1 BOCKES ROAD SITE PLAN & CONDITIONAL USE PERMIT

SP# 11-25 & CUP# 04-25

STAFF REPORT

December 10, 2025

SITE: 1 Bockes Road, Map 145/Lot 001-000

ZONING: General - 1 (G-1)

PURPOSE OF PLAN: to propose a 12,000 SF multi-tenant retail building with associated parking and drainage improvements. The retaining wall and minor site grading will encroach into the 75-foot wetland buffer.

PLAN UNDER REVIEW:

1 Bockes Road Non-Residential Site Plan, SP# 11-25 & CUP# 04-25, Map 145 Lot 001, 1 Bockes Road, Hudson, NH; prepared by: Greenman-Pedersen, Inc. (GPI), 44 Stiles Road, Salem, NH 03079; prepared for: 1 Bockes Road LLC, 25 Pelham Road STE 103, Salem, NH 03079 consisting of 16 sheets and general notes 1-20 on Sheet 2; dated October 21, 2025, revised November 20, 2025.

ATTACHMENTS:

1) Site Plan & CUP Applications and associated waiver request, received October 21, 2025– Attachment "**A**".
2) Project Narrative – Attachment "**B**"
3) Department Review Comments – Attachment "**C**."
4) Stormwater Management Report, prepared by GPI, Revised November 20, 2025 – Attachment "**D**". (Digital Only)
5) Inspection & Maintenance Plan, prepared by GPI, Revised November 20, 2025 – Attachment "**E**". (Digital Only)
6) Trip Generation Letter, prepared by GPI, dated October 16, 2025 – Attachment "**F**"
7) Peer review memo, prepared by Fuss & O'Neill, dated November 11, 2025 – Attachment "**G**".
8) Peer Review Response Letter, prepared by GPI, dated November 20, 2025 – Attachment "**H**".
9) CAP fee sheet – Attachment "**I**".
10) 2010 Site Plan Development Agreement & Approved Site Plan – Attachment "**J**".
11) NHDOT Driveway Permit dated November 20, 2025 – Attachment "**K".**
12) Site Plan dated October 2, 2024, Revised January 7, 2025.

APPLICATION TRACKING:

- October 21, 2025 – Site plan & CUP applications received.
- November 20, 2025 – Revised application materials received.
- December 10, 2025 – Public Hearing scheduled.

WAIVERS REQUESTED:
§276.11.1.B.(12).(b) – 100' Residential Buffer
§290-5.A.4 – Groundwater Recharge Volume
§290-5.A.5 – Stormwater Volumes

COMMENTS & RECOMMENDATIONS:

BACKGROUND
The site is approximately 3.2 acres and is located in the General – One (G-1) zone, and is currently undeveloped, with a prior 2010 Site Plan approval but was never built. The approved Site Plan has since expired, which is why the applicant is seeking a new Site Plan approval. This site does not have access to Town water or sewer. No section of the property falls within FEMA designated flood zones. The site does contain wetlands along the north-eastern edge of the property. When the 2010 approval was obtained, the commercial wetland buffer was 50-feet. With the current buffer being 75-feet for commercial, the applicant needs to obtain a Conditional Use Permit. The site currently has no curb cuts, and is proposed to be serviced by one on Bockes Road, with no direct access to Central Street from the site. This site is an Asbestos Disposal Site (Inactive), with capped materials on parts of the site. The applicant is seeking three waivers, for which additional information may be found below.

DEPARTMENT COMMENTS
All Departments have indicated this project is ready for approval. Full Comments can be found in **Attachment "C."**

WAIVER REQUESTED
As noted above, the Applicant is seeking two waivers:

1. Waiver for Landscaping Requirements, **§276.11.1.B.(12).(b) – 100' Residential Buffer,** to allow for 88' of buffer where 100' would elsewise be required. The applicant states that the infringement is not detrimental to the nearby residence, it is across Bockes Road, and that additional landscape screening is proposed to compensate.

2. Waiver for Loading Space Dimensions, **§290-5.A.4 – Groundwater Recharge Volume**. The applicant states that due to being an Asbestos Disposal Site, standard infiltration of water is not practicable, and that stormwater will still be treated per town regulations.

3. Wavier for **§290-5.A.5 – Stormwater Volumes,** to allow for more runoff than would elsewise be allowed. This applicant states that this is due to it being an Asbestos Disposal Site, and that rates still meet town regulations.

STORMWATER MANAGEMENT REPORT
As part of the application, a Stormwater Management Report, revised November 20, 2025, has been supplied (Attachment "**D**"). This report concludes that there will be a decrease or no change in the peak rates of stormwater runoff leaving the property at the design point. Staff notes that some of the challenges with his site is due to it being an Asbestos Disposal Site.

TRIP GENERATION LETTER

The applicant has submitted a memo dated October 16, 2025, addressing trip generation associated with the site's development. The memo concludes that the anticipated increase in traffic volumes is not expected to significantly impact existing operating conditions along the corridor. The full memo may be found in Attachment "**F**".

DOT CORRESPONDENCE

NHDOT issued Driveway Permit# DOT-DRI-004086 (Attachment "**K**") on November 20, 2025. This permit supersedes the old Permit# 05-229-0010, but notes that all conditions stipulated in the original permit shall remain in effect under the new permit. The original design from 2010 is remaining largely intact. A copy of the original 2010 NHDOT Driveway Permit application, plan, and Town Correspondence can also be found in Attachment "**K**".

CONSERVATION COMMISSION

The Conditional Use Permit was first reviewed by the Conservation Commission on November 10, 2025, followed by a site walk on November 22, 2025. The next meeting to discuss the project is scheduled for December 8, 2025. During the initial review, the Commission identified several design critiques and requested modifications related to the on-site drainage pond located within the wetland buffer. The revised submissions have been prepared in response to those comments.

STAFF COMMENTS

Staff does not have any outstanding issues to resolve at this time, aside from the ordinance requirement that written recommendation from the Conservation Commission be received prior to approval.

Staff notes that in the 2010 approval, some unique stipulations were approved related to offsite improvements to the road. As follows:

#5: A contribution of $7,500.00 shall be submitted to the Town prior to the Certificate of Occupancy. This contribution shall be used exclusively for the design, engineering and/or installation of a traffic signal at the intersection of Rte., 111/Sullivan Rd./Lawrence Rd. and for other traffic related improvements associated with Lawrence and Bockes Roads. Said contribution shall be inscribed on the Site Plan-of-Record prior to Planning Board endorsement.

#12: The applicant or his assigns, at his/her expense, shall be responsible for repairing all construction cuts, if any, on Bockes Rd., Lawrence Rd. and Rte. 111, and this work shall be properly bonded with the Town of Hudson, and if applicable, the State of New Hampshire.

Staff believes these stipulations should be carried forward to the new approval, and they have been included in the stipulation lists below.

RECOMMENDATIONS

Staff recommends that the Board deliberate on the site plan and the associated waiver requests, along with any revisions that may be necessary. Staff further recommends that the Board determine whether any additional studies are needed to support a decision. Written comments from the Conservation Commission must be received prior to Planning Board approval. Draft stipulations

for the Site Plan and Conditional Use Permit approvals are provided below for the Board's consideration, amendment, or discussion.

Site Plan 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. All improvements shown on the Plan, including all Notes, shall be completed in their entirety and at the expense of the applicant or the applicant's assigns.
3. 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 Development Services Department, confirming that the site conforms to the Planning Board approved Site Plan.
4. Prior to the Planning Board endorsement of the Plan, it shall be subject to final administrative review by Town Planner and Town Engineer.
5. A cost allocation procedure (CAP) amount of $48,480.00 shall be paid prior to the issuance of a Certificate of Occupancy for the lot improvements to be made.
6. Prior to application for a building permit, the Applicant shall schedule a pre-construction meeting with the Town Engineer.
7. The onsite drainage system shall be constructed and maintained in compliance with NHDES requirements for such systems.
8. 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.
9. Hours of refuse removal shall be exclusive to the hours between 7:00 A.M. and 7:00 P.M., Monday through Friday only.
10. A contribution of S7,500.00 shall be submitted to the Town prior to the Certificate of Occupancy. This contribution shall be used exclusively for the design, engineering and/or installation of a traffic signal at the intersection of Rte., 111/Sullivan Rd./Lawrence Rd. and for other traffic related improvements associated with Lawrence and Bockes Roads. Said contribution shall be inscribed on the Site Plan-of-Record prior to Planning Board endorsement.
11. The applicant or his assigns, at his/her expense, shall be responsible for repairing all construction cuts, if any, on Bockes Rd., Lawrence Rd. and Rte. 111, and this work shall be properly bonded with the Town of Hudson, and if applicable, the State of New Hampshire.
12. The plan shall reflect hours of operation from 9:00AM to 10:00 PM.

Conditional Use Permit Stipulations:

1. All stipulations of approval shall be incorporated into the Site Plan Development Agreement, which shall be recorded at the HCRD, together with the Plan.

2. Prior to the Planning Board endorsement of the Plan, it shall be subject to final administrative review by the Town Planner, Town Engineer, and Town Counsel.
3. Planning Board endorsement of the Plan shall be contingent upon proof of a valid Alteration of Terrain (AOT) Permit issued by New Hampshire Department of Environmental Services (NHDES).
4. Construction activities involving the subject lot shall be limited to the hours between 7:00 A.M. and 7:00 P.M, Monday thru Saturday. No exterior construction activities shall be allowed on Sundays.

DRAFT MOTIONS:
TO ACCEPT APPLICATIONS:

I move to accept the Non-Residential Site Plan for the Proposed Retail Building, SP# 11-25, Map 145 / Lot 001, 1 Bockes Road, Hudson, NH.

Motion by: _____Second: _____Carried/Failed: _____

I move to accept the Conditional Use Permit for the Proposed Retail Building CUP# 04-25, Map 145 / Lot 001, 1 Bockes Road, Hudson, NH.

Motion by: _____Second: _____Carried/Failed: _____

TO GRANT A WAIVER:
I move to grant a waiver **§276.11.1.B.(12).(b) – 100' Residential Buffer,** to allow for 88' of buffer where 100' would elsewise 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 **§290-5.A.4 – Groundwater Recharge Volume**, to allow for less groundwater recharge rate than existing where it would elsewise not 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 **§290-5.A.5 – Stormwater Volumes,** to allow for more runoff than would elsewise 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: _____

TO CONTINUE APPLICATIONS:

I move to continue the Non-Residential Site Plan for the Proposed Retail Building SP# 11-25, Map 145 / Lot 001, 1 Bockes Road, Hudson, NH, to date certain_____, 2026.

Motion by: _____Second: _____Carried/Failed: _____

I move to continue the Conditional Use Permit for the Proposed Retail Building CUP# 04-25, Map 145 Lot 001, 1 Bockes Road, Hudson, NH, to date certain_____, 2026.

Motion by: _____Second: _____Carried/Failed: _____

Town of Hudson
12 School Street
Hudson, NH 03501

SITE PLAN APPLICATION

Revised August 2024

The following information must be filed with the Planning Department ***at the time of filing a site plan application***:

1. One (1) original completed application with original signatures.

2. One (1) full plan set *folded* (sheet size: 22" x 34").

3. One (1) original copy of the project narrative.

4. A list of direct abutters and a list of indirect abutters, and two (2) sets of mailing labels for abutter notifications.

5. Site Plan Review Checklist.

6. All of the above application materials, including plans, shall also be submitted in electronic form as a PDF.

7. ***All plans shall be folded*** and all pertinent data shall be attached to the plans with an elastic band or other enclosure.

The following information is required to be filed with the Planning Department ***no later than 10:00 A.M., Tuesday ONE WEEK prior to the scheduled Planning meeting***. ***The purpose of these materials is hardcopy distribution to Planning Board members, not review.***
Any plan revisions that require staff review must be submitted no later than 10:00A.M., Tuesday TWO WEEKS prior to the scheduled Planning meeting. Depending on the complexity of changes, more time may be required for review. Please contact the Town Planner if you have any questions on this matter.

1. Submission of fifteen (15) 11" X 17" plan sets *folded*, revised if applicable.

2. Submission of one (1) full plan set *folded* (sheet size: 22" x 34"), if revised.

3. All of the above application materials, including plans, shall also be submitted in electronic form as a PDF.

Note: Prior to filing an application, it is recommended to schedule an appointment with the Town Planner.

SITE PLAN APPLICATION

Date of Application: 10/21/2025 Tax Map #: 145 Lot #: 1

Site Address: 1 Bockes Road

Name of Project: Proposed Retail Building

Zoning District: General (G-1) General SP#: _____
(For Town Use Only)

Z.B.A. Action: _____

PROPERTY OWNER:	DEVELOPER:
Name: 1 Bockes Road, LLC	Deepak Sharma
Address: 25 Pelham Road, Suite 103	25 Pelham Road, Suite 103
Address: Salem, NH 03079	Salem, NH 03079
Telephone # _____	
Email: dspediatrics@hotmail.com	dspediatrics@hotmail.com
PROJECT ENGINEER:	**SURVEYOR:**
Name: Greenman-Pedersen, Inc.	Greenman-Pedersen, Inc.
Address: 44 Pelham Road	44 Pelham Road
Address: Salem, NH 03079	Salem, NH 03079
Telephone # 603-766-5238	603-766-5238
Email: cyork@gpinet.com	cyork@gpinet.com

PURPOSE OF PLAN:

A proposed 12,000 s.f. multi-tenant retail building with associated parking and drainage improvements.

(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: Proposed Retail Building

PLAN TYPE: SITE PLAN

LEGAL DESCRIPTION: MAP 145 LOT 1

DATE: 10/21/2025

Location by Street: 1 Bockes Road

Zoning: General (G-1)

Proposed Land Use: Proposed multi-tenant retail building

Existing Use: Vacant

Surrounding Land Use(s): Residential

Number of Lots Occupied: 1

Existing Area Covered by Building: 0

Existing Buildings to be removed: 0

Proposed Area Covered by Building: 12,000 s.f.

Open Space Proposed: 62%

Open Space Required: 40%

Total Area: S.F.: 137,850 Acres: 3.16

Area in Wetland: 9,915 s.f. Area Steep Slopes: 33,365 s.f.

Required Lot Size: 87,120 s.f.

Existing Frontage: > 200'

Required Frontage: 200'

Building Setbacks:	Required*	Proposed
Front:	50' (Arterial) 30' (Local)	70' (Arterial) 57' (Local)
Side:	15'	201'
Rear:	15'	N/A

SITE DATA SHEET
(Continued)

Flood Zone Reference: FIRM # 33011C0536E

Width of Driveways: 30'

Number of Curb Cuts: 1

Proposed Parking Spaces: 60

Required Parking Spaces: 60

Basis of Required Parking (Use): Retail business

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

Waiver Requests

Town Code Reference:	*Regulation Description:*
276-11.1 B. (12)(b)	100' Residential Buffer
290-5.A.4	Groundwater Recharge Volume
290-5.A.5	Stormwater Volumes

(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: 10/15/25

Print Name of Owner: DEEPAK SHARMA

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

Signature of Developer: _____ Date: 10/15/25

Print Name of Developer: DEEPAK SHARMA

- 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.

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Proposed Retail Building

Street Address: 1 Bockes Road

I 1 Bockes Road, LLC hereby request that the Planning Board waive the requirements of item 276-11.1 B. (12)(b) - 100' Residential Buffer of the Hudson Land Use Regulations in reference to a plan presented by Greenman-Pedersen, Inc.

_____ (name of surveyor and engineer) dated 10/21/25 for property tax map(s) 145 and lot(s) 1 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):

Due to site constraints including wetlands on the property and the shape of the lot, we are unable to meet the 100' residential buffer requirement. We have proposed 88' from the nearest residential property line across the street to the edge of the paved driveway in front of the proposed building.

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):

It is our professional opinion that the minor reduction in the residential buffer is not detrimental to the neighboring residential properties. The residential property line is across Bockes Road and additional landscape screening is proposed.

Signed: _____

Applicant or Authorized Agent

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Proposed Retail Building

Street Address: 1 Bockes Road

I 1 Bockes Road, LLC hereby request that the Planning Board waive the requirements of item 290-5.A.4 Groundwater Recharge Volume of the Hudson Land Use Regulations in reference to a plan presented by Greenman-Pedersen, Inc.

_____ (name of surveyor and engineer) dated 10/21/25 for property tax map(s) 145 and lot(s) 1 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):

Because this is an Asbestos Disposal Site, and infiltration is not practicable, we are requesting a waiver from the required groundwater recharge volume. The stormwater from the proposed site is still being treated per Town regulations, so the project will not create any water quality impairment.

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):

It is our professional opinion that the minimization of groundwater recharge is not detrimental to the wetland resource area.

Signed: _____

Applicant or Authorized Agent

WAIVER REQUEST FORM

Name of Subdivision/Site Plan: Proposed Retail Building

Street Address: 1 Bockes Road

I 1 Bockes Road, LLC hereby request that the Planning Board waive the requirements of item 290-5.A.5 Stormwater Volumes of the Hudson Land Use Regulations in reference to a plan presented by Greenman-Pedersen, Inc. _____ (name of surveyor and engineer) dated 10/21/25 for property tax map(s) 145 and lot(s) 1 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):

Because this is an Asbestos Disposal Site, and infiltration is not practicable, we are requesting a waiver from the required stormwater volume rates.

The volume of proposed stormwater is greater than existing rates, but the stormwater runoff rates still meet the Town's regulations.

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):

It is our professional opinion that the increase in stormwater volume is not detrimental to the wetland resource area.

Signed: _____

Applicant or Authorized Agent

SCHEDULE OF FEES

A. REVIEW FEES:

1. **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.	$ 1,884
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 3.16 acres @ $600.00 per acre, or $1,250.00, whichever is greater. $ 1,900

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:

11	Direct Abutters Applicant, Professionals, etc. as required by RSA 676:4.1.d @~~$5.58~~ $6.08 **(or Current Certified Mail Rate)**	$ 66.88
2	Indirect Abutters (property owners within 200 feet) @~~$0.73~~ $0.78 **(or Current First Class Rate)**	$ 1.56

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

TOTAL $ 4,127.44

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)

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)**.	
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		Notes
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]**	

(End of checklist)

Town of Hudson
12 School Street
Hudson, NH 03501

CONDITIONAL USE PERMIT APPLICATION: WETLAND CONSERVATION OVERLAY DISTRICT

Revised September 2025

Applications must be received at least 21 days prior to the Planning Board and Conservation Commission meetings at which the application will be heard. ***The following information must be filed to each board.***

CONSERVATION COMMISSION:

1. Ten (10) copies of the completed application, including the project narrative that demonstrates that the proposal meets the conditions of Article IX of the Zoning Ordinance.
2. Ten (10) reduced size plan sets *folded* (sheet size: 11" X 17"). Plans require the stamp of a licensed land surveyor and a certified wetlands scientist. At a minimum, plans must show topography and any wetland within fifty (50) feet of the proposed project.

***Complete Application material should be delivered to the Engineering Department (603)886-6008.**

PLANNING BOARD:

1. One (1) copy of the completed application, including the project narrative that demonstrates that the proposal meets the conditions of Article IX of the Zoning Ordinance.
2. One (1) full size plan set *folded* (sheet size: 22" x 34") and fifteen (15) reduced size plan sets *folded* (sheet size: 11" X 17"). Plans require the stamp of a licensed land surveyor and a certified wetlands scientist. At a minimum, plans must show topography and any wetland within fifty (50) feet of the proposed project.
3. A list of direct abutters and indirect abutters, and two (2) sets of mailing labels for abutter notifications.
4. All of the above application materials, including plans, shall also be submitted in electronic form as a PDF.
5. Check should be made payable to the *Town of Hudson*, and submitted to the Planning Department.

***Complete Application material & check should be delivered to the Planning Department (603)886-6008.**

Revised plans and other application materials must be filed with the Planning Department ***no later than 10:00A.M., Tuesday ONE WEEK prior to the scheduled meeting, as applicable. The purpose of these materials is hardcopy distribution to Planning Board members, not review.***
Any plan revisions that require staff review must be submitted no later than 10:00A.M., Tuesday TWO WEEKS prior to the scheduled Planning meeting. Depending on the complexity of changes, more time may be required for review. Please contact the Town Planner if you have any questions on this matter.

Note: Prior to filing an application, it is recommended to schedule an appointment with the Town Planner and Town Engineer.

CONDITIONAL USE PERMIT APPLICATION

Date of Application: 10/21/2025 Tax Map #: 145 Lot #: 1

Site Address: 1 Bockes Road

Name of Project: Proposed Retail Building

Zoning District: General (G-1) General CUP#: _____
(For Town Use Only)

Z.B.A. Action: _____

PROPERTY OWNER:	DEVELOPER:
Name: 1 Bockes Road, LLC	Deepak Sharma
Address: 25 Pelham Road, Suite 103	25 Pelham Road, Suite 103
Address: Salem, NH 03079	Salem, NH 03079
Telephone # _____	_____
Email: dspediatrics@hotmail.com	dspediatrics@hotmail.com
PROJECT ENGINEER or SURVEYOR:	**CERTIFIED WETLANDS SCIENTIST:**
Name: Greenman-Pedersen, Inc.	Greenman-Pedersen, Inc.
Address: 44 Pelham Road	44 Pelham Road
Address: Salem, NH 03079	Salem, NH 03079
Telephone # 603-766-5238	603-766-5224
Email: cyork@gpinet.com	jbolduc@gpinet.com

PURPOSE OF PLAN:

A proposed 12,000 s.f. multi-tenant retail building with associated parking and drainage improvements.

(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: Proposed Retail Building

PLAN TYPE: (Site Plan, Subdivision, or other) Site Plan

LEGAL DESCRIPTION: MAP 145 LOT 1

DATE: 10/21/2025

Location by Street: 1 Bockes Road

Zoning: General (G-1)

Proposed Land Use: Proposed multi-tenant retail building

Existing Use: Vacant

Total Site Area: S.F.: 137,850 Acres: 3.16

Total Wetland Area (SF): 9,915 s.f.

Permanent Wetland Impact Area (SF): 0

Permanent Wetland Buffer Impact Area (SF): 5,070 s.f.

Temporary Wetland Impact Area (SF): 0

Temporary Wetland Buffer Impact Area (SF): 0

Flood Zone Reference: FIRM # 33011C0536E

Proposed Mitigation:

Additional buffer zone plantings are proposed where disturbance occurs within the 75' wetland setback.

(For Town Use Only)

Data Sheets Checked By: _____ Date: _____

WETLAND CONDITIONAL USE PERMIT CHECKLIST

Yes	No	NA	QUESTIONS/INFORMATION NEEDED	HCC Comments
			NARRATIVE REPORT	
			Existing Conditions	
○	●	○	Has a DES Dredge and Fill Permit been issued for any part of this site? If yes, provide number, date, and description.	
○	○	●	Is there evidence of altered wetlands or surface waters on site?	
●	○	○	All prime and other wetlands in the vicinity, plus any wetlands/watersheds past the immediate vicinity affected by this project	
●	○	○	• Description of each wetland and associated values	
●	○	○	Wetland mapping results – Including the flagging date and technique plus the name, company and qualifications of the wetland scientist	
●	○	○	Was property surveyed? If yes, the date of survey. (Please attach the survey plan)	
			National Wetland Inventory	
●	○	○	• Vegetative cover types	
○	○	●	• Existence of vernal pools and associated habitat	
○	○	●	• Unique geological and cultural features	
○	○	●	• NH Natural Heritage inventory – For list of rare and endangered species, contact the NH Division of Forests and Lands (603)271-3623	
○	○	●	• Wildlife and fauna species, including estimated number and locations (large projects)	
○	●	○	• Public or private wells located within the vicinity	
○	○	●	• Monitoring well(s) located on site	
●	○	○	• Current land use and zoning district	
○	●	○	Photos of existing area (please use color photos)	
			Proposed Project Description	
●	○	○	Entire project and associated activities	
○	●	○	Time table of project and anticipated phasing	
●	○	○	Land use	
●	○	○	Grading plan	
			Impact to Wetlands and/or Buffers	
○	○	●	• Depending on size and proposed impacts, a report from a biologist may be appropriate	
●	○	○	Removing, filling, dredging, or altering (Area square ft. and locations)	
○	●	○	Intercepting or diverging of ground or surface water (Locations and size)	
○	●	○	• Change in run-off characteristics	
●	○	○	Delineation of drainage area contributing to each discharge point	

Yes	*No*	*NA*	*Questions/Information Needed*	***HCC COMMENTS***
●	○	○	Estimated water quality characteristics of runoff at each point of discharge for both pre- and post-development	
●	○	○	Erosion control practices	
○	●	○	• If using rip-rap, attach documentation explaining why other erosion control methods are not feasible	
●	○	○	• How storm water runoff will be handled	
○	○	●	If backyards or lots include a buffer area, buffer restriction wording shall be included in each deed (A physical marker may be requested to designate buffer boundaries at site)	
			Mitigation	
●	○	○	Square footage of mitigation – wetland and upland areas	
●	○	○	Wetland or upland plants identified to replace any losses	
○	○	●	• Restoration plan for planting and vegetation	
○	○	●	Conservation easements, including location and aesthetic, wildlife and vegetative values	
○	○	●	• If easement is on or added to the site(s), a copy of the legal document shall be given to the HCC (HCC conservation easement markers may also be required along the easement)	

CONCEPTUAL SITE PLAN/DRAWING

●	○	○	Locus map depicting project site and vicinity within approximately ½ mile and also on a larger scale	
●	○	○	All prime and other wetlands in the vicinity	
●	○	○	Wetland(s) impacted (identified as prime or other) and the wetland boundaries with 50', buffer areas highlighted in color	
●	○	○	Assessor's sheet(s), lot(s), and property account number(s)	
●	○	○	Existing and proposed structures	
●	○	○	Square footage listed for temporary and permanent impact	
●	○	○	Erosion control plan (Suggested: Biodegradable silt fences so area won't be disturbed again and no hay to avoid invasive species)	
●	○	○	Topographical map with contours	
●	○	○	Storm water treatment swales and basins highlighted in color if in buffer area	
○	○	●	Conservation and utility easements	
●	○	○	Grading plan	
○	○	●	Culvert, arch, bridge - sizes, material, etc.	
●	○	○	Vegetative cover types	
○	○	●	Vernal pools	
●	○	○	Existing and proposed stone walls, tree lines, and unusually large, rare or beautiful trees, and other notable site features	

QUESTIONS TO CONSIDER BEFORE SUBMITTING

- Will the increased discharge cause erosion and channelization?
- Is there potential for off-site flooding?
- Does the decreased infiltration in the drainage area cause vegetation stress due to reduced or increased ground water or surface water discharge into wetland?
- Will the nutrients in the runoff increase eutrophication potential in downstream water bodies?
- Do you own any adjacent parcels or easements for roadways across adjacent parcels which could be used for access to avoid a wetland crossing
- Does a wetland crossing occur where it will result in the least amount of alteration to a wetland?
- Is preservation of upland areas adjacent to the impacted wetland a priority?
- Can using an alternative crossing design such as a bridge, retaining wall, etc. decrease the width or area of wetland alteration?
- Does a proposed road crossing of a wetland exceed the minimum width acceptable to the Planning Board and can this be negotiated downwards?
- Have you established that no reasonable alternative access from a public way to an upland is possible?
- Can the parking lot spaces be decreased?
- Is the roadway designed in such a way that does not restrict the flow of water?
- Is additional information needed to assess water quality impacts due to runoff?
- Is there an increase in other pollutants (e.g., heavy metals, turbidity, coli form) from streets and parking lots?
- Is there a need to restrict or prohibit the use of pesticides and fertilizers?
- Is there a need to restrict the use of roadway salting?

CONDITIONAL USE PERMIT APPLICATION AUTHORIZATION

I hereby apply for *Conditional Use Permit* 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 *Conditional Use Permit* 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 Hudson Conservation Commission, 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: 10/15/25

Print Name of Owner: DEEPAK SHARMA

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

Signature of Developer: _____ Date: 10/15/25

Print Name of Developer: DEEPAK SHARMA

- 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

(Fee covers both Conservation Commission & Planning Board)

A. REVIEW FEES:

1. Conditional Use Permit
   $100 Flat Fee $_100.00____

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:

11 Direct Abutters Applicant, Professionals, etc. as required by RSA 676:4.1.d @$6.08 **(or Current Certified Mail Rate)** $ Included in Site Plan fees

2 Indirect Abutters (property owners within 200 feet) @$0.78 **(or Current First Class Rate)** $ Included in Site Plan fees

TOTAL $ $100

(For Town Use)

AMOUNT RECEIVED: $_____ DATE RECEIVED: _____

RECEIPT NO.: _____ RECEIVED BY: _____

October 27, 2025

Hudson Planning Board
12 School Street
Hudson, NH 03051

RE: Site Plan Application
Proposed Retail Building
1 Bockes Road

Dear Members of the Hudson Planning Board:

Greenman-Pedersen, Inc. (GPI), on behalf of the project applicant, 1 Bockes Road, LLC, is submitting an application for Site Plan Approval and a request for a Conditional Use Permit for the parcel at 1 Bockes Road identified as Map 145, Lot 1. The lot is bound by Central Street (Route 111) to the south, Lawrence Road to the west, Bockes Road to the north and a residential property to the east. The site is undeveloped. There are wetlands located along the easterly side of the property. The site is registered by the NH Department of Environmental Services as an asbestos disposal site (ADS Site #060).

The plan was previously approved in 2010. The applicant is proposing to develop the property with a new 12,000 s.f. multi-tenant retail building. The property is located in the General One (G-1) zoning district, where a retail use is permitted by right. The proposed building meets all setback requirements. Access to the proposed building will be via Bockes Road. Parking will be located along three sides of the building. 60 parking spaces are proposed.

In order to mitigate increases in peak discharge rates and volumes of stormwater runoff as a result of the new impervious surfaces, a comprehensive stormwater management system has been designed that includes deep sump catch basins with hooded outlets, a Jellyfish filter, and underground Stormtech detention chambers.

The site will be serviced by private water and sewer. Electric service will be underground from an existing utility pole on Bockes Road. Site lighting and landscaping is proposed. The hours of operation will be 6AM to 10 PM, 7 days a week. A Trip Gen Memo has been prepared and is included with this submittal.

As mentioned above, we are requesting a Conditional Use Permit in the Wetlands Conservation Overlay District for encroachment into the 75 foot wetland buffer, per section 334-35 of the Hudson Zoning Ordinance. Some minor site grading and a retaining wall are proposed within the wetland buffer. The proposed activity will have no significant negative environmental impacts to abutting or downstream properties.

This Conditional Use Permit request is formatted in accordance with the provisions of the Hudson Zoning Ordinance, section 334-37A. (1) and (2). The required criteria are printed below in bold text. Our response is printed beneath the criteria:

(1) The proposed activity minimizes degradation of land situated within the District and offsets potential adverse impacts to functions and values of wetlands, surface waters, and vernal pools including but not limited to their capacity to:

(a) Support fish and wildlife;
(b) Attenuate flooding;
(c) Supply and protect surface and groundwater resources;
(d) Remove sediments;

(e) Remove pollutants;
(f) Support wetland vegetation;
(g) Promote public health and safety; and
(h) Moderate fluctuations in surface water levels.

The proposed stormwater system is sized to reduce and treat the runoff entering the wetlands. The limit of work is 55' from the edge of wetlands. As mentioned above, that is just for minor site grading. This area will be replenished with buffer zone plantings.

(2) The proposed activity will have no significant negative environmental impact to abutting or downstream properties and/or hydrologically connected water and/or wetland resources, including:

(a) Increased potential for erosion, siltation, and turbidity of surface waters;
(b) Loss of fish and wildlife habitat;
(c) Loss of unique habitat having demonstrable natural, scientific, or educational value;
(d) Loss or decrease of beneficial aquatic organisms and wetland plants and their habitat;
(e) Increased danger of flooding and/or transport of pollutants; and
(f) Destruction of the economic, aesthetic, recreational, and other public and private uses and values of the wetland to the community.

The limit of proposed grading is approximately 20 feet higher than the base flood elevation. There are no changes in drainage patterns and erosion control measures will be implemented during construction activities.

(3) The proposed activity or use cannot practicably be located otherwise on the site to eliminate or reduce impact to the Wetland Conservation Overlay District.

The project was previously approved by the Hudson Planning Board in 2010. Back then the wetland setback was 50'. In order to minimize the disturbance within the current 75' buffer, the updated site layout has been shifted as far as possible to the west while still maintaining building setback requirements. We have also reduced the size of the building. This results in no impervious surfaces within the wetland buffer. Only minor site grading and a retaining wall are proposed within the wetland buffer.

(4) The proposed activity incorporates the use of those Best Management Practices recommended by the New Hampshire Department of Environmental Services and/or other state agencies having jurisdiction.

As mentioned above, a comprehensive stormwater management system has been designed that includes deep sump catch basins with hooded outlets, a Jellyfish filter, and underground Stormtech detention chambers

(5) All applicable federal and/or state permit(s) have been received for the proposed activity in accordance with New Hampshire Code of Administrative Rules, Part Env-Wt 100-800 and Section 404 of the Federal Clean Water Act, as amended.

This does not apply to this project. There are no state or federal permits required.

(6) Where applicable, proof of application to all required state and/or federal permits.

This does not apply to this project. There are no state or federal permits required.

(7) Prior to making a decision on any Conditional Use Permit pursuant to the Wetland Conservation Overlay District, the Planning Board shall receive a written comment from the Conservation Commission. The Conservation Commission may recommend the Planning Board impose conditions of approval is deemed necessary to mitigate the potential for adverse effects of the proposed activity or use.

This request will be presented to the Hudson Conservation Commission for their review and recommendation.

If you have any questions or need additional information, please feel free to contact me at (603) 766-5238 or by email to cyork@gpinet.com.

Sincerely,
Greenman-Pedersen, Inc.

Christopher M. York, P.E.
Project Manager

Attachment - "C"

Planning Board Sign-off

Project Name	SP# 11-25 1 Bockes	Map/Lot:	145-001-000
Site Address:	1 Bockes Road	Zone:	General -1
		Due by:	11/19/25

Project Status		**Ready for Approval**	**Awaiting Revisions**	**Approval with Stipulations**
DEPARTMENT	**INITIAL**			
FUSS & O'NEILL:	DK	✔		
ZONING:	CJS	✔		
ASSESSING:	JM	✔		
ENGINEERING:	EZD	✔		
PUBLIC WORKS:	JT	✔		
FIRE:	DRH	✔		
POLICE:	PMM	✔		

Comments:

ZONING:
ASSESSING:
ENGINEERING:
PUBLIC WORKS:
FIRE:
POLICE:

Attachment - "C"

Planning Board Sign-off

Project Name	SP# 11-25 1 Bockes	Map/Lot:	145-001-000
Site Address:	1 Bockes Road	Zone:	General -1
		Due by:	11/19/25

Extended Comments:

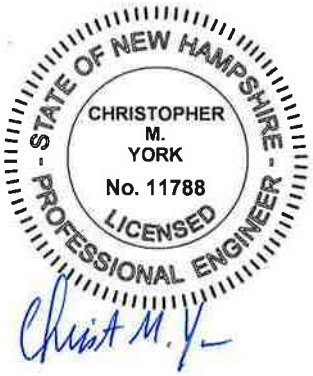
Attachment "D"

STORMWATER MANAGEMENT REPORT

PROPOSED RETAIL BUILDING
MAP 145 LOT 1
1 BOCKES ROAD
HUDSON, NEW HAMPSHIRE

GPI

44 Stiles Road, Suite One
Salem, NH 03079
(603) 893-0720



11-20-25

Prepared For:

1 Bockes Road, LLC
25 Pelham Road, Suite 103
Salem, NH 03079

October 21, 2025
Revised: November 20, 2025

(GPI Project No.: NEX-2500040)

Proposed Retail Building
1 Bockes Road, LLC
Stormwater Management Report

TABLE OF CONTENTS

STORMWATER MANAGEMENT REPORT

APPENDICES

EXECUTIVE SUMMARY — SECTION 1

This report contains a stormwater management analysis for the proposed retail building development located at 1 Bockes Road in Hudson, New Hampshire. The analysis includes both pre- and post-development calculations of stormwater runoff rates and volumes at specific locations on the project site.

This analysis has been prepared in accordance with the Town of Hudson Stormwater Management Regulations and the guidelines contained in the New Hampshire Department of Environmental Services (NHDES) New Hampshire Stormwater Manual.

The project site consists of a single parcel identified as Map 145 Lot 1 with an area of approximately 3.16 acres. The site is bordered by a private residence to the northeast, Central Street (Route 111) to the southeast, Lawrence Road to the southwest, and Bockes Road to the northwest.

The applicant, 1 Bockes Road, LLC, is proposing to develop the property with a new 12,000 square foot retail building. A new on-site paved parking lot will serve the proposed use, and access will be provided by a proposed driveway via Bockes Road. The development will also include site grading, erosion control measures, new utility connections, and construction of a new stormwater management system.

Based on site topography and discharge points, one design point is identified for the purposes of this analysis. Design Point #1 represents the on-site vegetated wetland near the northern and eastern property boundaries which receives overland flow from site and surrounding areas.

The tables below summarize the comparative pre- and post-development peak rates and volumes of stormwater runoff at the design point.

TABLE 1: PEAK RATE ANALYSIS SUMMARY

Design Storm	Pre-Development (cfs)	Post-Development (cfs)	Change (cfs)
Design Point #1 – Wetlands			
2-year	0.5	0.5	0.0
10-year	0.8	0.7	-0.1
25-year	1.0	0.9	-0.1
50-year	1.3	1.3	0.0

(All values shown are peak rates in CFS, cubic feet per second)

TABLE 2: VOLUME ANALYSIS SUMMARY

Design Storm	Pre-Development (cf)	Post-Development (cf)	Change (cf)
Design Point #1 – Wetlands			
2-year	2,213	9,653	+7,440
10-year	3,690	13,517	+9,827
25-year	5,658	19,089	+13,431
50-year	8,761	26,261	+17,500

(All values shown are volumes in CF, cubic feet)

In conclusion, by incorporating a new on-site stormwater management system that includes provisions for stormwater detention and treatment, there will be a decrease or no change in the peak rates of stormwater runoff leaving the property at the design point during all storms analyzed.

The stormwater management system has been designed to maximize volume storage in the available site area. An Asbestos Disposal Site (NHDES #60) is located on site, which significantly limits options to implement further storage or groundwater recharge without impacting the asbestos disposal area which is located 32" below existing grade. As designed, the proposed stormwater management system will provide treatment and detention of runoff meeting the spirit of the Hudson Stormwater Management Regulations.

Implementing the maintenance procedures outlined in the attached Inspection and Maintenance Manual (I&M) will ensure the long-term performance of the system.

EXISTING CONDITIONS SECTION 2

The project site consists of a single parcel identified as Map 145 Lot 1 with an area of approximately 3.16 acres. The site is bordered by a private residence to the north, Central Street to the east, Lawrence Road to the south, and Bockes Road to the west.

The site is currently undeveloped and contains a combination of woods, overgrown grass, and brush. There is a stone wall located along a majority of the northern property boundary.

The only drainage structure on the property is a 10" reinforced concrete pipe (RCP) which conveys runoff from an off-site catch basin opposite Bockes Road and discharges onto the site near the intersection of Bockes Road and Lawrence Road. Runoff from this pipe flows to the east over the wooded area and eventually discharges into the on-site wetlands. Just off-site to the southeast, a 10" RCP with headwall discharges off-site runoff opposite Route 111 to the on-site wetland.

Site topography is variable, with slopes of approximately 5%-10% along the property boundaries adjacent to roadways. The central portion of the site contains more gradual slopes of approximately 1%-2%. The area near the on-site wetlands contains steeper slopes of approximately 20%-25% down towards the wetlands. Approximate elevations range from 204' near the Bockes Road and Lawrence Road intersection to 174' within the on-site wetlands.

The NRCS Web Soil Survey identifies on-site and surrounding soils as Deerfield loamy fine sand and Windsor loamy sand, both with a Hydrologic Soil Group (HSG)-A classification. Refer to Appendix B for additional information.

Test pits were performed by Greenman-Pedersen, Inc. (GPI) on July 8, 2025. The two test pits encountered sand, sandy loam, gravelly sand, and buried asbestos with depths to estimated seasonal high water table (ESHWT) of between 30 and 81 inches below ground. The pits were excavated to depths of up to 81 inches below ground and did not encounter refusal. Test pit logs are included in Appendix C.

An Asbestos Disposal Site identified as NHDES ADS #60 is located on site. The EPA completed remediation of the site in November 1983. The EPA remediation consisted of covering 105,000 square feet of the lot with 30" of various soils (gravel, bank run gravel and loam) and 5" of stone riprap in drainage swales and over the steeply sloped grade adjacent to the wetland. The EPA returned in May 1985 to address minor erosion and vegetative cover problems, bringing the total cap depth to 32".

An on-site vegetated wetland is located near the northern and eastern property boundaries. The wetland was delineated by Greenman-Pedersen, Inc. (GPI) on July 8, 2025. This wetland system is associated with Beaver Brook which runs along Sullivan Road to the south and eventually discharges into the Merrimack River.

A small portion of the site is located in a special flood hazard area (100-year flood) per Flood Insurance Rate Map Number 33011C0536E, with a preliminary date of October 12, 2022. The boundary of Zone X and Zone AE is depicted on the plans.

PROPOSED CONDITIONS SECTION 3

The applicant, 1 Bockes Road, LLC, is proposing to develop the property with a new 12,000 square foot retail building. A new on-site paved parking lot will serve the proposed use, and access will be provided by a proposed driveway on Bockes Road. The development will also include site grading, erosion control measures, new utility connections, and construction of a stormwater management system.

In order to mitigate increases in peak discharge rates of stormwater runoff as a result of the new impervious surfaces, a comprehensive stormwater management system has been designed that includes deep sump catch basins with hooded outlets, an underground detention system with two isolator rows, and a Jellyfish filter treatment unit.

Runoff from a majority of the proposed impervious area will be captured by deep sump catch basins with hooded outlets and directed through an isolator row of the underground detention system for treatment. The underground detention system consists of ten rows of ADS Stormtech SC-800 chambers surrounded by crushed stone and an impermeable PVC liner. Overflow from the detention system will be conveyed in a 12" diameter pipe to a Jellyfish filter treatment unit designed by the manufacturer to remove TSS and provide nutrient removal. Runoff will then discharge over a riprap apron and eventually into the on-site wetlands. Runoff from the remainder of the site will maintain its existing drainage pattern to the maximum extent practicable and eventually discharge into the on-site wetlands.

Collectively, the deep sump catch basins with hooded outlets, underground detention system with isolator rows, and Jellyfish filter treatment unit provide treatment of the water quality flow (WQF) of stormwater runoff associated with the development. Due to the asbestos disposal area located on site, infiltration is not feasible. However, implementation of the proposed stormwater management system will not create nor contribute to water quality impairment of site runoff. Refer to calculation worksheets within Appendix G.

Low Impact Development (LID) strategies were evaluated as part of the design process, with the goal of mimicking natural hydrology and reducing disturbance to the site. However, due to site constraints including the on-site asbestos disposal area and steep slopes surrounding the on-site wetlands, it was determined that LID strategies would not be appropriate in order to reduce the potential of storm runoff exposure to asbestos contaminants. The remainder of the site was designed to minimize impervious cover for the development and maintain existing hydrological conditions to the maximum extent practicable.

In accordance with the Town of Hudson Stormwater Management Regulations section 290-5.B.1.b, at least 80% removal efficiency of the average annual load of total suspended solids (TSS) and 50% removal efficiency of the average annual load of the total phosphorous (TP) are expected to be achieved from the post-construction impervious area on site. The proposed stormwater management system is expected to achieve a weighted average of 94% TSS removal efficiency as described in Table 3 and Table 4 below. Deep sump catch basins are identified in the New Hampshire Stormwater Manual as effective at providing reductions of TSS in stormwater runoff. Jellyfish filter treatment units are effective at providing reductions of TSS and TP in stormwater runoff through membrane filters. The Jellyfish unit provides TSS and TP removal rates of 89% and 59% respectively and is verified by independent laboratory testing. See Appendix F for further information.

TABLE 3: TSS REMOVAL RATES SUMMARY

BMP	TSS Removal Rate
Deep Sump Catch Basin	25%
Isolator Row	25%
Jellyfish Filter Treatment Unit	89%

TABLE 4: TSS REMOVAL CALCULATIONS

Treatment Train 'A'				
BMP	**Starting TSS Load**	**TSS Removal Rate**	**Amount Removed**	**Remaining Load**
Deep Sump Catch Basin	1.00	0.25	0.25	0.75
Isolator Row	0.75	0.25	0.19	0.56
Jellyfish Filter Treatment Unit	0.56	0.89	0.50	0.06
			TSS Removal Rate=	**94%**

Treatment Train 'B'				
BMP	**Starting TSS Load**	**TSS Removal Rate**	**Amount Removed**	**Remaining Load**
Isolator Row	1.00	0.25	0.25	0.75
Jellyfish Filter Treatment Unit	0.75	0.89	0.67	0.08
			TSS Removal Rate=	**92%**

To prevent erosion and discharge of sediment during construction, Best Management Practices including catch basin inlet protection, sediment control fence, erosion control blankets, a stabilized construction exit, and mulch and seeding have been incorporated into the construction sequence.

The total area of disturbance related to the proposed site and stormwater management system construction is approximately 83,000 square feet, therefore the project will require an EPA Construction General Permit under the NPDES program.

STORMWATER MODELING METHODOLOGY SECTION 4

The drainage system for this project was modeled using HydroCAD, a stormwater modeling computer program that analyzes the hydrology, and hydraulics of stormwater runoff. HydroCAD is based largely on the hydrology techniques developed by the Soil Conservation Service (SCS/NRCS), combined with other hydrology and hydraulics calculations. For a given rainfall event, these techniques are used to generate hydrographs throughout a watershed. This provides verification that a given drainage system is adequate for the area under consideration, or to predict where flooding or erosion is likely to occur.

In HydroCAD, each watershed is modeled as a subcatchment, streams and culverts as a Reach (or Pond, depending on available storage capacity), and large wetlands and other natural or artificial storage areas as a Pond. SCS hydrograph generation and routing procedures were used to model both Pre-development and Post-development runoff conditions.

The Pre-development and Post-development watershed limits and the subcatchment characteristics were determined using both USGS and on-the-ground topographic survey information and through visual, on-site inspection. Conservative estimates were used at all times in estimating the hydrologic characteristics of each watershed or subcatchment.

The analysis utilizes rainfall amounts from the Northeast Regional Climate Center (NRCC) Extreme Precipitation Tables for the project site location. Rainfall depths for each 24-hour design storm are summarized below.

TABLE 5: RAINFALL SUMMARY

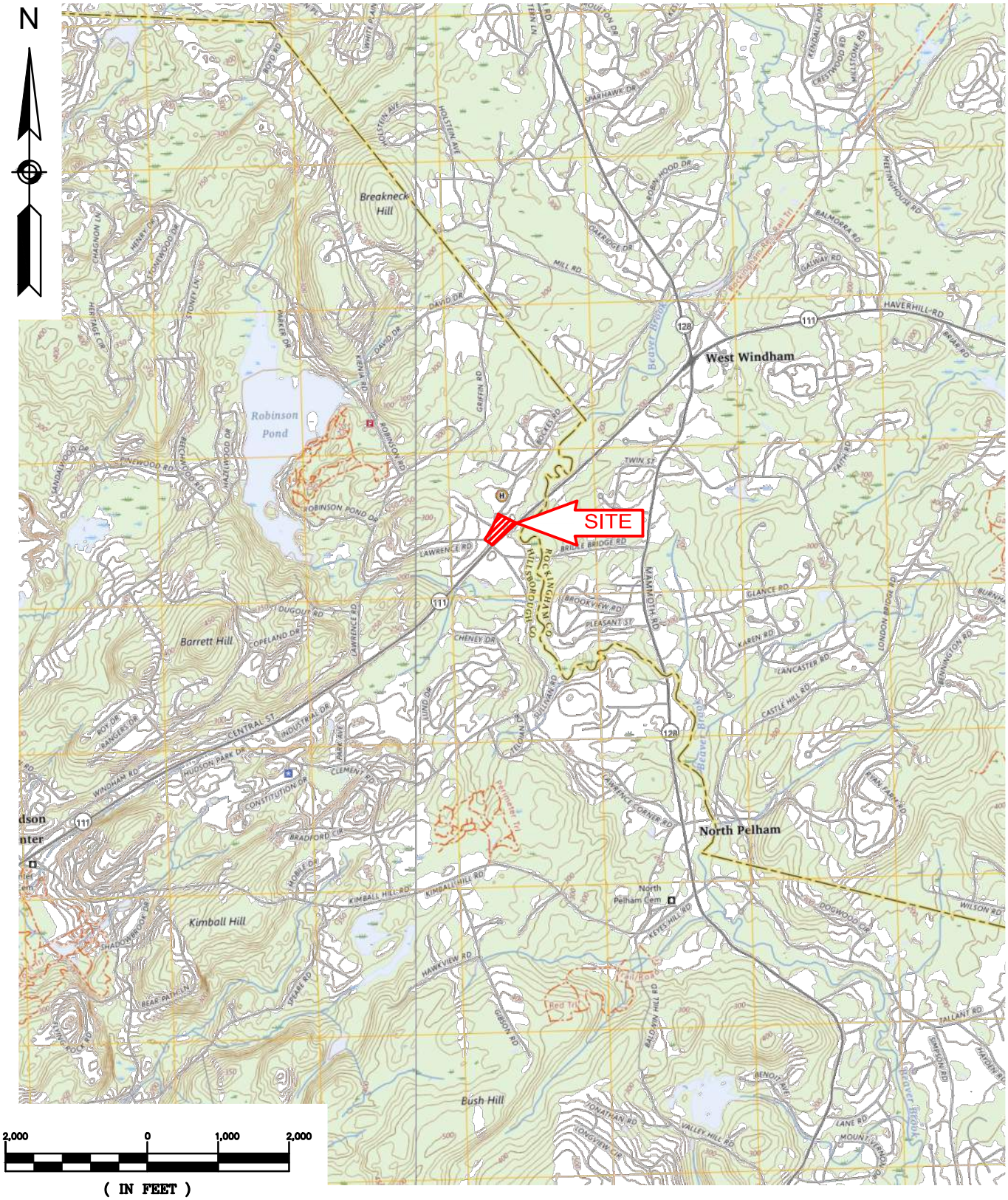
2-Year (in)	10-Year (in)	25-Year (in)	50-Year (in)
2.96	4.49	5.69	6.82

LIST OF APPENDICIES

APPENDIX A

FIGURES

Attachment "D"



USGS MAP

MAP 145 LOT 1
1 BOCKES ROAD
HUDSON, NEW HAMPSHIRE 03051

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

DRAWN BY: ARM
PROJECT #: NEX-2500040
DATE: 10/13/2025
FIGURE 1

Attachment "D"

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall
- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)

OTHER FEATURES
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Mapping and Insurance eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on the FIRM uses imagery from 2015 provided by the U.S. Geological Survey at a resolution of 0.15 meter, 2016 transportation data provided by the U.S. Census Bureau with an undefined scale, and political boundaries from 2016 provided by University of New Hampshire GRANIT at a scale of 1:24,000.

SCALE

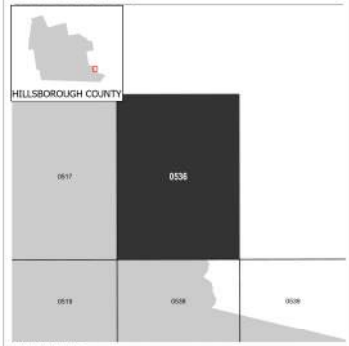
Map Projection: NAD 1983 State Plane, New Hampshire, FIPS 2800, Feet; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

HILLSBOROUGH COUNTY, NEW HAMPSHIRE
(All Jurisdictions)

PANEL 0536 OF 0701

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
HUDSON, TOWN OF	330092	0536	E
PELHAM, TOWN OF	330100	0536	E

PRELIMINARY
10/12/2022

VERSION NUMBER
2.6.3.6

MAP NUMBER
33011C0536E

MAP REVISED

APPENDIX B

SOILS INFORMATION

Attachment "D"

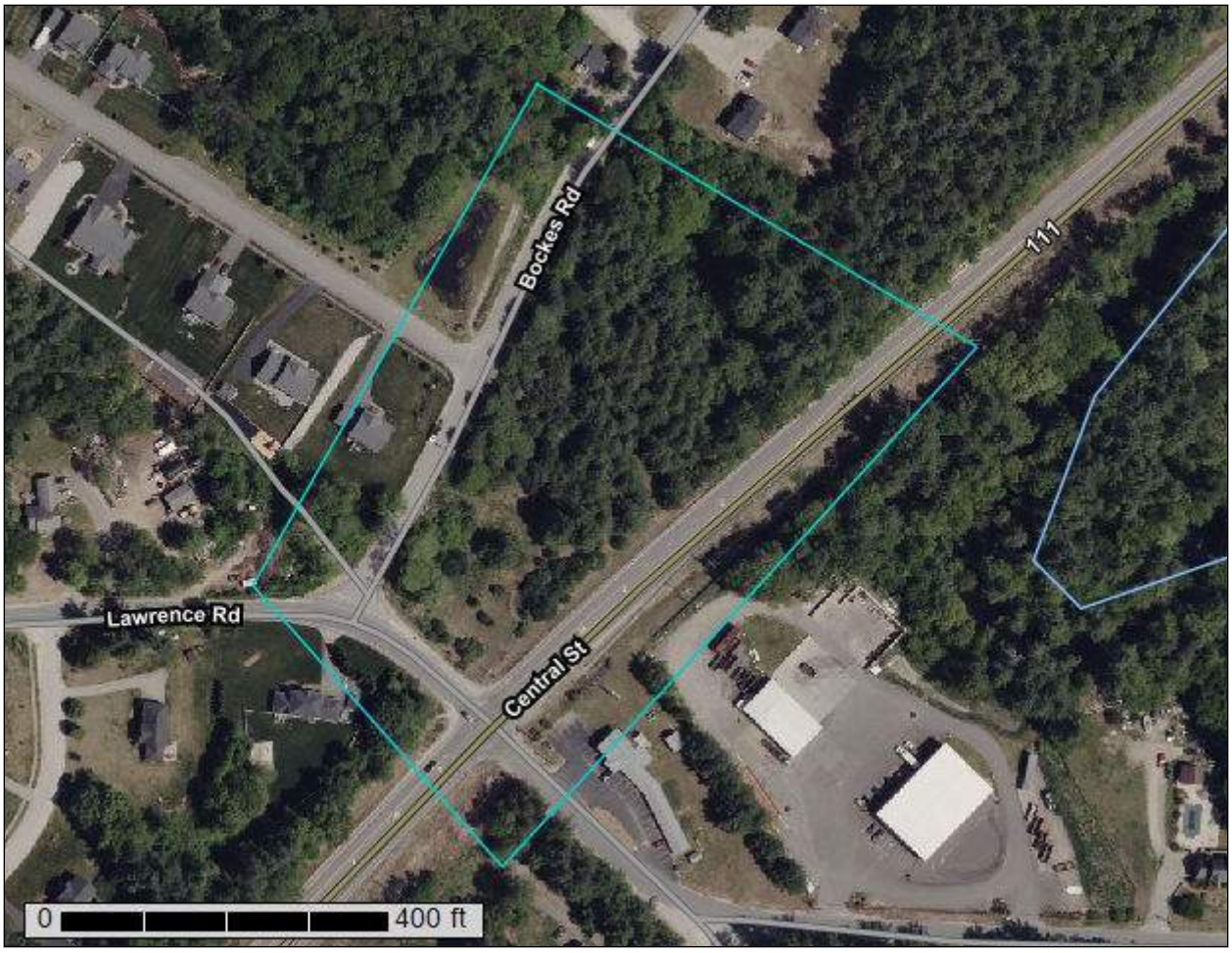
United States Department of Agriculture

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



October 7, 2025

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

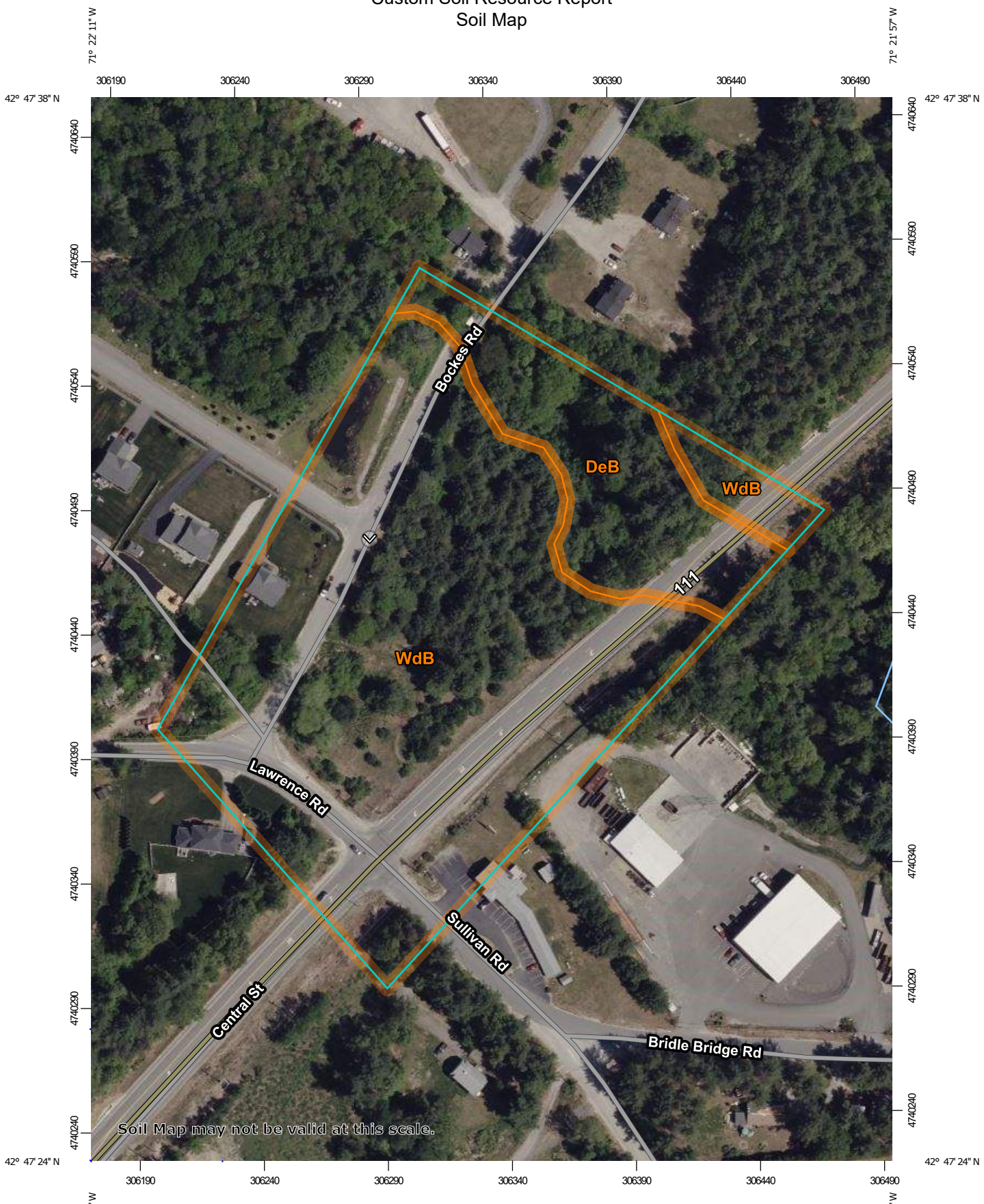
Contents

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.

Attachment "D"

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,080 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

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 28, Sep 9, 2025

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

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
DeB	Deerfield loamy fine sand, 3 to 8 percent slopes	1.8	19.2%
WdB	Windsor loamy sand, 3 to 8 percent slopes	7.7	80.8%
Totals for Area of Interest		**9.5**	**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

DeB—Deerfield loamy fine sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2xfg9
Elevation: 0 to 1,190 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition

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

Description of Deerfield

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well 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: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

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

Minor Components

Windsor

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

Wareham

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

Sudbury

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

Ninigret

Percent of map unit: 1 percent
Landform: Outwash plains, outwash terraces, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

WdB—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of local importance

Map Unit Composition

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

Description of Windsor

Setting

Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Eskers
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

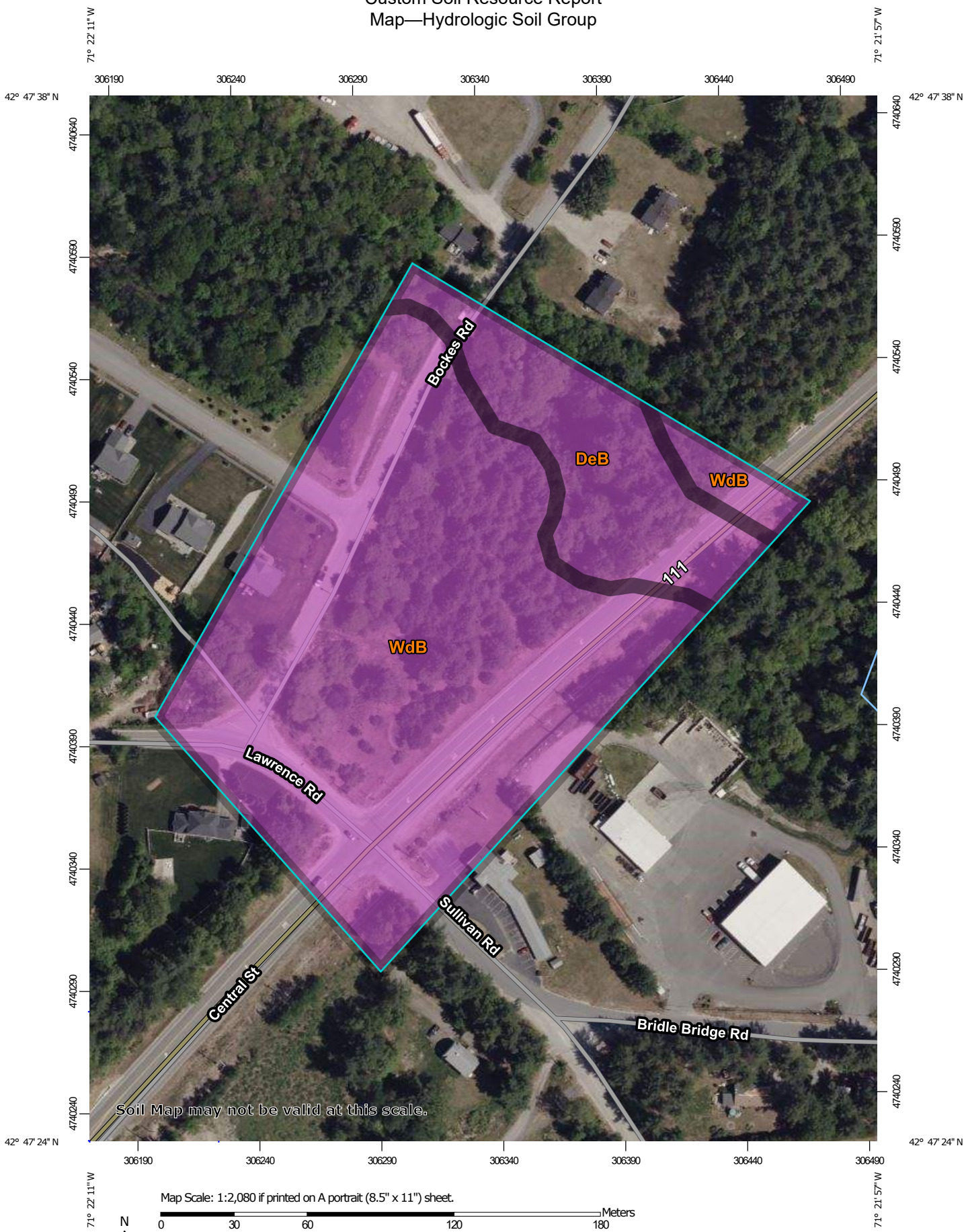
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:2,080 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 28, Sep 9, 2025

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

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DeB	Deerfield loamy fine sand, 3 to 8 percent slopes	A	1.8	19.2%
WdB	Windsor loamy sand, 3 to 8 percent slopes	A	7.7	80.8%
Totals for Area of Interest			**9.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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APPENDIX C

TEST PIT LOGS

TEST PIT DATA

Client: Deepak Sharma
Project Address: 1 Bockes Road
Town, State: Hudson, NH
Job Number: NEX-2500040
Date: July 8, 2025
Performed by: Jason C. Bolduc, Environmental Scientist, Greenman-Pedersen, Inc.

Test Pit No.	1	**Witnessed by:**	DK (Town of Hudson)
ESHWT:	>78”	**Standing Water:**	None
Refusal:	>78”	**Roots:**	48”

Depth	Color	Texture	Structure	Consistence
0-30”	10YR 3/3 Dark Brown	Sandy Loam	Granular	Very Friable
30-78”	2.5Y 7/4 Pale Brown	Gravelly Sand	Single Grain	Loose

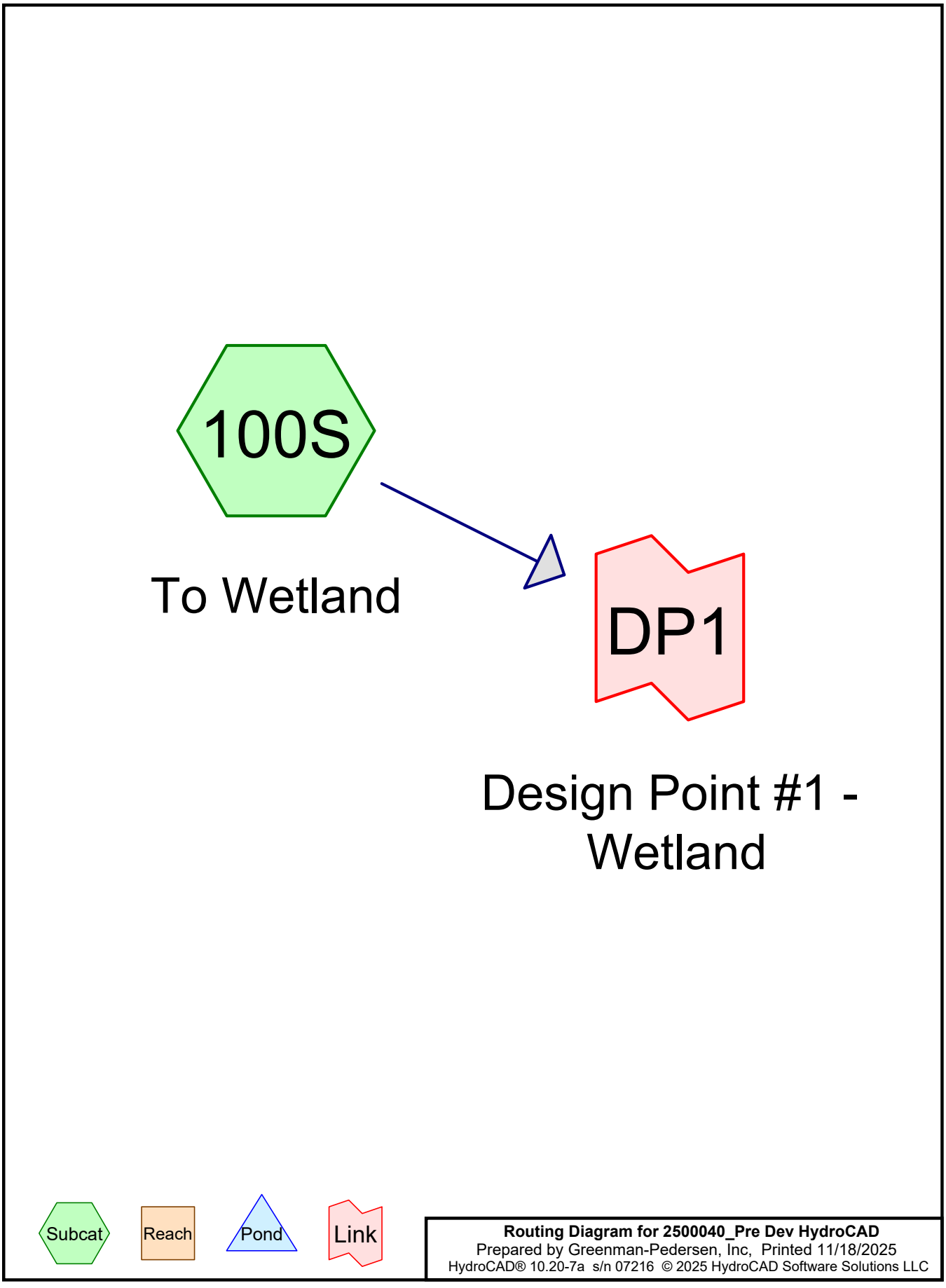
Test Pit No.	2	**Witnessed by:**	DK (Town of Hudson)
ESHWT:	>80”	**Standing Water:**	None
Refusal:	>80”	**Roots:**	50”

Depth	Color	Texture	Structure	Consistence
0-8”	10YR 3/3 Dark Brown	Fine Sandy Loam	Granular	Very Friable
8-80”	10YR 5/3 Brown	Gravelly Sandy Loam (Fill)	Massive	Friable

NOTES

APPENDIX D

PRE-DEVELOPMENT HYDROCAD COMPUTATIONS



Routing Diagram for 2500040_Pre Dev HydroCAD
Prepared by Greenman-Pedersen, Inc, Printed 11/18/2025

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
26,453	39	>75% Grass cover, Good, HSG A (100S)
9,731	98	Paved parking, HSG A (100S)
123,326	30	Woods, Good, HSG A (100S)
159,510	**36**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
159,510	HSG A	100S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
159,510		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
26,453	0	0	0	0	26,453	>75% Grass cover, Good	
9,731	0	0	0	0	9,731	Paved parking	
123,326	0	0	0	0	123,326	Woods, Good	
159,510	**0**	**0**	**0**	**0**	**159,510**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment100S: To Wetland Runoff Area=3.662 ac 6.10% Impervious Runoff Depth=0.17"
Flow Length=420' Tc=12.9 min CN=WQ Runoff=0.52 cfs 2,213 cf

Link DP1: Design Point #1 - Wetland Inflow=0.52 cfs 2,213 cf
Primary=0.52 cfs 2,213 cf

Total Runoff Area = 159,510 sf Runoff Volume = 2,213 cf Average Runoff Depth = 0.17"
93.90% Pervious = 149,779 sf 6.10% Impervious = 9,731 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment100S: To Wetland Runoff Area=3.662 ac 6.10% Impervious Runoff Depth=0.43"
Flow Length=420' Tc=12.9 min CN=WQ Runoff=1.01 cfs 5,658 cf

Link DP1: Design Point #1 - Wetland Inflow=1.01 cfs 5,658 cf
Primary=1.01 cfs 5,658 cf

Total Runoff Area = 159,510 sf Runoff Volume = 5,658 cf Average Runoff Depth = 0.43"
93.90% Pervious = 149,779 sf 6.10% Impervious = 9,731 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment100S: To Wetland Runoff Area=3.662 ac 6.10% Impervious Runoff Depth=0.66"
Flow Length=420' Tc=12.9 min CN=WQ Runoff=1.33 cfs 8,761 cf

Link DP1: Design Point #1 - Wetland Inflow=1.33 cfs 8,761 cf
Primary=1.33 cfs 8,761 cf

Total Runoff Area = 159,510 sf Runoff Volume = 8,761 cf Average Runoff Depth = 0.66"
93.90% Pervious = 149,779 sf 6.10% Impervious = 9,731 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment100S: To Wetland Runoff Area=3.662 ac 6.10% Impervious Runoff Depth=0.28"
Flow Length=420' Tc=12.9 min CN=WQ Runoff=0.79 cfs 3,690 cf

Link DP1: Design Point #1 - Wetland Inflow=0.79 cfs 3,690 cf
Primary=0.79 cfs 3,690 cf

Total Runoff Area = 159,510 sf Runoff Volume = 3,690 cf Average Runoff Depth = 0.28"
93.90% Pervious = 149,779 sf 6.10% Impervious = 9,731 sf

Summary for Subcatchment 100S: To Wetland

Runoff = 0.79 cfs @ 12.17 hrs, Volume= 3,690 cf, Depth= 0.28"
Routed to Link DP1 : Design Point #1 - Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.49", P2=2.96"

Area (ac)	CN	Description
0.607	39	>75% Grass cover, Good, HSG A
0.223	98	Paved parking, HSG A
2.831	30	Woods, Good, HSG A
3.662		Weighted Average
3.438		93.90% Pervious Area
0.223		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	25	0.0330	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
1.4	86	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.4	252	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	57	0.3290	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.9	420	Total			

Summary for Link DP1: Design Point #1 - Wetland

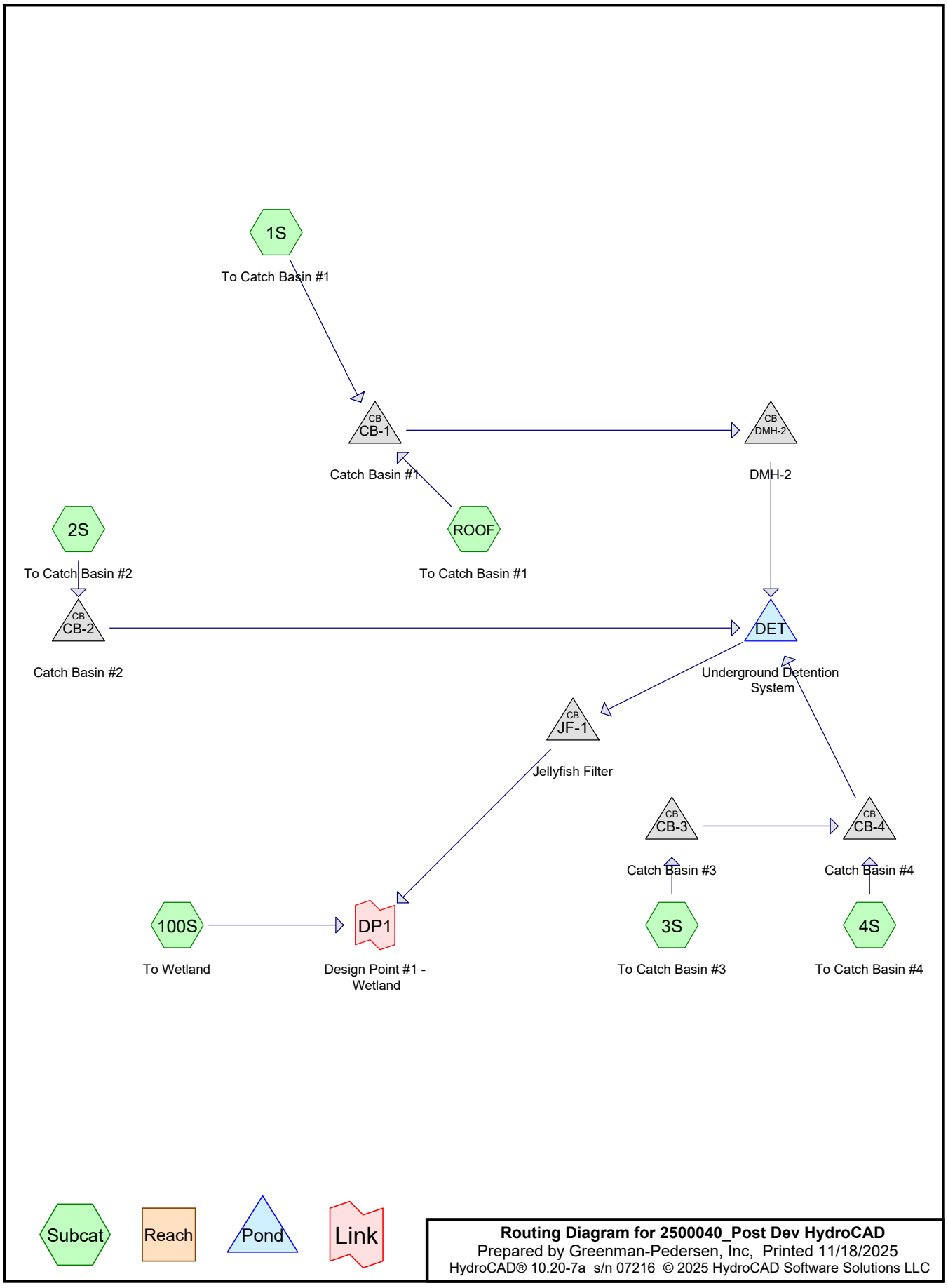
Inflow Area = 159,510 sf, 6.10% Impervious, Inflow Depth = 0.28" for 10-year event
Inflow = 0.79 cfs @ 12.17 hrs, Volume= 3,690 cf
Primary = 0.79 cfs @ 12.17 hrs, Volume= 3,690 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

APPENDIX E

POST-DEVELOPMENT HYDROCAD COMPUTATIONS

Attachment "D"



Routing Diagram for 2500040_Post Dev HydroCAD
Prepared by Greenman-Pedersen, Inc, Printed 11/18/2025

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
59,761	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S, 100S)
48,548	98	Paved parking, HSG A (1S, 2S, 3S, 4S, 100S)
12,000	98	Roofs, HSG A (ROOF)
39,201	30	Woods, Good, HSG A (100S)
159,510	**59**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
159,510	HSG A	1S, 2S, 3S, 4S, 100S, ROOF
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
159,510		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
59,761	0	0	0	0	59,761	>75% Grass cover, Good	
48,548	0	0	0	0	48,548	Paved parking	
12,000	0	0	0	0	12,000	Roofs	
39,201	0	0	0	0	39,201	Woods, Good	
159,510	**0**	**0**	**0**	**0**	**159,510**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	CB-1	196.10	195.45	121.0	0.0054	0.012	0.0	15.0	0.0	
2	CB-2	196.75	194.89	74.0	0.0251	0.012	0.0	12.0	0.0	
3	CB-3	196.00	195.10	99.0	0.0091	0.012	0.0	12.0	0.0	
4	CB-4	195.00	194.89	13.0	0.0085	0.012	0.0	12.0	0.0	
5	DET	194.20	194.10	9.0	0.0111	0.012	0.0	12.0	0.0	
6	DMH-2	195.35	194.89	83.0	0.0055	0.012	0.0	15.0	0.0	
7	JF-1	193.60	193.50	13.0	0.0077	0.012	0.0	12.0	0.0	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: To Catch Basin #1 Runoff Area=28,426 sf 58.59% Impervious Runoff Depth=1.60"
Flow Length=219' Tc=3.1 min CN=WQ Runoff=1.22 cfs 3,787 cf

Subcatchment2S: To Catch Basin #2 Runoff Area=10,336 sf 73.46% Impervious Runoff Depth=2.00"
Flow Length=85' Tc=4.8 min CN=WQ Runoff=0.52 cfs 1,726 cf

Subcatchment3S: To Catch Basin #3 Runoff Area=8,664 sf 98.84% Impervious Runoff Depth=2.70"
Flow Length=119' Tc=3.2 min CN=WQ Runoff=0.62 cfs 1,947 cf

Subcatchment4S: To Catch Basin #4 Runoff Area=9,638 sf 90.22% Impervious Runoff Depth=2.46"
Flow Length=138' Slope=0.0100 '/' Tc=3.3 min CN=WQ Runoff=0.63 cfs 1,977 cf

Subcatchment100S: To Wetland Runoff Area=2.076 ac 7.78% Impervious Runoff Depth=0.21"
Flow Length=425' Tc=13.3 min CN=WQ Runoff=0.37 cfs 1,601 cf

SubcatchmentROOF: To Catch Basin #1 Runoff Area=12,000 sf 100.00% Impervious Runoff Depth=2.73"
Tc=0.0 min CN=98 Runoff=0.96 cfs 2,728 cf

Pond CB-1: Catch Basin #1 Peak Elev=196.88' Inflow=1.99 cfs 6,515 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0054 '/' Outflow=1.99 cfs 6,515 cf

Pond CB-2: Catch Basin #2 Peak Elev=197.11' Inflow=0.52 cfs 1,726 cf
12.0" Round Culvert n=0.012 L=74.0' S=0.0251 '/' Outflow=0.52 cfs 1,726 cf

Pond CB-3: Catch Basin #3 Peak Elev=196.42' Inflow=0.62 cfs 1,947 cf
12.0" Round Culvert n=0.012 L=99.0' S=0.0091 '/' Outflow=0.62 cfs 1,947 cf

Pond CB-4: Catch Basin #4 Peak Elev=195.68' Inflow=1.25 cfs 3,924 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0085 '/' Outflow=1.25 cfs 3,924 cf

Pond DET: Underground Detention System Peak Elev=195.58' Storage=8,041 cf Inflow=3.69 cfs 12,166 cf
Outflow=0.12 cfs 8,052 cf

Pond DMH-2: DMH-2 Peak Elev=196.12' Inflow=1.99 cfs 6,515 cf
15.0" Round Culvert n=0.012 L=83.0' S=0.0055 '/' Outflow=1.99 cfs 6,515 cf

Pond JF-1: Jellyfish Filter Peak Elev=193.79' Inflow=0.12 cfs 8,052 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0077 '/' Outflow=0.12 cfs 8,052 cf

Link DP1: Design Point #1 - Wetland Inflow=0.47 cfs 9,653 cf
Primary=0.47 cfs 9,653 cf

Total Runoff Area = 159,510 sf Runoff Volume = 13,767 cf Average Runoff Depth = 1.04"
62.04% Pervious = 98,962 sf 37.96% Impervious = 60,548 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: To Catch Basin #1 Runoff Area=28,426 sf 58.59% Impervious Runoff Depth=3.34"
Flow Length=219' Tc=3.1 min CN=WQ Runoff=2.36 cfs 7,921 cf

Subcatchment2S: To Catch Basin #2 Runoff Area=10,336 sf 73.46% Impervious Runoff Depth=4.10"
Flow Length=85' Tc=4.8 min CN=WQ Runoff=1.01 cfs 3,532 cf

Subcatchment3S: To Catch Basin #3 Runoff Area=8,664 sf 98.84% Impervious Runoff Depth=5.39"
Flow Length=119' Tc=3.2 min CN=WQ Runoff=1.21 cfs 3,894 cf

Subcatchment4S: To Catch Basin #4 Runoff Area=9,638 sf 90.22% Impervious Runoff Depth=4.95"
Flow Length=138' Slope=0.0100 '/' Tc=3.3 min CN=WQ Runoff=1.23 cfs 3,979 cf

Subcatchment100S: To Wetland Runoff Area=2.076 ac 7.78% Impervious Runoff Depth=0.62"
Flow Length=425' Tc=13.3 min CN=WQ Runoff=0.73 cfs 4,668 cf

SubcatchmentROOF: To Catch Basin #1 Runoff Area=12,000 sf 100.00% Impervious Runoff Depth=5.45"
Tc=0.0 min CN=98 Runoff=1.87 cfs 5,452 cf

Pond CB-1: Catch Basin #1 Peak Elev=197.34' Inflow=3.86 cfs 13,373 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0054 '/' Outflow=3.86 cfs 13,373 cf

Pond CB-2: Catch Basin #2 Peak Elev=197.27' Inflow=1.01 cfs 3,532 cf
12.0" Round Culvert n=0.012 L=74.0' S=0.0251 '/' Outflow=1.01 cfs 3,532 cf

Pond CB-3: Catch Basin #3 Peak Elev=196.91' Inflow=1.21 cfs 3,894 cf
12.0" Round Culvert n=0.012 L=99.0' S=0.0091 '/' Outflow=1.21 cfs 3,894 cf

Pond CB-4: Catch Basin #4 Peak Elev=196.91' Inflow=2.44 cfs 7,873 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0085 '/' Outflow=2.44 cfs 7,873 cf

Pond DET: Underground Detention Peak Elev=196.91' Storage=16,329 cf Inflow=7.17 cfs 24,778 cf
Outflow=0.29 cfs 14,421 cf

Pond DMH-2: DMH-2 Peak Elev=196.91' Inflow=3.86 cfs 13,373 cf
15.0" Round Culvert n=0.012 L=83.0' S=0.0055 '/' Outflow=3.86 cfs 13,373 cf

Pond JF-1: Jellyfish Filter Peak Elev=193.90' Inflow=0.29 cfs 14,421 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0077 '/' Outflow=0.29 cfs 14,421 cf

Link DP1: Design Point #1 - Wetland Inflow=0.88 cfs 19,089 cf
Primary=0.88 cfs 19,089 cf

Total Runoff Area = 159,510 sf Runoff Volume = 29,446 cf Average Runoff Depth = 2.22"
62.04% Pervious = 98,962 sf 37.96% Impervious = 60,548 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: To Catch Basin #1 Runoff Area=28,426 sf 58.59% Impervious Runoff Depth=4.15"
Flow Length=219' Tc=3.1 min CN=WQ Runoff=2.91 cfs 9,826 cf

Subcatchment2S: To Catch Basin #2 Runoff Area=10,336 sf 73.46% Impervious Runoff Depth=5.02"
Flow Length=85' Tc=4.8 min CN=WQ Runoff=1.23 cfs 4,325 cf

Subcatchment3S: To Catch Basin #3 Runoff Area=8,664 sf 98.84% Impervious Runoff Depth=6.51"
Flow Length=119' Tc=3.2 min CN=WQ Runoff=1.45 cfs 4,702 cf

Subcatchment4S: To Catch Basin #4 Runoff Area=9,638 sf 90.22% Impervious Runoff Depth=6.01"
Flow Length=138' Slope=0.0100 '/' Tc=3.3 min CN=WQ Runoff=1.48 cfs 4,824 cf

Subcatchment100S: To Wetland Runoff Area=2.076 ac 7.78% Impervious Runoff Depth=0.94"
Flow Length=425' Tc=13.3 min CN=WQ Runoff=1.09 cfs 7,053 cf

SubcatchmentROOF: To Catch Basin #1 Runoff Area=12,000 sf 100.00% Impervious Runoff Depth=6.58"
Tc=0.0 min CN=98 Runoff=2.25 cfs 6,581 cf

Pond CB-1: Catch Basin #1 Peak Elev=197.63' Inflow=4.67 cfs 16,407 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0054 '/' Outflow=4.67 cfs 16,407 cf

Pond CB-2: Catch Basin #2 Peak Elev=197.44' Inflow=1.23 cfs 4,325 cf
12.0" Round Culvert n=0.012 L=74.0' S=0.0251 '/' Outflow=1.23 cfs 4,325 cf

Pond CB-3: Catch Basin #3 Peak Elev=197.44' Inflow=1.45 cfs 4,702 cf
12.0" Round Culvert n=0.012 L=99.0' S=0.0091 '/' Outflow=1.45 cfs 4,702 cf

Pond CB-4: Catch Basin #4 Peak Elev=197.44' Inflow=2.93 cfs 9,526 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0085 '/' Outflow=2.93 cfs 9,526 cf

Pond DET: Underground Detention Peak Elev=197.44' Storage=18,648 cf Inflow=8.67 cfs 30,258 cf
Outflow=0.64 cfs 19,208 cf

Pond DMH-2: DMH-2 Peak Elev=197.44' Inflow=4.67 cfs 16,407 cf
15.0" Round Culvert n=0.012 L=83.0' S=0.0055 '/' Outflow=4.67 cfs 16,407 cf

Pond JF-1: Jellyfish Filter Peak Elev=194.06' Inflow=0.64 cfs 19,208 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0077 '/' Outflow=0.64 cfs 19,208 cf

Link DP1: Design Point #1 - Wetland Inflow=1.34 cfs 26,261 cf
Primary=1.34 cfs 26,261 cf

Total Runoff Area = 159,510 sf Runoff Volume = 37,311 cf Average Runoff Depth = 2.81"
62.04% Pervious = 98,962 sf 37.96% Impervious = 60,548 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: To Catch Basin #1 Runoff Area=28,426 sf 58.59% Impervious Runoff Depth=2.54"
Flow Length=219' Tc=3.1 min CN=WQ Runoff=1.86 cfs 6,012 cf

Subcatchment2S: To Catch Basin #2 Runoff Area=10,336 sf 73.46% Impervious Runoff Depth=3.15"
Flow Length=85' Tc=4.8 min CN=WQ Runoff=0.80 cfs 2,717 cf

Subcatchment3S: To Catch Basin #3 Runoff Area=8,664 sf 98.84% Impervious Runoff Depth=4.21"
Flow Length=119' Tc=3.2 min CN=WQ Runoff=0.95 cfs 3,036 cf

Subcatchment4S: To Catch Basin #4 Runoff Area=9,638 sf 90.22% Impervious Runoff Depth=3.85"
Flow Length=138' Slope=0.0100 '/' Tc=3.3 min CN=WQ Runoff=0.96 cfs 3,091 cf

Subcatchment100S: To Wetland Runoff Area=2.076 ac 7.78% Impervious Runoff Depth=0.38"
Flow Length=425' Tc=13.3 min CN=WQ Runoff=0.57 cfs 2,898 cf

SubcatchmentROOF: To Catch Basin #1 Runoff Area=12,000 sf 100.00% Impervious Runoff Depth=4.25"
Tc=0.0 min CN=98 Runoff=1.47 cfs 4,254 cf

Pond CB-1: Catch Basin #1 Peak Elev=197.14' Inflow=3.04 cfs 10,266 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0054 '/' Outflow=3.04 cfs 10,266 cf

Pond CB-2: Catch Basin #2 Peak Elev=197.20' Inflow=0.80 cfs 2,717 cf
12.0" Round Culvert n=0.012 L=74.0' S=0.0251 '/' Outflow=0.80 cfs 2,717 cf

Pond CB-3: Catch Basin #3 Peak Elev=196.56' Inflow=0.95 cfs 3,036 cf
12.0" Round Culvert n=0.012 L=99.0' S=0.0091 '/' Outflow=0.95 cfs 3,036 cf

Pond CB-4: Catch Basin #4 Peak Elev=196.36' Inflow=1.92 cfs 6,128 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0085 '/' Outflow=1.92 cfs 6,128 cf

Pond DET: Underground Detention Peak Elev=196.36' Storage=13,177 cf Inflow=5.64 cfs 19,110 cf
Outflow=0.15 cfs 10,620 cf

Pond DMH-2: DMH-2 Peak Elev=196.36' Inflow=3.04 cfs 10,266 cf
15.0" Round Culvert n=0.012 L=83.0' S=0.0055 '/' Outflow=3.04 cfs 10,266 cf

Pond JF-1: Jellyfish Filter Peak Elev=193.81' Inflow=0.15 cfs 10,620 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0077 '/' Outflow=0.15 cfs 10,620 cf

Link DP1: Design Point #1 - Wetland Inflow=0.69 cfs 13,517 cf
Primary=0.69 cfs 13,517 cf

Total Runoff Area = 159,510 sf Runoff Volume = 22,008 cf Average Runoff Depth = 1.66"
62.04% Pervious = 98,962 sf 37.96% Impervious = 60,548 sf

Summary for Subcatchment 1S: To Catch Basin #1

Runoff = 1.86 cfs @ 12.04 hrs, Volume= 6,012 cf, Depth= 2.54"
Routed to Pond CB-1 : Catch Basin #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.49", P2=2.96"

Area (sf)	CN	Description
11,770	39	>75% Grass cover, Good, HSG A
16,656	98	Paved parking, HSG A
28,426		Weighted Average
11,770		41.41% Pervious Area
16,656		58.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	25	0.1340	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.2	19	0.0370	1.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	175	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.1	219	Total			

Summary for Subcatchment 2S: To Catch Basin #2

Runoff = 0.80 cfs @ 12.07 hrs, Volume= 2,717 cf, Depth= 3.15"
Routed to Pond CB-2 : Catch Basin #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.49", P2=2.96"

Area (sf)	CN	Description
2,744	39	>75% Grass cover, Good, HSG A
7,593	98	Paved parking, HSG A
10,336		Weighted Average
2,744		26.54% Pervious Area
7,593		73.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	25	0.0100	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.1	6	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	85	Total			

Summary for Subcatchment 3S: To Catch Basin #3

Runoff = 0.95 cfs @ 12.05 hrs, Volume= 3,036 cf, Depth= 4.21"
Routed to Pond CB-3 : Catch Basin #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.49", P2=2.96"

Area (sf)	CN	Description
101	39	>75% Grass cover, Good, HSG A
8,563	98	Paved parking, HSG A
8,664		Weighted Average
101		1.16% Pervious Area
8,563		98.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	12	0.0100	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.7	107	0.0180	2.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.2	119	Total			

Summary for Subcatchment 4S: To Catch Basin #4

Runoff = 0.96 cfs @ 12.05 hrs, Volume= 3,091 cf, Depth= 3.85"
Routed to Pond CB-4 : Catch Basin #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.49", P2=2.96"

Area (sf)	CN	Description
942	39	>75% Grass cover, Good, HSG A
8,695	98	Paved parking, HSG A
9,638		Weighted Average
942		9.78% Pervious Area
8,695		90.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	11	0.0100	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
1.0	127	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.3	138	Total			

Summary for Subcatchment 100S: To Wetland

Runoff = 0.57 cfs @ 12.17 hrs, Volume= 2,898 cf, Depth= 0.38"
Routed to Link DP1 : Design Point #1 - Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.49", P2=2.96"

Area (ac)	CN	Description
1.015	39	>75% Grass cover, Good, HSG A
0.162	98	Paved parking, HSG A
0.900	30	Woods, Good, HSG A
2.076		Weighted Average
1.915		92.22% Pervious Area
0.162		7.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	30	0.0330	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
1.4	86	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.4	252	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	57	0.3290	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.3	425	Total			

Summary for Subcatchment ROOF: To Catch Basin #1

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.47 cfs @ 12.00 hrs, Volume= 4,254 cf, Depth= 4.25"
Routed to Pond CB-1 : Catch Basin #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.49", P2=2.96"

Area (sf)	CN	Description
12,000	98	Roofs, HSG A
12,000		100.00% Impervious Area

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

Summary for Pond CB-1: Catch Basin #1

Inflow Area = 40,426 sf, 70.88% Impervious, Inflow Depth = 3.05" for 10-year event
Inflow = 3.04 cfs @ 12.03 hrs, Volume= 10,266 cf
Outflow = 3.04 cfs @ 12.03 hrs, Volume= 10,266 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.04 cfs @ 12.03 hrs, Volume= 10,266 cf
Routed to Pond DMH-2 : DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 197.14' @ 12.03 hrs
Flood Elev= 199.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	196.10'	**15.0" Round Culvert** L= 121.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.10' / 195.45' S= 0.0054 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.03 cfs @ 12.03 hrs HW=197.14' TW=196.35' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.03 cfs @ 3.78 fps)

Summary for Pond CB-2: Catch Basin #2

Inflow Area = 10,336 sf, 73.46% Impervious, Inflow Depth = 3.15" for 10-year event
Inflow = 0.80 cfs @ 12.07 hrs, Volume= 2,717 cf
Outflow = 0.80 cfs @ 12.07 hrs, Volume= 2,717 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.80 cfs @ 12.07 hrs, Volume= 2,717 cf
Routed to Pond DET : Underground Detention System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 197.20' @ 12.07 hrs
Flood Elev= 199.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	196.75'	**12.0" Round Culvert** L= 74.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.75' / 194.89' S= 0.0251 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.80 cfs @ 12.07 hrs HW=197.20' TW=195.58' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.80 cfs @ 2.29 fps)

Summary for Pond CB-3: Catch Basin #3

Inflow Area = 8,664 sf, 98.84% Impervious, Inflow Depth = 4.21" for 10-year event
Inflow = 0.95 cfs @ 12.05 hrs, Volume= 3,036 cf
Outflow = 0.95 cfs @ 12.05 hrs, Volume= 3,036 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.95 cfs @ 12.05 hrs, Volume= 3,036 cf
Routed to Pond CB-4 : Catch Basin #4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 196.56' @ 12.05 hrs
Flood Elev= 199.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	196.00'	**12.0" Round Culvert** L= 99.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.00' / 195.10' S= 0.0091 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.94 cfs @ 12.05 hrs HW=196.55' TW=195.88' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.94 cfs @ 3.05 fps)

Summary for Pond CB-4: Catch Basin #4

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=129)
[80] Warning: Exceeded Pond CB-3 by 0.10' @ 22.28 hrs (0.03 cfs 57 cf)

Inflow Area = 18,301 sf, 94.30% Impervious, Inflow Depth = 4.02" for 10-year event
Inflow = 1.92 cfs @ 12.05 hrs, Volume= 6,128 cf
Outflow = 1.92 cfs @ 12.05 hrs, Volume= 6,128 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.92 cfs @ 12.05 hrs, Volume= 6,128 cf
Routed to Pond DET : Underground Detention System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 196.36' @ 16.00 hrs
Flood Elev= 199.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	195.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 195.00' / 194.89' S= 0.0085 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.91 cfs @ 12.05 hrs HW=195.88' TW=195.52' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.91 cfs @ 3.46 fps)

Summary for Pond DET: Underground Detention System

[80] Warning: Exceeded Pond CB-4 by 1.15' @ 22.27 hrs (2.74 cfs 20,162 cf)
[80] Warning: Exceeded Pond DMH-2 by 0.71' @ 24.09 hrs (1.74 cfs 4,504 cf)

Inflow Area = 69,064 sf, 77.47% Impervious, Inflow Depth = 3.32" for 10-year event
Inflow = 5.64 cfs @ 12.04 hrs, Volume= 19,110 cf
Outflow = 0.15 cfs @ 16.00 hrs, Volume= 10,620 cf, Atten= 97%, Lag= 237.4 min
Primary = 0.15 cfs @ 16.00 hrs, Volume= 10,620 cf
Routed to Pond JF-1 : Jellyfish Filter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 196.36' @ 16.00 hrs Surf.Area= 8,794 sf Storage= 13,177 cf
Flood Elev= 197.45' Surf.Area= 8,794 sf Storage= 18,698 cf

Plug-Flow detention time= 519.8 min calculated for 10,616 cf (56% of inflow)
Center-of-Mass det. time= 400.8 min (1,149.9 - 749.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.20'	7,722 cf	**44.25'W x 182.57'L x 3.75'H Field A** 30,295 cf Overall - 10,989 cf Embedded = 19,305 cf x 40.0% Voids
#2A	194.70'	10,989 cf	**ADS_StormTech SC-800 +Cap** x 216 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 216 Chambers in 9 Rows Cap Storage= 3.4 cf x 2 x 9 rows = 61.6 cf
#3B	194.20'	625 cf	**4.25'W x 168.33'L x 3.75'H Field B** 2,683 cf Overall - 1,120 cf Embedded = 1,563 cf x 40.0% Voids
#4B	194.70'	1,120 cf	**ADS_StormTech SC-800 +Cap** x 22 Inside #3 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap Cap Storage= 3.4 cf x 2 x 1 rows = 6.8 cf
		20,457 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	194.20'	**12.0" Round Culvert** L= 9.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 194.20' / 194.10' S= 0.0111 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	194.20'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	196.50'	**2.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	197.35'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.15 cfs @ 16.00 hrs HW=196.36' TW=193.81' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.15 cfs of 4.87 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.15 cfs @ 6.94 fps)
3=Orifice/Grate (Controls 0.00 cfs)
4=Orifice/Grate (Controls 0.00 cfs)

Summary for Pond DMH-2: DMH-2

Inflow Area = 40,426 sf, 70.88% Impervious, Inflow Depth = 3.05" for 10-year event
Inflow = 3.04 cfs @ 12.03 hrs, Volume= 10,266 cf
Outflow = 3.04 cfs @ 12.03 hrs, Volume= 10,266 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.04 cfs @ 12.03 hrs, Volume= 10,266 cf
Routed to Pond DET : Underground Detention System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 196.36' @ 16.00 hrs
Flood Elev= 200.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	195.35'	**15.0" Round Culvert** L= 83.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 195.35' / 194.89' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.03 cfs @ 12.03 hrs HW=196.35' TW=195.46' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.03 cfs @ 3.95 fps)

Summary for Pond JF-1: Jellyfish Filter

Inflow Area = 69,064 sf, 77.47% Impervious, Inflow Depth > 1.85" for 10-year event
Inflow = 0.15 cfs @ 16.00 hrs, Volume= 10,620 cf
Outflow = 0.15 cfs @ 16.00 hrs, Volume= 10,620 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 16.00 hrs, Volume= 10,620 cf
Routed to Link DP1 : Design Point #1 - Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 193.81' @ 16.00 hrs
Flood Elev= 199.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	193.60'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 193.60' / 193.50' S= 0.0077 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 16.00 hrs HW=193.81' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.15 cfs @ 1.90 fps)

Summary for Link DP1: Design Point #1 - Wetland

Inflow Area = 159,510 sf, 37.96% Impervious, Inflow Depth > 1.02" for 10-year event
Inflow = 0.69 cfs @ 12.18 hrs, Volume= 13,517 cf
Primary = 0.69 cfs @ 12.18 hrs, Volume= 13,517 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

APPENDIX F

SUPPLEMENTAL CALCULATIONS AND BACKUP DATA

Attachment "D"

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point	
Smoothing	Yes
State	
Location	
Latitude	42.792 degrees North
Longitude	71.368 degrees West
Elevation	60 feet
Date/Time	Wed Oct 08 2025 11:54:21 GMT-0400 (Eastern Daylight Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.42	0.52	0.68	0.85	1.07	**1yr**	0.73	1.01	1.23	1.55	1.96	2.48	2.70	**1yr**	2.19	2.60	3.03	3.71	4.32	**1yr**
2yr	0.33	0.51	0.63	0.83	1.05	1.32	**2yr**	0.91	1.21	1.52	1.90	2.37	2.96	3.29	**2yr**	2.62	3.16	3.67	4.38	4.98	**2yr**
5yr	0.39	0.61	0.76	1.02	1.31	1.66	**5yr**	1.13	1.51	1.93	2.42	3.01	3.75	4.19	**5yr**	3.32	4.03	4.65	5.51	6.24	**5yr**
10yr	0.44	0.69	0.87	1.19	1.55	1.98	**10yr**	1.33	1.79	2.31	2.90	3.62	4.49	5.03	**10yr**	3.97	4.84	5.57	6.55	7.39	**10yr**
25yr	0.52	0.83	1.06	1.46	1.93	2.50	**25yr**	1.67	2.24	2.92	3.68	4.60	5.69	6.43	**25yr**	5.04	6.18	7.08	8.25	9.27	**25yr**
50yr	0.58	0.94	1.21	1.69	2.29	2.99	**50yr**	1.98	2.65	3.51	4.43	5.53	6.82	7.73	**50yr**	6.03	7.43	8.49	9.82	10.99	**50yr**
100yr	0.67	1.09	1.41	1.99	2.71	3.57	**100yr**	2.34	3.15	4.20	5.31	6.62	8.17	9.31	**100yr**	7.23	8.95	10.18	11.69	13.05	**100yr**
200yr	0.77	1.25	1.62	2.33	3.22	4.26	**200yr**	2.78	3.74	5.03	6.37	7.94	9.78	11.21	**200yr**	8.66	10.78	12.22	13.92	15.50	**200yr**
500yr	0.92	1.52	1.98	2.88	4.04	5.39	**500yr**	3.49	4.69	6.38	8.10	10.10	12.44	14.34	**500yr**	11.01	13.79	15.55	17.56	19.46	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.35	0.43	0.58	0.71	0.82	**1yr**	0.61	0.80	1.08	1.31	1.66	2.19	2.54	**1yr**	1.94	2.44	2.69	3.03	3.85	**1yr**
2yr	0.31	0.49	0.60	0.81	1.00	1.19	**2yr**	0.86	1.17	1.37	1.79	2.30	2.84	3.16	**2yr**	2.51	3.04	3.54	4.23	4.81	**2yr**
5yr	0.36	0.55	0.69	0.94	1.20	1.42	**5yr**	1.03	1.39	1.62	2.10	2.68	3.51	3.77	**5yr**	3.11	3.62	4.21	5.04	5.71	**5yr**
10yr	0.39	0.61	0.75	1.05	1.36	1.61	**10yr**	1.17	1.57	1.83	2.37	3.02	4.06	4.28	**10yr**	3.59	4.12	4.81	5.75	6.46	**10yr**
25yr	0.45	0.68	0.85	1.21	1.60	1.89	**25yr**	1.38	1.85	2.16	2.78	3.51	4.91	5.08	**25yr**	4.34	4.89	5.74	6.87	7.52	**25yr**
50yr	0.49	0.75	0.93	1.34	1.80	2.15	**50yr**	1.55	2.10	2.45	3.16	3.94	5.68	5.81	**50yr**	5.03	5.58	6.60	7.88	8.41	**50yr**
100yr	0.54	0.82	1.02	1.48	2.03	2.43	**100yr**	1.75	2.37	2.78	3.59	4.43	5.70	6.64	**100yr**	5.04	6.38	7.61	9.06	9.41	**100yr**
200yr	0.60	0.90	1.14	1.65	2.30	2.76	**200yr**	1.99	2.70	3.14	4.08	5.00	6.41	7.61	**200yr**	5.67	7.32	8.80	10.44	10.51	**200yr**
500yr	0.68	1.02	1.31	1.90	2.71	3.27	**500yr**	2.34	3.20	3.72	4.85	5.90	7.49	9.20	**500yr**	6.63	8.85	10.70	12.63	12.18	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.47	0.57	0.77	0.95	1.11	**1yr**	0.82	1.08	1.25	1.64	2.08	2.73	2.86	**1yr**	2.41	2.75	3.41	4.14	4.83	**1yr**
2yr	0.35	0.54	0.66	0.90	1.10	1.30	**2yr**	0.95	1.27	1.48	1.91	2.46	3.12	3.49	**2yr**	2.77	3.36	3.84	4.58	5.27	**2yr**
5yr	0.43	0.67	0.83	1.14	1.45	1.65	**5yr**	1.25	1.62	1.89	2.43	3.05	4.04	4.67	**5yr**	3.58	4.49	5.10	6.04	6.79	**5yr**
10yr	0.52	0.81	1.00	1.40	1.80	2.02	**10yr**	1.56	1.97	2.28	2.90	3.63	5.01	5.85	**10yr**	4.43	5.63	6.35	7.45	8.36	**10yr**
25yr	0.68	1.03	1.29	1.84	2.41	2.61	**25yr**	2.08	2.55	2.94	3.68	4.53	6.65	7.92	**25yr**	5.89	7.62	8.47	9.83	11.03	**25yr**
50yr	0.82	1.25	1.56	2.24	3.02	3.18	**50yr**	2.61	3.11	3.57	4.42	5.36	8.25	9.97	**50yr**	7.30	9.59	10.51	12.10	13.62	**50yr**
100yr	1.01	1.52	1.91	2.75	3.78	3.88	**100yr**	3.26	3.80	4.34	5.29	6.36	11.46	12.53	**100yr**	10.14	12.05	13.03	14.92	16.83	**100yr**
200yr	1.23	1.85	2.34	3.39	4.73	4.73	**200yr**	4.08	4.63	5.26	6.33	7.55	14.46	15.71	**200yr**	12.80	15.11	16.13	18.38	20.81	**200yr**
500yr	1.61	2.39	3.08	4.47	6.36	6.14	**500yr**	5.49	6.00	6.81	8.04	9.46	19.73	21.21	**500yr**	17.46	20.40	21.41	24.21	27.56	**500yr**

Powered by ACIS Northeast Regional Climate Center

OUTLET APRON DESIGN

Project: Bockes Road - Hudson, NH Job # 2500040
Date: 21-Oct-25

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

FES-1 (from HydroCAD POND DET)
Q25 = 0.28 cfs
D_o = 12 inches
Tw = 0.2 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **3** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do

USE THIS La= **7.50** feet

Where:

La is the length of the apron
Q is the discharge from the pipe or channel
D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o

La= **7.84** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La

USE THIS W= **10.50** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La

W= **6.14** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **0.22** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:
d_{50} is the median stone diameter in feet
Tw is the tailwater depth above the invert of the pipe channel in feet
Q is the discharge from the pipe or channel in cubic feet per second
D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap
d = 1.5*(d100 avg.(largest stone size))
d= **8** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

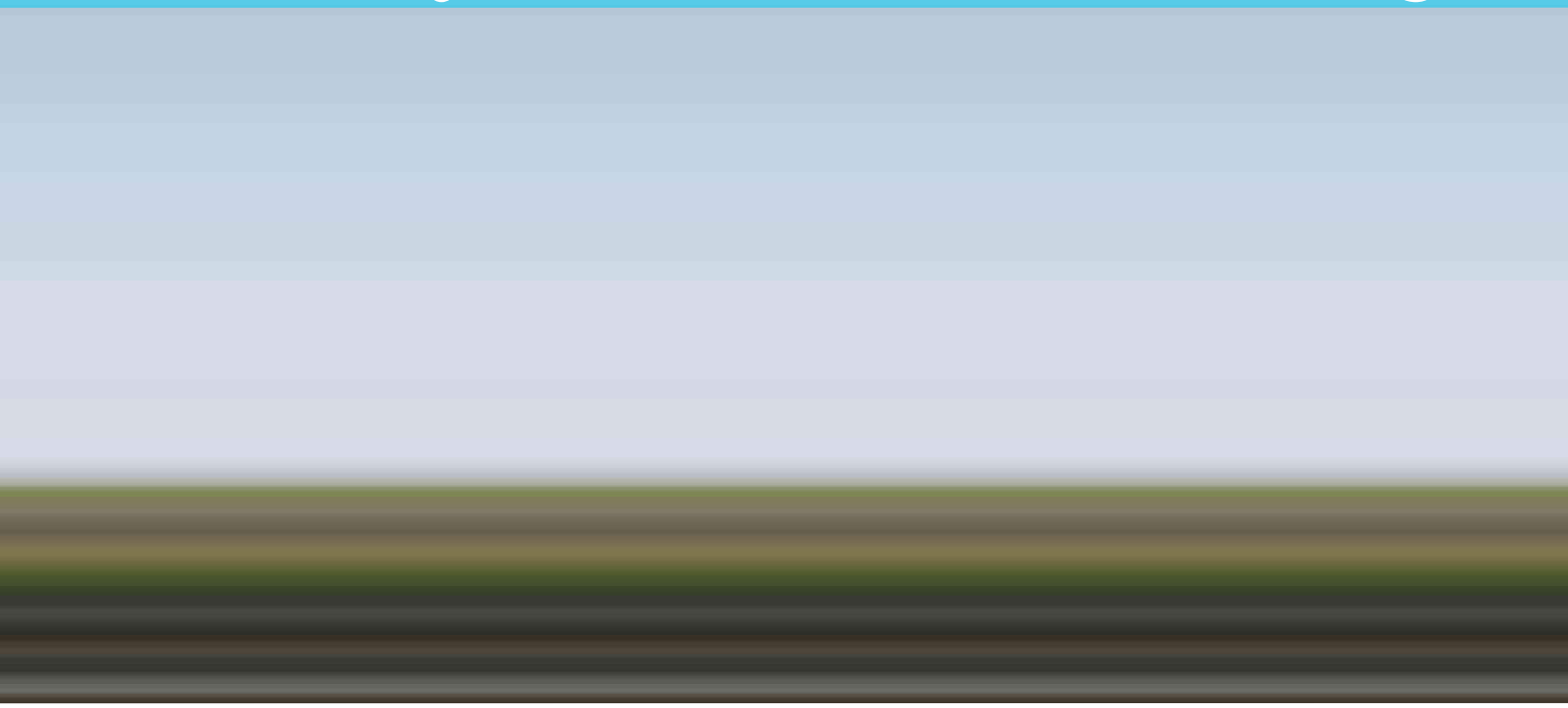
% of weight smaller than the given size	size of stone in inches		
100	**4.5**	to	**6.0**
85	**3.9**	to	**5.4**
50	**3.0**	to	**4.5**
15	**0.9**	to	**1.5**

Attachment "D"

CONTECH®
ENGINEERED SOLUTIONS

Jellyfish® Filter
Stormwater Treatment

The experts you need to solve your stormwater challenges



Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

Your Contech Team

STORMWATER CONSULTANT

It's my job to recommend the best solution to meet permitting requirements.

STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.

REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.

SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Contech is your partner in stormwater management solutions

Attachment "D"

Setting new standards in Stormwater Treatment – Jellyfish® Filter

The Jellyfish Filter has been tested in the field and laboratory, and has received approval from numerous stormwater regulatory agencies.

The Jellyfish Filter is a stormwater quality treatment technology featuring high flow pretreatment and membrane filtration in a compact stand-alone system. Jellyfish removes floatables, trash, oil, debris, TSS, fine silt-sized particles, and a high percentage of particulate-bound pollutants; including phosphorus, nitrogen, metals and hydrocarbons. The high surface area membrane cartridges, combined with up-flow hydraulics, frequent, passive backwashing, and rinseable/ reusable cartridges ensure long-lasting performance.

Jellyfish® Filter

How the Jellyfish® Filter Treats Stormwater

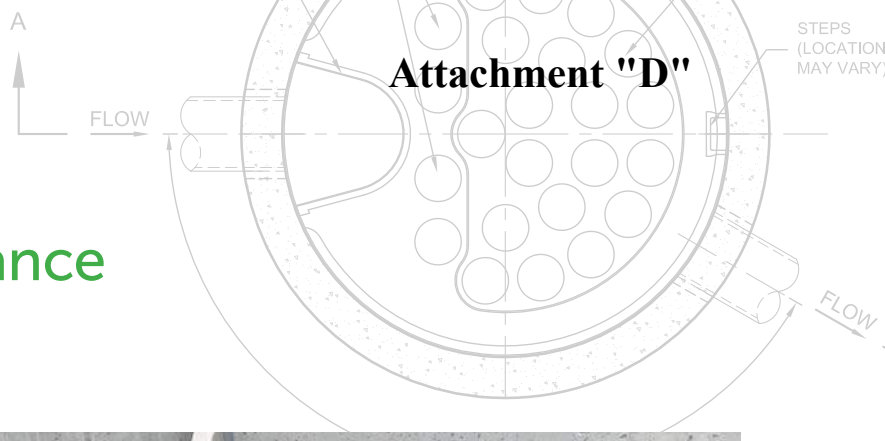
Tested in the field and laboratory ...

- Stormwater enters the Jellyfish through the inlet pipe and traps floating pollutants behind the maintenance access wall and below the cartridge deck.
- Water is conveyed below the cartridge deck where a separation skirt around the cartridges isolates oil, trash and debris outside the filtration zone.
- Water is directed to the filtration zone and up through the top of the cartridge where it exits via the outlet pipe.
- The membrane filters provide a very large surface area to effectively remove fine sand and silt-sized particles, and a high percentage of particulate-bound pollutants such as nitrogen, phosphorus, metals, and hydrocarbons while ensuring long-lasting treatment.
- As influent flow subsides, the water in the backwash pool flows back into the lower chamber. This passive backwash extends cartridge life.
- The draindown cartridge(s) located outside the backwash pool enables water levels to balance.

Jellyfish® Filter Standard Configuration

Learn More:
www.ContechES.com/jellyfish

Pretreat bioretention or infiltration with Jellyfish to extend service life.



Attachment "D"

Jellyfish® Filter Performance Testing Results

APPLICATION TIPS

- The Peak Diversion Jellyfish provides treatment and high-flow bypass in one structure, eliminating the need for a separate bypass structure.
- LID and GI are complemented by filtration solutions, as they help keep sites free from fine sediments that can impede performance, remove unsightly trash, and provide a single point of maintenance.
- Selecting a filter with a long maintenance cycle and low maintenance cost will result in healthy waterways and happy property owners.

The pleated tentacles of the Jellyfish® Filter provide a large surface area for pollutant removal.

POLLUTANT OF CONCERN	% REMOVAL
Total Trash	99%
Total Suspended Solids (TSS)	89%
Total Phosphorus (TP)	59%
Total Nitrogen (TN)	51%
Total Copper (TCu)	> 50%
Total Zinc (TZn)	> 50%

Sources:
TARP II Field Study – 2012 JF 4-2-1 Configuration
MRDC Floatables Testing – 2008 JF6-6-1 Configuration

Jellyfish® Filter Features and Benefits

FEATURE	BENEFITS
High surface area membrane filtration	Low flux rate promotes cake filtration and slows membrane occlusion
High design treatment flow rate per cartridge (up to 80 gpm (5 L/s))	Compact system with a small footprint, lower construction cost
Low driving head (typically 18 inches or less (457 mm))	Design flexibility, lower construction cost
Lightweight cartridges with passive backwash	Easy maintenance and low life-cycle cost

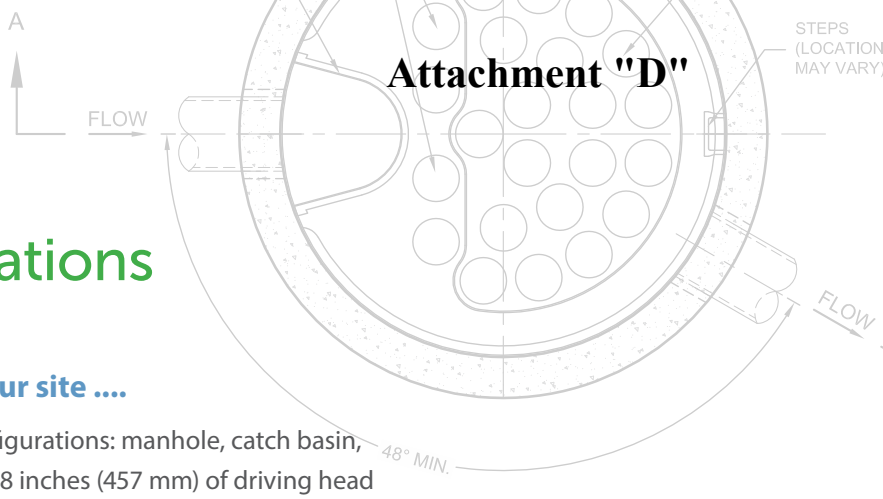
The Jellyfish Filter can be configured in a manhole, catch basin, or vault.

Select Jellyfish® Filter Certifications and Verifications

The Jellyfish Filter has been reviewed by numerous state and federal programs, including:

- New Jersey Corporation for Advanced Technology (NJCAT) – Field Performance per TARP Tier II Protocol
- Washington State Department of Ecology (TAPE – CULD)
- Maryland Department of the Environment (MD DOE)
- Canada ISO 14034 Environmental Management - Environmental Technology Verification (ETV)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)

Field tested and performance verified



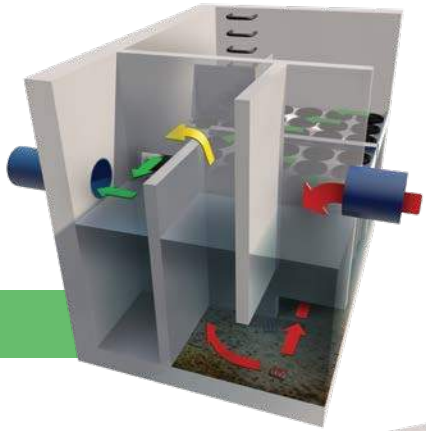
Attachment "D"

Jellyfish® Filter Configurations

Multiple system configurations to optimize your site ....

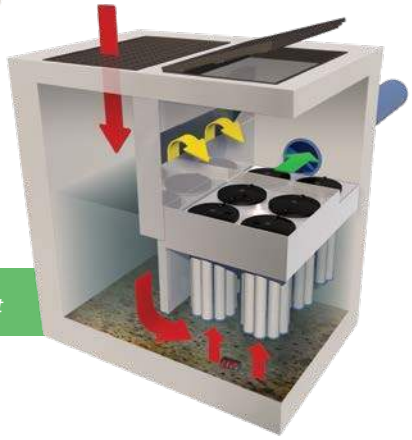
The Jellyfish Filter can be manufactured in a variety of configurations: manhole, catch basin, vault, fiberglass tank, or custom configurations. Typically, 18 inches (457 mm) of driving head is designed into the system. For low drop sites, the designed driving head can be less.

Manhole



Vault

Curb Inlet



Grated Inlet

Jellyfish® Filter Maintenance

- Jellyfish Filter cartridges are light weight and reusable
- Maintenance of the filter cartridges is performed by removing, rinsing and reusing the cartridge tentacles.
- Vacuum extraction of captured pollutants in the sump is recommended at the same time.
- Full cartridge replacement intervals differ by site due to varying pollutant loading and type, and maintenance frequency. Replacement is anticipated every 2-5 years.
- Contech® has created a network of Certified Maintenance Providers to provide maintenance on stormwater BMP's.

The Jellyfish® Filter tentacle is light and easy to clean.

A partner you can rely on

STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

TAKE THE NEXT STEP

For more information: www.ContechES.com

CONTECH® ENGINEERED SOLUTIONS

Get social with us:

800-338-1122 | www.ContechES.com

Attachment "D"

GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

This worksheet may be useful when designing a BMP that does not fit into one of the specific worksheets already provided (such as for a technology which is not a stormwater wetland, infiltration practice, etc.)

Water Quality Volume (WQV)

1.59	ac	A = Area draining to the practice
1.23	ac	A_I = Impervious area draining to the practice
0.77	decimal	I = Percent impervious area draining to the practice, in decimal form
0.75	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)
1.19	ac-in	WQV= 1" x Rv x A
4,307	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")

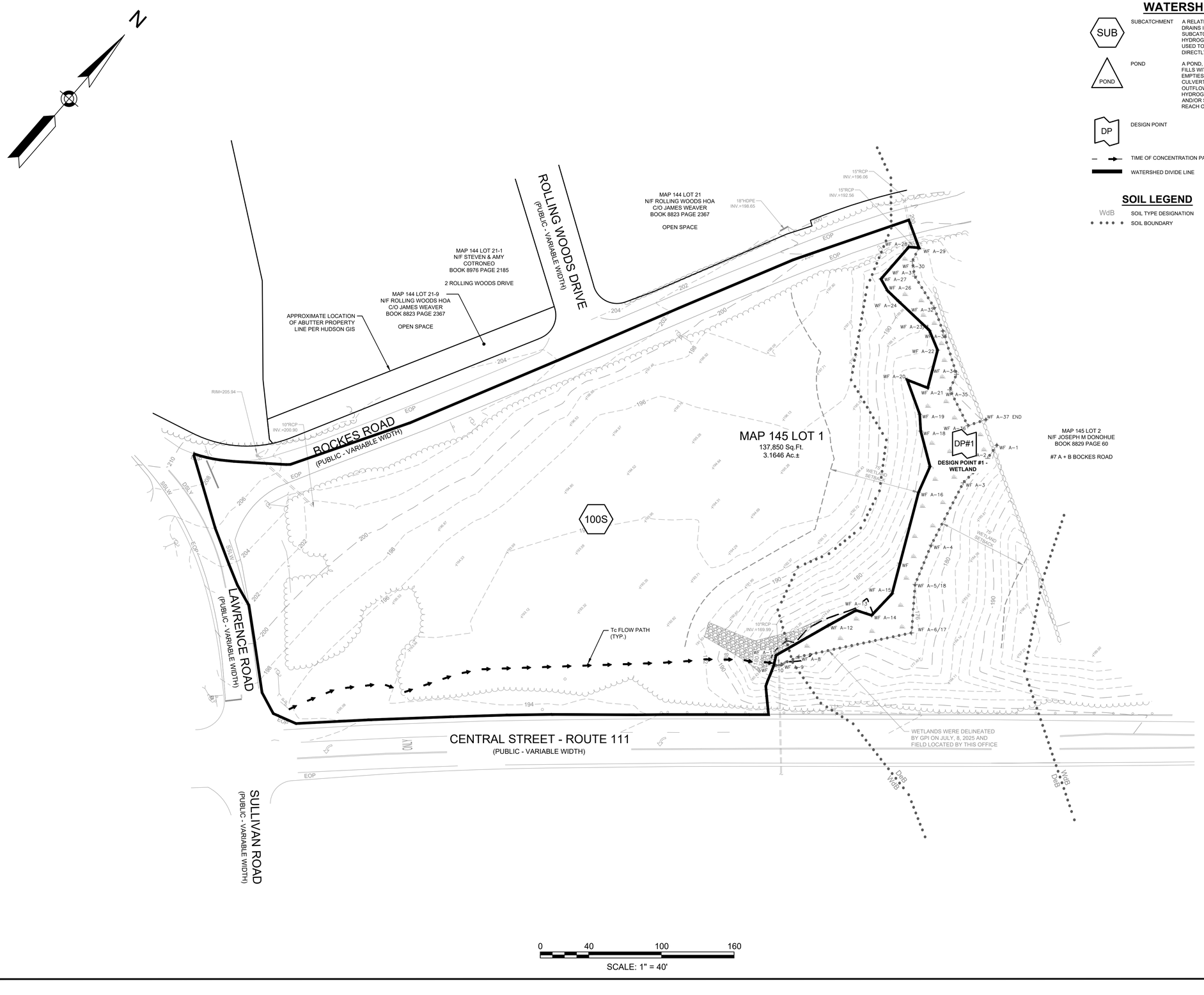
Water Quality Flow (WQF)

1	inches	P = Amount of rainfall. For WQF in NH, P = 1".
0.75	inches	Q = Water quality depth. Q = WQV/A
97	unitless	CN = Unit peak discharge curve number. CN =1000/(10+5P+10Q–10*[Q^2 + 1.25*Q*P] $^{0.5}$)
0.3	inches	S = Potential maximum retention. S = (1000/CN) - 10
0.051	inches	Ia = Initial abstraction. Ia = 0.2S
6.0	minutes	T_c = Time of Concentration
650.0	cfs/mi^2/in	q_u is the unit peak discharge. Obtain this value from TR-55 exhibits 4-II and 4-III.
1.205	cfs	WQF = q_u x WQV. Conversion: to convert "cfs/mi^2/in * ac-in" to "cfs" multiply by 1mi^2/640ac.

Designer's Notes: Jellyfish treatment unit will be sized by the manufacturer to provide treatment capacity in excess of the WQF.

APPENDIX G

DRAINAGE AREA PLANS



WATERSHED LEGEND

SUB — SUBCATCHMENT	A RELATIVELY HOMOGENEOUS AREA OF LAND THAT DRAINS INTO A SINGLE REACH OR POND. EACH SUBCATCHMENT GENERATES A RUNOFF HYDROGRAPH. (A SUBCATCHMENT MAY ALSO BE USED TO ACCOUNT FOR THE RAIN FALLING DIRECTLY ON THE SURFACE OF A POND.)
POND	A POND, SWAMP, DAM, OR OTHER IMPOUNDMENT THAT FILLS WITH WATER FROM ONE OR MORE SOURCES AND EMPTIES IN A MANNER DETERMINED BY A WEIR, CULVERT, OR OTHER DEVICE(S) AT ITS OUTLET. THE OUTFLOW(S) OF EACH POND IS DETERMINED BY A HYDROGRAPH ROUTING CALCULATION. THE PRIMARY AND/OR SECONDARY OUTFLOW MAY DRAIN INTO A REACH OR INTO ANOTHER POND.
DP — DESIGN POINT	
TIME OF CONCENTRATION PATH (Tc)	
WATERSHED DIVIDE LINE	

SOIL LEGEND

WdB	SOIL TYPE DESIGNATION
• • • • •	SOIL BOUNDARY

GPI
Engineering
Design
Planning
Construction Inspection
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road
Salem, NH 03079

PREPARED FOR:
1 BOCKES ROAD, LLC
25 PELHAM ROAD, SUITE 103
SALEM, NH 03079

PROPOSED RETAIL BUILDING
ASSESSORS MAP 145 LOT 1
1 BOCKES ROAD
HUDSON, NEW HAMPSHIRE

NO.	REVISION	DATE
1	MISC. REVISIONS	11/20/25

OCTOBER 21, 2025

DRAWN/DESIGN BY	CHECKED BY
ARM/CMY	DRJ

PRE - DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1"=40'

PROJECT NO. NEX-2500040

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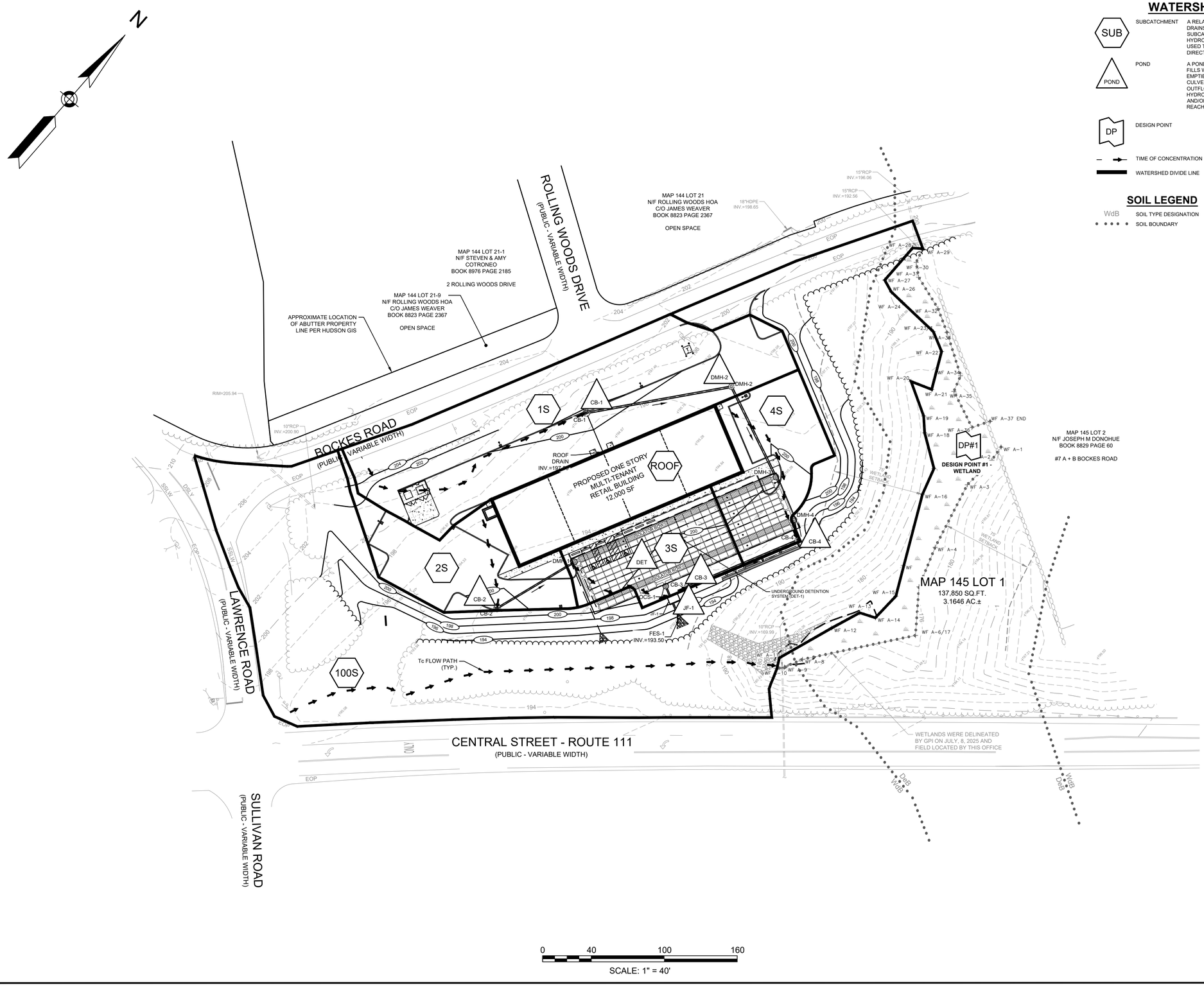


WATERSHED LEGEND

SUB — SUBCATCHMENT	A RELATIVELY HOMOGENEOUS AREA OF LAND THAT DRAINS INTO A SINGLE REACH OR POND. EACH SUBCATCHMENT GENERATES A RUNOFF HYDROGRAPH. (A SUBCATCHMENT MAY ALSO BE USED TO ACCOUNT FOR THE RAIN FALLING DIRECTLY ON THE SURFACE OF A POND.)
POND	A POND, SWAMP, DAM, OR OTHER IMPOUNDMENT THAT FILLS WITH WATER FROM ONE OR MORE SOURCES AND EMPTIES IN A MANNER DETERMINED BY A WEIR, CULVERT, OR OTHER DEVICE(S) AT ITS OUTLET. THE OUTFLOW(S) OF EACH POND IS DETERMINED BY A HYDROGRAPH ROUTING CALCULATION. THE PRIMARY AND/OR SECONDARY OUTFLOW MAY DRAIN INTO A REACH OR INTO ANOTHER POND.
DP — DESIGN POINT	
TIME OF CONCENTRATION PATH (Tc)	
WATERSHED DIVIDE LINE	

SOIL LEGEND

WdB	SOIL TYPE DESIGNATION
• • • • •	SOIL BOUNDARY

GPI
Engineering
Design
Planning
Construction Inspection
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road
Salem, NH 03079

PREPARED FOR:
1 BOCKES ROAD, LLC
25 PELHAM ROAD, SUITE 103
SALEM, NH 03079

PROPOSED RETAIL BUILDING
ASSESSORS MAP 145 LOT 1
1 BOCKES ROAD
HUDSON, NEW HAMPSHIRE

NO.	REVISION	DATE
1	MISC. REVISIONS	11/20/25

OCTOBER 21, 2025

DRAWN/DESIGN BY	CHECKED BY
ARM/CMY	DRJ

POST - DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1"=40'

PROJECT NO. NEX-2500040

Attachment "D"

(UNDER SEPARATE COVER)

INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT SYSTEMS

Attachment - "E"

INSPECTION & MAINTENANCE PLAN FOR STORMWATER MANAGEMENT SYSTEMS

PROPOSED RETAIL BUILDING
MAP 145 LOT 1
1 BOCKES ROAD
HUDSON, NEW HAMPSHIRE

GPI

44 Stiles Road, Suite One
Salem, NH 03079
(603) 893-0720

Prepared For:

1 Bockes Road, LLC
25 Pelham Road, Suite 103
Salem, NH 03079

October 21, 2025
Revised: November 20, 2025

(GPI Project No.: NEX-2500040)

Proposed Retail Building
1 Bockes Road, LLC
Stormwater Inspection & Maintenance Plan

INSPECTION & MAINTENANCE PLAN
FOR STORMWATER MANAGEMENT SYSTEMS (I&M)
Proposed Retail Building
1 Bockes Road
Hudson, NH 03051

DOCUMENTATION REQUIREMENTS

1 Bockes Road, LLC shall be responsible for ensuring the proper operation and maintenance of the stormwater management system after construction in accordance with the below criteria. Logs of inspections and cleanings shall be maintained and shall be submitted to the Town of Hudson Engineering Department at the required intervals or as requested.

Stormwater Management System Owner: Property owner

Party or Parties Responsible for Operation and Maintenance: Property owner

Property Owner Contact Information: 1 Bockes Road, LLC
25 Pelham Road, Suite 103
Salem, NH 03079
dspediatrics@hotmail.com
(603) 893-1521

Documentation: A maintenance log shall be kept summarizing inspections, maintenance and any corrective actions taken. The log shall include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. Photos shall be taken and included with the completed maintenance logs. If a maintenance task requires the clean out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Stormwater BMPs are identified on Figure 1 contained within this manual. BMPs shall be inspected and maintained in accordance with the procedures outlined below.

INSPECTION & MAINTENANCE PROCEDURES

Deep Sump Hooded Catch Basins
Inspect catch basins at least twice per year and at the end of the foliage and snow removal seasons (preferably in spring and fall) to ensure that the catch basins and slotted drain are working in their intended fashion and that they are free of debris. Sediment must also be removed twice per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. If the basin outlet is designed with a hood to trap floatable materials check to ensure watertight seal is working. At a minimum, remove floating debris and hydrocarbons at the time of the inspection. Sediment and debris can be removed by a clamshell bucket however, a vacuum truck is preferred. A vacuum truck must be used at a minimum of once per year for sediment removal. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Treatment Filter (Jellyfish)
See attached product maintenance materials by Contech ES.

Underground Detention System

The underground system should initially be inspected within the first three months after completion of the site's construction. Preventive maintenance should be performed at least every six months and sediment shall be removed from pretreatment BMP's after every major storm event. The detention system shall be inspected on regular bi-annual scheduled dates. Sediment and debris removal should be through the use of truck mounted vacuum equipment. Outlet pipes should be flushed to point of discharge on the same frequency as mentioned above. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

The following is the recommended procedure to inspect the underground system in service:

1. Locate the riser or cleanout section of the system. The riser/cleanout will typically be 6 or 12" in diameter or larger.
2. Remove the lid from the riser/cleanout.
3. Measure the sediment buildup at each riser and cleanout location. Only certified confined space entry personnel having appropriate equipment should be permitted to enter the system.
4. Inspect each manifold, all laterals, and outlet pipes for sediment build up, obstructions, or other problems. Obstructions should be removed at this time.
5. If measured sediment build up is between 2" to 8", cleaning should be considered; if sediment build up exceeds 8", cleaning should be performed at the earliest opportunity. A thorough cleaning of the system (manifolds and laterals) shall be performed by water jets and/or truck mounted vacuum equipment.

Pretreatment BMP's shall be inspected and cleaned during the regular bi-annual inspections.

The inlet and outlet of the subsurface systems should be checked periodically to ensure that flow structures are not blocked by debris. All pipes connecting the structures to the system should be checked for debris that may obstruct flow. Inspections should be conducted monthly during wet weather conditions from March to November.

Stone Aprons/Flared Ends

Inspect at least once annually for damage and deterioration. Repair damage immediately.

Vegetated Areas

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows. During the summer months, all landscape features are to be maintained with the minimum possible amount of fertilizers, pesticides or herbicides.

Winter Maintenance

Proposed snow storage is located along the edge of the parking areas and driveways. Any excess snow is to be trucked offsite. During the winter months all snow is to be stored such that snowmelt is controlled. Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. The minimum amount of deicing chemicals needed is to be used.

Control of Invasive Species

During maintenance activities, check for the presence of invasive species. Invasive species must be managed/removed in accordance with RSA 430:530 and AGR 3800. See end of this manual for information from the University of New Hampshire Cooperative Extension and the New Hampshire Guide to Upland Invasive Species from the New Hampshire Department of Agriculture Markets and Food, Plant Industry Division or the information provided on their website (http://www.agriculture.nh.gov/divisions/plant-industry/invasive-plants.htm).

Attachment - "E"

INSPECTION & MAINTENANCE LOG FORMS

Deep Sump Catch Basin Maintenance Log			
Grates clear of debris	YES	NO	
Inlet and outlet clear of debris	YES	NO	
Evidence of oil grease	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Evidence of structural deterioration	YES	NO	
Evidence of flow bypassing facility	YES	NO	
Other (specify)	YES	NO	

Notes:

Treatment Filter (Jellyfish) Maintenance Log
See separate maintenance log for Jellyfish Filter

Notes:

Stone Aprons/Flared Ends Maintenance Log			
Damage	YES	NO	
Inlet/inflow pipe clear of debris	YES	NO	
Overflow spillway clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Tree growth	YES	NO	
Other (specify)	YES	NO	

Notes:

Underground Stormwater Detention Maintenance Log			
Inlet and outlet clear of sediment/debris	YES	NO	
Chamber bottom clear of sediment/ debris	YES	NO	
Outlet control structure clear of sediment/debris	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Bottom dewaters within 72 hrs. of a storm event	YES	NO	
Other (specify)	YES	NO	

Notes:

Vegetated Areas Maintenance Log			
Clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Vegetation healthy and growing	YES	NO	
Standing water or wet spots	YES	NO	
Tree growth	YES	NO	
Other (specify)	YES	NO	

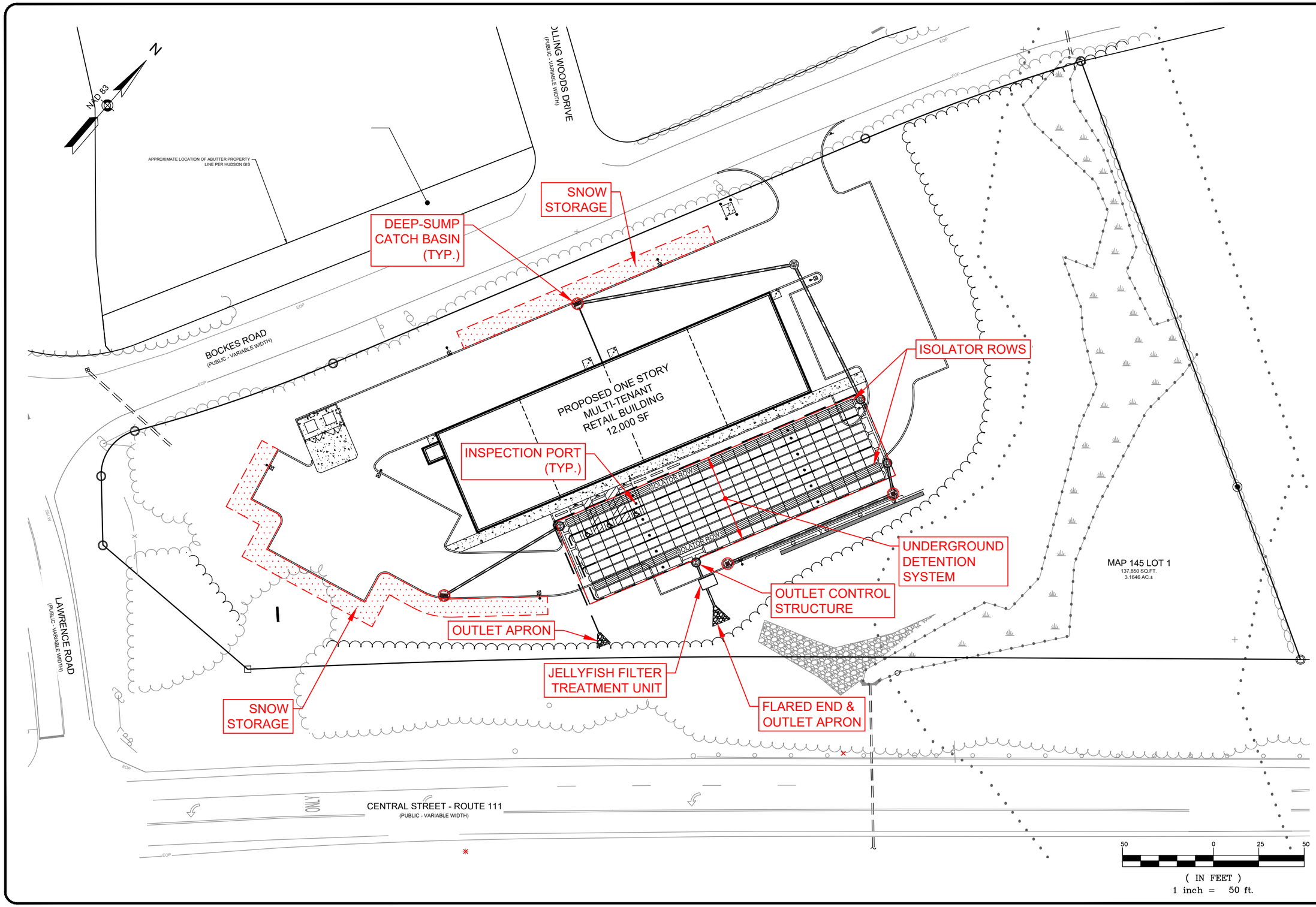
Notes:

General Inspection Notes:

Attachment - "E"

BMP MAINTENANCE EXHIBIT

Attachment - "E"



DRAWN BY: ARM
PROJECT #: NEX-2500040
DATE: 10/21/25
REV.: 11/20/25 -
FIGURE 1

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

BMP MAINTENANCE EXHIBIT

1 BOCKES ROAD
HUDSON, NEW HAMPSHIRE

LONG-TERM MAINTENANCE PLAN

The primary focus of the Long-Term Maintenance Plan is to establish procedures and controls for limiting the potential sources of pollutants, including nutrients that may contribute to excessive contaminant levels in the site's stormwater runoff. To this end, the following source controls and procedures will be in place at the site:

- **Good housekeeping** – It shall be the responsibility of the property owner to keep the site clean at all times. Refuse disposal and pickup shall occur on a regular basis and all material shall be disposed of in the specified dumpster location area on the Site Development Plans.

- **Pavement sweeping** – The sweeping of paved surfaces is recommended to be done once in the early fall and following spring snowmelt to remove sand, leaf accumulation, and other debris and when visual buildup of debris is apparent. Once removed, the sweeping should be handled and disposed of in accordance with applicable local, state, and federal guidelines and regulations.

- **Storing material and waste products inside or under cover** – No material storage is to take place outside the proposed facility on either paved or lawn areas. All materials will be stored in a neat, orderly manner and under a roof or containment area. At a minimum, all stored containers should be stored with the lid on when not in use. All products shall always remain in their original containers. All material stored on site will conform with all storage requirements of local, state, and federal agencies.

- **Routine inspections and maintenance of stormwater BMP's** – Refer to the Inspection and Maintenance procedures for each BMP as described in the I&M Plan.

- **Maintenance of lawns, gardens and other landscaped areas** – All landscaping and maintenance to be performed by an authorized company chosen by the property owner.

- **Storage and use of fertilizers, herbicides and pesticides** – Any application of herbicides or pesticides will be applied by a licensed applicator. Fertilizers, herbicides, and pesticides stored on-site shall be kept in sealed, clearly labeled containers inside the building(s).

- **Proper management of deicing chemicals and snow** – Deicing chemicals and snow removal shall primarily be the responsibility of the property owner. Deicing materials or sanding materials stored on-site must be contained in a single area and kept covered to prevent spills and avoid exposure to precipitation.

- **Proper management of cleaning products and petroleum products** – Cleaning products and petroleum products, if any, will be stored in tightly sealed, clearly labeled containers and kept inside the building(s).

- **Nutrient management plan** - The goal of the nutrient management plan is to minimize the potential sources of excess nutrients on the site and the release of nutrients in the stormwater from the site. This minimization relates both to infiltrated water and runoff. In general, the nature of the site use will tend to reduce the nutrients in the stormwater. Further, procedures indicated above related to deicing procedures, BMP maintenance procedures, and street sweeping will act to reduce the levels of nutrients in the stormwater, and the nutrients entering the adjacent wetland and the groundwater.

CONTROL OF INVASIVE SPECIES

CONTACT INFORMATION

TERRESTRIAL PLANTS

Douglas Cygan, Invasive Species Coordinator, NH Department of Agriculture, Markets & Food, Division of Plant Industry, 29 Hazen Drive, Concord, NH 03301
(603) 271-3488, douglas.cygan@agr.nh.gov
Website: www.agriculture.nh.gov

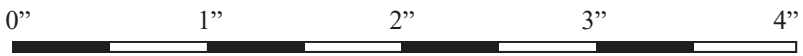
AQUATIC PLANTS

Amy Smagula, Clean Lakes and Exotic Species Coordinator, NH Department of Environmental Services, 29 Hazen Drive, PO Box 95, Concord, NH 03302
(603) 271-2248, asmagula@des.state.nh.us.

RESOURCES

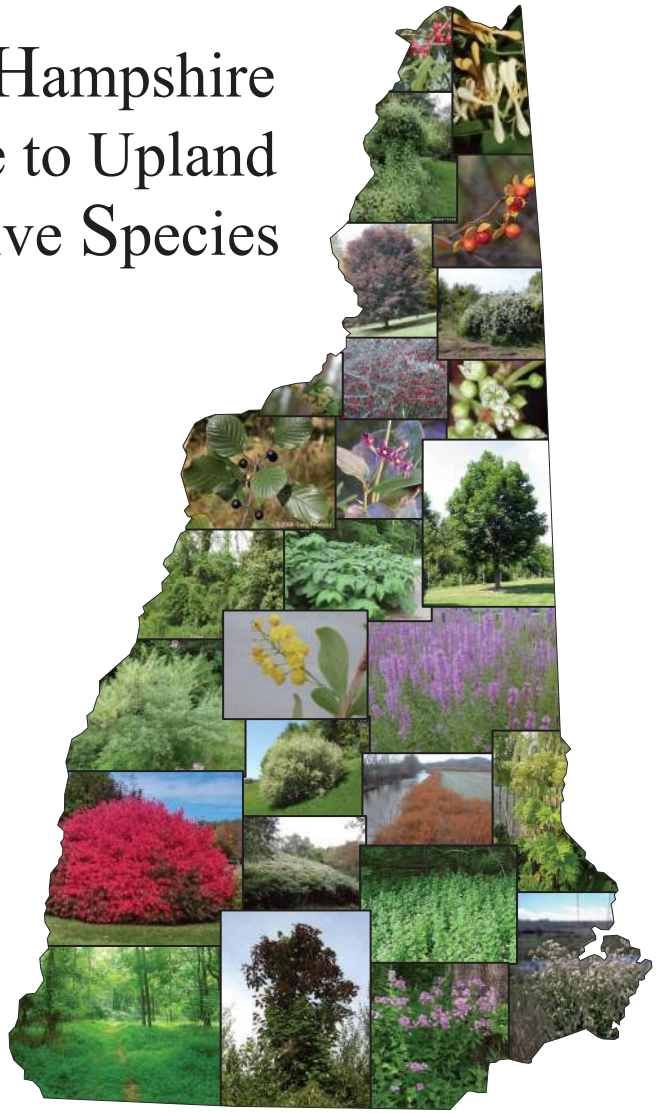
NH Coastal Watershed Invasive Plant Partnership (CWIPP)
www.des.nh.gov/organization/divisions/water/wmb/coastal/cwipp/index.htm
Invasive Plant Atlas of New England (IPANE)
http://invasives.eeb.uconn.edu/ipane
Natural Resource Conservation Service (NRCS)
http://plants.usda.gov
New England Wildflower Society (NEWS)
www.newfs.org
New Hampshire Department of Agriculture, Markets & Food (DAMF)
www.agriculture.nh.gov
New Hampshire Department of Resources & Economic Development, Natural Heritage Bureau (DRED)
http://www.naturalheritage.org
New Hampshire Department of Resources & Economic Development, Division of Forests and Lands (DRED)
http://www.nhdfl.org/organization/div_nhnhi.htm
New Hampshire Department of Environmental Services (DES)
www.des.state.nh.us/wmb/exoticspecies
New Hampshire Fish & Game Department
www.wildlife.state.nh.us
The Nature Conservancy (TNC)
www.nature.org
U.S. Department of Agriculture's Animal Plant Health Inspection Service (USDA APHIS)
www.aphis.usda.gov
University of New Hampshire Cooperative Extension (UNHCE)
www.ceinfo.unh.edu

Funding for the printing of this booklet provided by:
U.S. Department of Agriculture's Animal Plant Health Inspection Service



Attachment - "E"

New Hampshire Guide to Upland Invasive Species



New Hampshire
Department of Agriculture
Markets and Food, Plant Industry Division

5th Edition
2018

Douglas Cygan

Introduction

Throughout the world, non-native invasive species have become an overwhelming problem resulting in impacts to the natural environment and managed landscapes. Invasive species typically possess certain traits that give them an advantage over most native species. The most common traits include the production of many offspring, early and rapid development, and adaptability and high tolerance to many environmental conditions. These traits allow invasive species to be highly competitive and, in many cases, suppress native species. Studies show that invasives can reduce natural diversity, impact endangered or threatened species, reduce wildlife habitat, create water quality impacts, stress and reduce forest and agricultural crop production, damage personal property, and cause health problems.

Invasive species began arriving in North America in the mid-to-late 1700s by various means. Many were brought here for ornamental uses, erosion control, or to provide for wildlife habitat. Others arrived inadvertently through international travel and commerce.

Impacts and Actions

Biologists have found that invasive species cover more than 100 million acres of land in the U.S. and their population numbers continue to spread. The repeated process of spread has become so extreme that invasive species cost the United States billions of dollars per year. This is a result of lost agricultural and forest crops, impacts to natural resources and the environment, and the control efforts required to eradicate them.

On February 3, 1999, President Clinton signed Executive Order 13112, which established the National Invasive Species Council. The Council is responsible for assessing the impacts of invasive species, providing the nation with guidance and leadership on invasive species issues, and seeing that federal programs are coordinated and compatible with state and local initiatives.

Each state is also required to participate by evaluating and responding to their invasive species concerns. In the summer of 2000, the State of New Hampshire passed House Bill 1258-FN, which created the Invasive Species Act (ISA) and the New Hampshire Invasive Species Committee.

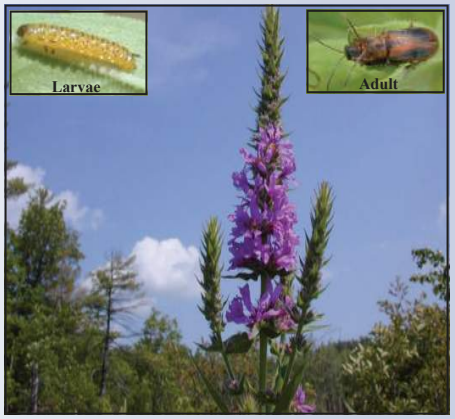
GLOSSARY OF TERMS

Alternate: Arranged singly at each node, as leaves or buds on different sides of a stem.
Annual: Living or growing for only one year or season.
Aril: A fleshy, usually brightly colored cover of a seed that develops from the ovule stalk and partially or entirely envelops the seed.
Axis: The point at which the leaf is attached to the main stem or branch.
Berry: A small, juicy, fleshy fruit.
Biennial: Having a life cycle that normally takes two growing seasons to complete.
Capsule: A dry dehiscent fruit that develops from two or more united capsules.
Compound: Composed of more than one part.
Deciduous: Shedding or losing foliage at the end of the growing season.
Dehiscent: The spontaneous opening of a fruit at maturity.
Drupe: A fleshy fruit usually having a single hard stone enclosing a seed.
Entire: Referring to a leaf not having an indented margin.
Filiform: Having the form resembling a thread or filament.
Furrowed: A rut groove or narrow depression.
Glabrous: Having no hairs or projections; smooth.
Imbricate: To be arranged with regular overlapping edges.
Inflorescence: A cluster of small flowers arranged on a flower stalk.
Lanceolate: A leaf tapering from a rounded base toward an apex, lance-shaped
Lenticels: The small, corky pores or narrow lines on the surface of the stems of woody plants that allow the interchange of gases between the interior tissue and the surrounding air.
Lustrous: Having a sheen or glow.
Native: A species that originated in a certain place or region; indigenous.
Naturalized: Adapted or acclimated to a new environment without cultivation.
Opposite: Growing in pairs on either side of a stem.
Ovate: Broad or rounded at the base and tapering toward the end.
Panicle: A branched cluster of flowers in which the branches are racemes
Peduncle: The stalk of a solitary flower of an inflorescence.
Peltate: Leaf being round with the stem attached near its center.
Perennial: Living three or more years.
Perfect: Having both stamens and pistals in the same flower.
Pod: A dry, several-sealed, dehiscent fruit.
Pubescent: Covered in fine short hairs.
Raceme: Elongated cluster of flowers along the main stem in which the flowers at the base open first.
Rhizome: A horizontal, usually underground stem that often sends out roots and shoots from its nodes.
Samara: A winged, often one-seed indehiscent fruit as of the ash, elm or maple.
Simple: Having no divisions or branches; not compound.
Umbel: A flat-topped or rounded inflorescence.

Lythrum salicaria - Purple Loosestrife

Family: Lythraceae
Native to: Eurasia

Description: Perennial growing 30-80" tall by $^{2}/_{3}$'s as wide. **Stems:** 4-6 sided, turning woody in summer. **Leaves:** Opposite to whorled, lanceolate, 2-4" long. **Flowers:** Spiked raceme, purple to magenta, June to October. **Fruit:** Capsule. **Habitat:** Mostly found in wetlands and aquatic systems, full to partial sun. **Spread:** Each plant can produce approximately 2.5-4.5 million seeds. Seeds dispersed by water, wildlife and humans. **Comments:**Invades wetlands suppressing native species and destroying wildlife habitat. **Controls:** Hand pull, use a spade to dig larger plants or use biocontrols (*Galerucella Spp*., top left is a larvae & top right is an adult).



Photos by Douglas Cygan

Phragmites australis - Common Reed

Family: Poaceae
Native to: Eurasia

Description: Perennial rhizomatous grass growing 14' tall. **Stems:** Called 'culms' are large, hollow and grow up to 1" dia. **Leaves:** Lanceolate, up to 24" long, bluish-green in color. **Flowers:** Panicles with many spikelets having seven small reddish flowers. **Habitat:** Mostly found in marshlands, but also grows in freshwater wetlands and aquatic systems, full to partial sun. **Spread:** Spreads primarily by rhizomes. **Comments:** Forms dense colonies that suppress native species and alter wildlife habitat. **Controls:** Hand pull small plants. Use a spade to dig larger plants or apply herbicides.

Photos by Douglas Cygan

Attachment - "E"

New Hampshire Invasive Species Committee

The New Hampshire Invasive Species Committee (ISC) is an advisory group for the Commissioner of the NH Department of Agriculture, Markets & Food (DAMF) on matters concerning invasive species in the state. The ISC consists of 11 appointed members representing the following: the NH Department of Agriculture, the NH Department of Environmental Services, the NH Department of Resources & Economic Development, the NH Department of Transportation, the NH Department of Fish & Game, The College of Life Science & Agriculture of the University of NH, the UNH Cooperative Extension, environmental interests, horticultural interests, general public interests, and livestock owners & feed growers interests. The ISC meets regularly to conduct the following efforts:

- Review information;
- Evaluate and discuss potentially invasive plant, insect and fungi species of concern;
- Host guest presentations on related topics;
- Develop outreach and educational materials;
- Formulate management practices as guidance for the control of invasive species; and
- Prepare lists of proposed prohibited and restricted species.

(*Note: This committee is not charged with the evaluation or listing of aquatic plant species, which is conducted by the Department of Environmental Services under RSA-487:16-a. However, a brief description of the program and four of the aquatic species are described on pages 29 & 30 of this book*).

New Hampshire Rules

In accordance with the Invasive Species Act (ISA), HB 1258-FN, the DAMF is the lead state agency for terrestrial invasive plants, insects and fungi species. The DAMF has the responsibility for the evaluation, publication and development of rules on invasive plant species. This is for the purpose of protecting the health of native species, the environment, commercial agriculture, forest crop production, and human health. Therefore, the rule, Agr 3800, states "**No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living or viable portion of any listed prohibited invasive plant species, which includes all of their cultivars and varieties, listed"** (see the New Hampshire Department of Agriculture's website at www.agriculture.nh.gov to review the complete set of rules).

Invasive Upland Plant Species (Agr 3800)

Invasive Insect Species

(To see the complete list of all 16 invasive insects refer to rules Agr 3800)

Invasive Aquatic Plant Species

To see the complete list of invasive aquatic plants refer to DES's Env-Wq 1300 rules

New Hampshire Department of Environmental Services
Aquatic Invasive Plant Species

"Exotic aquatic species" are plants or animals that are not part of New Hampshire's native aquatic flora and fauna. Since the first exotic aquatic plant infestation in New Hampshire was discovered in 1965 in Lake Winnipesaukee, exotic aquatic plant infestations have increased to a total of 83 infestations in 72 waterbodies in 2008. Species present include variable milfoil (63 waterbodies), Eurasian milfoil (3 waterbodies), fanwort (9 waterbodies), water chestnut (1 waterbody) and Brazilian elodea (1 waterbody), Curly Leaf Pondweed (3 waterbodies), and European Naiad (3 waterbodies), and Didymo (1 waterbody). Most of these exotic plants can propagate by fragmentation as well as by seed.

Exotic aquatic plant fragments can easily become attached to aquatic recreational equipment, such as boats, motors, and trailers, and can spread from waterbody to waterbody through transient boating activities. Infestations can have detrimental effects on the ecological, recreational, aesthetic, and economic values of the state's precious surface waters, limiting use of the waterbodies and decreasing shorefront property values by as much as 1020 percent according to a UNH study (Halstead, et al., 2001).

Myriophyllum heterophyllum - Variable Milfoil

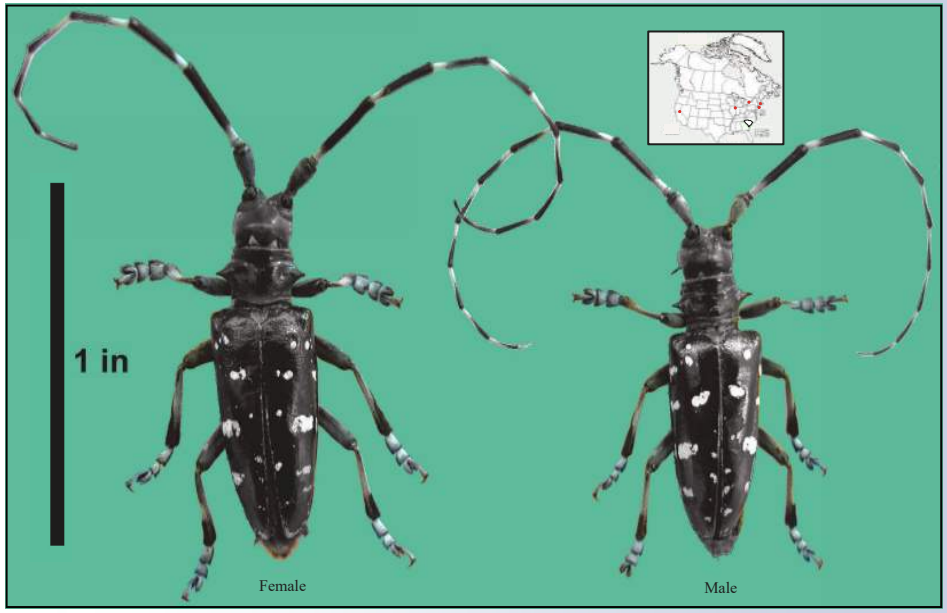
Family: Haloragaceae
Native to: Eurasia

Description: Submerged aquatic perennial growing 20' tall. **Stems:** Round, thick and reddish. **Leaves:** Feathery leaflets surrounding the stem. **Flowers:** Stalks that emerge above the water with green leaves, June to August. **Habitat:** Lakes, ponds, calm streams, and other similar aquatic systems with full to partial sun. **Spread:** It reproduces primarily by vegetative propagules when individual plant segments break off, and dispersed by water movement, humans, and boats. **Comments:** Invades water bodies, suppresses native species and destroys fish habitat. **Controls:** Prevention, hand pulling, bottom screening, and aquatic herbicide use.

Photos by Amy Smagula

Anoplophora glabripennis - Asian Longhorned Beetle

Family: Cerambycidae
Native to: Europe



Asian Longhorned Beetle—*Anoplophora glabripennis* (Photo by Chris Rallis)

The Asian longhorned beetle (ALB) is a serious threat to a large variety of deciduous hardwoods in North America. ALB is a large glossy black insect with white spots dotting its elytra. Adults grow to 1-1.5" long and have whitish bandings on their antennae. Females are typically bigger than males. Tree injury occurs when larvae tunnel through the xylem (heartwood) of the host, thus weakening the tree. Hosts trees include, but aren't limited to: Maple, Chestnut, Poplar, Willow, Birch, Elm, and Mountain ash. Adult females chew a crater in the bark and lay 1-egg per site. Upon hatching the larvae feed on the wood and emerge as adults in 1-2 years through perfect $^{3}/_{8}$" diameter exit holes. Other signs include coarse wood shavings called frass, oozing sap, oviposition sites, leaf-feeding damage, and mature beetles. **If found, please call the NH Dept. of Agriculture at (603) 271-2561**.


Oviposition Site


Egg (Rutgers University)


Sap flow from injury


Larval damage (Rutgers Univ.)


Adult feeding damage on leaf


3/8" diameter exit hole

Photos by Douglas Cygan, Chris Rallis & Rutgers University

DO NOT MOVE FIREWOOD

WHAT YOU CAN DO

Attachment - "E"

There are many things that you, as an individual, can do to help control the spread of invasive species and preserve native flora and fauna:

- Minimize impacts to natural vegetation, soils, and drainage.
- Learn how to identify invasive plants and know how to tell them apart from native species.
- Control invasives on your property by following recommended practices.
- When landscaping, ask your local garden center or contact your County Extension Service about alternative plantings.
- Become active in local or regional initiatives to control invasives.
- After working in an area with invasive species remove any soil, or propagules that may have adhered to clothing, shoes, vehicle tires, etc.

CONTROL METHODS

Mechanical: Mechanical control involves hand pulling, digging, cultivation, mowing, cutting or utilizing some type of physical barrier such as a tarpaulin, mulch, wood chips, etc. This method is most effective when populations of unwanted species are low.

Cultural: Cultural control is the manipulation of a plant community to prevent the introduction or spread of an unwanted species. This can be accomplished by modifying the growing environment such as the soil, available light or moisture, or planting trees or shrubs that can outcompete the invasive species.

Chemical: Chemical control involves the use of an approved herbicide to manage a targeted species. The application method must be chosen to avoid damage to beneficial or native species. The applicator must adhere to all State and Federal pesticide regulations and in many cases be licensed by the state. For more information, contact the NH Department of Agriculture's Pesticide Control Division at 603-271-3550 or www.agriculture.nh.gov.

Biological: Biological control is the use of native or introduced beneficial organisms to naturally reduce populations of unwanted species. Most biological controls are found to be self-sustaining and host specific.

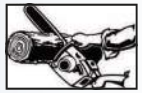

Pulling


Digging


Cutting-Hand tools


Herbiciding


Mowing

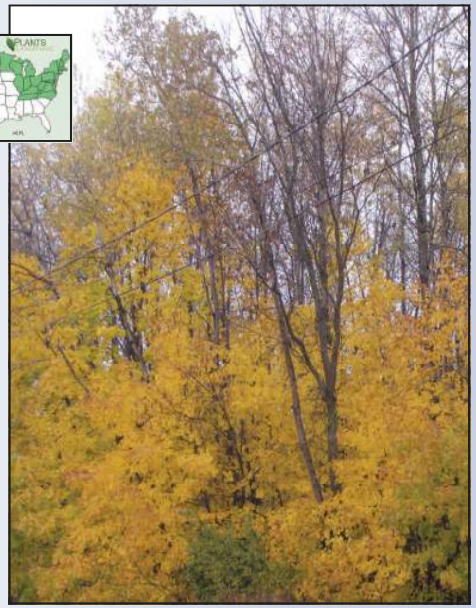

Cutting-Saws


Biocontrols

Acer platanoides - Norway Maple

Family: Aceraceae
Native to: Europe

Norway Maple—*Acer platanoides*



Norway Maple (in yellow) Invasion in Franklin, NH

Description: Large deciduous tree 60' high by 40' wide. **Bark:** Grayish and somewhat furrowed. **Twigs:** Smooth, olive-brown. **Buds:** Terminal, imbricate, rounded, smooth, greenish-red. **Leaves:** Opposite, 4-7" wide, 5-lobed, dark green to dark red above, lustrous below. **Flowers:** Greenish-yellow, April. **Fruit:** Horizontal samara. **Zone:** 3-7. **Habitat:** Moist, well drained soils, full sun to partial shade. **Spread:** Seeds spread by wind and water. **Comments:** Leaf stalks exude milky white sap. Fast growing, buds break earlier than most native species. Naturalizes in woodlands where it can outcompete native species. **Controls:** Pull or dig seedlings/saplings. Cut large trees and prune suckers when they sprout. Herbicide: foliar spray, cut-stem, bark banding, or slash bark with ax and apply to wounds.

Milky white sap-leaf petiole

Leaf with winged seed

Terminal buds rounded

Flowers greenish-yellow

Bark is grayish & furrowed

Leaves turn yellow in Fall

Photos by Douglas Cygan

Agrilus planipennis - Emerald Ash Borer

Family: Buprestidae
Native to: Asia

Emerald Ash Borer—*Agrilus planipennis*

Dead standing Ash trees (Canadian Forest Service)

Emerald Ash Borers (EAB) are small invasive wood boring beetles that attack all species of ash trees (*Fraxinus spp.*). Native to East Asia, it is suspected that they were accidentally introduced to North America in infested wood packing material. The adults are 3/8" to ½" in length by 1/16" in width. Their bodies have a dark metallic green appearance. Adults emerge from a D-shaped exit hole from late May to mid-July and live for 3-6 weeks, during which time they feed on ash foliage, and fly 1-mile or so in search of a mate and to lay eggs. Females will lay 60-90 eggs in the crevices of ash tree bark. Larvae emerging from the eggs create distinctive S -shaped feeding galleries within the cambium which is directly beneath the bark. These feeding galleries can girdle the tree and result in tree death. Movement of EAB into new uninfested areas is principally through transportation of firewood. **If found, please contact the NH Dept. of Agriculture at (603) 271-2561.**

Egg

Larvae in feeding galleries

Adult with wings spread

Feeding galleries in cambium

D-shaped exit hole

EAB Purple prism trap

Photos by Douglas Cygan & Chris Rallis

DO NOT MOVE FIREWOOD

Adelges tsugae - Hemlock Wooly Adelgid

Family: Adelgidae
Native to: Asia

Hemlock Wooly Adelgid—*Adelges tsugae* Nests

Hemlock trees dead from Adelgid (www.earthportal.org)

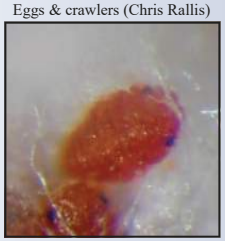
Hemlock Wooly Adelgid (*Adelges tsugae*) (HWA) is a serious pest to all North American hemlock trees (*Tsuga spp.*). It is native to Japan & China and was first found in the Pacific Northwest in the 1920's. By the 1950's it had reached the east coast and now infects hemlock trees from Georgia to Maine. It spreads by movement of nursery stock, wind and animals. These insects are extremely small averaging about $^{1}/_{8}$" in length with piercing-sucking mouth parts similar in appearance to aphids. All adults are females with each producing 50-300 eggs. To protect themselves & their eggs they produce a white-waxy covering. Adults insert their piercing mouth parts into the stem at the base of the needles. Trees die from needle loss & lack of nutrition. **If found, please call the NH Dept. of Agriculture at (603) 271-2561**.

Adult female laying eggs

Egg mass in protective nest

Eggs & crawlers (Chris Rallis)

Heavily infested branch



Crawlers (Chris Rallis)

Crawler leaving nest (Chris Rallis)

Photos by Douglas Cygan & Chris Rallis

DO NOT MOVE FIREWOOD

Ailanthus altissima - Tree of Heaven

Family: Simaroubaceae
Native to: China

Tree of Heaven—*Ailanthus altissima*

Tree of Heaven invasion

Description: Deciduous tree up to 60' tall by 40' wide. **Bark:** Grayish, slightly furrowed. **Twigs:**Reddish-brown. **Leaves:** Compound, 18-24" long with 13 -25 leaflets arranged alternately on stem, lanceolate, 3-5" long with 2-4 teeth near base. **Flowers:** Panicles, 8-16" long, yellowish-green, mid-June. **Fruit:** Samara. **Zone:** 4-8. **Habitat:** Highly adaptable and pollution tolerant, full sun to partial shade. **Spread:** Seeds are wind dispersed. **Comments:** Very fast growing, dense canopy shades out native species. **Controls:** Remove seedlings and saplings by hand. Larger trees can be mechanically removed or cut. To prevent suckering, if trees are cut, apply herbicide to cut portion of stump.

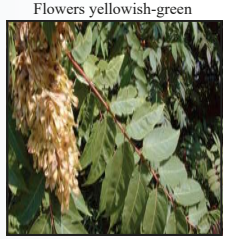
Leaf scar on stem

Compound leaves & leaf

Leaf bud

Flowers yellowish-green

Bark grayish & furrowed



Winged seed cluster

Photos by Douglas Cygan

Alliaria petiolata - Garlic Mustard

Family: Cruciferae
Native to: Europe

Garlic Mustard—*Alliaria petiolata*

Woodland invasion (photo by Cornell University)

Description: Cool season biennial, 2nd year plants flower and reach 2-3$^1/_2$' tall. **Leaves:** Triangular, coarsely toothed, heart-shaped. **Flowers:** Umbel, small, 4-petals, white, April-May. **Fruit:** Pods, seeds turn black when mature. **Zone:** 4-8. **Habitat:** Prefers moist shaded flood-plains, forests and roadsides, adaptable to most soil and light conditions. **Spread:** Seeds spread by water and wildlife. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Basal rosette

Leaf

Flower buds

Flowers 4-petaled, white

Stems

Seed pods

Photos by Douglas Cygan

Rosa multiflora - Multiflora Rose

Family: Rosaceae
Native to: Japan & Korea

Multiflora Rose-*Rosa multiflora*

Multiflora Rose invasion, Canterbury, NH

Description: Hardy shrub / climber reaching up to 15' or more in height and 10' in width. **Stems:** Long and arching, forming dense clumps, thorns may or may not be present. **Leaves:** Alternately arranged, compound with 7-9 leaflets and having feather margins at base. **Flowers:** Clusters of white or pink, June to July. **Fruit:** Rose hips turn red in fall. **Zone:** 3-8. **Habitat:** Prefers moist, well drained soils, full sun. **Spread**: Fruits with seeds are dispersed by birds. **Comments:** Very aggressive, leading to competition and displacement of native species. **Controls:** Hand or mechanical removal, cutting, or herbicide application.

Twig/stem bark

Leaves

Feathery margin at base of leaf

Flowers white

Fall color

Fruit is called a hip

Photos by Douglas Cygan

Rhamnus cathartica - Common Buckthorn

Family: Rhamnaceae
Native to: Eurasia

Description: Deciduous shrub or small tree measuring 20' by 15'. **Bark:** Grayish to brown with raised lenticels. **Stems:** Cinnamon colored with terminal spine. **Leaves:** Alternate, simple and broadly ovate with toothed margins. **Flowers:** Inconspicuous, 4-petaled, greenish-yellow, mid-June. **Fruit:** Fleshy, 1/4" diameter turning black in the fall. **Zone:** 3-7. **Habitat:** Adapts to most conditions including pH, heavy shade to full sun. **Spread:** Seeds are bird dispersed. **Comments: Highly:** Aggressive, fast growing, outcompetes native species. **Controls:** Remove seedlings and saplings by hand. Larger trees can be cut or plants can be treated with an herbicide.

Photos courtesy of John M. Randall/The Nature Conservancy

Rhamnus frangula - Glossy Buckthorn

Family: Rhamnaceae
Native to: Japan

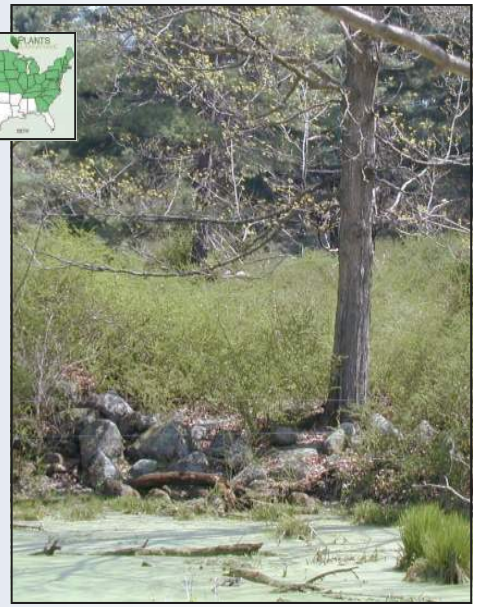
Description: Tall deciduous shrub up to 20' in height by 15' wide, **Bark:** Grayish with whitish lenticels. **Twigs:** Reddish-brown. **Leaves:** Ovate, 4-5" long by 3-4" wide, arranged alternate or whorled on stem. **Flowers:** Small, greenish-white, mid-June. **Fruit:** Fleshy, turning black in the fall. **Zone:** 2-7. **Habitat:** Highly adaptable and pollution tolerant, full sun to partial shade. **Spread:** Seeds are bird dispersed. **Comments:** Very fast growing, dense canopy shades out native species. **Controls:** Remove seedlings and saplings by hand. Larger trees can be cut or herbicide may be used.

Photos by Douglas Cygan

Berberis thunbergii - Japanese Barberry

Family: Berberidaceae
Native to: Japan

Japanese Barberry-*Berberis thunbergii*



Japanese Barberry invasion, Antrim, NH

Description: Deciduous shrub, 2-4$^{1}/_{2}$' tall. **Leaves:** Ovate, simple, entire. Color varies depending on variety. **Flowers:** Small yellowish, bloom in May in clusters of 2-4. **Fruit:** Drupe, turning red in summer. **Zone:** 4-8. **Habitat:** Prefers well drained soils in semi shade and often occurring in forests, roadsides, and open fields. **Spread:** Seeds are dispersed by wildlife. **Comments:** Forms dense thickets in natural environments where it becomes established, resulting in impacts to native flora and fauna. **Controls:** Remove small immature plants by hand. Dig larger plants with a garden spade or remove mechanically. Cut stems at base or control with herbicide treatment.

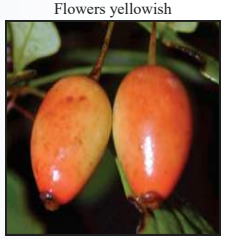
'Crimson Pygmy' variety

Leaves

Thorn

Flowers yellowish

Frost covered Barberry



Fruit is a fleshy drupe

Photos by Douglas Cygan

Berberis vulgaris - European Barberry

Family: Berberidaceae
Native to: China

European Barberry-*Berberis vulgaris*

Woodland invasion, Claremont, NH

Description: Shrub 3-8' in height by 3-6' in width. **Stems:** Tan bark with 3 long spines at each leaf axis. **Leaves:** Alternate, simple, $^{1}/_{2}$"-1$^{1}/_{2}$" long, bright green above, dull below. **Flowers:** Perfect, yellow, $^{1}/_{2}$" long, mid-April to May. **Fruit:** Oblong drupe turning pale red in fall. **Zone:** 4-8. **Habitat:** Prefers full sun to partial shade and open spaces to wooded areas. **Spread:** Seeds are dispersed by birds and wildlife. **Comments:** Highly adaptable to most environments and is pollution tolerant. **Controls:** Hand pull young plants. Cut or mechanically remove older larger plants or apply approved herbicides for large populations.

Thorns

Leaves

Flowers

Flowers whitish-yellow

Stems

Seed pods

Photos by Douglas Cygan

Polygonum cuspidatum - Japanese Knotweed

Family: Polygonaceae
Native to: Japan

Description: Perennial reaching 10' in height and width. Bohemian Knotweed (*Reynoutria x bohemica*) is similar. **Stems:** Greenish, hollow and jointed, similar to bamboo. **Leaves:** Alternate, broadly ovate, 3-7" long. **Flowers:** Small, whitish, forming panicles, August-September. **Seeds:** Calyx, brown, triangular. **Habitat:** Found in woodland sites, open spaces, ditches, roadsides, riverbanks. Prefers moist, well-drained soils. **Spread:** Stem & root fragments, and by seed. **Comments:** Aggressive, spreads quickly along surface waters and in right-of-ways. **Controls: Do <u>not</u> mow**, cut stems at base then smother by covering area with heavy-duty fabric/plastic, herbicides also recommended.

Photos by Douglas Cygan

Polygonum perfoliatum - Mile-a-Minute Vine

Family: Polygonaceae
Native to: Asia

Description: Very fast growing herbaceous perennial vine growing to 25' in height. **Stems:** Greenish with stiff barbs used for support. **Leaves:** Alternate, triangular in shape with clasping bract at the base, 1-3" long. **Flowers:** Racemes, inconspicuous and white forming at the bract, August - October. **Seeds:** An achene within a greenish, berry-like fruit. **Habitat:** Grows in partial shade to full sun, fields, roadsides & forests. Prefers moist, well-drained soils. **Spread:** Seed spread by birds & wildlife. **Comments:** Fast growing, aggressive. **Controls:** Mowing, hand cutting or herbicide use is recommended.

Photos by Leslie J. Mehrhoff

Microstegium vimineum - Japanese Stilt Grass

Family: Poaceae
Native to: Asia

Japanese Stilt Grass—*Microstegium vimineum*

Japanese Stilt Grass woodland invasion

Description: Weak-stemmed annual grass, reaching 2-4' tall. **Leaves:** Lanceolate, tapered at both ends, 2-3" long with silvery stripe of reflective hairs down the midrib. **Flowers:** Racemes occur at the ends of the stalk itself, late August. **Fruit:** Achenes develop in late fall. **Zone:** 5-11. **Habitat:** Occurs along riverbanks, floodplains, forests and roadsides, adaptable to most soil and light conditions. **Spread:** Seeds spread by water, wildlife & humans. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Early development

Root (UMASS Extension)

Leaf with silvery reflective hairs along midrib

Fall-leaves turn purplish

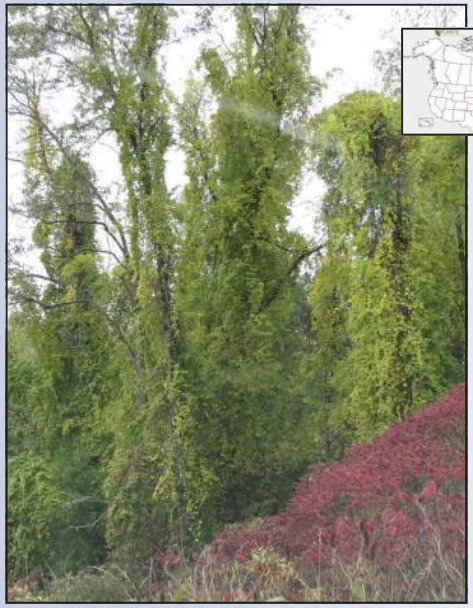
Seed-Achene

Photos courtesy of Leslie J. Mehrhoff/UCONN-IPANE and UMASS Extension

Celastrus orbiculatus - Oriental Bittersweet

Attachment - "E"

Family: Celastraceae
Native to: Japan, China



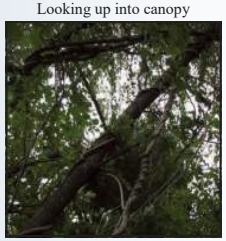
Oriental Bittersweet-*Celastrus orbiculatus*

Oriental Bittersweet invasion, Concord, NH

Description: Deciduous vine reaching heights of 40-60'. **Bark:** Tannish, furrowed. **Leaves:** Alternate, ovate, bluntly toothed, 3-4" long by 2/3's as wide, tapered at the base. **Flowers:** Small, greenish, blooming in spring. **Fruit:** Yellow dehiscent capsule surrounding an orange-red aril. *Fruits occur in the axils of the stems whereas native bittersweet (Celastrus scandens) fruits at the ends.* **Zone:** 4-8. **Habitat:** Disturbed edges, roadsides, fields, forests and along rivers and streams. **Spread:** Birds and humans. **Comments:** Very aggressive, climbs up and over trees and smothers them. Do not buy wreaths made of these vines. **Controls:** Difficult to manage. Cutting, pulling, or recommended herbicide use applied to foliage, bark, or cut-stump.

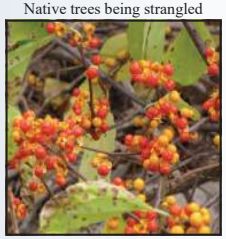
Looking up into canopy

Leaves

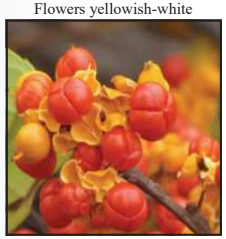


Native trees being strangled

Flowers yellowish-white

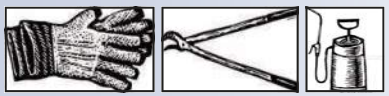


Mature Orange-yellow fruit



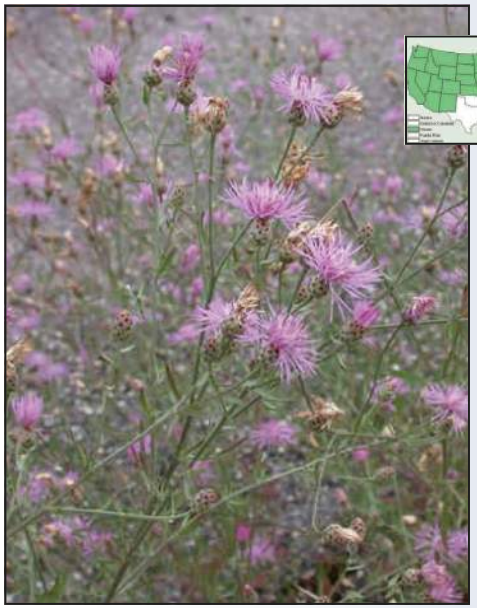
Fruit is a fleshy capsule

Photos by Douglas Cygan

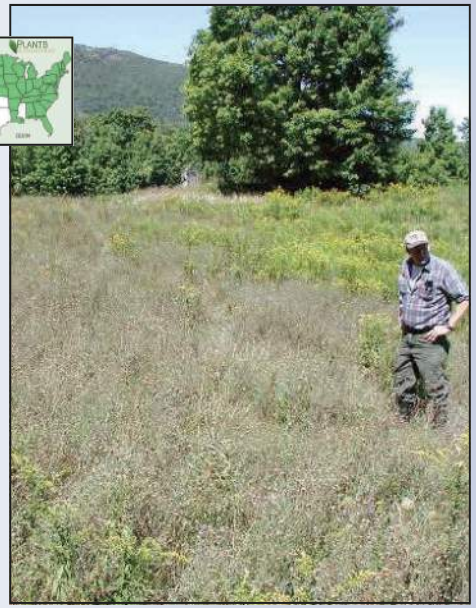


Centaurea maculosa - Spotted Knapweed

Family: Compositae
Native to: Eurasia



Spotted Knapweed—*Centaurea maculosa*



Invasion (photo by Leslie Mehrhoff)

Description: Tall erect herbaceous perennial living 3-5 years. **Leaves:** Alternate, divided, Pale green, 1-3" long. **Flowers:** Aster-like, terminal, purple, July-August. **Fruit:** Each plant produces thousands of brownish seeds per year. **Zone:** 3-10. **Habitat:** Invades dry sunny roadsides, fields and waste places. Its large taproot allows it to survive harsh winters and draught **Spread:** Seeds spread by wind and wildlife. **Comments:** Plants spread quickly into natural meadows and fields leading to competition and displacement of native species. Roots excrete a toxin killing off other plants. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Basal rosette

Leaf

Seed head

Flowers—Aster like

Stems

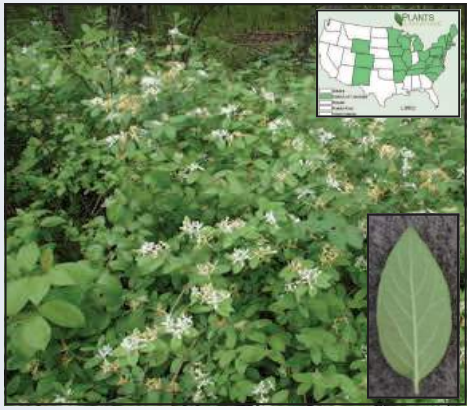
Seeds

Photos by Leslie Mehrhoff & Douglas Cygan

Lonicera morrowii - Morrow's Honeysuckle

Family: Caprifoliaceae
Native to: Japan

Description: Shrub reaching 6-8' tall. **Stems:** Smooth, glabrous, Tannish, hollow. **Leaves:** Ovate, simple, entire, opposite, pubescent beneath, 1-2$^1/_2$" long. **Flowers:** Tubular, white, turning yellow with age, May to June. **Fruits:** Berry turning red. **Zone:** 3 . **Habitat:** Moist to wet shaded floodplains, forests, roadsides, fields, waste places. **Spread:** Seeds are dispersed by wildlife and humans. **Comments:** Rapidly invades sites, forming a dense vegetative layer that outcompetes native flora and fauna species. **Controls:** Hand control is effective for small plants, while mechanical removal and repetitive cutting also work well. Herbicide treatment is better for areas with greater infestations.



Photos by Douglas Cygan & Leaf Photo by Leslie J. Mehrhoff

Lonicera tatarica - Tatarian Honeysuckle

Family: Caprifoliaceae
Native to: Eurasia

Description: Upright deciduous shrub reaching 6-15' tall. **Stems:** Smooth, glabrous, tan, hollow. **Leaves:** Ovate, smooth, bluish-green, opposite, 1-2$^1/_2$" long. **Flowers:** Tubular, pink or white, April to May. **Fruit:** Berry with two seeds, turning red in fall. **Zone:** 3. **Habitat:** Under story species in woodland sites, also invades open spaces. Thrives in moist soils. **Spread:** Seeds dispersed by wildlife and humans. **Comments:** Rapidly invades forests, fields, roadsides and floodplains. Outcompetes native species. **Controls:** Hand control is effective for small plants while mechanical removal, cutting and chemical applications are better for larger stands.

Photos by Leslie J. Mehrhoff & Berry Photo by Douglas Cygan

Lonicera x bella - Showy Bush Honeysuckle

Family: Caprifoliaceae
Native to: Eurasia

Description: Shrub reaching 20' in height and width. **Stems:** Greenish to tan with corky wings. **Leaves:** Oppositely arranged, simple and elliptic, 1-3" long by half as wide, light green. **Flowers:** Yellow, white or pink, May to early June. **Fruit:** Fleshy red, forming in pairs in leaf axis. **Zone:** 4. **Habitat:** Prefers dry upland soils, full sun to heavy shade, pH adaptable. **Spread:** Seeds are dispersed by birds. **Comments:** *L. x bella* is a cross between *L. tatarica* & *L. morrowii*. Spreads into natural areas forming dense stands, which displace native species. **Controls**: Hand or mechanical removal, continuous cutting, girdling, and herbicide treatment.

Photos courtesy of Leslie J. Mehrhoff/UCONN-IPANE

Lonicera japonica - Japanese Honeysuckle

Family: Caprifoliaceae
Native to: Eurasia

Description: Climbing vine. **Stems:** Reddish-brown, pubescent. **Leaves:** Opposite and not clasping the stem as opposed to the three native honeysuckle vines that do clasp the stem, oblong, $1^1/_2$ -2" long, rounded at base. **Flowers:** Tubular, white or yellow, fragrant, May to mid-July. **Fruit:** Berry, smooth, blackish to slightly purplish. **Zone:** 4-8. **Habitat:** Prefers moist soils and full sun to partial shade. **Spread:** Seeds spread by wildlife. **Comments:** Vines grow quickly, covering native vegetation, resulting in loss of habitat. **Controls:** hand or mechanical removal, cutting, girdling, chemical.

Photos courtesy of John M. Randall/The Nature Conservancy
& Leaf Photo by Leslie J. Mehrhoff

Attachment - "E"

Cynanchum nigrum - Black Swallow-Wort

Family: Asclepiadaceae
Native to: Eurasia

Description: Perennial herbaceous vine that grows to 6'. **Leaves:** Opposite, lanceolate, dark glossy green, simple with a smooth edge, 2-4" long. **Flowers:** Small $^1/_4$", 5-petaled, purplish, from June to September. **Seed:** Seeds are similar to those of milkweed. **Zone:** 4 to 8. **Habitat:** It prefers full to partial sun. **Spread:** Seeds dispersed by wind. **Comments:** Invades roadsides, fields, disturbed sites, meadows, and woodlands, outcompeting native species. **Controls:** Hand pull young plants. Remove and destroy seed pods before they open. Apply herbicides as a foliar spray during the growing season. If plants are to be dug, use a spade and make sure that all root fragments are removed.

Photos by Douglas Cygan

Cynanchum rossicum - Pale Swallow-Wort

Family: Asclepiadaceae
Native to: China

Description: Perennial vine growing to 3-6'. Very similar to black swallow-wort with the exception of the flowers. **Leaves:** Opposite, lanceolate, 2-4" long. **Flowers:** Magenta, $^3/_8$", flowering from June to September. **Seed:** Seeds are similar to milkweed. **Zone:** 4 to 8. **Habitat:** It prefers full to partial sun. **Spread:** Seeds dispersed by wind. **Comments:** Invades roadsides, fields, disturbed sites, meadows and woodlands. **Controls:** Hand pull young plants. Remove and destroy seed pods before they open. Apply herbicides as a foliar spray. Dig using a spade to ensure all root fragments are removed.

Photos courtesy of John M. Randall/The Nature Conservancy

Elaeagnus umbellata - Autumn Olive

Family: Elaeagnaceae
Native to: Asia

Autumn Olive—Elaeagnus umbellata

Autumn Olive invasion in Concord, NH

Description: Weedy deciduous shrub measuring 20' by 20'. **Bark:** Silvery-gray and smooth with whitish lenticels. **Stems:** Cinnamon-brown. **Leaves:** Elliptical, 2-3" long, glossy, green above and silverish below. **Flowers:** Solitary, whitish, 4-petaled, mid-June. **Fruit:** Drupe. **Zone:** 3-8. **Habitat:** Naturalizes in open spaces exposed to full sun. **Spread:** Seeds dispersed by birds and wildlife. **Comments:** Very aggressive. Outcompetes and displaces native species. **Controls:** Remove seedlings and saplings by hand. Larger shrubs can be mechanically removed, or cut and apply herbicide to stump.

Silvery-gray Bark

Leaves

Terminal bud

Flowers whitish

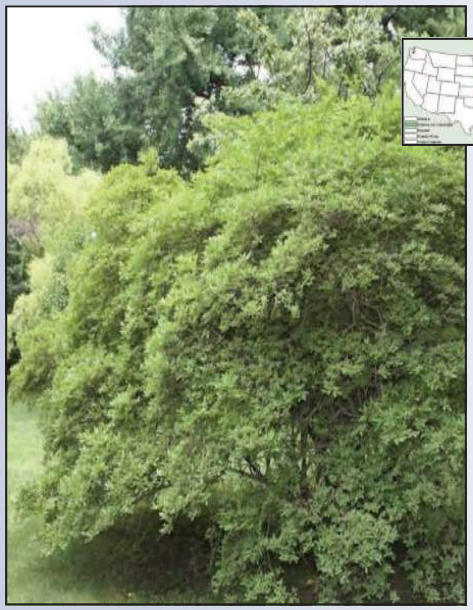
Fall Color

Fruit is a fleshy drupe

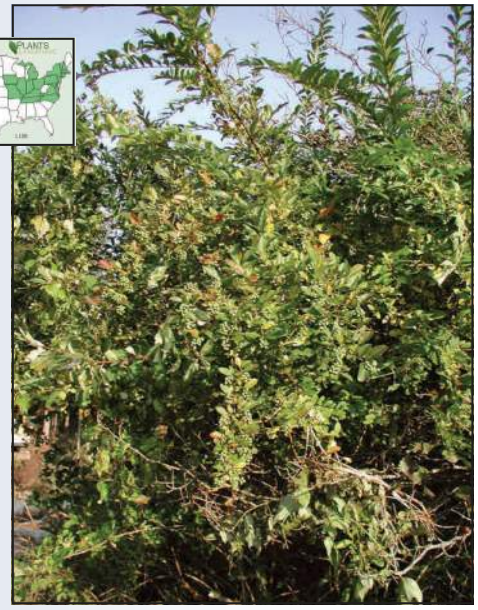
Photos by Douglas Cygan

Ligustrum obtusifolium - Blunt-leaved Privet

Family: Oleaceae
Native to: Europe



Blunt-leaved Privet-*Ligustrum obtusifolium*



Blunt-leaved Privet (Photo: Leslie J. Mehrhoff)

Description: Shrub reaching 12' tall by 10-12' wide. **Stems:** Greenish, smooth. **Leaves:** Opposite, simple and elliptic, 1-3" long by half as wide, blunt tipped, light green. **Flowers:** Small white panicles, May to early June. **Fruit:** Small blackish drupe. **Zone:** 4-7. **Habitat:** Prefers dry upland soils, full sun to heavy shade, pH adaptable. **Spread:** Seeds dispersed by birds. **Comments**: Becomes established in natural areas leading to competition and displacement of native species. **Controls:** Hand or mechanical removal, cutting, herbicide applications such as foliar or cut-stem.

Twig/stem bark

Leaves

Terminal bud

Flowers white

Fall color

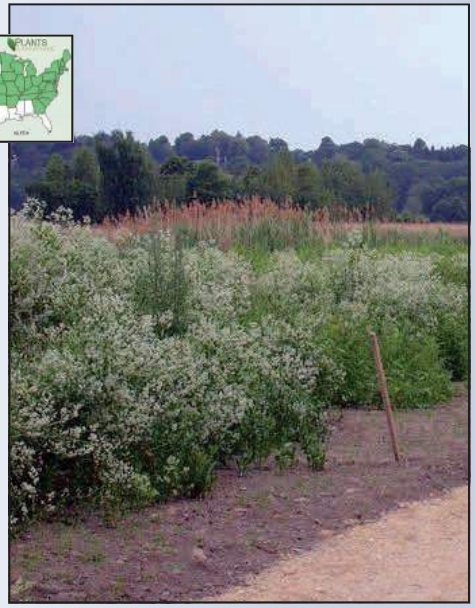
Fruit is a dark drupe

Photos by Douglas Cygan & Leslie Mehrhoff

Lepidium latifolium - Perennial Pepperweed

Family: Cruciferae
Native to: Eurasia

Perennial Pepperweed—*Lepidium latifolium*

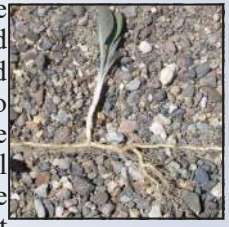


Perennial Pepperweed invasion Seacoast area, NH

Description: Long lived perennial growing 2-4' tall. **Leaves:** Alternate, lanceolate with serrated edge. **Flowers:** Terminal, tightly clustered, white, July. **Fruit:** Silicle, rounded, flattish, hairy $^{1}/_{16}$" long. **Zone:** 4-8. **Habitat:** Prefers wet, brackish soils such as coastal tidal marshes and ditches, wetlands, and floodplains. **Spread:** Seeds and creeping rhizome fragments spread by water, wildlife and humans. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native coastal wetland species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Basal rosette

Leaf



Rhizome root with shoot

Flower head

Persistent stems

Seeds (photo—USDA)

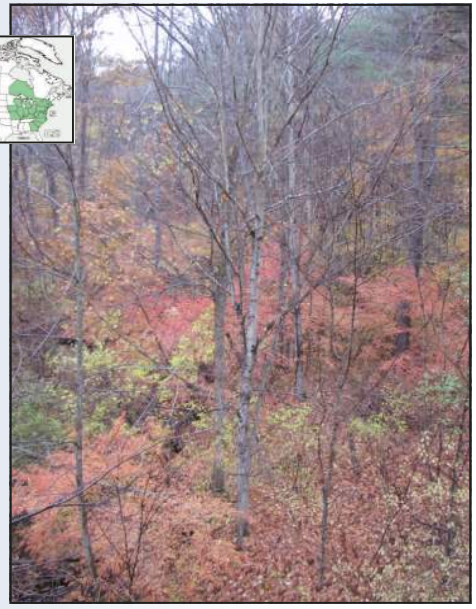
Photos by Kevin Lucey & Jennifer Forman

Euonymus alatus - Burning Bush

Attachment - "E"

Family: Celastraceae
Native to: Asia

Burning Bush-*Euonymus alatus*



Burning Bush invasion, Boscawen, NH

Description: Deciduous shrub reaching 20' in height and width. **Stems:** Greenish with corky wings. **Leaves:** Oppositely arranged, simple and elliptic, 1-3" long by half as wide, light green. **Flowers:** Inconspicuous greenish-yellow, May to June. **Fruit:** Fleshy green capsule turning red in fall. **Zone:** 3 to 8. **Habitat:** Prefers dry upland soils, full sun to heavy shade, pH adaptable. **Spread**: Seeds are dispersed by birds and wildlife. **Comments:** Outcompetes and displaces native species. **Controls:** Hand remove seedlings and saplings. Use a spade or shovel to dig out larger plants. Large populations may be controlled with herbicide use.

Corky-winged bark

Leaves

Terminal buds

Flowers yellowish-white

Fall color

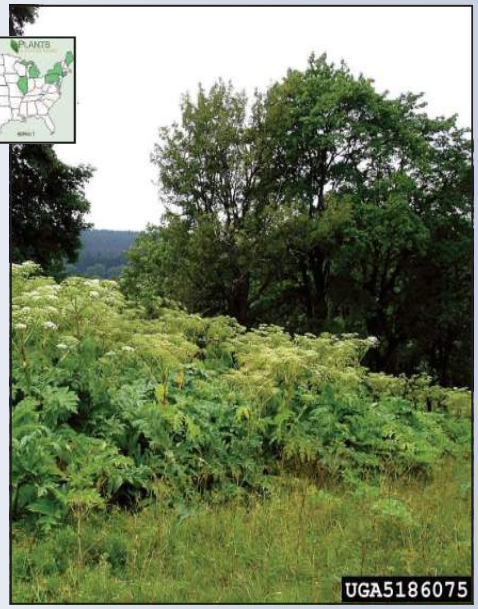
Fruit is a fleshy capsule

Photos by Douglas Cygan

Heracleum mantegazzianum - Giant Hogweed

Family: Apiaceae
Native to: China

Giant Hogweed-*Heracleum mantegazzianum*



Open field invasion (Photo-Bugwood.org)

Description: Biennial growing to 15' tall. **Stems:** Greenish with purple splotches, 2-4" diameter with coarse hairs, hollow. **Leaves:** Large, compound, deeply incised, 3-5' wide, hairy on underside. **Flowers:** White inflorescence, 1-2' in diameter, May-June. **Seeds:** Flattened, $^{3}/_{8}$" long, ovate with 4 brown resin canals. **Zone:** 3-8. **Habitat:** Found in wet areas, roadsides, gardens, open spaces, full sun to partial shade. **Spread:** Seeds dispersed by water, wildlife and humans. **Comments:** The clear, watery sap is phototoxic to human skin, causing severe blistering and burns. Spreads readily and displaces native species. **Controls:** Remove plants by digging up tap root. Herbicide can also be used as a foliar treatment.

Purple spotted, hairy stem

Leaf

130-150 Floral rays

Flowers whitish umbel

Persistent dead stalks

Seeds with resinous veins

Photos by Douglas Cygan

Hesperis matronalis - Dame's Rocket

Family: Brassicaceae
Native to: Eurasia

Dame's Rocket—*Hesperis matronalis*

Dame's Rocket invasion

Description: Cool season biennial, 2nd year plants flower and reach 30" tall. **Leaves:** Alternately arranged and lanceolate in shape with toothed margins. **Flowers:** Terminal racemes, 4-petals, purplish, early to mid spring. **Fruit:** Pods, seeds turn brown when mature. **Zone:** 4-8. **Habitat:** Prefers partial sun, moist to mesic conditions such as floodplains, forests and roadsides, adaptable to full sun with adequate moisture. **Spread:** Seeds spread by water and wildlife. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Basal rosette

Leaf

Flower buds

Flowers 4-petaled, white

Stems

Seed pods

Photos by Leslie Mehroff

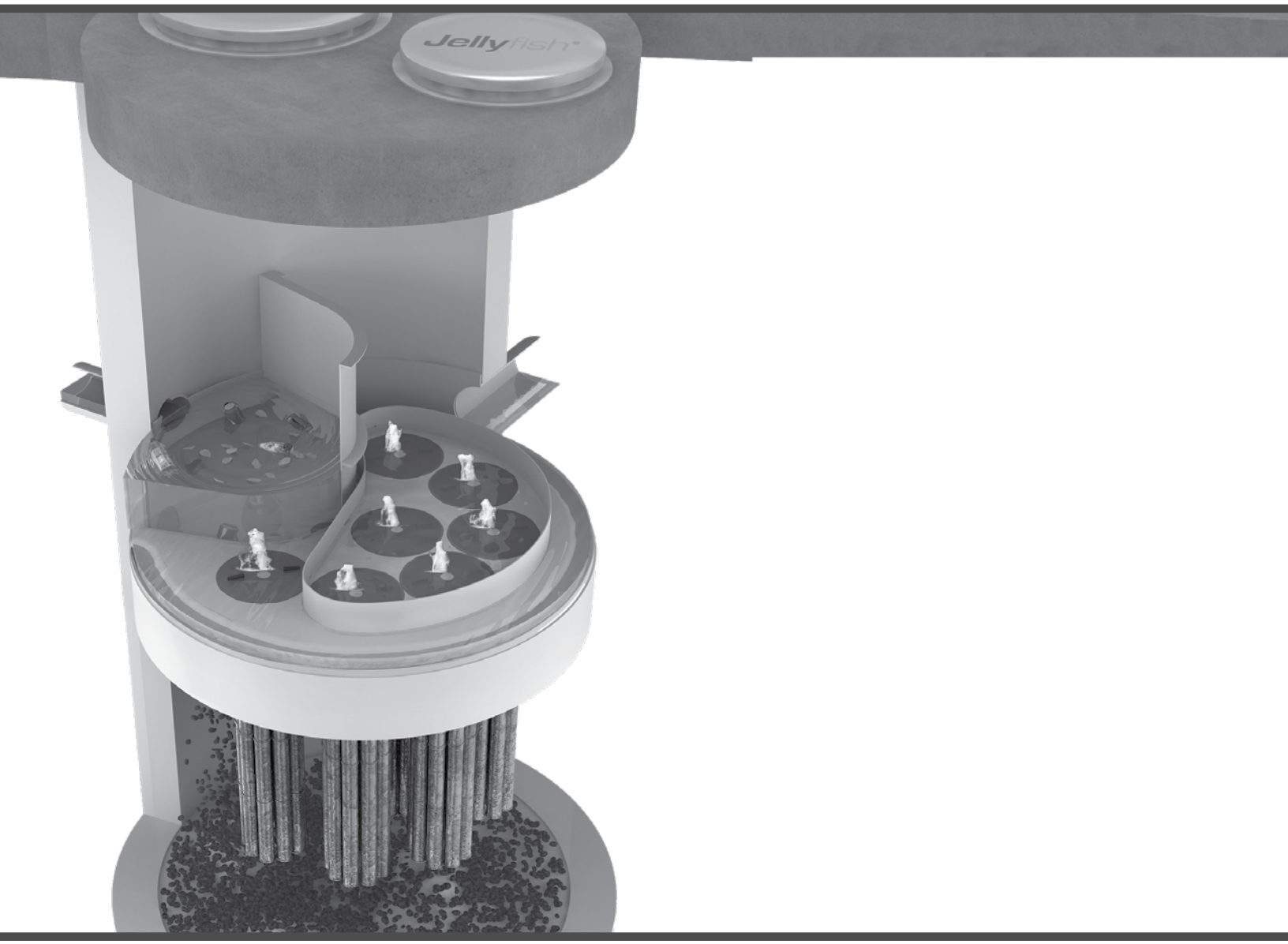
Attachment - "E"

MANUFACTURER OPERATION & MAINTENANCE DOCUMENTS

Attachment - "E"

CONTECH®
ENGINEERED SOLUTIONS

Jellyfish® Filter Maintenance Guide



Jellyfish®

Jellyfish®

JELLYFISH® FILTER
INSPECTION & MAINTENANCE GUIDE

Jellyfish units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the Jellyfish filter to be successful, it is imperative that all other components be properly maintained. The maintenance and repair of upstream facilities should be carried out prior to Jellyfish maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

TABLE OF CONTENTS

1.0 Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

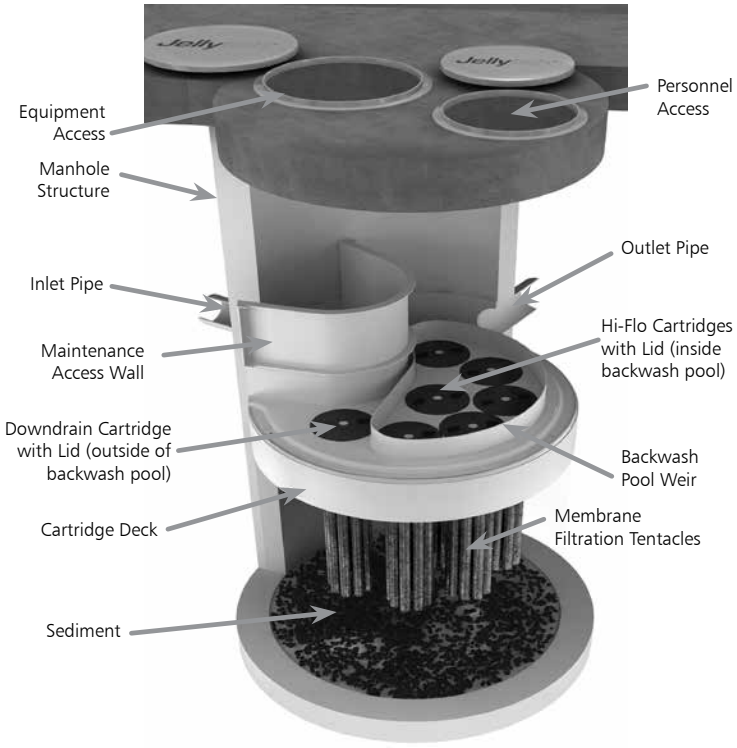
Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Additional maintenance activities may be required in the event of non-storm event runoff, such as base-flow or seasonal flow, an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW) or inlet bay for vault systems

Maintenance activities include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed



Note: Separator Skirt not shown

2.0 Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of, the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent*.

1. A minimum of quarterly inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
2. Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
3. Inspection is recommended after each major storm event.
4. Inspection is required immediately after an upstream oil, fuel or other chemical spill.

3.0 Inspection Procedure

The following procedure is recommended when performing inspections:

1. Provide traffic control measures as necessary.
2. Inspect the MAW or inlet bay for floatable pollutants such as trash, debris, and oil sheen.
3. Measure oil and sediment depth in several locations, by lowering a sediment probe until contact is made with the floor of the structure. Record sediment depth, and presences of any oil layers.
4. Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
5. Inspect the MAW (where appropriate), cartridge deck and receptacles, and backwash pool weir, for damaged or broken components.

3.1 Dry weather inspections

- Inspect the cartridge deck for standing water, and/or sediment on the deck.
- No standing water under normal operating conditions.
- Standing water inside the backwash pool, but not outside the backwash pool indicates, that the filter cartridges need to be rinsed.

Inspection Utilizing Sediment Probe

- Standing water outside the backwash pool is not anticipated and may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- Any appreciable sediment (≥1/16") accumulated on the deck surface should be removed.

3.2 Wet weather inspections

- Observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW or inlet bay.
- Less than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- Greater than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- 18 inches or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges need to be rinsed.

4.0 Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

1. Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
2. Floatable trash, debris, and oil removal.
3. Deck cleaned and free from sediment.
4. Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
5. Replace tentacles if rinsing does not restore adequate hydraulic capacity, remove accumulated sediment, or if damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
6. Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
7. The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged or compromised by the spill.

5.0 Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

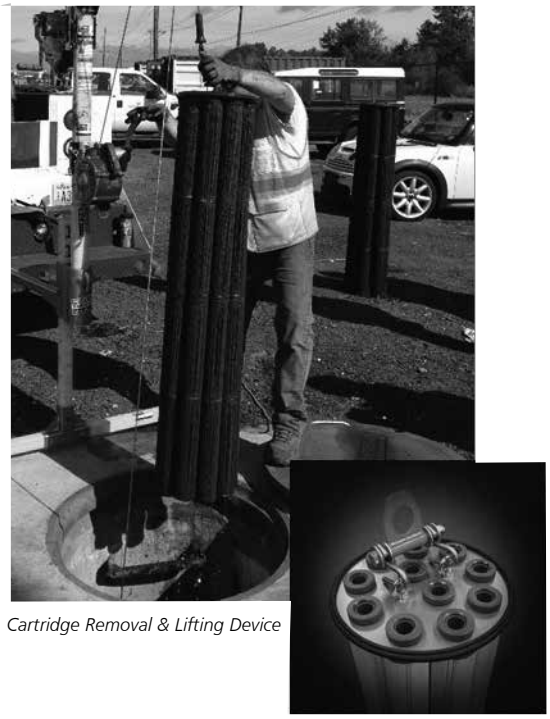
1. Provide traffic control measures as necessary.
2. Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures. *Caution: Dropping objects onto the cartridge deck may cause damage*.
3. Perform Inspection Procedure prior to maintenance activity.
4. To access the cartridge deck for filter cartridge service, descend into the structure and step directly onto the deck. Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
5. Maximum weight of maintenance crew and equipment on the cartridge deck not to exceed 450 lbs.

5.1 Filter Cartridge Removal

1. Remove a cartridge lid.
2. Remove cartridges from the deck using the lifting loops in the cartridge head plate. Rope or a lifting device (available from Contech) should be used. *Caution: Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Wet cartridges typically weigh between 100 and 125 lbs*.
3. Replace and secure the cartridge lid on the exposed empty receptacle as a safety precaution. Contech does not recommend exposing more than one empty cartridge receptacle at a time.

5.2 Filter Cartridge Rinsing

1. Remove all 11 tentacles from the cartridge head plate. Take care not to lose or damage the O-ring seal as well as the plastic threaded nut and connector.



Cartridge Removal & Lifting Device

2. Position tentacles in a container (or over the MAW), with the threaded connector (open end) facing down, so rinse water is flushed through the membrane and captured in the container.
3. Using the Jellyfish rinse tool (available from Contech) or a low-pressure garden hose sprayer, direct water spray onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. *Caution: Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane*.

4. Collected rinse water is typically removed by vacuum hose.
5. Reassemble cartridges as detailed later in this document. Reuse O-rings and nuts, ensuring proper placement on each tentacle.

5.3 Sediment and Flotables Extraction

1. Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening. Be careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck on manhole systems. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
2. Vacuum floatable trash, debris, and oil, from the MAW opening or inlet bay. Alternatively, floatable solids may be removed by a net or skimmer.

Vacuuming Sump Through MAW

3. Pressure wash cartridge deck and receptacles to remove all sediment and debris. Sediment should be rinsed into the sump area. Take care not to flush rinse water into the outlet pipe.
4. Remove water from the sump area. Vacuum or pump equipment should only be introduced through the MAW or inlet bay.
5. Remove the sediment from the bottom of the unit through the MAW or inlet bay opening.

Vacuuming Sump Through MAW

6. For larger diameter Jellyfish Filter manholes (≥8-ft) and some vaults complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.

5.4 Filter Cartridge Reinstallation and Replacement

1. Cartridges should be installed after the deck has been cleaned. It is important that the receptacle surfaces be free from grit and debris.
2. Remove cartridge lid from deck and carefully lower the filter cartridge into the receptacle until head plate gasket is seated squarely in receptacle. ***Caution: Do not force the cartridge downward; damage may occur.***
3. Replace the cartridge lid and check to see that both male threads are properly seated before rotating approximately 1/3 of a full rotation until firmly seated. Use of an approved rim gasket lubricant may facilitate installation. See next page for additional details.
4. If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.

5.5 Chemical Spills

Caution: If a chemical spill has been captured, do not attempt maintenance. Immediately contact the local hazard response agency and contact Contech.

5.6 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Jellyfish Filter Components & Filter Cartridge Assembly and Installation

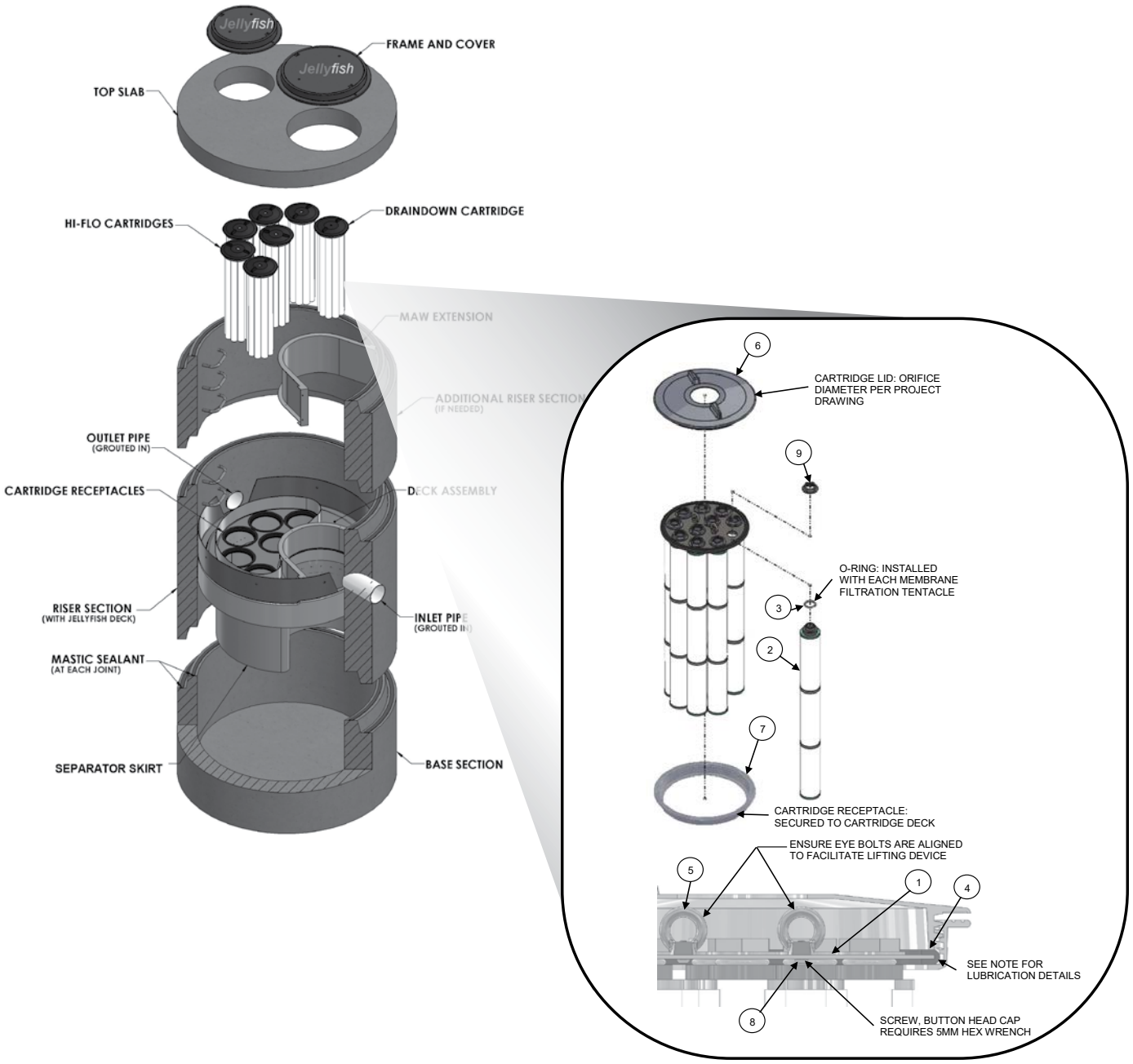


TABLE 1: BOM

ITEM NO.	DESCRIPTION
1	JF HEAD PLATE
2	JF TENTACLE
3	JF O-RING
4	JF HEAD PLATE GASKET
5	JF CARTRIDGE EYELET
6	JF 14IN COVER
7	JF RECEPTACLE
8	BUTTON HEAD CAP SCREW M6X14MM SS
9	JF CARTRIDGE NUT

TABLE 2: APPROVED GASKET LUBRICANTS

PART NO.	MFR	DESCRIPTION
78713	LA-CO	LUBRI-JOINT
40501	HERCULES	DUCK BUTTER
30600	OATEY	PIPE LUBRICANT
PSLUBXL1Q	PROSELECT	PIPE JOINT LUBRICANT

NOTES:

Head Plate Gasket Installation:
Install Head Plate Gasket (Item 4) onto the Head Plate (Item 1) and liberally apply a lubricant from Table 2: Approved Gasket Lubricants onto the gasket where it contacts the Receptacle (Item 7) and Cartridge Lide (ITem 6). Follow Lubricant manufacturer's instructions.

Lid Assembly:
Rotate Cartridge Lid counter-clockwise until both male threads drop down and properly seat. Then rotate Cartridge Lid clock-wise approximately one-third of a full rotation until Cartridge Lid is firmly secured, creating a watertight seal.

Attachment - "E"

Jellyfish Filter Inspection and Maintenance Log

Owner:				Jellyfish Model No:		
Location:				GPS Coordinates:		
Land Use:	Commercial:		Industrial:		Service Station:	
	Roadway/Highway:		Airport:		Residential:	

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed:						
Floatable Debris Present: (Y/N)						
Floatable Debris Removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Draindown Cartridges: (Y/N)						
Hi-Flo Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						

Jellyfish®

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Support

- Drawings and specifications are available at www.conteches.com/jellyfish.
- Site-specific design support is available from Contech Engineered Solutions.
- Find a Certified Maintenance Provider at www.conteches.com/ccmp

800.338.1122
www.ContechES.com

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, wastewater treatment and earth stabilization products. For information on other Contech segment offerings, visit ContechES.com or call 800.338.1122

Attachment - "E"

Isolator® Row Plus
O&M Manual

ADS StormTech™

The Isolator® Row Plus

Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS), Total Phosphorus (TP), Total Petroluem Hydrocarbons (TPH) and Total Nitrogen (TN) removal with easy access for inspection and maintenance.

The Isolator Row Plus

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, SC-800, MC-3500, MC-4500 or MC-7200 models, are lined with filter fabric and connected to a closely located manhole for easy access. The fabric lined chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers allow stormwater to flow vertically out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS Isolator Row and Plus fabric are placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting.

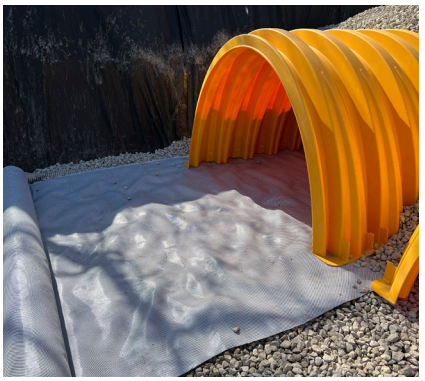
The Isolator Row Plus is designed to capture the “first flush” runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

The Isolator Row Plus Flamp™ is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end, or more difficult to remove and require confined space entry into the chamber area. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

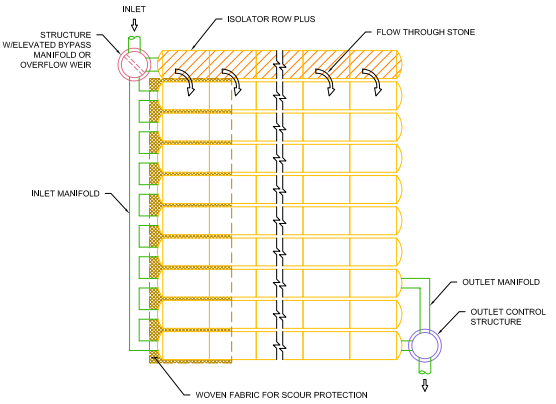
The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

Note: *See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.*

Looking down the Isolator Row Plus from the manhole opening, ADS Plus Fabric is shown between the chamber and stone base.



StormTech Isolator Row Plus with Overflow Structure (not to scale)



Isolator Row Plus Inspection/Maintenance

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

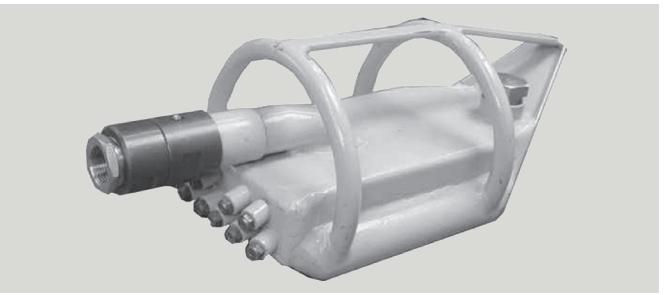
The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3" (75 mm) throughout the length of the Isolator Row Plus, clean-out should be performed.

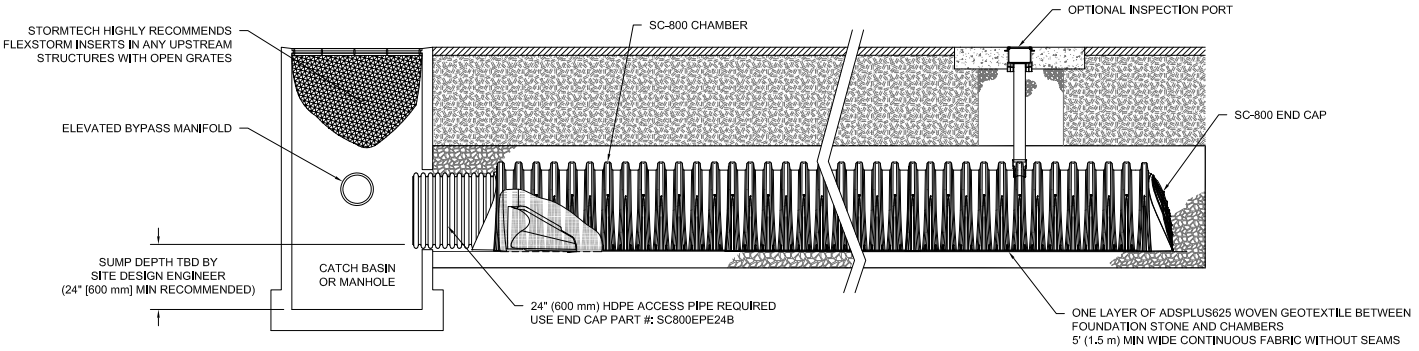
Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entry.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). **The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.**



StormTech Isolator Row Plus (*not to scale*)



Isolator Row Plus Step By Step Maintenance Procedures

Step 1

Inspect Isolator Row Plus for sediment.

A) Inspection ports (if present)
   i. Remove lid from floor box frame
   ii. Remove cap from inspection riser
   iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
   iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.

B) All Isolator Row Plus
   i. Remove cover from manhole at upstream end of Isolator Row Plus
   ii. Using a flashlight, inspect down Isolator Row Plus through outlet pipe
      1. Mirrors on poles or cameras may be used to avoid a confined space entry
      2. Follow OSHA regulations for confined space entry if entering manhole
   iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2.
   If not, proceed to Step 3.

Step 2

Clean out Isolator Row Plus using the JetVac process.

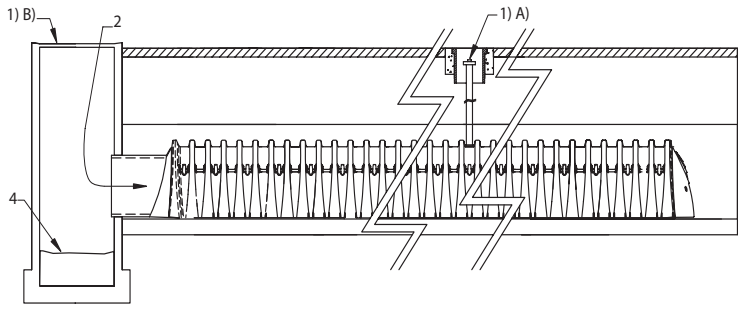
A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

Step 3

Replace all caps, lids and covers, record observations and actions.

Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



Sample Maintenance Log

Date	Stadia Rod Readings		Sedi-ment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row Plus, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

adspipe.com
800-821-6710

Attachment - "E"

WINTER MAINTENANCE AND SALT MINIMIZATION PLAN

WINTER MAINTENANCE AND SALT MINIMIZATION PLAN

Proposed Retail Building
1 Bockes Road
Hudson, NH 03051

Background

The proposed site development at 1 Bockes Road is located in close proximity to a wetland system tributary to the Merrimack River. The presence of snow and ice on driveways and roads creates a public safety concern, hence the need for the use of salt and other de-icing measures. Salt however, and specifically chloride, can have a negative impact to plants, animals, birds and groundwater. The objective of this Winter Maintenance and Salt Minimization Plan is to reduce the amount of chloride entering the groundwater and other environmentally significant areas while still maintaining parking lots and site safety.

Project Area Description

The project site consists of a single parcel identified as Map 145 Lot 1 with an area of approximately 3.16 acres. The site is bordered by a private residence to the north, Central Street to the east, Lawrence Road to the south, and Bockes Road to the west. The parcel does not have any existing roadway access points.

Purpose and Goals

The purpose of this plan is to establish clear procedures for winter maintenance operations within the project site to ensure safe passage for vehicles and pedestrians while minimizing the use of sodium chloride and other de-icing chemicals. This plan is designed to protect local water resources, including groundwater and nearby surface waters, from chloride contamination.

Responsible Parties

The applicant, 1 Bockes Road, LLC, will be responsible for the implementation of this plan. A copy of this Plan shall be given to all personnel that are involved with winter maintenance within the development for mandatory implementation.

Operator Training and Certification

The applicant will contract with a professional winter maintenance company for all plowing and de-icing services. The applicant must contract with a company that is NHDES Green SnowPro Certified. Proof of the contractor's valid certification shall be kept on file by the applicant. This certification ensures operators are trained in:

- Modern salt reduction techniques.
- Proper equipment calibration and use.
- The science behind how de-icing agents work at different pavement temperatures.
- Accurate material application rates.

Weather Monitoring

Winter maintenance contractors and salt applicators employed shall monitor storm events using National Weather Service (http://www.noaa.gov), local TV stations and website weather information. All vehicles used for the application of road salt or brining and pre-wetting solution shall be equipped with an annually calibrated air and ground surface temperature monitor. Air and ground temperatures shall be monitored throughout the day to ensure

Attachment - "E"

that the operators are making informed decisions as to when and to what extent materials are applied to the driveway, parking lots and sidewalks.

Pretreatment And Treatment of Roadway
Apply pre-wetted de-icer, salt brine or liquid de-icers to pavement prior to frost or snow accumulation to prevent icing. Pre-wetting paved areas has been shown to limit the amount of salt needed in most snow storms. Salt brine or liquid de-icers shall not be applied before a rainstorm, but can be applied before a light freezing drizzle.

If snow accumulates prior to salting, the surfaces should be plowed before applying de-icers. Salt shall not be used to "burn-off snow". Only apply salt to pavement surface or icy surfaces to prevent or reduce icing.

A "plow-first" philosophy shall be employed. The primary method for snow and ice control will always be mechanical removal. Chemical treatments are to be used only when necessary to prevent the bonding of ice to the pavement or to break a bond that has already formed. When forecasts predict frost or light snow with ground temperatures near freezing, a liquid brine solution shall be applied to the pavement before the precipitation begins. Anti-icing prevents the snow/ice bond from forming, making mechanical removal (plowing) more efficient and significantly reducing the total amount of salt needed. Plowing operations shall commence when snow accumulation reaches one (1) inch. Plowing shall continue as needed to keep the pavement clear. Granular salt shall only be applied after the pavement has been thoroughly plowed. Salt is to be used to break the ice-pavement bond, not to melt all accumulated snow and ice. Application rates will be determined based on pavement temperature, not air temperature.

Snow piles shall not be located on top of drainage inlets, or within swales and ponds.

Equipment and Equipment Calibration
Spreaders used shall be equipped with ground speed control applicators to regulate the amount of salt discharged consistently. All equipment utilized for the application of pre-wetted de-icer, liquid chemical and road salt aggregate should be calibrated each fall. Equipment should be checked after each storm and recalibrated if necessary.

Environmental Monitoring and Record Keeping
For each winter storm event, the certified contractor shall maintain a detailed log. The log shall include:

- Date and time of operations.
- Weather conditions (precipitation type, air temperature).
- Pavement temperature at the time of application.
- Type of material used (brine, salt).
- Application rate (e.g., gallons/lane-mile or lbs/lane-mile).
- Total amount of material used for the event.
- Name of the certified operator.

Plan Review
This plan shall be reviewed annually by the applicant and the contracted winter maintenance provider to identify opportunities for further salt reduction and improved efficiency.

ATTACHMENT B – SMART SALTING PRACTICES

A checklist for snow and ice maintenance contractors.

Recommended practice	Check which response applies to current practices and anticipated site maintenance activities for job site.				
	Already do	Will do	Might do	Will not do	If "will not do"….why not?
Use an application rate chart.					
Calibrate equipment each year.					
Learn about the deicer ingredients and use the appropriate one for the condition.					
Look for reasons if and why materials are leaking or spilling from vehicles and fix them (e.g. gaps, overfilling, etc).					
Develop a comprehensive winter maintenance policy. Follow your policy.					
Measure and use pavement temperatures.					
Use anti-icing appropriately prior to the storm.					
Plow before applying deicers.					
Use wet materials (pre-wet or pre-treated).					
Don't apply sodium chloride (road salt) for pavement temperatures below 15ºF.					
Don't apply deicers for pavement temps under -10º F. It's too cold.					
Separate salt and sand. Use salt for melting. Use sand for traction.					
Apply deicers in the center of the road or on the high side of the curve.					
Store the salt in a building or under secure cover.					
Store salt away from water flow and direct the water away from storage area.					
Store snow away from lakes, ponds and wetlands.					
Sweep up sand, dispose of properly.					
For each event, document what you did and how well it worked. Use this information to make improvements.					

Checklist is adapted from worksheet created by Fortin Consulting as a part of the Minnesota Pollution Control Agency Smart Salting Voluntary Certification Program.

Attachment - "E"

Anti-Icing

NH Best Management Practices

GET OUT EARLY

Typically anti-icing is most effective if applied 1-2 hours before the precipitation begins however it can be applied up to 24 hours in advance.

TRY IT FIRST

Trying anti-icing for the first time? Make a 23.3% brine solution and before a storm spray pavement on your own property using a masonry/ plant sprayer. Use this experiment to determine how best to use it with your clients.

LEAVE SOME PAVEMENT BARE

It's always best to use stream nozzles instead of fan tip to avoid creating a slippery condition. If the anti-icing liquid freezes the bare pavement will still provide a traction surface.

USE A FILTER

Having a filter in your liquid dispensing system will reduce clogs in your nozzle. Automotive in line fuel filters work quiet well. If your liquid dispenser is not functioning properly be sure to check the filter first.

A Proactive Treatment

Anti-Icing before a storm is very similar to using a non-stick spray on a pan before cooking. Just like a non-stick spray prevents food from bonding to the pan, anti-icing prevents snow and ice from bonding to the pavement so that it can be plowed away. Anti-icing can save you money as it costs 50% less than reactive deicing.

Make Your Own Salt Brine

When making brine it is important to add enough salt to produce a 23.3% solution which freezes around 0°F. Roughly 2.5lb per gallon of water will produce a 23.3% solution. You can verify using a salometer (~$20) a 23.3% solution will have a specific gravity of 1.176, or 85% salinity. Consult the Brine Making BMP sheet for more info.

How Much Should I Use and When?

You can apply brine up to 24 hours in advance of the storm. Typical application rates range from 0.5 to 0.75 gallon per 1000 sq.ft. (10' x 100' area). Other chemicals such as magnesium are also available—consult your supplier for application rates. Anti-icing is not advised prior to freezing rain events.

Getting Started

Try making your own salt brine by putting 13 lb of salt in 5 gallons of water to get a 23.3% salt brine solution. Mix the brine until all of the salt is dissolved. Using a masonry sprayer apply the liquid several hours before a storm. Start by applying about 0.25—0.5 gallons to a 10' x 50' area. Adjust the application rates based on your experience. Being careful not to over apply and cause a slippery condition.

Produced in partnership with:

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

New Hampshire DOT

Technology Transfer Center
New Hampshire LTAP at UNH

Attachment - "E"

Brine Making

NH Best Management Practices

GET THE LOWEST FREEZE POINT

When salt brine is 23% salt (measured with a hydrometer: 1.176, or with a salimeter: 85%) it has the lowest freeze point possible (about 0°F).

BRINE STORAGE

23% brine solution may be stored outside, however if temperatures get below 0°F the brine may freeze. A circulator pump will reduce the risk of freezing. If possible store brine indoors to eliminate risk of freezing.

COST OF BRINE

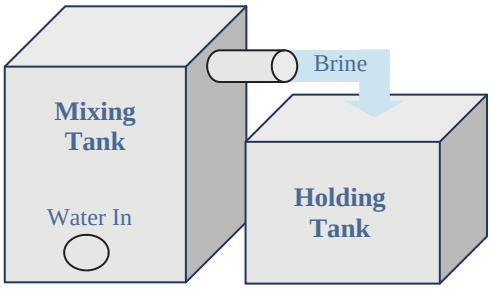
Calcium chloride brine costs about 7¢ / gallon (assuming $58/ton for salt) after you have your equipment setup.

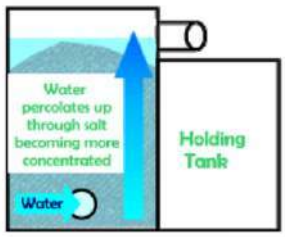
MULTIPLE USES

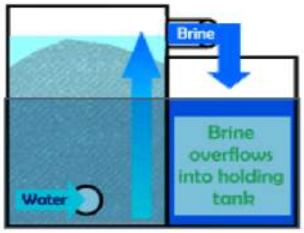
Brine can be used directly for anti-icing, for prewetting salt as it is dispensed from your truck, or to pretreat salt before it is loaded into your truck. Brine can be safely stored for up to a year, however, the concentration should be tested before use.

What Do You Need?

Brine making is a fairly simple process—the only ingredients are salt and water, and the only equipment you'll need is an open top mixing tank, a holding tank, a small pump, and a salimeter.





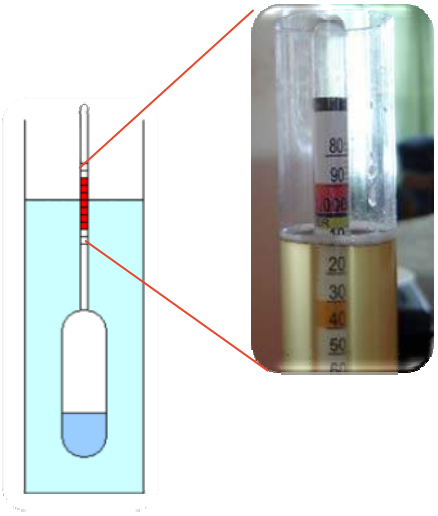


Images courtesy of Iowa DOT

Step 1: Fill Mixing Tank

Add Salt: Add about 2.5 lb of salt per gallon of water you plan to add. Make sure your mixing tank has a large opening to make adding salt easy.

Add Water: Slowly add water from the bottom of your brine mixing tank. This will allow it to percolate up through the salt and overflow into the holding tank.



Step 2: Check Concentration

Float a hydrometer or salimeter directly in your holding tank and read the value at the surface of the water. The number should be either 85% or 1.176 depending on the units of your device.

If the values are too low, pump some brine from your holding tank back into the mixing tank and allow it to overflow. If values are too high simply add some fresh water

Quality Control & Documentation

Make sure that you record the date when you create each batch of brine and document who mixed it and checked the concentration. It is also a good idea to note the final concentration. These records should be kept for at least two years to protect your group in the event of litigation.

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New Hampshire LTAP at UNH

Attachment - "E"

Hydraulic-Run Spreader Calibration

NH Best Management Practices

WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration chart *will* be different than the sand calibration chart).

Calibrations should be preformed annually, or after a spreader is serviced.

CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration. Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.

Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.

Step 2: Set Your Controls

Gate Height: Set the gate height to its lowest practical setting (~ 2"). This should be kept constant throughout the calibration process. If you find that not enough material is dispensed with this setting, try 2.5" to 3".

Engine Speed: Warm the truck up and run the engine at the typical rate seen during spreading (approximately 2000 rpm).

Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each conveyor/auger setting you are calibrating. Round your numbers to the nearest half foot and record them in column "**W**" of the calibration chart (see reverse side).

Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weight the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each conveyor/auger setting that is typically used. Average these three values together and record in the orange column in the calibration chart.

Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and conveyor/auger setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

Step 6: Distribute Completed Calibration Cards!

Put a copy of the calibration chart in the truck you just calibrated. Also, leave a copy of the calibration chart in the office so you have a copy incase the original is damaged.

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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

New Hampshire DOT

Technology Transfer Center
New Hampshire LTAP at UNH

Calibration Chart (Hydraulic Type)

Material: _____ Truck/Spreader ID: _____

Date: _____ Performed by: _____

Tarp/Canvas/Bucket Weight: _____

Conveyor or Auger Setting	W	A	Discharge Rate (lb/min.)			B	D					
	Spread Width (ft.)	5.28 × W	Run 1	Run 2	Run 3	Average Discharge Rate *((Run1 + Run2 + Run3)/3)*	Pounds of Material Discharged per 1000 square ft. *(D = B × C ÷ A)*					
							5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)
1												
2												
3												
4												
5												
EX	14	5.28 × 14= **73.92**	87	92	93	(87+92+93)÷3= **90.67**	12 × 90.67 ÷ 73.92= **14.72**	6 × 90.67 ÷ 73.92= **7.36**	4 × 90.67 ÷ 73.92= **4.91**	3 × 90.67 ÷ 73.92= **3.68**	2.4 × 90.67 ÷ 73.92= **2.94**	2 × 90.67 ÷ 73.92= **2.45**

Calculation Instructions: Multiply the spread width from column **W** by **5.28** and record the answer in column **A**. For each conveyor/auger setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by **3** and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable "**C**". The "**C**" value for each travel speed is shown in red under that given speed. Multiply column **B** by the "**C**" value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$

Attachment - "E"

Attachment - "E"

Pony Motor-Run Spreader Calibration

NH Best Management Practices

WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration card *will* be different than the sand calibration card).

Calibrations should be preformed annually, or after a spreader is serviced.

CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration. Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.

Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.

Step 2: Set Your Controls

Gate Height: Set the gate height to its lowest practical setting to start (approximately 1" to 1.5"). After the truck is calibrated for the lowest gate setting, calibrate for each 1/2" increment greater than the lowest setting. Continue until all gate settings you use are calibrated.

Engine Speed: Set the pony motor speed to the maximum setting, or to the setting you would normally use.

Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each gate setting you are calibrating. Round your numbers to the nearest half foot and record them in column "**W**" of the calibration chart (see reverse side).

Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weight the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each gate opening that is typically used. Average these three values together and record in the orange column in the calibration chart.

Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and gate setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

Step 6: Distribute Completed Calibration Cards!

Put a copy of the calibration card in the truck you just calibrated. Also, leave a copy of the calibration card in the office so you have a copy incase the original is damaged.

Produced in partnership with:

NH Department of Environmental Services

New Hampshire DOT

Technology Transfer Center
New Hampshire LTAP at UNH

Calibration Chart (Pony Motor Type)

Material: _____ Truck/Spreader ID: _____

Date: _____ Performed by: _____

Tarp/Canvas/Bucket Weight: _____

Gate Opening	W	A	Discharge Rate (lb/min.)			B	D					
	Spread Width (ft.)	5.28 × W	Run 1	Run 2	Run 3	Average Discharge Rate *((Run1 + Run2 + Run3)/3)*	Pounds of Material Discharged per 1000 square ft. *(D = B × C ÷ A)*					
							5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)
1”												
1.5”												
2”												
2.5”												
3”												
EX	14	5.28 × 14= **73.92**	87	92	93	(87+92+93)÷3= **90.67**	12 × 90.67 ÷ 73.92= **14.72**	6 × 90.67 ÷ 73.92= **7.36**	4 × 90.67 ÷ 73.92= **4.91**	3 × 90.67 ÷ 73.92= **3.68**	2.4 × 90.67 ÷ 73.92= **2.94**	2 × 90.67 ÷ 73.92= **2.45**

Calculation Instructions: Multiply the spread width from column **W** by **5.28** and record the answer in column **A**. For each gate setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by **3** and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable “**C**”. The “**C**” value for each travel speed is shown in red under that given speed. Multiply column **B** by the “**C**” value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$

Attachment - "E"

Attachment - "E"

Pre-wetting

NH Best Management Practices

PRE-WETTING?

Pre-wetting is the process of coating a solid de-icer with a liquid before it is spread on a roadway.

WHY PRE-WET?

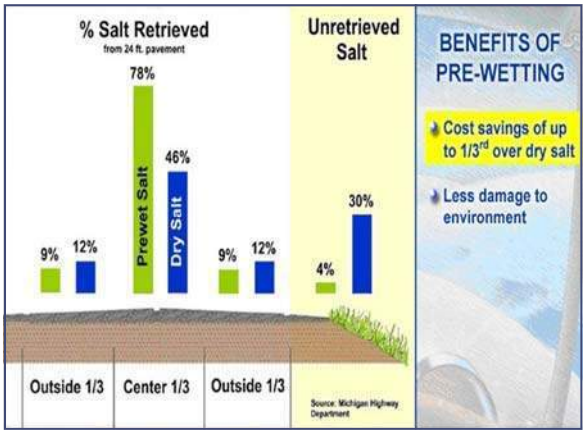
De-icing chemicals must form a brine before they can begin melting ice. Pre-wetting your chemicals accelerates the brine making process, which improves the melting action of the material. Pre-wetting also reduces bounce and scatter of material during spreading, and reduces the total amount of de-icer needed to obtain the desired results.

REDUCED RATES

If you are pre-wetting, don't forget to reduce your application rates accordingly. Reductions in the range of 15-20% are typical.

HOW MUCH LIQUID?

A good rule of thumb is to use 8-10 gallons of pre-wetting liquid for every ton of de-icer. For other chemicals, such as magnesium chloride, consult your supplier for application rates

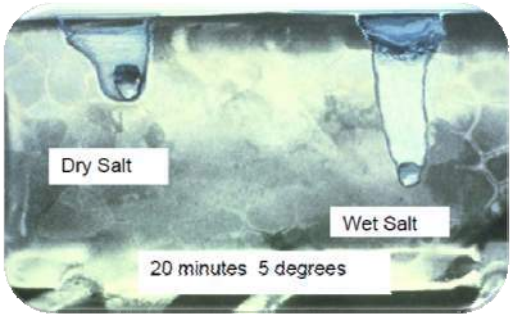


Pre-wetting Liquids

You have a few options for pre-wetting liquids. The most commonly used is a 23% sodium chloride brine solution. Calcium chloride at 32% solution is also used, as well as Magic Minus Zero™ and other patented products.

Getting Started

Wet the pile! There are two ways to pre-wet your de-icing chemicals. The easiest way to get started with pre-wetting is to spread your salt pile, spray it with pre-wetting liquid, mix it around, and re-pile it. More advanced truck mounted pre-wet systems can be installed on your trucks if you decide to make the investment.



Source: Wisconsin DOT Transportation Bulletin

Spraying the Pile

This is the easiest and most cost effective way to get started in pre-wetting. The first step is to spread your salt pile on a flat, impermeable surface. Next, spray the salt while it is spread out, and mix it around to ensure adequate and consistent liquid coverage. After the salt is sufficiently covered, re-stack the salt in your storage shed for later use.

Truck Mounted Systems

These systems are mounted in the truck bed and coat the de-icer with liquid as it comes off the conveyor/auger onto the spinner. These systems have the benefit of applying liquid only to the material you use as you use it. However, these systems must be installed on every truck that will be used to spread pre-wetted material.

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New Hampshire DOT

Technology Transfer Center
New Hampshire LTAP at UNH

Attachment - "E"

How Salt Works

NH Best Management Practices

BE PROACTIVE - ANTI-ICE

Anti-icing is the proactive method of preventing snow and ice from bonding to pavement. It can be more than 50% more efficient than deicing. See the NH Anti-Icing Factsheet for more information.

PRE-WETTING FOR FASTER ACTING SALT

Adding brine to salt before you apply it to pavement jump starts the melting process which means your pavement will be clear sooner. See the Pre-wetting Fact Sheet for more information.

KNOW YOUR LIMITS

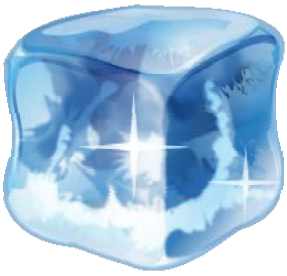
Dry salt becomes ineffective below 15°F if possible wait until the temperature rises before applying salt. At 30°F 1 lb of salt can melt 46.3 lb of ice in 5 minutes. At 15°F 1 lb of salt can melt 6.3 lb of ice in 1 hour.

PLOW FIRST

Always plow before applying any kind of chemical deicer to avoid pushing it away!

How Do We Melt Ice?

Ice can be melted by increasing the temperature, or lowering the freezing point of the water. It's not cost effective to use heat to melt ice on our roads so we use chemicals to reduce the freezing point—anything that will dissolve in water will work, including: salt, sugar, even alcohol!

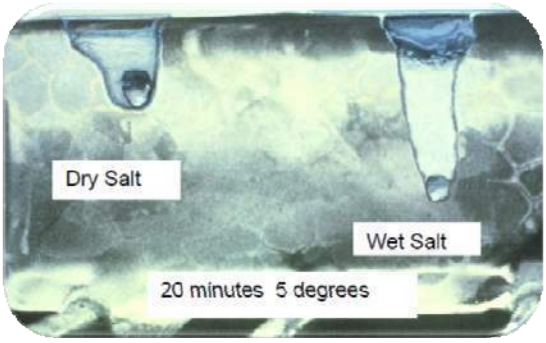


Why Use Salt?

Salt (Sodium Chloride) is the cheapest and most readily available chemical that efficiently melts ice and can be easily applied to our roadways and parking lots. However salt does corrode our cars and bridges, contaminates drinking water and pollutes our streams. Alternatives include potassium acetate, and calcium magnesium acetate (CMA), — all of which are considerably more expensive than calcium chloride, and have their own environmental concerns.

Brine Makes It Happen

The first step in melting ice is the formation of a brine. Salt crystals pull water molecules out of ice formation which creates a brine with a lower freeze point. Once the brine is formed melting is greatly accelerated. Save time and money by pre-wetting your salt with a brine before it hits the pavement to jump start melting! See the Pre-Wetting fact sheet for more information.



Source: Wisconsin DOT Transportation Bulletin #22

Save $$ and the Environment

In New Hampshire there are over 40 watersheds currently contaminated from road salt. As the pavement temperature drops more salt is required. As the pavement temperature rises less salt is required. Save money and the environment by using only what is needed to do the job. See NH application rate charts for recommended rates.

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New Hampshire LTAP at UNH

Example: Step #1, blank calibration form

See the References and Resources section for a full size form to copy for calibration. This is how the empty form looks.(Keep a stack of these on a clipboard when ready to begin the calibration.)

CALIBRATION CHART FOR AUGER OR CONVEYOR SYSTEMS

DATE _____ SPREADER # _____ MATERIAL _____

SETTING	POUNDS PER MINUTE	5 MPH (x12)	10 MPH (x6)	15 MPH (x4)	20 MPH (x3)
1					
2					
3					

Figure 10: Blank calibration form

Example: Step #2, calibration form filled out during calibration

Fill in the header information and column 2, the discharge weight per setting.

CALIBRATION CHART FOR AUGER OR CONVEYOR SYSTEMS

DATE 8-Aug-15 SPREADER # A4219 MATERIAL Rock Salt

SETTING	POUNDS PER MINUTE	5 MPH (x12)	10 MPH (x6)	15 MPH (x4)	20 MPH (x3)
1	10				
2	22				
3	34				

Figure 11: Example calibration form with discharge and header information filled out

Example: Step #3, calibration form ready to put in truck for road application

Back in the shop, do the calculations to fill in the rest of the blanks. Multiply the weight in column 2 with the multiplier in the top row. This provides the pounds per mile that needed to fill in the table.

CALIBRATION CHART FOR AUGER OR CONVEYOR SYSTEMS

DATE 8-Aug-15 SPREADER # A4219 MATERIAL Rock Salt

SETTING	POUNDS PER MINUTE	5 MPH (x12)	10 MPH (x6)	15 MPH (x4)	20 MPH (x3)
1	10	* 120	60	40	30
		**			
2	22	264	132	88	66
3	34	408	204	136	102

* top half of each row = lbs/lane mile. To get this number, multiply lbs/min by the factor shown for each speed.

** bottom half of each row = lbs/1000 sq.ft. To find this, divide the number in the top half by 63.

Figure 12: Example calibration form with pounds per lane mile filled out

Some fish species are affected by concentrations of less than 1000 ppm NaCl, about 1 to 1.5 tablespoons of salt in 5 gallons of water.

Example: Step #4, calibration form ready to zip tie to hand spreader or put in truck for parking lot application.

Divide by 63 to convert pounds per lane mile to pounds per 1,000 square feet. This is very useful for parking lot and sidewalk applications.

CALIBRATION CHART FOR AUGER OR CONVEYOR SYSTEMS

DATE 8-Aug-15 SPREADER # A4219 MATERIAL Rock Salt

SETTING	POUNDS PER MINUTE	5 MPH (x12)	10 MPH (x6)	15 MPH (x4)	20 MPH (x3)
1	10	*120	60	40	30
		**1.9	1.0	0.6	0.5
2	22	264	132	88	66
		4.2	2.1	1.4	1.0
3	34	408	204	136	102
		6.5	3.2	2.2	1.6

* top half of each row = lbs/lane mile. To get this number, multiply lbs/min by the factor shown for each speed.

** bottom half of each row = lbs/1000 sq.ft. To find this, divide the number in the top half by 63.

Figure 13: Example calibration form with pounds per 1000 sq. ft. filled out

Gravity Flow Equipment

This is applicable for equipment that does not have a motorized delivery system such as an auger. This type of equipment might be a pickup mounted spreader, gator mounted spreader or a hand push spreader. Gravity flow equipment is typically controlled by gate opening and speed of application.

Step 1: Calculate discharge rate

- Mark out a 10-foot stretch of pavement. (By increasing the size of the test area i.e., the longer the test area, the more accurate the results will be).
- Sweep it clean of sand or any other material.
- Using a constant speed, apply one pass of material to the test area.
- Measure the width the material is spread or bounces, in feet.
- Sweep up and weigh the material that is within the marked 10-foot stretch.
- Record the lever position/setting for the gate/chute. If there are no numbers for the positions, make permanent marks on the equipment to identify the positions.
- To improve accuracy, repeat this two more times and calculate the average weight of material applied.
- Record results in columns A, B, C, and D (Figure 14).

Step 2: Repeat step #1 for various settings.

Step 3: Fill out chart.

- Fill out columns E, F, and G (Figure 14).
- If using more than one type of material, repeat the test for each material.
- Place the completed calibration chart with the equipment.

Shortcuts:

- Put down a tarp over the application area; this makes it quicker to recover and weigh material.
- After the first pass, put a bag around spreader to catch discharge material. The first pass is needed to determine the spread width.

Calculate application rate:

Equipment: _____ Material: _____ Date: _____

A	B	C	D	E	F	G
Speed	Lever position or gate setting	Pounds spread in 10 feet*	Spread width in feet	Coverage area in sq. ft. (**D x 10**)*	Application rate in lbs./1000 ft^2 (**1000/E x C**)	Application rate in lbs./lane mile (12' width) (**F x 63.4**)
.....EXAMPLE.....						
20 MPH	*Half-closed*	*0.4 lbs.*	*13 feet*	*130 sq. ft.*	*3.1 lbs. per 1000 sq. ft.*	*196 lbs./mile*

* If changing the test strip length, adjust the title in column C and the multiplier in column E.

Figure 14: Example calibration chart for gravity flow equipment

What if calibration is not a practice?

Even without calibrating the equipment, the amount of material to use can be determined but will take more time to calculate. Know the material, the size of the area to be treated, and the pavement temperature, then consult the application rate chart (application rate section) and do the math. Without calibration, the way to evenly distribute the recommended amount across the maintenance area must be determined by the professional. This approach may work well for treating sidewalks using the "chicken feed" method. For example:

- 20°F degrees pavement temperature and rising
- Using dry salt
- Sidewalk is 2,000 square feet
- Table recommends 2.25 lbs. per 1,000 square feet (for this situation)
- Measure about 4.5 lbs. of salt
- Figure out a way to spread it evenly over the 2,000 sq. ft. surface

Sand fills in lake bottoms, accelerating the aging process of lakes. Lakes get shallower as they age, some eventually becoming wetlands.

Calibration Charts

Calibration Chart for Gravity Flow Equipment						
Vehicle or spreader number:					Date:	
Material Type:				Calibrated by:		
		A	**B**	**C**	**D**	**E**
Speed	Lever position or gate setting	Lbs. Material recovered in 10 feet	Spread width in feet	Square feet covered with material (**B x 10**)	Application rate in lbs./1000 ft^2 (**1000/C x A**)	Application rate in lbs./lane mile (12' width) (**D x 63.4**)

Figure 15: Blank calibration chart for gravity flow equipment

CALIBRATION CHART FOR AUGER OR CONVEYOR SYSTEMS

DATE _____ SPREADER # _____ MATERIAL _____

SETTING	POUNDS PER MINUTE	Quantity / Area	5 MPH (x12)	10 MPH (x6)	15 MPH (x4)	20 MPH (x3)
1		lbs/lane mile				
		lbs/1000 sq.ft.				
2		lbs/lane mile				
		lbs/1000 sq.ft.				
3		lbs/lane mile				
		lbs/1000 sq.ft.				
4		lbs/lane mile				
		lbs/1000 sq.ft.				
5		lbs/lane mile				
		lbs/1000 sq.ft.				
6		lbs/lane mile				
		lbs/1000 sq.ft.				

Figure 16: Blank calibration chart for augured or conveyed manual controlled spreaders

NEW HAMPSHIRE CERTIFIED GREEN SnowPro

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Hiring a NH Certified Green SnowPro as your snow removal contractor will help protect you and your company from slip and fall claims arising from snow and ice conditions.

What can you do?

Look for a certified salt applicator at http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/salt-applicator-certification.htm or ask your current contractor to take the Green SnowPro course and become certified.

How can your organization benefit from the certification?

Reduce Your Liability

Under RSA 508:22, certified applicators and those who hire them are granted liability protection from claims arising from snow and ice conditions (slip and fall claims).

Certified Green SnowPros

NH Certified Green SnowPros are leaders in the snow removal industrywho are trained in the most up to date technologies and snow management practices to ensure a high level of service and safety to their customers.

Reduce Impacts to Local Waterbodies

Once in our water supplies, there is no practical way to remove salt. Certified Green SnowPros are trained in salt reduction practices to help ensure clean water for future generations.

Why is salt reduction important?

As of 2014, 46 water bodies in New Hampshire are polluted with chloride due to road salt application. In several watersheds analyzed in the southern I-93 corridor, more than 50% of the salt load comes from private roads and parking lots. The other major sources are state and local roads and highways.

Training

For upcoming Green SnowPro Training dates go to http://t2.unh.edu/greensnowpro-training-and-certification

For more information:

Visit http://www.des.nh.gov and see “Road Salt Reduction”under the A-Z list.

Contact: *Patrick Woodbrey*
Patrick.Woodbrey@des.nh.gov
(603) 271-5329

ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

WMB-3 2015

Snow Disposal Guidelines

Introduction

Each winter, the Department of Environmental Services receives numerous complaints related to snow disposal into and/or near surface water. There are several different concerns regarding disposal of snow cleared from streets and parking lots ranging from aesthetic concerns, such as minimizing the visibility of debris and huge snow piles, to environmental concerns, such as protection of groundwater quality, drinking water supplies, surface water quality and aquatic life.

The environmental impacts of disposed snow result from high levels of salt, sand, debris and trash, along with contaminants from automobiles including oil and exhaust. The debris and contaminants that inevitably end up in plowed snow make it illegal to dump snow directly into water bodies. RSA 485-A:13,I(a) prohibits discharging wastes to surface waters without a permit. In addition to water quality impacts, snow disposed in open water can cause dangerous ice jams.

Manchester NH sign prohibiting snow dumping. Photo: Robert Robinson, City of Manchester

Groundwater is sensitive to snow dumping due to the high levels of chloride and automotive waste in plowed snow. RSA 485-C:12 prohibits the siting or operation of snow dumps within classified wellhead protection areas.

Refer to the following guidelines for siting legal snow dumps and protecting New Hampshire's water.

Recommended Guidelines for Snow Disposal

These guidelines will assist in identifying snow disposal sites that minimize impact to the environment. Please note that snow dumps are kept out of water bodies due to waste materials, such as litter and debris. Waste does not belong on the land surface either; after the snow melts, all waste must be collected and disposed of properly.

- Disposed snow should be stored near flowing surface waters, but at least 25 feet from the high water mark of the surface water and/or top of stream bank. If a site cannot be found near a flowing surface water, then upland sites further from surface waters are acceptable, provided they do not impact water supply sources as described below.
- A silt fence or equivalent barrier should be securely placed between the snow storage area and the high water mark and/or the top of stream bank with care taken not to exceed the barrier with over-piling. This area should also be accessible for post-melt cleanup. Note: silt fence must be installed prior to the ground freezing.

- The snow storage area should be at least 75 feet from any private water supply wells, at least 200 feet from any community water supply wells, and at least 400 feet from any municipal wells. (Note: Snow storage areas are prohibited in wellhead protection areas.)
- All debris in the snow storage area should be cleared from the site prior to snow storage.
- By May 15 of each year, all debris from active snow storage areas should be cleared and properly disposed of.

Snow Disposal Site Selection Procedures

Municipal public works officials should consider consulting with the local health officer and conservation commission to identify sites. Securing sites prior to the winter season will help to alleviate capacity problems during winters with heavy snowfall. NHDES is available to help municipal officials identify appropriate snow disposal sites. The following are guidelines for site selection:

- Estimate how much snow disposal capacity is needed for the season so that an adequate number of sites can be selected and prepared.
- Sites lacking mature tree growth are preferred; trees make collection of debris more difficult after the winter season.
- Identify sites that could potentially be used for snow disposal such as municipal open space, parks, recreation fields and parking areas. If no additional municipal sites are available, consider securing permission from landowners of non-municipally owned sites.

For more information about snow storage contact the NHDES Watershed Management Bureau at (603) 271-3398.

Attachment - "E"

DE-ICING LOG

Deicing Log

Date Applied	Type of Deicing Material	Amount Applied

October 16, 2025

NEX-2500040.01

Dr. Deepak Sharma
25 Pelham Road
Suite 103
Salem, New Hampshire 03079

SUBJECT: Proposed Retail Development
1 Bockes Road
Map 145 / Lot 1
Hudson, New Hampshire

Dear Dr. Sharma:

Greenman-Pedersen, Inc. (GPI) is pleased to submit preliminary trip generation estimates for a proposed retail development to be located at 1 Bockes Road (Map 145 / Lot 1) in Hudson, New Hampshire.

The site is currently vacant. The project consists of constructing a 12,000± square foot (sf) one-story, multi-tenant retail building. Access and egress to/from the site will be provided via one new full-access driveway on the south side of Bockes Road, approximately 120-feet (ft) east of its intersection with Rolling Woods Drive.

To estimate the volume of traffic to be generated by the proposed retail development, the trip generation rates published in the ITE *Trip Generation Manual*[1] were researched. Land Use Code (LUC) 822 (Strip Retail Plaza [<40k]) for 12.000 ksf was considered. Table 1 summarizes the results of the trip-generation estimates based on ITE methodology. All trip generation calculations are attached to this letter.

As shown in Table 1 on the following page, the proposed retail development is expected to generate 47 vehicle trips (26 entering and 21 exiting) during the weekday AM peak hour, 86 vehicle trips (43 entering and 43 exiting) during the weekday PM peak hour, and 80 vehicle trips (41 entering and 39 exiting) during the Saturday midday peak hour. On a daily basis, the proposed retail development is expected to generate 736 vehicle trips per day on a weekday and 964 vehicle trips per day on a Saturday. It should be noted that no reductions were taken for pass-by trips, the portion of site generated vehicle-trips already present on the adjacent roadway system that turn into the site on impulse, or part of an overall trip elsewhere. Published pass-by rates for this land use are not available; however, pass-by trips typically account for a substantial component of vehicle-trips associated with commercial/retail developments.

Traffic volume increases of this magnitude are not expected to significantly affect prevailing operations along the corridor. Accordingly, it is anticipated that the development can be safely and efficiently accommodated along the existing roadway network.

[1] *Trip Generation Manual, 12th Edition*. Institute of Transportation Engineers; Washington, DC; 2025.

Table 1
Trip-Generation Summary

Peak Hour/Direction	Proposed Trips [a]
Weekday Daily:	736
Weekday AM Peak Hour:	
Enter	26
Exit	21
Total	47
Weekday PM Peak Hour:	
Enter	43
Exit	43
Total	86
Saturday Daily:	964
Saturday Midday Peak Hour:	
Enter	41
Exit	39
Total	80

[a] ITE LUC 822 (Strip Retail Plaza [<40k]) for 12.000 ksf.

We hope you find this information useful, and should you have any questions or require additional information, please feel free contact me at (603) 766-5229 or bbollinger@gpinet.com.

Sincerely,

GREENMAN-PEDERSEN, INC.

Robert E. Bollinger, P.E., PTOE
Assistant Vice President / Traffic Engineering Department Head
116 S. River Road, Bldg. B., Suite 1
Bedford, NH 03110

Enclosures
1. Trip Generation Calculations

cc: D. Jordan, GPI
C. York, GPI
H. Monticup, GPI

Institute of Transportation Engineers (ITE) - 12th Edition

Land Use Code (LUC) 822 - Strip Retail Plaza (<40k)

General Urban/Suburban

Average Vehicle Trips Ends vs: 1000 Sq. Ft. Gross Floor Area
Independent Variable (X): 12.000

AVERAGE WEEKDAY DAILY

T = 42.20 * (X) + 229.68
T = 42.20 * (12.000) + 229.68
T = 736.08
T = 736 vehicle trips
with 50% (368 vph) entering and 50% (368 vph) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 3.93 * (X)
T = 3.93 * 12.000
T = 47.16
T = 47 vehicle trips
with 55% (26 vph) entering and 45% (21 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.68 Ln (X) + 2.77
Ln T = 0.68 Ln(12.000) + 2.77
Ln T = 4.46
T = 86.46
T = 86 vehicle trips
with 50% (43 vph) entering and 50% (43 vph) exiting.

SATURDAY DAILY

$$\frac{\text{ITE LUC 821 Saturday Daily Trip Rate}}{\text{ITE LUC 821 Saturday Peak Hour Trip Rate}} = \frac{\text{ITE LUC 822 Saturday Daily Trip Rate}}{\text{ITE LUC 822 Saturday Peak Hour Trip Rate}}$$

$$\frac{92.93}{7.67} = \frac{(Y)}{6.63} \qquad Y = 80.33$$

T = Y * 12.000
T = 963.96
T = 964 vehicle trips
with 50% (482 vpd) entering and 50% (482 vpd) exiting.

(same distribution split as ITE LUC 821 during the Saturday Daily)

SATURDAY PEAK HOUR OF GENERATOR

T = 6.63 * (X)
T = 6.63 * 12.000
T = 79.56
T = 80 vehicle trips
with 51% (41 vph) entering and 49% (39 vph) exiting.

MEMORANDUM

TO: File

FROM: Steven W. Reichert, PE

DATE: November 11, 2025

RE: Town of Hudson Planning Board Review
1 Bockes Road Site Plan, 1 Bockes Road
Tax Map 145, Lot 1; Acct. #1350-747
Fuss & O'Neill Reference No. 20030249.256

The following list itemizes the set of documents reviewed related to the Site Plan project located at 1 Bockes Road in Hudson, New Hampshire.

- Emails between the Town of Hudson and Fuss & O'Neill between October 23 and October 27, 2025.

- Package from Greenman-Pedersen, Inc., to Fuss & O'Neill, received October 24, 2025, including the following:
  1. Copy of *Site Plan Application*, dated October 21, 2025.
  2. Copy of *Town of Hudson Site Plan Review Checklist*, not dated.
  3. Copy of *Conditional Use Permit Application: Wetland Conservation Overlay District*, dated October 21, 2025.
  4. Copy of Site Plan Narrative, prepared by Greenman-Pedersen, Inc., dated October 21, 2025.
  5. Copy of Trip Generation *Letter from* Greenman-Pedersen, Inc., dated October 16, 2025.
  6. Copy of *Stormwater Management Report*, prepared by Greenman-Pedersen, Inc., dated October 21, 2025.
  7. Copy of *Inspection & Maintenance Plan for Stormwater Management Systems*, prepared by Greenman-Pedersen, Inc., dated October 21, 2025.
  8. Copy of *Site Development Plans Proposed Retail Building for Assessors Map 145 Lot 1, 1 Bockes Road, Hudson, New Hampshire*, prepared by Greenman-Pedersen, Inc., dated October 21, 2025, unless otherwise noted, with no revisions noted, including the following:
     a. *Title Sheet*, 1 of 13.
     b. *General Notes,* 2 of 13.
     c. *Existing Conditions Plan,* 3 of 13.
     d. *Site Plan,* 4 of 13.
     e. *Grading & Drainage Plan,* 5 of 13.
     f. *Utility Plan,* 6 of 13.
     g. *Erosion & Sediment Control Plan,* 7 of 13.
     h. *Landscape Plan,* 8 of 13.
     i. *Detail Sheet,* 9 to 13 of 13.
     j. *Truck Turn Plan,* 1 of 1.
     k. *Sight Distance Plan,* 1 of 1.
     l. *Lighting Proposal,* Sheet 1 of 1, prepared by LSI, dated October 10, 2025.

9. Copy of *Site Development Plans Proposed Retail Building, 1 Bockes Road, Hudson, New Hampshire*, prepared by SFC Engineering Partnership, Inc., dated May 15, 2009, revised April 9, 2010, unless otherwise noted, including the following:
   a. *Cover Sheet*, Sheet 1 of 17.
   b. *Existing Conditions and Boundary Plan,* Sheet 1 of 1, prepared by TF Moran, dated December 7, 2025, revised August 6, 2008.
   c. *Soils Plan,* Sheet 3 of 17, revised February 10, 2010.
   d. *Site Layout Plan,* Sheet 4 of 17.
   e. *Grading Plan,* Sheet 5 of 17, revised March 9, 2010.
   f. *Utility Plan,* Sheet 6 of 17.
   g. *Stormwater Management Plan,* Sheet 7 of 17 revised February 10, 2010.
   h. *Construction Details,* Sheet 8 of 17, revised February 10, 2010.
   i. *Construction Details,* Sheet 9 of 17, revised January 12, 2010.
   j. *Construction Details,* Sheets 10 & 11 of 17, revised February 10, 2010.
   k. *Construction Details,* Sheet 11A & 11B of 17, dated April 9, 2010, with no revisions noted.
   l. *Landscaping Plan,* Sheet 12 of 14.
   m. *Lighting Plan,* Sheet 13 of 17, revised February 10, 2010.
   n. *Septic Design Plan,* Sheet 14 of 17, revised February 10, 2010.
   o. *Septic Details,* Sheet 15 of 17, revised February 10, 2010.
   p. *Sight Distance Exhibit,* Sheet 16 of 17, revised March 9, 2010.
   q. *Intersection Improvement Plan,* Sheet 17 of 17, revised February 10, 2010.
   r. *Elevations,* A2.0, prepared by GSD Associates, with no revisions noted.

SWR:elc

cc: Brooke Dubowik – Town of Hudson
Town of Hudson Engineering Division – File

November 20, 2025

Ms. Brooke Dubowik
Town Planner
Town of Hudson
12 School Street
Hudson, NH 03051

SUBJECT: Response to Fuss & O'Neill Comments – Peer Review #1
1 Bockes Road Site Plan, 1 Bockes Road
Tax Map 145 Lot 1
Hudson, NH
(GPI Project No. NEX-2500040)

Dear Ms. Dubowik:

Greenman Pedersen, Inc. (GPI) is in receipt of the Peer Review Letter prepared by Steven W. Reichert, P.E. of Fuss & O'Neill. dated November 11, 2025 regarding the above referenced project. In response to this review, we have included the original comments in *italics*, followed by our responses in **bold**.

1. Site Plan Review Codes (HR 275)
a. Hudson Regulation (HR) 275-6.C & T.(1)(b) The applicant has not proposed adding any sidewalks to the site. We note that there are no existing sidewalks along Central Street, Lawrence Road or Bockes Road in the vicinity of the project site.
RESPONSE: Comment acknowledged.

b. HR 275-6.I. The scope of this review does not include the adequacy of any fire protection provisions for the site. We note that the applicant had proposed a 30,000-gallon fire cistern on the site. The applicant should review the design with the Fire Department.
RESPONSE: We've had discussions with the Fire Marshal and he has told us a 30,000 gallon cistern is sufficient.

c. HR 275-6.T. The applicant is proposing limited off-site improvements that include utility connections and driveway installation.
RESPONSE: Comment acknowledged.

d. HR 275-8.C.(2)(g) and Zoning Ordinance (ZO) 334-15.A. The applicant has provided parking calculations on the plan set which show that 60 parking spaces are required based on the building square footage for the retail use. The applicant has proposed 60 spaces.
RESPONSE: Comment acknowledged.

e. HR 275-8.C.(6)(b). The applicant has provided two loading spaces on the plan that meet the amount and size required by the Regulation.
RESPONSE: Comment acknowledged.

f. HR 275-9.C.(11). The applicant has provided three handicapped accessible parking spaces for the site which exceeds the minimum requirement. The applicant should show the tip down locations on the plan and in greater detail. The applicant should also show the building entrances to be sure they do not conflict with the tip down locations.
RESPONSE: There are no tip-down locations along the sidewalk. The parking lot is graded in such a way that it becomes flush with the top of sidewalk in the vicinity of the accessible spaces. A note has been added to the Grading & Drainage Plan for clarity.

g. HR 275-9.F. The applicant did not provide copies of any easements and deeds as part of the package received for review. We note that no existing or proposed easements were shown on the plan.
RESPONSE: A copy of the deed is included with this submittal.

2. Administrative Review Codes (HR 276)
a. HR 276-7. The applicant should note the waivers requested on the plan set.
RESPONSE: The waivers have been added to the plans (see General Note #18, sheet 2).

b. HR 276-11.B.(4). & 289-27.A. The applicant should add the required approval block on each sheet of the plan set as required. We note that it is currently missing from the Existing Conditions Plan.
RESPONSE: The approval block has been added to the Existing Conditions Plan.

c. HR 276-11.B.(6). The applicant has not provided the owner's signature on the plan set. A space for the signature has been provided.
RESPONSE: We would request the owner sign the plans after approval by the Board.

d. HR 276-11.1.B.(12).(b). The applicant has shown an 88-foot distance from the residential lot boundary to the edge of pavement for the site. We note that the Regulation requires a 100-foot buffer from the residential property line to any improved part of the commercial development.
RESPONSE: A waiver from this regulation has been requested and is included with this submittal.

e. HR 276-11.1.B.(13). The applicant has shown a free-standing sign on the site plan. The applicant should revise their sign note to match the Regulation.
RESPONSE: According to the Site Plan Review Checklist, the reference to the Planning Board in the regulations is outdated and signs are subject to approval by the Zoning Administrator.

3. Driveway Review Codes (HR 275-6.B/Chapter 193)
a. HR 193.10.E. The applicant has shown that sight distances for the proposed site are adequate after some minor vegetation removal within the Town right-of-way. We recommend that the removal of the vegetation on the sight distance plan also be shown on the site plan so that removal requirements are clear during construction.
RESPONSE: The tree line has been revised on the Site Plan.

b. HR 193.10.G. The applicant has proposed one driveway on Bockes Road for the site.
RESPONSE: Comment acknowledged.

4. Traffic (HR 275-9.B)
a. HR 275-9.B. We have reviewed the trip generation analysis letter prepared by Greenman-Pedersen, Inc. (GPI) dated October 16, 2025, for the proposed retail development on the 1 Bockes Road (Tax Map 145 / Lot 1) site in Hudson, New Hampshire. This analysis includes an estimate of the expected traffic to be generated by the proposed retail building.

The procedures that GPI uses are reasonable and use appropriate ITE trip generation information for the scenario provided. The proposed development is expected to generate approximately 736 vehicle trips per weekday, including 47 trips during the AM peak hour (26 entering and 21 exiting) and 86 trips during the PM peak hour (43 entering and 43 exiting). On Saturdays, the development is projected to generate about 964 daily vehicle trips, with 80 trips occurring during the Saturday midday peak hour (41 entering and 39 exiting).

GPI notes that no reductions in trips generated were taken for pass-by trips, which are trips already present on the adjacent roadway network that turn into the site on impulse or part of an overall trip

elsewhere, and not as a pre-determined trip to the retail businesses at the site. The proposed retail businesses at the site are not identified in the submission documents, so determining a percentage of pass-by trips that would access the site would be difficult.

GPI concludes in their letter that traffic volume increases are not expected to significantly affect prevailing operations along the corridor, and they anticipate that the development can be safely and efficiently accommodated along the existing roadway network. We note that although the tenants for the proposed retail spaces have not been identified, the estimated trip generation values are not insignificant. The project is estimated to be adding 86 trips to the roadway network during the weekday PM peak hour and 964 trips on Saturdays. It would be anticipated that the majority of those trips will be accessing Lawrence Road and the Bockes Road site via the unsignalized intersection at Route 111 (Central Street), but no trip distribution information is included in the letter. The Lawrence Road approach to Central Street appears to be a single vehicle wide, so queuing of vehicles may occur while waiting for lead vehicles to turn left onto Central Street or go straight to Sullivan Road.
RESPONSE: Comment acknowledged. We have submitted an application to NHDOT and are waiting for any review comments.

5. Utility Design/Conflicts
a. HR 275-9.E & 276-13.G. The applicant has not provided any details for the proposed septic system.
RESPONSE: We would request a full septic design be a condition of approval.

b. HR 275-9.E & 276-13.H. Per Env-We 602.09.(b)(5) wells should not be located within 75 feet of a public right-of-way. We note that the applicant currently shows the 75-foot well radius within Bockes Road right-of-way.
RESPONSE: The well location has been revised accordingly.

c. Per Env-Wq 700 Table 1008-2, there are varying setbacks to the septic tank from both pressure and suction water lines. The applicant should verify if the water line from the underground fire cistern meets the required setbacks.
RESPONSE: It is our understanding that the setbacks do not apply as this is a fire suppression line and not a domestic water line.

6. Drainage Design/Stormwater Management (HR 275-9.A./Chapter 290)
a. HR 275-6.F. & 290-5.A.4. The applicant should coordinate with the Town to request the required waivers for GRV due to the existence of the Asbestos Disposal Site.
RESPONSE: We have requested the waiver and it is included with this submittal.

b. HR 275-9.A.1 & 290-5.A.5. The applicant should coordinate with the Town to confirm if the 200%+ increase in volume is permitted in all storms analyzed, or if a waiver is warranted.
RESPONSE: We have requested the waiver and it is included with this submittal.

c. HR 290-5.A.(10). Due to the CUP request, the applicant should coordinate with the Town to confirm if a waiver is also required to install erosion controls within the wetland buffer.
RESPONSE: Per discussions with the Conservation Commission, we have added additional erosion control measures along the limits of the 75-foot wetland buffer.

d. HR 290-5.A.(11). The proposed conditions and Table 3 refer to offline deep sump catch basins. We note that CB-4 is a flow through CB, and not offline. The applicant should revise the write up and TSS removal calculations appropriately.
RESPONSE: The write up has been revised and additional calculations have been added to account for a treatment train without the credit of offline catch basins.

e. HR 290-5.A.(12). We note that snow storage is proposed directly over the proposed septic system. This layout is not ideal and could reduce the lifespan of the septic system. To ensure effective winter maintenance, the applicant should clearly identify designated snow storage areas on the Inspection & Maintenance (I&M) plan, as the maintenance crew does not routinely reference full site plans.
RESPONSE: Snow storage areas have been added to the I&M plan that avoids the area of the septic field.

f. HR 290-5.A.(12). The applicant should provide responsible party contact information in the I&M document, including but not limited to email and phone number.
RESPONSE: Contact information has been added to the I&M plan.

g. HR 290-5.A.(12). Due to the location of the onsite wetlands, the applicant should coordinate with the Town if preparation of a winter maintenance and salt minimization plan is required.
RESPONSE: A Winter Maintenance and Salt Minimization Plan is included as part of the I&M plan.

h. HR 290-5.B.(1).b. The applicant should provide support material or calculations showing the required 50% TP pollutant removals.
RESPONSE: The TP removal rate of the Jellyfish unit has been added to the write up. For additional information, a product brochure from the manufacturer is included in Appendix F

i. HR 290-6.A.(9). The applicant should ensure the 30-day disturbed area timeframe is listed upon the plan set. We note that Erosion Control Note #7 on Plan Sheet 2 of 13, notes a 45-day time limit.
RESPONSE: The Erosion Control Note #7 has been updated to note a 30-day time limit.

j. HR 275-8.A.(4). & (5). The applicant should ensure a note is upon the plan set, stating the requirement to coordinate the need for a Bond or Escrow with the Town Engineer.
RESPONSE: The note has been added to the plans (see General Note #17, sheet 2).

k. 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.
RESPONSE: Comment acknowledged.

l. 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.
RESPONSE: Comment acknowledged.

7. Zoning (ZO 334)
a. ZO 334-17 & 334-21. The subject parcel is located within the General (G-1) zoning district and the applicant has noted this on the plans. The proposed retail use is allowed within the district.
RESPONSE: Comment acknowledged.

b. ZO 334-36.C. The applicant has requested a Conditional Use Permit for installation of a retaining wall, fence, guardrail and grading within the 75-foot wetlands buffer.

RESPONSE: Comment acknowledged.

c. ZO 334-83 and HR 218-4.E. The applicant has noted that a portion of the site is located within the Flood Hazard Area. We note that the applicant has not proposed any disturbance or development within this area.
RESPONSE: Comment acknowledged.

8. Erosion Control/Wetland Impacts
a. The applicant should note that the Town of Hudson reserves the right to require any additional erosion control measures as needed.
RESPONSE: As mentioned above, we have added additional erosion control measures along the limits of the 75-foot wetland buffer.

9. Landscaping (HR 275-8.C.(7) & 276-11.1.B.(20)) and Lighting (HR 276-11.1.B.(14))
a. HR 275-8.C.(8). The applicant has provided landscape screening between the rear of the building and the residential use across Bockes Road.
RESPONSE: Comment acknowledged.

b. HR 275-17.D.2. The applicant should note the hours of operation for the site and the relationship of those hours to the site lighting.
RESPONSE: The note has been added to the plans (see General Note #20, sheet 2).

c. HR 275-17.D.6. The supplicant has proposed 0.2 fc of light trespass onto the adjacent Central Street right-of-way. We note that no light trespass reaches the actual roadway.
RESPONSE: Comment acknowledged.

d. HR 275-17.E.1. The applicant should update the Light Fixture detail to match the light pole base height requirements of the Regulation.
RESPONSE: The light fixture detail has been revised.

10. State and Local Permits (HR 275-9.G.)
a. HR 275-9.G. The applicant has listed the required permits and their status on the plan set.
RESPONSE: Comment acknowledged.

b. HR 275-9.G. The applicant should provide copies of any applicable Town, State or Federal approvals or permits.
RESPONSE: All approvals will be forwarded to the Town upon receipt.

c. Additional local and state permitting may be required.
RESPONSE: Comment acknowledged.

11. Other
a. No other comments at this time.
RESPONSE: Comment acknowledged.

If you have any questions or need additional information, please feel free to contact me by phone at 603-766-5238 or by email at cyork@gpinet.com.

Sincerely,

GREENMAN-PEDERSEN, INC.

Christopher York, P.E.
Project Manager

enclosure(s)

cc: Steven W. Reichert

Attachment - "I"

TOWN OF HUDSON

Planning Department

12 School Street · Hudson, New Hampshire 03051 · Tel: 603-886-6008 · Fax: 603-594-1142

CAP FEE WORKSHEET - 2025

Date: 12/01/25 **Zone #** 1 **Map/Lot:** 145/001-000

1 Bockes Road

Project Name: Retail Building Site Plan

Proposed ITE Use #1: Shopping Center

Proposed Building Area (square footage): 12,000 S.F.

CAP FEES: (ONE CHECK NEEDED)

1.	**(Bank 09) 2070-701**	**($4.04 x 12,000) Traffic Improve (Zone 1)**	**$ 48,480.00**
		Total CAP Fee	**$ 48,480.00**

CAP FEE is calculated using the 2025 *Traffic Impact Fee Matrix*.

CAP FEE to be paid prior to Project Completion (Final Building Inspection).

Check should be made payable to the **Town of Hudson.**

Thank you,

Brooke Dubowik

Town Planner

Doc #4030007 Jun 30, 2010 1:48 PM
Book 8217 Page 0070 Page 1 of 6
Register of Deeds, Hillsborough County
Pamela D Caughlin

Attachment - "J"

546
Hudson Planning

SITE PLAN DEVELOPMENT AGREEMENT

This Agreement is entered into this 23rd day of June 2010, between Dr. Deepak Sharma, Owner (Proposed Retail Building – 1 Bockes Road) and the **Town of Hudson,** a municipal corporation, at 12 School Street, Hudson, New Hampshire. It represents the understanding of the parties regarding the granting by the Hudson Planning Board of site plan approval in accordance with the ordinances of the Town of Hudson, and to contain improvements pursuant to the plans and conditions referenced below.

WHEREAS, the Applicant is proposing to construct a 12,800 square foot single-story multi-tenant retail building with associated access driveway, paved parking, drainage, landscaping and lighting improvements

WHEREAS, the Hudson Planning Board has been duly authorized to regulate the subdivision of land and to approve and disapprove site plans for multifamily dwelling units and nonresidential developments pursuant to RSA 674 et seq.

WHEREAS, Applicant has applied for approval for the above described project in compliance with Town zoning ordinances and the rules and regulations of Hudson Planning Board.

WHEREAS, site plan approval is conditioned upon the execution of a Development Agreement.

In consideration for the Hudson Planning Board granting site plan approval, the parties hereby agree as follows:

Final site plan approval is granted for the Site Plan entitled: Proposed Retail Building – 1 Bockes Road, Hudson, New Hampshire, Tax Map 145, Lot 001 prepared by SFC Engineering Partnership, Inc., 25 Sundial Avenue, Suite 205W, Manchester, NH 03103-7230 dated: May 15, 2009 and revised thru June 19, 2010, consisting of Sheets 1 – 17 and Sheet A2.0 Building Elevations (by others) and Notes 1-22, Hillsborough County Registry of Deeds Plan No. HCRD# 36816, in accordance with the following terms and conditions:

1. All stipulations of approval shall be incorporated into the Development Agreement, which shall be recorded at the HCRD, together with the Site Plan of Record.

2. Prior to the Planning Board endorsement of the Site Plan, the Development Agreement shall be favorably reviewed and recommended on by Town Counsel.

3. All improvements shown on the Site Plan-of-Record, including Notes 1-22, shall be completed in their entirety and at the expense of the Applicant or his assigns.

4. The calculated CAP fee of $27,348.00, prepared in accordance with the 2010 CAP Fee Matrix, shall be submitted to the Town prior to the issuance of the Certificate of Occupancy. Said CAP Fee amount shall be inscribed on the Site Plan-of-Record prior to Planning Board endorsement.

5. A contribution of $7,500.00 shall be submitted to the Town prior to the Certificate of Occupancy. This contribution shall be used exclusively for the design, engineering and/or installation of a traffic signal at the intersection of Rte. 111/Sullivan Rd./Lawrence Rd. and for other traffic related improvements associated with Lawrence and Bockes Roads. Said contribution shall be inscribed on the Site Plan-of-Record prior to Planning Board endorsement.

6. After the issuance of foundation permit for the structure and prior to the issuance of framing permit, the applicant shall submit to the Hudson Community Development Department a foundation "As-Built" plan on a transparency and to the same scale as the approved site plan. The foundation "As-Built" plan shall include all structural dimensions and lot line setback measurements to the foundation and be stamped by a licensed land surveyor. Any discrepancy between the approved site plan and foundation "As-Built" plan shall be documented by the applicant and be part of the foundation "As-Built" submission.

7. Prior to the issuance of a final certificate of occupancy, a L.L.S. certified "As Built" site plan shall be provided to the Town of Hudson Community Development Department, confirming that the site conforms with the Planning Board approved site plan.

8. The Applicant shall be responsible for implementing and maintaining the Stormwater Pollution Prevention Plan (SWPPP).

9. Onsite landscaping shall be provided for in accordance with the plant and tree species specified on Sheet 12 of the Site Plan.

10. Construction activities on the site shall be limited to between 7:00 A.M. and 7:00 P.M. Monday through Friday. No construction activities shall occur on Saturday or Sunday.

11. This approval shall be subject to final engineering review, including approval of the SWPPP.

12. The applicant or his assigns, at his/her expense, shall be responsible for repairing all construction cuts, if any, on Bockes Rd., Lawrence Rd. and Rte. 111, and this work shall be properly bonded with the Town of Hudson, and if applicable, the State of New Hampshire.

13. This plan shall reflect hours of operation from 9:00 AM to 10:00 PM.

I

All conditions contained in the notes of the plan are incorporated herein by reference as approved by the Planning Board. Furthermore, all representations of fact or intention made by the applicant or any of applicant's representatives during testimony before the Planning Board relative to the obtaining of approval of this plan, shall be considered conditions of this approval regardless of the fact that such fact or intentions were not specifically stated as part of the motion to grant.

II

Applicant shall comply with all subdivision, site review and zoning regulations which have been promulgated by the Town and which are in effect as of the date of this Agreement. If this Agreement contains terms, including but not limited to variance and special exception stipulations granted by the Hudson Zoning Board of Adjustment, which are stricter or impose higher standards than the above-mentioned regulations, the stricter or higher standards shall control. All improvements shall meet the standards of workmanship as required by the Town, as required by the New Hampshire Water Supply and Pollution Control Commission, as required by the New Hampshire Department of Transportation, and as required by the New Hampshire Wetlands Board.

III

Applicant shall obtain all necessary local, state and federal permits prior to commencing work and shall comply fully with their terms.

IV

Applicant shall comply with the plan as submitted to, reviewed by and approved by the Planning Board, including but not limited to, notations set forth on the plan. Deviation from or amendments to the plan may only be made with the written approval of the Planning Board, or the Town Engineer, as appropriate.

V

Applicant acknowledges that it will have sole responsibility for ensuring the quality of the construction and that Applicant will not hold the Town, building inspector or other officers, employees, agents or assigns of the Town responsible for any claims, damages, fees or costs alleged to be incurred on account of the Town's negligent inspection of the improvements to be constructed. Similarly, Applicant agrees to hold harmless and indemnify the Town for any claims, damages, fees or costs sought or asserted by third parties against the Town on the grounds of negligent or improper inspection of the construction of the improvements called for herein.

VI

Applicant shall provide and install erosion and sedimentation control measures as required by the plan, by RSA 149-M, and as deemed necessary by the Town Engineer or his designated agent.

VII

The Applicant shall be responsible for any off-site problems, which arise from this construction. This includes, but is not limited to, erosion, runoff, sedimentation, drainage, and property damage by construction equipment, including damage to existing streets, sewers and drainage systems. Upon notification by the Town in writing, the developer must submit a plan within one week to remedy the problem. The Town Engineer division shall then set a construction schedule in consultation with the developer so that the problem can be corrected as soon as practical.

VIII

It is the intent of the signatories to the Agreement that only they can sue to enforce the Agreement's terms. The Agreement confers no rights on third parties.

IX

The Applicant's promise to perform improvements incorporated herein is an obligation independent from any alleged breach by the Town, once the Planning Board has given the developer site plan/subdivision approval and work on the site has begun.

X

Applicant shall notify the Town Engineer at least sixty (60) days prior to anticipated construction. A pre-construction meeting shall be held at least thirty (30) days prior to commencement of construction. A three-party inspection agreement and any other pertinent documents shall be finalized prior to the pre-construction meeting.

XI

The Agreement to complete bonded or otherwise secured improvements is not contingent upon the commencement of work on the site or on the sale of any of the lots or property contained in the approved plan.

XII

If the Town shall fail to notify Applicant in writing of its approval or rejection of the completed improvements within forty (40) days of the receipt of any such notice of completion, the improvement shall be deemed to be approved by the Town as completed in accordance with this Agreement. This period may be extended for thirty (30) days upon the Town's showing that the forty (40) day period is insufficient to enable the Town to reach such a determination despite using due diligence due to factors beyond the control of the Town.

XIII

At the time of plan recording, Applicant shall also execute and deliver to the Town easements for sewer, drainage, water, utilities as may be specified by the Hudson Planning Board, or otherwise specified on the plan.

XIV

The Applicant shall remove all waste from the particular site prior to the issuance of any Certificate of Completion or occupancy permit. All waste will be removed in compliance with applicable Town, State and Federal regulations.

XV

Prior to commencing construction, Applicant agrees to pay all fees as required by all ordinances and regulations of the Town in effect at the time of this Agreement, as well as any other fees imposed by the Hudson Planning Board, upon application for a building permit, unless phased payments are provided for. Applicant shall have an affirmative obligation to supplement this fee schedule, as information about the number of dwelling units per lot becomes available.

XVI

Applicant agrees that if in the future the Town determines that Applicant has committed a material breach of this Agreement or has violated any Town zoning, subdivision, site plan or any State land use or environmental law or regulation or building code, and said material breach or violation is decided against Applicant by a court of competent jurisdiction in a legal action by the Town against Applicant, Applicant agrees to pay, on demand, all reasonable attorney fees, court costs, sheriff charges and related costs incurred by the Town in connection with the breach or violation to the extent that said fees, costs and charges would not have been incurred had the breach or violation not occurred.

XVII

A note shall be added to the recorded plan. This note shall state the existence of this Development Agreement, and that a copy of it is on file with the Planning Department or other designated Town department. This Agreement shall be recorded with the plan.

XVIII

This agreement shall run with the land and shall be binding on any subsequent purchaser of the proposed development on applicant's heirs and assigns, and on any successor entity.

XIX

Severability: If any section, clause, provision, article or portion of this contract shall be invalidated by any court of competent jurisdiction, such holding shall not invalidate any other section of this Agreement.

IN WITNESS WHEREOF, the parties have hereunto set their hands the day and year first written above.

BOCKES ROAD RETAIL DEVELOPMENT

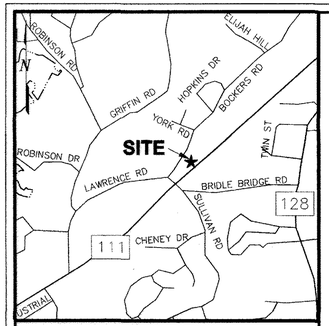
Witness

by: Dr. Deepak Sharma 6/22/10
Owner

TOWN OF HUDSON, NH

Witness

by: Vincent Russo, Chairman 6-23-10
Hudson Planning Board



LOCATION PLAN

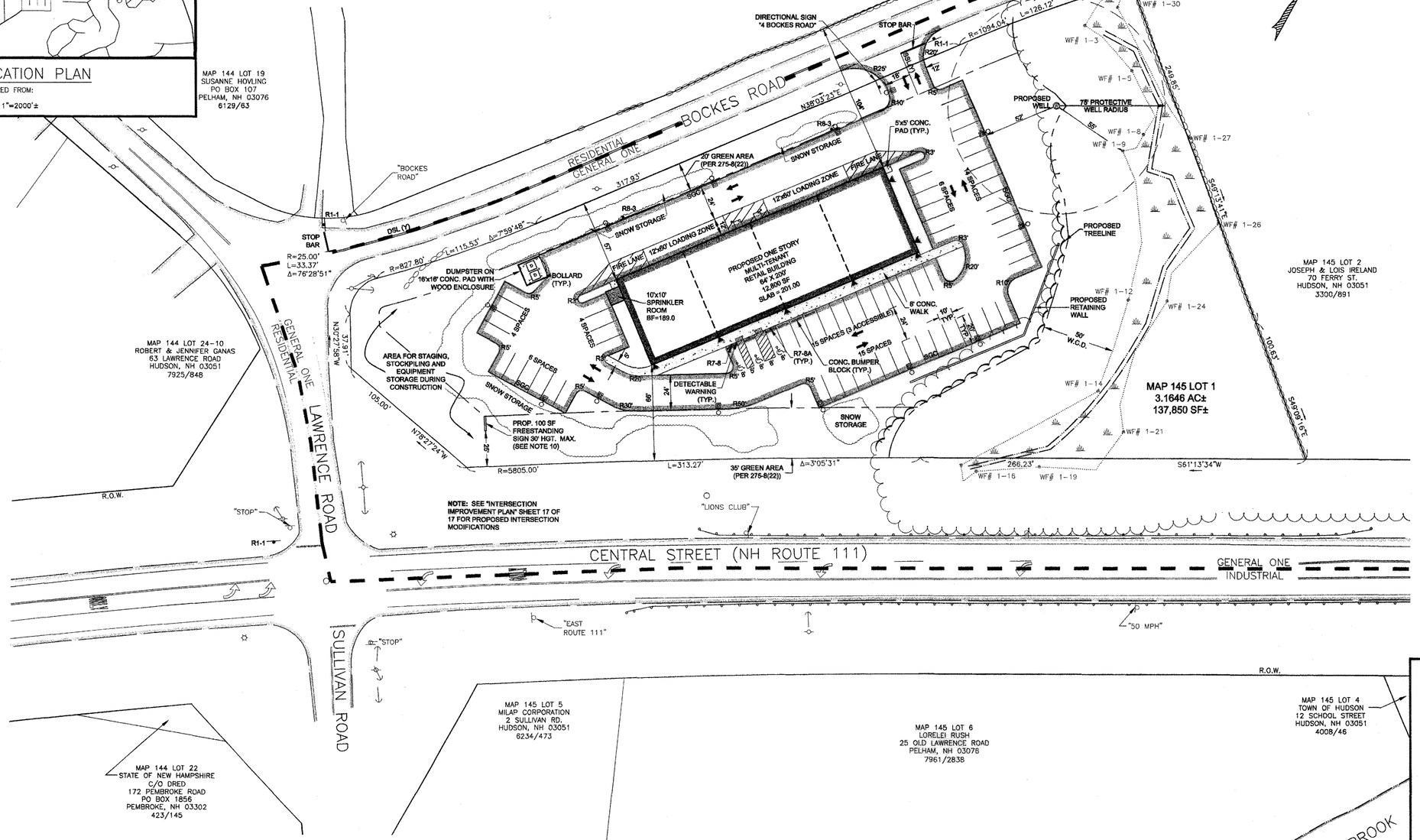
PREPARED FROM:

SCALE: 1"=2000'±

I CERTIFY THAT THIS SURVEY PLAT IS NOT A SUBDIVISION PURSUANT TO THIS TITLE AND THAT THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS AND WAYS ALREADY ESTABLISHED AND THAT NO NEW WAYS ARE SHOWN. I FURTHER CERTIFY THAT I HAVE FILED A COPY OR THIS PLAN WITH THE PLANNING BOARD OF THE TOWN OF HUDSON, NEW HAMPSHIRE IN ACCORDANCE WITH RSA 676:18 IV.

DAVID R. JORDAN, L.L.S. — DATE 6/23/10

STATE OF NEW HAMPSHIRE — NO. 858 — DAVID R. JORDAN — LICENSED LAND SURVEYOR



PLAN OF REFERENCE

1. "TAX MAP 145 LOT 1, EXISTING CONDITION AND BOUNDARY PLAN, 1 BOCKES ROAD, HUDSON, NEW HAMPSHIRE, OWNED BY AND PREPARED FOR DEEPAK SHARMA", PREPARED BY: TFMORAIN, INC. DATED: DECEMBER 7, 2005 LASTED REVISED 8/6/08.

NOTES

1. OWNER OF RECORD OF MAP 145 LOT 001:
   DEEPAK SHARMA, M.D.
   23 STILES ROAD
   SALEM, NH 03079
   DEED REFERENCE TO PARCEL IS BK. 7287 PG. 1744
   AREA OF PARCEL = 137,850 S.F.± OR 3.1646 ACRES±
2. 145-001 INDICATES TAX MAP AND LOT NUMBER.
3. THE PURPOSE OF THIS PLAN IS TO CONSTRUCT 12,800 S.F. OF RETAIL SPACE AND PARKING FOR THE FACILITY.
4. THIS SITE IS REGISTERED BY THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES AS AN ASBESTOS DISPOSAL SITE (AOS SITE #060). NO PERSON SHALL EXCAVATE, REMOVE, EXPOSE OR OTHERWISE DISTURB ANY ASBESTOS AT AN ASBESTOS DISPOSAL SITE, UNLESS THE WORK IS CONDUCTED IN ACCORDANCE WITH STATE OF NEW HAMPSHIRE ADMINISTRATIVE RULE ENV-SW 2100 AND FEDERAL REGULATIONS.
5. THE LOCATION OF ANY UTILITY INFORMATION SHOWN ON THIS PLAN IS APPROXIMATE. SFC ENGINEERING PARTNERSHIP, INC., MAKES NO CLAIM TO THE ACCURACY OR COMPLETENESS OF UTILITIES SHOWN. PRIOR TO ANY EXCAVATION ON SITE THE CONTRACTOR SHALL CONTACT DIG SAFE AT 1-888-344-7233.
6. CURRENT ZONING IS G-1 (GENERAL ONE) ZONING DISTRICT.

	REQUIRED	PROVIDED
MIN. LOT SIZE:	87,120 S.F.	137,850 S.F (85,850 EXC. WET & STEEP SLOPES)
MIN. LOT FRONTAGE:	200'	579.50' (CENTRAL ST) & 559.58' (BOCKES RD)
MIN. BUILDING SETBACKS:		
FRONT	50' (CENTRAL ST)	66'
	30' (BOCKES RD)	57'
SIDE	15'	201'
REAR	15'	N/A
MAX. BUILDING HEIGHT:	38'	<38'
OPEN SPACE:	40%	62%

7. THE SUBJECT SITE DOES NOT LIE WITHIN THE 100 YEAR FLOOD ZONE AS INTERPRETED FROM THE FLOOD INSURANCE RATE MAP FOR THE TOWN OF HUDSON, COMMUNITY PANEL NO. 330092 0005 B, EFFECTIVE DATE JANUARY 3, 1978.
8. THE PROPERTY LINES AND BOUNDARY INFORMATION SHOWN ARE TAKEN FROM PLAN OF REFERENCE. THIS PLAN DOES NOT REPRESENT A BOUNDARY SURVEY BY SFC ENGINEERING PARTNERSHIP, INC.
9. ALL SIGNS ARE SUBJECT TO APPROVAL BY THE HUDSON PLANNING BOARD PRIOR TO INSTALLATION THEREOF.
10. ACCESSIBILITY SHALL BE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE "ADA STANDARDS FOR ACCESSIBLE DESIGN" (28 CFR PART 36), 7-1-94 EDITION.
11. PARKING CALCULATIONS:
    REQUIRED: RETAIL BUSINESS (12,800 SF) x 1 SPACE/ 200 SF = 64 SPACES
    PROPOSED: 64 SPACES (INCL. 3 ACCESSIBLE SPACES)
12. LOADING SPACES:
    REQUIRED: 1 SPACE FOR FIRST 5,000 SF PLUS 1 SPACE FOR EACH ADDITIONAL 10,000 SF = 1 + 1 = 2 SP
    PROVIDED: 2 SPACES @ 12' x 60'
13. SITE LIGHTING SHALL BE DOWN CAST AS SHOWN ON THESE PLANS AND SHALL CONFORM TO THE TOWN OF HUDSON REGULATIONS.
14. TRASH PICKUP SHALL OCCUR BETWEEN 7:00 AM AND 7:00 PM, MONDAY THROUGH FRIDAY ONLY.
15. CONSTRUCTION ACTIVITIES SHALL BE LIMITED TO 7:00 AM THROUGH 7:00 PM, MONDAY THROUGH FRIDAY. NO CONSTRUCTION ACTIVITY SHALL OCCUR ON SATURDAYS OR SUNDAYS.
16. REQUIRED STATE PERMITS FOR CONSTRUCTION:
    NH DES SEPTIC: CA2009096883 - DATED 5/7/09
17. ON APRIL 28, 2010 THE HUDSON PLANNING BOARD GRANTED THE FOLLOWING WAIVERS:
    HTC 275 - 9C NOISE STUDY
    HTC 275 - 9D FISCAL IMPACT STUDY
18. PLOWED SNOW FROM THE PARKING SPACES AND DRIVEWAYS SHALL BE STORED IN THE DESIGNATED AREA SHOWN. EXCESS SNOW SHALL BE HAULED OFF-SITE AND DISPOSED OF IN AN ENVIRONMENTALLY SOUND MANNER IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.
19. MAINTENANCE OF THE ON-SITE DRAINAGE SYSTEM SHALL BE THE RESPONSIBILITY OF THE OWNER AND CONDUCTED IN ACCORDANCE WITH NH DES REQUIREMENTS.
20. HOURS OF OPERATION: 9:00 AM THROUGH 10:00 PM.
21. A CAP FEE OF $27,348.00 SHALL BE SUBMITTED TO THE TOWN PRIOR TO ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.
22. A CONTRIBUTION OF $7,500.00 FOR THE DESIGN, ENGINEERING AND/OR INSTALLATION OF A TRAFFIC SIGNAL AT THE INTERSECTION OF ROUTE 111 / SULLIVAN ROAD / LAWRENCE ROAD SHALL BE SUBMITTED TO THE TOWN PRIOR TO ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.

No.	Revision	Date
3	Revise Per Conditions of Approval	6/19/2010
2	Add Road Striping	4/9/2010
1	Misc. Revision Per CLD Review	2/10/2010
	Designed by: DRJ — Drawn by: JRS — Checked by: DRJ	

APPROVED BY THE HUDSON, NH PLANNING BOARD

DATE OF MEETING: April 28, 2010

PLANNING BOARD CHAIRMAN — SIGNATURE DATE 6-23-10

PLANNING BOARD SECRETARY — SIGNATURE DATE 6/23/10

SITE PLANS ARE VALID FOR ONE (1) YEAR FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN RECEIVES 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.

PRESENT OWNER MAP 145 LOT 1

SIGNATURE

DATE: 6/23/10

Site Layout Plan

Proposed Retail Building
1 Bockes Road
Hudson, New Hampshire

Assessors Map 145 Lot 1

Prepared by:
SFC ENGINEERING PARTNERSHIP INC.
25 SUNDIAL AVENUE, SUITE 205W
MANCHESTER, NH 03103-7230
TEL. 603-647-9700
FAX. 603-647-8711
www.sfceng.com

Sheet 4 of 17 — Scale: 1"=40' — Date: 5/15/2009

STATE OF NEW HAMPSHIRE — DAVID R. JORDAN — No. 7776 — LICENSED PROFESSIONAL LAND SURVEYOR — 6/23/10

Prepared for:
Deepak Sharma
23 Stiles Road
Salem, NH 03079

Hudson Planning Board Approval

Zoning Classification: G-1 (General One)

Drawing: Site Development Plan
Layout: Layout - 4

HCRD #36816

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

DRIVEWAY PERMIT

To Landowner:
Elvis Dhima
Town of Hudson, NH
12 School Street
Hudson, NH 03051

City/Town: Hudson
Route/Road: NH 111 (S0000111__)
Patrol Section: 516
Tax Map: 145
Lot: 1
Development: Municipal

Permit#: DOT-DRI-004086
District: 05
Permit Date: 11/20/2025

Permission is hereby granted to construct (alter) a driveway, entrance, exit or approach adjoining NH 111 (S0000111__), pursuant to the location and specifications as described below. Failure to adhere to the standards and engineering drawings previously approved shall render this instrument null and void. Failure to start or complete construction of said facility within one calendar year of the date of this permit shall require application for permit extension or renewal in accordance with the Driveway Access Rules. Facilities constructed in violation of the permit specifications or the rules, shall be corrected immediately upon notification by a Department representative. Any cost by the State to correct deficiencies shall be fully borne by the landowner. The landowner shall defend, indemnify and hold harmless the Department and its duly appointed agents and employees against any action for personal injury and/or property damage sustained by reason of the exercise of this permit. All supporting documentation for this permit, on file in the State of New Hampshire Permit Portal for the respective application, is considered part of the final permit and all parties are responsible for complying with these documents.

Drive 1

Location: Approximately 0.01 miles East of Rolling Woods Drive on the South side of NH 111 (S0000111__).

GPS: 42.791210, -71.368607

Land Use: Municipal Road

Specifications: This permit authorizes a Paved access for the land use stated above. Any change in use, increase in use or reconstruction of the driveway requires reapplication.

The right-of-way line is located (See Referenced Plan Set).

The driveway shall not exceed (See Referenced Plan Set) feet in width. The entrance of the drive may be flared; typically the flare radius is one half the driveway width.

This permit supersedes permit #05-229-0010

All conditions stipulated in the original permit shall remain in effect under the new permit.

This permit updates the Lawence Road access to Route 111 to include an additional retail development.

Other Conditions:

No structures, including buildings, permanent or portable signs, lights, displays, fences, walls, etc. shall be permitted on, over or under the Highway Right of Way.

No parking, catering or servicing shall be conducted within the Highway Right of Way.

The applicant shall comply with all applicable ordinances and regulations of the municipality or other State Agencies.

The Department has relied on the title and subdivision information provided by the landowner. The Department has not performed additional title research and makes no warranty or representation concerning landowner's legal right to access. In the event of a dispute about the landowner's legal right to the access provided herein, the landowner will defend and indemnify the Department.

All excavated topsoil, or in the absence of topsoil the top 6 inches of soil, within the limits of state ROW shall be properly re-used within the limits of the state ROW. All temporary stockpiles of the re-use material shall be located within the state ROW, or as otherwise approved by the District Engineer.

The Contractor shall be solely responsible for the handling, transport and disposal of any surplus material generated by their project and shall comply with all federal, state and local laws, ordinances and rules in doing so.

I/We, the contractor/Owner, certify that the property will not have any illicit unauthorized drainage connections to the NHDOT storm water drainage system. An illicit discharge is any direct or Indirect discharge to the NHDOT drainage system that is not composed entirely of storm water. Illicit discharges include, without limitation, sewage, process wastewater, or wash water and any connections from floor drains, sinks, or toilets.

Highway and driveway modifications are to be constructed as shown on plans entitled "Site Development Plans" prepared by Greenman-Peterson Inc. for 1 Bockes Road, LLC date last revised October 21, 2025, on file in the District Five Office.

No work in the State right-of-way shall be performed between November 15 and April 15, or during periods of inclement weather, unless otherwise directed or authorized by the District Engineer.

No additional surface drainage will enter upon the highway.

This permit to act relates solely to the use of the State right-of-way and is not determinative of any rights of flowage between private landowners.

A copy of this permit shall be present at the site during construction of the drive(s).

All work is to be done by the applicant at no cost to the State of New Hampshire.

This permit does not include or approve the location or installation of underground utilities. All utility work located within the State Right-Of-Way, will require a NHDOT Right-Of-Way Activities Permit.

Drive(s) shall approach the highway at or about 90 degrees.

All materials and structures shall conform to the current version of the NHDOT Standard Specifications for Road and Bridge Construction, as amended.

Notify the District 5 Office at (603) 666-3336, forty-eight (48) hours prior to construction in the State right-of-way.

During construction within the highway right-of-way, traffic shall be maintained in accordance with MUTCD standards and as directed by the District Engineer.

Approved by

Zachery Roller

Assistant District Engineer

For Director of Administration

Copies:

Bureau, Owner, Patrolman

IA-0000004112

Attachment "K"

GEORGE N. CAMPBELL, JR.
COMMISSIONER

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

District 5 Office, 16 East Point Drive, Bedford, NH 03110 603-666-3336

JEFF BRILLHART, P.E.
ASSISTANT COMMISSIONER

DRIVEWAY PERMIT

To: KENNETH MASSEY
TOWN OF HUDSON
12 SCHOOL ST
HUDSON, 03051

City/Town: Hudson
Route/Road: NH 111 (S0000111)
Patrol Section: 516
Tax Map:
Lot:
Development: Widen Lawrence Rd approach

Permit #: 05-229-0010
District: 05
Permit Date 2/25/2011

Permission is hereby granted to construct (alter) a driveway, entrance, exit or approach adjoining NH 111 (S0000111), pursuant to the location and specifications as described below. Failure to adhere to the standards and engineering drawings previously approved shall render this instrument null and void. Failure to start or complete construction of said facility within one calendar year of the date of this permit shall require application for permit extension or renewal in accordance with the Driveway Access Rules. Facilities constructed in violation of the permit specifications or the rules, shall be corrected immediately upon notification by a Department representative. Any cost by the State to correct deficiencies shall be fully borne by the landowner. The landowner shall defend, indemnify and hold harmless the Department and its duly appointed agents and employees against any action for personal injury and/or property damage sustained by reason of the exercise of this permit.

Drive 1

Location: Approximately 0 miles from / of Lawrence Rd on the north side of NH 111 (S0000111).
SLD Station: 18555 (left) GPS: 42.7912 N 71.36853 W.

Specifications: This permit authorizes a paved access to be used as a Town Road / drive. Any change in use, increase in use or reconstruction of the driveway requires reapplication.

The right-of-way line is located 75 feet from and parallel to the centerline of the highway. The entrance shall be graded so that the surface of the drive drops (see plan) at a point (see plan) from NH 111 (S0000111) edge of pavement to create a drainage swale.

The driveway shall not exceed (see plan) in width. The entrance of the drive may be flared; typically the flare radius is one half the driveway width.

Other Conditions:

No structures, including buildings, permanent or portable signs, lights, displays, fences, walls, etc. shall be permitted on, over or under the Highway Right of Way.

No parking, catering or servicing shall be conducted within the Highway Right of Way.

The applicant shall comply with all applicable ordinances and regulations of the municipality or other State Agencies.

The Department has relied on the title and subdivision information provided by the landowner. The Department has not performed additional title research and makes no warranty or representation concerning landowner's legal right to access. In the event of a dispute about the landowner's legal right to the access provided herein, the landowner will defend and indemnify the Department.

No work in the State right-of-way shall be performed between November 15 and April 15, or during periods of inclement weather, unless otherwise directed or authorized by the District Engineer.

No additional surface drainage will enter upon the highway.

This permit to act relates solely to the use of the State right-of-way, and is not determinative of any rights of flowage between private land owners.

A copy of this permit shall be present at the site during construction of the drive(s).

All work is to be done by the applicant at no cost to the State of New Hampshire.

This permit does not include or approve the location or installation of underground utilities.

Drive(s) shall approach the highway at or about 90 degrees.

The applicant shall furnish an approved continuing Surety Bond in the amount of $50,000.00 dollars payable to the State of New Hampshire, guaranteeing the fulfillment of the provisions, instructions, and regulations prescribed in this permit and later instructions issued by the District Engineer during the performance of the work and satisfactory maintenance of the work area for a period of two (2) years following State acceptance of the project.

A pre-construction conference will be required prior to the start of any work within the highway right-of-way. Contact the District 5 office at (603) 666-3336 at least 2 weeks prior to the anticipated start date to schedule.

All materials and structures shall conform to the current version of the NHDOT Standard Specifications for Road and Bridge Construction, as amended.

During construction within the highway right-of-way, traffic shall be maintained in accordance with MUTCD standards and as directed by the District Engineer.

A yellow centerline shall be maintained at all times as approved by the District Engineer. When temporary tape or raised pavement markers are used, they shall be removable.

Related roadway modifications are to be constructed as shown on plans prepared by MHF Design Consultants for Deepak Sharma dated 2/15/11, on file in the District Five Office.

Copies: District, Town, Patrolman

SFC ENGINEERING PARTNERSHIP, INC.
DAVID W JORDAN
25 SUNDIAL AVE., SUITE 205W
MANCHESTER, NH 03103-7230

Approved _____

Assistant District Engineer
For Director of Administration

Attachment "K"

New Hampshire DOT
Department of Transportation

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

GEORGE N. CAMPBELL, JR.
COMMISSIONER

JEFF BRILLHART, P.E.
ASSISTANT COMMISSIONER

RECEIVED
DEC 21 2009
TOWN OF HUDSON
ENGINEERING DEPARTMENT

December 15, 2009

Mr. David R. Jordan, P.E.
SFC Engineering Partnership, Inc.
25 Sundial Avenue
Manchester, NH, 03103

Subject: Hudson, Bockes Rd, Retail Development

Dear Mr. Jordan;

I apologize for the delay in responding to your October 12, 2009 submission. We agree with the conclusions contained in the Stephen G. Pernaw & Co., Inc. Traffic Impact Assessment.

Since the access from the proposed retail-building site is located on Bockes Road and not NH Route 111 and both Bockes Road and Lawrence Road are local roads, we do not have any direct jurisdiction over this site or its access. However, we do need a permit application from the Town of Hudson for the proposed improvements to the Lawrence Road approach to NH 111 and the proposed westbound right-turn lane on NH 111. Please advise your client and your contact at the Town of this determination.

Also, it appears that you are proposing a total width of 12' (11'-1') for the right-turn lane and its shoulder along NH 111 WB. However, given the existing 4-foot shoulder along NH 111 in this area, as well as the substantial volumes of traffic along NH 111 and the 50 mph posted speed limit, we will require that the proposed right-turn lane and shoulder have a 10'- 4' or 12'- 2' typical.

If you have further questions, you can contact me at (603) 666-3336.

Sincerely,

William F. O'Donnell, P.E.
Access & Utility Engineer

WFO'D/jll

cc: Gary Webster (Hudson Town Engineer)
Keith Kelley (516)
Mike Dugas (Hwy Design)

BUREAU OF HIGHWAY MAINTENANCE • DISTRICT FIVE • 16 East Point Drive Bedford NH 03110
TELEPHONE: 603-666-3336 • FAX: 603-485-9825 • TDD ACCESS: RELAY NH 1-800-735-2964 • INTERNET: WWW.NHDOT.COM

Attachment "K"

CONSULTING ENGINEERS

October 16, 2009

HUDSON
OCT 19 2009
COMMUNITY DEVELOPMENT

Mr. John Cashell, Town Planner
Town of Hudson
12 School Street
Hudson, NH 03051

Re: Town of Hudson Planning Board Reviews
Bockes Road Retail Site Plan, 1 Bockes Road
Tax Map 145, Lot 001; PO #1350-571
CLD Reference No. 03-0249.1002

Dear Mr. Cashell:

CLD Consulting Engineers, Inc. has reviewed the Traffic Impact Assessment by Stephen G. Pernaw & Company, Inc. for the above-referenced project. We received the report on September 30, 2009, and authorization to proceed with the review of the study was received on October 5, 2009. The project consists of the construction of a 12,800 square-foot retail building on a 3.16-acre lot.

This report is an update of a previous report by Robert E. Bollinger Engineering, PLLC (REB), which was reviewed by CLD on June 22, 2009.

The Traffic Impact Assessment provides appropriate information to determine the off-site traffic impacts of this development. The following items are noted:

1. The report utilizes the traffic data collected by REB in 2008 and 2009, and then presents updated traffic projections and analysis. As in the previous report, the traffic data collected for the assessment is appropriate. Appropriate seasonal and background factors have been applied to determine the No-Build traffic volumes.
2. The crash data was updated from the previous report, and it shows that the intersection of Lawrence and Sullivan Roads at NH Route 111 had an average of less than 4 crashes per year from 2005 through 2007. It should be noted that a fatal crash did occur at the intersection in May 2003.
3. The consultant used data from the ITE *Trip Generation, 8th Edition* report, which is the most recent available version. Trip generation estimates were prepared for the proposed development for both "shopping center" (as was used in the previous report) and four hypothetical uses. The resulting higher generation numbers were for the four uses, and those numbers were used in the analysis. The pass-by trips were determined for each assumed use and applied appropriately. The trips were properly distributed, based on population data, regional accessibility, and existing travel patterns.
4. The analysis of the intersections shows that the side road approaches to NH Route 111

operate poorly now during the peak hours, and are expected to have worse operating conditions for both the No-Build and Build scenarios. The intersection of Lawrence Road at Bockes Road is expected to operate satisfactorily, as is the Site Drive at Bockes Road.

5. The analysis of auxiliary turn lanes shows that a westbound right turn lane on NH Route 111 is now warranted, even without the development. In addition, the capacity analysis shows that a separate right turn lane southbound from Lawrence Road would improve operations at this intersection.

6. The traffic signal warrants analysis indicates that a Four-Hour Volume warrant is currently met. With the development in place, Warrant 1B (Eight Hour Interruption of Continuous Traffic) will be met in 2010 for the intersection of Lawrence & Sullivan Roads with NH Route 111, whereas this warrant is not met without the development (only 5 of 8 hours). The report states that "the signalization of the subject intersection is justified by the current volume of traffic utilizing the intersection, not by the projected traffic increase due to development of the site". However, this applies only to the Four-Hour warrant. The NHDOT typically prefers to have the more rigorous Eight-Hour warrant met before considering the installation of signals. As such, the NHDOT may not consider the current Four-Hour warrant under No-Build conditions sufficient to justify the signal. The additional traffic from the development causes the preferred Eight-Hour warrant to be met.

7. The study recommends that Lawrence Road be widened to provide a right turn lane, and NH Route 111 westbound be widened to provide a right turn lane. No recommendation is made as to who would implement the improvements.

8. The study recommends that the developer provide a fair share contribution of the cost of installing traffic signals at the intersection of Lawrence and Sullivan Roads with NH Route 111. A fair share contribution of 7% (the site's contribution of overall traffic using the intersection) is suggested. However, the reason for the signal warrant being met is the additional traffic exiting Lawrence Road from the site. Existing traffic levels are at least 60% of the warrant volumes, and the additional site traffic essentially doubles this volume to the point where the Eight-Hour warrant is met. Therefore, we think that 7% is not a realistic assessment of the impact of the site on this intersection.

9. The study also recommends the following modifications, which should be included in the site plan:

   - Installation of a STOP sign and stop line on the Bockes Road approach to Lawrence Road
   - Installation of a STOP sign and stop line on the site driveway approach to Bockes Road
   - Installation of a four-inch double-yellow centerline on Bockes Road between Lawrence Road and the proposed driveway
   - Widening of the ingress lane of the site drive.

NEW HAMPSHIRE VERMONT MAINE
540 Commercial Street • Manchester, NH 03101 • ph: (603) 668-8223 • fx: (603) 668-8802 • www.cldengineers.com

CONSULTING ENGINEERS

10. The sight distance information is not provided in the report. However, the site plan has this information. As described, it appears that there will be 400 feet of sight distance looking in both directions from the site driveway if vegetation in the right-of-way on the south side of Bockes Road to the east of the site drive is removed or kept low to the ground. Any landscaping or signs for the development must be placed so as to not obscure the sight lines.

The Traffic Impact Assessment provides appropriate information to determine the off-site traffic impacts of this development. The traffic from the development will trigger the warrant for traffic signals at the intersection of Lawrence and Sullivan Roads with NH Route 111, and right-turn lanes should be constructed at the intersection. The Town of Hudson should coordinate with the developer and NHDOT to determine the best course of action with respect to the implementation of the proposed improvements at this intersection.

We will continue our review upon receipt of the additional or clarified information. Please feel free to call if you have any questions.

Very truly yours,

Robert W. Lyford, P.E.
Senior Transportation Engineer

RWL:lab

cc: Town of Hudson Engineering Division – File
SFC Engineering Partnership, Inc.
25 Sundial Avenue, Suite 205W
Manchester, NH 03103
Fax 603-647-8711

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Attachment "K"

CONSULTING ENGINEERS

June 22, 2009

Mr. John Cashell, Town Planner
Town of Hudson
12 School Street
Hudson, NH 03051

Re: Town of Hudson Planning Board Reviews
Bockes Road Retail Site Plan, 1 Bockes Road
Tax Map 145, Lot 001; PO #1350-571
CLD Reference No. 03-0249.1002

Dear Mr. Cashell:

CLD has reviewed the Traffic Impact Assessment for the above-referenced project received on June 2, 2009. Authorization to proceed with the review of the traffic study was received on June 8, 2009. The project consists of the construction of a 12,800-square-foot retail building on a 3.16-acre lot.

The following items are noted:

1. The consultant had a scoping meeting with Town officials on March 3, 2009, at which time the requirements of the traffic analysis were set forth. The weekday afternoon and Saturday midday time periods were selected for analysis; these times are appropriate for such a retail development. Also, the consultant determined that the NHDOT would not require the project to go through the State driveway permit process because the proposed driveway is not directly on a State-maintained highway, even though this section of NH Route 111 is under State jurisdiction.

2. The traffic data collected for the assessment is appropriate, and appropriate seasonal and background factors are applied to determine the No-Build traffic volumes.

3. The crash data shows that the intersection of Lawrence and Sullivan Roads at NH Route 111 had an average of 5 crashes per year from 2006 through 2008. Most of these crashes appear to be caused by 'failure to yield' or 'stop sign violations'.

4. The consultant used data for shopping center traffic from the ITE *Trip Generation, 8th Edition* report, which is the most recent available version. The shopping center data are the appropriate category for this proposed retail development. The consultant used trip rates rather than the trip equations to calculate the number of trips that would be expected to use the proposed development. For the size of this proposed development, the rates (48 and 63 trips generated in the PM and Saturday peak hour respectively) yield lower values than the equations (160 and 225 trips generated in the PM and Saturday peak hour respectively).

5. The consultant used a pass-by rate based on average ITE data. However, based on available ITE data, the pass-by rate for this size of development could be considerably higher than the rate used in the report. Using a higher rate would affect the number of new trips using the proposed facility but would not affect the total number of site-generated trips.

6. The trip distribution patterns were derived from the existing traffic counts. This is an appropriate method for this type of development, considering the surrounding land uses. As a result, the development is expected to add 22 PM and 28 Saturday peak hour trips to the southbound Lawrence Road approach, increases of 40% and 47%, respectively, over existing traffic volumes on that approach.

7. The analysis of the intersections using the data as generated shows that the side road approaches to NH Route 111 operate poorly now during the peak hours, and are expected to have worse operating conditions for both the No-Build and Build scenarios. The intersection of Lawrence Road at Bockes Road is expected to operate satisfactorily, as is the Site Drive at Bockes Road.

8. Based on the information in the report, the sight distance at intersections is adequate. Sight distance at the Site Drive should be confirmed by survey and shown on the plans.

9. The traffic signal warrants analysis indicates that, with the development in place and using the data developed in the report, Warrant 1B (Eight Hour Interruption of Continuous Traffic) will be met for 10 hours of the average day in 2010 for the intersection of Lawrence & Sullivan Roads with NH Route 111, whereas the warrant will be met for only 5 hours without the development. The Four Hour and Peak Hour warrants are met with or without the development.

The possible changes in traffic volumes that would result from revising the trip generation methodology are not likely to change the conclusions of the capacity analysis of the intersections as presented in the report. However, given the wide range of the number of trips that could be generated by the proposed development, there could be sufficient additional traffic so that signal warrants would be met at the intersection at NH Route 111. In addition, it appears that the type of crashes shown could be reduced by installing traffic signals, even though there is not a warrant for traffic signals for this intersection based solely on crashes.

Since there are uncertainties of the number of trips that may be generated by the proposed development and because the combination of existing and development traffic is very close to making signal warrants, it is recommended that the Town require that the traffic volumes at the intersection of Lawrence and Sullivan Roads at NH Route 111 be monitored after the completion of the development to determine its actual impact on the intersection. If a traffic signal at the intersection of Lawrence and Sullivan Roads at NH Route 111 is determined to be warranted at

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that time, the Town should coordinate with NHDOT concerning installation of such a signal. Since this development may add upwards of 50% to the southbound approach to the intersection, the Town should consider some method of holding the developer responsible for its fair share of the cost of the signal based on the traffic increases from the development.

We will continue our review upon receipt of the additional or clarified information. Please feel free to call if you have any questions.

Very truly yours,

Robert W. Lyford, P.E.

RWL:lab

cc: Town of Hudson Engineering Division – File
Robert E. Bollinger Engineering, PLLC
74 Northeastern Boulevard, Suite 20B
Nashua, NH 03062
Fax (603) 880-6507

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540 Commercial Street • Manchester, NH 03101 • ph: (603) 668-8223 • fx: (603) 668-8802 • www.cldengineers.com

Attachment "K"

5-25-10

6/8/10 agenda

TOWN OF HUDSON
Office of the Town Administrator

12 School Street
Hudson, New Hampshire 03051

Stephen A. Malizia, Town Administrator -- smalizia@hudsonnh.gov -- 603-886-6024

Motion Couto/Jasper to defer until June 8th mtg. 5-0

To: Board of Selectmen

From: Steve Malizia

Date: May 14, 2010

Re: Retail Site Plan, 1 Bockes Road, Map 145, Lot 001

At their meeting on April 28, 2010, the Hudson Planning Board granted site plan approval for the Bockes Road retail center located off of Central Street (Route 111). As part of this approval, the project applicant received NHDOT approval for proposed improvements to Central Street and the Central Street/Lawrence Road intersection, specifically to construct a transition lane westbound on Central Street leading to Lawrence Road and a widening of Lawrence Road at the Central Street Intersection to allow for turning lanes and improved ingress and egress on Lawrence Road. The applicant is seeking the Board of Selectmen's approval for the proposed road improvements as the NHDOT permit application needs to be signed by the Town. Should the Board of Selectmen approve the proposed road improvements for the Bockes Road retail center, the following motion is appropriate:

Couto/Jasper 5-0

Motion: To approve the Bockes Road retail center proposed road improvements as shown on the intersection improvement plan entitled Proposed Retail Building, 1 Bockes Road, Hudson, NH, Map 145, Lot 1 as prepared by SFC Engineering Partnership, Inc. as revised through February 10, 2010 and to authorize the Chairman of the Board of Selectmen to sign the NHDOT Application for Driveway Permit.

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

HUDSON JUN 11 2010 COMMUNITY DEVELOPMENT

6-9 Cvg pkt to John Cashell w/plans

RECEIVED FEB 16 2010

Attachment "K"

New Hampshire DOT
Department of Transportation

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

GEORGE N. CAMPBELL, JR.
COMMISSIONER

JEFF BRILLHART, P.E.
ASSISTANT COMMISSIONER

February 12, 2010

Mr. David R. Jordan, P.E.
SFC Engineering Partnership, Inc.
66 Gold Ledge Ave.
Auburn, NH, 03032

Subj: Proposed Retail Building, 1 Bockes Rd, Hudson

As requested, please be advised that your latest conceptual plan, revised January 12, 2010, associated with the subject development, satisfactorily addresses our concerns about the width of the westbound right-turn lane and shoulder on NH Route 111. Thus, we concur with these proposed improvements to NH Route 111, subject to our review of the detailed treatment of the slopes, drainage, guardrail, signing and striping, etc., in the next plan submission.

Sincerely,

William F. O'Donnell, P.E.
Access & Utility Engineer

WFO'D/jll

cc: Hudson Planning Board
Keith Kelley
File w/ Hudson

Attachment "K"

SFC ENGINEERING PARTNERSHIP, INC.
"FROM VISION TO REALIZATION"

May 11, 2010

RECEIVED
MAY 13 2010
TOWN OF HUDSON
SELECTMEN'S OFFICE

Mr. Steve Malizia
Town Administrator
Town of Hudson
12 School Street
Hudson, NH 03051

RE: **Retail Site Plan, 1 Bockes Road**
Tax Map 145, Lot 1

Dear Mr. Malizia,

SFC Engineering Partnership, Inc. (SFC), has recently received Site Plan approval from the Hudson Planning Board for a 12,800 square foot retail building located at the Central Street (Route 111)/Lawrence Road/Bockes Road intersection. As part of this project certain improvements will be made to both Central Street and Lawrence Road, which NH DOT has agreed to (see attached letter). Since our project does not enter onto Central Street directly, the NH DOT permit application needs to be signed by the Town.

Enclosed is a reduced size copy of the plan showing the proposed road improvements. Specifically, Central Street will be widened in the westbound direction to provide a dedicated right turn lane onto Lawrence Road while Lawrence Road will be widened to provide two egress lanes onto Central Street (a dedicated right turn lane and a combination straight/left turn lane) and a widened ingress lane from Central Street

On behalf of our client, Dr. Deepak Sharma, I would like to request to be placed on the June 8, 2010 Board of Selectmen agenda to present the project in person. If you have any questions, or need additional information, please don't hesitate to contact me by phone at 647-8700 ext. 214 or by email to djordan@sfceng.com. I thank you in advance for you consideration of this request.

Sincerely,
SFC ENGINEERING PARTNERSHIP, INC.

David R. Jordan, P.E., L.L.S., LEED AP
Principal

Cc: John Cashell, Town Planner
Dr. Deepak Sharma

Attachment "K"

SFC ENGINEERING PARTNERSHIP, INC.
"FROM VISION TO REALIZATION"

HUDSON
MAY - 4 2010
COMMUNITY DEVELOPMENT

66 Gold Ledge Avenue
Auburn, NH 03032
Phone: (603) 647-8700

Fax: (603) 647-8711

Letter of Transmittal

TO: Town of Hudson
12 School Street
Hudson, NH 03051

DATE: May 3, 2010 PROJECT: 479001
ATTN.: John Cashell
RE: Retail Site Plan, 1 Bockes Road, Hudson

We are sending you ☒ Attached ☐ Under separate cover via

The following items:

☐ Shop Drawings
☐ Specifications
☐ Samples

☐ Prints
☐ Plans
☐ Disks

☐ Copy of Letter
☐ Change Order
☒ Other: See Below

****

Copies	Date	No.	Description
1			Application for Driveway Permit

****

THESE ARE TRANSMITTED as checked below:

☐ For approval
☐ For your use
☐ As requested
☐ For review & comment
☐ Submit copies
☐ FOR BIDS DUE

☐ Approved as submitted
☐ Approved as corrected/noted
☐ Revise and resubmit
☐ Resubmit copies for approval
☐ Return corrected copies
☐ PRINTS RETURNED AFTER LOAN

REMARKS:
The enclosed application needs to be signed and dated by the Town. Please let me know when it has been signed and I will arrange to have it picked up.

Thank you.

SIGNED: _____
David R. Jordan, P.E.

COPY TO: File

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

Attachment "K"

Application For Driveway Permit

District Engineer
N.H. Dept. of Transportation
District 5, ~~P.O. Box 16476~~ 16 EAST POINT DR.
~~Hooksett~~, ~~N.H. 03106~~ BEDFORD, NH 03110

Pursuant to the provisions of Revised Statutes Annotated, Chapter 236, Section 13 (printed on reverse side of application) and amendments thereto, and Administrative Rule Tra 302, permission is requested to construct (alter) 1 driveway entrance(s) to my property on the NORTH side of Route 111 or CENTRAL ST. ~~Road~~ in the Town of HUDSON at a location which will meet the requirements for safety specified in said statutes.

The driveway(s) requested is for access to BUSINESS
Residence, Business, Subdivision, Other

Describe nature and size of industry, business or subdivision 12,800 SQUARE FOOT MULTI-TENANT RETAIL BUILDING

This parcel is shown on Tax Map 145 Lot Number 1

As the landowner (applicant), I agree to the following:

1. To construct driveway entrance(s) only for the bonafide purpose of securing access to private property such that the highway right-of-way is used for no purpose other than travel.
2. To construct driveway entrance(s) at permitted location(s).
3. To construct driveway entrance(s) in accordance with statutes, rules, standard drawings and permit specifications issued by New Hampshire Department of Transportation.
4. To defend, indemnify and hold harmless the New Hampshire Department of Transportation and its duly appointed agents and employees against any action for personal injury and/or property damage sustained by reason of the exercise of this permit.
5. To furnish and install drainage structures that are necessary to maintain existing highway drainage and adequately handle increased runoff resulting from development and obtain all easements thereto.

Kenneth Vasey, Chairman
Signature of Landowner (Applicant)

TOWN OF HUDSON
Printed Name of Landowner

6/08/2010
Date

12 SCHOOL STREET
Mailing Address

HUDSON, NH 03051
Town/City, State and Zip Code

886-6000
Telephone Number(s)

Contact Person/Agent, if not Landowner: DAVID R. JORDAN, SFC ENGINEERING PARTNERSHIP
647-8700

NOTE (1): Attach sketch or plan showing existing and proposed drive(s) and the adjacent highway indicating distance to town road, townline or other readily identifiable feature or landmark and also to the nearest utility pole (indicate pole number

NOTE (2): For new driveway(s) include, if applicable, subdivision history since July 1, 1971 of the tract from which the applicant's land was subdivided.

Attachment "K"

BOCKES ROAD

LAWRENCE ROAD

CENTRAL STREET (NH ROUTE 111)

SULLIVAN ROAD

PROPOSED ONE STORY
MULTI-TENANT
RETAIL BUILDING
64' X 200'
12,800 SF
SLAB = 201.00

SEE SITE PLANS BY OTHERS FOR PROPOSED SITE WORK

LIMIT OF WORK

MILL TO LIMITS SHOWN AND REPAVE LAWRENCE ROAD WITH 1 1/2" WEARING COURSE. RE-STRIPE AS SHOWN ON SHEET 4.

SAWCUT EXISTING PAVEMENT 1' FROM EXISTING EDGE

RE-LOCATE EXISTING STOP SIGN (SEE SHEET 4)

RE-LOCATE EXISTING GUY WIRE

RE-LOCATE EXISTING LIGHT POLE

PROP. EDGE OF PAVEMENT

EXISITNG EDGE OF PAVEMENT

NEW FULL-DEPTH PAVEMENT CONSTRUCTION (TYP)

RE-LOCATE "LIONS CLUB" SIGN

INSTALL NEW GUARDRAIL
50' EAGRT
UNIT
INSTALL 44'
NEW STEEL GUARDRAIL

SAWCUT EXISTING PAVEMENT 1' INSIDE EXISTING TRAVEL LANE

EXISTING STOP BAR AND LANE MARKINGS TO BE REMOVED

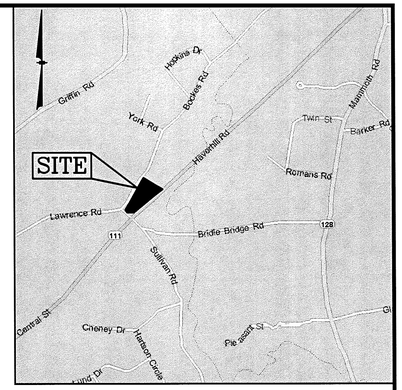
P.I.=236+03.86
Δ=7°07'RT.
D=1°-00'
T=356.30'
L=711.67'
R=5730.00'

PT=239+59.23 BACK
=240+99.44 AHEAD

EXISTING C.A.R.O.W.

R=827.80'
L=115.53'
DELTA=7°59'48"
317.93'
R=25.00'
L=33.37'
?=76°28'51"
N00°27'58"W
37.91'
105.00'
N78°27'24"W
(RECORD S75°03'00"E)
S72°19'24"E
R=5805.00'
L=313.27'
DELTA=3°05'31"
266.23'
N61°13'34"E
(RECORD N63°38'30"E)

LOCATION MAP
(NOT TO SCALE)



NOTES:

1) OWNER OF RECORD OF MAP 145 LOT 001:
DEEPAK SHARMA, M.D.
25 PELHAM ROAD, UNIT 103
SALEM, NH 03079
DEED REFERENCE TO PARCEL IS BK. 7267 PG. 1744
AREA OF PARCEL = 137,850 S.F.± OR 3.1646 ACRES±

2) 145-001 INDICATES TAX MAP AND LOT NUMBER.

3) THE PURPOSE OF THIS PLAN IS TO SHOW CERTAIN ROADWAY AND INTERSECTION IMPROVEMENTS ASSOCIATED WITH THE PROPOSED 12,800 SF RETAIL DEVELOPMENT AT 1 BOCKES ROAD.

4) LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OTHER THAN THOSE SHOWN MAY BE ENCOUNTERED. PRIOR TO ANY EXCAVATION ON SITE THE CONTRACTOR SHALL CONTACT DIG SAFE AT 1-888-344-7233.

5) ALL WORK WITHIN NH ROUTE 111 SHALL BE COMPLETED IN ACCORDANCE WITH THE NHDOT STANDARD SPECIFICATIONS (2010 EDITION), NHDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION (2010 EDITION). ALL WORK WITHIN LAWRENCE AND BOCKES ROADS SHALL CONFORM TO TOWN OF HUDSON REQUIREMENTS.

PLAN REFERENCES:

1) "TAX MAP 145 LOT 1, EXISTING CONDITION AND BOUNDARY PLAN, 1 BOCKES ROAD, HUDSON, NEW HAMPSHIRE, OWNED BY AND PREPARED FOR DEEPAK SHARMA", PREPARED BY: TFMORAIN, INC. DATED: DECEMBER 7, 2005 LASTED REVISED 8/6/08.

LEGEND

IRON PIN FOUND	UTILITY POLE
CONCRETE BOUND FOUND	DRAIN MANHOLE
DRILL HOLE FOUND	SEWER MANHOLE
OVERHEAD SERVICE WIRES	TELEPHONE MANHOLE
DOUBLE SOLID YELLOW LINE	CATCH BASIN
SINGLE SOLID WHITE LINE	WATER LINE
BROKEN WHITE LINE	UNDERGROUND TELEPHONE LINE
SIGN	CONTOUR ELEVATION
TREELINE	

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

DIG SAFE
UNDERGROUND FACILITY DAMAGE PREVENTION SYSTEM
DIG SAFE
MA-ME-NH-RI-VT
1-888-DIGSAFE
NY 1-800-962-7962
CT 1-800-922-4455

STATE OF NEW HAMPSHIRE
DAVID R. JORDAN
No. 7778
LICENSED PROFESSIONAL ENGINEER
1/28/11

NO.	DESCRIPTION	BY	DATE
1	REVISE PER NHDOT COMMENTS	DRJ	1/24/11

REVISIONS

INTERSECTION IMPROVEMENT- GENERAL PLAN

PROPOSED RETAIL BUILDING
NH ROUTE 111/LAWRENCE ROAD/BOCKES ROAD
HUDSON, NEW HAMPSHIRE

PREPARED FOR:
DEEPAK SHARMA
25 PELHAM ROAD, UNIT 103
SALEM, NH 03079

MHF Design Consultants, Inc.
44 Stiles Road, Suite One
Salem, New Hampshire 03079
(603) 893-0720
ENGINEERS • PLANNERS • SURVEYORS
www.mhfdesign.com

SCALE: 1"= 20'	DATE: NOVEMBER 18, 2010		DRAWING NO. 2812SP.DWG
DRAWN BY:	CHECKED BY:	PROJECT NO.	SHEET NO.
CCC	DRJ	281210	2 OF 6

F:\Projects\CAD\281210\2812SP.dwg SP 1/27/11 4:26pm ccc

BOCKES ROAD

LAWRENCE ROAD

CENTRAL STREET (NH ROUTE 111)

SULLIVAN ROAD

EXISTING C.A.R.O.W.

PROPOSED ONE STORY
MULTI-TENANT
RETAIL BUILDING
64' X 200'
12,800 SF
SLAB = 201.00

SEE SITE PLANS BY
OTHERS FOR PROPOSED
SITE WORK

STOP BAR

DSL (Y)

R=827.80'
L=115.53'
DELTA=7°58'48"

R=25.00'
L=33.37'
?=76°28'51"

317.93'

N30°27'56"W
37.19'

105.00'

N76°27'24"W

R=5805.00'
L=313.27'
DELTA=3°05'31"

266.23'

NOTE: CONTRACTOR SHALL MAINTAIN PROPER DRAINAGE WITHIN EXISTING DITCH LINE WHICH FALLS APPROXIMATELY ALONG LIMIT OF WORK.

INSTALL "DANDY BAG" OR "SILT SACK" OR OTHER EROSION CONTROL MEASURE TO PREVENT SILT FROM ENTERING EXISTING CATCH BASIN DURING CONSTRUCTION

LIMIT OF WORK (SLOPE LINE)

PROP. EDGE OF PAVEMENT

EXISTING EDGE OF PAVEMENT

EDGE OF BIT. CONC.

7'0"

9'6"

10'0"

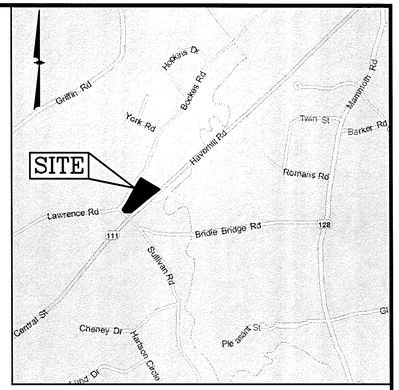
9'0"

234+50
235+00
235+48.86 ℄
= 10+14.72
236+00
237+00
238+00
239+00
239+50
240+00

PT=239+59.23 BACK
=240+94.44 AHEAD

4"SSL(W)
4"DSL(Y)
4"SSL(W)
18"RCP (LOCATION PER DESIGN PLAN)
15"RCP

BWL



LOCATION MAP
(NOT TO SCALE)

NOTES:

1) LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OTHER THAN THOSE SHOWN MAY BE ENCOUNTERED. PRIOR TO ANY EXCAVATION ON SITE THE CONTRACTOR SHALL CONTACT DIG SAFE AT 1-888-344-7233.
2) ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE NHDOT STANDARD SPECIFICATIONS (2010 EDITION), NHDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION (2010 EDITION) AND TOWN OF HUDSON REQUIREMENTS.
3) SEE GENERAL PLAN SHEET 2 FOR ADDITIONAL NOTES.
4) SEE CROSS SECTIONS SHEET 6 FOR ADDITIONAL GRADING AND UTILITY INFORMATION.

DIG SAFE
UTILITIES UNDER GROUND - PLANT DAMAGE PREVENTION SYSTEM
DIG SAFE
MA-ME-NH-RI-VT
1-888-DIGSAFE
NY 1-800-962-7962
CT 1-800-922-4455

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

LEGEND

○	IRON PIN FOUND	-○-	UTILITY POLE
□	CONCRETE BOUND FOUND	(D)	DRAIN MANHOLE
⊙	DRILL HOLE FOUND	(S)	SEWER MANHOLE
— · —	OVERHEAD SERVICE WIRES	(T)	TELEPHONE MANHOLE
DSL(Y)	DOUBLE SOLID YELLOW LINE	□	CATCH BASIN
SSL(W)	SINGLE SOLID WHITE LINE	— W —	WATER LINE
BWL	BROKEN WHITE LINE	— U/T —	UNDERGROUND TELEPHONE LINE
-o-	SIGN	190	CONTOUR ELEVATION
	TREELINE		

STATE OF NEW HAMPSHIRE
DAVID R. JORDAN
No. 7778
LICENSED
PROFESSIONAL ENGINEER
1/28/11

NO.	DESCRIPTION	BY	DATE
1	REVISE PER NHDOT COMMENTS	DRJ	1/24/11

REVISIONS

INTERSECTION IMPROVEMENT GRADING & UTILITY PLAN

PROPOSED RETAIL BUILDING
NH ROUTE 111/LAWRENCE ROAD/BOCKES ROAD
HUDSON, NEW HAMPSHIRE

PREPARED FOR:
DEEPAK SHARMA
25 PELHAM ROAD, UNIT 103
SALEM, NH 03079

MHF Design Consultants, Inc.
44 Stiles Road, Suite One
Salem, New Hampshire 03079
(603) 893-0720
ENGINEERS • PLANNERS • SURVEYORS
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SCALE: 1"= 20'	DATE: NOVEMBER 18, 2010		DRAWING NO. 2812SP.DWG
DRAWN BY:	CHECKED BY:	PROJECT NO.	SHEET NO.
CCC	DRJ	281210	3 OF 6

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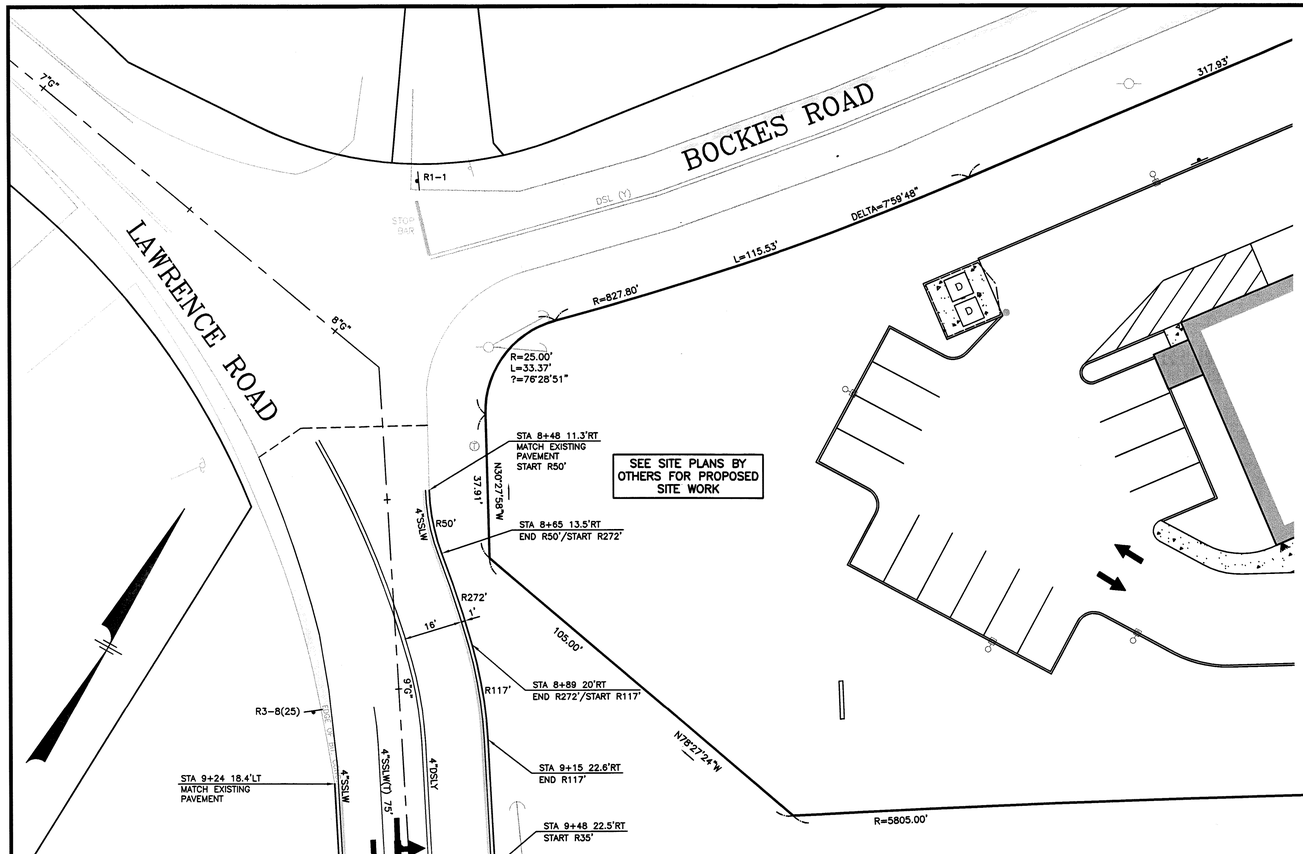
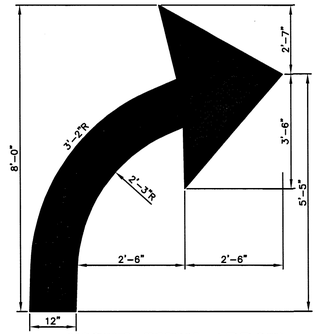
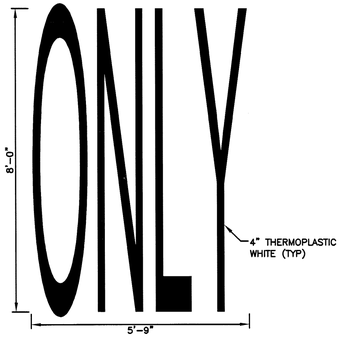
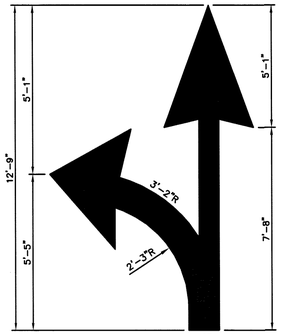




RIGHT TURN ARROW
NOT TO SCALE



ONLY SYMBOL
NOT TO SCALE



COMBINATION ARROW
NOT TO SCALE

SIGN KEY

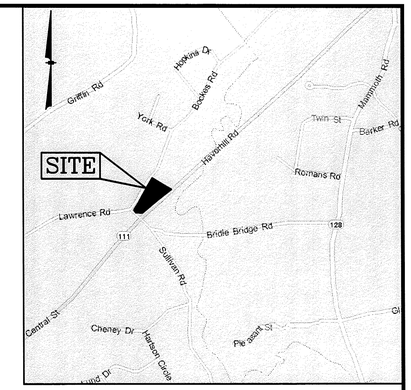
SIGN I.D. NUMBER	TEXT/COLOR	SIZE/REMARKS
R1-1	STOP R/W	30" x 30" NEW SIGN WITH POST
R3-8 (135)	ONLY ONLY B/W	30" x 48" NEW SIGN WITH POST
R3-8 (25)	ONLY ONLY B/W	30" x 36" NEW SIGN WITH POST

STRIPING LEGEND

SSL( ) SINGLE SOLID LINE (COLOR)

DSL( ) DOUBLE SOLID LINE (COLOR)

SBL( ) SINGLE BROKEN LINE (COLOR)



LOCATION MAP
(NOT TO SCALE)

NOTES:

1) LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OTHER THAN THOSE SHOWN MAY BE ENCOUNTERED. PRIOR TO ANY EXCAVATION ON SITE THE CONTRACTOR SHALL CONTACT DIG SAFE AT 1-888-344-7233.
2) ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE NHDOT STANDARD SPECIFICATIONS (2010 EDITION), NHDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION (2010 EDITION) AND TOWN OF HUDSON REQUIREMENTS.
3) SEE SHEET 2 FOR ADDITIONAL NOTES.
4) ALL PAVEMENT MARKINGS AND SIGNAGE SHALL CONFORM TO THE LATEST EDITION OF THE MUTCD AND THE NHDOT STANDARD PLANS FOR ROAD CONSTRUCTION (2010 EDITION).
5) WORDS AND SYMBOLS SHALL BE CENTERED LATERALLY WITHIN THE LANE. THE LONGITUDINAL DIMENSION SHALL BE PARALLEL TO THE LANE. MULTI-WORD MESSAGES SHALL READ "UP": THAT IS THE FIRST WORD SHALL BE NEAREST THE APPROACHING DRIVER.
6) LONGITUDINAL SPACING BETWEEN SUCCESSIVE WORDS AND/OR SYMBOLS IN TURN LANES SHOULD BE AT LEAST 4 TIMES THE HEIGHT OF THE LARGEST CHARACTER.
7) ALL WORDS, SYMBOLS, TRANSVERSE MARKINGS (STOP BARS, CROSSWALK LINES AND RAILROAD SYMBOLS), LANE LINES AND OTHER MARKINGS NOTES WITH A (T) SYMBOL SHALL BE THERMOPLASTIC.
8) PREFORMED WORDS AND SYMBOLS SHALL BE PRE-CUT BY THE MANUFACTURER.
9) LOCATION OF THE STOP LINE MAY VARY DUE TO INTERSECTION SIGHT DISTANCE AND VEHICLE TURNING RADIUS AND MAY NOT ALWAYS COINCIDE WITH THE LOCATION OF THE STOP SIGN.
10) THE CONTRACTOR SHALL CONTACT SUBRAMANIAN SHARMA AT NHDOT'S TRAFFIC BUREAU AT (603) 271-2291 ONE WEEK PRIOR TO PAVEMENT MARKINGS.

LEGEND

○	IRON PIN FOUND	-○-	UTILITY POLE
□	CONCRETE BOUND FOUND	Ⓓ	DRAIN MANHOLE
⊙	DRILL HOLE FOUND	Ⓢ	SEWER MANHOLE
— · · —	OVERHEAD SERVICE WIRES	Ⓣ	TELEPHONE MANHOLE
DSL(Y)	DOUBLE SOLID YELLOW LINE	□	CATCH BASIN
SSL(W)	SINGLE SOLID WHITE LINE	W	WATER LINE
BWL	BROKEN WHITE LINE	U/T	UNDERGROUND TELEPHONE LINE
-○-	SIGN	190	CONTOUR ELEVATION
	TREELINE		

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

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STATE OF NEW HAMPSHIRE
DAVID R. JORDAN No. 7778
LICENSED PROFESSIONAL ENGINEER
2/15/11

NO.	DESCRIPTION	BY	DATE
2	UPDATE PAVEMENT MARKINGS	DRJ	2/15/11
1	REVISE PER NHDOT COMMENTS	DRJ	1/24/11

REVISIONS

INTERSECTION IMPROVEMENT PAVEMENT LAYOUT, STRIPING & SIGNAGE

PROPOSED RETAIL BUILDING
NH ROUTE 111/LAWRENCE ROAD/BOCKES ROAD
HUDSON, NEW HAMPSHIRE

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