GEORGE GIUNTA, JR.

ATTORNEY AT LAW*
281 CHESTNUT STREET
NEEDHAM, MASSACHUSETTS 02492
*Also admitted in Maryland

TELEPHONE (781) 449-4520 FAX (781) 465-6095

July 16, 2024

Lee Newman
Planning Director
Town of Needham
1471 Highland Avenue
Needham, MA 02492

Re: Definitive Subdivision Application
40 Highland Ave, LLC
40 Highland Avenue & 14-16 Riverside Street

Dear Lee,

Please be advised that I represent 40 Highland Ave, LLC relative to its properties at 40 Highland Avenue and 14-16 Riverside Street, Needham, MA (jointly, the "Premises') and the intent to subdivide same into three lots; one commercial lot and two residential lots. In connection therewith, submitted herewith please find the following:

1. Completed Application for Approval of a Definitive Subdivision Plan;

2. Exhibit A – List of Waivers;

3. Exhibit B - Description;

4. Definitive Subdivision Plan, prepared by Land Design Collaborative, Chauncy Place, Terrace North, Suite 1, 45 Lyman Street, Westborough, MA 01581 and Field Resources, Inc., 281 Chestnut Street, Needham, MA 02492, consisting of eleven sheets, as follows: (a) Cover Sheet, dated April 26, 2024; (b) Sheet 1 of 10, titled "General Notes and Legend", dated April 26, 2024; (b) Sheet 2 of 10, titled "Existing Conditions Plan", dated April 26, 2024; (c) Sheet 3 of 10, titled "Lotting Plan "By Right"", dated April 26, 2024; Sheet 4 of 10, titled "Lotting Plan "Waiver"", dated April 26, 2024; (d) Sheet 5 of 10, titled "Grading & Drainage Plan", dated April 26, 2024; (e) Sheet 6 of 10, titled "Plan & Profile, STA 0+00 to End", dated April 26, 2024; (f) Sheet 7 of 10, titled "Details", dated April 26, 2024; (g) Sheet 8 of 10, titled "Details", dated April 26, 2024; (h) Sheet 9 of 10, titled "Details", dated April 26, 2024; and (i) Sheet 10 of 10, titled "Turning Movement Exhibit", dated April 26, 2024; (hereinafter, collectively, the "Subdivision Plan");

5. Stormwater Management Report, dated April, 2024, prepared by Land Design Collaborative,

6. Letter of Authorization; and

7. Check No. 190 in the amount of $1,250 for the applicable filing fee.

The Premises, which consists of two parcels of land, is located on the southerly side of Highland Avenue and the easterly side of Riverside Street. It is known and numbered as 40 Highland Avenue and 14-16 Riverside Street, and shown and identified, respectively, as Parcels 58 and 45 on Assessor's Map No. 73. The aforesaid Parcel 45, which is located entirely in the General Residence Zoning District, is currently occupied by a two-story, two-family residential dwelling, detached three-car garage, and associated driveway and yard. The aforesaid Parcel 58, which is located partially in the Highland Commercial-128 zoning district and partially in the General Residence zoning district, is currently occupied by a commercial building and associated driveway and parking, used for automotive repair.[1]

As shown and depicted on the Subdivision Plan, the applicant is proposing to subdivide the Premises into three building lots, two of which will be used for residential purposes and the third of which will continue to be used for commercial purposes.[2] The commercial lot will continue to have frontage on and be served and accessed from Highland Avenue, and the two residential lots will have frontage on and will be served by and accessed from the proposed new roadway, off Riverside Street. All three lots comply with applicable dimensional and density requirements.

As depicted on sheet 3 of 10 of the Subdivision Plan, a new roadway can be built with a 60 foot radius circle and 50 foot width road. However, whereas the proposed road will only serve two residential lots, will end in a turn-around, and is located in relatively close proximity to the Charles River, the Applicant is of the opinion that a full 50 foot wide roadway, with a full 120 foot diameter circle is not the best and most appropriate way to divide this portion of the property. Therefore, the Applicant is requesting a waiver of construction as well as several other waivers in order to utilize a short road ending with a hammerhead or "T" style turnaround. Given the nature of the development, its location and past practice of the Board, The Applicant asserts that the requested waivers are appropriate for this development.

Finally, as noted on the Subdivision Plan, whereas the two new residential lots are located in the General Residence zoning district, it is the plan and intention of the Applicant to utilize same for two-family residential dwellings. In that regard, I note that, consistent with the zoning district, the vast majority of other properties on Riverside Street are used and occupied by two-family dwelling, albeit on much smaller lots, with less than conforming frontage.

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[1] The existing commercial building, driveway and parking area and automotive repair use are all located entirely within that portion of the lot contained within the Highland Commerical-128 zoning district. The balance of the lot, situated in the General Residence zoning district is presently undeveloped.

[2] No change is currently anticipated or proposed in connection with the within application relative to the existing automotive repair business.

Kindly schedule this matter for consideration at the next available meeting of the Planning Board. Please also let me know if you require any further information or materials.

As always, your anticipated courtesy and cooperation and appreciated.

Sincerely,

George Giunta, Jr.

TOWN OF NEEDHAM
MASSACHUSETTS

Room 20, Town Hall
Needham, MA 02492
781-455-7526

APPLICATION FOR APPROVAL
OF A DEFINITIVE SUBDIVISION PLAN

PLANNING DEPARTMENT

Date: June 20 20 24

The undersigned, on behalf of 40 Highland Ave, LLC (owner's name or self) of 435E Dedham Street, Newton, MA 02459 (address), owner of land in Needham, the description of said land being submitted herewith, desiring to make a subdivision of said land hereby submits the following required plans and documents:

a) the original tracings and eight full sized copies and six reduced sized copies of each of the following plans –
   i. a key location map
   ii. a lot plan
   iii. a profile plan
   iv. a municipal services and utility plan
   v. a topographic plan
   vi. any detail plans required

   Each plan bearing titles, endorsements and imprints required.

b) a filing fee of $500 plus $250 per lot for each lot in the subdivision.

c) a description of the boundaries of the entire area to be subdivided; and

d) ~~a list of names and addresses of all abutters as they appear on the most recent Needham Assessors' records.~~

e) Exhibit A - List of Waivers; Exhibit B - Legal Description; and Drainage Calculations
(specify any additional material or information submitted)

and petitions the Planning Board to consider and approve such subdivision plans under the provisions of the Subdivision Control Law (M.G.L. Chapter 41, Sections 81-A through 81-G inclusive, as amended) and in accordance with the Rules and Regulations of the Needham Planning Board and the applicable By-Laws of the Town of Needham.

The undersigned certifies that the applicant(s) is/are the sole owner(s) of the entire land proposed to be subdivided and that the subdivision plans and the description submitted indicate the true boundaries of said land and ~~the correct names of all abutters as shown on the most recent records of the Needham Assessors.~~

(If the applicant is not the owner, written authorization to act as agent must be at

_____ (owners)
40 Highland Ave, LLC
by Steven Wolberg, Manager

By _____ (agent)

This application is accepted by the Needham Planning Board in accordance with Sections 81-Q and 81-T of the Subdivision Control Law.

_____ 20___ *By* _____

EXHIBIT A

Definitive Subdivision Application
40 Highland Avenue & 14-16 Riverside Street
Needham, MA

LIST OF WAIVERS

The Applicants hereby request the following waivers with respect to the Town of Needham, Subdivision Regulations and Procedural Rules of the Planning Board:

1. Waiver of the requirements of 3.2, relative to submission of definitive plans, as follows:

a. A waiver from the requirements of subsection (b) that plans be drawn on blue tracing cloth or mylar, that the plan be drawn to a scale of 1" = 40' and that the Title Block be located in the lower right-hand corner;

b. A waiver from the requirements of subsection (e) that street line traverse closures be provided.

2. Waiver of the requirements of Section 3.3, relative to street and construction details, as follows:

a. A waiver from the required width of roadway layout at Section 3.3.1 from 50 feet to 40 feet;

b. A waiver from the required circular turnaround at Section 3.3.5 in favor of an alternative back-up strip;

c. A waiver from the requirement of sidewalks on both sides of the road layout at Section 3.3.16 to no sidewalk

d. A general waiver of construction and such other unspecified waivers as may be necessary for the construction of the way and related improvements as shown on the plans submitted herewith.

3. Waiver of any and all other requirements as may be necessary and appropriate for the division and reconfiguration of the subject premises as depicted on the plan.

EXHIBIT B

Definitive Subdivision Application
40 Highland Avenue & 14-16 Riverside Street
Needham, MA

Description

Two certain parcels of land in Needham, Norfolk County, as follows:

Parcel I

That certain parcel of land known and numbered 40 Highland Avenue, Needham, Norfolk County, MA, being more particularly described as follows:

Beginning at a point on the westerly sideline of Highland Avenue, Massachusetts highway layout number 8542, at the intersection of the southerly sideline of the Metropolitan District Commission;

Thence running, south 74°21'18" east, by land now or formerly of the Metropolitan District Commission, a distance of 453.41 to a concrete bound with a drill hole;

Thence turning and running, south 22°40'29" west, by land now or formerly of Joseph P. & Eileen J. Manning, a distance of 147.31 feet;

Thence turning and running, north 67°55'38" west, by four parcels, a distance of 384.74 feet;

Thence turning and running, south 25°45'55" west, by land now or formerly of Arthur & Anna Deych, a distance of 9.48 feet;

Thence turning and running. north 64°40'02" west, by land now or formerly of Nina Prohodski and Helen Harcovitz, a distance of 85.29 feet to the aforementioned sideline of Highland Avenue;

Thence turning and running, north 34°04'13" east, by said sideline, a distance of 103.41 to the point of beginning.

Containing 56,409 square feet, more or less.

Parcel II

That certain parcel of land known and numbered 14 Riverside Drive, Needham, Norfolk County, MA, being more particularly bounded and described as follows:

Beginning at a point on the northerly sideline of riverside drive being the southwesterly corner of said parcel;

Thence running, north 25°45'55" east, by land now or formerly of Arthur & Anna Deych, a distance of 60.71 to an iron rod with a cap;

Thence turning and running, south 67°55'38" east, by land now or formerly of 40 highland Avenue LLC, a distance of 150.31 feet;

Thence turning and running, south 25°45'55" west, by land now or formerly of Boris Karpachev & Rufina Veysberg, a distance of 70.39 feet to the aforementioned sideline of Riverside Drive;

Thence turning and running, north 64°14'05" west, by said sideline, a distance of 150.00 feet to the point of beginning;

Containing 9,832 square feet, more or less.

40 Highland Ave, LLC
435E Dedham Street
Newton, MA 02459

June 20, 2024

Town of Needham
Planning Board
Needham, Massachusetts 02492

Attn: Lee Newman, Planning Director

Re: 40 Highland Ave, LLC
Application for Approval of
Definitive Subdivision Plan
40 Highland Avenue & 14-16 Riverside Street

Dear Mrs. Newman,

Please accept this letter as confirmation that 40 Highland Ave, LLC, a Massachusetts limited liability company, current owner of the properties known and numbered 40 Highland Avenue and 14-16 Riverside Street, Needham, MA (jointly, the "Premises"), have authorized George Giunta, Jr., Esquire, to make application to the Planning Board for Approval of Definitive Subdivision Plan and other zoning and planning related relief that may be required or appropriate in connection with the division of the said Premises into one commercial lot, two residential lots and a new roadway. In connection therewith, Attorney Giunta is specifically authorized to execute, sign, deliver and receive all necessary documentation related thereto, including, without limitation, Application for Approval of a Definitive Subdivision Plan.

Sincerely,

40 Highland Ave, LLC
By Steven Wolberg, Manager

DEFINITIVE SUBDIVISION PLAN

PURSUANT TO THE TOWN OF NEEDHAM SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE PLANNING BOARD SECTION 3.2

FOR

40 HIGHLAND AVENUE, LLC

40 Highland Avenue & 14-16 Riverside Street
Needham, MA

DATE
April 26, 2024

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

NAME DATE

NEEDHAM TOWN ENGINEER

NAME DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE"

NAME DATE

PROJECT TEAM

Civil Engineer | Landscape Architect

LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581

508.952.6300 | LDCollaborative.com

Land Surveyor

Field Resources, Inc.

281 Chestnut Street
Needham, MA 02492

P.O. Box 324
Auburn, MA 01501

PROJECT OWNER	PROJECT APPLICANT
40 Highland Avenue, LLC 435 Dedham, MA Unit E Newton, MA 02459	40 Highland Avenue, LLC 435 Dedham, MA Unit E Newton, MA 02459

LOCUS

0 250' 500' 1,000' 1,500'
Scale: 1" = 500'

Source: Mass Mapper GIS

N S W E

SHEET INDEX

SHEET NO.	SHEET TITLE
1 OF 10	GENERAL NOTES AND LEGEND
2 OF 10	EXISTING CONDITIONS PLAN (BY FIELD RESOURCES INC.)
3 OF 10	LOTTING PLAN "BY-RIGHT"
4 OF 10	LOTTING PLAN "WAIVER" (REGISTRY SHEET 1 OF 1)
5 OF 10	GRADING & DRAINAGE PLAN
6 OF 10	PLAN & PROFILE SHEET
7-9 OF 10	DETAILS
10 OF 10	TURNING MOVEMENT EXHIBIT (FIRE APPARATUS)

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

COMMONWEALTH OF MASSACHUSETTS
MICHAEL J. SCOTT
CIVIL
No. 40863
REGISTERED PROFESSIONAL ENGINEER

NAME REGISTRATION NO.

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

COMMONWEALTH OF MASSACHUSETTS
BRADLEY J. SIMONELLI
#47581
PROFESSIONAL LAND SURVEYOR

NAME REGISTRATION NO.

C:\Users\JamesAlmonte\Land Design Collaborative\Land Design Collaborative - Documents__L-datto New\projects (landdesigndatto)\PROJECTS\21-0089 - 40 Highland Avenue\DWG\21-0089-C000.dwg

GENERAL NOTES:

1. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND AND IS WITHIN THE NPDES CONSTRUCTION GENERAL PERMIT (CGP) AND THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA) JURISDICTION. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO SUBMIT A NOTICE OF INTENT WITH THE EPA AND SECURE AND COMPLY WITH THE CGP IN ACCORDANCE WITH THE NPDES REGULATIONS.
2. A MINIMUM OF SEVENTY-TWO (72) HOURS BEFORE COMMENCING SITE WORK, CONTRACTOR SHALL CALL "DIG SAFE" AT 1-888-344-7233 (PER 220 CMR 99), MUNICIPAL UTILITY DEPARTMENTS, AND UTILITY DISTRICTS TO ACCURATELY LOCATE UNDERGROUND UTILITIES.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CONSTRUCTION NOTIFICATION AND APPLY FOR AND OBTAIN ALL NECESSARY CONSTRUCTION PERMITS. THE CONTRACTOR SHALL PAY ALL FEES AND POST ALL BONDS ASSOCIATED WITH THE WORK AND COORDINATE WITH THE PROJECT ARCHITECT AND ENGINEER AS NECESSARY.
4. THE CONTRACTOR SHALL OBTAIN PERMIT(S) FOR TRENCH EXCAVATION (PER 520 CMR 14).
5. ALL ITEMS NOTED FOR REMOVAL AND DISPOSAL, AS WELL AS THOSE ITEMS DISCOVERED DURING EXCAVATION THAT REQUIRE REMOVAL AND REPLACEMENT, SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND MUST EITHER BE RECYCLED OR DISPOSED OF OFF SITE ACCORDING TO APPLICABLE REGULATIONS (310 CMR 7, 18 & 19 AND 453 CMR 6). CONTRACTOR IS RESPONSIBLE FOR OBTAINING NECESSARY PERMITS FOR DEMOLITION, HAULING AND DISPOSING OF SAID MATERIALS.
6. CONTRACTOR SHALL VERIFY ALL CONDITIONS IN THE FIELD AND REPORT ANY DISCREPANCIES TO THE OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY, JOB SAFETY AND CONSTRUCTION MEANS AND METHODS. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH OSHA STANDARDS AND STATE AND LOCAL REQUIREMENTS.
8. REFUELING OF CONSTRUCTION VEHICLES AND EQUIPMENT SHALL NOT BE CONDUCTED IN PROXIMITY TO CATCH BASINS, STORMWATER BASINS OR WETLAND RESOURCES.
9. ANY ALTERATIONS MADE IN THE FIELD TO THE WORK SHOWN ON THESE DRAWINGS SHALL BE RECORDED BY THE CONTRACTOR ON RECORD DOCUMENTS.
10. THE CONTRACTOR SHALL NOTIFY APPROPRIATE UTILITY COMPANIES OF ANY UTILITIES DAMAGED DURING CONSTRUCTION. ANY COSTS RELATED TO THE REPAIR OF UTILITIES DAMAGED AS A RESULT OF CONSTRUCTION ACTIVITY SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
11. THE CONTRACTOR IS RESPONSIBLE FOR PREPARING AND MAINTAINING RECORD AS-BUILT DRAWINGS OF ALL SUBSURFACE UTILITIES.
12. ANY AREA DISTURBED BY THE CONTRACTOR OUTSIDE THE LIMIT OF WORK SHALL BE RESTORED TO ITS ORIGINAL CONDITIONS AT NO COST TO THE OWNER.

EROSION AND SEDIMENT CONTROL NOTES:

1. PRIOR TO CONSTRUCTION A FENCE SHALL BE PLACED AROUND ALL TREES THAT ARE TO BE MAINTAINED AND PROTECTED. NO CONSTRUCTION ACTIVITY OR STOCKPILING OF MATERIAL SHALL BE ALLOWED WITHIN THE DRIPLINE OF THE EXISTING TREES THAT ARE TO REMAIN.
2. SITE ELEMENTS TO REMAIN SHALL BE PROTECTED DURING CONSTRUCTION.
3. PRIOR TO CONSTRUCTION AN EROSION CONTROL BARRIER (ECB) SHALL BE PROVIDED AT THE EDGE OF THE DEVELOPMENT AREA AS SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE ECB THROUGHOUT ALL PHASES OF CONSTRUCTION AS WELL AS COMPLYING WITH ANY OTHER CONDITIONS ESTABLISHED IN THE ORDER OF CONDITIONS (MASSDEP FILE # ___-___) ISSUED BY THE __________ CONSERVATION COMMISSION OR ANY OTHER PERMIT ISSUED FOR THE SITE.
4. THE CONTRACTOR SHALL TAKE SUFFICIENT PRECAUTIONS DURING CONSTRUCTION TO MINIMIZE THE RUNOFF OF POLLUTING SUBSTANCES SUCH AS SILT, CLAY, FUELS, OILS, BITUMENS, CALCIUM CHLORIDE OR OTHER POLLUTING MATERIALS HARMFUL TO HUMANS, FISH, OR OTHER LIFE, INTO WATER SUPPLIES AND SURFACE WATERS. SPECIAL PRECAUTIONS SHALL BE TAKEN IN THE USE OF CONSTRUCTION EQUIPMENT TO PREVENT OPERATIONS WHICH PROMOTE EROSION.
5. CONTRACTOR SHALL UTILIZE TEMPORARY SEDIMENT PITS OR BASINS AS NECESSARY TO PREVENT SEDIMENT LADEN WATERS FROM ENTERING DRAINAGE FACILITIES. SPECIAL ATTENTION SHALL BE GIVEN TO AREAS FOR PROPOSED STORMWATER INFILTRATION SYSTEMS. IF ADDITIONAL SILTATION CONTROL IS REQUIRED, CHECK DAMS OR SILT FENCES MAY BE PLACED IN DITCHES RECEIVING STORMWATER FROM DISTURBED AREAS, UPON APPROVAL OF THE PROJECT ENGINEER.
6. AS CONSTRUCTION PROGRESSES AND SEASONAL CONDITIONS DICTATE, MORE SILTATION CONTROL FACILITIES MAY BE REQUIRED. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS NEW CONDITIONS THAT MAY BE CREATED AND TO PROVIDE ADDITIONAL FACILITIES OVER AND ABOVE THE MEASURES DEPICTED HEREON.
7. MEASURES FOR CONTROL OF EROSION MUST BE ADEQUATE TO ASSURE THAT TURBIDITY IN THE RECEIVING WATER WILL NOT BE INCREASED BEYOND LEVELS ESTABLISHED BY THE STATE OR OTHER CONTROLLING BODY, IN WATERS USED FOR PUBLIC SUPPLY OR FISHING UNLESS OTHER LIMITS HAVE BEEN ESTABLISHED FOR THE PARTICULAR WATER.
8. ALL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED ON A DAILY BASIS DURING THE DURATION OF CONSTRUCTION TO INSURE THAT CHANNELS, DITCHES AND PIPES ARE CLEAR OF DEBRIS AND THAT EROSION CONTROL BARRIERS ARE INTACT. EROSION CONTROL BARRIERS SHALL BE CLEANED AND MAINTAINED AS REQUIRED TO ENSURE FUNCTIONALITY.
9. AN ANTI-TRACKING CONSTRUCTION ENTRANCE SHALL BE MAINTAINED AT ALL POINTS OF CONSTRUCTION ACCESS AND EGRESS TO PUBLIC RIGHTS-OF-WAY FOR THE DURATION OF CONSTRUCTION.
10. ANY SEDIMENT TRACKED ONTO PUBLIC RIGHTS-OF-WAY SHALL BE SWEPT AND CLEANED AT THE END OF EACH WORK DAY.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR DUST CONTROL, WHICH INCLUDES STREET SWEEPING OF ALL PAVED SURFACES WITHIN THE SITE AND OFF-SITE AREAS THAT ARE IMPACTED BY SITE CONSTRUCTION.
12. ALL TOPSOIL WITHIN THE LIMITS OF THE EXCAVATED AREAS SHALL BE STRIPPED TO ITS FULL DEPTH AND STOCKPILED FOR REUSE AND SEGREGATED FROM SUBSURFACE SOIL MATERIAL. EXCESS TOPSOIL SHALL BE DISPOSED OF ON SITE AS DIRECTED BY THE PROJECT ENGINEER.
13. ALL STOCKPILE AREAS SHALL BE LOCATED WITHIN THE LIMIT OF WORK LINE AND STABILIZED TO PREVENT EROSION.
14. SILT SACKS SHALL BE INSTALLED IN ALL DOWNSTREAM DRAIN INLETS PRIOR TO CONSTRUCTION TO CONTROL SILTATION.
15. WITHIN THE LIMIT OF WORK TREES THAT ARE TO BE REMOVED MAY BE CUT BUT BRUSH AND STUMPS SHALL NOT BE REMOVED UNTIL ONE WEEK PRIOR THE START OF CONSTRUCTION. DISTURBANCE OF THE EXISTING GROUND SURFACE SHALL BE MINIMIZED PRIOR TO THE START OF CONSTRUCTION.
16. SILTATION AND SEDIMENTATION BASINS SHALL BE INSTALLED ON SITE TO DE-SILT ALL STORMWATER OR WATER PUMPED FROM EXCAVATED AREAS. PROPOSED DETENTION AND INFILTRATION BASINS MAY BE UTILIZED AS SILTATION PONDS PROVIDED THAT TOPSOIL AND SUBSOIL IS NOT STRIPPED FROM THE BOTTOM OF THE BASINS. SILTATION AND SEDIMENTATION BASINS SHALL BE CONSTRUCTED TO RECEIVE DISCHARGE FROM SILTATION AND SEDIMENTATION PONDS IN ACCORDANCE WITH THE REQUIREMENTS OF THE AGENCIES HAVING JURISDICTION. FOLLOWING STABILIZATION OF UPSTREAM TRIBUTARY AREAS, TOPSOIL AND SUBSOIL SHALL BE REMOVED FROM BASINS AND FREE-DRAINING SOIL FILL MATERIAL PLACED FROM PARENT MATERIAL UP TO SUBGRADE. BASIN BOTTOMS SHALL RECEIVE FINAL LOAM AND SEED.
17. EROSION CONTROL BLANKETS SHALL BE INSTALLED PER MANUFACTURE'S SPECIFICATIONS FOR AREAS REQUIRING SLOPE STABILIZATION AND SHALL BE LOAMED, SEEDED AND FERTILIZED PRIOR TO THE PLACEMENT OF THE BLANKETS.
18. CONTRACTOR SHALL DIVERT STORMWATER RUNOFF AROUND THE SITE AS REQUIRED AND DRAINAGE SHALL BE RESTORED TO CONDITION EXISTING PRIOR TO CONSTRUCTION UNLESS OTHERWISE SHOWN ON THE DRAWINGS.
19. ALL DISTURBED AREAS SHALL BE LOAMED AND SEEDED OR MULCHED AS SOON AS PRACTICABLE.

CONSTRUCTION SEQUENCING NOTES:

1. INSTALL CONSTRUCTION ENTRANCE.
2. CLEAR AND GRUB ONLY AS NECESSARY FOR SAFE ACCESS TO SITE FOR TREE REMOVAL EQUIPMENT AND MACHINERY AND THE THE INSTALLATION OF EROSION CONTROL BARRIER AND SEDIMENT CONTROL MEASURES AROUND THE INITIAL STAGING AREA(S).
3. FELL TREES WITHIN APPROVED LIMITS OF CLEARING (WORK AREA).
4. INSTALL EROSION CONTROL BARRIERS AND SEDIMENT CONTROL MEASURES AS WELL AS LIMIT OF WORK DEMARCATION (FLAGGING OR FENCING) AS MAY BE SHOWN ON THE DRAWINGS OR REQUIRED BY PERMIT GRANTING AUTHORITIES.
5. EXCAVATE TEMPORARY SEDIMENTATION BASINS TO ONE FOOT ABOVE BOTTOM OF BASIN ELEVATION AND CONSTRUCT TEMPORARY DIVERSION SWALES TO DIRECT SEDIMENTATION RUNOFF TO BASINS.
6. CLEAR AND GRUB WITHIN LIMIT OF WORK AREA AND PROPERLY DISPOSE OF STUMPS AND BRUSH.
7. PERFORM SITE CUT AND FILL OPERATIONS AND ESTABLISH ROUGH SUB-GRADES.
8. ROUGH GRADE PAVED AREAS.
9. LOAM AND SEED TEMPORARY SEDIMENT BASINS AND TEMPORARY DIVERSION SWALES.
10. ESTABLISH STOCKPILE AREA AND SURROUND WITH EROSION CONTROL BARRIER. AVOID STOCKPILING IN VALLEYS OR LOW-LYING AREA WHERE SUSCEPTIBLE TO EROSION.
11. MAINTAIN CONSTRUCTION ENTRANCE, EROSION CONTROL MEASURES, TEMPORARY DIVERSION SWALES AND TEMPORARY SEDIMENTATION BASINS THROUGHOUT DURATION OF CONSTRUCTION. REMOVE SEDIMENT IN TEMPORARY BASIN(S) WHEN ACCUMULATED TO A DEPTH OF TWELVE (12) INCHES.
12. SEDIMENTATION BASINS TO REMAIN DURING EARTHWORK OPERATIONS. ALL SEDIMENT SHALL BE REMOVED FROM BASINS AND BOTTOM OF BASINS EXCAVATED TO FINAL BOTTOM ELEVATION FOLLOWING STABILIZATION OF DISTURBED AREAS.
13. EROSION AND SEDIMENT CONTROL IS SUBJECT TO CHANGE BASED UPON FIELD CONDITIONS, CONSTRAINTS, AND OTHER UNFORESEEN FACTORS.

LAYOUT AND MATERIAL NOTES:

1. ALL SETBACK LINES AND DIMENSIONS ARE PARALLEL OR PERPENDICULAR TO THE LINES FROM WHICH THEY ARE MEASURED, UNLESS NOTED OTHERWISE.
2. DIMENSIONS ARE FROM THE FACE OF CURB, FACE OF BUILDING, FACE OF WALL AND CENTERLINE OF PAVEMENT MARKINGS UNLESS NOTED OTHERWISE.
3. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE GROUND AND REPORT ANY DISCREPANCIES TO THE PROJECT ENGINEER.
4. SEE ARCHITECTURAL DRAWINGS FOR EXACT BUILDING DIMENSIONS AND DETAILS CONTIGUOUS TO THE BUILDING.
5. EXISTING PROPERTY LINE MONUMENTATION SHALL BE PROTECTED DURING CONSTRUCTION. ANY MONUMENTATION DISTURBED DURING CONSTRUCTION OR ANY PROPOSED MONUMENTATION SHALL BE SET OR RESET BY A PROFESSIONAL LICENSED SURVEYOR.
6. SYMBOLS OF PROJECT FEATURES DEPICTED IN THESE DRAWINGS ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SCALED TO THEIR DIMENSIONS OR LOCATIONS ON THE DRAWINGS. THE CONTRACTOR SHALL REFER TO THE DETAIL SHEET DIMENSIONS, MANUFACTURER'S SPECIFICATIONS, SHOP DRAWINGS AND FIELD MEASUREMENTS FOR ACCURATE INFORMATION.
7. ALL PAVEMENT MARKINGS INCLUDING PARKING SPACES AND CROSSWALKS SHALL BE PAINTED WHITE UNLESS OTHERWISE NOTES.
8. EACH ACCESSIBLE PARKING SPACE SHALL BE IDENTIFIED BY A SIGN CONTAINING THE "INTERNATIONAL SYMBOL OF ACCESSIBILITY" AS DESCRIBED IN THE AMERICANS WITH DISABILITIES ACT, PUBLIC LAW 101-366, AND DETAILED IN THE FHWA/USDOT MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, AS AMENDED.

GRADING, DRAINAGE AND UTILITY NOTES:

1. THE CONTRACTOR SHALL CONFIRM THE SIZE AND DISPOSITION OF ALL UTILITIES TO SITE AND COORDINATE WITH RESPECTIVE UTILITY COMPANIES REGARDING ANY UTILITIES THAT REQUIRE REMOVAL OR RELOCATION. NO EXCAVATION SHALL BE PERFORMED UNTIL ALL UTILITY COMPANIES HAVE BEEN NOTIFIED.
2. LOCATIONS OF UNDERGROUND UTILITIES SHOWN HEREON WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND ARE APPROXIMATE AND ASSUMED. THERE MAY BE ADDITIONAL UNDERGROUND UTILITIES THAT ARE NOT DEPICTED HEREON. NO WARRANTEE IS EXPRESSED OR IMPLIED AS TO THE ACCURACY OF SUBSURFACE UTILITY LOCATIONS OR DISPOSITION, UNLESS OTHERWISE NOTED ON THE PLAN.
3. CONTRACTOR SHALL CONFIRM DEPTH(S) OF PERTINENT UTILITIES BY TEST PIT AND NOTIFY OWNER'S REPRESENTATIVE OF ANY DISCREPANCIES.
4. THE CONTRACTOR SHALL VERIFY EXISTING GRADES IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE PROJECT SURVEYOR AND ENGINEER.
5. PROVIDE CRIBBING TO PROTECT UTILITY LINES DURING CONSTRUCTION AS NECESSARY.
6. THE CONTRACTOR SHALL PROTECT SUBSURFACE DRAINAGE, SEWER AND ALL OTHER UTILITIES FROM EXCESSIVE VEHICLE LOADS DURING CONSTRUCTION. FACILITIES DAMAGED DUE TO CONSTRUCTION LOADS SHALL BE RESTORED TO THE ORIGINAL CONDITION BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER OR UTILITY OWNER.
7. ALL DRAIN PIPE SHALL BE CLASS III RCP (ASTM C76) OR SMOOTH INTERIOR CORRUGATED POLYETHYLENE (CPE TYPE S; AASHTO M252 OR M294), UNLESS OTHERWISE NOTED. PIPE LENGTHS ARE MEASURED CENTER-OF-STRUCTURE TO CENTER-OF-STRUCTURE.
8. ALL GRAVITY SEWER PIPE SHALL BE SDR 35 PVC (ASTM D3034) WITH WATERTIGHT INTEGRAL BELL GASKETED JOINT (ASTM D3212) AND ELASTOMERIC GASKET (ASTM F477), UNLESS OTHERWISE NOTED.
9. ALL FORCE MAIN SEWER PIPE SHALL BE SDR 21 PVC (200 PSI RATED, ASTM D2241) WITH WATERTIGHT JOINTS (ASTM D2672 OR D3212 AS ALLOWED), UNLESS OTHERWISE NOTED.
10. ALL WATER MAIN PIPE AND FITTINGS SHALL BE CLDI CLASS 52 (AWWA C151, C110 & C104) WITH RUBBER GASKETED JOINTS (AWWA 111), UNLESS OTHERWISE NOTED. ALL WATER SERVICES TO BE PRESSURE RATED PE OR COPPER AS REQUIRED AND APPROVED BY DPW. PROVIDE FIVE (5) FEET MINIMUM COVER ON ALL WATER MAINS AND SERVICES.
11. WHERE 10' HORIZONTAL SEPARATION BETWEEN SEWER AND WATER MAINS CANNOT BE MAINTAINED, CROWN OF SEWER MAIN SHALL BE EIGHTEEN (18) INCHES BELOW BOTTOM OF WATER MAIN, IN ACCORDANCE WITH SECTION 9.7.2 OF MASSDEP "GUIDELINES AND POLICIES FOR PUBLIC WATER SYSTEMS" (AS DEFINED IN 310 CMR 22.02).
12. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION OF GAS, ELECTRIC, TELECOMMUNICATIONS AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES AS REQUIRED. WHERE AN EXISTING UTILITY IS IN CONFLICT WITH THE PROPOSED WORK THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE OWNER AND PROJECT ENGINEER FOR RESOLUTION.
13. PROPOSED GAS, ELECTRIC, TELECOMMUNICATIONS AND CABLE TV DEPICTED IS SCHEMATIC ONLY. CONTRACTOR SHALL COORDINATE WITH RESPECTIVE UTILITY COMPANY FOR FINAL PLANS AND SPECIFICATIONS.
14. CONTRACTOR SHALL COORDINATE CONNECTION TO MUNICIPAL FIRE ALARM.
15. ALL UTILITIES INCLUDING CONCRETE PADS ARE TO BE INSTALLED PER UTILITY COMPANY OR LOCAL DPW STANDARDS AS APPLICABLE.
16. ALL UTILITY COVERS, GRATES, HATCHES, ETC., SHALL BE FLUSH WITH THE PAVEMENT FINISHED GRADE.
17. EXISTING PAVEMENT SHALL BE SAW CUT AND NEW PAVEMENT SHALL BE BLENDED SMOOTHLY TO MEET CUT EDGES.
18. FINAL GRADES SHALL BE PITCHED EVENLY BETWEEN SPOT ELEVATIONS AND ALL AREAS SHALL BE GRADED TO DRAIN WITH NO PUDDLING OR PONDING.
19. THE CONTRACTOR SHALL SCHEDULE THE WORK TO ALLOW THE FINISHED SUBGRADE ELEVATIONS TO DRAIN PROPERLY WITHOUT PUDDLING. SPECIFICALLY, ALLOW WATER TO ESCAPE WHERE PROPOSED CURBING MAY RETAIN RUNOFF PRIOR TO APPLICATION OF THE FINISH SUBGRADE AND/OR SURFACE PAVING. PROVIDE TEMPORARY POSITIVE DRAINAGE AS REQUIRED.
20. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE (1.5% MINIMUM) AWAY FROM ALL BUILDING FOUNDATIONS AND STRUCTURES.
21. GRADES IN ACCESSIBLE PARKING SPACES SHALL NOT EXCEED 2% IN ANY DIRECTION (PER 521 CMR 23.4.3).
22. GRADES IN ACCESSIBLE WALKWAYS SHALL NOT EXCEED 5% (PER 521 CMR 22.3) AND SHALL NOT HAVE A CROSS PITCH OF MORE THAN 2% (PER 521 CMR 22.3.1).
23. RIPRAP APRONS SHALL BE PROVIDED AT ALL FLARED ENDS AND HEADWALLS.
24. RETAINING WALLS OVER FOUR (4) FEET IN HEIGHT ARE TO BE DESIGNED BY OTHERS. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE ENGINEERED STRUCTURAL DRAWINGS FOR RETAINING WALLS WHERE REQUIRED BY CODE, INCLUDING BUT NOT LIMITED TO THE STATE BUILDING CODE (780 CMR).
25. ALL DISTURBED AREAS SHALL BE LOAMED TO A SIX (6) INCH DEPTH AND SEEDED WITH SUITABLE GRASS SEED MIX UNLESS OTHERWISE SPECIFIED ON THE PLANS.

PLANTING NOTES:

1. ALL PLANT MATERIAL SHALL MEET THE THE SPECIFICATIONS AND GUIDELINES OF THE AMERICAN STANDARD FOR NURSERY STOCK ISSUED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
2. ANY PROPOSED SUBSTITUTION OF PLANT MATERIAL SHALL BE EQUAL IN OVERALL SIZE, HEIGHT, LEAF, FORM, BRANCHING HABIT, FRUIT, FLOWER, COLOR, AND CULTURE. ALL PROPOSED SUBSTITUTIONS SHALL BE REVIEWED AND APPROVED IN WRITING BY LANDSCAPE ARCHITECT PRIOR TO PURCHASING.
3. FINAL QUANTITIES FOR EACH PLANT TYPE SHALL BE AS GRAPHICALLY SHOWN ON THE PLANS. THIS NUMBER SHALL TAKE PRECEDENCE IN CASE OF ANY DISCREPANCY BETWEEN QUANTITIES SHOWN ON THE PLANT LIST AND ON THE PLAN. THE LANDSCAPE CONTRACTOR SHALL REPORT AND DISCREPANCIES BETWEEN THE NUMBER OF PLANTS SHOWN ON THE PLANT LIST AND PLANT LABELS PRIOR TO BIDDING.
4. THE LANDSCAPE ARCHITECT RESERVES THE RIGHT TO REJECT ANY PLANT MATERIAL AT THE SITE. MATERIAL SHALL BE REMOVED FROM THE PROPERTY BY THE LANDSCAPE CONTRACTOR AND REPLACED WITH PLANT MATERIAL APPROVED BY LANDSCAPE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.
5. ALL TREES SHALL BE BALLED AND BURLAPPED UNLESS OTHERWISE SPECIFIED.
6. THE LANDSCAPE CONTRACTOR SHALL VERIFY LOCATIONS OF ALL BELOW AND ABOVE GRADE UTILITIES AND NOTIFY THE LANDSCAPE ARCHITECT OF ANY CONFLICTS.
7. ALL TREE PLANTINGS TO MAINTAIN A 10 FOOT HORIZONTAL SEPARATION FROM PROPOSED AND EXISTING SEWER AND WATER LINES.
8. ALL PLANTING BEDS ARE TO BE CROWNED WITH TOPSOIL AND MULCH ABOVE ADJACENT AREAS.
9. NO PLANT MATERIAL SHALL BE INSTALLED UNTIL ALL GRADING AND CONSTRUCTION HAS BEEN COMPLETED IN THE IMMEDIATE AREA. THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT OF ANY CONFLICT.
10. THE LANDSCAPE CONTRACTOR SHALL LAYOUT ALL PLANT MATERIAL AS SHOWN ON THE PLANS AND SHALL NOTIFY THE LANDSCAPE ARCHITECT A MINIMUM OF 48 HOURS PRIOR TO INSTALLAITON FOR FIELD REVIEW AND APPROVAL BY THE LANDSCAPE ARCHITECT.
11. PROVIDE A 3" DEPTH OF MULCH AS SHOWN ON THE PLANTING DETAILS UNDER AND AROUND ALL PLANT MATERIAL AND IN ALL PLANT BEDS AND LANDSCAPE ISLANDS. MULCH SHALL BE CLEAN, SHREDDED PINE BARK MULCH UNLESS OTHERWISE SPECIFIED. PRIOR TO SPREADING MULCH, APPLY A WEED PRE-EMERGENT SUCH AS "PREEN" OR APPROVED EQUAL. FOLLOW MANUFACTURER'S APPLICATION INSTRUCTIONS.
12. ALL TREES ADJACENT TO SIDEWALKS SHALL HAVE A 6'-8" MINIMUM BRANCHING HEIGHT AT TIME OF PLANTING.
13. LAWN AND DISTURBED SHALL RECEIVE A MINIMUM OF 6" OF LOAM AND SPECIFIED SEED MIX UNLESS OTHERWISE NOTED. AREAS OVER 2:1 SLOPE SHALL BE PROTECTED WITH EROSION CONTROL FABRIC.
14. THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETE MAINTENANCE OF THE PLANT MATERIAL AND LAWN AREAS UNTIL DATE OF FINAL ACCEPTANCE BY THE LANDSCAPE ARCHITECT. WATERING SHALL BE PROVIDED DURING THE FIRST GROWING SEASON WHEN NATURAL RAINFALL IS BELOW ONE INCH PER WEEK.
15. IF AN IRRIGATION SYSTEM IS PROVIDED THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR FULL COORDINATION WITH THE IRRIGATION CONTRACTOR TO PROVIDE PROPER IRRIGATION TO ALL TREES, PLANT BEDS AND LAWN AREAS UNLESS OTHERWISE NOTED. IRRIGATION DESIGN AND PERMITTING TO BE PROVIDED BY OTHERS.
16. ALL PLANT MATERIAL SHALL BE GUARANTEED BY THE LANDSCAPE CONTRACTOR FOR A PERIOD OF ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE BY THE LANDSCAPE ARCHITECT. ALL REPLACEMENTS SHALL BE AT NO ADDITIONAL COST TO OWNER.

LEGEND

ENVIRONMENTAL

100' FLOOD ZONE	
100' WETLAND BUFFER ZONE	100' WBZ
200' RIVERFRONT AREA	
APPROX. BOUNDARY BORDERING VEGETATED WETLAND	BBVW
BOUNDARY BORDERING VEGETATED WETLAND	ABBVW
EROSION CONTROL BARRIER	ECB
STREAM - INTERMITTENT	FLOW
STREAM - PERENNIAL	FLOW
WATER BODY	

GRADING & TOPOGRAPHY

BASEMENT FLOOR ELEVATION	BFE=100.00
CONTOUR - MINOR	99
CONTOUR - MAJOR	100
CURB - BOTOM OF CURB	BCx100
CURB - TOP OF CURB	TCx100
FINISH FLOOR ELEVATION	FFE=100.00
FOUNDATION - TOP OF FOUNDATION	TOF=100.00
GARAGE FLOOR ELEVATION	GFE=100.00
HIGH POINT	HPx100
LOW POINT	LPx100
SPOT ELEVATION	x100.00
TREELINE	
WALL - BOTTOM OF WALL	BWx100
WALL - TOP OF WALL	TWx100

MATERIALS

BOLLARD POST	BP
BUILDING	
BUILDING - DOOR	D
BUILDING - OVERHEAD DOOR	OHD
BUILDING - OVERHANG	
CAPE COD BERM	CCB
CURB - BITUMINOUS CONCRETE	BCC
CURB - CONCRETE	CC
CURB - HAUNCHED	HCC
CURB - SLOPED GRANITE	SGC
CURB - VERTICAL GRANITE	VGC
EDGE OF PAVEMENT	EOP
FENCE - CHAIN LINK	CLF
FENCE - POST & RAIL	PRF
FENCE - STOCKADE	SF
GUARDRAIL - STEEL	SGR
GUARDRAIL - STEEL BACK WOODEN	SBWG
GUARDRAIL - WOODEN	WGR
HANDICAP ACCESSIBLE PARKING SPACE	
HANDICAP ACCESSIBLE RAMP	WCR
HANDRAIL - STEEL	SHR
HANDRAIL - WOODEN	WHR
LIGHTPOLE	(TRADITIONAL) LP (ORNAMENTAL)
RIPRAP	
SIGN	S
WALL - CONCRETE	
WALL - HEAD	
WALL - RAILROAD TIE	
WALL - STONE	
WALL - WING	

MONITORING & TESTING

MONITORING WELL	MW
PERCOLATION TEST	PT-##
TEST PIT	TP-##

UTILITIES & DRAINAGE

ELECTRIC & COMMUNICATION

ELECTRIC BOX	E
ELECTRIC, COMMUNICATION & DATE LINE	UGE
ELECTRIC MANHOLE	EMH
OVERHEAD WIRE	OHW
TELEPHONE MANHOLE	TMH
TRANSFORMER	T
UTILITY POLE	UP

GAS

GAS LINE	G
GAS METER	GM
GATE VALVE	GV

SANITARY SEWER & WASTEWATER

FORCEMAIN	FM
SANITARY SEWER LINE	S
SANITARY SEWER SERVICE	SS
SANITARY SEWER MANHOLE	SMH

STORMWATER

AREA DRAIN	AD
CATCH BASIN	CB
CATCH BASIN - D-TYPE	CB D-TYPE
CATCH BASIN - DOUBLE	DCB
CATCH BASIN - LEACHING	LCB
CATCH BASIN - ROUND	CB
DROP INLET	DI
DRAINLINE	D
DRAIN MANHOLE	DMH
FLARED END	FE
FOUNDATION DRAIN	FD
INVERT	INV=100.00
OUTLET CONTROL STRUCTURE	OCS
RIM	R=100.00
ROOF DRAIN	RD

WATER & APPURTENANCES

HYDRANT	HYD
GATE VALVE	GV
REDUCER	
TEE	
WATER LINE	W
WATER SERVICE	WS
WATER SHUT OFF	WSO
WELL	W

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

NAME REGISTRATION NO.

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

SIGNATURE DATE

NEEDHAM TOWN ENGINEER

SIGNATURE DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

SIGNATURE DATE

1-888-344-7233 STOP CALL BEFORE YOU DIG!

THE COMMONWEALTH OF MASSACHUSETTS REQUIRES NOTIFICATION BY EXCAVATORS OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE COMMONWEALTH.

ABBREVIATIONS

ACRES	AC.
BITUMINOUS CONCRETE	BIT. CONC.
CONCRETE	CONC.
DIAMETER	DIA.
FOUND	FND
LINEAR FEET	L.F.
MAINTAIN AND PROTECT	M&P
NOT TO SCALE	N.T.S.
NOW OR FORMERLY	N / F
PLUS OR MINUS	±
SQUARE FEET	S.F.
REMOVE AND DISPOSE	R&D
REMOVE AND REPLACE	R&R
REMOVE AND STOCKPILE	R&S
VERIFY IN FIELD	V.I.F.

For Registry Use Only

Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
GENERAL NOTES AND LEGEND

Definitive Subdivision

Prepared By:
LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
FIELD RESOURCES, INC.
Land Surveyors
P.O. Box 324, Auburn, MA, 508.832.4332
281 Chestnut Street, Needham, MA, 781.444.5936
fieldresources@hotmail.com

THE CONTENT, INFORMATION AND DESIGN OF THIS PLAN ARE PROPRIETARY AND DUPLICATION AND/OR UTILIZATION FOR ANY PURPOSES IS STRICTLY PROHIBITED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM LAND DESIGN COLLABORATIVE. ONLY APPROVED, SIGNED AND SEALED PLANS SHALL BE UTILIZED FOR CONSTRUCTION PURPOSES.
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No:	Date:	Revision | Issue:

Drawn By:	JTA	Checked By:	MJS
Date:	04/19/2024	Project No.:	21-0089

0 10' 20' 40' 60'
Scale: 1" = 20'

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LEGEND

—Z—	INDICATES COMMON OWNERSHIP
—o—o—	FENCE
BF	BUILDING FACTOR
BVW	BORDERING VEGETATED WETLAND
SF	SQUARE FEET
TYP.	TYPICAL
MAHW	MEAN ANNUAL HIGH WATER
L	LENGTH
R	RADIUS
Δ	DELTA
⊡	PROPOSED BOUND
	WETLANDS
▲	WETLAND FLAG

NOTES:

1) **BENCHMARK INFORMATION:**

   TBM #1 SET 2 FEET UP ON STREET SIDE OF U-POLE #3 ELEVATION = 490.80

   TBM #2 SET 1 FOOT UP ON STREET SIDE OF U-POLE #2. ELEVATION = 489.24

2) **ELEVATIONS REFER TO PROJECT BASE WHICH IS 284.13 FEET ABOVE THE TOWN OF NEEDHAM DATUM**

3) **CONTOUR INTERVAL EQUALS ONE (1) FOOT.**

4) **UTILITY INFORMATION SHOWN IS BASED ON BOTH A FIELD SURVEY AND THE LATEST PLANS OF RECORD. THE LOCATIONS OF UNDERGROUND PIPES AND CONDUITS HAVE BEEN DETERMINED FROM THE AFOREMENTIONED RECORD PLANS AND ARE APPROXIMATE ONLY. BEFORE PLANNING FUTURE CONNECTIONS, THE PROPER UTILITY ENGINEERING DEPARTMENT SHOULD BE CONSULTED AND THE ACTUAL LOCATION OF SUB-SURFACE STRUCTURES SHOULD BE DETERMINED IN THE FIELD. CALL, TOLL-FREE, THE DIG SAFE CALL CENTER AT 1-888-344-7233 (1-888-DIG-SAFE) SEVENTY-TWO HOURS PRIOR TO EXCAVATION.**

NEEDHAM DIRECTOR OF PUBLIC WORKS

NAME DATE

NEEDHAM TOWN ENGINEER

NAME DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

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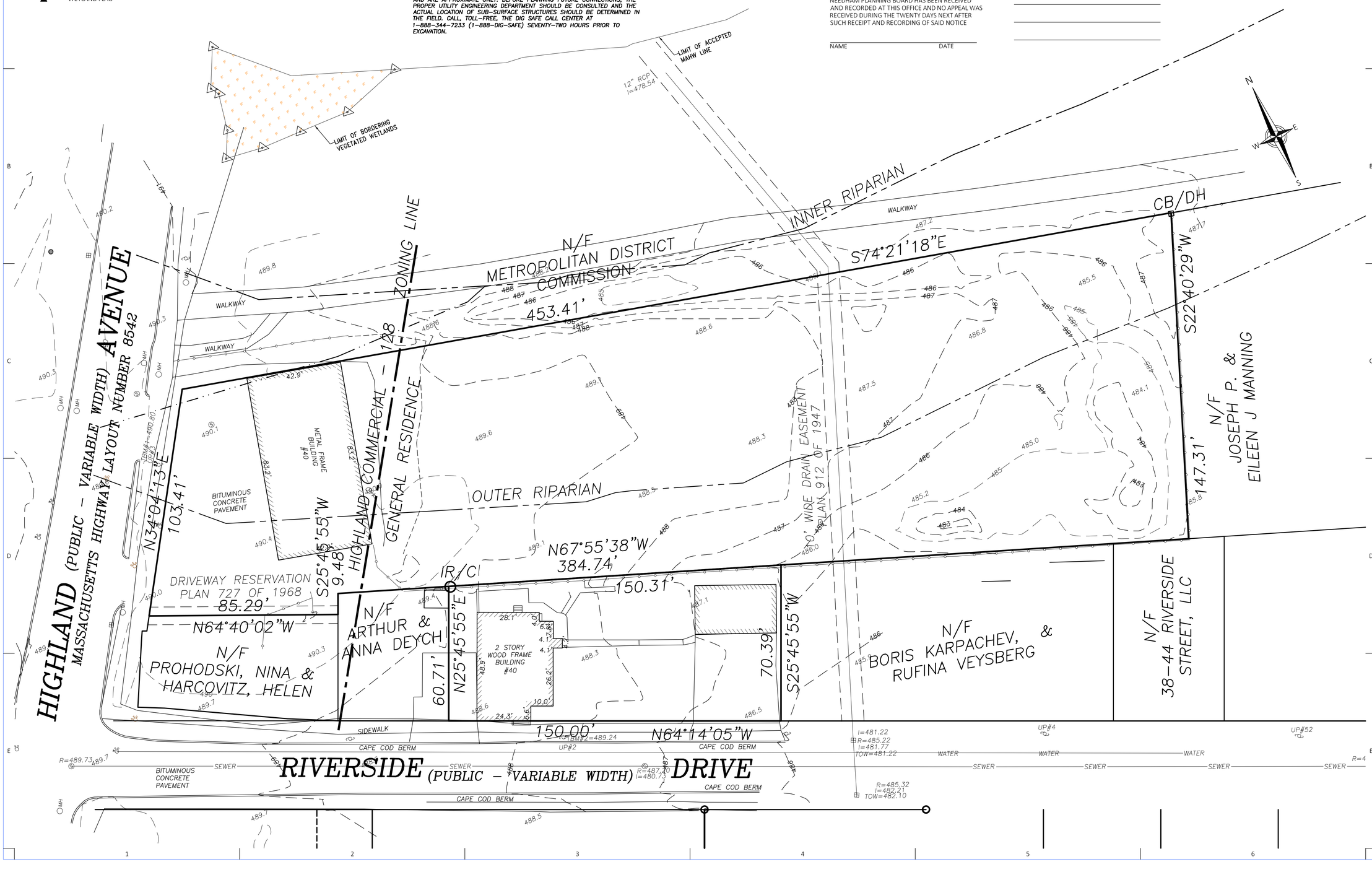
NEEDHAM PLANNING BOARD

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

COMMONWEALTH OF MASSACHUSETTS — BRADLEY SIMONELLI #47581 — PROFESSIONAL LAND SURVEYOR

NAME 47581 REGISTRATION NO.



Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
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435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
EXISTING CONDITIONS PLAN

Definitive Subdivision

Prepared By:
LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
Field Resources, Inc.
LAND SURVEYORS
P.O. Box 324, Auburn, MA 508.832.4332
281 Chestnut Street, Needham, MA 781.444.5936
office@fieldresources.net

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Drawn By: ___ Checked By: ___

Date: 04/26/2024 Project No.: 21-0089

0 10' 20' 40' 60'
Scale: 1" = 20'

Sheet No.:
2 OF 10

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ZONING SUMMARY TABLE

GENERAL RESIDENCE & HIGHLAND COMMERCIAL 128 DISTRICT(S) NO OVERLAY DISTRICTS

	GENERAL RESIDENCE			HIGHLAND COMMERCIAL 128		
	REQUIRED	PROVIDED		REQUIRED	EXISTING	PROVIDED
		LOT 102	LOT 103			LOT 101
MINIMUM LOT AREA (PER Z.B.L. 4.2.2 & 4.5)	10,000 S.F.	15,214 SF	17,986 SF	15,000 SF	57,172 SF	15,028 SF
MINIMUM LOT AREA (PER Z.B.L. 4.2.6)	10,000 S.F.	14,991 SF*	15,368 SF*	15,000 SF		15,028 SF
MAXIMUM BUILDING FACTOR	20	14.3	16.2	N/A	N/A	N/A
MINIMUM FRONTAGE	80'	214'±	152'±	100'	102'±	NO CHANGE
MINIMUM FRONT YARD	20'**	>25'	>25'	5'	34'±	NO CHANGE
MINIMUM SIDE YARD	14'***	>16'	>16'	10'*****	0'±	NO CHANGE
MINIMUM REAR YARD	20'	>20'	>20'	10'*****	382'±	20.5±'
MINIMUM LOT WIDTH	80'	80' & 187'±	137.0'±	N/A	N/A	NO CHANGE
MAXIMUM BUILDING HEIGHT	35'****	<35'	<35'	54'	LESS THAN 54'	NO CHANGE
MAXIMUM NUMBER OF BUILDING STORIES	2.5 STORIES	2.5 STORIES MAX	2.5 STORIES MAX	N/A	N/A	N/A
MAXIMUM LOT COVERAGE	30%	<30%	<30%	80%******	6%±	23±%
MAXIMUM FLOOR AREA RATIO	N/A	N/A	N/A	0.30	0.06	0.23±%

LEGEND

—Z—	INDICATES COMMON OWNERSHIP
—o—o—	FENCE
BF	BUILDING FACTOR
BVW	BORDERING VEGETATED WETLAND
SF	SQUARE FEET
TYP.	TYPICAL
MAHW	MEAN ANNUAL HIGH WATER
L	LENGTH
R	RADIUS
Δ	DELTA
⊡	PROPOSED BOUND
	WETLANDS
▲	WETLAND FLAG

* NO PORTION OF A LOT WHICH IS COVERED BY A WATER BODY SHALL BE COUNTED IN CALCULATING THE AREA OF A LOT FOR PURPOSES OF DETERMINING THE RESPECTIVE MINIMUM LOT AREAS AS LISTED IN THE TABLES 4.2.1, 4.2.2, 4.2.3, AND 4.2.4 ABOVE. NOT MORE THAN A COMBINED TOTAL OF THIRTY (30) PERCENT OF: (A) LAND LOCATED IN A FLOOD PLAIN DISTRICT; (B) LAND AREA SUBJECT TO THE WETLANDS PROTECTION ACT AND THE INLANDS WETLANDS ACT, M.G.L., CH. 131, S. 40 AND 40A (BUT NOT INCLUDING ANY AREA DEFINED AS A BUFFER AREA UNDER SAID STATUTES); AND (C) LAND SUBJECT TO FEDERAL FLOOD STORAGE RESTRICTIONS INCLUDED WITHIN THE CHARLES RIVER VALLEY STORAGE PROJECT SHALL BE COUNTED IN CALCULATING THE AREA OF A LOT FOR PURPOSES OF DETERMINING THE RESPECTIVE MINIMUM LOT AREAS IN SINGLE RESIDENCE A, SINGLE RESIDENCE B, GENERAL RESIDENCE AND INSTITUTIONAL DISTRICTS. THE PROVISIONS OF THE SECOND SENTENCE OF THIS PARAGRAPH (A) SHALL APPLY IN SINGLE RESIDENCE A, SINGLE RESIDENCE B AND GENERAL RESIDENCE DISTRICTS TO ANY LOT CREATED AFTER MAY 8, 1989.

** ATTACHED GARAGES SHALL HAVE A MINIMUM FRONT YARD SETBACK OF 25 FEET. FOR CORNER LOTS THE INCREASED FRONT YARD SETBACK OF 25 FEET IS REQUIRED ALONG BOTH FRONTAGE STREETS. EXISTING SINGLE OR TWO-FAMILY STRUCTURES NON-CONFORMING FOR FRONT YARD GARAGE SETBACK WHERE DEMOLITION EXCEEDS 50% OF THE BUILDING SHELL EXCLUSIVE OF DEMOLITION OF A SINGLE STORY ATTACHED GARAGE AND FOR WHICH THE BUILDING PERMIT FOR THE EXISTING STRUCTURE WAS ISSUED PRIOR TO JUNE 1, 2017 MAY BE ALTERED, EXTENDED OR STRUCTURALLY CHANGED (BUT NOT RECONSTRUCTED) TO A FRONT YARD GARAGE SETBACK OF 20 FEET UPON RECEIPT OF A SPECIAL PERMIT FROM THE BOARD OF APPEALS UNDER SECTION 7.5.2 OF THE ZONING BY-LAW PROVIDED: (1) THE NEW CONSTRUCTION MEETS ALL OTHER REQUIREMENTS OF THE ZONING BY-LAW; (2) THE GARAGE STRUCTURE IS SITED NO CLOSER TO THE FRONT LOT LINE THAN THE FARTHEST EXTENT OF THE EXISTING GARAGE STRUCTURE; AND (3) THE BOARD DETERMINES THAT SUCH CHANGE, EXTENSION OR ALTERATION SHALL NOT BE SUBSTANTIALLY MORE DETRIMENTAL TO THE NEIGHBORHOOD THAN THE EXISTING NONCONFORMING STRUCTURE. SAID SPECIAL PERMIT MAY BE GRANTED NOTWITHSTANDING THE PROVISIONS OF SECTION 1.4.7.2. FOR THE PURPOSES OF THIS FOOTNOTE, THE DEFINITION OF "SETBACK" IN SECTION 1.3 OF THESE BYLAWS SHALL CONTROL.

*** THE MINIMUM SIDE YARD SETBACK IS 14 FEET, AND A MAXIMUM OF 32 LINEAR FEET OF STRUCTURE MAY BE BUILT AT THE MINIMUM SETBACK LINE, AS MEASURED PARALLEL TO THE SIDE LOT LINE, PROVIDED THAT THE REMAINING LENGTH OF STRUCTURE ALONG THE SIDE YARD SETBACK MUST BE OFFSET AN ADDITIONAL 2 FEET. NOTWITHSTANDING THE ABOVE, THE MINIMUM SIDE YARD SETBACK REQUIREMENT FOR ALL BUILDINGS AND STRUCTURES ON ANY LOT THAT CONTAINS LESS THAN 80 FEET OF FRONTAGE SHALL BE 12 FEET, AND A MAXIMUM OF 32 LINEAR FEET OF STRUCTURE MAY BE BUILT AT THE MINIMUM SETBACK DISTANCE, AS MEASURED PARALLEL TO THE SIDE LOT LINE, PROVIDED THAT THE REMAINING LENGTH OF STRUCTURE ALONG THE SIDE YARD SETBACK MUST BE OFFSET AN ADDITIONAL 2 FEET. IN NO CASE SHALL A SIDE WALL EXTENSION EXTEND MORE THAN 32 LINEAR FEET WITHOUT A 2 FOOT OFFSET.

**** THE MAXIMUM HEIGHT AT ANY POINT OF ANY BUILDING OR STRUCTURE SHALL NOT EXCEED 41 FEET ABOVE THE LOWER OF ORIGINAL OR FINISHED GRADE. IF ALL OR A PORTION OF A BASEMENT WALL IS EXPOSED FOR THE FULL HEIGHT OF THE WALL, DORMERS IN THE ONE-HALF STORY ABOVE THE BASEMENT WALL SHALL NOT BE PERMITTED.

***** A 50-FOOT SETBACK SHALL BE REQUIRED FROM A GENERAL RESIDENCE ZONING DISTRICT LINE. HOWEVER, THE PLANNING BOARD MAY GRANT A SPECIAL PERMIT TO REDUCE SAID SETBACK, BUT NOT TO LESS THAN 20 FEET.

****** A MINIMUM OF 10% OF TOTAL LOT AREA MUST BE OPEN SPACE. THE OPEN SPACE AREA SHALL BE LANDSCAPED AND MAY NOT BE COVERED WITH BUILDINGS OR STRUCTURES OF ANY KIND, ACCESS STREETS, WAYS, PARKING AREAS, DRIVEWAYS, AISLES, WALKWAYS, OR OTHER CONSTRUCTED APPROACHES OR SERVICE AREAS.

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

NAME DATE

NEEDHAM TOWN ENGINEER

NAME DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

NAME DATE

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE REGISTERY OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

COMMONWEALTH OF MASSACHUSETTS BRADLEY J. SIMONELLI #47581 PROFESSIONAL LAND SURVEYOR 5/20/24

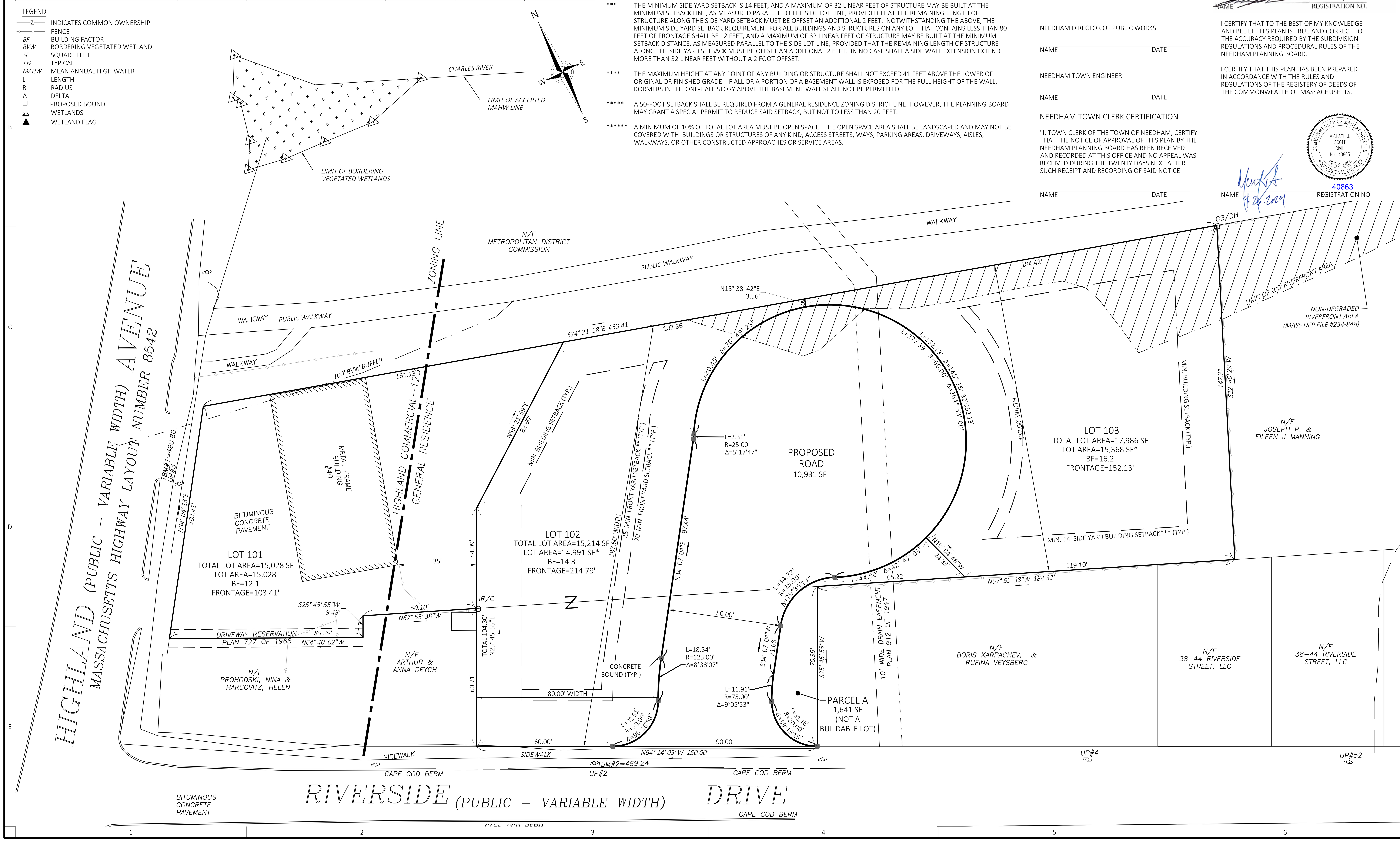
NAME 47581 REGISTRATION NO.

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE REGISTERY OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

COMMONWEALTH OF MASSACHUSETTS MICHAEL J. SCOTT CIVIL No. 40863 REGISTERED PROFESSIONAL ENGINEER

NAME 4.26.2024 40863 REGISTRATION NO.



CHARLES RIVER
LIMIT OF ACCEPTED MAHW LINE
LIMIT OF BORDERING VEGETATED WETLANDS
N E S W
N/F METROPOLITAN DISTRICT COMMISSION
WALKWAY
PUBLIC WALKWAY
ZONING LINE
100' BVW BUFFER
HIGHLAND (PUBLIC – VARIABLE WIDTH) AVENUE
MASSACHUSETTS HIGHWAY LAYOUT NUMBER 8542
TBM#1=490.80 UP#3
METAL FRAME BUILDING #40
BITUMINOUS CONCRETE PAVEMENT
HIGHLAND COMMERCIAL–128
GENERAL RESIDENCE
LOT 101
TOTAL LOT AREA=15,028 SF
LOT AREA=15,028
BF=12.1
FRONTAGE=103.41'
DRIVEWAY RESERVATION
PLAN 727 OF 1968
N/F PROHODSKI, NINA & HARCOVITZ, HELEN
N/F ARTHUR & ANNA DEYCH
LOT 102
TOTAL LOT AREA=15,214 SF
LOT AREA=14,991 SF*
BF=14.3
FRONTAGE=214.79'
PROPOSED ROAD
10,931 SF
LOT 103
TOTAL LOT AREA=17,986 SF
LOT AREA=15,368 SF*
BF=16.2
FRONTAGE=152.13'
PARCEL A
1,641 SF
(NOT A BUILDABLE LOT)
MIN. BUILDING SETBACK (TYP.)
25' MIN. FRONT YARD SETBACK** (TYP.)
20' MIN. FRONT YARD SETBACK** (TYP.)
MIN. 14' SIDE YARD BUILDING SETBACK*** (TYP.)
10' WIDE DRAIN EASEMENT PLAN 912 OF 1947
CONCRETE BOUND (TYP.)
LIMIT OF 200' RIVERFRONT AREA
NON-DEGRADED RIVERFRONT AREA (MASS DEP FILE #234-848)
N/F JOSEPH P. & EILEEN J MANNING
N/F BORIS KARPACHEV, & RUFINA VEYSBERG
N/F 38–44 RIVERSIDE STREET, LLC
N/F 38–44 RIVERSIDE STREET, LLC
SIDEWALK
CAPE COD BERM
TBM#2=489.24 UP#2
UP#4
UP#52
RIVERSIDE (PUBLIC – VARIABLE WIDTH) DRIVE
BITUMINOUS CONCRETE PAVEMENT

For Registry Use Only

Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
LOTTING PLAN
"BY-RIGHT"

Definitive Subdivision

Prepared By:
LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
Field Resources, Inc.
LAND SURVEYORS
P.O. Box 324, Auburn, MA, 508.832.4332
281 Chestnut Street, Needham, MA, 781.444.5936
office@fieldresources.net

No:	Date:	Revision | Issue:

Drawn By:	JTA	Checked By:	MJS
Date:	04/26/2024	Project No.:	21-0089

0 10' 20' 40' 60'
Scale: 1" = 20'

Sheet No.:
3 OF 10

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ZONING SUMMARY TABLE

GENERAL RESIDENCE & HIGHLAND COMMERCIAL 128 DISTRICT(S) NO OVERLAY DISTRICTS

	GENERAL RESIDENCE			HIGHLAND COMMERCIAL 128		
	REQUIRED	PROVIDED		REQUIRED	EXISTING	PROVIDED
		LOT 102	LOT 103			LOT 101
MINIMUM LOT AREA (PER Z.B.L. 4.2.2 & 4.5)	10,000 SF	18,679 SF	24,998 SF	15,000 SF	57,172 SF	15,028 SF
MINIMUM LOT AREA (PER Z.B.L. 4.2.6)	10,000 SF	18,369 SF*	21,919 SF*	15,000 SF		15,028 SF
MAXIMUM BUILDING FACTOR	20	14.8	13.4	N/A	N/A	N/A
MINIMUM FRONTAGE	80'	219.8'	153.7'	100'	102'±	NO CHANGE
MINIMUM FRONT YARD	20'**	>25'	>25'	5'	34'±	NO CHANGE
MINIMUM SIDE YARD	14'***	>16'	>16'	10'*****	0'±	NO CHANGE
MINIMUM REAR YARD	20'	>20'	>20'	10'*****	382'±	20.5±'
MINIMUM LOT WIDTH	80'	110' & 186'±	129'±	N/A	N/A	NO CHANGE
MAXIMUM BUILDING HEIGHT	35'****	<35'	<35'	54'	LESS THAN 54'	NO CHANGE
MAXIMUM NUMBER OF BUILDING STORIES	2.5 STORIES	2.5 STORIES MAX	2.5 STORIES MAX	N/A	N/A	N/A
MAXIMUM LOT COVERAGE	30%	22%	26%	80%******	6%±	23±%
MAXIMUM FLOOR AREA RATIO	N/A	N/A	N/A	0.30	0.06	0.23±%

LEGEND

Z	INDICATES COMMON OWNERSHIP
-o-o-	FENCE
BF	BUILDING FACTOR
BVW	BORDERING VEGETATED WETLAND
SF	SQUARE FEET
TYP.	TYPICAL
MAHW	MEAN ANNUAL HIGH WATER
L	LENGTH
R	RADIUS
Δ	DELTA
	PROPOSED BOUND
	WETLANDS
	WETLAND FLAG

* NO PORTION OF A LOT WHICH IS COVERED BY A WATER BODY SHALL BE COUNTED IN CALCULATING THE AREA OF A LOT FOR PURPOSES OF DETERMINING THE RESPECTIVE MINIMUM LOT AREAS AS LISTED IN THE TABLES 4.2.1, 4.2.2, 4.2.3, AND 4.2.4 ABOVE. NOT MORE THAN A COMBINED TOTAL OF THIRTY (30) PERCENT OF: (A) LAND LOCATED IN A FLOOD PLAIN DISTRICT; (B) LAND AREA SUBJECT TO THE WETLANDS PROTECTION ACT AND THE INLANDS WETLANDS ACT, M.G.L., CH. 131, S. 40 AND 40A (BUT NOT INCLUDING ANY AREA DEFINED AS A BUFFER AREA UNDER SAID STATUTES); AND (C) LAND SUBJECT TO FEDERAL FLOOD STORAGE RESTRICTIONS INCLUDED WITHIN THE CHARLES RIVER VALLEY STORAGE PROJECT SHALL BE COUNTED IN CALCULATING THE AREA OF A LOT FOR PURPOSES OF DETERMINING THE RESPECTIVE MINIMUM LOT AREAS IN SINGLE RESIDENCE A, SINGLE RESIDENCE B, GENERAL RESIDENCE AND INSTITUTIONAL DISTRICTS. THE PROVISIONS OF THE SECOND SENTENCE OF THIS PARAGRAPH (A) SHALL APPLY IN SINGLE RESIDENCE A, SINGLE RESIDENCE B AND GENERAL RESIDENCE DISTRICTS TO ANY LOT CREATED AFTER MAY 8, 1989.

** ATTACHED GARAGES SHALL HAVE A MINIMUM FRONT YARD SETBACK OF 25 FEET. FOR CORNER LOTS THE INCREASED FRONT YARD SETBACK OF 25 FEET IS REQUIRED ALONG BOTH FRONTAGE STREETS. EXISTING SINGLE OR TWO-FAMILY STRUCTURES NON-CONFORMING FOR FRONT YARD GARAGE SETBACK WHERE DEMOLITION EXCEEDS 50% OF THE BUILDING SHELL EXCLUSIVE OF DEMOLITION OF A SINGLE STORY ATTACHED GARAGE AND FOR WHICH THE BUILDING PERMIT FOR THE EXISTING STRUCTURE WAS ISSUED PRIOR TO JUNE 1, 2017 MAY BE ALTERED, EXTENDED OR STRUCTURALLY CHANGED (BUT NOT RECONSTRUCTED) TO A FRONT YARD GARAGE SETBACK OF 20 FEET UPON RECEIPT OF A SPECIAL PERMIT FROM THE BOARD OF APPEALS UNDER SECTION 7.5.2 OF THE ZONING BY-LAW PROVIDED: (1) THE NEW CONSTRUCTION MEETS ALL OTHER REQUIREMENTS OF THE ZONING BY-LAW; (2) THE GARAGE STRUCTURE IS SITED NO CLOSER TO THE FRONT LOT LINE THAN THE FARTHEST EXTENT OF THE EXISTING GARAGE STRUCTURE; AND (3) THE BOARD DETERMINES THAT SUCH CHANGE, EXTENSION OR ALTERATION SHALL NOT BE SUBSTANTIALLY MORE DETRIMENTAL TO THE NEIGHBORHOOD THAN THE EXISTING NONCONFORMING STRUCTURE. SAID SPECIAL PERMIT MAY BE GRANTED NOTWITHSTANDING THE PROVISIONS OF SECTION 1.4.7.2. FOR THE PURPOSES OF THIS FOOTNOTE, THE DEFINITION OF "SETBACK" IN SECTION 1.3 OF THESE BYLAWS SHALL CONTROL.

*** THE MINIMUM SIDE YARD SETBACK IS 14 FEET, AND A MAXIMUM OF 32 LINEAR FEET OF STRUCTURE MAY BE BUILT AT THE MINIMUM SETBACK LINE, AS MEASURED PARALLEL TO THE SIDE LOT LINE, PROVIDED THAT THE REMAINING LENGTH OF STRUCTURE ALONG THE SIDE YARD SETBACK MUST BE OFFSET AN ADDITIONAL 2 FEET. NOTWITHSTANDING THE ABOVE, THE MINIMUM SIDE YARD SETBACK REQUIREMENT FOR ALL BUILDINGS AND STRUCTURES ON ANY LOT THAT CONTAINS LESS THAN 80 FEET OF FRONTAGE SHALL BE 12 FEET, AND A MAXIMUM OF 32 LINEAR FEET OF STRUCTURE MAY BE BUILT AT THE MINIMUM SETBACK DISTANCE, AS MEASURED PARALLEL TO THE SIDE LOT LINE, PROVIDED THAT THE REMAINING LENGTH OF STRUCTURE ALONG THE SIDE YARD SETBACK MUST BE OFFSET AN ADDITIONAL 2 FEET. IN NO CASE SHALL A SIDE WALL EXTENSION EXTEND MORE THAN 32 LINEAR FEET WITHOUT A 2 FOOT OFFSET.

**** THE MAXIMUM HEIGHT AT ANY POINT OF ANY BUILDING OR STRUCTURE SHALL NOT EXCEED 41 FEET ABOVE THE LOWER OF ORIGINAL OR FINISHED GRADE. IF ALL OR A PORTION OF A BASEMENT WALL IS EXPOSED FOR THE FULL HEIGHT OF THE WALL, DORMERS IN THE ONE-HALF STORY ABOVE THE BASEMENT WALL SHALL NOT BE PERMITTED.

***** A 50-FOOT SETBACK SHALL BE REQUIRED FROM A GENERAL RESIDENCE ZONING DISTRICT LINE. HOWEVER, THE PLANNING BOARD MAY GRANT A SPECIAL PERMIT TO REDUCE SAID SETBACK, BUT NOT TO LESS THAN 20 FEET.

****** A MINIMUM OF 10% OF TOTAL LOT AREA MUST BE OPEN SPACE. THE OPEN SPACE AREA SHALL BE LANDSCAPED AND MAY NOT BE COVERED WITH BUILDINGS OR STRUCTURES OF ANY KIND, ACCESS STREETS, WAYS, PARKING AREAS, DRIVEWAYS, AISLES, WALKWAYS, OR OTHER CONSTRUCTED APPROACHES OR SERVICE AREAS.

LIST OF REQUESTED WAIVERS

APPLICABLE SECTION	PARAMETER	REQUIRED	PROVIDED
3.1.2	SCALE, DATUM	1"=40' & NEEDHAM SEWER OR USC&GS 1929	1"=20' & (SEE NOTES ON SHEET 2 OF 10)
3.3.1	STREETS	50' R.O.W.	40' R.O.W.
3.3.5	DEAD-END STREETS	60' R.O.W.; 50' PAVEMENT	HAMMERHEAD OR T-SHAPE BACK-UP STRIP
3.3.16	SIDEWALKS	4.5' WIDE ON ONE SIDE	8' WIDE GRASS STRIP

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

NAME DATE

NEEDHAM TOWN ENGINEER

NAME DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

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I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE REGISTERY OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

COMMONWEALTH OF MASSACHUSETTS — BRADLEY SIMONELLI — #47581 — REGISTERED PROFESSIONAL LAND SURVEYOR

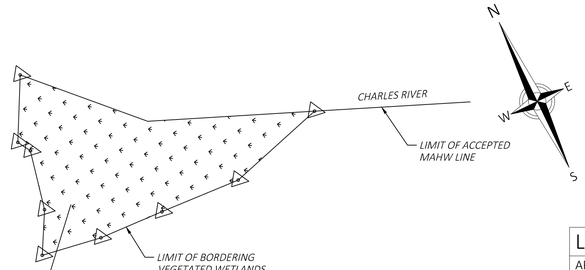
NAME 4758 REGISTRATION NO.

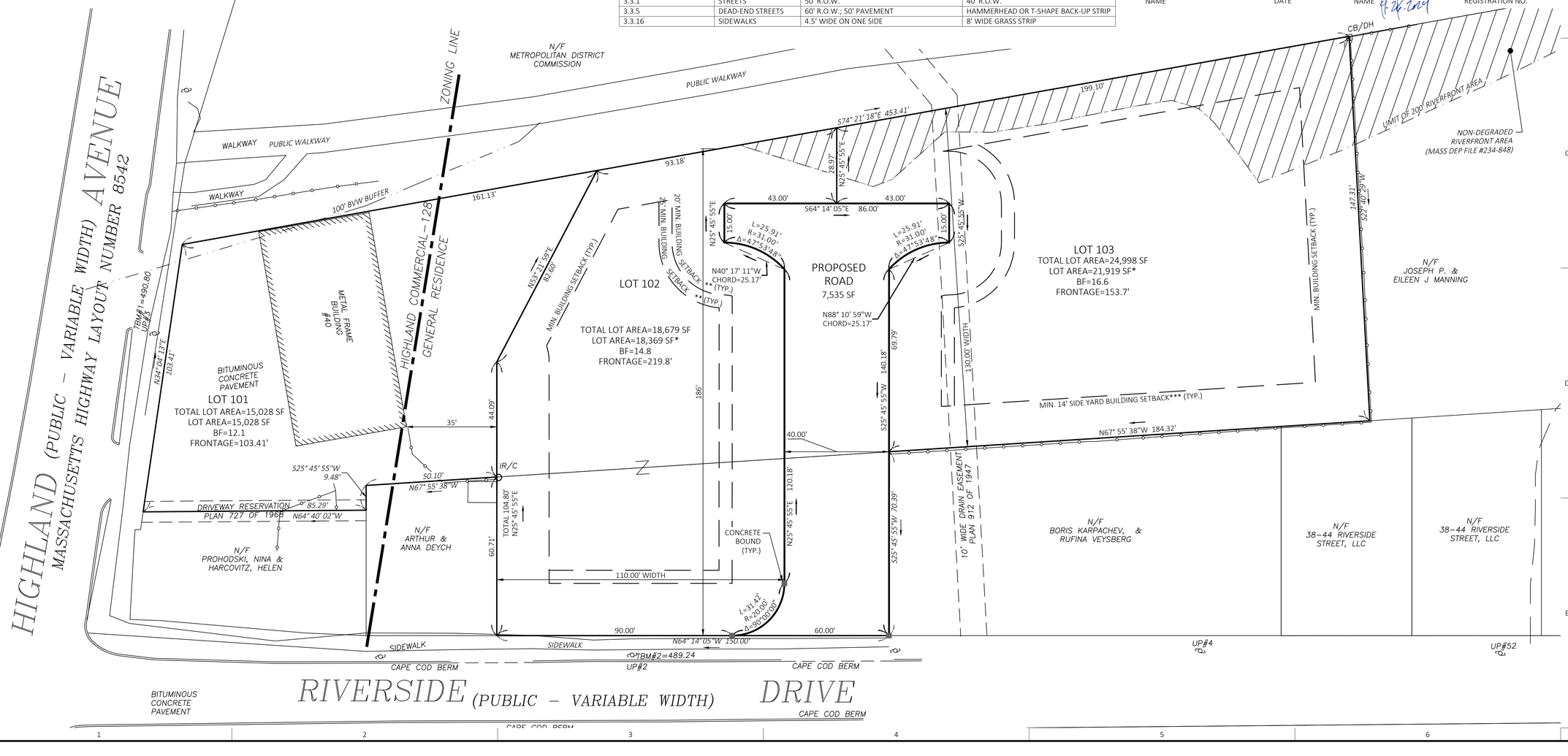
I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE REGISTERY OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

COMMONWEALTH OF MASSACHUSETTS — MICHAEL J. SCOTT — CIVIL — No. 40863 — REGISTERED PROFESSIONAL ENGINEER

NAME 4.26.2024 40863 REGISTRATION NO.





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Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
LOTTING PLAN "WAIVER"

Definitive Subdivision

Prepared By:

LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
Field Resources, Inc.
LAND SURVEYORS
P.O. Box 324, Auburn, MA, 508.832.4332
281 Chestnut Street, Needham, MA, 781.444.5936
office@fieldresources.net

No:	Date:	Revision | Issue:

Drawn By: JTA | Checked By: MJS
Date: 04/26/2024 | Project No.: 21-0089

0 10' 20' 40' 60'
Scale: 1" = 20'

Sheet No.:
4 OF 10

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REGISTRY SHEET 1 OF 1

NEEDHAM PLANNING BOARD

APPROVAL IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

SIGNATURE DATE

NEEDHAM TOWN ENGINEER

SIGNATURE DATE

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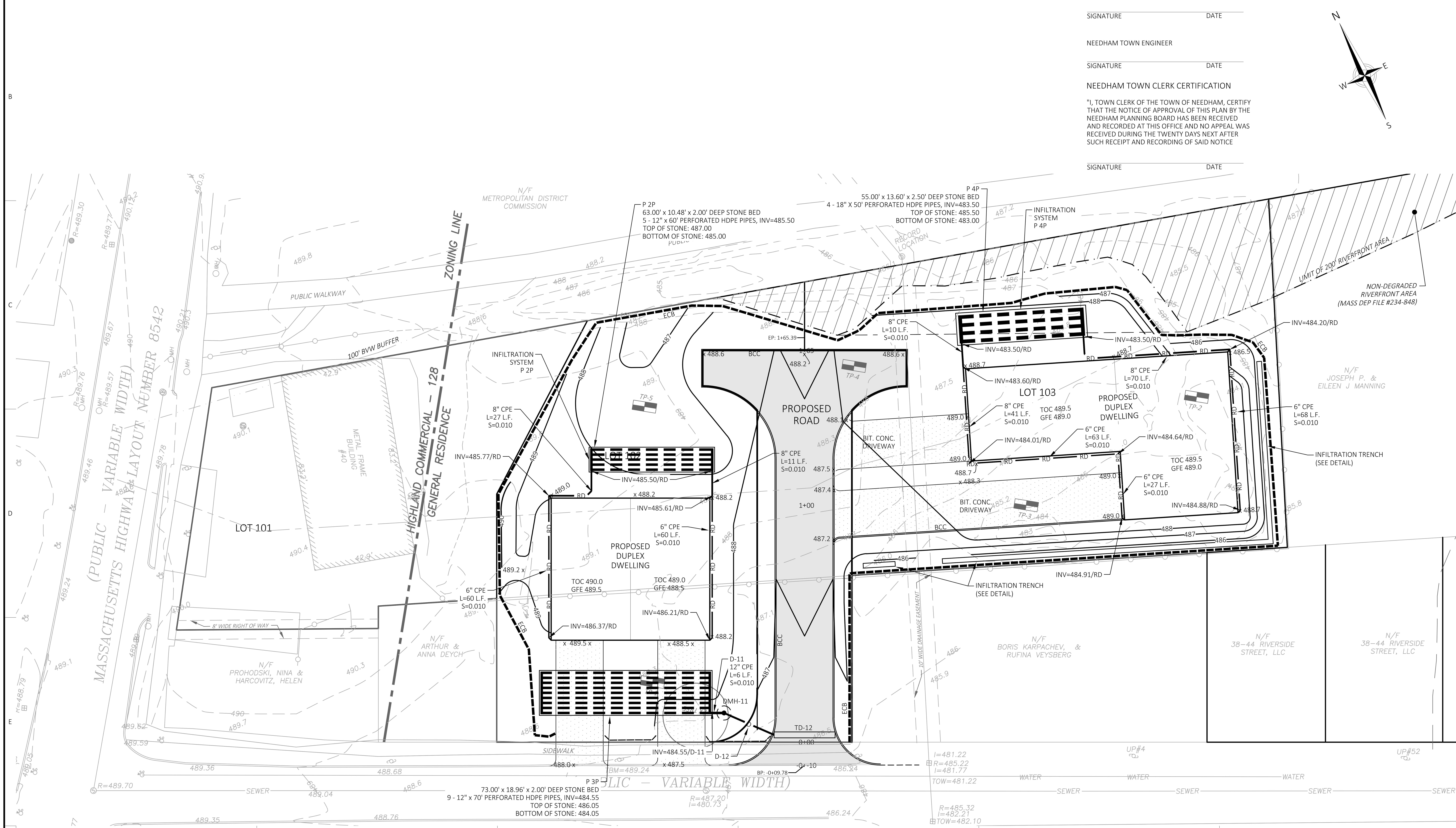

N
E
W
S
METROPOLITAN DISTRICT COMMISSION
ZONING LINE
HIGHLAND COMMERCIAL – 128
GENERAL RESIDENCE
(PUBLIC – VARIABLE WIDTH)
MASSACHUSETTS HIGHWAY LAYOUT NUMBER 8542
PUBLIC WALKWAY
100' BVW BUFFER
LOT 101
METAL FRAME BUILDING #40
8' WIDE RIGHT OF WAY
N/F PROHODSKI, NINA & HARCOVITZ, HELEN
N/F ARTHUR & ANNA DEYCH
P 2P
63.00' x 10.48' x 2.00' DEEP STONE BED
5 - 12" x 60' PERFORATED HDPE PIPES, INV=485.50
TOP OF STONE: 487.00
BOTTOM OF STONE: 485.00
P 4P
55.00' x 13.60' x 2.50' DEEP STONE BED
4 - 18" X 50' PERFORATED HDPE PIPES, INV=483.50
TOP OF STONE: 485.50
BOTTOM OF STONE: 483.00
INFILTRATION SYSTEM P 4P
INFILTRATION SYSTEM P 2P
RECORD LOCATION
LIMIT OF 200' RIVERFRONT AREA
NON-DEGRADED RIVERFRONT AREA (MASS DEP FILE #234-848)
EP: 1+65.39
8" CPE L=10 L.F. S=0.010
INV=483.50/RD
INV=483.60/RD
INV=484.20/RD
LOT 102
LOT 103
PROPOSED ROAD
PROPOSED DUPLEX DWELLING
TOC 490.0 GFE 489.5
TOC 489.0 GFE 488.5
TOC 489.5 GFE 489.0
8" CPE L=27 L.F. S=0.010
INV=485.77/RD
INV=485.50/RD
INV=485.61/RD
6" CPE L=60 L.F. S=0.010
INV=486.21/RD
INV=486.37/RD
8" CPE L=11 L.F. S=0.010
8" CPE L=41 L.F. S=0.010
8" CPE L=70 L.F. S=0.010
INV=484.01/RD
6" CPE L=63 L.F. S=0.010
INV=484.64/RD
6" CPE L=27 L.F. S=0.010
INV=484.88/RD
6" CPE L=68 L.F. S=0.010
INFILTRATION TRENCH (SEE DETAIL)
INV=484.91/RD
BIT. CONC. DRIVEWAY
N/F JOSEPH P. & EILEEN J MANNING
N/F BORIS KARPACHEV, & RUFINA VEYSBERG
N/F 38–44 RIVERSIDE STREET, LLC
10' WIDE DRAINAGE EASEMENT
D-11 12" CPE L=6 L.F. S=0.010
DMH-11
TD-12
D-12
INV=484.55/D-11
BP: -0+09.78
SIDEWALK
TBM=489.24
P 3P
73.00' x 18.96' x 2.00' DEEP STONE BED
9 - 12" x 70' PERFORATED HDPE PIPES, INV=484.55
TOP OF STONE: 486.05
BOTTOM OF STONE: 484.05
(PUBLIC – VARIABLE WIDTH)
SEWER
WATER
UP#4
UP#52

Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
GRADING & DRAINAGE PLAN

Definitive Subdivision

Prepared By:
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Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

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P.O. Box 324
Auburn, MA
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281 Chestnut Street
Needham, MA
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No:	Date:	Revision | Issue:

Drawn By:	JTA	Checked By:	MJS
Date:	04/19/2022	Project No.:	21-0089

0 10' 20' 40' 60'
Scale: 1" = 20'

Sheet No.:
5 OF 10

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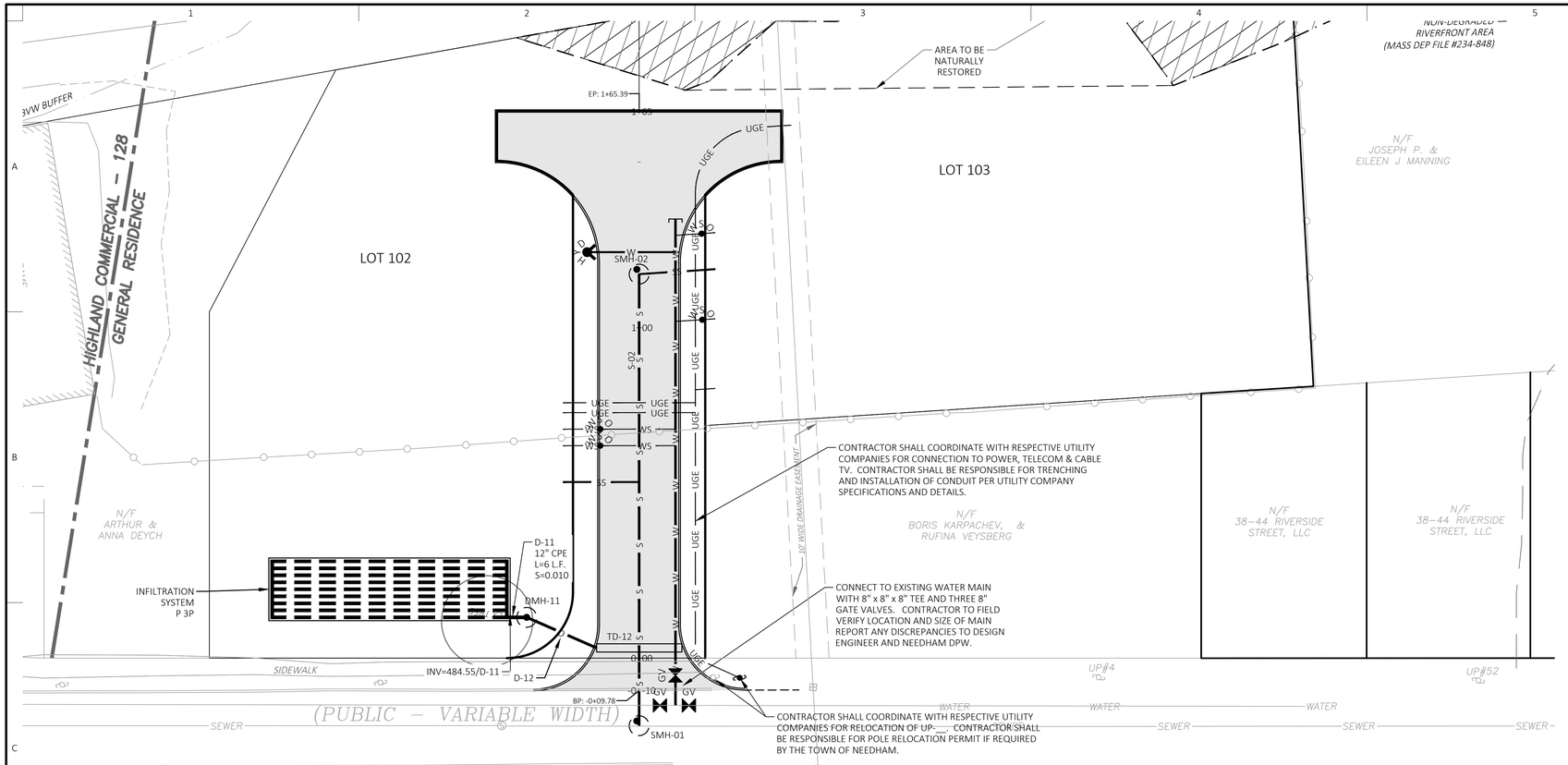
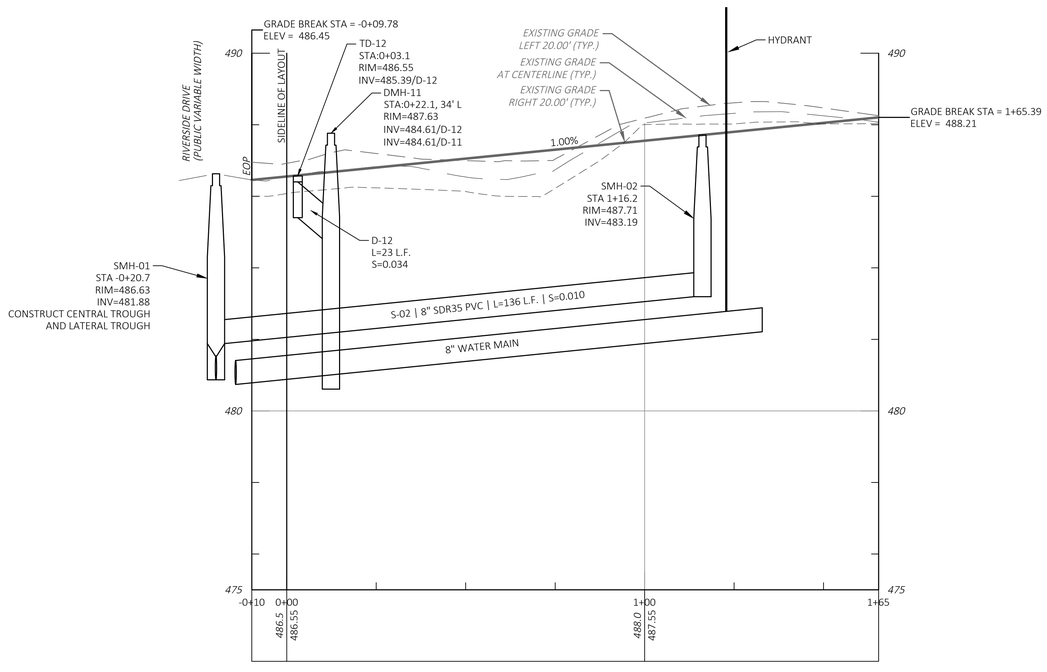


PLAN



PROFILE

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

NAME REGISTRATION NO.

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

SIGNATURE DATE

NEEDHAM TOWN ENGINEER

SIGNATURE DATE

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40 Highland Avenue, LLC
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Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
PLAN & PROFILE
STA 0+00 TO END

Definitive Subdivision

Prepared By:

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Chauncy Place | Terrace North | Suite 1
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Date: 04/26/2024	Project No.: 21-0089

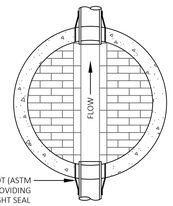
0 10' 20' 40' 60'
Scale: 1" = 2' V : 1" = 20' H

Sheet No.:
6 OF 10

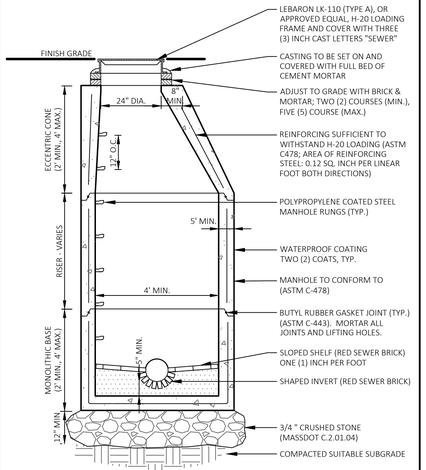
C:\Users\James Ammon\Land Design Collaborative\Land Design Collaborative - Documents_ - Edith\Newprojects (landdesignstaff)\PROJECTS\21-0089 - 40 Highland Avenue\DWG\21-0089-C200.dwg

NOTES:

1. STRUCTURES SHALL BE PRECAST CONCRETE, DESIGNED FOR HS-20 LOADING.
2. COPOLYMER MANHOLE STEPS SHALL BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
3. EXTERIOR SURFACES SHALL BE GIVEN TWO COATS OF BITUMINOUS WATER-PROOFING MATERIAL.



PLAN



SECTION

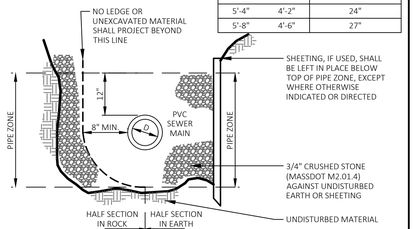
SEWER MANHOLE (SMH)

33 30 00 N.T.S.

NOTES:

1. WHERE INDICATED ON THE PLANS, PROVIDE AT LEAST ONE TRENCH DAM BETWEEN EACH SMH OR EVERY 300 FEET, WHICHEVER IS LESS.
2. REFER TO PLANS FOR SIZE AND MATERIAL OF SEWER MAIN.

TRENCH WIDTH		DIAMETER OF PIPE (D.)
SHEETED	UNSHEETED	
4'-2"	3'-0"	12" AND SMALLER
4'-4"	3'-2"	15"
4'-8"	3'-6"	18"
5'-0"	3'-10"	21"
5'-4"	4'-2"	24"
5'-8"	4'-6"	27"



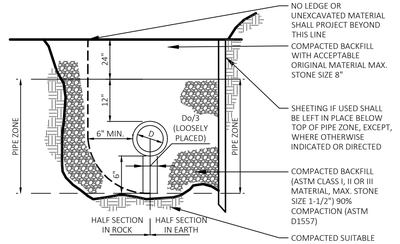
PVC SEWER TRENCH SECTION

33 30 00 N.T.S.

NOTES:

1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.

TRENCH WIDTH		DIAMETER OF PIPE (D.)
SHEETED	UNSHEETED	
4'-2"	3'-0"	15" AND SMALLER
4'-5"	3'-3"	18"
5'-2"	4'-0"	24"
6'-8"	5'-6"	30"
7'-8"	6'-6"	36"
8'-7"	7'-5"	48"



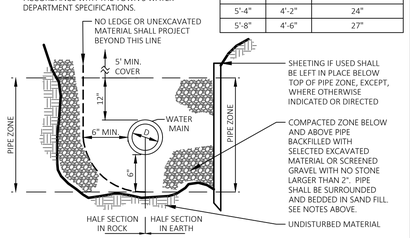
HDPE TRENCH SECTION

33 40 00 N.T.S.

NOTES:

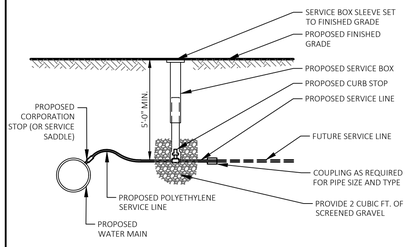
1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.
2. WATER MAIN INSTALLATION SHALL BE IN ACCORDANCE WITH THE TOWN'S WATER DEPARTMENT SPECIFICATIONS.

TRENCH WIDTH		DIAMETER OF PIPE (D.)
SHEETED	UNSHEETED	
4'-2"	3'-0"	12" AND SMALLER
4'-4"	3'-2"	15"
4'-8"	3'-6"	18"
5'-0"	3'-10"	21"
5'-4"	4'-2"	24"
5'-8"	4'-6"	27"



WATER MAIN TRENCH SECTION

33 10 00 N.T.S.



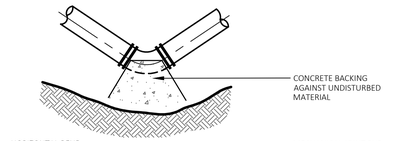
WATER SERVICE CONNECTION

33 10 00 N.T.S.

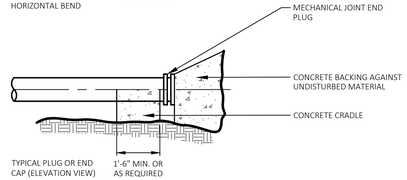
NOTES:

1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.
2. CONCRETE SHALL BE POURED TO NOT INTERFERE WITH DISASSEMBLY OF FITTING END JOINTS.

MINIMUM VERTICAL-PLANE BEARING AREAS FOR WATER MAIN FITTINGS (SF)			
SIZE OF MAIN (IN.)	22 1/2° BEND	45° BEND	TEES & PLUGS
8" OR LESS	8	8	10
10" & 12"	13	22	16

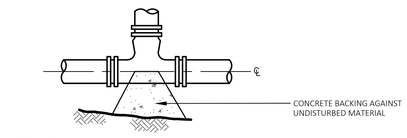


HORIZONTAL BEND



TYPICAL PLUG OR END CAP (ELEVATION VIEW)

1'-6" MIN. OR AS REQUIRED



TYPICAL TEE

THRUST BLOCKS FOR WATER MAIN

33 10 00 N.T.S.

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

NAME REGISTRATION NO.

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

SIGNATURE DATE

NEEDHAM TOWN ENGINEER

SIGNATURE DATE

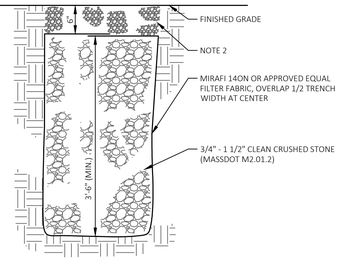
NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

SIGNATURE DATE

NOTES:

1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.
2. COVER SHALL BE: DIA. ≤ 8" - PEA STONE (MASSDOT M.2.01.6)

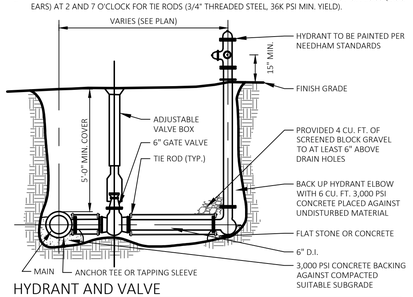


INFILTRATION TRENCH

33 40 00 N.T.S.

NOTES:

1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.
2. HYDRANT AND GATE VALVE TO BE RODDED TO ANCHOR TEE. FLANGES TO HAVE CAST ON LUGS (DOG EARS) AT 2 AND 7 O'CLOCK FOR TIE RODS (3/4" THREADED STEEL, 36K PSI MIN. YIELD).

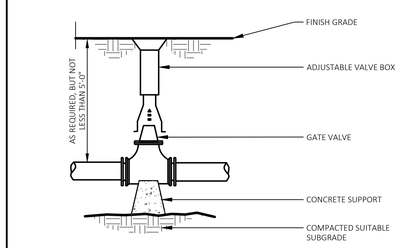


HYDRANT AND VALVE

33 10 00 N.T.S.

NOTES:

1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.

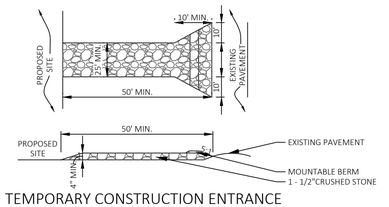


WATER GATE VALVE (WG)

33 10 00 N.T.S.

NOTES:

1. ENTRANCE WIDTH SHALL BE TWENTY-FIVE (25) FOOT (MIN.), BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS/EGRESS OCCUR.
2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION TO PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE, AND REPAIR OR MAINTENANCE OF OTHER MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY SHALL BE REMOVED DAILY.
3. STABILIZED CONSTRUCTION EXIT SHALL BE REMOVED PRIOR TO FINAL FINISH MATERIALS BEING INSTALLED, BUT NOT UNTIL DISTURBED AREAS OF THE SITE HAVE BEEN STABILIZED.
4. CONTRACTOR TO DETERMINE AND MANAGE LOCATION BASED ON PROJECT PHASING.

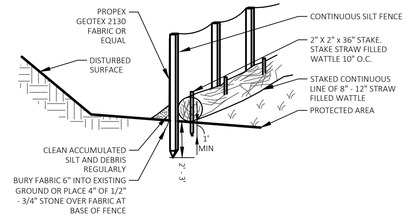


TEMPORARY CONSTRUCTION ENTRANCE

31 25 00 N.T.S.

NOTES:

1. STEEL POST MAY BE SUBSTITUTED/ DISTANCE BETWEEN POSTS TO VARY AS REQUIRED BY TRIBUTARY AREA: 10' FOR 100 SF/LF FENCE
   6' FOR 500 SF/LF FENCE
2. DEPTH TO VARY WITH TRIBUTARY AREA: 2' FOR 100 SF. IF POST IS TO BE SET IN PEAT OR UNSTABLE SOILS, THEN 3' OR DEPTH NECESSARY TO PROVIDE A STABLE POST FOR LOADED FENCE CONDITIONS

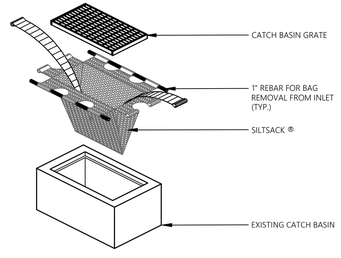


ECB (SILT FENCE WITH STRAW WATTLE)

31 25 00 N.T.S.

NOTES:

1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.
2. USE AFTER BINDER COURSE HAS BEEN PAVED, PRIOR TO STABILIZATION OF SURROUNDING UPGRADIENT TERRAIN.



INLET SEDIMENT CONTROL DEVICE

31 25 00

Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
DETAILS

Definitive Subdivision

No:	Date:	Revision | Issue:

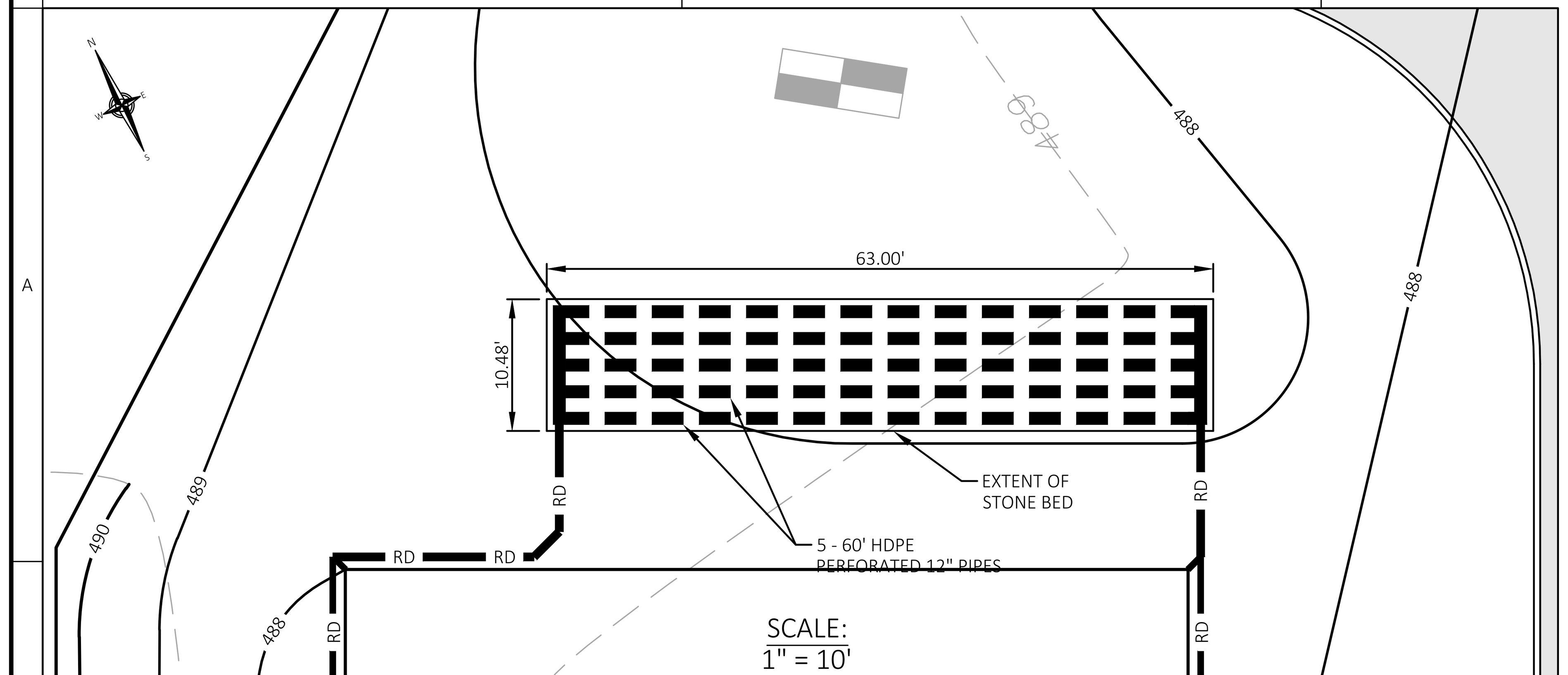
Drawn By:	JTA	Checked By:	MJS
Date:	04/26/2024	Project No.:	21-0089

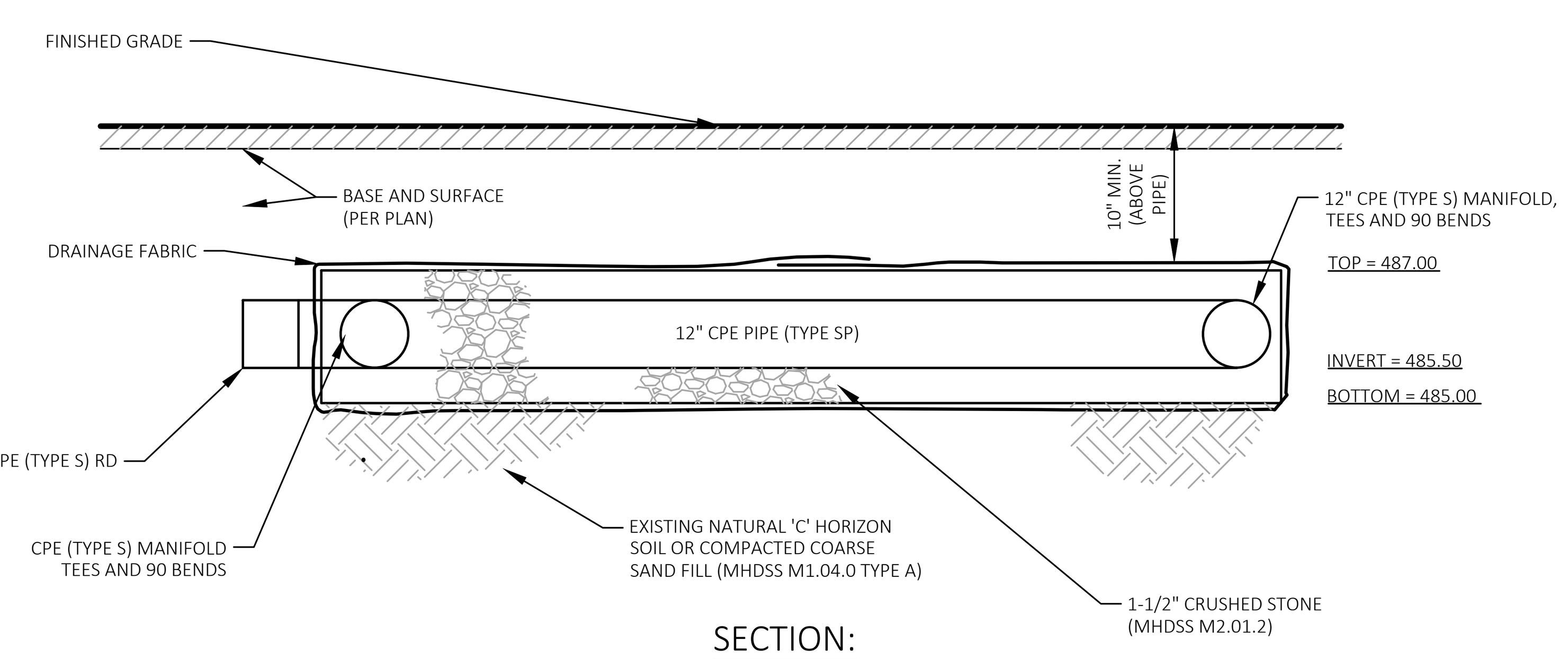
Sheet No.:
7 OF 10

LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
FIELD RESOURCES, INC.
Land Surveyors
P.O. Box 324
Auburn, MA
508.832.4332
281 Chestnut Street
Needham, MA
781.444.5936
fieldresources@hotmail.com

C:\Users\JamesAmmond\Land Design Collaborative\Land Design Collaborative - Documents_ Current Projects\Needham\21-0089 - 40 Highland Avenue\DWG\21-0089 - 40 Highland Avenue.dwg




FINISHED GRADE
BASE AND SURFACE (PER PLAN)
DRAINAGE FABRIC
10" MIN. (ABOVE PIPE)
12" CPE (TYPE S) MANIFOLD, TEES AND 90 BENDS
TOP = 487.00
12" CPE PIPE (TYPE SP)
INVERT = 485.50
BOTTOM = 485.00
CPE (TYPE S) RD
CPE (TYPE S) MANIFOLD TEES AND 90 BENDS
EXISTING NATURAL 'C' HORIZON SOIL OR COMPACTED COARSE SAND FILL (MHDSS M1.04.0 TYPE A)
1-1/2" CRUSHED STONE (MHDSS M2.01.2)

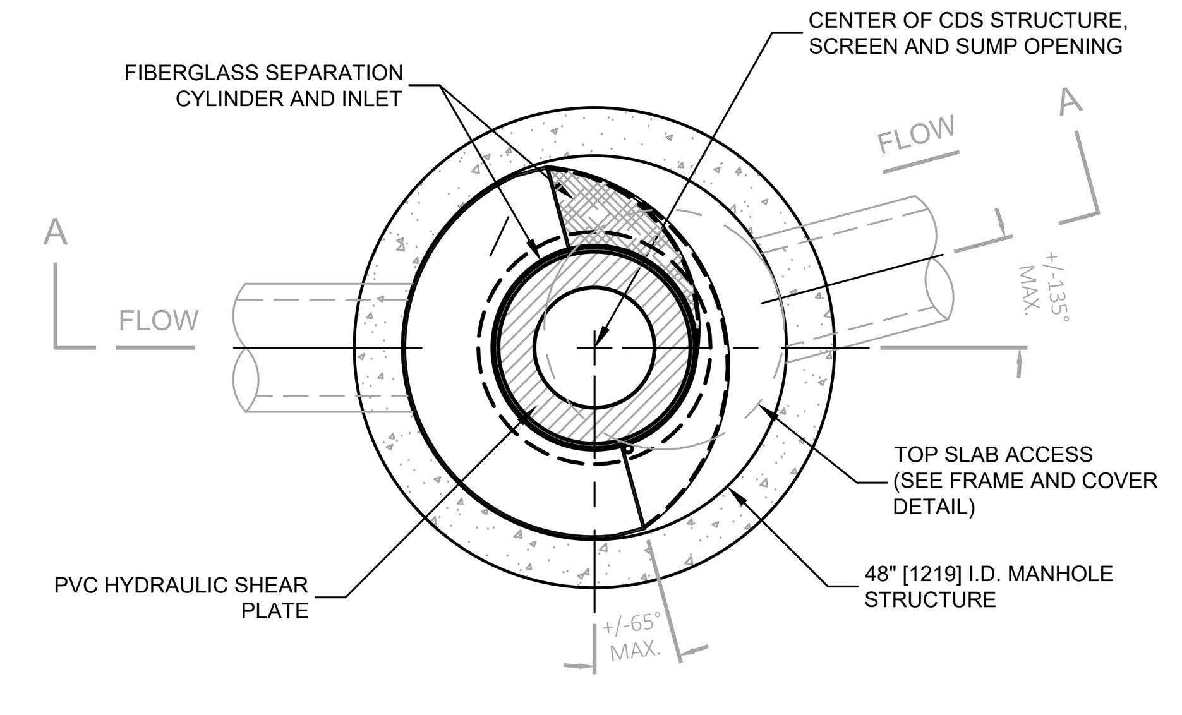
SECTION: NOT TO SCALE

STORMWATER INFILTRATION SYSTEM P 2P

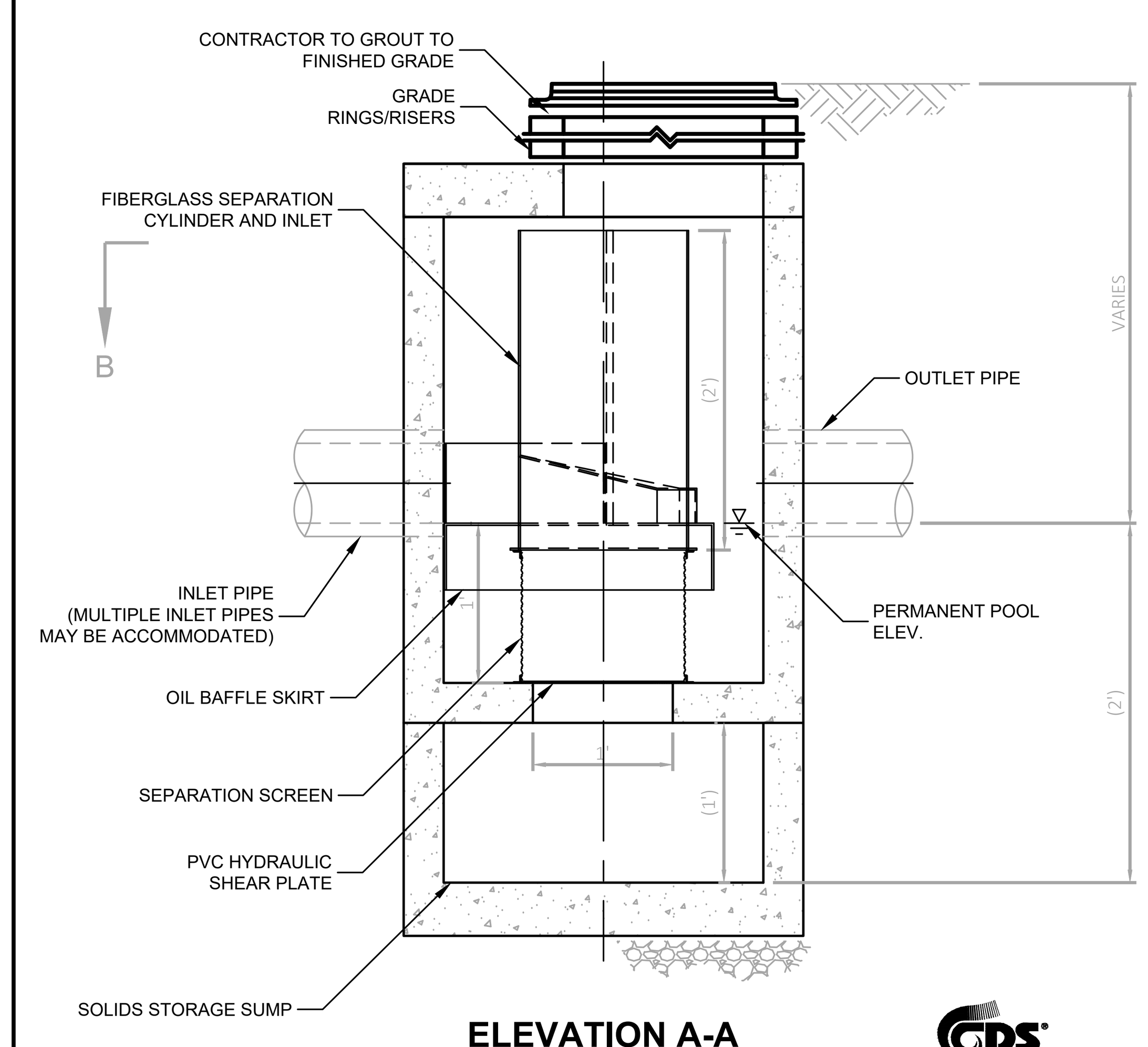
CDS2015-4-C DESIGN NOTES

THE STANDARD CDS2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW, SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



PLAN VIEW B-B
N.T.S.


CONTRACTOR TO GROUT TO FINISHED GRADE
GRADE RINGS/RISERS
FIBERGLASS SEPARATION CYLINDER AND INLET
B
VARIES
OUTLET PIPE
(2')
INLET PIPE (MULTIPLE INLET PIPES MAY BE ACCOMMODATED)
PERMANENT POOL ELEV.
OIL BAFFLE SKIRT
SEPARATION SCREEN
(1')
PVC HYDRAULIC SHEAR PLATE
SOLIDS STORAGE SUMP

ELEVATION A-A
N.T.S.

CDS®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CDS 2015-4
33 40 00 N.T.S.

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

NAME REGISTRATION NO.

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

SIGNATURE DATE

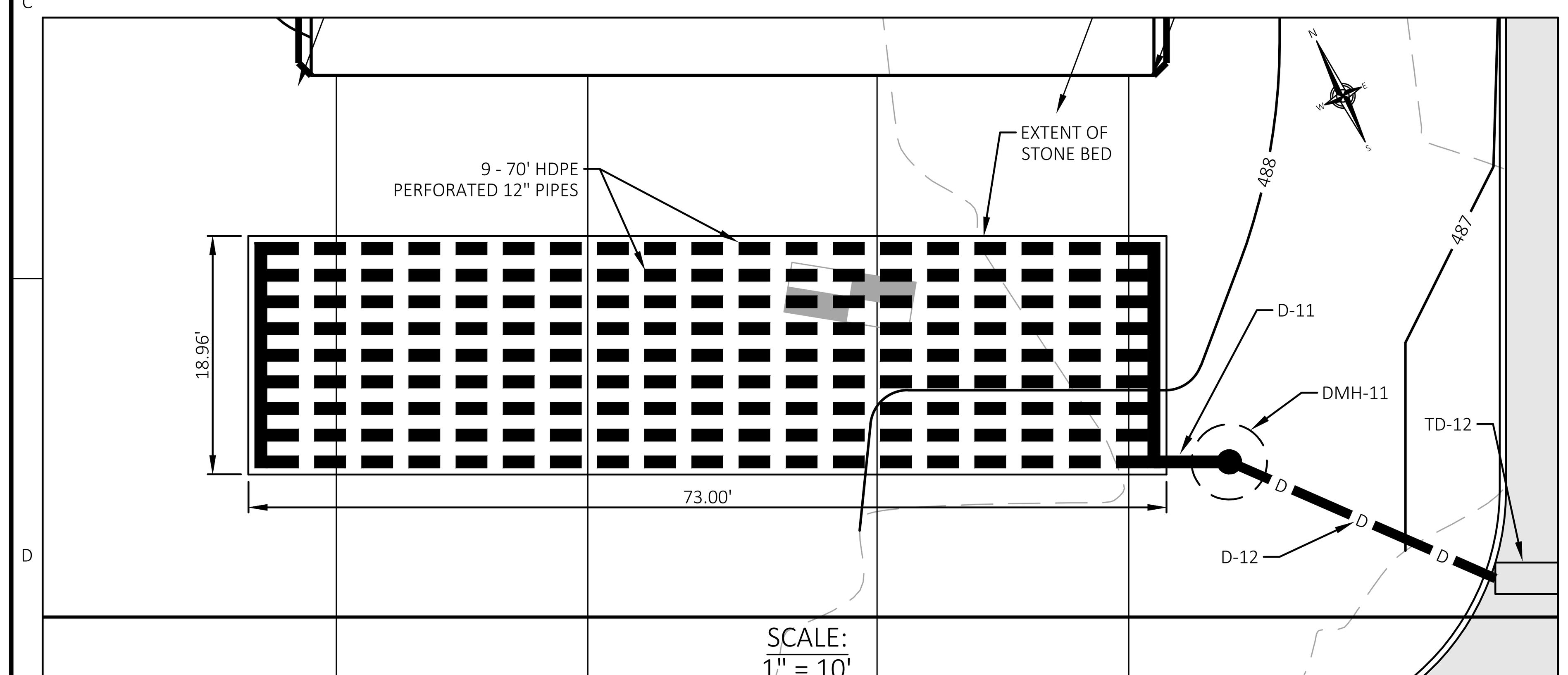
NEEDHAM TOWN ENGINEER

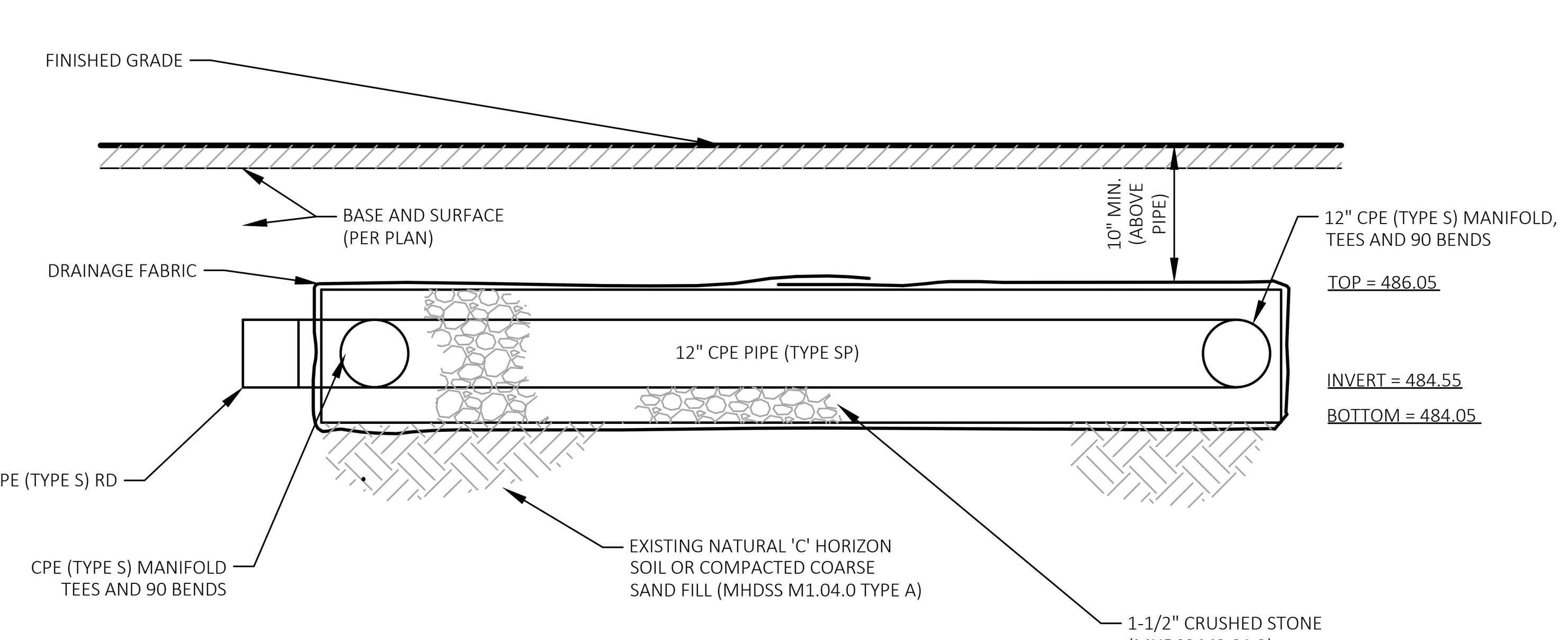
SIGNATURE DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

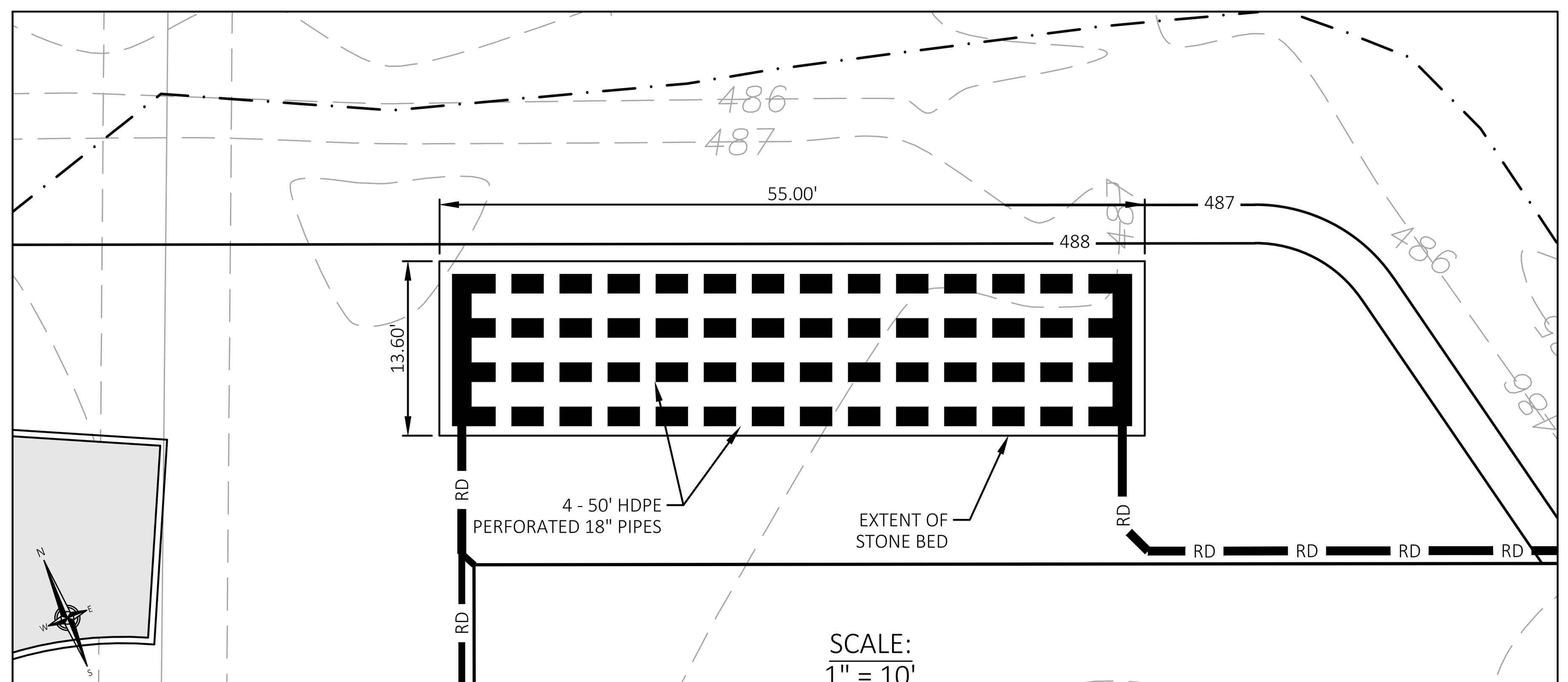
SIGNATURE DATE

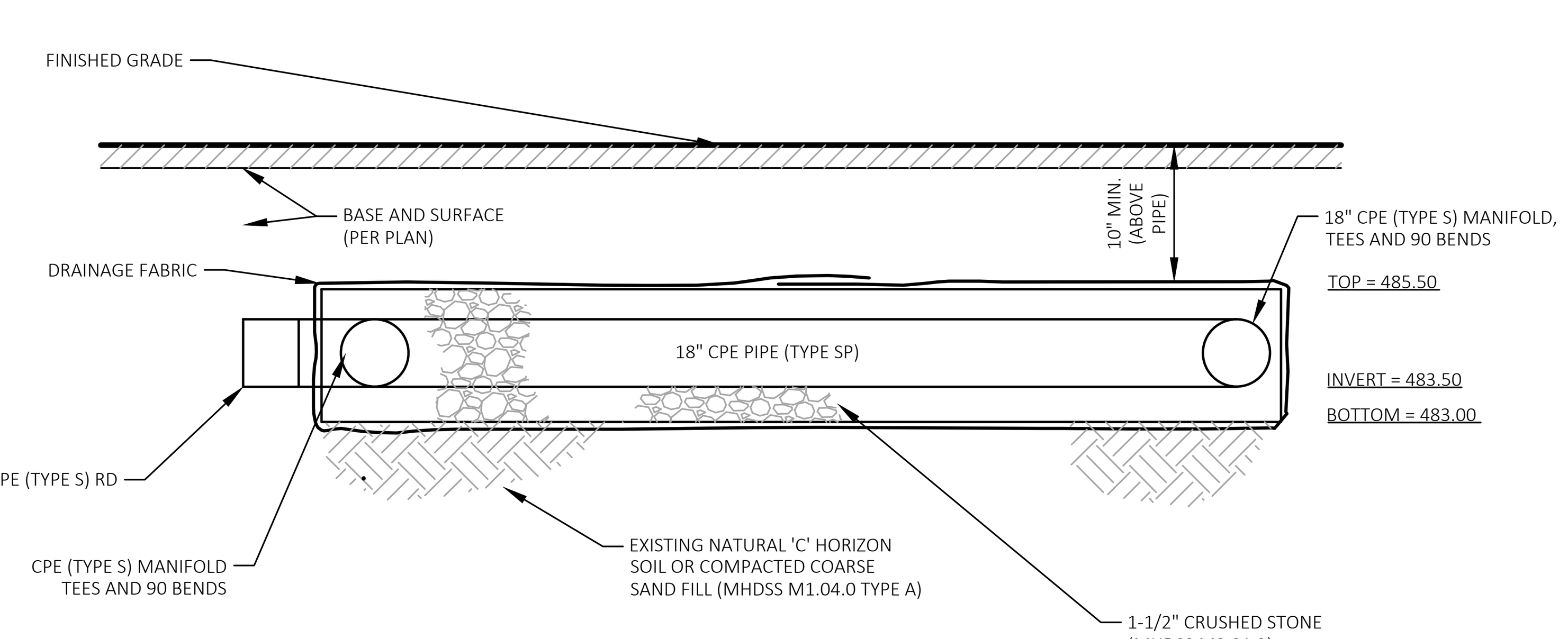



FINISHED GRADE
BASE AND SURFACE (PER PLAN)
DRAINAGE FABRIC
10" MIN. (ABOVE PIPE)
12" CPE (TYPE S) MANIFOLD, TEES AND 90 BENDS
TOP = 486.05
12" CPE PIPE (TYPE SP)
INVERT = 484.55
BOTTOM = 484.05
CPE (TYPE S) RD
CPE (TYPE S) MANIFOLD TEES AND 90 BENDS
EXISTING NATURAL 'C' HORIZON SOIL OR COMPACTED COARSE SAND FILL (MHDSS M1.04.0 TYPE A)
1-1/2" CRUSHED STONE (MHDSS M2.01.2)

SECTION: NOT TO SCALE

STORMWATER INFILTRATION SYSTEM P 3P



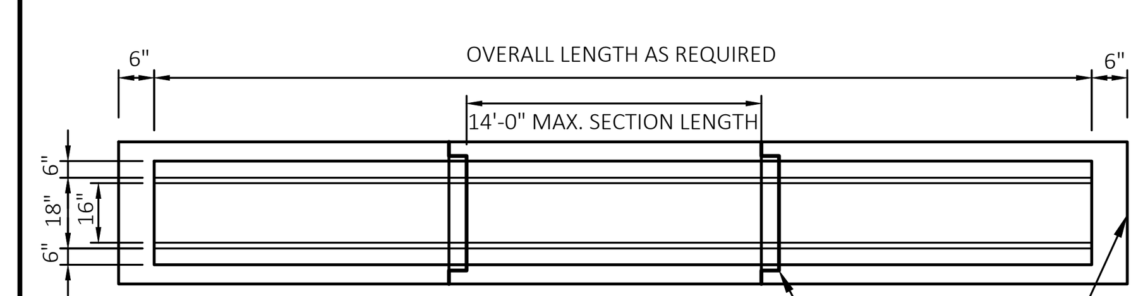

FINISHED GRADE
BASE AND SURFACE (PER PLAN)
DRAINAGE FABRIC
10" MIN. (ABOVE PIPE)
18" CPE (TYPE S) MANIFOLD, TEES AND 90 BENDS
TOP = 485.50
18" CPE PIPE (TYPE SP)
INVERT = 483.50
BOTTOM = 483.00
CPE (TYPE S) RD
CPE (TYPE S) MANIFOLD TEES AND 90 BENDS
EXISTING NATURAL 'C' HORIZON SOIL OR COMPACTED COARSE SAND FILL (MHDSS M1.04.0 TYPE A)
1-1/2" CRUSHED STONE (MHDSS M2.01.2)

SECTION: NOT TO SCALE

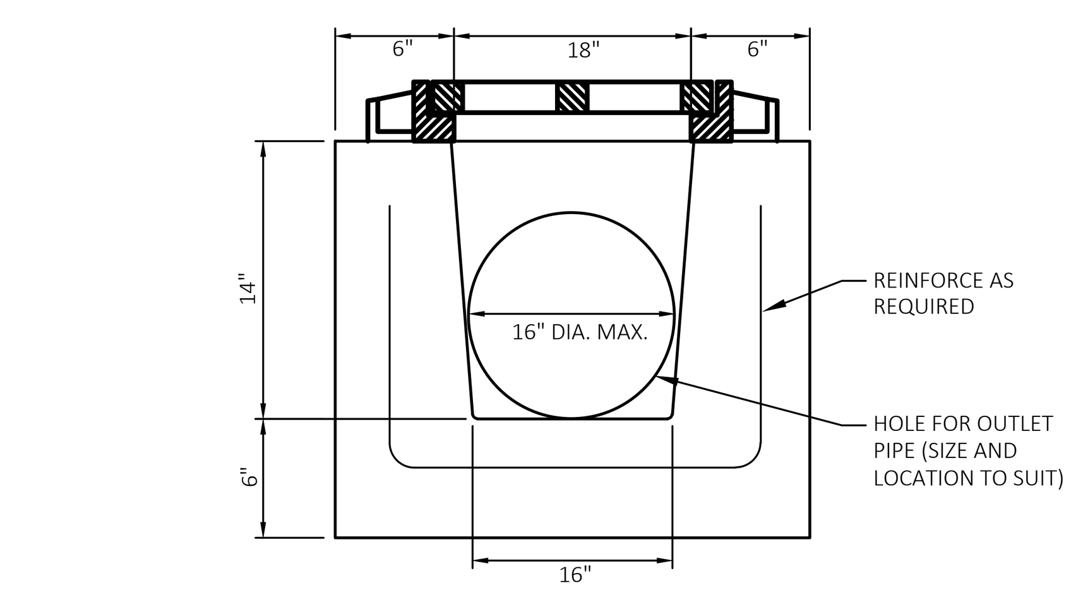
STORMWATER INFILTRATION SYSTEM P 4P

NOTES:

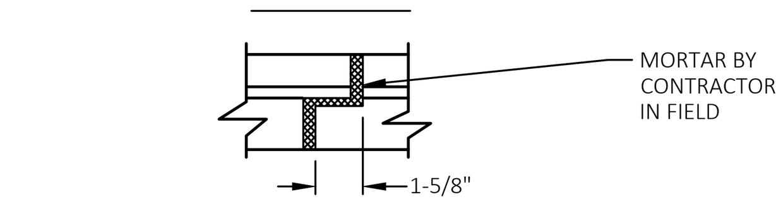
1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.
2. TRENCH DRAIN FRAMES AND GRATES TO BE SUPPLIED BY THE CONTRACTOR.
3. FRAMES AND GRATES TO BE INSTALLED ON TOP OF WALLS BY THE CONTRACTOR IN THE FIELD.



PLAN



SECTION



JOINT DETAIL

TRENCH DRAIN (TD)
33 40 00 N.T.S.

Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
DETAILS

Definitive Subdivision

Prepared By:
LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
FIELD RESOURCES, INC.
Land Surveyors
P.O. Box 324
Auburn, MA
508.832.4332
281 Chestnut Street
Needham, MA
781.444.5936
fieldresources@hotmail.com

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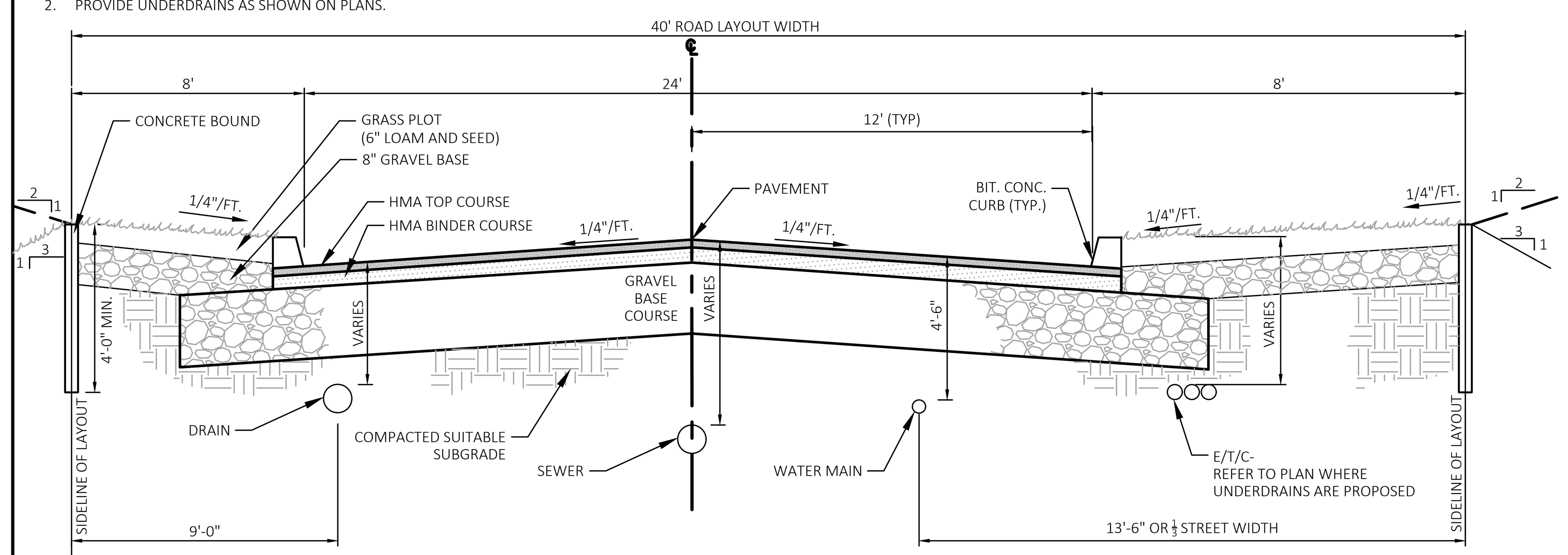
No:	Date:	Revision | Issue:

Drawn By:	ESM	Checked By:	MJS
Date:	04/26/2024	Project No.:	21-0089

0 10' 20' 40' 60'
Scale: 1" = 20'

NOTES:
1. INSTALL PER MASSDOT SECTION 500 AND CONSTRUCTION DETAIL E 106.2.0.
2. PROVIDE UNDERDRAINS AS SHOWN ON PLANS.



40' ROAD LAYOUT WIDTH
8'
24'
8'
12' (TYP)
CONCRETE BOUND
GRASS PLOT (6" LOAM AND SEED)
8" GRAVEL BASE
HMA TOP COURSE
HMA BINDER COURSE
PAVEMENT
BIT. CONC. CURB (TYP.)
1/4"/FT.
GRAVEL BASE COURSE
VARIES
4'-0" MIN.
4'-6"
DRAIN
COMPACTED SUITABLE SUBGRADE
SEWER
WATER MAIN
E/T/C- REFER TO PLAN WHERE UNDERDRAINS ARE PROPOSED
SIDELINE OF LAYOUT
9'-0"
13'-6" OR 1/3 STREET WIDTH

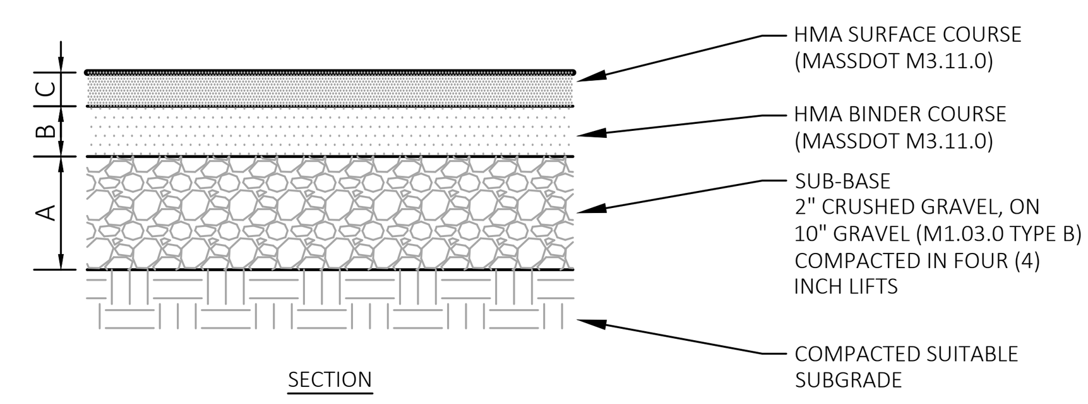
TYPICAL SECTION - SUBDIVISION ROADWAY (24' PAVEMENT WIDTH)

N.T.S.

NOTES:

1. SHALL BE IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.

	DEPTH			PLAN
SURFACE	A	B	C	
BIT. CONCRETE ROAD (PASSENGER CAR/ PARKING AREAS)	12"	2"	1"	

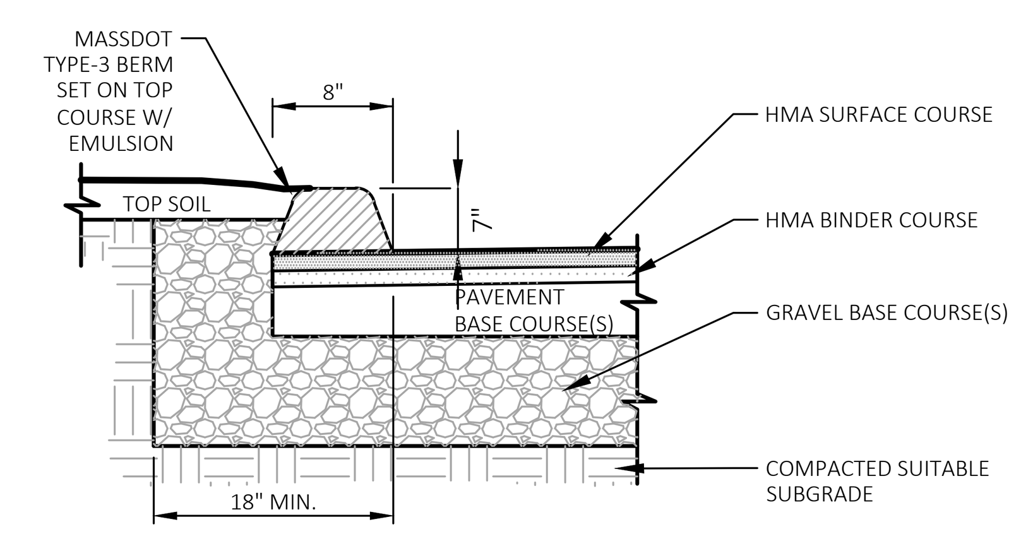


BITUMINOUS CONCRETE PAVEMENT

32 10 00 N.T.S.

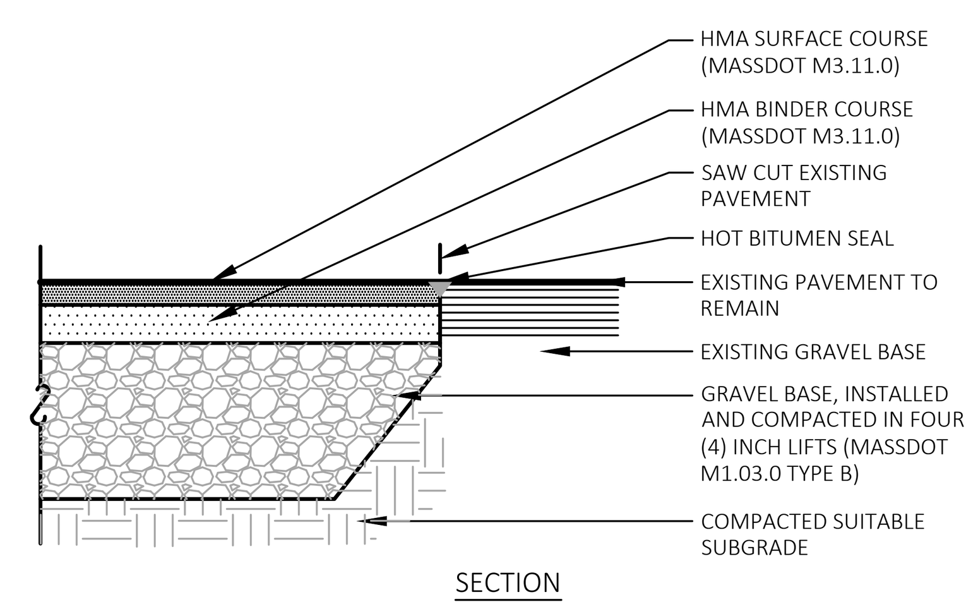
NOTES:

1. INSTALL PER MASSDOT SECTION 500 AND CONSTRUCTION DETAIL E 106.2.0.



BIT. CONC. CURB (BCC) TYPE-3

32 10 00 N.T.S.



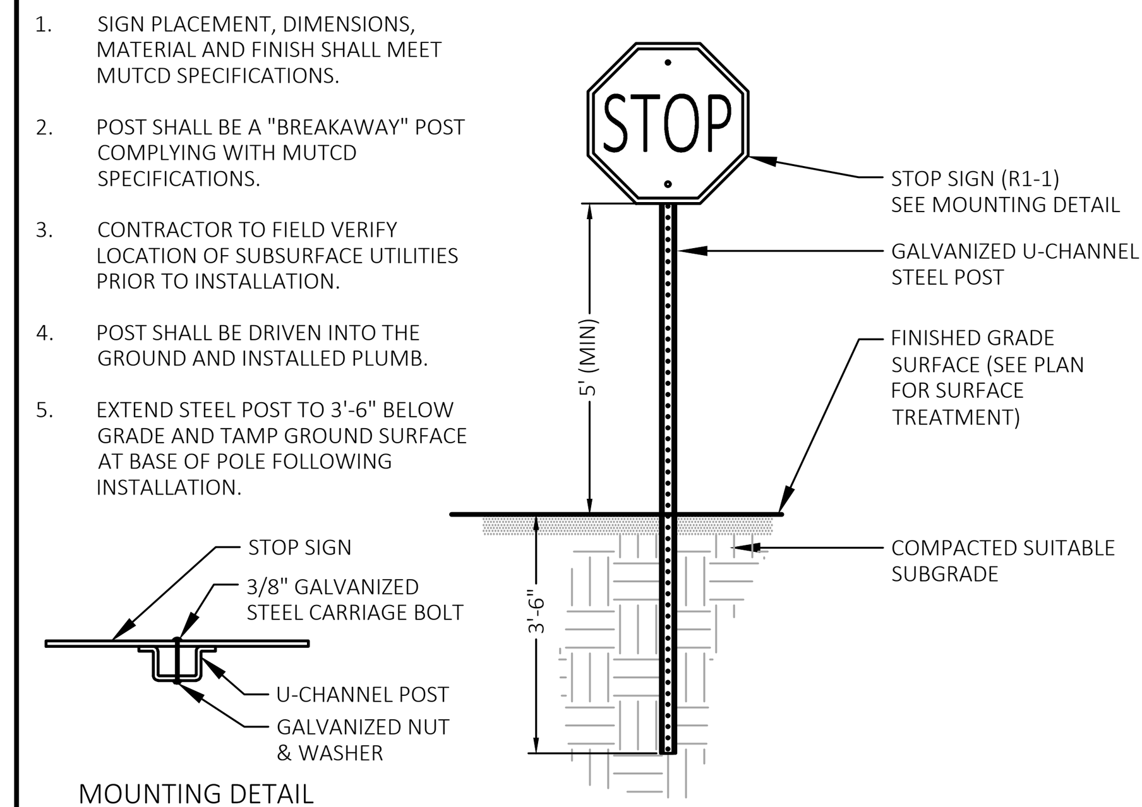
HMA SURFACE COURSE (MASSDOT M3.11.0)
HMA BINDER COURSE (MASSDOT M3.11.0)
SAW CUT EXISTING PAVEMENT
HOT BITUMEN SEAL
EXISTING PAVEMENT TO REMAIN
EXISTING GRAVEL BASE
GRAVEL BASE, INSTALLED AND COMPACTED IN FOUR (4) INCH LIFTS (MASSDOT M1.03.0 TYPE B)
COMPACTED SUITABLE SUBGRADE
SECTION

NEW / EXISTING PAVEMENT BOUNDARY

32 10 00 N.T.S.

NOTES:

1. SIGN PLACEMENT, DIMENSIONS, MATERIAL AND FINISH SHALL MEET MUTCD SPECIFICATIONS.
2. POST SHALL BE A "BREAKAWAY" POST COMPLYING WITH MUTCD SPECIFICATIONS.
3. CONTRACTOR TO FIELD VERIFY LOCATION OF SUBSURFACE UTILITIES PRIOR TO INSTALLATION.
4. POST SHALL BE DRIVEN INTO THE GROUND AND INSTALLED PLUMB.
5. EXTEND STEEL POST TO 3'-6" BELOW GRADE AND TAMP GROUND SURFACE AT BASE OF POLE FOLLOWING INSTALLATION.



STOP
STOP SIGN (R1-1) SEE MOUNTING DETAIL
GALVANIZED U-CHANNEL STEEL POST
FINISHED GRADE SURFACE (SEE PLAN FOR SURFACE TREATMENT)
COMPACTED SUITABLE SUBGRADE
5' (MIN)
3'-6"
STOP SIGN
3/8" GALVANIZED STEEL CARRIAGE BOLT
U-CHANNEL POST
GALVANIZED NUT & WASHER
MOUNTING DETAIL

STOP SIGNAGE

10 14 00 N.T.S.

NOTES:

1. SIGN PLACEMENT, DIMENSIONS, MATERIAL AND FINISH SHALL MEET MUTCD SPECIFICATIONS.
2. POST SHALL BE A "BREAKAWAY" POST COMPLYING WITH MUTCD SPECIFICATIONS.
3. CONTRACTOR TO FIELD VERIFY LOCATION OF SUBSURFACE UTILITIES PRIOR TO INSTALLATION.
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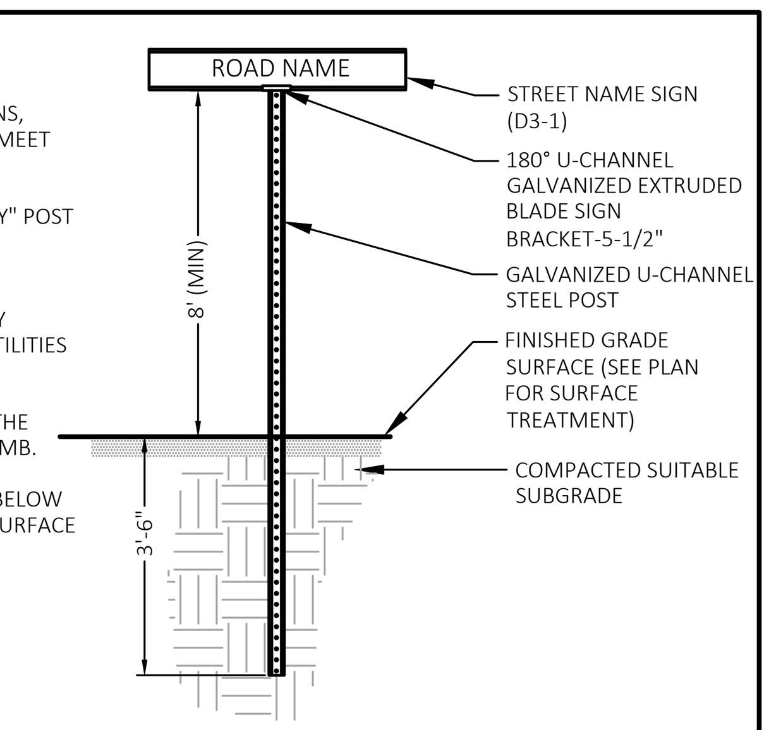
5. EXTEND STEEL POST TO 3'-6" BELOW GRADE AND TAMP GROUND SURFACE AT BASE OF POLE FOLLOWING INSTALLATION.



STREET NAME SIGNAGE

10 14 00 N.T.S.

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

NAME REGISTRATION NO.

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

NEEDHAM DIRECTOR OF PUBLIC WORKS

SIGNATURE DATE

NEEDHAM TOWN ENGINEER

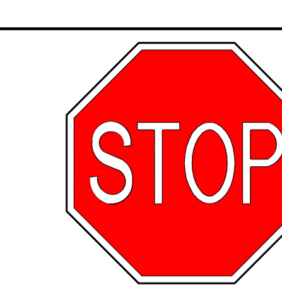
SIGNATURE DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

SIGNATURE DATE

SIGN SUMMARY TABLE

M.U.T.C.D. NUMBER	SIZE WIDTH	SIZE HEIGHT	DESCRIPTION
D3-1	VAR.	8"	ROAD NAME
R1-1	30"	30"	

Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
DETAILS

Definitive Subdivision

Prepared By:
LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
FIELD RESOURCES, INC.
Land Surveyors
P.O. Box 324
Auburn, MA
508.832.4332
281 Chestnut Street
Needham, MA
781.444.5936
fieldresources@hotmail.com

THE CONTENT, INFORMATION AND DESIGN OF THIS PLAN ARE PROPRIETARY AND DUPLICATION AND/OR UTILIZATION FOR ANY PURPOSES IS STRICTLY PROHIBITED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM LAND DESIGN COLLABORATIVE. ONLY APPROVED, SIGNED AND SEALED PLANS SHALL BE UTILIZED FOR CONSTRUCTION PURPOSES.
© LAND DESIGN COLLABORATIVE, LLC.

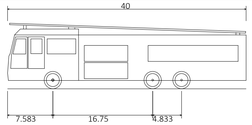
No:	Date:	Revision | Issue:

Drawn By: ESM | Checked By: MJS
Date: 04/26/2024 | Project No.: 21-0089
0 10' 20' 40' 60'
Scale: 1" = 20'

Sheet No.:
9 OF 10

C:\Users\JamesAlmonte\Land Design Collaborative\Land Design Collaborative - Documents__L-datto New\projects (landdesigndatto)\PROJECTS\21-0089 - 40 Highland Avenue\DWG\21-0089-C300.dwg

FIRE APPARATUS VEHICLE PROFILE



E-ONE HP100 Aerial	
Overall Length	40.000ft
Overall Width	8.333ft
Overall Body Height	11.000ft
Min Body Ground Clearance	1.393ft
Track Width	8.333ft
Lock-to-lock time	6.00s
Max Wheel Angle	45.00°

VEHICLE TRACKING KEY

= VEHICLE WHEEL PATH

= VEHICLE BODY SWING PATH

VEHICLE TRACKING NOTES

1. THIS PLAN IS INTENDED SOLELY FOR THE REVIEW BY THE TOWN OF NEEDHAM RELATIVE TO THE MANEUVERABILITY OF VEHICLE APPARATUS WITHIN THE PROJECT SITE.
2. VEHICLE PATHS SHOWN ARE A RESULT OF VEHICLE TRACKING DESIGN SOFTWARE. THE FIRE APPARATUS SHOWN IS A E-ONE HP100 AERIAL VEHICLE.

NEEDHAM PLANNING BOARD

APPROVED IN ACCORDANCE WITH SECTION 81-U OF CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

APPROVED SUBJECT TO TERMS AND CONDITIONS OF A COVENANT GIVEN IN ACCORDANCE WITH SECTION 81-U CHAPTER 41 OF THE GENERAL LAWS AS AMENDED.

NEEDHAM PLANNING BOARD

_____

_____

_____

_____

_____

NEEDHAM DIRECTOR OF PUBLIC WORKS

_____

NAME DATE

NEEDHAM TOWN ENGINEER

_____

NAME DATE

NEEDHAM TOWN CLERK CERTIFICATION

"I, TOWN CLERK OF THE TOWN OF NEEDHAM, CERTIFY THAT THE NOTICE OF APPROVAL OF THIS PLAN BY THE NEEDHAM PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS NEXT AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE

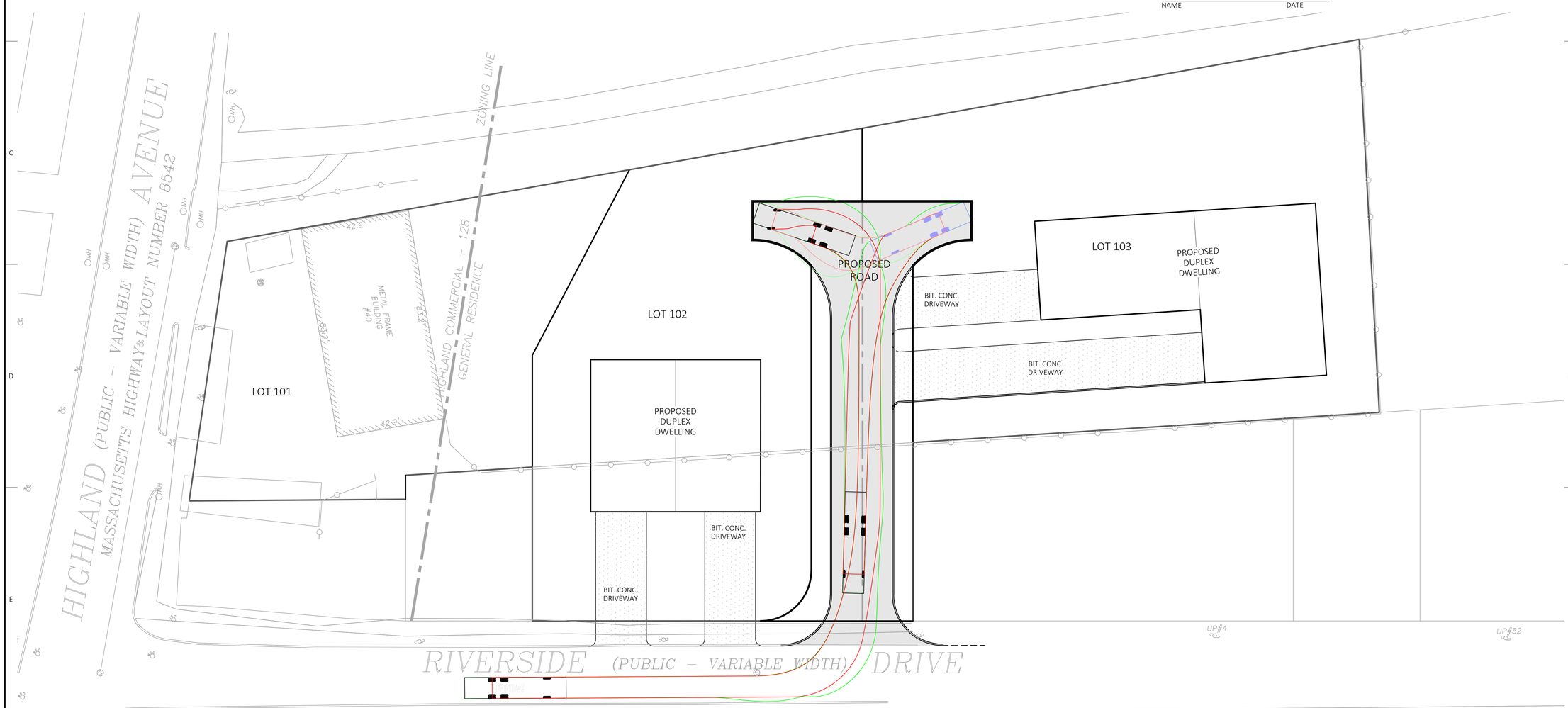
_____

NAME DATE

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS PLAN IS TRUE AND CORRECT TO THE ACCURACY REQUIRED BY THE SUBDIVISION REGULATIONS AND PROCEDURAL RULES OF THE NEEDHAM PLANNING BOARD.

_____

NAME REGISTRATION NO.



Project Owner:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Prepared For:
40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Project Title:
Definitive Subdivision Plan
40 Highland Ave.
Needham, MA
(Norfolk County)

Sheet Title:
TURNING MOVEMENT EXHIBIT
Fire Apparatus

Definitive Subdivision

Prepared By:
LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

Project Surveyor:
FIELD RESOURCES, INC.
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508.832.4332
281 Chestnut Street
Needham, MA
781.444.5936
fieldresources@hotmail.com

No:	Date:	Revision | Issue:

Drawn By:	JTA	Checked By:	MJS
Date:	04/26/2024	Project No.:	21-0089

0 10' 20' 40' 60'
Scale: 1" = 20'

Sheet No.:
10 OF 10

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Stormwater Management Report

Date: April 2024

Project: Residential Subdivision
40 Highland Avenue
Needham, MA

Prepared For: 40 Highland Avenue, LLC
435 Dedham Street, Unit E
Newton, MA 02459

Locus Map:

LAND DESIGN COLLABORATIVE

No Information on This Page

Stormwater quality and quantity calculations have been performed for 40 Highland Avenue and 14 Riverside Drive (collectively the Property) to demonstrate compliance with the MassDEP Stormwater Standards, as enumerated in the Wetland Protection Regulations (310 CMR 10) and Town of Needham Stormwater By-Law.

The western portion of the subject Property (adjacent to Highland Avenue) is located within the Highland Commercial district, whereas the central/eastern portion of the Property resides in the General Residence district. The portion of the lot in the Highland Commercial district is developed with a commercial building and a parking lot. The portion of 40 Highland Ave in the General Residence district is presently undeveloped, though there is evidence of historic use as depicted on the survey plan and confirmed by the Needham Conservation Commission. The Applicant also owns 14 Riverside Street. Existing on this parcel is a two-family house and a detached garage. The Applicant proposes a reconfigure the two lots by subdividing the commercial building and parking lot (adjacent to 40 Highland Avenue) along the Town of Needham's zoning line from the rear/eastern portion of the lot, which will be added to the 14 Riverside Street lot. This reconfiguration will allow the current and future uses to reside within the appropriate zoning district. A hammerhead road is proposed (as discussed with Town staff) to access one of the future residential subdivision lots. Both residential lots will have a duplex erected onsite with a driveway for each unit. The road and future duplexes constitute the Project.

The Property resides just south of the Charles River and a portion of the site within the 200' Riverfront Area (RFA). A drainage easement runs through the Property. It appears the street drainage system in Riverside Street discharges through this easement towards the Charles River as shown on the Existing Conditions plan. The site generally drains towards the southeast corner of the Property to a local depression with infiltration occurring throughout the flow path and at the low point. The soils are mapped as Hinckley and Deerfield, both Hydrologic Soil Group A (HSG A). Site specific soils testing confirmed the USDA/NRCS mapping in the area of the proposed development. There is a FEMA flood zone on the Property associated with the 0.2% Flood (500-year storm) as mapped on FIRM 25017C0562E. However, the FEMA mapping appears to be inconsistent with the FEMA Flood Insurance Study (FIS). The FIS for Norfolk County (Revised on July 6, 2021, Flood Insurance Study Number: 25021CV004D) shows the 0.2% Flood elevation as elevation 92 (Flood Profile for the Charles River (Lower Reach) on Pg. '38P'), which is highlighted in red in the LIDAR Exhibit in Appendix F. As can be seen with the highlighted 92 contour, the 0.2% chance flood elevation resides roughly 90' away from the Property.

Site improvements for the future duplexes will be made, including utility connections for sewer, water, underground electric, and stormwater management. Analysis for the proposed stormwater management system shows the Project complies with the guidance documents.

This Report contains:

A) MassDEP Stormwater Management Checklist

B) Existing and Proposed Hydrologic Calculations (MassDEP Standards 1 & 2)

C) Water Quality Calculations (MassDEP Standards 3, 4, 5, 6 & 7)

D) Construction Period Pollution Prevention Plan, Long-Term Pollution Prevention Plan, Long-Term Operations & Maintenance Plan, and Illicit Discharge Statement (MassDEP Standards 8, 9 & 10)

E) Soils Information

F) FEMA Flood Map, FIS Profile & LIDAR Exhibit

G) Existing Hydrology Map

H) Proposed Hydrology Map

A) MassDEP Stormwater Management Checklist (8 pages)

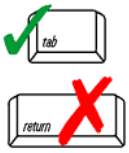
No Information on This Page

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

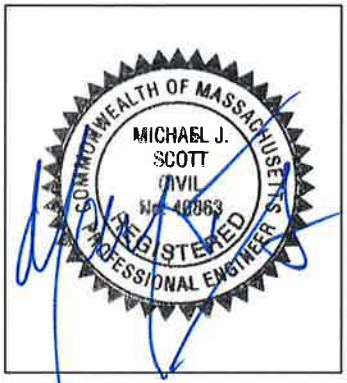
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



4-19-2024

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☐ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): No new distubance in the RFA and retoration of a portion of previously disturbed RFA

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

☐ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☒ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

B) Pre- and Post-Development Hydrologic Calculations (Standards 1 & 2)

Standard 1)

The stormwater management system has been designed to mimic existing conditions and infiltrate runoff during all storm events, collecting, treating, and discharging (recharging) stormwater via subsurface infiltration systems. The proposed drainage system will mitigate water quality and quantity to match the existing conditions as reported for the 2-, 10-, and 100-year return periods. Stormwater runoff from paved areas will be pretreated as required. Roof drains will collect and direct the 'clean' runoff to one of two infiltration systems. The three proposed infiltration systems maintain a 2' offset to groundwater.

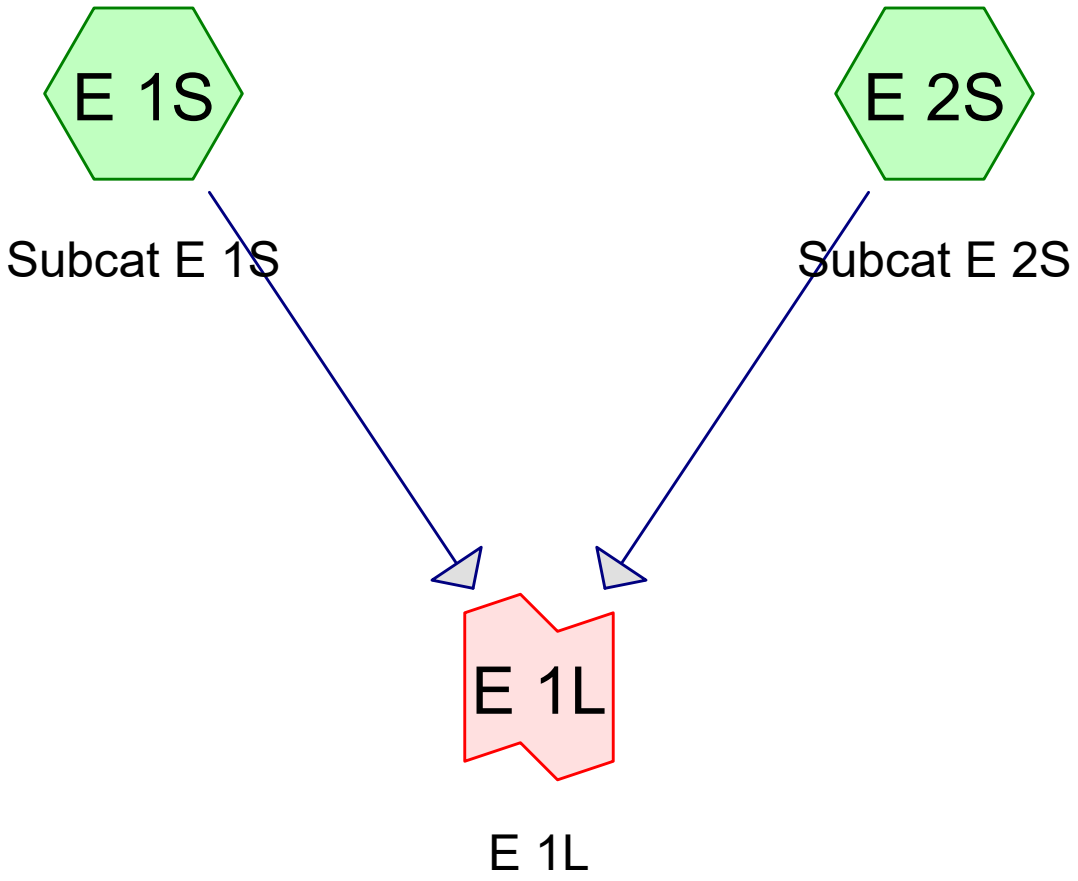
Standard 2)

The Project results in new impervious surfaces. The proposed stormwater management system has been designed to mitigate stormwater runoff rates for the required storm events (refer to HydroCAD calculations), as summarized below.

EXXX Y	Existing Conditions Features where "E" designates "Existing"; XXX designates the area or feature "name"; and Y designates the feature - a sub-catchment "S", a basin/depression/pond/ "P", a conveyance/reach "R", or a point of interest/summation point/link "L"
PXXX- Y	Proposed Conditions Features where "P" designates "Proposed"; XXX designates area or feature "name"; and Y designates the feature - a sub-catchment "S", a basin/depression/pond/ "P", a conveyance/reach "R", or a point of interest/summation point/link "L"

Rates			
Point of Interest	Storm Event / Runoff (cubic feet/second)		
	2-Year	10-Year	100- Year
E 1L	0.1	0.2	0.5
P 1L	0.0	0.0	0.5

Volumes			
Point of Interest	Storm Event / Runoff (cubic feet)		
	2-Year	10-Year	100-Year
E 1L	277	1,256	4,208
P 1L	6	430	1,929



Subcat Reach Pond Link

Routing Diagram for 21-0089 - Existing
Prepared by Land Design Collaborative

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,214	39	>75% Grass cover, Good, HSG A (E 1S, E 2S)
2,116	98	Paved parking, HSG A (E 1S, E 2S)
2,501	98	Roofs, HSG A (E 1S, E 2S)
36,645	36	Woods, Fair, HSG A (E 1S)
4,736	30	Woods, Good, HSG A (E 1S)
51,212	**41**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
51,212	HSG A	E 1S, E 2S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
51,212		**TOTAL AREA**

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E 1S: Subcat E 1S Runoff Area=47,440 sf 5.39% Impervious Runoff Depth=0.00"
Flow Length=346' Tc=20.5 min CN=39 Runoff=0.0 cfs 1 cf

Subcatchment E 2S: Subcat E 2S Runoff Area=3,772 sf 54.64% Impervious Runoff Depth=0.88"
Tc=6.0 min CN=71 Runoff=0.1 cfs 276 cf

Link E 1L: E 1L Inflow=0.1 cfs 277 cf
Primary=0.1 cfs 277 cf

Total Runoff Area = 51,212 sf Runoff Volume = 277 cf Average Runoff Depth = 0.06"
90.98% Pervious = 46,595 sf 9.02% Impervious = 4,617 sf

Summary for Subcatchment E 1S: Subcat E 1S

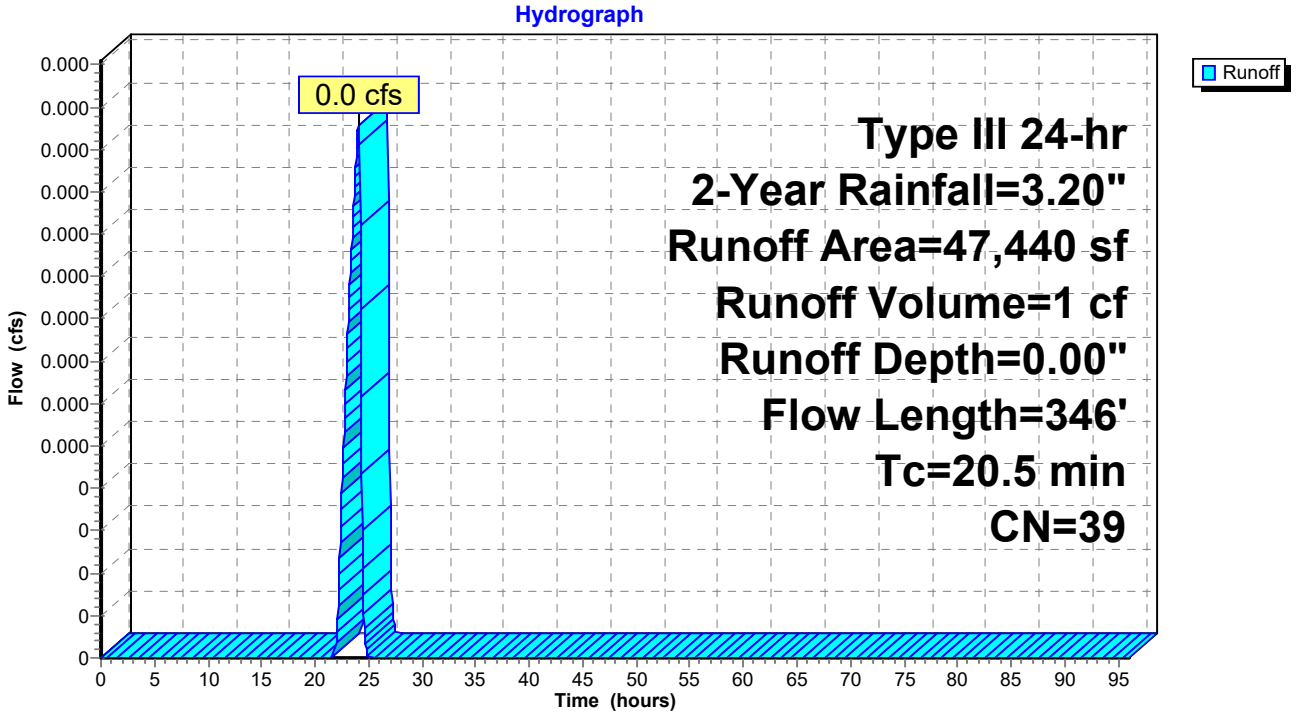
Runoff = 0.0 cfs @ 24.05 hrs, Volume= 1 cf, Depth= 0.00"
Routed to Link E 1L : E 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,503	39	>75% Grass cover, Good, HSG A
619	98	Paved parking, HSG A
1,937	98	Roofs, HSG A
36,645	36	Woods, Fair, HSG A
4,736	30	Woods, Good, HSG A
47,440	39	Weighted Average
44,884		94.61% Pervious Area
2,556		5.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	296	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.5	346	Total			

Subcatchment E 1S: Subcat E 1S



Summary for Subcatchment E 2S: Subcat E 2S

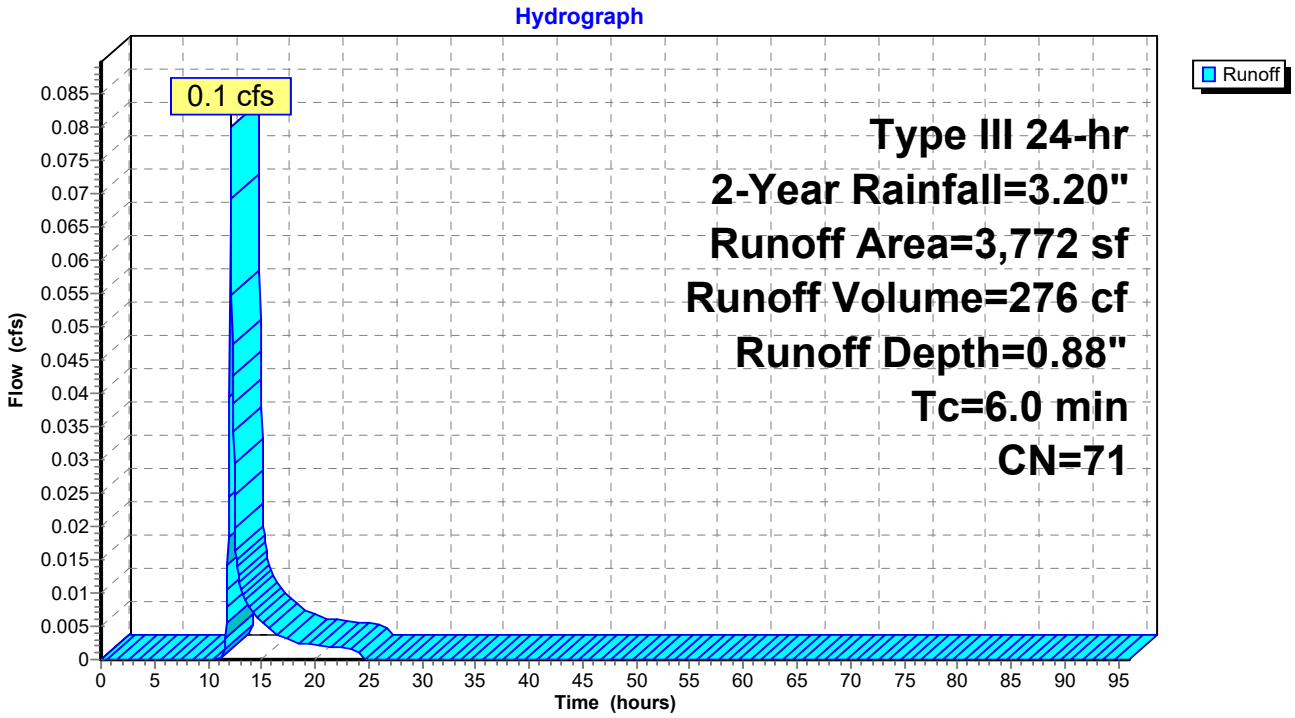
Runoff = 0.1 cfs @ 12.10 hrs, Volume= 276 cf, Depth= 0.88"
Routed to Link E 1L : E 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
1,711	39	>75% Grass cover, Good, HSG A
1,497	98	Paved parking, HSG A
564	98	Roofs, HSG A
3,772	71	Weighted Average
1,711		45.36% Pervious Area
2,061		54.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment E 2S: Subcat E 2S

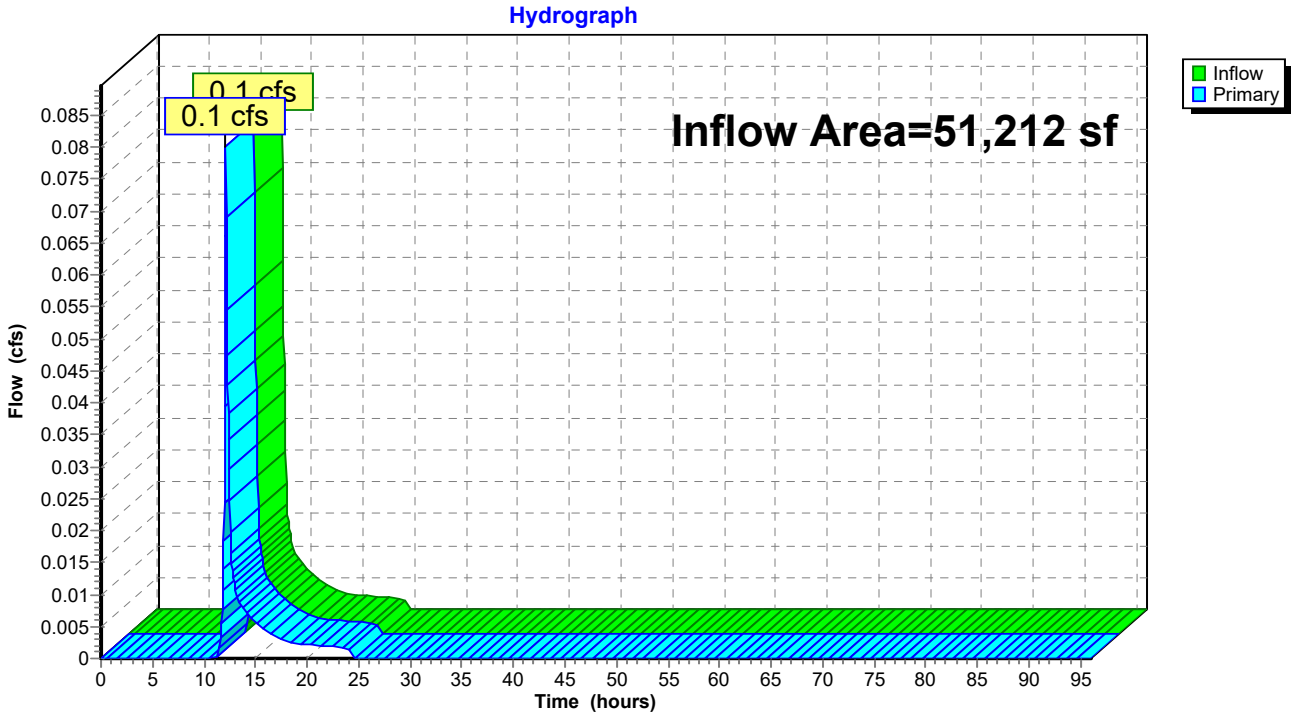


Summary for Link E 1L: E 1L

Inflow Area = 51,212 sf, 9.02% Impervious, Inflow Depth = 0.06" for 2-Year event
Inflow = 0.1 cfs @ 12.10 hrs, Volume= 277 cf
Primary = 0.1 cfs @ 12.10 hrs, Volume= 277 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link E 1L: E 1L



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E 1S: Subcat E 1S Runoff Area=47,440 sf 5.39% Impervious Runoff Depth=0.16"
Flow Length=346' Tc=20.5 min CN=39 Runoff=0.0 cfs 638 cf

Subcatchment E 2S: Subcat E 2S Runoff Area=3,772 sf 54.64% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=71 Runoff=0.2 cfs 618 cf

Link E 1L: E 1L Inflow=0.2 cfs 1,256 cf
Primary=0.2 cfs 1,256 cf

Total Runoff Area = 51,212 sf Runoff Volume = 1,256 cf Average Runoff Depth = 0.29"
90.98% Pervious = 46,595 sf 9.02% Impervious = 4,617 sf

Summary for Subcatchment E 1S: Subcat E 1S

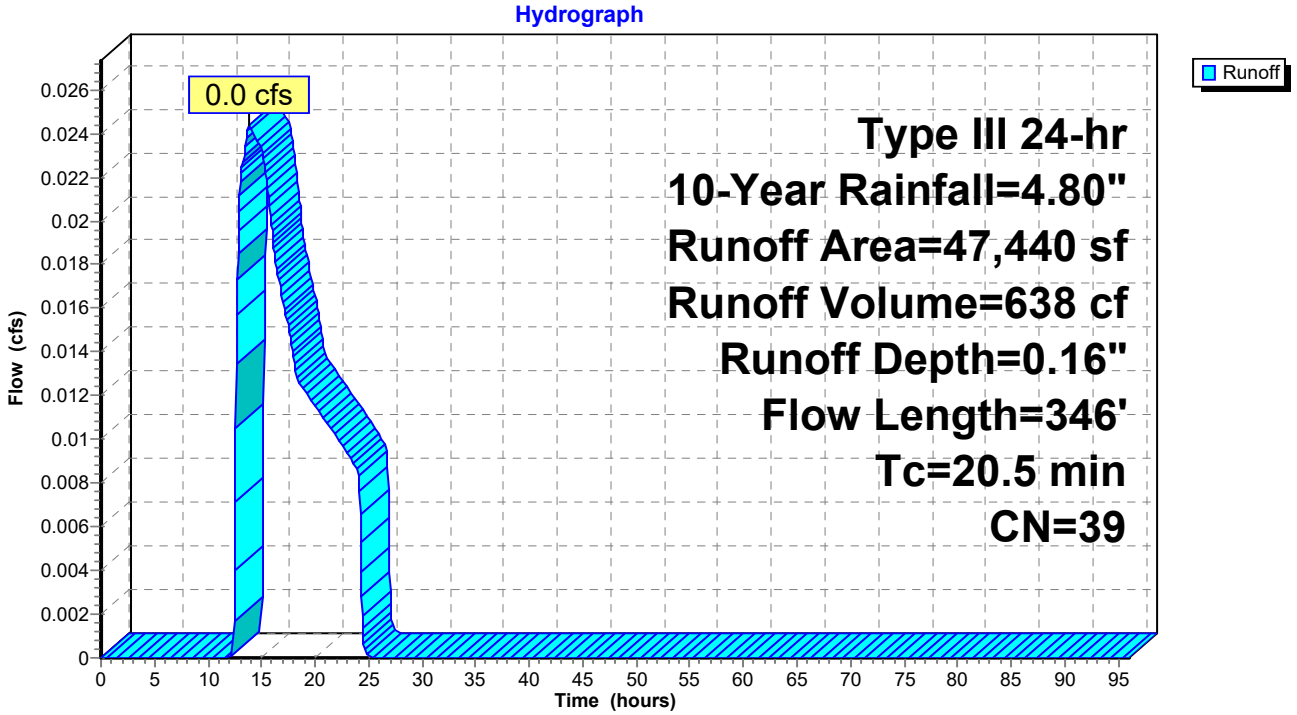
Runoff = 0.0 cfs @ 13.90 hrs, Volume= 638 cf, Depth= 0.16"
Routed to Link E 1L : E 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
3,503	39	>75% Grass cover, Good, HSG A
619	98	Paved parking, HSG A
1,937	98	Roofs, HSG A
36,645	36	Woods, Fair, HSG A
4,736	30	Woods, Good, HSG A
47,440	39	Weighted Average
44,884		94.61% Pervious Area
2,556		5.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	296	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.5	346	Total			

Subcatchment E 1S: Subcat E 1S



Summary for Subcatchment E 2S: Subcat E 2S

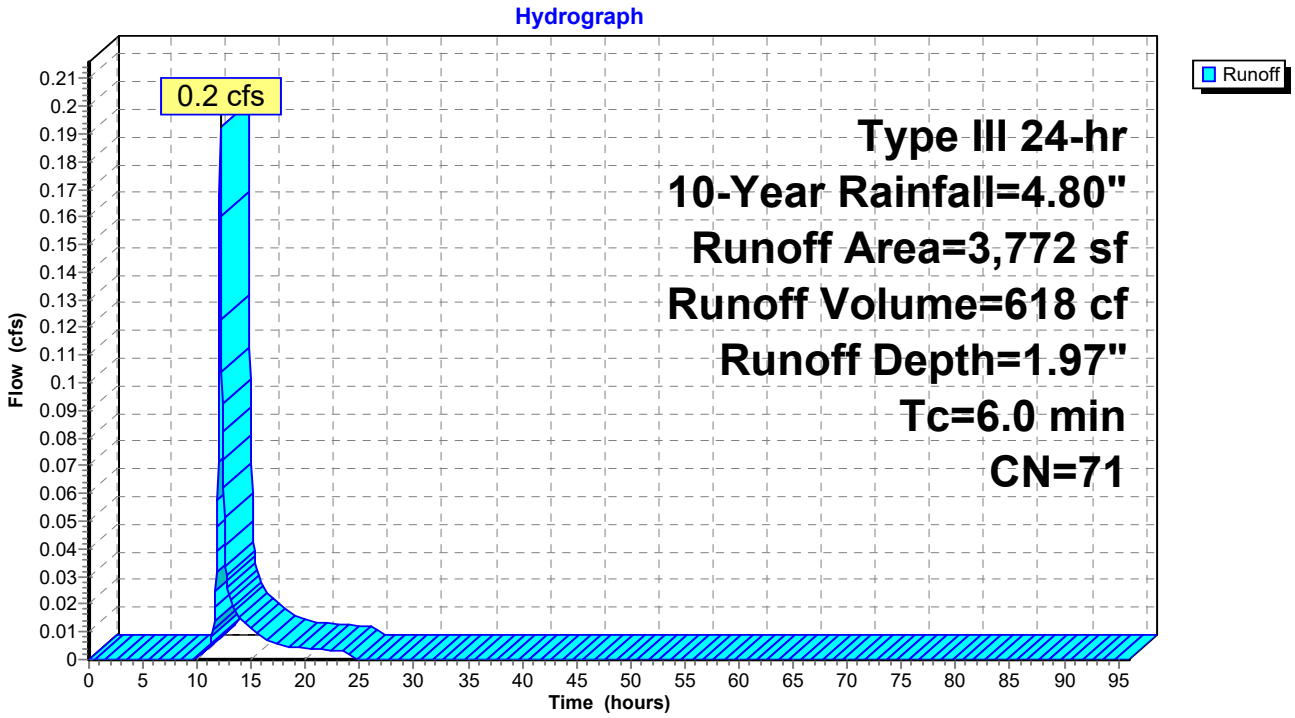
Runoff = 0.2 cfs @ 12.10 hrs, Volume= 618 cf, Depth= 1.97"
Routed to Link E 1L : E 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
1,711	39	>75% Grass cover, Good, HSG A
1,497	98	Paved parking, HSG A
564	98	Roofs, HSG A
3,772	71	Weighted Average
1,711		45.36% Pervious Area
2,061		54.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment E 2S: Subcat E 2S

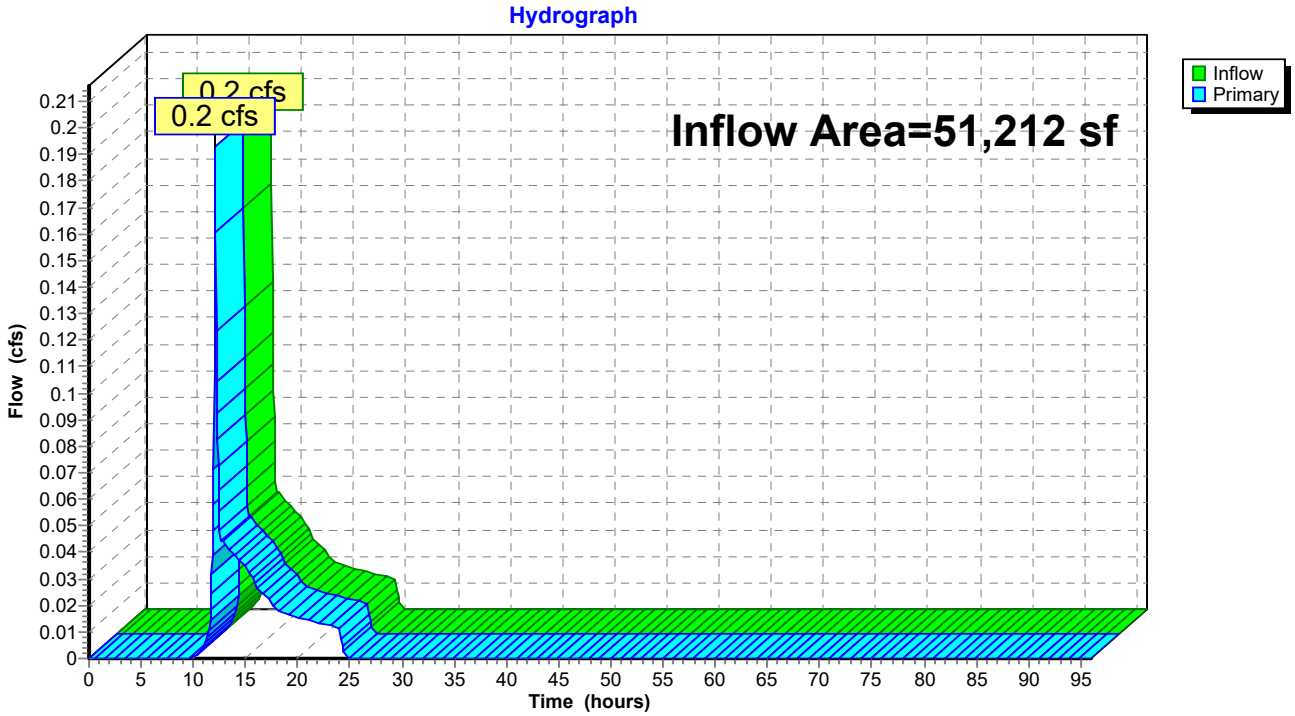


Summary for Link E 1L: E 1L

Inflow Area = 51,212 sf, 9.02% Impervious, Inflow Depth = 0.29" for 10-Year event
Inflow = 0.2 cfs @ 12.10 hrs, Volume= 1,256 cf
Primary = 0.2 cfs @ 12.10 hrs, Volume= 1,256 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link E 1L: E 1L



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E 1S: Subcat E 1S Runoff Area=47,440 sf 5.39% Impervious Runoff Depth=0.77"
Flow Length=346' Tc=20.5 min CN=39 Runoff=0.4 cfs 3,037 cf

Subcatchment E 2S: Subcat E 2S Runoff Area=3,772 sf 54.64% Impervious Runoff Depth=3.72"
Tc=6.0 min CN=71 Runoff=0.4 cfs 1,170 cf

Link E 1L: E 1L Inflow=0.5 cfs 4,208 cf
Primary=0.5 cfs 4,208 cf

Total Runoff Area = 51,212 sf Runoff Volume = 4,208 cf Average Runoff Depth = 0.99"
90.98% Pervious = 46,595 sf 9.02% Impervious = 4,617 sf

Summary for Subcatchment E 1S: Subcat E 1S

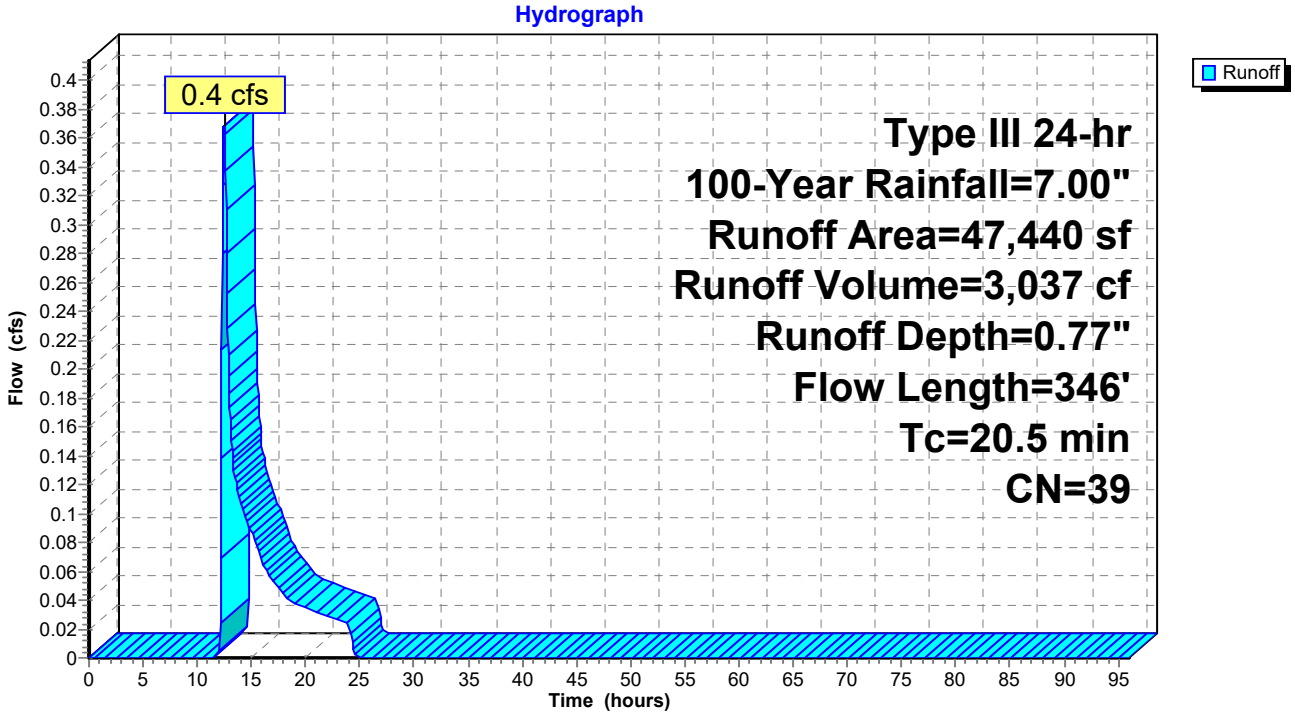
Runoff = 0.4 cfs @ 12.48 hrs, Volume= 3,037 cf, Depth= 0.77"
Routed to Link E 1L : E 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
3,503	39	>75% Grass cover, Good, HSG A
619	98	Paved parking, HSG A
1,937	98	Roofs, HSG A
36,645	36	Woods, Fair, HSG A
4,736	30	Woods, Good, HSG A
47,440	39	Weighted Average
44,884		94.61% Pervious Area
2,556		5.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	296	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.5	346	Total			

Subcatchment E 1S: Subcat E 1S



Summary for Subcatchment E 2S: Subcat E 2S

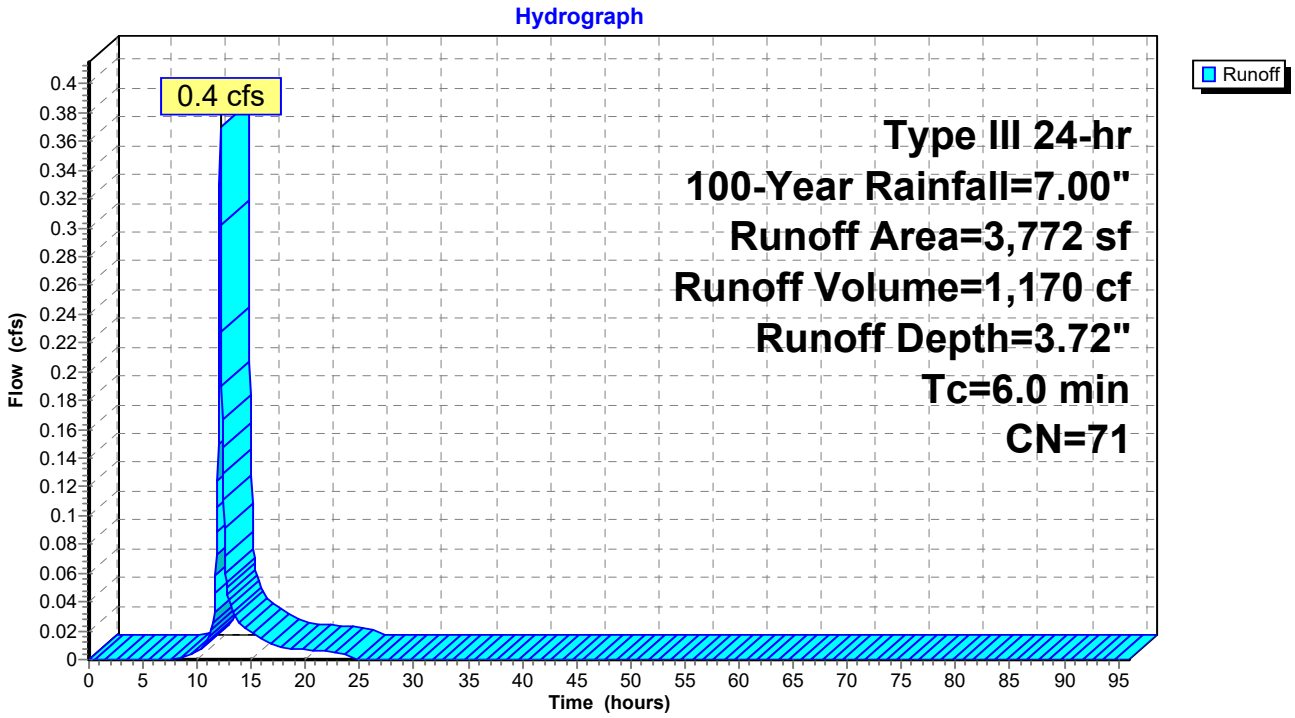
Runoff = 0.4 cfs @ 12.09 hrs, Volume= 1,170 cf, Depth= 3.72"
Routed to Link E 1L : E 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
1,711	39	>75% Grass cover, Good, HSG A
1,497	98	Paved parking, HSG A
564	98	Roofs, HSG A
3,772	71	Weighted Average
1,711		45.36% Pervious Area
2,061		54.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment E 2S: Subcat E 2S

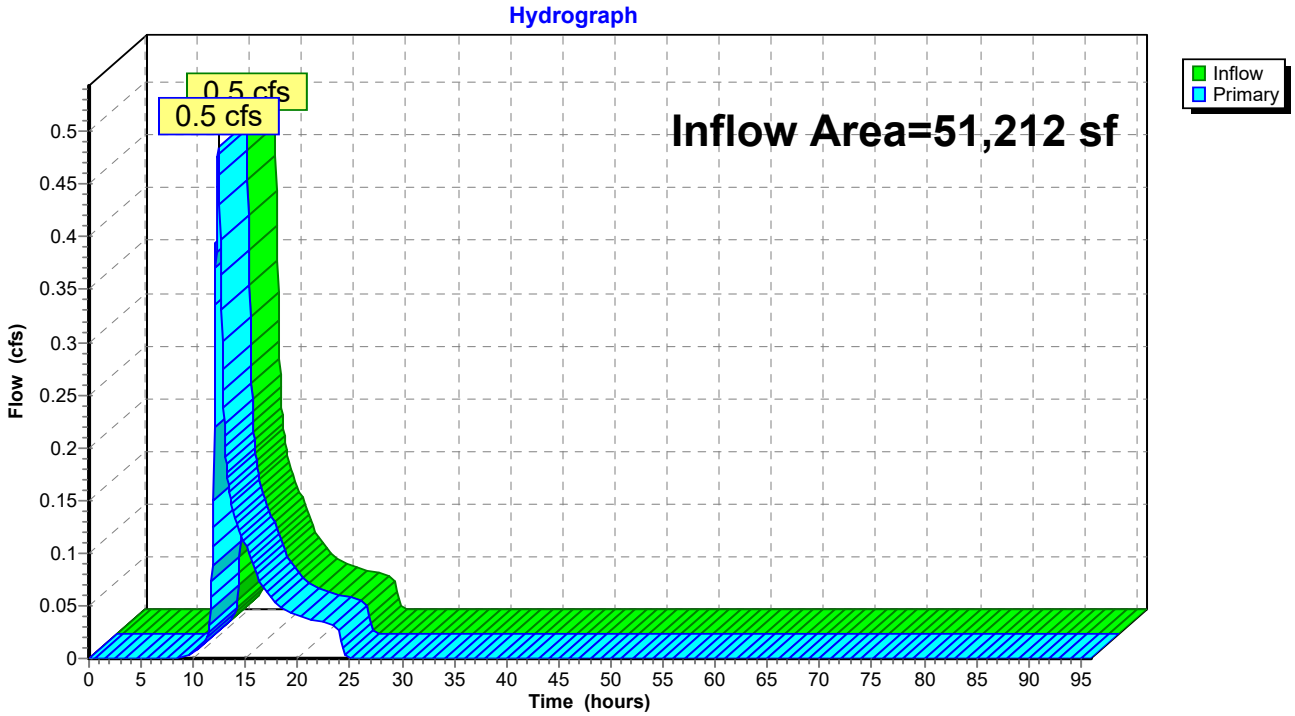


Summary for Link E 1L: E 1L

Inflow Area = 51,212 sf, 9.02% Impervious, Inflow Depth = 0.99" for 100-Year event
Inflow = 0.5 cfs @ 12.40 hrs, Volume= 4,208 cf
Primary = 0.5 cfs @ 12.40 hrs, Volume= 4,208 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link E 1L: E 1L



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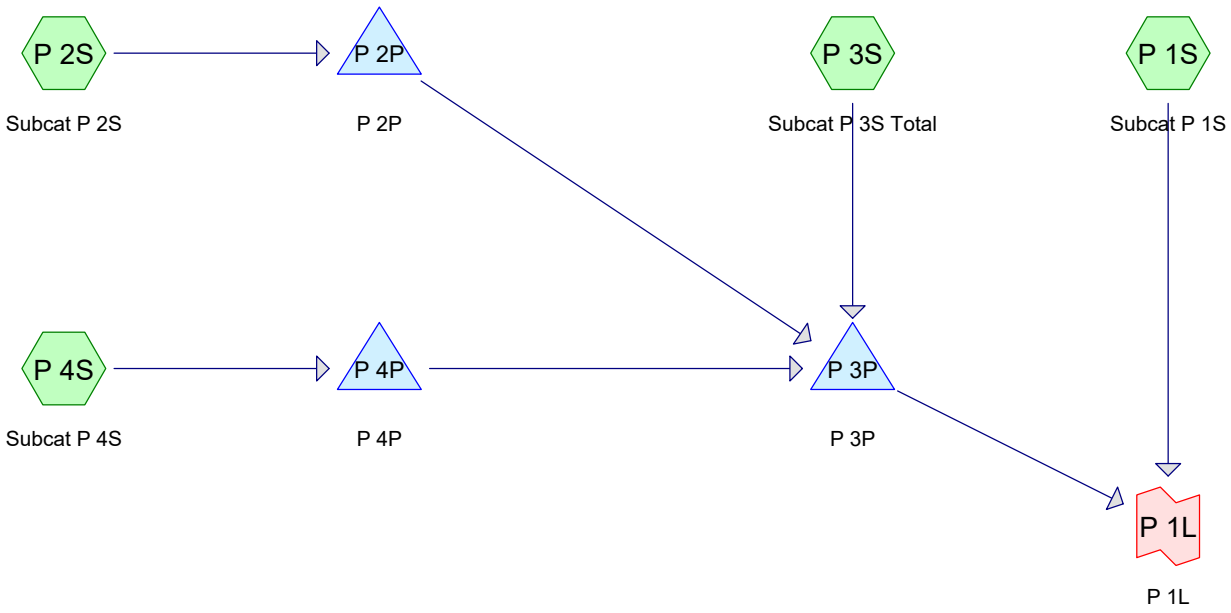


Subcat Reach Pond Link

Routing Diagram for 21-0089 - Proposed
Prepared by Land Design Collaborative

Rainfall Events Listing (selected events)

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	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.80	2
3	100-Year	Type III 24-hr		Default	24.00	1	7.00	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
22,766	39	>75% Grass cover, Good, HSG A (P 1S, P 3S)
3,076	30	Meadow, non-grazed, HSG A (P 1S)
10,656	98	Paved parking, HSG A (P 1S, P 3S)
9,738	98	Roofs, HSG A (P 2S, P 4S)
239	36	Woods, Fair, HSG A (P 1S)
4,737	30	Woods, Good, HSG A (P 1S)
51,212	**61**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
51,212	HSG A	P 1S, P 2S, P 3S, P 4S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
51,212		**TOTAL AREA**

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P 1S: Subcat P 1S Runoff Area=26,765 sf 6.62% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=40 Runoff=0.0 cfs 6 cf

Subcatchment P 2S: Subcat P 2S Runoff Area=4,020 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.3 cfs 994 cf

Subcatchment P 3S: Subcat P 3S Total Runoff Area=14,709 sf 60.39% Impervious Runoff Depth=1.09"
Tc=6.0 min CN=75 Runoff=0.4 cfs 1,341 cf

Subcatchment P 4S: Subcat P 4S Runoff Area=5,718 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.4 cfs 1,414 cf

Pond P 2P: P 2P Peak Elev=485.36' Storage=95 cf Inflow=0.3 cfs 994 cf
Discarded=0.1 cfs 993 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 993 cf

Pond P 3P: P 3P Peak Elev=484.18' Storage=72 cf Inflow=0.4 cfs 1,341 cf
Discarded=0.3 cfs 1,341 cf Primary=0.0 cfs 0 cf Outflow=0.3 cfs 1,341 cf

Pond P 4P: P 4P Peak Elev=483.62' Storage=192 cf Inflow=0.4 cfs 1,414 cf
Discarded=0.1 cfs 1,414 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 1,414 cf

Link P 1L: P 1L Inflow=0.0 cfs 6 cf
Primary=0.0 cfs 6 cf

Total Runoff Area = 51,212 sf Runoff Volume = 3,755 cf Average Runoff Depth = 0.88"
60.18% Pervious = 30,818 sf 39.82% Impervious = 20,394 sf

Summary for Subcatchment P 1S: Subcat P 1S

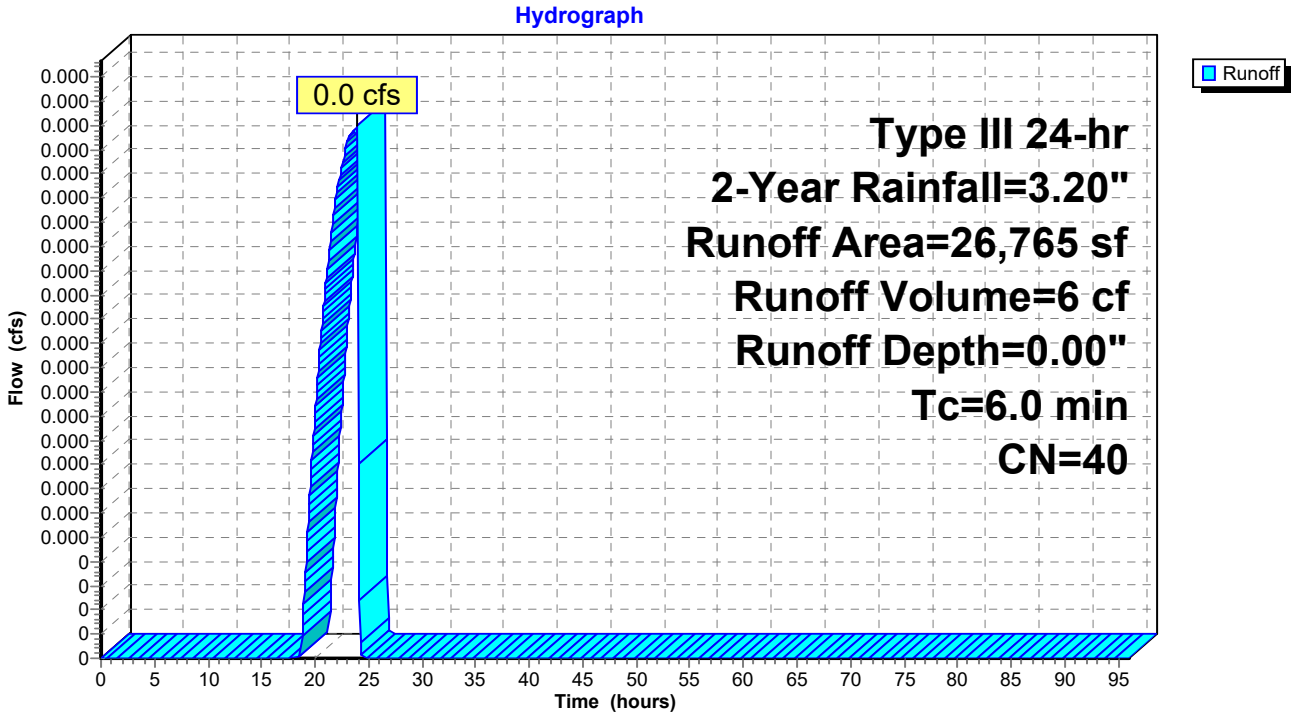
Runoff = 0.0 cfs @ 23.95 hrs, Volume= 6 cf, Depth= 0.00"
Routed to Link P 1L : P 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
16,940	39	>75% Grass cover, Good, HSG A
3,076	30	Meadow, non-grazed, HSG A
1,773	98	Paved parking, HSG A
239	36	Woods, Fair, HSG A
4,737	30	Woods, Good, HSG A
26,765	40	Weighted Average
24,992		93.38% Pervious Area
1,773		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 1S: Subcat P 1S



Summary for Subcatchment P 2S: Subcat P 2S

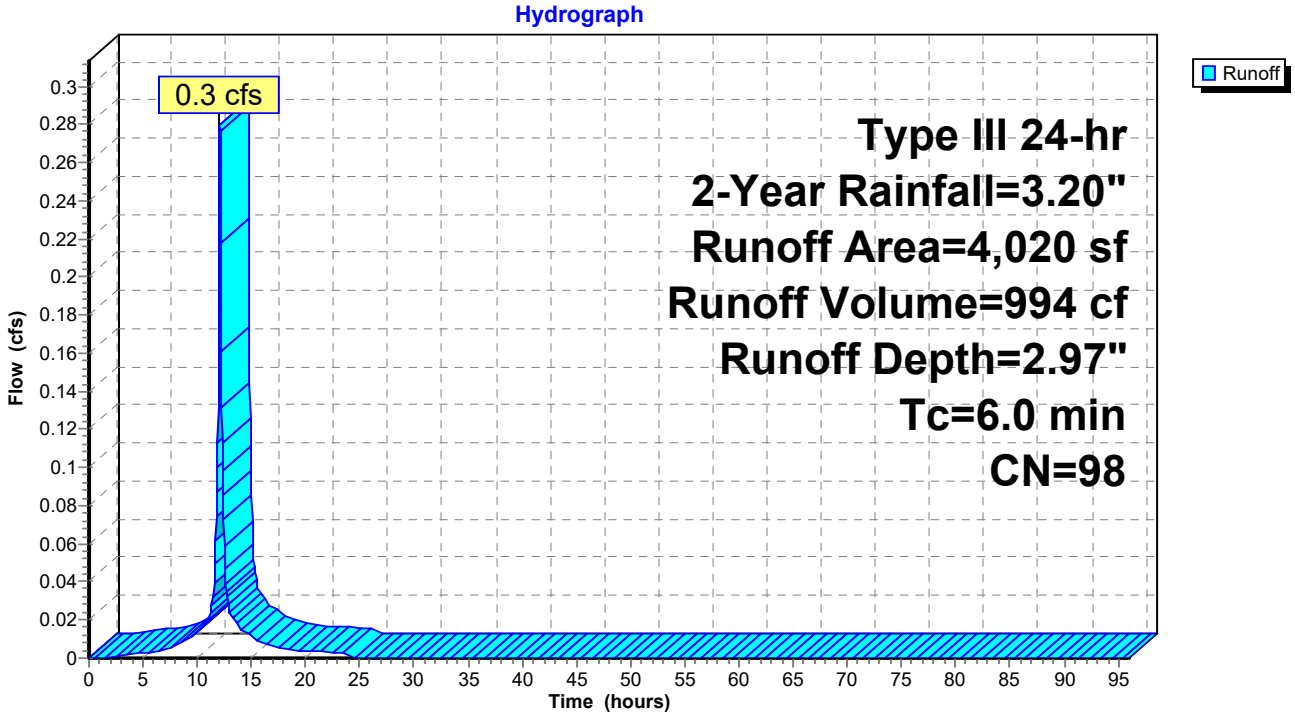
Runoff = 0.3 cfs @ 12.09 hrs, Volume= 994 cf, Depth= 2.97"
Routed to Pond P 2P : P 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,020	98	Roofs, HSG A
4,020		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 2S: Subcat P 2S



Summary for Subcatchment P 3S: Subcat P 3S Total

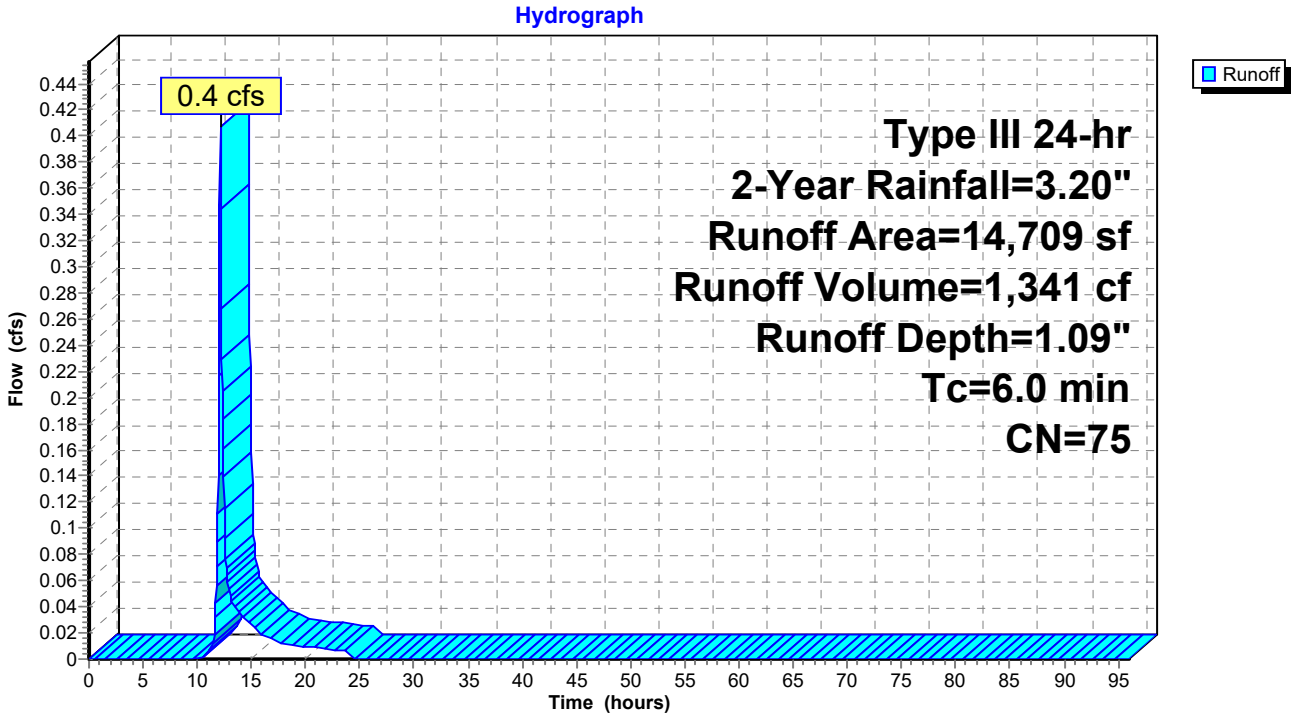
Runoff = 0.4 cfs @ 12.10 hrs, Volume= 1,341 cf, Depth= 1.09"
Routed to Pond P 3P : P 3P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
2	98	Paved parking, HSG A
44	39	>75% Grass cover, Good, HSG A
5,280	98	Paved parking, HSG A
1,143	98	Paved parking, HSG A
2,458	98	Paved parking, HSG A
1,049	39	>75% Grass cover, Good, HSG A
4,733	39	>75% Grass cover, Good, HSG A
14,709	75	Weighted Average
5,826		39.61% Pervious Area
8,883		60.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 3S: Subcat P 3S Total



Summary for Subcatchment P 4S: Subcat P 4S

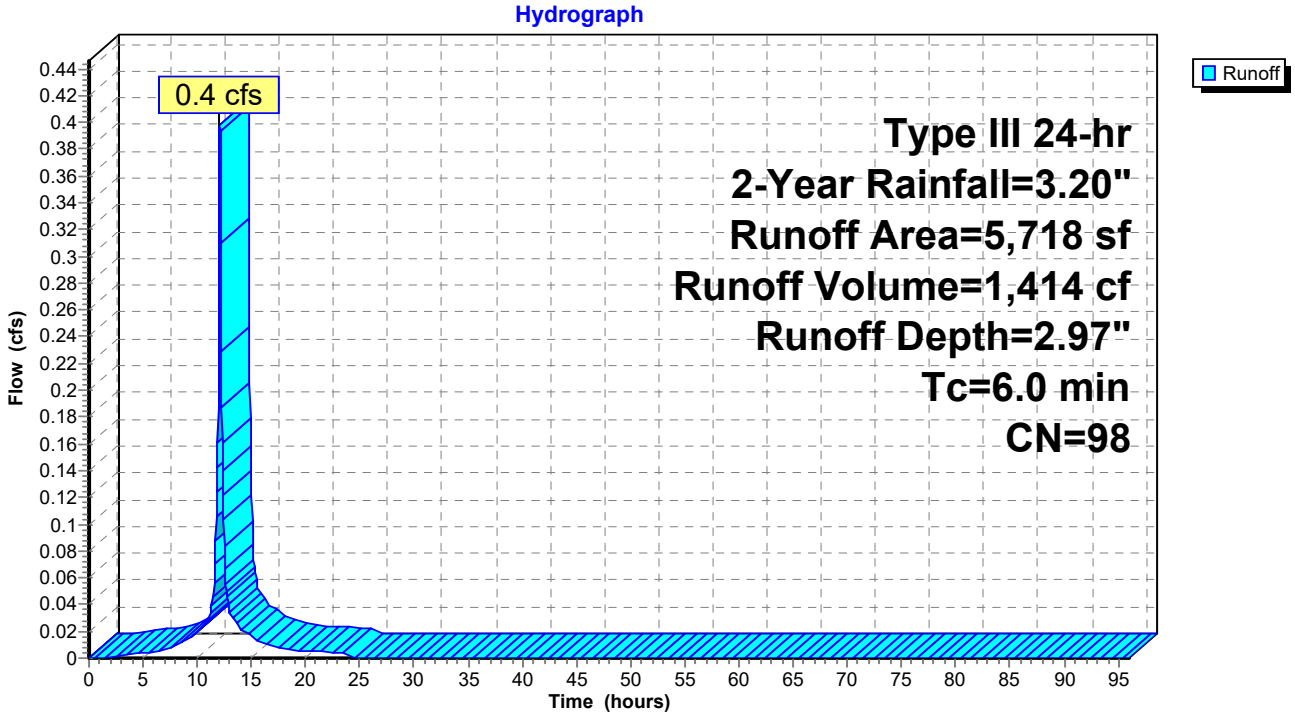
Runoff = 0.4 cfs @ 12.09 hrs, Volume= 1,414 cf, Depth= 2.97"
Routed to Pond P 4P : P 4P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
5,718	98	Roofs, HSG A
5,718		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 4S: Subcat P 4S



Summary for Pond P 2P: P 2P

Inflow Area = 4,020 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year event
Inflow = 0.3 cfs @ 12.09 hrs, Volume= 994 cf
Outflow = 0.1 cfs @ 12.00 hrs, Volume= 993 cf, Atten= 55%, Lag= 0.0 min
Discarded = 0.1 cfs @ 12.00 hrs, Volume= 993 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond P 3P : P 3P

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 485.36' @ 12.27 hrs Surf.Area= 660 sf Storage= 95 cf

Plug-Flow detention time= 4.5 min calculated for 993 cf (100% of inflow)
Center-of-Mass det. time= 3.5 min (759.9 - 756.4)

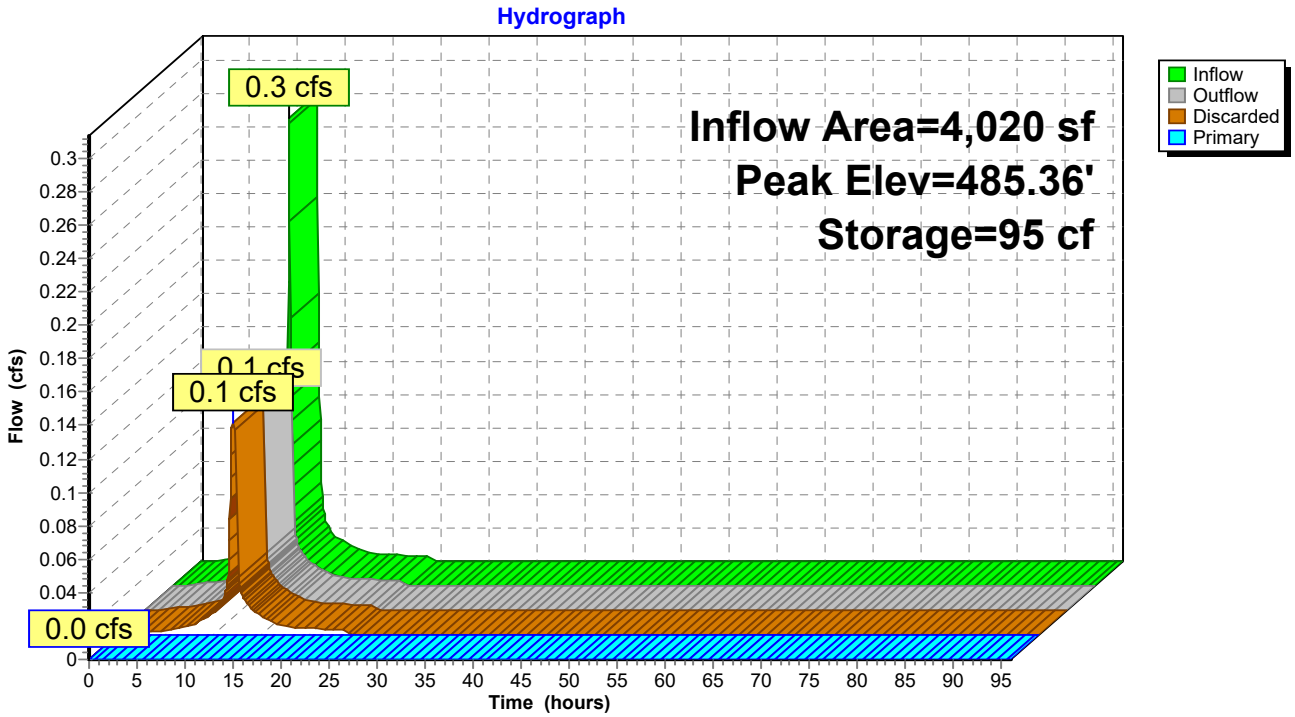
Volume	Invert	Avail.Storage	Storage Description
#1	485.50'	2 cf	**1.00'D x 2.71'H Vertical Cone/Cylinder**
#2	485.50'	236 cf	**12.0" Round Pipe Storage** x 5 Inside #3 L= 60.0'
#3	485.00'	434 cf	**10.48'W x 63.00'L x 2.00'H Prismatoid** 1,320 cf Overall - 236 cf Embedded = 1,085 cf x 40.0% Voids
		672 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	488.20'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	485.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 12.00 hrs HW=485.06' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=485.00' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 2P: P 2P


Hydrograph
Inflow Area=4,020 sf
Peak Elev=485.36'
Storage=95 cf
0.3 cfs
0.1 cfs
0.1 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95

Summary for Pond P 3P: P 3P

Inflow Area = 24,447 sf, 76.17% Impervious, Inflow Depth = 0.66" for 2-Year event
Inflow = 0.4 cfs @ 12.10 hrs, Volume= 1,341 cf
Outflow = 0.3 cfs @ 12.05 hrs, Volume= 1,341 cf, Atten= 35%, Lag= 0.0 min
Discarded = 0.3 cfs @ 12.05 hrs, Volume= 1,341 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link P 1L : P 1L

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 484.18' @ 12.21 hrs Surf.Area= 1,384 sf Storage= 72 cf

Plug-Flow detention time= 1.8 min calculated for 1,340 cf (100% of inflow)
Center-of-Mass det. time= 1.8 min (860.6 - 858.8)

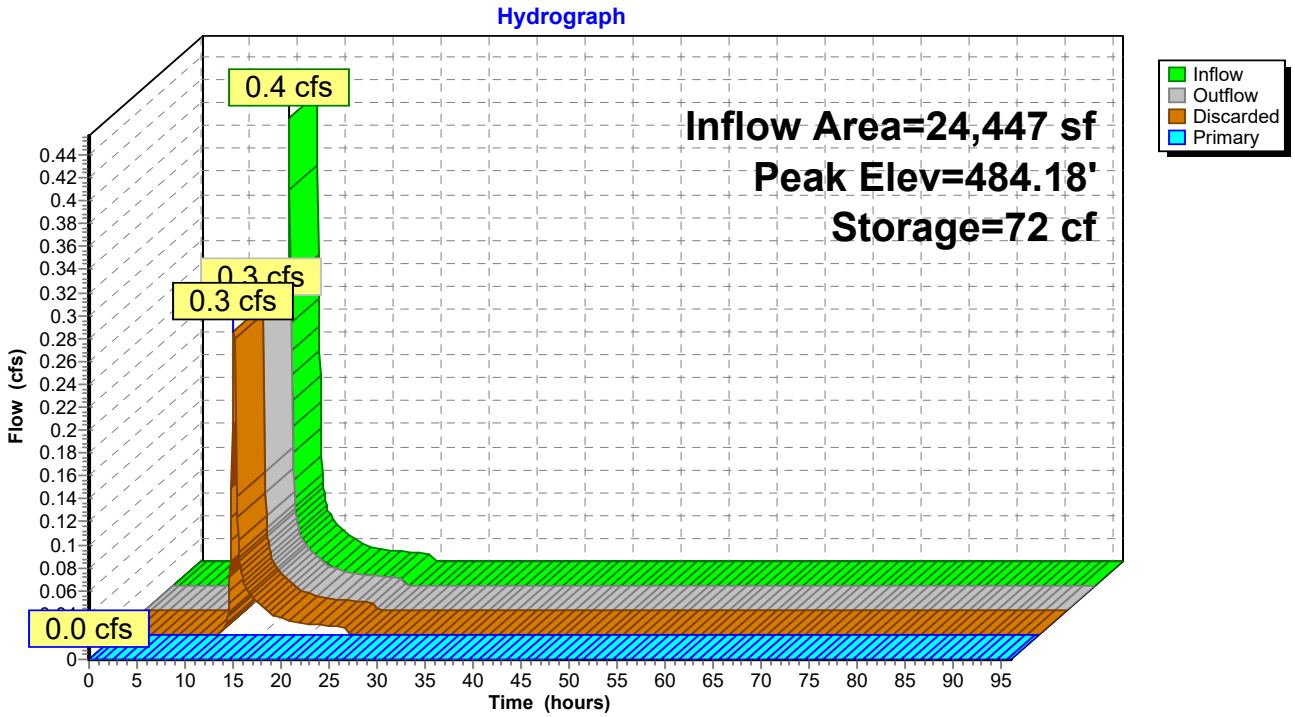
Volume	Invert	Avail.Storage	Storage Description
#1	484.61'	38 cf	**4.00'D x 3.03'H Vertical Cone/Cylinder**
#2	484.55'	495 cf	**12.0" Round Pipe Storage** x 9 Inside #3 L= 70.0'
#3	484.05'	909 cf	**18.96'W x 73.00'L x 2.00'H Prismatoid** 2,768 cf Overall - 495 cf Embedded = 2,273 cf x 40.0% Voids
		1,442 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	486.58'	**1.0" x 5.0" Horiz. Orifice/Grate X 11.00 columns** X 2 rows C= 0.600 in 18.0" x 25.7" Grate (24% open area) Limited to weir flow at low heads
#2	Discarded	484.05'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.3 cfs @ 12.05 hrs HW=484.09' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=484.05' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 3P: P 3P


Hydrograph
Inflow Area=24,447 sf
Peak Elev=484.18'
Storage=72 cf
0.4 cfs
0.3 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Summary for Pond P 4P: P 4P

Inflow Area = 5,718 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year event
Inflow = 0.4 cfs @ 12.09 hrs, Volume= 1,414 cf
Outflow = 0.1 cfs @ 12.15 hrs, Volume= 1,414 cf, Atten= 64%, Lag= 3.8 min
Discarded = 0.1 cfs @ 12.15 hrs, Volume= 1,414 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond P 3P : P 3P

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 483.62' @ 12.34 hrs Surf.Area= 749 sf Storage= 192 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.8 min (763.2 - 756.4)

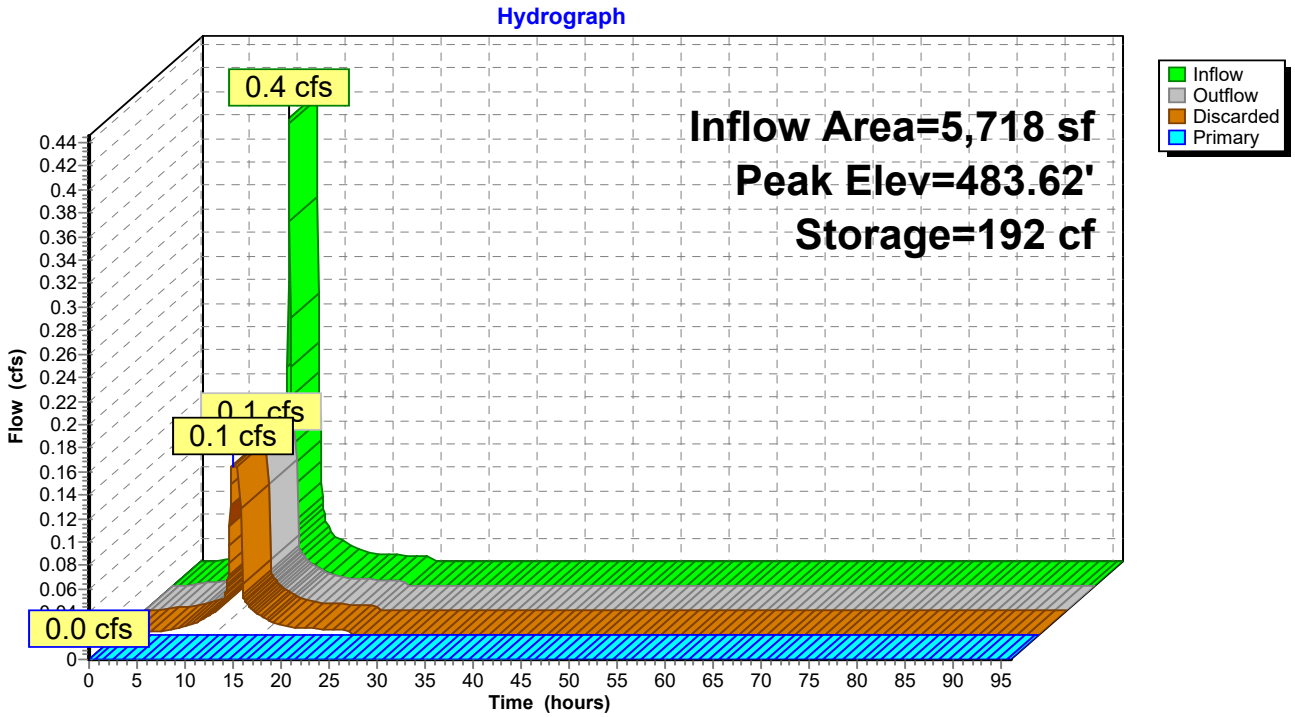
Volume	Invert	Avail.Storage	Storage Description
#1	483.50'	4 cf	**1.00'D x 5.51'H Vertical Cone/Cylinder**
#2	483.50'	353 cf	**18.0" Round Pipe Storage** x 4 Inside #3 L= 50.0'
#3	483.00'	607 cf	**13.60'W x 55.00'L x 2.50'H Prismatoid** 1,870 cf Overall - 353 cf Embedded = 1,517 cf x 40.0% Voids
		964 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	489.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	483.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 12.15 hrs HW=483.51' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=483.00' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 4P: P 4P

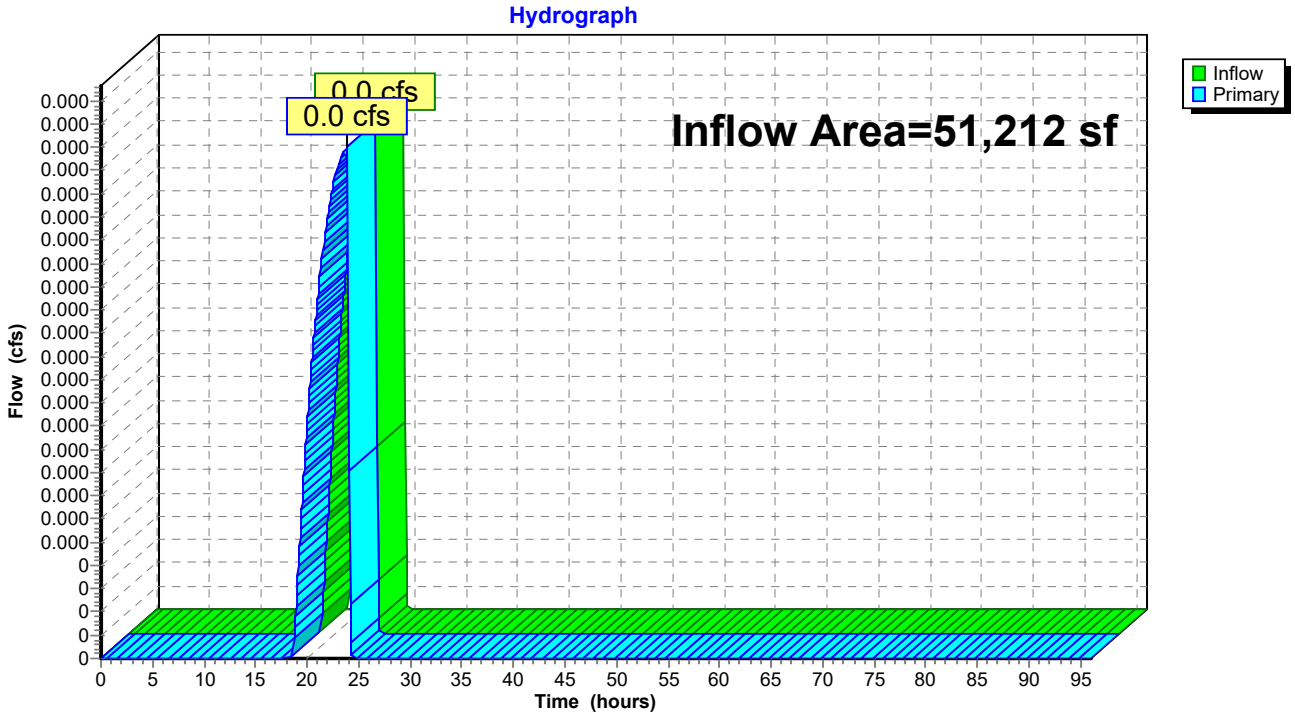

Hydrograph
Inflow Area=5,718 sf
Peak Elev=483.62'
Storage=192 cf
0.4 cfs
0.1 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Summary for Link P 1L: P 1L

Inflow Area = 51,212 sf, 39.82% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.0 cfs @ 23.95 hrs, Volume= 6 cf
Primary = 0.0 cfs @ 23.95 hrs, Volume= 6 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link P 1L: P 1L



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P 1S: Subcat P 1S Runoff Area=26,765 sf 6.62% Impervious Runoff Depth=0.19"
Tc=6.0 min CN=40 Runoff=0.0 cfs 430 cf

Subcatchment P 2S: Subcat P 2S Runoff Area=4,020 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.4 cfs 1,529 cf

Subcatchment P 3S: Subcat P 3S Total Runoff Area=14,709 sf 60.39% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=75 Runoff=0.9 cfs 2,805 cf

Subcatchment P 4S: Subcat P 4S Runoff Area=5,718 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,175 cf

Pond P 2P: P 2P Peak Elev=485.80' Storage=246 cf Inflow=0.4 cfs 1,529 cf
Discarded=0.1 cfs 1,526 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 1,526 cf

Pond P 3P: P 3P Peak Elev=484.83' Storage=507 cf Inflow=0.9 cfs 2,805 cf
Discarded=0.3 cfs 2,805 cf Primary=0.0 cfs 0 cf Outflow=0.3 cfs 2,805 cf

Pond P 4P: P 4P Peak Elev=484.18' Storage=445 cf Inflow=0.6 cfs 2,175 cf
Discarded=0.1 cfs 2,175 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 2,175 cf

Link P 1L: P 1L Inflow=0.0 cfs 430 cf
Primary=0.0 cfs 430 cf

Total Runoff Area = 51,212 sf Runoff Volume = 6,938 cf Average Runoff Depth = 1.63"
60.18% Pervious = 30,818 sf 39.82% Impervious = 20,394 sf

Summary for Subcatchment P 1S: Subcat P 1S

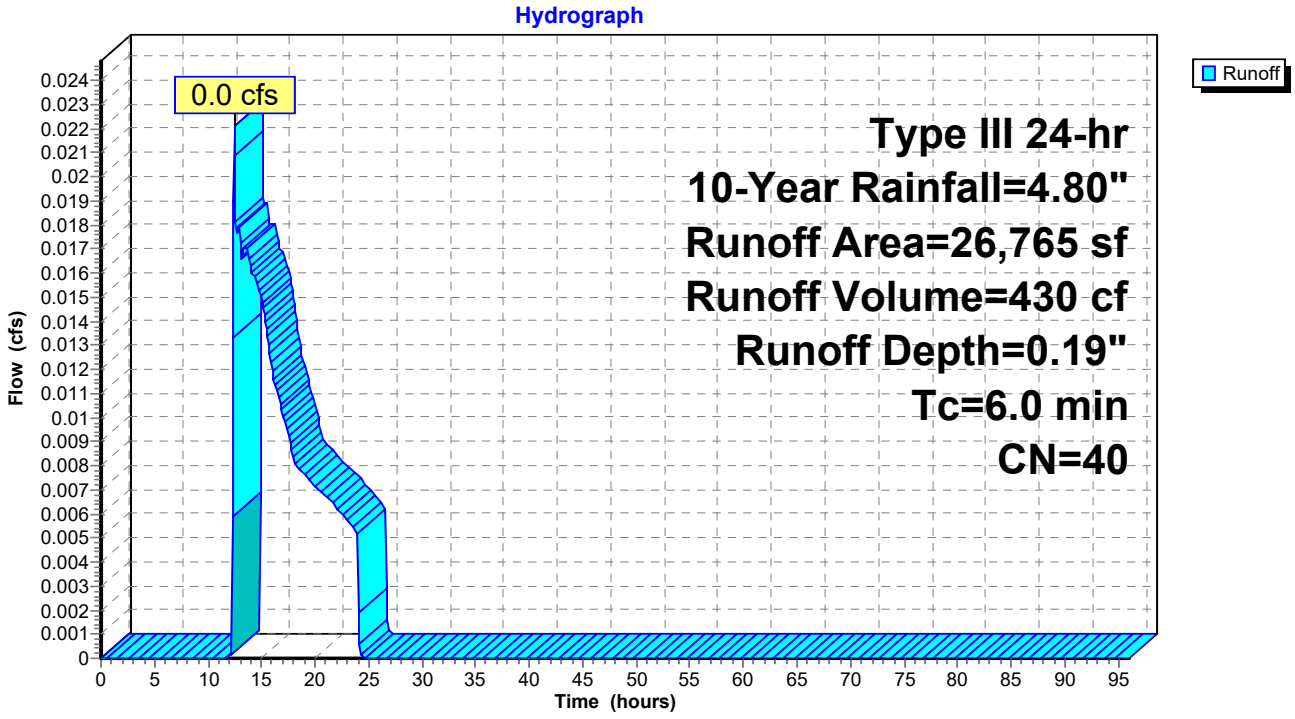
Runoff = 0.0 cfs @ 12.48 hrs, Volume= 430 cf, Depth= 0.19"
Routed to Link P 1L : P 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
16,940	39	>75% Grass cover, Good, HSG A
3,076	30	Meadow, non-grazed, HSG A
1,773	98	Paved parking, HSG A
239	36	Woods, Fair, HSG A
4,737	30	Woods, Good, HSG A
26,765	40	Weighted Average
24,992		93.38% Pervious Area
1,773		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 1S: Subcat P 1S



Summary for Subcatchment P 2S: Subcat P 2S

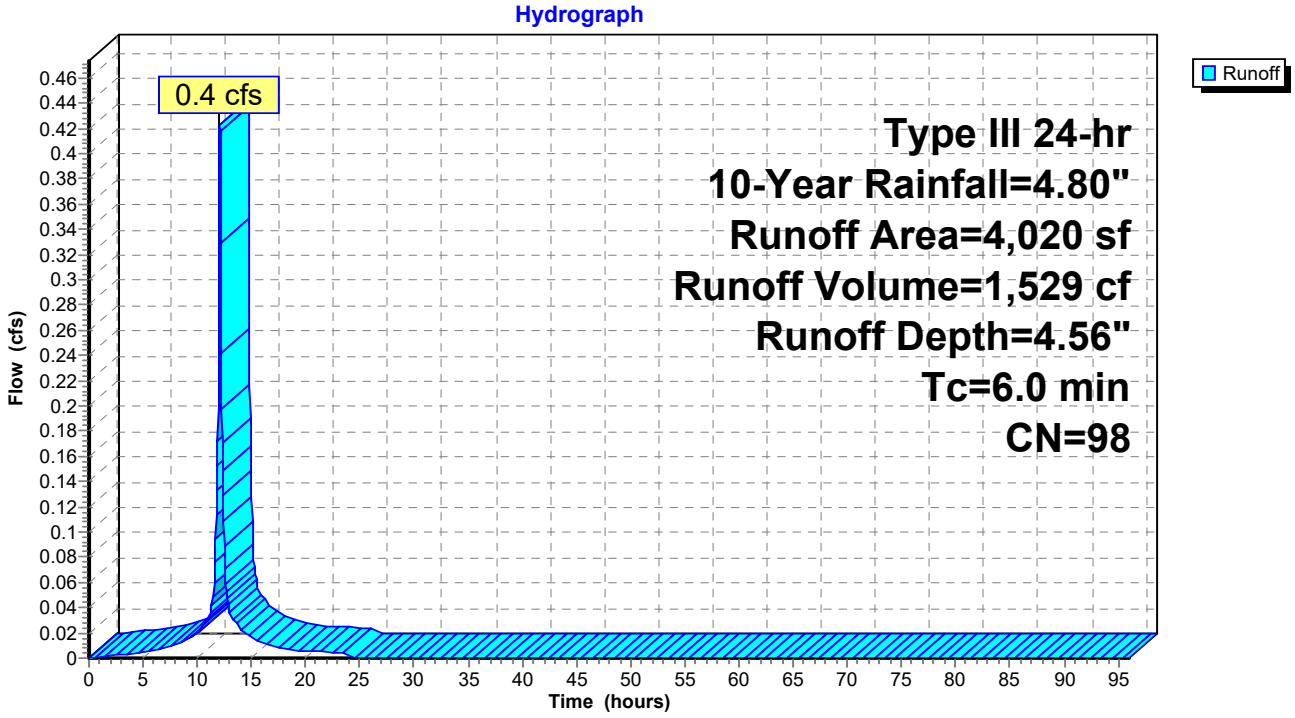
Runoff = 0.4 cfs @ 12.09 hrs, Volume= 1,529 cf, Depth= 4.56"
Routed to Pond P 2P : P 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
4,020	98	Roofs, HSG A
4,020		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 2S: Subcat P 2S



Summary for Subcatchment P 3S: Subcat P 3S Total

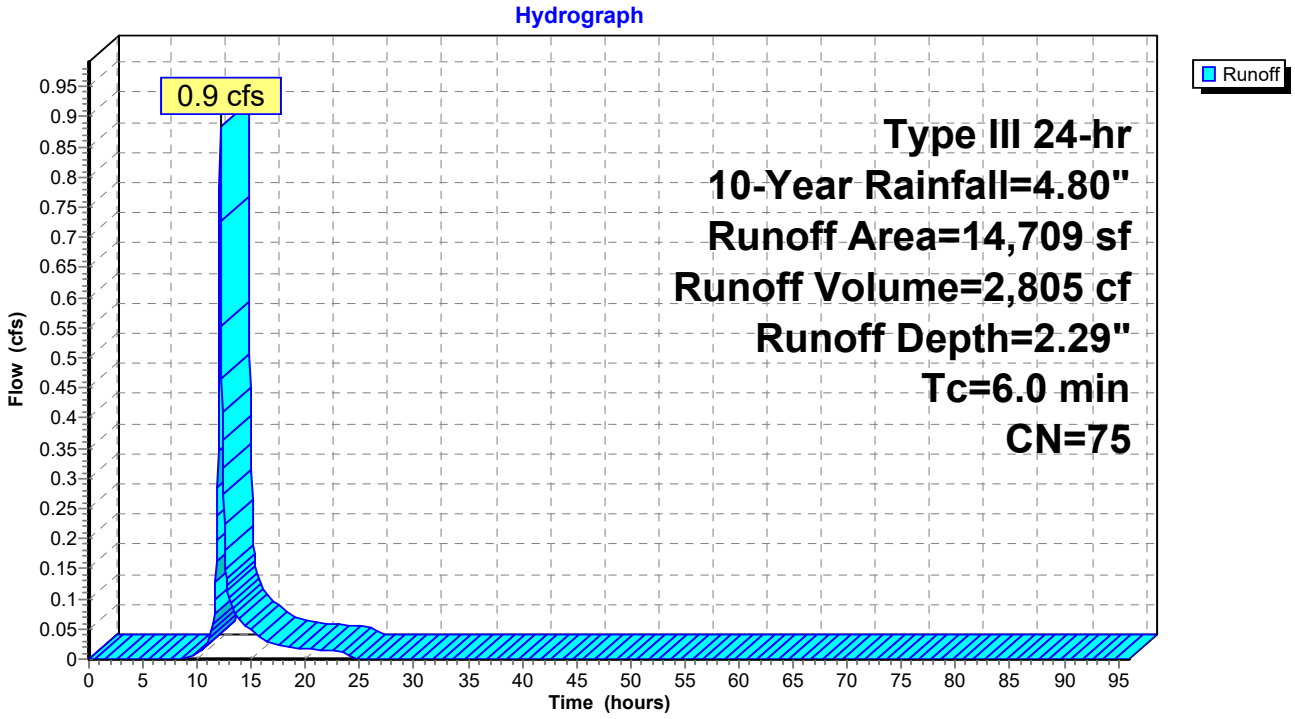
Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,805 cf, Depth= 2.29"
Routed to Pond P 3P : P 3P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2	98	Paved parking, HSG A
44	39	>75% Grass cover, Good, HSG A
5,280	98	Paved parking, HSG A
1,143	98	Paved parking, HSG A
2,458	98	Paved parking, HSG A
1,049	39	>75% Grass cover, Good, HSG A
4,733	39	>75% Grass cover, Good, HSG A
14,709	75	Weighted Average
5,826		39.61% Pervious Area
8,883		60.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 3S: Subcat P 3S Total



Summary for Subcatchment P 4S: Subcat P 4S

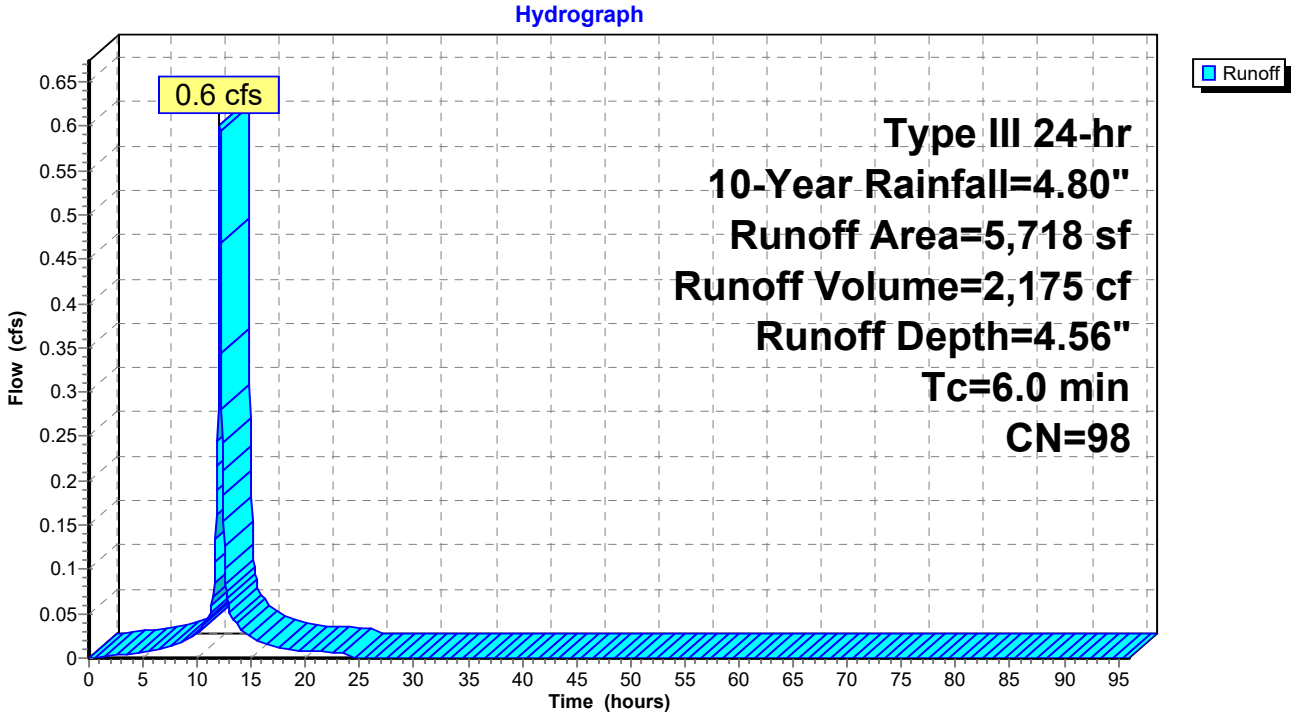
Runoff = 0.6 cfs @ 12.09 hrs, Volume= 2,175 cf, Depth= 4.56"
Routed to Pond P 4P : P 4P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
5,718	98	Roofs, HSG A
5,718		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 4S: Subcat P 4S



Summary for Pond P 2P: P 2P

Inflow Area = 4,020 sf,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 0.4 cfs @ 12.09 hrs, Volume= 1,529 cf
Outflow = 0.1 cfs @ 12.10 hrs, Volume= 1,526 cf, Atten= 70%, Lag= 0.8 min
Discarded = 0.1 cfs @ 12.10 hrs, Volume= 1,526 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond P 3P : P 3P

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 485.80' @ 12.41 hrs Surf.Area= 661 sf Storage= 246 cf

Plug-Flow detention time= 9.8 min calculated for 1,526 cf (100% of inflow)
Center-of-Mass det. time= 8.8 min (757.5 - 748.7)

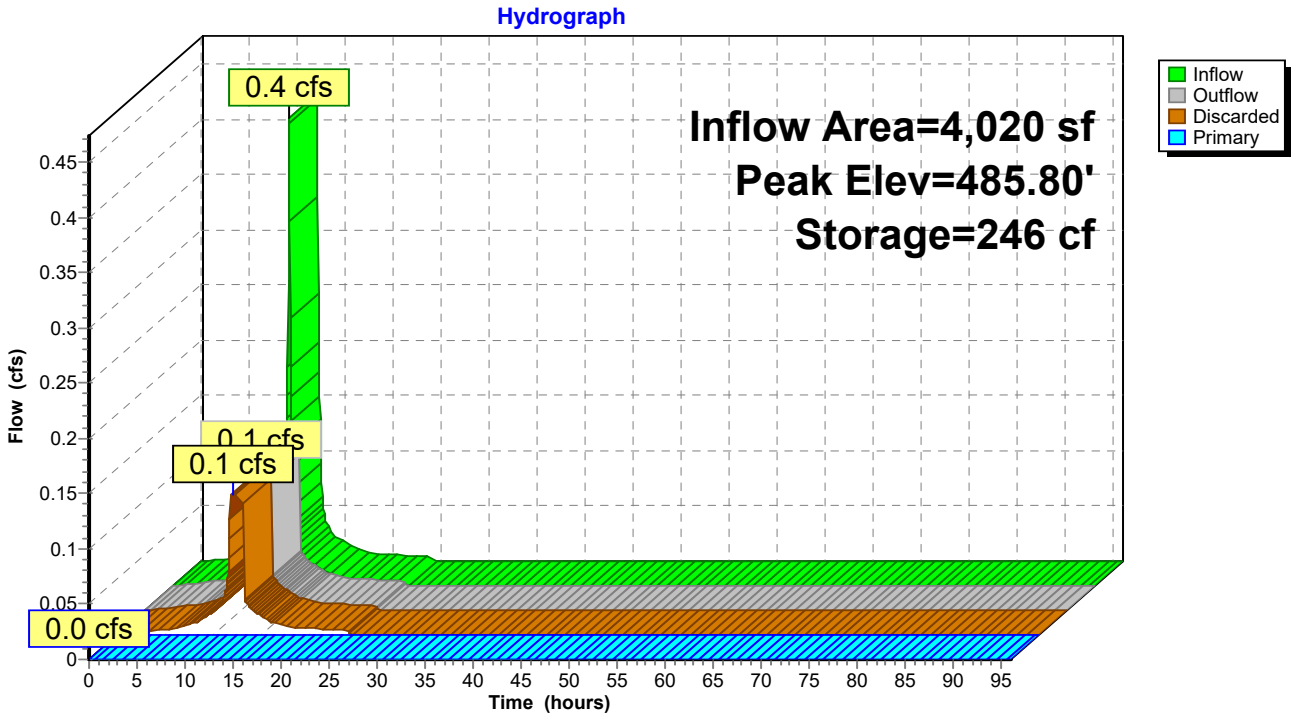
Volume	Invert	Avail.Storage	Storage Description
#1	485.50'	2 cf	**1.00'D x 2.71'H Vertical Cone/Cylinder**
#2	485.50'	236 cf	**12.0" Round Pipe Storage** x 5 Inside #3 L= 60.0'
#3	485.00'	434 cf	**10.48'W x 63.00'L x 2.00'H Prismatoid** 1,320 cf Overall - 236 cf Embedded = 1,085 cf x 40.0% Voids
		672 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	488.20'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	485.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 12.10 hrs HW=485.52' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=485.00' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 2P: P 2P


Hydrograph
Inflow Area=4,020 sf
Peak Elev=485.80'
Storage=246 cf
0.4 cfs
0.1 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95

Summary for Pond P 3P: P 3P

Inflow Area = 24,447 sf, 76.17% Impervious, Inflow Depth = 1.38" for 10-Year event
Inflow = 0.9 cfs @ 12.09 hrs, Volume= 2,805 cf
Outflow = 0.3 cfs @ 12.15 hrs, Volume= 2,805 cf, Atten= 70%, Lag= 3.3 min
Discarded = 0.3 cfs @ 12.15 hrs, Volume= 2,805 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link P 1L : P 1L

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 484.83' @ 12.45 hrs Surf.Area= 1,397 sf Storage= 507 cf

Plug-Flow detention time= 10.0 min calculated for 2,803 cf (100% of inflow)
Center-of-Mass det. time= 10.0 min (846.9 - 836.9)

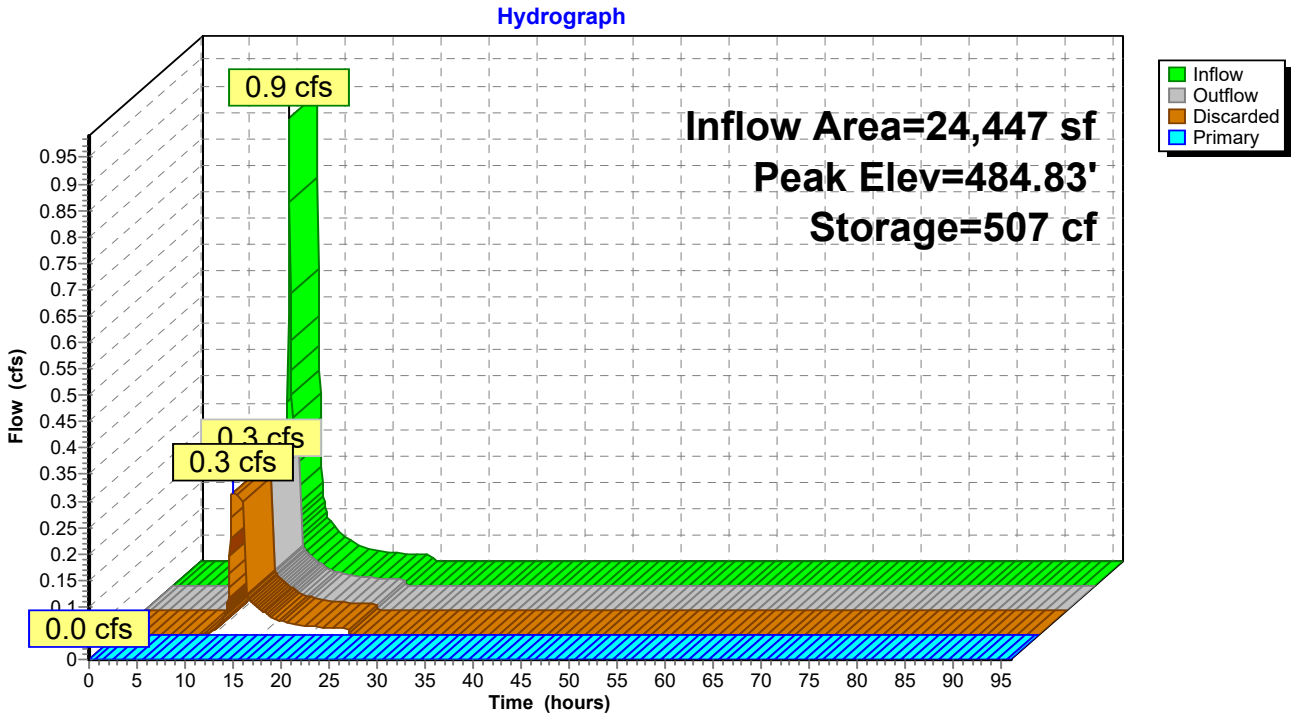
Volume	Invert	Avail.Storage	Storage Description
#1	484.61'	38 cf	**4.00'D x 3.03'H Vertical Cone/Cylinder**
#2	484.55'	495 cf	**12.0" Round Pipe Storage** x 9 Inside #3 L= 70.0'
#3	484.05'	909 cf	**18.96'W x 73.00'L x 2.00'H Prismatoid** 2,768 cf Overall - 495 cf Embedded = 2,273 cf x 40.0% Voids
		1,442 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	486.58'	**1.0" x 5.0" Horiz. Orifice/Grate X 11.00 columns** X 2 rows C= 0.600 in 18.0" x 25.7" Grate (24% open area) Limited to weir flow at low heads
#2	Discarded	484.05'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.3 cfs @ 12.15 hrs HW=484.62' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=484.05' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 3P: P 3P


Hydrograph
Inflow Area=24,447 sf
Peak Elev=484.83'
Storage=507 cf
0.9 cfs
0.3 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Summary for Pond P 4P: P 4P

Inflow Area = 5,718 sf,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 0.6 cfs @ 12.09 hrs, Volume= 2,175 cf
Outflow = 0.1 cfs @ 12.05 hrs, Volume= 2,175 cf, Atten= 76%, Lag= 0.0 min
Discarded = 0.1 cfs @ 12.05 hrs, Volume= 2,175 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond P 3P : P 3P

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 484.18' @ 12.47 hrs Surf.Area= 749 sf Storage= 445 cf

Plug-Flow detention time= 15.3 min calculated for 2,174 cf (100% of inflow)
Center-of-Mass det. time= 15.5 min (764.2 - 748.7)

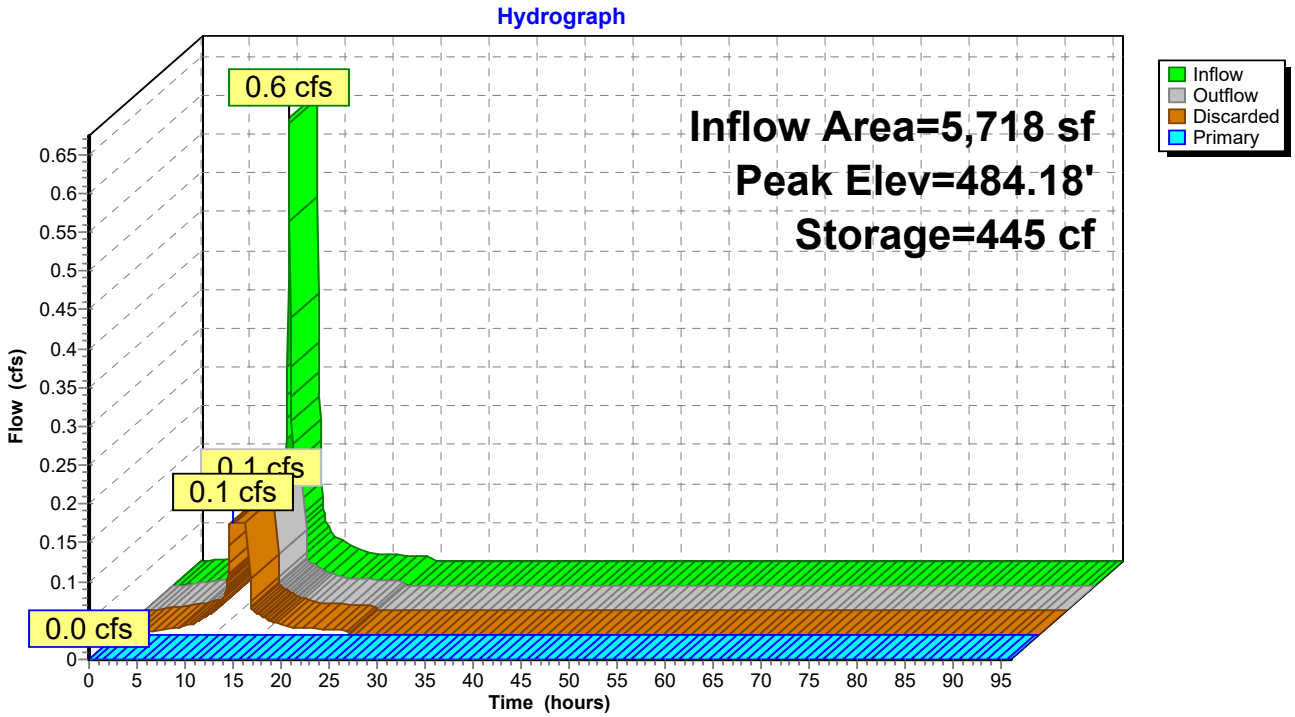
Volume	Invert	Avail.Storage	Storage Description
#1	483.50'	4 cf	**1.00'D x 5.51'H Vertical Cone/Cylinder**
#2	483.50'	353 cf	**18.0" Round Pipe Storage** x 4 Inside #3 L= 50.0'
#3	483.00'	607 cf	**13.60'W x 55.00'L x 2.50'H Prismatoid** 1,870 cf Overall - 353 cf Embedded = 1,517 cf x 40.0% Voids
		964 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	489.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	483.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 12.05 hrs HW=483.55' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=483.00' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 4P: P 4P

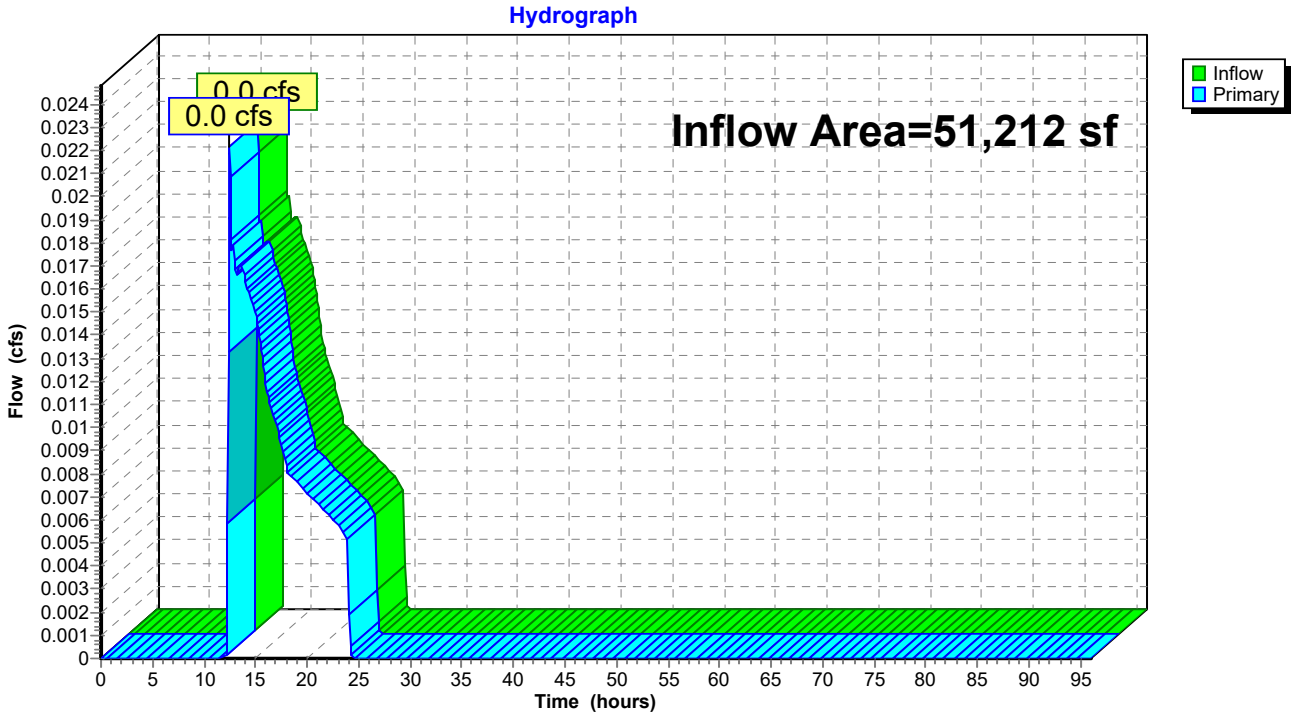

Hydrograph
Inflow Area=5,718 sf
Peak Elev=484.18'
Storage=445 cf
0.6 cfs
0.1 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95

Summary for Link P 1L: P 1L

Inflow Area = 51,212 sf, 39.82% Impervious, Inflow Depth = 0.10" for 10-Year event
Inflow = 0.0 cfs @ 12.48 hrs, Volume= 430 cf
Primary = 0.0 cfs @ 12.48 hrs, Volume= 430 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link P 1L: P 1L



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P 1S: Subcat P 1S Runoff Area=26,765 sf 6.62% Impervious Runoff Depth=0.84"
Tc=6.0 min CN=40 Runoff=0.3 cfs 1,878 cf

Subcatchment P 2S: Subcat P 2S Runoff Area=4,020 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,265 cf

Subcatchment P 3S: Subcat P 3S Total Runoff Area=14,709 sf 60.39% Impervious Runoff Depth=4.15"
Tc=6.0 min CN=75 Runoff=1.6 cfs 5,086 cf

Subcatchment P 4S: Subcat P 4S Runoff Area=5,718 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=0.9 cfs 3,222 cf

Pond P 2P: P 2P Peak Elev=486.41' Storage=508 cf Inflow=0.6 cfs 2,265 cf
Discarded=0.1 cfs 2,264 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 2,264 cf

Pond P 3P: P 3P Peak Elev=486.66' Storage=1,430 cf Inflow=1.6 cfs 5,086 cf
Discarded=0.3 cfs 5,035 cf Primary=0.3 cfs 51 cf Outflow=0.6 cfs 5,086 cf

Pond P 4P: P 4P Peak Elev=485.11' Storage=843 cf Inflow=0.9 cfs 3,222 cf
Discarded=0.1 cfs 3,223 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 3,223 cf

Link P 1L: P 1L Inflow=0.5 cfs 1,929 cf
Primary=0.5 cfs 1,929 cf

Total Runoff Area = 51,212 sf Runoff Volume = 12,451 cf Average Runoff Depth = 2.92"
60.18% Pervious = 30,818 sf 39.82% Impervious = 20,394 sf

Summary for Subcatchment P 1S: Subcat P 1S

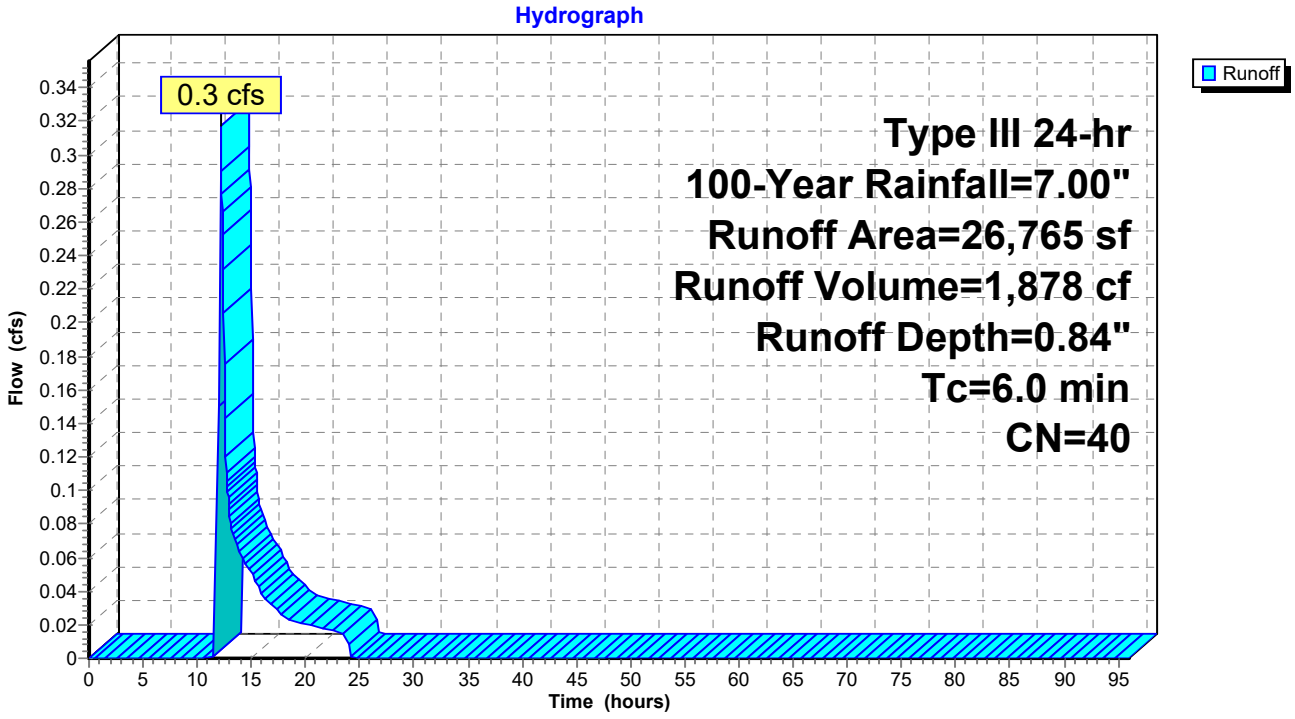
Runoff = 0.3 cfs @ 12.15 hrs, Volume= 1,878 cf, Depth= 0.84"
Routed to Link P 1L : P 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
16,940	39	>75% Grass cover, Good, HSG A
3,076	30	Meadow, non-grazed, HSG A
1,773	98	Paved parking, HSG A
239	36	Woods, Fair, HSG A
4,737	30	Woods, Good, HSG A
26,765	40	Weighted Average
24,992		93.38% Pervious Area
1,773		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 1S: Subcat P 1S



Summary for Subcatchment P 2S: Subcat P 2S

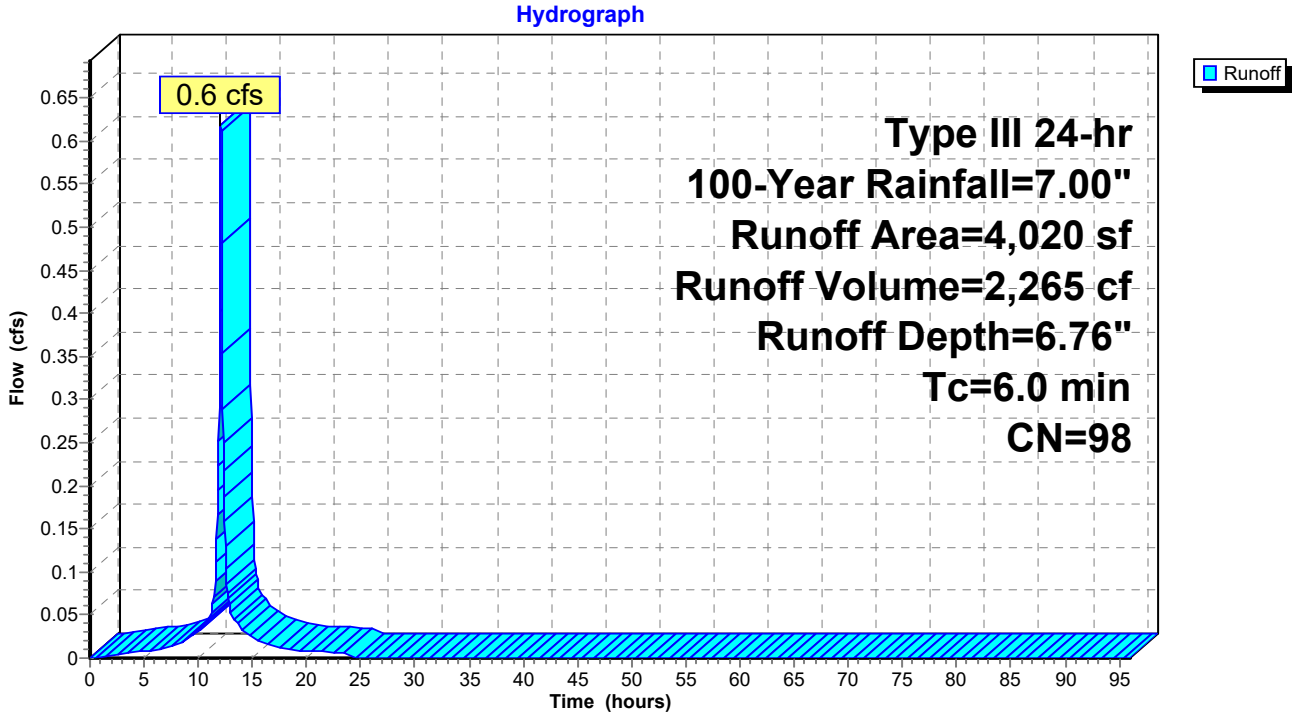
Runoff = 0.6 cfs @ 12.09 hrs, Volume= 2,265 cf, Depth= 6.76"
Routed to Pond P 2P : P 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
4,020	98	Roofs, HSG A
4,020		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 2S: Subcat P 2S



Summary for Subcatchment P 3S: Subcat P 3S Total

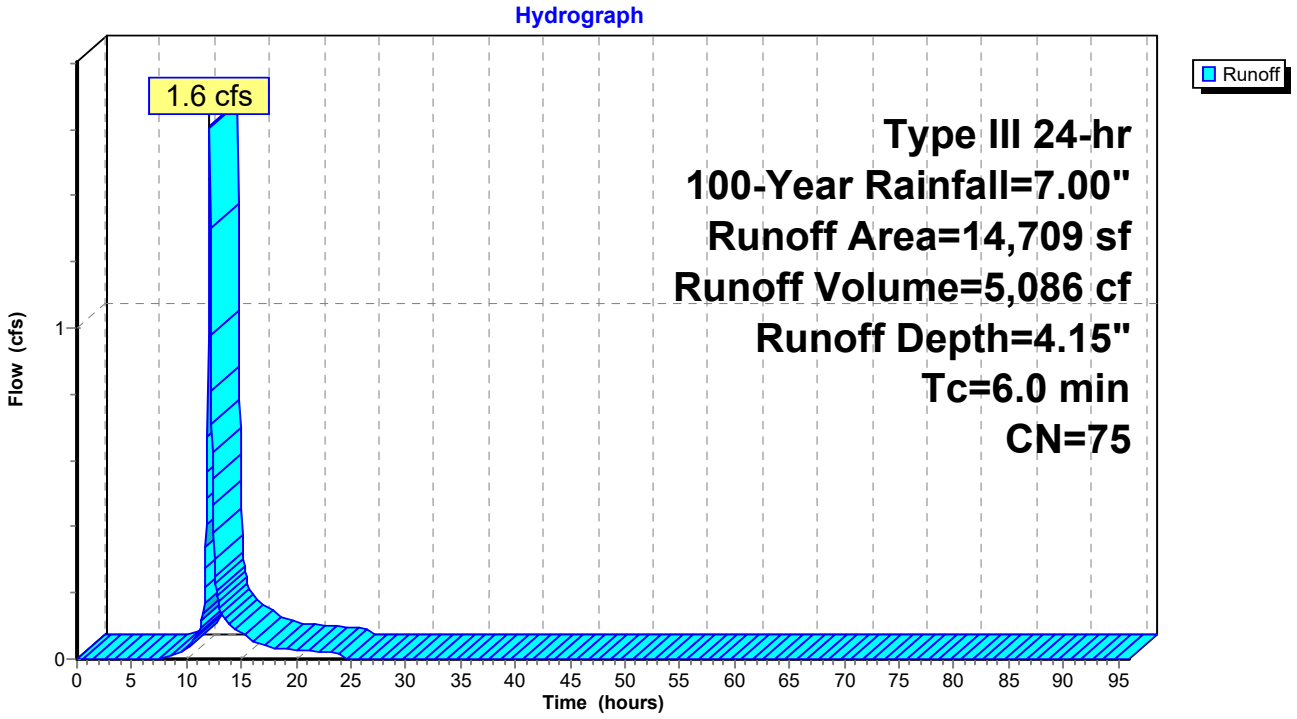
Runoff = 1.6 cfs @ 12.09 hrs, Volume= 5,086 cf, Depth= 4.15"
Routed to Pond P 3P : P 3P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
2	98	Paved parking, HSG A
44	39	>75% Grass cover, Good, HSG A
5,280	98	Paved parking, HSG A
1,143	98	Paved parking, HSG A
2,458	98	Paved parking, HSG A
1,049	39	>75% Grass cover, Good, HSG A
4,733	39	>75% Grass cover, Good, HSG A
14,709	75	Weighted Average
5,826		39.61% Pervious Area
8,883		60.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 3S: Subcat P 3S Total



Summary for Subcatchment P 4S: Subcat P 4S

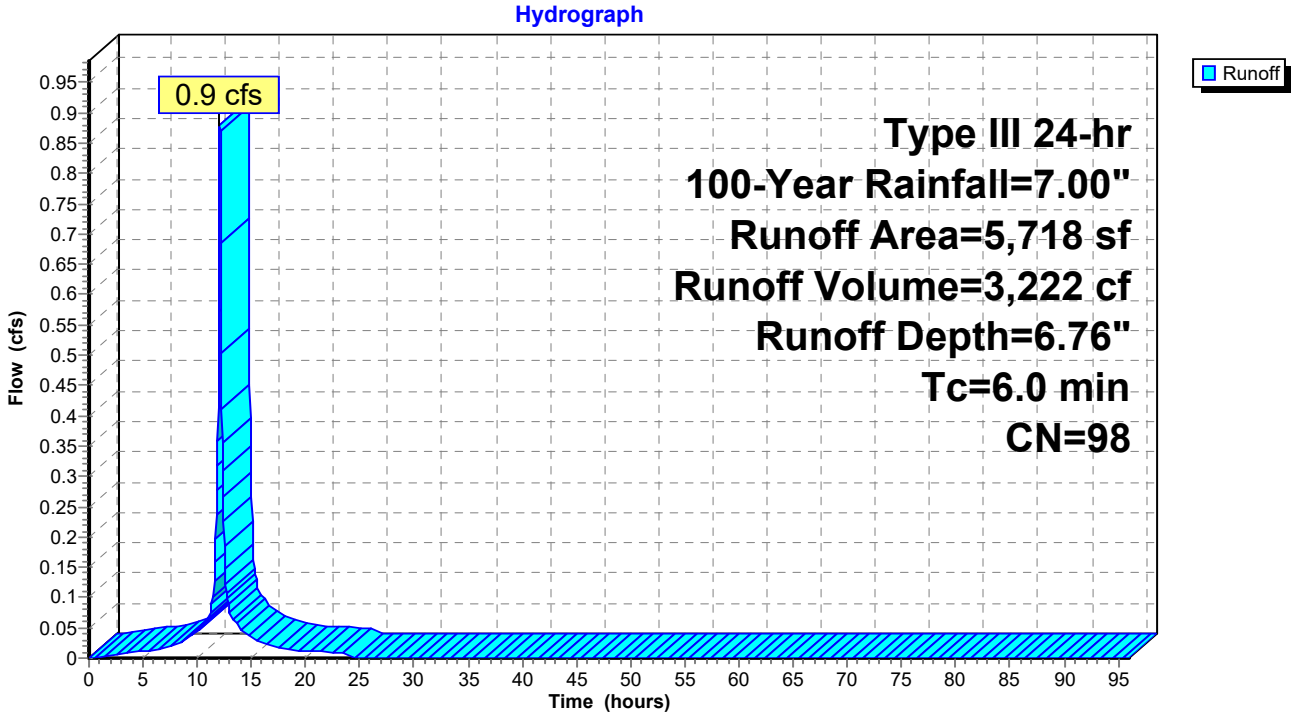
Runoff = 0.9 cfs @ 12.09 hrs, Volume= 3,222 cf, Depth= 6.76"
Routed to Pond P 4P : P 4P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
5,718	98	Roofs, HSG A
5,718		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment P 4S: Subcat P 4S



Summary for Pond P 2P: P 2P

Inflow Area = 4,020 sf,100.00% Impervious, Inflow Depth = 6.76" for 100-Year event
Inflow = 0.6 cfs @ 12.09 hrs, Volume= 2,265 cf
Outflow = 0.1 cfs @ 12.05 hrs, Volume= 2,264 cf, Atten= 80%, Lag= 0.0 min
Discarded = 0.1 cfs @ 12.05 hrs, Volume= 2,264 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond P 3P : P 3P

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 486.41' @ 12.51 hrs Surf.Area= 661 sf Storage= 508 cf

Plug-Flow detention time= 20.0 min calculated for 2,264 cf (100% of inflow)
Center-of-Mass det. time= 19.8 min (762.8 - 743.0)

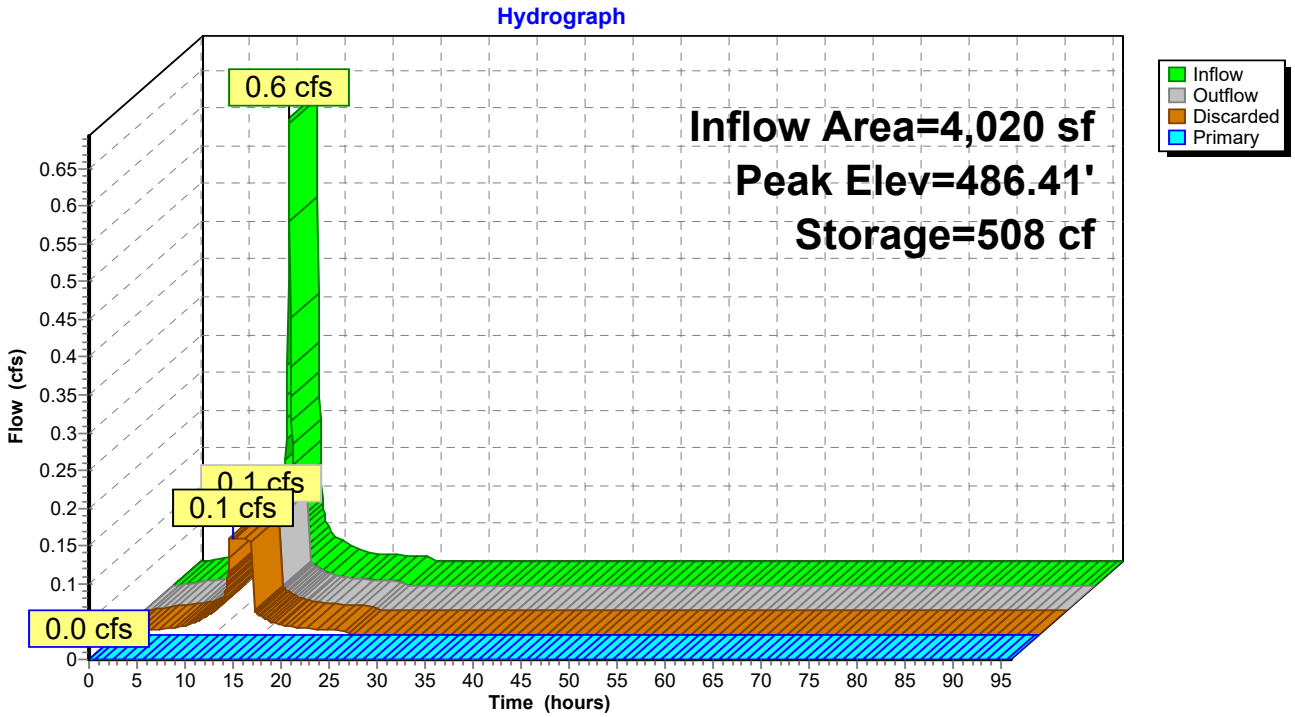
Volume	Invert	Avail.Storage	Storage Description
#1	485.50'	2 cf	**1.00'D x 2.71'H Vertical Cone/Cylinder**
#2	485.50'	236 cf	**12.0" Round Pipe Storage** x 5 Inside #3 L= 60.0'
#3	485.00'	434 cf	**10.48'W x 63.00'L x 2.00'H Prismatoid** 1,320 cf Overall - 236 cf Embedded = 1,085 cf x 40.0% Voids
		672 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	488.20'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	485.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 12.05 hrs HW=485.66' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=485.00' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 2P: P 2P


Hydrograph
Inflow Area=4,020 sf
Peak Elev=486.41'
Storage=508 cf
0.6 cfs
0.1 cfs
0.1 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95

Summary for Pond P 3P: P 3P

Inflow Area = 24,447 sf, 76.17% Impervious, Inflow Depth = 2.50" for 100-Year event
Inflow = 1.6 cfs @ 12.09 hrs, Volume= 5,086 cf
Outflow = 0.6 cfs @ 12.50 hrs, Volume= 5,086 cf, Atten= 66%, Lag= 24.5 min
Discarded = 0.3 cfs @ 12.05 hrs, Volume= 5,035 cf
Primary = 0.3 cfs @ 12.50 hrs, Volume= 51 cf
Routed to Link P 1L : P 1L

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 486.66' @ 12.49 hrs Surf.Area= 1,397 sf Storage= 1,430 cf

Plug-Flow detention time= 33.9 min calculated for 5,084 cf (100% of inflow)
Center-of-Mass det. time= 33.9 min (853.6 - 819.7)

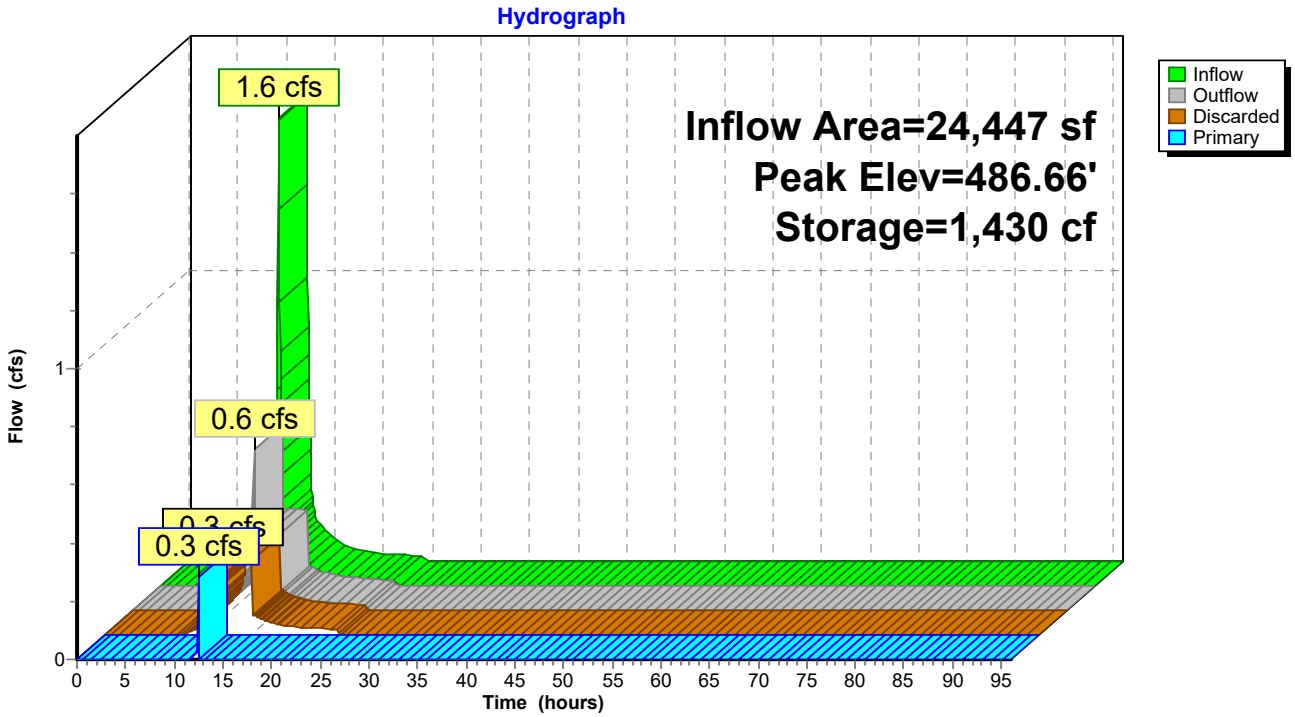
Volume	Invert	Avail.Storage	Storage Description
#1	484.61'	38 cf	**4.00'D x 3.03'H Vertical Cone/Cylinder**
#2	484.55'	495 cf	**12.0" Round Pipe Storage** x 9 Inside #3 L= 70.0'
#3	484.05'	909 cf	**18.96'W x 73.00'L x 2.00'H Prismatoid** 2,768 cf Overall - 495 cf Embedded = 2,273 cf x 40.0% Voids
		1,442 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	486.58'	**1.0" x 5.0" Horiz. Orifice/Grate X 11.00 columns** X 2 rows C= 0.600 in 18.0" x 25.7" Grate (24% open area) Limited to weir flow at low heads
#2	Discarded	484.05'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.3 cfs @ 12.05 hrs HW=484.78' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.3 cfs @ 12.50 hrs HW=486.63' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.3 cfs @ 0.74 fps)

Pond P 3P: P 3P


Hydrograph
1.6 cfs
0.6 cfs
0.3 cfs
Inflow Area=24,447 sf
Peak Elev=486.66'
Storage=1,430 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95
Time (hours)

Summary for Pond P 4P: P 4P

Inflow Area = 5,718 sf,100.00% Impervious, Inflow Depth = 6.76" for 100-Year event
Inflow = 0.9 cfs @ 12.09 hrs, Volume= 3,222 cf
Outflow = 0.1 cfs @ 11.95 hrs, Volume= 3,223 cf, Atten= 84%, Lag= 0.0 min
Discarded = 0.1 cfs @ 11.95 hrs, Volume= 3,223 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond P 3P : P 3P

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 485.11' @ 12.56 hrs Surf.Area= 749 sf Storage= 843 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 32.4 min (775.3 - 743.0)

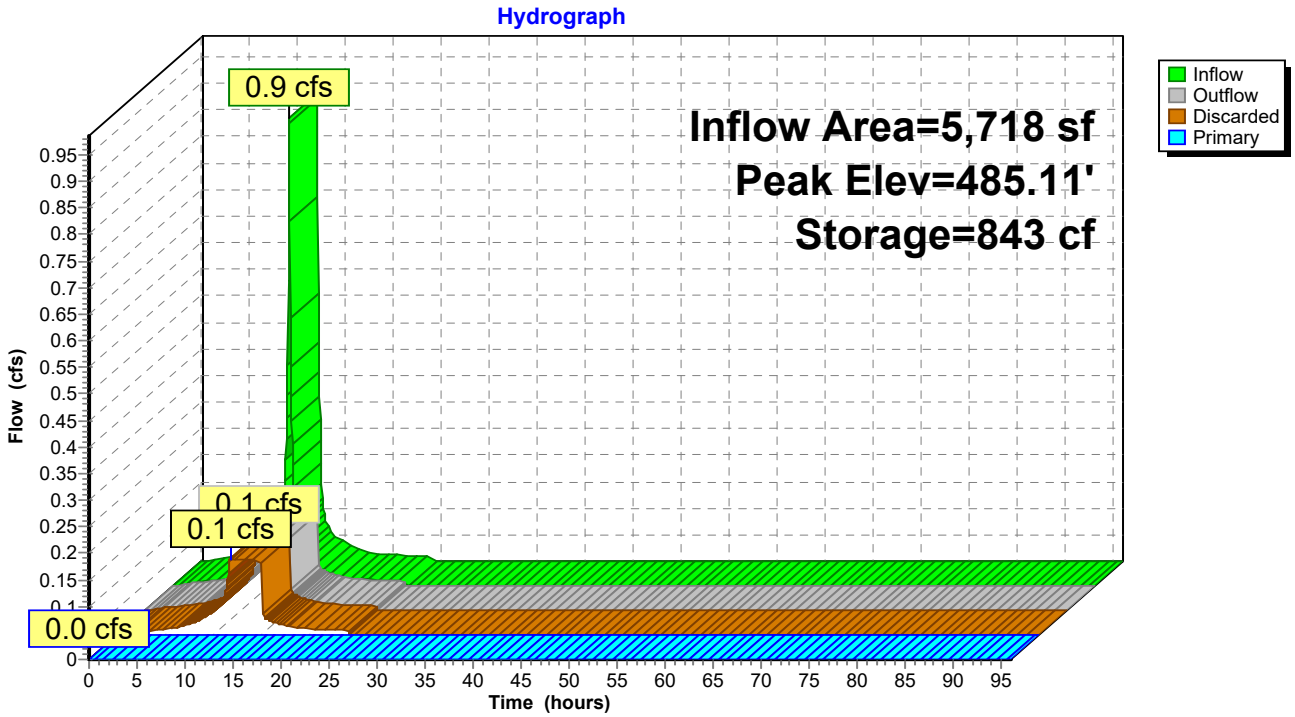
Volume	Invert	Avail.Storage	Storage Description
#1	483.50'	4 cf	**1.00'D x 5.51'H Vertical Cone/Cylinder**
#2	483.50'	353 cf	**18.0" Round Pipe Storage** x 4 Inside #3 L= 50.0'
#3	483.00'	607 cf	**13.60'W x 55.00'L x 2.50'H Prismatoid** 1,870 cf Overall - 353 cf Embedded = 1,517 cf x 40.0% Voids
		964 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	489.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	483.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 11.95 hrs HW=483.55' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=483.00' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.0 cfs)

Pond P 4P: P 4P

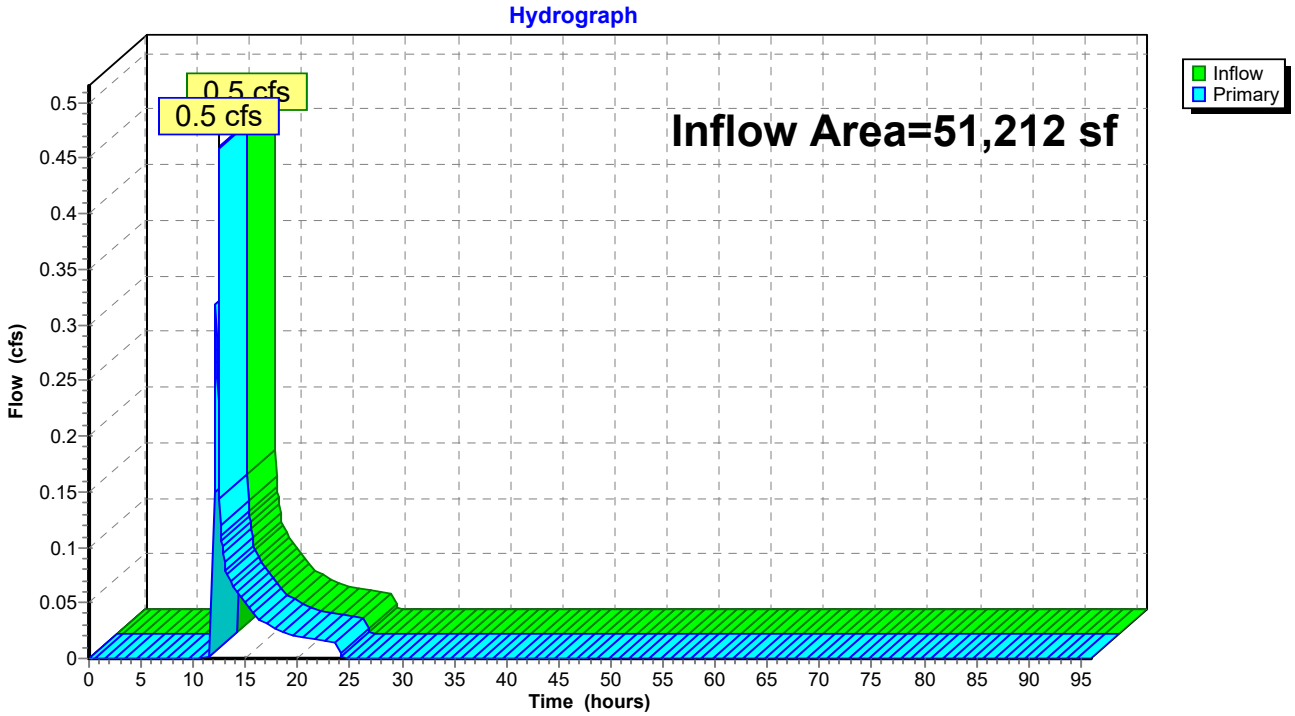

Hydrograph
Inflow Area=5,718 sf
Peak Elev=485.11'
Storage=843 cf
0.9 cfs
0.1 cfs
0.1 cfs
0.0 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75 0.8 0.85 0.9 0.95
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95

Summary for Link P 1L: P 1L

Inflow Area = 51,212 sf, 39.82% Impervious, Inflow Depth = 0.45" for 100-Year event
Inflow = 0.5 cfs @ 12.50 hrs, Volume= 1,929 cf
Primary = 0.5 cfs @ 12.50 hrs, Volume= 1,929 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link P 1L: P 1L



C) Water Quality Calculations (Standards 3, 4, 5, 6 & 7)

The proposed stormwater management system is comprised of pervious areas, a trench drain, roof drains, a water quality unit, and three subsurface infiltration systems.

Standard 3)

The Project results in an increase in impervious area of about 15,077 S.F. however accounts for about twice the required recharge volume for the 20,394 S.F. paved access drive, roof areas, and driveways thereby meeting the recharge requirements. Stormwater runoff from the site is pretreated and then directed to the infiltration systems to provide recharge.

Standard 4)

The Project results in an increase in impervious area of about 15,077 S.F. however proposed TSS removal accounts for a water quality volume for the 29,394 S.F. paved access drive, roof areas, and driveways thereby meeting the water quality volume requirements. The site stormwater system provides water quality volume in the water quality structure and below the overflow outlet from the subsurface detention/ infiltration systems.

Standard 5)

This Standard is not applicable.

Standard 6)

This Standard is not applicable.

Standard 7)

The Project is a mix of new and redevelopment. The stormwater management system has been designed to fully comply with all ten Standards.

No Information on This Page

MassDEP Stormwater Standard 3 Project: 40 Highland Avenue Date: Apr-24
TSS Removal Project No: 21--0089 Page: C-2

Critical Area - Yes or No No

BMP Name	TSS Removal Rate	Starting TSS	Amount Removed	Remaining Load
Sump	25%	100%	25%	75%
CDS Unit	50%	75%	38%	38%
Infiltration	80%	38%	30%	8%
	0%	8%	0%	8%
	0%	8%	0%	8%
		Total TSS Remaining:	8%	**OK**

MassDEP Stormwater Standard 3 | Project: 40 Highland Avenue | Date: Apr-24
Recharge Volume | Project No: 21--0089 | Page: C-3

Critical Area - Yes or No No

Note: No credit for existing impervious areas was taken for the recharge calculations.

Impervious Area	Area (S.F.)	Soil	Depth (inches)	Volume (C.F.)
P 2S	4,020	A	0.60	201.0
P 3S	8,883	A	0.60	444.2
P 4S	5,718	A	0.60	285.9

Total Area 18,621 S.F. Volume Required **931.1** C.F.

Capture Area Adjustment

To Recharge Facility	Area (S.F.)		
P 1S	1,773	Volume Required	**1029.0** C.F.

Volume Provided below lowest invert (Static Method)

BMP			
P 2P	672	C.F.	(See Stormwater Report)
P 3P	1429	C.F.	(See Stormwater Report)
P 4P	964	C.F.	(See Stormwater Report)

Volume Provided: 3065.0 C.F. OK

MassDEP Stormwater Standard 3 | Project: 40 Highland Avenue | Date: Apr-24
Water Quality Volume | Project No: 21--0089 | Page: C-4

Critical Area - Yes or No | Yes | (Note: Not a Critical Area, however the 1" was used for documentation

Watershed (Subcatchment)	Impervious Area (S.F.)	Required Depth (inches)	Required Volume (C.F.)
P 1S	1,773	1.00	147.8
P 2S	4,020	1.00	335.0
P 3S	8,883	1.00	740.3
P 4S	5,718	1.00	476.5

Total Area: 20,394 | Volume Required: 1699.5

Volume Provided (per HydroCAD)

BMP			
P 2P	672	C.F.	(See Stormwater Report)
P 3P	1429	C.F.	(See Stormwater Report)
P 4P	964	C.F.	(See Stormwater Report)

Volumes reported are below lowest invert (Static Method)

Volume Provided 3065.0 C.F. **OK**

No Information on This Page

D) Construction Period Pollution Prevention Plan, Long-Term Pollution Prevention Plan, and Long-Term Operations & Maintenance Plan (Standards 8, 9 & 10)

Standards 8 & 9)

The owner is responsible for implementation of the Construction Period Pollution Prevention Plan, the Long-Term Operation & Maintenance Plan, and the Long-Term Pollution Prevention Plan for 40 Highland Avenue in Needham, Massachusetts.

The site work will result in more than one (1) acre of disturbance, therefore NPDES requirements of the Construction General Permit are applicable and a SWPPP is required. A SWPPP will be prepared prior to the start of construction once a contractor has been selected.

The stormwater management system for 40 Highland Avenue is comprised of pervious areas, roof drains, trench drains, drain manholes, and three subsurface infiltration systems. Only stormwater may be discharged through these facilities, there shall be no connections of floor drains and/or sanitary connections. Refer to the following pages for specific requirements to prevent pollution and the maintenance of the stormwater management system.

Standard 10)

No illicit connections to the stormwater management system are known or proposed. Sanitary wastewater will be discharged to an onsite sewage disposal system designed in accordance with 310 CMR 15 (Title 5) and industrial wastewater will be collected in holding tanks in accordance with 314 CMR 18.

No Information on This Page

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency (major storms being ½" of rain or more)	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Natural Buffer	Daily	These areas are beyond the Limit of Work and are to be protected. Replace Limit of Work demarcation (flagging, berms/dikes, fencing or ECB's) when deteriorated. Should infringement into Natural Buffers occur, take corrective action immediately and implement mitigation measures (seeding, planting of native trees or shrubs) to restore Natural Buffers.		
Erosion Control Barriers (ECB)	Weekly and after major storms	Remove sediment before it has accumulated to one-half of the above-ground height of ECB's. Replace ECB's before they have deteriorated/decomposed to half their original height or every twelve (12) months, whichever comes first. Sediments to be removed and disposed of above the ECB line in an area to be stabilized later. Fabric to be disposed of offsite. Natural liners and wooden stakes may be left to decompose.		
Silt-sacks	Weekly and after major storms	Replace at least twice per year, or when sediment reaches two (2) inches in depth, or if flooding is observed. Dispose of materials offsite.		
Anti-tracking Pad	Daily	Replace at least one per year, or when effectiveness has diminished. Where sediment has been tracked-out offsite onto paved roads, sidewalks, or other paved areas offsite, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED.		
Equipment Storage and Refueling	Daily	Storage or refueling of construction equipment within one hundred (100) feet of any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED. Spill kits shall be readily available on site if refueling is to occur. All materials shall be disposed of offsite.		
Soil Stockpiles	Weekly and after major storms	Locate Stockpiles away from stormwater channels and conveyances. Provide ECB or Stone Check Dams around Stockpiles. Stockpiles that will remain unused for more than a month should be seeded with a quick cover crop such as Ryegrass (10-30 lbs./acres). Hosing or sweeping tracked-out		

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency (major storms being ½" of rain or more)	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Soil Stockpiles (Cont.)		sediment into any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED.		
Sediment Basins	Weekly and after major storms	Remove floatables and any accumulated debris or as soon as observed. Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition.		
Stone Check Dams	Weekly and after major storms	Remove sediment at least every other month or when sediment is six (6) inches deep.		
Dust Control	Daily	Minimizing disturbed areas and rapid seeding/stabilization of disturbed areas is the preferred option. Water or an acceptable Dust Palliative should be used on haul roads to prevent dust from emanating and leaving the site or affecting Natural Buffers.		
Outlet & Channel Protection	Weekly and after major storm events	Observe slopes downgradient of Sediment Basins for stability, integrity, and erosion and repair immediately with seed or Turf Reinforcement Mat (TRM) and seed as necessary.		

Potential Source of Pollution	Protective Measures
Reportable Spill(s)	• The Responsible Party or its representative is obligated to notify appropriate authorities of any spills of hazardous/harmful materials. • Should a spill bypass a containment device – trench drain, berm, etc. – and impact a stormwater detention or retention facility, the Responsible Party shall clean-up, mitigate and/or restore the facility to its original condition.
Lawn/Landscape Maintenance	• Clippings and yard waste shall not be disposed of in stormwater management facilities or wetland resource areas. • Pesticides and fertilizers shall only be stored on site in approved containers within a structure. • Pesticides and fertilizers shall be applied at the proper time of year in the minimal effective quantity/concentration. They should not be applied when severe rainfall events are forecast. • Use drought-tolerant species to limit watering requirements, and mulch and compost to retain soil moisture. Irrigate at appropriate times of day - early morning and late evening – for the minimal period necessary to restore soil moisture. • Pet waste shall not be disposed of in stormwater management facilities or wetland resource areas.
De-icing	• Application rates of de-icing materials shall be the minimum acceptable to adequately treat storm-specific conditions. Multiple treatments are preferred to use of excessive quantities during the initial response. • De-icing materials may not be stored on site. • Non-toxic and inert materials (sand/gravel) are preferable in areas adjacent to stormwater management facilities and wetland resource areas. For general use, calcium magnesium acetate (CMA), calcium chloride and potassium acetate are preferable to sodium chloride.
Snow Removal	• Snow shall be piled in pervious areas where melt water can infiltrate (as designated on the plan). • Snow shall not be piled within one hundred (100) feet of a wetland resource area. • Snow shall not be piled on trench drains or swales. • Management of snow shall not create a nuisance or hazard. The Responsible Party shall remove snow from site if adequate area on site is not available. • Sediments deposited in snow storage areas shall be removed each spring and disposed of offsite.

No Information on This Page

Residential Subdivision
40 Highland Avenue
Needham, MA
Owner: 40 Highland Avenue, LLC

Stormwater Management
Long Term Operation
& Maintenance Plan

LAND DESIGN COLLABORATIV

Responsible Party:

Owner or their assigns are responsible for implementation of the Long-Term Operation & Maintenance Plan and the Long-Term Pollution Prevention Plan for 40 Highland Avenue in Needham, Massachusetts.

System Components:

The stormwater management system for 40 Highland Avenue in Needham, Massachusetts is comprised of pervious areas, a trench drain, roof leaders/drains, subsurface infiltration systems, infiltration trenches, and stabilized discharge points. Only stormwater may be discharged through these facilities, there shall be no connections of floor drains and/or sanitary connections, and nothing shall be dumped into any of the System Components. The stormwater system components are shown on the attached Stormwater Management System Plan.

Trench Drain – the Trench Drain is meant to collect, but not treat, runoff from the roadway and some future driveways.

Roof Leaders/Drains – conveyances that collect and direct runoff from the two roofs towards the designated subsurface infiltration system.

Subsurface Infiltration Systems – subsurface stormwater systems meant to capture, retain, and infiltrate stormwater. Each system is made up of pipe and stone and utilizes trench drains as stabilized outlets/overflows meant to allow water to drain during periods of frozen ground or saturated conditions. The infiltration systems are to be kept free of trash and debris. No yard waste and / or landscape maintenance clippings or brush shall be disposed of in these areas. No accessory structures are permitted in these areas.

Pervious Areas / Vegetated Filter Strips – open, vegetated (turf lawns or other grasses) areas over which stormwater runoff flows slowly and in a sheeting manner. These areas are to be kept free of trash and debris. No yard waste and/or landscape maintenance clippings or brush shall be disposed of in these areas. Residents may not store vehicles or other personal items in these areas. No accessory structures are permitted in these areas.

Infiltration Trenches – open drains of crushed stone capped with pea stone for collecting and infiltration runoff from surrounding areas. No yard waste and/or landscape maintenance clippings or brush shall be disposed of in these areas. Residents may not store vehicles or other personal items in these areas. No accessory structures are permitted in these areas.

Grass Channels / Drainage Swales – shallow channels/swales lined with vegetation. Some may be lined with a turf reinforcement mat (TRM).

Illicit Connections

No illicit connections to the stormwater management system are proposed or shall be installed during construction. No future connections to the stormwater system shall be allowed without permission of the Needham DPW or other Town's issuing authorities, as applicable. The proposed townhomes will be served by a wastewater (sewer) system including pipes and manholes connecting to the Town's system in Riverside Ave.

Maintenance Schedule and Forms:

Refer to the following pages for specific requirements to prevent pollution and the maintenance of the stormwater management system.

Snow Storage / Removal:

Refer to the following pages for specific requirements on snow storage and removal.

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Street/Pavement Sweeping	Annually (March – April)	Annually (March – April). Paved areas to be swept of sediments, trash, and debris. Sediments to be removed and disposed off-site.		
Trench Drain	Monthly or per Manufacturer's Recommendation	At least twice per year, or per Manufacturer's Recommendation. Remove floatables and remove sediment when it reaches one (1) foot in depth. Dispose of debris and sediment off-site.		
Subsurface Infiltration	Monthly for first three (3) months, Quarterly and after major storm events	Twice per year or after major storm events. Camera inspection may be required. Remove debris and sediment at inlets and outlets by jetting or vactor truck. Debris and sediment must be disposed of off-site in accordance with Local, State, and Federal requirements.		
Grassed Channel / Drainage Swale	Monthly (mowing) Annually	Mow monthly during growing season. Remove sediment annually and re-seed (if necessary). Repair erosion and re-seed when necessary. Turf reinforcement mat (TRM) or rock riprap may be required.		
Infiltration Trenches	Monthly for first three (3) months, Quarterly and after major storm events	Remove any sediment and/or woody vegetation annually. Replace crushed stone if system becomes clogged as evidenced by prolonged periods of ponding.		

No Information on This Page

E) Soils Information

No Information on This Page

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Middlesex County, Massachusetts, and Norfolk and Suffolk Counties, Massachusetts

April 2, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:24,000 to 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 19, Sep 10, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

MAP LEGEND

MAP INFORMATION

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	1.0	3.6%
602	Urban land	0.7	2.4%
Subtotals for Soil Survey Area		**1.7**	**5.9%**
Totals for Area of Interest		**28.0**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	3.3	11.9%
105D	Rock outcrop-Hollis complex, 3 to 25 percent slopes	0.1	0.3%
245B	Hinckley loamy sand, 3 to 8 percent slopes	18.2	65.2%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	2.4	8.4%
602	Urban land, 0 to 15 percent slopes	2.3	8.3%
Subtotals for Soil Survey Area		**26.3**	**94.1%**
Totals for Area of Interest		**28.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They

generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: 996p
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Setting

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit

Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum
Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents, loamy
Percent of map unit: 5 percent
Hydric soil rating: No

Norfolk and Suffolk Counties, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: vkyp
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

105D—Rock outcrop-Hollis complex, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: vkxr
Elevation: 0 to 620 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 65 percent
Hollis and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Parent material: Igneous and metamorphic rock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Description of Hollis

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear

Across-slope shape: Convex
Parent material: Shallow, friable loamy ablation till

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 14 inches: gravelly fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Chatfield

Percent of map unit: 7 percent
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent
Landform: Bogs
Hydric soil rating: Yes

Whitman

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

245B—Hinckley loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svm8
Elevation: 0 to 1,430 feet
Mean annual precipitation: 36 to 53 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, kames, kame terraces, moraines, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Base slope, crest, nose slope, side slope, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 8 percent
Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Landform position (three-dimensional): Base slope, crest, nose slope, side slope, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Outwash deltas, outwash terraces, moraines, outwash plains, kame terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, head slope, side slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Base slope, crest, nose slope, side slope, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Deerfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear

Across-slope shape: Convex, concave
Hydric soil rating: No

602—Urban land, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: vkyj
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 99 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Rock outcrops

Percent of map unit: 1 percent
Hydric soil rating: Unranked

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

No Information on This Page

Commonwealth of Massachusetts
City/Town of NEEDHAM

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

40 HIGHLAND AVENUE LLC
Owner Name

234 ARNOLD ROAD
Street Address

Map/Lot #

NEWTON
City

MA
State

02459
Zip Code

B. Site Information

1. (Check one) ☑ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☑ Yes ☐ No If yes: NRCS SOIL SURVEY (Source) 245B (Soil Map Unit)

HINCKLEY LOAMY SAND
Soil Name

Soil Limitations

MATTAPAN VOLCANIC COMPLEX
Soil Parent material

Landform

3. Surficial Geological Report Available? ☑ Yes ☐ No If yes:

Year Published/Source

Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☑ No

5. Within a velocity zone? ☐ Yes ☑ No

6. Within a Mapped Wetland Area? ☐ Yes ☑ No If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): Month/Day/ Year Range: ☐ Above Normal ☑ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of MEDWAY

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 622-01 (Hole #) | 6/17/22 (Date) | AM (Time) | SUNNY 60'S (Weather) | 42.729 (Latitude) | -71.129 (Longitude:)

1. Land Use: LAWN (e.g., woodland, agricultural field, vacant lot, etc.) | Vegetation: GRASS | Surface Stones (e.g., cobbles, stones, boulders, etc.): N/A | Slope (%): 2-8%

Description of Location: _____

2. Soil Parent Material: MED. SAND | Landform: OUTWASH TERRACE | Position on Landscape (SU, SH, BS, FS, TS): BACKSLOPE

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet | Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☑ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-13"	Ap	SANDY LOAM	10YR 3/2								
13"-40"	Bw	"	10YR 5/6								
40"-90"	C	MED SAND	2.5Y 3/3	75"	7.5YR 5/8	5%					

Additional Notes:
NO GROUNDWATER, NO SEEPAGE
NO STONES

Commonwealth of Massachusetts
City/Town of MEDWAY

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: 622-02 (Hole #) 6/17/22 (Date) 1PM (Time) SUNNY 60'S (Weather) 42.729 (Latitude) -71.128 (Longitude:)

1. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) MAPLES (Vegetation) N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.) 1-5% (Slope (%)

Description of Location:

2. Soil Parent Material: FINE SAND OUTWASH (Landform) TERRACE BACK SLOPE (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet; Drainage Way _____ feet; Wetlands _____ feet; Property Line _____ feet; Drinking Water Well _____ feet; Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☑ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-49"											
49-70"	Bw	SANDY LOAM	10YR 5/6								
70-105"	C	FINE SAND	5Y 6/4	70"	7.5YR 5/6	5%					LENSES OF SANDY LOAM

Additional Notes:
NO GROUNDWATER
NO SEEPAGE

Commonwealth of Massachusetts
City/Town of MEDFIELD

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: 62203 (Hole #) | 6/17/22 (Date) | 1PM (Time) | SUNNY 60S (Weather) | 42.729 (Latitude) | -71.128 (Longitude)

1. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | MAPLE, ASH (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 2-5% (Slope (%))

Description of Location: _____

2. Soil Parent Material: FINE SAND | OUTWASH TERRACE (Landform) | BACKSLOPE (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet | Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☑ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-72"	FILL										
72-79"	B/C	SANDY LOAM	10YR 5/6								
79-110"	C	FINE SAND	2.5Y 5/3	86"	7.5YR 5/6	5%					LENSES OF SANDY LOAM

Additional Notes:
NO GROUNDWATER, NO SEEPAGE, NO STONES

Commonwealth of Massachusetts
City/Town of MEDFIELD

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 6720-4 (Hole #) 6/17/22 (Date) AM (Time) SUNNY 60'S (Weather) 42.729 (Latitude) -71.128 (Longitude:)

1. Land Use WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) MAPLE, ASH (Vegetation) N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.) 2-5% (Slope (%)

Description of Location:

2. Soil Parent Material: MED. SAND OUTWASH TERRACE (Landform) BACK-SLOPE (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet; Drainage Way _____ feet; Wetlands _____ feet; Property Line _____ feet; Drinking Water Well _____ feet; Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☑ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-60"	FILL										
60-68"	Bw	SANDY LOAM	10YR 5/6								
68-96"	C	MED SAND	2.5Y 5/3	72"	7.5YR 5/8	5%					

Additional Notes:
NO GROUNDWATER, NO SEEPAGE

Commonwealth of Massachusetts
City/Town of MEDFIELD

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 6225 (Hole #) 6/17/22 (Date) AM (Time) SUNNY 60's (Weather) 42.729 (Latitude) -71.128 (Longitude:)

1. Land Use WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) MAPLE, ASH (Vegetation) N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 2-5% (Slope (%))

Description of Location:

2. Soil Parent Material: FINE SAND OUTWASH TERRACE (Landform) BACKSLOPE (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet; Drainage Way _____ feet; Wetlands _____ feet; Property Line _____ feet; Drinking Water Well _____ feet; Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☑ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-5"	FILL										
5"-80"	B	SANDY LOAM	10YR 5/6	75"	7.5YR 5/8	5%					
80"-101"	C	FINE SAND	2.5Y 3/3								COARSE

Additional Notes:
NO GROUNDWATER, NO SEEPAGE

Commonwealth of Massachusetts
City/Town of NEEDHAM

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole #_____	Obs. Hole #_____
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☑ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: VARIABLE inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☑ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: VARIABLE inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of MEDFIELD

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

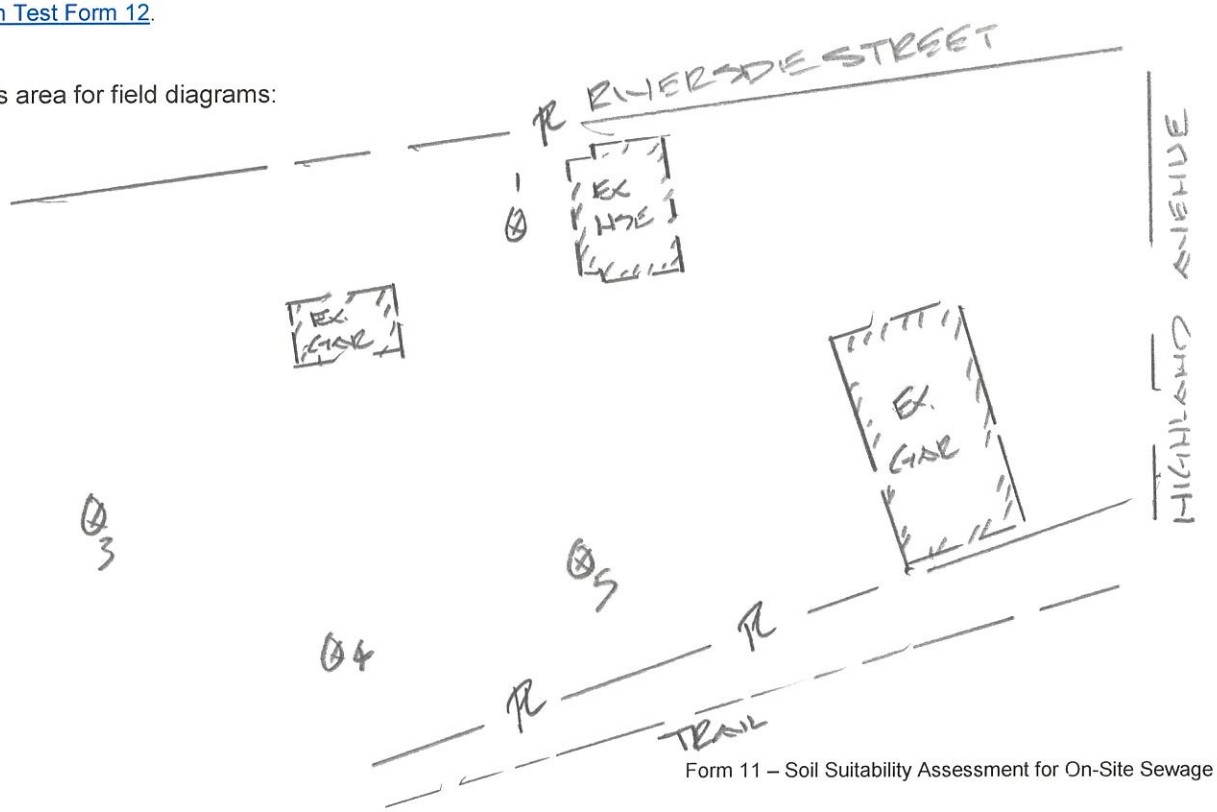
F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator	Date 6/15/22
Typed or Printed Name of Soil Evaluator / License # LAWRENCE C GREENE 2085	Expiration Date of License 6/30/22
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:



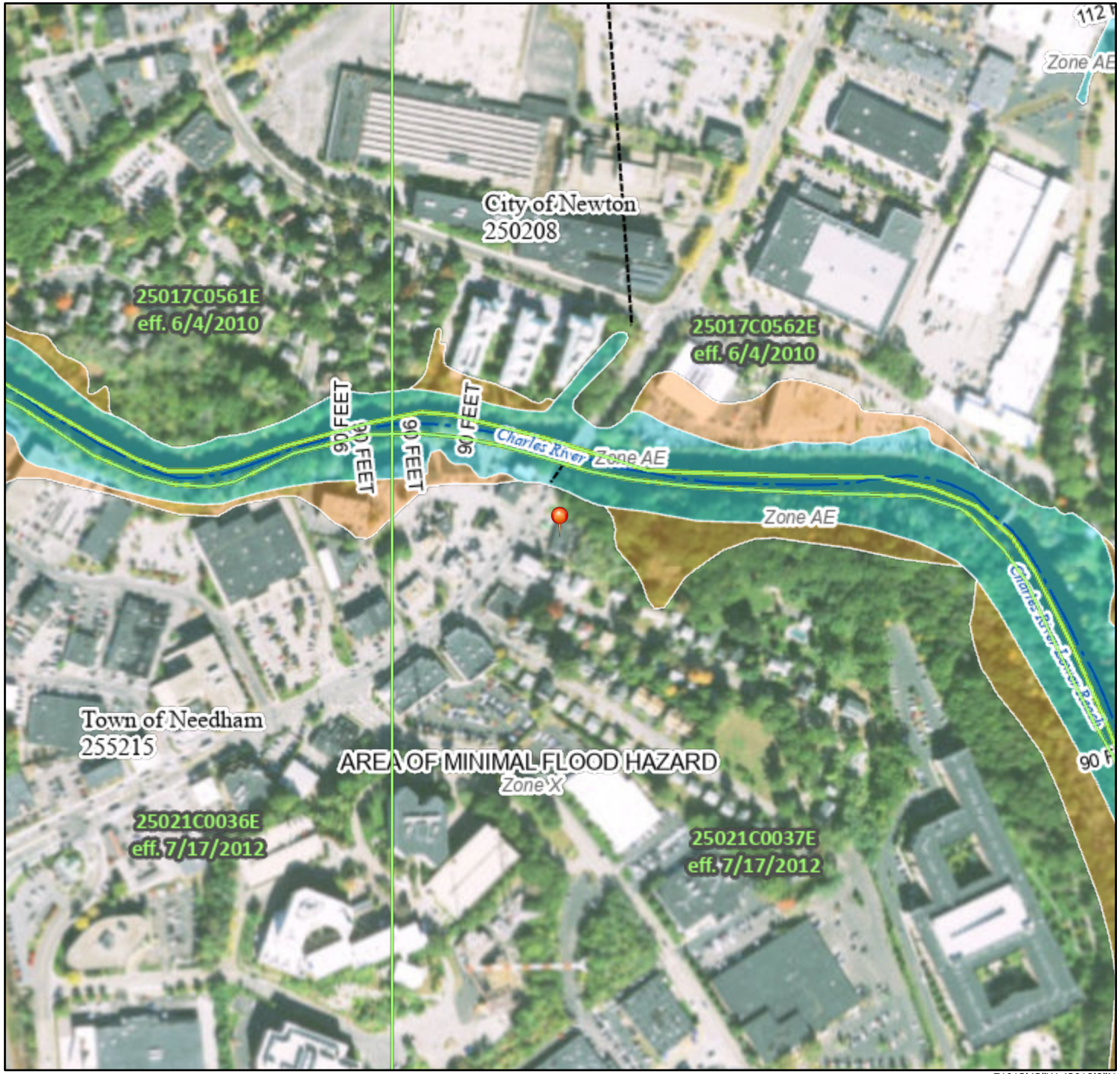
F) FEMA Flood Map, FIS Profile & LIDAR Exhibit

No Information on This Page

National Flood Hazard Layer FIRMette

FEMA

71°13'21"W 42°18'35"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

71°12'43"W 42°18'8"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

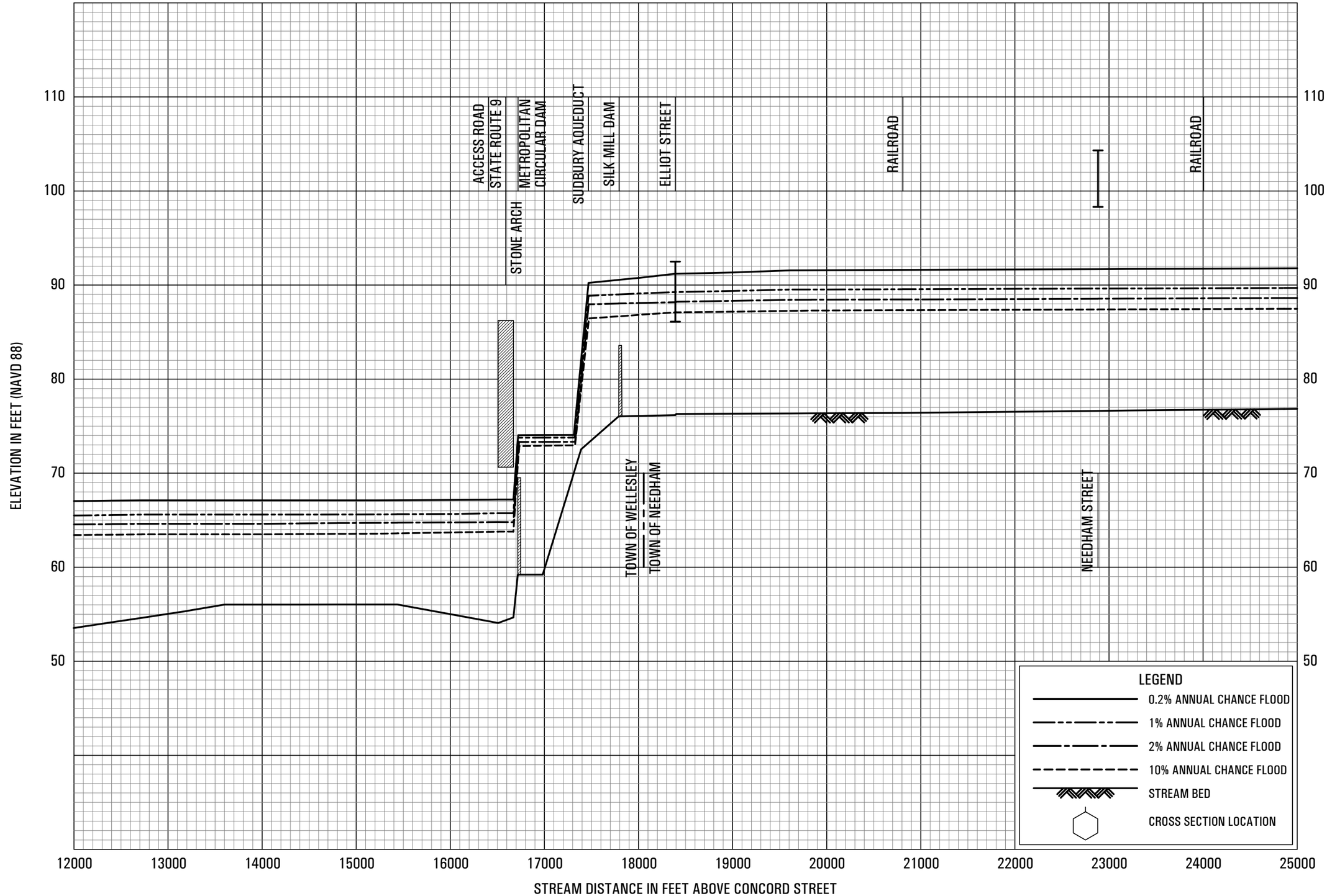
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/6/2023 at 9:49 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

No Information on This Page



FLOOD PROFILES

CHARLES RIVER (LOWER REACH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

No Information on This Page

HIGHLAND (PUBLIC – VARIABLE WIDTH) AVENUE
MASSACHUSETTS HIGHWAY LAYOUT NUMBER 8542

RIVERSIDE (PUBLIC – VARIABLE WIDTH) DRIVE

LOT 101
15,299 SF
BF=19.4

METAL FRAME BUILDING #40

2 STORY WOOD FRAME BUILDING #14-#16

LOT 102
16,302 SF
BF=13.4

LOT 103
18,486 SF
BF=16.0

PARCEL A
1,051 SF

100' BUFFER

HIGHLAND COMMENRCIAL – 128
GENERAL RESIDENCE

ZONING LINE

LIMIT OF BORDERING VEGETATED WETLANDS

LIMIT OF ACCEPTED BANK LINE

FEMA 0.2% CHANCE (500-YEAR) FLOOD ELEVATION

FEMA 1% CHANCE (100-YEAR) FLOOD ELEVATION

CHARLES RIVER

100' INNER RIPARIAN

200' OUTER RIPARIAN

96 98 95 91 93 92 94 99 97 90 100

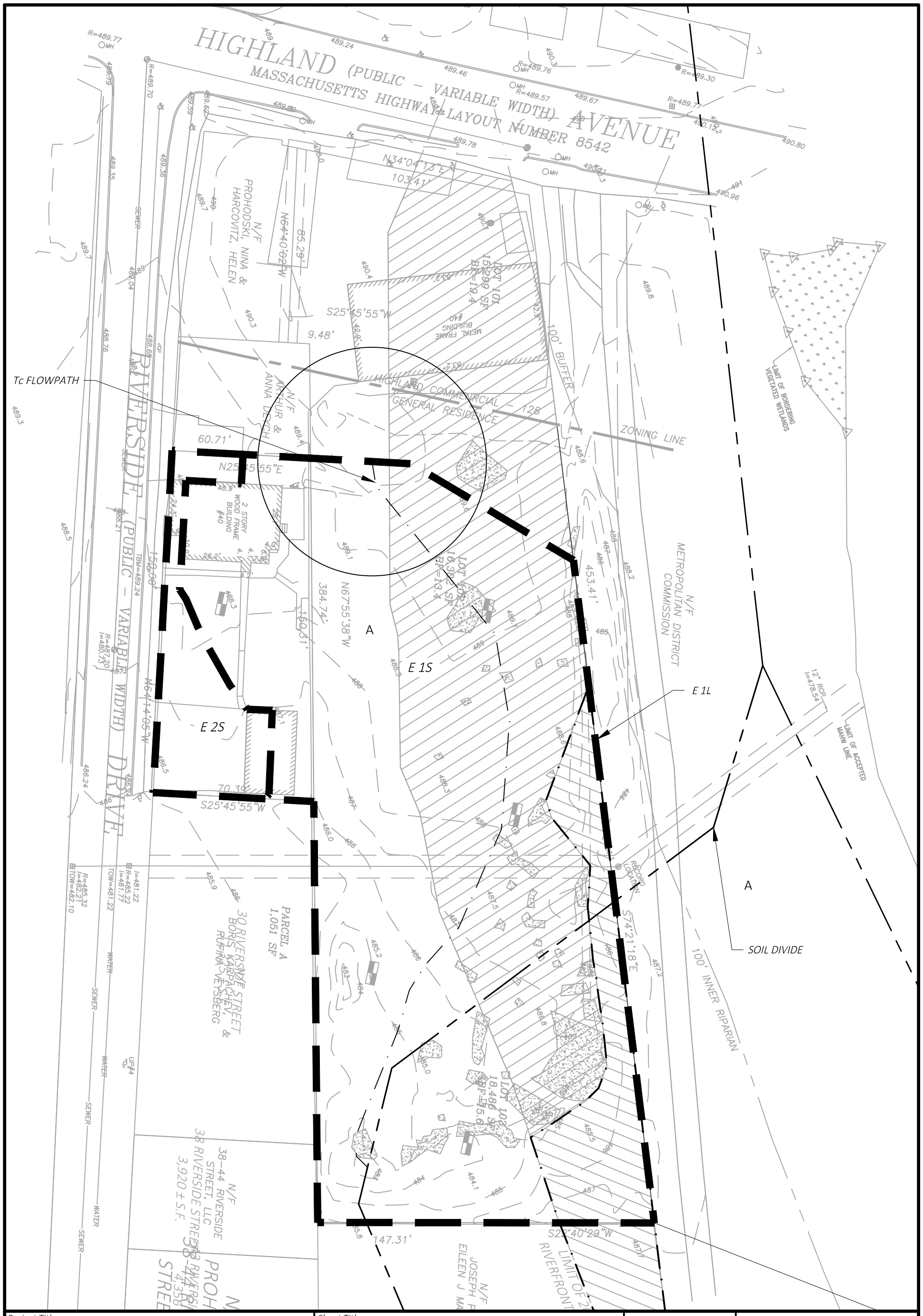
Project Title: 40 Highland Avenue, LLC Needham, MA (Norfolk County)	Sheet Title: FEMA & LIDAR Overlay 40 Highland Avenue Needham, MA (Norfolk County)			
Date: 12/07/2023	Project No.: 21-0089	Reference Plan No.: LIDAR & ILSF	Drawn By: ESM	Checked By: MJS
0 30 60 120 180 Scale: 1" = 60'			LIDAR Exhibit	

LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

No Information on This Page

G) Existing Watershed Map

No Information on This Page



Project Title: Residential Subdivision, 40 Highland Avenue, Needham, MA 02459	Sheet Title: Existing Hydrology, 40 Highland Avenue, Needham, MA (Norfolk County)			
Date: 04/01/2024	Project No.: 21-0089	Reference Plan No.: C-250	Drawn By: ESM	Checked By: MJS
0 20 40 80 120 Scale: 1" = 40'			G-2	

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H) Proposed Watershed Map

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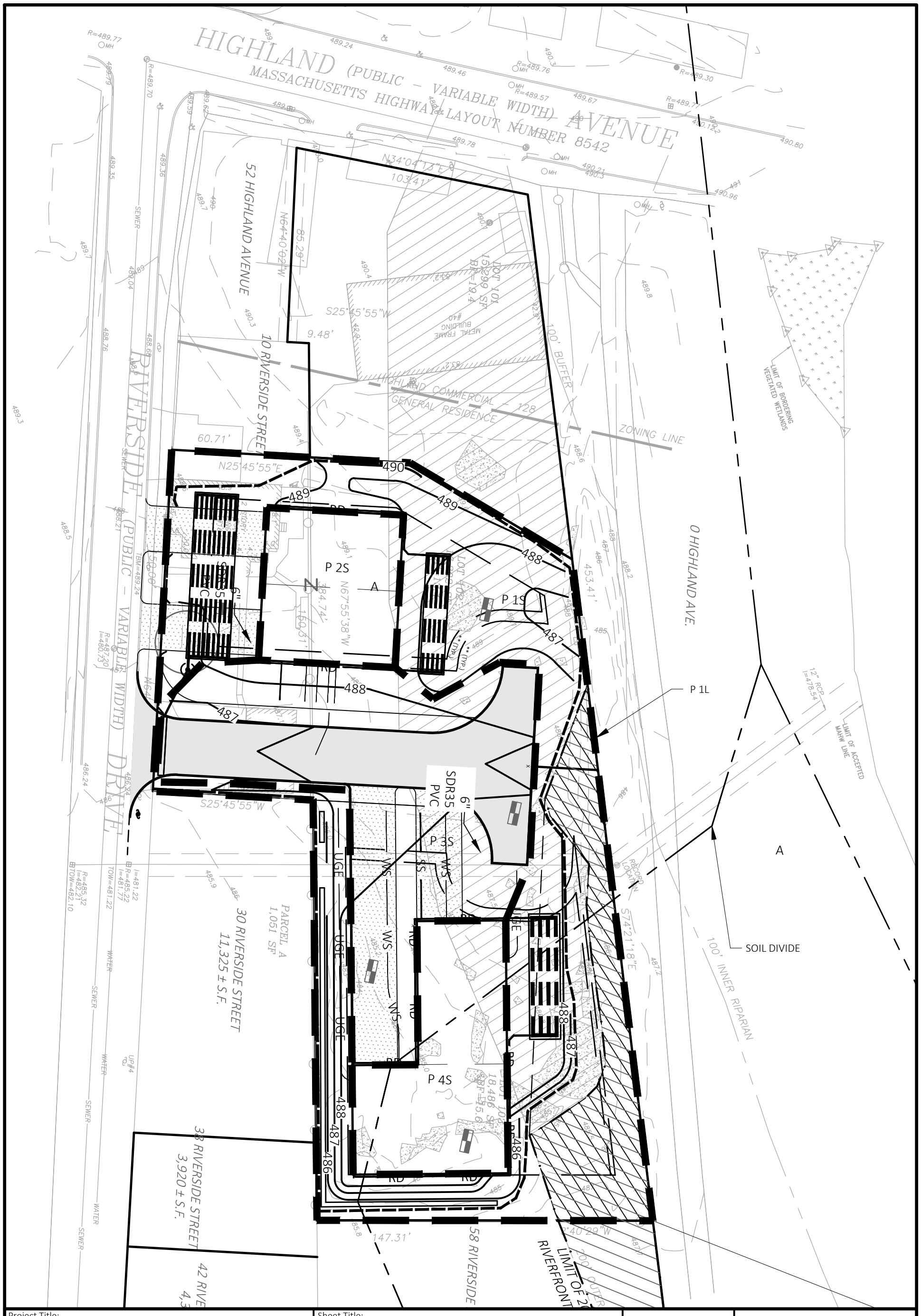

Project Title: Residential Subdivision 40 Highland Avenue Needham, MA 02459	Sheet Title: Proposed Hydrology 40 Highland Avenue Needham, MA (Norfolk County)			
Date: 04/01/2024	Project No.: 21-0089	Reference Plan No.: C-260	Drawn By: ESM	Checked By: MJS
0 20 40 80 120 Scale: 1" = 40'			H-2	

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