection capacity analysis for the signalized study area intersections; the capacity analysis worksheets are included in the Appendix to this report.

The intersection of Central Avenue at Forest Street is not expected to see a degrade in LOS between the 2032 No-Build Condition and the 2032 Build Condition in either the AM and PM peak hour. The intersection and its movements show very little change to delay or queueing between the analysis conditions.

Table 6 Signalized Intersection Capacity Analysis Summary

Location / Movement	2025 Existing Condition					2032 No-Build Condition					2032 Build Condition				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Central Avenue at Forest Street															
<i>Weekday Morning</i>															
Forest Street EB L	0.43	42.9	D	40	#180	0.44	43.5	D	42	#189	0.44	43.6	D	42	#189
Forest Street EB R	0.14	5.7	A	0	33	0.14	5.7	A	0	34	0.14	5.7	A	0	34
Central Avenue NB T	0.5	12.1	B	33	140	0.61	15.7	B	42	172	0.61	15.8	B	43	172
Central Avenue NB L	0.61	12.3	B	135	524	0.65	13.3	B	157	592	0.66	13.5	B	162	607
Central Street SB T/R	0.64	21.7	C	139	366	0.64	21.5	C	144	392	0.64	21.5	C	146	395
Overall	0.64	16.7	B			0.65	17.5	B			0.66	17.6	B		
<i>Weekday Evening</i>															
Forest Street EB L	0.87	85.5	F	114	#345	0.94	100.3	F	125	#369	0.97	106.6	F	130	#369
Forest Street EB R	0.36	8.2	A	14	65	0.40	9.2	A	21	74	0.40	9.4	A	22	74
Central Avenue NB T	0.78	40.6	D	43	#243	0.83	47.0	D	51	#272	0.83	47	D	50	#270
Central Avenue NB L	0.38	10.7	B	81	288	0.39	10.8	B	84	307	0.39	10.8	B	86	311
Central Street SB T/R	0.88	35.5	D	363	#925	0.87	35.1	D	374	#1010	0.87	34.7	C	384	#1033
Overall	0.88	31.7	C			0.94	33.8	C			0.97	34.2	C		

^a Volume to capacity ratio.

^b Average total delay, in seconds per vehicle.

^c Level-of-service.

^d 50th percentile queue, in vehicles.

^e 95th percentile queue, in vehicles.

~ Volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

5.1.3 Unsignalized Intersection Capacity Analysis

Table 7 summarizes the intersection capacity analysis for the unsignalized study area intersections; the capacity analysis worksheets are included in the Appendix to this report.

Generally, the operating conditions at these intersections are expected to continue under the 2032 Future Conditions with and without the addition of site-generated traffic.

The E Militia Heights Drive approach to its intersection with Forest Street operates with little delay, a condition that is expected to continue under both 2032 Future Conditions.

The West Street approach to Central Avenue operates with volumes that exceed the intersection's capacity, and thus, operates with high average vehicle delay (LOS F) in all conditions.

The Nehoiden Street (side-street) westbound approach to Central Avenue currently operates with long average delays and either LOS E or F during the weekday AM and PM peak hours, a condition that is expected to continue under both 2032 Future Conditions. The approach will experience the highest increase in delay of approximately 40 seconds between the 2032 No-Build Condition and the 2032 Build Condition in the PM peak hour.

The Dwight Road approach to its intersection with Central Avenue operates with delays, particularly in the AM peak hour, a condition that is expected to continue under Future Conditions with some increase to average delays in both periods.

Table 7 Unsignalized Intersection Capacity Analysis Summary

Location / Movement	2025 Existing Condition				2032 No-Build Condition				2032 Build Condition			
	v/c ^a	Del ^b	LOS ^c	95 Q ^e	v/c	Del	LOS	95 Q	v/c	Del	LOS	95 Q
Forest Street at E Militia Heights Drive												
<i>Weekday Morning</i>												
E Militia Heights Drive NB L/R	0.07	11.7	B	0.2	0.04	11.4	B	0.1	0.04	11.5	B	0.1
<i>Weekday Evening</i>												
E Militia Heights Drive NB L/R	0.04	11.5	B	0.1	0.02	11.6	B	0.1	0.02	11.8	B	0.1
West Street at Central Avenue												
<i>Weekday Morning</i>												
West Street WB L/R	1.51	323.7	F	13.8	1.40	273.0	F	13.0	1.43	289.4	F	13.3
<i>Weekday Evening</i>												
West Street WB L/R	1.40	275.6	F	13.1	1.84	471.6	F	17.1	1.89	494.0	F	17.6
Nehoiden Street at Central Avenue												
<i>Weekday Morning</i>												
Nehoiden Street WB L/R	0.81	43.9	E	7.2	0.87	54.2	F	8.3	0.91	63.0	F	9.1
<i>Weekday Evening</i>												
Nehoiden Street WB L/R	1.16	141.0	F	14.2	1.27	189.5	F	16.3	1.34	228.9	F	17.9
Dwight Road at Central Avenue												
<i>Weekday Morning</i>												
Dwight Road EB L/R	0.64	57.1	F	3.7	0.29	38.2	E	1.1	0.43	46.3	E	1.9
<i>Weekday Evening</i>												
Dwight Road EB L/R	0.13	23.8	C	0.4	0.12	24.4	C	0.3	0.19	27.6	D	0.7

- a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 95th percentile queue, in vehicles.
e Movement beyond capacity, no results reported.

5.2 Sight Distance Evaluation

VHB conducted a sight distance evaluation for the two Project-site access roads, E. Militia Heights Drive at Forest Street and Dwight Road at Central Avenue. The objective is to identify whether these driveways provide adequate, safe visibility for motorists at these intersections. VHB collected field observations in May 2025, taking measurements to evaluate Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD) in accordance with American Association of State Highway and Transportation Officials (AASHTO) guidelines and sight distance criteria; these are provided in the Appendix.

Sight distance considers Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD). Stopping sight distance (SSD) is the distance required for a motorist approaching an intersection from either direction to perceive, react, and come to a complete stop to avoid colliding with an object in the road (such as another vehicle). In this respect, SSD can be considered as the minimum visibility criterion for the safe operation of an unsignalized intersection. Intersection sight distance (ISD) is based on the time required for a motorist to perceive, react, and complete a desired critical exiting maneuver (typically, a left turn) once the driver on a minor street approach (or a driveway) decides to execute the maneuver. Calculations for ISD include the time to (1) turn left and clear the near half of the intersection without conflicting with the vehicles approaching from the left; and (2) upon turning left, to accelerate to the operating speed on the roadway without causing approaching vehicles on the main road to unduly reduce their speed. In this context, ISD can be considered as a desirable visibility criterion for the safe operation of an unsignalized intersection.

The assessment is summarized in Table 8.

Table 8 Driveway Sight Distance Assessment

Driveway	85 th Percentile Speed (mph)	Design SSD (ft)		ISD (ft)	
		Required ^a	Measured	Desirable ^a	Measured
Central Avenue at Dwight Road					
North of Dwight Road	38	280	285	420	205
South of Dwight Road	37	270	310	365	400
Forest Street at E Militia Heights Drive					
East of E Militia Heights	34	450	245	310	350
West of E Militia Heights	32	300	215	375	440

^a Based on the guidelines established in *A Policy on the Geometric Design of Highways and Streets*, 7th Edition, American Association of State Highway and Transportation Officials (AASHTO), 2018

The available SSD at each intersection exceeds (meets) the AASHTO requirements for safe operations. Motorists have adequate sight lines as they approach each driveway intersection on the main street.

At the intersection of E Militia Heights Drive at Forest Street, the desirable ISD was met; motorists at the driveway have adequate sight lines to view on-coming traffic.

At the intersection of Dwight Road at Central Avenue, the desirable ISD north of Dwight Road was not met due to vegetation (trees/shrubs) limiting the view of on-coming southbound traffic; the Central Avenue roadway also curves. To ensure the desirable ISD is provided, this vegetation should be removed within a setback from the sidewalk.

J. Tenant Selection

Supportive Housing units

These units are intended to be filled using a closed referral system in coordination with the Massachusetts Department of Development Services.

Traditional affordable and workforce housing units

The Applicant will retain a qualified lottery and compliance agent, subject to approval by the Massachusetts Executive Office of Housing and Livable Communities (“EOHLC”), to oversee the marketing and tenant selection process for Charles River Heights. It is anticipated that Peabody Properties, a multidisciplinary property management and compliance firm with extensive experience in affordable housing, will serve in this capacity. The Affirmative Fair Housing Marketing Plan (AFHMP) and Tenant Selection Plan will be prepared and administered in full compliance with all applicable federal, state, and local regulations and guidelines to ensure an open, transparent, and equitable process.

The marketing program will be designed to reach a broad and diverse applicant pool, including individuals who may not otherwise be aware of affordable housing opportunities in Needham. All outreach materials—including brochures, pamphlets, flyers, and advertisements—will prominently display the Fair Housing and Barrier-Free logos as well as the phrase “Equal Housing Opportunity.” Marketing materials will clearly state that Charles River Heights does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender identity, age, disability, national origin, familial or marital status, veteran or military status, ancestry, source of income, or any other protected category under federal, state, or local law. If human likenesses or models are used in any marketing, they will reflect the racial and ethnic diversity consistent with the project’s affirmative fair housing goals.

While Project will seek a local preference for Needham Residents of up to 70%, outreach will extend beyond Needham to surrounding communities, with targeted efforts to reach minority populations and groups identified as least likely to apply. Marketing efforts will include multilingual materials and, where necessary, translation services to ensure accessibility for persons with limited English proficiency.

The tenant selection process will be carried out in a manner that is fair, consistent, and fully compliant with all Equal Housing Opportunity requirements. Applications will be made widely available both online and in person over a defined application period. Extended office hours, including evenings and weekends, will be offered to accommodate working households. At least two public informational sessions will be held in accessible venues to explain the application and lottery process, and staff will provide assistance to applicants who require reasonable accommodations under Section 504 or other civil rights statutes.

All applications will be logged, date-stamped upon receipt, and recorded in a master list. The management agent will provide free language assistance to applicants with limited English proficiency and ensure that application materials are available in multiple languages. Written notices of eligibility and ineligibility will also be provided in multiple languages and will include instructions for translation or assistance. The lottery will be conducted publicly, using a computerized randomization system to establish rank order for all applicants. Witnesses will document the process to ensure transparency. Following the lottery, applicants will be organized into pools according to income level, household size, and any applicable preferences, such as for households requiring accessible units. Units will then be offered to applicants in rank order within each pool.

In the event that an applicant does not qualify for their assigned pool, they will be transferred to the appropriate pool in their proper rank order. Applicants who are rejected during final screening will receive written notice explaining the reason for the decision and will be provided at least ten (10) days to appeal. Applicants will also be informed of their rights to file a complaint with the Massachusetts Commission Against Discrimination (MCAD) or the U.S. Department of Housing and Urban Development (HUD) if they believe discrimination has occurred.

All staff involved in marketing, application intake, and tenant selection will be trained in fair housing law, civil rights protections, and the requirements of the AFHMP and Tenant Selection Plan. Supervisory staff from the management agent will oversee compliance and ensure that procedures are carried out consistently and equitably.

Through this structured and comprehensive approach, Charles River Heights will advance the principles of equal housing opportunity and foster a community that reflects the racial, ethnic, and economic diversity of the broader region, consistent with both federal fair housing objectives and the Town of Needham's local housing goals.

K. Long-term Monitoring

EOHLC will serve as the subsidizing agency responsible for long-term monitoring of the Project's affordability restrictions. In accordance with EOHLC requirements, a Low-Income Housing Tax Credit (LIHTC) monitoring fee will be included in the Project's operating pro forma. The current budget includes a \$1,000 per year expense to support EOHLC's ongoing oversight, ensuring that all affordability and compliance obligations are maintained throughout the duration of the affordability period. The proposed project will be affordable in perpetuity.