INSIDE OUT PAINTING AND REMODELING SITE PLAN

SP# 07-24

STAFF REPORT

March 26, 2025

SITE: 100 Lowell Road, Map 198/Lot 147-000

ZONING: Business (B)

PURPOSE OF PLAN: Development of a 6,855 square-foot commercial building to support a painting business, including a business office, and conditioned space to store materials.

PLAN UNDER REVIEW:

Commercial Development Site Plan Inside Out Painting and Remodeling SP# 07-24, Map 198 Lot 147, 100 Lowell Road, Hudson, NH; prepared by: SFC Engineering, 183 Rockingham Road Unit 3, Windham, 03087; prepared for: 100 Lowell Rd LLC, 112 Lowell Road, Suite 3, Hudson, NH 03051; consisting of 10 sheets and general notes 1-23 on Sheet 3; dated October 2, 2024, revised March 5, 2025.

ATTACHMENTS:

1) Application with associated waiver request, received October 2, 2024, revised November 1, 2024 – Attachment “**A**”.
2) Resubmission Letter, prepared by SFC Engineering – Attachment “**B**”.
3) Department Review Comments – Attachment “**C**”.
4) Traffic Impact Study (TIS), prepared by Vanasse & Associates, Inc. (VAI), dated October 1, 2024, revised November 25, 2024 – Attachment “**D**”. (Digital Only)
5) Stormwater Management Report, prepared by SFC Engineering, dated October 2, 2024, revised January 7, 2025 – Attachment “**E**”.(Digital Only)
6) Inspection & Maintenance Manual, prepared by SFC Engineering – Attachment “**F**”
7) Traffic Impact Study (TIS) peer review, prepared by Fuss & O’Neill, dated October 29, 2024 – Attachment “**G**”.
8) Peer Review #2, Prepared by Fuss & O’Neill, dated February 19, 2025 – Attachment “**H**”.
9) Comment Response Letter, prepared by SFC Engineering, dated March 5, 2025 – Attachment “**I**”.
10) CAP Fee Sheet - Attachment "**J**".
11) Site Plan dated October 2, 2024, revised March 5, 2025.

APPLICATION TRACKING:

- October 2, 2024 – Site plan application received.
- November 13, 2024 – Public Hearing held, continued to February 12, 2025.
- February 12, 2025 – Public Hearing continued to March 26, 2025.
- March 26, 2025 – Public Hearing scheduled.

WAIVERS REQUESTED:
§276-11.1.B. (9) – General Plan Requirements (Error of Closure)
§275-8.C. (2) (m) – Parking Calculations
§193-10.G – Number of Driveways
§275-8.C. (6). (b) – Loading Space Dimensions
§276-11.1.B. (12). (c) – 100' Residential Buffer

COMMENTS & RECOMMENDATIONS:

BACKGROUND

The site is approximately 0.8 acres and is located in the Business zone. The site was previously occupied by a single-family residence which was razed over a decade ago. The site is served by Town water and sewer and has pre-existing connections. No section of the property falls within FEMA designated flood zones. The site contains no wetlands, and is relatively flat within the primary buildable area. The site currently has two curb cuts, approximately located where the proposed entrance and exit drive are proposed. The applicant is seeking a total of five waivers, for which additional information may be found below.

DEPARTMENT COMMENTS

Department staff have indicated that all comments have been resolved.

Full Comments can be found in **Attachment "C."**

WAIVERS REQUESTED

As noted above, the Applicant is seeking a total of five waivers:

1. Waiver for Site Plan Scale, **§276-11.1.B.(9)–Error of Closure,** to allow the usage of PE stamped plans of bounds in lieu of a NH Licensed Surveyor, pursuant to **RSA 310-A:2-IV**. The Applicant states that the listed RSA grants permission for a PE stamp to be sufficient when bounds are not being re-drawn or altered.

2. Waiver for parking spaces, **§275-8.C. (2) (m)–Parking Calculations**, to allow for 14 parking spaces where 23 would be required. The applicant states that of the gross area, 3300 is intended for traditional office use, with the rest dedicated to material storage. The applicant notes in addition that the location is not open to customer visits or the public, and that the business only has 7 employees.

3. Waiver for number of Driveways, **§193-10.G – Number of Driveways**, to allow for two driveways where only one is allowed. Applicant states that this is pursuant to recommendations provided by the traffic engineer.

4. Waiver for the loading space dimensions, **§275-8.C.(6).(b) – Loading Space Dimensions**, to allow for a loading space of only 35' where elsewise a loading space of 60' would be required. The applicant states that a 60' loading space is not needed as the delivery trucks for the site are not full sized tractor-trailers.

5. Waiver for the 100’ residential buffer, **§276-11.1.B. (12). (c) – 100’ Residential Buffer**, to allow for development within 100’ of a residential use. The applicant states that the development within 100’ will be parking, and is 15’ below grade of the house alongside being screened by vegetation.

A waiver for **§276-11.1.B. (9)–Error of Closure** was granted at the November 13, 2024 meeting.

PEER REVIEW

Fuss & O’Neill completed a review of the proposed plan set on October 23, 2024, and a second round of review on February 19, 2025. The majority of issues outlined within the review are administrative in nature, with no major design flaws noted. (Attachment “**H**”)

Fuss & O’Neill completed a review of the Traffic Impact Study, dated October 29, 2024. (Attachment “**G**”) The applicant has provided a revised Study per these comments.

TRAFFIC STUDY

As part of their application, the applicant has supplied a traffic impact study completed by Vanasse & Associates, Inc. (VAI), dated October 1, 2024, Revised November 25, 2024. (Attachment “**D**”). In the report, VAI notes no meaningful increase in traffic on Lowell or County road, as would be expected from such a small development with no on-site service for customers. The revisions done per board, department, and peer review comments have not changed the conclusions of the report post-revision.

STORMWATER MANAGEMENT REPORT

As part of the application, a Stormwater Management Report dated October 2, 2024 has been supplied. The report was revised January 7, 2025 to accommodate changes in the catch basin and sewer design. This report concludes that no adverse downstream impacts shall occur, and that peak flow rates shall remain the same or diminish. (Attachment “**E**”)

RESPONSE LETTER

The applicant has issued a second response letter, dated March 5, 2025. Included with this letter is revised HydroCAD sheets, and a revised Inspection & Maintenance Manual per Fuss & O’Neill request. (Attachment “**I**”)

STAFF COMMENTS

Assuming that the additional waiver requests are granted, staff does not have any remaining concerns with the proposal. The application does not have any outstanding issues that are known at this time.

RECOMMENDATIONS

Staff recommends deliberation and consideration of the site plan and waiver requests prior to potential approval. Staff has not identified any outstanding issues or additional information required for the board to make an appropriate decision on this application.

DRAFT MOTIONS:

MOTION TO GRANT A WAIVER:

I move to grant a waiver **§275-8.C(2)(m)–Parking Calculations**, to allow for 14 parking spaces where 23 would be required, based on the Board's discussion, the testimony of the Applicant's representative, and in accordance with the language included in the submitted Waiver Request Form for said waiver.

Motion by: ________________Second: __________________Carried/Failed: __________________

I move to grant a waiver **§193-10.G – Number of Driveways**, to allow for two driveways where elsewise only one would be allowed, based on the Board's discussion, the testimony of the Applicant's representative, and in accordance with the language included in the submitted Waiver Request Form for said waiver.

Motion by: ________________Second: __________________Carried/Failed: __________________

I move to grant a waiver from **§275-8.C(6)(b) – Loading Space Dimensions**, to allow for a loading space of only 35' where elsewise a loading space of 60' would be required, based on the Board's discussion, the testimony of the Applicant's representative, and in accordance with the language included in the submitted Waiver Request Form for said waiver.

Motion by: ________________Second: __________________Carried/Failed: __________________

I move to grant a waiver from **§276-11.1.B(12)(c) – 100' Residential Buffer**, to allow for development within 100' of a residential use, based on the Board's discussion, the testimony of the Applicant's representative, and in accordance with the language included in the submitted Waiver Request Form for said waiver.

Motion by: ________________Second: __________________Carried/Failed: __________________

MOTION TO CONTINUE:

I move to continue the Site Plan Application for Inside Out Painting and Remodeling SP# 07-24 located at 100 Lowell Road, Hudson, New Hampshire, Map 198/Lot 147, to date certain _______________, 2025.

Motion by: ________________Second: __________________Carried/Failed: ____________________

MOTION TO APPROVE:

I move to approve the Site Plan Application: Inside Out Painting and Remodeling SP# 07-24, Map 198 / Lot 147, 100 Lowell Road, Hudson, New Hampshire; prepared by: SFC Engineering, 183 Rockingham Road Unit 3, Windham, New Hampshire 03087; prepared for: 100 Lowell Rd LLC, 112 Lowell Road, Suite 3, Hudson, New Hampshire 03051; consisting of 9 sheets and general notes 1-23 on Sheet 3; dated October 2, 2024, last revised March 5, 2025; and:

That the Planning Board finds that this application complies with the Zoning Ordinance, and with the Land Use Regulations with consideration of the waivers granted and for the reasons set forth in the written submissions, together with the testimony and factual representations made by the applicant during the public hearing;

Subject to, and revised per, the following stipulations:

1. All stipulations of approval shall be incorporated into the Development Agreement, which shall be recorded at the HCRD, together with the Plan.
2. Prior to the issuance of a final certificate of occupancy, an L.L.S. Certified "As-Built" site plan shall be provided to the Town of Hudson Land Use Department, confirming that the site conforms to the Planning Board approved Site Plan.
3. Prior to the Planning Board endorsement of the Plan, it shall be subject to final administrative review by Town Planner and Town Engineer.
4. A cost allocation procedure (CAP) amount of $17,480.25 shall be paid prior to the issuance of a Certificate of Occupancy.
5. The applicant shall schedule a pre-construction meeting with the Town Engineer prior to beginning work on the site.
6. Construction activities involving the subject lot shall be limited to the hours between 7:00 A.M. and 7:00 P.M., Monday through Saturday. No exterior construction activities shall be allowed on Sundays.
7. Hours of refuse removal shall be exclusive to the hours between 7:00 A.M. and 7:00 P.M., Monday through Friday only.

Motion by: ________________ Second: __________________ Carried/Failed: __________________

SITE PLAN APPLICATION

Date of Application: 10/2/2024 Tax Map #: 198 Lot #: 147

Site Address: 100 Lowell Road

Name of Project: Inside Out Painting and Remodeling

Zoning District: Buisness General SP#: ______ (For Town Use Only)

Z.B.A. Action: ______

PROPERTY OWNER:	DEVELOPER:
Name: 100 Lowell Rd LLC	
Address: 122 Lowell Road, Suite 3	
Address: Hudson, NH 03051	
Telephone # (781)-844-3432	
Email: dhamilton13@mac.com	

PROJECT ENGINEER:	SURVEYOR:
Name: SFC Engineering, Daniel M. Flores, PE	
Address: 183 Rockingham Road, Unit 3 East	
Address: Windham, NH 03087	
Telephone # (603) 361-3294	
Email: dflores@sfceng.com	

PURPOSE OF PLAN:
The purpose of this plan is to propose development of a 6,855 GSF commercial building for Inside Out Painting and Remodeling.

(For Town Use Only)

Routing Date: ______ Deadline Date: ______ Meeting Date: ______

______ I have no comments ______ I have comments (attach to form)

______ Title: ______ Date: ______
(Initials)

Department:

Zoning: ___ Engineering: ___ Assessor: ___ Police: ___ Fire: ___ DPW: ___ Consultant: ___

SITE DATA SHEET

PLAN NAME: Inside Out Painting and Remodeling

PLAN TYPE: SITE PLAN

LEGAL DESCRIPTION: MAP 198 LOT 147

DATE: 10/2/2024

Location by Street:	100 Lowell Road
Zoning:	Business
Proposed Land Use:	Business
Existing Use:	Vacant (previously residential)
Surrounding Land Use(s):	Commercial, Residential
Number of Lots Occupied:	1
Existing Area Covered by Building:	0
Existing Buildings to be removed:	0
Proposed Area Covered by Building:	4,500 sqft
Open Space Proposed:	18,254 sqft
Open Space Required:	13,989 sqft
Total Area:	S.F.: 34,848 Acres: 0.8
Area in Wetland:	0 Area Steep Slopes: 19,154 SF
Required Lot Size:	30,000 sqft
Existing Frontage:	171
Required Frontage:	150

Building Setbacks:	Required*	Proposed
Front:	50	135
Side:	15	16
Rear:	15	17

SITE DATA SHEET
(Continued)

Flood Zone Reference: Flood Insurance Rate Map for Town of Hudson, map number 33011C0518D with effective date of 9/25/2009

Width of Driveways: 20

Number of Curb Cuts: 2

Proposed Parking Spaces: 12

Required Parking Spaces: 12

Basis of Required Parking (Use): Business (1SP/300 SF)

Dates/Case #/Description/Stipulations of ZBA, Conservation Commission, NH Wetlands Board Actions: N/A
(Attach stipulations on separate sheet)

Waiver Requests

Town Code Reference:	*Regulation Description:*
276-11.1.B.(9)	The error of closure performed by licensed land surveyor
275-8.C.(2)(m)	Required parking quantity

(For Town Use Only)

Data Sheets Checked By: ______________________ Date: __________

SITE PLAN APPLICATION AUTHORIZATION

I hereby apply for *Site Plan* Review and acknowledge I will comply with all of the Ordinances of the Town of Hudson, New Hampshire State Laws, as well as any stipulations of the Planning Board, in development and construction of this project. I understand that if any of the items listed under the *Site Plan* specifications or application form are incomplete, the application will be considered rejected.

Pursuant to RSA 674:1-IV, the owner(s) by the filing of this application as indicated above, hereby given permission for any member of the Hudson Planning Board, the Town Planner, the Town Engineer, and such agents or employees of the Town or other persons as the Planning Board may authorize, to enter upon the property which is the subject of this application at all reasonable times for the purpose of such examinations, surveys, tests and inspections as may be appropriate. The owner(s) release(s) any claim to or right he/she (they) may now or hereafter possess against any of the above individuals as a result of any examinations, surveys, tests and/or inspections conducted on his/her (their) property in connection with this applications.

Signature of Owner: ________________ Date: 10/01/24

Print Name of Owner: 100 Lowell Rd LLC

❖ If other than an individual, indicate name of organization and its principal owner, partners, or corporate officers.

Signature of Developer: ________________ Date: ________

Print Name of Developer: ________________

❖ The developer/individual in charge must have control over all project work and be available to the Code Enforcement Officer/Building Inspector during the construction phase of the project. The individual in charge of the project must notify the Code Enforcement Officer/Building Inspector within two (2) working days of any change.

SCHEDULE OF FEES

A. REVIEW FEES:

1. **Site Plan Use** — **Project Size/Fee**

Site Plan Use	Project Size/Fee	
Multi-Family	$105.00/unit for 3-50 units $78.50/unit for each additional unit over 50	$____________
Commercial/Semi Public/Civic or Recreational	$157.00/1,000 sq. ft. for first 100,000 sq.ft. (bldg. area): $78.50/1,000 sq.ft. thereafter.	$ 1076.23
Industrial	$150.00/1,000 sq.ft for first 100,000 sq.ft. (bldg. area); $78.50/1,000 sq.ft thereafter.	$____________
No Buildings	$30.00 per 1,000 sq.ft. of proposed developed area	$____________

CONSULTANT REVIEW FEE: (Separate Check)

Total 0.8 acres @ $600.00 per acre, or $1,250.00, whichever is greater. $ $1,250

This is an estimate for cost of consultant review. The fee is expected to cover the amount. A complex project may require additional funds. A simple project may result in a refund.

LEGAL FEE:

The applicant shall be charged attorney costs billed to the Town for the Town's attorney review of any application plan set documents.

B. POSTAGE:

7 Direct Abutters Applicant, Professionals, etc. as required by RSA 676:4.1.d @$5.08 **(or Current Certified Mail Rate)** $ 35.56

8 Indirect Abutters (property owners within 200 feet) @$0.68 **(or Current First Class Rate)** $ 5.44

C. TAX MAP UPDATING FEE: (FLAT FEE) $ 275.00

TOTAL $ 2,642.23

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Inside Out Painting and Remodeling

Street Address: 100 Lowell Road

I Daniel M. Flores, P.E. hereby request that the Planning Board waive the requirements of item 276-11.1.B.(9) of the Hudson Land Use Regulations in reference to a plan presented by SFC Engineering (name of surveyor and engineer) dated 10/2/2024 for property tax map(s) 198 and lot(s) 147 in the Town of Hudson, NH.

As the aforementioned applicant, I, herein, acknowledge that this waiver is requested in accordance with the provisions set forth in RSA 674:36, II (n), i.e., without the Planning Board granting said waiver, it would pose an unnecessary hardship upon me (the applicant), and the granting of this waiver would not be contrary to the spirit and intent of the Land Use Regulations.

Hardship reason(s) for granting this waiver (if additional space is needed please attach the appropriate documentation hereto):

The error of closure by a NH licensed land surveyor will add unnecessary expense for development of an existing lot of record where no change to the boundary is proposed.

Reason(s) for granting this waiver, relative to not being contrary to the spirit and intent of the Land Use Regulations: (if additional space is needed please attach the appropriate documentation hereto):

The error of closure is irrelevant because this is an existing lot of record and no change to the boundary is proposed. NH RSA 310-A:2-IV that allows for engineering surveys to be performed by a NH licensed professional engineer, which we include with our plan set. A survey performed by a NH licensed land surveyor is not required because this is an existing lot of record and no change to the boundary is proposed.

Signed:

Applicant or Authorized Agent

Daniel M. Flores, PE, Agent

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Inside Out Painting and Remodeling

Street Address: 100 Lowell Road

I Daniel M. Flores, P.E. hereby request that the Planning Board waive the requirements of item 275-8.C.(2)(m) of the Hudson Land Use Regulations in reference to a plan presented by SFC Engineering (name of surveyor and engineer) dated 10/2/2024 for property tax map(s) 198 and lot(s) 147 in the Town of Hudson, NH.

As the aforementioned applicant, I, herein, acknowledge that this waiver is requested in accordance with the provisions set forth in RSA 674:36, II (n), i.e., without the Planning Board granting said waiver, it would pose an unnecessary hardship upon me (the applicant), and the granting of this waiver would not be contrary to the spirit and intent of the Land Use Regulations.

Hardship reason(s) for granting this waiver (if additional space is needed please attach the appropriate documentation hereto):
Complying with the parking demand calculation in the site plan review regulations will result in unnecessary parking spaces.

Reason(s) for granting this waiver, relative to not being contrary to the spirit and intent of the Land Use Regulations: (if additional space is needed please attach the appropriate documentation hereto):
The parking calculation for business services is based on gross leasable area of the building, requiring 1 space per 300 sf, which requires 23 spaces for the 6855 sf gross floor area building. The building area to be occupied for business use is closer to 3300 sf, with the remaining used for storage. At 3300 sf, 11 spaces are required, which the site provides. Note that the business employs 7 people and does not have customer visits.

Signed:

Applicant or Authorized Agent

DANIEL M. FLORES, PE, AGENT

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Inside Out Painting and Remodeling

Street Address: 100 Lowell Road

I Daniel M. Flores, PE hereby request that the Planning Board waive the requirements of item 193-10.G of the Hudson Land Use Regulations in reference to a plan presented by SFC Engineering (name of surveyor and engineer) dated 10/2/2024 for property tax map(s) 198 and lot(s) 147 in the Town of Hudson, NH.

As the aforementioned applicant, I, herein, acknowledge that this waiver is requested in accordance with the provisions set forth in RSA 674:36, II (n), i.e., without the Planning Board granting said waiver, it would pose an unnecessary hardship upon me (the applicant), and the granting of this waiver would not be contrary to the spirit and intent of the Land Use Regulations.

Hardship reason(s) for granting this waiver (if additional space is needed please attach the appropriate documentation hereto):

The regulations allow for only one driveway per lot, where our redevelopment requires two driveways.

Reason(s) for granting this waiver, relative to not being contrary to the spirit and intent of the Land Use Regulations: (if additional space is needed please attach the appropriate documentation hereto):

The property has historically had two driveway curb cuts. We will utilize these two existing curb cuts to provide a right-in/right-out driveway layout to minimize conflict at the difficult Lowell Road-County Road intersection.

Signed: (Auth. Agent)

Applicant or Authorized Agent

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Inside Out Painting and Remodeling

Street Address: 100 Lowell Road

I Daniel M. Flores, PE hereby request that the Planning Board waive the requirements of item 275-8.C(6)(b) of the Hudson Land Use Regulations in reference to a plan presented by SFC Engineering (name of surveyor and engineer) dated 10/2/2024 for property tax map(s) 198 and lot(s) 147 in the Town of Hudson, NH.

As the aforementioned applicant, I, herein, acknowledge that this waiver is requested in accordance with the provisions set forth in RSA 674:36, II (n), i.e., without the Planning Board granting said waiver, it would pose an unnecessary hardship upon me (the applicant), and the granting of this waiver would not be contrary to the spirit and intent of the Land Use Regulations.

Hardship reason(s) for granting this waiver (if additional space is needed please attach the appropriate documentation hereto):
The regulations requires a loading space that is 60' long, but allows includes provision to allow a 35' long loading space when demonstrated that delivery is by a shorter truck. The site plan shows a 35' long loading space.

Reason(s) for granting this waiver, relative to not being contrary to the spirit and intent of the Land Use Regulations: (if additional space is needed please attach the appropriate documentation hereto):
Inside Out Painting and Remodeling currently receives deliveries from box trucks where a 35' loading space is ample. This proposed site at 100 Lowell Road will not change their delivery practices. As such, continuing with a 35' loading space length at this new location is more than adequate for their operations.

Signed:

Applicant or Authorized Agent

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Inside Out Painting and Remodeling

Street Address: 100 Lowell Road

I Daniel M. Flores, PE hereby request that the Planning Board waive the requirements of item 276-11.1.B.(12)(c) of the Hudson Land Use Regulations in reference to a plan presented by SFC Engineering (name of surveyor and engineer) dated 10/2/2024 for property tax map(s) 198 and lot(s) 147 in the Town of Hudson, NH.

As the aforementioned applicant, I, herein, acknowledge that this waiver is requested in accordance with the provisions set forth in RSA 674:36, II (n), i.e., without the Planning Board granting said waiver, it would pose an unnecessary hardship upon me (the applicant), and the granting of this waiver would not be contrary to the spirit and intent of the Land Use Regulations.

Hardship reason(s) for granting this waiver (if additional space is needed please attach the appropriate documentation hereto):
The regulations requires that where a commercial or industrial use or zoning district abuts a residential use or zoning district, there shall be a one-hundred-foot distance between the residential use or zoning district and any improved part of the nonresidential development.

Reason(s) for granting this waiver, relative to not being contrary to the spirit and intent of the Land Use Regulations: (if additional space is needed please attach the appropriate documentation hereto):
The proposed site plan has the retaining wall and south parking spaces within 100' of the abutting residential dwelling at 104 Lowell Road (map 198 lot 148). However, the parking area is set approximately 15' below the grade of the house, as well as screened by vegetation. In addition, the owner of that abutting lot has expressed support for this development.

Signed: (Agent)

Applicant or Authorized Agent

SCHEDULE OF FEES
(Continued)

(For Town Use)			
AMOUNT RECEIVED:	$________________	DATE RECEIVED:	________________
RECEIPT NO.:	________________	RECEIVED BY:	________________

NOTE: fees below apply only upon plan approval, not collected at time of application.

D. RECORDING:

*****The applicant shall be responsible for the recording of the approved plan, and all documents as required by an approval, at the Hillsborough County Registry of Deeds (HCRD), located at 19 Temple Street, Nashua, NH 03061. Additional fees associated with recording can be found at HCRD.*****

E. COST ALLOCATION PROCEDURE AMOUNT CONTRIBUTION AND OTHER IMPACT FEE PAYMENTS:

To be determined by the Planning Board at time of plan approval and shall be paid by the applicant at the time of submittal of the Certificate of Occupancy Permit requests.

*****The applicant shall be responsible for all fees incurred by the town for processing and review of the applicant's application, plan and related materials.*****

TOWN OF HUDSON
SITE PLAN REVIEW CHECKLIST

This checklist is intended to help the applicant and staff to ensure application completeness. Please refer to the regulations on the exact language of each requirement.

Key: Y=Yes P =Pending W=Waiver Request

Relevant Regulations:
§ 276-11.1 General Plan Requirements
§§ 275-8 – 275-9 Site Plan Requirements

	Y	P	W		Notes
1.	☑	☐	☐	- A list of the names and addresses of the owner(s) of the property, the applicant(s), and all abutters as indicated in the office of the Town Assessor records not more than five (5) days prior to the day of filing **[§ 276-11.1.A.]**	
2	☑	☐	☐	- Sets of plans and copies as indicated on application.	
3.	☑	☐	☐	- Scale no smaller than 50 feet to the inch (1" = 50') **[§ 276-11.1.B.(2)]**	
4.	☑	☐	☐	- Title block in the lower right-hand corner of the plan, containing: **[§ 276-11.1.B.(3)]**	
5.	☑	☐	☐	- Title, including the term "site plan" or "subdivision plan"	
6.	☑	☐	☐	- The name for whom the plan was prepared	
7.	☑	☐	☐	- Preparer of the plan	
8.	☑	☐	☐	- The scale(s) of the plan	
9.	☑	☐	☐	- Date of the plan	
10.	☑	☐	☐	- Appropriate revision block	
11.	☑	☐	☐	- Approval block (2"x6") located on the lower left corner of each sheet, with the required language and signature line **[§ 276-11.1.B.(4) & § 289-27.A]**	
12.	☑	☐	☐	- Owner's printed name and address and signature **[§ 276-11.1.B.(6)]**	
13.	☑	☐	☐	- Name and address of all abutting property owners **[§ 276-11.1.B.(7)]**	
14.	☑	☐	☐	- A locus plan at one inch equals 1,000 feet (1" = 1,000') **[§ 276-11.1.B.(8)]**	

(Continue next page)

15. ☑ ☐ ☐ - Boundary of the entire parcel held in single ownership with boundary dimensions and bearings **[§ 276-11.1.B.(9)]**

16. ☐ ☐ ☑ - Error of closure shown and certified by a licensed land surveyor

17. ☑ ☐ ☐ - North point arrow

18. ☑ ☐ ☐ - Zoning classification note of the tract and location of the zoning district boundaries if the property is located in two or more zoning district **[§ 276-11.1.B.(10)]**

19. ☑ ☐ ☐ - The location of all buildings within 50 feet of the tract **[§ 276-11.1.B.(15)]**

20. ☑ ☐ ☐ - The location of roadways, driveways, travel areas or parking areas within 200 feet of the tract, in accordance with **§ 276-11.1.B.(16)**

21. ☑ ☐ ☐ - Existing topography at two-foot contour intervals of that portion of the tract being proposed for development from a topographic survey and contours on the remainder of the tract from a reliable plan source **[§ 276-11.1.B.(17)]**

22. ☑ ☐ ☐ - Proposed topography at two-foot contour intervals **[§ 276-11.1.B.(18)]**

23. ☑ ☐ ☐ - A note identifying the Tax Map and Lot Number of the tract **[§ 276-11.1.B.(19)]**

24. ☑ ☐ ☐ - The location of all existing buildings (including size and height), driveways, sidewalks, parking spaces, loading area, open spaces, large trees, open drainage courses, signs, exterior lighting, service areas, easements landscaping and other pertinent items. **[§ 276-11.1.B.(20)]**

25. ☑ ☐ ☐ - The location of all proposed construction, buildings, structures, pavement, etc. **[§ 276-11.1.B.(21)]**

26. ☐ ☐ ☐ - A green area shown between the right-of-way line and any pavement, gravel or structure meeting the required minimum width **[§ 276-11.1.B.(22)]**

29. ☐ ☐ ☑ - Note any pertinent highway projects. **[§ 276-11.1.B.(23)]**

(Continue next page)

29. N/A, no known highway projects in vicinity

TOWN OF HUDSON
SITE PLAN REVIEW CHECKLIST

This checklist is intended to help the applicant and staff to ensure application completeness. Please refer to the regulations on the exact language of each requirement.

Key: Y=Yes P =Pending W=Waiver Request NA=Not Applicable (please explain)

	Y	P	W	NA		Notes
30.	☑	☐	☐		- The location of all building setback lines as required by Chapter 334, Zoning, and setback lines as required by **§ 276-11.1.B.(12)**.	43. is not applicable due to a business use being proposed in the business zone.
31.	☑	☐	☐		- The location size and character of all signs or a note* stating "All signs are subject to approval by the Hudson Zoning Administrator prior to installation thereof." [**§ 276-11.1.B.(13)**] *The discrepancy on the note language is correct – reference to the Planning Board in the regulations is outdated.	
32.	☑	☐	☐		- The location, detail and character of all exterior lighting or a note stating: "There will be no exterior lighting." [**§ 276-11.1.B.(14)**]	
33.	☑	☐	☐	☐	- Required open space, including the calculation showing the requirement is met [**§ 276-11.1.B.(24)**]	
34.	☑	☐	☐	☐	- Parking space calculation showing and a statement stating the required parking spaces are provided [**§ 275-8.C.(2) & (3)**]	
35.	☑	☐	☐	☐	- Required dimensions for parking space **[§ 275-8.C.(4)]**	
36.	☑	☐	☐	☐	- Required dimensions for aisle/access drive **[§ 275-8.C.(5)]**	
37.	☐	☐	☐	☑	- Required off-street loading spaces **[§ 275-8.C.(6)]**	
38.	☑	☐	☐	☐	- Required landscaping for the parking lot, including calculation shown the planting requirement is met **[§ 275-8.C.(7)]**	
39.	☑	☐	☐	☐	- Required screening for visual separation of incompatible uses **[§ 275-8.C.(8)]**	
40.	☑	☐	☐	☐	- Handicap accessibility provided in accordance with the latest ADA Regulations **[§ 275-8.C.(11)]**	
41.	☑	☐	☐	☐	- Stormwater Management Plan **[§ 275-9.A]**	
42.	☑	☐	☐	☐	- Traffic Study, if required **[§ 275-9.B]**	
43.	☐	☐	☐	☑	- Noise Study, if required **[§ 275-9.C]**	

(Continue next page)

TOWN OF HUDSON
SITE PLAN REVIEW CHECKLIST

This checklist is intended to help the applicant and staff to ensure application completeness. Please refer to the regulations on the exact language of each requirement.

Key: Y=Yes P =Pending W=Waiver Request NA=Not Applicable (please explain)

	Y	P	W	NA	
44.	☐	☐	☐	☑	- Fiscal Impact Study, if required [**§ 275-9.D]**
45.	☑	☐	☐	☐	- Utility Study [**§ 275-9.E]**
46.	☐	☐	☐	☑	- Copies of any proposed or existing easements, covenants, deed restrictions or any other similar document pertinent to the Site Plan [**§ 275-9.F]**
47.	☐	☐	☐	☑	- A copy of all applicable Town, state, county or federal approvals or applications [**§ 275-9.G]**
48.	☐	☐	☐	☑	- Environmental Impact Study, if required [**§ 275-9.I]**

Notes

46 is not applicable due to there being no existing or proposed easements and there are no deed restrictions.

47 is not applicable since the project is located at a previously developed lot of record.

(End of checklist)

October 1, 2024

Jay Minkarah, Interim Town Planner/NRPC Circuit Rider
Town of Hudson
12 School Street
Hudson, NH 03501

RE: 100 Lowell Road Owner Authorization

Mr. Minkarah,

SFC Engineering Partnership, Inc. is authorized to represent 100 Lowell Rd LLC throughout the local approval process for proposed development at 100 Lowell Road.

Sincerely,

100 Lowell Rd LLC

Abutters List

Inside Out Painting and Remodeling
100 Lowell Road
Map 198 Lot 147-000

September 30, 2024

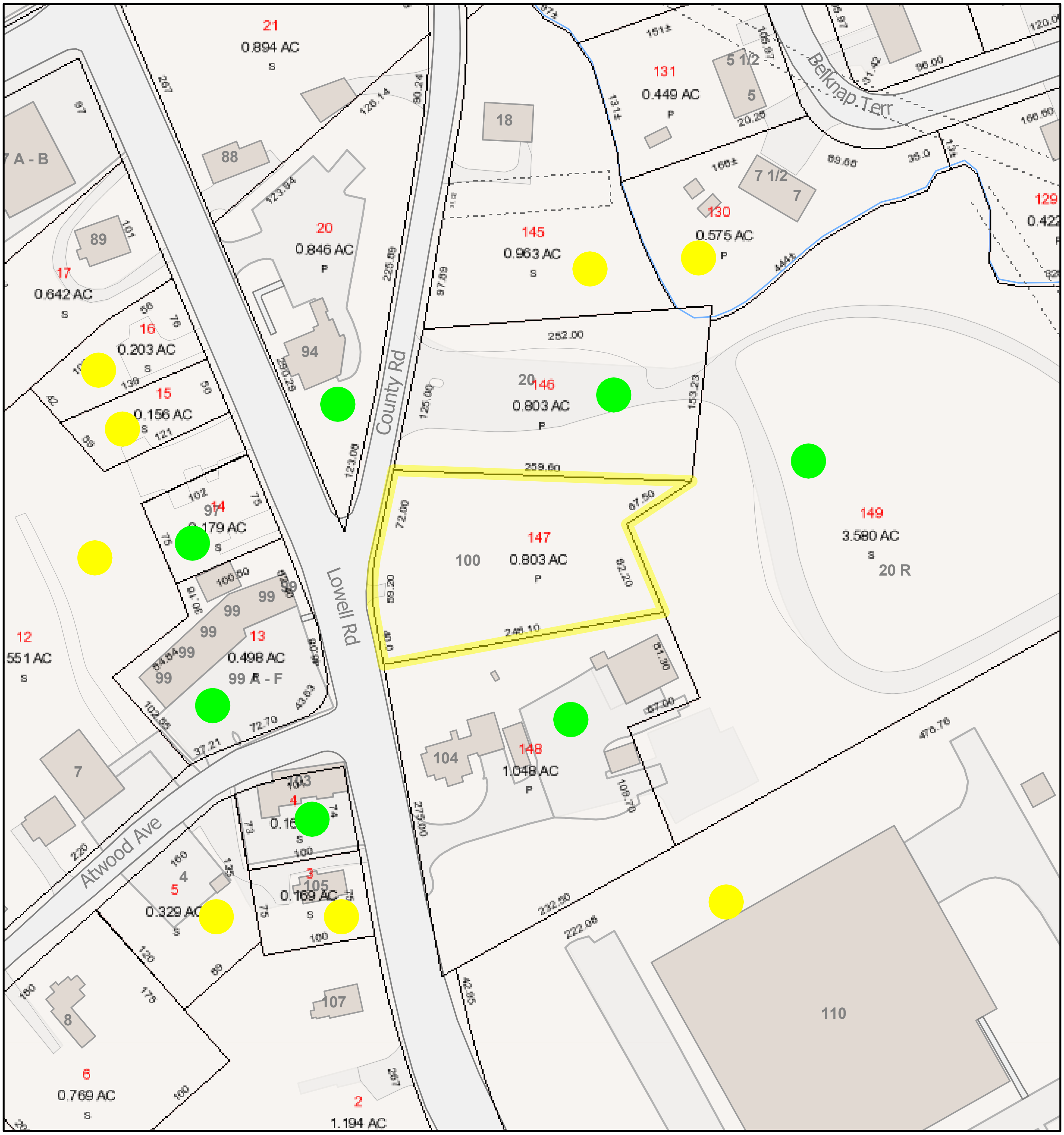
	MAP	LOT	OWNER
OWNER & APPLICANT	198	147-000	100 Lowell Rd LLC 122 Lowell Road, Suite 3 Hudson, NH 03051
DIRECT ABUTTERS	198	146-000	Town of Hudson 12 School Street Hudson, NH 03051
	198	148-000	Ronald F. Maynard 104 Lowell Road Hudson, NH 03051
	198	149-000	Town of Hudson 12 School Street Hudson, NH 03051
	198	013-CDX	Stratos Realty Trust Steve Tsoulakos, Trustee 2651 San Luis Road Holiday, FL 34691-3115
	198	020-000	Nicholas Katsoulis 88 Lowell Road Hudson NH 03051
	198	004-000	Dillon-James Properties LLC 195R Central Street Hudson, NH 03051

	198	014-000	Colbea Enterprises, LLC 695 George Washington Highway Lincoln, RI 02865
INDIRECT ABUTTERS	198	003-000	Anne L. Sojka Trust 11 Atwood Avenue Hudson, NH 03051
	198	005-000	Anne L. Sojka Trust 11 Atwood Avenue Hudson, NH 03051
	198	150-000	Teledyne Technologies Inc. 4736 Socialville Foster Road Mason, OH 45040
	198	012-000	Colbea Enterprises, LLC 695 George Washington Highway Lincoln, RI 02865
	198	015-000	Colbea Enterprises, LLC 695 George Washington Highway Lincoln, RI 02865
	198	016-000	Colbea Enterprises, LLC 695 George Washington Highway Lincoln, RI 02865
	198	130-CDX	Gauthier, Lisa M. 7 ½ Belknap TER. Hudson, NH 03051
	198	130-CDX	Donald L. Flores 7 Belknap Terrace Hudson, NH 03051
	198	145-000	Pamela J. Quigley 18 County Road Hudson, NH 03051

ENGINEER

SFC Engineering Partnership, Inc.
183 Rockingham Road, Unit 3
Windham, NH 03087

100 Lowell Rd



9/30/2024

NOTE:
GREEN - DIRECT ABUTTERS
YELLOW - INDIRECT ABUTTERS

1:2,000

0 0.01 0.03 0.05 mi

0 0.02 0.04 0.07 km

Attachment "B"

SFC ENGINEERING

March 5, 2025

Jay Minkarah
Acting Town Planner
12 School Street
Hudson, NH 03051

RE: **Transmittal Letter for Resubmittal of Site Plan Material**
Inside Out Painting and Remodeling 100 Lowell Road (Tax Map 198, Lot 147)

Mr. Jay Minkarah,

We respectfully submit the following items to the Planning Board for the above project. We wish to be placed on the March 26, 2025 agenda.

One copy each of the following is included, unless noted:

- Letter to the Planner dated 3/5/2025 addressing Fuss & O'Neill review comments. Note this was sent electronically to Steve Reichert with Fuss & O'Neill on 3/5/2025, with the town copied.
- 2 Page Deed from Hillsborough Country Registry of Deeds.
- Updated HydroCAD printout for porous pavement from drainage report.
- Updated I&M manual.
- Full size (22"x34") revised plan set dated 3/5/2025.
- (15) half size (11"x17") copies of the revised plan set dated 3/5/2025.

Sincerely,
SFC ENGINEERING PARTNERSHIP, INC.

Daniel M. Flores, P.E.
Vice President - Civil Engineering

Attachment "C"

Gradert Benjamin

From:	Dhima, Elvis
Sent:	Thursday, March 6, 2025 9:50 AM
To:	Dubowik, Brooke
Cc:	Gradert Benjamin
Subject:	RE: Inside Out Painting- 100 Lowell Road

All set

E

Elvis Dhima, P.E.
Town Engineer

12 School Street
Hudson, NH 03051
Phone: (603) 886-6008

Town of Hudson
NEW HAMPSHIRE 03051

Attachment "C"

Dubowik, Brooke

From:	Michaud, Jim
Sent:	Friday, January 24, 2025 7:54 AM
To:	Dubowik, Brooke
Subject:	RE: 100 Lowell Rd Resubmittal

Hi Brooke, Assessing has no further comments.

Jim

Attachment "C"

Dubowik, Brooke

From: Twardosky, Jason
Sent: Thursday, January 23, 2025 4:10 PM
To: Dubowik, Brooke; Dhima, Elvis; Gradert Benjamin; Hebert, David; Kirkland, Donald; McElhinney, Steven; Michaud, Jim; Sullivan, Christopher; Malley, Tim
Subject: RE: 100 Lowell Rd Resubmittal

All set

Attachment "C"

Dubowik, Brooke

From:	Hebert, David
Sent:	Thursday, January 23, 2025 3:39 PM
To:	Dubowik, Brooke; Dhima, Elvis; Gradert Benjamin; Kirkland, Donald; McElhinney, Steven; Michaud, Jim; Sullivan, Christopher; Malley, Tim; Twardosky, Jason
Subject:	RE: 100 Lowell Rd Resubmittal

Fire comments have been addressed. No further comments

Dave Hebert
Fire Marshal
Hudson Fire Department
Inspectional Services Division

Town of Hudson | 12 School Street | Hudson, NH 03051
603-886-6005 (Main) | 603-816-1271 (Direct)

Attachment "C"

Dubowik, Brooke

From:	McElhinney, Steven
Sent:	Monday, January 27, 2025 10:42 AM
To:	Dubowik, Brooke
Subject:	RE: Inside Out Painting Site Plan - First Review (20030249.243)

No comments (there wasn’t a sign off sheet correct?) !

Steve

Respectfully,

Captain Steven C. McElhinney
Administrative Bureau Commander
Hudson, NH Police
Tel: (603) 816-2244

Attachment "C"

Dubowik, Brooke

From:	Sullivan, Christopher
Sent:	Thursday, January 23, 2025 3:54 PM
To:	Dubowik, Brooke; Dhima, Elvis; Gradert Benjamin; Hebert, David; Kirkland, Donald; McElhinney, Steven; Michaud, Jim; Malley, Tim; Twardosky, Jason
Subject:	RE: Inside Out Painting Site Plan - First Review (20030249.243)

Zoning is all set

Attachment "D"

MEMORANDUM

TO:	Mr. Daniel M. Flores, P.E. Project Manager/Lead Civil Engineer SFC Engineering Partnership, Inc. 183 Rockingham Road, Unit 3 East Windham, NH 03087	**FROM:**	Mr. Jeffrey S. Dirk, P.E.*, PTOE, FITE Managing Partner *and* Mr. Makenlove Marc Transportation Engineer Vanasse & Associates, Inc. 35 New England Business Center Drive Suite 140 Andover, MA 01810-1066 (978) 269-6830 jdirk@rdva.com **Professional Engineer in CT, MA, ME, NH, RI and VA*
DATE:	October 1, 2024 ***Updated November 25, 2024***	**RE:**	9998
SUBJECT:	Traffic Impact Study Proposed Commercial Building – 100 Lowell Road (NH Route 3A) Hudson, New Hampshire		

Vanasse & Associates, Inc. (VAI) has prepared an update to the October 1, 2024 Traffic Impact Study (TIS) That was prepared for the proposed construction of a commercial building to be located at 100 Lowell Road (NH Route 3A) in Hudson, New Hampshire (hereafter referred to as the "Project"). This update revises the trip-generation calculations and Build condition analyses to reflect an increase in the size of the proposed building from 4,500± square feet (sf) to 6,855 sf (an increase of 2,355± sf). In addition, motor vehicle crash data has been provided by the Hudson Police Department for the Lowell Road (NH Route 3A)/ County Road and has been incorporated into this updated study.

This study has been completed in accordance with the New Hampshire Department of Transportation (NHDOT) guidelines for the preparation of a TIS as defined in the Driveway Permit Policy, and evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing traffic conditions and future traffic conditions, both with and without the Project along Lowell Road (NH Route 3A) and County Road. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the Institute of Transportation Engineer (ITE),[1] the Project is expected to generate approximately 68 vehicle trips on an average weekday (two-way volume over the operational day of the Project), with approximately 11 vehicle trips expected during the weekday morning peak-hour and 13 vehicle trips expected during the weekday evening peak-hour;

2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions), with no (0) changes in level of service or vehicle queuing shown to occur. Independent of the Project, all

[1] *Trip Generation*, 11th Edition; Institute of Transportation Engineers; Washington, DC; 2021.

movements from the County Road approach to NH Route 3A are currently operating over capacity (i.e., level-of-service (LOS) "F");

3. Under 2025 Opening Year Build and 2035 Build conditions, all movements exiting the Project site driveway to County Road were shown to operate at LOS A/B with negligible vehicle queuing. All movements along NH Route 3A and County Road approaching the Project site driveways were shown to operate at LOS A, also with negligible vehicle queuing;

4. Based on a review of motor vehicle crash data provided by the Hudson Police Department for the NH Route 3A/County Road intersection, the majority of the reported crashes involved distracted motorists or failure to yield, conditions that are not attributable to a specific roadway or intersection defect; and

5. With the regrading of the embankment along the Project site frontage on both NH Route 3A and County Road and the selective trimming/removal of trees and vegetation located within the sight triangle areas of the County Road driveway, the lines of sight at the Project site driveway intersections will meet or exceed the recommended minimum distances for the intersections to operate in a safe manner based on the appropriate approach speed.

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

The following details our assessment of the Project.

PROJECT DESCRIPTION

As proposed, the Project will entail the construction of a 6,855± sf commercial building to be located at 100 Lowell Road in Hudson, New Hampshire, that will be designed for use by specialty trade contractors and will feature storage bays and associated office space. The Project site encompasses approximately 0.80± acres of land bounded by the Jette and Sousa baseball/softball fields and associated parking area and appurtenances to the north and east; NH Route 3A and a commercial property to the south; and NH Route3A and County Road to the west. The Project site currently contains previously disturbed areas and areas of open and wooded space. Figure 1 depicts the Project site location in relation to the existing roadway network.

Access to the Project site will be provided by way of two (2) driveways configured as follows: a one-way, right-turn, entrance only driveway that will intersect the east side of NH Route 3A on the northeast corner of the NH Route 3A/County Road intersection and a one-way, right-turn, exit only driveway that will intersect the east side of County Road approximately 110 feet north of NH Route 3A.

On-site parking will be provided for 11 vehicles, which is below the parking requirements for a similar use (Industrial) as specified in Section 275-8.1 C (2), *Parking Calculation,* of the Town of Hudson Zoning Ordinance.[2]

[2]For "Professional offices and business services", the Zoning Ordinance requires that 1.0 parking spaces be provided for every 300 square feet of gross leasable area, which would be 23 parking spaces in the case of the Project.

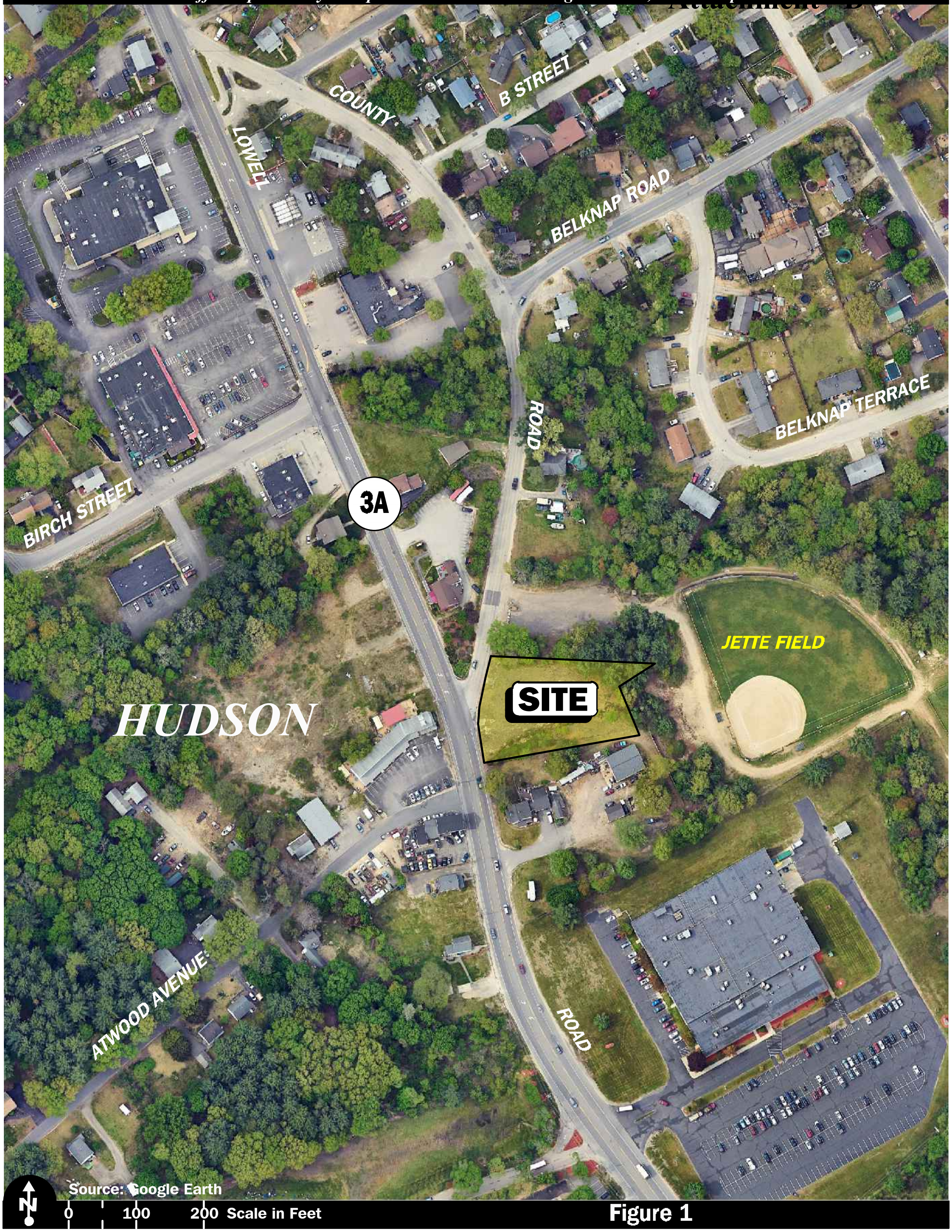


Figure 1

Site Location Map

Vanasse & Associates inc

STUDY METHODOLOGY

This study was prepared in consultation with the Town of Hudson and NHDOT; was performed in accordance with the NHDOT guidelines for the preparation of TISs as defined in the Driveway Permit Policy and the standards of the Traffic Engineering and Transportation Planning Professions for the preparation of such reports; and was conducted in three distinct stages.

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

In the second stage of the study, future conditions on the transportation system were projected and analyzed. Specific travel demand forecasts for the Project were assessed along with future demands on the transportation system that are expected due to growth independent of the Project. In accordance with NHDOT guidelines for the preparation of TISs, four future conditions were evaluated: 1) 2025 No-Build conditions *without* the Project; 2) 2025 Opening-Year Build conditions *with* the Project; 3) 2035 No-Build conditions *without* the Project; and 4) 2035 Build conditions (ten-year projection from opening-year) *with* the Project. The analyses conducted in stage two of the study identify existing or projected future roadway capacity and traffic safety issues.

The third stage of the study presents and evaluates measures to address roadway and intersection capacity issues and safety concerns, if any, identified in stages one and two of the study.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in July 2024. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area that was assessed for the Project consisted of NH Route 3A and County Road, and the intersection of NH Route 3A at County Road. The following describes the study area roadways and intersection.

Roadways

NH Route 3A

NH Route 3A in the vicinity of the Project site is a three-lane (one lane in each direction with a center left-turn lane), Tier 5, Class 4, principal arterial roadway that is under Town jurisdiction and traverses the study area in a general north-south direction. Within the study area, NH Route 3A provides two 12-foot-wide travel lanes that are separated by a 12-foot wide center turn lane that accommodates left-turn movements in both directions with 4- to 6-foot wide marked shoulders. The posted speed limit is 30 miles per hour (mph) in the vicinity of the Project site. Sidewalks are not provided within the study area. Illumination is provided by way of street lights mounted on wood poles. Land use along NH Route 3A in the vicinity of the Project site consists of residential and commercial properties and areas of open and wooded space.

County Road

County Road in the vicinity of the Project site is a two-lane, Tier 5, Class 5, minor arterial roadway under Town jurisdiction that traverses the study area in a general northeast-southwest direction intersecting NH Route 3A adjacent to and approximately 1,100 feet north of the Project site. Within the study area, County Road provides two 11-foot-wide travel lanes separated by a double-yellow centerline with no marked shoulders. A posted speed limit is not provided and, as such, the statutory speed limit pursuant to RSA 265:60 is 30 mph in a business district.[3] Sidewalks and illumination are not provided within the study area. Land use along County Road in the vicinity of the Project site consists of residential and commercial properties, Jette Field and Sousa Field, and areas of open and wooded space.

Intersection

Table 1 summarizes existing lane use, traffic control, and pedestrian and bicycle accommodations at the intersection of NH Route 3A at County Road as observed in July 2024.

Table 1
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
NH Rte. 3A/ County Rd.	S	1 general-purpose lane provided on all approaches, with a center turn lane that accommodates left-turn maneuvers provided along NH Rte. 3A	Yes; 4 to 6 feet on NH Rte. 3A and 1 to 2 feet on County Rd.	No	Yes; shared traveled-way provided on NH Rte. 3A[b]

[a]S = stop signal control.
[b]Combined shoulder and travel lane width equal to or exceeding 14 feet.

Existing Traffic Volumes

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts, turning movement counts (TMCs), and vehicle classification counts were completed in July 2024. The ATR counts were conducted on July 23rd through 24th, 2024 (Tuesday through Wednesday, inclusive), on NH Route 3A south of Atwood Avenue in order to record weekday daily traffic conditions over an extended period, with weekday morning (7:00 to 9:00 AM) and evening (3:00 to 6:00 PM) peak-period TMCs performed at the study area intersection on Wednesday, July 24, 2024. These time periods were selected for analysis purposes as they are representative of the peak-traffic-volume hours for both the Project and the adjacent roadway network.

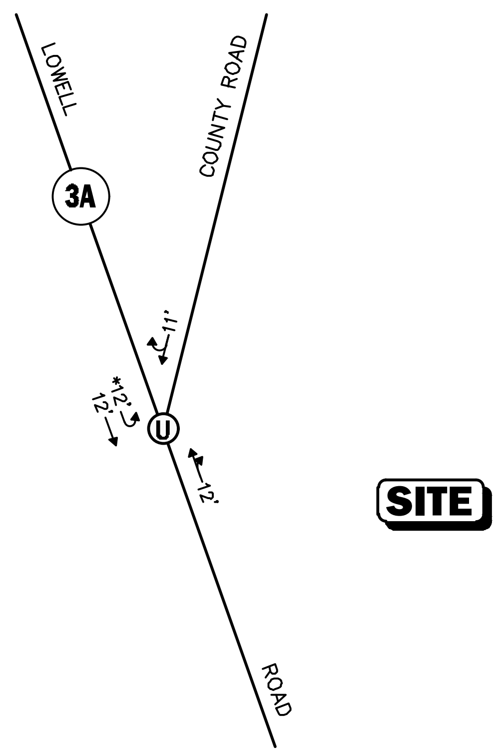
---

[3]RSA 265:60 defines the "reasonable and prudent standard" as follows: "No person shall drive a vehicle on a way at a speed greater than is reasonable and prudent under the conditions and having regard to the actual and potential hazards then existing. In every event speed shall be so controlled as may be necessary to avoid colliding with any person, vehicle, or other conveyance on or entering the way in compliance with the legal requirements and the duty of all persons to use due care."

Attachment "D"

Legend:

Ⓤ	Unsignalized Intersection
XX'	Lane Use and Travel Lane Width
*XX'	Center Left-Turn Lane



Not To Scale

Figure 2

Existing Intersection Lane Use, Travel Lane Width, and Pedestrian Facilities

Vanasse & Associates inc

Traffic Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, 2019 peak-hour and average daily traffic count data were reviewed for NHDOT Continuous Count Station No. 62315281, which is located on the Frederick E. Everett Turnpike south of the Canal Bridge Exit 5-6. Based on a review of this data, it was determined that traffic volumes for the month of July are approximately 2.0 percent below peak-month (August) conditions. As such, the July traffic volumes were adjusted upward by 2.0 percent to be representative of peak-month conditions in accordance with NHDOT standards.

In order to account for the impact on the traffic volume and trip patterns resulting from the COVID-19 pandemic, traffic-volume data collected at NHDOT Continuous Count No. 62315281 was reviewed. Traffic-volume data for July 2024 was compared to data collected at the same location in July 2019. Based on this pre- and post-COVID-19 comparison, it was found that July 2024 average daily and peak-hour traffic volumes are between 9.1 and 14.8 percent *below* conditions that existed prior to the COVID-19 pandemic. As such, the seasonally adjusted July 2024 traffic volumes were further adjusted upward by the following percentages:

- Average Daily Traffic Volumes: -9.1%
- Weekday Morning Peak-Hour Traffic Volumes: -14.8%
- Weekday Evening Peak-Hour Traffic Volumes: -9.6%

The 2024 Existing peak-month traffic volumes are summarized in Table 2, with the weekday morning and evening peak-month, peak-hour traffic volumes graphically depicted on Figure 3. Note that the peak-hour traffic volumes that are presented in Table 2 were obtained from the aforementioned figure.

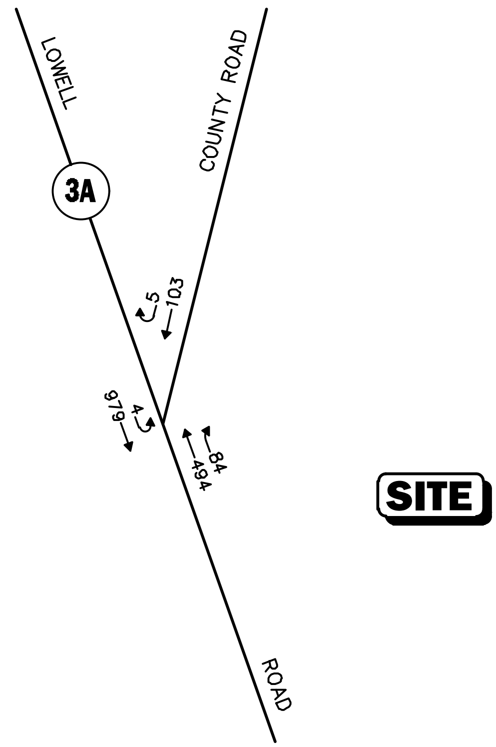
Table 2
2024 EXISTING PEAK-MONTH TRAFFIC VOLUMES

Location/Peak Hour	AWT[a]	VPH[b]	K Factor[c]	Directional Distribution[e]
NH Route 3A, south of Atwood Avenue:	23,195	--	--	--
Weekday Morning (7:30 – 8:30 AM)	--	1,663	7.2	65.2% SB
Weekday Evening (4:15 – 5:15 PM)	--	2,098	9.0	58.5% NB

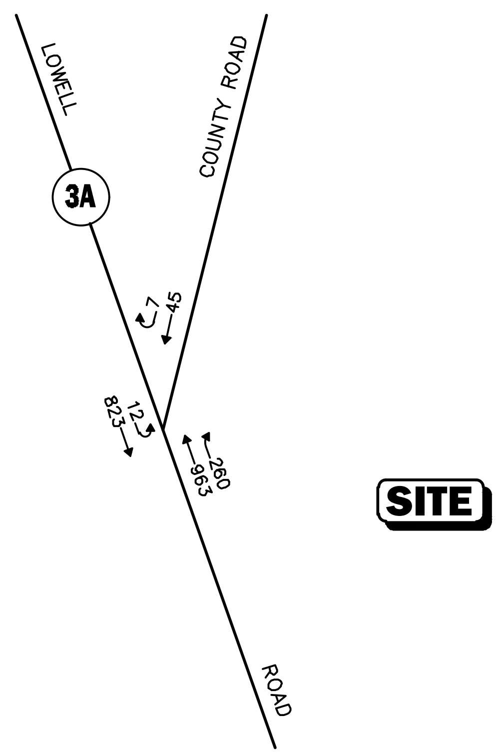
[a]Average weekday traffic in vehicles per day.
[b]Vehicles per hour.
[c]Percent of daily traffic occurring during the peak hour.
[d]Percent traveling in peak direction.
NB = northbound, SB = southbound

As can be seen in Table 2, NH Route 3A south of Atwood Avenue was found to accommodate approximately 23,195 vehicles on an average weekday (two-way, 24-hour volume) under peak-month conditions, with approximately 1,663 vehicles per hour (vph) during the weekday morning peak-hour and 2,098 vph during the weekday evening peak-hour.

WEEKDAY MORNING PEAK HOUR (7:30 - 8:30 AM)



WEEKDAY EVENING PEAK HOUR (4:15 - 5:15 PM)



Not To Scale

Figure 3

2024 Existing Peak-Month Peak-Hour Traffic Volumes

Vanasse & Associates inc

Spot Speed Measurements

Vehicle travel speed measurements were performed on NH Route 3A in the vicinity of the Project site in conjunction with the ATR counts, the results of which are summarized in Table 3.

Table 3
VEHICLE TRAVEL SPEED MEASUREMENTS

	NH Route 3A	
	Northbound	Southbound
Mean Travel Speed (mph)	34	33
85^{th} Percentile Speed (mph)	39	38
Posted Speed Limit (mph)	30	30

mph = miles per hour.

As can be seen in Table 3, the mean vehicle travel speed along NH Route 3A in the vicinity of the Project site was found to be 34 mph in the northbound direction and 33 mph southbound. The measured 85^{th} percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be 39 mph northbound and 38 mph southbound, which is 8 to 9 mph above the posted speed limit (30 mph) in the vicinity of the Project site. The 85^{th} percentile speed is used as the basis of engineering design and in the evaluation of sight distances and is often used in establishing posted speed limits.

Pedestrian and Bicycle Facilities

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in July 2024. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways, as well as the location of existing and planned future bicycle facilities. Sidewalks, marked crosswalks and formal bicycle facilities are not provided within the study area; however, NH Route 3A provides sufficient width to accommodate bicycle travel in a shared-traveled-way configuration.[4]

Public Transportation

Regularly scheduled public transportation services are not provided within the study area; however, the Nashua Transit System (NTS) provides the Hudson Demand Response service for residents of Hudson. The service is application-based and provides door-to-door transportation within the town and the city of Nashua. Trips are reserved on a limited space available basis and priority is given to persons with disabilities and senior citizens. Information pertaining to this service is attached.

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

Motor Vehicle Crash Data

Motor vehicle crash data for the NH Route 3A/County Road intersection was provided by the Hudson Police Department for the period January 1, 2019 through August 1, 2024 in order to examine motor vehicle crash trends occurring at the subject intersection and in the vicinity of the Project site. The data is summarized in Table 4.

Table 4
MOTOR VEHICLE CRASH DATA SUMMARY[a]

	NH Route 3A/County Road
Traffic Control Type[b]	U
Year:	
2019	5
2020	6
2021	3
2022	7
2023	3
2024 (through 8/1)	4
Total	28
Average	5.0
Lighting:	
Daylight	24
Dawn/Dusk	0
Dark (Road Lit)	4
Dark (Road Unlit)	0
Total	28
Day of Week:	
Monday-Friday	26
Saturday	0
Sunday	2
Total	28
Severity:	
Property Damage Only	22
Non-fatal Injury	6
Fatalities	0
Not Reported	0
Total	28

[a]Source: Hudson Police Department, January 1, 2019, through August 1, 2024.
[b]Traffic Control Type: U = unsignalized.

As can be seen in Table 4, the NH Route 3A/County Road intersection was reported to have experienced a total of 28 reported motor vehicle crashes between January 1, 2019 and August 1, 2024, or an average of approximately 5.0 crashes per year. The majority of the reported crashes occurred on a weekday, during daylight and resulted in property damage only. A review of the findings of the crash investigation indicates that the primary contributing factors were distracted driving and failure to yield, neither of which are attributable to a specific roadway or intersection defect.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the years 2025 and 2035, which reflects the anticipated opening-year of the Project and a ten-year planning horizon from opening-year, respectively, consistent with NHDOT TIS guidelines. The future condition traffic-volume projections incorporate identified specific development projects by others, as well as general background traffic growth as a result of development external to the study area and presently unforeseen projects. Anticipated Project-generated traffic volumes superimposed upon the 2025 and 2035 No-Build traffic volumes reflect the Build conditions with the Project.

Future Traffic Growth

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

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

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

Specific Development by Others

The Town of Hudson Planning Department was contacted in order to determine if there were any projects planned within the Town that would have an impact on future traffic volumes within the study area. Based on this consultation, the following projects were identified for review in conjunction with this assessment:

- ***Proposed Commercial Development, NH Route 3A, Hudson, New Hampshire.*** This project entails the construction of a commercial development to be located on the southeast corner of the intersection of NH Route 3A at Central Street and north of the Project site. The project will consist of a 10-vehicle fueling position gasoline station and a 4,560 sf convenience store with a drive-through coffee shop. The majority of the trips associated with this project will consist of pass-by trips (i.e., existing traffic), with the new trips that would occur within the study area of this assessment expected to be reflected in the general background traffic growth rate (discussion follows).

- ***Proposed Commercial Development, NH Route 3A, Hudson, New Hampshire.*** This project entails the construction of a commercial development to be located at 91-97 Lowell Road and west of the of the Project site. Formal plans for this project have not been submitted to the Planning Board at this time and, as such, the traffic associated with this Project were not included in this study.

No other developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate.

General Background Traffic Growth

Traffic-volume data compiled by NHDOT from count station No. 62315281 was reviewed in order to determine general traffic growth trends in the area. This data indicates that traffic volumes have fluctuated over the 10-year period between 2009 and 2019, with the average traffic growth rate found to be approximately 0.79 percent. In order to provide a prudent planning condition from which to assess the potential impact of the Project on the transportation infrastructure, a slightly higher 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

Roadway Improvement Projects

The Town of Hudson and NHDOT were contacted in order to determine if there were any planned roadway improvement projects expected to be completed within the study area. Based on these discussions, the following roadway improvement project was identified:

- ***Belknap Road Extension Project.*** This project has been submitted to NHDOT for inclusion in the Ten-Year Transportation Improvement Plan and would include the extension of Belknap Road to intersect NH Route 3A at Birch Street. This project was first assessed in 2019, with further discussions occurring at meetings of the Highway Safety Committee and the Board of Selectmen due to the high rate of motor vehicle crashes (14 crashes in four years) occurring at the southern intersection of NH Route 3A at County Road adjacent to the Project site. At this time, design plans for these improvements are not currently available and, as such, the improvements are not reflected in this assessment.

No other roadway improvement projects aside from routine maintenance activities were identified to be planned within the study area at this time.

No-Build Traffic Volumes

The 2025 and 2035 No-Build peak-month, peak-hour traffic volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2024 Existing peak-month, peak-hour traffic volumes. The resulting 2025 No-Build weekday morning and evening peak-month, peak-hour traffic volumes are shown on Figure 4, with the corresponding 2035 No-Build peak-month, peak-hour traffic volumes shown on Figure 5.

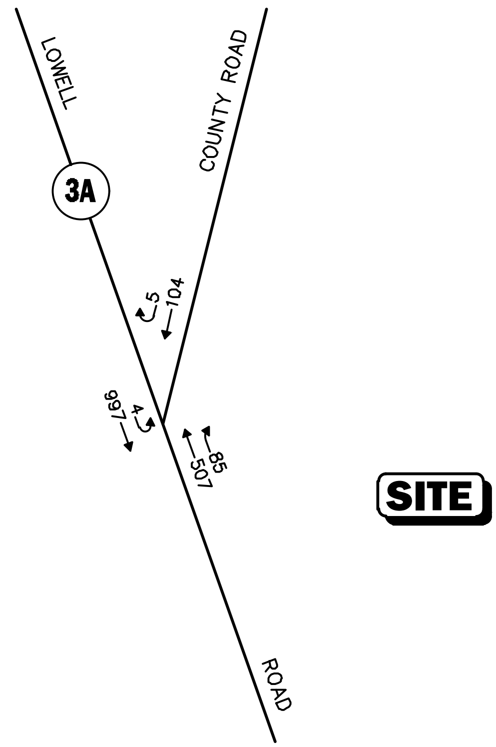
PROJECT-GENERATED TRAFFIC

As proposed, the Project will entail the construction of a 6,855± sf commercial building that will be designed for use by specialty trade contractors. In order to develop the traffic characteristics of the Project, trip-generation statistics published by the ITE[5] for a similar land use as that proposed were used. ITE Land Use Code (LUC) 180, *Specialty Trade Contractor*, was used to develop the anticipated traffic characteristics of the Project, the results of which are summarized in Table 5.

[5]Institute of Transportation Engineers, op. cit. 1.

Attachment "D"

WEEKDAY MORNING PEAK HOUR (7:30 - 8:30 AM)



WEEKDAY EVENING PEAK HOUR (4:15 - 5:15 PM)

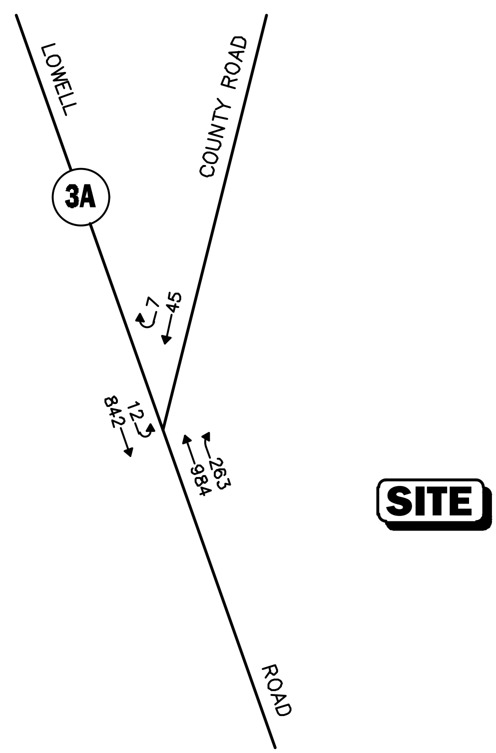


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Figure 4

2025 No-Build Peak-Month Peak-Hour Traffic Volumes

Vanasse & Associates inc

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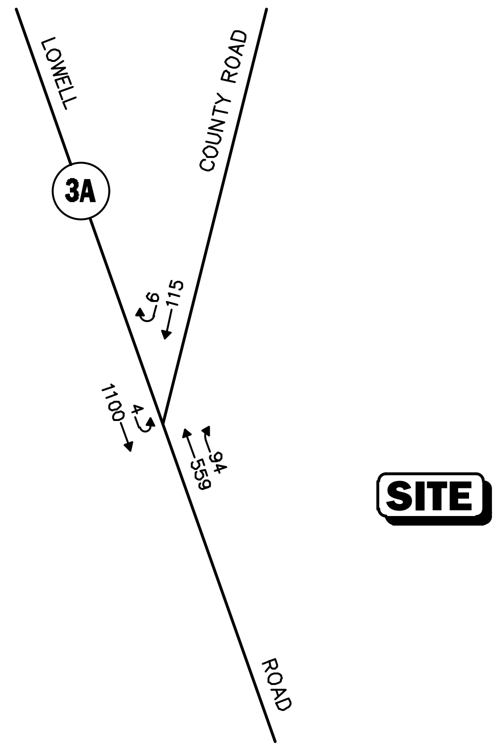
Attachment "D"

WEEKDAY MORNING PEAK HOUR (7:30 - 8:30 AM)



WEEKDAY EVENING PEAK HOUR (4:15 - 5:15 PM)

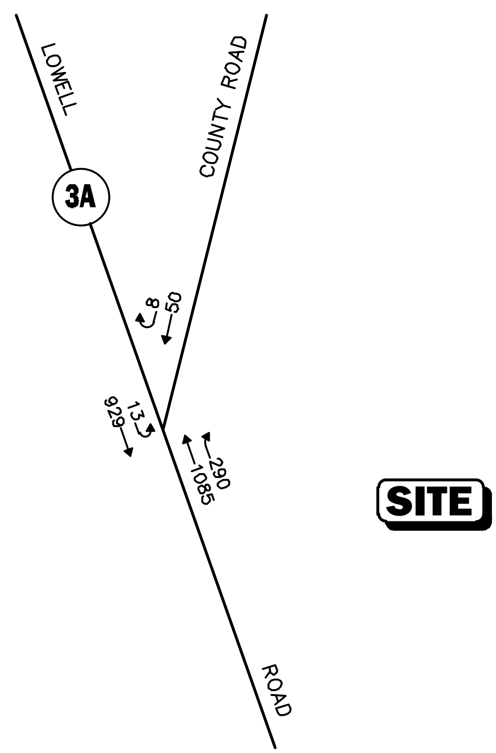


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Figure 5

Vanasse & Associates inc

2035 No-Build Peak-Month Peak-Hour Traffic Volumes

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Table 5
TRIP GENERATION SUMMARY

Time Period	Vehicle Trips[a]		
	Entering	Exiting	Total
Average Weekday:	34	34	68
Weekday Morning Peak-Hour:	8	3	11
Weekday Evening Peak-Hour:	4	9	13

[a]Based on ITE LUC 180, *Specialty Trade Contractor;* 6,855 sf.

Project-Generated Traffic-Volume Summary

As can be seen in Table 5, the Project is predicted to generate approximately 68 vehicle trips on an average weekday (two-way volume over the operational day of the Project, or 34 vehicles entering and 34 exiting) and approximately 11 vehicle trips (8 vehicles entering and 3 exiting) expected during the weekday morning peak-hour and 13 vehicle trips (4 vehicles entering and 9 exiting) expected during the weekday evening peak-hour.

Trip Distribution and Assignment

The directional distribution of generated trips to and from the Project site was determined based on a review of existing traffic patterns at the NH Route 3A/County Road intersection and the location of the Project site in relation to the regional roadway network. The general trip distribution for the Project is graphically depicted on Figure 6, with the additional traffic expected to be generated by the Project assigned onto the study area roadway network as shown on Figure 7.

Build Traffic Volumes

The 2025 Opening-Year Build and 2035 Build condition traffic volumes were developed by adding the peak-hour Project-generated traffic to the corresponding 2025 and 2035 No-Build peak-month, peak-hour traffic volumes. The resulting 2025 Opening-Year Build condition weekday morning and evening peak-hour traffic volumes are graphically depicted on Figure 8, with the corresponding 2035 Build condition peak-month, peak-hour traffic volumes depicted on Figure 9.

TRAFFIC OPERATIONS ANALYSIS

In order to assess the potential impact of the Project on the roadway network, a detailed traffic operations analysis (motorist delays, vehicle queuing, and level of service) was performed at the NH Route 3A/ County Road intersection. Capacity analyses provide an indication of how well transportation facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

In brief, six levels of service are defined for each type of facility. They are given letter designations ranging from A to F, with LOS "A" representing the best operating conditions and LOS "F" representing congested or constrained operations. An LOS of "E" is representative of a transportation facility that is operating at its design capacity with an LOS of "D" is generally defined as the limit of "acceptable" traffic operations. Since the level of service of a traffic facility is a function of the flows placed upon it, such a facility may

Legend:

XX	Entering Trips
(XX)	Exiting Trips

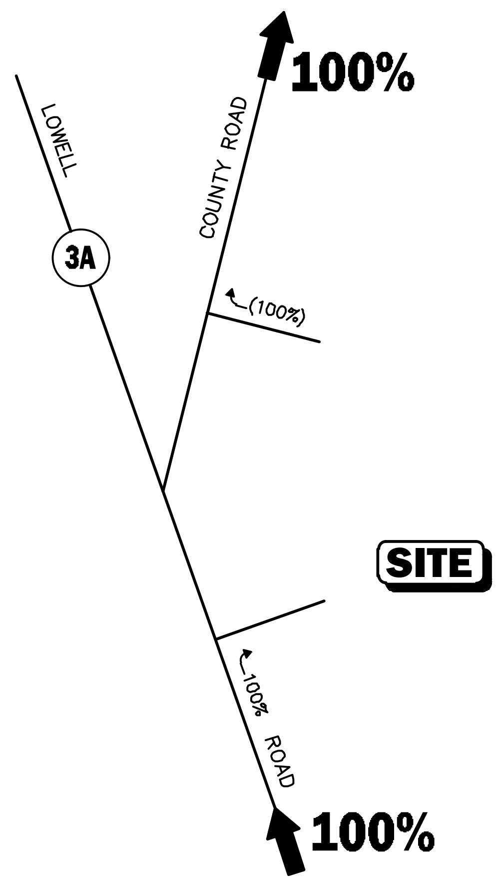

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Figure 6

Trip Distribution Map

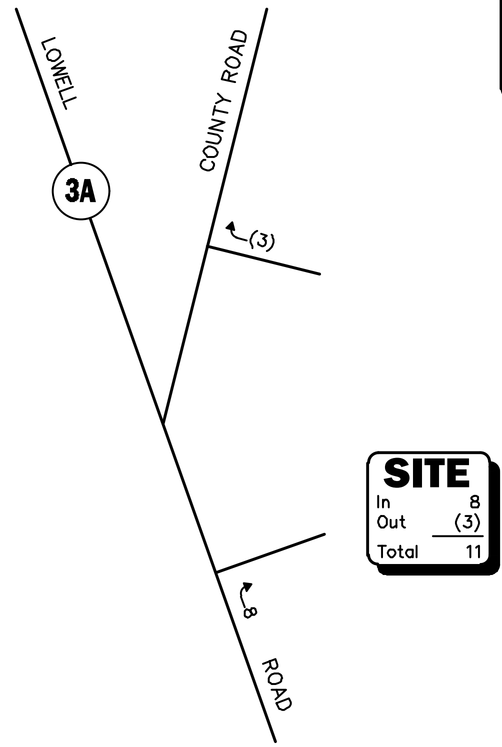
Vanasse & Associates inc

Attachment "D"

Legend:

XX	Entering Trips
(XX)	Exiting Trips

WEEKDAY MORNING PEAK HOUR (7:30 - 8:30 AM)



WEEKDAY EVENING PEAK HOUR (4:15 - 5:15 PM)

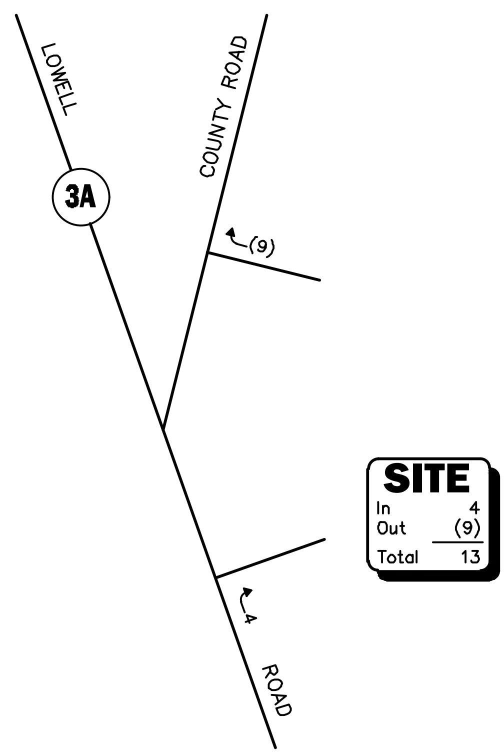


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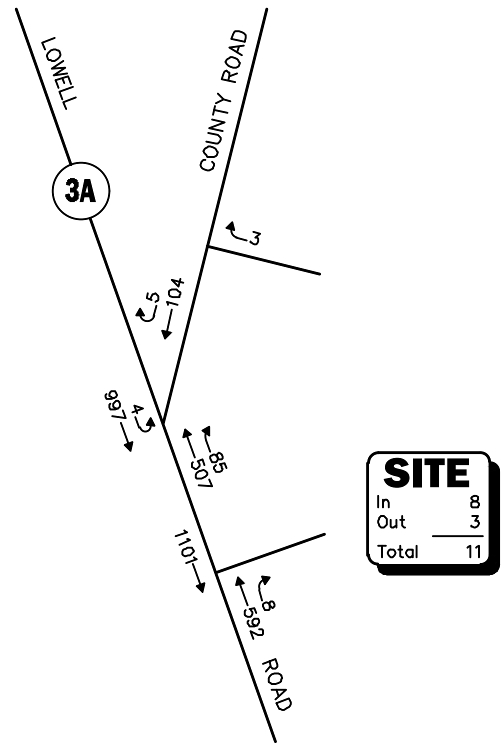
Figure 7

Project-Generated Peak-Month Peak-Hour Traffic Volumes

Vanasse & Associates inc

Attachment "D"

WEEKDAY MORNING PEAK HOUR (7:30 - 8:30 AM)



WEEKDAY EVENING PEAK HOUR (4:15 - 5:15 PM)

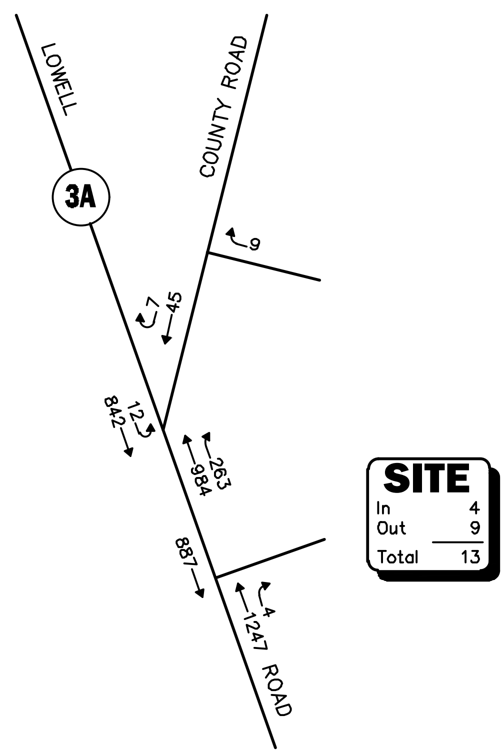


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Figure 8

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2025 Opening-Year Build Peak-Month Peak-Hour Traffic Volumes

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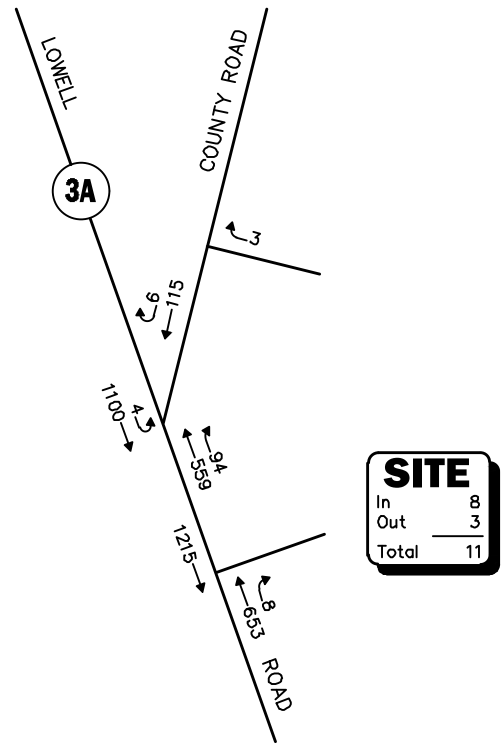
Attachment "B"

WEEKDAY MORNING PEAK HOUR (7:30 - 8:30 AM)



WEEKDAY EVENING PEAK HOUR (4:15 - 5:15 PM)

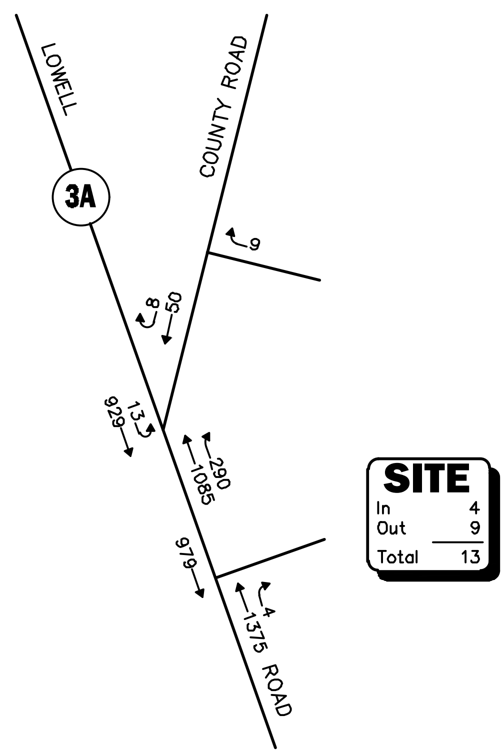


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Figure 9

Vanasse & Associates inc

2035 Build
Peak-Month
Peak-Hour Traffic Volumes

operate at a wide range of levels of service depending on the time of day, day of week, or period of the year. The Synchro® 11 intersection capacity analysis software, which is based on the analysis methodologies and procedures presented in the 2000 *Highway Capacity Manual* (HCM),[6] was used to complete the level-of-service and vehicle queue analyses for the signalized study area intersection.

Analysis Results

Level-of-service and vehicle queue analyses were conducted for 2024 Existing, 2025 No-Build, 2025 Opening-Year Build, 2035 No-Build and 2035 Build conditions for the study area intersection and the Project site driveways. The results of the intersection capacity and vehicle queue analyses are summarized in Table 6, with the detailed analysis results presented in the Attachment.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area. For context, we note that an LOS of "D" or better is generally defined as "acceptable" operating conditions.

NH Route 3A at County Road

Under 2025 Opening-Year and 2035 Build peak-month conditions, no changes in level of service or vehicle queuing were shown to occur over No-Build conditions as a result of the addition of Project-related traffic. Independent of the Project, all movements from County Road are currently operating over capacity (i.e., LOS "F") during both peak hours with vehicle queues of up to 11 vehicles.

County Road at the Project Site Exit Driveway

Under 2025 Opening-Year Build peak-month conditions, all movements exiting the exit-only Project site driveway to County Road (restricted to right-turn movements only) were shown to operate at LOS A during both the weekday morning and evening peak hours with negligible vehicle queuing predicted. All movements along County Road approaching the Project site driveway were shown to operate at LOS A, also with negligible vehicle queuing predicted.

Under 2035 Build peak-month conditions, all movements exiting the exit-only Project site driveway to County Road were shown to operate at LOS A during the weekday morning peak-hour and at LOS B during the weekday evening peak-hour with negligible vehicle queuing predicted. All movements along County Road approaching the Project site driveway were shown to continue to operate at LOS A with negligible vehicle queuing predicted.

NH Route 3A at the Project Site Entrance Driveway

All movements at the entrance only Project site driveway intersection with NH Route 3A were shown to operate at LOS A under 2025 Opening-Year and 2035 Build conditions with negligible vehicle queuing predicted.

[6] *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000.

Table 6
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2024 Existing				2025 No Build				2025 Opening-Year Build				2035 No-Build				2035 Build			
Unsignalized Intersection/Peak Hour/Movement	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
NH Route 3A at County Road																				
Weekday Morning:																				
County Road WB LT/RT	108	>50.0	F	7	109	>50.0	F	8	109	>50.0	F	8	121	>50.0	F	11	121	>50.0	F	11
NH Route 3A NB TH/RT	578	0.0	A	0	592	0.0	A	0	592	0.0	A	0	653	0.0	A	0	653	0.0	A	0
NH Route 3A SB LT	979	0.0	A	0	997	0.0	A	0	997	0.0	A	0	1,100	0.0	A	0	1,100	0.0	A	0
NH Route 3A SB TH	4	8.7	A	0	4	8.8	A	0	4	8.8	A	0	4	9.0	A	0	4	9.0	A	0
Weekday Evening:																				
County Road WB LT/RT	52	>50.0	F	4	52	>50.0	F	4	52	>50.0	F	4	58	>50.0	F	6	58	>50.0	F	6
NH Route 3A NB TH/RT	1,223	0.0	A	0	1,247	0.0	A	0	1,247	0.0	A	0	1,375	0.0	A	0	1,375	0.0	A	0
NH Route 3A SB LT	823	0.2	A	0	842	0.2	A	0	842	0.2	A	0	929	0.2	A	0	929	0.2	A	0
NH Route 3A SB TH	12	11.8	B	0.1	12	12.0	B	0	12	12.0	B	0	13	12.9	B	0	13	12.9	B	0
County Road at the Project Site Exit Driveway																				
Weekday Morning:																				
County Road EB TH	--	--	--	--	--	--	--	--	89	0.0	A	0	--	--	--	--	98	0.0	A	0
County Road WB TH	--	--	--	--	--	--	--	--	109	0.0	A	0	--	--	--	--	121	0.0	A	0
Project Site Driveway NB RT	--	--	--	--	--	--	--	--	3	8.8	A	0	--	--	--	--	3	8.8	A	0
Weekday Evening:																				
County Road EB TH	--	--	--	--	--	--	--	--	275	0.0	A	0	--	--	--	--	304	0.0	A	0
County Road WB TH	--	--	--	--	--	--	--	--	52	0.0	A	0	--	--	--	--	58	0.0	A	0
Project Site Driveway NB RT	--	--	--	--	--	--	--	--	9	8.6	A	0	--	--	--	--	9	10.1	B	0
Lowell** Road **at the Project Site Entrance Driveway																				
Weekday Morning:																				
Lowell Road NB TH/RT	--	--	--	--	--	--	--	--	600	0.0	A	0	--	--	--	--	661	0.0	A	0
Lowell Road SB TH	--	--	--	--	--	--	--	--	1,101	0.0	A	0	--	--	--	--	1,215	0.0	A	0
Weekday Evening:																				
Lowell Road EB TH/RT	--	--	--	--	--	--	--	--	1,251	0.0	A	0	--	--	--	--	1,379	0.0	A	0
Lowell Road WB TH	--	--	--	--	--	--	--	--	887	0.0	A	0	--	--	--	--	979	0.0	A	0

[a]Demand in vehicles per hour.
[b]Average control delay per vehicle (in seconds).
[c]Level of service.
[d]Queue length in vehicles, based on 25 linear feet per vehicle (including clearances).
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

SIGHT DISTANCE MEASUREMENTS

Sight distance measurements were performed at the Project site driveway intersections with County Road in accordance with the American Association of State Highway and Transportation Officials (AASHTO)[7] requirements. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an oncoming vehicle and safely complete a turning or crossing maneuver with oncoming traffic. In accordance with AASHTO standards, if the measured ISD is at least equal to the required SSD value for the appropriate design speed, the intersection can operate in a safe manner. Table 7 presents the measured SSD and ISD at the subject intersections.

Table 7
SIGHT DISTANCE MEASUREMENTS[a]

	Feet		
Intersection/Sight Distance Measurement	Required Minimum (SSD)	Desirable (ISD)[b]	Measured
NH Route 3A at the Project Site Driveway			
Stopping Sight Distance:			
NH Route 3A approaching from the north	305	--	500+
NH Route 3A approaching from the south	305	--	456
County Road at the Project Site Driveway			
Stopping Sight Distance:			
County Road approaching from the northeast	200	--	467
County Road approaching from the southeast	200	--	238[c]
Intersection Sight Distance:			
Looking to the southeast from the driveway	200	290	228[c]

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets,* 7th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2018; and based on a 40 mph approach speed along NH Route 3A and a 30 mph approach speed on County Road.

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

[c]Available sight distance with the regrading of the embankment (slope) along the Project site frontage on both NH Route 3A and County Road and the selective trimming/removal of trees and vegetation located within the sight triangle areas of the Project site driveway.

As can be seen in Table 7, with the regrading of the embankment/slope along the Project site frontage on both NH Route 3A and County Road and the selective trimming/removal of trees and vegetation located within the sight triangle areas of the County Road Project site driveway, the available lines of sight at the Project site driveway intersections will meet or exceed the recommended minimum sight distances to function in a safe manner (SSD) based on the appropriate approach speeds.

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[7] *A Policy on Geometric Design of Highway and Streets,* 7th Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2018.

SUMMARY

VAI has completed a detailed assessment of the potential impacts on the transportation infrastructure associated with the proposed construction of a commercial building to be located at 100 Lowell Road in Hudson, New Hampshire. This study has been completed in accordance with the NHDOT guidelines for the preparation of a TIS as defined in the Driveway Permit Policy and has evaluated the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; under existing and future conditions, both with and without the Project. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the ITE,[8] the Project is expected to generate approximately 68 vehicle trips on an average weekday (two-way volume over the operational day of the Project), with approximately 11 vehicle trips expected during the weekday morning peak-hour and 13 vehicle trips expected during the weekday evening peak-hour;

2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions), with no (0) changes in level of service or vehicle queuing shown to occur. Independent of the Project, all movements from the County Road approach to NH Route 3A are currently operating over capacity (i.e., LOS "F");

3. Under 2025 Opening Year Build and 2035 Build conditions, all movements exiting the Project site driveway to County Road were shown to operate at LOS A/B with negligible vehicle queuing. All movements along NH Route 3A and County Road approaching the Project site driveways were shown to operate at LOS A, also with negligible vehicle queuing;

4. Based on a review of motor vehicle crash data provided by the Hudson Police Department for the NH Route 3A/County Road intersection, the majority of the reported crashes involved distracted motorists or failure to yield, conditions that are not attributable to a specific roadway or intersection defect; and

5. With the regrading of the embankment along the Project site frontage on both NH Route 3A and County Road and the selective trimming/removal of trees and vegetation located within the sight triangle areas of the County Road driveway, the lines of sight at the Project site driveway intersections will meet or exceed the recommended minimum distances for the intersections to operate in a safe manner based on the appropriate approach speed.

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

RECOMMENDATIONS

Project Access

Access to the Project site will be provided by way of two (2) driveways configured as follows: a one-way, right-turn, entrance only driveway that will intersect the east side of NH Route 3A on the northeast corner of the NH Route 3A/County Road intersection and a one-way, right-turn, exit only driveway that will

[8]Institute of Transportation Engineers, op. cit. 1.

intersect the east side of County Road approximately 110 feet north of NH Route 3A. The following recommendations are offered with respect to the design and operation of the Project site access and internal circulations, many of which are reflected on the site plans:

- The Project site driveways will be a minimum of 20 feet in width and will convey one-way traffic entering the Project site from NH Route 3A and one-way exiting traffic to County Road, respectively, with both entering and exiting traffic restricted to right turns only. Both driveways will be designed to accommodate the turning and maneuvering requirements of delivery trucks and the largest anticipated responding emergency vehicle.
- Vehicles exiting the Project site to County Road should be placed under STOP-sign control with a marked STOP-line provided.
- "One-Way", "Do Not Enter" and "No Left Turn" signs should be installed at both driveways with the "No Left Turn" signs installed at the Project site driveway on NH Route 3A facing southbound motorists and on County Road opposite the Project site driveway. In addition, a "Right Turn Only" sign should be installed beneath the STOP-sign for the County Road Project site driveway.
- Where perpendicular parking is proposed, the drive aisle behind the parking should be a minimum of 23 feet in order to facilitate parking maneuvers.
- All signs and pavement markings to be installed within the Project site should conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[9]
- Americans with Disabilities Act (ADA)-compliant wheelchair ramps should be provided at all pedestrian crossings to be constructed or modified in conjunction with the Project.
- The embankment/slope along the Project site frontage on NH Route 3A and County Road should be regraded such that no portion of the slope that is located within the sight triangle area of the County Road Project site driveway exceeds 2-feet in height as measured in reference to the surface elevation of the County Road Project site driveway. In addition, existing trees and vegetation located within the sight triangle areas of the County Road Project site driveway should be selectively trimmed or removed and maintained.
- Signs and landscaping to be installed as a part of the Project within the intersection sight triangle areas should be designed and maintained so as not to restrict lines of sight.
- Snow accumulations (windrows) within sight triangle areas should be promptly removed where such accumulations would impede sight lines.

<u>Off-Site</u>

NH Route 3A at County Road

As discussed previously, the Town is coordinating with NHDOT to advance specific improvements to address the disproportionate number of motor vehicle crashes that are occurring at the NH Route 3A/County Road intersection, that will include extending Belknap Road to intersect NH Route 3A opposite Birch Street becoming the fourth leg of the existing signalized intersection. This improvement will also benefit traffic operations at the NH Route 3A/County Road intersection by diverting traffic to the new intersection. In an effort to advance geometric improvements at the NH Route 3A/County Road intersection, the Project

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

proponent will donate land to the Town to allow for the County Road approach to NH Route 3A to be realigned so as to intersect NH Route 3A at a perpendicular angle.

In advance of these improvements, it is recommended that the following measures be advanced:

1. Install "Intersection Ahead" warning signs (graphic symbol) with supplemental street name plaques on both NH Route 3A approaches to County Road;
2. Replace the existing STOP-sign and marked STOP-line on the County Road approach; and
3. Install a "Stop Sign Ahead" warning sign on County Road approximately 100 feet in advance of the STOP-sign.

The recommended improvements will be implemented prior to the issuance of a Certificate of Occupancy for the Project subject to receipt of all necessary rights, permits and approvals.

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

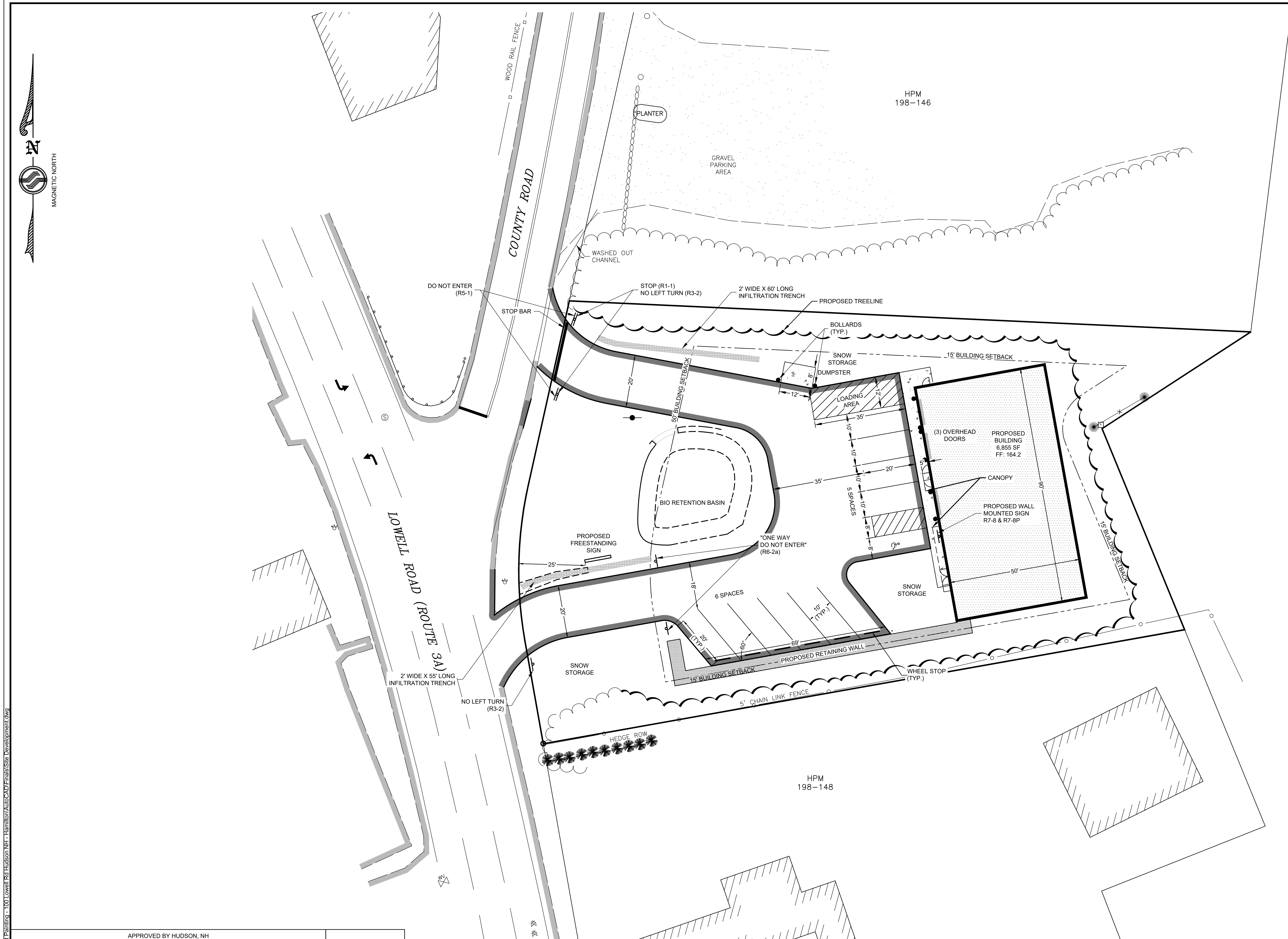
Attachments

ATTACHMENT

PROJECT SITE PLAN
AUTOMATIC TRAFFIC RECORDER COUNT DATA
MANUAL TURNING MOVEMENT COUNT DATA
SEASONAL ADJUSTMENT DATA
COVID-19 ADJUSTMENT DATA
VEHICLE TRAVEL SPEED DATA
TRANSIT INFORMATION
CRASHES
GENERAL BACKGROUND TRAFFIC GROWTH
BACKGROUND DEVELOPMENT TRAFFIC-VOLUME NETWORKS
TRIP-GENERATION CALCULATIONS
CAPACITY ANALYSIS WORKSHEETS

Attachment "D"

PROJECT SITE PLAN



NOTES

1. THE PURPOSE OF THIS PLAN IS TO DEPICT THE DEVELOPMENT OF A COMMERCIAL BUILDING ON HUDSON PROPERTY MAP 198 LOT 147 CONSISTING OF 0.80 Ac.
2. THE PROPOSED DEVELOPMENT INCLUDES:
   A. NEW COMMERCIAL BUILDING
   B. PARKING AND MANUEVERING SPACE
   C. THREE OVERHEAD DOORS
   D. DUMPSTER WITH ENCLOSURE
   E. RETAINING WALL
   F. PROPERTY TO BE SERVED BY RIGHT IN/RIGHT OUT DRIVEWAYS
   G. CONNECTION TO MUNICIPAL UTILITIES (WATER AND SEWER) AND NATURAL GAS
   H. RELOCATION OF OVERHEAD ELECTRIC, THEN UNDERGROUND TO BUILDING
   I. NEW FREESTANDING SIGN
3. ZONING DISTRICT: B - Buisness

DIMENSIONAL REQUIREMENT	REQUIRED	PROVIDED
MINIMUM LOT SIZE:	0.69 Ac.± (30,000 SQ.FT.)	0.8 Ac.± (34,848 SQ.FT.)
MINIMUM FRONTAGE:	150'	171'
MAXIMUM BUILDING HEIGHT	35'	35'
FRONT SETBACK:	50'	135'
SIDE SETBACK:	15'	16'
REAR SETBACK:	15'	17'
OPEN SPACE:	13,939'	18,254

4. TOTAL LAND AREA TO BE DISTRIBUTED WITH THIS PROJECT: 28,981 SF
5. TOTAL PAVEMENT ON SITE AFTER DEVELOPMENT: 9,628 SF
6. THE PROPOSED BUILDING WILL BE SERVED BY MUNICIPAL WATER AND SEWER AND UNDERGROUND GAS AND ELECTRIC.
7. ALL WORK IS TO CONFORM TO THE TOWN OF HUDSON STANDARDS.
8. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL VERTIFY THAT THEY HAVE THE MOST RECENT SET OF PLANS. ALL WORK SHALL BE PERFORMED USING THE COMPLETE SET OF PLANS AS SOME ITEMS ARE NOT SHOWN ON EVERY SHEET.
9. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY IF CONDITIONS ARE FOUND THAT DO NOT MATCH WHAT IS SHOWN ON THESE PLANS
10. ALL DIMENSIONS ARE TO FACE OF CURB UNLESS OTHERWISE NOTED.
11. EACH ACCESSIBLE SPACE SHALL BE MARKED WITH AN UPRIGHT SIGN.
12. ALL PARKING SPACES SHALL BE STRIPED WITH WHITE TRAFFIC PAINT WITH A 4" MINIMUM LINE WIDTH.
13. ALL DISTURBED AREAS SHALL BE DRESSED WITH 4" OF LOAM AND SEED UNLESS OTHERWISE SPECIFIED.
14. ALL SITE AND CONSTRUCTION PLANS MAY BE REVIEWED BY A THIRD PARTY CONSULTANT OF THE TOWNS CHOOSING. ALL COSTS ASSOCIATED WITH THE THIRD PARTY REVIEWS AND INSPECTION SHALL BE PAID BY THE DEVELOPER.
15. OVERHEAD DOORS ARE PROVIDED FOR STORAGE OF VEHICLES DURING NON-BUISNESS HOURS TO KEEP MATERIAL IN A CONDITIONED SPACE. USE OF THESE DOORS WILL NOT IMPACT AVAILBLE PARKING.
16. LOCATION OF A SIGN MEETING ZONING REQUIREMENTS IS SHOWN. ALL SIGNS ARE SUBJECT TO APPROVAL BY THE HUDSON ZONING ADMINISTRATOR PRIOR TO INSTALLATION THEREOF.
17. HUDSON SITE PLAN REVIEW REGULATIONS SECTION 275-8.c(7)(e) THAT STATES THAT LANDSCAPING REQUIREMENTS DO NOT APPLY TO PARKING AREAS CONSISTING OF A SINGLE ACCESS LANE.
18. PARKING REQUIREMENTS
    REQUIRED: 6,855 SF / 300 SF = 23 SPACES
    PROVIDED: 11, OF WHICH 1 IS VAN ACCESSIBLE

WAIVER REQUESTS

1. 276-11.1.B.(9) THAT REQUIRES ERROR OF CLOSURE PREPARED BY A NH LICENSED LAND SURVEYOR.
2. TOTAL 75-8.C.(2)(m) FOR PARKING QUANTITY

THIS PLAN SET SUBMITTED FOR PERMITTING AND CONSTRUCTION ESTIMATES. THIS PLAN SET SHALL NOT BE USED FOR CONSTRUCTION.

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

No.	Revision	Date
Designed by: TDD	Drawn by: BRC	Checked by: DMF

Site Development Plan

Commercial Development
Inside Out Painting and Remodeling
100 Lowell Road
Hudson, NH

Assessors Map 198 Lot 147

SFC ENGINEERING

Windham, New Hampshire
Portland, Maine

(603) 647-8700
www.sfceng.com

Sheet 3 of 9 | Scale: 1" = 20' | Date: 10/2/2024

STATE OF NEW HAMPSHIRE DANIEL M. FLORES No. 15761 LICENSED PROFESSIONAL ENGINEER

Prepared for:

100 Lowell Road LLC
122 Lowell Road, Suite 3
Hudson, NH 03501

Hudson Planning Board Approval

Zoning Classification: B - Business

APPROVED BY HUDSON, NH PLANNING BOARD

DATE OF MEETING:______

SIGNATURE SIGNATURE

SIGNATURE DATE:___________ SIGNATURE DATE:___________

SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING DATE AT WHICH THE PLAN RECIEVES FINAL APPROVAL

PURSUANT TO THE SITE REVIEW REGULATIONS OF THE HUDSON PLANNING BOARD, THE SITE PLAN APPROVAL GRANTED HEREIN EXPIRES ONE YEAR FROM DATE OF APPROVAL.

Drawing name: K:\6677\10 Inside Out Painting - 100 Lowell Rd Hudson NH - Hamilton\AutoCAD\Finals\Site Development.dwg

Attachment "D"

AUTOMATIC TRAFFIC RECORDER COUNT DATA

Stephen G. Pernaw & Company, Inc.

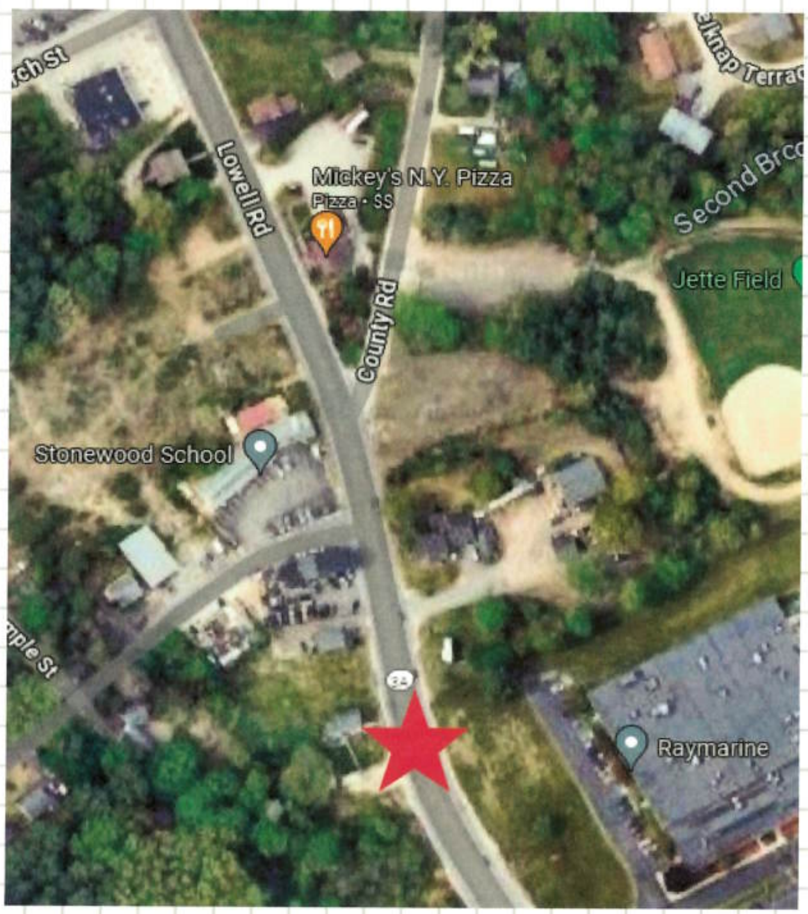
CALCULATION SHEET

Attachment "D"

Project:	SFC - Hudson	Job Number:	2312A
Calculated By:		Date:	
Checked By:		Date:	
Sheet No:		Of:	
Subject:	ATR Data - NH Route 3A		

Lowell Road (NH Route 3A) - South of Atwood Avenue

Tuesday, July 23, 2024 & Wednesday, July 24, 2024



Attachment "D"

Daily Vehicle Volume Report

Study Date: Tuesday, 07/23/2024
Unit ID: SGP13
Location: Hudson

	SB ~~Northbound~~(B-A) Volume	NB Northbound(A-B) Volume	Total Volume
00:00 - 00:59	21	55	**76**
01:00 - 01:59	22	24	**46**
02:00 - 02:59	25	36	**61**
03:00 - 03:59	57	21	**78**
04:00 - 04:59	260	62	**322**
05:00 - 05:59	646	135	**781**
06:00 - 06:59	794	232	**1026**
07:00 - 07:59	817	375	**1192**
08:00 - 08:59	839	459	**1298**
09:00 - 09:59	711	503	**1214**
10:00 - 10:59	641	491	**1132**
11:00 - 11:59	646	634	**1280**
12:00 - 12:59	713	708	**1421**
13:00 - 13:59	636	652	**1288**
14:00 - 14:59	634	737	**1371**
15:00 - 15:59	638	925	**1563**
16:00 - 16:59	708	916	**1624**
17:00 - 17:59	626	959	**1585**
18:00 - 18:59	554	727	**1281**
19:00 - 19:59	386	595	**981**
20:00 - 20:59	318	451	**769**
21:00 - 21:59	262	302	**564**
22:00 - 22:59	178	133	**311**
23:00 - 23:59	76	135	**211**
Totals	**11208**	**10267**	**21475**
AM Peak Time	**07:37 - 08:36**	**11:00 - 11:59**	**07:43 - 08:42**
AM Peak Volume	**875**	**634**	**1332**
PM Peak Time	**12:15 - 13:14**	**16:56 - 17:55**	**16:43 - 17:42**
PM Peak Volume	**720**	**971**	**1646**

Daily Vehicle Volume Report

Study Date: Wednesday, 07/24/2024
Unit ID: SGP13
Location: Hudson

	SB ~~Northbound~~(B-A) Volume	NB Nor~~thbound~~(A-B) Volume	Total Volume
00:00 - 00:59	33	74	**107**
01:00 - 01:59	15	23	**38**
02:00 - 02:59	22	31	**53**
03:00 - 03:59	56	23	**79**
04:00 - 04:59	255	58	**313**
05:00 - 05:59	629	127	**756**
06:00 - 06:59	817	248	**1065**
07:00 - 07:59	855	382	**1237**
08:00 - 08:59	779	420	**1199**
09:00 - 09:59	510	448	**958**
10:00 - 10:59	615	483	**1098**
11:00 - 11:59	632	554	**1186**
12:00 - 12:59	376	601	**977**
13:00 - 13:59	485	565	**1050**
14:00 - 14:59	602	709	**1311**
15:00 - 15:59	617	904	**1521**
16:00 - 16:59	625	931	**1556**
17:00 - 17:59	612	914	**1526**
18:00 - 18:59	550	739	**1289**
19:00 - 19:59	441	604	**1045**
20:00 - 20:59	364	449	**813**
21:00 - 21:59	258	303	**561**
22:00 - 22:59	120	168	**288**
23:00 - 23:59	75	104	**179**
Totals	**10343**	**9862**	**20205**
AM Peak Time	**07:04 - 08:03**	**10:57 - 11:56**	**07:32 - 08:31**
AM Peak Volume	**866**	**564**	**1291**
PM Peak Time	**14:45 - 15:44**	**15:37 - 16:36**	**16:08 - 17:07**
PM Peak Volume	**638**	**957**	**1573**

Attachment "D"

MANUAL TURNING MOVEMENT COUNT DATA

Stephen G. Pernaw & Company, Inc.

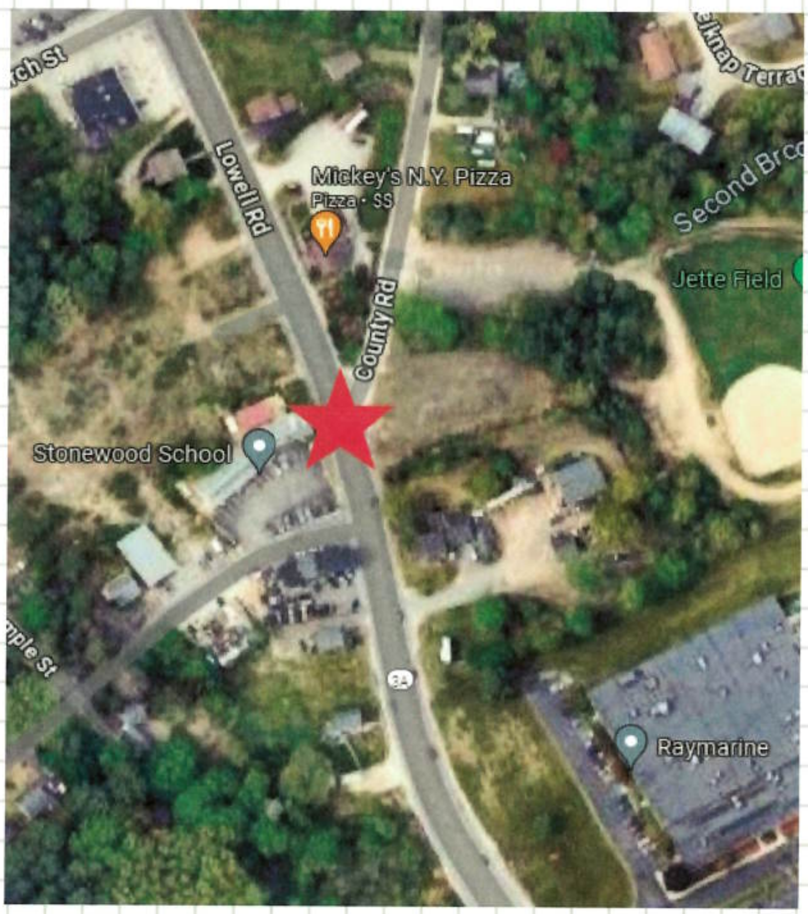
CALCULATION SHEET

Attachment "D"

Project:	SFC - Hudson	Job Number:	2312A
Calculated By:		Date:	
Checked By:		Date:	
Sheet No:		Of:	
Subject:	TMC Data - Intersection 1		

Lowell Road (NH Route 3A) / County Road

Wednesday, July 24, 2024 (7:00-9:00 AM & 3:00-6:00 PM)



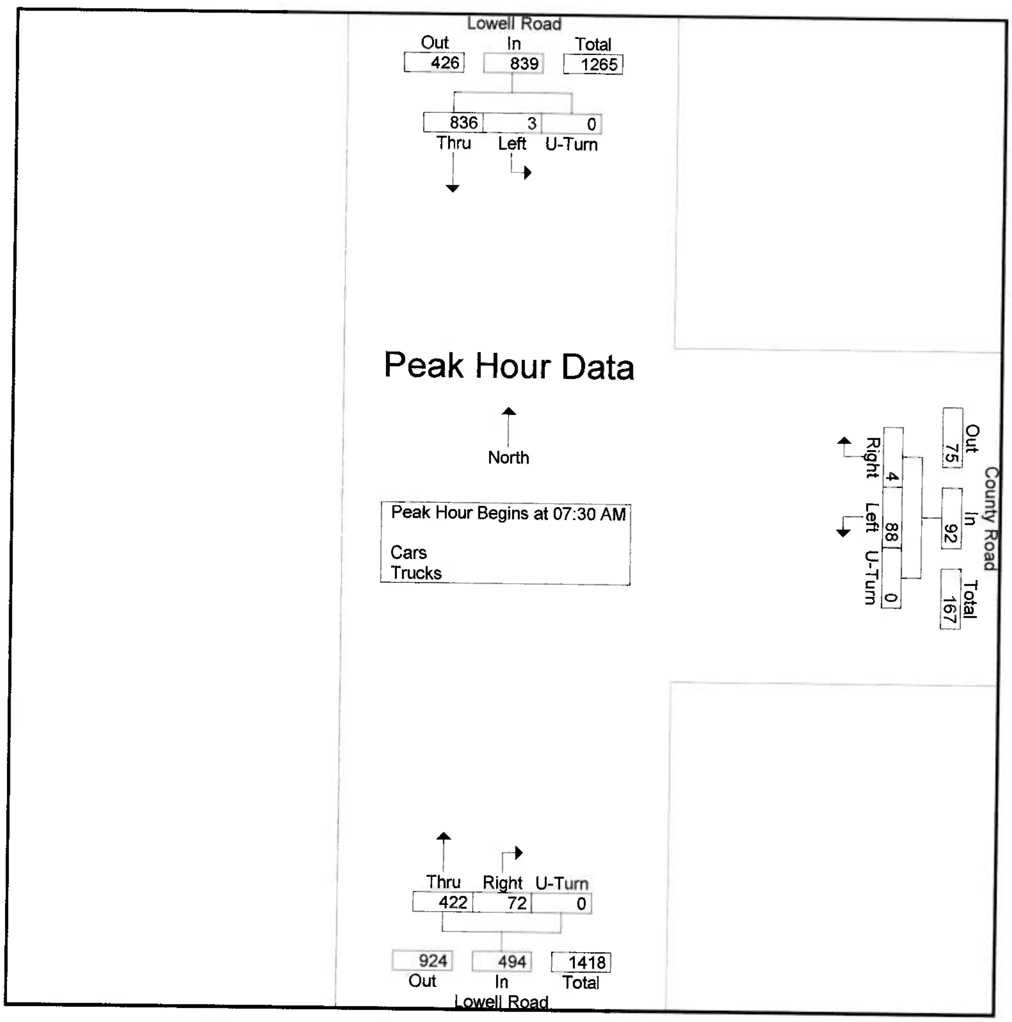
Attachment "D"

Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 2

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	194	**3**	0	197	**3**	21	0	24	17	103	0	120	341
07:45 AM	**222**	0	0	**222**	1	**25**	0	**26**	16	109	0	125	**373**
08:00 AM	212	0	0	212	0	21	0	21	**20**	**111**	0	**131**	364
08:15 AM	208	0	0	208	0	21	0	21	19	99	0	118	347
Total Volume	836	3	0	839	4	88	0	92	72	422	0	494	1425
% App. Total	99.6	0.4	0		4.3	95.7	0		14.6	85.4	0		
PHF	.941	.250	.000	.945	.333	.880	.000	.885	.900	.950	.000	.943	.955



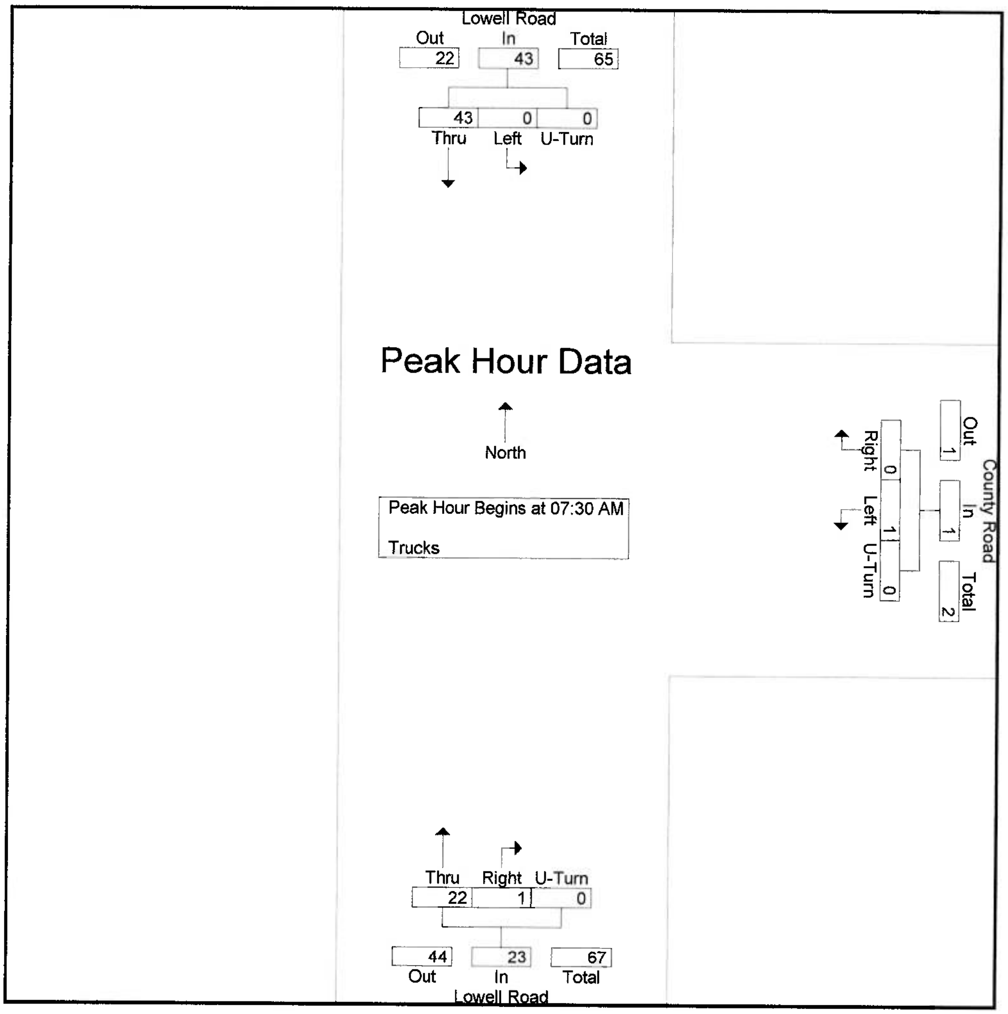
Attachment "D"

Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 2

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	**15**	0	0	**15**	0	**1**	0	**1**	0	**7**	0	**7**	**23**
07:45 AM	7	0	0	7	0	0	0	0	0	7	0	7	14
08:00 AM	15	0	0	15	0	0	0	0	0	5	0	5	20
08:15 AM	6	0	0	6	0	0	0	0	**1**	3	0	4	10
Total Volume	43	0	0	43	0	1	0	1	1	22	0	23	67
% App. Total	100	0	0		0	100	0		4.3	95.7	0		
PHF	.717	.000	.000	.717	.000	.250	.000	.250	.250	.786	.000	.821	.728



Attachment "D"

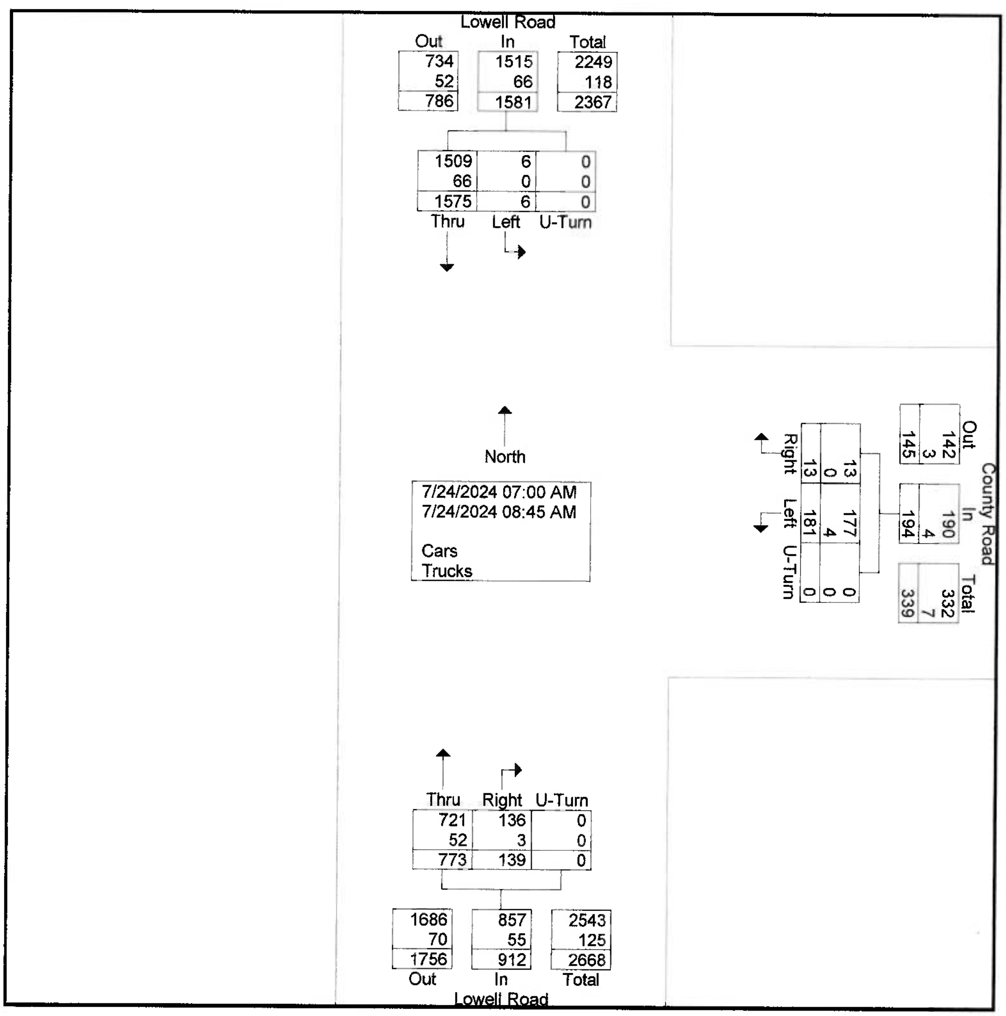
Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 1

Groups Printed- Cars - Trucks

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	201	3	0	204	1	28	0	29	19	70	0	89	322
07:15 AM	197	0	0	197	2	25	0	27	12	88	0	100	324
07:30 AM	194	3	0	197	3	21	0	24	17	103	0	120	341
07:45 AM	222	0	0	222	1	25	0	26	16	109	0	125	373
Total	814	6	0	820	7	99	0	106	64	370	0	434	1360
08:00 AM	212	0	0	212	0	21	0	21	20	111	0	131	364
08:15 AM	208	0	0	208	0	21	0	21	19	99	0	118	347
08:30 AM	170	0	0	170	2	19	0	21	14	84	0	98	289
08:45 AM	171	0	0	171	4	21	0	25	22	109	0	131	327
Total	761	0	0	761	6	82	0	88	75	403	0	478	1327
Grand Total	1575	6	0	1581	13	181	0	194	139	773	0	912	2687
Apprch %	99.6	0.4	0		6.7	93.3	0		15.2	84.8	0		
Total %	58.6	0.2	0	58.8	0.5	6.7	0	7.2	5.2	28.8	0	33.9	
Cars	1509	6	0	1515	13	177	0	190	136	721	0	857	2562
% Cars	95.8	100	0	95.8	100	97.8	0	97.9	97.8	93.3	0	94	95.3
Trucks	66	0	0	66	0	4	0	4	3	52	0	55	125
% Trucks	4.2	0	0	4.2	0	2.2	0	2.1	2.2	6.7	0	6	4.7



Attachment "D"

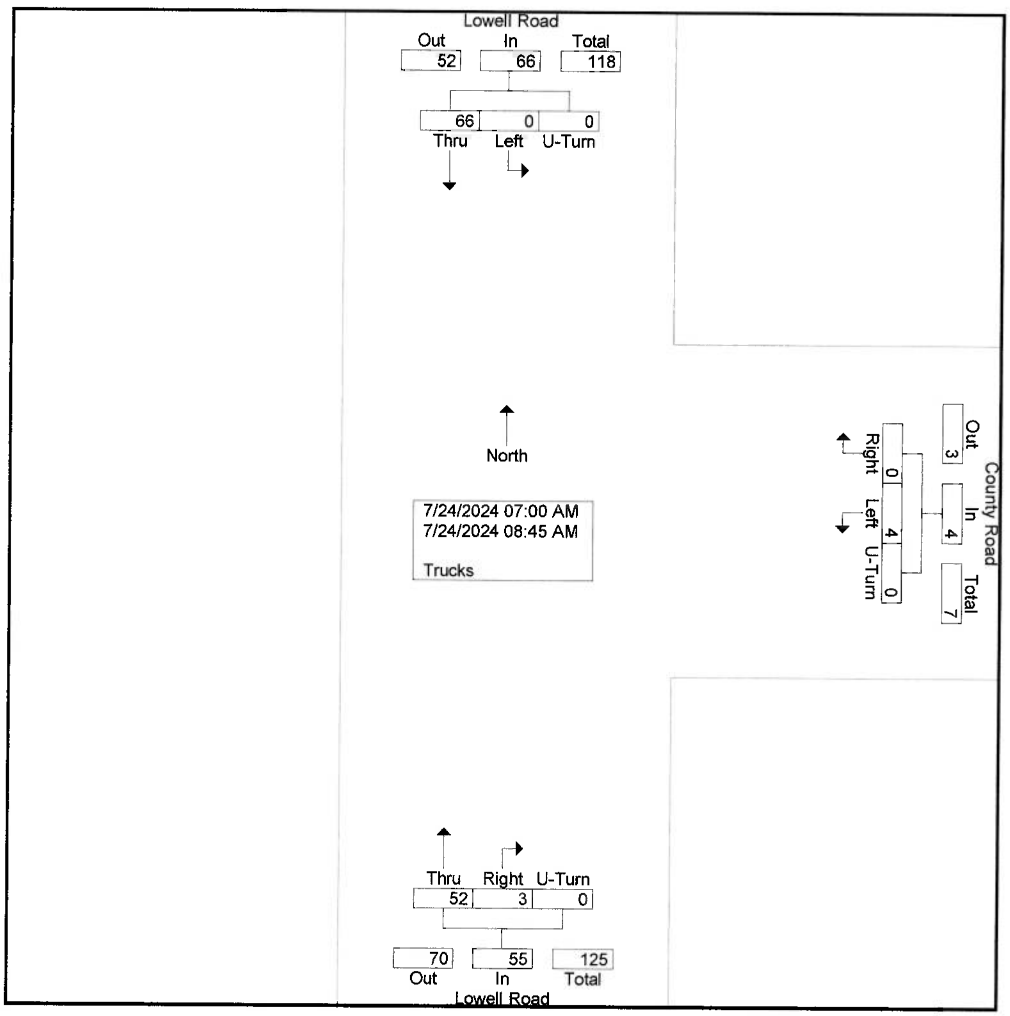
Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 1

Groups Printed- Trucks

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	7	0	0	7	0	2	0	2	0	6	0	6	15
07:15 AM	2	0	0	2	0	1	0	1	2	9	0	11	14
07:30 AM	15	0	0	15	0	1	0	1	0	7	0	7	23
07:45 AM	7	0	0	7	0	0	0	0	0	7	0	7	14
Total	31	0	0	31	0	4	0	4	2	29	0	31	66
08:00 AM	15	0	0	15	0	0	0	0	0	5	0	5	20
08:15 AM	6	0	0	6	0	0	0	0	1	3	0	4	10
08:30 AM	10	0	0	10	0	0	0	0	0	7	0	7	17
08:45 AM	4	0	0	4	0	0	0	0	0	8	0	8	12
Total	35	0	0	35	0	0	0	0	1	23	0	24	59
Grand Total	66	0	0	66	0	4	0	4	3	52	0	55	125
Apprch %	100	0	0		0	100	0		5.5	94.5	0		
Total %	52.8	0	0	52.8	0	3.2	0	3.2	2.4	41.6	0	44	



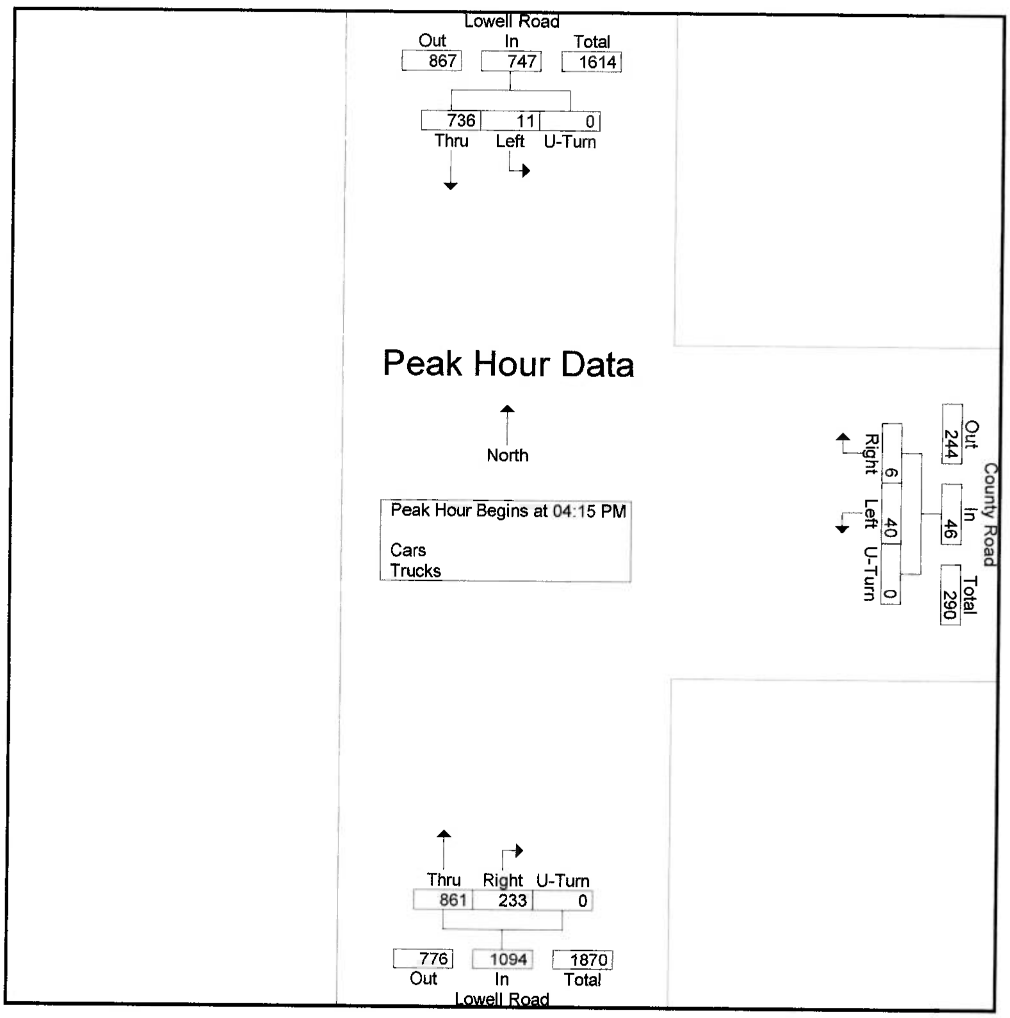
Attachment "D"

Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 3

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	185	1	0	186	**2**	9	0	11	**63**	**228**	0	**291**	**488**
04:30 PM	**191**	**4**	0	**195**	1	**11**	0	**12**	62	210	0	272	479
04:45 PM	169	3	0	172	2	10	0	12	55	199	0	254	438
05:00 PM	191	3	0	194	1	10	0	11	53	224	0	277	482
Total Volume	736	11	0	747	6	40	0	46	233	861	0	1094	1887
% App. Total	98.5	1.5	0		13	87	0		21.3	78.7	0		
PHF	.963	.688	.000	.958	.750	.909	.000	.958	.925	.944	.000	.940	.967



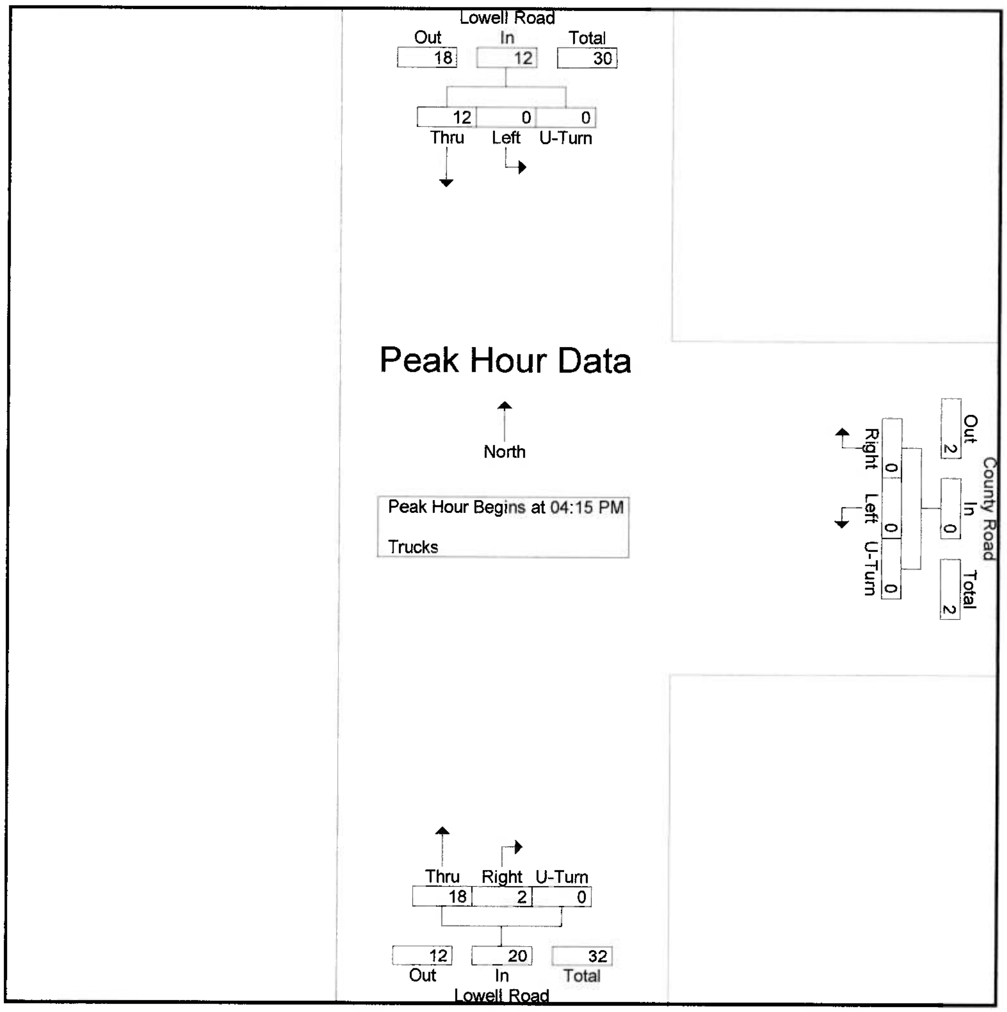
Attachment "D"

Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 2

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	1	0	0	1	0	0	0	0	0	3	0	3	4
04:30 PM	4	0	0	4	0	0	0	0	**1**	3	0	4	8
04:45 PM	**5**	0	0	**5**	0	0	0	0	0	5	0	5	**10**
05:00 PM	2	0	0	2	0	0	0	0	1	**7**	0	**8**	10
Total Volume	12	0	0	12	0	0	0	0	2	18	0	20	32
% App. Total	100	0	0		0	0	0		10	90	0		
PHF	.600	.000	.000	.600	.000	.000	.000	.000	.500	.643	.000	.625	.800



Attachment "D"

Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

Weather: Fair
Collected By: MV
Job Number: 2312A
Town/State: Hudson, New Hampshire

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 1

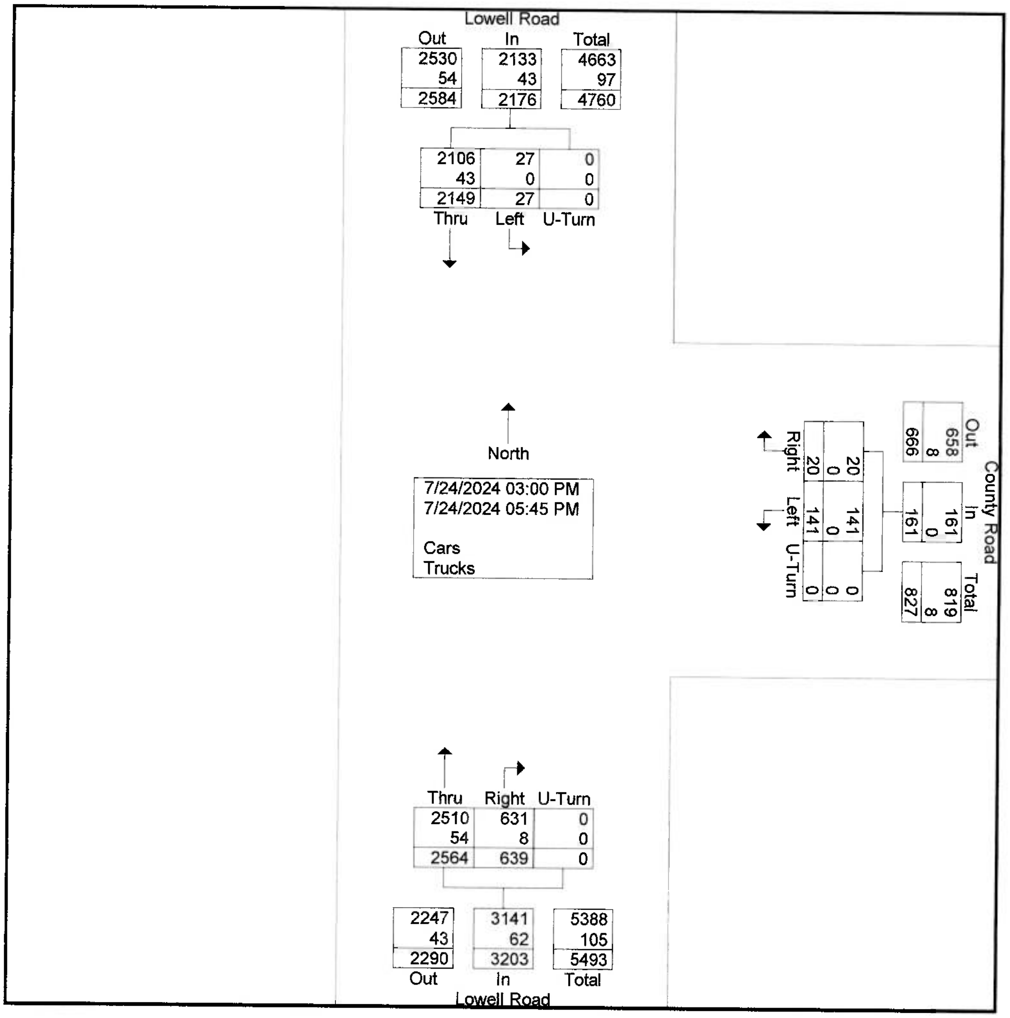
Groups Printed- Cars - Trucks

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	179	1	0	180	1	14	0	15	57	195	0	252	447
03:15 PM	163	1	0	164	1	12	0	13	51	219	0	270	447
03:30 PM	189	0	0	189	2	11	0	13	56	206	0	262	464
03:45 PM	172	4	0	176	2	15	0	17	43	209	0	252	445
Total	703	6	0	709	6	52	0	58	207	829	0	1036	1803
04:00 PM	170	1	0	171	5	19	0	24	54	204	0	258	453
04:15 PM	185	1	0	186	2	9	0	11	63	228	0	291	488
04:30 PM	191	4	0	195	1	11	0	12	62	210	0	272	479
04:45 PM	169	3	0	172	2	10	0	12	55	199	0	254	438
Total	715	9	0	724	10	49	0	59	234	841	0	1075	1858
05:00 PM	191	3	0	194	1	10	0	11	53	224	0	277	482
05:15 PM	185	1	0	186	0	9	0	9	43	247	0	290	485
05:30 PM	193	1	0	194	0	10	0	10	53	207	0	260	464
05:45 PM	162	7	0	169	3	11	0	14	49	216	0	265	448
Total	731	12	0	743	4	40	0	44	198	894	0	1092	1879
Grand Total	2149	27	0	2176	20	141	0	161	639	2564	0	3203	5540
Apprch %	98.8	1.2	0		12.4	87.6	0		20	80	0		
Total %	38.8	0.5	0	39.3	0.4	2.5	0	2.9	11.5	46.3	0	57.8	
Cars	2106	27	0	2133	20	141	0	161	631	2510	0	3141	5435
% Cars	98	100	0	98	100	100	0	100	98.7	97.9	0	98.1	98.1
Trucks	43	0	0	43	0	0	0	0	8	54	0	62	105
% Trucks	2	0	0	2	0	0	0	0	1.3	2.1	0	1.9	1.9

Attachment "D"

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 2



Attachment "D"

Stephen G. Pernaw & Company, Inc.

P.O. Box 1721
Concord, New Hampshire 03302

Weather: Fair
Collected By: MV
Job Number: 2312A
Town/State: Hudson, New Hampshire

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 1

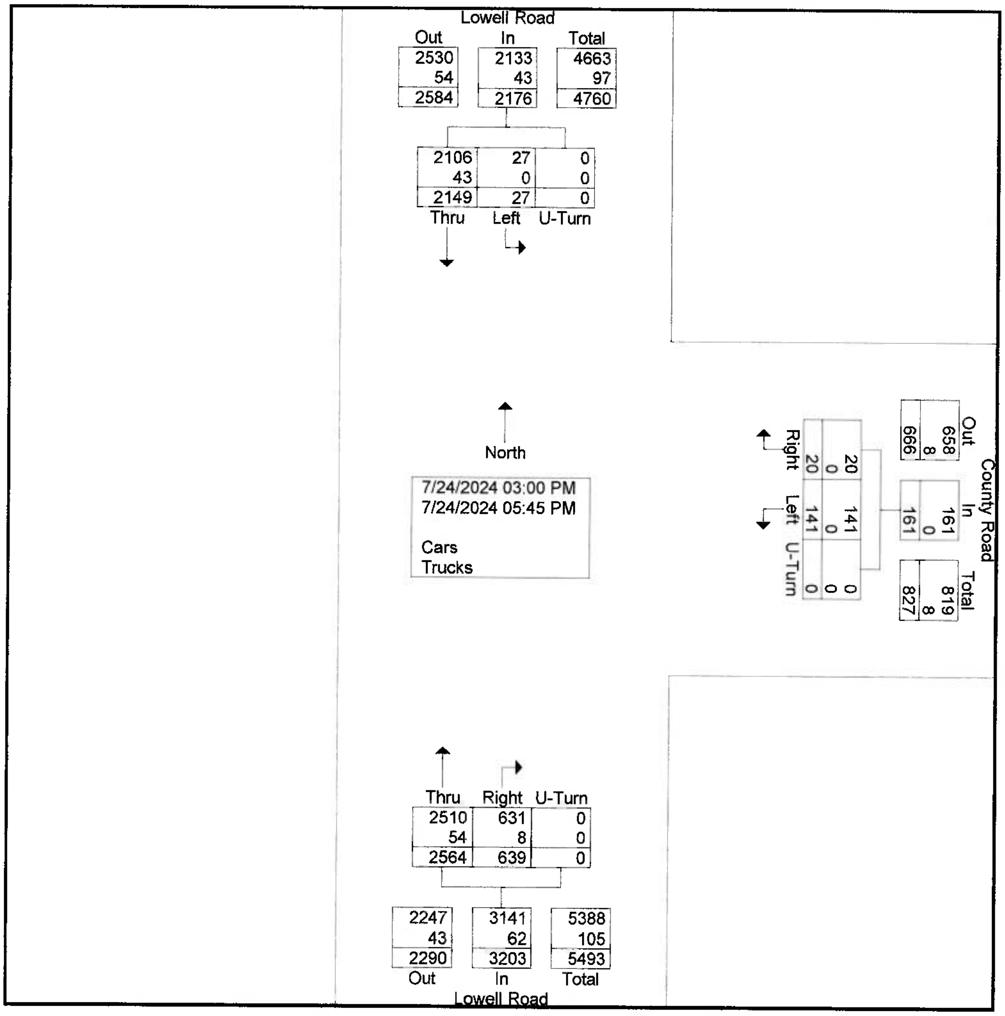
Groups Printed- Cars - Trucks

	Lowell Road Southbound				County Road Westbound				Lowell Road Northbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	179	1	0	180	1	14	0	15	57	195	0	252	447
03:15 PM	163	1	0	164	1	12	0	13	51	219	0	270	447
03:30 PM	189	0	0	189	2	11	0	13	56	206	0	262	464
03:45 PM	172	4	0	176	2	15	0	17	43	209	0	252	445
Total	703	6	0	709	6	52	0	58	207	829	0	1036	1803
04:00 PM	170	1	0	171	5	19	0	24	54	204	0	258	453
04:15 PM	185	1	0	186	2	9	0	11	63	228	0	291	488
04:30 PM	191	4	0	195	1	11	0	12	62	210	0	272	479
04:45 PM	169	3	0	172	2	10	0	12	55	199	0	254	438
Total	715	9	0	724	10	49	0	59	234	841	0	1075	1858
05:00 PM	191	3	0	194	1	10	0	11	53	224	0	277	482
05:15 PM	185	1	0	186	0	9	0	9	43	247	0	290	485
05:30 PM	193	1	0	194	0	10	0	10	53	207	0	260	464
05:45 PM	162	7	0	169	3	11	0	14	49	216	0	265	448
Total	731	12	0	743	4	40	0	44	198	894	0	1092	1879
Grand Total	2149	27	0	2176	20	141	0	161	639	2564	0	3203	5540
Apprch %	98.8	1.2	0		12.4	87.6	0		20	80	0		
Total %	38.8	0.5	0	39.3	0.4	2.5	0	2.9	11.5	46.3	0	57.8	
Cars	2106	27	0	2133	20	141	0	161	631	2510	0	3141	5435
% Cars	98	100	0	98	100	100	0	100	98.7	97.9	0	98.1	98.1
Trucks	43	0	0	43	0	0	0	0	8	54	0	62	105
% Trucks	2	0	0	2	0	0	0	0	1.3	2.1	0	1.9	1.9

Stephen G. Pernaw & Company, Inc. **Attachment "D"**

P.O. Box 1721
Concord, New Hampshire 03302

File Name : 2312A_Intersection_1_1209201_07-24-2024
Site Code :
Start Date : 7/24/2024
Page No : 2



Attachment "D"

SEASONAL ADJUSTMENT DATA

Attachment "D"

Year 2019 Monthly Data

Town: Nashua
Station: 62315281
Location: FEET south of the Canal Bridge Exit 5-6
Group: 3

Month	ADT	Adjustment to Average	Adjustment to Peak
January	115,162	1.09	1.14
February	118,623	1.06	1.11
March	121,898	1.03	1.08
April	126,360	0.99	1.04
May	130,908	0.96	1.01
June	130,727	0.96	1.01
July	128,641	0.98	1.02
August	131,834	0.95	1.00
September	128,012	0.98	1.03
October	131,793	0.95	1.00
November	125,941	1.00	1.05
December	116,379	1.08	1.13

AADT: 125,544
Peak Month: 131,834

Attachment "D"

COVID-19 ADJUSTMENT DATA

July 2019 Average Count Data – Sta. 62315281

ADT: 128,641
Weekday Morning Peak-Hour Traffic: 9,425
Weekday Evening Peak-Hour Traffic: 11,017

July 2024 Average Count Data – Sta. 62315281

ADT: 117,869
Weekday Morning Peak-Hour Traffic: 8,209
Weekday Evening Peak-Hour Traffic: 10,050

COVID Adjustment

ADT: $1 - \frac{128{,}641}{117{,}869} = -0.091$

Weekday Morning Adjustment: $1 - \frac{9{,}425}{8{,}209} = -0.148$

Weekday Evening Adjustment: $1 - \frac{11017}{10{,}050} = -0.096$

Attachment "D"

VEHICLE TRAVEL SPEED DATA

Attachment "D"

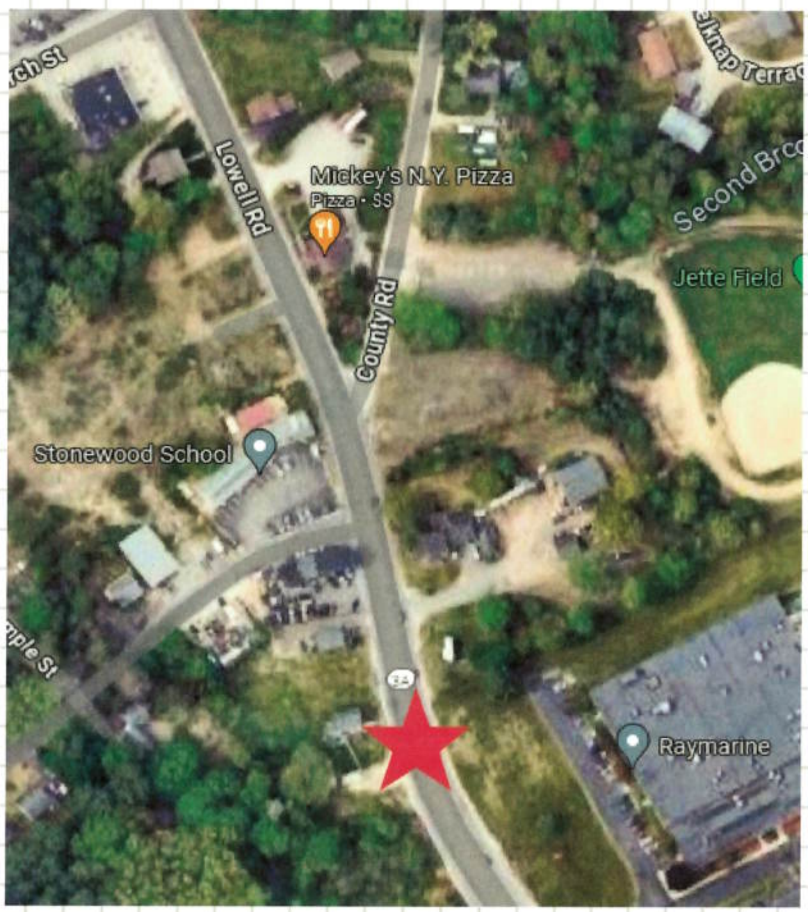
CALCULATION SHEET

Stephen G. Pernaw & Company, Inc.

Project:	SFC - Hudson	Job Number:	2312A
Calculated By:		Date:	
Checked By:		Date:	
Sheet No:		Of:	
Subject:	Travel Speed Data - NH Route 3A		

Lowell Road (NH Route 3A) - South of Atwood Avenue

Tuesday, July 23, 2024 & Wednesday, July 24, 2024



Printed: 07/25/2024 at 13:11
TrafficViewer Pro v1.6.4.124

Attachment "D"
PicoCount 2500 V2.35 (s/n# 16051056)

Daily Total Speeds (MPH)

Study Date: Tuesday, 07/23/2024
Unit ID: SGP13
Location: Hudson

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	6	25	26	13	5	1	0	0	0	0	0	0	**76**
01:00 - 01:59	0	0	0	4	23	14	4	1	0	0	0	0	0	0	0	**46**
02:00 - 02:59	0	0	1	6	34	16	3	1	0	0	0	0	0	0	0	**61**
03:00 - 03:59	0	0	0	5	15	40	16	1	0	0	0	0	0	0	1	**78**
04:00 - 04:59	0	1	0	19	111	158	30	2	1	0	0	0	0	0	0	**322**
05:00 - 05:59	0	0	1	58	365	308	43	5	1	0	0	0	0	0	0	**781**
06:00 - 06:59	1	1	10	172	511	255	63	9	1	0	1	0	1	0	1	**1026**
07:00 - 07:59	1	1	20	166	558	366	67	9	1	1	1	0	0	0	0	**1191**
08:00 - 08:59	1	1	14	200	633	377	53	7	3	3	0	1	0	0	2	**1295**
09:00 - 09:59	0	3	11	112	600	409	62	9	2	1	2	1	1	0	1	**1214**
10:00 - 10:59	0	2	10	112	551	392	53	7	1	1	1	0	0	0	1	**1131**
11:00 - 11:59	1	3	24	163	627	387	60	4	4	1	0	0	2	0	3	**1279**
12:00 - 12:59	0	13	38	187	683	408	78	5	1	2	1	2	1	0	1	**1420**
13:00 - 13:59	4	4	26	211	631	344	56	3	3	1	0	1	0	0	3	**1287**
14:00 - 14:59	2	13	40	253	701	312	36	6	3	2	1	0	0	0	1	**1370**
15:00 - 15:59	7	42	89	281	764	335	30	6	1	1	1	0	0	0	3	**1560**
16:00 - 16:59	1	26	59	385	815	287	31	7	0	1	0	2	0	1	3	**1618**
17:00 - 17:59	17	29	41	254	789	405	38	3	2	1	2	1	1	1	0	**1584**
18:00 - 18:59	1	2	21	183	667	346	46	5	1	0	0	2	2	1	0	**1277**
19:00 - 19:59	0	12	12	82	451	360	50	7	1	0	2	1	2	0	1	**981**
20:00 - 20:59	0	1	6	77	367	269	43	2	1	1	0	1	0	0	1	**769**
21:00 - 21:59	0	2	6	64	257	196	34	4	1	0	0	0	0	0	0	**564**
22:00 - 22:59	0	0	0	27	143	103	31	6	1	0	0	0	0	0	0	**311**
23:00 - 23:59	0	1	1	15	100	74	18	2	0	0	0	0	0	0	0	**211**
Totals	**36**	**157**	**430**	**3042**	**10421**	**6187**	**958**	**116**	**30**	**16**	**12**	**12**	**10**	**3**	**22**	**21452**
Percent of Total	**0.2**	**0.7**	**2.0**	**14.2**	**48.6**	**28.8**	**4.5**	**0.5**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.1**	**100**
Percent of AM	**0.0**	**0.1**	**1.1**	**12.0**	**47.7**	**32.3**	**5.5**	**0.7**	**0.2**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of PM	**0.2**	**1.1**	**2.6**	**15.6**	**49.2**	**26.6**	**3.8**	**0.4**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.1**	**100**

Standard Deviation: 5.3 MPH
Mean Speed: 33.6 MPH
Median Speed: 33.4 MPH
Modal Speed: 32.5 MPH

Ten Mile Pace: 30 to 39 MPH
Percent in Ten Mile Pace: 77.4%

85th Percentile: 38.4 MPH
15th Percentile: 29.3 MPH
90th Percentile: 39.2 MPH
95th Percentile: 40.6 MPH

Attachment "D"

PicoCount 2500 V2.35 (s/n# 16051056)

Daily Total Speeds (MPH)

Study Date: Wednesday, 07/24/2024

Unit ID: SGP13

Location: Hudson

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	1	11	35	52	5	2	0	1	0	0	0	0	0	**107**
01:00 - 01:59	0	0	0	3	14	19	2	0	0	0	0	0	0	0	0	**38**
02:00 - 02:59	0	0	0	6	25	20	2	0	0	0	0	0	0	0	0	**53**
03:00 - 03:59	0	0	1	9	18	33	17	1	0	0	0	0	0	0	0	**79**
04:00 - 04:59	0	1	0	14	94	162	32	7	2	1	0	0	0	0	0	**313**
05:00 - 05:59	0	0	2	29	302	339	70	10	4	0	0	0	0	0	0	**756**
06:00 - 06:59	1	2	7	78	468	401	83	16	5	1	0	0	1	0	2	**1065**
07:00 - 07:59	3	7	17	159	586	387	63	7	3	1	0	0	1	1	1	**1236**
08:00 - 08:59	0	3	18	165	590	351	58	7	1	2	2	0	0	0	1	**1198**
09:00 - 09:59	70	50	62	179	370	177	24	9	3	1	0	0	1	0	3	**949**
10:00 - 10:59	1	2	7	138	638	266	40	2	1	1	0	0	0	1	0	**1097**
11:00 - 11:59	8	4	23	197	580	317	49	5	0	2	0	0	0	0	0	**1185**
12:00 - 12:59	72	73	50	173	416	159	20	3	4	0	0	1	0	0	0	**971**
13:00 - 13:59	10	3	15	140	555	273	40	6	1	0	3	0	0	0	2	**1048**
14:00 - 14:59	3	4	23	162	590	453	63	2	2	2	0	0	0	0	2	**1306**
15:00 - 15:59	15	29	41	201	711	458	57	2	0	0	1	2	0	1	0	**1518**
16:00 - 16:59	1	6	29	290	819	356	36	8	2	2	1	0	3	1	1	**1555**
17:00 - 17:59	4	19	52	158	706	502	62	11	4	1	2	1	1	1	0	**1524**
18:00 - 18:59	0	1	13	132	589	472	66	9	1	1	2	1	1	0	1	**1289**
19:00 - 19:59	2	6	9	103	457	376	73	6	5	2	0	0	0	1	1	**1041**
20:00 - 20:59	0	2	6	85	403	270	39	3	1	0	1	0	0	0	0	**810**
21:00 - 21:59	0	2	16	97	290	135	17	4	0	0	0	0	0	0	0	**561**
22:00 - 22:59	0	0	2	22	137	98	25	4	0	0	0	0	0	0	0	**288**
23:00 - 23:59	0	0	0	8	81	70	15	4	1	0	0	0	0	0	0	**179**
Totals	**190**	**214**	**394**	**2559**	**9474**	**6146**	**958**	**128**	**40**	**18**	**12**	**5**	**8**	**6**	**14**	**20166**
Percent of Total	**0.9**	**1.1**	**2.0**	**12.7**	**47.0**	**30.5**	**4.8**	**0.6**	**0.2**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of AM	**1.0**	**0.9**	**1.7**	**12.2**	**46.1**	**31.3**	**5.5**	**0.8**	**0.2**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of PM	**0.9**	**1.2**	**2.1**	**13.0**	**47.6**	**30.0**	**4.2**	**0.5**	**0.2**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**100**

Standard Deviation: 5.7 MPH
Mean Speed: 33.6 MPH
Median Speed: 33.5 MPH
Modal Speed: 32.5 MPH

Ten Mile Pace: 30 to 39 MPH
Percent in Ten Mile Pace: 77.5%

85th Percentile: 38.5 MPH
15th Percentile: 29.4 MPH
90th Percentile: 39.3 MPH
95th Percentile: 40.9 MPH

Attachment "D"

Daily Northbound(A-B) Speeds (MPH)

Study Date: Tuesday, 07/23/2024
Unit ID: SGP13
Location: Hudson

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	4	16	19	11	4	1	0	0	0	0	0	0	**55**
01:00 - 01:59	0	0	0	2	12	7	2	1	0	0	0	0	0	0	0	**24**
02:00 - 02:59	0	0	0	3	22	8	2	1	0	0	0	0	0	0	0	**36**
03:00 - 03:59	0	0	0	1	3	11	5	1	0	0	0	0	0	0	0	**21**
04:00 - 04:59	0	0	0	3	14	27	16	1	1	0	0	0	0	0	0	**62**
05:00 - 05:59	0	0	1	4	31	66	27	5	1	0	0	0	0	0	0	**135**
06:00 - 06:59	0	0	1	5	58	102	53	9	1	0	1	0	1	0	1	**232**
07:00 - 07:59	0	0	3	12	126	180	46	7	0	0	1	0	0	0	0	**375**
08:00 - 08:59	0	1	3	66	183	157	40	4	2	2	0	0	0	0	0	**458**
09:00 - 09:59	0	3	5	30	192	218	41	7	2	1	1	1	1	0	1	**503**
10:00 - 10:59	0	2	5	40	198	201	39	4	1	0	0	0	0	0	1	**491**
11:00 - 11:59	1	2	19	90	270	204	42	2	1	0	0	0	1	0	1	**633**
12:00 - 12:59	0	4	26	101	285	226	57	3	1	0	1	2	1	0	1	**708**
13:00 - 13:59	1	1	14	72	292	222	45	2	1	1	0	0	0	0	1	**652**
14:00 - 14:59	2	11	22	149	384	141	23	3	1	1	0	0	0	0	0	**737**
15:00 - 15:59	7	41	80	184	414	176	14	5	1	0	0	0	0	0	0	**922**
16:00 - 16:59	0	24	53	239	425	142	22	4	0	1	0	1	0	1	2	**914**
17:00 - 17:59	16	28	35	168	454	230	22	1	1	1	1	1	0	0	0	**958**
18:00 - 18:59	1	1	18	126	350	194	30	2	1	0	0	1	2	1	0	**727**
19:00 - 19:59	0	12	12	49	238	239	36	6	1	0	2	0	0	0	0	**595**
20:00 - 20:59	0	1	6	34	185	190	31	2	1	0	0	1	0	0	0	**451**
21:00 - 21:59	0	0	3	19	122	129	26	3	0	0	0	0	0	0	0	**302**
22:00 - 22:59	0	0	0	4	45	56	22	5	1	0	0	0	0	0	0	**133**
23:00 - 23:59	0	0	0	10	56	56	11	2	0	0	0	0	0	0	0	**135**
Totals	**28**	**131**	**306**	**1415**	**4375**	**3201**	**663**	**84**	**19**	**7**	**7**	**7**	**6**	**2**	**8**	**10259**
Percent of Total	**0.3**	**1.3**	**3.0**	**13.8**	**42.6**	**31.2**	**6.5**	**0.8**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.1**	**100**
Percent of AM	**0.0**	**0.3**	**1.2**	**8.6**	**37.2**	**39.7**	**10.7**	**1.5**	**0.3**	**0.1**	**0.1**	**0.0**	**0.1**	**0.0**	**0.1**	**100**
Percent of PM	**0.4**	**1.7**	**3.7**	**16.0**	**44.9**	**27.7**	**4.7**	**0.5**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.1**	**100**

Standard Deviation: 5.8 MPH
Mean Speed: 33.8 MPH
Median Speed: 33.7 MPH
Modal Speed: 32.5 MPH

Ten Mile Pace: 30 to 39 MPH
Percent in Ten Mile Pace: 73.8%

85th Percentile: 38.8 MPH
15th Percentile: 28.8 MPH
90th Percentile: 39.7 MPH
95th Percentile: 42.2 MPH

Attachment "D"

Daily Northbound(A-B) Speeds (MPH)

Study Date: Wednesday, 07/24/2024
Unit ID: SGP13
Location: Hudson

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	6	21	40	4	2	0	1	0	0	0	0	0	74
01:00 - 01:59	0	0	0	1	9	12	1	0	0	0	0	0	0	0	0	23
02:00 - 02:59	0	0	0	5	15	9	2	0	0	0	0	0	0	0	0	31
03:00 - 03:59	0	0	0	3	5	9	5	1	0	0	0	0	0	0	0	23
04:00 - 04:59	0	0	0	3	12	28	10	2	2	1	0	0	0	0	0	58
05:00 - 05:59	0	0	0	2	23	55	37	6	4	0	0	0	0	0	0	127
06:00 - 06:59	1	0	1	6	52	115	52	15	5	0	0	0	0	0	1	248
07:00 - 07:59	0	1	3	27	135	159	47	4	3	1	0	0	1	1	0	382
08:00 - 08:59	0	0	9	45	153	158	46	6	1	1	1	0	0	0	0	420
09:00 - 09:59	4	2	16	89	200	101	23	7	2	0	0	0	1	0	1	446
10:00 - 10:59	0	2	7	73	246	127	24	2	1	0	0	0	0	0	0	482
11:00 - 11:59	1	1	8	97	247	164	30	3	0	2	0	0	0	0	0	553
12:00 - 12:59	6	25	27	119	277	121	18	3	3	0	0	0	0	0	0	599
13:00 - 13:59	4	1	8	67	267	177	32	5	1	0	2	0	0	0	1	565
14:00 - 14:59	0	1	11	81	313	257	41	1	0	0	0	0	0	0	2	707
15:00 - 15:59	11	24	29	132	397	264	41	1	0	0	1	0	0	1	0	901
16:00 - 16:59	1	6	24	211	472	188	24	1	0	0	0	0	2	1	0	930
17:00 - 17:59	4	18	50	123	393	264	47	8	2	0	1	1	0	1	0	912
18:00 - 18:59	0	1	10	84	322	270	42	7	0	1	1	0	0	0	1	739
19:00 - 19:59	2	5	8	48	248	219	59	4	5	1	0	0	0	0	1	600
20:00 - 20:59	0	0	4	29	205	173	35	2	0	0	1	0	0	0	0	449
21:00 - 21:59	0	1	8	42	141	94	14	3	0	0	0	0	0	0	0	303
22:00 - 22:59	0	0	1	7	73	62	21	4	0	0	0	0	0	0	0	168
23:00 - 23:59	0	0	0	2	43	45	10	3	1	0	0	0	0	0	0	104
Totals	**34**	**88**	**224**	**1302**	**4269**	**3111**	**665**	**90**	**30**	**8**	**7**	**1**	**4**	**4**	**7**	**9844**
Percent of Total	**0.3**	**0.9**	**2.3**	**13.2**	**43.4**	**31.6**	**6.8**	**0.9**	**0.3**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of AM	**0.2**	**0.2**	**1.5**	**12.5**	**39.0**	**34.1**	**9.8**	**1.7**	**0.6**	**0.2**	**0.0**	**0.0**	**0.1**	**0.0**	**0.1**	**100**
Percent of PM	**0.4**	**1.2**	**2.6**	**13.5**	**45.2**	**30.6**	**5.5**	**0.6**	**0.2**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**100**

Standard Deviation: 5.7 MPH
Mean Speed: 34.0 MPH
Median Speed: 33.8 MPH
Modal Speed: 32.5 MPH

Ten Mile Pace: 30 to 39 MPH
Percent in Ten Mile Pace: 75.0%

85th Percentile: 38.9 MPH
15th Percentile: 29.3 MPH
90th Percentile: 39.7 MPH
95th Percentile: 42.4 MPH

Attachment "D"

JB

Daily ~~Northbound~~(B-A) Speeds (MPH)

Study Date: Tuesday, 07/23/2024
Unit ID: SGP13
Location: Hudson

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	2	9	7	2	1	0	0	0	0	0	0	0	**21**
01:00 - 01:59	0	0	0	2	11	7	2	0	0	0	0	0	0	0	0	**22**
02:00 - 02:59	0	0	1	3	12	8	1	0	0	0	0	0	0	0	0	**25**
03:00 - 03:59	0	0	0	4	12	29	11	0	0	0	0	0	0	0	1	**57**
04:00 - 04:59	0	1	0	16	97	131	14	1	0	0	0	0	0	0	0	**260**
05:00 - 05:59	0	0	0	54	334	242	16	0	0	0	0	0	0	0	0	**646**
06:00 - 06:59	1	1	9	167	453	153	10	0	0	0	0	0	0	0	0	**794**
07:00 - 07:59	1	1	17	154	432	186	21	2	1	1	0	0	0	0	0	**816**
08:00 - 08:59	1	0	11	134	450	220	13	3	1	1	0	1	0	0	2	**837**
09:00 - 09:59	0	0	6	82	408	191	21	2	0	0	1	0	0	0	0	**711**
10:00 - 10:59	0	0	5	72	353	191	14	3	0	1	1	0	0	0	0	**640**
11:00 - 11:59	0	1	5	73	357	183	18	2	3	1	0	0	1	0	2	**646**
12:00 - 12:59	0	9	12	86	398	182	21	2	0	2	0	0	0	0	0	**712**
13:00 - 13:59	3	3	12	139	339	122	11	1	2	0	0	1	0	0	2	**635**
14:00 - 14:59	0	2	18	104	317	171	13	3	2	1	1	0	0	0	1	**633**
15:00 - 15:59	0	1	9	97	350	159	16	1	0	1	1	0	0	0	3	**638**
16:00 - 16:59	1	2	6	146	390	145	9	3	0	0	0	1	0	0	1	**704**
17:00 - 17:59	1	1	6	86	335	175	16	2	1	0	1	0	1	1	0	**626**
18:00 - 18:59	0	1	3	57	317	152	16	3	0	0	0	1	0	0	0	**550**
19:00 - 19:59	0	0	0	33	213	121	14	1	0	0	0	1	2	0	1	**386**
20:00 - 20:59	0	0	0	43	182	79	12	0	0	1	0	0	0	0	1	**318**
21:00 - 21:59	0	2	3	45	135	67	8	1	1	0	0	0	0	0	0	**262**
22:00 - 22:59	0	0	0	23	98	47	9	1	0	0	0	0	0	0	0	**178**
23:00 - 23:59	0	1	1	5	44	18	7	0	0	0	0	0	0	0	0	**76**
Totals	**8**	**26**	**124**	**1627**	**6046**	**2986**	**295**	**32**	**11**	**9**	**5**	**5**	**4**	**1**	**14**	**11193**
Percent of Total	**0.1**	**0.2**	**1.1**	**14.5**	**54.0**	**26.7**	**2.6**	**0.3**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of AM	**0.1**	**0.1**	**1.0**	**13.9**	**53.5**	**28.3**	**2.6**	**0.3**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of PM	**0.1**	**0.4**	**1.2**	**15.1**	**54.5**	**25.1**	**2.7**	**0.3**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.2**	**100**

Standard Deviation: 4.9 MPH
Mean Speed: 33.4 MPH
Median Speed: 33.2 MPH
Modal Speed: 32.5 MPH

Ten Mile Pace: 30 to 39 MPH
Percent in Ten Mile Pace: 80.7%

85th Percentile: 37.8 MPH
15th Percentile: 29.7 MPH
90th Percentile: 38.8 MPH
95th Percentile: 39.7 MPH

Attachment "D"

SB

Daily ~~Northbound~~(B-A) Speeds (MPH)

Study Date: Wednesday, 07/24/2024

Unit ID: SGP13

Location: Hudson

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	1	5	14	12	1	0	0	0	0	0	0	0	0	**33**
01:00 - 01:59	0	0	0	2	5	7	1	0	0	0	0	0	0	0	0	**15**
02:00 - 02:59	0	0	0	1	10	11	0	0	0	0	0	0	0	0	0	**22**
03:00 - 03:59	0	0	1	6	13	24	12	0	0	0	0	0	0	0	0	**56**
04:00 - 04:59	0	1	0	11	82	134	22	5	0	0	0	0	0	0	0	**255**
05:00 - 05:59	0	0	2	27	279	284	33	4	0	0	0	0	0	0	0	**629**
06:00 - 06:59	0	2	6	72	416	286	31	1	0	1	0	0	1	0	1	**817**
07:00 - 07:59	3	6	14	132	451	228	16	3	0	0	0	0	0	0	1	**854**
08:00 - 08:59	0	3	9	120	437	193	12	1	0	1	1	0	0	0	1	**778**
09:00 - 09:59	66	48	46	90	170	76	1	2	1	1	0	0	0	0	2	**503**
10:00 - 10:59	1	0	0	65	392	139	16	0	0	1	0	0	0	1	0	**615**
11:00 - 11:59	7	3	15	100	333	153	19	2	0	0	0	0	0	0	0	**632**
12:00 - 12:59	66	48	23	54	139	38	2	0	1	0	0	1	0	0	0	**372**
13:00 - 13:59	6	2	7	73	288	96	8	1	0	0	1	0	0	0	1	**483**
14:00 - 14:59	3	3	12	81	277	196	22	1	2	2	0	0	0	0	0	**599**
15:00 - 15:59	4	5	12	69	314	194	16	1	0	0	0	2	0	0	0	**617**
16:00 - 16:59	0	0	5	79	347	168	12	7	2	2	1	0	1	0	1	**625**
17:00 - 17:59	0	1	2	35	313	238	15	3	2	1	1	0	1	0	0	**612**
18:00 - 18:59	0	0	3	48	267	202	24	2	1	0	1	1	1	0	0	**550**
19:00 - 19:59	0	1	1	55	209	157	14	2	0	1	0	0	0	1	0	**441**
20:00 - 20:59	0	2	2	56	198	97	4	1	1	0	0	0	0	0	0	**361**
21:00 - 21:59	0	1	8	55	149	41	3	1	0	0	0	0	0	0	0	**258**
22:00 - 22:59	0	0	1	15	64	36	4	0	0	0	0	0	0	0	0	**120**
23:00 - 23:59	0	0	0	6	38	25	5	1	0	0	0	0	0	0	0	**75**
Totals	**156**	**126**	**170**	**1257**	**5205**	**3035**	**293**	**38**	**10**	**10**	**5**	**4**	**4**	**2**	**7**	**10322**
Percent of Total	**1.5**	**1.2**	**1.6**	**12.2**	**50.4**	**29.4**	**2.8**	**0.4**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of AM	**1.5**	**1.2**	**1.8**	**12.1**	**50.0**	**29.7**	**3.1**	**0.3**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**100**
Percent of PM	**1.5**	**1.2**	**1.5**	**12.2**	**50.9**	**29.1**	**2.5**	**0.4**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**100**

Standard Deviation: 5.7 MPH
Mean Speed: 33.1 MPH
Median Speed: 33.3 MPH
Modal Speed: 32.5 MPH

Ten Mile Pace: 30 to 39 MPH
Percent in Ten Mile Pace: 79.8%

85th Percentile: 38.1 MPH
15th Percentile: 29.4 MPH
90th Percentile: 38.9 MPH
95th Percentile: 39.8 MPH

TRANSIT INFORMATION

Attachment "D"

Hudson Demand Response

Nashua Transit System
11 Riverside Street
Nashua, NH 03062
Phone: 603-880-0100
Fax: 603-821-2042

Nashua Transit System's Hudson Demand Response is an origin to destination transportation service for residents of Hudson, New Hampshire. Please fill out this application and return it to NTS.

Applicant Information

Name (Print): ______________________________ DOB: ______________________

Address: ____

City/Town: ______________________________ Zip: ______________________

Phone (Primary): _______________________ (Secondary): ______________________

Email Address: ____

Emergency Contact Information

Name (Print): ______________________________ Relationship: _________________

Phone (Primary): _______________________ (Secondary): ______________________

Email Address: ____

Please select a mobility aide, if applicable;

☐ Wheelchair ☐ Cane ☐ Walker ☐ Other: ____________________

Will you need assistance getting to the vehicle upon pick-up?

☐ Yes ☐ No ☐ Sometimes

If you need to travel with a Personal Care Attendant, please call (603) 880-0100 extension 4.

Signature of Applicant: ___________________________ Date: __________________

FOR OFFICE USE ONLY

The applicant has been approved to travel with a PCA: Yes No

Signature: ______________________

Date: _______________

ABOUT THE SERVICE

Service Hours

The Hudson Demand Response service runs Monday – Friday. The earliest pick up in Hudson is 8:30-9 a.m., arriving in Nashua at 10 a.m. for the earliest drop-off.

Return times vary. Passengers are asked to call NTS prior to scheduling appointments.

Hudson Demand Response does not run on weekends or the following holidays: New Year's Day, Memorial Day, Independence Day (July 4), Labor Day, Thanksgiving Day and Christmas Day.

Service Area

The Hudson Demand Response service provides transportation within the Town of Hudson and the City of Nashua.

Exact Fare Prices

Fare prices are dependent on both your origin and your destination.

You will be required to pay a fare each way of your trip using exact change.

- Hudson to Hudson **$3.50**
- Hudson to Nashua **$5.50**

Fare prices may be subject to change.

WHO WE ARE

About Us

Nashua Transit System's Hudson Demand Response service is a shared trip, origin to destination, public transportation option for residents of Hudson, NH.

Rides are scheduled on a limited, space-available basis. Priority is given to persons with disabilities and senior citizens needing transportation to non-emergency medical appointments.

Title VI

Nashua Transit System is committed to ensuring that no person is excluded from participation in, or denied the benefits of its transit services on the basis of race, color, or national origin, as protected by Title VI in the Federal Transit Administration (FTA) Circular 4702.1.B.

Contact Us

To schedule a trip:

603-880-0100 ext. 2

Ask Questions:

603-880-0100 ext. 4

TTY/TDD: 711

Relay NH (English): 1-800-735-2964

Relay NH (Spanish): 1-866-479-7569

Attachment "D"

Nashua Transit System

DEMAND RESPONSE RIDE GUIDE

Residents of Hudson

Nashua Transit System

11 Riverside Street

Nashua, NH 03062

July 2024

HOW TO SCHEDULE A TRIP

When to Schedule a Trip

Trips must be scheduled at least two (2) business days in advance. To make your trip reservation, call 603-880-0100 ext. 2., during our office hours: Monday – Friday 8 AM to 4:30 PM.

Reservations are accepted up to two (2) weeks prior to your requested trip.

Information Needed

- Full Name
- Telephone Number
- Date of Trip
- Pick-up address and drop-off address
- Time you would like to arrive and return from your destination
- Whether you use a mobility device (i.e. wheelchair, walker, cane, etc.) or a *service animal.
- Whether a Personal Care Attendant (PCA) or guest will be riding with you.
- Whether you will need any assistance from the driver at your pick up or drop-off location

All NTS vehicles are ADA accessible for wheelchairs, walkers, canes, etc.

ON THE DAY OF PICK UP

Boarding the Vehicle

Be ready at the curb to board the vehicle at the beginning of your 30-minute pick up window, which will be provided to you when scheduling your trip

If assistance is needed getting to the vehicle, and you have told us so, please be ready at the building entrance door that you specified when making your reservation.

If you are running late, contact NTS at 603-880-0100 ext. 2.

Canceling Trips

Call NTS immediately if you no longer require transportation.

Failure to cancel a trip more than two (2) hours before the scheduled pick up time or meet the vehicle within five (5) minutes of the vehicle's arrival is considered a No-Show.

If you miss your vehicle on the first leg of the trip, the remainder of your trips for the day are canceled. If you still need transportation home, call dispatch at 603-880-0100 ext. 2.

Attachment "D"

RIDING WITH NTS

Carry-Ons

NTS has a two (2) bag limit on all parcels. You must be able to carry your packages and control them at all times while in the vehicle. Drivers are not permitted to carry your bags or other property.

Packages or parcels may not obstruct aisles and doorways or prevent seats from being used.

Traveling with Someone

Guests are welcome to ride with you on a space available basis. An additional fare equal to what you pay is required. You and your guest must have the same origin, destination and pick up times.

If you have a registered personal care attendant (PCA) with NTS, they may accompany you any time at no additional charge. To travel with a PCA, you must complete the Personal Care Attendant Request Form.

*Service Animals

A service animal is a guide dog, signal dog or other animal trained to work or perform tasks for a person with a disability. Pets and emotional support animals are not allowed on NTS vehicles. (eCFR:: 49 CFR 37.167)

Attachment "D"

CRASHES

Attachment "D"

Accident Study Lowell Road at County Lane
Note: this analysis includes intersections of Dana Crt and Atwood Ave which can effect the intersections at both ends of County Lane
January 1, 2019 - August 1, 2024

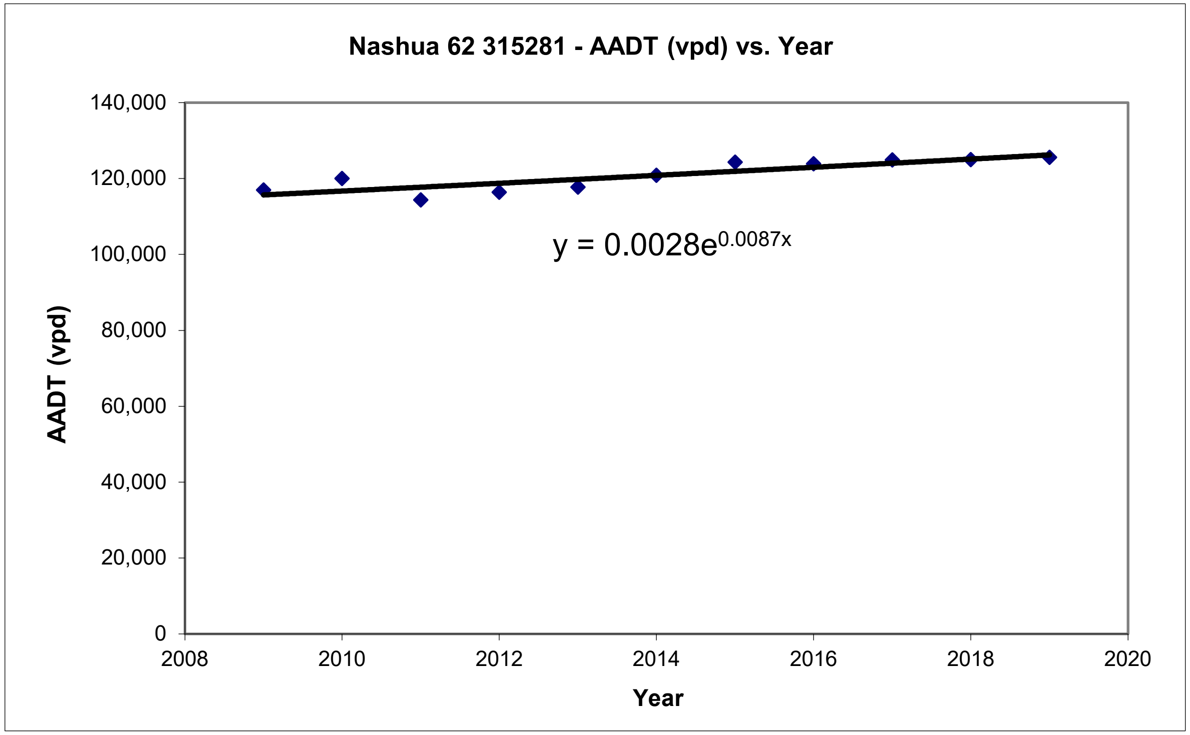
Location	AC#	Date	Day	Time	Veh's	Injury	# Injured	Finding
Lowell @ County	19-81-AC	2/14/2019	Thurs	830	2	No		Following to closely
Lowell @ County	19-95-AC	2/26/2019	Tues	1503	2	No		Distracted driver
Lowell @ County	19-140-AC	3/24/2019	Sun	1232	3	Yes	2	Distracted driver
Lowell @ County	19-174-AC	4/14/2019	Sun	1815	2	No		Failure to yield
Lowell @ County	19-247-AC	5/27/2019	Mon	1457	2	Yes	1	Failure to yield
Lowell @ Atwood/Cour	20-3-AC	1/3/2020	Fri	1613	2	No		Illegal Passing
Lowell @ County	20-52-AC	1/24/2020	Fri	1356	2	Yes	1	Failure to yield
Lowell @ County	20-271-AC	7/30/2020	Thurs	1201	2	No		Distracted driver
Lowell @ County	20-292-AC	8/13/2020	Thurs	1815	2	No		Failure to yield
Lowell @ County	20-397-AC	10/27/2020	Tues	1710	2	No		Distracted driver
Lowell @ County	20-422-AC	11/4/2020	Wed	1718	1	No		Swerving to avoid collisior
Lowell @ County	20-434-AC	11/10/2020	Tues	1522	2	No		Failure to yield
Lowell @ County	21-133-AC	3/31/2021	Wed	1728	2	No		Failure to yield
Lowell @ County	21-287-AC	6/25/2021	Fri	1515	2	No		Stopping/Standing/Parking & Distracted drive
Lowell @ Dana/County	21-359-AC	7/19/2021	Fri	323	2	No		Failure to yield
Lowell @ County	21-533-AC	11/22/2021	Mon	1643	2	No		Failure to yield
Lowell @ County	22-14-AC	1/7/2022	Fri	634	2	Yes	1	Veh/Bicyclist. Bicyclist in center lane/Weathe
Lowell @ County	22-306-AC	7/4/2022	Mon	1332	2	Yes	1	Failure to yield
Lowell @ County	22-316-AC	7/7/2022	Thurs	1337	2	No		Medical Emergency
Lowell @ County	22-393-AC	8/26/2022	Fri	1901	2	No		Failure to yield
Lowell @ County	22-400-AC	8/31/2022	Wed	1738	2	No		Failure to yield
Lowell @ County	22-500-AC	10/27/2022	Thurs	754	2	No		Failure to yield
Lowell @ County	22-519-AC	11/9/2022	Wed	906	2	No		Failure to yield
Lowell @ County	23-40-AC	1/20/2023	Fri	1721	2	No		Improper passing & Failure to yield
Lowell @ County	23-522-AC	11/10/2023	Fri	1738	2	No		Failure to yield
Lowell @ County	23-591-AC	12/26/2023	Tues	1251	2	No		Failure to yield
Lowell @ County	24-63-AC	1/31/2024	Wed	1711	3	No		Following to closely
Lowell @ County	24-115-AC	3/8/2024	Fri	1809	2	No		Failure to yield
Lowell @ County	24-209-AC	5/9/2024	Thurs	1440	2	No		Failure to yield
Lowell @ County	24-220-AC	5/15/2024	Wed	807	3	Yes	1	Following to closely

Attachment "D"

GENERAL BACKGROUND TRAFFIC GROWTH

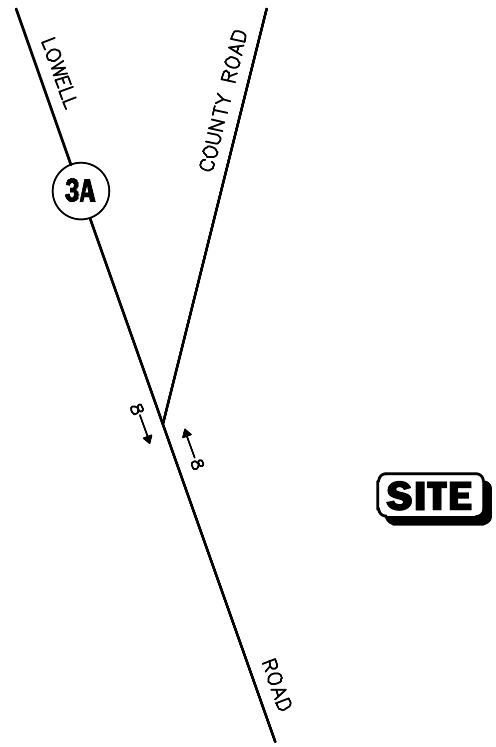
Station 62315281
Nashua - FEET At the Canal Bridge Exits 5-6
Group 3
Region E
FC 12

	AADT	Annual Change
2009	117000	
2010	120000	2.56%
2011	114349	-4.71%
2012	116405	1.80%
2013	117735	1.14%
2014	120827	2.63%
2015	124280	2.86%
2016	123875	-0.33%
2017	124932	0.85%
2018	125001	0.06%
2019	125544	0.43%
	CAGR	0.71%
	Exp	0.87%
	Avg	0.79%

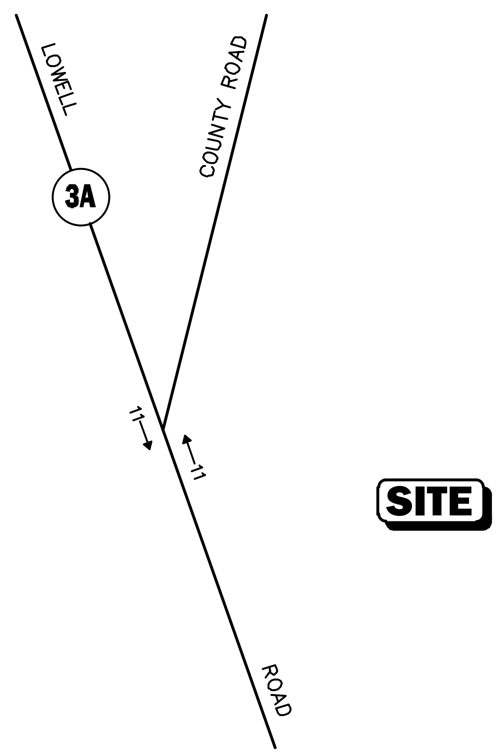


BACKGROUND DEVELOPMENT TRAFFIC-VOLUME NETWORKS

WEEKDAY MORNING PEAK HOUR (7:30 - 8:30 AM)



WEEKDAY EVENING PEAK HOUR (4:15 - 5:15 PM)



N

Not To Scale

Figure A-1

Vanasse & Associates inc

Lowell Road and Central Street Commercial Development Peak-Hour Traffic Volumes

R:\9998\Graphics\TIA\August 2024\9998NT1.dwg, 8/15/2024 10:41:05 AM

TRIP-GENERATION CALCULATIONS

Attachment "D"

ITETripGen Web-based App

Help | Jeffrey Dirk | Sign out

Graph Look Up

ITETripGen Web-based App

- Graph Look Up
- How to Use *ITETripGen*
- TGM Desk Reference
- TGM Appendices
- Support Documents
- Add Users
- Comments

Query | Filter

DATA SOURCE: Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE: 180

LAND USE GROUP: (100-199) Industrial

LAND USE : 180 - Specialty Trade Contractor

LAND USE SUBCATEGORY: All Sites

SETTING/LOCATION: General Urban/Suburban

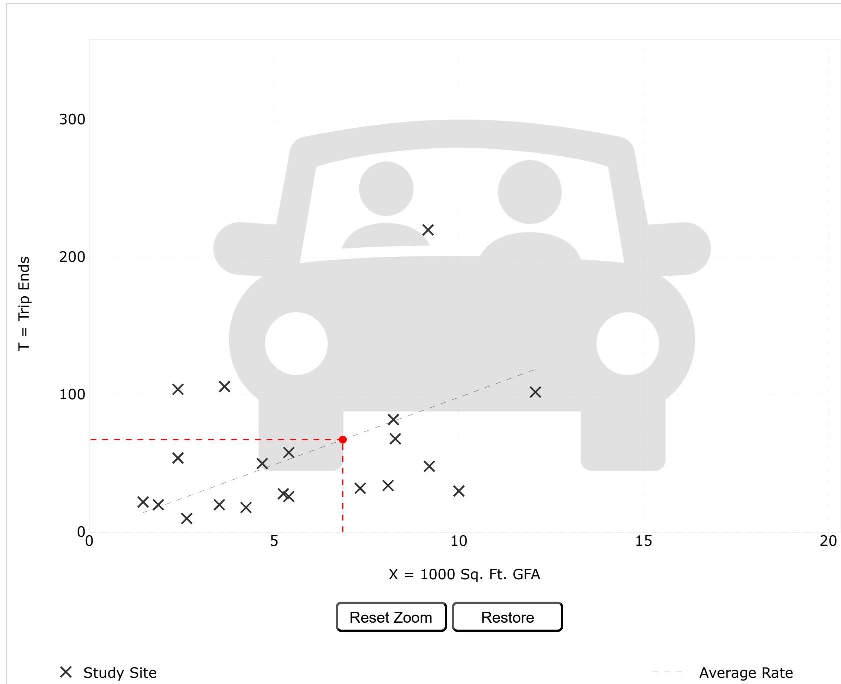
INDEPENDENT VARIABLE (IV): 1000 Sq. Ft. GFA

TIME PERIOD: Weekday

TRIP TYPE: Vehicle

ENTER IV VALUE TO CALCULATE TRIPS: 6.86 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Specialty Trade Contractor (180) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
20

Avg. 1000 Sq. Ft. GFA:
6

Average Rate:
9.82

Range of Rates:
3.00 - 43.33

Standard Deviation:
8.56

Fitted Curve Equation:
Not Given

R^2:
****

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 67 (Total), 34 (Entry), 33 (Exit)

Add-ons to do more

Try OTISS Pro

VERSION: 4.0.0.421 (UPDATES) | DATA: 11TH EDITION | TERMS AND CONDITIONS | PRIVACY | ITE MARKETPLACE

Attachment "D"

ITETripGen Web-based App ? Help Jeffrey Dirk Sign out

Graph Look Up

ITETripGen Web-based App

Graph Look Up
How to Use *ITETripGen*
TGM Desk Reference
TGM Appendices
Support Documents
Add Users
Comments

Query Filter

DATA SOURCE: Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE: 180

LAND USE GROUP: (100-199) Industrial

LAND USE : 180 - Specialty Trade Contractor

LAND USE SUBCATEGORY: All Sites

SETTING/LOCATION: General Urban/Suburban

INDEPENDENT VARIABLE (IV): 1000 Sq. Ft. GFA

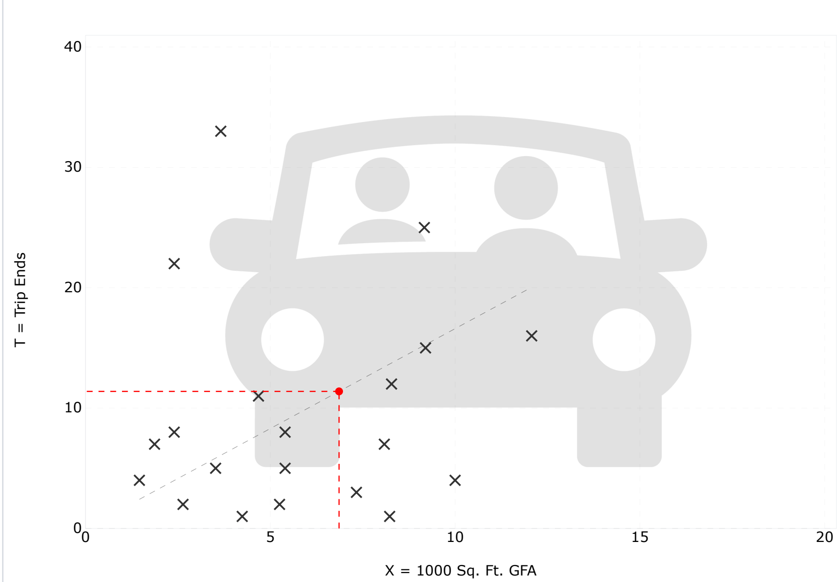
TIME PERIOD: Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE: Vehicle

ENTER IV VALUE TO CALCULATE TRIPS: Vehicle

6.86 Calculate

Data Plot and Equation



Reset Zoom Restore

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Specialty Trade Contractor (180) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
20

Avg. 1000 Sq. Ft. GFA:
6

Average Rate:
1.66

Range of Rates:
0.12 - 9.17

Standard Deviation:
2.00

Fitted Curve Equation:
Not Given

R^2:
****

Directional Distribution:
74% entering, 26% exiting

Calculated Trip Ends:
Average Rate: 11 (Total), 8 (Entry), 3 (Exit)

Add-ons to do more
Try OTISS Pro

Attachment "D"

ITETripGen Web-based App

Help | Jeffrey Dirk | Sign out

Graph Look Up

ITETripGen Web-based App

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- TGM Appendices
- Support Documents
- Add Users
- Comments

Query | Filter

DATA SOURCE: Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE: 180

LAND USE GROUP: (100-199) Industrial

LAND USE : 180 - Specialty Trade Contractor

LAND USE SUBCATEGORY: All Sites

SETTING/LOCATION: General Urban/Suburban

INDEPENDENT VARIABLE (IV): 1000 Sq. Ft. GFA

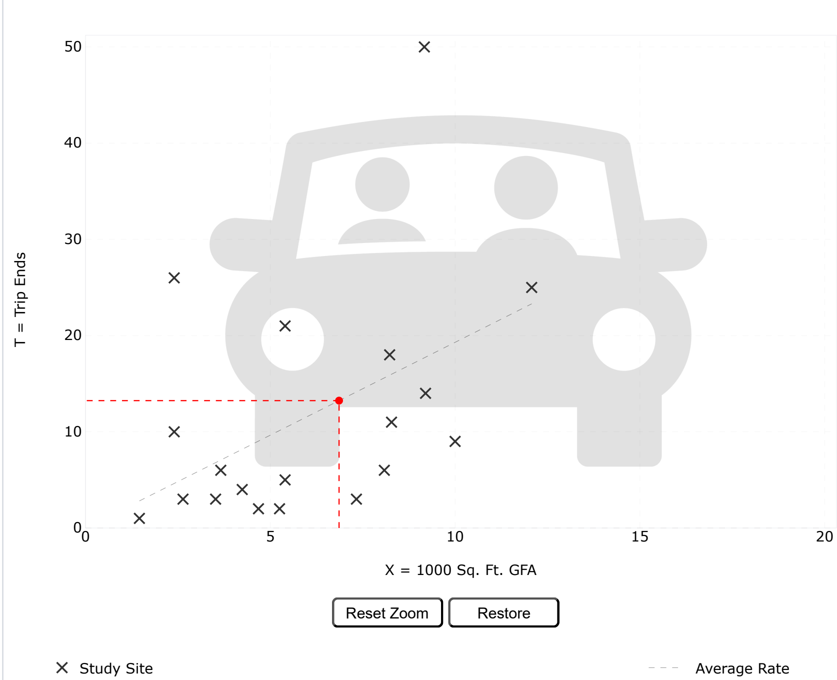
TIME PERIOD: Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE: Vehicle

ENTER IV VALUE TO CALCULATE TRIPS: 6.86 Calculate

Vehicle

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Specialty Trade Contractor (180) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
19

Avg. 1000 Sq. Ft. GFA:
6

Average Rate:
1.93

Range of Rates:
0.38 - 10.83

Standard Deviation:
1.98

Fitted Curve Equation:
Not Given

R^2:
****

Directional Distribution:
32% entering, 68% exiting

Calculated Trip Ends:
Average Rate: 13 (Total), 4 (Entry), 9 (Exit)

Add-ons to do more

Try OTISS Pro

Attachment "D"

CAPACITY ANALYSIS WORKSHEETS

2024 Existing
2025 No-Build
2025 Opening Year Build
2035 No-Build
2035 Build

Attachment "D"

2024 Existing

Intersection						
Int Delay, s/veh	10.7					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	103	5	494	84	4	979
Future Vol, veh/h	103	5	494	84	4	979
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	94	94	95	95
Heavy Vehicles, %	1	0	1	1	0	1
Mvmt Flow	116	6	526	89	4	1031

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1609	570	0	0	615	0
Stage 1	570	-	-	-	-	-
Stage 2	1039	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	116	525	-	-	975	-
Stage 1	568	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 115	525	-	-	975	-
Mov Cap-2 Maneuver	~ 115	-	-	-	-	-
Stage 1	568	-	-	-	-	-
Stage 2	341	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	155.58	0	0.04
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	120	975	-
HCM Lane V/C Ratio	-	-	1.014	0.004	-
HCM Control Delay (s/veh)	-	-	155.6	8.7	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	6.9	0	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	7	963	260	12	823
Future Vol, veh/h	45	7	963	260	12	823
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	94	94	96	96
Heavy Vehicles, %	0	0	2	1	0	2
Mvmt Flow	47	7	1024	277	13	857

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2045	1163	0	0	1301	0
Stage 1	1163	-	-	-	-	-
Stage 2	882	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	62	239	-	-	539	-
Stage 1	300	-	-	-	-	-
Stage 2	408	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	61	239	-	-	539	-
Mov Cap-2 Maneuver	61	-	-	-	-	-
Stage 1	300	-	-	-	-	-
Stage 2	398	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	158.09	0	0.17
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	68	539	-
HCM Lane V/C Ratio	-	-	0.799	0.023	-
HCM Control Delay (s/veh)	-	-	158.1	11.8	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	3.7	0.1	-

Attachment "D"

2025 No-Build

Attachment "D"

Intersection	
Int Delay, s/veh	12.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	104	5	507	85	4	997
Future Vol, veh/h	104	5	507	85	4	997
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	94	94	95	95
Heavy Vehicles, %	1	0	1	1	0	1
Mvmt Flow	117	6	539	90	4	1049

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1642	585	0	0	630	0
Stage 1	585	-	-	-	-	-
Stage 2	1058	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 110	515	-	-	962	-
Stage 1	559	-	-	-	-	-
Stage 2	335	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 110	515	-	-	962	-
Mov Cap-2 Maneuver	~ 110	-	-	-	-	-
Stage 1	559	-	-	-	-	-
Stage 2	334	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	177.61	0	0.03
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	114	962	-
HCM Lane V/C Ratio	-	-	1.073	0.004	-
HCM Control Delay (s/veh)	-	-	177.6	8.8	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	7.3	0	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	4.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	7	984	263	12	842
Future Vol, veh/h	45	7	984	263	12	842
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	94	94	96	96
Heavy Vehicles, %	0	0	2	1	0	2
Mvmt Flow	47	7	1047	280	13	877

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2089	1187	0	0	1327	0
Stage 1	1187	-	-	-	-	-
Stage 2	902	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	59	232	-	-	527	-
Stage 1	292	-	-	-	-	-
Stage 2	399	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	57	232	-	-	527	-
Mov Cap-2 Maneuver	57	-	-	-	-	-
Stage 1	292	-	-	-	-	-
Stage 2	390	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	178.59	0	0.17
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	64	527	-
HCM Lane V/C Ratio	-	-	0.85	0.024	-
HCM Control Delay (s/veh)	-	-	178.6	12	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	3.9	0.1	-

2025 Opening Year Build

Attachment "D"

Intersection	
Int Delay, s/veh	12.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	104	5	507	85	4	997
Future Vol, veh/h	104	5	507	85	4	997
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	94	94	95	95
Heavy Vehicles, %	1	0	1	1	0	1
Mvmt Flow	117	6	539	90	4	1049

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1642	585	0	0	630	0
Stage 1	585	-	-	-	-	-
Stage 2	1058	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 110	515	-	-	962	-
Stage 1	559	-	-	-	-	-
Stage 2	335	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 110	515	-	-	962	-
Mov Cap-2 Maneuver	~ 110	-	-	-	-	-
Stage 1	559	-	-	-	-	-
Stage 2	334	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	177.61	0	0.03
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	114	962	-
HCM Lane V/C Ratio	-	-	1.073	0.004	-
HCM Control Delay (s/veh)	-	-	177.6	8.8	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	7.3	0	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	592	8	0	1101
Future Vol, veh/h	0	0	592	8	0	1101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	643	9	0	1197

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	648	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	470	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	470	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s/veh)	-	-	0	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-

Intersection						
Int Delay, s/veh	0.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		↱
Traffic Vol, veh/h	89	0	0	109	0	3
Future Vol, veh/h	89	0	0	109	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	97	0	0	118	0	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	97
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	0	0	-	0	960
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	960
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0	8.76
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	960	-	-
HCM Lane V/C Ratio	0.003	-	-
HCM Control Delay (s/veh)	8.8	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	4.4					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	7	984	263	12	842
Future Vol, veh/h	45	7	984	263	12	842
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	94	94	96	96
Heavy Vehicles, %	1	0	1	1	0	1
Mvmt Flow	47	7	1047	280	13	877

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2089	1187	0	0	1327	0
Stage 1	1187	-	-	-	-	-
Stage 2	902	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	58	232	-	-	527	-
Stage 1	291	-	-	-	-	-
Stage 2	398	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	57	232	-	-	527	-
Mov Cap-2 Maneuver	57	-	-	-	-	-
Stage 1	291	-	-	-	-	-
Stage 2	388	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	180.81	0	0.17
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	63	527	-
HCM Lane V/C Ratio	-	-	0.855	0.024	-
HCM Control Delay (s/veh)	-	-	180.8	12	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	4	0.1	-

Intersection						
Int Delay, s/veh	0					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	1247	4	0	887
Future Vol, veh/h	0	0	1247	4	0	887
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	1355	4	0	964

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1358	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	182	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	182	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s/veh)	-	-	0	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-

Intersection						
Int Delay, s/veh	0.2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	52	0	0	275	0	9
Future Vol, veh/h	52	0	0	275	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	0	0	299	0	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	57
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	0	0	-	0	1010
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	1010
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	1010	-	-
HCM Lane V/C Ratio	0.01	-	-
HCM Control Delay (s/veh)	8.6	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Attachment "D"

2035 No-Build

Intersection						
Int Delay, s/veh	24.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	115	6	559	94	4	1100
Future Vol, veh/h	115	6	559	94	4	1100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	94	94	95	95
Heavy Vehicles, %	1	0	1	1	0	1
Mvmt Flow	129	7	595	100	4	1158

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1811	645	0	0	695	0
Stage 1	645	-	-	-	-	-
Stage 2	1166	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 87	476	-	-	910	-
Stage 1	524	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 86	476	-	-	910	-
Mov Cap-2 Maneuver	~ 86	-	-	-	-	-
Stage 1	524	-	-	-	-	-
Stage 2	296	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	$ 359.62	0	0.03
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	90	910	-
HCM Lane V/C Ratio	-	-	1.508	0.005	-
HCM Control Delay (s/veh)	-	-	$ 359.6	9	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	10.6	0	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

2035 Build

Intersection	
Int Delay, s/veh	24.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	115	6	559	94	4	1100
Future Vol, veh/h	115	6	559	94	4	1100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	94	94	95	95
Heavy Vehicles, %	1	0	1	1	0	1
Mvmt Flow	129	7	595	100	4	1158

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1811	645	0	0	695	0
Stage 1	645	-	-	-	-	-
Stage 2	1166	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 87	476	-	-	910	-
Stage 1	524	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 86	476	-	-	910	-
Mov Cap-2 Maneuver	~ 86	-	-	-	-	-
Stage 1	524	-	-	-	-	-
Stage 2	296	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	$ 359.62	0	0.03
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	90	910	-
HCM Lane V/C Ratio	-	-	1.508	0.005	-
HCM Control Delay (s/veh)	-	-	$ 359.6	9	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	10.6	0	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	653	8	0	1215
Future Vol, veh/h	0	0	653	8	0	1215
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	710	9	0	1321

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	714	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	431	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	431	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s/veh)	-	-	0	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		↱
Traffic Vol, veh/h	98	0	0	121	0	3
Future Vol, veh/h	98	0	0	121	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	107	0	0	132	0	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	107
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	0	0	-	0	948
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	948
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0	8.81
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	948	-	-
HCM Lane V/C Ratio	0.003	-	-
HCM Control Delay (s/veh)	8.8	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	9.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	50	8	1085	290	13	929
Future Vol, veh/h	50	8	1085	290	13	929
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	94	94	96	96
Heavy Vehicles, %	1	0	1	1	0	1
Mvmt Flow	52	8	1154	309	14	968

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2303	1309	0	0	1463	0
Stage 1	1309	-	-	-	-	-
Stage 2	995	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 43	197	-	-	468	-
Stage 1	254	-	-	-	-	-
Stage 2	359	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 41	197	-	-	468	-
Mov Cap-2 Maneuver	~ 41	-	-	-	-	-
Stage 1	254	-	-	-	-	-
Stage 2	349	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	$ 373.33	0	0.18
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	46	468	-
HCM Lane V/C Ratio	-	-	1.3	0.029	-
HCM Control Delay (s/veh)	-	-	$ 373.3	12.9	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	5.7	0.1	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Attachment "D"

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	1375	4	0	979
Future Vol, veh/h	0	0	1375	4	0	979
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	1495	4	0	1064

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1497	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	151	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	151	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s/veh)	-	-	0	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-

Intersection						
Int Delay, s/veh	0.2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		↱
Traffic Vol, veh/h	304	0	0	58	0	9
Future Vol, veh/h	304	0	0	58	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	330	0	0	63	0	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	330
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	0	0	-	0	711
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	711
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0	10.13
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	711	-	-
HCM Lane V/C Ratio	0.014	-	-
HCM Control Delay (s/veh)	10.1	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0	-	-

Attachment"E"

STORM WATER MANAGEMENT REPORT

for

COMMERCIAL REDEVELOPMENT
INSIDE OUT PAINTING AND REMODELING
MAP 198 LOT 147
100 LOWELL ROAD
HUDSON, NEW HAMPSHIRE

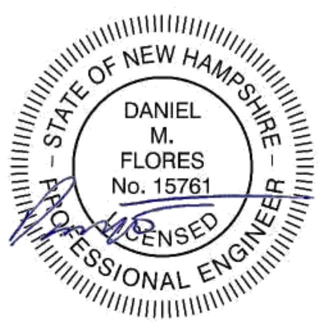
Prepared for:

100 LOWELL ROAD, LLC
122 LOWELL ROAD, SUITE 3
HUDSON, NH 03501

Prepared by:

SFC ENGINEERING PARTNERSHIP, INC.
183 ROCKINGHAM ROAD, UNIT 3 EAST
WINDHAM, NH 03087

OCTOBER 2, 2024
Revised 1/7/2025



SFC
ENGINEERING

Attachment"E"

Attachment"E"

TABLE OF CONTENTS

NARRATIVE

Attachment"E"

STORM WATER MANAGEMENT REPORT

COMMERCIAL DEVELOPMENT
100 LOWELL ROAD HUDSON NH

A. PROJECT DESCRIPTION

100 Lowell Rd LLC proposes the development of a 6,855 gross square foot commercial building to support their painting business, Inside Out Painting and Remodeling. The building will provide them a business office with conditioned space to store material.

B. EXISTING CONDITIONS

The property is identified as lot 198 on tax map 147 consisting of 0.8± acres located at 100 Lowell Road in the Hudson Business zoning district. The property is currently vacant, having previously contained a single-family residence. The property has frontage on Lowell Road and County Road. Sousa Field is to the east, with the field parking lot to the north.

The property is nearly all cleared, with a treeline along the north, east, and south boundary. The cleared area is flat, with steeper slopes in the treeline.

Soils consist of Hinckley loamy sand. Test pits were observed by SFC, with no seasonal high-water table observed to greater than 84". No wetlands exist on the property. No portion of the parcel is located within a flood hazard area, as interpreted from the FEMA Flood Insurance Rate Map for the Town of Hudson, Community-Panel number 33011C0518D with effective date of September 25, 2009.

The property is served by municipal water and sewer, and underground gas. Electric and communications are overhead to a utility pole on the property.

The USDA Natural Resources Conservation Service (NRCS) web soil survey shows the lot comprised of Hinckley loamy sand, within the Hydrologic Soil Group (HSG) A. Three test pits were observed by SFC, with the soil found to be consistent with Hinckley. No seasonal high-water table was observed in the 3 pits down to a total depth of 90".

C. PROPOSED DEVELOPMENT

Proposed development includes a 6,855 gross square foot commercial building with one-way access drive and associated parking, a dumpster with enclosure, and loading area. A bioretention area at the front of the property, porous pavement areas and Infiltration Trench Swales will treat and attenuate stormwater runoff. A retaining wall will be provided along the south side of the property. Utilities will include underground water and sewer from existing service stubs on the property. Underground gas will connect to the existing main in the road. The overhead electric and communications will be moved to a new utility pole, then underground to the building.

Given the accidents associated with the intersection of Lowell Road and County Road, this development proposes right-in and right-out access to the site. Vehicles will enter the site from the northbound lane of Lowell Road and exit utilizing the northbound lane of County Road. This alleviates the potential for adding cross traffic to the difficult intersection.

D. STORMWATER MANAGEMENT APPROACH

The stormwater management system has been designed in accordance with the requirements of the Town of Hudson stormwater regulations and the New Hampshire Stormwater Manual.

Stormwater facilities consisting of two infiltration trenches, a bio-retention basin area and porous pavement areas will be constructed to capture stormwater runoff from the development. These features have been designed to capture, treat, and infiltrate proposed development runoff while reducing peak flows and volumes.

The bioretention basin will outlet to the northwest portion of the site. The infiltration trenches will outlet upgradient of Lowell and County Road open drainage systems. Design of the bioretention area, infiltration trenches, and porous pavement is based on test pits by SFC with no seasonal high-water table observed. The soil infiltration rate is per the Ksat Values for NH Soils prepared by the Society of Soil Scientists of Northern New England, which lists Hinckley soil having a C horizon low-end Ksat of 20 inches per hour. Our design uses a conservative 10 inches per hour, as required by Env-Wq 1504.14(c)(3).

Groundwater Recharge Volume calculations are included with the BMP worksheets in Appendix F.

This stormwater design conforms to the Hudson Stormwater Management regulations (Chapter 290) for a site disturbing greater than 20,000 sf.

E. ANALYTICAL APPROACH

A hydrologic model was prepared to identify pre-development runoff patterns and post-development impacts. An SCS TR-20 hydrologic model was used to assist in the analysis. HydroCAD™ Version 10.0 software was used to perform drainage calculations. Design storms, using an SCS Type-III, 24-hour rainfall distribution, were considered for storms with return periods of 2, 10, 25, and 50 years.

The stormwater model includes a detailed analysis of the locus subcatchments for both the pre- and post-development condition as well as a hydraulic analysis of each component in the drainage system.

F. PRE-DEVELOPMENT ANALYSIS

The pre-development site was analyzed based on the existing cover conditions and includes one discharge location and one subcatchment. The site flows overland to an open drainage system on Lowell and County Road and outfalls in the northwest corner of the property.

The site has been analyzed with a single subcatchment identified as 1E. This subcatchment includes the entire property. The house, garage, and driveway that historically occupied the site are included for existing impervious cover. Stormwater runoff flows overland towards Lowell and County Road and discharges to the open drainage system in the northwest corner of the property. The drainage area totals 0.78 acres with a weighed curve number of 42.

Our design point (1L) for analysis is the County Road open drainage and outfall at the northwest corner of the property.

G. POST-DEVELOPMENT ANALYSIS

The post-development site was analyzed based on the proposed cover conditions, with the single discharge location (1L). The pre-development subcatchment has been divided into seven, with the changes described below.

Subcatchment 1P includes the lawn area fronting County Road, a portion of the exit driveway, and undeveloped land along the north and west side of the property. Stormwater runoff flows overland to the open drainage in County Road or sheet flows to the town property to the north. The drainage area is 0.21 acres with a weighed curve number of 39.

Subcatchments 1.1P, 1.2P, 2P, 2.1P, 2.2P, and 3P consist of the proposed development with the commercial building, parking areas, and remainder of the access drive. Stormwater runoff from 1.1P includes the entrance driveway and land to the southwest and flows overland to infiltration trench (P2) along the north side of the entrance driveway. Stormwater runoff from 1.2P includes a portion of the exit driveway and the dumpster area and flows to infiltration trench (P1) along the north side of the exit driveway. Stormwater runoff from 2P includes the parking area east of the bioretention basin and land around it that flows to the bioretention basin (Bio) P1. Subcatchments 2.1P and 2.2P are the porous pavement parking areas PP-1 beside the building and PP-2 to the south, respectively. 3P is the commercial building roof that runs to the bioretention basin via an 8" HDPE.

The two infiltration trenches and bio-retention basin are designed to treat and attenuate stormwater runoff. A broad crested weir is provided at the bioretention basin as an emergency overflow outlet to discharge upgradient of design point 1L.

H. MODEL RESULTS

A comparison of pre-development and post-development peak flows for the 2-, 10-, 25-, and 50-year storms can be seen in Table One as follows:

TABLE ONE: RUNOFF RATE COMPARISON

	Pre		Post		Delta	
Storm	Peak Flow CFS	Volume CF	Peak Flow CFS	Volume CF	Peak Flow CFS	Volume CF
2yr	0.0	1	0.0	0	0.0	(1)
10yr	0.0	498	0.0	94	0.0	(404)
25yr	0.2	1195	0.1	297	(0.1)	(898)
50yr	0.4	1859	0.2	533	(0.2)	(1326)

I. CONCLUSION

An examination of the results of the analysis indicates that the proposed BMP infrastructure reduces peak flow and volume for all storms. We conclude that the project will result in no adverse downstream impacts.

Attachment"E"

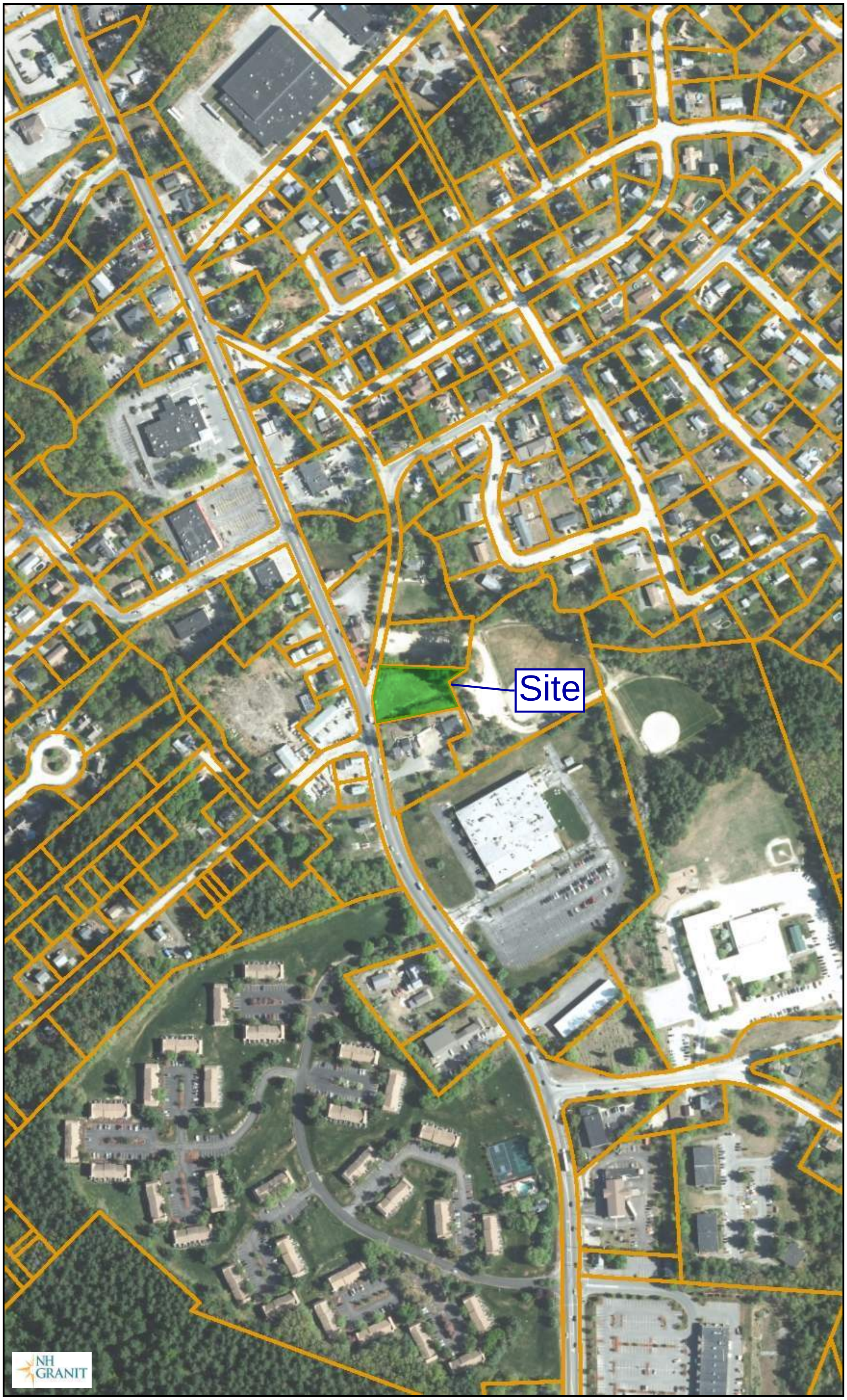
APPENDIX A

AERIAL & USGS MAP

Attachment"E"

Attachment"E"

100 Lowell Road - Hudson, NH



Legend

- Parcels
- State
- County
- City/Town

Map Scale

1: 5,000

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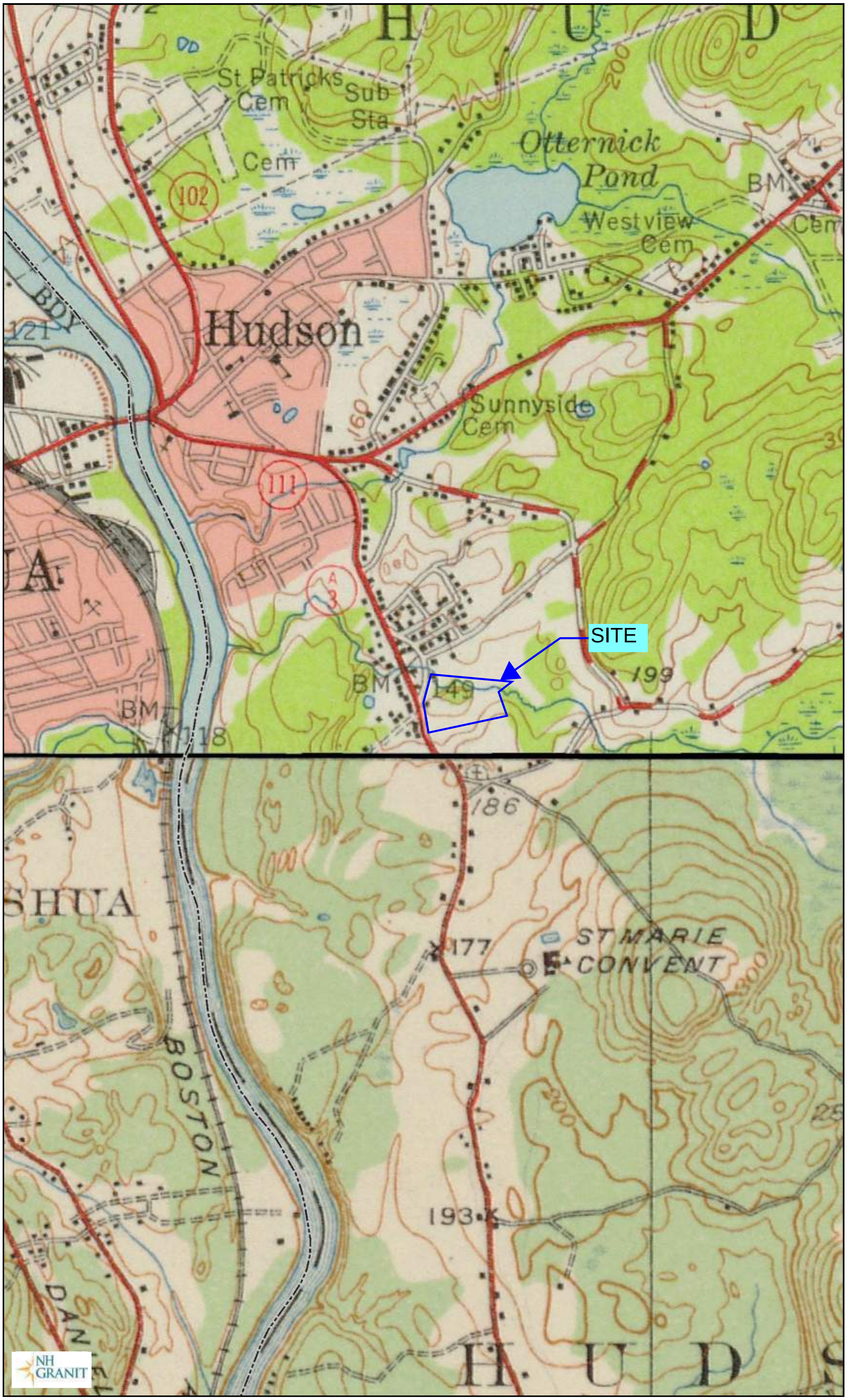
Map Generated: 12/23/2024

Notes

Attachment"E"

Attachment"E"

Map 198 Lot 147



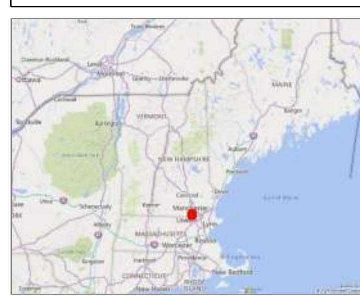
Legend

State
County
City/Town
1953 with vegetation
1935 with vegetation

Map Scale
1: 24,000

Map Generated: 8/20/2024

Notes



Attachment"E"

APPENDIX B

SOILS DATA

Attachment"E"

Attachment"E"

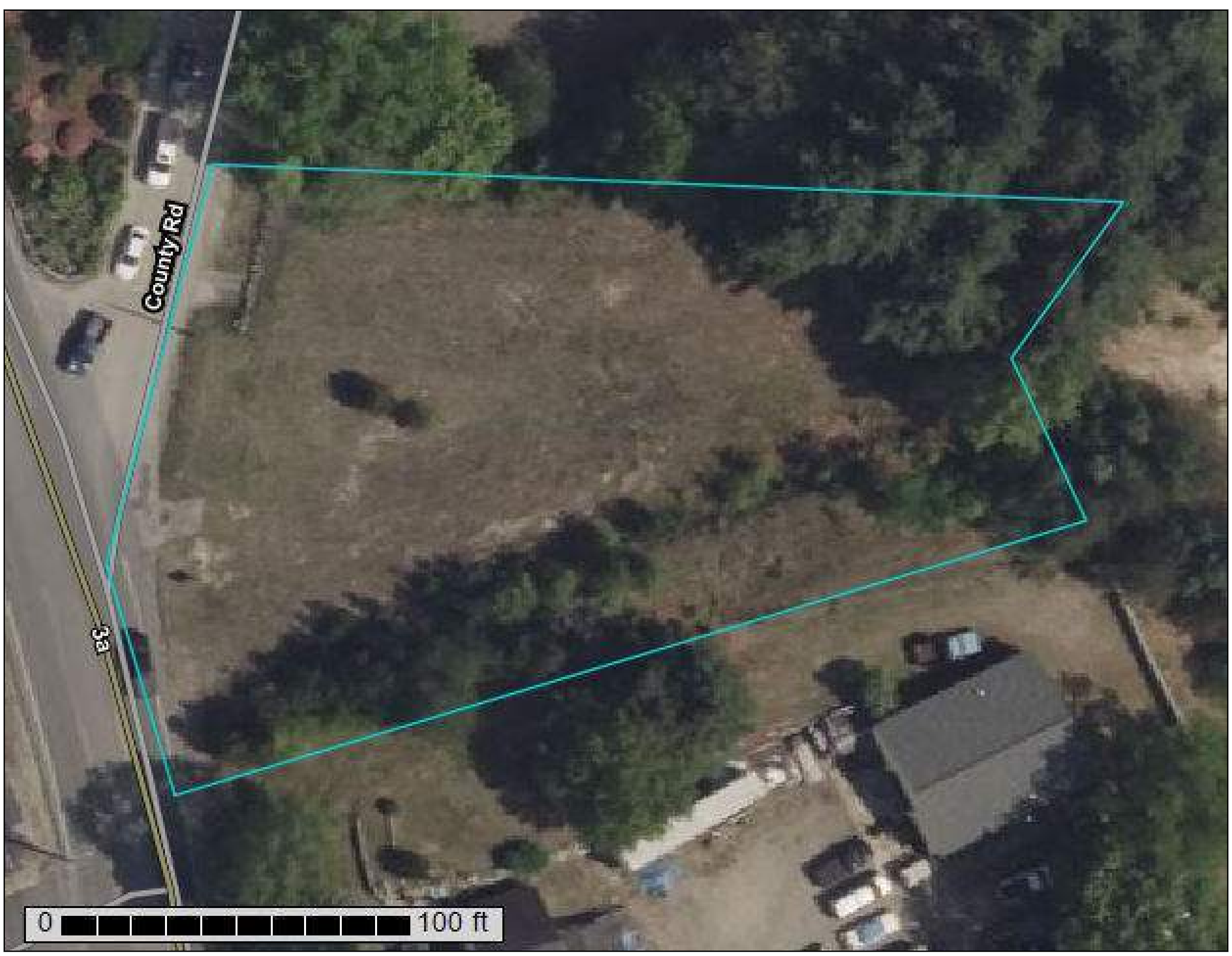
United States Department of Agriculture

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 Hillsborough County, New Hampshire, Eastern Part



September 29, 2024

Contents

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.

Soil Map

Map Scale: 1:490 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 19N WGS84

Attachment"E"

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 1:20,000.

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: Hillsborough County, New Hampshire, Eastern Part
Survey Area Data: Version 26, Aug 22, 2023

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

Attachment"E"

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HsB	Hinckley loamy sand, 3 to 8 percent slopes	0.5	62.2%
HsC	Hinckley loamy sand, 8 to 15 percent slopes	0.3	37.8%
Totals for Area of Interest		**0.8**	**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.

Hillsborough County, New Hampshire, Eastern Part

HsB—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: Not prime farmland

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 plains, eskers, moraines, kame terraces, kames, outwash terraces, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, base slope, crest, 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: Kame terraces, outwash plains, kames, eskers, moraines, outwash terraces, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, base slope, crest, 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: Kame terraces, outwash plains, moraines, outwash terraces, outwash deltas
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Head slope, base 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: Kame terraces, outwash plains, kames, eskers, moraines, outwash terraces, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, base slope, crest, side slope, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

HsC—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

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: Kame terraces, outwash plains, kames, eskers, moraines, outwash terraces, outwash deltas
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
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: 8 to 15 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: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Eskers, moraines, outwash terraces, outwash plains, kames
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent

Landform: Outwash terraces, kame terraces, outwash plains, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, outwash deltas, kames, eskers, moraines
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Attachment"E"

Attachment"E"

SFC ENGINEERING

TEST PIT LOG

DATE: **08/29/24**	PROJECT NUMBER: **667710**	PROJECT NAME: **Inside Out Painting**
INSPECTOR: **JRB** TOWN: **Hudson**	MAP: LOT:	TEST PIT NUMBER **#1**

LAYER DEPTH	COLOR	TEXTURE & MOISTURE	STRUCTURE, GRADE & CONSISTENCE	REDOX. FEATURES & NOTES
0-4"	**10YR 2/3**	**Sandy Loam Moist**	**Massive Loose**	
4-36"	**2.5Y 6/4**	**Medium Sand Moist**	**Single Grain Loose**	
36-90"	**2.5Y 6/3**	**Medium to Coarse Gravely Sand**	**Single Grain Loose**	

E.S.H.W.T.:	**>90"**
FREE WATER:	**n/o**
LEDGE/ROCK REFUSAL:	**n/o**
% STONE/BOULDERS:	**0/0**
RESTRICTIVE LAYER:	**n/o**
ROOT DEPTH:	**6"**

NOTES:

DESIGNER STAMP

Attachment"E"

SFC ENGINEERING

TEST PIT LOG

DATE: 08/29/24	PROJECT NUMBER: 667710	PROJECT NAME: Inside Out Painting
INSPECTOR: JRB TOWN: Hudson	MAP: LOT:	TEST PIT NUMBER #2

LAYER DEPTH	COLOR	TEXTURE & MOISTURE	STRUCTURE, GRADE & CONSISTENCE	REDOX. FEATURES & NOTES
0-4"	**10YR 4/3**	**Sandy Loam Moist**	**Massive Loose**	
4-36"	**2.5Y 6/4**	**Loamy Sand Moist**	**Single Grain Loose**	
36-84"	**2.5Y 6/3**	**Medium to Coarse Gravely Sand**	**Single Grain Loose**	

		NOTES:	
E.S.H.W.T.:	**>84"**		
FREE WATER:	**n/o**		
LEDGE/ROCK REFUSAL:	**n/o**		
% STONE/BOULDERS:	**0/0**		
RESTRICTIVE LAYER:	**n/o**		
ROOT DEPTH:	**10"**		**DESIGNER STAMP**

Attachment"E"

SFC ENGINEERING

TEST PIT LOG

DATE: 08/29/24	PROJECT NUMBER: 667710		PROJECT NAME: Inside Out Painting	
INSPECTOR: JRB TOWN: Hudson			MAP: LOT:	TEST PIT NUMBER #3

LAYER DEPTH	COLOR	TEXTURE & MOISTURE	STRUCTURE, GRADE & CONSISTENCE	REDOX. FEATURES & NOTES
0-4"	10YR 4/3	Sandy Loam Moist	Massive Loose	
4-84"	2.5Y 4/4	Loamy Sand Moist	Single Grain Very Friable	mix fill with broken concrete OG between 36-42"

E.S.H.W.T.:	>84"	
FREE WATER:	n/o	
LEDGE/ROCK REFUSAL:	n/o	
% STONE/BOULDERS:	0/0	
RESTRICTIVE LAYER:	n/o	
ROOT DEPTH:	42"	

NOTES:

DESIGNER STAMP

Attachment"E"

Attachment "E"

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Occum	1	0.6	2.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	mesic	loamy	no	loamy over loamy sand
Suncook	2	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	occasionally flooded
Lim	3	0.6	2.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Pootatuck	4	0.6	6.0	6.00	20.0	B	3	Flood Plain (Bottom Land)	mesic	loamy	no	single grain in C
Rippowam	5	0.6	6.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Saco	6	0.6	2.0	6.00	20.0	D	6	Flood Plain (Bottom Land)	mesic	silty	no	strata
Hadley	8	0.6	2.0	0.60	6.0	B	2	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand
Winooski	9	0.6	6.0	0.60	6.0	B		Flood Plain (Bottom Land)	mesic	silty over loamy	no	
Merrimac	10	2.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	gravelly sand	no	loamy cap
Gloucester	11	6.0	20.0	6.00	20.0	A	1	Sandy Till	mesic	sandy-skeletal	no	loamy cap
Hinckley	12	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	
Sheepscot	14	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly coarse sand
Searsport	15	6.0	20.0	6.00	20.0	D	6	Outwash and Stream Terraces	frigid	sandy	no	organic over sand
Saugatuck	16	0.06	0.2	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	yes	ortstein
Colton, gravelly	21	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly surface
Colton	22	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	
Masardis	23	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	slate, loamy cap
Agawam	24	6.0	20.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Windsor	26	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	sandy	no	
Groveton	27	0.6	2.0	0.60	6.0	B	2	Outwash and Stream Terraces	frigid	loamy	yes	loamy over sandy
Madawaska	28	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Woodbridge	29	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	mesic	loamy	no	sandy loam in Cd
Unadilla	30	0.6	2.0	2.00	20.0	B	2	Terraces and glacial lake plains	mesic	silty	no	silty over gravelly
Hartland	31	0.6	2.0	0.20	2.0	B	2	Terraces and glacial lake plains	mesic	silty	no	very fine sandy loam
Boxford	32	0.1	0.2	0.00	0.2	C	3	Silt and Clay Deposits	mesic	fine	no	silty clay loam
Scitico	33	0.0	0.2	0.00	0.2	C	5	Silt and Clay Deposits	mesic	fine	no	
Wareham	34	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Champlain	35	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	gravelly sand	no	
Adams	36	6.0	20.0	20.00	99.0	A	1	Outwash and Stream Terraces	frigid	sandy	yes	
Melrose	37	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	silty clay loam in C
Eldridge	38	6.0	20.0	0.06	0.6	C	3	Sandy/loamy over silt/clay	mesic	sandy over loamy	no	
Millis	39					C	3	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Canton	42	2.0	6.0	6.00	20.0	B	2	Loose till, sandy textures	mesic	loamy over sandy	no	loamy over loamy sand
Montauk	44	0.6	6.0	0.06	0.6	C	3	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Henniker	46	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Madawaska, aquentic	48	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Whitman	49	0.0	0.2	0.00	0.2	D	6	Firm, platy, loamy till	mesic	loamy	no	mucky loam
Hermon	55	2.0	20.0	6.00	20.0	A	1	Sandy Till	frigid	sandy-skeletal	yes	loamy cap
Becket	56	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	gravelly sandy loam in Cd
Waumbeck	58	2.0	20.0	6.00	20.0	B	3	Loose till, sandy textures	frigid	sandy-skeletal	yes	very cobbly loamy sand
Charlton	62	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	mesic	loamy	no	fine sandy loam
Paxton	66	0.6	2.0	0.00	0.2	C	3	Firm, platy, loamy till	mesic	loamy	no	
Sutton	68	0.6	6.0	0.60	6.0	B	3	Loose till, loamy textures	mesic	loamy	no	
Berkshire	72	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	fine sandy loam
Marlow	76	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Peru	78	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	
Thorndike	84	0.6	2.0	0.60	2.0	C/D	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	less than 20 in. deep
Hollis	86	0.6	6.0	0.60	6.0	C/D	4	Loose till, bedrock	mesic	loamy	no	less than 20 in. deep
Winnecook	88	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Chatfield	89	0.6	6.0	0.60	6.0	B	4	Loose till, bedrock	mesic	loamy	no	20 to 40 in. deep
Hogback	91	2.0	6.0	2.00	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Lyman	92	2.0	6.0	2.00	6.0	A/D	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Woodstock	93	2.0	6.0	2.00	6.0	C/D	4	Loose till, bedrock	frigid	loamy	no	less than 20 in. deep
Rawsonville	98	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Tunbridge	99	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep

Attachment"E"

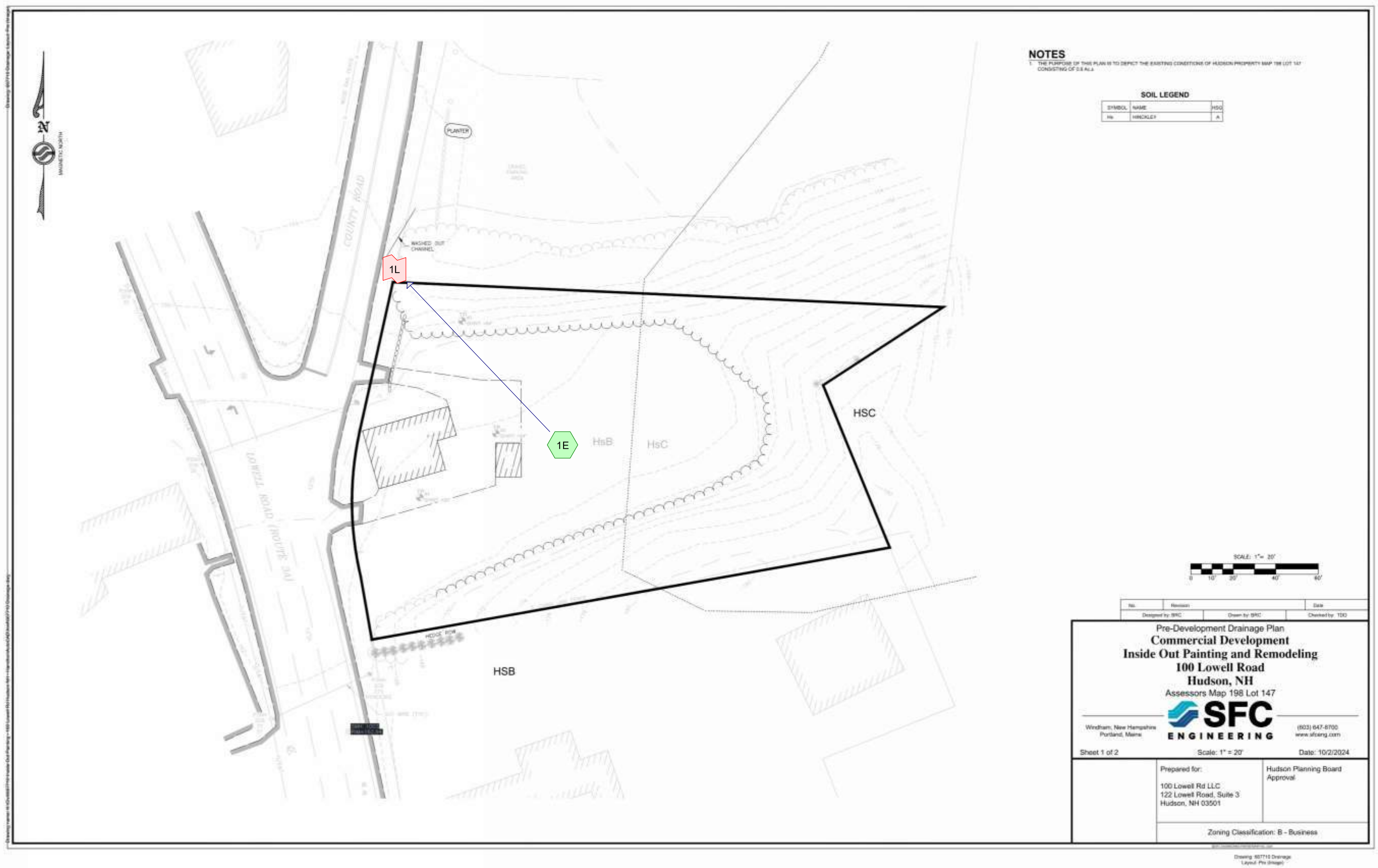
Attachment"E"

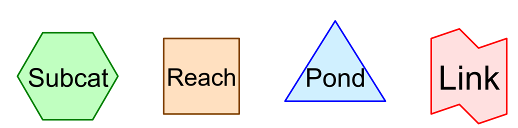
APPENDIX C

PRE-DEVELOPMENT HYDROLOGIC ANALYSIS

Attachment"E"

Attachment"E"





Routing Diagram for 667710 Pre-Res Home
Prepared by SFC Engineering, Printed 12/23/2024
HydroCAD® 10.10-5a s/n 01053 © 2020 HydroCAD Software Solutions LLC

Attachment"E"

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,390	96	Gravel surface, HSG A (1E)
15,558	39	Pasture/grassland/range, Good, HSG A (1E)
240	98	Paved parking, HSG A (1E)
1,172	98	Unconnected roofs, HSG A (1E)
14,509	30	Woods, Good, HSG A (1E)
33,869	**42**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
33,869	HSG A	1E
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
33,869		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1E: Runoff Area=33,869 sf 4.17% Impervious Runoff Depth>0.00"
Flow Length=238' Tc=4.1 min UI Adjusted CN=41 Runoff=0.0 cfs 1 cf

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

Total Runoff Area = 33,869 sf Runoff Volume = 1 cf Average Runoff Depth = 0.00"
95.83% Pervious = 32,457 sf 4.17% Impervious = 1,412 sf

Summary for Subcatchment 1E:

[49] Hint: Tc<2dt may require smaller dt
[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 1 cf, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Adj	Description
15,558	39		Pasture/grassland/range, Good, HSG A
14,509	30		Woods, Good, HSG A
240	98		Paved parking, HSG A
1,172	98		Unconnected roofs, HSG A
2,390	96		Gravel surface, HSG A
33,869	42	41	Weighted Average, UI Adjusted
32,457			95.83% Pervious Area
1,412			4.17% Impervious Area
1,172			83.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods**
					Woods: Light underbrush n= 0.400 P2= 2.90"
0.3	38	0.2500	2.50		**Shallow Concentrated Flow, Shallow Woods**
					Woodland Kv= 5.0 fps
1.2	150	0.0400	2.00		**Shallow Concentrated Flow, Shallow Bare**
					Nearly Bare & Untilled Kv= 10.0 fps
0.2	30	0.2300	2.40		**Shallow Concentrated Flow, Shallow Enbankment**
					Woodland Kv= 5.0 fps
4.1	238	Total			

Summary for Link 1L:

Inflow Area = 33,869 sf, 4.17% Impervious, Inflow Depth > 0.00" for 2-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 1 cf
Primary = 0.0 cfs @ 20.00 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1E: Runoff Area=33,869 sf 4.17% Impervious Runoff Depth>0.18"
Flow Length=238' Tc=4.1 min UI Adjusted CN=41 Runoff=0.0 cfs 498 cf

Link 1L: Inflow=0.0 cfs 498 cf
Primary=0.0 cfs 498 cf

Total Runoff Area = 33,869 sf Runoff Volume = 498 cf Average Runoff Depth = 0.18"
95.83% Pervious = 32,457 sf 4.17% Impervious = 1,412 sf

Summary for Subcatchment 1E:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.0 cfs @ 12.41 hrs, Volume= 498 cf, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

Area (sf)	CN	Adj	Description
15,558	39		Pasture/grassland/range, Good, HSG A
14,509	30		Woods, Good, HSG A
240	98		Paved parking, HSG A
1,172	98		Unconnected roofs, HSG A
2,390	96		Gravel surface, HSG A
33,869	42	41	Weighted Average, UI Adjusted
32,457			95.83% Pervious Area
1,412			4.17% Impervious Area
1,172			83.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.3	38	0.2500	2.50		**Shallow Concentrated Flow, Shallow Woods** Woodland Kv= 5.0 fps
1.2	150	0.0400	2.00		**Shallow Concentrated Flow, Shallow Bare** Nearly Bare & Untilled Kv= 10.0 fps
0.2	30	0.2300	2.40		**Shallow Concentrated Flow, Shallow Enbankment** Woodland Kv= 5.0 fps
4.1	238	Total			

Summary for Link 1L:

Inflow Area = 33,869 sf, 4.17% Impervious, Inflow Depth > 0.18" for 10-YR event
Inflow = 0.0 cfs @ 12.41 hrs, Volume= 498 cf
Primary = 0.0 cfs @ 12.41 hrs, Volume= 498 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Attachment"E"

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1E: Runoff Area=33,869 sf 4.17% Impervious Runoff Depth>0.42"
Flow Length=238' Tc=4.1 min UI Adjusted CN=41 Runoff=0.2 cfs 1,195 cf

Link 1L: Inflow=0.2 cfs 1,195 cf
Primary=0.2 cfs 1,195 cf

Total Runoff Area = 33,869 sf Runoff Volume = 1,195 cf Average Runoff Depth = 0.42"
95.83% Pervious = 32,457 sf 4.17% Impervious = 1,412 sf

Summary for Subcatchment 1E:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.2 cfs @ 12.28 hrs, Volume= 1,195 cf, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

Area (sf)	CN	Adj	Description
15,558	39		Pasture/grassland/range, Good, HSG A
14,509	30		Woods, Good, HSG A
240	98		Paved parking, HSG A
1,172	98		Unconnected roofs, HSG A
2,390	96		Gravel surface, HSG A
33,869	42	41	Weighted Average, UI Adjusted
32,457			95.83% Pervious Area
1,412			4.17% Impervious Area
1,172			83.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.3	38	0.2500	2.50		**Shallow Concentrated Flow, Shallow Woods** Woodland Kv= 5.0 fps
1.2	150	0.0400	2.00		**Shallow Concentrated Flow, Shallow Bare** Nearly Bare & Untilled Kv= 10.0 fps
0.2	30	0.2300	2.40		**Shallow Concentrated Flow, Shallow Enbankment** Woodland Kv= 5.0 fps
4.1	238	Total			

Summary for Link 1L:

Inflow Area = 33,869 sf, 4.17% Impervious, Inflow Depth > 0.42" for 25-YR event
Inflow = 0.2 cfs @ 12.28 hrs, Volume= 1,195 cf
Primary = 0.2 cfs @ 12.28 hrs, Volume= 1,195 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Attachment"E"

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1E: Runoff Area=33,869 sf 4.17% Impervious Runoff Depth>0.66"
Flow Length=238' Tc=4.1 min UI Adjusted CN=41 Runoff=0.4 cfs 1,859 cf

Link 1L: Inflow=0.4 cfs 1,859 cf
Primary=0.4 cfs 1,859 cf

Total Runoff Area = 33,869 sf Runoff Volume = 1,859 cf Average Runoff Depth = 0.66"
95.83% Pervious = 32,457 sf 4.17% Impervious = 1,412 sf

Summary for Subcatchment 1E:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,859 cf, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

Area (sf)	CN	Adj	Description
15,558	39		Pasture/grassland/range, Good, HSG A
14,509	30		Woods, Good, HSG A
240	98		Paved parking, HSG A
1,172	98		Unconnected roofs, HSG A
2,390	96		Gravel surface, HSG A
33,869	42	41	Weighted Average, UI Adjusted
32,457			95.83% Pervious Area
1,412			4.17% Impervious Area
1,172			83.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.3	38	0.2500	2.50		**Shallow Concentrated Flow, Shallow Woods** Woodland Kv= 5.0 fps
1.2	150	0.0400	2.00		**Shallow Concentrated Flow, Shallow Bare** Nearly Bare & Untilled Kv= 10.0 fps
0.2	30	0.2300	2.40		**Shallow Concentrated Flow, Shallow Enbankment** Woodland Kv= 5.0 fps
4.1	238	Total			

Summary for Link 1L:

Inflow Area = 33,869 sf, 4.17% Impervious, Inflow Depth > 0.66" for 50-YR event
Inflow = 0.4 cfs @ 12.11 hrs, Volume= 1,859 cf
Primary = 0.4 cfs @ 12.11 hrs, Volume= 1,859 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

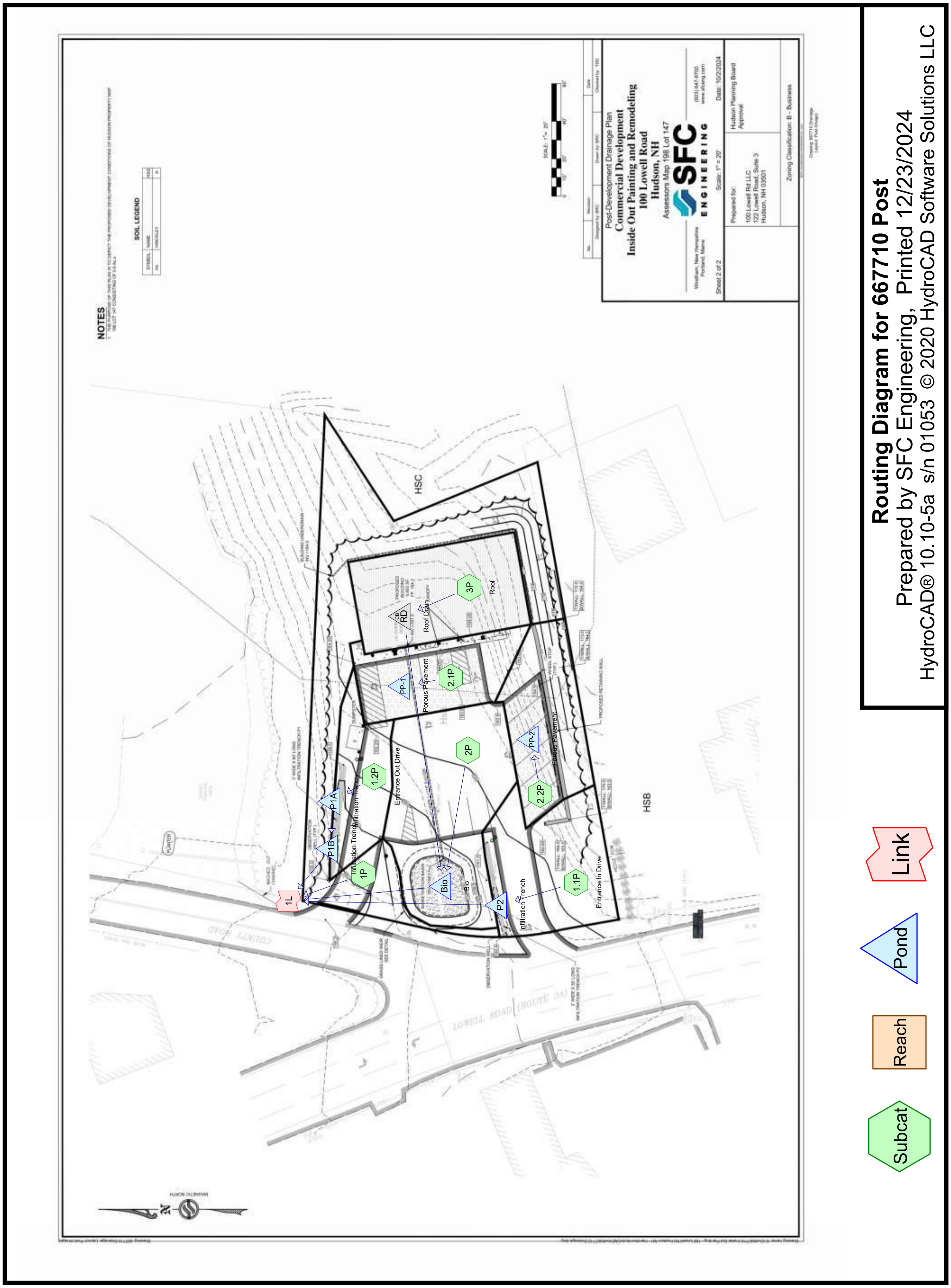
Attachment"E"

APPENDIX D

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

Attachment"E"

Attachment"E"



Attachment"E"

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
11,863	39	>75% Grass cover, Good, HSG A (1.1P, 1.2P, 1P, 2.1P, 2.2P, 2P)
8,145	98	Paved parking, HSG A (1.1P, 1.2P, 1P, 2P)
210	98	Retaining Wall, HSG A (2.2P)
4,500	98	Roofs, HSG A (3P)
4,185	98	Unconnected pavement, HSG A (2.1P, 2.2P)
4,966	30	Woods, Good, HSG A (1.1P, 1P, 2.2P)
33,869	**67**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
33,869	HSG A	1.1P, 1.2P, 1P, 2.1P, 2.2P, 2P, 3P
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
33,869		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1.1P: Entrance In Drive Runoff Area=4,316 sf 33.13% Impervious Runoff Depth>0.23"
Flow Length=70' Tc=1.3 min CN=57 Runoff=0.0 cfs 84 cf

Subcatchment1.2P: Entrance Out Drive Runoff Area=2,560 sf 71.09% Impervious Runoff Depth>1.28"
Flow Length=65' Slope=0.0730 '/' Tc=0.3 min CN=81 Runoff=0.1 cfs 273 cf

Subcatchment1P: Runoff Area=9,381 sf 6.93% Impervious Runoff Depth=0.00"
Flow Length=40' Tc=2.4 min CN=39 Runoff=0.0 cfs 0 cf

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>0.51"
Tc=692.0 min CN=88 Runoff=0.0 cfs 133 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.12"
Tc=692.0 min CN=67 Runoff=0.0 cfs 36 cf

Subcatchment2P: Runoff Area=6,386 sf 66.47% Impervious Runoff Depth>1.10"
Flow Length=85' Tc=0.6 min CN=78 Runoff=0.2 cfs 585 cf

Subcatchment3P: Roof Runoff Area=4,500 sf 100.00% Impervious Runoff Depth>2.67"
Flow Length=40' Slope=0.0200 '/' Tc=0.6 min CN=98 Runoff=0.4 cfs 1,003 cf

Pond Bio: Bio Peak Elev=157.12' Storage=255 cf Inflow=0.6 cfs 1,587 cf
Discarded=0.2 cfs 1,590 cf Primary=0.0 cfs 0 cf Outflow=0.2 cfs 1,590 cf

Pond P1A: Infiltration Trench Peak Elev=154.39' Storage=52 cf Inflow=0.1 cfs 273 cf
Discarded=0.0 cfs 273 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 273 cf

Pond P1B: Infiltration Trench Peak Elev=151.50' Storage=0 cf Inflow=0.0 cfs 0 cf
Discarded=0.0 cfs 0 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 0 cf

Pond P2: Infiltration Trench Peak Elev=158.01' Storage=1 cf Inflow=0.0 cfs 84 cf
Discarded=0.0 cfs 84 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 84 cf

Pond PP-1: Porous Pavement Peak Elev=161.08' Storage=5 cf Inflow=0.0 cfs 133 cf
Outflow=0.0 cfs 128 cf

Pond PP-2: Porous Pavement Peak Elev=160.92' Storage=1 cf Inflow=0.0 cfs 36 cf
Outflow=0.0 cfs 34 cf

Pond RD: Roof Drain Peak Elev=161.34' Inflow=0.4 cfs 1,003 cf
8.0" Round Culvert n=0.012 L=115.0' S=0.0261 '/' Outflow=0.4 cfs 1,003 cf

Link 1L: Inflow=0.0 cfs 0 cf
Primary=0.0 cfs 0 cf

Total Runoff Area = 33,869 sf Runoff Volume = 2,113 cf Average Runoff Depth = 0.75"
49.69% Pervious = 16,829 sf 50.31% Impervious = 17,040 sf

Summary for Subcatchment 1.1P: Entrance In Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.0 cfs @ 12.24 hrs, Volume= 84 cf, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
1,430	98	Paved parking, HSG A
560	30	Woods, Good, HSG A
2,326	39	>75% Grass cover, Good, HSG A
4,316	57	Weighted Average
2,886		66.87% Pervious Area
1,430		33.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	20	0.2000	0.29		**Sheet Flow, Sheet Grass** Grass: Short n= 0.150 P2= 2.90"
0.0	12	0.6700	5.73		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.2000	3.13		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
1.3	70	Total			

Summary for Subcatchment 1.2P: Entrance Out Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.1 cfs @ 12.01 hrs, Volume= 273 cf, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
1,820	98	Paved parking, HSG A
740	39	>75% Grass cover, Good, HSG A
2,560	81	Weighted Average
740		28.91% Pervious Area
1,820		71.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0730	1.59		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.1	45	0.0730	5.48		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	65	Total			

Summary for Subcatchment 1P:

[49] Hint: Tc<2dt may require smaller dt
[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
4,006	30	Woods, Good, HSG A
4,725	39	>75% Grass cover, Good, HSG A
650	98	Paved parking, HSG A
9,381	39	Weighted Average
8,731		93.07% Pervious Area
650		6.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.1	20	0.3300	4.02		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
2.4	40	Total			

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 133 cf, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,635	98	Unconnected pavement, HSG A
515	39	>75% Grass cover, Good, HSG A
3,150	88	Weighted Average
515		16.35% Pervious Area
2,635		83.65% Impervious Area
2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 36 cf, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Subcatchment 2P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.2 cfs @ 12.01 hrs, Volume= 585 cf, Depth> 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,141	39	>75% Grass cover, Good, HSG A
4,245	98	Paved parking, HSG A
6,386	78	Weighted Average
2,141		33.53% Pervious Area
4,245		66.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0350	1.19		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.3	65	0.0400	4.06		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.6	85	Total			

Summary for Subcatchment 3P: Roof

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.4 cfs @ 12.01 hrs, Volume= 1,003 cf, Depth> 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
4,500	98	Roofs, HSG A
4,500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0200	1.09		**Sheet Flow, Roof Sheet** Smooth surfaces n= 0.011 P2= 2.90"

Summary for Pond Bio: Bio

[82] Warning: Early inflow requires earlier time span

Inflow Area = 10,886 sf, 80.33% Impervious, Inflow Depth > 1.75" for 2-YR event
Inflow = 0.6 cfs @ 12.01 hrs, Volume= 1,587 cf
Outflow = 0.2 cfs @ 12.30 hrs, Volume= 1,590 cf, Atten= 69%, Lag= 17.2 min
Discarded = 0.2 cfs @ 12.30 hrs, Volume= 1,590 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 157.12' @ 12.30 hrs Surf.Area= 650 sf Storage= 255 cf
Flood Elev= 160.00' Surf.Area= 1,000 sf Storage= 1,831 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 7.5 min (768.6 - 761.1)

Volume	Invert	Avail.Storage	Storage Description
#1	156.00'	1,831 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
156.00	650	0.0	0	0	650
157.75	650	35.0	398	398	828
159.50	1,000	100.0	1,433	1,831	1,232

Device	Routing	Invert	Outlet Devices
#1	Discarded	156.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.00'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.2 cfs @ 12.30 hrs HW=157.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=156.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P1A: Infiltration Trench

Inflow Area =	2,560 sf,	71.09% Impervious,	Inflow Depth > 1.28"	for 2-YR event
Inflow =	0.1 cfs @	12.01 hrs, Volume=	273 cf	
Outflow =	0.0 cfs @	12.31 hrs, Volume=	273 cf,	Atten= 69%, Lag= 18.2 min
Discarded =	0.0 cfs @	12.31 hrs, Volume=	273 cf	
Primary =	0.0 cfs @	5.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 154.39' @ 12.31 hrs Surf.Area= 93 sf Storage= 52 cf

Plug-Flow detention time= 9.8 min calculated for 273 cf (100% of inflow)
Center-of-Mass det. time= 9.6 min (807.7 - 798.1)

Volume	Invert	Avail.Storage	Storage Description
#1	153.00'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
153.00	93	0	0	93
157.00	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	156.95'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir**

Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
2.50 3.00 3.50
Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88
2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.31 hrs HW=154.39' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=153.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P1B: Infiltration Trench

Inflow Area = 2,560 sf, 71.09% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.0 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 151.50' @ 5.00 hrs Surf.Area= 93 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	151.50'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.50	93	0	0	93
155.50	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	151.50'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	155.40'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 5.00 hrs HW=151.50' (Free Discharge)
└─**1=Exfiltration** (Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=151.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P2: Infiltration Trench

Inflow Area =	4,316 sf,	33.13% Impervious,	Inflow Depth > 0.23"	for 2-YR event
Inflow =	0.0 cfs @	12.24 hrs, Volume=	84 cf	
Outflow =	0.0 cfs @	12.25 hrs, Volume=	84 cf,	Atten= 0%, Lag= 0.9 min
Discarded =	0.0 cfs @	12.25 hrs, Volume=	84 cf	
Primary =	0.0 cfs @	5.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 158.01' @ 12.25 hrs Surf.Area= 110 sf Storage= 1 cf

Plug-Flow detention time= 0.9 min calculated for 84 cf (100% of inflow)
Center-of-Mass det. time= 0.6 min (877.5 - 876.9)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	132 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc) 330 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	110	0	0	110
161.00	110	330	330	236

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.25 hrs HW=158.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=158.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Summary for Pond PP-1: Porous Pavement

Inflow Area =	3,150 sf,	83.65% Impervious,	Inflow Depth > 0.51"	for 2-YR event
Inflow =	0.0 cfs @	20.00 hrs, Volume=	133 cf	
Outflow =	0.0 cfs @	20.00 hrs, Volume=	128 cf,	Atten= 1%, Lag= 0.0 min
Discarded =	0.0 cfs @	20.00 hrs, Volume=	128 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.08' @ 20.00 hrs Surf.Area= 2,176 sf Storage= 5 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 7.3 min calculated for 128 cf (96% of inflow)
Center-of-Mass det. time= 2.5 min (1,069.2 - 1,066.6)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=161.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.12" for 2-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 36 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 34 cf, Atten= 2%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 34 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.92' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 1 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 7.3 min calculated for 34 cf (96% of inflow)
Center-of-Mass det. time= 2.3 min (1,084.3 - 1,082.0)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.92' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Summary for Pond RD: Roof Drain

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 161.34' (Flood elevation advised)

Inflow Area = 4,500 sf,100.00% Impervious, Inflow Depth > 2.67" for 2-YR event
Inflow = 0.4 cfs @ 12.01 hrs, Volume= 1,003 cf
Outflow = 0.4 cfs @ 12.01 hrs, Volume= 1,003 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.4 cfs @ 12.01 hrs, Volume= 1,003 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.34' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**8.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.00' S= 0.0261 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.3 cfs @ 12.01 hrs HW=161.33' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.3 cfs @ 1.96 fps)

Summary for Link 1L:

Inflow Area = 27,143 sf, 46.59% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1.1P: Entrance In Drive Runoff Area=4,316 sf 33.13% Impervious Runoff Depth>0.88"
Flow Length=70' Tc=1.3 min CN=57 Runoff=0.1 cfs 317 cf

Subcatchment1.2P: Entrance Out Drive Runoff Area=2,560 sf 71.09% Impervious Runoff Depth>2.61"
Flow Length=65' Slope=0.0730 '/' Tc=0.3 min CN=81 Runoff=0.2 cfs 556 cf

Subcatchment1P: Runoff Area=9,381 sf 6.93% Impervious Runoff Depth>0.12"
Flow Length=40' Tc=2.4 min CN=39 Runoff=0.0 cfs 94 cf

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>0.99"
Tc=692.0 min CN=88 Runoff=0.0 cfs 259 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.36"
Tc=692.0 min CN=67 Runoff=0.0 cfs 109 cf

Subcatchment2P: Runoff Area=6,386 sf 66.47% Impervious Runoff Depth>2.35"
Flow Length=85' Tc=0.6 min CN=78 Runoff=0.5 cfs 1,249 cf

Subcatchment3P: Roof Runoff Area=4,500 sf 100.00% Impervious Runoff Depth>4.21"
Flow Length=40' Slope=0.0200 '/' Tc=0.6 min CN=98 Runoff=0.5 cfs 1,579 cf

Pond Bio: Bio Peak Elev=158.21' Storage=717 cf Inflow=1.0 cfs 2,828 cf
Discarded=0.2 cfs 2,827 cf Primary=0.0 cfs 0 cf Outflow=0.2 cfs 2,827 cf

Pond P1A: Infiltration Trench Peak Elev=156.91' Storage=145 cf Inflow=0.2 cfs 556 cf
Discarded=0.1 cfs 556 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 556 cf

Pond P1B: Infiltration Trench Peak Elev=151.50' Storage=0 cf Inflow=0.0 cfs 0 cf
Discarded=0.0 cfs 0 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 0 cf

Pond P2: Infiltration Trench Peak Elev=159.17' Storage=51 cf Inflow=0.1 cfs 317 cf
Discarded=0.0 cfs 317 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 317 cf

Pond PP-1: Porous Pavement Peak Elev=161.08' Storage=9 cf Inflow=0.0 cfs 259 cf
Outflow=0.0 cfs 250 cf

Pond PP-2: Porous Pavement Peak Elev=160.93' Storage=4 cf Inflow=0.0 cfs 109 cf
Outflow=0.0 cfs 104 cf

Pond RD: Roof Drain Peak Elev=161.44' Inflow=0.5 cfs 1,579 cf
8.0" Round Culvert n=0.012 L=115.0' S=0.0261 '/' Outflow=0.5 cfs 1,579 cf

Link 1L: Inflow=0.0 cfs 94 cf
Primary=0.0 cfs 94 cf

Total Runoff Area = 33,869 sf Runoff Volume = 4,162 cf Average Runoff Depth = 1.47"
49.69% Pervious = 16,829 sf 50.31% Impervious = 17,040 sf

Summary for Subcatchment 1.1P: Entrance In Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.1 cfs @ 12.04 hrs, Volume= 317 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

Area (sf)	CN	Description
1,430	98	Paved parking, HSG A
560	30	Woods, Good, HSG A
2,326	39	>75% Grass cover, Good, HSG A
4,316	57	Weighted Average
2,886		66.87% Pervious Area
1,430		33.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	20	0.2000	0.29		**Sheet Flow, Sheet Grass** Grass: Short n= 0.150 P2= 2.90"
0.0	12	0.6700	5.73		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.2000	3.13		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
1.3	70	Total			

Summary for Subcatchment 1.2P: Entrance Out Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.2 cfs @ 12.01 hrs, Volume= 556 cf, Depth> 2.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

Area (sf)	CN	Description
1,820	98	Paved parking, HSG A
740	39	>75% Grass cover, Good, HSG A
2,560	81	Weighted Average
740		28.91% Pervious Area
1,820		71.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0730	1.59		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.1	45	0.0730	5.48		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	65	Total			

Summary for Subcatchment 1P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.0 cfs @ 13.64 hrs, Volume= 94 cf, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

Area (sf)	CN	Description
4,006	30	Woods, Good, HSG A
4,725	39	>75% Grass cover, Good, HSG A
650	98	Paved parking, HSG A
9,381	39	Weighted Average
8,731		93.07% Pervious Area
650		6.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.1	20	0.3300	4.02		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
2.4	40	Total			

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 259 cf, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

Area (sf)	CN	Description
2,635	98	Unconnected pavement, HSG A
515	39	>75% Grass cover, Good, HSG A
3,150	88	Weighted Average
515		16.35% Pervious Area
2,635		83.65% Impervious Area
2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 109 cf, Depth> 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Subcatchment 2P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.5 cfs @ 12.01 hrs, Volume= 1,249 cf, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

Area (sf)	CN	Description
2,141	39	>75% Grass cover, Good, HSG A
4,245	98	Paved parking, HSG A
6,386	78	Weighted Average
2,141		33.53% Pervious Area
4,245		66.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0350	1.19		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.3	65	0.0400	4.06		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.6	85	Total			

Summary for Subcatchment 3P: Roof

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.5 cfs @ 12.01 hrs, Volume= 1,579 cf, Depth> 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

Area (sf)	CN	Description
4,500	98	Roofs, HSG A
4,500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0200	1.09		**Sheet Flow, Roof Sheet** Smooth surfaces n= 0.011 P2= 2.90"

Summary for Pond Bio: Bio

[82] Warning: Early inflow requires earlier time span
[79] Warning: Submerged Pond RD Primary device # 1 OUTLET by 0.21'

Inflow Area = 10,886 sf, 80.33% Impervious, Inflow Depth > 3.12" for 10-YR event
Inflow = 1.0 cfs @ 12.01 hrs, Volume= 2,828 cf
Outflow = 0.2 cfs @ 12.40 hrs, Volume= 2,827 cf, Atten= 79%, Lag= 23.7 min
Discarded = 0.2 cfs @ 12.40 hrs, Volume= 2,827 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 158.21' @ 12.40 hrs Surf.Area= 735 sf Storage= 717 cf
Flood Elev= 160.00' Surf.Area= 1,000 sf Storage= 1,831 cf

Plug-Flow detention time= 21.1 min calculated for 2,826 cf (100% of inflow)
Center-of-Mass det. time= 20.8 min (777.6 - 756.8)

Volume	Invert	Avail.Storage	Storage Description
#1	156.00'	1,831 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
156.00	650	0.0	0	0	650
157.75	650	35.0	398	398	828
159.50	1,000	100.0	1,433	1,831	1,232

Device	Routing	Invert	Outlet Devices
#1	Discarded	156.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.00'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.2 cfs @ 12.40 hrs HW=158.21' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=156.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir**(Controls 0.0 cfs)

Summary for Pond P1A: Infiltration Trench

Inflow Area = 2,560 sf, 71.09% Impervious, Inflow Depth > 2.61" for 10-YR event
Inflow = 0.2 cfs @ 12.01 hrs, Volume= 556 cf
Outflow = 0.1 cfs @ 12.35 hrs, Volume= 556 cf, Atten= 74%, Lag= 20.7 min
Discarded = 0.1 cfs @ 12.35 hrs, Volume= 556 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 156.91' @ 12.35 hrs Surf.Area= 93 sf Storage= 145 cf

Plug-Flow detention time= 20.7 min calculated for 556 cf (100% of inflow)
Center-of-Mass det. time= 20.5 min (802.4 - 781.9)

Volume	Invert	Avail.Storage	Storage Description
#1	153.00'	149 cf	**Trench (Pyramidal)**Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
153.00	93	0	0	93
157.00	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	156.95'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.1 cfs @ 12.35 hrs HW=156.91' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=153.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P1B: Infiltration Trench

Inflow Area = 2,560 sf, 71.09% Impervious, Inflow Depth = 0.00" for 10-YR event
Inflow = 0.0 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.0 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 151.50' @ 5.00 hrs Surf.Area= 93 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	151.50'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.50	93	0	0	93
155.50	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	151.50'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	155.40'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 5.00 hrs HW=151.50' (Free Discharge)
└─**1=Exfiltration** (Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=151.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P2: Infiltration Trench

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Inflow Area =       4,316 sf,  33.13% Impervious,  Inflow Depth >   0.88"    for  10-YR event
Inflow      =      0.1 cfs @  12.04 hrs,  Volume=           317 cf
Outflow     =      0.0 cfs @  12.40 hrs,  Volume=           317 cf,  Atten= 65%,  Lag= 21.2 min
Discarded   =      0.0 cfs @  12.40 hrs,  Volume=           317 cf
Primary     =      0.0 cfs @   5.00 hrs,  Volume=             0 cf
```

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 159.17' @ 12.40 hrs Surf.Area= 110 sf Storage= 51 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.2 min (843.2 - 835.0)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	132 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc) 330 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	110	0	0	110
161.00	110	330	330	236

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.40 hrs HW=159.16' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=158.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond PP-1: Porous Pavement

```
Inflow Area =       3,150 sf,  83.65% Impervious,  Inflow Depth >   0.99"    for  10-YR event
Inflow      =      0.0 cfs @  20.00 hrs,  Volume=           259 cf
Outflow     =      0.0 cfs @  20.00 hrs,  Volume=           250 cf,  Atten= 1%,  Lag= 0.0 min
Discarded   =      0.0 cfs @  20.00 hrs,  Volume=           250 cf
```

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.08' @ 20.00 hrs Surf.Area= 2,176 sf Storage= 9 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 7.3 min calculated for 249 cf (96% of inflow)
Center-of-Mass det. time= 2.5 min (1,061.3 - 1,058.8)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=161.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.36" for 10-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 109 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 104 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 104 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.93' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 4 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 7.3 min calculated for 104 cf (96% of inflow)
Center-of-Mass det. time= 2.4 min (1,080.0 - 1,077.5)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Summary for Pond RD: Roof Drain

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 161.44' (Flood elevation advised)

Inflow Area = 4,500 sf,100.00% Impervious, Inflow Depth > 4.21" for 10-YR event
Inflow = 0.5 cfs @ 12.01 hrs, Volume= 1,579 cf
Outflow = 0.5 cfs @ 12.01 hrs, Volume= 1,579 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.5 cfs @ 12.01 hrs, Volume= 1,579 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.44' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**8.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.00' S= 0.0261 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.5 cfs @ 12.01 hrs HW=161.43' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.5 cfs @ 2.23 fps)

Summary for Link 1L:

Inflow Area = 27,143 sf, 46.59% Impervious, Inflow Depth > 0.04" for 10-YR event
Inflow = 0.0 cfs @ 13.64 hrs, Volume= 94 cf
Primary = 0.0 cfs @ 13.64 hrs, Volume= 94 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1.1P: Entrance In Drive Runoff Area=4,316 sf 33.13% Impervious Runoff Depth>1.42"
Flow Length=70' Tc=1.3 min CN=57 Runoff=0.2 cfs 511 cf

Subcatchment1.2P: Entrance Out Drive Runoff Area=2,560 sf 71.09% Impervious Runoff Depth>3.50"
Flow Length=65' Slope=0.0730 '/' Tc=0.3 min CN=81 Runoff=0.3 cfs 746 cf

Subcatchment1P: Runoff Area=9,381 sf 6.93% Impervious Runoff Depth>0.33"
Flow Length=40' Tc=2.4 min CN=39 Runoff=0.0 cfs 258 cf

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>1.31"
Tc=692.0 min CN=88 Runoff=0.0 cfs 343 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.56"
Tc=692.0 min CN=67 Runoff=0.0 cfs 166 cf

Subcatchment2P: Runoff Area=6,386 sf 66.47% Impervious Runoff Depth>3.20"
Flow Length=85' Tc=0.6 min CN=78 Runoff=0.7 cfs 1,704 cf

Subcatchment3P: Roof Runoff Area=4,500 sf 100.00% Impervious Runoff Depth>5.17"
Flow Length=40' Slope=0.0200 '/' Tc=0.6 min CN=98 Runoff=0.7 cfs 1,937 cf

Pond Bio: Bio Peak Elev=158.63' Storage=1,046 cf Inflow=1.3 cfs 3,642 cf
Discarded=0.2 cfs 3,644 cf Primary=0.0 cfs 0 cf Outflow=0.2 cfs 3,644 cf

Pond P1A: Infiltration Trench Peak Elev=157.03' Storage=149 cf Inflow=0.3 cfs 746 cf
Discarded=0.1 cfs 670 cf Primary=0.1 cfs 58 cf Outflow=0.2 cfs 727 cf

Pond P1B: Infiltration Trench Peak Elev=152.15' Storage=24 cf Inflow=0.1 cfs 58 cf
Discarded=0.0 cfs 56 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 56 cf

Pond P2: Infiltration Trench Peak Elev=159.95' Storage=86 cf Inflow=0.2 cfs 511 cf
Discarded=0.0 cfs 473 cf Primary=0.1 cfs 39 cf Outflow=0.1 cfs 512 cf

Pond PP-1: Porous Pavement Peak Elev=161.08' Storage=11 cf Inflow=0.0 cfs 343 cf
Outflow=0.0 cfs 332 cf

Pond PP-2: Porous Pavement Peak Elev=160.93' Storage=6 cf Inflow=0.0 cfs 166 cf
Outflow=0.0 cfs 160 cf

Pond RD: Roof Drain Peak Elev=161.50' Inflow=0.7 cfs 1,937 cf
8.0" Round Culvert n=0.012 L=115.0' S=0.0261 '/' Outflow=0.7 cfs 1,937 cf

Link 1L: Inflow=0.1 cfs 297 cf
Primary=0.1 cfs 297 cf

Total Runoff Area = 33,869 sf Runoff Volume = 5,666 cf Average Runoff Depth = 2.01"
49.69% Pervious = 16,829 sf 50.31% Impervious = 17,040 sf

Summary for Subcatchment 1.1P: Entrance In Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.2 cfs @ 12.04 hrs, Volume= 511 cf, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

Area (sf)	CN	Description
1,430	98	Paved parking, HSG A
560	30	Woods, Good, HSG A
2,326	39	>75% Grass cover, Good, HSG A
4,316	57	Weighted Average
2,886		66.87% Pervious Area
1,430		33.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	20	0.2000	0.29		**Sheet Flow, Sheet Grass** Grass: Short n= 0.150 P2= 2.90"
0.0	12	0.6700	5.73		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.2000	3.13		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
1.3	70	Total			

Summary for Subcatchment 1.2P: Entrance Out Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.3 cfs @ 12.01 hrs, Volume= 746 cf, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

Area (sf)	CN	Description
1,820	98	Paved parking, HSG A
740	39	>75% Grass cover, Good, HSG A
2,560	81	Weighted Average
740		28.91% Pervious Area
1,820		71.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0730	1.59		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.1	45	0.0730	5.48		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	65	Total			

Summary for Subcatchment 1P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.0 cfs @ 12.31 hrs, Volume= 258 cf, Depth> 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

Area (sf)	CN	Description
4,006	30	Woods, Good, HSG A
4,725	39	>75% Grass cover, Good, HSG A
650	98	Paved parking, HSG A
9,381	39	Weighted Average
8,731		93.07% Pervious Area
650		6.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.1	20	0.3300	4.02		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
2.4	40	Total			

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 343 cf, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

Area (sf)	CN	Description
2,635	98	Unconnected pavement, HSG A
515	39	>75% Grass cover, Good, HSG A
3,150	88	Weighted Average
515		16.35% Pervious Area
2,635		83.65% Impervious Area
2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 166 cf, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Subcatchment 2P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.7 cfs @ 12.01 hrs, Volume= 1,704 cf, Depth> 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

Area (sf)	CN	Description
2,141	39	>75% Grass cover, Good, HSG A
4,245	98	Paved parking, HSG A
6,386	78	Weighted Average
2,141		33.53% Pervious Area
4,245		66.47% Impervious Area

Attachment"E"

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0350	1.19		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.3	65	0.0400	4.06		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.6	85	Total			

Summary for Subcatchment 3P: Roof

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.7 cfs @ 12.01 hrs, Volume= 1,937 cf, Depth> 5.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

Area (sf)	CN	Description
4,500	98	Roofs, HSG A
4,500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0200	1.09		**Sheet Flow, Roof Sheet** Smooth surfaces n= 0.011 P2= 2.90"

Summary for Pond Bio: Bio

[82] Warning: Early inflow requires earlier time span
[79] Warning: Submerged Pond RD Primary device # 1 OUTLET by 0.63'

Inflow Area = 10,886 sf, 80.33% Impervious, Inflow Depth > 4.01" for 25-YR event
Inflow = 1.3 cfs @ 12.01 hrs, Volume= 3,642 cf
Outflow = 0.2 cfs @ 12.44 hrs, Volume= 3,644 cf, Atten= 82%, Lag= 25.7 min
Discarded = 0.2 cfs @ 12.44 hrs, Volume= 3,644 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 158.63' @ 12.44 hrs Surf.Area= 818 sf Storage= 1,046 cf
Flood Elev= 160.00' Surf.Area= 1,000 sf Storage= 1,831 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 30.1 min (784.5 - 754.3)

Volume	Invert	Avail.Storage	Storage Description
#1	156.00'	1,831 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
156.00	650	0.0	0	0	650
157.75	650	35.0	398	398	828
159.50	1,000	100.0	1,433	1,831	1,232

Device	Routing	Invert	Outlet Devices
#1	Discarded	156.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.00'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.2 cfs @ 12.44 hrs HW=158.63' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=156.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P1A: Infiltration Trench

[93] Warning: Storage range exceeded by 0.03'

Inflow Area = 2,560 sf, 71.09% Impervious, Inflow Depth > 3.50" for 25-YR event
Inflow = 0.3 cfs @ 12.01 hrs, Volume= 746 cf
Outflow = 0.2 cfs @ 12.06 hrs, Volume= 727 cf, Atten= 43%, Lag= 3.0 min
Discarded = 0.1 cfs @ 12.05 hrs, Volume= 670 cf
Primary = 0.1 cfs @ 12.05 hrs, Volume= 58 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 157.03' @ 12.05 hrs Surf.Area= 93 sf Storage= 149 cf

Plug-Flow detention time= 30.1 min calculated for 727 cf (98% of inflow)
Center-of-Mass det. time= 20.3 min (795.3 - 775.0)

Volume	Invert	Avail.Storage	Storage Description
#1	153.00'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
153.00	93	0	0	93
157.00	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	156.95'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50

Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88
2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.1 cfs @ 12.05 hrs HW=157.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.1 cfs @ 12.05 hrs HW=157.02' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.1 cfs @ 0.68 fps)

Summary for Pond P1B: Infiltration Trench

Inflow Area =	2,560 sf,	71.09% Impervious,	Inflow Depth = 0.27"	for 25-YR event
Inflow =	0.1 cfs @	12.05 hrs, Volume=	58 cf	
Outflow =	0.0 cfs @	12.31 hrs, Volume=	56 cf,	Atten= 75%, Lag= 15.5 min
Discarded =	0.0 cfs @	12.31 hrs, Volume=	56 cf	
Primary =	0.0 cfs @	5.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 152.15' @ 12.31 hrs Surf.Area= 93 sf Storage= 24 cf

Plug-Flow detention time= 10.5 min calculated for 56 cf (98% of inflow)
Center-of-Mass det. time= 10.2 min (739.9 - 729.7)

Volume	Invert	Avail.Storage	Storage Description
#1	151.50'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.50	93	0	0	93
155.50	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	151.50'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	155.40'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.31 hrs HW=152.15' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=151.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P2: Infiltration Trench

Inflow Area = 4,316 sf, 33.13% Impervious, Inflow Depth > 1.42" for 25-YR event
Inflow = 0.2 cfs @ 12.04 hrs, Volume= 511 cf
Outflow = 0.1 cfs @ 12.17 hrs, Volume= 512 cf, Atten= 42%, Lag= 7.9 min
Discarded = 0.0 cfs @ 12.15 hrs, Volume= 473 cf
Primary = 0.1 cfs @ 12.17 hrs, Volume= 39 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 159.95' @ 12.15 hrs Surf.Area= 110 sf Storage= 86 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.2 min (835.4 - 823.1)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	132 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc) 330 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	110	0	0	110
161.00	110	330	330	236

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.15 hrs HW=159.95' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.1 cfs @ 12.17 hrs HW=159.95' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.1 cfs @ 0.55 fps)

Summary for Pond PP-1: Porous Pavement

Inflow Area = 3,150 sf, 83.65% Impervious, Inflow Depth > 1.31" for 25-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 343 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 332 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 332 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.08' @ 20.00 hrs Surf.Area= 2,176 sf Storage= 11 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 7.3 min calculated for 331 cf (96% of inflow)
Center-of-Mass det. time= 2.5 min (1,057.3 - 1,054.8)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 20.00 hrs HW=161.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.56" for 25-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 166 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 160 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 160 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.93' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 6 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 7.3 min calculated for 160 cf (96% of inflow)
Center-of-Mass det. time= 2.5 min (1,077.9 - 1,075.4)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Summary for Pond RD: Roof Drain

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 161.50' (Flood elevation advised)

Inflow Area = 4,500 sf,100.00% Impervious, Inflow Depth > 5.17" for 25-YR event
Inflow = 0.7 cfs @ 12.01 hrs, Volume= 1,937 cf
Outflow = 0.7 cfs @ 12.01 hrs, Volume= 1,937 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.7 cfs @ 12.01 hrs, Volume= 1,937 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.50' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**8.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.00' S= 0.0261 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.6 cfs @ 12.01 hrs HW=161.49' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.6 cfs @ 2.38 fps)

Summary for Link 1L:

Inflow Area = 27,143 sf, 46.59% Impervious, Inflow Depth > 0.13" for 25-YR event
Inflow = 0.1 cfs @ 12.17 hrs, Volume= 297 cf
Primary = 0.1 cfs @ 12.17 hrs, Volume= 297 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1.1P: Entrance In Drive Runoff Area=4,316 sf 33.13% Impervious Runoff Depth>1.87"
Flow Length=70' Tc=1.3 min CN=57 Runoff=0.2 cfs 671 cf

Subcatchment1.2P: Entrance Out Drive Runoff Area=2,560 sf 71.09% Impervious Runoff Depth>4.17"
Flow Length=65' Slope=0.0730 '/' Tc=0.3 min CN=81 Runoff=0.3 cfs 889 cf

Subcatchment1P: Runoff Area=9,381 sf 6.93% Impervious Runoff Depth>0.54"
Flow Length=40' Tc=2.4 min CN=39 Runoff=0.1 cfs 419 cf

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>1.55"
Tc=692.0 min CN=88 Runoff=0.0 cfs 407 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.72"
Tc=692.0 min CN=67 Runoff=0.0 cfs 213 cf

Subcatchment2P: Runoff Area=6,386 sf 66.47% Impervious Runoff Depth>3.85"
Flow Length=85' Tc=0.6 min CN=78 Runoff=0.8 cfs 2,050 cf

Subcatchment3P: Roof Runoff Area=4,500 sf 100.00% Impervious Runoff Depth>5.87"
Flow Length=40' Slope=0.0200 '/' Tc=0.6 min CN=98 Runoff=0.8 cfs 2,200 cf

Pond Bio: Bio Peak Elev=158.93' Storage=1,296 cf Inflow=1.6 cfs 4,250 cf
Discarded=0.3 cfs 4,247 cf Primary=0.0 cfs 0 cf Outflow=0.3 cfs 4,247 cf

Pond P1A: Infiltration Trench Peak Elev=156.99' Storage=148 cf Inflow=0.3 cfs 889 cf
Discarded=0.1 cfs 748 cf Primary=0.0 cfs 43 cf Outflow=0.1 cfs 791 cf

Pond P1B: Infiltration Trench Peak Elev=151.94' Storage=16 cf Inflow=0.0 cfs 43 cf
Discarded=0.0 cfs 43 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 43 cf

Pond P2: Infiltration Trench Peak Elev=159.99' Storage=87 cf Inflow=0.2 cfs 671 cf
Discarded=0.0 cfs 560 cf Primary=0.1 cfs 114 cf Outflow=0.2 cfs 674 cf

Pond PP-1: Porous Pavement Peak Elev=161.08' Storage=13 cf Inflow=0.0 cfs 407 cf
Outflow=0.0 cfs 394 cf

Pond PP-2: Porous Pavement Peak Elev=160.93' Storage=8 cf Inflow=0.0 cfs 213 cf
Outflow=0.0 cfs 205 cf

Pond RD: Roof Drain Peak Elev=161.54' Inflow=0.8 cfs 2,200 cf
8.0" Round Culvert n=0.012 L=115.0' S=0.0261 '/' Outflow=0.8 cfs 2,200 cf

Link 1L: Inflow=0.2 cfs 533 cf
Primary=0.2 cfs 533 cf

Total Runoff Area = 33,869 sf Runoff Volume = 6,849 cf Average Runoff Depth = 2.43"
49.69% Pervious = 16,829 sf 50.31% Impervious = 17,040 sf

Summary for Subcatchment 1.1P: Entrance In Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.2 cfs @ 12.03 hrs, Volume= 671 cf, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

Area (sf)	CN	Description
1,430	98	Paved parking, HSG A
560	30	Woods, Good, HSG A
2,326	39	>75% Grass cover, Good, HSG A
4,316	57	Weighted Average
2,886		66.87% Pervious Area
1,430		33.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	20	0.2000	0.29		**Sheet Flow, Sheet Grass** Grass: Short n= 0.150 P2= 2.90"
0.0	12	0.6700	5.73		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.2000	3.13		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
1.3	70	Total			

Summary for Subcatchment 1.2P: Entrance Out Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.3 cfs @ 12.01 hrs, Volume= 889 cf, Depth> 4.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

Area (sf)	CN	Description
1,820	98	Paved parking, HSG A
740	39	>75% Grass cover, Good, HSG A
2,560	81	Weighted Average
740		28.91% Pervious Area
1,820		71.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0730	1.59		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.1	45	0.0730	5.48		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	65	Total			

Summary for Subcatchment 1P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.1 cfs @ 12.11 hrs, Volume= 419 cf, Depth> 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

Area (sf)	CN	Description
4,006	30	Woods, Good, HSG A
4,725	39	>75% Grass cover, Good, HSG A
650	98	Paved parking, HSG A
9,381	39	Weighted Average
8,731		93.07% Pervious Area
650		6.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.1	20	0.3300	4.02		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
2.4	40	Total			

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 407 cf, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

Area (sf)	CN	Description
2,635	98	Unconnected pavement, HSG A
515	39	>75% Grass cover, Good, HSG A
3,150	88	Weighted Average
515		16.35% Pervious Area
2,635		83.65% Impervious Area
2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 213 cf, Depth> 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Subcatchment 2P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.8 cfs @ 12.01 hrs, Volume= 2,050 cf, Depth> 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

Area (sf)	CN	Description
2,141	39	>75% Grass cover, Good, HSG A
4,245	98	Paved parking, HSG A
6,386	78	Weighted Average
2,141		33.53% Pervious Area
4,245		66.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0350	1.19		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.3	65	0.0400	4.06		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.6	85	Total			

Summary for Subcatchment 3P: Roof

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.8 cfs @ 12.01 hrs, Volume= 2,200 cf, Depth> 5.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

Area (sf)	CN	Description
4,500	98	Roofs, HSG A
4,500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0200	1.09		**Sheet Flow, Roof Sheet** Smooth surfaces n= 0.011 P2= 2.90"

Summary for Pond Bio: Bio

[82] Warning: Early inflow requires earlier time span
[79] Warning: Submerged Pond RD Primary device # 1 OUTLET by 0.93'

Inflow Area = 10,886 sf, 80.33% Impervious, Inflow Depth > 4.68" for 50-YR event
Inflow = 1.6 cfs @ 12.01 hrs, Volume= 4,250 cf
Outflow = 0.3 cfs @ 12.45 hrs, Volume= 4,247 cf, Atten= 84%, Lag= 26.7 min
Discarded = 0.3 cfs @ 12.45 hrs, Volume= 4,247 cf
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 158.93' @ 12.45 hrs Surf.Area= 878 sf Storage= 1,296 cf
Flood Elev= 160.00' Surf.Area= 1,000 sf Storage= 1,831 cf

Plug-Flow detention time= 37.0 min calculated for 4,247 cf (100% of inflow)
Center-of-Mass det. time= 36.7 min (789.4 - 752.7)

Volume	Invert	Avail.Storage	Storage Description
#1	156.00'	1,831 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
156.00	650	0.0	0	0	650
157.75	650	35.0	398	398	828
159.50	1,000	100.0	1,433	1,831	1,232

Device	Routing	Invert	Outlet Devices
#1	Discarded	156.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.00'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.3 cfs @ 12.45 hrs HW=158.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=156.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P1A: Infiltration Trench

Inflow Area = 2,560 sf, 71.09% Impervious, Inflow Depth > 4.17" for 50-YR event
Inflow = 0.3 cfs @ 12.01 hrs, Volume= 889 cf
Outflow = 0.1 cfs @ 12.23 hrs, Volume= 791 cf, Atten= 70%, Lag= 13.7 min
Discarded = 0.1 cfs @ 12.23 hrs, Volume= 748 cf
Primary = 0.0 cfs @ 12.23 hrs, Volume= 43 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 156.99' @ 12.23 hrs Surf.Area= 93 sf Storage= 148 cf

Plug-Flow detention time= 60.5 min calculated for 789 cf (89% of inflow)
Center-of-Mass det. time= 25.6 min (796.4 - 770.8)

Volume	Invert	Avail.Storage	Storage Description
#1	153.00'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
153.00	93	0	0	93
157.00	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	156.95'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.1 cfs @ 12.23 hrs HW=156.99' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 12.23 hrs HW=156.99' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.0 cfs @ 0.52 fps)

Summary for Pond P1B: Infiltration Trench

Inflow Area =	2,560 sf, 71.09% Impervious,	Inflow Depth = 0.20" for 50-YR event	
Inflow =	0.0 cfs @ 12.23 hrs,	Volume=	43 cf
Outflow =	0.0 cfs @ 12.37 hrs,	Volume=	43 cf, Atten= 45%, Lag= 8.1 min
Discarded =	0.0 cfs @ 12.37 hrs,	Volume=	43 cf
Primary =	0.0 cfs @ 5.00 hrs,	Volume=	0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 151.94' @ 12.37 hrs Surf.Area= 93 sf Storage= 16 cf

Plug-Flow detention time= 6.4 min calculated for 43 cf (100% of inflow)
Center-of-Mass det. time= 6.6 min (741.6 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	151.50'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.50	93	0	0	93
155.50	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	151.50'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	155.40'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.37 hrs HW=151.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=151.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P2: Infiltration Trench

```
Inflow Area =       4,316 sf,  33.13% Impervious,  Inflow Depth >   1.87"   for  50-YR event
Inflow      =     0.2 cfs @  12.03 hrs,  Volume=          671 cf
Outflow     =     0.2 cfs @  12.08 hrs,  Volume=          674 cf,  Atten= 27%,  Lag= 2.6 min
Discarded   =     0.0 cfs @  12.10 hrs,  Volume=          560 cf
Primary     =     0.1 cfs @  12.08 hrs,  Volume=          114 cf
```

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 159.99' @ 12.10 hrs Surf.Area= 110 sf Storage= 87 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 11.6 min (828.3 - 816.8)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	132 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc) 330 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	110	0	0	110
161.00	110	330	330	236

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.10 hrs HW=159.99' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.1 cfs @ 12.08 hrs HW=159.99' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.1 cfs @ 0.75 fps)

Summary for Pond PP-1: Porous Pavement

```
Inflow Area =       3,150 sf,  83.65% Impervious,  Inflow Depth >   1.55"   for  50-YR event
Inflow      =     0.0 cfs @  20.00 hrs,  Volume=          407 cf
Outflow     =     0.0 cfs @  20.00 hrs,  Volume=          394 cf,  Atten= 1%,  Lag= 0.0 min
Discarded   =     0.0 cfs @  20.00 hrs,  Volume=          394 cf
```

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.08' @ 20.00 hrs Surf.Area= 2,176 sf Storage= 13 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 7.3 min calculated for 393 cf (96% of inflow)
Center-of-Mass det. time= 2.5 min (1,054.6 - 1,052.1)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 20.00 hrs HW=161.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.72" for 50-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 213 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 205 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 205 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.93' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 8 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 7.3 min calculated for 205 cf (96% of inflow)
Center-of-Mass det. time= 2.5 min (1,076.5 - 1,074.1)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Summary for Pond RD: Roof Drain

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 161.54' (Flood elevation advised)

Inflow Area = 4,500 sf,100.00% Impervious, Inflow Depth > 5.87" for 50-YR event
Inflow = 0.8 cfs @ 12.01 hrs, Volume= 2,200 cf
Outflow = 0.8 cfs @ 12.01 hrs, Volume= 2,200 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.8 cfs @ 12.01 hrs, Volume= 2,200 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.54' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**8.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.00' S= 0.0261 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.7 cfs @ 12.01 hrs HW=161.53' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.7 cfs @ 2.48 fps)

Summary for Link 1L:

Inflow Area = 27,143 sf, 46.59% Impervious, Inflow Depth > 0.24" for 50-YR event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 533 cf
Primary = 0.2 cfs @ 12.09 hrs, Volume= 533 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1.1P: Entrance In Drive Runoff Area=4,316 sf 33.13% Impervious Runoff Depth>2.39"
Flow Length=70' Tc=1.3 min CN=57 Runoff=0.3 cfs 859 cf

Subcatchment1.2P: Entrance Out Drive Runoff Area=2,560 sf 71.09% Impervious Runoff Depth>4.91"
Flow Length=65' Slope=0.0730 '/' Tc=0.3 min CN=81 Runoff=0.4 cfs 1,047 cf

Subcatchment1P: Runoff Area=9,381 sf 6.93% Impervious Runoff Depth>0.81"
Flow Length=40' Tc=2.4 min CN=39 Runoff=0.1 cfs 631 cf

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>1.82"
Tc=692.0 min CN=88 Runoff=0.0 cfs 478 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.90"
Tc=692.0 min CN=67 Runoff=0.0 cfs 268 cf

Subcatchment2P: Runoff Area=6,386 sf 66.47% Impervious Runoff Depth>4.58"
Flow Length=85' Tc=0.6 min CN=78 Runoff=0.9 cfs 2,435 cf

Subcatchment3P: Roof Runoff Area=4,500 sf 100.00% Impervious Runoff Depth>6.63"
Flow Length=40' Slope=0.0200 '/' Tc=0.6 min CN=98 Runoff=0.9 cfs 2,486 cf

Pond Bio: Bio Peak Elev=159.05' Storage=1,407 cf Inflow=1.8 cfs 4,921 cf
Discarded=0.3 cfs 4,698 cf Primary=0.3 cfs 224 cf Outflow=0.6 cfs 4,922 cf

Pond P1A: Infiltration Trench Peak Elev=157.16' Storage=149 cf Inflow=0.4 cfs 1,047 cf
Discarded=0.1 cfs 833 cf Primary=0.5 cfs 326 cf Outflow=0.6 cfs 1,159 cf

Pond P1B: Infiltration Trench Peak Elev=155.60' Storage=149 cf Inflow=0.5 cfs 326 cf
Discarded=0.1 cfs 228 cf Primary=0.5 cfs 160 cf Outflow=0.5 cfs 387 cf

Pond P2: Infiltration Trench Peak Elev=160.04' Storage=90 cf Inflow=0.3 cfs 859 cf
Discarded=0.0 cfs 655 cf Primary=0.3 cfs 197 cf Outflow=0.3 cfs 852 cf

Pond PP-1: Porous Pavement Peak Elev=161.09' Storage=15 cf Inflow=0.0 cfs 478 cf
Outflow=0.0 cfs 463 cf

Pond PP-2: Porous Pavement Peak Elev=160.94' Storage=10 cf Inflow=0.0 cfs 268 cf
Outflow=0.0 cfs 258 cf

Pond RD: Roof Drain Peak Elev=161.59' Inflow=0.9 cfs 2,486 cf
8.0" Round Culvert n=0.012 L=115.0' S=0.0261 '/' Outflow=0.9 cfs 2,486 cf

Link 1L: Inflow=0.8 cfs 1,212 cf
Primary=0.8 cfs 1,212 cf

Total Runoff Area = 33,869 sf Runoff Volume = 8,205 cf Average Runoff Depth = 2.91"
49.69% Pervious = 16,829 sf 50.31% Impervious = 17,040 sf

Summary for Subcatchment 1.1P: Entrance In Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.3 cfs @ 12.03 hrs, Volume= 859 cf, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.43"

Area (sf)	CN	Description
1,430	98	Paved parking, HSG A
560	30	Woods, Good, HSG A
2,326	39	>75% Grass cover, Good, HSG A
4,316	57	Weighted Average
2,886		66.87% Pervious Area
1,430		33.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	20	0.2000	0.29		**Sheet Flow, Sheet Grass** Grass: Short n= 0.150 P2= 2.90"
0.0	12	0.6700	5.73		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.2000	3.13		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
1.3	70	Total			

Summary for Subcatchment 1.2P: Entrance Out Drive

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.4 cfs @ 12.01 hrs, Volume= 1,047 cf, Depth> 4.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.43"

Area (sf)	CN	Description
1,820	98	Paved parking, HSG A
740	39	>75% Grass cover, Good, HSG A
2,560	81	Weighted Average
740		28.91% Pervious Area
1,820		71.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0730	1.59		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.1	45	0.0730	5.48		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	65	Total			

Summary for Subcatchment 1P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.1 cfs @ 12.08 hrs, Volume= 631 cf, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.43"

Area (sf)	CN	Description
4,006	30	Woods, Good, HSG A
4,725	39	>75% Grass cover, Good, HSG A
650	98	Paved parking, HSG A
9,381	39	Weighted Average
8,731		93.07% Pervious Area
650		6.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2500	0.15		**Sheet Flow, Sheet Woods** Woods: Light underbrush n= 0.400 P2= 2.90"
0.1	20	0.3300	4.02		**Shallow Concentrated Flow, Shallow Grass** Short Grass Pasture Kv= 7.0 fps
2.4	40	Total			

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 478 cf, Depth> 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.43"

Area (sf)	CN	Description
2,635	98	Unconnected pavement, HSG A
515	39	>75% Grass cover, Good, HSG A
3,150	88	Weighted Average
515		16.35% Pervious Area
2,635		83.65% Impervious Area
2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 268 cf, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.43"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Subcatchment 2P:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.9 cfs @ 12.01 hrs, Volume= 2,435 cf, Depth> 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.43"

Area (sf)	CN	Description
2,141	39	>75% Grass cover, Good, HSG A
4,245	98	Paved parking, HSG A
6,386	78	Weighted Average
2,141		33.53% Pervious Area
4,245		66.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0350	1.19		**Sheet Flow, Sheet Pavement** Smooth surfaces n= 0.011 P2= 2.90"
0.3	65	0.0400	4.06		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.6	85	Total			

Summary for Subcatchment 3P: Roof

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.9 cfs @ 12.01 hrs, Volume= 2,486 cf, Depth> 6.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.43"

Area (sf)	CN	Description
4,500	98	Roofs, HSG A
4,500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0200	1.09		**Sheet Flow, Roof Sheet** Smooth surfaces n= 0.011 P2= 2.90"

Summary for Pond Bio: Bio

[82] Warning: Early inflow requires earlier time span
[79] Warning: Submerged Pond RD Primary device # 1 OUTLET by 1.05'

Inflow Area = 10,886 sf, 80.33% Impervious, Inflow Depth > 5.42" for 100-YR event
Inflow = 1.8 cfs @ 12.01 hrs, Volume= 4,921 cf
Outflow = 0.6 cfs @ 12.27 hrs, Volume= 4,922 cf, Atten= 67%, Lag= 15.7 min
Discarded = 0.3 cfs @ 12.27 hrs, Volume= 4,698 cf
Primary = 0.3 cfs @ 12.27 hrs, Volume= 224 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 159.05' @ 12.27 hrs Surf.Area= 904 sf Storage= 1,407 cf
Flood Elev= 160.00' Surf.Area= 1,000 sf Storage= 1,831 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 37.2 min (788.3 - 751.1)

Volume	Invert	Avail.Storage	Storage Description
#1	156.00'	1,831 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
156.00	650	0.0	0	0	650
157.75	650	35.0	398	398	828
159.50	1,000	100.0	1,433	1,831	1,232

Device	Routing	Invert	Outlet Devices
#1	Discarded	156.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.00'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.3 cfs @ 12.27 hrs HW=159.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.3 cfs @ 12.27 hrs HW=159.05' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.3 cfs @ 0.57 fps)

Summary for Pond P1A: Infiltration Trench

[93] Warning: Storage range exceeded by 0.16'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 2,560 sf, 71.09% Impervious, Inflow Depth > 4.91" for 100-YR event
Inflow = 0.4 cfs @ 12.01 hrs, Volume= 1,047 cf
Outflow = 0.6 cfs @ 12.02 hrs, Volume= 1,159 cf, Atten= 0%, Lag= 0.8 min
Discarded = 0.1 cfs @ 12.00 hrs, Volume= 833 cf
Primary = 0.5 cfs @ 12.02 hrs, Volume= 326 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 157.16' @ 12.00 hrs Surf.Area= 93 sf Storage= 149 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 11.3 min (778.2 - 766.9)

Volume	Invert	Avail.Storage	Storage Description
#1	153.00'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
153.00	93	0	0	93
157.00	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	156.95'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00

2.50 3.00 3.50
Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88
2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.1 cfs @ 12.00 hrs HW=157.16' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.5 cfs @ 12.02 hrs HW=157.15' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.5 cfs @ 1.15 fps)

Summary for Pond P1B: Infiltration Trench

[93] Warning: Storage range exceeded by 0.10'

Inflow Area = 2,560 sf, 71.09% Impervious, Inflow Depth = 1.53" for 100-YR event
Inflow = 0.5 cfs @ 12.02 hrs, Volume= 326 cf
Outflow = 0.5 cfs @ 12.11 hrs, Volume= 387 cf, Atten= 2%, Lag= 5.4 min
Discarded = 0.1 cfs @ 12.10 hrs, Volume= 228 cf
Primary = 0.5 cfs @ 12.11 hrs, Volume= 160 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 155.60' @ 12.10 hrs Surf.Area= 93 sf Storage= 149 cf

Plug-Flow detention time= 10.9 min calculated for 326 cf (100% of inflow)
Center-of-Mass det. time= 19.6 min (745.9 - 726.3)

Volume	Invert	Avail.Storage	Storage Description
#1	151.50'	149 cf	**Trench (Pyramidal)** Listed below (Recalc) 372 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.50	93	0	0	93
155.50	93	372	372	247

Device	Routing	Invert	Outlet Devices
#1	Discarded	151.50'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	155.40'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.1 cfs @ 12.10 hrs HW=155.60' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.4 cfs @ 12.11 hrs HW=155.59' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.4 cfs @ 1.10 fps)

Summary for Pond P2: Infiltration Trench

Inflow Area = 4,316 sf, 33.13% Impervious, Inflow Depth > 2.39" for 100-YR event
Inflow = 0.3 cfs @ 12.03 hrs, Volume= 859 cf
Outflow = 0.3 cfs @ 12.06 hrs, Volume= 852 cf, Atten= 0%, Lag= 1.6 min
Discarded = 0.0 cfs @ 12.06 hrs, Volume= 655 cf
Primary = 0.3 cfs @ 12.06 hrs, Volume= 197 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 160.04' @ 12.06 hrs Surf.Area= 110 sf Storage= 90 cf

Plug-Flow detention time= 15.8 min calculated for 852 cf (99% of inflow)
Center-of-Mass det. time= 12.7 min (823.8 - 811.2)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	132 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc) 330 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	110	0	0	110
161.00	110	330	330	236

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**10.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	159.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.0 cfs @ 12.06 hrs HW=160.03' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.3 cfs @ 12.06 hrs HW=160.04' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.3 cfs @ 0.93 fps)

Summary for Pond PP-1: Porous Pavement

Inflow Area = 3,150 sf, 83.65% Impervious, Inflow Depth > 1.82" for 100-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 478 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 463 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 463 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.09' @ 20.00 hrs Surf.Area= 2,176 sf Storage= 15 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 7.3 min calculated for 463 cf (97% of inflow)
Center-of-Mass det. time= 2.5 min (1,052.0 - 1,049.5)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 20.00 hrs HW=161.09' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.1 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.90" for 100-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 268 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 258 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 258 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.94' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 10 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 7.3 min calculated for 257 cf (96% of inflow)
Center-of-Mass det. time= 2.5 min (1,075.1 - 1,072.6)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.94' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.0 cfs)

Summary for Pond RD: Roof Drain

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 161.59' (Flood elevation advised)

Inflow Area = 4,500 sf,100.00% Impervious, Inflow Depth > 6.63" for 100-YR event
Inflow = 0.9 cfs @ 12.01 hrs, Volume= 2,486 cf
Outflow = 0.9 cfs @ 12.01 hrs, Volume= 2,486 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.9 cfs @ 12.01 hrs, Volume= 2,486 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.59' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**8.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.00' S= 0.0261 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.8 cfs @ 12.01 hrs HW=161.58' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.8 cfs @ 2.59 fps)

Summary for Link 1L:

Inflow Area = 27,143 sf, 46.59% Impervious, Inflow Depth > 0.54" for 100-YR event
Inflow = 0.8 cfs @ 12.10 hrs, Volume= 1,212 cf
Primary = 0.8 cfs @ 12.10 hrs, Volume= 1,212 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Attachment"E"

APPENDIX E

SUPPORTING HYDROLOGIC DATA

Attachment"E"

Attachment"E"

NOAA Atlas 14, Volume 10, Version 3
Location name: Hudson, New Hampshire, USA*
Latitude: 42.7522°, Longitude: -71.4281°
Elevation: 163 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.312 (0.251-0.386)	0.371 (0.297-0.459)	0.467 (0.373-0.580)	0.547 (0.434-0.683)	0.657 (0.502-0.857)	0.739 (0.553-0.987)	0.826 (0.597-1.14)	0.925 (0.628-1.31)	1.07 (0.695-1.57)	1.19 (0.753-1.78)
10-min	0.442 (0.355-0.547)	0.525 (0.421-0.650)	0.661 (0.528-0.821)	0.774 (0.614-0.967)	0.930 (0.712-1.21)	1.05 (0.783-1.40)	1.17 (0.846-1.62)	1.31 (0.890-1.85)	1.52 (0.986-2.22)	1.68 (1.07-2.52)
15-min	0.520 (0.418-0.643)	0.618 (0.496-0.765)	0.778 (0.622-0.967)	0.911 (0.723-1.14)	1.09 (0.837-1.43)	1.23 (0.921-1.64)	1.38 (0.995-1.91)	1.54 (1.05-2.18)	1.78 (1.16-2.61)	1.98 (1.25-2.96)
30-min	0.713 (0.573-0.882)	0.851 (0.682-1.05)	1.08 (0.859-1.34)	1.26 (1.00-1.58)	1.52 (1.16-1.98)	1.71 (1.28-2.28)	1.91 (1.38-2.65)	2.14 (1.46-3.03)	2.48 (1.61-3.63)	2.75 (1.74-4.11)
60-min	0.907 (0.728-1.12)	1.08 (0.869-1.34)	1.37 (1.10-1.70)	1.61 (1.28-2.02)	1.94 (1.49-2.54)	2.19 (1.64-2.92)	2.45 (1.77-3.39)	2.75 (1.87-3.88)	3.18 (2.06-4.65)	3.53 (2.23-5.26)
2-hr	1.13 (0.915-1.39)	1.38 (1.12-1.70)	1.80 (1.44-2.22)	2.14 (1.71-2.65)	2.60 (2.01-3.39)	2.95 (2.22-3.94)	3.33 (2.43-4.62)	3.77 (2.57-5.31)	4.45 (2.90-6.47)	5.02 (3.18-7.45)
3-hr	1.30 (1.05-1.59)	1.59 (1.29-1.96)	2.08 (1.68-2.56)	2.49 (2.00-3.08)	3.05 (2.36-3.97)	3.47 (2.62-4.61)	3.92 (2.87-5.43)	4.46 (3.04-6.25)	5.29 (3.45-7.68)	6.00 (3.82-8.88)
6-hr	1.65 (1.34-2.00)	2.03 (1.66-2.48)	2.66 (2.16-3.26)	3.18 (2.57-3.92)	3.90 (3.04-5.05)	4.43 (3.38-5.87)	5.01 (3.70-6.93)	5.72 (3.92-7.97)	6.81 (4.46-9.82)	7.75 (4.94-11.4)
12-hr	2.10 (1.72-2.54)	2.56 (2.11-3.11)	3.33 (2.72-4.05)	3.96 (3.22-4.85)	4.84 (3.79-6.21)	5.48 (4.20-7.21)	6.19 (4.59-8.48)	7.04 (4.84-9.75)	8.35 (5.49-12.0)	9.48 (6.06-13.8)
24-hr	2.53 (2.10-3.05)	3.09 (2.56-3.72)	4.01 (3.30-4.84)	4.77 (3.90-5.79)	5.82 (4.58-7.42)	6.59 (5.07-8.61)	7.43 (5.53-10.1)	8.45 (5.84-11.6)	10.0 (6.61-14.3)	11.4 (7.29-16.5)
2-day	2.90 (2.42-3.47)	3.57 (2.97-4.27)	4.65 (3.85-5.58)	5.55 (4.56-6.70)	6.78 (5.38-8.61)	7.70 (5.96-10.0)	8.69 (6.51-11.8)	9.91 (6.87-13.6)	11.8 (7.80-16.7)	13.4 (8.63-19.3)
3-day	3.19 (2.67-3.80)	3.90 (3.26-4.65)	5.06 (4.21-6.05)	6.02 (4.97-7.24)	7.34 (5.83-9.28)	8.32 (6.46-10.8)	9.38 (7.04-12.7)	10.7 (7.42-14.5)	12.6 (8.39-17.8)	14.3 (9.25-20.6)
4-day	3.45 (2.90-4.10)	4.19 (3.51-4.98)	5.39 (4.49-6.43)	6.38 (5.28-7.66)	7.76 (6.17-9.76)	8.77 (6.82-11.3)	9.87 (7.41-13.2)	11.2 (7.80-15.2)	13.2 (8.76-18.5)	14.9 (9.62-21.4)
7-day	4.17 (3.51-4.92)	4.94 (4.16-5.85)	6.21 (5.21-7.37)	7.26 (6.04-8.67)	8.71 (6.96-10.9)	9.79 (7.63-12.5)	10.9 (8.21-14.5)	12.3 (8.59-16.6)	14.3 (9.50-19.9)	15.9 (10.3-22.7)
10-day	4.84 (4.09-5.70)	5.64 (4.76-6.65)	6.95 (5.85-8.22)	8.04 (6.72-9.57)	9.54 (7.64-11.8)	10.7 (8.32-13.5)	11.8 (8.88-15.6)	13.2 (9.25-17.7)	15.1 (10.1-21.0)	16.7 (10.8-23.7)
20-day	6.82 (5.81-7.98)	7.69 (6.54-9.01)	9.12 (7.72-10.7)	10.3 (8.66-12.2)	11.9 (9.60-14.6)	13.2 (10.3-16.5)	14.5 (10.8-18.7)	15.8 (11.1-21.0)	17.5 (11.8-24.2)	18.9 (12.3-26.7)
30-day	8.46 (7.24-9.87)	9.40 (8.02-11.0)	10.9 (9.29-12.8)	12.2 (10.3-14.4)	13.9 (11.2-17.0)	15.3 (12.0-19.0)	16.6 (12.4-21.2)	17.9 (12.7-23.8)	19.6 (13.2-26.9)	20.8 (13.5-29.3)
45-day	10.5 (9.04-12.2)	11.5 (9.88-13.4)	13.2 (11.2-15.4)	14.5 (12.3-17.1)	16.4 (13.3-19.9)	17.9 (14.0-22.1)	19.3 (14.4-24.5)	20.6 (14.7-27.3)	22.2 (15.0-30.4)	23.3 (15.2-32.7)
60-day	12.3 (10.6-14.2)	13.3 (11.5-15.5)	15.1 (12.9-17.5)	16.5 (14.0-19.3)	18.5 (15.0-22.4)	20.1 (15.8-24.7)	21.6 (16.1-27.3)	22.9 (16.3-30.2)	24.5 (16.6-33.5)	25.5 (16.7-35.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

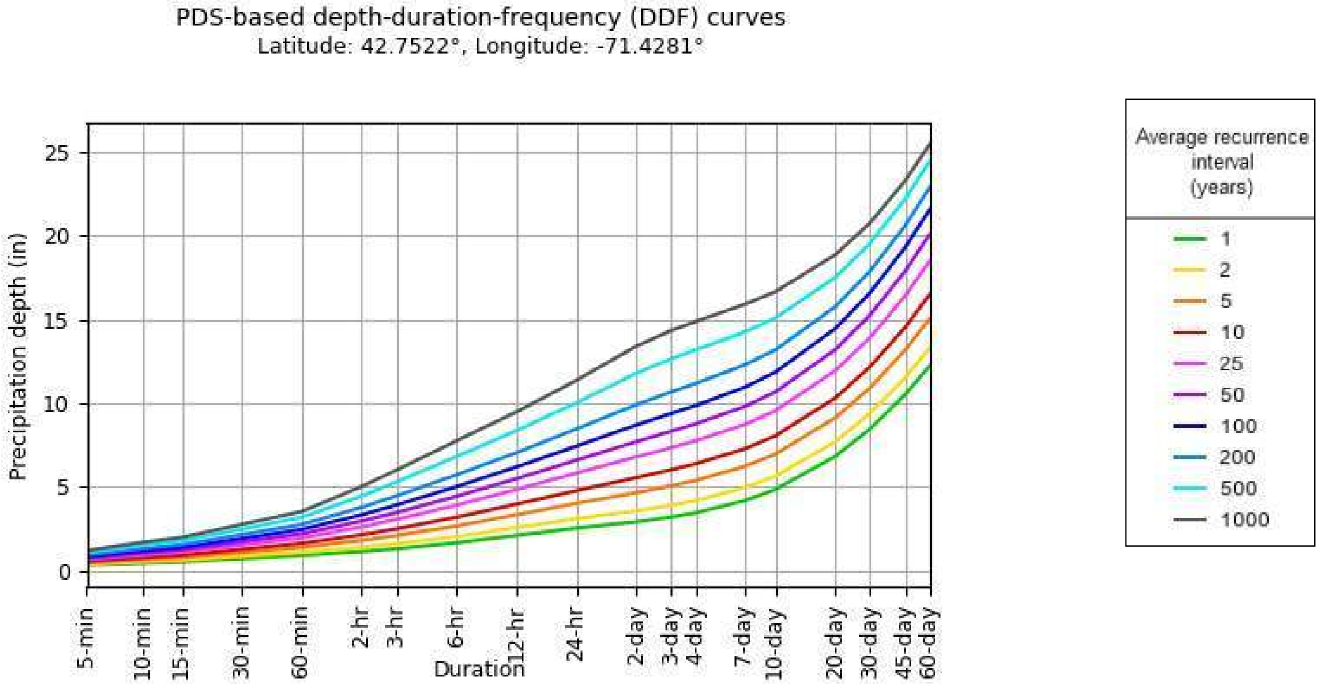
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

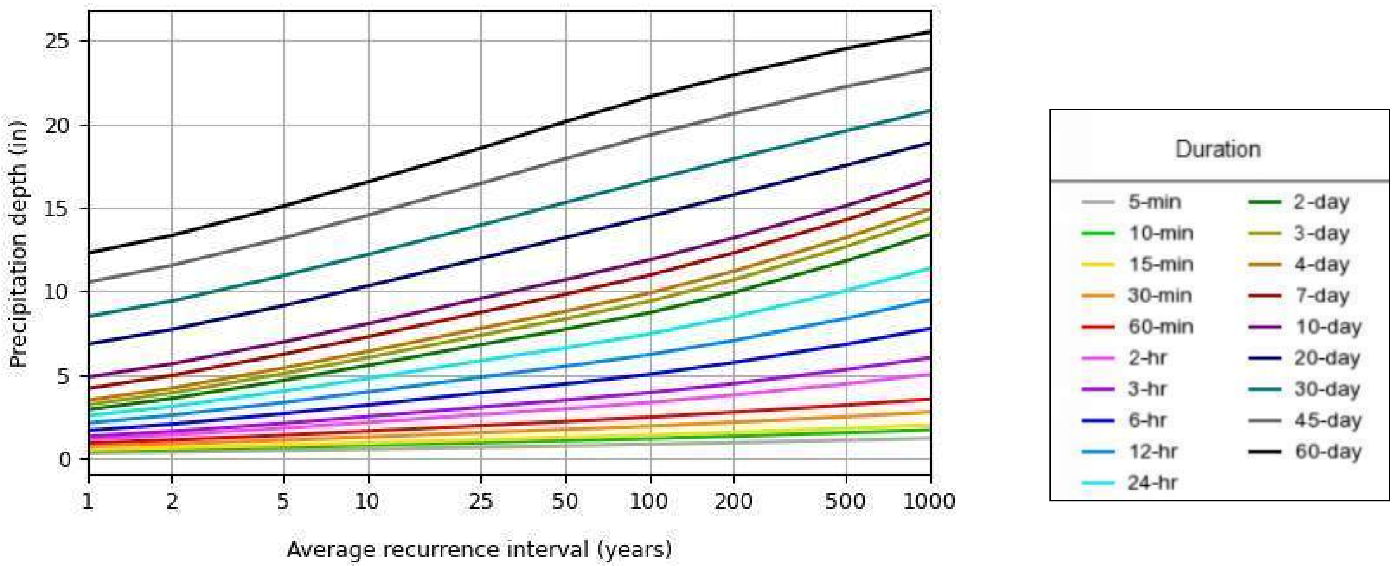
Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Attachment"E"





NOAA Atlas 14, Volume 10, Version 3

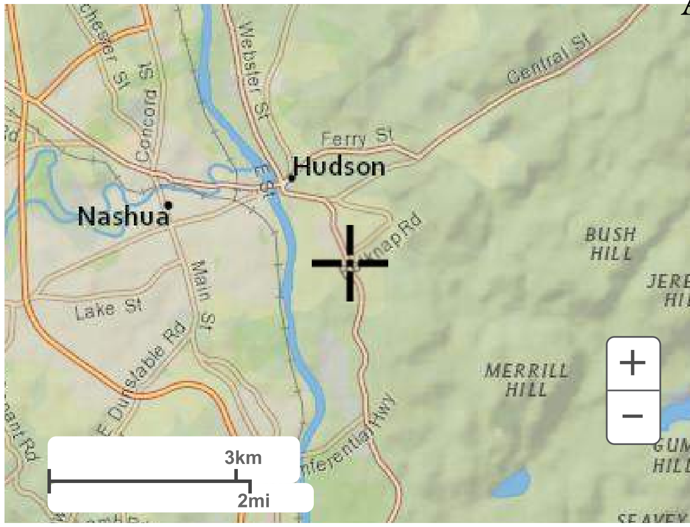
Created (GMT): Mon Jul 29 12:02:03 2024

Back to Top

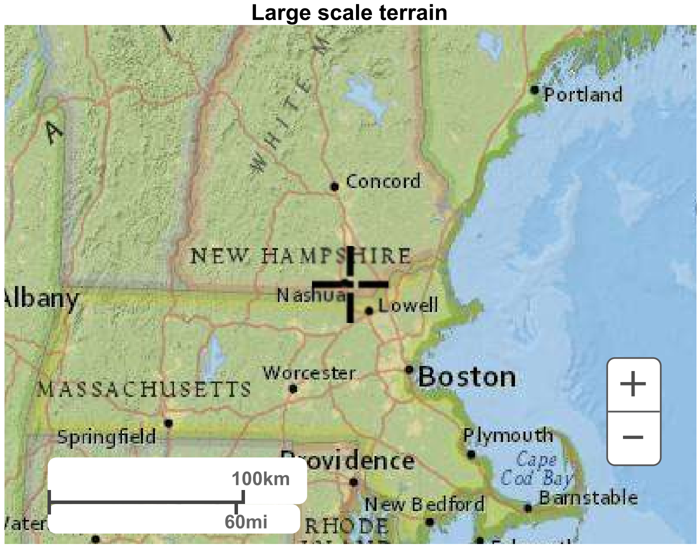
Maps & aerials

Small scale terrain

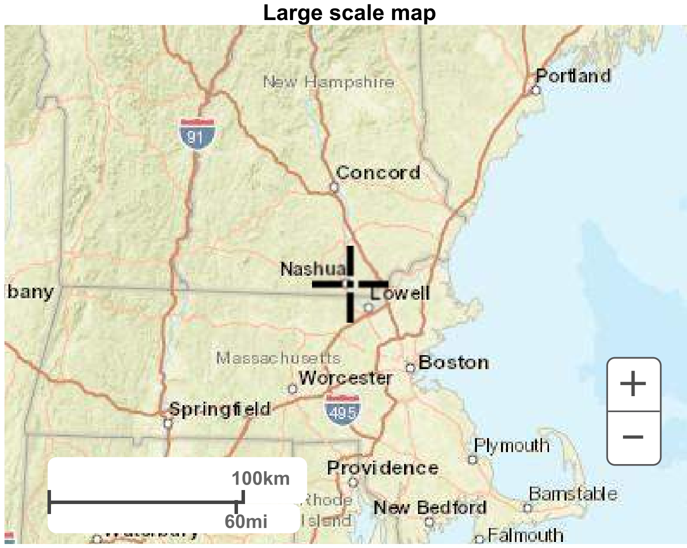
Attachment"E"



Large scale terrain

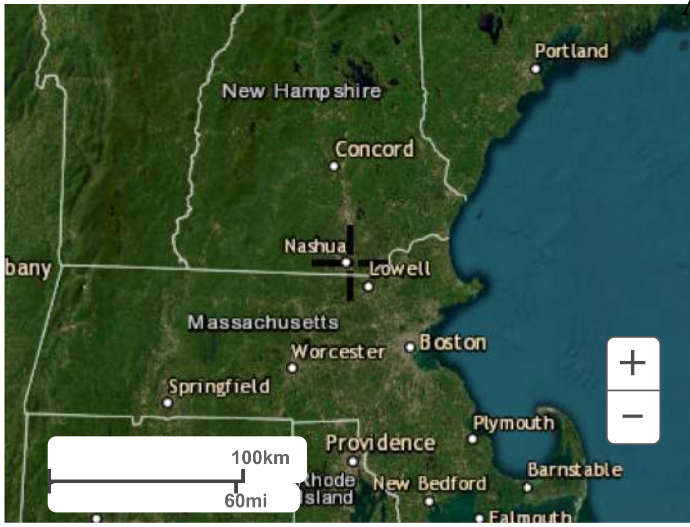


Large scale map



Large scale aerial

Attachment"E"



[Back to Top](#)

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National Oceanic and Atmospheric Administration
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Attachment"E"

APPENDIX F

BMP WORKSHEETS

Attachment"E"

Attachment"E"

Groundwater Recharge Volume (GRV) Calculation

0.35	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.40	inches	Rd = weighted groundwater recharge depth	
0.14	ac-in	GRV = AI * Rd	
508	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12")	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

Bioretention (Bio) = 1,590 CF

Infitration Trench (P1) = 273 CF

Infitration Trench (P2) = 84 CF

Porous Pavement (PP-1) = 128 CF

Porous Pavement (PP-2) = 34 CF

Total GRV=2,109 CF

Attachment"E"

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

INFILTRATION PRACTICE CRITERIA
(Env-Wq 1508.06)

Type/Node Name: **Infiltration Trench P1**

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable.

Value	Unit	Description	Criteria
Yes		Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	**← yes**
0.06	ac	A = Area draining to the practice	
0.04	ac	A_I = Impervious area draining to the practice	
0.71	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.69	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.04	ac-in	WQV= 1" x Rv x A	
147	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
37	cf	25% x WQV (check calc for sediment forebay volume)	
Grass Filter Strip		Method of pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
280	cf	V = Volume[1] (attach a stage-storage table)	**≥ WQV**
186	sf	A_{SA} = Surface area of the bottom of the pond	
10.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[2]	
0.9	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
151.50	feet	E_{BTM} = Elevation of the bottom of the basin	
151.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
151.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
0.50	feet	D_{SHWT} = Separation from SHWT	**≥ *[3]**
0.5	feet	D_{ROCK} = Separation from bedrock	**≥ *[3]**
	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	**≥ 24"**
4.00	ft	D_T = Depth of trench, if trench proposed	**4 - 10 ft**
Yes	Yes/No	If a trench or underground system is proposed, has observation well been provided?	**←yes**
Yes		If a trench is proposed, does materialmeet Env-Wq 1508.06(k)(2) requirements.[4]	**← yes**
	Yes/No	If a basin is proposed, Is the perimeter curvilinear, and basin floor flat?	**← yes**
	:1	If a basin is proposed, pond side slopes.	**≥3:1**
156.92	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
156.99	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
157.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	**← yes**
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	**← yes**

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. $Ksat_{DESIGN}$ includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes: 0.5' of separation to SHWT in test pit #3 is to bottom of observed excavation (84"). Other test pits on site show no SHWT in the area down to 90".

Stage-Area-Storage for Pond P1A: Infiltration Trench

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
153.00	**90**	90	0
153.10	90	94	4
153.20	90	98	7
153.30	90	101	11
153.40	90	105	14
153.50	90	109	18
153.60	90	113	22
153.70	90	117	25
153.80	90	120	29
153.90	90	124	32
154.00	90	128	36
154.10	90	132	40
154.20	90	136	43
154.30	90	139	47
154.40	90	143	50
154.50	90	147	54
154.60	90	151	58
154.70	90	155	61
154.80	90	158	65
154.90	90	162	68
155.00	90	166	72
155.10	90	170	76
155.20	90	173	79
155.30	90	177	83
155.40	90	181	86
155.50	90	185	90
155.60	90	189	94
155.70	90	192	97
155.80	90	196	101
155.90	90	200	104
156.00	90	204	108
156.10	90	208	112
156.20	90	211	115
156.30	90	215	119
156.40	90	219	122
156.50	90	223	126
156.60	90	227	130
156.70	90	230	133
156.80	90	234	137
156.90	90	238	140
157.00	90	**242**	**144**

Stage-Area-Storage for Pond P1B: Infiltration Trench

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
151.50	**90**	90	0
151.60	90	94	4
151.70	90	98	7
151.80	90	101	11
151.90	90	105	14
152.00	90	109	18
152.10	90	113	22
152.20	90	117	25
152.30	90	120	29
152.40	90	124	32
152.50	90	128	36
152.60	90	132	40
152.70	90	136	43
152.80	90	139	47
152.90	90	143	50
153.00	90	147	54
153.10	90	151	58
153.20	90	155	61
153.30	90	158	65
153.40	90	162	68
153.50	90	166	72
153.60	90	170	76
153.70	90	173	79
153.80	90	177	83
153.90	90	181	86
154.00	90	185	90
154.10	90	189	94
154.20	90	192	97
154.30	90	196	101
154.40	90	200	104
154.50	90	204	108
154.60	90	208	112
154.70	90	211	115
154.80	90	215	119
154.90	90	219	122
155.00	90	223	126
155.10	90	227	130
155.20	90	230	133
155.30	90	234	137
155.40	90	238	140
155.50	90	**242**	**144**

Attachment"E"

NEW HAMPSHIRE DEPARTMENT OF **Environmental Services**

INFILTRATION PRACTICE CRITERIA
(Env-Wq 1508.06)

Type/Node Name: **Infiltration Trench P2**

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable.

Yes		Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	**← yes**
0.10	ac	A = Area draining to the practice	
0.03	ac	A_I = Impervious area draining to the practice	
0.33	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.35	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.03	ac-in	WQV= 1” x Rv x A	
125	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	
31	cf	25% x WQV (check calc for sediment forebay volume)	
Grass Filter Strip		Method of pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
128	cf	V = Volume[1] (attach a stage-storage table)	**≥ WQV**
110	sf	A_{SA} = Surface area of the bottom of the pond	
10.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[2]	
1.4	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
158.00	feet	E_{BTM} = Elevation of the bottom of the basin	
155.50	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
155.50	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
2.50	feet	D_{SHWT} = Separation from SHWT	**≥ *** [3]
2.5	feet	D_{ROCK} = Separation from bedrock	**≥ *** [3]
	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	**≥ 24"**
4.00	ft	D_T = Depth of trench, if trench proposed	**4 - 10 ft**
Yes	Yes/No	If a trench or underground system is proposed, has observation well been provided?	**←yes**
Yes		If a trench is proposed, does materialmeet Env-Wq 1508.06(k)(2) requirements.[4]	**← yes**
	Yes/No	If a basin is proposed, Is the perimeter curvilinear, and basin floor flat?	**← yes**
	:1	If a basin is proposed, pond side slopes.	**≥3:1**
159.10	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
159.99	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
161.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	**← yes**
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	**← yes**

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. $Ksat_{DESIGN}$ includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes: 2.5' of separation to SHWT in test pit #1 is to bottom of observed excavation (90").

Stage-Area-Storage for Pond P2: Infiltration Trench

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
158.00	**110**	110	0
158.10	110	114	4
158.20	110	118	9
158.30	110	123	13
158.40	110	127	18
158.50	110	131	22
158.60	110	135	26
158.70	110	139	31
158.80	110	144	35
158.90	110	148	40
159.00	110	152	44
159.10	110	156	48
159.20	110	160	53
159.30	110	165	57
159.40	110	169	62
159.50	110	173	66
159.60	110	177	70
159.70	110	181	75
159.80	110	186	79
159.90	110	190	84
160.00	110	194	88
160.10	110	198	92
160.20	110	202	97
160.30	110	206	101
160.40	110	211	106
160.50	110	215	110
160.60	110	219	114
160.70	110	223	119
160.80	110	227	123
160.90	110	232	128
161.00	110	**236**	**132**

Attachment"E"

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

Type/Node Name: **Bioretention Basin**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.25	ac	A = Area draining to the practice	
0.20	ac	A_I = Impervious area draining to the practice	
0.80	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.77	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.19	ac-in	WQV= 1" x Rv x A	
701	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
175	cf	25% x WQV (check calc for sediment forebay volume)	
526	cf	75% x WQV (check calc for surface sand filter volume)	
Grass Filter Strip		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
650	sf	A_{SA} = Surface area of the practice	
10.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
1.3	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
156.00	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
155.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
155.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
156.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
1.00	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
1.00	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
158.93	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
159.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:

YES ac		Drainage Area no larger than 5 ac?	**← yes**
1,358 cf		V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0 inches		D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	8	Note what sheet in the plan set contains the filter course specification	
3.0 :1		Pond side slopes	**≥ 3:1**
Sheet	8	Note what sheet in the plan set contains the planting plans and surface cover	

If porous pavement is proposed:

		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
acres		A_{SA} = Surface area of the pervious pavement	
:1		Ratio of the contributing area to the pervious surface area	**≤ 5:1**
inches		D_{FC} = Filter course thickness	**12", or 18" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course spec.	**mod. 304.1 (see spec)**

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Stage-Area-Storage for Pond Bio: Bio

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
156.00	650	650	0
156.10	650	660	23
156.20	650	670	45
156.30	650	681	68
156.40	650	691	91
156.50	650	701	114
156.60	650	711	136
156.70	650	721	159
156.80	650	732	182
156.90	650	742	205
157.00	650	752	227
157.10	650	762	250
157.20	650	772	273
157.30	650	783	296
157.40	650	793	319
157.50	650	803	341
157.60	650	813	364
157.70	650	823	387
157.80	659	839	431
157.90	677	860	498
158.00	695	881	566
158.10	714	902	637
158.20	733	924	709
158.30	752	946	783
158.40	771	968	859
158.50	791	991	938
158.60	811	1,013	1,018
158.70	831	1,037	1,100
158.80	851	1,060	1,184
158.90	872	1,084	1,270
159.00	892	1,108	1,358
159.10	913	1,132	1,448
159.20	935	1,156	1,541
159.30	956	1,181	1,635
159.40	978	1,206	1,732
159.50	**1,000**	**1,232**	**1,831**
159.60	1,000	1,232	1,831
159.70	1,000	1,232	1,831
159.80	1,000	1,232	1,831
159.90	1,000	1,232	1,831
160.00	1,000	1,232	1,831

Attachment"E"

NEW HAMPSHIRE DEPARTMENT OF **Environmental Services**

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

Type/Node Name: **Porous Pavement PP1**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.07	ac	A = Area draining to the practice	
0.06	ac	A_I = Impervious area draining to the practice	
0.84	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.80	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.06	ac-in	WQV= 1" x Rv x A	
211	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
53	cf	25% x WQV (check calc for sediment forebay volume)	
158	cf	75% x WQV (check calc for surface sand filter volume)	
Not Requrired		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
2,176	sf	A_{SA} = Surface area of the practice	
10.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
0.1	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
161.82	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
155.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
155.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
161.82	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
6.82	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
6.82	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
161.08	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
163.65	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification	
	:1	Pond side slopes	**≥ 3:1**
Sheet		Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
Asphalt		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
0.0	acres	A_{SA} = Surface area of the pervious pavement	
1.4	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
12.0	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA**
Sheet	8	Note what sheet in the plan set contains the filter course spec.	**mod. 304.1 (see spec)**

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes: ______________________________

Attachment"E"

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

Type/Node Name: **Porous Pavement PP2**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Value	Unit	Description	Criteria
Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.08	ac	A = Area draining to the practice	
0.04	ac	A_I = Impervious area draining to the practice	
0.49	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.49	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.04	ac-in	WQV= 1" x Rv x A	
147	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
37	cf	25% x WQV (check calc for sediment forebay volume)	
110	cf	75% x WQV (check calc for surface sand filter volume)	
Not Requrired		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
1,550	sf	A_{SA} = Surface area of the practice	
10.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
0.1	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
161.67	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
155.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
155.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
161.67	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
6.67	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
6.67	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
160.93	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
163.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	← yes
	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ WQV
	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet		Note what sheet in the plan set contains the filter course specification	
	:1	Pond side slopes	≥ 3:1
Sheet		Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
Asphalt		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
0.0	acres	A_{SA} = Surface area of the pervious pavement	
2.3	:1	Ratio of the contributing area to the pervious surface area	≤ 5:1
12.0	inches	D_{FC} = Filter course thickness	12", or 18" if within GPA
Sheet	8	Note what sheet in the plan set contains the filter course spec.	mod. 304.1 (see spec)

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Attachment"E"

Attachment"E"

APPENDIX G

INSPECTION AND MAINTENANCE MANUAL

Attachment"E"

Attachment"E"

INSPECTION AND MAINTENANCE MANUAL

COMMERCIAL DEVELOPMENT
100 LOWELL ROAD HUDSON NH

PREPARED BY: SFC ENGINEERING

INTRODUCTION

Proper operation and maintenance of the stormwater management features of the proposed development will ensure that the stormwater system and individual best management practices (BMPs) will remain effective at removing pollutants as designed, and that water quality objectives will be maintained.

Upon completion of all terrain alteration activities that direct stormwater to a certain practice, the landowner shall initiate inspection and maintenance of that practice. 100 Lowell Rd LLC, the landowner, or their designer shall be responsible to implement these activities.

If the ownership of the property is transferred, the new owner shall become the responsible party.

REQUIRED MAINTENANCE

Development of 100 Lowell Road in Hudson NH includes the following stormwater practices and their required maintenance. In general, the owner should inspect the practices at least once per year and after significant rain events. Any maintenance debris shall be properly disposed of. Contact Hudson Transfer Station at 603-886-6018 for guidance on disposal.

- **Infiltration Trench.** The development includes two infiltration trenches: one on the north side of the entrance driveway and one on the north side of the exit driveway. The infiltration trench is a stone trench to receive and infiltrate stormwater runoff.

  Prevent sediment and debris from clogging the trench by maintaining grass cover upstream and around the practice. Any exposed soil upstream or around the practice needs to be seeded and stabilized.

  Any trash or debris that may collect on the practice should be removed.

  Contact a SFC if loss of infiltration is observed.

- **Bioretention Area.** The development includes a bioretention area at the front of the property between the two driveways. The bioretention area is a grass depression that receives and infiltrate stormwater runoff. The depression includes a grass weir as an overflow to discharge stormwater that cannot be infiltrated.

Prevent sediment and debris from clogging the depression by maintaining grass cover upstream and around the practice. Any exposed soil upstream or around the practice needs to be seeded and stabilized. Sweep the pavement areas in the spring to remove any sand used during the winter.

Any trash or debris that may collect on the practice should be removed.

The grass within the practice should be maintained, with any bare patches seeded.

The outlet weir and the banks of the practice should be checked periodically to ensure no erosion has occurred.

Contact SFC Engineering if loss of infiltration is observed. The practice is designed to drain within 72 hours.

- **Porous Pavement.** The development includes porous pavement in two locations: the pavement and parking in front of the building (practice PP1) and the side (south) parking area (practice PP2). Check for standing water on the surface of the pavement after a precipitation event. If standing water remains within 30 minutes after rainfall has ended, cleaning of porous pavement is recommended.

  Remove any trash or debris that may collect on the practice.

  Pavement vacuuming shall be used regularly to remove sediment and organic debris that has accumulated on the pavement surface.

  Pavement vacuuming should occur during spring cleanup following the last snow event and during fall clean up to remove accumulated debris, at a minimum.

  Pressure washing can be an effective tool for cleaning clogged areas. This should occur at mid pressure, typically less than 500 psi and at an angle of 30 degrees or less.

  Contact SFC if loss of infiltration is observed.

INSPECTION CHECKLISTS AND MAINTENANCE LOGS

Inspection checklists and maintenance log templates are included at the end of this section.

Checklists have been adapted from checklists developed by the Virginia Department of Conservation and Recreation. The checklists state the minimum frequency of inspections. BMPs shall also be inspected after large storm events, and corrective action shall be implemented as required.

Any special concerns observed during routine or special inspections shall be reported to the owner immediately.

Maintenance logs have been adapted from logs developed by the Special Services Department of New Castle County in Delaware.

Maintenance logs shall be completed by the assigned inspector with initials to indicate which items were inspected. Comments shall be provided as necessary to document the state of the BMPs. Comments shall be dated.

The completed log, along with appropriate checklists, shall be submitted to the owner and kept on file.

DEICING

A deicing log is part of this long-term maintenance plan because proper application of deicing materials for winter maintenance is critical to the protection of water quality.

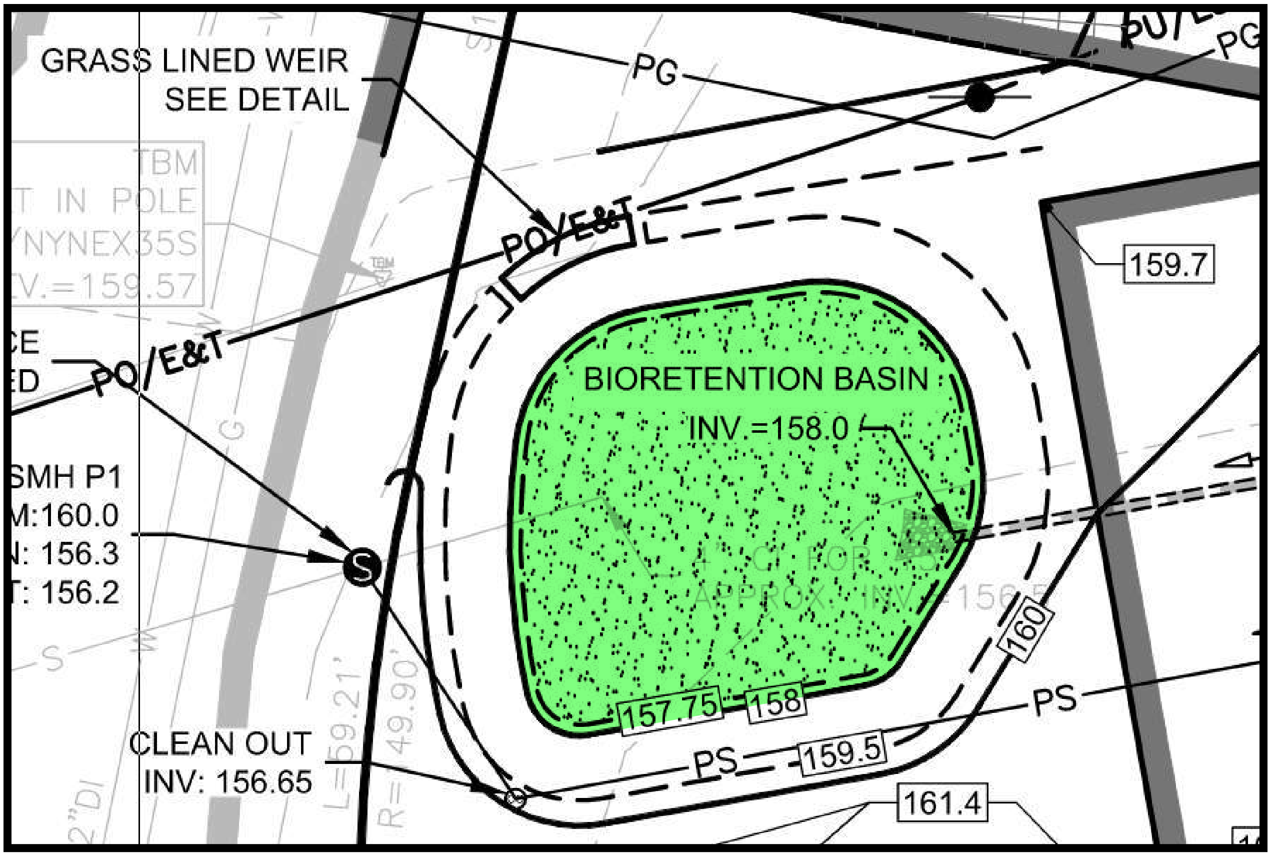
See the Anti-Icing Best Management Practices sheet prepared by the Technology Transfer Center included is included in this section.

Also reference NHDES fact sheet (WD-WMB-4) about Road Salt and Water Quality. This document can also be found at:

https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/wmb-4.pdf

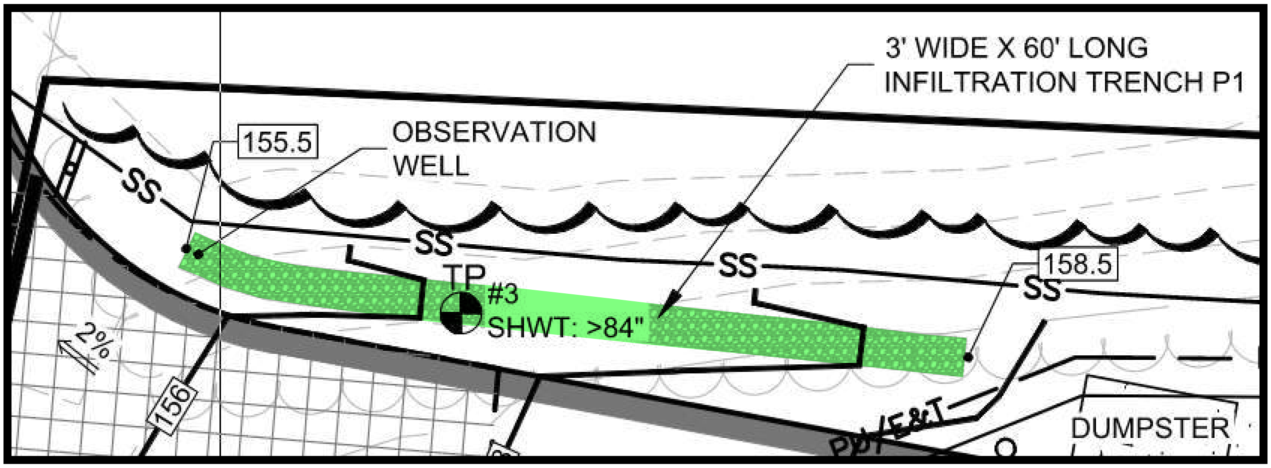
END

Attachment"E"

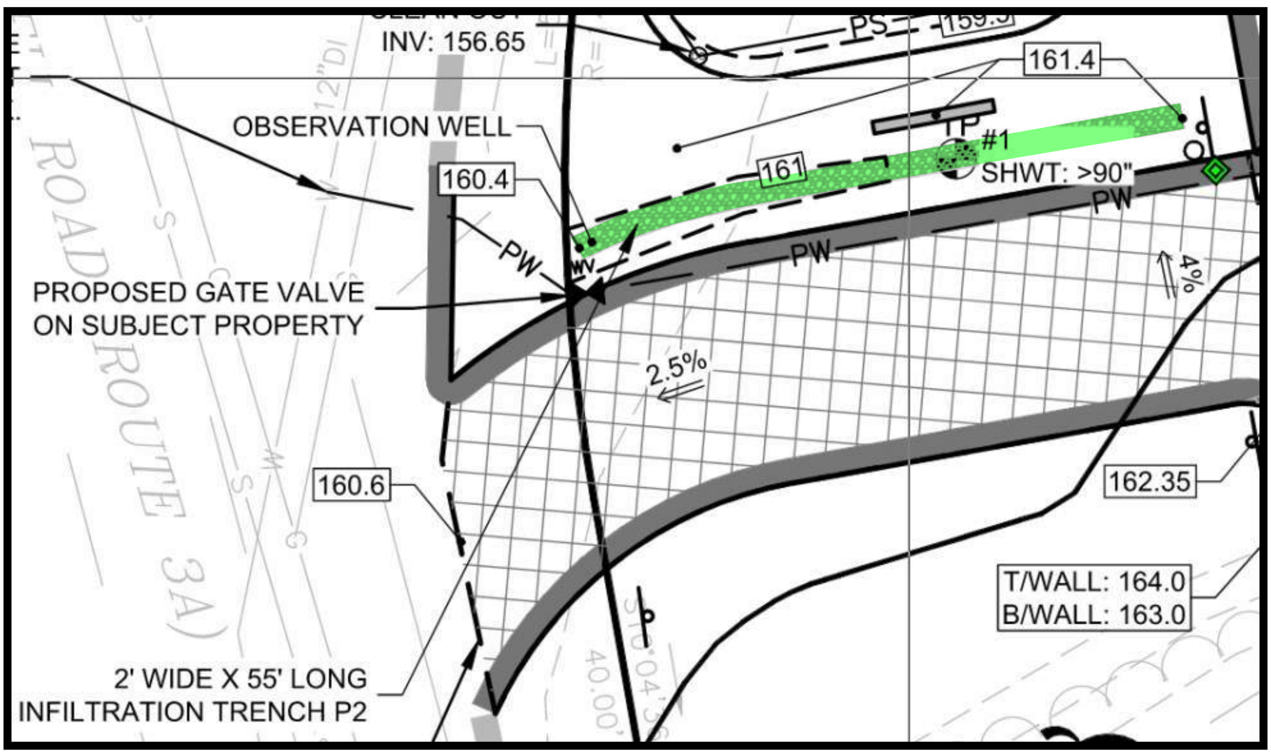


BIORETENTION BASIN

Attachment"E"

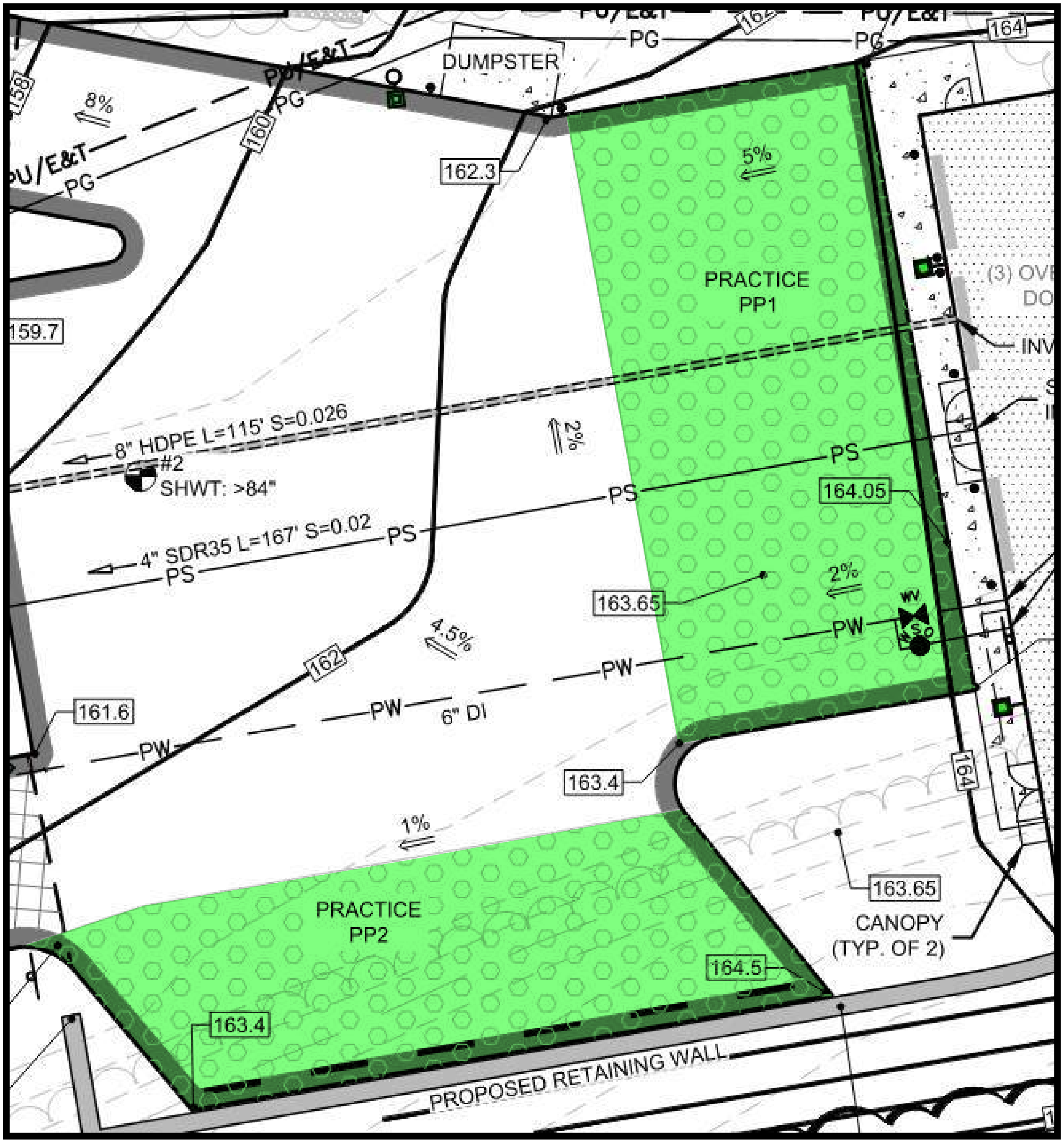


INFILTRATION TRENCH P1



INFILTRATION TRENCH P2

Attachment"E"



POROUS PAVEMENT AREAS PP1 & PP2

Attachment"E"

Operation and Maintenance Inspection Checklist
BIORETENTION BASIN

Date: ______________________
Project: **100 Lowell Road LLC**
Location: **100 Lowell Road - Hudson NH**

Date BMP Placed in Service: ______________________
Date Last Inspected: ______________________
Inspector: ______________________

As-Built Plans Available: Yes No

Bioretention Facility Type:
Infiltration X Filter Green ________ Alley ________

Warning: If any bioretention facility component has a watertight cover; be careful regarding the possibility of flammable gases within the facility. Care should be taken lighting a match or smoking while inspecting facilities that are not vented. If the bioretention facility is in a completely enclosed vault, the ***OSHA Confined Space*** Entry procedures must be followed.

A customized maintenance schedule must be prepared for each bioretention facility, since the maintenance tasks will differ depending on the scale of bioretention, the landscaping template chosen, and the nature of the surface cover. This is a general guideline.

Facility Location:
X Surface
____ Underground

Hydraulic Configuration:
X On-Line facility
____ Off-line facility

Filtration Media:
____ No filtration media (e.g. dry well)
____ Sand
X Bioretention soil
____ Peat
____ Other:

Type of pretreatment facility:
____ Sediment forebay (above ground)
____ Sediment chamber
____ Grass channel
X Grass filter strip
____ Plunge pool
____ Stone diaphram
____ Other:

Element of BMP	Potential Problem	Does Problem Exist? Yes/No	How to fix problem	Who Will Address Problem	Comments
Contributing Drainage Area	Excessive trash/debris				
	Bare/exposed soil				
	Evidence of erosion				
	Excessive landscape waste/ yard clippings				
Pretreatment	Maintenance access to pretreatment facility				
	Excessive trash/debris/sediment				
	Dead vegetation/exposed soil				
	Evidence of erosion				
Inlets	Inlets provide stable conveyance into facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Contributing Drainage Area/ Overall (*Annually*)	Activities in drainage area allow oil & grease, or other unauthorized substances to enter practice		Control what enters he practice. It may be necessary to introduce fences, signs, etc. If the source is obvious, stabilize correct	Owner or professional	
	Bare soil or sediment sources are seen in the contributing drainage area		Stabilize erosive immediately	Owner or professional	
	Litter is present within the practice		Remove immediately. Maintain contributing	Owner or	

Attachment"E"

Side Slopes (*Annually, after major storms*)	Soil is exposed, flow channels/ rill/gullies are forming		Stabilized using appropriate erosion control measures	Owner or professional	
	Side slopes support nuisance animals/insects		Animal burrows shall be backfilled and compacted. Burrowing animals shall be	Professional	
Inlet (*Annually*)	Inflow is hindered by trees/shrubs.		Woody vegetation should not be located at points of inflow. Trees should not grow directly above underdrains, but be located closer to the perimeter.	Owner or professional	
Vegetation (*monthly*)	Plants experience unsatisfactory growth or mortality, there is evidence of hydrocarbons or other deleterious materials		Replace contaminated mulch. If problem persists, test soils for hydrocarbons and other toxic substances. If excess levels are found, the soils, plants and mulch may all need to be replaced in accordance with the approved construction plans	Professional	
	Invasive species contribute 10% of vegetation within the practice		Unauthorized plants should immediately be removed from BMP and replaced	Owner or professional	
	Vegetation is dead and/or dying		Remove and replace. Avoid using chemical fertilizers, unless absolutely necessary. Otherwise, increase the frequency of watering	Professional	
	Winter-killed or salt-killed vegetation is present		Replace with hardier species.	Owner or professional	
	Presence of invasive species/weeds				
	Dead vegetation/exposed soil				
Filter Media (*Annually*)	The filter media is too low, compacted, or the composition is inconsistent with design specifications		Amend media to contain 85-88% sand 8-12% soil fines 3-5% organic matter in form of leaf compost	Professional	
	Chemicals, fertilizers, and/or oil are present		No dumping of yard wastes into practice. Remove oil/grease from practice immediately	Professional	
	Sediments are greater than 20% of design depth		Check plant health, manually remove sediment immediately without damaging plants	Owner or professional	
	Exposed/bare soil		Backfill with soil, reseed, and protect area until vegetation is reestablished	Professional	
	Topsoil is in poor condition, the pH level is not 6-7, the composition is inappropriate		3 inch surface depth of loamy sand or sandy loam texture, with less than 5% clay content, and organic matter content of at least 2% If the pH is less than 6.5, spread limestone over the practice	Owner or professional	
	Filter bed is blocked and/or filled inappropriately		Redistribute soil substrate and remove sediments within two weeks		
Outlet/ Overflow Spillway	Evidence of blockage		Determine source of debris and promptly address	Professional	
Annually/after major	Litter is present within the practice		Remove immediately. Maintain contributing	Professional	
Outlet	Outlets provide stable conveyance out of facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Overall	Maintenance access to facility				
	Condition of structural components				
	Condition of hydraulic control components				
	Excessive trash/debris/sediment				
	Evidence of erosion				
	Evidence of oil/chemical accumulation				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Complaints from local residents				
	Mosquito proliferation				
	Encroachment on facility or easement by buildings or other structures				

This checklist is based on a template prepared by the Virginia Department of Conservation and Recreation.

Attachment"E"

INSIDE OUT PAINTING AND REMODELING in HUDSON NH

STORMWATER FACILITY MANAGEMENT

INSPECTION AND MAINTENANCE LOG FOR BMP'S

OWNER / RESPONSIBLE PARTY: 100 Lowell Rd LLC

INSPECTOR:

STORMWATER PRACTICE IDENTIFICATION NAME / NUMBER: Bioretention Basin

	month: date:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
EROSION													
GRASS CUTTING													
SEDIMENT REMOVAL													
SOIL AMENDMENTS													

WRITE COMMENTS HERE & REPORT TO RESPONSIBLE PARTY

Fill in the date of inspection below the month and write your inItIals for each item inspected. Use one maintenance log per practice facility each year.

See inspection checklist for inspection frequency. Reference New Hampshire Stormwater Manual, Volume 2, chapter 5

Contact SFC Engineering Partnership, Inc. at (603) 647-8700 will questions or concerns regarding inspection and maintenance

Attachment"E"

Operation and Maintenance Inspection Checklist
INFILTRATION TRENCH P1

Date ______________________

Project 100 Lowell Road LLC

Location 100 Lowell Road – Hudson NH

Date of Last Inspection ____________

NHDES/Permit Number ________________

Date BMP Placed in Service ______________

Inspector ____

As-Built Plans available: Y / N

Infiltration Facility Type: Basin ________ **Trench** X **Perm. Pavement** ______________

Facility location:
- ___ Surface
- X Underground

Hydraulic configuration
- X On-line facility
- __ Off-line facility

Filtration Media
- X No filtration media (e.g. dry well)
- ___ Sand
- ___ Bioretention soil
- ___ Peat
- ___ Other: ______________________

Type of pretreatment facility
- ___ Sediment forebay (above ground)
- ___ Sedimentation chamber
- ___ Grass channel
- X Grass filter strip
- ___ Plunge pool
- ___ Stone diaphragm
- ___ Other: ______________________

Spill Prevention measures should be used when handling substances that contaminate stormwater. Releases of pollutants should be corrected as soon as identified.

Element of BMP	Potential Problem	Does Problem Exist? Yes/No	How to Fix Problem	Who Will Address Problem	Comments
Contributing Drainage Area	Excessive trash/debris				
	Bare/exposed soil				
	Evidence of erosion				
	Excessive landscape waste/ yard clippings				
Pretreatment	Maintenance access to pretreatment facility				
	Excessive trash/debris/sediment				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Evidence of clogging				
	Dead vegetation/exposed soil				
	Evidence of erosion				
Inlets	Inlets provide stable conveyance into facility				

	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Basin Inlet (*twice a year*)	Stormwater flow to the vegetated basin is restricted. Weedy growth on rock surfaces might indicate sediment deposition or clogging.		Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present. Inlet shall be cleared when conveyance capacity is plugged. Rock splash pads shall be replenished to prevent erosion.	Owner or professional	
Embankment , Dikes, Berms & Side Slopes (*yearly*)	Water is not retained in the infiltration basin		Slopes shall immediately be stabilized using appropriate erosion control measures when soil is exposed/ flow channels are forming. Sources of erosion damage shall be identified and controlled.	Owner or professional	
Overflow or Emergency Spillway (*twice a year*)	Pipe does not successfully carry excess water to an approved receiving system		Overflow pipe shall be cleared of sediment and debris when 50% of the conveyance capacity is plugged. Damaged pipe shall be repaired or replaced upon discovery.	Owner or professional	
	The reservoir does not perform as per specifications		Overflow shall be cleared when 25% of the conveyance capacity is plugged. Sources of erosion damage shall be identified and controlled when soil is exposed. Rocks or other armament shall be replaced when only one layer of rock exists.	Owner or professional	
Observation Well (*every 2 years*)	Condition of element is poor.		Replace observation well if needed and make sure it is still capped.	Professional l	
Sediment/ Debris Management (*yearly*)	The capacity volume of the infiltration basin is compromised by sedimentation. Gauges located at the opposite ends of the basin indicate too much debris		Sediment and debris exceeding 4" in depth shall be removed every 2-5 years or sooner if performance is affected. Restricted sources of sediment and debris shall be identified and prevented.	Professional	
Overall (*yearly*)	Access to the stormwater planter is unsafe and inefficient. Egress and ingress routes are not maintained to design standards. Roadways are unable to accommodate size and weight of vehicles.		Obstacles preventing maintenance personnel and/or equipment access to the stormwater planter shall be removed. Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.	Owner or professional	

	Insects & Rodents are harbored in the stormwater planter.		Pest control measures shall be taken when insects/rodents are found to be present. If sprays are considered, then a mosquito larvicide, such as Bacillus thurendensis or Altoside formulations can be applied only if absolutely necessary and only by a licensed individual or contractor. Holes in the ground located in and around the stormwater planter shall be filled and compacted.	Professional	
Outlet	Outlets provide stable conveyance out of facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Overall	Maintenance access to facility				
	Condition of structural components				
	Condition of hydraulic control components				
	Excessive trash/debris/sediment				
	Evidence of erosion				
	Evidence of oil/chemical accumulation				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Complaints from local residents				
	Mosquito proliferation				
	Encroachment on facility or easement by buildings or other structures				

Attachment"E"

Attachment"E"

INSIDE OUT PAINTING AND REMODELING in HUDSON NH

STORMWATER FACILITY MANAGEMENT

INSPECTION AND MAINTENANCE LOG FOR BMP'S

OWNER / RESPONSIBLE PARTY: 100 Lowell Rd LLC

INSPECTOR:

STORMWATER PRACTICE IDENTIFICATION NAME / NUMBER: Infiltration Trench P1

month: date:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
EROSION												
STONE CLEAR OF DEBRIS												

WRITE COMMENTS HERE & REPORT TO RESPONSIBLE PARTY

Fill in the date of inspection below the month and write your inItIals for each item inspected. Use one maintenance log per practice facility each year.

See inspection checklist for inspection frequency. Reference New Hampshire Stormwater Manual, Volume 2, chapter 5

Contact SFC Engineering Partnership, Inc. at (603) 647-8700 will questions or concerns regarding inspection and maintenance

Attachment"E"

Operation and Maintenance Inspection Checklist
INFILTRATION TRENCH P2

Date ____________________

Project 100 Lowell Road LLC

NHDES/Permit Number ____________________

Date BMP Placed in Service ____________________

Location 100 Lowell Road – Hudson NH

Date of Last Inspection ____________ **Inspector** ____________________

As-Built Plans available: Y / N

Infiltration Facility Type: Basin ________ **Trench** X **Perm. Pavement** ____________

Facility location:
- ___ Surface
- X Underground

Hydraulic configuration
- X On-line facility
- __ Off-line facility

Filtration Media
- X No filtration media (e.g. dry well)
- ___ Sand
- ___ Bioretention soil
- ___ Peat
- ___ Other: ____________________

Type of pretreatment facility
- ___ Sediment forebay (above ground)
- ___ Sedimentation chamber
- ___ Grass channel
- X Grass filter strip
- ___ Plunge pool
- ___ Stone diaphragm
- ___ Other: ____________________

Spill Prevention measures should be used when handling substances that contaminate stormwater. Releases of pollutants should be corrected as soon as identified.

Element of BMP	Potential Problem	Does Problem Exist? Yes/No	How to Fix Problem	Who Will Address Problem	Comments
Contributing Drainage Area	Excessive trash/debris				
	Bare/exposed soil				
	Evidence of erosion				
	Excessive landscape waste/ yard clippings				
Pretreatment	Maintenance access to pretreatment facility				
	Excessive trash/debris/sediment				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Evidence of clogging				
	Dead vegetation/exposed soil				
	Evidence of erosion				
Inlets	Inlets provide stable conveyance into facility				

	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Basin Inlet (*twice a year*)	Stormwater flow to the vegetated basin is restricted. Weedy growth on rock surfaces might indicate sediment deposition or clogging.		Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present. Inlet shall be cleared when conveyance capacity is plugged. Rock splash pads shall be replenished to prevent erosion.	Owner or professional	
Embankment , Dikes, Berms & Side Slopes (*yearly*)	Water is not retained in the infiltration basin		Slopes shall immediately be stabilized using appropriate erosion control measures when soil is exposed/ flow channels are forming. Sources of erosion damage shall be identified and controlled.	Owner or professional	
Overflow or Emergency Spillway (*twice a year*)	Pipe does not successfully carry excess water to an approved receiving system		Overflow pipe shall be cleared of sediment and debris when 50% of the conveyance capacity is plugged. Damaged pipe shall be repaired or replaced upon discovery.	Owner or professional	
	The reservoir does not perform as per specifications		Overflow shall be cleared when 25% of the conveyance capacity is plugged. Sources of erosion damage shall be identified and controlled when soil is exposed. Rocks or other armament shall be replaced when only one layer of rock exists.	Owner or professional	
Observation Well (*every 2 years*)	Condition of element is poor.		Replace observation well if needed and make sure it is still capped.	Professional l	
Sediment/ Debris Management (*yearly*)	The capacity volume of the infiltration basin is compromised by sedimentation. Gauges located at the opposite ends of the basin indicate too much debris		Sediment and debris exceeding 4” in depth shall be removed every 2-5 years or sooner if performance is affected. Restricted sources of sediment and debris shall be identified and prevented.	Professional	
Overall (*yearly*)	Access to the stormwater planter is unsafe and inefficient. Egress and ingress routes are not maintained to design standards. Roadways are unable to accommodate size and weight of vehicles.		Obstacles preventing maintenance personnel and/or equipment access to the stormwater planter shall be removed. Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.	Owner or professional	

	Insects & Rodents are harbored in the stormwater planter.		Pest control measures shall be taken when insects/rodents are found to be present. If sprays are considered, then a mosquito larvicide, such as Bacillus thurendensis or Altoside formulations can be applied only if absolutely necessary and only by a licensed individual or contractor. Holes in the ground located in and around the stormwater planter shall be filled and compacted.	Professional	
Outlet	Outlets provide stable conveyance out of facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Overall	Maintenance access to facility				
	Condition of structural components				
	Condition of hydraulic control components				
	Excessive trash/debris/sediment				
	Evidence of erosion				
	Evidence of oil/chemical accumulation				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Complaints from local residents				
	Mosquito proliferation				
	Encroachment on facility or easement by buildings or other structures				

Attachment"E"

Attachment"E"

INSIDE OUT PAINTING AND REMODELING in HUDSON NH

STORMWATER FACILITY MANAGEMENT

INSPECTION AND MAINTENANCE LOG FOR BMP'S

OWNER / RESPONSIBLE PARTY: 100 Lowell Rd LLC

INSPECTOR:

STORMWATER PRACTICE IDENTIFICATION NAME / NUMBER: Infiltration Trench P2

month: date:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
EROSION												
STONE CLEAR OF DEBRIS												

WRITE COMMENTS HERE & REPORT TO RESPONSIBLE PARTY

Fill in the date of inspection below the month and write your inItIals for each item inspected. Use one maintenance log per practice facility each year.

See inspection checklist for inspection frequency. Reference New Hampshire Stormwater Manual, Volume 2, chapter 5

Contact SFC Engineering Partnership, Inc. at (603) 647-8700 will questions or concerns regarding inspection and maintenance

Attachment"E"

Regular Inspection and Maintenance Guidance for Porous Pavements

Regular inspection and maintenance is critical to the effective operation of porous pavement. It is the responsibility of the owner to maintain the pavement in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, seasonal changes, and traffic conditions.

Inspection Activities

Visual inspections are an integral part of system maintenance. This includes monitoring pavement to ensure water drainage, debris accumulation, and surface deterioration.

ACTIVITY	FREQUENCY
Check for standing water on the surface of the pavement after a precipitation event. If standing water remains within 30 minutes after rainfall had ended, cleaning of porous pavement is recommended.	2 to 4 times per year, more frequently for high use sites or sites with higher potential for run-on
Vacuum sweeper shall be used regularly to remove sediment and organic debris on the pavement surface. The sweeper may be fitted with water jets.	
Pavement vacuuming should occur during spring cleanup following the last snow event to remove accumulated debris, at minimum.	
Pavement vacuuming should occur during fall cleanup to remove dead leaves, at minimum.	
Power washing can be an effective tool for cleaning clogged areas. This should occur at mid pressure typically less than 500 psi and at an angle of 30 degrees or less.	
Check for debris accumulating on pavement, especially debris buildup in winter. For loose debris, a power/leaf blower or gutter broom can be used to remove leaves and trash.	
Check for damage to porous pavements from non-design loads. Damaged areas may be repaired by use of infrared heating and rerolling of pavement. Typical costs may be 2,000/ day for approximately 500 ft of trench.	

Maintenance Activities

Routine preventative cleaning is more effective than corrective cleaning.

Activity	Frequency
Controlling run-on and debris tracking is key to extending the life of porous surfaces. Erosion and sedimentation control of adjacent areas is crucial. Vacuuming adjacent non porous asphalt can be effective at minimizing run-on.	Whenever vacuuming adjacent porous pavements
Repairs may be needed from cuts of utilities. Repairs can be made using standard (non-porous) asphalt for most damages. Repairs using standard asphalt should not exceed 15% of total area.	As needed
Do not store materials such as sand/salt, mulch, soil, yard waste, and other stock piles on porous surfaces.	
Stockpiled snow areas on porous pavements will require additional maintenance and vacuuming. Stockpiling on snow on porous pavements is not recommended and will lead to premature clogging.	
Damage can occur to porous pavement from non-design loads. Precautions such as clearance bars, signage, tight turning radius, high curbs, and video surveillance may be required where there is a risk off non-design loads.	
Posting of signage is recommended indicating presence of porous pavement. Signage should display limitation of design load (i.e. passenger vehicles only, light truck traffic, etc. as per pavement durability rating.)	

Attachment"E"

CHECKLIST FOR INSPECTION OF POROUS PAVEMENTS

Location: 100 Lowell Rd Hudson NH

Inspector:

Date:

Time:

Site Conditions:

Date Since Last Rain Event:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)		Comments/Corrective Action
1. Salt / Deicing *Note complete winter maintenance guidance is available at UNHSC			
Use salt only for ice management	S	U	
Piles of accumulated salt removed in spring	S	U	
2. Debris Cleanup (2-4 times a year minimum, Spring & Fall)			
Clean porous pavement to remove sediment and organic debris on the pavement surface via vacuum street sweeper.	S	U	
Adjacent non porous pavement vacuumed	S	U	
Clean catch basins (if available)	S	U	
3**. Controlling Run-On (2-4 times a year)**			
Adjacent vegetated areas show no signs of erosion and run-on to porous pavement	S	U	
4. Outlet / Catch Basin Inspection (if available) (2 times a year, After large storm events)			
No evidence of blockage	S	U	
Good condition, no need for cleaning/repair	S	U	
5. Poorly Drained Pavement (2-4 times a year)			
Pavement has been pressure washed and vacuumed	S	U	
6. Pavement Condition (2-4 times a year minimum, Spring & Fall)			
No evidence of deterioration	S	U	
No cuts from utilities visible	S	U	
No evidence of improper design load applied	S	U	
7. Signage / Stockpiling (As Needed)			
Proper signage posted indicating usage for traffic load	S	U	
No stockpiling of materials and no seal coating	S	U	

Corrective Action Needed	Due Date
1.	
2.	
3.	

Attachment"E"

INSIDE OUT PAINTING AND REMODELING in HUDSON NH

STORMWATER FACILITY MANAGEMENT

INSPECTION AND MAINTENANCE LOG FOR BMP'S

OWNER / RESPONSIBLE PARTY: 100 Lowell Road LLC

INSPECTOR:

STORMWATER PRACTICE IDENTIFICATION NAME / NUMBER: Porous Pavement

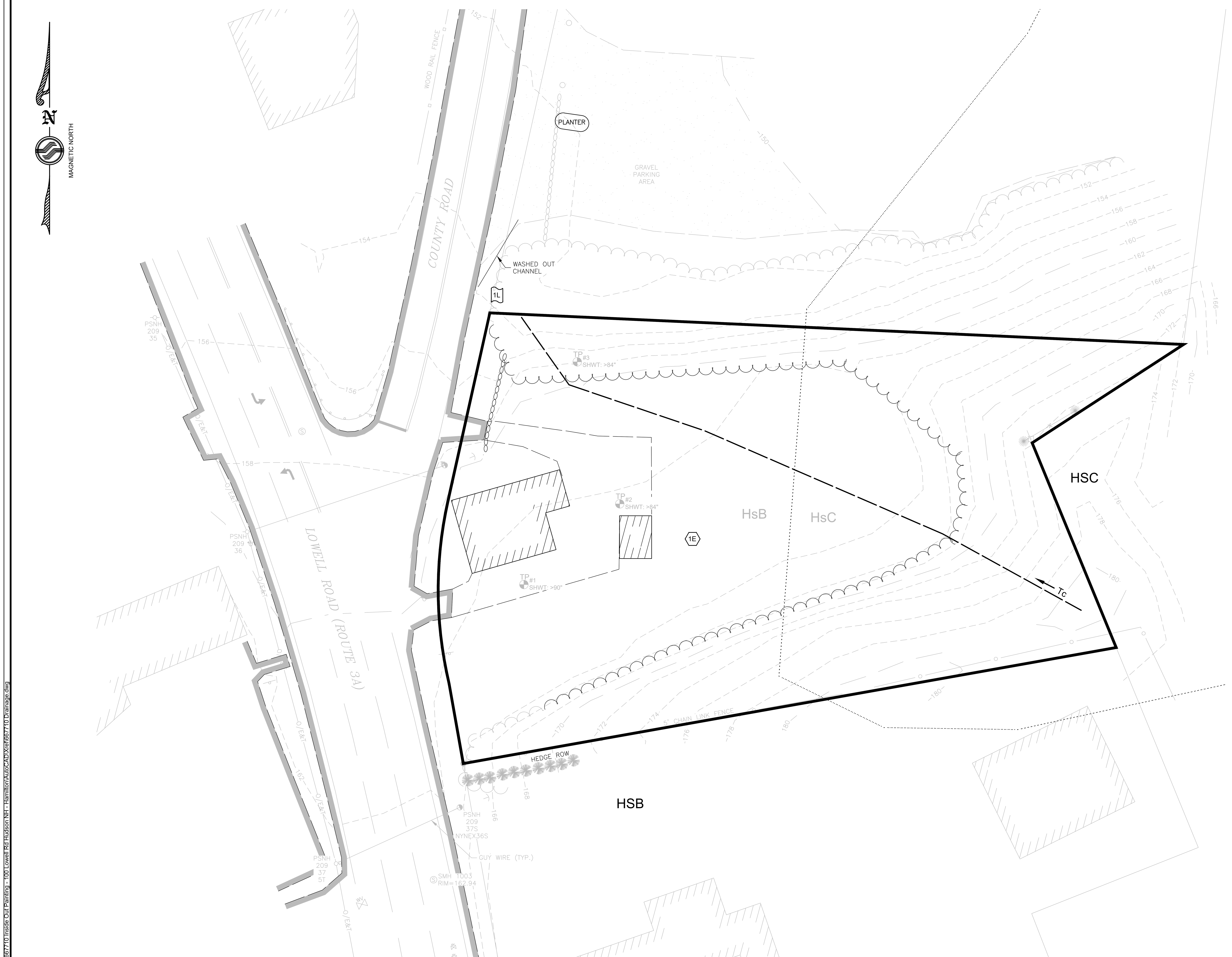
month: date:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SALT/DEICING												
DEBRIS CLEANUP												
CONTROLLING RUN-ON												
PAVEMENT CONDITION												
SIGNAGE												

WRITE COMMENTS HERE & REPORT TO RESPONSIBLE PARTY

Fill in the date of inspection below the month and write your inItIals for each item inspected. Use one maintenance log per practice facility each year.

See inspection checklist for inspection frequency. Reference New Hampshire Stormwater Manual, Volume 2, chapter 5

Contact SFC Engineering Partnership, Inc. at (603) 647-8700 will questions or concerns regarding inspection and maintenance



NOTES

1. THE PURPOSE OF THIS PLAN IS TO DEPICT THE PREDEVELOPMENT CONDITIONS OF HUDSON PROPERTY MAP 198 LOT 147 CONSISTING OF 0.8 Ac.±

SOIL LEGEND

SYMBOL	NAME	HSG
Hs	HINCKLEY	A

SCALE: 1"= 20'

0 10' 20' 40' 60'

No.	Revision	Date
1	Addressed F&O Comments	1/7/2025

Designed by: JRB | Drawn by: JRB | Checked by: DMF

Pre-Development Drainage Plan

Commercial Development
Inside Out Painting and Remodeling
100 Lowell Road
Hudson, NH

Assessors Map 198 Lot 147

SFC ENGINEERING

Windham, New Hampshire
Portland, Maine

(603) 647-8700
www.sfceng.com

Sheet 1 of 2 | Scale: 1" = 20' | Date: 10/2/2024

STATE OF NEW HAMPSHIRE
DANIEL M. FLORES
No. 15761
LICENSED
PROFESSIONAL ENGINEER

Prepared for:

100 Lowell Rd LLC
122 Lowell Road, Suite 3
Hudson, NH 03501

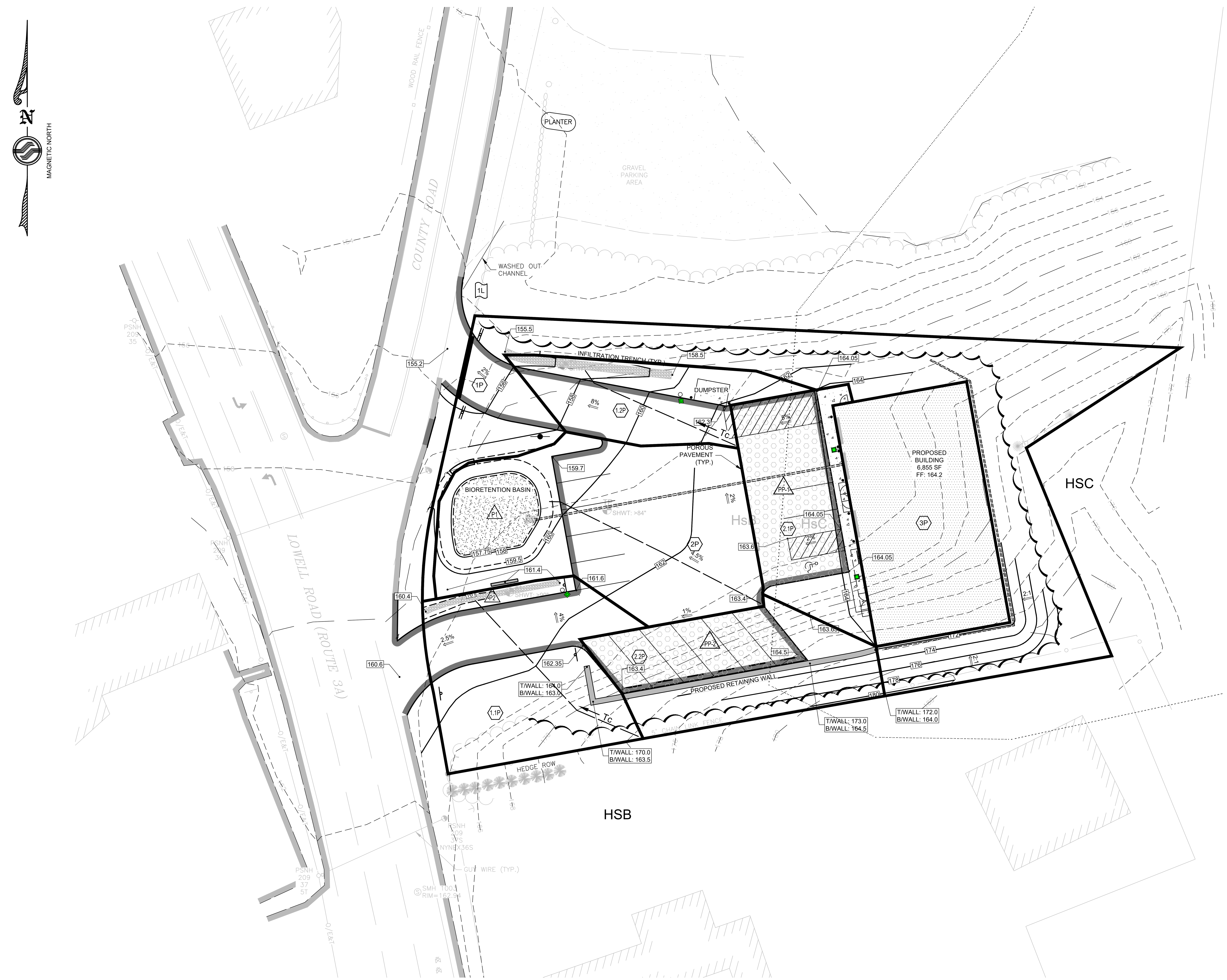
Hudson Planning Board Approval

Zoning Classification: B - Business

Drawing: 667710 Drainage
Layout: Pre

Drawing name: K:\Civil\667710 Inside Out Painting - 100 Lowell Rd Hudson NH - Hamilton\Ad\CAD\Xref\667710 Drainage.dwg

Attachment"E"



NOTES

1. THE PURPOSE OF THIS PLAN IS TO DEPICT THE POST DEVELOPMENT CONDITIONS OF HUDSON PROPERTY MAP 198 LOT 147 CONSISTING OF 0.8 Ac.±

SOIL LEGEND

SYMBOL	NAME	HSG
Hs	HINCKLEY	A

SCALE: 1"= 20'

0 10' 20' 40' 60'

1	Addressed F&O Comments	1/7/2025
No.	Revision	Date

Designed by: JRB	Drawn by: JRB	Checked by: DMF

Post-Development Drainage Plan

Commercial Development

Inside Out Painting and Remodeling

100 Lowell Road

Hudson, NH

Assessors Map 198 Lot 147

SFC ENGINEERING

Windham, New Hampshire
Portland, Maine

(603) 647-8700
www.sfceng.com

Sheet 2 of 2 | Scale: 1" = 20' | Date: 10/2/2024

STATE OF NEW HAMPSHIRE DANIEL M. FLORES No. 15761 LICENSED PROFESSIONAL ENGINEER

Prepared for:

100 Lowell Rd LLC
122 Lowell Road, Suite 3
Hudson, NH 03501

Hudson Planning Board Approval

Zoning Classification: B - Business

Drawing: 667710 Drainage
Layout: Post

Attachment "F"

INSPECTION AND MAINTENANCE MANUAL

COMMERCIAL DEVELOPMENT
100 LOWELL ROAD HUDSON NH

PREPARED BY: SFC ENGINEERING

INTRODUCTION

Proper operation and maintenance of the stormwater management features of the proposed development will ensure that the stormwater system and individual best management practices (BMPs) will remain effective at removing pollutants as designed, and that water quality objectives will be maintained.

Upon completion of all terrain alteration activities that direct stormwater to a certain practice, the landowner shall initiate inspection and maintenance of that practice. 100 Lowell Rd LLC, the landowner, or their designer shall be responsible to implement these activities.

If the ownership of the property is transferred, the new owner shall become the responsible party.

REQUIRED MAINTENANCE

Development of 100 Lowell Road in Hudson NH includes the following stormwater practices and their required maintenance. In general, the owner should inspect the practices at least once per year and after significant rain events. Any maintenance debris shall be properly disposed of. Contact Hudson Transfer Station at 603-886-6018 for guidance on disposal.

- **Infiltration Trench.** The development includes two infiltration trenches: one on the north side of the entrance driveway and one on the north side of the exit driveway. The infiltration trench is a stone trench to receive and infiltrate stormwater runoff.

  Prevent sediment and debris from clogging the trench by maintaining grass cover upstream and around the practice. Any exposed soil upstream or around the practice needs to be seeded and stabilized.

  Any trash or debris that may collect on the practice should be removed.

  Contact a SFC if loss of infiltration is observed.

- **Bioretention Area.** The development includes a bioretention area at the front of the property between the two driveways. The bioretention area is a grass depression that receives and infiltrate stormwater runoff. The depression includes a grass weir as an overflow to discharge stormwater that cannot be infiltrated.

Prevent sediment and debris from clogging the depression by maintaining grass cover upstream and around the practice. Any exposed soil upstream or around the practice needs to be seeded and stabilized. Sweep the pavement areas in the spring to remove any sand used during the winter.

Any trash or debris that may collect on the practice should be removed.

The grass within the practice should be maintained, with any bare patches seeded.

The outlet weir and the banks of the practice should be checked periodically to ensure no erosion has occurred.

Contact SFC Engineering if loss of infiltration is observed. The practice is designed to drain within 72 hours.

- **Porous Pavement.** The development includes porous pavement in two locations: the pavement and parking in front of the building (practice PP1) and the side (south) parking area (practice PP2). Check for standing water on the surface of the pavement after a precipitation event. If standing water remains within 30 minutes after rainfall has ended, cleaning of porous pavement is recommended.

  Remove any trash or debris that may collect on the practice.

  Pavement vacuuming shall be used regularly to remove sediment and organic debris that has accumulated on the pavement surface.

  Pavement vacuuming should occur during spring cleanup following the last snow event and during fall clean up to remove accumulated debris, at a minimum.

  Pressure washing can be an effective tool for cleaning clogged areas. This should occur at mid pressure, typically less than 500 psi and at an angle of 30 degrees or less.

  Contact SFC if loss of infiltration is observed.

  The porous pavement sections depicted on these plans are an integral part of the stormwater management design for the site and must remain porous. The land owner shall not seal or change these areas to conventional pavement.

INSPECTION CHECKLISTS AND MAINTENANCE LOGS

Inspection checklists and maintenance log templates are included at the end of this section.

<u>Checklists</u> have been adapted from checklists developed by the Virginia Department of Conservation and Recreation. The checklists state the minimum frequency of inspections. BMPs shall also be inspected after large storm events, and corrective action shall be implemented as required.

Any special concerns observed during routine or special inspections shall be reported to the owner immediately.

<u>Maintenance logs</u> have been adapted from logs developed by the Special Services Department of New Castle County in Delaware.

Maintenance logs shall be completed by the assigned inspector with initials to indicate which items were inspected. Comments shall be provided as necessary to document the state of the BMPs. Comments shall be dated.

The completed log, along with appropriate checklists, shall be submitted to the owner and kept on file.

DEICING

A deicing log is part of this long-term maintenance plan because proper application of deicing materials for winter maintenance is critical to the protection of water quality.

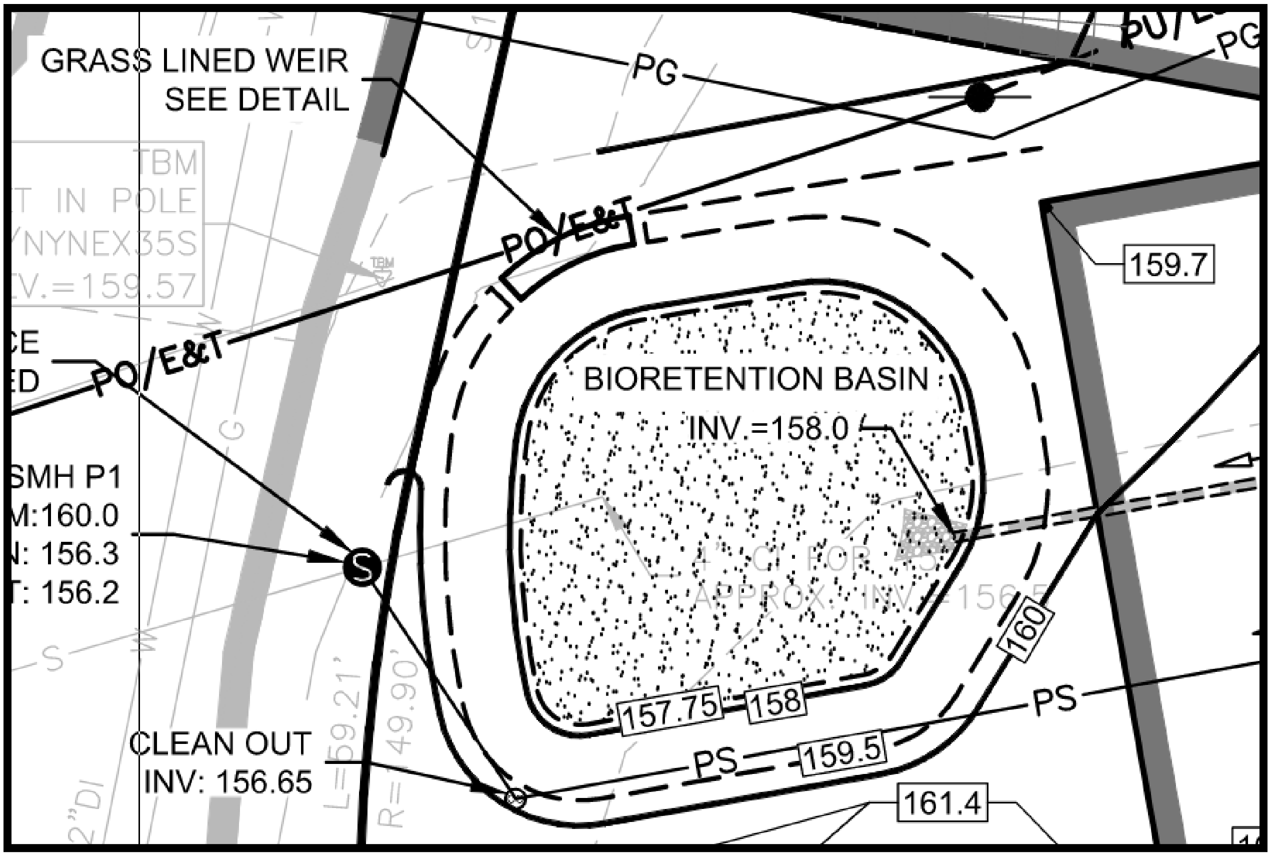
See the Anti-Icing Best Management Practices sheet prepared by the Technology Transfer Center included is included in this section.

Also reference NHDES fact sheet (WD-WMB-4) about Road Salt and Water Quality. This document can also be found at:

https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/wmb-4.pdf

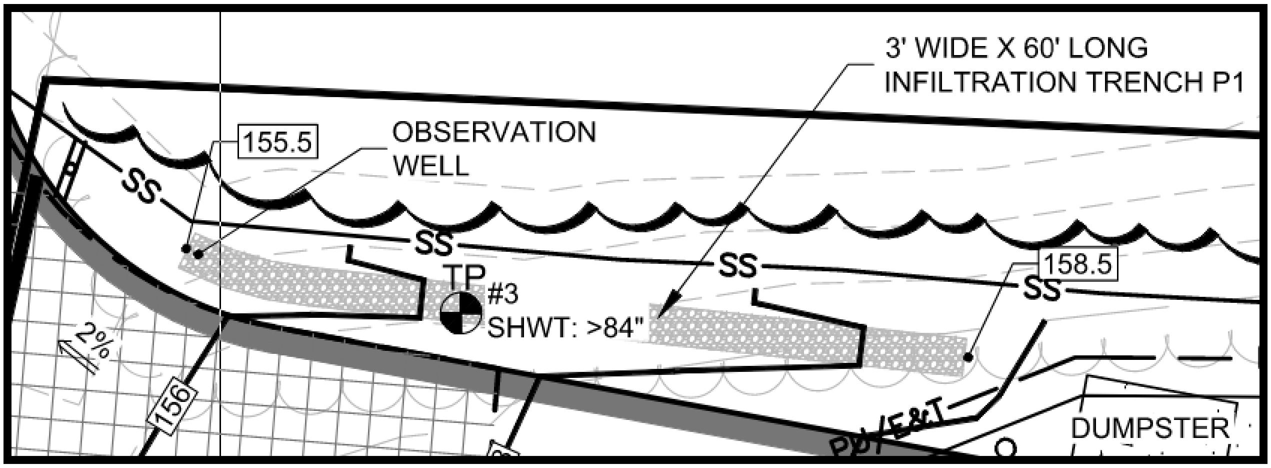
END

Attachment "F"



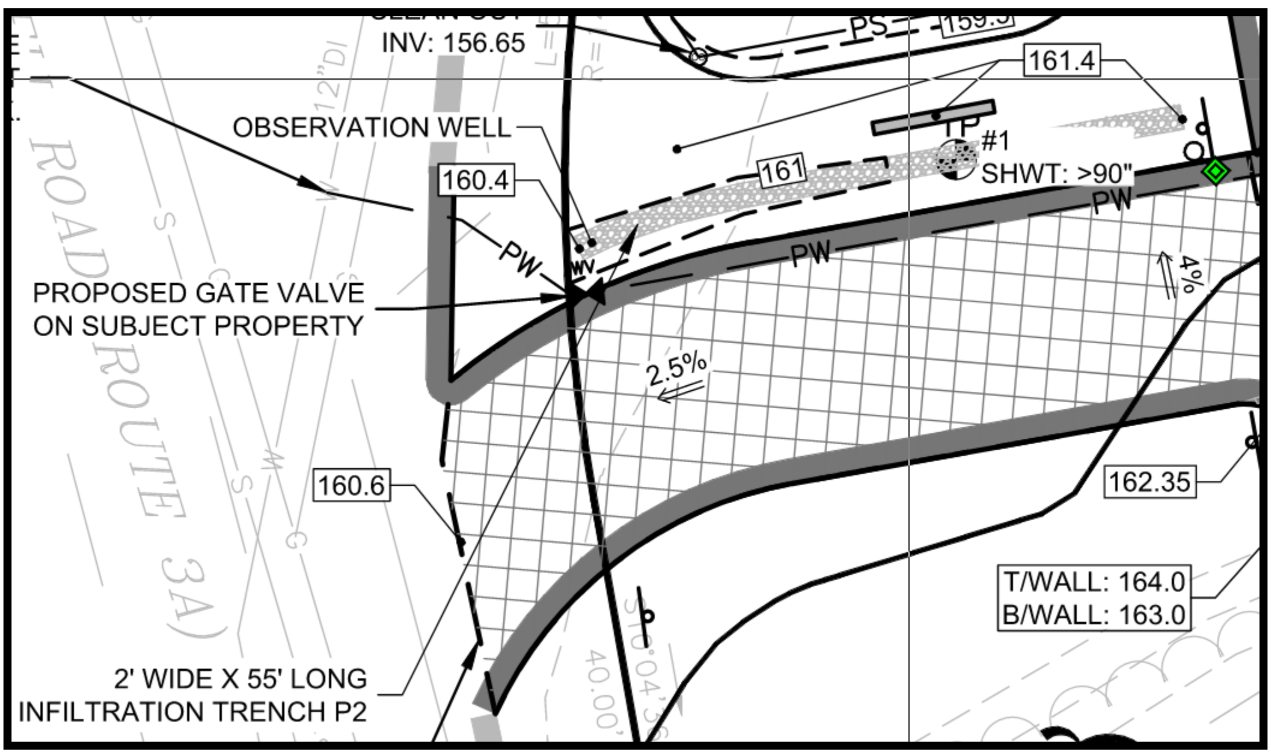
BIORETENTION BASIN

Attachment "F"



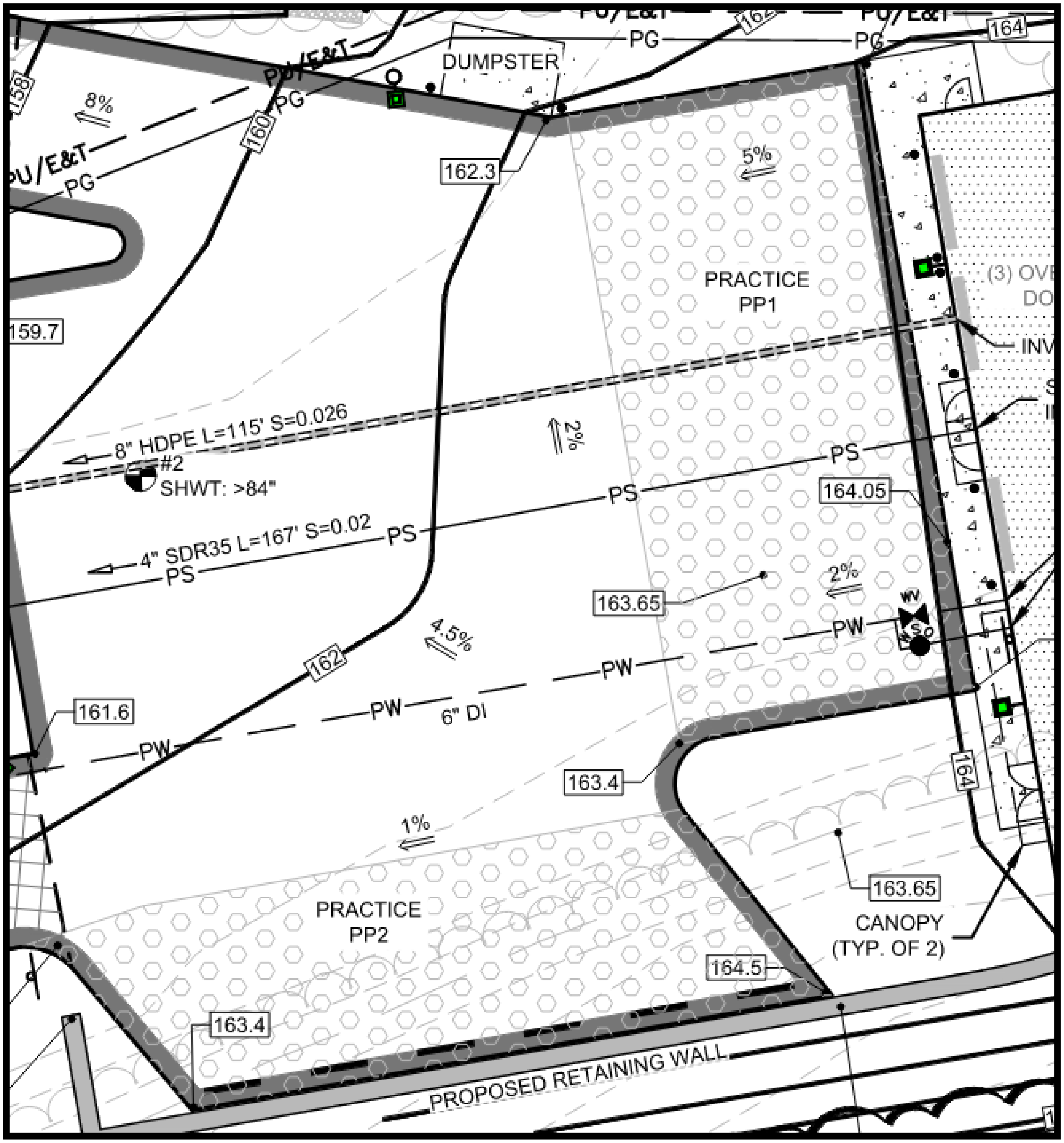
INFILTRATION TRENCH P1

P



INFILTRATION TRENCH P2

Attachment "F"



POROUS PAVEMENT AREAS PP1 & PP2

FUSS & O'NEILL
50 Commercial Street, Suite 2S
Manchester, NH 03101
603.668.8223
www.fando.com

October 29, 2024

Mr. Jay Minkarah
Acting Town Planner
Town of Hudson
12 School Street
Hudson, NH 03051

Re: Town of Hudson Planning Board Review
Inside Out Painting Site Plan, 100 Lowell Road
Tax Map 198 Lot 147; Acct. #1350-180
Reference No. 20030249.243

Dear Mr. Minkarah:

Fuss & O'Neill, Inc. has reviewed the Traffic Impact and Access Study prepared by VAI dated October 1, 2024, for the proposed commercial building to be located at 100 Lowell Road (NH Route 3A) in Hudson. Please refer to our previous letter dated October 23, 2024, for our comments related to the review of the site plans and stormwater management report.

The project proposes the development of 4,500 square feet (sf) of commercial buildings on the approximately 0.8 acre lot, which is currently bounded by the Jette and Sousa baseball/softball fields and associated parking area and appurtenances to the north and east of the lot, NH Route 3A (Lowell Road) and a commercial property to the south, and NH Route 3A and County Road to the west. Access and egress to the site will be provided by two driveways - one for the one way entrance into the site, and the other driveway which will be a right turn exit only onto County Road.

The procedures that the VAI Consultants' report uses are reasonable with the appropriate ITE generation rates used for a commercial building with the Land Use Code (LUC) 180, Specialty Trade Contractor. This data shows an estimated generation of trips to the volume of 44 during the average weekday, 7 during the weekday morning peak hour, and 7 during the weekday evening peak hour.

The intersection analysis in the report shows that the westbound intersection approach of County Road at NH Route 3A has a level of service (LOS) of F for the No-Build and the Build for all years analyzed. The site driveway layout restricts traffic leaving the site to use the westbound County Road approach, by making the exit from the site a right only. This eliminates trips from the site impacting the westbound intersection approach but distributes all trips through the neighborhood area of County Road towards the Belknap Road intersection and through until County Road meets NH Route 3A to the north.

The report acknowledges the Town of Hudson and NHDOT future roadway project which intends to extend Belknap Roadway to NH Route 3A, which would significantly improve the intersection operations of NH Route 3A and County Road. However, it is our understanding that one consideration for this project is to make the section of County Road south of Belknap Road a dead-end street in the future. The applicant should coordinate with the Town of Hudson and the NHDOT regarding this potential change to the County Road traffic pattern as this may require redesigning the site driveways. Given the potential future project a consolidated site driveway off County Road might make more sense, removing the entrance driveway off of NH Route 3, which is currently the only entrance into the site and must be accessed by traveling northbound on NH Route 3A.

Overall, we concur with the VAI report's conclusion that the proposed development will have no significant impact on the NH Route 3A Highway corridor. However, there is significant concern that the site driveway layout could require redesign due to the Belknap Road extension project.

Please feel free to call if you have any questions.

Very truly yours,

Steven W. Reichert, P.E.

SWR:

Enclosure

cc: Town of Hudson Engineering Division – File
SFC Engineering – dflores@sfceng.com

FUSS & O'NEILL
50 Commercial Street, Suite 2S
Manchester, NH 03101
603.668.8223
www.fando.com

February 19, 2025

Mr. Jay Minkarah
Acting Town Planner
Town of Hudson
12 School Street
Hudson, NH 03051

Re: Town of Hudson Planning Board Review
Inside Out Painting Site Plan, 100 Lowell Road
Tax Map 198 Lot 147; Acct. #1350-180
Reference No. 20030249.243

Dear Mr. Minkarah:

Fuss & O'Neill (F&O) has reviewed the second submission of the materials received on January 17, 2025, related to the above-referenced project. Authorization to proceed was received on February 5, 2025. A list of items reviewed is enclosed. The scope of our review is based on the Site Plan Review Codes, Stormwater Codes, Driveway Review Codes, Sewer Use Ordinance 77, Zoning Regulations, and criteria outlined in the CLD Consulting Engineers Proposal approved September 16, 2003, revised September 20, 2004, June 4, 2007, September 3, 2008, and October 2015.

The project consists of constructing a commercial building on a previously developed but vacant lot. Proposed improvements to the site include the construction of parking areas, drainage, utilities, and other associated site improvements. The site is to be serviced by public water and sewer systems.

The following items have outstanding issues:

1. **Site Plan Review Codes (HR 275)**
   g. *Former Fuss & O'Neill Comment: HR 275-9.F. The applicant did not provide copies of easements or deeds as part of the package received for review. No easements are shown on the Existing Conditions plan or the proposed plans.*
   Current Fuss & O'Neill Comment: The applicant stated that a copy of the deed was attached. We note that a copy was not provided in the package received for review.

5. **Utility Design/Conflicts**
   b. *Former Fuss & O'Neill Comment: HR 275-9.E & 276-13. The applicant is proposing a sewer service from the building with less than 2 feet of cover where it leaves the building and similar minimal cover where the sewer service pipe extends around the edge of the bioretention basin.*
   Current Fuss & O'Neill Comment: The applicant has revised the cover over the sewer service at the building but we continue to note approximately 2 feet of cover around the bioretention basin.
   f. *Former Fuss & O'Neill Comment: HR 275-9.E & 276-13. The applicant has noted that the proposed water service size shall be per the building design. The size of the existing service that is being tied into is not noted on the plans. If a larger size than existing is required to accommodate the proposed building use then the water service should be replaced to the water main, not connected to a smaller service stub. If the existing water service stub is being replaced the curb stop should be relocated to the property line per ETGTD detail W-19 or W-20.*
   Current Fuss & O'Neill Comment: The applicant has revised the plan to show a new 6-inch service from the existing main within the roadway. The applicant should provide a detail for this connection and a curb stop detail.

6. Drainage Design/Stormwater Management (HR 275-9.A./Chapter 290)

c. *Former Fuss & O'Neill Comment: HR 275-5.A.(9). The applicant should provide the BMP worksheets for the three proposed treatment practices.*
Current Fuss & O'Neill Comment: The applicant has provided BMP worksheets. The SSSNNE Ksat spreadsheet was provided within the drainage report. The applicant should provide additional information on the use of infiltration rates of 10 in/hr for the proposed basin and infiltration trenches. The applicant should also provide additional information on the use of the C horizon infiltration rate, rather than the B horizon. The applicant should provide additional information on the use of infiltration rates of 1 in/hr for the proposed permeable pavers. We note there are test pits utilized within the design that do not fall within the footprint of the infiltration systems. The applicant should review with the Town Engineer if additional test pits are required for the Basin and permeable paver locations.

e. *Former Fuss & O'Neill Comment: HR 275-5.A.(11). The applicant should review the use of a 5min Tc in the existing conditions. Measuring from PDF, it appears an approximate 125'-150'± long Tc time/path could be longer than 5min. This path flows diagonally from the southeast of the property to the northwest property line.*
Current Fuss & O'Neill Comment: The applicant has revised Tc path and updated HydroCAD. The applicant should also provide additional information on the use of a Tc of 692 minutes for Subcatchments 2.1P and 2.2P.

j. *Former Fuss & O'Neill Comment: HR 275-5.A.(12). The applicant should provide the following:*

i. *Former Fuss & O'Neill Comment: A BMP location map in the I&M Manual. This will ensure both of the infiltration trenches and the basin are maintained as required.*

Current Fuss & O'Neill Comment: The applicant has included an I&M Manual. The applicant should note upon the I&M, as well as the Plan Set, that removing to pavers or sealing of the pervious pavers is not allowed. Future owners/maintenance crews might not be aware of the implications to drainage design, if this area is converted to impervious ground cover.

The following items require Town evaluation or input:

1. Site Plan Review Codes (HR 275)

d. *Former Fuss & O'Neill Comment: HR 275-8.C.(2)(a) and Zoning Ordinance (ZO) 334-15.A. The applicant has provided parking calculations on the plan set which show that 23 parking spaces are required for the professional office and business services use. The applicant has requested a waiver from the Regulation to allow only 11 parking spaces on site. Note #2 under Waiver Requests on the Site Development Plan should be revised to note 275-8.C.(2)(m), not 75-8.C.(2)(m).*
Current Fuss & O'Neill Comment: The plan has been updated to propose 14 parking spaces. The applicant has updated the waiver note.

e. *Former Fuss & O'Neill Comment: HR 275-8.C.(6).(b). The applicant has shown one loading area on the plan set. The applicant should review the need for a waiver from the size requirement as the space is only 35 feet long and 60 feet is required.*
Current Fuss & O'Neill Comment: The applicant has added a waiver request note to the plan set for the loading space dimensions and confirmed that the shorter loading space will be sufficient for the vehicles expected on site.

2. Administrative Review Codes (HR 276)

a. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(6). The applicant should add the owner's signature to the plan set for the final approval copy.*
Current Fuss & O'Neill Comment: The applicant has noted that the final plans will be signed for the Town.

b. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(9). The applicant has requested a waiver for the boundary survey of the site.

c. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(12)(c). The applicant has not provided any information regarding the 100-foot setback required on the south side of the site where there is an abutting residential use.*
Current Fuss & O'Neill Comment: The applicant has added a waiver to the plan requesting relief from this requirement.

11. Other

b. *Former Fuss & O'Neill Comment: The site appears to be missing lot monumentation based on the Existing Conditions Plan. The applicant should review the need to add monumentation to the site.*
Current Fuss & O'Neill Comment: The applicant has stated they do not plan to add monumentation. The Town should confirm that additional monumentation is not necessary.

The following items are resolved or have no further Fuss & O'Neill input:

1. Site Plan Review Codes (HR 275)

a. *Former Fuss & O'Neill Comment: Hudson Regulation (HR) 275-6.C. There currently are no sidewalks abutting the site. The applicant has not proposed adding any sidewalks to the site.*
b. *Former Fuss & O'Neill Comment: HR 275-6.I. The scope of this review does not include the adequacy of any fire protection provisions for the site. The applicant has shown a proposed six-inch fire service connection to the building.*
c. *Former Fuss & O'Neill Comment: HR 275-6.T. The applicant is proposing limited off-site improvements that include utility connections and driveway improvements. Other proposed work is within the subject site.*
f. *Former Fuss & O'Neill Comment: HR 275-9.C.(11). The applicant has provided one handicap accessible parking space for the site which meets the minimum requirement.*

2. Administrative Review Codes (HR 276)

d. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(13) The applicant has shown proposed traffic signs and a freestanding sign within the site. The orientation of the 'No Left Turn' sign R3-2 at the entrance driveway appears to be facing the wrong direction.*
Current Fuss & O'Neill Comment: The applicant has provided information about the sign location. No further Fuss & O'Neill comment.
e. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(16). The applicant has not provided locations of driveways and parking ways within 200 feet of the site.*
Current Fuss & O'Neill Comment: The applicant has provided an aerial image on the plan to satisfy this requirement. No further Fuss & O'Neill comment.

3. Driveway Review Codes (HR 275-6.B/Chapter 193)

a. *Former Fuss & O'Neill Comment: HR-193. We note that the Town is redesigning the intersection of Belknap Road and County Road, and that design may impact the proposed site exit driveway as one of the options for that redesigned intersection is to make County Road northbound a dead end street prior to Belknap Road. The applicant should coordinate with the Town Engineer regarding proposed improvements or confirm that this coordination has already taken place.*
Current Fuss & O'Neill Comment: The applicant has confirmed that they have coordinated with the Town Engineer and that there is no conflict with the current design. No further Fuss & O'Neill comment.
b. *Former Fuss & O'Neill Comment: HR 193.10.E. The applicant has provided information in the Traffic Study noting that adequate sight distance is provided for the proposed driveways.*
c. *Former Fuss & O'Neill Comment: HR 193.10.G. We note that the applicant has proposed keeping the two existing driveways for the site. We note that their exact locations have been adjusted but are in the general areas of the existing driveway aprons.*

Attachment "H"
FUSS & O'NEILL

4. **Traffic (HR 275-9.B)**
   a. *Former Fuss & O'Neill Comment: HR 275-9.B. Fuss & O'Neill will be providing comments on the review of the Traffic Impact Study under a separate review letter.*
   Current Fuss & O'Neill Comment: A traffic review letter dated October 29, 2024, was provided by Fuss & O'Neill. We note that the only concern was the site driveway layout due to the Belknap Road extension project. The applicant has confirmed with the Town Engineer that the current layout proposed will not conflict with the design. No further Fuss & O'Neill comment.

5. **Utility Design/Conflicts**
   a. *Former Fuss & O'Neill Comment: HR 275-9.E & 276-13. The applicant has proposed to connect the sewer service for the site to existing sewer stub on site.*
   c. *Former Fuss & O'Neill Comment: Hudson Engineering Technical Guidelines Typical Details (ETGTD) Section 720.8.3 and Detail S-6. The applicant has proposed a cleanout at the sewer service change of direction. The applicant should confirm with the Town Engineer if a manhole is required due to commercial and/or industrial use.*
   Current Fuss & O'Neill Comment: The applicant stated that the design was reviewed with the Town Engineer and a sewer manhole was added where the sewer service meets the existing pipe. The cleanout remains at the direction change. No further Fuss & O'Neill comment.
   d. *Former Fuss & O'Neill Comment: ETGTD Section 720.8.5. The applicant should note on the plans that floor drains, roof drains, sump pumps, or any other non-sanitary sewerage drain cannot be connected to the building's sewer service connection.*
   Current Fuss & O'Neill Comment: The applicant has added the recommended note to the plans. No further Fuss & O'Neill comment.
   e. *Former Fuss & O'Neill Comment: HR 275-9.E & 276-13. The applicant should review with the Town to confirm the availability of sufficient water flow to accommodate the site.*
   Current Fuss & O'Neill Comment: The applicant noted that the flow has been confirmed. No further Fuss & O'Neill comment.
   g. *Former Fuss & O'Neill Comment: The proposed water service is shown directly within the proposed infiltration trench adjacent to the entrance driveway. The infiltration trench detail does not show a proposed depth, nor are there any notes within the water service trench detail regarding coordination between these two proposed site features.*
   Current Fuss & O'Neill Comment: The applicant has revised the water connection location outside of the trench. No further Fuss & O'Neill comment.
   h. *Former Fuss & O'Neill Comment: The applicant should update the Building Water Service detail notes to reference Town of Hudson requirements, not Town of Salem.*
   Current Fuss & O'Neill Comment: The applicant has revised the detail notes. No further Fuss & O'Neill comment.

6. **Drainage Design/Stormwater Management (HR 275-9.A./Chapter 290)**
   a. *Former Fuss & O'Neill Comment: HR 275-5.A.(5). The applicant has proposed peak flow increases within the 25-year and 50-year storm events. The applicant should review with the Town if such increases are reasonable and allowable and if a waiver is required.*
   Current Fuss & O'Neill Comment: The applicant has revised drainage to reduce stormwater flows in all storms analyzed. No further Fuss & O'Neill comment.
   b. *Former Fuss & O'Neill Comment: HR 275-5.A.(7). With the increases listed in the comment above, the applicant should review with the Town if flooding of downstream properties is a concern.*
   Current Fuss & O'Neill Comment: The applicant has revised drainage to reduce stormwater flows in all storms analyzed. No further Fuss & O'Neill comment.
   d. *Former Fuss & O'Neill Comment: HR 275-5.A.(11). We note the existing conditions utilized takes into account a "previously razed residence" with driveway. Google maps illustrate this residence was razed sometime between September 2007 and August of 2011. This window of time represents nearly a 15-year timeframe, in which the property has established brush or field-grass type of growth for groundcover. The applicant should review with the Town if the*

Attachment "H"
FUSS & O'NEILL

pre-development existing conditions "residential paved/gravel/roofs" utilized properly models the ground cover conditions that have been in effect for approximately 15 years.
Current Fuss & O'Neill Comment: The applicant has reviewed the design with the Town. No further Fuss & O'Neill comment.

f. *Former Fuss & O'Neill Comment: HR 275-5.A.(11). With the increase in runoff proposed in the 10-year and 25-year storm analysis, we note the existing and proposed conditions models site runoff as one analysis point. It appears the site produces a sheet flow discharge to the property to the north (TM 198-L146), as well as west toward the Lowell Rd/County Rd ROW. The applicant should provide additional stormwater calculations to illustrate that stormwater does not increase at property lines, which may adversely impact the property owner and roadways.*
Current Fuss & O'Neill Comment: The applicant has revised drainage to reduce stormwater flows in all storms analyzed. No further Fuss & O'Neill comment.

g. *Former Fuss & O'Neill Comment: HR 275-5.A.(11). The applicant should provide additional information as to the design intent of the Infiltration Trench Cross Section Detail upon Sheet 9. It is uncertain if the detail is intended to have filter fabric line the perimeter of the stone. It is recommended filter fabric be noted to ensure the lifespan of the drainage feature. Also please provide additional information on the "observation well, with screw top lid" illustrated, including but not limited to material, size, height below grade, height above grade, perforated/solid, etc. Is this vertical well port connected to a horizontal pipe element of the design? If so, additional information is required.*
Current Fuss & O'Neill Comment: The applicant updated the details. No further Fuss & O'Neill comment.

h. *Former Fuss & O'Neill Comment: HR 275-5.A.(11). The applicant should provide the overflow outlet dimensions and elevation upon the plan set, with an overflow detail.*
Current Fuss & O'Neill Comment: The applicant updated the details. No further Fuss & O'Neill comment.

i. *Former Fuss & O'Neill Comment: HR 275-5.A.(11). The applicant should provide additional information on the design of the infiltration trenches. It is noted that the HydroCAD utilizes a 3' deep flat/level infiltration trench for volume, while the design plans illustrate varying grade designs for both trenches. The sloped/varying grade will affect the infiltration ability, as well as the hydraulics, and modeling of storage capacity prior to infiltration or overflow.*
Current Fuss & O'Neill Comment: The applicant updated the details. No further Fuss & O'Neill comment.

j. *Former Fuss & O'Neill Comment: HR 275-5.A.(12). The applicant should provide the following:*

    ii. *Former Fuss & O'Neill Comment: Separate naming/labeling of the infiltration trenches, to ensure both are maintained.*

    Current Fuss & O'Neill Comment: The applicant labeled the Infiltration Trenches. No further Fuss & O'Neill comment.

    iii. *Former Fuss & O'Neill Comment: Additional direction should include, but not be limited to the following: prepared by, party responsible during construction, party responsible after construction, timing (months/years) of inspections, depth of sediment cleaning requirements, recommended maintenance debris disposal methods, etc.*

    Current Fuss & O'Neill Comment: The applicant updated the I&M Manual. Obviously the I&M is long term, not during construction, that is the purpose of an I&M manual. No further Fuss & O'Neill comment.

    iv. *Former Fuss & O'Neill Comment: The I&M states to "contact a professional if loss of infiltration is observed", please note the intended professional.*

    Current Fuss & O'Neill Comment: The applicant updated the I&M Manual. No further Fuss & O'Neill comment.

k. *Former Fuss & O'Neill Comment: The applicant will be required to comply with all provisions of the Town of Hudson's MS4 permit, including but not limited to annual reporting requirements, construction site stormwater runoff control, and record keeping requirements. The applicant has noted that the project has been designed to meet MS4 requirements.*

l. *Former Fuss & O'Neill Comment: Please note that this review was carried out in accordance with applicable regulations and standards in place in New Hampshire at this time. Note that conditions at the site, including average weather conditions, patterns and trends, and design storm characteristics, may change in the future. In addition, future changes in federal, state or local laws, rules or regulations, or in generally accepted scientific or industry information concerning environmental, atmospheric and geotechnical conditions and developments may affect the information and conclusions set forth in this review. In no way shall Fuss & O'Neill be liable for any of these changed conditions that may impact this review, regardless of the source of or reason for such changed conditions. Other than as described herein, no other investigation or analysis has been requested by the Client or performed by Fuss & O'Neill in preparing this review.*

7. Zoning (ZO 334)

a. *Former Fuss & O'Neill Comment: ZO 334-17 & 334-21. The subject parcel is located within the Business (B) zoning district and the applicant has noted this on the plans. The proposed commercial use is allowed within the district.*

b. *Former Fuss & O'Neill Comment: The applicant has noted that no wetlands are present on site.*

c. *Former Fuss & O'Neill Comment: ZO 334-58. The applicant has shown a proposed freestanding sign location on the plans but has not included any size or detail information for that sign.*
Current Fuss & O'Neill Comment: The applicant has provided the sign detail on the plan set. The size appears to meet the Ordinance requirements. No further Fuss & O'Neill comment.

d. *Former Fuss & O'Neill Comment: ZO 334-83 and HR 218-4.E. The applicant has noted that the site is not located within a Food Hazard Area.*

e. *Former Fuss & O'Neill Comment: ZO 334 Attachment 4. The applicant has shown the proposed retaining wall partially within the 15-foot side setback. The applicant should review with the Town if a retaining wall is considered a structure that needs to meet setback requirements, and if the wall needs to be moved within the building setback envelope or if a variance is required.*
Current Fuss & O'Neill Comment: The retaining wall has been moved from the setback. No further Fuss & O'Neill requirement.

8. Erosion Control/Wetland Impacts

a. *Former Fuss & O'Neill Comment: The applicant should note that the Town of Hudson reserves the right to require any additional erosion control measures as needed.*

9. Landscaping (HR 275-8.C.(7) & 276-11.1.B.(20)) and Lighting (HR 276-11.1.B.(14))

a. *Former Fuss & O'Neill Comment: HR 275-8.C.(8). The applicant has proposed to leave existing vegetation between the site and the property to the south. The abutting site to the south appears to be a residential home and therefore would require screening from parking areas. The applicant should confirm that they believe the existing vegetation to be dense enough to meet the screening intent.*
Current Fuss & O'Neill Comment: The applicant has confirmed that they feel the foliage is dense enough to meet this requirement. No further Fuss & O'Neill comment.

b. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(14). The applicant has provided a lighting plan. We note that at the north and south sides of the site, the plan shows light levels greater than 0.2 and up to 0.8 footcandles at the lot property lines. The applicant should review the design to reduce these amounts wherever practical. This would be especially important for the lot line to the south that abuts a residential use. We note that the proposed light pole fixtures*

have a 35' mounting height which seems excessive for the intended use and are likely contributing to the light trespass at the property lines.
Current Fuss & O'Neill Comment: Th applicant has revised the lighting plan to remove the light trespass and also reduce the height of the light poles. No further fuss & O'Neill comment.

c. *Former Fuss & O'Neill Comment: The applicant should note the hours of operation for the site and the relationship of those hours to the site lighting.*
Current Fuss & O'Neill Comment: The applicant has added the requested information to the plan set. No further Fuss & O'Neill comment.

d. *Former Fuss & O'Neill Comment: The applicant has not proposed any landscaping on site.*

10. State and Local Permits (HR 275-9.G.)

a. *Former Fuss & O'Neill Comment: HR 275-9.G. The applicant should list the required permits and their status on the plan set.*
Current Fuss & O'Neill Comment: The applicant has added the requested information to the plan. No further Fuss & O'Neill comment.

b. *Former Fuss & O'Neill Comment: HR 275-9.G. The applicant should provide copies of any applicable Town, State or Federal approvals or permits.*

c. *Former Fuss & O'Neill Comment: Additional local and state permitting may be required.*

11. Other

a. *Former Fuss & O'Neill Comment: The applicant should note the need for the retaining wall design to be completed and stamped by a NH Professional Engineer and submitted to the Town for review.*
Current Fuss & O'Neill Comment: The applicant has added this note to the plan set. No further Fuss & O'Neill comment.

c. *Former Fuss & O'Neill Comment: The applicant should include a pavement patch detail for the water service connection within Lowell/County Road.*
Current Fuss & O'Neill Comment: The applicant has added the detail to the plan set. No further Fuss & O'Neill comment.

Please feel free to call if you have any questions.

Very truly yours,

Steven W. Reichert, P.E.

SWR:

Enclosure

cc: Town of Hudson Engineering Division – File
SFC Engineering – dflores@sfceng.com

Attachment "I"

SFC ENGINEERING

March 5, 2025

Jay Minkarah
Acting Town Planner
12 School Street
Hudson, NH 03051

RE: **Fuss & O'Neill Site Plan Review #2 Dated February 19, 2025**
Inside Out Painting and Remodeling 100 Lowell Road (Tax Map 198, Lot 147)

Mr. Jay Minkarah,

We are in receipt of the site plan review comments by Fuss & O'Neill dated February 19, 2025 for the Inside Out Painting and Remodeling project located at 100 Lowell Road (tax map 198 lot 147).

The following are the Fuss & O'Neill second round of review comments in **bold,** with SFC responses in **BLUE**.

1. Site Plan Review Codes (HR 275)

g. HR 275-9.F. The applicant did not provide copies of easements or deeds as part of the package received for review. No easements are shown on the Existing Conditions plan or the proposed plans.

Current Fuss & O'Neill Comment: The applicant stated that a copy of the deed was attached. We note that a copy was not provided in the package received for review.

Please see the attached deed from Hillsborough County Registry of Deeds (book 9752 page 1966).

5. Utility Design/Conflicts

b. HR 275-9.E & 276-13. The applicant is proposing a sewer service from the building with less than 2 feet of cover where it leaves the building and similar minimal cover where the sewer service pipe extends around the edge of the bioretention basin.

Current Fuss & O'Neill Comment: The applicant has revised the cover over the sewer service at the building but we continue to note approximately 2 feet of cover around the bioretention basin.

SFC has reviewed this with the Town Engineer on February 21, 2025. He has requested a detail be added to show a minimum of 2" insulation on top and around the private service for any section with less than 4' cover. See note #17 on Site Grading & Utilities Plan (plan sheet 4) and detail showing insulation added to the Construction Details (plan sheet 9).

f. HR 275-9.E & 276-13. The applicant has noted that the proposed water service size shall be per the building design. The size of the existing service that is being tied into is not noted on the plans. If a larger size than existing is required to accommodate the proposed building use then the water service should be replaced to the water main, not connected to a smaller service stub. If the existing water service stub is being replaced the curb stop should be relocated to the property line per ETGTD detail W-19 or W-20.

Current Fuss & O'Neill Comment: The applicant has revised the plan to show a new 6-inch service from the existing main within the roadway. The applicant should provide a detail for this connection and curb stop detail.

The connection and curb stop detail have been added to the Construction Details (plan sheet 9).

6. Drainage Design/Stormwater Management (HR 275-9.A./Chapter 290)

c. HR 275-5.A.(9). The applicant should provide the BMP worksheets for the three proposed treatment practices.

Current Fuss & O'Neill Comment: The applicant has provided BMP worksheets. The SSSNNE Ksat spreadsheet was provided within the drainage report. The applicant should provide additional information on the use of infiltration rates of 10 in/hr for the proposed basin and infiltration trenches. The applicant should also provide additional information on the use of the C horizon infiltration rate, rather than the B horizon. The applicant should provide additional information on the use of infiltration rates of 1 in/hr for the proposed permeable pavers. We note there are test pits utilized within the design that do not fall within the footprint of the infiltration systems. The applicant should review with the Town Engineer if additional test pits are required for the Basin and permeable paver locations.

Our design is consistent with Env-Wq 1504.14(c)(1), which requires that the lowest Ksat value in the range for the most limiting layer located 0 to 5 feet below the proposed bottom of the practice be used. We have reviewed the practices against the test pits and note that the C value for Hinkley soil of 20 in/hr meets this requirement. We have used half this value, per Env-Wq 1504.14(c)(3).

The 1 in/hr infiltration has been revised to 3 in/hr to reflect exfiltration within the B horizon given the practice is only 31" deep. We have attached the updated HydroCAD printout for the porous pavement sections that shows this change. Note that no change results to the pre-post evaluation for the site. The Table One: Runoff Rate Comparison in the previously submitted drainage report does not require any update due to this change.

SFC has reviewed the need for additional test pits with the Town Engineer on March 4, 2025. Based on that review, we have added note #18 to the Site Grading & Utilities Plan (plan sheet 4) that states "additional test pits at the bioretention and porous pavement areas will be observed and witnessed by Hudson Engineering Department to confirm soils before these practices are constructed."

e. HR 275-5.A.(11). The applicant should review the use of a 5min Tc in the existing conditions. Measuring from PDF, it appears an approximate 125'-150'± long Tc time/path could be longer than 5min. This path flows diagonally from the southeast of the property to the northwest property line.

Current Fuss & O'Neill Comment: The applicant has revised Tc path and updated HydroCAD. The applicant should also provide additional information on the use of a Tc of 692 minutes for Subcatchments 2.1P and 2.2P.

Per HydroCAD.net - When modeling porous pavement, a Tc value of 790 minutes has produced good predictions for final discharge from porous pavement with a 41" base (this approach has been studied by UNH Stormwater Center). A proportional Tc can be used for smaller base thicknesses, as long as the layers remain proportional and in accordance with the UNH Specifications.

With a proposed porous pavement section thickness of 31" a proportional Tc value of 692 minutes was used where 597 minutes should have been used. This has been changed in HydroCAD with no adverse effect to the outcome. The revised Porous Pavement nodes from HydroCAD have been attached.

j. HR 275-5.A.(12). The applicant should provide the following:

i. A BMP location map in the I&M Manual. This will ensure both of the infiltration trenches and the basin are maintained as required.

Current Fuss & O'Neill Comment: **The applicant has included an I&M Manual. The applicant should note upon the I&M, as well as the Plan Set, that removing of pavers or sealing of the pervious pavers is not allowed. Future owners/maintenance crews might not be aware of the implications to drainage design, if this area is converted to impervious ground cover.**

Note #23 has been added to the Site Development Plan (plan sheet 3), and information is included in the I&M Manual on page 2.

The following items require Town evaluation or input:

1. Site Plan Review Codes (HR 275)

d. HR 275-8.C.(2)(a) and Zoning Ordinance (ZO) 334-15.A. The applicant has provided parking calculations on the plan set which show that 23 parking spaces are required for the professional office and business services use. The applicant has requested a waiver from the Regulation to allow only 11 parking spaces on site. Note #2 under Waiver Requests on the Site Development Plan should be revised to note 275-8.C.(2)(m), not 75-8.C.(2)(m).

Current Fuss & O'Neill Comment: The plan has been updated to propose 14 parking spaces. The applicant has updated the waiver note.

No Comment.

e. HR 275-8.C.(6).(b). The applicant has shown one loading area on the plan set. The applicant should review the need for a waiver from the size requirement as the space is only 35 feet long and 60 feet is required.

Current Fuss & O'Neill Comment: The applicant has added a waiver request note to the plan set for the loading space dimensions and confirmed that the shorter loading space will be sufficient for the vehicles expected on site.

No Comment.

2. Administrative Review Codes (HR 276)

a. HR 276-11.1.B.(6). The applicant should add the owner's signature to the plan set for the final approval copy.

Current Fuss & O'Neill Comment: The applicant has noted that the final plans will be signed for the Town.

No Comment.

c. HR 276-11.1.B.(12)(c). The applicant has not provided any information regarding the 100-foot setback required on the south side of the site where there is an abutting residential use.

Current Fuss & O'Neill Comment: The applicant has added a waiver to the plan requesting relief from this requirement.

No Comment.

11. Other

b. The site appears to be missing lot monumentation based on the Existing Conditions Plan. The applicant should review the need to add monumentation to the site.

Current Fuss & O'Neill Comment: The applicant has stated they do not plan to add monumentation. The Town should confirm that additional monumentation is not necessary.

SFC has reviewed this with the Town Engineer on February 21, 2025. He agrees that since this is an existing lot and no new boundaries are being proposed, no additional monumentation is necessary.

Sincerely,
SFC ENGINEERING PARTNERSHIP, INC.

Daniel M. Flores, P.E.
Vice President - Civil Engineering

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,931	39	>75% Grass cover, Good, HSG A (2.1P, 2.2P)
210	98	Retaining Wall, HSG A (2.2P)
4,185	98	Unconnected pavement, HSG A (2.1P, 2.2P)
400	30	Woods, Good, HSG A (2.2P)
6,726	**77**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
6,726	HSG A	2.1P, 2.2P
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
6,726		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>0.64"
Tc=597.0 min CN=88 Runoff=0.0 cfs 169 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.15"
Tc=597.0 min CN=67 Runoff=0.0 cfs 46 cf

Pond PP-1: Porous Pavement Peak Elev=161.07' Storage=2 cf Inflow=0.0 cfs 169 cf
Outflow=0.0 cfs 167 cf

Pond PP-2: Porous Pavement Peak Elev=160.92' Storage=1 cf Inflow=0.0 cfs 46 cf
Outflow=0.0 cfs 45 cf

Total Runoff Area = 6,726 sf Runoff Volume = 215 cf Average Runoff Depth = 0.38"
34.66% Pervious = 2,331 sf 65.34% Impervious = 4,395 sf

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 169 cf, Depth> 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

	Area (sf)	CN	Description
	2,635	98	Unconnected pavement, HSG A
	515	39	>75% Grass cover, Good, HSG A
	3,150	88	Weighted Average
	515		16.35% Pervious Area
	2,635		83.65% Impervious Area
	2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 46 cf, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Pond PP-1: Porous Pavement

Inflow Area = 3,150 sf, 83.65% Impervious, Inflow Depth > 0.64" for 2-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 169 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 167 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 167 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.07' @ 20.00 hrs Surf.Area= 2,176 sf Storage= 2 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 2.5 min calculated for 167 cf (99% of inflow)
Center-of-Mass det. time= 1.0 min (1,064.0 - 1,063.1)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=161.07' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.0 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.15" for 2-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 46 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 45 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 45 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.92' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 1 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 2.5 min calculated for 45 cf (99% of inflow)
Center-of-Mass det. time= 0.9 min (1,086.4 - 1,085.6)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.92' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>1.25"
Tc=597.0 min CN=88 Runoff=0.0 cfs 328 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.47"
Tc=597.0 min CN=67 Runoff=0.0 cfs 139 cf

Pond PP-1: Porous Pavement Peak Elev=161.07' Storage=3 cf Inflow=0.0 cfs 328 cf
Outflow=0.0 cfs 325 cf

Pond PP-2: Porous Pavement Peak Elev=160.92' Storage=2 cf Inflow=0.0 cfs 139 cf
Outflow=0.0 cfs 137 cf

Total Runoff Area = 6,726 sf Runoff Volume = 467 cf Average Runoff Depth = 0.83"
34.66% Pervious = 2,331 sf 65.34% Impervious = 4,395 sf

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 19.92 hrs, Volume= 328 cf, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

	Area (sf)	CN	Description
	2,635	98	Unconnected pavement, HSG A
	515	39	>75% Grass cover, Good, HSG A
	3,150	88	Weighted Average
	515		16.35% Pervious Area
	2,635		83.65% Impervious Area
	2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 139 cf, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.77"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Pond PP-1: Porous Pavement

Inflow Area = 3,150 sf, 83.65% Impervious, Inflow Depth > 1.25" for 10-YR event
Inflow = 0.0 cfs @ 19.92 hrs, Volume= 328 cf
Outflow = 0.0 cfs @ 19.95 hrs, Volume= 325 cf, Atten= 0%, Lag= 1.8 min
Discarded = 0.0 cfs @ 19.95 hrs, Volume= 325 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.07' @ 19.95 hrs Surf.Area= 2,176 sf Storage= 3 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 2.5 min calculated for 325 cf (99% of inflow)
Center-of-Mass det. time= 1.0 min (1,054.6 - 1,053.7)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 19.95 hrs HW=161.07' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.1 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.47" for 10-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 139 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 137 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 137 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.92' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 2 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 2.5 min calculated for 137 cf (98% of inflow)
Center-of-Mass det. time= 0.9 min (1,079.1 - 1,078.2)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.92' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.0 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>1.65"
Tc=597.0 min CN=88 Runoff=0.0 cfs 434 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.71"
Tc=597.0 min CN=67 Runoff=0.0 cfs 213 cf

Pond PP-1: Porous Pavement Peak Elev=161.07' Storage=4 cf Inflow=0.0 cfs 434 cf
Outflow=0.0 cfs 430 cf

Pond PP-2: Porous Pavement Peak Elev=160.92' Storage=3 cf Inflow=0.0 cfs 213 cf
Outflow=0.0 cfs 210 cf

Total Runoff Area = 6,726 sf Runoff Volume = 647 cf Average Runoff Depth = 1.15"
34.66% Pervious = 2,331 sf 65.34% Impervious = 4,395 sf

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 19.91 hrs, Volume= 434 cf, Depth> 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

	Area (sf)	CN	Description
	2,635	98	Unconnected pavement, HSG A
	515	39	>75% Grass cover, Good, HSG A
	3,150	88	Weighted Average
	515		16.35% Pervious Area
	2,635		83.65% Impervious Area
	2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 213 cf, Depth> 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.82"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Pond PP-1: Porous Pavement

Inflow Area = 3,150 sf, 83.65% Impervious, Inflow Depth > 1.65" for 25-YR event
Inflow = 0.0 cfs @ 19.91 hrs, Volume= 434 cf
Outflow = 0.0 cfs @ 19.95 hrs, Volume= 430 cf, Atten= 0%, Lag= 2.5 min
Discarded = 0.0 cfs @ 19.95 hrs, Volume= 430 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.07' @ 19.95 hrs Surf.Area= 2,176 sf Storage= 4 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 2.5 min calculated for 428 cf (99% of inflow)
Center-of-Mass det. time= 0.9 min (1,050.0 - 1,049.1)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 19.95 hrs HW=161.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.71" for 25-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 213 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 210 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 210 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.92' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 3 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 2.5 min calculated for 209 cf (98% of inflow)
Center-of-Mass det. time= 0.9 min (1,075.9 - 1,074.9)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 20.00 hrs HW=160.92' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2.1P: Runoff Area=3,150 sf 83.65% Impervious Runoff Depth>1.96"
Tc=597.0 min CN=88 Runoff=0.0 cfs 514 cf

Subcatchment2.2P: Runoff Area=3,576 sf 49.22% Impervious Runoff Depth>0.91"
Tc=597.0 min CN=67 Runoff=0.0 cfs 272 cf

Pond PP-1: Porous Pavement Peak Elev=161.08' Storage=5 cf Inflow=0.0 cfs 514 cf
Outflow=0.0 cfs 509 cf

Pond PP-2: Porous Pavement Peak Elev=160.93' Storage=3 cf Inflow=0.0 cfs 272 cf
Outflow=0.0 cfs 269 cf

Total Runoff Area = 6,726 sf Runoff Volume = 787 cf Average Runoff Depth = 1.40"
34.66% Pervious = 2,331 sf 65.34% Impervious = 4,395 sf

Summary for Subcatchment 2.1P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 19.90 hrs, Volume= 514 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

	Area (sf)	CN	Description
	2,635	98	Unconnected pavement, HSG A
	515	39	>75% Grass cover, Good, HSG A
	3,150	88	Weighted Average
	515		16.35% Pervious Area
	2,635		83.65% Impervious Area
	2,635		100.00% Unconnected

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

Summary for Subcatchment 2.2P:

[73] Warning: Peak may fall outside time span

Runoff = 0.0 cfs @ 20.00 hrs, Volume= 272 cf, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=6.59"

	Area (sf)	CN	Description
	1,550	98	Unconnected pavement, HSG A
	400	30	Woods, Good, HSG A
	1,416	39	>75% Grass cover, Good, HSG A
*	210	98	Retaining Wall, HSG A
	3,576	67	Weighted Average
	1,816		50.78% Pervious Area
	1,760		49.22% Impervious Area
	1,550		88.07% Unconnected

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

Summary for Pond PP-1: Porous Pavement

Inflow Area = 3,150 sf, 83.65% Impervious, Inflow Depth > 1.96" for 50-YR event
Inflow = 0.0 cfs @ 19.90 hrs, Volume= 514 cf
Outflow = 0.0 cfs @ 19.95 hrs, Volume= 509 cf, Atten= 0%, Lag= 2.9 min
Discarded = 0.0 cfs @ 19.95 hrs, Volume= 509 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 161.08' @ 19.95 hrs Surf.Area= 2,176 sf Storage= 5 cf
Flood Elev= 163.65' Surf.Area= 2,176 sf Storage= 2,110 cf

Plug-Flow detention time= 2.5 min calculated for 509 cf (99% of inflow)
Center-of-Mass det. time= 0.9 min (1,047.1 - 1,046.1)

Volume	Invert	Avail.Storage	Storage Description
#1	161.07'	2,110 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.07	2,176	0.0	0	0	2,176
161.57	2,176	40.0	435	435	2,269
161.82	2,176	35.0	190	626	2,316
162.82	2,176	35.0	762	1,387	2,503
163.65	2,176	40.0	722	2,110	2,657

Device	Routing	Invert	Outlet Devices
#1	Discarded	161.07'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 19.95 hrs HW=161.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Summary for Pond PP-2: Porous Pavement

Inflow Area = 3,576 sf, 49.22% Impervious, Inflow Depth > 0.91" for 50-YR event
Inflow = 0.0 cfs @ 20.00 hrs, Volume= 272 cf
Outflow = 0.0 cfs @ 20.00 hrs, Volume= 269 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.0 cfs @ 20.00 hrs, Volume= 269 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 160.93' @ 20.00 hrs Surf.Area= 1,550 sf Storage= 3 cf
Flood Elev= 163.50' Surf.Area= 1,550 sf Storage= 1,503 cf

Plug-Flow detention time= 2.5 min calculated for 269 cf (99% of inflow)
Center-of-Mass det. time= 0.9 min (1,073.9 - 1,072.9)

Volume	Invert	Avail.Storage	Storage Description
#1	160.92'	1,503 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
160.92	1,550	0.0	0	0	1,550
161.42	1,550	40.0	310	310	1,629
161.67	1,550	35.0	136	446	1,668
162.67	1,550	35.0	543	988	1,826
163.50	1,550	40.0	515	1,503	1,956

Device	Routing	Invert	Outlet Devices
#1	Discarded	160.92'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 20.00 hrs HW=160.93' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

100 Lowell Road, Hudson, New Hampshire

Return to:
100 Lowell Rd LLC
122 Lowell Road, Suite 3
Hudson, NH 03051

Transfer Tax:

E- Doc # 240001360 01/16/2024 11:22:24 AM
Book 9752 Page 1966 Page 1 of 2
Mary Ann Crowell
Register of Deeds, Hillsborough County
LCHIP HIA727635 25.00
TRANS TAX HI158134 3,900.00

WARRANTY DEED

KNOW ALL BY THESE PRESENTS, THAT, **Brian H. Craven, Trustee of the Nancy J. Craven Revocable Trust**, u/d/t dated February 12, 1999 and **Brian H. Craven, Trustee of the Ronald D. Craven Revocable Trust**, u/d/t dated February 12, 1999, with a mailing address of 88 Speare Road, Hudson, Hillsborough County, New Hampshire 03051, for consideration paid, grants to **100 Lowell Rd LLC**, a New Hampshire limited liability company with a principal place of business at 122 Lowell Road, Suite 3, Hudson, New Hampshire 03051, with WARRANTY COVENANTS, the following described premises:

A certain tract of land, with the buildings thereon, situated on the Easterly side of Lowell Road and also of Old County Road, at the junction of said roads in Hudson, New Hampshire, said premises being designated as Lot No. 2 as shown on plan of land prepared for Felix Maynard by Roland R. Girouard, Surveyor, dated October, 1969, and recorded as Plan #4281 more particularly bounded and described as follows:

Beginning at an iron pipe set in the Easterly line of Lowell Road at the Northwest corner of land now or formerly of Felix Maynard, designated as Lot 1 on said plan, and at the Southwest corner of the premises; thence South 86 degrees 27 minutes East, along said Lot No. 1 on said plan, a distance of two hundred forty-eight and one hundredths (248.1) feet, more or less, to an iron pipe at land now or formerly of Edmond Jette et ux; thence North 8 degrees 42 minutes West along said Jette land, a distance of eighty-two and twenty hundredths (82.20) feet, more or less, to an iron pipe at other land of said Jette; thence North 70 degrees 36 minutes East along said Jette land, a distance of sixty-seven and fifty hundredths (67.50) feet, more or less, to a stone bound at the Southeast corner of Lot No. 3 on said Felix Maynard plan; thence North 73 degrees 46 minutes West along said Lot No. 3, a distance of two hundred fifty-nine and sixty hundredths (259.60) feet, more or less, to an iron pipe in the Easterly line of Old County Road; thence in a Southwesterly direction along said Old County Road, a distance of seventy-two (72) feet, more or less, to an iron pipe in said Road, approximately at a point where Old County Road joins with Lowell Road; thence in a Southwesterly and Southeasterly direction, following a curved line as shown on aforesaid plan, along said Lowell Road, a distance of fifty-nine and twenty hundredths (59.20) feet, to an iron pipe set in the Easterly line of said Lowell Road; thence Southerly along said Lowell Road, a distance of forty (40) feet to the point of beginning.

Subject to right of entry to haul or service an irrigation pump as more particularly set forth in deed recorded in Book 1593, Page 74.

Meaning and intending to describe and convey the same premises conveyed to the Ronald D. Craven Revocable Trust and Nancy J. Craven Revocable Trust by Deed dated November 8, 2008 and recorded in the Hillsborough County Registry of Deeds in Book 8034, Page 1233 on November 18, 2008.

THIS IS NOT HOMESTEAD PROPERTY.

WITNESS my hand this 17 day of January, 2024.

RONALD D. CRAVEN REVOCABLE TRUST

Amy S LaViolette
Witness

By: Brian H Craven
Brian H. Craven, Trustee

NANCY J. CRAVEN REVOCABLE TRUST

Amy S. LaViolette
Witness

By: Brian H Craven
Brian H. Craven, Trustee

STATE OF NEW HAMPSHIRE
COUNTY OF HILLSBOROUGH

On this 17 day of January, 2024, personally appeared Brian H. Craven, in his capacity as Trustee of the Nancy J. Craven Revocable Trust, u/d/t dated February 12, 1999 and as Trustee of the Ronald D Craven Revocable Trust, u/d/t dated February 12, 1999, known to me, or satisfactorily proven, to be the person whose name is subscribed to the foregoing instrument and acknowledged that he executed the same for the purposes therein contained.

Before me,

AMY S. LaVIOLETTE
MY COMMISSION EXPIRES APRIL 17, 2024
NOTARY PUBLIC
NEW HAMPSHIRE

Amy S. LaViolette
Notary Public
My commission expires: 4/17/2024

Attachment "J"

TOWN OF HUDSON

Planning Department

12 School Street · Hudson, New Hampshire 03051 · Tel: 603-886-6008 · Fax: 603-594-1142

CAP FEE WORKSHEET - 2024

Date: __11/13/24__ **Zone #** __2__ **Map/Lot:** __198-147-000__
100 Lowell Road

Project Name: __Inside Out Painting & Remodeling Site Plan__

Proposed ITE Use #1: __General Office__

Proposed Building Area (square footage): __6,855__ **S.F.**

CAP FEES: (ONE CHECK NEEDED)

1.	**(Bank 09) 2070-702**	**($2.55 x 6,855) Traffic Improve (Zone 2)**	**$ 17,480.25**
		Total CAP Fee	**$ 17,480.25**

CAP FEE to be paid prior to Certificate of Occupancy application.

Check should be made payable to the Town of Hudson

Thank you,

Brooke Dubowik

Planning Administrative Aide II