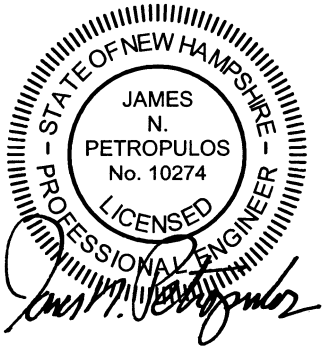
STORMWATER MANAGEMENT & EROSION CONTROL PLAN (SMECP)

Proposed Building Additions
Tax Map 209, Lot 4
22 Friars Drive
Hudson, New Hampshire

January 27, 2022
Revised March 8, 2022



Prepared for:
Integra Biosciences Corp.
2 Wentworth Drive
Hudson, NH 03051

Prepared by:
Hayner/Swanson, Inc.
3 Congress Street

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Plan Reference: Site Plan (15 Sheets) Map 209, Lot 4, Proposed Building Additions, 22 Friars Drive, Hudson, NH, prepared for/record owner: Integra Biosciences Corp., Hudson, NH, dated 27 January 2022 and prepared by Hayner/Swanson, Inc., Nashua, NH

I. INTRODUCTION

A. Abstract

The following report is a detailed stormwater study of the Proposed Building Additions project located at 22 Friars Drive in Hudson, NH. The purpose of the study is to analyze the qualitative and quantitative stormwater impacts of the proposed building expansions. The goal of the stormwater management system for this project is to comply with the stormwater management regulations set forth in the Town of Hudson Stormwater Management Regulations (Chapter 290) and the New Hampshire Department of Environmental Services (NHDES) Alteration of Terrain (AOT) Permit.

B. Existing Conditions

The project area under consideration for this application is located at 22 Friars Drive, Hudson, NH (see Figure 1). The site is known to the Hudson Assessors Department as Map 209, Lot 4. The parcel measures 5.61+/- acres and is located in the I - Industrial zoning district and within the Sagamore Industrial Park. The site is abutted by Friars Drive to the south, commercial properties to the west and across Friars Drive and undeveloped land to the west and east.

The lot currently contains a partial 2-story, 32,969 square foot office, manufacturing and warehouse building along with associated parking and loading areas. Access to the site is provided via a curb cut on Friars Drive. The site is currently serviced by municipal sewer and water, underground gas, telecommunications and electric utilities. There are no formal stormwater management practices located on the site. The existing parking lot on the east side of the building sheet flows in an easterly direction into a stone level spreader which then discharges into the adjacent wetlands. Additionally, there is an existing stormwater easement which contains a swale and a stormwater basin which was constructed along the westerly property line to accommodate runoff from Friars Drive.

NRCS soil mapping shows that this site contains mostly Windsor and Hinckley and a small amount of Pipestone sandy soils. The project's certified wetland scientist flagged the limit of wetlands associated with a perennial stream along the northern and eastern boundaries of the property. This stream originates east of the site, flows through the Sagamore Industrial Park, then flows under Friars Drive, and then in a northwestern direction into an existing pond adjacent to the subject property's northwest property line. The pond ultimately continues to flow in a westerly direction approximately a ¼-

mile and empties into the Merrimack River. No portion of the subject site is located within the 100-year Flood Hazard Area.

C. Proposed Development

Integra Biosciences, Corp. manufactures liquid handling and media preparation tools and equipment used in research, diagnostics and quality control laboratories. It is being proposed to construct several building additions to the existing building. First, a 1-story 34,340 square foot warehouse addition will be constructed on the northern portion of the building. Second, a 2-story 5,820 square foot manufacturing addition will be constructed on the westerly portion of the building. Third, second floor, totaling 7,617 square feet of manufacturing space will be constructed on a portion of the building which is only 1-story. Finally, a 400 square foot building addition will be constructed on the western side of the existing warehouse to provide an additional loading dock door. Associated site improvements include new parking and loading areas, site grading, two new curb cuts for improving access onto Friars Drive, and onsite drainage system with subsurface stormwater management systems, a new water utility extension, landscaping and site lighting. To the best of our knowledge the sewer, water, gas, telecommunication and electric utilities present in the adjacent roadways have adequate capacity to service this intended use.

Upon project completion, the site will contain approximately 42% open space, where 35% is the minimum required by zone. There are no wetland impacts, however, the proposed project does impact approximately 14,716 square feet of wetland buffer. The layout for the building addition and associated site improvements has been developed to minimize environmental issues. The site development associated with the overall construction of this project disturbs approximately 171,000 square feet of contiguous area and therefore a NHDES Alteration of Terrain permit is required. Construction is expected to begin in the spring of 2022 and will be completed in the fall of 2023.

II. STORM DRAINAGE ANALYSES

A. Intent

With regard to stormwater management, it is the intent of this design to address both qualitative and quantitative aspects of the runoff produced by the proposed improvements. The design shall address the requirements of the Town of Hudson Stormwater Management Regulations (Chapter 290) and NHDES AoT requirements by using, to the maximum extent possible, Low Impact Development (LID) strategies to promote recharge and reduce site disturbances. Furthermore, the design shall seek to

maintain existing drainage patterns, provide permanent methods for protecting water quality and minimize impacts to downstream drainage facilities.

It should be noted that the subject site was originally constructed in the 1990's. In 1997, two proposed additions to the building totaling 17,800 square feet were approved on the site but never constructed. Apart from ability to discharge water into an existing stormwater basin in an adjacent easement, the site does not contain provisions for handling stormwater other than to sheet flow in a northerly and easterly direction into the adjacent wetlands along the property line.

To meet these goals, the proposed project will include a combination of stormwater management practices that include leaching catch basins and subsurface infiltration basins. These measures are permanent methods for protecting water quality by providing pollutant removal through the use of vertical filtration through the native soils. Through settling, storage and recharge, infiltration practices can achieve high rates of removal for a number of urban pollutants (sediment, trace metals, hydrocarbons, BOD, nutrients, pesticides, etc.) and provide removal of total suspended solids, total nitrogen, and total phosphorous (New Hampshire Stormwater Manual). In addition to water quality benefits, the stormwater management area will provide flood control during large storm events by reducing the peak rates of runoff leaving this site.

B. Methodology

In accordance with the Town of Hudson and NHDES AoT requirements the 2-year, 10-year, 25-year and 50-year 24-hour storm events were evaluated. Evaluation of the quantitative runoff impacts of the proposed development were determined by comparing the post-development flows with the pre-development flows for this site.

Total drainage area calculations for pre-development conditions and post development conditions were evaluated and designed using the HydroCAD® version 10.1 stormwater modeling program for the Soil Conservation Service (SCS) type III storm distribution. Values for time of concentration used in the analysis were calculated using the methodology contained within U.S.D.A-S.C.S. publication Urban Hydrology for Small Watersheds Technical Release No. 55 (TR55).

The Rational Method of determining peak rates of runoff was used to size and design the individual drain lines for this project based upon the 25-year storm frequency. Stormwater Management Areas were designed in accordance with the methodology for the "best management practice" (BMP), as presented in the New Hampshire Department of Environmental Services New Hampshire Stormwater Manual.

C. Pre-Development Drainage Conditions

As can be seen on the Pre-Development Drainage Area Map, the existing site has two distinct drainage patterns. First, runoff from the north, east and south portions of the site (including building rooftops, parking, loading and open areas) flows in a northeasterly direction into the stream which makes up the easterly property boundary and flows into an existing pond just north of the site. The summation of runoff leaving the site, entering the stream and ultimately entering the pond north of the site will be analyzed in this study as **Point of Analysis East (POA E).**

Second, the western portion of the site flows in a westerly direction into the existing swale and stormwater basin adjacent to the property. The basin is currently dry and appears to be functioning properly. This practice outlets in a northwesterly direction and ultimately into a stream downstream of the existing pond. This stream flows in a westerly direction and discharges into the Merrimack River ¼ mile west of the site. The summation of runoff leaving the site and entering the existing basin will be analyzed in this study as **Point of Analysis West (POA W).** The pre-development drainage calculations are shown in Appendix A of this study and summarized in Table 1 below.

TABLE 1: SUMMARY OF PRE-DEVELOPMENT PEAK FLOWS

Location	Storm Frequency	Pre-Development Peak Flows (cfs)
POA E	2-year	2.52
	10-year	6.76
	25-year	10.61
	50-year	14.42
POA W	2-year	1.17
	10-year	3.16
	25-year	4.95
	50-year	6.73

D. Post-Development Drainage Conditions

Given that the intent of the overall stormwater management design to address both qualitative and quantitative aspects of runoff in accordance with the Town of Hudson and NHDES AoT regulations, several treatment practices are included in the overall drainage system. Due to the limited available room onsite and generally good soils, three subsurface infiltration systems are proposed.

First, runoff generated by a large portion the paved parking and loading areas and portions of both existing and proposed roof area will be collected by a system of roof drains and catch basins. This runoff is conveyed in a northerly direction into **Stormwater Management Area 'A' (SMA A).** SMA A is a large subsurface infiltration system consisting of several rows of Stormtech MC-3500 chambers in a bed of crushed stone. This subsurface practice is located under the proposed access road in the northern portion of the site. SMA A will contain an isolator row for pre-treatment, which will provide for the initial removal of grit and sediment from stormwater runoff. A piped overflow connection will be provided into the second chambered subsurface infiltration basin.

Stormwater Management Area 'B' (SMA B) is a also a Stormtech MC-3500 subsurface infiltration system with a pretreatment isolator row located under the proposed access road in the northern portion of the site. In addition to receiving overflow runoff from SMA A, SMA B receives additional runoff from a portion of roof and paved area. **SMA 'A' and SMA 'B' will function as a combined treatment/flood control facility and provides sufficient storage capacity to completely store and infiltrate up to and including the 25-year storm event.** A piped overflow connection to a new end wall discharging in the direction of the existing pond will be provided. Similar to the pre-development condition, the summation of runoff leaving the site and entering the pond to the north of the site will be analyzed in this study as **Point of Analysis East (POA E)**.

Finally, runoff generated by a portion of existing and proposed roof, sidewalk and open areas will be collected by roof drains and leaching catch basins and conveyed into a subsurface leaching trench. **Stormwater Management Area 'C' (SMA C)** is a subsurface infiltration system located under the open area adjacent to the proposed building addition on the west side of the existing building. Pretreatment is provided via sumps in the leaching catch basins. The system contains an 18-inch perforated HDPE pipe in a bed of crushed stone that will provide storage and recharge for contributing runoff. A piped overflow connection is provided into the existing catch basins which discharge into the riprap apron along the western property boundary.

Similar to the pre-development condition, the summation of runoff leaving the site and entering the existing stormwater basin in the easement adjacent to the site will be analyzed in this study as **Point of Analysis West (POA W)**.

The characteristics of the proposed stormwater management areas are shown below in Table 2. The post-development runoff computations are detailed in Appendix B.

TABLE 2: SUMMARY OF POST-DEVELOPMENT STORMWATER MANAGEMENT AREA CHARACTERISTICS

Location	Storm Frequency	Inflow (cfs)	Outflow (cfs)	Bottom of Practice Elevation	Top of Practice Elevation	Max. Water Elevation
SMA A	2-year	6.55	1.21	148.25	154.0	150.05
	10-year	10.43	3.18			151.26
	50-year	13.43	3.91			152.70
	100-year	16.20	3.60			153.90
SMA B	2-year	1.76	0.00	148.25	154.0	149.95
	10-year	4.55	0.00			151.26
	50-year	6.70	0.00			152.70
	100-year	7.25	2.25			153.60
SMA C	2-year	0.52	0.00	150.75	160.0	151.18
	10-year	1.20	0.00			153.17
	50-year	1.78	0.18			155.21
	100-year	2.34	1.29			155.60

A comparison of pre-development and post-development peak flows and volumes are summarized in Tables 3 and 4, respectfully below:

TABLE 3: COMPARISON OF PRE-DEVELOPMENT AND POST-DEVELOPMENT PEAK FLOWS

Location	Storm Frequency	Pre-Development Peak Flows (cfs)	Post-Development Peak Flows (cfs)	Δ
POA E	2-year	2.52	0.50	-2.02
	10-year	6.76	2.04	-4.72
	25-year	10.61	3.55	-7.06
	50-year	14.42	5.11	-9.31
POA W	2-year	1.17	1.04	-0.13
	10-year	3.16	2.14	-1.02
	25-year	4.95	3.09	-1.85
	50-year	6.73	4.52	-2.21

TABLE 4: COMPARISON OF PRE-DEVELOPMENT AND POST-DEVELOPMENT VOLUMES

Location	Storm Frequency	Pre-Development Runoff (cfs)	Post-Development Runoff (cfs)	Δ
POA E	2-year	0.23	0.06	-0.17
	10-year	0.54	0.18	-0.36
	25-year	0.83	0.29	-0.54
	50-year	1.12	0.49	-0.63
POA W	2-year	0.11	0.08	-0.03
	10-year	0.26	0.17	-0.09
	25-year	0.40	0.26	-0.14
	50-year	0.54	0.36	-0.18

E. Impervious Area Calculations

This proposed building addition results in a net increase in onsite impervious area of 0.295 acres. A summary of on-site impervious cover is provided below in table 5.

TABLE 5: COMPARISON OF PRE-DEVELOPMENT AND POST-DEVELOPMENT IMPERVIOUS AREAS

	Pre-Development	Post-Development	Δ
Total Impervious Area (Ac)	2.45	3.38	+0.93
Treated Impervious Area (Ac)	0.0	2.63	+2.63

In order to comply with the Town of Hudson Stormwater Management standards, this project will meet requirement 290-5B2(a) by implementing treatment measures for at least 30% of existing impervious and 50% of additional proposed impervious cover using filtration/infiltration practices. Using these guidelines, a minimum area of 1.20

acres of impervious cover would need to be treated. The proposed stormwater management features provide treatment for 2.63 acres of impervious cover; thus, meeting the requirement.

F. Results

1. The project uses Low Impact Development techniques to accommodate stormwater runoff created by the proposed building additions and associated site improvements.
2. The project provides permanent methods for protecting water quality through the use of treatment practices such as deep-sump catch basins and three subsurface infiltration systems that promote the recharge of runoff into native soils.
3. The proposed stormwater management systems provides sufficient recharge and storage volumes so that the post-development peak rates of runoff are less than the pre-development peak rates of runoff for the 2-, 10-, 25- and 50-year storm events to **POA West** and **POA East**.
4. The design complies with Chapter 290 of the Town of Hudson Stormwater Management standards with regard to treatment of impervious areas for redeveloped sites. Given that the project reduces peak rates and volumes leaving this site at both Points of Analysis, it is our opinion that there will be no adverse impact to the downstream drainage condition.

III. STORMWATER MANAGEMENT INFORMATION

A. Chapter 290 – Report/Plan Checklist:

Town of Hudson – Chapter 290 - Stormwater Management

Chapter 290-7A Report Checklist	
Item	**Applicant Comment**
1.Project Narrative	See SMECP report, Pages 1 & 2
2.Description of wetlands	See SMECP report, Page 1 & 2
3.Description of LID practices	See SMECP report, Page 5
4.Description of application buffers	See SMECP report, Page 1
5.Description of erosion control practices	See SMECP report, Page 9 & 10
6.Drainage Calculations	See SMECP report/Appendices A, B & C
7.Other studies	See SMECP Appendix E for Geotech Report
8.Stamped Report and Plans	See SMECP report and Plans
9.Inspection & Maintenance Manual	See SMECP Appendix E
10.BMP Maintenance Plan	See I & M Manual in SMECP Appendix E

Chapter 290-7B Plan Checklist	
Item	**Applicant Comment**
1.Locus Map	See Cover Sheet, Sheets 1 & 6 of 15
2.Parcel Map	See Sheet 1 of 15
3.Base Map Information	See Sheet 2 of 15 for Existing Conditions
4.Existing and Proposed Plan Information	See Sheet 1-4 of 15
5.Location of CRITICAL areas	See Sheets 1,2 & 4 of 15
6.Wetland Locations	See Sheets 1,2 & 4 of 15
7.Limits of Disturbance	See note 10 on Sheet 12 of 15
8.Proposed Erosion Control Measures	See Sheet 6 of 15
9.Proposed Construction Information	See Sheet 6 of 15
10.Sanitary Waste Locations	See Sheet 2 of 15
11.Construction Schedule/Phasing	18 Month Construction Project
12.100-Year Flood Boundaries	None
13.Soils Information	See SMECP Appendix E
14.Wetland Impact Areas	Buffer Impact on Sheets 1 & 4 of 15
15.Permanent BMP's	See Sheets 4, 5 and 11 of 15
16.Snow Storage Areas	See Sheet 4 of 15
17.Proposed Drainage Information	See Sheets 4 & 11 of 15
18.Test Pit and Infiltration rates	See SMECP report and Sheet 2 & 11 of 15
19.Location of Nearest Receiving Wetland	Stream makes up easterly property boundary
20.Downstream Drainage Capacity	See SMECP report, Page 7
21.Explanation of Downstream Impact	See SMECP report, Page 7

IV. EROSION CONTROL PROVISIONS

Temporary and permanent erosion control measures are proposed throughout the project, to ensure that the adjacent off-site areas and public roadways are protected from erosion and debris during and after construction of this project. A DRAFT copy of the prepared Stormwater Pollution Prevention Plan (SWPPP) for this project is also included as an Appendix to this report to provide additional information regarding erosion control measures during construction.

A. Temporary Erosion Control Measures

During the site construction phase of the project, specific erosion and sedimentation controls have been developed into the design of the project. Proposed locations and construction details of these devices are shown in greater detail on the attached site

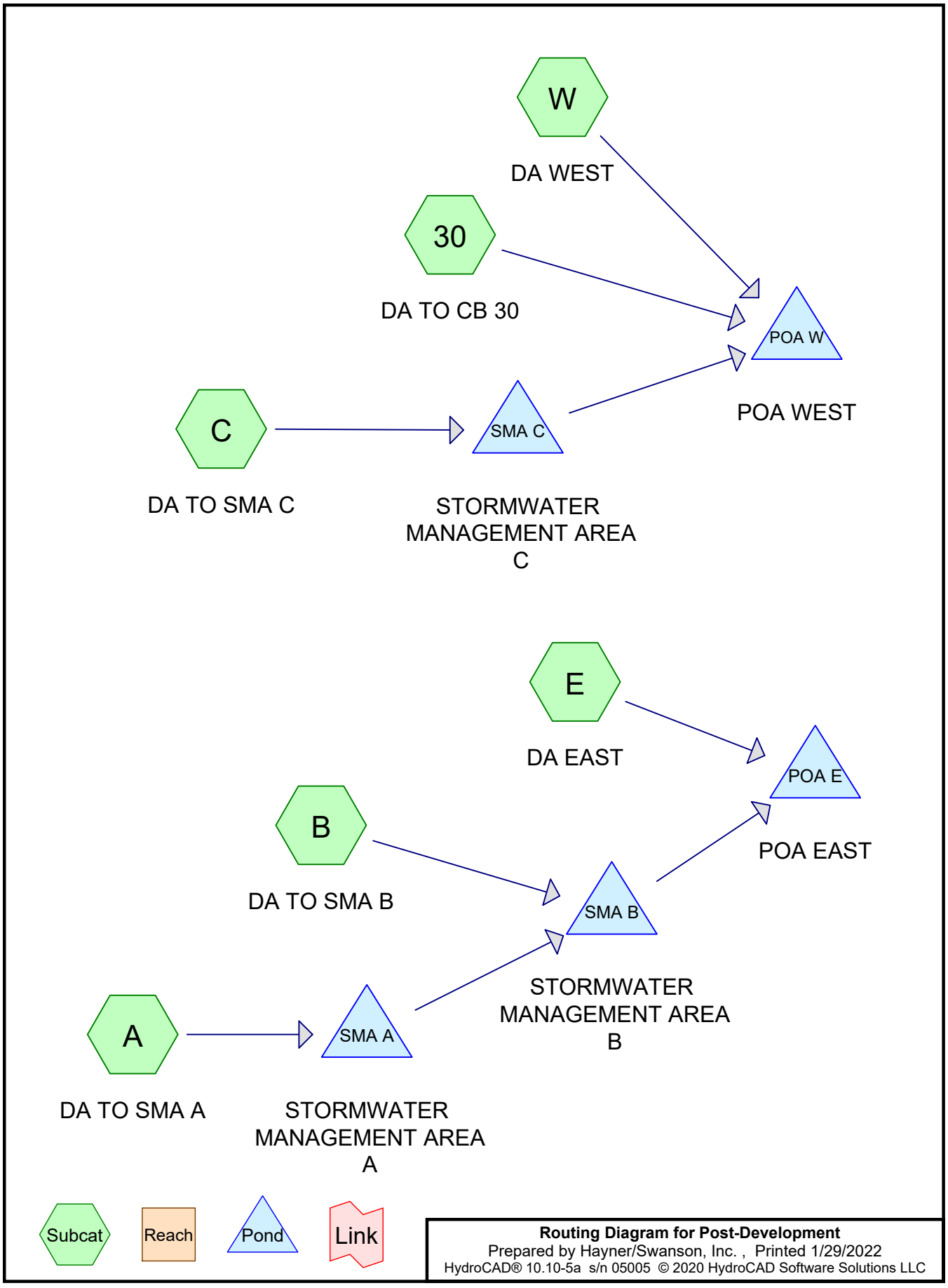
plans. Reference to the New Hampshire Stormwater Management Manual, Vol. 3, Construction Phase Erosion and Sediment Controls was made for the temporary erosion control devices such as silt socks, a gravel construction exit, and temporary seeding. The erosion control notes and construction sequence were developed to limit soil loss due to erosion and are therefore directed at minimizing the degradation of water quality on and off the site.

B. Permanent Erosion Control Measures

Permanent erosion control measures have been included in the design of the project to limit long-term erosion conditions. The proposed subsurface infiltration basins reduce peak rates of runoff which lessens he likelihood of downstream adverse impacts caused by erosion. Riprap aprons provide outlet protection at the new discharge headwall and where needed to reduce stormwater velocities to manageable levels. Loam and seed requirements have been specified to establish conditions that minimize erodible conditions. This is complemented by the minimization of stormwater flow lengths to keep runoff quantities and velocities as low as possible. These permanent measures, when completed and in place, provide treatment methods that will maintain long-term water quality in downstream waterways.

APPENDIX A

PRE-DEVELOPMENT DRAINAGE CALCULATIONS



Routing Diagram for Post-Development
Prepared by Hayner/Swanson, Inc. , Printed 1/29/2022

Project Notes

Rainfall events imported from "POST-DEVELOPMENT.hcp"

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-YR	Type III 24-hr		Default	24.00	1	5.65	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.965	39	>75% Grass cover, Good, HSG A (30, A, C, E, W)
0.132	74	>75% Grass cover, Good, HSG C (E)
1.803	98	Paved parking, HSG A (30, A, B, C, E, W)
0.102	98	Paved parking, HSG C (A, E)
1.470	98	Roofs, HSG A (30, A, B, C, W)
0.186	98	Water Surface, HSG A (E)
0.306	98	Water Surface, HSG C (E)
0.644	30	Woods, Good, HSG A (E, W)
0.217	70	Woods, Good, HSG C (E)
5.825	**79**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.068	HSG A	30, A, B, C, E, W
0.000	HSG B	
0.757	HSG C	A, E
0.000	HSG D	
0.000	Other	
5.825		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.965	0.000	0.132	0.000	0.000	1.097	>75% Grass cover, Good	30, A, C, E, W
1.803	0.000	0.102	0.000	0.000	1.905	Paved parking	30, A, B, C, E, W
1.470	0.000	0.000	0.000	0.000	1.470	Roofs	30, A, B, C, W
0.186	0.000	0.306	0.000	0.000	0.492	Water Surface	E
0.644	0.000	0.217	0.000	0.000	0.861	Woods, Good	E, W
5.068	**0.000**	**0.757**	**0.000**	**0.000**	**5.825**	**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)
1	SMA A	149.25	149.25	28.0	0.0000	0.012	0.0	12.0	0.0
2	SMA B	149.58	149.50	16.0	0.0050	0.012	0.0	12.0	0.0
3	SMA C	155.00	154.12	88.0	0.0100	0.012	0.0	12.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 30: DA TO CB 30 Runoff Area=19,912 sf 78.39% Impervious Runoff Depth=3.97"
Tc=0.0 min CN=85 Runoff=2.56 cfs 0.151 af

Subcatchment A: DA TO SMA A Runoff Area=2.055 ac 93.04% Impervious Runoff Depth=4.95"
Tc=0.0 min CN=94 Runoff=13.43 cfs 0.848 af

Subcatchment B: DA TO SMA B Runoff Area=20,100 sf 100.00% Impervious Runoff Depth=5.41"
Tc=0.0 min CN=98 Runoff=3.12 cfs 0.208 af

Subcatchment C: DA TO SMA C Runoff Area=18,104 sf 60.70% Impervious Runoff Depth=2.99"
Tc=0.0 min CN=75 Runoff=1.78 cfs 0.103 af

Subcatchment E: DA EAST Runoff Area=1.787 ac 33.46% Impervious Runoff Depth=1.94"
Flow Length=524' Tc=8.5 min CN=63 Runoff=3.55 cfs 0.288 af

Subcatchment W: DA WEST Runoff Area=28,255 sf 43.86% Impervious Runoff Depth=1.94"
Flow Length=122' Tc=9.3 min CN=63 Runoff=1.25 cfs 0.105 af

Pond POA E: POA EAST Inflow=3.55 cfs 0.288 af
Primary=3.55 cfs 0.288 af

Pond POA W: POA WEST Inflow=3.09 cfs 0.257 af
Primary=3.09 cfs 0.257 af

Pond SMA A: STORMWATER Peak Elev=152.70' Storage=11,570 cf Inflow=13.43 cfs 0.848 af
Discarded=0.68 cfs 0.685 af Primary=3.91 cfs 0.162 af Outflow=4.52 cfs 0.848 af

Pond SMA B: STORMWATER Peak Elev=152.70' Storage=7,022 cf Inflow=6.70 cfs 0.370 af
Discarded=0.43 cfs 0.370 af Primary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.370 af

Pond SMA C: STORMWATER Peak Elev=155.21' Storage=1,599 cf Inflow=1.78 cfs 0.103 af
Discarded=0.24 cfs 0.102 af Primary=0.18 cfs 0.001 af Outflow=0.42 cfs 0.103 af

Total Runoff Area = 5.825 ac Runoff Volume = 1.703 af Average Runoff Depth = 3.51"
33.62% Pervious = 1.958 ac 66.38% Impervious = 3.867 ac

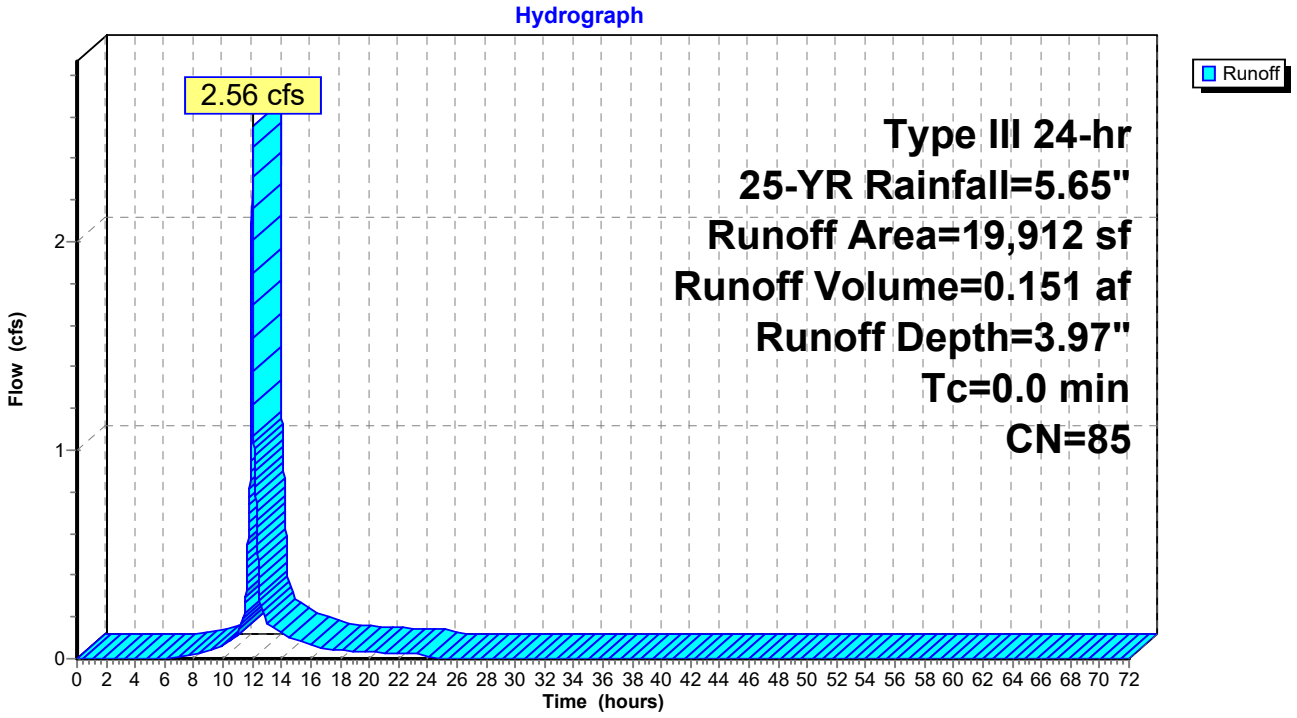
Summary for Subcatchment 30: DA TO CB 30

Runoff = 2.56 cfs @ 12.00 hrs, Volume= 0.151 af, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (sf)	CN	Description
9,559	98	Paved parking, HSG A
6,051	98	Roofs, HSG A
4,302	39	>75% Grass cover, Good, HSG A
19,912	85	Weighted Average
4,302		21.61% Pervious Area
15,610		78.39% Impervious Area

Subcatchment 30: DA TO CB 30



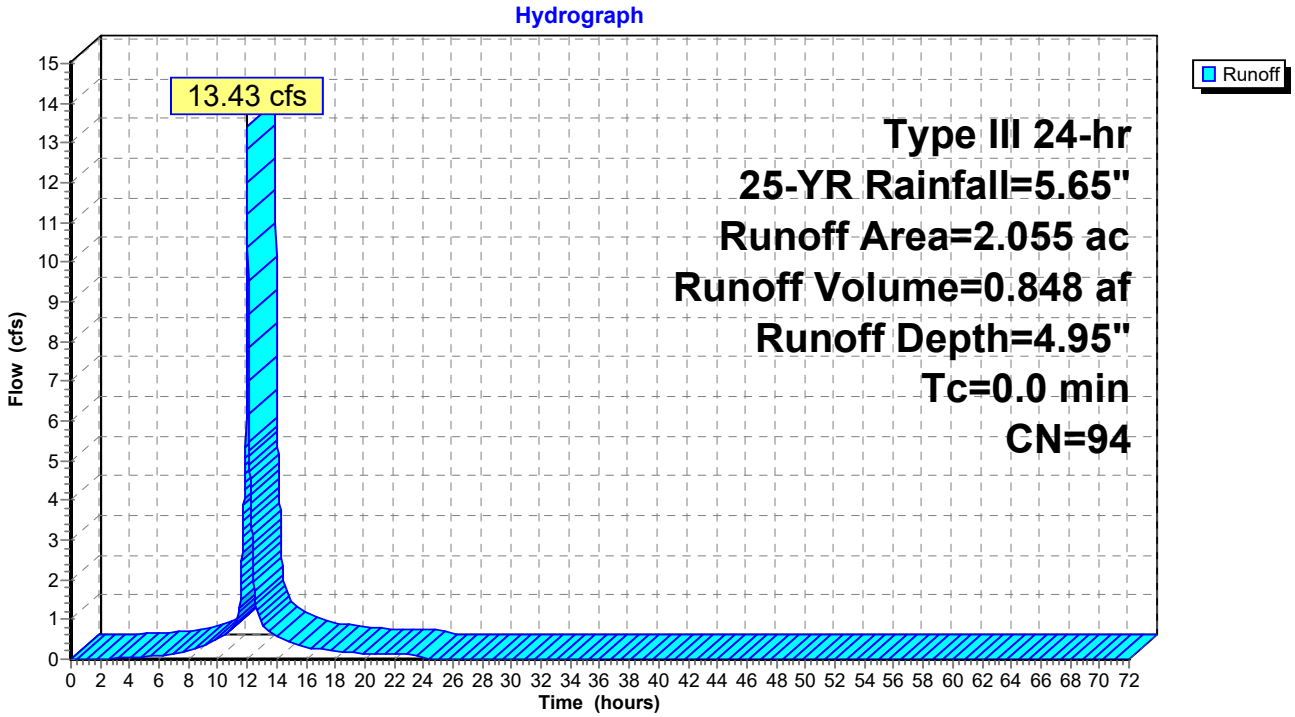
Summary for Subcatchment A: DA TO SMA A

Runoff = 13.43 cfs @ 12.00 hrs, Volume= 0.848 af, Depth= 4.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (ac)	CN	Description
0.985	98	Paved parking, HSG A
0.100	98	Paved parking, HSG C
0.827	98	Roofs, HSG A
0.143	39	>75% Grass cover, Good, HSG A
2.055	94	Weighted Average
0.143		6.96% Pervious Area
1.912		93.04% Impervious Area

Subcatchment A: DA TO SMA A



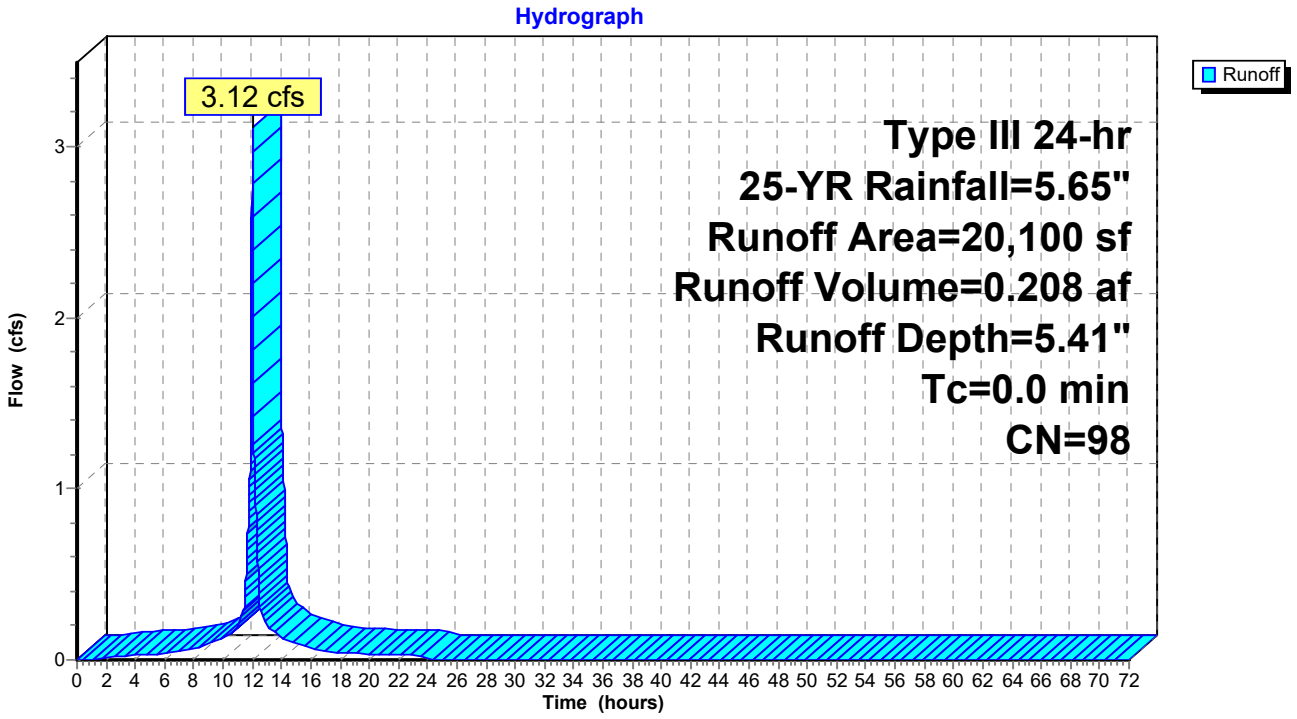
Summary for Subcatchment B: DA TO SMA B

Runoff = 3.12 cfs @ 12.00 hrs, Volume= 0.208 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (sf)	CN	Description
8,499	98	Paved parking, HSG A
11,601	98	Roofs, HSG A
20,100	98	Weighted Average
20,100		100.00% Impervious Area

Subcatchment B: DA TO SMA B



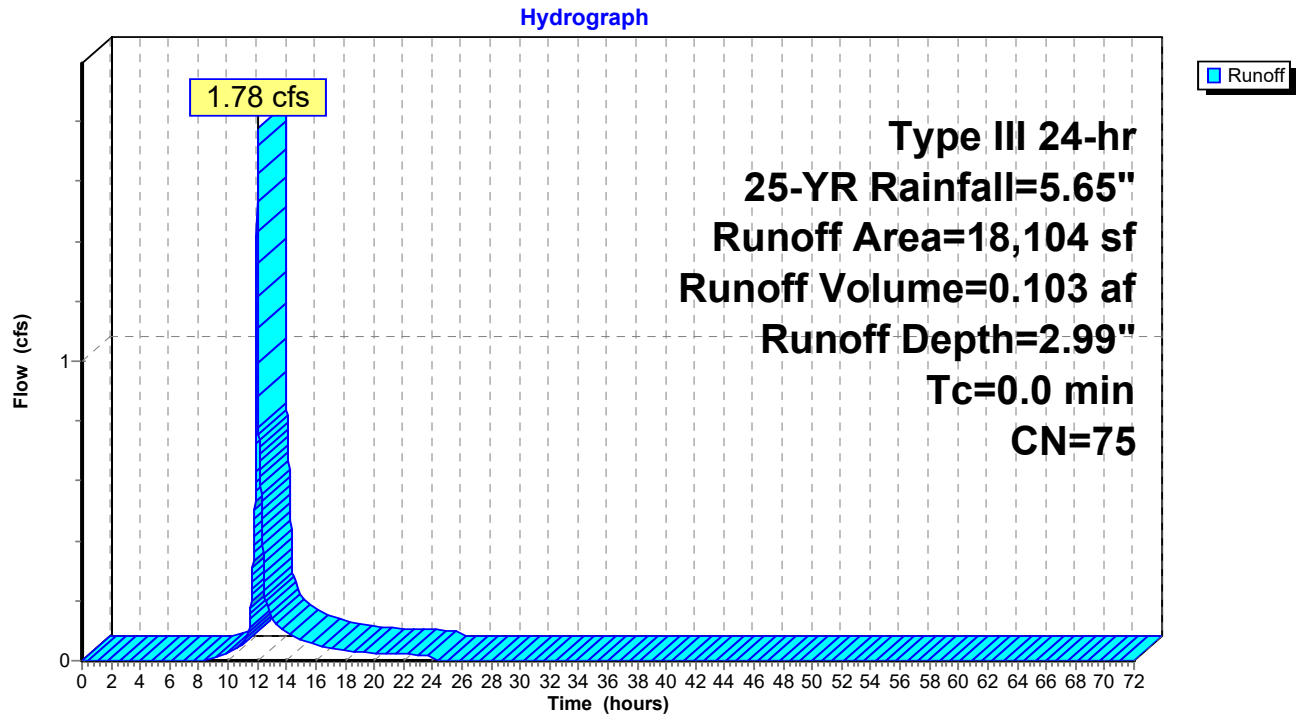
Summary for Subcatchment C: DA TO SMA C

Runoff = 1.78 cfs @ 12.00 hrs, Volume= 0.103 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (sf)	CN	Description
1,030	98	Paved parking, HSG A
9,960	98	Roofs, HSG A
7,114	39	>75% Grass cover, Good, HSG A
18,104	75	Weighted Average
7,114		39.30% Pervious Area
10,990		60.70% Impervious Area

Subcatchment C: DA TO SMA C



Summary for Subcatchment E: DA EAST

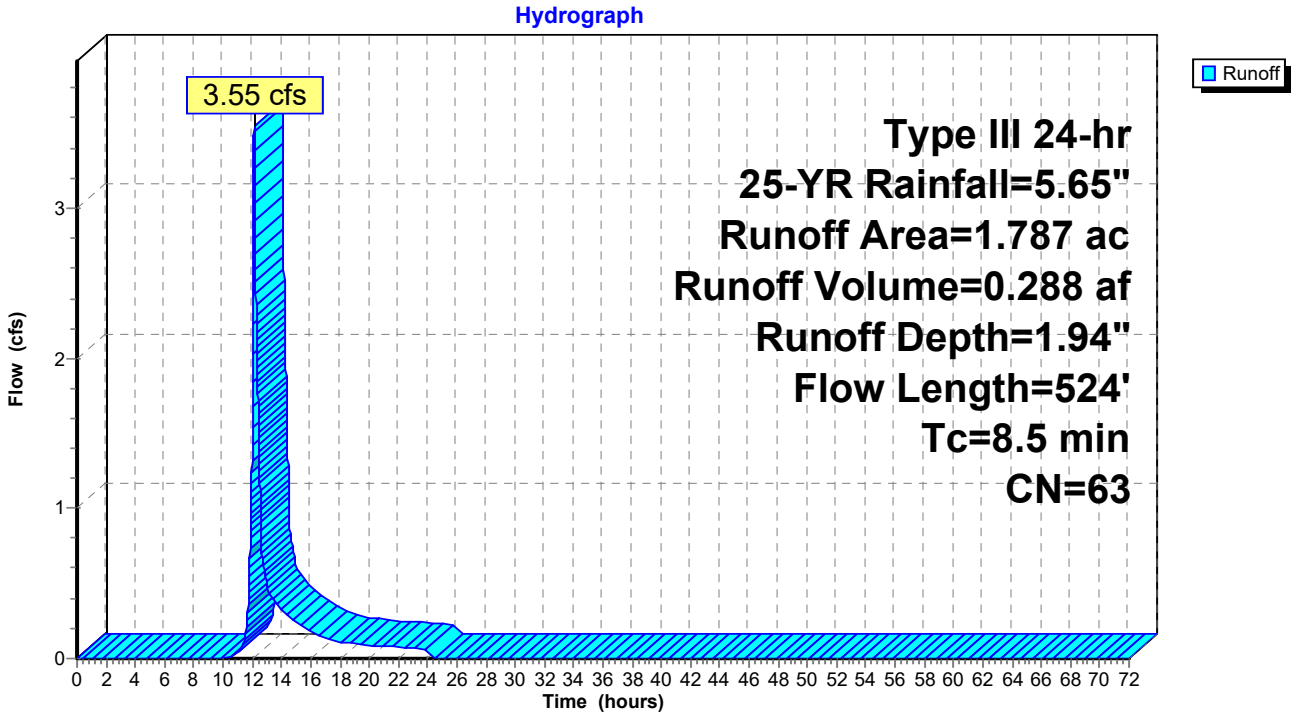
Runoff = 3.55 cfs @ 12.13 hrs, Volume= 0.288 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (ac)	CN	Description
0.186	98	Water Surface, HSG A
0.104	98	Paved parking, HSG A
0.511	30	Woods, Good, HSG A
0.329	39	>75% Grass cover, Good, HSG A
0.132	74	>75% Grass cover, Good, HSG C
0.306	98	Water Surface, HSG C
0.002	98	Paved parking, HSG C
0.217	70	Woods, Good, HSG C
1.787	63	Weighted Average
1.189		66.54% Pervious Area
0.598		33.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	46	0.0380	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.96"
2.1	412	0.0260	3.27		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	66	0.9700	4.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	524	Total			

Subcatchment E: DA EAST



Summary for Subcatchment W: DA WEST

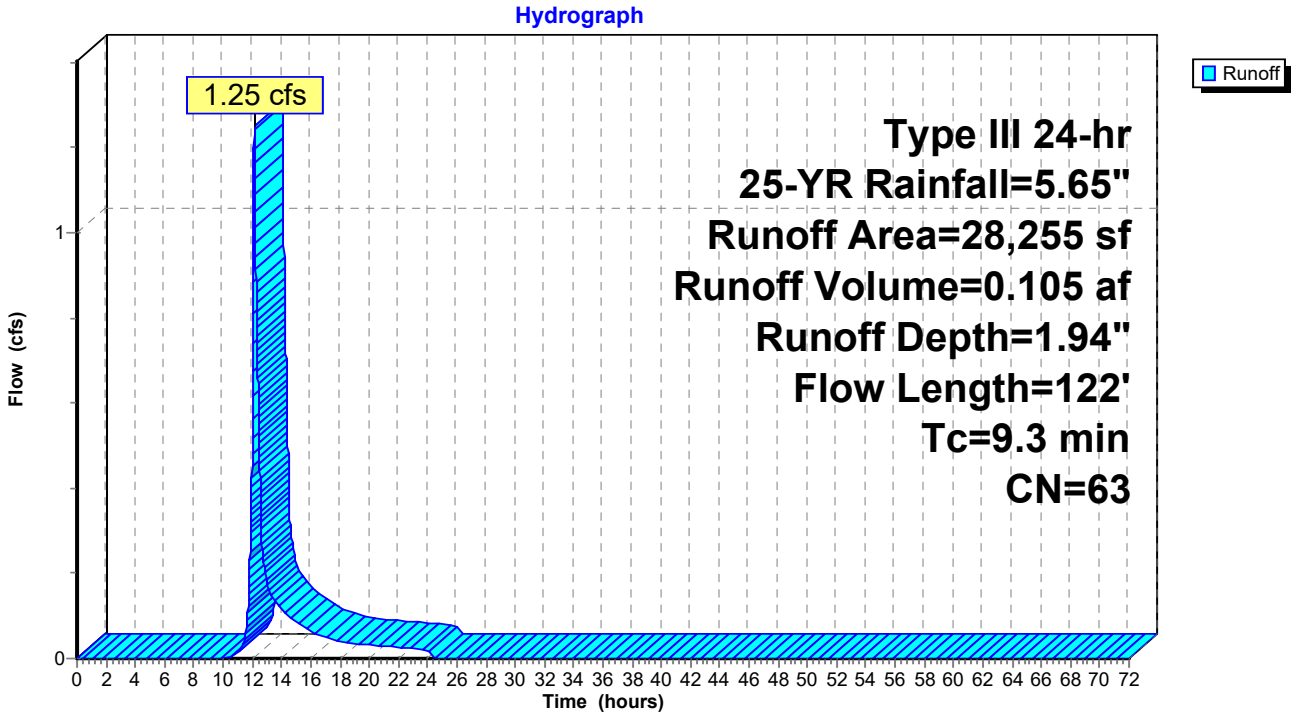
Runoff = 1.25 cfs @ 12.14 hrs, Volume= 0.105 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (sf)	CN	Description
11,993	98	Paved parking, HSG A
5,804	30	Woods, Good, HSG A
10,058	39	>75% Grass cover, Good, HSG A
400	98	Roofs, HSG A
28,255	63	Weighted Average
15,862		56.14% Pervious Area
12,393		43.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0180	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.96"
0.2	30	0.1330	2.55		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0190	2.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.2900	2.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.3	122	Total			

Subcatchment W: DA WEST

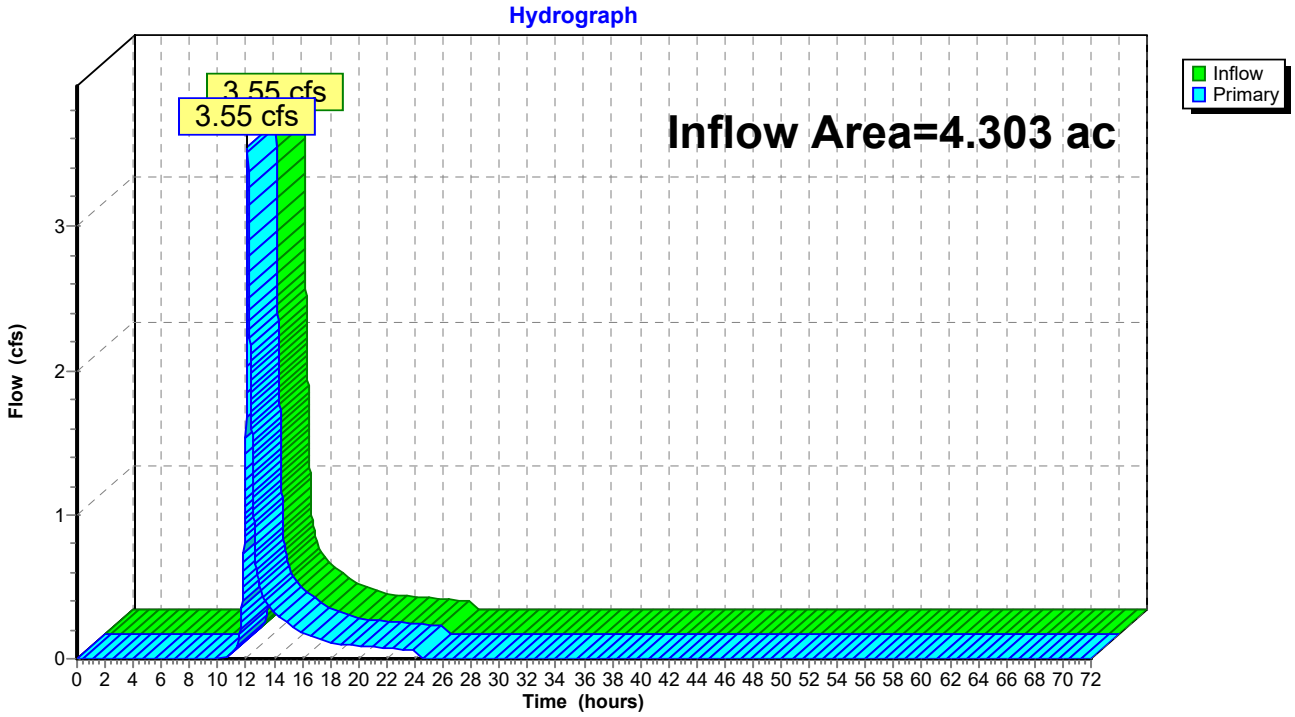


Summary for Pond POA E: POA EAST

Inflow Area = 4.303 ac, 69.05% Impervious, Inflow Depth = 0.80" for 25-YR event
Inflow = 3.55 cfs @ 12.13 hrs, Volume= 0.288 af
Primary = 3.55 cfs @ 12.13 hrs, Volume= 0.288 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Pond POA E: POA EAST

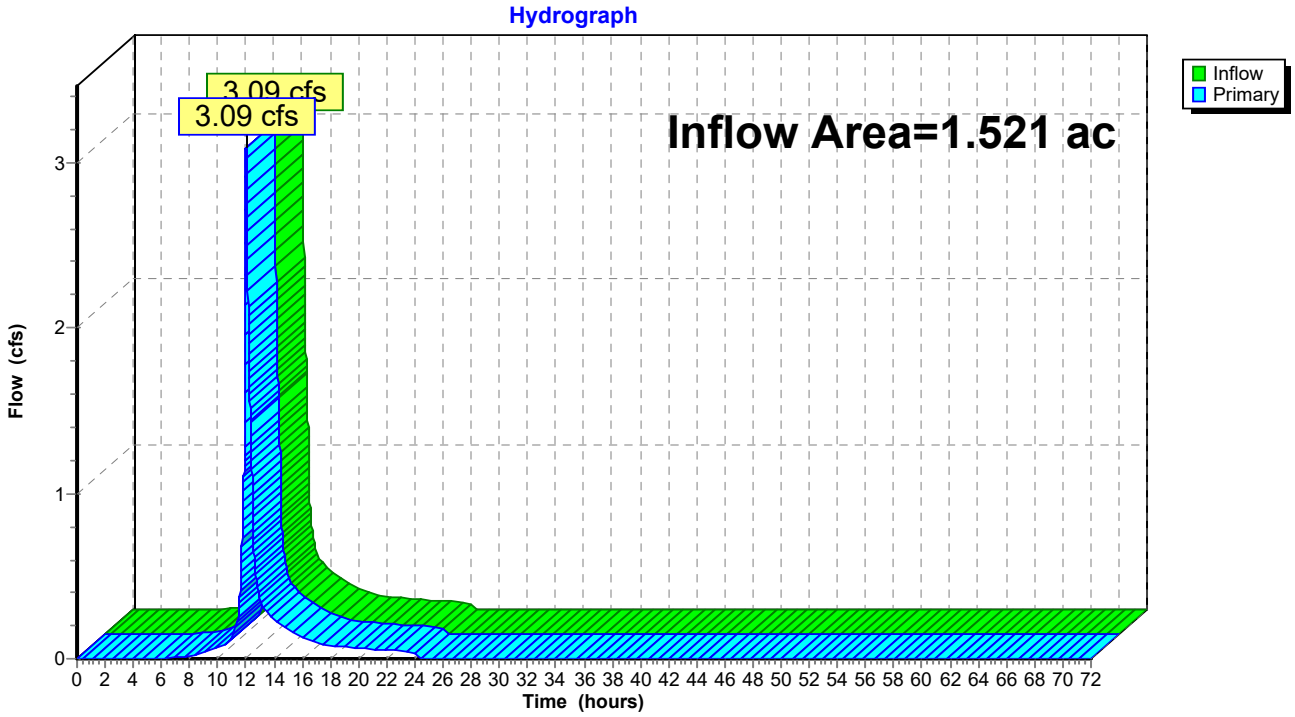


Summary for Pond POA W: POA WEST

Inflow Area = 1.521 ac, 58.84% Impervious, Inflow Depth = 2.03" for 25-YR event
Inflow = 3.09 cfs @ 12.00 hrs, Volume= 0.257 af
Primary = 3.09 cfs @ 12.00 hrs, Volume= 0.257 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Pond POA W: POA WEST



Summary for Pond SMA A: STORMWATER MANAGEMENT AREA A

Inflow Area = 2.055 ac, 93.04% Impervious, Inflow Depth = 4.95" for 25-YR event
Inflow = 13.43 cfs @ 12.00 hrs, Volume= 0.848 af
Outflow = 4.52 cfs @ 12.02 hrs, Volume= 0.848 af, Atten= 66%, Lag= 1.4 min
Discarded = 0.68 cfs @ 12.94 hrs, Volume= 0.685 af
Primary = 3.91 cfs @ 12.02 hrs, Volume= 0.162 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 152.70' @ 12.94 hrs Surf.Area= 4,106 sf Storage= 11,570 cf

Plug-Flow detention time= 112.6 min calculated for 0.848 af (100% of inflow)
Center-of-Mass det. time= 112.6 min (877.1 - 764.5)

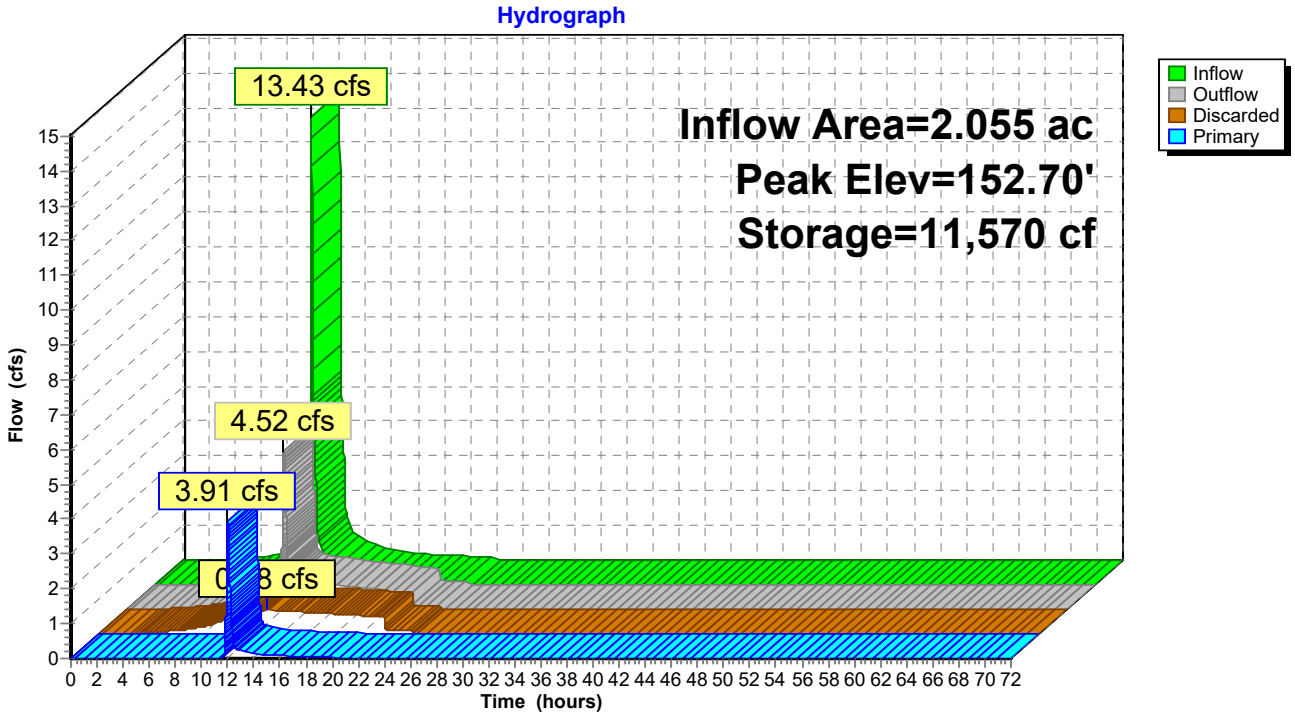
Volume	Invert	Avail.Storage	Storage Description
#1	148.25'	6,600 cf	**23.00'W x 178.50'L x 5.75'H Prismatoid** 23,607 cf Overall - 7,106 cf Embedded = 16,501 cf x 40.0% Voids
#2	149.00'	2,728 cf	**ADS_StormTech MC-3500 d +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 24 Chambers in 3 Rows Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf
#3	149.00'	4,378 cf	**ADS_StormTech MC-3500 d +Cap** x 39 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 39 Chambers in 3 Rows Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf
		13,706 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	148.25'	**5.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	149.25'	**12.0" Round Culvert** L= 28.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 149.25' / 149.25' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.68 cfs @ 12.94 hrs HW=152.70' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.68 cfs)

Primary OutFlow Max=3.65 cfs @ 12.02 hrs HW=151.16' TW=150.22' (Dynamic Tailwater)
2=Culvert (Inlet Controls 3.65 cfs @ 4.65 fps)

Pond SMA A: STORMWATER MANAGEMENT AREA A



Summary for Pond SMA B: STORMWATER MANAGEMENT AREA B

Inflow Area = 2.516 ac, 94.32% Impervious, Inflow Depth = 1.77" for 25-YR event
Inflow = 6.70 cfs @ 12.01 hrs, Volume= 0.370 af
Outflow = 0.43 cfs @ 12.93 hrs, Volume= 0.370 af, Atten= 94%, Lag= 55.0 min
Discarded = 0.43 cfs @ 12.93 hrs, Volume= 0.370 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 152.70' @ 12.93 hrs Surf.Area= 2,553 sf Storage= 7,022 cf

Plug-Flow detention time= 149.8 min calculated for 0.370 af (100% of inflow)
Center-of-Mass det. time= 149.8 min (913.7 - 763.9)

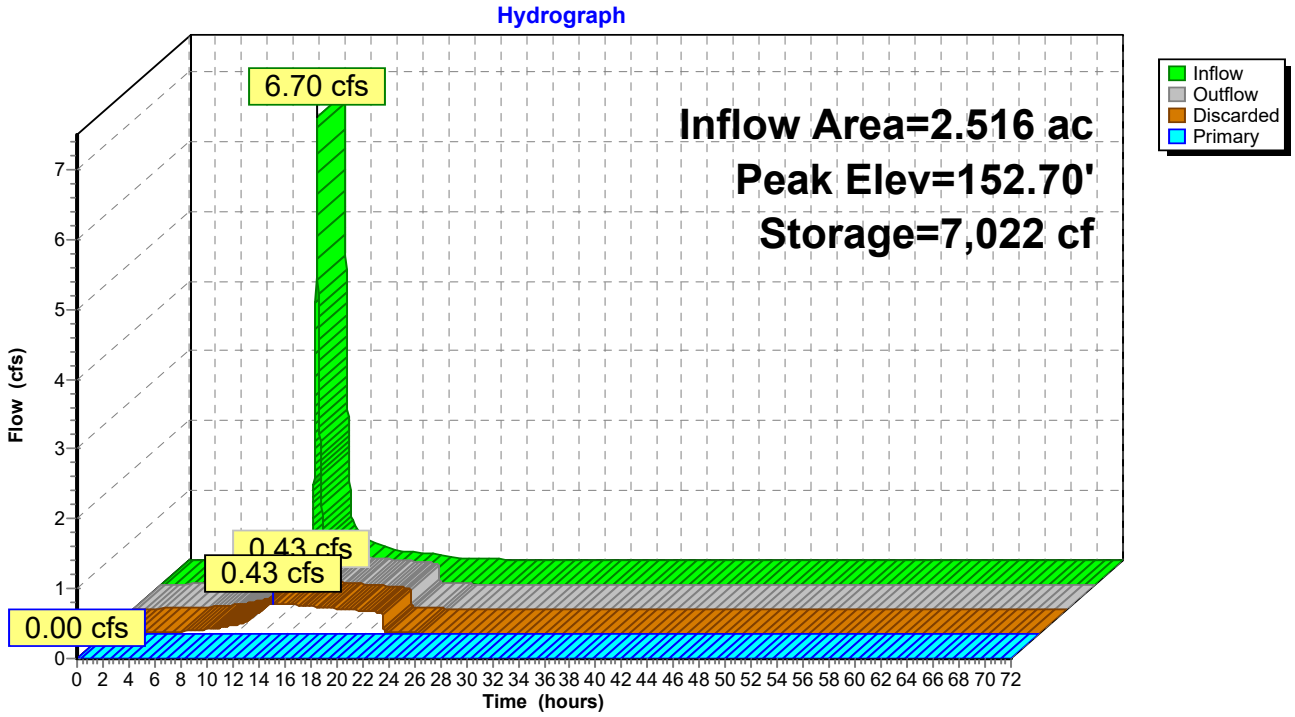
Volume	Invert	Avail.Storage	Storage Description
#1	148.25'	4,217 cf	**23.00'W x 111.00'L x 5.75'H Prismatoid** 14,680 cf Overall - 4,137 cf Embedded = 10,543 cf x 40.0% Voids
#2	149.00'	1,739 cf	**ADS_StormTech MC-3500 d +Cap** x 15 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 15 Chambers in 3 Rows Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf
#3	149.00'	2,398 cf	**ADS_StormTech MC-3500 d +Cap** x 21 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 21 Chambers in 3 Rows Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf
		8,354 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	148.25'	**5.000 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Device 3	149.58'	**12.0" Round Culvert** L= 16.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 149.58' / 149.50' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Primary	153.25'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.43 cfs @ 12.93 hrs HW=152.70' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=148.25' TW=0.00' (Dynamic Tailwater)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**2=Culvert** (Controls 0.00 cfs)

Pond SMA B: STORMWATER MANAGEMENT AREA B



Summary for Pond SMA C: STORMWATER MANAGEMENT AREA C

Inflow Area = 0.416 ac, 60.70% Impervious, Inflow Depth = 2.99" for 25-YR event
Inflow = 1.78 cfs @ 12.00 hrs, Volume= 0.103 af
Outflow = 0.42 cfs @ 12.36 hrs, Volume= 0.103 af, Atten= 76%, Lag= 21.6 min
Discarded = 0.24 cfs @ 12.36 hrs, Volume= 0.102 af
Primary = 0.18 cfs @ 12.36 hrs, Volume= 0.001 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 155.21' @ 12.36 hrs Surf.Area= 713 sf Storage= 1,599 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 76.3 min (899.9 - 823.6)

Volume	Invert	Avail.Storage	Storage Description
#1	150.75'	178 cf	**18.0" Round Pipe Storage** Inside #2 L= 101.0'
#2	150.50'	929 cf	**5.50'W x 101.00'L x 4.50'H Prismatoid** 2,500 cf Overall - 178 cf Embedded = 2,321 cf x 40.0% Voids
#3	149.50'	75 cf	**4.00'D x 6.00'H LCB 36** Inside #4 103 cf Overall - 4.0" Wall Thickness = 75 cf
#4	148.50'	179 cf	**10.00'D x 7.00'H LCB 36 STONE** 550 cf Overall - 103 cf Embedded = 447 cf x 40.0% Voids
#5	149.50'	63 cf	**4.00'D x 5.00'H LCB 34** Inside #6
#6	148.50'	195 cf	**10.00'D x 7.00'H LCB 34 STONE** 550 cf Overall - 63 cf Embedded = 487 cf x 40.0% Voids
#7	159.50'	203 cf	**Custom Stage Data (Conic)** Listed below (Recalc)
		1,822 cf	Total Available Storage

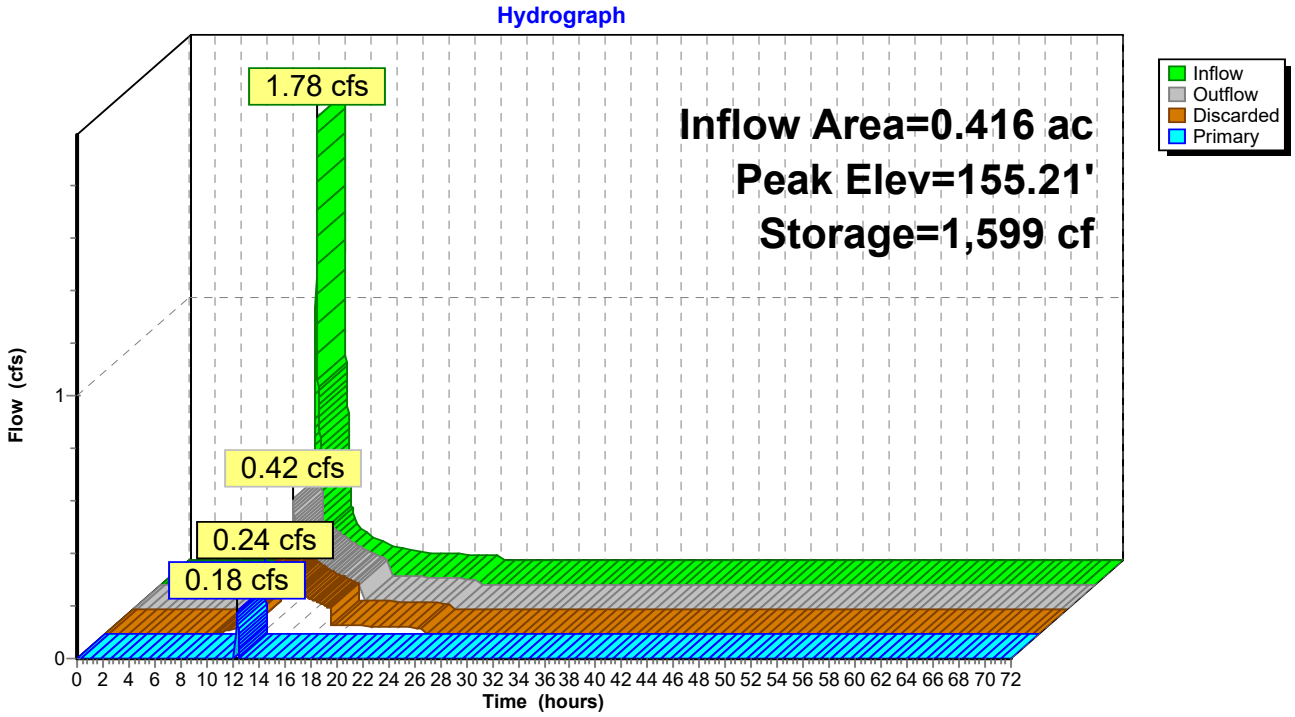
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
159.50	100	0	0	100
160.00	832	203	203	833

Device	Routing	Invert	Outlet Devices
#1	Discarded	148.50'	**5.000 in/hr Exfiltration over Wetted area**
#2	Primary	155.00'	**12.0" Round Culvert** L= 88.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 155.00' / 154.12' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.24 cfs @ 12.36 hrs HW=155.21' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.18 cfs @ 12.36 hrs HW=155.21' TW=0.00' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 0.18 cfs @ 1.54 fps)

Pond SMA C: STORMWATER MANAGEMENT AREA C



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 30: DA TO CB 30 Runoff Area=19,912 sf 78.39% Impervious Runoff Depth=1.55"
Tc=0.0 min CN=85 Runoff=1.02 cfs 0.059 af

Subcatchment A: DA TO SMA A Runoff Area=2.055 ac 93.04% Impervious Runoff Depth=2.31"
Tc=0.0 min CN=94 Runoff=6.55 cfs 0.396 af

Subcatchment B: DA TO SMA B Runoff Area=20,100 sf 100.00% Impervious Runoff Depth=2.73"
Tc=0.0 min CN=98 Runoff=1.61 cfs 0.105 af

Subcatchment C: DA TO SMA C Runoff Area=18,104 sf 60.70% Impervious Runoff Depth=0.93"
Tc=0.0 min CN=75 Runoff=0.52 cfs 0.032 af

Subcatchment E: DA EAST Runoff Area=1.787 ac 33.46% Impervious Runoff Depth=0.42"
Flow Length=524' Tc=8.5 min CN=63 Runoff=0.50 cfs 0.062 af

Subcatchment W: DA WEST Runoff Area=28,255 sf 43.86% Impervious Runoff Depth=0.42"
Flow Length=122' Tc=9.3 min CN=63 Runoff=0.18 cfs 0.022 af

Pond POA E: POA EAST Inflow=0.50 cfs 0.062 af
Primary=0.50 cfs 0.062 af

Pond POA W: POA WEST Inflow=1.04 cfs 0.082 af
Primary=1.04 cfs 0.082 af

Pond SMA A: STORMWATER Peak Elev=150.05' Storage=4,604 cf Inflow=6.55 cfs 0.396 af
Discarded=0.56 cfs 0.341 af Primary=1.21 cfs 0.055 af Outflow=1.77 cfs 0.396 af

Pond SMA B: STORMWATER Peak Elev=149.95' Storage=2,611 cf Inflow=1.76 cfs 0.160 af
Discarded=0.35 cfs 0.160 af Primary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.160 af

Pond SMA C: STORMWATER MANAGEMENT Peak Elev=151.18' Storage=367 cf Inflow=0.52 cfs 0.032 af
Discarded=0.12 cfs 0.032 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.032 af

Total Runoff Area = 5.825 ac Runoff Volume = 0.677 af Average Runoff Depth = 1.39"
33.62% Pervious = 1.958 ac 66.38% Impervious = 3.867 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 30: DA TO CB 30 Runoff Area=19,912 sf 78.39% Impervious Runoff Depth=2.88"
Tc=0.0 min CN=85 Runoff=1.88 cfs 0.110 af

Subcatchment A: DA TO SMA A Runoff Area=2.055 ac 93.04% Impervious Runoff Depth=3.79"
Tc=0.0 min CN=94 Runoff=10.43 cfs 0.648 af

Subcatchment B: DA TO SMA B Runoff Area=20,100 sf 100.00% Impervious Runoff Depth=4.23"
Tc=0.0 min CN=98 Runoff=2.46 cfs 0.163 af

Subcatchment C: DA TO SMA C Runoff Area=18,104 sf 60.70% Impervious Runoff Depth=2.03"
Tc=0.0 min CN=75 Runoff=1.20 cfs 0.070 af

Subcatchment E: DA EAST Runoff Area=1.787 ac 33.46% Impervious Runoff Depth=1.18"
Flow Length=524' Tc=8.5 min CN=63 Runoff=2.04 cfs 0.176 af

Subcatchment W: DA WEST Runoff Area=28,255 sf 43.86% Impervious Runoff Depth=1.18"
Flow Length=122' Tc=9.3 min CN=63 Runoff=0.72 cfs 0.064 af

Pond POA E: POA EAST Inflow=2.04 cfs 0.176 af
Primary=2.04 cfs 0.176 af

Pond POA W: POA WEST Inflow=2.14 cfs 0.174 af
Primary=2.14 cfs 0.174 af

Pond SMA A: STORMWATER Peak Elev=151.26' Storage=8,226 cf Inflow=10.43 cfs 0.648 af
Discarded=0.62 cfs 0.534 af Primary=3.18 cfs 0.114 af Outflow=3.78 cfs 0.648 af

Pond SMA B: STORMWATER Peak Elev=151.26' Storage=4,981 cf Inflow=4.55 cfs 0.277 af
Discarded=0.39 cfs 0.277 af Primary=0.00 cfs 0.000 af Outflow=0.39 cfs 0.277 af

Pond SMA C: STORMWATER Peak Elev=153.17' Storage=1,044 cf Inflow=1.20 cfs 0.070 af
Discarded=0.18 cfs 0.070 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.070 af

Total Runoff Area = 5.825 ac Runoff Volume = 1.232 af Average Runoff Depth = 2.54"
33.62% Pervious = 1.958 ac 66.38% Impervious = 3.867 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 30: DA TO CB 30 Runoff Area=19,912 sf 78.39% Impervious Runoff Depth=5.01"
Tc=0.0 min CN=85 Runoff=3.20 cfs 0.191 af

Subcatchment A: DA TO SMA A Runoff Area=2.055 ac 93.04% Impervious Runoff Depth=6.04"
Tc=0.0 min CN=94 Runoff=16.20 cfs 1.034 af

Subcatchment B: DA TO SMA B Runoff Area=20,100 sf 100.00% Impervious Runoff Depth=6.51"
Tc=0.0 min CN=98 Runoff=3.73 cfs 0.250 af

Subcatchment C: DA TO SMA C Runoff Area=18,104 sf 60.70% Impervious Runoff Depth=3.93"
Tc=0.0 min CN=75 Runoff=2.34 cfs 0.136 af

Subcatchment E: DA EAST Runoff Area=1.787 ac 33.46% Impervious Runoff Depth=2.72"
Flow Length=524' Tc=8.5 min CN=63 Runoff=5.11 cfs 0.404 af

Subcatchment W: DA WEST Runoff Area=28,255 sf 43.86% Impervious Runoff Depth=2.72"
Flow Length=122' Tc=9.3 min CN=63 Runoff=1.81 cfs 0.147 af

Pond POA E: POA EAST Inflow=5.11 cfs 0.491 af
Primary=5.11 cfs 0.491 af

Pond POA W: POA WEST Inflow=4.52 cfs 0.355 af
Primary=4.52 cfs 0.355 af

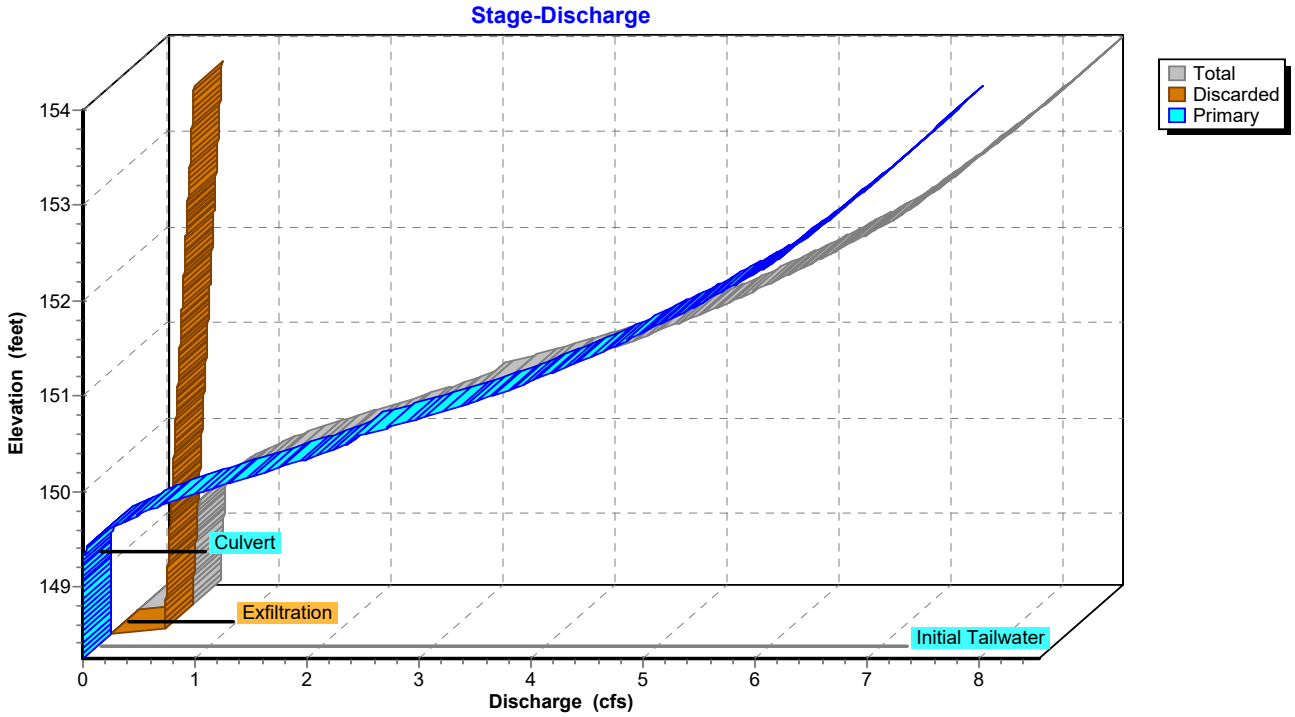
Pond SMA A: STORMWATER Peak Elev=153.90' Storage=13,547 cf Inflow=16.20 cfs 1.034 af
Discarded=0.74 cfs 0.775 af Primary=3.60 cfs 0.260 af Outflow=4.25 cfs 1.034 af

Pond SMA B: STORMWATER Peak Elev=153.60' Storage=7,948 cf Inflow=7.25 cfs 0.510 af
Discarded=0.46 cfs 0.423 af Primary=2.25 cfs 0.087 af Outflow=2.71 cfs 0.510 af

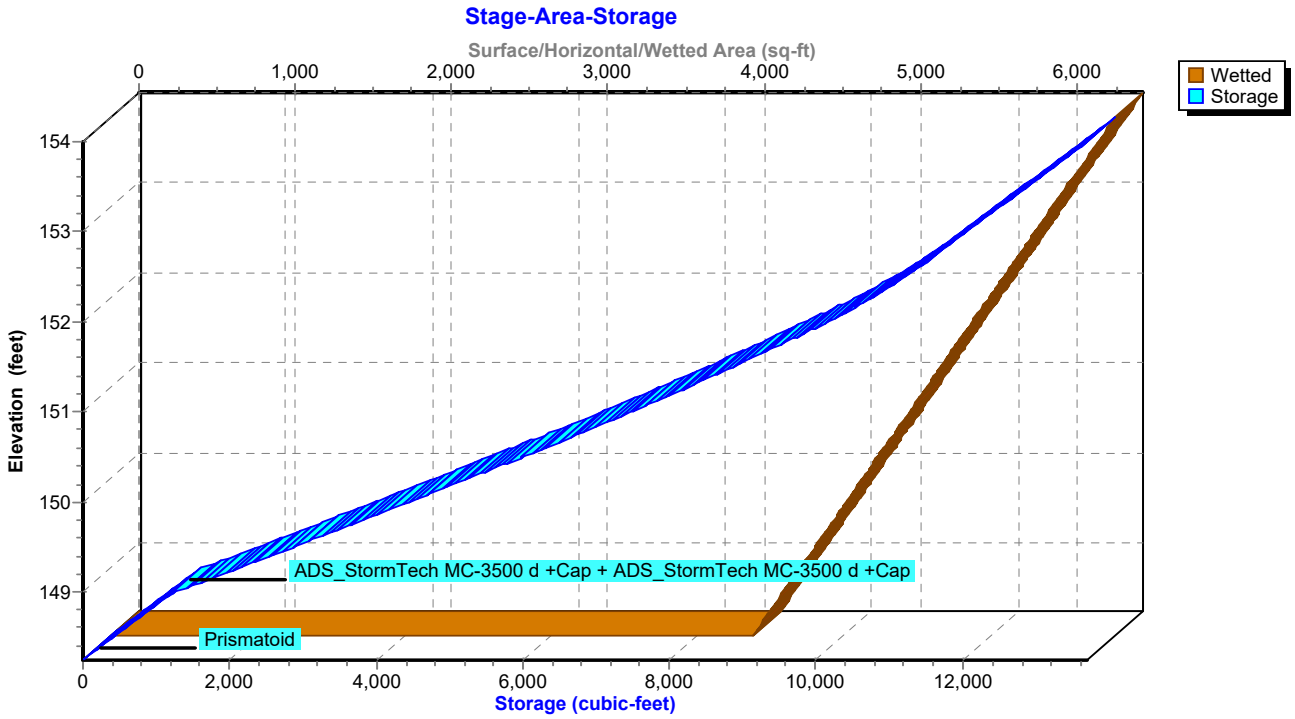
Pond SMA C: STORMWATER Peak Elev=155.60' Storage=1,619 cf Inflow=2.34 cfs 0.136 af
Discarded=0.24 cfs 0.119 af Primary=1.29 cfs 0.017 af Outflow=1.53 cfs 0.136 af

Total Runoff Area = 5.825 ac Runoff Volume = 2.163 af Average Runoff Depth = 4.46"
33.62% Pervious = 1.958 ac 66.38% Impervious = 3.867 ac

Pond SMA A: STORMWATER MANAGEMENT AREA A



Pond SMA A: STORMWATER MANAGEMENT AREA A



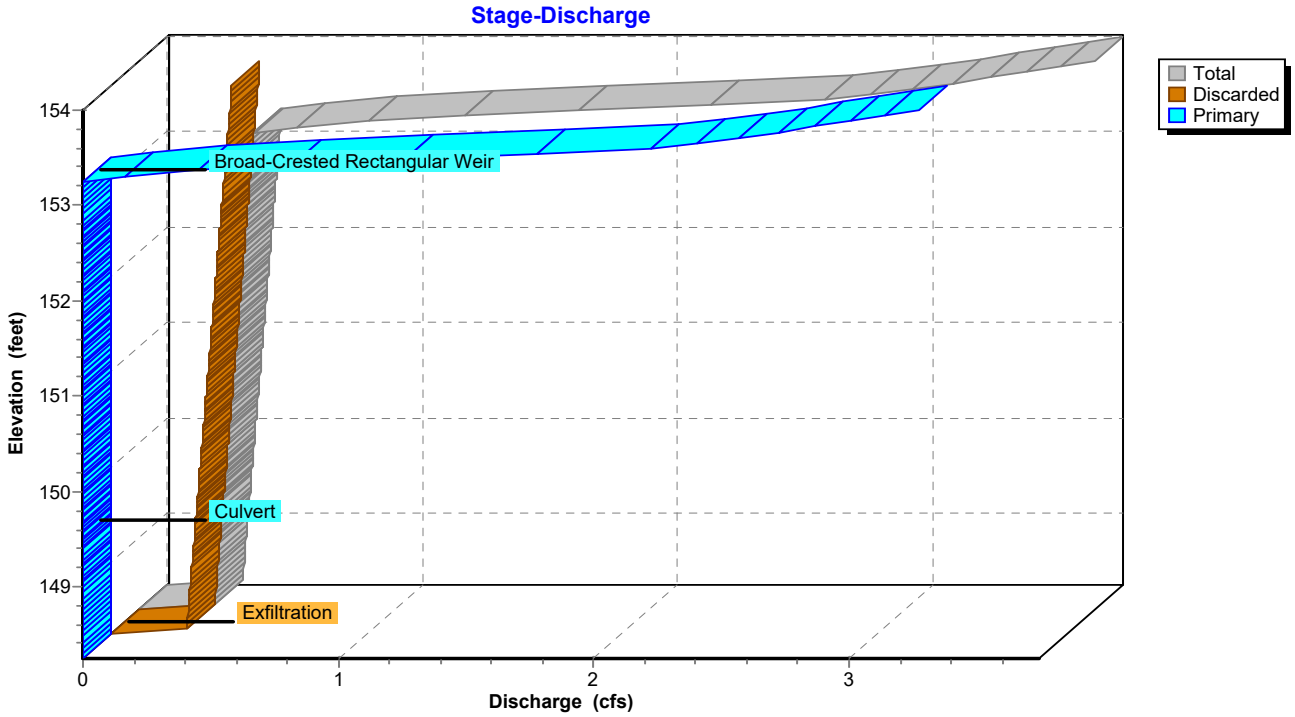
Stage-Discharge for Pond SMA A: STORMWATER MANAGEMENT AREA A

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
148.25	0.00	0.00	0.00
148.35	0.48	0.48	0.00
148.45	0.48	0.48	0.00
148.55	0.49	0.49	0.00
148.65	0.49	0.49	0.00
148.75	0.50	0.50	0.00
148.85	0.50	0.50	0.00
148.95	0.51	0.51	0.00
149.05	0.51	0.51	0.00
149.15	0.52	0.52	0.00
149.25	0.52	0.52	0.00
149.35	0.54	0.53	0.01
149.45	0.60	0.53	0.06
149.55	0.70	0.54	0.16
149.65	0.84	0.54	0.30
149.75	1.03	0.55	0.48
149.85	1.25	0.55	0.70
149.95	1.50	0.55	0.94
150.05	1.76	0.56	1.20
150.15	2.04	0.56	1.48
150.25	2.33	0.57	1.76
150.35	2.60	0.57	2.02
150.45	2.84	0.58	2.26
150.55	3.01	0.58	2.43
150.65	3.25	0.59	2.66
150.75	3.56	0.59	2.97
150.85	3.85	0.60	3.26
150.95	4.12	0.60	3.52
151.05	4.36	0.61	3.76
151.15	4.60	0.61	3.99
151.25	4.82	0.62	4.20
151.35	5.03	0.62	4.41
151.45	5.23	0.62	4.60
151.55	5.42	0.63	4.79
151.65	5.61	0.63	4.97
151.75	5.79	0.64	5.15
151.85	5.96	0.64	5.32
151.95	6.13	0.65	5.48
152.05	6.29	0.65	5.64
152.15	6.45	0.66	5.79
152.25	6.61	0.66	5.94
152.35	6.76	0.67	6.09
152.45	6.89	0.67	6.21
152.55	7.00	0.68	6.33
152.65	7.12	0.68	6.44
152.75	7.24	0.69	6.55
152.85	7.35	0.69	6.66
152.95	7.46	0.69	6.76
153.05	7.57	0.70	6.87
153.15	7.68	0.70	6.97
153.25	7.78	0.71	7.07
153.35	7.89	0.71	7.18
153.45	7.99	0.72	7.27
153.55	8.09	0.72	7.37
153.65	8.20	0.73	7.47
153.75	8.30	0.73	7.56
153.85	8.39	0.74	7.66
153.95	**8.49**	**0.74**	**7.75**

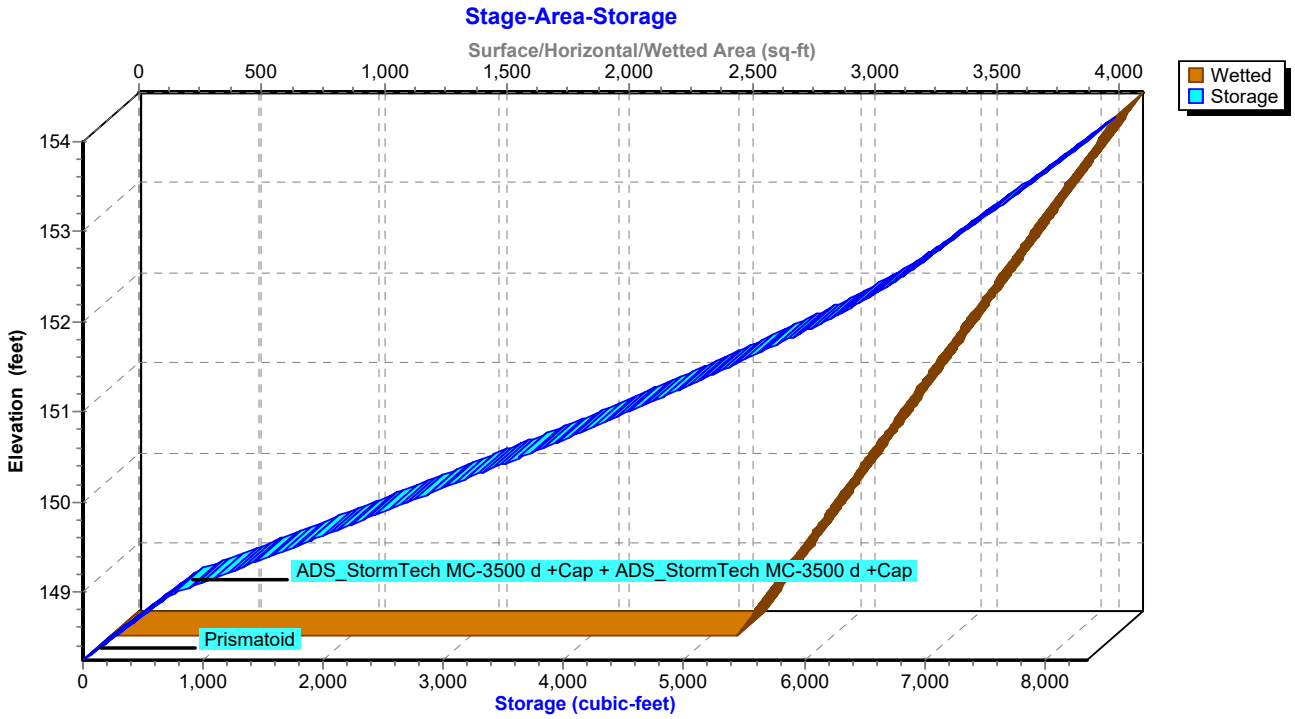
Stage-Area-Storage for Pond SMA A: STORMWATER MANAGEMENT AREA A

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
148.25	4,106	0
148.35	4,146	164
148.45	4,186	328
148.55	4,226	493
148.65	4,267	657
148.75	4,307	821
148.85	4,347	985
148.95	4,388	1,150
149.05	4,428	1,395
149.15	4,468	1,722
149.25	4,509	2,047
149.35	4,549	2,371
149.45	4,589	2,694
149.55	4,629	3,015
149.65	4,670	3,336
149.75	4,710	3,654
149.85	4,750	3,972
149.95	4,791	4,287
150.05	4,831	4,601
150.15	4,871	4,913
150.25	4,912	5,223
150.35	4,952	5,531
150.45	4,992	5,837
150.55	5,032	6,140
150.65	5,073	6,441
150.75	5,113	6,740
150.85	5,153	7,035
150.95	5,194	7,327
151.05	5,234	7,617
151.15	5,274	7,903
151.25	5,315	8,185
151.35	5,355	8,463
151.45	5,395	8,737
151.55	5,435	9,007
151.65	5,476	9,272
151.75	5,516	9,531
151.85	5,556	9,785
151.95	5,597	10,033
152.05	5,637	10,273
152.15	5,677	10,505
152.25	5,718	10,728
152.35	5,758	10,937
152.45	5,798	11,130
152.55	5,838	11,311
152.65	5,879	11,486
152.75	5,919	11,653
152.85	5,959	11,818
152.95	6,000	11,982
153.05	6,040	12,146
153.15	6,080	12,310
153.25	6,121	12,474
153.35	6,161	12,639
153.45	6,201	12,803
153.55	6,241	12,967
153.65	6,282	13,131
153.75	6,322	13,296
153.85	6,362	13,460
153.95	**6,403**	**13,624**

Pond SMA B: STORMWATER MANAGEMENT AREA B



Pond SMA B: STORMWATER MANAGEMENT AREA B



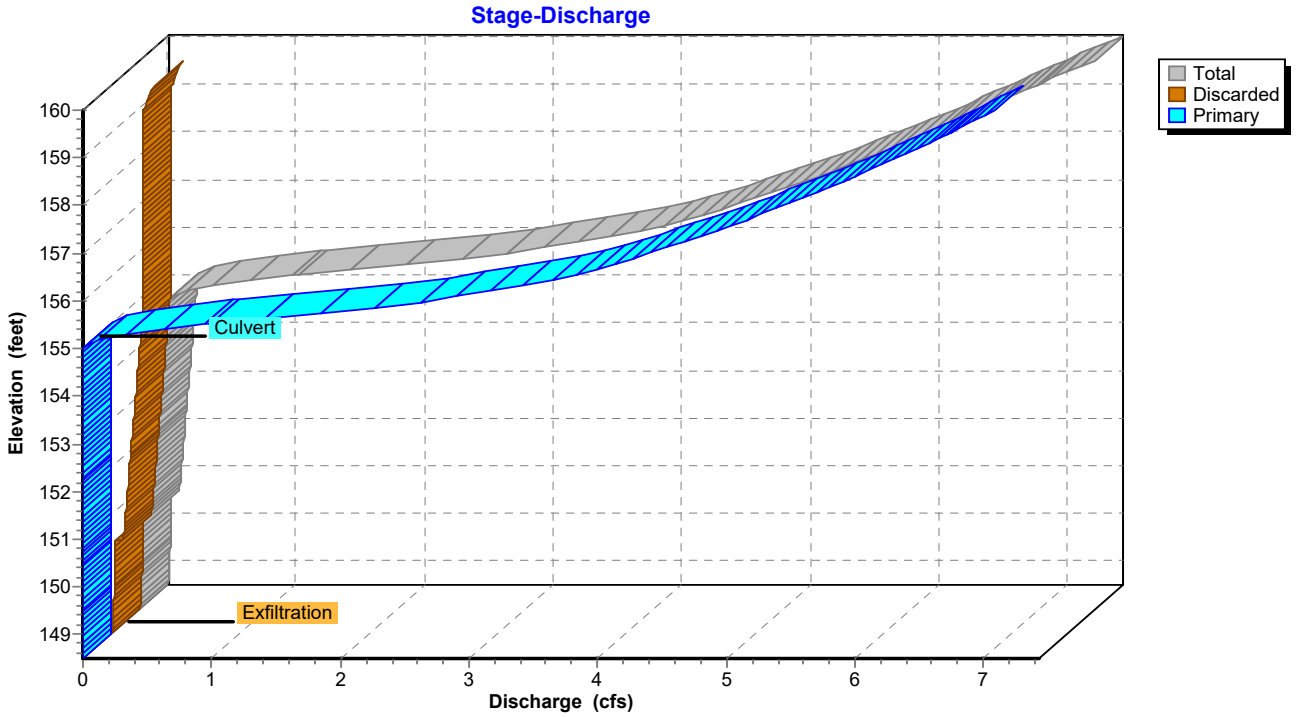
Stage-Discharge for Pond SMA B: STORMWATER MANAGEMENT AREA B

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
148.25	0.00	0.00	0.00
148.35	0.30	0.30	0.00
148.45	0.30	0.30	0.00
148.55	0.30	0.30	0.00
148.65	0.31	0.31	0.00
148.75	0.31	0.31	0.00
148.85	0.31	0.31	0.00
148.95	0.32	0.32	0.00
149.05	0.32	0.32	0.00
149.15	0.32	0.32	0.00
149.25	0.33	0.33	0.00
149.35	0.33	0.33	0.00
149.45	0.33	0.33	0.00
149.55	0.34	0.34	0.00
149.65	0.34	0.34	0.00
149.75	0.34	0.34	0.00
149.85	0.35	0.35	0.00
149.95	0.35	0.35	0.00
150.05	0.35	0.35	0.00
150.15	0.35	0.35	0.00
150.25	0.36	0.36	0.00
150.35	0.36	0.36	0.00
150.45	0.36	0.36	0.00
150.55	0.37	0.37	0.00
150.65	0.37	0.37	0.00
150.75	0.37	0.37	0.00
150.85	0.38	0.38	0.00
150.95	0.38	0.38	0.00
151.05	0.38	0.38	0.00
151.15	0.39	0.39	0.00
151.25	0.39	0.39	0.00
151.35	0.39	0.39	0.00
151.45	0.39	0.39	0.00
151.55	0.40	0.40	0.00
151.65	0.40	0.40	0.00
151.75	0.40	0.40	0.00
151.85	0.41	0.41	0.00
151.95	0.41	0.41	0.00
152.05	0.41	0.41	0.00
152.15	0.42	0.42	0.00
152.25	0.42	0.42	0.00
152.35	0.42	0.42	0.00
152.45	0.43	0.43	0.00
152.55	0.43	0.43	0.00
152.65	0.43	0.43	0.00
152.75	0.44	0.44	0.00
152.85	0.44	0.44	0.00
152.95	0.44	0.44	0.00
153.05	0.44	0.44	0.00
153.15	0.45	0.45	0.00
153.25	0.45	0.45	0.00
153.35	0.81	0.45	0.35
153.45	1.46	0.46	1.00
153.55	2.34	0.46	1.88
153.65	2.85	0.46	2.39
153.75	3.14	0.47	2.67
153.85	3.40	0.47	2.93
153.95	**3.64**	**0.47**	**3.16**

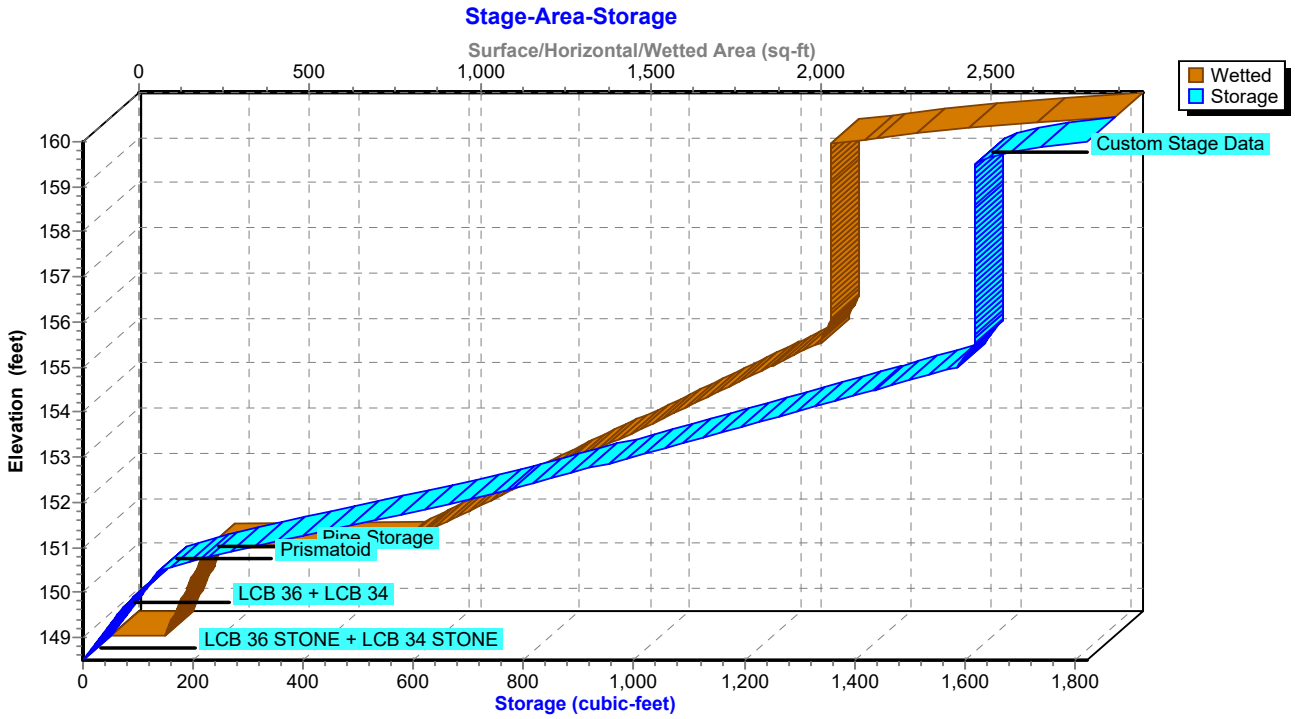
Stage-Area-Storage for Pond SMA B: STORMWATER MANAGEMENT AREA B

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
148.25	2,553	0
148.35	2,580	102
148.45	2,607	204
148.55	2,633	306
148.65	2,660	408
148.75	2,687	511
148.85	2,714	613
148.95	2,741	715
149.05	2,767	864
149.15	2,794	1,061
149.25	2,821	1,257
149.35	2,848	1,452
149.45	2,875	1,646
149.55	2,901	1,840
149.65	2,928	2,033
149.75	2,955	2,225
149.85	2,982	2,416
149.95	3,009	2,607
150.05	3,035	2,796
150.15	3,062	2,984
150.25	3,089	3,171
150.35	3,116	3,357
150.45	3,143	3,542
150.55	3,169	3,725
150.65	3,196	3,906
150.75	3,223	4,087
150.85	3,250	4,265
150.95	3,277	4,442
151.05	3,303	4,617
151.15	3,330	4,790
151.25	3,357	4,961
151.35	3,384	5,129
151.45	3,411	5,295
151.55	3,437	5,459
151.65	3,464	5,619
151.75	3,491	5,777
151.85	3,518	5,931
151.95	3,545	6,082
152.05	3,571	6,229
152.15	3,598	6,370
152.25	3,625	6,506
152.35	3,652	6,635
152.45	3,679	6,754
152.55	3,705	6,865
152.65	3,732	6,973
152.75	3,759	7,078
152.85	3,786	7,180
152.95	3,813	7,282
153.05	3,839	7,384
153.15	3,866	7,486
153.25	3,893	7,588
153.35	3,920	7,690
153.45	3,947	7,792
153.55	3,973	7,895
153.65	4,000	7,997
153.75	4,027	8,099
153.85	4,054	8,201
153.95	**4,081**	**8,303**

Pond SMA C: STORMWATER MANAGEMENT AREA C



Pond SMA C: STORMWATER MANAGEMENT AREA C



Stage-Discharge for Pond SMA C: STORMWATER MANAGEMENT AREA C

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
148.50	0.00	0.00	0.00
148.70	0.02	0.02	0.00
148.90	0.02	0.02	0.00
149.10	0.02	0.02	0.00
149.30	0.02	0.02	0.00
149.50	0.03	0.03	0.00
149.70	0.03	0.03	0.00
149.90	0.03	0.03	0.00
150.10	0.03	0.03	0.00
150.30	0.03	0.03	0.00
150.50	0.10	0.10	0.00
150.70	0.10	0.10	0.00
150.90	0.11	0.11	0.00
151.10	0.12	0.12	0.00
151.30	0.12	0.12	0.00
151.50	0.13	0.13	0.00
151.70	0.14	0.14	0.00
151.90	0.14	0.14	0.00
152.10	0.15	0.15	0.00
152.30	0.15	0.15	0.00
152.50	0.16	0.16	0.00
152.70	0.17	0.17	0.00
152.90	0.17	0.17	0.00
153.10	0.18	0.18	0.00
153.30	0.19	0.19	0.00
153.50	0.19	0.19	0.00
153.70	0.20	0.20	0.00
153.90	0.21	0.21	0.00
154.10	0.21	0.21	0.00
154.30	0.22	0.22	0.00
154.50	0.22	0.22	0.00
154.70	0.23	0.23	0.00
154.90	0.24	0.24	0.00
155.10	0.28	0.24	0.04
155.30	0.61	0.24	0.37
155.50	1.19	0.24	0.95
155.70	1.92	0.24	1.67
155.90	2.65	0.24	2.40
156.10	3.17	0.24	2.93
156.30	3.63	0.24	3.38
156.50	4.02	0.24	3.77
156.70	4.28	0.24	4.04
156.90	4.53	0.24	4.28
157.10	4.76	0.24	4.52
157.30	4.98	0.24	4.74
157.50	5.20	0.24	4.95
157.70	5.40	0.24	5.16
157.90	5.60	0.24	5.35
158.10	5.79	0.24	5.54
158.30	5.97	0.24	5.73
158.50	6.15	0.24	5.90
158.70	6.32	0.24	6.07
158.90	6.49	0.24	6.24
159.10	6.65	0.24	6.40
159.30	6.81	0.24	6.56
159.50	6.97	0.26	6.72
159.70	7.15	0.28	6.87
159.90	**7.34**	**0.32**	**7.02**

Stage-Area-Storage for Pond SMA C: STORMWATER MANAGEMENT AREA C

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
148.50	157	0
148.70	170	13
148.90	182	25
149.10	195	38
149.30	207	50
149.50	220	63
149.70	232	78
149.90	245	93
150.10	258	108
150.30	270	124
150.50	838	139
150.70	893	199
150.90	949	264
151.10	1,004	337
151.30	1,059	413
151.50	1,114	491
151.70	1,169	568
151.90	1,224	645
152.10	1,280	718
152.30	1,335	783
152.50	1,390	843
152.70	1,445	902
152.90	1,500	962
153.10	1,555	1,022
153.30	1,611	1,081
153.50	1,666	1,141
153.70	1,721	1,201
153.90	1,776	1,260
154.10	1,831	1,320
154.30	1,886	1,380
154.50	1,942	1,439
154.70	1,997	1,497
154.90	2,052	1,556
155.10	2,086	1,591
155.30	2,098	1,605
155.50	2,111	1,619
155.70	2,111	1,619
155.90	2,111	1,619
156.10	2,111	1,619
156.30	2,111	1,619
156.50	2,111	1,619
156.70	2,111	1,619
156.90	2,111	1,619
157.10	2,111	1,619
157.30	2,111	1,619
157.50	2,111	1,619
157.70	2,111	1,619
157.90	2,111	1,619
158.10	2,111	1,619
158.30	2,111	1,619
158.50	2,111	1,619
158.70	2,111	1,619
158.90	2,111	1,619
159.10	2,111	1,619
159.30	2,111	1,619
159.50	2,211	1,619
159.70	2,419	1,658
159.90	**2,740**	**1,749**

Events for Pond SMA A: STORMWATER MANAGEMENT AREA A

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-YR	6.55	1.77	0.56	1.21	150.05	4,604
10-YR	10.43	3.78	0.62	3.18	151.26	8,226
25-YR	13.43	**4.52**	0.68	**3.91**	152.70	11,570
50-YR	**16.20**	4.25	**0.74**	3.60	**153.90**	**13,547**

Events for Pond SMA B: STORMWATER MANAGEMENT AREA B

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-YR	1.76	0.35	0.35	0.00	149.95	2,611
10-YR	4.55	0.39	0.39	0.00	151.26	4,981
25-YR	6.70	0.43	0.43	0.00	152.70	7,022
50-YR	**7.25**	**2.71**	**0.46**	**2.25**	**153.60**	**7,948**

Events for Pond SMA C: STORMWATER MANAGEMENT AREA C

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-YR	0.52	0.12	0.12	0.00	151.18	367
10-YR	1.20	0.18	0.18	0.00	153.17	1,044
25-YR	1.78	0.42	0.24	0.18	155.21	1,599
50-YR	**2.34**	**1.53**	**0.24**	**1.29**	**155.60**	**1,619**

Events for Pond POA W: POA WEST

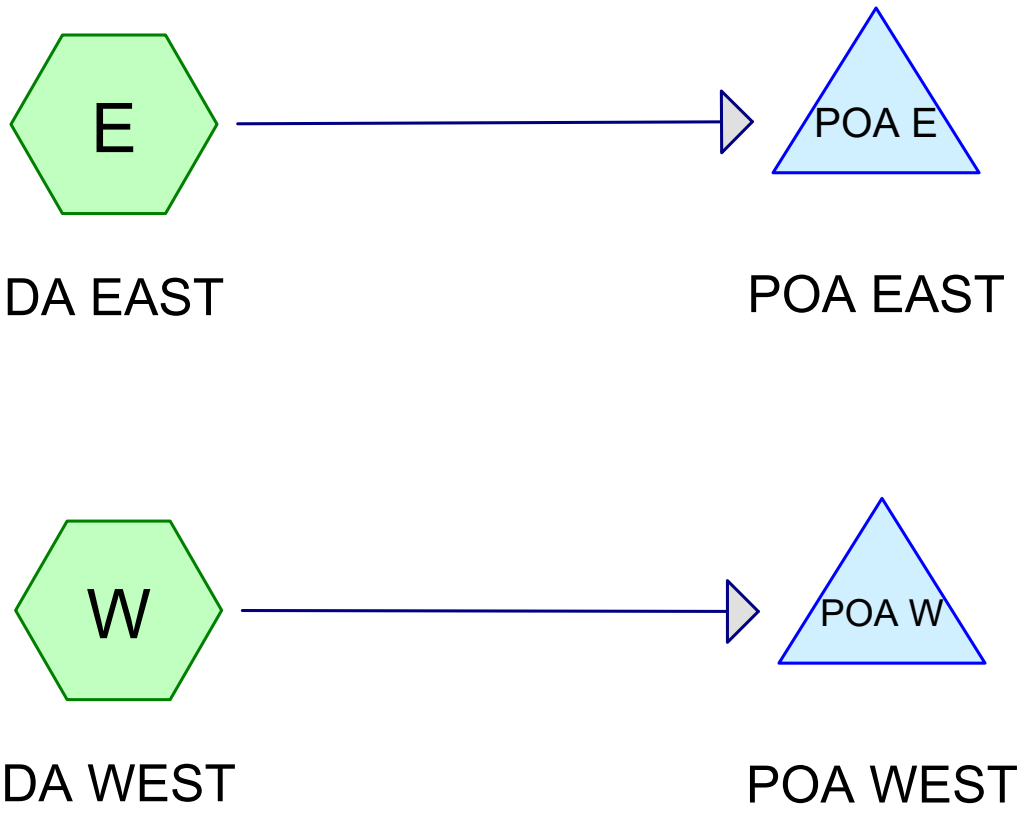
Event	Inflow (cfs)	Primary (cfs)	Volume (acre-feet)	Elevation (feet)	Storage (acre-feet)
2-YR	1.04	1.04	0.082	**0.00**	**0.000**
10-YR	2.14	2.14	0.174	0.00	0.000
25-YR	3.09	3.09	0.257	0.00	0.000
50-YR	**4.52**	**4.52**	**0.355**	0.00	0.000

Events for Pond POA E: POA EAST

Event	Inflow (cfs)	Primary (cfs)	Volume (acre-feet)	Elevation (feet)	Storage (acre-feet)
2-YR	0.50	0.50	0.062	**0.00**	**0.000**
10-YR	2.04	2.04	0.176	0.00	0.000
25-YR	3.55	3.55	0.288	0.00	0.000
50-YR	**5.11**	**5.11**	**0.491**	0.00	0.000

APPENDIX B

POST DEVELOPMENT DRAINAGE CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for Pre-Development
Prepared by Hayner/Swanson, Inc. , Printed 1/29/2022

Project Notes

Rainfall events imported from "POST-DEVELOPMENT.hcp"

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-YR	Type III 24-hr		Default	24.00	1	5.65	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.867	39	>75% Grass cover, Good, HSG A (E, W)
0.129	74	>75% Grass cover, Good, HSG C (E)
1.730	98	Paved parking, HSG A (E, W)
0.104	98	Paved parking, HSG C (E)
0.620	98	Roofs, HSG A (E, W)
0.186	98	Water Surface, HSG A (E)
0.306	98	Water Surface, HSG C (E)
0.664	30	Woods, Good, HSG A (E, W)
0.217	70	Woods, Good, HSG C (E)
5.823	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.067	HSG A	E, W
0.000	HSG B	
0.756	HSG C	E
0.000	HSG D	
0.000	Other	
5.823		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.867	0.000	0.129	0.000	0.000	1.996	>75% Grass cover, Good	E, W
1.730	0.000	0.104	0.000	0.000	1.834	Paved parking	E, W
0.620	0.000	0.000	0.000	0.000	0.620	Roofs	E, W
0.186	0.000	0.306	0.000	0.000	0.492	Water Surface	E
0.664	0.000	0.217	0.000	0.000	0.881	Woods, Good	E, W
5.067	**0.000**	**0.756**	**0.000**	**0.000**	**5.823**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E: DA EAST Runoff Area=171,408 sf 48.97% Impervious Runoff Depth=2.53"
Flow Length=524' Tc=8.5 min CN=70 Runoff=10.61 cfs 0.830 af

Subcatchment W: DA WEST Runoff Area=82,241 sf 53.97% Impervious Runoff Depth=2.53"
Flow Length=122' Tc=9.3 min CN=70 Runoff=4.95 cfs 0.398 af

Pond POA E: POA EAST Inflow=10.61 cfs 0.830 af
Primary=10.61 cfs 0.830 af

Pond POA W: POA WEST Inflow=4.95 cfs 0.398 af
Primary=4.95 cfs 0.398 af

Total Runoff Area = 5.823 ac Runoff Volume = 1.228 af Average Runoff Depth = 2.53"
49.41% Pervious = 2.877 ac 50.59% Impervious = 2.946 ac

Summary for Subcatchment E: DA EAST

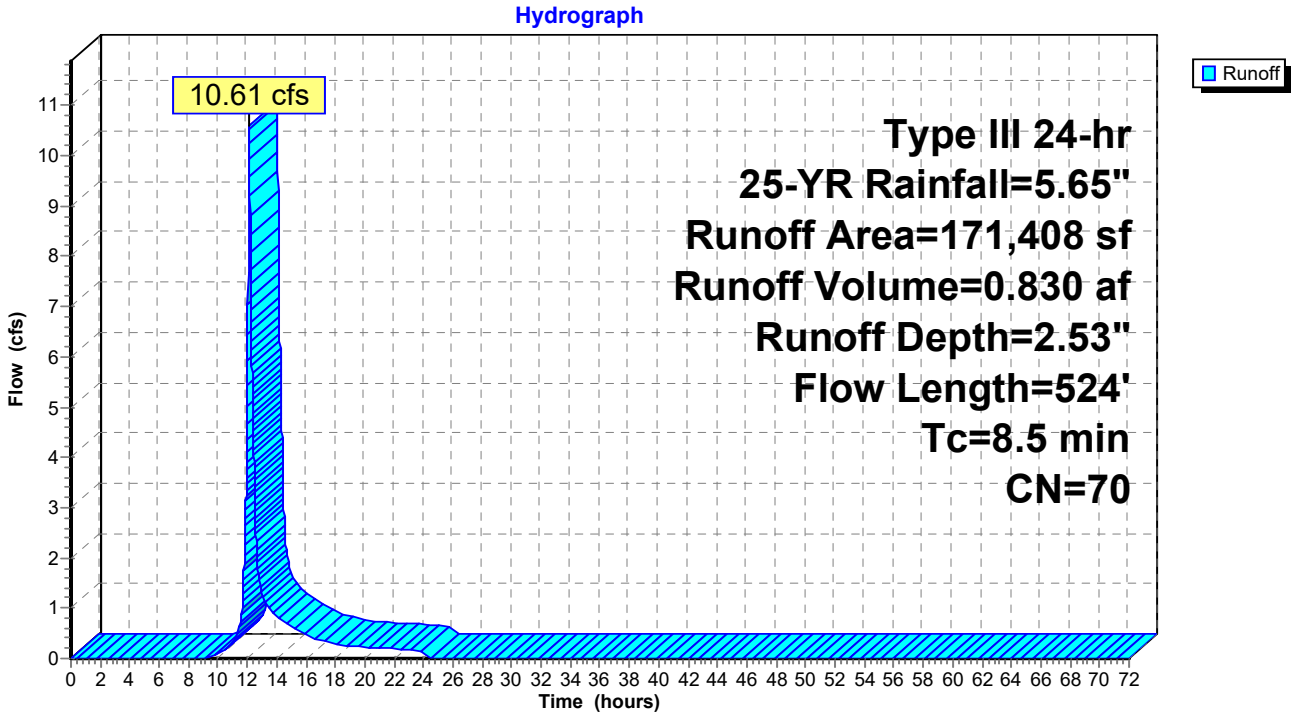
Runoff = 10.61 cfs @ 12.12 hrs, Volume= 0.830 af, Depth= 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (sf)	CN	Description
8,102	98	Water Surface, HSG A
4,008	98	Roofs, HSG A
53,971	98	Paved parking, HSG A
23,130	30	Woods, Good, HSG A
49,266	39	>75% Grass cover, Good, HSG A
5,619	74	>75% Grass cover, Good, HSG C
13,329	98	Water Surface, HSG C
4,530	98	Paved parking, HSG C
9,453	70	Woods, Good, HSG C
171,408	70	Weighted Average
87,468		51.03% Pervious Area
83,940		48.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	46	0.0380	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.96"
2.1	412	0.0260	3.27		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	66	0.9700	4.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	524	Total			

Subcatchment E: DA EAST



Summary for Subcatchment W: DA WEST

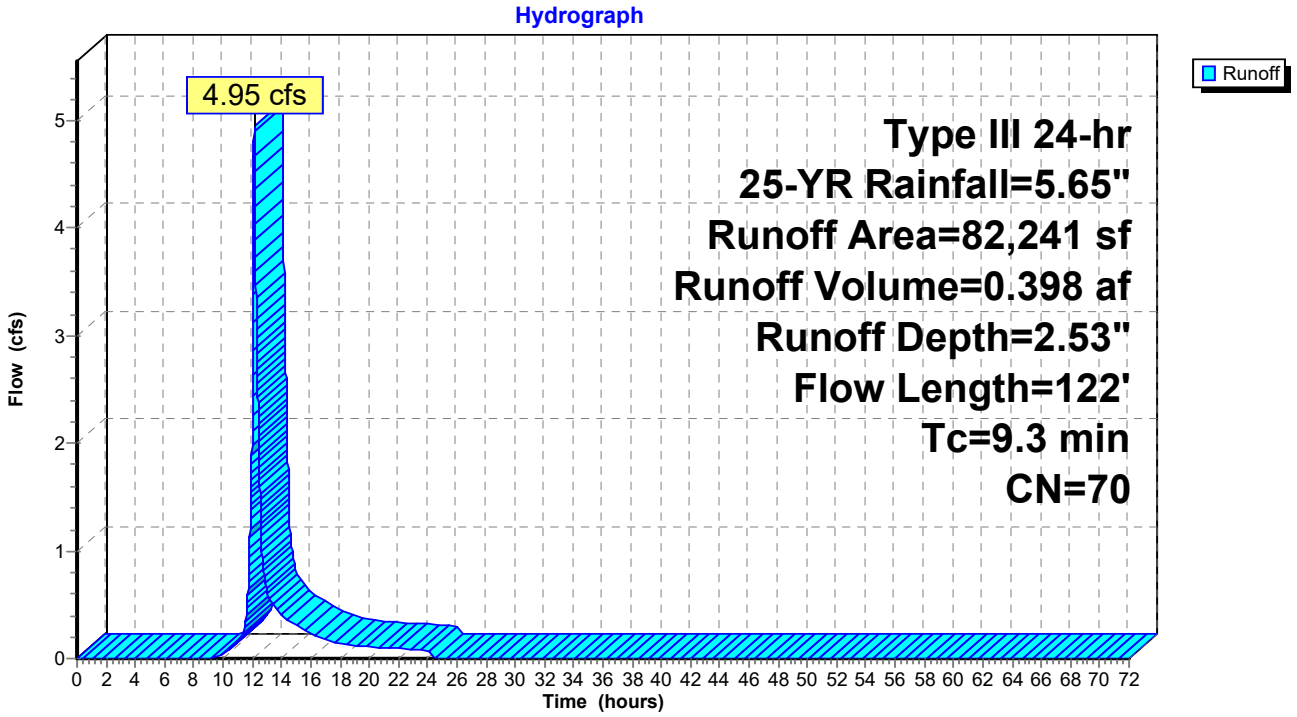
Runoff = 4.95 cfs @ 12.14 hrs, Volume= 0.398 af, Depth= 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.65"

Area (sf)	CN	Description
23,000	98	Roofs, HSG A
21,388	98	Paved parking, HSG A
5,793	30	Woods, Good, HSG A
32,060	39	>75% Grass cover, Good, HSG A
82,241	70	Weighted Average
37,853		46.03% Pervious Area
44,388		53.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0180	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.96"
0.2	30	0.1330	2.55		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0190	2.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.2900	2.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.3	122	Total			

Subcatchment W: DA WEST

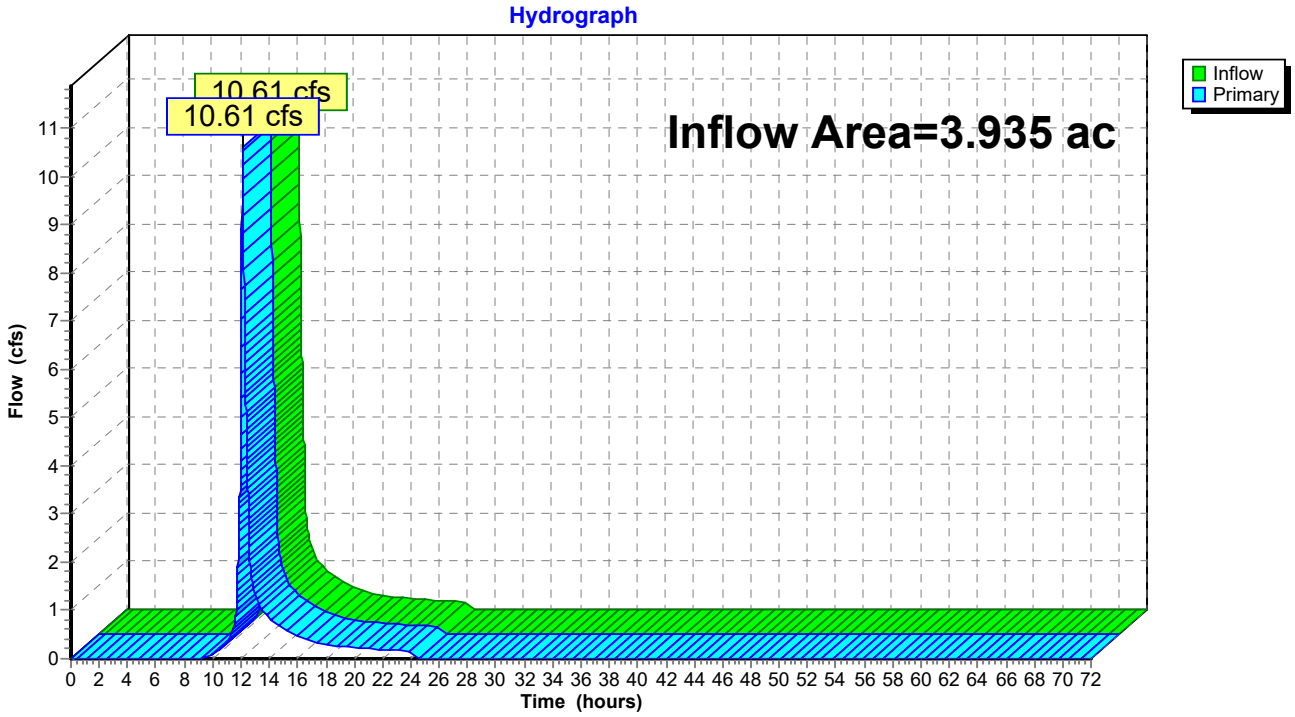


Summary for Pond POA E: POA EAST

Inflow Area = 3.935 ac, 48.97% Impervious, Inflow Depth = 2.53" for 25-YR event
Inflow = 10.61 cfs @ 12.12 hrs, Volume= 0.830 af
Primary = 10.61 cfs @ 12.12 hrs, Volume= 0.830 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Pond POA E: POA EAST

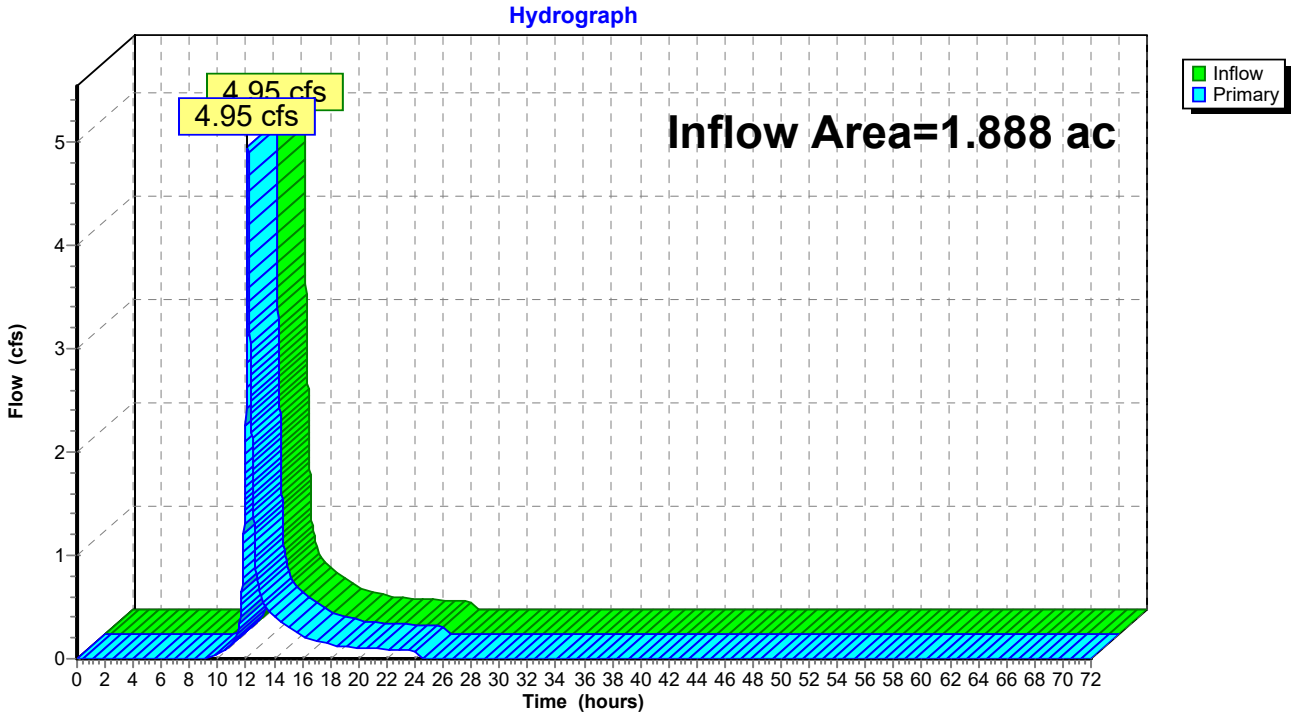


Summary for Pond POA W: POA WEST

Inflow Area = 1.888 ac, 53.97% Impervious, Inflow Depth = 2.53" for 25-YR event
Inflow = 4.95 cfs @ 12.14 hrs, Volume= 0.398 af
Primary = 4.95 cfs @ 12.14 hrs, Volume= 0.398 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Pond POA W: POA WEST



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E: DA EAST Runoff Area=171,408 sf 48.97% Impervious Runoff Depth=0.69"
Flow Length=524' Tc=8.5 min CN=70 Runoff=2.52 cfs 0.227 af

Subcatchment W: DA WEST Runoff Area=82,241 sf 53.97% Impervious Runoff Depth=0.69"
Flow Length=122' Tc=9.3 min CN=70 Runoff=1.17 cfs 0.109 af

Pond POA E: POA EAST Inflow=2.52 cfs 0.227 af
Primary=2.52 cfs 0.227 af

Pond POA W: POA WEST Inflow=1.17 cfs 0.109 af
Primary=1.17 cfs 0.109 af

Total Runoff Area = 5.823 ac Runoff Volume = 0.336 af Average Runoff Depth = 0.69"
49.41% Pervious = 2.877 ac 50.59% Impervious = 2.946 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E: DA EAST Runoff Area=171,408 sf 48.97% Impervious Runoff Depth=1.65"
Flow Length=524' Tc=8.5 min CN=70 Runoff=6.76 cfs 0.542 af

Subcatchment W: DA WEST Runoff Area=82,241 sf 53.97% Impervious Runoff Depth=1.65"
Flow Length=122' Tc=9.3 min CN=70 Runoff=3.16 cfs 0.260 af

Pond POA E: POA EAST Inflow=6.76 cfs 0.542 af
Primary=6.76 cfs 0.542 af

Pond POA W: POA WEST Inflow=3.16 cfs 0.260 af
Primary=3.16 cfs 0.260 af

Total Runoff Area = 5.823 ac Runoff Volume = 0.802 af Average Runoff Depth = 1.65"
49.41% Pervious = 2.877 ac 50.59% Impervious = 2.946 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E: DA EAST Runoff Area=171,408 sf 48.97% Impervious Runoff Depth=3.41"
Flow Length=524' Tc=8.5 min CN=70 Runoff=14.42 cfs 1.119 af

Subcatchment W: DA WEST Runoff Area=82,241 sf 53.97% Impervious Runoff Depth=3.41"
Flow Length=122' Tc=9.3 min CN=70 Runoff=6.73 cfs 0.537 af

Pond POA E: POA EAST Inflow=14.42 cfs 1.119 af
Primary=14.42 cfs 1.119 af

Pond POA W: POA WEST Inflow=6.73 cfs 0.537 af
Primary=6.73 cfs 0.537 af

Total Runoff Area = 5.823 ac Runoff Volume = 1.655 af Average Runoff Depth = 3.41"
49.41% Pervious = 2.877 ac 50.59% Impervious = 2.946 ac

Events for Pond POA E: POA EAST

Event	Inflow (cfs)	Primary (cfs)	Volume (acre-feet)	Elevation (feet)	Storage (acre-feet)
2-YR	2.52	2.52	0.227	**0.00**	**0.000**
10-YR	6.76	6.76	0.542	0.00	0.000
25-YR	10.61	10.61	0.830	0.00	0.000
50-YR	**14.42**	**14.42**	**1.119**	0.00	0.000

Events for Pond POA W: POA WEST

Event	Inflow (cfs)	Primary (cfs)	Volume (acre-feet)	Elevation (feet)	Storage (acre-feet)
2-YR	1.17	1.17	0.109	**0.00**	**0.000**
10-YR	3.16	3.16	0.260	0.00	0.000
25-YR	4.95	4.95	0.398	0.00	0.000
50-YR	**6.73**	**6.73**	**0.537**	0.00	0.000

APPENDIX C

INDIVIDUAL DRAIN LINE SIZING

STORM DRAIN DESIGN

PROJECT:	PROPOSED BUILDING ADDITION, 22 FRIARS DRIVE
HSI JOB #:	5734
DESIGN METHOD:	RATIONAL METHOD
DESIGN STORM EVENT:	25-YR (PER TOWN OF HUDSON STORMWATER REGULATIONS)
COMPUTED BY:	EMB
DATE:	1.27.22 (Rev 3.3.22)

HSI Hayner/Swanson, Inc.
Civil Engineers/Land Surveyors
Three Congress Street Nashua, New Hampshire 03062-3301
Tel (603) 883-2057 www.hayner-swanson.com Fax (603) 883-5057

FROM PIPE INLET				TO PIPE OUTLET				SUBCATCHMENT AREA					PIPE SIZE & MATERIAL					PIPE CAPACITY						Water Velocity			
LOCATION	RIM	INVERT	COVER	LOCATION	RIM	INVERT	COVER	ACRES (ACRES)	C	CA (ACRES)	ΣCA (ACRES)	Tc (MIN)	LENGTH (FT)	SLOPE (FT/FT)	DIA. (IN)	MATERIAL	n	I (in/hr)	Q_{DESIGN} (cfs)	Q_{FULL} (cfs)	V_{FULL} (fps)	T_{FLOW} (min)	Q CHECK:	q/Q	d/D	v/V	Vdesign
RD 28	-	155.06	-	CB 27	160.1	155.00	4.43	0.09	0.90	0.08	0.08	6.0	6	0.010	8	PVC	0.012	6.5	0.53	1.31	3.76	0.0	OK	40%	44%	95%	3.56
CB 27	160.1	151.36	7.74	DMH 24	156.2	150.70	4.50	0.02	0.68	0.01	0.09	6.0	133	0.005	12	HDPE	0.012	6.5	0.61	2.73	3.48	0.6	OK	23%	32%	80%	2.78
RD 23	-	152.00	-	CB 22	155.5	151.76	2.74	0.32	0.90	0.29	0.29	6.0	24	0.010	12	PVC	0.012	6.5	1.87	3.86	4.92	0.1	OK	48%	48%	99%	4.87
CB 26	158.9	153.80	3.85	CB 25	154.8	151.16	2.39	0.31	0.77	0.24	0.24	6.0	132	0.020	15	HDPE	0.012	6.5	1.55	9.91	8.08	0.3	OK	16%	26%	72%	5.82
CB 25	154.8	150.91	2.39	DMH 24	156.2	150.55	4.15	0.66	0.83	0.55	0.79	6.3	72	0.005	18	HDPE	0.012	6.4	5.03	8.05	4.55	0.3	OK	63%	57%	106%	4.80
DMH 24	156.2	150.45	4.25	CB 22	155.5	150.10	3.90	-	-	-	0.88	6.5	70	0.005	18	HDPE	0.012	6.3	5.55	8.05	4.55	0.3	OK	69%	61%	108%	4.90
CB 22	155.5	150.00	4.00	DMH 21	156.0	149.35	5.15	0.09	0.90	0.08	1.25	6.8	93	0.007	18	HDPE	0.012	6.3	7.88	9.52	5.39	0.3	OK	83%	69%	112%	6.01
DMH 21	156.0	149.25	5.25	SMA A	-	149.25	-	-	-	-	1.25	7.1	8	0.000	18	HDPE	0.012	6.1	7.63	0.00	0.00	0.0	NA	NA	NA	NA	NA
RD 12	-	152.00	-	DMH 11	155.5	151.78	2.72	0.33	0.90	0.30	0.30	6.0	22	0.010	12	PVC	0.012	6.5	1.93	3.86	4.92	0.1	OK	50%	49%	100%	4.90
DMH 11	155.5	149.25	4.75	SMA A	-	149.25	-	-	-	-	0.30	6.1	6	0.000	18	HDPE	0.012	6.5	1.93	0.00	0.00	0.0	NA	NA	NA	NA	NA
CB 14	155.0	150.90	3.10	DMH 13	155.2	150.75	3.45	0.24	0.90	0.22	0.22	6.0	15	0.010	12	HDPE	0.012	6.5	1.40	3.86	4.92	0.1	OK	36%	41%	92%	4.53
DMH 13	155.2	149.25	4.45	SMA A	-	149.25	-	-	-	-	0.22	6.1	6	0.000	18	HDPE	0.012	6.5	1.40	0.00	0.00	0.0	NA	NA	NA	NA	NA
SMA A	-	149.25	-	DMH 9	155.7	149.25	4.95	-	-	-	-	6.0	10	0.000	18	HDPE	0.012	6.5	-	0.00	0.00	0.0	NA	NA	NA	NA	NA
DMH 9	155.7	149.25	4.95	SMA B	-	149.25	-	-	-	-	-	6.0	7	0.000	18	HDPE	0.012	6.5	-	0.00	0.00	0.0	NA	NA	NA	NA	NA
CB 6	155.0	150.90	3.10	DMH 5	155.3	150.73	3.57	0.20	0.90	0.18	0.18	6.0	17	0.010	12	HDPE	0.012	6.5	1.17	3.86	4.92	0.1	OK	30%	37%	88%	4.31
DMH 5	155.3	149.25	4.55	SMA B	-	149.25	-	-	-	-	0.18	6.1	6	0.000	18	HDPE	0.012	6.5	1.17	0.00	0.00	0.0	NA	NA	NA	NA	NA
RD 8	-	152.00	-	DMH 7	155.6	151.78	2.82	0.27	0.90	0.24	0.24	6.0	22	0.010	12	PVC	0.012	6.5	1.58	3.86	4.92	0.1	OK	41%	44%	95%	4.65
DMH 7	155.6	149.25	4.85	SMA B	-	149.25	-	-	-	-	0.24	6.1	6	0.000	18	HDPE	0.012	6.5	1.58	0.00	0.00	0.0	NA	NA	NA	NA	NA
SMA B	-	149.25	-	DMH 3	156.1	149.25	5.35	-	-	-		6.0	6	0.000	18	HDPE	0.012	6.5	0.00	0.00	0.00	0.0	NA	NA	NA	NA	NA
DMH 3	156.0	149.58	5.42	EW 2	-	149.50	-	-	-	-		6.0	17	0.005	12	HDPE	0.012	6.5	0.00	2.73	3.48	0.1	OK	0%	4%	#N/A	#N/A
RD 35	-	155.33	-	LCB 34	158.8	155.30	2.83	0.15	0.90	0.14	0.14	6.0	3	0.010	8	PVC	0.012	6.5	0.88	1.31	3.76	0.0	OK	67%	59%	107%	4.01
RD 33	-	155.83	-	DMH 32	158.9	155.80	2.43	0.14	0.90	0.13	0.13	6.0	3	0.010	8	PVC	0.012	6.5	0.82	1.31	3.76	0.0	OK	62%	57%	106%	3.97
CB 31	158.9	154.01	3.89	CB 30	156.7	152.98	2.72	0.32	0.71	0.23	0.23	6.0	103	0.010	12	HDPE	0.012	6.5	1.48	3.86	4.92	0.3	OK	38%	43%	93%	4.58
RD 37	-	156.16	-	LCB 36	159.5	155.83	3.00	0.07	0.90	0.06	0.06	6.0	33	0.010	8	PVC	0.012	6.5	0.41	1.31	3.76	0.1	OK	31%	38%	88%	3.31
LCB 36	159.5	150.50	7.50	LCB 34	158.8	150.50	6.80	0.12	0.40	0.05	0.11	6.1	101	0.000	18	HDPE	0.012	6.5	0.72	0.00	0.00	0.0	NA	NA	NA	NA	NA
LCB 34	158.8	155.00	2.75	DMH 32	158.9	154.12	3.78	0.06	0.33	0.02	0.27	6.1	88	0.010	12	HDPE	0.012	6.5	1.73	3.86	4.92	0.3	OK	45%	46%	97%	4.77
DMH 32	158.9	154.02	3.88	CB 30	156.7	152.98	2.72	-	-	-	0.27	6.4	26	0.040	12	HDPE	0.012	6.4	1.70	7.73	9.84	0.0	OK	22%	32%	80%	7.88
CB 30	156.7	152.88	2.82	EX CB 8950	156.0	152.25	2.75	0.02	0.30	0.01	0.27	6.5	42	0.015	12	HDPE	0.012	6.4	1.74	4.73	6.03	0.1	OK	37%	41%	92%	5.55

INDIVIDUAL DRAIN LINE DESIGN - DRAINAGE AREAS

DRAINAGE AREA	AREA (AC)	Cw	WOODS (AC)	OPEN (AC)	ROOF (AC)	PAVED (AC)
6	0.20	0.90	0.00	0.00	0.00	0.20
8	0.27	0.90	0.00	0.00	0.27	0.00
12	0.33	0.90	0.00	0.00	0.33	0.00
14	0.24	0.90	0.00	0.00	0.00	0.24
23	0.32	0.90	0.00	0.00	0.32	0.00
22	0.09	0.90	0.00	0.00	0.00	0.09
25	0.66	0.83	0.00	0.08	0.08	0.50
26	0.31	0.77	0.00	0.06	0.00	0.24
27	0.02	0.68	0.00	0.01	0.00	0.01
28	0.09	0.90	0.00	0.00	0.09	0.00
31	0.32	0.71	0.00	0.10	0.00	0.22
33	0.14	0.90	0.00	0.00	0.14	0.00
34	0.06	0.33	0.00	0.06	0.00	0.00
35	0.15	0.90	0.00	0.00	0.15	0.00
36	0.12	0.40	0.00	0.10	0.00	0.02
37	0.07	0.90	0.00	0.00	0.07	0.00
30	0.02	0.30	0.00	0.02	0.00	0.00
8950	0.01	0.30	0.00	0.01	0.00	0.00
E	1.78	0.49	0.73	0.42	0.01	0.63
W	0.62	0.53	0.13	0.24	0.00	0.25

APPENDIX D

NHDES AOT BMP/GRV WORKSHEETS

INFILTRATION PRACTICE CRITERIA
(Env-Wq 1508.06)

Type/Node Name: **Stormwater Management Area A (SMA A)**

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable

YES		Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	
2.06	ac	A = Area draining to the practice	
1.91	ac	A_I = Impervious area draining to the practice	
0.93	decimal	I = percent impervious area draining to the practice, in decimal form	
0.88	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
1.82	ac-in	WQV= 1" x Rv x A	
6,614	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
1,653	cf	25% x WQV (check calc for sediment forebay volume)	
Isolator Row		Method of pretreatment? (not required for clean or roof runoff)	
n/a	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
13,460	cf	V = volume[1] (attach a stage-storage table)	← ≥ WQV
4,106	sf	A_{SA} = surface area of the bottom of the pond	
5.00	iph	$Ksat_{DESIGN}$ = design infiltration rate[2]	
7.9	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
148.25	feet	E_{BTM} = elevation of the bottom of the basin	
147.40	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
147.40	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
0.85	feet	D_{SHWT} = separation from SHWT	← ≥ *[3]
0.8	feet	D_{ROCK} = separation from bedrock	← ≥ *[3]
n/a	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	← ≥ 24"
n/a	ft	D_T = depth of trench, if trench proposed	← 4 - 10 ft
Yes	Yes/No	If a trench or underground system is proposed, observation well provided[4]	
n/a		If a trench is proposed, material in trench	
n/a		If a basin is proposed, basin floor material	
n/a	Yes/No	If a basin is proposed, the perimeter should be curvilinear, basin floor shall be flat.	
n/a	:1	If a basin is proposed, pond side slopes	← ≥3:1
151.27	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
153.91	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
154.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. $Ksat_{DESIGN}$ includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes:

INFILTRATION PRACTICE CRITERIA
(Env-Wq 1508.06)

Type/Node Name: **Stormwater Management Area B (SMA B)**

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable

YES		Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	
0.46	ac	A = Area draining to the practice	
0.46	ac	A_I = Impervious area draining to the practice	
1.00	decimal	I = percent impervious area draining to the practice, in decimal form	
0.95	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.44	ac-in	WQV= 1" x Rv x A	
1,586	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
397	cf	25% x WQV (check calc for sediment forebay volume)	
Isolator Row		Method of pretreatment? (not required for clean or roof runoff)	
n/a	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
8,201	cf	V = volume[1] (attach a stage-storage table)	← ≥ WQV
2,553	sf	A_{SA} = surface area of the bottom of the pond	
4.00	iph	$Ksat_{DESIGN}$ = design infiltration rate[2]	
9.6	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
148.25	feet	E_{BTM} = elevation of the bottom of the basin	
148.25	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
148.25	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
-	feet	D_{SHWT} = separation from SHWT	← ≥ *[3]
-	feet	D_{ROCK} = separation from bedrock	← ≥ *[3]
n/a	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	← ≥ 24"
n/a	ft	D_T = depth of trench, if trench proposed	← 4 - 10 ft
Yes	Yes/No	If a trench or underground system is proposed, observation well provided[4]	
n/a		If a trench is proposed, material in trench	
n/a		If a basin is proposed, basin floor material	
n/a	Yes/No	If a basin is proposed, the perimeter should be curvilinear, basin floor shall be flat.	
n/a	:1	If a basin is proposed, pond side slopes	← ≥3:1
151.27	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
153.61	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
154.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. $Ksat_{DESIGN}$ includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes:

INFILTRATION PRACTICE CRITERIA
(Env-Wq 1508.06)

Type/Node Name: **Stormwater Management Area C (SMA C)**

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable

YES		Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	
0.42	ac	A = Area draining to the practice	
0.25	ac	A_I = Impervious area draining to the practice	
0.60	decimal	I = percent impervious area draining to the practice, in decimal form	
0.59	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.25	ac-in	WQV= 1" x Rv x A	
893	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
223	cf	25% x WQV (check calc for sediment forebay volume)	
NA		Method of pretreatment? (not required for clean or roof runoff)	
n/a	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
1,627	cf	V = volume[1] (attach a stage-storage table)	← ≥ WQV
556	sf	A_{SA} = surface area of the bottom of the pond	
5.00	iph	$Ksat_{DESIGN}$ = design infiltration rate[2]	
7.0	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
150.50	feet	E_{BTM} = elevation of the bottom of the basin	
NA	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
NA	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
#######	feet	D_{SHWT} = separation from SHWT	← ≥ *[3]
#######	feet	D_{ROCK} = separation from bedrock	← ≥ *[3]
n/a	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	← ≥ 24"
n/a	ft	D_T = depth of trench, if trench proposed	← 4 - 10 ft
Yes	Yes/No	If a trench or underground system is proposed, observation well provided[4]	
n/a		If a trench is proposed, material in trench	
n/a		If a basin is proposed, basin floor material	
n/a	Yes/No	If a basin is proposed, the perimeter should be curvilinear, basin floor shall be flat.	
n/a	:1	If a basin is proposed, pond side slopes	← ≥3:1
153.17	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
155.60	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
160.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. $Ksat_{DESIGN}$ includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes:

Groundwater Recharge Volume (GRV) Calculation

0.88	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
-	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
-	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
-	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.40	inches	Rd = weighted groundwater recharge depth	
0.3536	ac-in	GRV = AI * Rd	
1,284	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12")	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

GRV PROVIDED AT SMA A & SMA B & SMA C = 20,565 CF > GRV = 1,284 CF

Pre Treatment Sizing SMA A

Stage-Area-Storage for Pond 2P: STORMWATER MANAGEMENT AREA A

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
149.00	906	0
149.05	922	45
149.10	938	90
149.15	954	135
149.20	969	180
149.25	985	225
149.30	1,001	269
149.35	1,017	314
149.40	1,033	358
149.45	1,048	402
149.50	1,064	445
149.55	1,080	489
149.60	1,096	533
149.65	1,112	576
149.70	1,128	619
149.75	1,144	662
149.80	1,160	704
149.85	1,176	747
149.90	1,192	789
149.95	1,208	831
150.00	1,225	872
150.05	1,241	914
150.10	1,257	955
150.15	1,273	996
150.20	1,290	1,037
150.25	1,306	1,077
150.30	1,323	1,117
150.35	1,339	1,157
150.40	1,356	1,197
150.45	1,373	1,236
150.50	1,390	1,274
150.55	1,407	1,313
150.60	1,424	1,351
150.65	1,441	1,389
150.70	1,458	1,426
150.75	1,475	1,463
150.80	1,492	1,500
150.85	1,510	1,536
150.90	1,527	1,572
150.95	1,545	1,608
151.00	1,563	1,642
151.05	1,581	1,677
151.10	1,599	1,711
151.15	1,618	1,745
151.20	1,636	1,778
151.25	1,655	1,810
151.30	1,674	1,842
151.35	1,693	1,874
151.40	1,713	1,904
151.45	1,732	1,935
151.50	1,752	1,964
151.55	1,773	1,993
151.60	1,793	2,021
151.65	1,814	2,049
151.70	1,836	2,076
151.75	1,858	2,102
151.80	1,880	2,127
151.85	1,903	2,152
151.90	1,927	2,175
151.95	1,951	2,198
152.00	1,976	2,220
152.05	2,003	2,240
152.10	2,031	2,260
152.15	2,061	2,278
152.20	2,094	2,295
152.25	2,128	2,311
152.30	2,174	2,324
152.35	2,222	2,336
152.40	2,273	2,345
152.45	2,312	2,352
152.50	2,347	2,357
152.55	2,369	2,361
152.60	2,392	2,364
152.65	2,416	2,367
152.70	2,440	2,368
152.75	**2,465**	**2,369**

Isolator Row: 1 Row x 8 chambers + 1 row x 13 chambers
↳ see above for storage table

Drainage Area to Isolator Row (DMH 11)

1.82 ac Total ⇒ 1.67 ac impervious

WQV = 5786 CF ⇒ 25% = 1,447 CF

Weir Elevation = 150.75

Storage Below 150.75 = 1,463 CF > 1,447 CF

Pre-Treatment Sizing SMA B

Stage-Area-Storage for Pond 1P: STORMWATER MANAGEMENT AREA B

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
149.00	306	0
149.05	311	15
149.10	316	31
149.15	322	46
149.20	327	61
149.25	332	76
149.30	338	91
149.35	343	106
149.40	349	121
149.45	354	136
149.50	359	150
149.55	365	165
149.60	370	180
149.65	375	194
149.70	381	209
149.75	386	223
149.80	392	238
149.85	397	252
149.90	402	266
149.95	408	280
150.00	413	294
150.05	419	308
150.10	424	322
150.15	430	336
150.20	435	350
150.25	441	364
150.30	446	377
150.35	452	391
150.40	458	404
150.45	463	417
150.50	469	430
150.55	475	443
150.60	480	456
150.65	486	469
150.70	492	481
150.75	498	494
150.80	504	506
150.85	510	519
150.90	516	531
150.95	522	543
151.00	528	554
151.05	534	566
151.10	540	578
151.15	546	589
151.20	552	600
151.25	559	611
151.30	565	622
151.35	571	632
151.40	578	643
151.45	585	653
151.50	591	663
151.55	598	673
151.60	605	682
151.65	612	692
151.70	620	701
151.75	627	709
151.80	635	718
151.85	642	726
151.90	650	734
151.95	659	742
152.00	667	749
152.05	676	756
152.10	686	763
152.15	696	769
152.20	707	775
152.25	718	780
152.30	734	785
152.35	750	788
152.40	767	791
152.45	781	794
152.50	792	796
152.55	800	797
152.60	807	798
152.65	815	799
152.70	824	799
152.75	**832**	**799**
152.80	**832**	799
152.85	832	799
152.90	832	799
152.95	832	799
153.00	832	799
153.05	832	799
153.10	832	799
153.15	832	799
153.20	832	799
153.25	832	799

Isolator Row: 1 row x 7 Chambers
↳ see above for storage table

Drainage Area to Isolator Row (OMH7)
0.27 ac (all impervious)

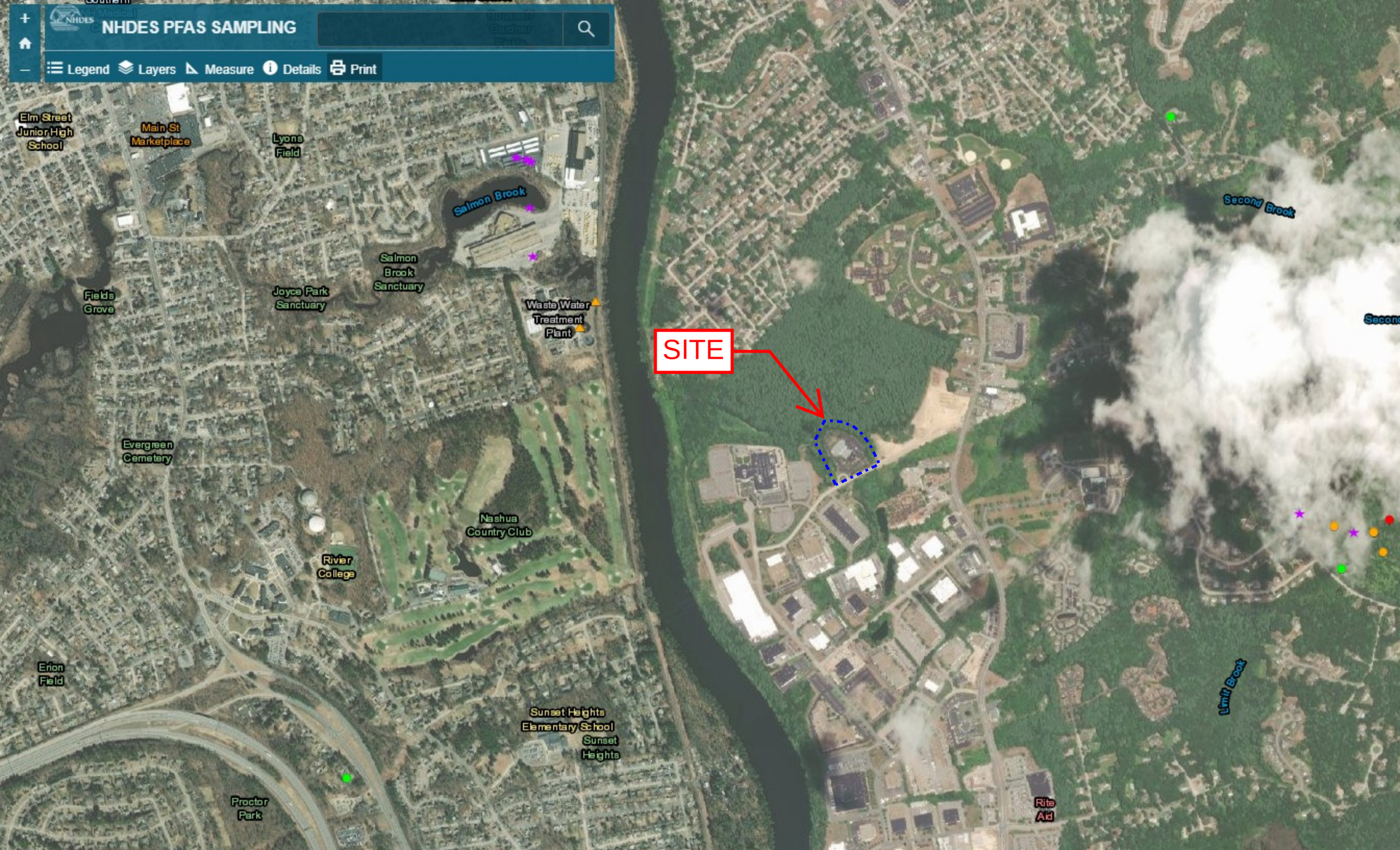
WQV = 931 CF => 25 % = 233 CF

Weir Elevation = 150.00'

Storage Below 150 = 294 CF > 233 CF

APPENDIX E

NHDES AOT SUPPORT MATERIAL


NHDES PFAS SAMPLING
Legend
Layers
Measure
Details
Print
Elm Street Junior High School
Main St Marketplace
Lyons Field
Salmon Brook
Salmon Brook Sanctuary
Joyce Park Sanctuary
Fields Grove
Waste Water Treatment Plant
SITE
Second Brook
Evergreen Cemetery
Nashua Country Club
Rivier College
Erion Field
Sunset Heights Elementary School
Sunset Heights
Proctor Park
Rite Aid
Limit Brook

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

REGISTRATION AND NOTIFICATION FORM FOR STORMWATER INFILTRATION TO GROUNDWATER (5H1)

Groundwater Discharge Program

RSA/Rule: RSA 485-A:6, VII; 485:3, X; Env-Wq 402

Applicant Information

Name: Integra Biosciences Corp.	Daytime Phone: (603) 578-5800	
Mailing Address: 2 Wentworth Drive		
City: Hudson	State: NH	ZIP: 03051
Contact Person Name: Robert Fougere	Email: robert.fougere@integra-biosciences.com	
Contact Person Phone Number: (603) 578-5800	Fax Number: NA	

Facility Information

Name: Integra Biosciences		
Address: 22 Friars Drive		
City: Hudson	State: NH	ZIP: 03051
Property Tax Map: 209	Lot Number: 4	
Latitude & Longitude of discharge point(s): 42.74374, 71.43208 (SMA A) ; 42.74362, 71.43241 (SMA B); 42.74292, 71.43184 (SMA C)		

Facility Owner Information (complete only if different than applicant)

Owner Name:	Daytime Phone:	
Mailing Address:		
City/Town:	State:	ZIP:
Contact Person Name:	Email:	
Contact Person Phone Number:	Fax Number:	

Property Owner (complete only if different then Applicant)

Name:	Daytime Phone:	
Mailing Address:		
City:	State:	ZIP:
Contact Person Name:	Email:	
Contact Person Phone Number:	Fax Number:	

Facility Operator's Information (complete only if different than applicant)

Facility Operator Name:	Daytime Phone:	
Mailing Address:		
City:	State:	ZIP:

Complete this form if you are using a drywell or other subsurface infiltration structures to recharge stormwater to the ground or groundwater. If a completed Underground Injection Control (UIC) registration form was submitted to the Alteration of Terrain Bureau for this project, then one is not required to be sent directly to the Drinking Water and Groundwater Bureau (DWGB).

REGISTRATION AND NOTIFICATION FORM FOR STORMWATER INFILTRATION TO GROUNDWATER (attach additional sheets, as necessary, for responses to questions below)

Please provide a complete description of the facility including historic uses, any former contamination and/or ongoing remedial action at the site.
The existing site is currently developed as an existing partial 2-story 35,157 square foot manufacturing/warehouse/office building along with associated parking and loading areas. The site was constructed in the 1990's and the project team is not aware of any other historic uses, former contaminants or ongoing remedial actions.

Please provide information concerning the location of the infiltration activity, include Locus map (i.e. USGS map).
See attached site plan for additional information.

Please describe the pretreatment system, if any, and capacity of the system.
Deep sump catch basins, catch basins with hoods, pretreatment isolator row.

Please describe the materials and products used for the subsurface infiltration structure (i.e., pipe and stone leachfield, plastic chamber units, concrete drywell, etc.).
Stormtech MC-3500 Chambers, 18-inch perforated HDPE Pipe in bed of stone- see attached site plan for additional information.

Please describe the disposal method and location. Include a site plan showing: the infiltration structure, any other on-site infiltration structures, dimensions, depth to groundwater (if known), adjacent septic system(s), and drinking water source(s).
Stormwater infiltration system to natural soils- see attached stormwater management report for additional information.

Please provide information concerning methods and schedule for periodic inspection and/or maintenance.
See site plan for construction details and notes.

Applicant/Owner Certification Statement and Signature

By signing this application, the signer certifies that the information contained in or otherwise submitted with this application is true, complete and not misleading to the best of the signer's knowledge and belief.

By signing this application, the signer understands that submission of false, incomplete or misleading information is grounds for:

- **Denying the application;**
- **Revoking any application that is granted based on the information; and**
- **If the signer is acting as or on behalf of a listed engineer as defined in Env-C 502.10, debarring the listed engineer from the roster.**

By signing the application, the signer and applicant agree to comply with all applicable rules and conditions of this permit and to not discharge to the holding tank(s) until written permission from the department has been received.

	1/31/2022
Signature of Facility Owner or Contact	**Date**

Outlet Protection		
Reference: NH Stormwater Manual: Volume 2 Revision 1.0		
Job #:	5734	
Project:	22 Friars Building Addition	
Design by:	EMB	
Date:	1.27.22	
Structure:	EW 2	
Invert:	149.50	
A. Conditions:		
Pipe D_o =	1	ft
Q_{10}=	0.35	cfs
Q_F =	2.73	cfs
Q_{10}/Q_F =	13	%
d/D =	25	%
Tw =	0.25	ft
	Tw < Do/2	
B. Design Parameters		
Apron Length =	8	ft
Apron Width at Culvert Outlet =	3	ft
Apron Width at End of Apron =	11	ft
Median Stone =	0	in
Maximum Size of Stone =	0	in
Minimum Depth of Stone =	1	in

INSPECTION & MAINTENANCE (I&M) MANUAL

Proposed Building Additions
Tax Map 209, Lot 4
22 Friars Drive
Hudson, New Hampshire

February 2022

Prepared for:

Integra Biosciences Corp.
2 Wentworth Drive
Hudson, NH 03051

Prepared by:

Hayner/Swanson, Inc.
3 Congress Street
Nashua, NH 03062

In accordance with the Town of Hudson Stormwater Regulations Section 290, the mechanism for providing long-term inspection and maintenance of stormwater management practices for this development are as follows:

I. RESPONSIBLE MAINTENANCE PARTY

Integra Biosciences Corp
2 Wentworth Drive
Hudson, NH 03051

Attn: Robert Fougere
Phone: (603) 578-5800

II. MAINTENANCE RECOMMENDATIONS FOR BMP's

The following recommendations are to be used as a guide for the inspection and maintenance of the permanent erosion and sediment control measures.

A. PARKING/LOADING AREA SWEEPING

- Inspect parking and loading areas at least semi-annually for the accumulation of sediment along drainage flow lines. Additional inspections recommended particularly during and after the winter months if the ice conditions during the winter were severe.
- Sweep parking and loading areas to remove sediment buildup along and drainage flow lines.
- Dispose of sediments and other wastes in conformance with applicable local, state, and federal regulations.

B. LEACHING CATCH BASINS

- Inspect basins at least semi-annually at the same time that the parking lot is inspected.
- Vacuum the sediment in the basins when the sediment reaches one-half the depth from the bottom of the catch basin to the invert of the outlet pipe.
- Repair damaged basin grates immediately after the inspection.
- Repair pavement damage around the basins immediately after the inspection to prevent further damage to the structures.
- Dispose of sediments and other wastes in conformance with applicable local, state, and federal regulations.

C. SUBSURFACE INFILTRATION BASINS (STORMWATER MANAGEMENT AREAS A, B & C)

- Inspect the infiltration basins at least twice annually, and following any rainfall event exceeding 2.5-inches in a 24- hour period, with maintenance or rehabilitation as warranted by such inspection.
- Dispose of sediments and other wastes in conformance with applicable local, state, and federal regulations
- If the system does not drain within 72-hours following a rainfall event, then a qualified professional should assess the condition of the facility to determine measures required to restore infiltration function, including but not limited to removal of accumulated sediments or reconstruction.

III. INSPECTION CHECKLIST/MAINTENANCE AND DEICING LOGS

The accompanying sheets to this section are to be used as a guide for the inspection reporting for this project. Inspection reports shall include photographs of the above-referenced practices.

Completed inspection reports should be kept on-site and be easily accessible to a Town Engineer.

IV. EXHIBIT PLAN

The accompanying plan identifies the stormwater practices that will need to be inspected as part of this I & M program.

V. INVASIVE SPECIES RESPONSE

Attached is information provided by the New Hampshire Department of Agriculture, Markets & Food related to the identification and control of invasive species. During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described on the following pages. They should be controlled as described on the following pages.

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by: becoming weedy and overgrown; killing established shade trees; obstructing pipes and drainage systems; forming dense beds in water; lowering water levels in lakes, streams, and wetlands; destroying natural communities; promoting erosion on stream banks and hillsides; and resisting control except by hazardous chemical.

VI. SALT MINIMIZATION PLAN AND DE-ICING LOG

The following information and attached references comprise the Salt Minimization Plan as prepared for the Integra Biosciences Building Additions project.

1) Background:

The Proposed Building Additions project is located at 22 Friars Drive in Hudson, NH. The existing site contains a large wetland and is bordered by a brook running in a northwesterly direction to an existing pond which lies just off site to the northwest. Due to the proximity of the development to these wetlands, a salt minimization plan and deicing log is included as part of the ongoing maintenance of the site.

The presence of snow and ice on roadways, driveways, and sidewalks 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, nearby brook/wetland complex and other environmentally significant areas while still maintaining roadway and site safety.

2) Project Area Description:

The Building Additions project is proposed at Integra Biosciences located at 22 Friars Drive in Hudson, NH. The site is located in the Sagamore Industrial Park in the southern portion of Hudson. The project proposes several building additions onto an existing office/manufacturing/warehouse building. In addition to the building additions, the project includes access, parking, loading ,driveway, stormwater and other site improvements.

3) Responsibility:

The property owner, Integra Biosciences Corp is responsible for implementing and complying with the Winter Maintenance and Salt Minimization Plan, reviewing the success of the Plan and continuing to update the Plan as new requirements, practices and products are developed. A copy of this Plan shall be given to all personnel that is involved with winter maintenance within the Integra Biosciences site for mandatory implementation.

4) Certifications:

All Salt Applicators within the Integra Biosciences Building Additions project shall be current UNHT2 Green SnowPro Certified applicators or equivalent. In addition, a NHDES Salt Applicator Certification is recommended, but not required. Information on these certifications can be found in the links provided below:

- http://t2.unh.edu/green-snopro-training-and-nhdes-certification

- http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/saltapplicator-certification.htm

5) Weather Monitoring:

Winter maintenance contractors and salt applicators employed within the Integra Biosciences Building Additions project 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 that the operators are making informed decisions as to when and to what extent materials are applied to the roadways, driveways and sidewalks.

6) Pre-Treatment and Treatment of Roadways:

Apply pre-wetted de-icer, salt brine or liquid de-icers to parking lots and roadways prior 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. For more information, refer to attached Anti-Icing and Pre-wetting NH Best Management Practices sheets from the Technology Transfer Center at UNH.

If snow accumulates prior to salting the parking lots and roadways within the Integra Biosciences Building Additions project, 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. Pavement surface temperature shall be monitored in parking lots and roadways. If pavement temperature is below 15ºF, winter maintenance contractors shall only use pre-wetted salt or brining solution. Dry salt (sodium chloride) will not melt fast enough at these temperatures.

7) Plowing:

Plow operations should be timed so as to allow maximum melting by salt before snow is plowed off the road or parking lot. Snow piles shall not be located on top of catch basins or within swales and ponds. Within the commercial development, snow piles should be stored within the parking lot as much as possible so that solids can be recovered after the snow melts.

8) Documentation:

All winter maintenance contractors shall record salt usage by vehicle for each storm and periodically compare the usage rates to confirm spreader calibrations. All winter maintenance contractors shall record storm response data, including date, air temperature, ground surface temperature, storm start and end time, snow fall total, salt usage, application rates, application times, and plow times to be compared and analyzed by the Applicators and property managers to improve

the salt minimization process. The attached "checklist for snow and ice maintenance contractors" shall be used as a guide.

Inspection Checklist & Maintenance Log

Project Name: Proposed Building Additions, 22 Friars Drive Hudson, NH

☐ Roadway areas

☐ Leaching catch basins and drain manholes

☐ Riprap aprons at headwall outlets

☐ Subsurface infiltration systems (Stormwater Management Areas A, B & C)

Inspection Date	Inspector Name(s)	Description of BMP Condition	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

Deicing Log

Project Name: Proposed Building Additions, 22 Friars Drive Hudson, NH

Application Date	Application	Type of Deicer	Amount of Deicer

Control of Invasive Plants

New Hampshire
Department of Agriculture,
Markets & Food
Douglas Cygan
603-271-3488
doug.cygan@agr.nh.gov

This guide lists garden plants and weeds which are already causing significant changes to natural areas in the Mid-Atlantic. **Measures for controlling each species are indicated by number, e.g., (3), in the text with a full explanation at the end of this article.** Click on the word Control: to jump to that section. Then click your "back" button to return to the text. Following each section suggested alternative plants are given. These alternatives are native plants, well adapted and needing little care, attractive to birds and butterflies, and an important part of the food web for our indigenous species.

INVASIVE TREES

NORWAY MAPLE (*Acer platanoides*) has large leaves similar to sugar maple. To easily confirm that the plant is Norway maple, break off a leaf and if it's truly Norway maple it will exude milky white sap. Fall foliage is yellow. (Exception: cultivars such as 'Crimson King,' which have red leaves in spring or summer, may have red autumn leaves.) The leaves turn color late, usually in late October after native trees have dropped their foliage. This tree suppresses growth of grass, garden plants, and forest understory beneath it, at least as far as the drip-line. Its wind-borne seeds can germinate and grow in deep shade. The presence of young Norway maples in our woodlands is increasing.
Control: (1); (7), (8), (9), or (10); (11) in mid-October to early November, before the leaves turn color.

TREE OF HEAVEN (*Ailanthus altissima*), is incredibly tough and can grow in the poorest conditions. It produces huge quantities of wind-borne seeds, grows rapidly, and secretes a toxin that kills other plants. Its long compound leaves, with 11-25 lance-shaped leaflets, smell like peanut butter or burnt coffee when crushed. Once established, this tree cannot be removed by mechanical means alone.
Control: (1) - seedlings only. Herbicide - use Garlon 3a (9) with no more than a 1" gap between cuts, or (10); plus (11) on re-growth. Or paint bottom 12" of bark with Garlon 4 Ultra (in February or March to protect surrounding plants). USE MAXIMUM STRENGTH SPECIFIED ON LABEL for all herbicide applications on Ailanthus. Glyphosate is not effective against Ailanthus.

INVASIVE SHRUBS

AUTUMN OLIVE (*Eleagnus umbellata*): Formerly recommended for erosion control and wildlife value, these have proved highly invasive and diminish the overall quality of wildlife habitat.
Control: (1) - up to 4" diameter trunks; (7) or (10) or bury stump. Do not mow.
MULTIFLORA ROSE (*Rosa multiflora*), formerly recommended for erosion control, hedges, and wildlife habitat, becomes a huge shrub that chokes out all other vegetation and is too dense for many species of birds to nest in, though a few favor it. In shade, it grows up trees like a vine. It is covered with white flowers in June. (Our native roses have fewer flowers, mostly pink.) Distinguish multiflora by its size, and by the presence of very hard, curved thorns, and a fringed edge to the leaf stalk.
Control: (1) - pull seedlings, dig out larger plants at least 6" from the crown and 6" down; (4) on extensive infestations; (10) or (11). It may remain green in winter, so herbicide may *applied when other plants are dormant. For foliar application, mix Rodeo with extra sticker-spreader, or use RoundupSureShot Foam on small plants.*

BUSH HONEYSUCKLES (*Lonicera spp.*), including Belle, Amur, Morrow's, and Tatarian honeysuckle. (In our region, assume that any honeysuckle is exotic unless it is a scarlet-flowered vine). Bush honeysuckles create denser shade than native shrubs, reducing plant diversity and eliminating nest sites for many forest interior species.
Control: (2) on ornamentals; (1); on shady sites only, brush cut in early spring and again in early fall (3); (4) during the growing season; (7); or (10) late in the growing season.

BLUNT-LEAVED PRIVET (*Ligustrum* obtusifolium). *Control*: (1); (7) or (10); or trim off all flowers. Do not cut back or mow.

BURNING BUSH, WINGED EUONYMUS (*Euonymus alatus*), identified by wide, corky wings on the branches.
Control: (1); (7) or (10); or trim off all flowers.

JAPANESE BARBERRY (*Berberis thunbergii*), and all cultivars and varieties.
Control: (1); (7) or (10); or trim off all flowers.

INVASIVE WOODY VINES

All of these vines shade out the shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle. DO NOT PLANT NEXT TO OPEN SPACE.

JAPANESE HONEYSUCKLE (*Lonicera japonica*), including Hall's honeysuckle, has gold-and-white flowers with a heavenly scent and sweet nectar in June. This is probably the familiar honeysuckle of your childhood. It is a rampant grower that spirals around trees, often strangling them.
Control: (1); (3); (10); (11) in fall or early spring when native vegetation is dormant. Plan to re-treat repeatedly.

ORIENTAL BITTERSWEET (*Celastrus orbiculatus*) has almost completely displaced American bittersweet (*C. scandens*). The Asian plant has its flowers and bright orange seed capsules in clusters all along the stem, while the native species bears them only at the branch tips.
Control: (1); keep ornamental plants cut back, remove all fruits as soon as they open, and bag or burn fruits; to eradicate use Garlon 3a (10).

JAPANESE KNOTWEED, MEXICAN BAMBOO (*Polygonum cuspidatum*) can grow in shade. The stems have knotty joints, reminiscent of bamboo. It grows 6-10' tall and has large pointed oval or triangular leaves.
Control: Cut at least 3 times each growing season and/or treat with Rodeo (10) or (11). In gardens, heavy mulch or dense shade may kill it.

INVASIVE HERBACEOUS PLANTS

GARLIC MUSTARD (*Alliaria petiolata, A. officinalis*), a white-flowered biennial with rough, scalloped leaves (kidney-, heart- or arrow-shaped), recognizable by the smell of garlic and taste of mustard when its leaves are crushed. (The odor fades by fall.)
Control: Pull before it flowers in spring (1), removing crown and roots. Tamp down soil afterwards. Once it has flowered, cut (2), being careful not to scatter seed, then bag and burn or send to the landfill. (11) may be appropriate in some settings.

JAPANESE STILT GRASS (*Microstegium vimineum*) can be identified by its lime-green color and a line of silvery hairs down the middle of the 2-3" long blade. It tolerates sun or dense shade and quickly invades areas left bare or disturbed by tilling or flooding. An annual grass, it builds up a large seed bank in the soil.

Control: Easily pulled in early to mid-summer (1) - be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to landfill. Mowing weekly or when it has just begun to flower may prevent it from setting seed (3). Use glyphosate (11) or herbicidal soap (less effective) on large infestations. Follow up with (5) in spring.

MILE-A-MINUTE VINE, DEVIL'S TAIL TEARTHUMB (*Polygonum perfoliatum*), a rapidly growing annual vine with triangular leaves, barbed stems, and turquoise berries in August which are spread by birds. It quickly covers and shades out herbaceous plants.
Control: same as for stilt grass.

SPOTTED KNAPWEED (*Centaurea maculosa*), a biennial with thistle-like flowers.
Control: Do NOT pull (1) unless the plant is young and the ground is very soft - the tap root will break off and produce several new plants. Wear sturdy gloves. (2); (6); (10) or (11).

CONTROL MEASURES

(1) PULL seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs.
(2) DEADHEAD to prevent spread of seeds of invasive plants. Cut off seeds or fruits before they ripen. Bag, and burn or send to a landfill.
(3) MOW or CUTTING at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year.
(4) CONTROLLED BURNING during the spring, repeated over several years, allows native vegetation to compete more effectively with the invasive species. This requires a permit. Spot treatment with glyphosate in late fall can be used to make this method more effective.
(5) Use a CORN-BASED PRE-EMERGENCE HERBICIDE on annual weeds. This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.
(6) In lawns, SPOT TREAT with BROAD-LEAF WEEDKILLER. Good lawn-care practices (test soil; use lime and fertilizer only when soil test shows a need; mow high and frequently; leave clippings on lawn) reduce weed infestations.
(7) CUT DOWN the tree. Grind out the stump, or clip off re-growth.
(8) GIRDLE tree: cut through the bark and growing layer (cambium) all around the trunk, about 6" above the ground. Girdling is most effective in spring when the sap is rising, and from middle to late summer when the tree is sending down food to the roots. Clip off sucker sprouts.
(9) FRILL: Using a machete, hatchet or similar device, hack scars (several holes in larger trees) downward into the cambium layer, and squirt in glyphosate (or triclopyr if recommended in text above). Follow label directions for Injection and Frill Applications. This is most effective from middle to late summer. Clip off any sucker sprouts or treat with glyphosate.
(10) CUT STEM / CUT STUMP WITH GLYPHOSATE (or triclopyr if specified above). Follow label directions for Cut Stump Application. Clip off sucker sprouts or paint with glyphosate. See Note on Herbicides.
(11) FOLIAR SPRAY WITH GLYPHOSATE herbicide (see Note on Herbicides). Use a backpack or garden sprayer or mist blower, following label directions. Avoid overspray and/or dripping onto non-target plants, because glyphosate kills most plants except moss. If it rolls off waxy or grass-like foliage, use additional sticker-spreader. Deciduous trees, shrubs, and perennials move nutrients down to the roots in late summer. Glyphosate is particularly effective at this time and when plants have just gone out of flowering. Several invasive species retain their foliage after native plants have lost theirs, and resume growth earlier in spring than most natives. This allows you to treat them without harming the natives. However, the plant must be actively growing for the herbicide to work. Retreatments may be necessary the following year if suckering occurs or the plant hasn't been entirely killed.

NOTE ON HERBICIDES: It is highly recommended that small populations try to be controlled using non-chemical methods wherever feasible. However, for large infestations, and for a few plants specified above, herbicide use is essential. Apply herbicides carefully to avoid non-target plants, glyphosate is the least environmentally damaging herbicide in most cases. Add food coloring for visibility, and a soap-based sticker such as Cide-Kick. Glyphosate is ineffective on some plants; for these, triclopyr (Garlon) may be indicated. When using herbicides, read the entire label and observe all precautions listed, including proper disposal. If in doubt, call your local Cooperative Extension Service.

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

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

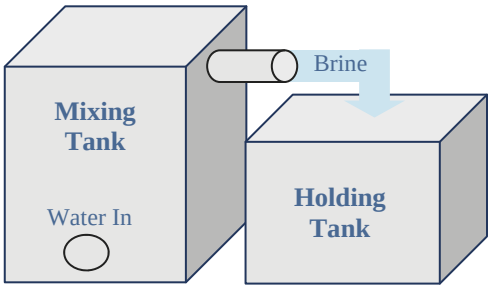
Calcium chloride brine costs about 7¢ / gallon (assuming $58/ton for salt) after you have your equipment setup.

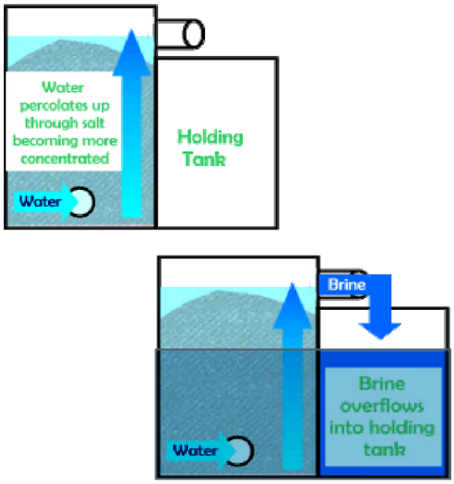
MULTIPLE USES

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

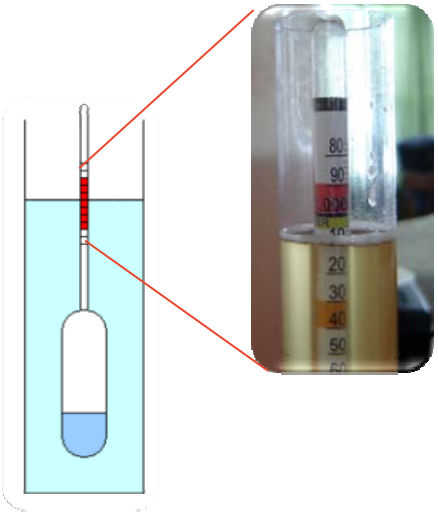
Add Salt: Add about 2.5 lb of salt per gallon of water you plan to add. Make sure your mixing tank has a large opening to make adding salt easy.

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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Material Storage and Housekeeping

NH Best Management Practices

IMPERMEABLE SURFACE STORAGE

Store salt and liquids on an impermeable surface to prevent groundwater contamination.

COVERED STORAGE AREAS

If possible, store your salt in a covered shed to prevent runoff. If there is not a shed available, cover your salt pile well with an impermeable membrane or tarp.

SECONDARY CONTAINMENT

Keep your liquids in an appropriate storage container. Secondary containment should be used incase a leak develops in the primary container.

PROPER DRAINAGE & COLLECTION

Protect your ground water supply! A drainage system should be in place to collect runoff from your salt pile, as well as to collect any liquids that may escape containment. Remember, the collected liquid can be used as a base for salt brine.

Proper Material Storage

Proper storage of materials (especially chemicals) is essential. If impermeable surfaces are NOT used in your storage facilities and brine infiltrates the ground or groundwater, you need to register with the DES under the Groundwater Discharge Permit and Registration Rules, Env-Wq 402. It is a free registration used for tracking potential contaminant sources.

Secondary Containment

Secondary containment for your liquid storage is a HIGHLY recommended technique to help reduce soil and groundwater contamination. If a tank Begins leak, the secondary containment prevents liquid from seeping into sensitive environments.

Liquid Storage

Brine stored using holding tanks must be managed so that there are no releases to drains, groundwater or surface water.


ENVIRONMENTAL
Fact Sheet
Environmental Services

Storage and Management of Deicing Materials

Need for Proper Management

NHDES Fact Sheet DWGB-22-30

This fact sheet outlines the basic required specifications for salt and chemical storage facilities. For additional information, please contact the Drinking Water and Groundwater Bureau at (603)271-2513 or dwgbinfo@des.nh.gov, or visit their website at: http://des.nh.gov/organization/divisions/water/dwgb/index.html. *The Salt Storage Handbook* contains more information and guidelines that should be referenced.

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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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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:

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

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.

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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)
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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:

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

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?

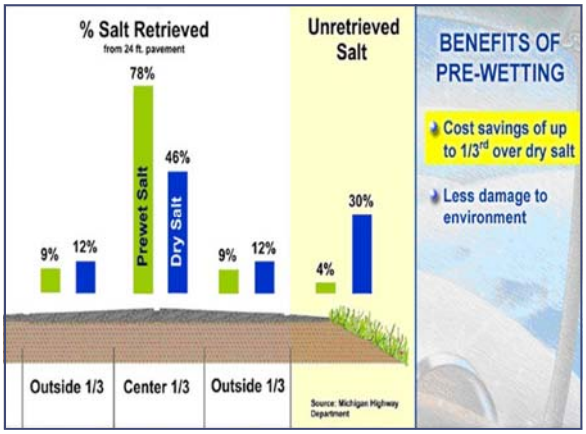
De-icing chemicals must form a brine before they can begin melting ice. Pre-wetting your chemicals accelerates the brine making process, which improves the melting action of the material. Pre-wetting also reduces bounce and scatter of material during spreading, and reduces the total amount of de-icer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

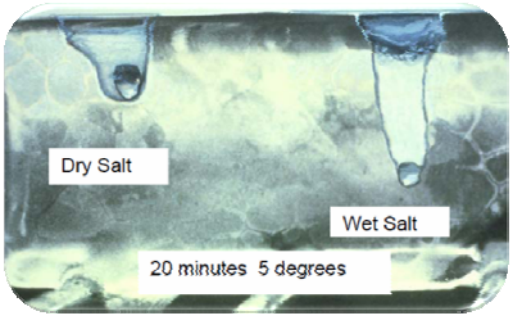


Pre-wetting Liquids

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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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

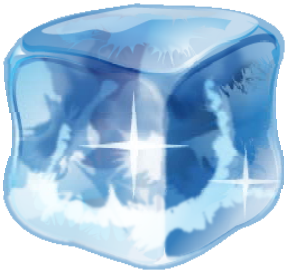
Dry salt becomes ineffective below 15°F if possible wait until the temperature rises before applying salt. At 30°F 1 lb of salt can melt 46.3 lb of ice in 5 minutes. At 15°F 1 lb of salt can melt 6.3 lb of ice in 1 hour.

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!

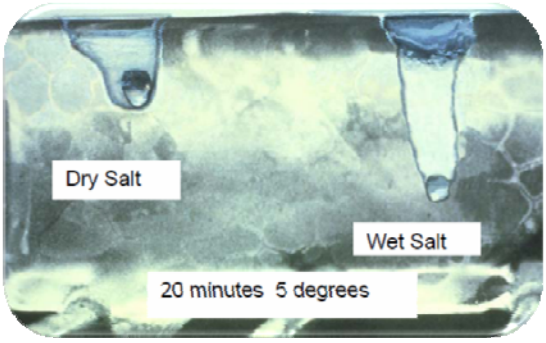


Why Use Salt?

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.

Produced in partnership with:

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

New Hampshire DOT

Technology Transfer Center
New Hampshire LTAP at UNH

ENVIRONMENTAL
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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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

WD-DWGB-3-17 2019

Sodium and Chloride in Drinking Water

INTRODUCTION AND OCCURRENCE

"Salt in drinking water" refers to sodium and chloride levels in your well water. Every water supply contains some natural levels of sodium and chloride and those levels tend to vary based on a water supply's location relative to both natural and cultural features. Overall, sodium and chloride are not major contaminants in the water served by community public water systems in New Hampshire.

Background levels of sodium and chloride for non-developed areas in New Hampshire are typically less than 20 to 30 milligrams per liter (mg/L) or part per million (ppm). Elevated levels of sodium and chloride occur naturally in seacoast area due to air-blown marine spray. Concentrations in groundwater in the seacoast area typically range up to 75 mg/L sodium and 150 mg/L chloride, respectively. Levels of sodium and chloride that are substantially higher than the levels above tend to imply contamination by human activities, including road salt storage/use, discharges from water softeners, human or animal waste disposal, septic systems, and other activities.

HEALTH EFFECTS, STANDARDS AND ADVISORIES

At present, there are no federal or state primary health-based drinking water standards for sodium or chloride. Although there is sufficient scientific evidence that shows that the vast majority of sodium ingestion is from food rather than drinking water, EPA has recommended a drinking water advisory level of 20 mg/L sodium for those persons on a physician-prescribed "no salt diet" related to hypertension treatment.

EPA has identified a secondary or aesthetic standard for chloride of 250 mg/L as a concentration at which chloride can be expected to cause a salty taste in drinking water. New Hampshire has adopted 250 mg/L chloride and 250 mg/L Sodium as state secondary standards under Env-Dw 706.

TESTING

Obtain water sample bottles by contacting an accredited laboratory from the list provided at des.nh.gov, or a web search for "NHDES Private Wells." NHDES recommends testing for the "Standard Analysis" suite of parameters which includes sodium, chloride, bacteria, arsenic, lead, uranium and other important water quality parameters. NHDES recommends testing for the standard analysis suite **every 3 to 5 years**. Samples for sodium and chloride can be collected from any tap in the house and do not require any special handling requirements.

MITIGATION AND TREATMENT

Reducing Contamination Sources

The best method to control sodium and chloride in drinking water is to better manage those activities that add salt into or onto the ground. The following are the most common sources:

Water softeners – Sodium is added to drinking water directly during the water softening process, and concentrated brine is discharged into the subsurface through a home's septic system or drywell. The amount of salt use and discharges from home softening systems can be reduced by a) Avoiding hardness removal unless necessary for levels of 150 mg/L or higher; b) Using non-salt treatment technologies for iron / manganese, c) Selecting "on-demand" equipment regeneration based on actual water use instead of timer-based, d) If softening is necessary, treat only the hot water in your home, and e) Reducing your softener brine setting from the standard 10-12 lb/CF to 6-8 lb/CF of salt.

Road Salt / Sand Mix – The application of deicing salts to roads is an important component of maintaining road safety. The environmental impact of deicing salts on water supply sources can be minimized by use of best management practices in applying salt to impervious surfaces. Various tactics related to applying road salt like modifying the sand-to-salt ratio, pre-applying lesser amounts of salt before freezing conditions occur, or use of liquid salt solutions generally result in less salt loading to the road surface while maintaining public safety for road travel. For more information concerning road salt management and the effect of road salt on water quality, see NHDES fact sheet WD-WMB-4, "Road Salt and Water Quality."

Septic Discharges – Elevated sodium and/or chloride may also be indicators of domestic discharges to septic systems. Review the proper setbacks and potential influence from your or your neighbor's septic tank and leachfield, and perform additional sampling for bacteria, nitrates and other dissolved solids. If identified as the likely source of sodium and chloride, immediate steps should be taken to BOIL or use alternate water for cooking and drinking and to replace the well source to reduce risk of exposure to acute contaminants.

Water Treatment - Point of Use Reverse Osmosis

The recommended treatment to remove sodium and chloride from drinking water is Point of Use (POU) Reverse Osmosis (RO) filtration. RO treatment efficiency is only about 25% (1 gallon treated to 3-4 wasted) such that it is best applied only to the water used for drinking and cooking. The "reject" wastewater is directed to the septic system or a drywell, while filtered water is stored in a small pressure tank and dispensed through a dedicated tap. A major benefit of this technology is that it reduces all dissolved water constituents, including smaller ions such as sodium and chloride. Equipment costs for POU-RO range from $150 to over $1,000, but generally have similar performance in terms of salt removal. Look for equipment certified under NSF/ANSI 58 for RO systems.

FOR MORE INFORMATION

Contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov, or visit us at www.des.nh.gov. You may also input your water test results to the NHDES Be Well Informed water treatment application (available via an internet search) to interpret your results and identify appropriate treatment options.

Note: This fact sheet is accurate as of June 2019. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.

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 industry who 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 http://t2.unh.edu/green-snowpro-training-and-certification

For more information:

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

***Contact**: Salt Coordinator*
salt@des.nh.gov
(603) 271-5329

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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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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.

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WD-WMB-4 2016

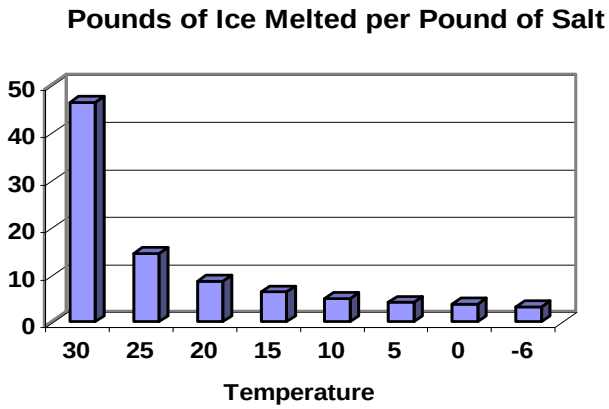
Road Salt and Water Quality

The amount of snowfall in New Hampshire and the necessity of overland travel require winter snow and ice management by the state, the municipalities, and the private sector. Deicing materials are often used in order to keep the public safe during these winter weather events. The most commonly used de-icing chemical is sodium chloride (NaCl) also known more commonly as road salt. Road salt is relatively inexpensive with an average cost of $50 - $60 per ton. Road Salt is readily available and easy to handle, store, and spread. Its purpose is to reduce the adherence of snow and ice to the pavement, preventing the formation of hard pack. Once hard pack forms, it is difficult to remove by plowing alone.

In the United States from 2005-2009 an average of 23 million tons of salt were applied to our roads, parking lots, sidewalks and driveways each year.[1] Studies have shown that, in urbanized areas, about 95 percent of the chloride inputs to a watershed are from road and parking lot deicing. In four chloride impaired watersheds in the southern I-93 corridor of New Hampshire, road salt sources were 10-15 percent from state roads, 30-35 percent from municipal roads, and 45-50 percent from private roads and parking lots.

How Salt Works

The first step in melting ice is to lower its freezing point. This is done through the formation of brine where salt crystals pull water molecules out of ice formation. Once the brine is formed, melting is greatly accelerated. The rate at which melting occurs is dependent on the temperature. Sodium chloride loses its effectiveness (has difficulty going into solution) when temperatures fall below 15° F. Applications below this temperature, even at high rates, will not result in significant snow or ice melting; therefore, it is critical to know the current and expected temperature range of the winter weather event.



Graph obtained from The Salt institute FY03 Snow & Ice Fact #20

What Happens to Salt in the Environment

The applied salt dissolves into 40 percent sodium ions (Na+) and 60 percent chloride ions (Cl-) in the melting snow and ice and make their way into our environment.

Chloride(Cl-): Chloride is highly soluble, very mobile, and its density allows for it to settle to the bottom of a waterbody. Chloride is toxic to aquatic life at levels above 230 mg/l, which is the state water quality standard.

[1] U.S. Geological Survey, Mineral Commodity Summaries, January 2010

There is no natural process by which chlorides are broken down, metabolized or taken up by vegetation. In 2008, New Hampshire listed 19 water bodies impaired by chloride; by 2016 that number increased to 46. Trends show that chloride levels continue to rise with increasing use of road salt. Although chloride does not pose a human health concern, it can affect the taste of drinking water.

Sodium (Na+): The transport of sodium in the environment is not as prominent as chloride due to ion exchange; however, this exchange can alter the soil chemistry by replacing and releasing nutrients such as calcium, magnesium and potassium into the groundwater and surface water. This can lead to increased nutrient concentrations and affect the ability of the water to buffer acid deposition impacting the aquatic environment. Contamination of sodium in drinking water is a concern for individuals restricted to low-sodium diets due to hypertension (high blood pressure). The USEPA has set an advisory limit for drinking water for public water systems at 20mg Na/L to assist doctors in making recommendations for those patients on a salt restricted diet.

Road Salt Additives: Additives to road salt like ferrocyanide, which is used as an anti-caking compound in large salt supplies, can have impacts on both the environment and human health due to cyanide ions being released by certain types of bacteria as well as from exposure to sunlight. The USEPA in 2003 added this compound to its list of toxic pollutants under section 307(a) of the Clean Water Act.

Road Salt Management Issues

For many road managers and parking lot maintainers the winter maintenance goal is to obtain bare and dry pavements at the earliest practical time following cessation of a storm for effective regular high-speed travel and pedestrian safety. Traffic, volume, speed and gradient are the primary factors in determining the level of winter maintenance service for State and municipal roads. Pedestrian travel along with slip and fall liability are the priority for landowners and private sector operators.

A road manager's duty entails awareness of the current and expected weather events, temperatures, equipment capabilities, de-icing chemical inventories, application rates, driving routes, as well as staffing availability for each winter storm event. Expectations from the driving public, property managers and customers along with balancing the environmental effects of de-icing chemicals makes the job of these managers challenging.

Another concern to road managers, property owners, and to citizens is the damage and cost to infrastructure and vehicles associated with road salt use. Corrosion of concrete reinforcing rods in roads, bridges, parking garages along with the cost of corrosion protection practices for highways and the automobile industry cost a staggering $16 billion-$19 billion a year.[2] Road salt alternatives that help reduce the cost to infrastructure and limit the environmental impact are critical.

Best Management Practices

Following best management practices and recommendations can help in effective and efficient use of de-icing materials while reducing the impact and preserving the quality of our freshwaters.

Application of Road Salt

- Plow, shovel, and blow the snow. Use mechanical means to remove snow, do not use salt or other de-icing chemical to "burn-off" snow and ice.

[2] Adapted from Report of the Salt Use Subcommittee to the Commission on the Environment on Road Salt Use and Recommendations City of Madison, Wisconsin December 2006

- Calibrate your equipment. Knowing your equipment is calibrated and the application rate is accurate will save chemical cost and will reduce the environmental impacts. Calibrate annually and keep a record in the vehicle for spreader settings.
- Choose the right material and apply the correct amount. Know the limits of deicing chemicals. Rock salt is not effective at temperatures below 15°F no matter how much is applied. Check application rates given the current weather conditions.
- Use ground speed controls on your spreader. Application rates should correspond with vehicles speed.
- Pre-wet the salt. Adding brine to salt before it is applied will jump start the melting process and help keep the salt in place by reducing bounce and scatter. Pre-wetting salt can reduce application rates by 20 percent. Typical rates are 8-10 gallons of pre-wet liquid to 1 ton of salt.
- For road applications place salt in a windrow near the centerline. Less salt is wasted and traffic will help work the salt into brine and move it to the shoulder of the road.
- Use anti-icing. Be proactive by applying de-icing chemical prior to snow and ice accumulation. It can reduce the amount of chemical needed by 30 percent. Know when to take action; time plowing operations to allow maximum melting by salt before snow is plowed off the road or parking lot.
- Don't mix salt and sand. Salt is for melting and sand is for traction on top of the ice, they work against each other.
- Be familiar with sensitive areas, such as public water supplies, impaired waters and other water sources. Consider designating reduced salt areas or identifying safe alternatives to road salt in these areas.
- Create a winter snow and ice control policy. Outlining your levels of service, application rates, and plowing frequency and practices provide a reference for decision makers and staff.
- Keep a winter storm log. Record storm events, time, application rates, and other important information describing maintenance activities and results.
- Attend training workshops, become NH Green SnowPro Certified, and stay up to date with new technologies and practices.
- For additional information on training, please refer to UNH Technology Transfer Center training.

Storage and Handling

Salt, sand, and snow storage facilities have the potential to cause water pollution due to runoff. For maximum environmental protection, all salt storage facilities and piles should be covered and placed on an impervious surface with adequate drainage controls to prevent runoff. This is also important for sand piles that may contain a small percentage of salt to prevent the pile from freezing. Take care while loading salt, sand or chemicals and clean up any spills that occur. Snow piles should be kept away from water sources and below areas where salt is stored. Vehicle washing facilities should have proper drainage to avoid discharge into surface and ground waters.

To obtain more information, please see the following NHDES fact sheets.

- Snow Dumping WD-WMB-3
- Holding Tanks for Floor Drains WD-DWGB-22-8
- Storage and Management of Salt Deicing Materials WD-DWGB-22-30
- Car Washes and Water Quality WD-WMB-14

Alternatives to Road Salt

Environmental impact should be considered when selecting any de-icing chemical or product. Many of the road salt alternatives have a relatively short history or limited amount of use. It is unclear what the potential

long term impacts will be for many of these chemicals. Ongoing research, data analysis, and documentation in scientific literature of non-corrosive and environmentally friendly chemicals are necessary.

Calcium Chloride (CaCl) – is the second most common used chemical, it is available in flake, pellet or liquid. It is effective at lower temperatures with a practical melting temperature of -20°F. In liquid form it can be used to pre-wet salt or applied directly as an anti-icing technique which can help in preventing snow and ice from bonding to the pavement and reduce the application amount needed. Several disadvantages to CaCl include a higher cost, environmental impact due to chloride, corrosive to metal, it can be difficult to handle and store, and can contribute to slippery conditions if applied incorrectly.

Potassium chloride (KCl) – is a naturally occurring material (muriate of potash) that also is used as fertilizer. It is available in liquid or crystal with a practical melting temperature of 20°F. It can be damaging to concrete, has environmental impacts due to chloride and can inhibit plant growth and burn foliage.

Magnesium Chloride (MgCl) – is available in liquid or crystal form that melts faster than rock salt; it has a practical melting temperature of 5°F. MgCl attracts moisture and can lead to slippery conditions if applied incorrectly. It is corrosive and contributes to the chloride load in our waters.

Urea – is used primarily as fertilizer with a practical melting temperature of 25°F. It releases nitrogen into the soil and can lead to a chemical imbalance in water systems due to nutrient loading. Urea is corrosive and breaks down rapidly into ammonia, which is released into the environment.

Potassium Acetate (KA) – has a practical melting temperature of -15°F and is biodegradable and non-corrosive. It can cause slick road conditions if applied in excess and can lower oxygen levels in the waterbody. This is a commonly used deicer in the airline industry and is relatively non corrosive.

Calcium Magnesium Acetate (CMA) – is made from limestone and acetic acid. Its lowest practical melt temperature is 20°F. It is less damaging to soils and vegetation, less corrosive to concrete and steel, less toxic to aquatic organisms, and has limited impact on ground water in comparison to road salt. It is much more expensive than road salt but a full cost analysis may show that is it an economically viable choice given its benefits. It is currently being used in environmentally sensitive areas and on bridges prone to salt corrosion.

Agricultural by-products – are mostly proprietary to the manufacturer and can be derived from sources such as corn, beet, grain, alcohol, or molasses. These products are not good at melting snow and ice; however, they do slow down the formation of ice crystals by having a lower freezing point. They are less corrosive than conventional materials and in many cases act as tackifiers to keep product on the road surface. These attributes make the product good for anti-icing and pre-treating salt. They do have environmental impacts in aquatic systems due to their organic nature and can lead to biological oxygen demand, heavy metals, and nutrient enrichment by nitrogen and phosphorus in our waters.

For Additional Information

For more road salt and water quality information, visit the NHDES New Hampshire Road Salt Reduction Initiative website or contact the NHDES Watershed Assistance Section at (603) 271-7889 or salt@des.nh.gov.

For information on road salt and drinking water, see fact sheet "DWGB-3-17 Sodium and Chloride in Drinking Water" or contact the Drinking Water and Ground Water Bureau at (603) 271-2513.

Note: This fact sheet is accurate as of August, 2016. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.

ENVIRONMENTAL Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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WD-WMB-24 2014

Snow and Ice Removal for the Business Owner
Clean Water and Safe Parking Lots

New Snow and Ice Liability Protection in New Hampshire

Under a new law, RSA 489-C, *Salt Applicator Certification Option* (effective November 1, 2013), any business owner who contracts for snowplowing and deicing with a "certified" salt applicator, has liability protection from damages arising from hazards caused solely by snow or ice. The "certified" applicator is a snow removal contractor (contractor) who has undertaken specialized training through the University of New Hampshire "Green SnowPro Program" in the "how to's" of efficient application of road salt (sodium chloride). In addition to providing limited liability protection, hiring a Green SnowPro certified contractor will:

- Increase the efficiency of removing snow and ice while ultimately decreasing the amount of road salt that is applied to the parking areas that they care for.
- Potentially save the business owner money through reduced salt use.
- Reduce impacts to the surrounding environment by protecting our ground water and nearby streams, ponds and lakes from potential chloride contamination from runoff that often originates from parking lot areas.
- Minimize the salt and sand that is often tracked into the lobbies and offices at one's facility.
- Protect the landscape plantings (the trees, shrubs, and grass) and soil that often surround a parking area.

As many business owners have already learned, the level of service (how effectively a parking area can be managed for customer satisfaction) and customer safety, *are actually increased* substantially by more efficient salt use and not compromised as once traditionally thought. In our more urban areas, up to 50 percent of the chloride polluting local waterbodies originates from commercial parking lots. Business owners can minimize their cumulative impact on the environment by engaging certified salt applicators and implementing best management practices for salt reduction. Encourage your current contractor to look into the Green SnowPro program at the University of New Hampshire: http://t2unh.edu/green-snowpro-training-and-certification or by calling Amy Begnoche, the Training Program Manager at (603) 862-2826.

NEW HAMPSHIRE CERTIFIED GREEN SnowPro

Snow and Ice Removal Tips

The following additional tips may also improve the success of winter snow and ice removal activities:

1) As stated above, contract for snow removal with a "certified" Green SnowPro contractor. Provide your company with important liability protection and maximize the usefulness and safety of your parking area for your customers during the wintertime by hiring these specially trained individuals.
2) Before the snow season, review the existing building design and layout with your contractor to assist in facilitating "mechanical" snow removal, a preferred method of removing snow and ice (mechanical snow removal is the removal of snow with plow equipment or by hand shoveling without the use of any de-icer). Identify where snow will be piled, and high priority pedestrian and vehicle traffic expectations.
3) Encourage mechanical snow removal as early as possible at the onset of a storm. This helps to prevent snow and ice from adhering to the parking lot pavement initially and normally requires less salt application(s) during the full course of the storm.
4) If possible, consider not maintaining low use areas in the winter. SIMA, a national organization representing the snow and ice removal industry, has observed that in large parking lots, customers routinely park in small, confined areas at the entrances of the respective businesses. After the Holiday rush (where full parking capacity may be required), consider reducing the size of the parking area normally maintained, thus reducing overall plowing cost and application of road salt.
5) Ask important questions. For example, does your contractor calibrate his/her salt spreader each year – this alone can improve efficiency and reduce the amount of salt that is spread by 5 to 7 percent. Involvement by management will improve snow removal activities and should ultimately reduce overall cost.
6) Ask your contractor if they are using infrared thermometers to reduce potential salt applications. It's all about temperature, temperature, temperature…studies show that parking lot pavement temperatures are usually warmer than air temperatures, particularly during the day. This means that there are many times when the pavement temperature will be above freezing even when air temperatures are well below freezing. Understanding this, a follow-up application of salt may not be necessary. At the opposite end, an application of road salt (sodium chloride) is generally not effective under 15 degrees Fahrenheit. It may be better during these periods to apply an abrasive like sand and wait to reapply road salt when the temperature rises again.
7) Direct your contractor to plow snow to the low side of the paved parking area. This will help to concentrate the snow piles away from customer service areas and may help to prevent slippage by customers on ice caused by the daily melting of snow piles.
8) Cover any sand and sand/salt mixtures stored within a parking area for treatment purposes to prevent salt from being washed or blown from the pile (studies have shown where 50 percent of this pile can be carried away).
9) Where possible, direct your contractor to use *drop-type* rather than *broad-cast* spreaders on sidewalks to increase the amount of material retained on the sidewalks to work. This will also help to limit salt damage to vegetated areas adjacent the sidewalks.
10) Encourage your contractor to use *anti-icing* measures before the storm. A concentrated liquid *anti-icing* product (brine) applied before the start of a snow storm has the advantage of preventing snow and ice from bonding to the pavement and accelerates the melting process. This practice can reduce slippery conditions more quickly to begin with, ultimately significantly decreasing the amount of sodium chloride that is applied to parking areas.

11) Encourage your contractor to use *pre-wetting* measures (where brine is used to wet sodium chloride) which increase the efficiency and speed at which the salt melts the ice. *Pre-wetting* through the use of saddle tanks mounted next to the salt hopper on the truck or by pre-wetting a pile of sodium chloride beforehand should also be considered as a worthy alternative and can provide another means of reducing the total application of salt. Both *anti-icing* and *pre-wetting* measures, when compared to other salt reducing efforts, are generally more effective at reducing substantial tonnage of salt.

The success of any salt reduction program requires effective procedures, the introduction of new salt reducing equipment or measures, and specialized training. Success will require the acceptance of these approaches by the business owner, property manager or supervisor, and the contractor; and most importantly a willingness to work together. For more information, please contact Patrick Woodbrey at the NHDES Watershed Assistance Section: (603) 271-5329 or patrick.woodbrey@des.nh.gov or visit the NHDES NH Road Salt Reduction Initiative Website: http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/index.htm

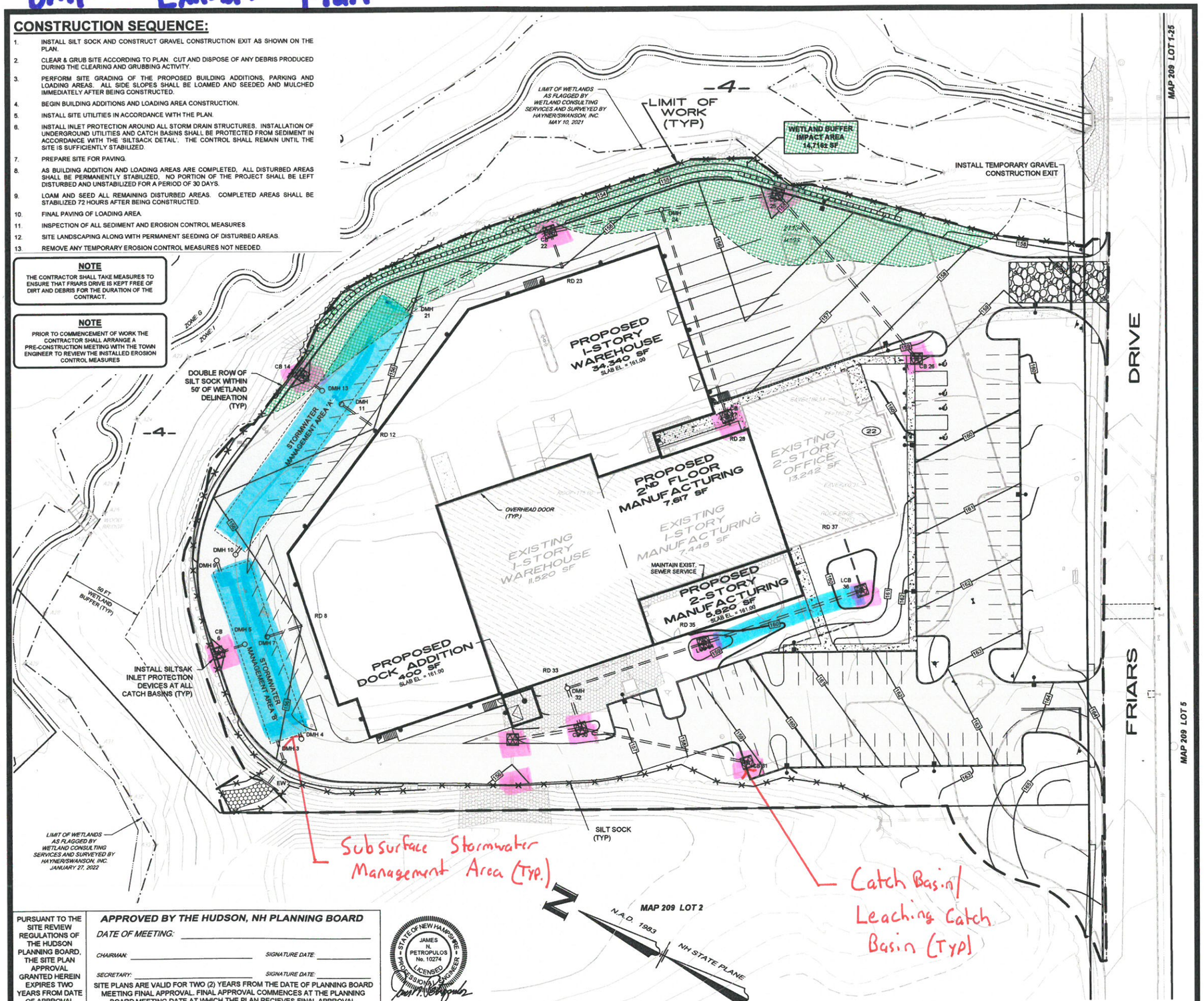
BMP Exhibit Plan

CONSTRUCTION SEQUENCE:

1. INSTALL SILT SOCK AND CONSTRUCT GRAVEL CONSTRUCTION EXIT AS SHOWN ON THE PLAN.
2. CLEAR & GRUB SITE ACCORDING TO PLAN. CUT AND DISPOSE OF ANY DEBRIS PRODUCED DURING THE CLEARING AND GRUBBING ACTIVITY.
3. PERFORM SITE GRADING OF THE PROPOSED BUILDING ADDITIONS, PARKING AND LOADING AREAS. ALL SIDE SLOPES SHALL BE LOAMED AND SEEDED AND MULCHED IMMEDIATELY AFTER BEING CONSTRUCTED.
4. BEGIN BUILDING ADDITIONS AND LOADING AREA CONSTRUCTION.
5. INSTALL SITE UTILITIES IN ACCORDANCE WITH THE PLAN.
6. INSTALL INLET PROTECTION AROUND ALL STORM DRAIN STRUCTURES. INSTALLATION OF UNDERGROUND UTILITIES AND CATCH BASINS SHALL BE PROTECTED FROM SEDIMENT IN ACCORDANCE WITH THE 'SILTSACK DETAIL'. THE CONTROL SHALL REMAIN UNTIL THE SITE IS SUFFICIENTLY STABILIZED.
7. PREPARE SITE FOR PAVING.
8. AS BUILDING ADDITION AND LOADING AREAS ARE COMPLETED, ALL DISTURBED AREAS SHALL BE PERMANENTLY STABILIZED. NO PORTION OF THE PROJECT SHALL BE LEFT DISTURBED AND UNSTABILIZED FOR A PERIOD OF 30 DAYS.
9. LOAM AND SEED ALL REMAINING DISTURBED AREAS. COMPLETED AREAS SHALL BE STABILIZED 72 HOURS AFTER BEING CONSTRUCTED.
10. FINAL PAVING OF LOADING AREA.
11. INSPECTION OF ALL SEDIMENT AND EROSION CONTROL MEASURES.
12. SITE LANDSCAPING ALONG WITH PERMANENT SEEDING OF DISTURBED AREAS.
13. REMOVE ANY TEMPORARY EROSION CONTROL MEASURES NOT NEEDED.

NOTE
THE CONTRACTOR SHALL TAKE MEASURES TO ENSURE THAT FRIARS DRIVE IS KEPT FREE OF DIRT AND DEBRIS FOR THE DURATION OF THE CONTRACT.

NOTE
PRIOR TO COMMENCEMENT OF WORK THE CONTRACTOR SHALL ARRANGE A PRE-CONSTRUCTION MEETING WITH THE TOWN ENGINEER TO REVIEW THE INSTALLED EROSION CONTROL MEASURES



PURSUANT TO THE SITE REVIEW REGULATIONS OF THE HUDSON PLANNING BOARD, THE SITE PLAN APPROVAL GRANTED HEREIN EXPIRES TWO YEARS FROM DATE OF APPROVAL

APPROVED BY THE HUDSON, NH PLANNING BOARD

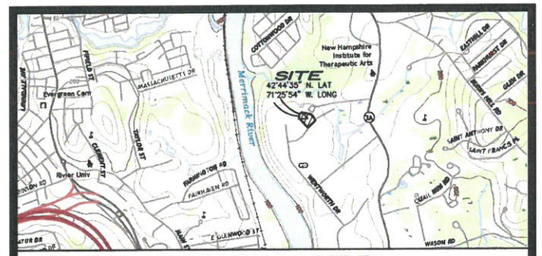
DATE OF MEETING: _____

CHAIRMAN: _____ SIGNATURE DATE: _____

SECRETARY: _____ SIGNATURE DATE: _____

SITE PLANS ARE VALID FOR TWO (2) YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN RECIEVES FINAL APPROVAL.

STATE OF NEW HAMPSHIRE — JAMES N. PETROPULOS No. 10274 LICENSED PROFESSIONAL ENGINEER



VICINITY MAP

GENERAL NOTES:

1. ALL CONTRACTORS AND SUBCONTRACTORS INVOLVED WITH THE PROJECT SHALL OBTAIN A COPY OF THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT (NPDES PERMIT) AND SHALL COMPLY WITH THE TERMS OF SWPPP AND NPDES PERMIT.
2. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES AS REQUIRED BY THE SWPPP. ADDITIONAL BEST MANAGEMENT PRACTICES SHALL BE IMPLEMENTED AS DICTATED BY SITE CONDITIONS AT NO ADDITIONAL COST OF OWNER THROUGHOUT ALL PHASES OF CONSTRUCTION.
3. BEST MANAGEMENT PRACTICES (BMP'S) AND CONTROLS SHALL CONFORM TO FEDERAL, STATE, OR LOCAL REQUIREMENTS OR MANUAL OF PRACTICE, AS APPLICABLE. CONTRACTOR SHALL IMPLEMENT ADDITIONAL CONTROLS AS DIRECTED BY PERMITTING AGENCY OR OWNER.
4. STOCKPILE AREAS SHALL BE SURROUNDED BY SILT SOCK AND RE-SEEDED IF THEY ARE LEFT UNTOUCHED FOR MORE THAN FOURTEEN (14) DAYS.
5. ALL MEASURES STATED ON THIS EROSION CONTROL PLAN, AND IN THE STORMWATER POLLUTION PREVENTION PLAN, SHALL BE MAINTAINED IN FULLY FUNCTIONAL CONDITION UNTIL NO LONGER REQUIRED FOR A COMPLETE PHASE OF WORK OR FINAL STABILIZATION OF THE SITE. ALL EROSION CONTROL MEASURES SHALL BE CHECKED BY A QUALIFIED PERSON IN ACCORDANCE WITH THE CONTRACT DOCUMENTS OR THE APPLICABLE PERMIT, WHICHEVER IS MORE STRINGENT.
6. SILT SOCK SHALL BE REPAIRED TO THEIR ORIGINAL CONDITIONS IF DAMAGED.
7. INLET PROTECTION DEVICES AND BARRIERS SHALL BE REPAIRED OR REPLACED IF THEY SHOW SIGNS OF UNDERMINING OR DETERIORATION.
8. ALL SEEDED AREAS SHALL BE CHECK REGULARLY TO SEE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED, WATERED AND RESEEDED AS NEEDED.
9. THE CONSTRUCTION EXIT SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHT-OF WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING OF THE CONSTRUCTION EXIT AS CONDITIONS DEMAND.
10. THE TOWN OF HUDSON RESERVES THE RIGHT TO REQUIRE ADDITIONAL EROSION CONTROL MEASURES DURING CONSTRUCTION IF NEEDED.

LEGEND

- EXISTING GROUND CONTOUR
- 100 PROPOSED GRADE
- F RUNOFF DIRECTION
- SILT SOCK PERIMETER BARRIER
- SILT-SACK INLET PROTECTION DEVICES
- GRAVEL CONSTRUCTION EXIT
- TEMPORARY STONE CHECK DAM

No.	DATE	REVISION	BY

EROSION CONTROL PLAN
(MAP 209, LOT 4)

PROPOSED BUILDING ADDITIONS

22 FRIARS DRIVE
HUDSON, NEW HAMPSHIRE

PREPARED FOR/RECORD OWNER:

INTEGRA BIOSCIENCES CORP.

2 WENTWORTH DRIVE HUDSON, NEW HAMPSHIRE 03051 (603) 578-5800

30 0 30 60 90 120 FEET
15 0 15 30 METERS
SCALE: 1"=30 Feet
1"=9.144 Meters

27 JANUARY 2022

HSI Hayner/Swanson, Inc.
Civil Engineers/Land Surveyors
3 Congress Street Nashua, NH 03062 (603) 883-2057
131 Middlesex Turnpike Burlington, MA 01803 (781) 203-1501
www.hayner-swanson.com

FIELD BOOK: 1234	DRAWING NAME: 5734 SITE-ER31	5734 File Number	6 OF 15 Sheet
DRAWING LOC: J:\5000\5734\DWG\5734 SITE 2021			

INFILTRATION FEASIBILITY REPORT

Proposed Building Additions
Site Plan
22 Friars Drive
Hudson, NH

The proposed development project contains three stormwater practices that will require infiltration to properly function. The project proposes two subsurface Stormtech MC-3500 chambered systems (SMA A & SMA B) and one subsurface infiltration trench (SMA C).

A. Location of the practice:

- Stormwater Management Area 'A' (SMA A) Located in the northeastern portion of the site adjacent to the proposed warehouse addition and under the proposed loop access driveway.
- Stormwater Management Area 'B' (SMA B) – Located in northern portion of the site adjacent to the proposed warehouse addition and under the proposed loop access driveway.
- Stormwater Management Area 'C' (SMA C) – Located in western portion of the site under a grassed area adjacent to the proposed manufacturing addition.

B. Existing Topography:

The subject property is currently developed as a manufacturing/warehouse/office building. Parking/loading and driveway areas surround the building on all sides. There is moderate sized grassed area to the north of the building adjacent to the existing access driveway. The site contains mild topography and generally slopes in three directions. The majority of the site slopes in a northerly and easterly direction towards an existing watercourse along the property boundary. A smaller portion of the site slopes in a westerly direction towards a drainage easement along the western property boundary.

C. Test Pit Locations:

HSI witnessed several test pits performed throughout the site, including in the area of the proposed stormwater management areas. The plans show the test pit locations on the site.

D. Test Pit Logs:

Test pits logs are attached as part of this report.

E. Soil Plan in the area of the proposed stormwater practices:

According to NRCS Soils mapping, the subject property contains mostly Windsor and Hinckley loamy sands (WdD, WdB and HsC) and a small amount of Pipestone loamy sand (PiA) type soils.

F. Summary of Estimated Seasonal High-Water Table (ESWHT) at proposed stormwater practices:

Practice Location	Bottom of Practice Elevation	Test Pit Location	ESHWT Elevation
SMA A	148.25	TP-2	147.40*
SMA B	148.25	TP-1	148.25*

*ESHWT not encountered at bottom of test pit

HSI #5734		TEST PITS:	FOR DRAINAGE
MAP 209 LOT 4		WEATHER:	34° CLEAR
INTEGRA BIOSCIENCES CORP.		EQUIPMENT:	KUBOTA KX161-3 MINI EXCAVATOR
22 FRIARS DRIVE		LOGGED BY:	PAUL CARIDEO, NHDES PERMIT #68
HUDSON, NH			

TEST PIT # 1 DATE: 12/28/21

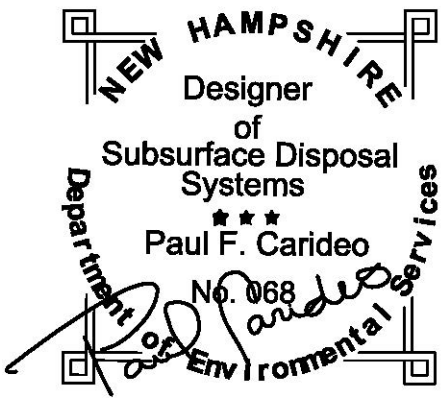
0-14" 10YR 3/3, DARK BROWN, SANDY LOAM FILL, FINE GRANULAR, VERY FRIABLE WITH FEW ROOTS
14-96" 10YR 5/4, YELLOWISH BROWN, MEDIUM SAND, SINGLE GRAIN, LOOSE WITH FEW ROOTS TO 38"

ESHWT: NONE OBSERVED OWT: NONE ROOTS: 38" LEDGE: NONE

TEST PIT # 2 DATE: 12/28/21

0-4" 10YR 3/3, DARK BROWN, SANDY LOAM FILL, FINE GRANULAR, VERY FRIABLE WITH FEW ROOTS
4-8" 10YR 3/2, VERY DARK GRAYISH BROWN, FINE SANY LOAM, WEAK FINE GRANULAR, VERY FRIABLE WITH MANY ROOTS
8-20" 10YR 5/6, YELLOWISH BROWN, SANDY LOAM, FINE GRANULAR, VERY FRIABLE WITH COMMON ROOTS
20-36" 10YR 5/3, BROWN, MEDIUM SAND, SINGLE GRAIN, LOOSE WITH FEW ROOTS
36-88" 10YR 5/4, YELLOWISH BROWN, MEDIUM SAND, SINGLE GRAIN, LOOSE WITH FEW ROOTS
88-96" 10YR 6/3, LIGHT YELLOWISH BROWN, GRAVELLY SAND, 15% ROUNDED COBBLES, 10% GRAVEL, SINGLE GRAIN, LOOSE WITH FEW ROOTS TO 90"

ESHWT: NONE OBSERVED OWT: NONE ROOTS: 90" LEDGE: NONE



TEST PIT # 3 DATE: 12/28/21

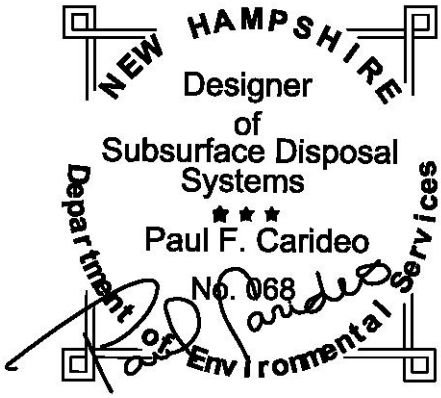
0-8" 10YR 3/3, DARK BROWN, FINE SANDY LOAM FILL, WEAK FINE GRANULAR, VERY FRIABLE WITH MANY ROOTS
8-14" 10YR 3/2, VERY DARK GRAYISH BROWN, FINE SANY LOAM, MASSIVE, VERY FRIABLE WITH MANY ROOTS
14-30" 10YR 5/8, YELLOWISH BROWN, SANDY LOAM, FINE GRANULAR, FRIABLE WITH COMMON ROOTS
30-76" 10YR 5/4, YELLOWISH BROWN, MEDIUM SAND, SINGLE GRAIN, LOOSE WITH FEW ROOTS TO 42" AND 7.5YR 5/8, STRONG BROWN, COMMON, DISTINCT REDOXIMORPHIC FEATURES AT 72"
76-80" 10YR 6/3, LIGHT YELLOWISH BROWN, MEDIUM SAND, SINGLE GRAIN, FIRM WITH 5YR 5/8, YELLOWISH RED REDOXIMORPHIC FEATURES THROUGHOUT
80-96" 10YR 6/2, LIGHT GRAYISH BROWN, VERY FINE SAND, MASSIVE, FIRM WITH 5YR 4/6, YELLOWISH RED REDOXIMORPHIC FEATURES THROUGHOUT

ESHWT: 72" OWT: 78" ROOTS: 42" LEDGE: NONE

TEST PIT # 4 DATE: 12/28/21

0-6" 10YR 3/3, DARK BROWN, SANDY LOAM FILL, GRANULAR, VERY FRIABLE WITH FEW ROOTS
6-20" 10YR 7/4, VERY PALE BROWN, CRUSHED GRAVEL FILL, 25% ANGULAR COBBLES, 20% GRAVEL GRANULAR, LOOSE WITH FEW ROOTS
20-42" 10YR 5/4, YELLOWISH BROWN, MEDIUM SAND, SINGLE GRAIN, LOOSE WITH FEW ROOTS TO 30"
42-76" 10YR 6/3, LIGHT YELLOWISH BROWN, FINE SAND, FINE GRANULAR, FIRM IN PLACE-FRIABLE REMOVED WITH 7.5YR 5/8, STRONG BROWN, COMMON, DISTINCT REDOXIMORPHIC FEATURES AT 72"
80-96" 10YR 5/3, BROWN, GRAVELLY SAND, 15% ROUNDED COBBLES, 10% GRAVEL, SINGLE GRAIN, LOOSE WITH 7.5YR 5/8, STRONG BROWN, COMMON, DISTINCT REDOXIMORPHIC FEATURES THROUGHOUT

ESHWT: 72" OWT: 78" ROOTS: 30" LEDGE: NONE



GEOTECHNICAL ENGINEERING REPORT
PROPOSED INTEGRA BIOSCIENCE BUILDING ADDITION
22 Friars Drive
Hudson, New Hampshire

January 18, 2022

Project No. 22.004.NH

PREPARED FOR:

SAKONNET ASSOCIATES
6 Moorings Way
Little Compton, Rhode Island 02837

PREPARED BY:

Miller Engineering & Testing, Inc.
100 Sheffield Road, P.O. Box 4776
Manchester, New Hampshire 03108

MILLER ENGINEERING & TESTING INC.

GEOTECHNICAL / SOIL BORINGS / ENVIRONMENTAL / SOILS / CONCRETE / MASONRY / STEEL / ROOFING / ASPHALT INSPECTION

Mail all correspondence to: 100 SHEFFIELD ROAD · PO BOX 4776 · MANCHESTER, NH 03108-4776 · TELEPHONE (603)668-6016 · Fax (603)668-8641

Via email: mladd@sakonnetassociates.com

January 18, 2022

Mr. Matthew Ladd
SAKONNET ASSOCIATES
6 Moorings Way
Little Compton, RI 02837

RE: Geotechnical Engineering Report
Proposed Building Addition
22 Friars Drive
Hudson, New Hampshire

Project 22.004.NH

Dear Mr. Ladd:

This Geotechnical Engineering Report presents our findings and recommendations for the proposed Building Addition at 22 Friars Drive in Hudson, New Hampshire. The subsurface conditions at the Site generally consisted of topsoil/asphalt pavements and fill materials overlying naturally occurring Sand deposit soils. Groundwater was encountered in several of the Site borings at depths between 6 and 8 feet below grade. We reached drilling refusals in several of the borings at a depth of approximately 20 feet below grade.

The topsoils, pavements, and fill materials will have to be stripped from the Building Addition footprint, and the underlying Sand deposit soils excavated to design grades. The Sand deposit soils should provide adequate support to a conventional shallow spread footing foundation system for the proposed Building Addition.

We appreciate the opportunity to provide these geotechnical services to Sakonnet Associates and INTEGRA. If you have any questions, please do not hesitate to contact us.

Very truly yours,
MILLER ENGINEERING & TESTING, INC.

Frank K. Miller, P.E.
Executive Vice President

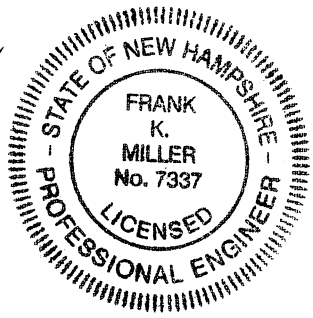


TABLE OF CONTENTS

1.0 INTRODUCTION

Miller Engineering & Testing, Inc. has prepared this Geotechnical Engineering Report for the proposed Building Addition at the INTEGRA Biosciences Corporation facility at 22 Friars Drive in Hudson, New Hampshire (referred to as the "Site" in this report). This evaluation was completed in general accordance with our proposal, dated July 22, 2021 (Ref. File 254-20, Revision I), and consisted of the following work tasks:

1. Performing a site reconnaissance and subsurface exploration program with a series of test borings at the location of the proposed Building Addition;
2. Evaluating the subsurface conditions and performing geotechnical engineering analyses to develop recommendations for the design and construction of the proposed project; and
3. Summarizing the exploration program and engineering evaluation in this Project Geotechnical Report.

Presented herein is a description of the proposed project and site, subsurface conditions, and the geotechnical implications on design and construction. The contents of this report are subject to the limitations in Appendix A.

2.0 SITE AND PROPOSED CONSTRUCTION

The Site consists of a 5.6-acre parcel with a physical street address of 22 Friars Drive in Hudson, New Hampshire.

2.1 *Existing Conditions*

The Site property slopes gently downward from south to north varying between elevations 162 and 146 feet above Mean Sea Level (MSL); while surface elevations in the addition footprint area generally range from 155 to 160 feet. Most of the proposed Building Addition footprint is currently developed with a paved parking lot and truck loading dock at the northeast portion of the existing building. Site topography is shown on the Existing Conditions Plan, dated August 10, 2021, prepared by Hayner/Swanson, Inc.

2.2 *Proposed Development*

The project layout is depicted on the Concept Plan, dated September 16, 2021, prepared by Hayner/Swanson, Inc. The project consists of constructing a Building Addition to the north and east sides of the existing Building. The Building Addition will be a one to two story high-bay structure and will have a footprint of approximately 34,340 square feet. The floor slab will have an elevation to match the existing slab elevation (estimated as approximately 160.97 feet above mean sea level). No basement levels are planned. The Building Addition will include ancillary paved driveways, walkways, and landscaped areas.

It is our understanding that structural engineering design of the Building Addition has not yet been completed; thus, structural loads were not available at the time this report was prepared.

3.0 SUBSURFACE EXPLORATION PROGRAM

The subsurface conditions at the site were characterized by advancing a series of test borings through the overburden soil formations in the proposed Building Addition footprint. The subsurface exploration program was performed to:

- Characterize the nature and consistency of the soil formations at the Site and provide samples for visual classification;
- Perform Standard Penetration Tests to estimate the relative density of the in-place soil units;
- Estimate the engineering properties of the subgrade soils and provide recommendations needed for designing the foundation elements; and
- Determine the depths to competent soil and/or bedrock, and the depth of the groundwater table.

The test borings (designated B-1 through B-12) were advanced on January 10 and 11, 2022 with a truck-mounted Diedrich model D-50 hydraulic rotary drill rig utilizing a 2¼-inch inside-diameter hollow-stem auger to bore the holes. Soil samples were generally obtained continuously from the ground surface to a depth of 6-feet and then at 5-foot intervals from the ground surface to the bottoms of the borings. Soil samples were obtained using 2-inch outside-diameter split-spoon samplers during Standard Penetration Tests; the Tests were performed with a 140-pound hammer dropping 30 inches in general accordance with ASTM Standard D 1586.

Our field engineer monitored the subsurface explorations, measured groundwater levels, and prepared test boring logs. Soil samples were placed in sealed, labeled containers and returned to our office for further evaluation. The test boring logs are included as Appendix B.

4.0 SUBSURFACE CONDITIONS

We reviewed the published geologic mapping to provide some basic information on the geologic conditions at the Site:

- The surficial geology of the Site and surrounding vicinity has been mapped as sand and gravel associated with the glaciofluvial and deltaic deposits of Glacial Lake Tyngsboro[1].

[1] R. Goldsmith. 1992. Surficial Geologic Map of the Hillsborough County, New Hampshire Part of the Nashua South Quadrangle, New Hampshire and Massachusetts. Office of the New Hampshire State Geologist, Open-File Report NH-92-1.

- The bedrock geology identifies the Site as being underlain by the Berwick Formation, which is a biotite-plagioclase-quartz Granofels that forms the bedrock for much of southern New Hampshire and adjacent parts of Massachusetts and Maine[2].

4.1 *Subsurface Soils*

Subsurface conditions at the Site were characterized by drilling into the overburden soil formations at selected locations within the proposed Building Addition footprint. The Subsurface Exploration Location Plan, Figure 1, illustrates the proposed site layout and the approximate test boring locations. The test borings were surveyed by Hayner/Swanson, Inc. prior to the test boring fieldwork.

The Site test borings were drilled to maximum depth of 23.5 feet below the existing ground surface. Results from the test borings indicate that the subsurface conditions at the Site consist of surficial layers of topsoils and asphalt pavements above fill materials and overlying naturally occurring sand deposits, and deeper dense glacial till soils. The table below is a summary of the subsurface conditions.

[2] Walsh, G.J., Jahns, R.H., and Aleinikoff, J.N. 2013. Bedrock Geologic Map of the Nashua South Quadrangle, Hillsborough County New Hampshire and Middlesex County, Massachusetts. U.S. Geological Survey, Scientific Investigations Map SIM-3200.

Test Boring/Surface Elevation (feet)	Depth/Elev. to Suitable Bearing Soils (feet)	Depth to Groundwater (feet)	Depth to Refusal (R) / Bottom of Boring (feet)
B-1/157	2.0/155	>14.4	14.4 (R)
B-2/159	2.0/157	>15.9	15.9 (R)
B-3/160	2.0/158	>13.5	13.5 (R)
B-4/157	2.0/155	18.0	23.5 (R)
B-5/159	7.5/151.5	>7.5	8.5 (R)
B-6/159	2.0/157	>9.0	9.0 (R)
B-7/156	0.8/155.2	8.0	21.0
B-8/157	1.0/156	8.0	20.9 (R)
B-9/155	1.0/154	6.0	17.0 (R)
B-10/159	2.0/157	>15.7	15.7 (R)
B-11/160	2.0/158	>21	21.0
B-12/160	2.0/158	>16	16.0

The general characteristics of the subsurface layers at the Site are described below in order of increasing depth below the ground surface; refer to the boring logs in Appendix B for more detailed soil descriptions at specific locations and depths.

Surficial Layers

The test borings penetrated layers of topsoil and asphalt pavements at the existing ground surface:

- The topsoil was generally 6 to 12-inches thick, and did not appear to be underlain by subsoil. Localized areas of thicker topsoil and possible subsoil layers could be encountered during construction.
- The proposed Building Addition footprint also includes areas of asphalt pavement that was approximately 3-inces thick.

Fill Materials

Fill materials were encountered in all the Site borings (Appendix B). The fill materials generally consisted of brown, fine to coarse sand with little gravel and trace to little amounts of silt. Standard Penetration Tests (SPT's) indicated that the fill materials were generally in a loose to medium dense relative density condition. **A very loose fill area was encountered at the location of test boring B-5, advanced near the northeast corner of the existing building. The loose fill zone is adjacent to the loading dock retaining wall, and the fill layer was 7.5 feet in thickness.**

Sand Deposit

The naturally occurring soils below the fill materials consisted of a brown, fine sand with trace amounts of silt grading downward into fine sand and silt. The upper sand formation was 9 to 12 feet thick at test boring locations. Standard Penetration Test values indicated that the sand deposit soils were generally in a medium dense condition (Appendix B).

Glaciofluvial and Till Soil Deposits

All test borings encountered an approximate 10-foot thick glaciofluvial soil layer consisting of medium dense to dense, fine to coarse sand and gravel with trace to little silt directly beneath the Sand layer. The outwash soils were deposited directly upon a thin layer of dense to very dense glacial till, comprised of grey, fine to medium sand, some gravel, and some to little silt material.

4.2 *Drilling Refusal/Presumed Bedrock Surface*

Drilling refusal, the depth below which the hollow-stem auger was not able to penetrate the deeper geologic formations, was encountered in 9 of the 12 test boring locations at depths ranging from 8.5 to 23.5 feet below the existing grades. It is our opinion that the drilling refusals were caused by boulders or bedrock; however, rock core sampling would be needed to verify the nature of refusal with certainty (which was outside our work scope).

4.3 *Groundwater*

Groundwater was encountered at four (4) test boring locations, at depths below the existing ground surface between 6 feet (in B-9) and 8 feet (in B-8). It is our opinion that these groundwater depths do not represent stabilized water levels, and fluctuations in groundwater levels should be anticipated due to variations in precipitation, snowmelt, site development, and other environmental conditions. The observed groundwater elevations appear below elevation 149, some 12 feet below proposed finish floor elevation (el. 160.97). Groundwater levels at other times, therefore, could be different from those observed and recorded during this exploration program. Groundwater levels could fluctuate by several feet during the annual hydrologic cycle.

5.0 ENGINEERING EVALUATION

Our explorations and engineering analyses indicate that the subsurface conditions at the Site are favorable for design and construction of a conventional shallow spread footing foundation system to support the proposed Building Addition, after removing and replacing any unsuitable soils below the proposed Building Addition footprint area. The foundation elements for the proposed Building Addition could be supported directly on the naturally occurring, medium dense Sand deposit soils, following preparations made in accordance with this report.

Our test borings indicated that the existing fill materials were undocumented (construction and compaction records were not available) and generally in a loose to medium dense condition. All of the existing granular fill materials should be overexcavated and removed from below the proposed Building Addition footprint. The granular components of these materials could be reused in the proposed construction, provided the contractor can place and compact these materials in accordance with the recommendations in this report.

6.0 DESIGN RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, we present the following recommendations for the design of the proposed Building Addition at 22 Friars Drive in Hudson, New Hampshire.

6.1 *Foundation Systems*

The Site subsurface conditions are generally suitable for a shallow foundation system, consisting of isolated spread footings (under columns) and continuous, strip footings (below interior and exterior load-bearing walls) to support the proposed Building Addition loads. The Building Addition footprint area must be cleared and grubbed of organic topsoil/subsoil layers and pavements. The fill materials (including utility backfills, landscaping fills, and backfill material adjacent to the existing building) must then be excavated to expose the undisturbed, naturally occurring Sand deposit soils, which are considered to be the uppermost suitable bearing stratum for the Building Addition foundation.

Engineering analyses indicate that the foundation elements constructed on these subsurface conditions should be designed using an allowable net bearing pressure of 4,000 pounds per square foot (2.0 tons per square foot).

Spread footings should be at least 3-feet in width; however, if smaller width footings are to be used, the allowable net bearing pressure should be reduced in direct proportion to the reduction in footing width (e.g., the allowable net bearing pressure for a 2-foot wide footing is 2/3 of 4,000 psf or 2,667 psf).

An allowable net bearing pressure of 4,000 psf should limit total settlements below footings to less than 1 inch. Differential settlement between adjacent footings should be less than 0.5 inch. Angular distortion beneath continuous wall footings should be less than 0.002 feet/foot. Settlement would tend to occur as loads are applied, thus most of the dead-load related settlement will probably occur by the end of construction.

The bottom-of-footing elevations should match the elevations of the adjacent portions of the existing foundations for the 22 Friars Drive building. Existing footings should not be undermined or disturbed in any way without approval of the geotechnical engineer.

Foundation elements of the building that will be exposed to subfreezing temperatures should be constructed at a depth of 4 feet below the final exterior grades to provide frost protection.

Lateral forces can be resisted by the shear developed at the base of the footings. Base shear should be calculated using a coefficient of friction of 0.40 for concrete cast directly on stable, compacted sand deposit soils.

6.2 *Slabs-on-Grade*

The subsurface conditions beneath the surficial organic layers and fill materials are suitable for constructing reinforced concrete slabs-on-grade for the Building Addition. The uppermost 12 inches of material beneath the Building Addition slab-on-grade should consist of Base Course Fill that conforms to the gradation specification in Table 1. This material should be placed in one loose lift and should be compacted to a minimum of 95 percent of its maximum dry density, as determined by ASTM D1557. A modulus of subgrade reaction (K_V) of 250 psi/inch should be used to proportion slabs-on-grade when constructed on Base Course Fill.

6.3 *Seismic Considerations*

The Building Addition will be founded within medium dense sand deposit soils. These soils are sufficiently dense and dry so as to theoretically preclude seismically induced liquefaction during the design regional seismic event. Accordingly, design provisions for liquefaction are not necessary at this Site.

The New Hampshire State Building Code (2015 International Building Code) requires that all structures be designed to withstand the forces generated by the maximum credible earthquake based on the soil and rock conditions. The soil profile beneath the proposed Building Addition constitutes a "stiff soil profile," and we assign the Site a Seismic Site Class of D. The seismic site coefficients for computing the design spectral response acceleration parameters should be:

S_s	S_1	F_a	F_v
0.24	0.076	1.6	2.4

6.4 *Groundwater and Drainage Issues*

Groundwater was encountered in several of the Site test borings, at depths between 6 and 8 feet below the existing ground surface. At this time, it is our opinion that foundation drains, a vapor barrier, and subslab drains are not necessary based on geotechnical considerations.

6.5 *Foundation Walls and Loading Docks*

Foundation walls for the building addition and truck loading docks should be designed as retaining walls using "at-rest" earth pressure conditions (restrained walls not allowed to rotate or translate).

The earth pressure diagrams can be developed using the design fluid weights, which assume that the walls would be backfilled using Select Granular Fill and the walls will be constructed with drains at foundation elevations. Geotechnical design parameters for the foundation walls are:

DESIGN PARAMETERS	
ϕ (select granular backfill)	35º
c (select granular backfill)	0 psf
γ (select granular backfill)	135 pcf
Net allowable bearing pressure	4,000 psf
Equivalent fluid weight (at-rest earth pressure condition, restrained walls)	60 pcf
Equivalent fluid weight (active earth pressure condition, unrestrained walls)	40 pcf
Coefficient of sliding friction (between concrete and compacted natural subgrade soils)	0.40

In addition to differential earth pressure, surcharge pressures should be applied to the foundation walls where appropriate. This uniformly distributed surcharge pressure can be resolved into a force (per linear foot of wall length), which would act at a depth of one-half the wall height below the upper level exterior grades. The surcharge force should be calculated using the following expression:

F_S = ½* P * H; where
F_S = surcharge force
P = live and dead load from the surcharge (psf)
H = height of wall (ft)

The walls should achieve wall stability factors of safety of 2.0 (for overturning), 1.5 (for sliding), and 1.5 for overall (“global”) stability. A maximum bearing pressure of 4,000 pounds per square foot should be used for wall stability analysis and footing design.

Lateral forces would be resisted by the shear developed at the base of the footings. Base shear should be calculated using a coefficient of sliding friction of 0.40 for concrete cast directly on the subgrade soils (compacted naturally occurring sand deposit soils).

6.6 *Foundations Adjacent to Existing Buildings*

New footings should be founded at the same bottom-of-footing elevation as the adjacent, existing foundation elements along the existing building wall. Footings should be stepped, as required, in transition areas where different footing levels occur. A maximum slope of 45º (approximately 1H:1V) from horizontal should be maintained between the bottom edges of adjacent footings and adjacent underground utility trenches.

To avoid adverse impacts on the existing building, the new foundation elements should be located outside the zone of stress influence of the existing building foundations. For this purpose, the zone of influence should be considered the zone beneath imaginary lines that extend downward and outward at a slope of 1H:1V from the outside edges of the existing footings. If new footings must be located near or within this zone, underpinning of the existing foundations or temporary shoring during construction will be necessary.

If proposed foundation elements will be at a higher elevation than the existing building foundations, they could impose significant lateral loads on the existing footings. We assume that the existing foundations were not designed to resist these additional loads. Alternatively, new foundation elements located adjacent to the existing footings could be lower in order to preclude application of additional lateral loads to the existing foundations.

7.0 EARTHWORK AND CONSTRUCTION RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, we present the following recommendations for the construction of the proposed Building Addition at 22 Friars Drive in Hudson, New Hampshire.

7.1 *Subgrade Preparations*

Topsoils, subsoil, and fill materials were encountered in the test borings at elevations above the likely design bottom-of-footing elevations. These materials are considered to be unsuitable for supporting the proposed foundation elements. The undisturbed, naturally occurring Sand deposit soils are considered to be the uppermost suitable bearing stratum for this construction, and excavation to remove the unsuitable soils should be continued to expose the undisturbed sand deposit soils below the Building Addition footprint and all foundation elements.

All pavements, topsoil, subsoil, fill materials, debris, frozen soils, and loose or disturbed soils should be excavated and removed from all proposed foundation bearing zones and slab areas to the lateral limits defined by a one horizontal to one vertical (1H:1V) line sloped down and away

from the bottom outside edges of foundation elements. All subsurface utilities should be located and removed, and the removal should include the associated backfill materials.

The granular portions of the existing fill materials could potentially be reused below the Building Addition footprint. These materials should be overexcavated, separated from topsoils, stockpiled, placed, and compacted in accordance with this report. These materials could require moisture conditioning to maximize compaction.

Following stripping of unsuitable soils, the resulting sand deposit subgrade should be compacted with at least four complete passes of a 10-ton vibratory drum roller in directions perpendicular to one another. Silty soil subgrades, if encountered, which are saturated or pump and weave during rolling should be excavated and replaced with Select Granular Fill material that is compacted to at least 95% of its maximum dry density as determined by ASTM Standard D 1557, or compacted ¾-inch crushed stone. The depth of undercutting and type of backfill material should be selected with consideration of the proposed use (i.e., buildings or pavements) and the soil and weather conditions encountered during construction. Crushed stone should be placed in 12-inch maximum loose lifts, wrapped in a geotextile filter fabric (Mirafi 140N or approved equal), and compacted to ensure stability.

The contractor is responsible for construction means and methods and should anticipate the need for methods to prevent disturbance, softening, or rutting of subgrades, or damage to overlying soils resulting from construction traffic. Care must be taken to avoid disturbing subgrades by keeping construction traffic off of subgrades during wet conditions and/or inclement weather until a firm fill layer has been placed.

Final foundation and subgrade preparation should include re-compaction of bearing surfaces. Care should be taken to limit disturbance to bearing surfaces prior to placement of concrete. Any loose, softened, or disturbed material should be removed and replaced with compacted structural fill prior to placement of concrete. Excavated subgrades should not be left exposed overnight unless the weather forecast calls for above-freezing, clear conditions.

7.2 *Earthwork in Wet Environments*

The Sand deposit soils have a minor fines content. Care must be taken to avoid disturbing subgrades by keeping construction traffic off silty sand subgrades during wet conditions and/or inclement weather until a firm fill layer has been placed. To reduce disturbance of exposed subgrade soils, it will be important to divert runoff, provide positive grading to shed seepage and runoff, and to compact exposed subgrades to reduce rutting, ponding, and surface water infiltration.

The native soils that will be encountered during construction slightly sensitive to moisture and difficult to place and compact during wet weather and freezing conditions. Silty soils that become saturated will not be suitable for reuse as fill and may need to be exported from the Site.

7.3 *Vibration Monitoring*

Earthwork operations could generate vibrations with the potential to affect operations at the neighboring 22 Friars Drive building. If vibration-sensitive operations are undertaken within the adjacent building, the Contractor should prepare a vibration monitoring plan for submittal to the Design Team for review.

7.4 *Excavations Adjacent to Existing Buildings*

The existing foundations could be undermined by close proximity excavations. Excavations for the Building Addition should not extend into the zone of influence of the existing building foundations without proper lateral support. All temporary shoring systems should be selected, designed, installed, and maintained by the contractor performing the excavation.

The project Geotechnical Engineer should be consulted should new foundation elements need to be founded below adjacent existing foundations; undermining the existing footings must be prevented, otherwise damage to the existing adjacent footings and frost walls could occur.

7.5 *Temporary Excavations*

Construction site safety, means and methods, and sequencing of construction activities is the sole responsibility of the contractor. Under no circumstances should the following information be interpreted to mean that Miller Engineering & Testing, Inc. is assuming responsibility for construction site safety, trench protection, or the contractor's responsibilities. Such responsibility is not being implied and should not be inferred.

All temporary excavations should be performed according to Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1926 Subpart P). It is our opinion that the fill materials and the undisturbed sand deposit soils are OSHA Type C soils, and temporary unbraced excavations should be cut no steeper than 1½H:1V under dry or dewatered conditions.

7.6 *Dewatering and Runoff Control*

Groundwater was encountered in some of the Site test borings, at depths between 6 and 8 feet below the existing ground surface. We anticipate that groundwater will not be encountered during foundation and building construction. Deeper excavations, for example, for utilities, could encounter groundwater that will require controls.

Should groundwater be encountered during construction, inflows should be controlled in order for earthwork to be completed "in the dry". The contractor should anticipate the need for controlling runoff during wet periods; pumping from open sumps will likely provide adequate control of water within excavations during construction.

Subgrade soils that become unstable should be undercut and replaced with structural fill or crushed stone, as necessary. Surface water runoff should be directed away from excavations to reduce dewatering efforts and to protect subgrades from becoming soft and unstable.

Temporary detention ponds, trenches, ditches, and dewatering sumps should not be made in areas to be filled.

7.7 *Placement of Granular Engineered Fills*

Engineered fills will be required to achieve the design grades in several areas of the proposed Site development. Table 1 is the gradation specifications for soils to be used in the engineered fills at the Site. The different granular fill types should be used as follows:

1. Select Granular Fill should be used for engineered fills below the Building Addition footprint areas, in foundation bearing zones, and as backfill around the foundation elements. Materials used as Select Granular Fill should have the gradation in Table 1. An acceptable alternative is NHDOT Item 304.3 (Crushed Gravel).

2. Clean Granular Fill should be used for engineered fills below roadway, parking, and other non-structural areas, and should have the gradation shown in Table 1. An acceptable alternative is NHDOT Item 304.1 (Sand) or 304.2 (Gravel).

3. Base Course should be used for the uppermost fill below the Building Addition slab-on-grade (Table 1). An acceptable alternative is NHDOT Item 304.33 (Crushed Aggregate for Shoulders).

All granular fills should be placed in 12-inch maximum loose lifts and should be compacted to a minimum of 95% of the material's maximum dry density, as determined by ASTM D 1557 (modified Proctor test) and verified with field density testing (ASTM D 6938 or equivalent method). Lift thickness should be a maximum of 6-inch (loose) when compacted with hand-guided equipment.

7.8 *Reuse of Site Materials*

A preliminary assessment of the suitability of using the unconsolidated soils as engineered fills in the proposed construction is based on the soil classifications and observations at the Site. The suitability of these materials is summarized below.

1. Topsoils are suitable for reuse on-site only within landscaped areas.

2. The inorganic fill materials and naturally occurring sand deposit soils are probably suitable for on-site reuse within the building footprint, in non-structural areas (outside the building footprint), and in landscaping areas, provided the contractor can place and compact them in accordance with this report. These soils have a moderate fines content

(silt and clay fractions combined) and could be difficult to reuse in earthwork under wet and freezing conditions.

Materials to be used as the engineered fills, base course below the slab-on-grade, and as the pavement base course will need to be imported to the Site. Representative samples of all materials proposed for use as fills should be submitted for testing during construction to compare their gradation characteristics to the requirements of the project specifications, and to establish their optimum water contents and maximum dry densities (modified proctor testing, ASTM Standard D 1557). The geotechnical engineer must approve use and reuse of on-site or borrow soils for use as engineered fills. Use of materials as engineered fills assumes that the moisture content of the material will be strictly controlled in order to allow for proper placement and compaction.

7.9 *Special Inspections*

In accordance with the State Building Code, special inspections are necessary during subgrade preparation and placement of fill within Building Addition footprint areas. The project geotechnical engineer should be engaged to make appropriate site visits during the excavation and subgrade preparations to confirm that our assumptions regarding subsurface conditions (which were based on a limited number of borings) were reasonably representative and that our recommendations are being properly interpreted and followed.

8.0 FINAL DESIGN AND CONSTRUCTION MONITORING

A qualified geotechnical engineer should be retained to provide engineering services during the excavation and construction phases of this project. This will become particularly important relative to the excavation of unsuitable materials, and the placement and compaction of engineered fills. This will also allow for design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction. The adequacy of fill compaction should be determined by field density testing as the fill is placed and compacted.

Representative samples of all backfill materials should be submitted to Miller Engineering & Testing, Inc. for testing to establish their optimum water contents and maximum dry densities, and to compare their gradation characteristics with the project specifications. In this manner, compaction criteria can be developed which will provide the materials with adequate strength and minimal distortion.

Lastly, we recommend that we be retained to assist in preparation of the project earthwork specifications and to review final design plans, specifications, and design submittals. In the event that any changes in the nature, design, or locations of the proposed project are planned, the conclusions and recommendations in this report will not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Miller Engineering & Testing, Inc.

TABLES

GEOTECHNICAL ENGINEERING REPORT
Proposed Building Addition
22 Friars Drive
Hudson, New Hampshire

TABLE 1
GRADATION SPECIFICATIONS

GEOTECHNICAL ENGINEERING REPORT
Proposed Building Addition
22 Friars Drive
Hudson, New Hampshire

SIEVE SIZE	PERCENT PASSING BY WEIGHT		
	CLEAN GRANULAR FILL	BASE COURSE	SELECT GRANULAR FILL
8”	100	100	100
3”	70 – 100	100	70 – 100
1½	-----	-----	-----
¾	-----	-----	-----
½”	40 – 100	40 – 80	40 – 90
No. 4	25 – 100	30 – 70	25 – 80
No. 10	15 – 95	20 – 60	15 – 70
No. 40	10 – 70	10 – 30	5 – 40
No. 50	-----	-----	-----
No. 200	0 – 15	3 - 10	0 – 12

FIGURES

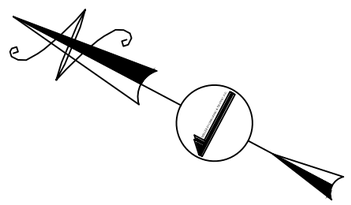
GEOTECHNICAL ENGINEERING REPORT
Proposed Building Addition
22 Friars Drive
Hudson, New Hampshire

NOTES

1. This plan is a reproduction of portions of "Existing Conditions Plan, Hudson, NH", (dated August 10, 2021) by Hayner/Swanson, Inc. of Nashua, NH.
2. A geotechnical engineer from Miller Engineering & Testing, Inc. inspected the test borings.
3. Exploration locations were located by Hayner/Swanson, Inc.

KEY

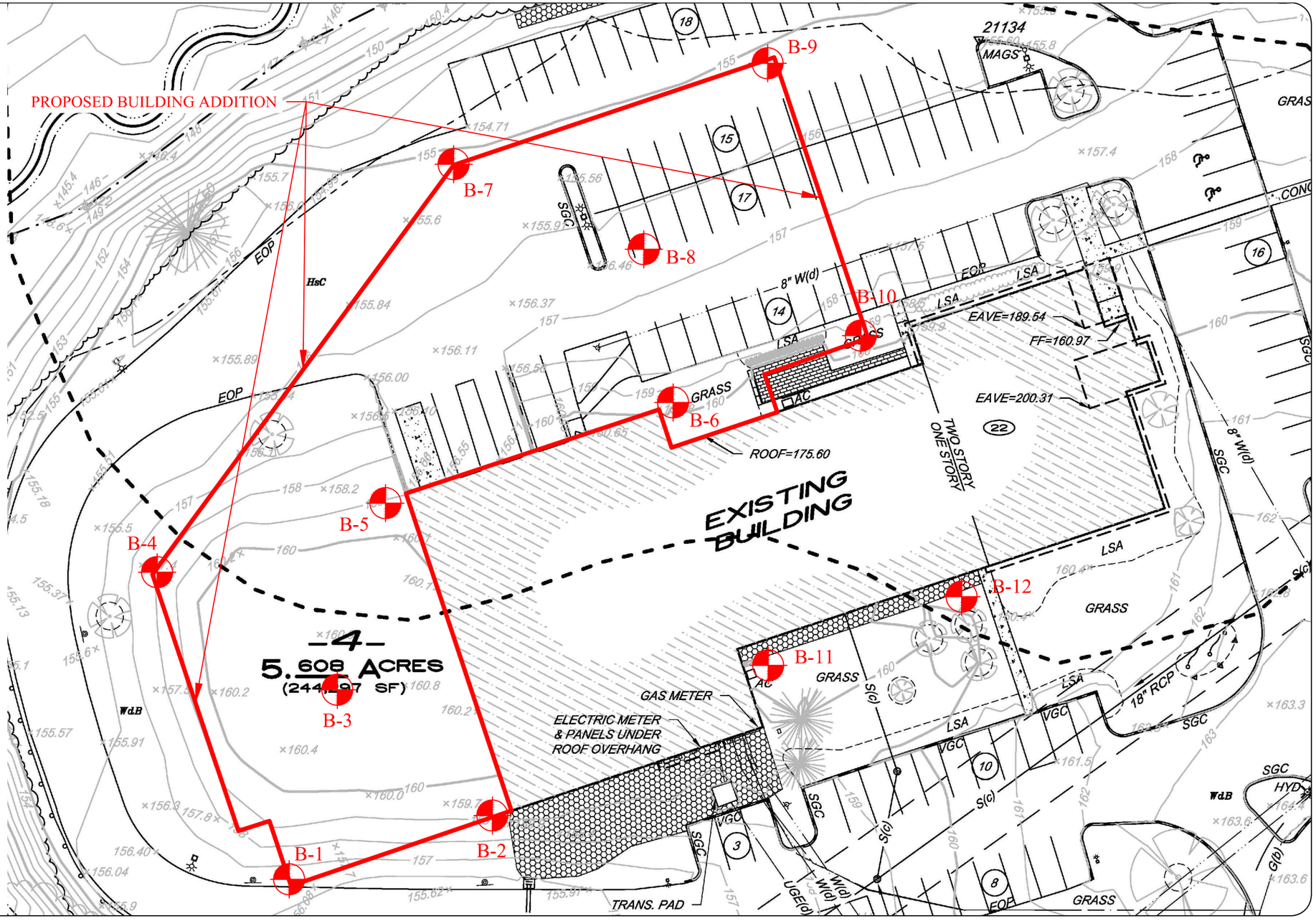
Approximate Boring Location



GRAPHIC SCALE

40 0 20 40 80

(IN FEET)



MILLER ENGINEERING & TESTING, INC.

100 SHEFFIELD ROAD - PO BOX 4776
MANCHESTER, NEW HAMPSHIRE 03108
TEL (603) 668-6016 // FAX (603) 668-8641

Integra Biosciences Corp. - Proposed Building Addition
22 Friars Drive
Hudson, NH
January 2021
Project No. 22.004.NH

SUBSURFACE EXPLORATION LOCATION PLAN

FIGURE No. 1

APPENDIX A

Limitations

GEOTECHNICAL ENGINEERING REPORT
Proposed Building Addition
22 Friars Drive
Hudson, New Hampshire

LIMITATIONS

Explorations

1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the boring logs.

3. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time measurements were made.

Review

4. It is recommended that this firm be retained to review final design plans and specifications. In the event that any changes in the nature, design, or location of the structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Miller Engineering & Testing, Inc.

Construction

5. It is recommended that this firm be retained to provide soils engineering services during the excavations and foundation construction phases of the work. This is to observe compliance with the design concepts, specifications, or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

6. This report has been prepared for the exclusive use of **INTEGRA Biosciences Corporation** and **Sakonnet Associates** for the **Proposed Building Addition** at **22 Friars Drive** in **Hudson, New Hampshire** in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

7. This soil and foundation engineering report has been prepared for this project by Miller Engineering & Testing, Inc. This report was completed for design purposes and may be limited in its scope to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

APPENDIX B

Exploration Logs

GEOTECHNICAL ENGINEERING REPORT
Proposed Building Addition
22 Friars Drive
Hudson, New Hampshire

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-11-22
Date End: 01-11-22

Sheet 1 **of** 1
Boring No: B-1
Location: See Plan
Approx. Surface Elev: 157

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS			
			Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-11-22	None	14.4'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 157		S-1	0.0-0.5	6	5	2					S-1: Topsoil	
		S-1A	0.5-2.0	18	3		6	7	5		S-1A: Brown, fine to coarse sand, some gravel, trace silt (FILL)	
		S-2	2.0-4.0	24	7	6	9	15	17		S-2: Brown, fine sand, trace silt, trace gravel	
5 152		S-3	4.0-6.0	24	19	5	13	13	18		S-3: Brown, fine sand, trace silt	
10 147		S-4	9.0-10.0	12	8	10	41	25/0"			S-4: Brown, fine to coarse sand, some gravel, trace silt	
		S-5	14.0-14.4	5	0	50/5"					S-5: No recovery	
15 142											BORING TERMINATED AT 14.4 ft	
20 137												
25 132												
30 127												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-11-22
Date End: 01-11-22

Sheet 1 **of** 1
Boring No: B-2
Location: See Plan
Approx. Surface Elev: 159

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS			
			Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-11-22	None	15.9	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 159		S-1	0.0-0.5	6	1	3					S-1: Topsoil	
		S-1A	0.5-2.0	18	2		4	3	4		S-1A: Brown, fine sand, trace silt (FILL)	
		S-2	2.0-2.3	4	16	5	9	9	14		S-2: Brown, fine sand, trace silt	
		S-3	4.0-6.0	24	16	6	8	9	15		S-3: Brown, fine sand, trace silt	
5 154												
		S-4	9.0-11.0	24	15	6	9	12	10		S-4: Brown, fine sand, trace silt	
10 149												
15 144		S-5	14.0-15.9	23	11	20	29	33	50/5"		S-5: Brown, fine to coarse sand, some gravel, trace silt	
											BORING TERMINATED AT 15.9 ft	
20 139												
25 134												
30 129												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-10-22
Date End: 01-10-22

Sheet 1 **of** 1
Boring No: B-3
Location: See Plan
Approx. Surface Elev: 160

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS			
			Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-10-22	None	13.5'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 160		S-1	0.0-0.5	6	4	1					S-1: Topsoil	
		S-1A	0.5-2.0	18	12		5	7	8		S-1A: Brown, fine sand, little gravel and coarse sand, trace silt (FILL)	
		S-2	2.0-4.0	24	18	7	10	14	14		S-2: Brown, fine sand, trace silt	
5 155		S-3	4.0-6.0	24	17	3	10	9	11		S-3: Brown, fine sand, trace silt	(1)
10 150		S-4	9.0-10.5	18	10	7	22	18			S-4: Brown, fine sand, trace silt	
		S-4A	10.5-11.0	6	4				15		S-4A: Brown, fine to coarse sand, some gravel, trace silt Auger Refusal at 13.5'	
15 145 20 140 25 135 30 130											BORING TERMINATED AT 13.5 ft	

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES: (1) Grain size analysis

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-11-22
Date End: 01-11-22

Sheet 1 **of** 1
Boring No: B-4
Location: See Plan
Approx. Surface Elev: 157

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-11-22	18'	23.5'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 157		S-1	0.0-0.5	6	6	1					S-1: Topsoil	
		S-1A	0.5-2.0	18	12		2	5	8		S-1A: Brown, fine sand, trace silt (FILL)	
		S-2	2.0-4.0	24	17	10	5	5	8		S-2: Brown, fine sand, trace silt, trace gravel	
5 152		S-3	4.0-6.0	24	18	3	5	8	11		S-3: Brown, fine sand, trace silt, trace gravel	
10 147		S-4	9.0-11.0	24	11	9	18	20	22		S-4: Brown, fine to medium sand, some silt, little gravel	
15 142		S-5	14.0-15.5	18	9	14	41	51			S-5: Brown, fine to coarse sand, some gravel, trace silt	
20 137		S-6	19.0-21.0	24	9	17	17	20	17		S-6: Brown, fine to coarse sand, some gravel, trace silt, wet Auger Refusal at 23.5'	
25 132											BORING TERMINATED AT 23.5 ft	
30 127												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-10-22
Date End: 01-10-22

Sheet 1 **of** 1
Boring No: B-5
Location: See Plan
Approx. Surface Elev: 159

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS			
			Date	**Depth**	**Casing At**	**Stabilization Period**
Type	HSA	SS	01-10-22	None	8.5'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 159		S-1	0.0-0.5	6	5	1					S-1: Topsoil	
		S-1A	0.5-2.0	18	10		3	4	3		S-1A: Loose, brown, fine sand, trace silt (FILL)	
		S-2	2.0-4.0	24	13	1	1	1	1		S-2: Very loose, brown, fine sand, trace silt (FILL)	
5 154		S-3	4.0-6.0	24	9	1	2	3	2		S-3: Loose, brown, fine to medium sand, little silt, trace gravel (FILL)	
		S-4	6.0-7.5	18	7	1/12"		4			S-4: Very loose, brown, fine sand, trace silt (FILL)	
		S-4A	7.5-8.0	6	5				19		S-4A: Brown, fine to coarse sand, some gravel, trace silt	
10 149											Auger Refusal at 8.5'	
											BORING TERMINATED AT 8.5 ft	
15 144												
20 139												
25 134												
30 129												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-10-22
Date End: 01-10-22

Sheet 1 **of** 1
Boring No: B-6
Location: See Plan
Approx. Surface Elev: 159

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS			
			Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-10-22	None	9'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 159		S-1	0.0-0.5	6	5	1					S-1: Topsoil	
		S-1A	0.5-2.0	18	9		5	5	5		S-1A: Brown, fine sand, little silt (FILL)	
		S-2	2.0-4.0	24	16	5	7	9	15		S-2: Brown, fine sand, trace silt	
5 154		S-3	4.0-6.0	24	5	6	24	28	32		S-3: Brown, fine to coarse sand, little silt, trace gravel (rock fragments in tip of split-spoon) Auger Refusal at 9'	
10 149											BORING TERMINATED AT 9 ft	
15 144												
20 139												
25 134												
30 129												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-10-22
Date End: 01-10-22

Sheet 1 **of** 1
Boring No: B-7
Location: See Plan
Approx. Surface Elev: 156

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-10-22	8'	21'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 156		-	0.0-0.3	3							-: 3" Asphalt	
		S-1	0.5-0.8	3	3		22/3"				S-1: Brown, fine to coarse sand, some gravel, trace silt (split-spoon and rod off vertical) (FILL)	
		S-2	2.0-4.0	24	15	7	16	16	13		S-2: Brown, fine sand, trace silt	
		S-3	4.0-6.0	24	18	4	10	13	13		S-3: Brown, fine sand, trace silt	
5 151												
		S-4	9.0-10.5	18	11	11	13	12			S-4: Gray, silt, trace fine sand, wet	
10 146												
		S-4A	10.5-11.0	6	4				17		S-4A: Brown, fine sand, trace silt, wet	
		S-5	14.0-16.0	24	12	7	14	10	10		S-5: Brown, fine to coarse sand, some gravel, trace silt, wet	
15 141												
		S-6	19.0-19.5	6	5	12					S-6: Brown, fine sand, trace silt, wet	
20 136		S-6A	19.5-21.0	18	8		22	21	28		S-6A: Brown/Olive, fine to medium sand, some silt, little gravel, wet	
											BORING TERMINATED AT 21 ft	
25 131												
30 126												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-10-22
Date End: 01-10-22

Sheet 1 **of** 1
Boring No: B-8
Location: See Plan
Approx. Surface Elev: 157

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-10-22	8'	20.9'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 157		-	0.0-0.3	3							-: 3" Asphalt	
		S-1	0.5-1.0	6	2		4				S-1: Brown, fine to coarse sand, some gravel, trace silt (FILL)	
		S-1A	1.0-2.0	12	7			10	29		S-1A: Brown, fine sand, trace gravel, trace silt (rock in tip of split-spoon)	
		S-2	2.0-4.0	24	15	10	19	16	18		S-2: Brown, fine sand, trace gravel, trace silt (rock in tip of split-spoon)	
5 152		S-3	4.0-6.0	24	17	5	6	11	9		S-3: Brown, fine sand, trace silt (rock in tip of split-spoon)	
		S-4	9.0-10.0	12	6	7	21				S-4: Brown, fine to coarse sand, some gravel, little silt, wet	
10 147		S-4A	10.0-11.0	12	2			20	22		S-4A: Tan, silt, wet	
		S-5	14.0-16.0	24	14	3	11	16	18		S-5: Brown, fine to coarse sand, some gravel, trace silt, wet	
15 142												
		S-6	19.0-20.9	23	3	14	29	24	50/5"		S-6: Brown, fine to coarse sand, some gravel, trace silt, wet (rock in tip of split-spoon)	
20 137												
											BORING TERMINATED AT 20.9 ft	
25 132												
30 127												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
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TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-10-22
Date End: 01-10-22

Sheet 1 **of** 1
Boring No: B-9
Location: See Plan
Approx. Surface Elev: 155

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS			
			Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-10-22	6'	17'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 155		-	0.0-0.3	3							-: 3" Asphalt	
		S-1	0.5-1.0	6	6		11				S-1: Brown, fine to coarse sand, some gravel, little silt (FILL)	
		S-1A	1.0-2.0	12	7			23	22		S-1A: Brown, fine sand, trace silt	
		S-2	2.0-4.0	24	15	16	12	12	15		S-2: Brown, fine sand, trace silt	(1)
		S-3	4.0-6.0	24	16	5	7	10	10		S-3: Brown, fine sand, trace silt	
5 150												
		S-4	9.0-10.5	18	8	5	7	10			S-4: Brown, fine sand, trace silt	
10 145												
		S-4A	10.5-11.0	6	4				10		S-4A: Brown, fine to coarse sand, little gravel, trace silt, wet	
		S-5	14.0-16.0	24	9	10	13	9	10		S-5: Brown, fine to coarse sand, some gravel, little silt, wet	
15 140											Auger Refusal at 17'	
											BORING TERMINATED AT 17 ft	
20 135												
25 130												
30 125												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES: (1) Grain size analysis

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-10-22
Date End: 01-10-22

Sheet 1 **of** 1
Boring No: B-10
Location: See Plan
Approx. Surface Elev: 159

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-10-22	None	15.7'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 159		S-1	0.0-1.0	12	9	1	4				S-1: Topsoil	
		S-1A	1.0-2.0	12	5		9	11	5		S-1A: Brown, fine to coarse sand, some gravel, little silt (FILL)	
		S-2	2.0-4.0	24	10	23	31	32	35		S-2: Brown, fine to coarse sand, some gravel, trace silt	
5 154		S-3	5.0-6.3	15	6	6	21	50/3"			S-3: Brown, fine to coarse sand, some gravel, trace silt	
10 149		S-4	10.0-12.0	24	12	16	31	30	27		S-4: Brown, fine to coarse sand, some gravel, trace silt	
15 144		S-5	15.0-15.7	8	3	9	15/2"	35/0"			S-5: Brown, fine to coarse sand, some gravel, little silt	
											BORING TERMINATED AT 15.7 ft	
20 139												
25 134												
30 129												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

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TEST BORING LOG

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100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-11-22
Date End: 01-11-22

Sheet 1 **of** 1
Boring No: B-11
Location: See Plan
Approx. Surface Elev: 160

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-11-22	None	21'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 / 160		S-1		6	3							
		S-1A	0.5-2.0	18	9		3	5	10		S-1A: Brown, fine sand, trace silt, trace gravel (FILL)	
		S-2	2.0-4.0	24	3	16	17	12	15		S-2: Brown, fine sand, trace silt, trace gravel (large piece of gravel at top of sample)	(1)
5 / 155		S-3	4.0-6.0	24	18	5	11	16	17		S-3: Brown, fine sand, trace silt	
10 / 150		S-4	9.0-11.0	24	18	2	7	7	10		S-4: Brown, fine sand, some silt	
15 / 145		S-5	14.0-16.0	24	14	24	40	36	37		S-5: Brown, fine to coarse sand, some gravel, trace silt	
		S-6	19.0-19.5	6	3						S-6: Brown, fine sand, trace silt	
20 / 140		S-6A	19.5-21.0	18	14		20	27	37		S-6A: Brown/Olive, fine to medium sand, some silt, little angular gravel	
25 / 135											BORING TERMINATED AT 21 ft	
30 / 130												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES: (1) Grain size analysis

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
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FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Integra Biosicence
Hudson, NH
Project No: 22.004.NH
Date Start: 01-11-22
Date End: 01-11-22

Sheet 1 **of** 1
Boring No: B-12
Location: See Plan
Approx. Surface Elev: 160

	CASING	SAMPLER	GROUNDWATER OBSERVATIONS			
			Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	01-11-22	None	16'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

Depth/ Elev.	Cas bl/ft	SAMPLE Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 160		S-1	0.0-0.5	6	3	2					S-1: Topsoil	
		S-1A	0.5-2.0	18	1		3	12	17		S-1A: Brown, fine sand, some gravel, trace silt (rock in tip of split-spoon) (FILL)	
		S-2	2.0-3.0	12	8	14	24				S-2: Brown, fine sand, trace silt, trace gravel	
		S-2A	3.0-4.0	12	5			16	17		S-2A: Brown, fine to medium sand, some gravel, little silt, trace fine roots	
		S-3	4.0-6.0	24	9	10	17	20	25		S-3: Brown, fine to coarse sand, some gravel, little silt	
5 155												
		S-4	9.0-11.0	24	15	13	16	21	16		S-4: Brown, fine to coarse sand, some gravel, trace silt	
10 150												
		S-5	14.0-16.0	24	1	26	23	23	21		S-5: Brown, fine to coarse sand, some gravel, little silt (rock in tip of split-spoon)	
15 145												
											BORING TERMINATED AT 16 ft	
20 140												
25 135												
30 130												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: T. Young

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50+ VERY DENSE

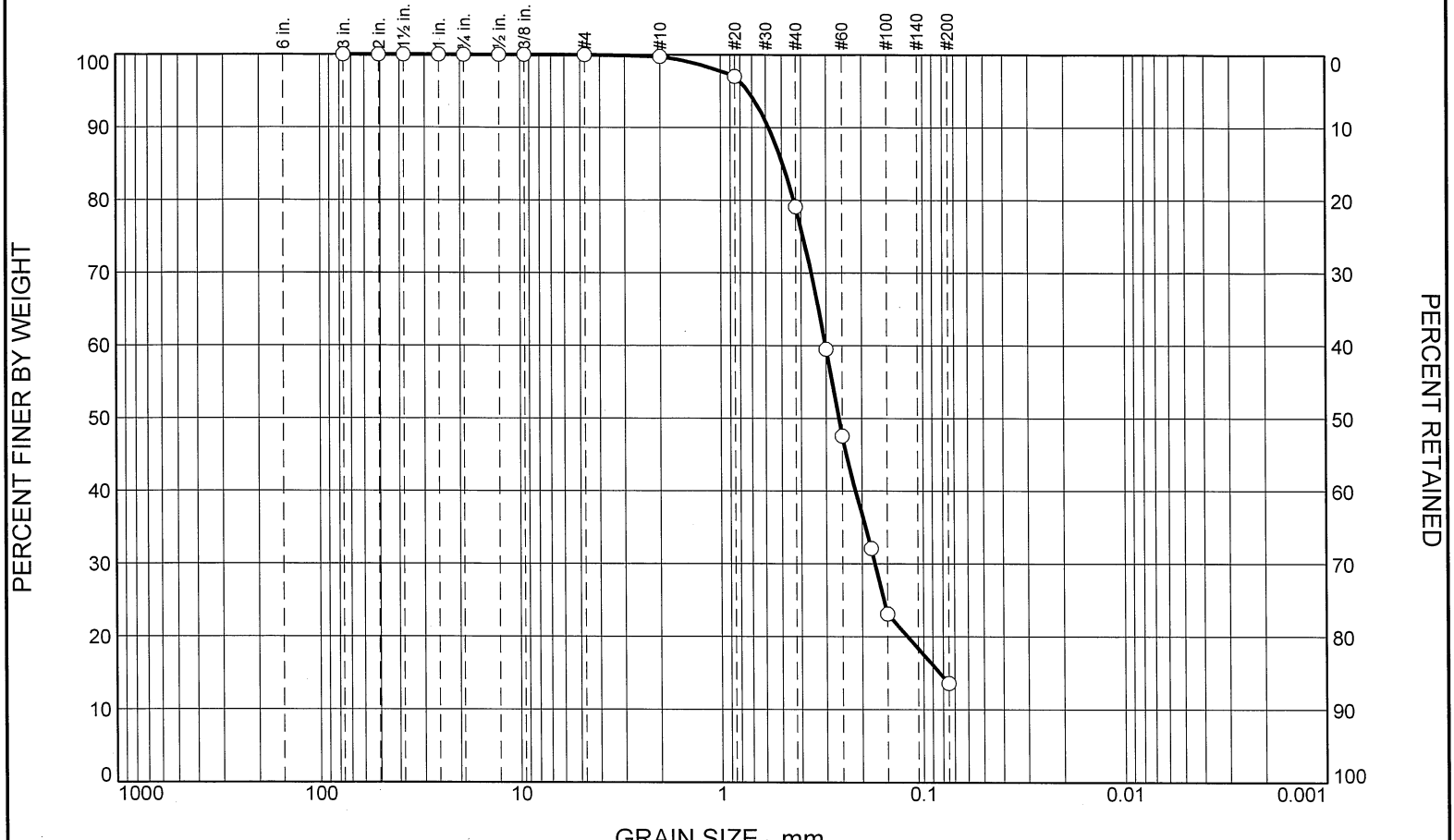
PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES:

REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL.
WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS.
FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

Appendix C

GRAINSIZE DISTRIBUTION REPORT - AGGREGATE GRADING



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	21	65	14	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	100		
1.5	100		
1	100		
3/4	100		
1/2	100		
3/8	100		
#4	100		
#10	100		
#20	97		
#40	79		
#50	59		
#60	48		
#80	32		
#100	23		
#200	14		

* (no specification provided)

Material Description

Brown, fine sand, trace silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5782 D_{85}= 0.4922 D_{60}= 0.3023
D_{50}= 0.2602 D_{30}= 0.1725 D_{15}= 0.0831
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

BORING JAR SAMPLE.

Source of Sample: B-3 **Depth:** 4
Sample Number: S-3

Date: 1-18-22

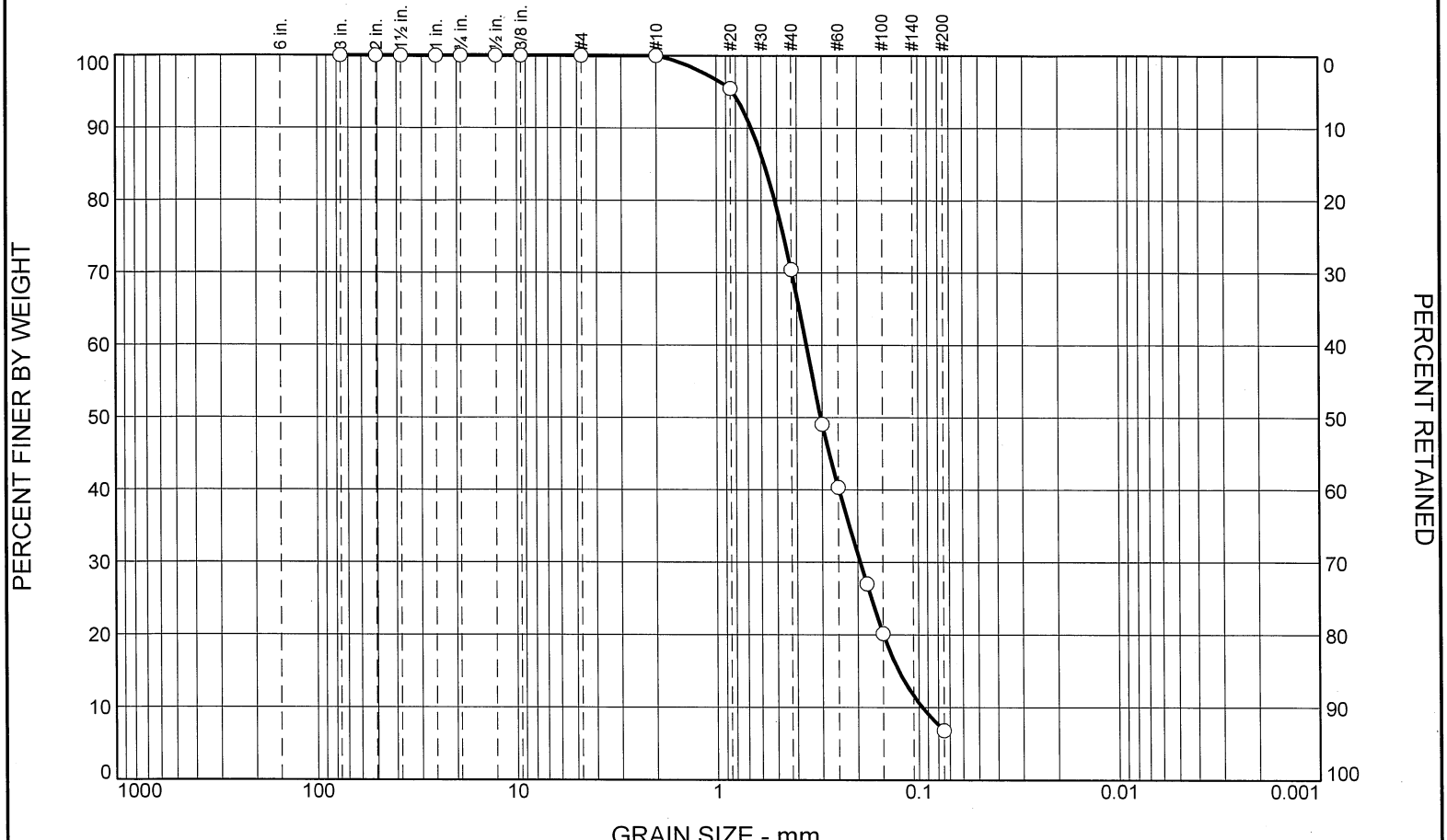
MILLER ENGINEERING & TESTING, INC.

Client: Sakonet Associates
Project: Integra Biosicence

Project No: 22.004.NH **Figure** L22006A

Tested By: DM/NL

GRAINSIZE DISTRIBUTION REPORT - AGGREGATE GRADING



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	30	63	7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	100		
1.5	100		
1	100		
3/4	100		
1/2	100		
3/8	100		
#4	100		
#10	100		
#20	95		
#40	70		
#50	49		
#60	40		
#80	27		
#100	20		
#200	6.8		

* (no specification provided)

Material Description

Brown, fine sand, trace silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6705 D_{85}= 0.5770 D_{60}= 0.3596
D_{50}= 0.3053 D_{30}= 0.1941 D_{15}= 0.1251
D_{10}= 0.0958 C_u= 3.75 C_c= 1.09

Classification

USCS= AASHTO=

Remarks

BORING JAR SAMPLE.

Source of Sample: B-9 **Depth:** 2
Sample Number: S-2

Date: 1-18-22

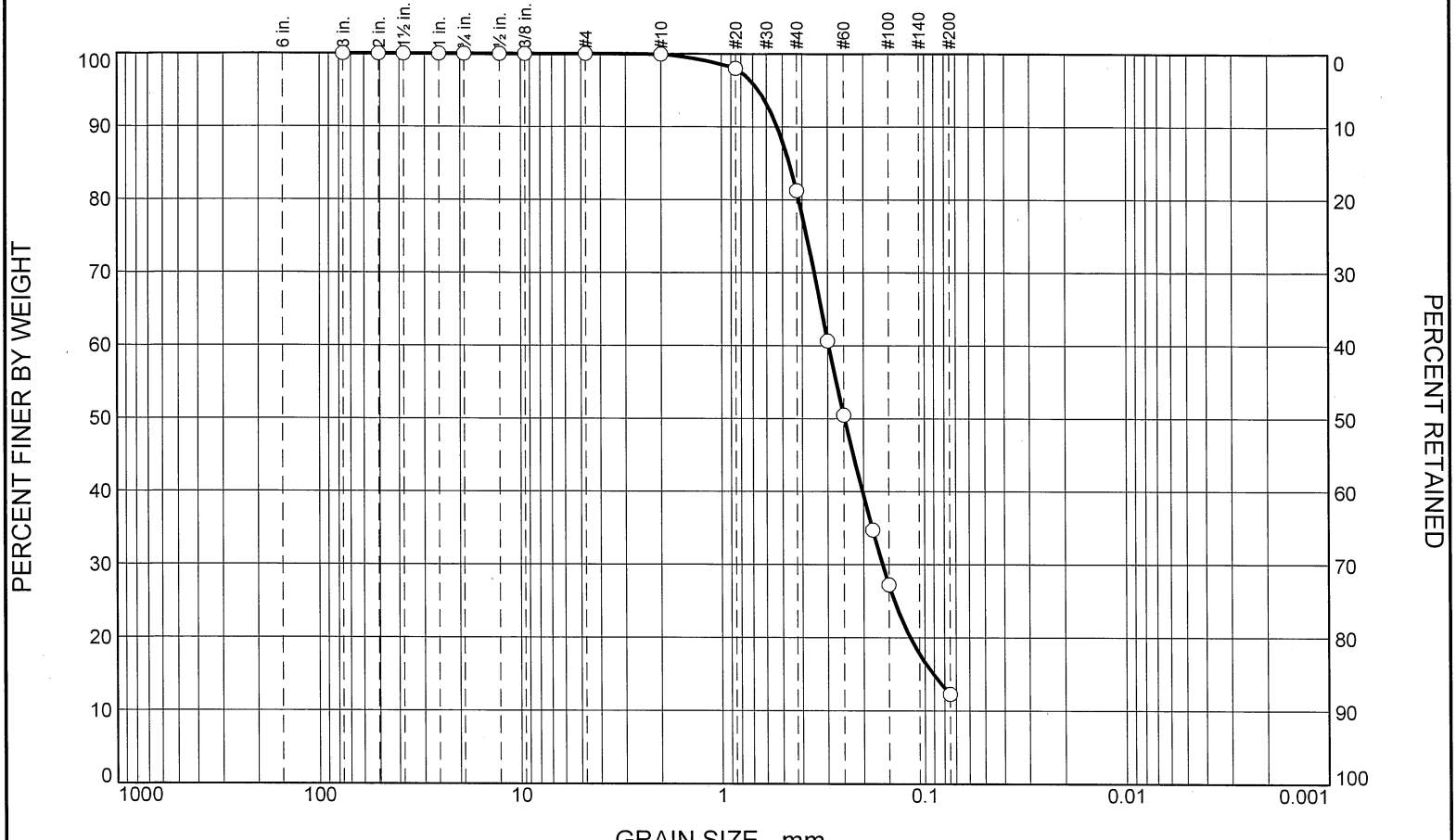
MILLER ENGINEERING & TESTING, INC.

Client: Sakonet Associates
Project: Integra Biosicence

Project No: 22.004.NH **Figure** L22006B

Tested By: DM/NL

GRAINSIZE DISTRIBUTION REPORT - AGGREGATE GRADING



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	19	69	12	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	100		
1.5	100		
1	100		
3/4	100		
1/2	100		
3/8	100		
#4	100		
#10	100		
#20	98		
#40	81		
#50	61		
#60	50		
#80	35		
#100	27		
#200	12		

* (no specification provided)

Material Description

Brown, fine sand, trace silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5297 D_{85}= 0.4612 D_{60}= 0.2968
D_{50}= 0.2477 D_{30}= 0.1611 D_{15}= 0.0906
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: B-11 **Depth:** 4
Sample Number: S-3

Date: 1-18-22

MILLER ENGINEERING & TESTING, INC.

Client: Sakonet Associates
Project: Integra Biosicence

Project No: 22.004.NH **Figure** L22006C

Tested By: DM/NL

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Smoothing	Yes
State	New Hampshire
Location	
Longitude	71.432 degrees West
Latitude	42.743 degrees North
Elevation	0 feet
Date/Time	Mon, 17 Jan 2022 10:16:54 -0500

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**	0.74	1.01	1.24	1.56	1.97	2.48	2.72	**1yr**	2.20	2.62	3.05	3.74	4.36	**1yr**
2yr	0.33	0.51	0.64	0.84	1.06	1.33	**2yr**	0.91	1.22	1.53	1.91	2.38	2.96	3.29	**2yr**	2.62	3.17	3.68	4.40	5.00	**2yr**
5yr	0.39	0.61	0.77	1.03	1.32	1.67	**5yr**	1.14	1.52	1.94	2.42	3.01	3.74	4.19	**5yr**	3.31	4.03	4.66	5.53	6.25	**5yr**
10yr	0.44	0.70	0.88	1.20	1.56	1.99	**10yr**	1.34	1.80	2.32	2.91	3.61	4.47	5.02	**10yr**	3.95	4.83	5.57	6.57	7.40	**10yr**
25yr	0.53	0.84	1.06	1.47	1.95	2.51	**25yr**	1.68	2.25	2.93	3.68	4.58	5.65	6.40	**25yr**	5.00	6.15	7.07	8.26	9.26	**25yr**
50yr	0.59	0.95	1.22	1.71	2.31	3.01	**50yr**	1.99	2.67	3.53	4.43	5.49	6.75	7.68	**50yr**	5.97	7.39	8.47	9.82	10.98	**50yr**
100yr	0.68	1.10	1.42	2.01	2.74	3.59	**100yr**	2.36	3.17	4.21	5.30	6.57	8.07	9.23	**100yr**	7.14	8.88	10.15	11.69	13.01	**100yr**
200yr	0.77	1.26	1.64	2.35	3.25	4.29	**200yr**	2.80	3.76	5.04	6.36	7.88	9.64	11.10	**200yr**	8.54	10.68	12.16	13.92	15.43	**200yr**
500yr	0.93	1.53	2.00	2.90	4.07	5.42	**500yr**	3.52	4.71	6.39	8.07	10.00	12.23	14.17	**500yr**	10.82	13.63	15.47	17.53	19.35	**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	0.42	0.57	0.70	0.80	**1yr**	0.61	0.79	1.06	1.33	1.68	2.29	2.56	**1yr**	2.03	2.46	2.72	3.02	3.78	**1yr**
2yr	0.32	0.49	0.60	0.81	1.00	1.20	**2yr**	0.87	1.18	1.37	1.79	2.30	2.90	3.21	**2yr**	2.57	3.09	3.58	4.29	4.89	**2yr**
5yr	0.36	0.56	0.69	0.95	1.20	1.42	**5yr**	1.04	1.39	1.63	2.12	2.70	3.51	3.91	**5yr**	3.11	3.76	4.30	5.17	5.86	**5yr**
10yr	0.40	0.61	0.75	1.05	1.36	1.61	**10yr**	1.18	1.57	1.82	2.39	3.05	4.06	4.53	**10yr**	3.59	4.36	4.95	5.92	6.70	**10yr**
25yr	0.45	0.69	0.85	1.22	1.60	1.88	**25yr**	1.38	1.84	2.14	2.82	3.55	4.91	5.53	**25yr**	4.35	5.32	5.95	7.10	8.00	**25yr**
50yr	0.49	0.75	0.93	1.34	1.80	2.13	**50yr**	1.55	2.09	2.42	3.20	4.00	5.69	6.44	**50yr**	5.03	6.20	6.85	8.15	9.14	**50yr**
100yr	0.54	0.81	1.02	1.47	2.01	2.41	**100yr**	1.74	2.36	2.73	3.49	4.50	6.52	7.54	**100yr**	5.77	7.25	7.90	9.37	10.42	**100yr**
200yr	0.59	0.89	1.12	1.63	2.27	2.73	**200yr**	1.96	2.67	3.07	3.95	5.10	7.55	8.82	**200yr**	6.68	8.48	9.11	10.77	11.91	**200yr**
500yr	0.67	1.00	1.28	1.86	2.65	3.23	**500yr**	2.28	3.16	3.61	4.65	6.04	9.18	10.92	**500yr**	8.13	10.50	10.99	12.94	14.19	**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	0.48	0.58	0.78	0.96	1.13	**1yr**	0.83	1.10	1.28	1.66	2.10	2.64	2.88	**1yr**	2.33	2.77	3.42	4.21	4.78	**1yr**
2yr	0.35	0.54	0.67	0.91	1.12	1.31	**2yr**	0.97	1.29	1.49	1.93	2.48	3.06	3.40	**2yr**	2.71	3.27	3.79	4.51	5.15	**2yr**
5yr	0.44	0.67	0.83	1.15	1.46	1.68	**5yr**	1.26	1.64	1.90	2.44	3.06	4.02	4.53	**5yr**	3.56	4.36	5.01	5.93	6.66	**5yr**
10yr	0.53	0.81	1.00	1.40	1.81	2.05	**10yr**	1.56	2.00	2.32	2.92	3.64	4.97	5.63	**10yr**	4.40	5.41	6.20	7.28	8.12	**10yr**
25yr	0.68	1.03	1.28	1.83	2.41	2.66	**25yr**	2.08	2.60	3.00	3.70	4.54	6.58	7.51	**25yr**	5.83	7.22	8.25	9.56	10.59	**25yr**
50yr	0.82	1.25	1.55	2.23	3.00	3.24	**50yr**	2.59	3.17	3.65	4.43	5.37	8.15	9.34	**50yr**	7.21	8.98	10.22	11.76	12.95	**50yr**
100yr	1.00	1.51	1.89	2.73	3.75	3.96	**100yr**	3.23	3.88	4.45	5.50	6.37	10.17	11.60	**100yr**	9.00	11.15	12.68	14.48	15.86	**100yr**
200yr	1.21	1.83	2.32	3.35	4.68	4.84	**200yr**	4.03	4.73	5.41	6.61	7.55	12.60	14.40	**200yr**	11.15	13.85	15.73	17.83	19.43	**200yr**
500yr	1.58	2.36	3.03	4.41	6.27	6.28	**500yr**	5.41	6.14	7.03	8.46	9.45	16.73	19.13	**500yr**	14.81	18.40	20.93	23.49	25.41	**500yr**

Powered by ACIS Northeast Regional Climate Center

22 Friars

Legend

- Remediation Sites
- Coastal and Great Bay Regi Communities
- Designated Rivers Quarterm Buffer
- Public Water Supply Wells
- Groundwater Classification GA1
- Groundwater Classification GA2
- Water Supply Intake Protect Areas
- Wellhead Protection Areas
- Class A Lakes with a Quarte Buffer
- Class A - All Features
- All Lakes, with a Quarter Mil Buffer
- Outstanding Resource Wate Watersheds
- Surface Waters with Impairm 2016 with Quarter Mile Buffe
- Watersheds with Chloride Impairments 2016

Parcels

- Parcel Polygons
- Attributes for Additional Lines

Map Scale

1: 6,494

Map Generated: 1/17/2022

Notes

Control of Invasive Plants

New Hampshire
Department of Agriculture,
Markets & Food
Douglas Cygan
603-271-3488
doug.cygan@agr.nh.gov

This guide lists garden plants and weeds which are already causing significant changes to natural areas in the Mid-Atlantic. **Measures for controlling each species are indicated by number, e.g., (3), in the text with a full explanation at the end of this article.** Click on the word Control: to jump to that section. Then click your "back" button to return to the text. Following each section suggested alternative plants are given. These alternatives are native plants, well adapted and needing little care, attractive to birds and butterflies, and an important part of the food web for our indigenous species.

INVASIVE TREES

NORWAY MAPLE (*Acer platanoides*) has large leaves similar to sugar maple. To easily confirm that the plant is Norway maple, break off a leaf and if it's truly Norway maple it will exude milky white sap. Fall foliage is yellow. (Exception: cultivars such as 'Crimson King,' which have red leaves in spring or summer, may have red autumn leaves.) The leaves turn color late, usually in late October after native trees have dropped their foliage. This tree suppresses growth of grass, garden plants, and forest understory beneath it, at least as far as the drip-line. Its wind-borne seeds can germinate and grow in deep shade. The presence of young Norway maples in our woodlands is increasing.
Control: (1); (7), (8), (9), or (10); (11) in mid-October to early November, before the leaves turn color.

TREE OF HEAVEN (*Ailanthus altissima*), is incredibly tough and can grow in the poorest conditions. It produces huge quantities of wind-borne seeds, grows rapidly, and secretes a toxin that kills other plants. Its long compound leaves, with 11-25 lance-shaped leaflets, smell like peanut butter or burnt coffee when crushed. Once established, this tree cannot be removed by mechanical means alone.
Control: (1) - seedlings only. Herbicide - use Garlon 3a (9) with no more than a 1" gap between cuts, or (10); plus (11) on re-growth. Or paint bottom 12" of bark with Garlon 4 Ultra (in February or March to protect surrounding plants). USE MAXIMUM STRENGTH SPECIFIED ON LABEL for all herbicide applications on Ailanthus. Glyphosate is not effective against Ailanthus.

INVASIVE SHRUBS

AUTUMN OLIVE (*Eleagnus umbellata*): Formerly recommended for erosion control and wildlife value, these have proved highly invasive and diminish the overall quality of wildlife habitat.
Control: (1) - up to 4" diameter trunks; (7) or (10) or bury stump. Do not mow.
MULTIFLORA ROSE (*Rosa multiflora*), formerly recommended for erosion control, hedges, and wildlife habitat, becomes a huge shrub that chokes out all other vegetation and is too dense for many species of birds to nest in, though a few favor it. In shade, it grows up trees like a vine. It is covered with white flowers in June. (Our native roses have fewer flowers, mostly pink.) Distinguish multiflora by its size, and by the presence of very hard, curved thorns, and a fringed edge to the leaf stalk.
Control: (1) - pull seedlings, dig out larger plants at least 6" from the crown and 6" down; (4) on extensive infestations; (10) or (11). It may remain green in winter, so herbicide may *applied when other plants are dormant. For foliar application, mix Rodeo with extra sticker-spreader, or use Roundup Sure Shot Foam on small plants.*

BUSH HONEYSUCKLES (*Lonicera spp.*), including Belle, Amur, Morrow's, and Tatarian honeysuckle. (In our region, assume that any honeysuckle is exotic unless it is a scarlet-flowered vine). Bush honeysuckles create denser shade than native shrubs, reducing plant diversity and eliminating nest sites for many forest interior species.
Control: (2) on ornamentals; (1); on shady sites only, brush cut in early spring and again in early fall (3); (4) during the growing season; (7); or (10) late in the growing season.

BLUNT-LEAVED PRIVET (*Ligustrum* obtusifolium). *Control*: (1); (7) or (10); or trim off all flowers. Do not cut back or mow.

BURNING BUSH, WINGED EUONYMUS (*Euonymus alatus*), identified by wide, corky wings on the branches.
Control: (1); (7) or (10); or trim off all flowers.

JAPANESE BARBERRY (*Berberis thunbergii*), and all cultivars and varieties.
Control: (1); (7) or (10); or trim off all flowers.

INVASIVE WOODY VINES

All of these vines shade out the shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle. DO NOT PLANT NEXT TO OPEN SPACE.

JAPANESE HONEYSUCKLE (*Lonicera japonica*), including Hall's honeysuckle, has gold-and-white flowers with a heavenly scent and sweet nectar in June. This is probably the familiar honeysuckle of your childhood. It is a rampant grower that spirals around trees, often strangling them.
Control: (1); (3); (10); (11) in fall or early spring when native vegetation is dormant. Plan to re-treat repeatedly.

ORIENTAL BITTERSWEET (*Celastrus orbiculatus*) has almost completely displaced American bittersweet (*C. scandens*). The Asian plant has its flowers and bright orange seed capsules in clusters all along the stem, while the native species bears them only at the branch tips.
Control: (1); keep ornamental plants cut back, remove all fruits as soon as they open, and bag or burn fruits; to eradicate use Garlon 3a (10).

JAPANESE KNOTWEED, MEXICAN BAMBOO (*Polygonum cuspidatum*) can grow in shade. The stems have knotty joints, reminiscent of bamboo. It grows 6-10' tall and has large pointed oval or triangular leaves.
Control: Cut at least 3 times each growing season and/or treat with Rodeo (10) or (11). In gardens, heavy mulch or dense shade may kill it.

INVASIVE HERBACEOUS PLANTS

GARLIC MUSTARD (*Alliaria petiolata*, *A. officinalis*), a white-flowered biennial with rough, scalloped leaves (kidney-, heart- or arrow-shaped), recognizable by the smell of garlic and taste of mustard when its leaves are crushed. (The odor fades by fall.)
Control: Pull before it flowers in spring (1), removing crown and roots. Tamp down soil afterwards. Once it has flowered, cut (2), being careful not to scatter seed, then bag and burn or send to the landfill. (11) may be appropriate in some settings.

JAPANESE STILT GRASS (*Microstegium vimineum*) can be identified by its lime-green color and a line of silvery hairs down the middle of the 2-3" long blade. It tolerates sun or dense shade and quickly invades areas left bare or disturbed by tilling or flooding. An annual grass, it builds up a large seed bank in the soil.

Control: Easily pulled in early to mid-summer (1) - be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to landfill. Mowing weekly or when it has just begun to flower may prevent it from setting seed (3). Use glyphosate (11) or herbicidal soap (less effective) on large infestations. Follow up with (5) in spring.

MILE-A-MINUTE VINE, DEVIL'S TAIL TEARTHUMB (*Polygonum perfoliatum*), a rapidly growing annual vine with triangular leaves, barbed stems, and turquoise berries in August which are spread by birds. It quickly covers and shades out herbaceous plants.
Control: same as for stilt grass.

SPOTTED KNAPWEED (*Centaurea maculosa*), a biennial with thistle-like flowers.
Control: Do NOT pull (1) unless the plant is young and the ground is very soft - the tap root will break off and produce several new plants. Wear sturdy gloves. (2); (6); (10) or (11).

CONTROL MEASURES

(1) PULL seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs.
(2) DEADHEAD to prevent spread of seeds of invasive plants. Cut off seeds or fruits before they ripen. Bag, and burn or send to a landfill.
(3) MOW or CUTTING at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year.
(4) CONTROLLED BURNING during the spring, repeated over several years, allows native vegetation to compete more effectively with the invasive species. This requires a permit. Spot treatment with glyphosate in late fall can be used to make this method more effective.
(5) Use a CORN-BASED PRE-EMERGENCE HERBICIDE on annual weeds. This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.
(6) In lawns, SPOT TREAT with BROAD-LEAF WEEDKILLER. Good lawn-care practices (test soil; use lime and fertilizer only when soil test shows a need; mow high and frequently; leave clippings on lawn) reduce weed infestations.
(7) CUT DOWN the tree. Grind out the stump, or clip off re-growth.
(8) GIRDLE tree: cut through the bark and growing layer (cambium) all around the trunk, about 6" above the ground. Girdling is most effective in spring when the sap is rising, and from middle to late summer when the tree is sending down food to the roots. Clip off sucker sprouts.
(9) FRILL: Using a machete, hatchet or similar device, hack scars (several holes in larger trees) downward into the cambium layer, and squirt in glyphosate (or triclopyr if recommended in text above). Follow label directions for Injection and Frill Applications. This is most effective from middle to late summer. Clip off any sucker sprouts or treat with glyphosate.
(10) CUT STEM / CUT STUMP WITH GLYPHOSATE (or triclopyr if specified above). Follow label directions for Cut Stump Application. Clip off sucker sprouts or paint with glyphosate. See Note on Herbicides.
(11) FOLIAR SPRAY WITH GLYPHOSATE herbicide (see Note on Herbicides). Use a backpack or garden sprayer or mist blower, following label directions. Avoid overspray and/or dripping onto non-target plants, because glyphosate kills most plants except moss. If it rolls off waxy or grass-like foliage, use additional sticker-spreader. Deciduous trees, shrubs, and perennials move nutrients down to the roots in late summer. Glyphosate is particularly effective at this time and when plants have just gone out of flowering. Several invasive species retain their foliage after native plants have lost theirs, and resume growth earlier in spring than most natives. This allows you to treat them without harming the natives. However, the plant must be actively growing for the herbicide to work. Retreatments may be necessary the following year if suckering occurs or the plant hasn't been entirely killed.

NOTE ON HERBICIDES: It is highly recommended that small populations try to be controlled using non-chemical methods wherever feasible. However, for large infestations, and for a few plants specified above, herbicide use is essential. Apply herbicides carefully to avoid non-target plants, glyphosate is the least environmentally damaging herbicide in most cases. Add food coloring for visibility, and a soap-based sticker such as Cide-Kick. Glyphosate is ineffective on some plants; for these, triclopyr (Garlon) may be indicated. When using herbicides, read the entire label and observe all precautions listed, including proper disposal. If in doubt, call your local Cooperative Extension Service.

APPENDIX F

DRAFT STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

Proposed Building Additions

22 Friars Drive
Hudson, New Hampshire

Jan 27, 2022

PREPARED FOR:

Integra Biosciences Corp.
2 Wentworth Drive
Hudson, NH 03051

PREPARED BY:

HSI Hayner/Swanson, Inc.

Civil Engineers/Land Surveyors

3 Congress Street
Nashua, New Hampshire 03062
(603) 883-2057

131 Middlesex Turnpike
Burlington, Massachusetts 01803
(781) 203-1501

www.hayner-swanson.com

CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: James N. Petropulos, P.E. Title: President/Principal Engineer

Signature: _____ Date: _____

FOR INTEGRA BIOSCIENCES, CORP. :
I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) Permit that authorizes the storm water discharge associated with activity from the construction site identified as part of this certification.

Name: _____ Title: _____

Signature: _____ Date: _____

FOR SELECTED SITE CONTRACTOR:
I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) Permit that authorizes the storm water discharge associated with activity from the construction site identified as part of this certification.

Name: _____ Title: _____

Signature: _____ Date: _____

January 27, 2022
Job #5734

Mr. Robert Fougere
Integra Biosciences
2 Wentworth Drive
Hudson, NH 03051

RE: STORMWATER POLLUTION PREVENTION PLAN (SWPPP)
PROPOSED BUILDING ADDITIONS
INTEGRA BIOSCIENCES
22 FRIARS DRIVE
HUDSON, NEW HAMPSHIRE

Dear Mr. Fougere:

Pursuant to the above referenced project, please find attached a Stormwater Pollution Prevention Plan (SWPPP) as required by the 2022 EPA NPDES Construction General Permit (CGP). The SWPPP has been prepared for use by your office and by the Site Contractor during the construction of this project. Amendments to the SWPPP are possible as the project progresses or if site conditions change.

Please feel free to contact me if you have any questions regarding this project.

Respectfully,

Ethan M. Beals
Project Manager
Hayner/Swanson, Inc.

SWPPP Amendment Log

Project Name: **Integra Biosciences Building Additions**
Project Location: **22 Friars Drive Hudson, NH**
SWPPP Contact: **Robert Fougere, Integra Biosciences, 2 Wentworth Drive Hudson, NH**

Number	Date	Description of the Amendment	Authorized Representative Signature

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

PROPOSED BUILDING ADDITIONS
INTEGRA BIOSCIENCES
TAX MAP '209', LOT 4
22 FRIARS DRIVE
HUDSON, NEW HAMPSHIRE

JANUARY 27, 2022

PREPARED FOR:

INTEGRA BIOSCIENCES CORP.
2 WENTWORTH DRIVE
HUDSON, NH 03051

PREPARED BY:

HAYNER/SWANSON, INC.
3 CONGRESS STREET
NASHUA, NEW HAMPSHIRE 03062

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SECTION 1: INTRODUCTION

1.1 Background

Federal law (40 CFR Part 122) requires that all construction sites with disturbed areas over one-acre comply with notification and other requirements of the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit. The law requires the "Operator" of the site to prepare a Stormwater Pollution Prevention Plan (SWPPP) and submit a Notice of Intent for Stormwater Discharges Associated with Construction Activity (NOI) form to the EPA at least fourteen (14) days prior to commencement of construction activity. The SWPPP needs to be maintained and retained at the construction site. The Contractor shall assume or delegate the duties of the "Operator" of the SWPPP, which shall include signing and forwarding a copy of the NOI to the EPA and performing the duties of the "Operator" during construction activities and provide to the EPA a Notice of Termination (NOT) form at the completion of the work.

1.2 Purpose of SWPPP

The goal of the SWPPP is to protect and improve the quality of the surface waters of the United States by reducing the amount of pollutants potentially contained in strormwater runoff through implementation, inspection and maintenance of the SWPPP. The purpose of the SWPPP is to identify potential sources of pollution and implement best management practices to reduce/prevent pollution caused by stormwater runoff.

SECTION 2: PROJECT OPERATORS, CONTACTS & PERMIT INFORMATION

2.1 Project Operators

1) Integra Biosciences, Corp., Hudson, NH
2) Site Contractor: To be selected at a later date

2.2 Stormwater Team

Owner/ Applicant:

Integra Biosciences, Corp.
2 Wentworth Drive
Hudson, NH 03051
Attn: Robert Fougere
(603) 578-5800
robert.fougere@integra-biosciences.com

Site Contractor:

Engineer/SWPPP Preparer:

Hayner/Swanson, Inc.
3 Congress Street
Nashua, NH 03062
Attn: James, N. Petropulos, P.E.
(603) 882-2057
jpetropulos@hayner-swanson.com

2.3 Location of SWPPP

The SWPPP shall be available in the Contractor's construction trailer on the site. In the event that the project is inactive, or the SWPPP is otherwise inaccessible, the SWPPP may be viewed at the office of Site Contractor.

2.4 Posting of Permit

Per Section 1.5 of the 2022 Construction General Permit, the Contractor shall post a sign or other notice of the permit coverage at a safe, publicly accessible location in close proximity to the construction site. The notice must be located to that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way. At a minimum, the notice must include the following the NPDES ID, a contact name and phone number for obtaining additional construction site information, and the following statements:

- "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Region 1 Office at (617) 918-1014.
- "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: https://www.epa.gov/enforcement/report-environmental-violations."

SECTION 3: PROJECT SITE/INFORMATION:

3.1 Project Location and Description:

The project area under consideration for this application is located at 22 Friars Drive, Hudson, NH (see Figure 1). The site is known to the Hudson Assessors Department as Map 209, Lot 4. The parcel measures 5.61+/- acres and is located in the I - Industrial zoning district and within the Sagamore Industrial Park. The site is abutted by Friars Drive to the south, commercial properties to the west and across Friars Drive and undeveloped land to the west and east.

Latitude: 42° 44' 35" N Longitude: 71° 25' 98" W (per Google Earth)

3.2 Existing Conditions:

The lot currently contains a partial 2-story, 32,969 square foot office, manufacturing and warehouse building along with associated parking and loading areas. Access to the site is provided via a curb cut on Friars Drive. The site is currently serviced by municipal sewer and water, underground gas, telecommunications and electric utilities. There are no formal stormwater management practices located on the site. The existing parking lot on the east side of the building sheet flows in an easterly direction into a stone level spreader which then discharges into the adjacent wetlands. Additionally, there is an existing stormwater easement which contains a swale and a stormwater basin which was constructed along the westerly property line to accommodate runoff from Friars Drive.

NRCS soil mapping shows that this site contains mostly Windsor and Hinckley and a small amount of Pipestone sandy soils. The project's certified wetland scientist flagged the limit of wetlands associated with a perennial stream along the northern and eastern boundaries of the property. This stream originates east of the site, flows through the Sagamore Industrial Park, then flows under Friars Drive, and then in a northwestern direction into an existing pond adjacent to the subject property's northwest property line. The pond ultimately continues to flow in a westerly direction approximately a ¼-mile and empties into the Merrimack River. No portion of the subject site is located within the 100-year Flood Hazard Area.

3.3 Project Description:

Integra Biosciences, Corp. manufactures liquid handling and media preparation tools and equipment used in research, diagnostics and quality control laboratories. It is being proposed to construct several building additions to the existing building. First, a 1-story 34,340 square foot warehouse addition will be constructed on the northern portion of the building. Second, a 2-story 5,820 square foot manufacturing addition will be constructed on the westerly portion of the building. Third, second floor, totaling 7,617 square feet of manufacturing space will be constructed on a portion of the building

which is only 1-story. Finally, a 400 square foot building addition will be constructed on the western side of the existing warehouse to provide an additional loading dock door. Associated site improvements include new parking and loading areas, site grading, two new curb cuts for improving access onto Friars Drive, and onsite drainage system with subsurface stormwater management systems, a new water utility extension, landscaping and site lighting. To the best of our knowledge the sewer, water, gas, telecommunication and electric utilities present in the adjacent roadways have adequate capacity to service this intended use.

Upon project completion, the site will contain approximately 42% open space, where 35% is the minimum required by zone. There are no wetland impacts, however, the proposed project does impact approximately 14,716 square feet of wetland buffer. The layout for the building addition and associated site improvements has been developed to minimize environmental issues. The site development associated with the overall construction of this project disturbs approximately 171,000 square feet of contiguous area.

Construction is expected to begin in the spring of 2022 and will be completed in the fall of 2023.

The project scope will include, but is not limited to, the following activites:

- Erosion and sediment control.
- Earthwork including excavation, borrow and disposal of excess materials if necessary.
- Dust control.
- Demolition of site items
- Construction of a new curb cuts onto Friars Drive
- Construction of new site driveways, parking and loading areas.
- Construction of building pads.
- Construction of on-site, drainage and stormwater management areas.
- Construction of retaining walls, site lighting and guardrail.
- Construction of utility main extensions/services
- Loam, seed and landscaping improvements.
- All other work incidental to these items as shown on the drawings and specified herein.

3.4 Stormwater Management Description/Intent:

With regard to stormwater management, it is the intent of this design to address both qualitative and quantitative aspects of the runoff produced by the proposed development. Furthermore, the intent is to maintain existing drainage patterns, provide permanent methods for protecting water quality and minimize impacts to downstream drainage facilities. To meet these goals, the proposed project will include a combination

of stormwater management practices, including deep-sump catch basins, leaching catch basins, and subsurface infiltration basins.

First, runoff generated by a large portion the paved parking and loading areas and portions of both existing and proposed roof area will be collected by a system of roof drains and catch basins. This runoff is conveyed in a northerly direction into Stormwater Management Area 'A' (SMA A). SMA A is a large subsurface infiltration system consisting of several rows of Stormtech MC-3500 chambers in a bed of crushed stone. This subsurface practice is located under the proposed access road in the northern portion of the site. SMA A will contain an isolator row for pre-treatment, which will provide for the initial removal of grit and sediment from stormwater runoff. A piped overflow connection will be provided into the second chambered subsurface infiltration basin.

Stormwater Management Area 'B' (SMA B) is a also a Stormtech MC-3500 subsurface infiltration system with a pretreatment isolator row located under the proposed access road in the northern portion of the site. In addition to receiving overflow runoff from SMA A, SMA B receives additional runoff from a portion of roof and paved area. SMA 'A' and SMA 'B' will function as a combined treatment/flood control facility and provides sufficient storage capacity to completely store and infiltrate up to and including the 25-year storm event. A piped overflow connection to a new endwall discharging in the direction of the existing pond will be provided.

Finally, runoff generated by a portion of existing and proposed roof, sidewalk and open areas will be collected by roof drains and leaching catch basins and conveyed into a subsurface leaching trench. Stormwater Management Area 'C' (SMA C) is a subsurface infiltration system located under the open area adjacent to the proposed building addition on the west side of the existing building. Pretreatment is provided via sumps in the leaching catch basins. The system contains an 18-inch perforated HDPE pipe in a bed of crushed stone that will provide storage and recharge for contributing runoff. A piped overflow connection is provided into the existing catch basins which discharge into the riprap apron along the western property boundary.

3.5 Project Area and Runoff Information:

The site development associated with the overall construction of this project disturbs approximately 171,000 square feet of contiguous area and adds approximately 0.92 +/- acres of new impervious area.
The proposed design provides qualitative treatment of stormwater and the removal of pollutants through the use of the above-referenced practices. The proposed stormwater management areas provide sufficient storage volumes so that the post-development peak flows leaving the project area are less than or equal to the pre-development peak flows for the 2, 10, 25 and 50-year storm events.

3.6 Receiving Waters:

The site contains two distinct drainage patterns in both the pre- and post-development drainage condition. First, runoff from the north, east and south portions of the site (including building rooftops, parking, loading and open areas) flows in a northeasterly direction into the stream which makes up the easterly property boundary and flows into an existing pond just north of the site. The **s**econd drainage pattern flows in a westerly direction into the existing swale and stormwater basin adjacent to the property. The basin is currently dry and appears to be functioning properly. This practice outlets in a northwesterly direction and ultimately into a stream downstream of the existing pond. This stream flows in a westerly direction and discharges into the Merrimack River ¼ mile west of the site.

3.7 Site Features and Sensitive Areas to be Protected:

The overall project layout for the Proposed Building Additions including the layout of the access driveways, parking, loading and, building pad areas has been developed to minimize land disturbance in order to protect the natural resources of the site. There are no proposed wetland impacts but there is an approximately 14,716 square foot wetland buffer impact is associated with the proposed development.

3.8 Potential Sources of Pollution:

Potential sources of pollution for this project include the following:

- Petroleum products associated with fueling/servicing of construction vehicles including clean and used motor oil, transmission fluid, anti-freeze, and hydraulic fluid.
- Leakage of petroleum fluids from construction equipment.
- Eroded soil/turbidity transported by stormwater.
- Dust.
- Solid waste/debris from construction activity.
- Waste asphalt/concrete.
- Earthwork operations.
- Landscaping operations.

3.9 Allowable Sources of Non-Stormwater Discharges:

The following non-stormwater discharges may occur during the construction activity:

- Uncontaminated groundwater from dewatering.
- Irrigation water.
- Pavement wash-waters.
- Water from dust control.
- Fire hydrant flushing and uncontaminated water line flushing.
- Water used to wash vehicles where detergents are not used.

- Emergency fire-fighting activities.

Note: In the State of New Hampshire It must be determined that any excavation dewatering discharges are not contaminated before they will be authorized as an allowable non-stormwater discharge under this permit. The water is considered uncontaminated if there is no groundwater contamination within 1,000 feet of the groundwater dewatering location. Any uncontaminated excavation dewatering discharges must be treated as necessary to remove suspended solids and turbidity. The discharges must be sampled at least once per week during weeks when discharges occur. Samples must be analyzed for total suspended solids (TSS) or turbidity and must meet daily maximum limits outlined in 9.1.1 (c) in the 2022 Construction General Permit (CGP) (as modified).

3.10 Endangered Species:

There is no federally-designated Critical Habitat in New Hampshire. The only federally-listed endangered and threatened species listed for the subject site is the Northern Long-eared Bat, which is threatened statewide (see Appendix E). **It is recommended that tree clearing minimized from June 1 to July 31 in order to mitigate potential impacts to bat habitats.**

3.11 Historic Preservation:

The property is currently developed as an existing manufacturing building which disturbed the majority of the site. The prior disturbances likely preclude the possibility that historical resources exist on the site.

3.12 References:

This SWPPP is subject to other documentation and reports that have been prepared for this project. These materials include the following:

- National Pollutant Discharge Elimination System (NPDES) Stormwater Construction General Permit (CGP) authorized February 17, 2022.
- New Hampshire Stormwater Manual, Volume 3, December 2008, prepared by NHDES.
- Best Management Practices for Roadside Invasive Plants, 2008, prepared by NHDOT.
- Site Plan (15 Sheets), Proposed Building Additions, 22 Friars Drive Hudson, NH, prepared for Integra Biosciences Corp., dated January 27, 2022 and prepared by Hayner/Swanson, Inc., Nashua, NH.
- Stormwater Management Report, Proposed Building Additions, 22 Friars Drive Hudson, NH, prepared for Integra Biosciences Corp., dated January 27, 2022 and prepared by Hayner/Swanson, Inc., Nashua, NH.

SECTION 4: EROSION & SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMP'S)

The following is a summary of temporary soil erosion and sediment control measures that are proposed for the project construction.

4.1 Minimize Disturbed Area and Protect Natural Features and Soil

The contractor shall minimize the area disturbed at any one-time during construction to minimize the potential for erosion from the construction site.

4.2 Control Storm Water Flow onto and through Project Site

The use of diversion berms/trenches shall be utilized where needed to divert and off-site stormwater from flowing through the construction site. Any diversion trench shall be stabilized prior to allowing stormwater to flow directly through the swale.

4.3 Street Cleaning and Construction Vehicle Tracking

Stabilized Construction Entrance/Exits:
Anti-tracking pads consisting of stone will be installed at the exit to the construction area to prevent the off-site transport of sediment by construction vehicles. The pad will be a minimum of 75 feet in length.

Street Cleaning:
If sediment is accidentally transported onto the adjacent streets accessing the construction site it will be removed from the street surface on a daily basis. Sediment will be swept or shoveled from the street and disposed of in a manner which prevents contamination with stormwater or surface water.

4.4 Establish Perimeter Controls and Sediment Barriers

Silt Socks:
Silt socks shall be installed as indicated and detailed on the plans and directed in the field along fill slopes and areas with erosion potential. The barrier should be maintained to remove sediment build-up and protect abutting areas. Install parallel to contour across the direction of expected flow and prevent by-pass by sweeping the ends in an up-gradient direction.

Temporary Stone Check Dams:
Temporary stone check dams shall be installed as indicated and detailed on the plans and directed in the field at the stormwater outfalls and other areas of concentrated flow as needed. The stone check dams should be maintained to remove sediment build-up and reduce velocities and provide protection to existing sediment/detention basins. Install across the direction of expected flow and extend upslope to prevent by-passing of the check dam.

4.5 Stabilize Soils

Temporary Stabilization of Soils:
Portions of the site where construction activities will temporarily cease for more than 14 days shall be temporarily stabilized with mulch. Winter stabilization will occur between October 15th and March 15th.

Permanent Stabilization of Soils:
Permanent stabilization will be done immediately after the final design grades are achieved but no later than 14 days after construction ceases within the area.

Dust Control:
Dust from the site will be controlled by using a water distribution truck to apply potable water to disturbed areas during windy days and dry conditions. In difficult areas/conditions, the contractor may choose to use an alternate product with soil bonding properties to control dust. The water truck will apply water at a rate which keeps the dust controlled but minimized as to prevent runoff and ponding. Dust control will be implemented as needed once construction activities start.

Stockpile Areas:
All temporary stockpiles will be mulched and seeded prior to the onset of wet weather. Long term stockpiles will be compacted, hydroseeded and silt socks installed around the perimeter.

4.6 Protect Slopes

Erosion Control Blankets:
Erosion control blankets will be used to provide stabilization for slopes greater than 3:1 or in difficult areas of the project.

4.7 Protect Drain Inlets

Inlet Protection:
Storm drain inlets existing within the vicinity of the construction activities and those to be installed as part of this project will be properly protected and maintained using approved inlet protection devices as shown of the plans. A NHDES approved BMP should be used at all catch basins which include the use of SiltSaks and block and gravel inlet filters.

4.8 Protect Downstream Waterbodies

Construction Dewatering:
Proper construction dewatering practices must be used in order to prevent discharged water from eroding soil on site and the sedimentation of downstream water resources. There are a number of methods for settling or filtering sediment from dewatering, including temporary basins or sediment traps, and manufactured fabric bags designed

for filtering pumped discharges. During active dewatering process, inspection of the dewatering facility should be reviewed daily, with more frequent or continuous supervision warranted by site conditions.

SECTION 5: MATERIAL MANAGEMENT AND SPILL PREVENTION

The operator shall employ measures and practices to reduce the risk of spills or other accidental exposure of materials to stormwater runoff. The operator shall pay special attention to the handling, use and disposal of materials such as petroleum products, fertilizers and paints to ensure that the risk associated with the use of these products is minimized. The following "Good Housekeeping" practices shall be followed during construction of the project:

- An effort shall be made to store only enough product required to do the job.
- All materials stored on-site shall be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products shall be kept in their original containers with their manufacturers' label.
- Whenever possible, all of a product shall be used before disposing of the container.
- Manufacturers' recommendations for proper use and disposal shall be followed.
- The operator shall inspect daily to ensure proper use and disposal of materials.

5.1 Potential Sources of Non-Sediment Pollutants

All potential pollutants other than sediment shall be handled and disposed of in a manner that does not cause contamination of stormwater. Non-sediment pollutants that may be present during construction of this project include:

- Petroleum products including fuel, lubricants, hydraulic fluids and form oils
- Water treatment chemicals (coagulant, acid, chlorine, sodium bicarbonate)
- Concrete
- Paints
- Fertilizers

These materials and other materials used during construction with the potential to impact strormwater shall be stored, managed, used and disposed of in a manner that minimizes the potential for release to the environment and stormwater.

5.2 Waste Management

The operator shall provide dumpsters within the materials storage area. Dumpsters shall have a water tight lid, be positioned away from stormwater conveyances and

drains. Only trash and construction debris form the site shall be disposed of in the dumpsters.

5.3 Hazardous Materials

These practices are used to reduce the risk associated with hazardous materials:

- Products will be kept in original containers unless they are not resealable
- Original labels and material safety data will be retained; they contain important product information
- If surplus product must be disposed of, manufacturers'' or local and State recommended methods for proper disposal will be followed

5.4 Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products:
All onsite vehicles will be monitored daily for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturers' recommendations. Vehicles should be fueled in the parking and storage areas to help contain any spills that may occur. Designated areas shall be flat and not within 75 feet of surface water or wetlands.

Fertilizers:
Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to stormwater. Fertilizers shall be stored in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints:
All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system, but will be properly disposed of according to the manufacturers' recommendations.

Concrete:
Concrete washout areas shall be provided for and shown on the site map. Washout areas shall be clearly marked on the site. All concrete trucks shall utilize the designated washout areas.

5.5 Spill Control Practices

In addition to the previous measures discussed for good housekeeping and material handling practices, the following practices will be followed for spill prevention and cleanup:

- Material Safety Data Sheets (MSDS) shall be kept onsite for reference to the Manufacturer's recommended methods of cleanup
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury form contact with hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State and local government agency, regardless of size.
- The spill control measures shall be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- The site superintendent will be responsible for day to day operations and will be the spill prevention and cleanup coordinator.

5.6 Requirements for Reporting Spills

Spill of toxic or hazardous materials or of a material of an amount that exceeds the reportable quantity (RQ) as defined in 40CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302, then the SWPPP coordinator shall do the following:

- Call the National Response Center to report the spill at (800)424-8802 or (202)267-2675
- Call NHDES to report a spill between 8 am and 4 pm at (603) 271-3899 or contact NH State Police at (603) 271-3636.
- Quantities of oil requiring reporting: 1) discharge of any oil into surface water or groundwater of the state; 2) A discharge of 25 gallons or more of oil to land; 3) A discharge oil that results in the presence of vapors that pose an imminent threat to human health; 4) A discharge of oil resulting in a violation of the groundwater quality criteria of ENV-OR 603.01 in a sample collected from a water supply well.
- Within 14 days, modify SWPPP to include a description of spill details and file a spill report.

SECTION 6: EROSION AND SEDIMENT INSPECTION AND MAINTENANCE

These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls for the project:

- All BMP's will be inspected at least once each week and within 24 hours following any storm event of 0.25 inches or greater.
- All measures shall be maintained in good working order; repairs, if necessary, shall be initiated within 24 hours of the inspection report depicting the deficiency.

- Sediments will be removed from silt socks when it has reached one-third the height of the barrier
- Silt socks will be inspected for depth of sediment, tears, to see if the barrier is properly attached to posts and is adequately anchored in the ground.
- Sediment basins will be inspected for depth of sediment. Sediment build up will be removed when it reaches 10 percent of the design capacity or at the end of the job.
- Temporary stone check dams will be inspected after each rainfall and daily during extended storm periods. Damaged check dams, undermining, and end-run erosion shall be repaired promptly. Sediment shall be removed once it reaches a depth of one-half the check dam height.
- Storm Drain Inlet Protections shall be inspected daily during extended storm periods. Remove collected sediments weekly, or more frequently during extended storm periods.
- Temporary and permanent seeding and landscape areas shall be inspected for rills, bare spots, washouts, and healthy growth and repaired as needed.
- A maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the inspector is attached.
- The owner and/or site contractor will select individuals who will be responsible for inspections, maintenance and repair activities.

SECTION 7: RECORD KEEPING

7.1 Recordkeeping

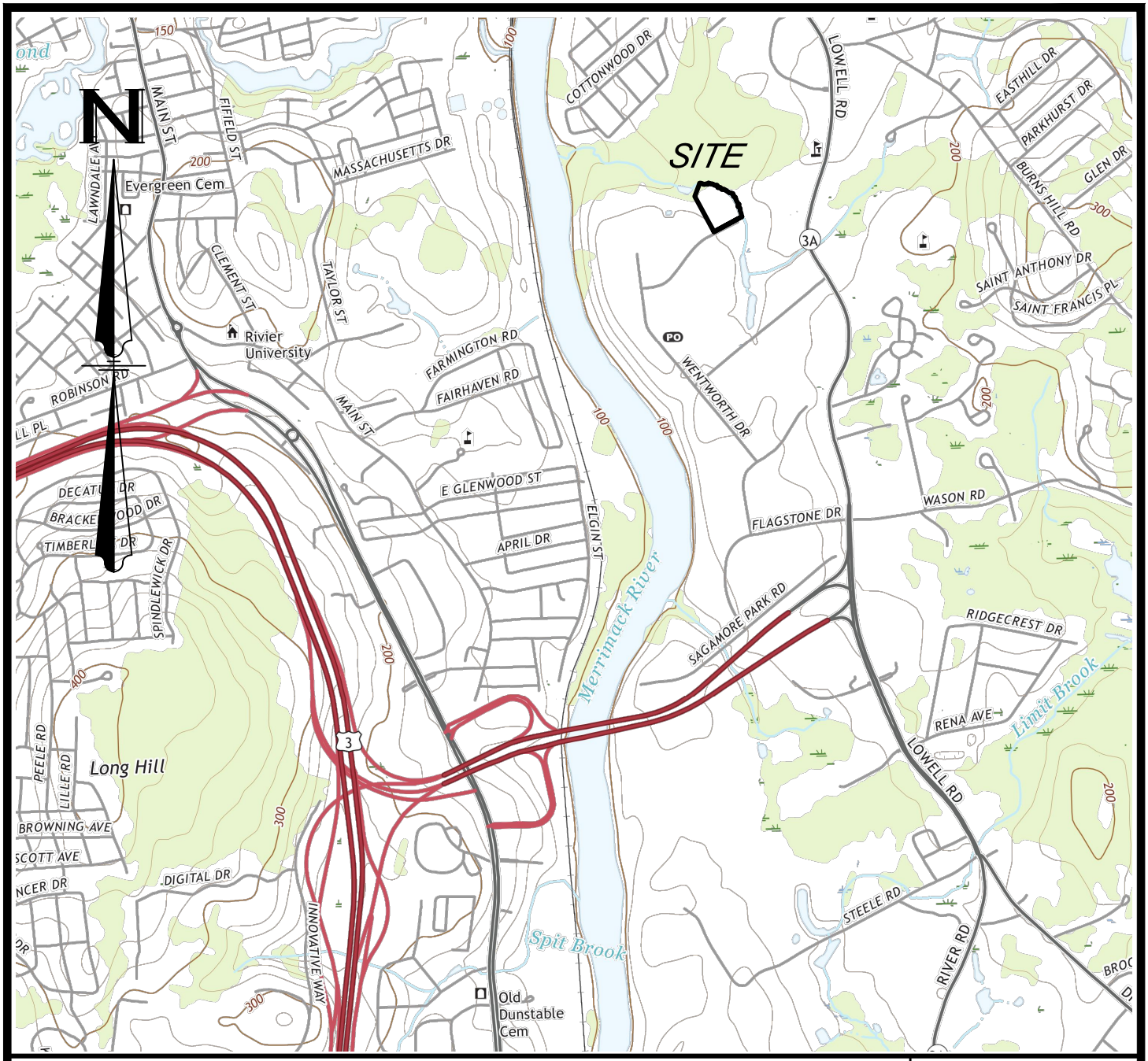
The General Permit requires that copies of the SWPPP and all documentation required by the permit, including records of all data used to complete the NOI to be cover by the permit, must be retained for a least three years from the date the permit coverage expires or is terminated. This period may be extended by the request of the EPA at any time.

7.2 Amendments to SWPPP

The operator shall update the SWPPP as necessary to reflect the project conditions. A SWPPP Amendment Log shall be kept up to date and can be found at the front of this report.

SWPPP Appendix A:

Site Locus Map



1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

NASHUA SOUTH, NH, MA
QUAD MAP (2021)

FIG. 1

VICINITY PLAN

PROPOSED BUILDING ADDITION

22 FRIARS DRIVE

HUDSON, NH

PREPARED FOR:

INTEGRA BIOSCIENCE CORP.

2 WENTWORTH DRIVE, HUDSON, NH 03051

JULY 2021

HSI *Hayner/Swanson, Inc.*
3 Congress Street Nashua, NH 03062 (603) 883-2057
131 Middlesex Turnpike Burlington, MA 01803 (781) 203-1501
www.hayner-swanson.com

Drawing: 5734 USGS

Location: J:\5000\5734\DWG

5734

File Number

SWPPP Appendix B:

EPA Construction General Permit

(Not submitted for DRAFT SWPPP)

SWPPP Appendix C:

Notice of Intent & EPA Acknowledgement Letter

(To be inserted)

SWPPP Appendix D:

Notice of Termination

(To be inserted by the contractor)

SWPPP Appendix E:
Endangered Species Documentation

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW HAMPSHIRE

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Belknap	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Meredith, Alton and Laconia
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Carroll	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Albany, Brookfield, Eaton, Effingham, Madison, Ossipee, Wakefield and Wolfeboro
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Coos	Canada Lynx	Threatened	Regenerating softwood forest, usually with a high density of snowshoe hare.	All Towns
	Dwarf wedgemussel	Endangered	Connecticut River main channel and Johns River	Northumberland, Lancaster and Dalton
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Cheshire	Dwarf wedgemussel	Endangered	S. Branch Ashuelot River and Ashuelot River	Swanzey, Keene and Surry
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Grafton	Dwarf wedgemussel	Endangered	Connecticut River main channel	Haverhill, Piermont, Orford and Lyme
	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Holderness
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Hillsborough	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Manchester, Weare
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Merrimack	Karner Blue Butterfly	Endangered	Pine Barrens with wild blue lupine	Concord and Pembroke
	Small whorled Pogonia	Threatened	Forests	Bow, Danbury, Epsom, Loudon, Warner and Allenstown
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

Updated 02/05/2016

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW HAMPSHIRE

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Rockingham	Piping Plover	Threatened	Coastal Beaches	Hampton and Seabrook
	Roseate Tern	Endangered	Atlantic Ocean and nesting at the Isle of Shoals	
	Red knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal towns
	Small whorled Pogonia	Threatened	Forests	Deerfield, Northwood, Nottingham, and Epping
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Strafford	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Middleton, New Durham, Milton, Farmington, Strafford, Barrington, and Madbury
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Sullivan	Northeastern bulrush	Endangered	Wetlands	Acworth, Charlestown, Langdon
	Dwarf wedgemussel	Endangered	Connecticut River main channel	Plainfield, Cornish, Claremont and Charlestown
	Jesup's milk-vetch	Endangered	Banks of the Connecticut River	Plainfield and Claremont
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

[1]Migratory only, scattered along the coast in small numbers

-Eastern cougar, gray wolf and Puritan tiger beetle are considered extirpated in New Hampshire.

-Endangered gray wolves are not known to be present in New Hampshire, but dispersing individuals from source populations in Canada may occur statewide.-There is no federally-designated Critical Habitat in New Hampshire

Updated 02/05/2016

SWPPP Appendix F:

Inspection Forms/ Reports/Corrective Action Logs

Stormwater Construction Site Inspection Report

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications	Insert qualifications or add reference to the SWPPP. (See Section 5 of the SWPPP Template)		
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1		❑Yes ❑No	❑Yes ❑No	
2		❑Yes ❑No	❑Yes ❑No	
3		❑Yes ❑No	❑Yes ❑No	
4		❑Yes ❑No	❑Yes ❑No	
5		❑Yes ❑No	❑Yes ❑No	
6		❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	
8		❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	
11		❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
12		❑Yes ❑No	❑Yes ❑No	
13		❑Yes ❑No	❑Yes ❑No	
14		❑Yes ❑No	❑Yes ❑No	
15		❑Yes ❑No	❑Yes ❑No	
16		❑Yes ❑No	❑Yes ❑No	
17		❑Yes ❑No	❑Yes ❑No	
18		❑Yes ❑No	❑Yes ❑No	
19		❑Yes ❑No	❑Yes ❑No	
20		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature:_____ **Date:**_____

Corrective Action Log

Project Name: **Integra Biosciences Building Additions**
Project Location: **22 Friars Drive Hudson, NH**
SWPPP Contact: **Robert Fougere, Integra Biosciences, 2 Wentworth Drive Hudson, NH**

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

SWPPP Appendix G:
Site-Related Permit Approvals
(To be inserted)

SWPPP Appendix H:

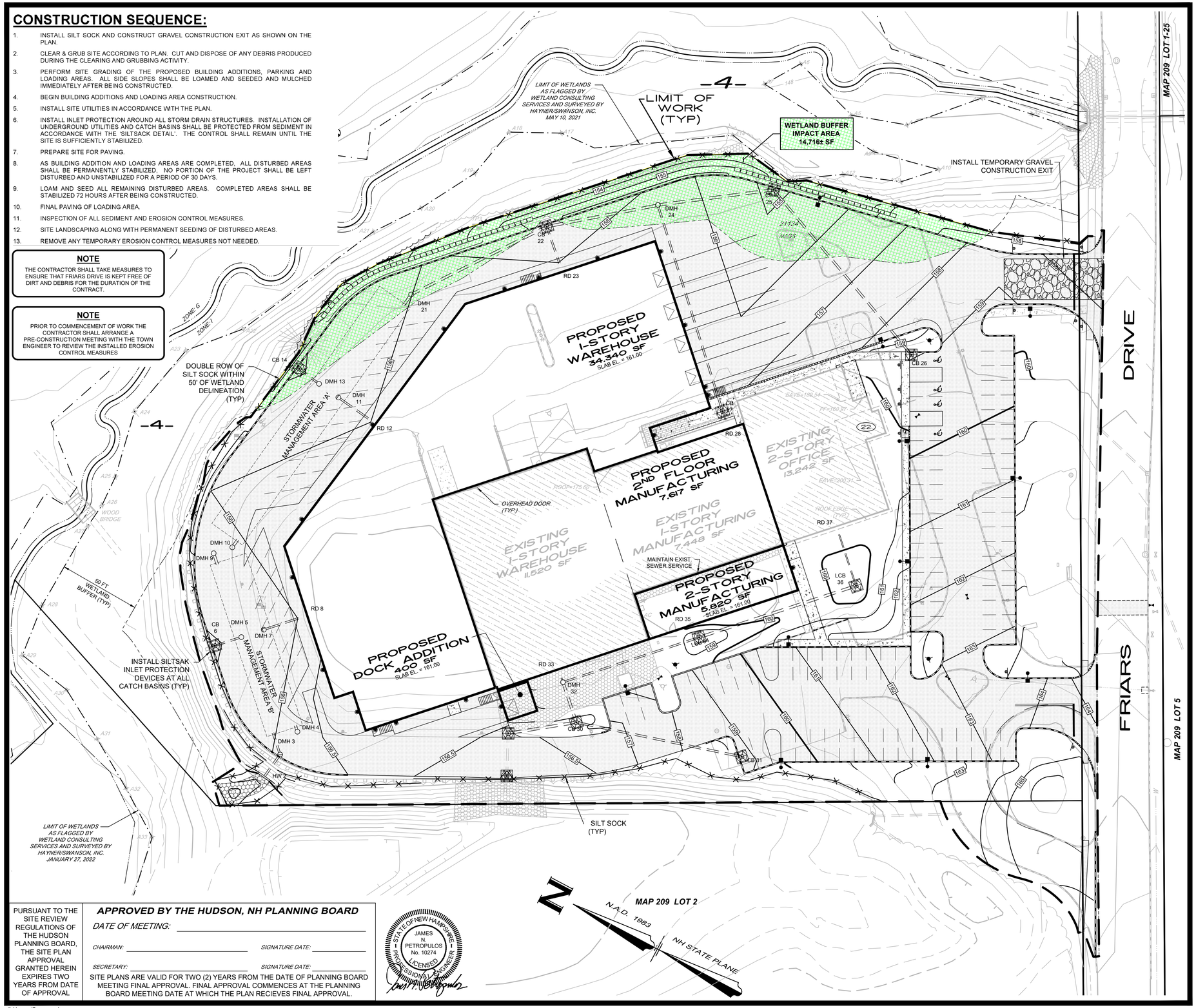
Erosion & Sediment Control Maps

CONSTRUCTION SEQUENCE:

1. INSTALL SILT SOCK AND CONSTRUCT GRAVEL CONSTRUCTION EXIT AS SHOWN ON THE PLAN.
2. CLEAR & GRUB SITE ACCORDING TO PLAN. CUT AND DISPOSE OF ANY DEBRIS PRODUCED DURING THE CLEARING AND GRUBBING ACTIVITY.
3. PERFORM SITE GRADING OF THE PROPOSED BUILDING ADDITIONS, PARKING AND LOADING AREAS. ALL SIDE SLOPES SHALL BE LOAMED AND SEEDED AND MULCHED IMMEDIATELY AFTER BEING CONSTRUCTED.
4. BEGIN BUILDING ADDITIONS AND LOADING AREA CONSTRUCTION.
5. INSTALL SITE UTILITIES IN ACCORDANCE WITH THE PLAN.
6. INSTALL INLET PROTECTION AROUND ALL STORM DRAIN STRUCTURES. INSTALLATION OF UNDERGROUND UTILITIES AND CATCH BASINS SHALL BE PROTECTED FROM SEDIMENT IN ACCORDANCE WITH THE 'SILTSACK DETAIL'. THE CONTROL SHALL REMAIN UNTIL THE SITE IS SUFFICIENTLY STABILIZED.
7. PREPARE SITE FOR PAVING.
8. AS BUILDING ADDITION AND LOADING AREAS ARE COMPLETED, ALL DISTURBED AREAS SHALL BE PERMANENTLY STABILIZED, NO PORTION OF THE PROJECT SHALL BE LEFT DISTURBED AND UNSTABILIZED FOR A PERIOD OF 30 DAYS.
9. LOAM AND SEED ALL REMAINING DISTURBED AREAS. COMPLETED AREAS SHALL BE STABILIZED 72 HOURS AFTER BEING CONSTRUCTED.
10. FINAL PAVING OF LOADING AREA.
11. INSPECTION OF ALL SEDIMENT AND EROSION CONTROL MEASURES.
12. SITE LANDSCAPING ALONG WITH PERMANENT SEEDING OF DISTURBED AREAS.
13. REMOVE ANY TEMPORARY EROSION CONTROL MEASURES NOT NEEDED.

NOTE
THE CONTRACTOR SHALL TAKE MEASURES TO ENSURE THAT FRIARS DRIVE IS KEPT FREE OF DIRT AND DEBRIS FOR THE DURATION OF THE CONTRACT.

NOTE
PRIOR TO COMMENCEMENT OF WORK THE CONTRACTOR SHALL ARRANGE A PRE-CONSTRUCTION MEETING WITH THE TOWN ENGINEER TO REVIEW THE INSTALLED EROSION CONTROL MEASURES



PURSUANT TO THE SITE REVIEW REGULATIONS OF THE HUDSON PLANNING BOARD, THE SITE PLAN APPROVAL GRANTED HEREIN EXPIRES TWO YEARS FROM DATE OF APPROVAL

APPROVED BY THE HUDSON, NH PLANNING BOARD

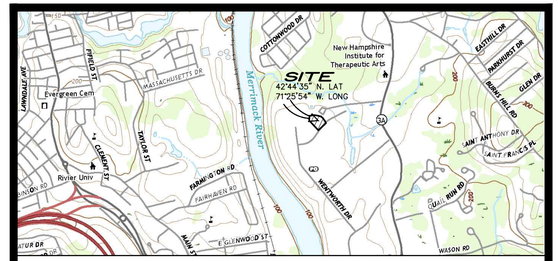
DATE OF MEETING: _____

CHAIRMAN: _____ SIGNATURE DATE: _____

SECRETARY: _____ SIGNATURE DATE: _____

SITE PLANS ARE VALID FOR TWO (2) YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN RECIEVES FINAL APPROVAL.

STATE OF NEW HAMPSHIRE — JAMES N. PETROPULOS No. 10274 LICENSED PROFESSIONAL ENGINEER



VICINITY MAP

GENERAL NOTES:

1. ALL CONTRACTORS AND SUBCONTRACTORS INVOLVED WITH THE PROJECT SHALL OBTAIN A COPY OF THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT (NPDES PERMIT) AND SHALL COMPLY WITH THE TERMS OF SWPPP AND NPDES PERMIT.
2. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES AS REQUIRED BY THE SWPPP. ADDITIONAL BEST MANAGEMENT PRACTICES SHALL BE IMPLEMENTED AS DICTATED BY SITE CONDITIONS AT NO ADDITIONAL COST OF OWNER THROUGHOUT ALL PHASES OF CONSTRUCTION.
3. BEST MANAGEMENT PRACTICES (BMP'S) AND CONTROLS SHALL CONFORM TO FEDERAL, STATE, OR LOCAL REQUIREMENTS OR MANUAL OF PRACTICE, AS APPLICABLE. CONTRACTOR SHALL IMPLEMENT ADDITIONAL CONTROLS AS DIRECTED BY PERMITTING AGENCY OR OWNER.
4. STOCKPILE AREAS SHALL BE SURROUNDED BY SILT SOCK AND RE-SEEDED IF THEY ARE LEFT UNTOUCHED FOR MORE THAN FOURTEEN (14) DAYS.
5. ALL MEASURES STATED ON THIS EROSION CONTROL PLAN, AND IN THE STORMWATER POLLUTION PREVENTION PLAN, SHALL BE MAINTAINED IN FULLY FUNCTIONAL CONDITION UNTIL NO LONGER REQUIRED FOR A COMPLETE PHASE OF WORK OR FINAL STABILIZATION OF THE SITE. ALL EROSION CONTROL MEASURES SHALL BE CHECKED BY A QUALIFIED PERSON IN ACCORDANCE WITH THE CONTRACT DOCUMENTS OR THE APPLICABLE PERMIT, WHICHEVER IS MORE STRINGENT.
6. SILT SOCK SHALL BE REPAIRED TO THEIR ORIGINAL CONDITIONS IF DAMAGED.
7. INLET PROTECTION DEVICES AND BARRIERS SHALL BE REPAIRED OR REPLACED IF THEY SHOW SIGNS OF UNDERMINING OR DETERIORATION.
8. ALL SEEDED AREAS SHALL BE CHECK REGULARLY TO SEE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED, WATERED AND RESEEDED AS NEEDED.
9. THE CONSTRUCTION EXIT SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHT-OF WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING OF THE CONSTRUCTION EXIT AS CONDITIONS DEMAND.
10. THE TOWN OF HUDSON RESERVES THE RIGHT TO REQUIRE ADDITIONAL EROSION CONTROL MEASURES DURING CONSTRUCTION IF NEEDED.
11. DISTURBED SOIL AREAS THAT WILL REMAIN IDLE FOR MORE THAN 30 DAYS SHALL BE TEMPORARILY STABILIZED AS SOON AS PRACTICABLE BUT NO LATER THAN 5 DAYS FROM THE INITIAL DISTURBANCE WITH SEED AND MULCH, EROSION CONTROL BLANKETS OR CRUSHED STONE OR OTHER SUITABLE MEASURES APPROVED BY THE TOWN ENGINEER OR DESIGNATED REPRESENTATIVE. ALL DISTURBED SOIL AREAS THAT HAVE ACHIEVED FINAL GRADING SHALL BE PERMANENTLY STABILIZED WITHIN 3 DAYS FOLLOWING FINAL GRADING.

LEGEND

- EXISTING GROUND CONTOUR
- PROPOSED GRADE
- RUNOFF DIRECTION
- SILT SOCK PERIMETER BARRIER
- SILT-SACK INLET PROTECTION DEVICES
- GRAVEL CONSTRUCTION EXIT
- TEMPORARY STONE CHECK DAM

No.	DATE	REVISION	BY
1	03/08/22	ADDRESS TOWN, PEER REVIEW COMMENTS	JNP

EROSION CONTROL PLAN
(MAP 209, LOT 4)

PROPOSED BUILDING ADDITIONS

22 FRIARS DRIVE
HUDSON, NEW HAMPSHIRE

PREPARED FOR/RECORD OWNER:

INTEGRA BIOSCIENCES CORP.

2 WENTWORTH DRIVE HUDSON, NEW HAMPSHIRE 03051 (603) 578-5800

30 0 30 60 90 120 FEET
15 0 15 30 METERS
SCALE: 1"=30 Feet
1"=9.144 Meters

27 JANUARY 2022

HSI Hayner/Swanson, Inc.
Civil Engineers/Land Surveyors
3 Congress Street, Nashua, NH 03062, (603) 883-2057
131 Middlesex Turnpike, Burlington, MA 01803, (781) 203-1501
www.hayner-swanson.com

FIELD BOOK: 1234	DRAWING NAME: 5734 SITE-ER31	5734	6 OF 15
DRAWING LOC: J:\5000\5734\DWG\5734 SITE 2021		File Number	Sheet

Welcome to New Hampshire's Watershed Report Cards built from the 2018, 305(b)/303(d)

Each Watershed Report Card covers a single 12 digit Hydrologic Unit Code (HUC12), on average a 34 square mile area. Each Watershed Report Card has three components;

1. REPORT CARD - A one page card that summarizes the overall use support for Aquatic Life Integrity, Primary Contact (i.e. Swimming), and Secondary Contact (i.e. Boating) Designated Uses on every Assessment Unit ID (AUID) within the HUC12.
2. HUC 12 MAP - A map of the watershed with abbreviated labels for each AUID within the HUC12.
3. ASSESSMENT DETAILS - Anywhere from one to forty pages with the detailed assessment information for each and every AUID in the Report Card and Map.

How are the Surface Water Quality Assessment determinations made?

All readily available data with reliable Quality Assurance/Quality Control is used in the biennial surface water quality assessments. For a full understanding of how the Surface Water Quality Standards (Env-Wq 1700) are translated into surface water quality assessments we urge the reader to review the 2018 Consolidated Assessment and Listing Methodology (CALM) at https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/documents/r-wd-19-04.pdf.

Where can I find more advanced mapping resources?

GIS files are available by assessment cycle at ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/GIS

I'd like to see the more raw water quality data?

The web mapping tool allows you to download the data used in the assessment of the primary contact and aquatic life designated uses by clicking on the "Data Access Waterbody Data (Aquatic Life and Swimming Uses)" link for any assessment unit. (https://www.des.nh.gov/organization/divisions/water/wmb/swqa/assessment-viewers.htm)

How are assessments coded in the report card?

Assessment outcomes are displayed on a color scale as well as an alpha numeric scale that provides additional distinctions for the designated use and parameter level assessments as outlined in the table below.

		Severe Not Supporting, Severe	**Poor** Not Supporting, Marginal	**Likely Bad** Insufficient Information – Potentially Not Supporting	**No Data** No Data	**Likely Good** Insufficient Information – Potentially Full Supporting	**Marginal** Full Support, Marginal	**Good** Full Support, Good
CATEGORY	**Description**							
Category 2	Meets standards						2-M or 2-OBS	2-G
Category 3	Insufficient Information			3-PNS	3-ND	3-PAS		
Category 4	Does not Meet Standards;							
4A	TMDL* Completed	4A-P	4A-M or 4A-T					
4B	Other enforceable measure will correct the issue.	4B-P	4B-M or 4B-T					
4C	Non-pollutant (i.e. exotic weeds)	4C-P	4C-M					
Category 5	TMDL^ Needed	5-P	5-M or 5-T					

* TMDL stands for Total Maximum Daily Load studies (http://des.nh.gov/organization/divisions/water/wmb/tmdl/index.htm)

WATERSHED 305(b) ASSESSMENT SUMMARY REPORT:

HUC 12 010700061206

HUC 12 NAME MERRIMACK MAINSTEM-NASHUA RIVER TO CONCORD RIVER

(Locator map on next page only applies to this HUC12)

Assessment Cycle 2018

Good		Full Support Good
Marginal		Full Support Marginal
Likely Good		Insufficient Information – Potentially Full Support
No Data		No Data
Likely Bad		Insufficient Information – Potentially Not Support
Poor		Not Support Marginal
Severe		Not Support Severe

ASSESSMENT UNIT ID	MAP LABEL	ASSESSMENT UNIT NAME	AQUATIC LIFE	SWIMMING	BOATING	FISH CONSUMP.
NHIMP700061206-01	I*01	MERRILL BROOK - ICE POND DAM	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-03	I*03	FIRST BROOK - FARM POND	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-04	I*04	FIRST BROOK - MELENDY POND	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-05	I*05	FIRE POND DAM	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-06	I*06	SPIT BROOK	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-07	I*07	SPIT BROOK	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-08	I*08	SPIT BROOK	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-09	I*09	VILLAGE AT BARRETTS HILL UPPER POND	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-10	I*10	VILLAGE AT BARRETTS HILL LOWER POND	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-11	I*11	UNNAMED BROOK - GOLF COURSE POND DAM	3-ND	3-ND	3-ND	4A-M
NHIMP700061206-12	I*12	MERRIL BROOK DAM	3-ND	3-ND	3-ND	4A-M
NHLAK700061206-01	L*01	AYERS POND	3-ND	3-ND	3-ND	4A-M
NHLAK700061206-02	L*02	OTTERNICK POND	5-P	5-P	3-ND	4A-M
NHLAK700061206-03	L*03	UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHLAK700061206-04	L*04	UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHLAK700061206-05	L*05	UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHLAK700061206-06	L*06	UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHLAK700061206-07	L*07	UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-01	R*01	GLOVER BROOK	5-M	3-ND	3-ND	4A-M
NHRIV700061206-02	R*02	MERRILL BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-03	R*03	MERRILL BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-04	R*04	MERRILL BROOK - UNNAMED BROOK	5-P	3-ND	3-ND	4A-M
NHRIV700061206-05	R*05	FIRST BROOK	5-M	3-ND	3-ND	4A-M
NHRIV700061206-06	R*06	FIRST BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-07	R*07	FIRST BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-08	R*08	SECOND BROOK - UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-09	R*09	SECOND BROOK - UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-10	R*10	SECOND BROOK	5-M	3-ND	3-ND	4A-M

WATERSHED 305(b) ASSESSMENT SUMMARY REPORT:

HUC 12 010700061206

HUC 12 NAME MERRIMACK MAINSTEM-NASHUA RIVER TO CONCORD RIVER

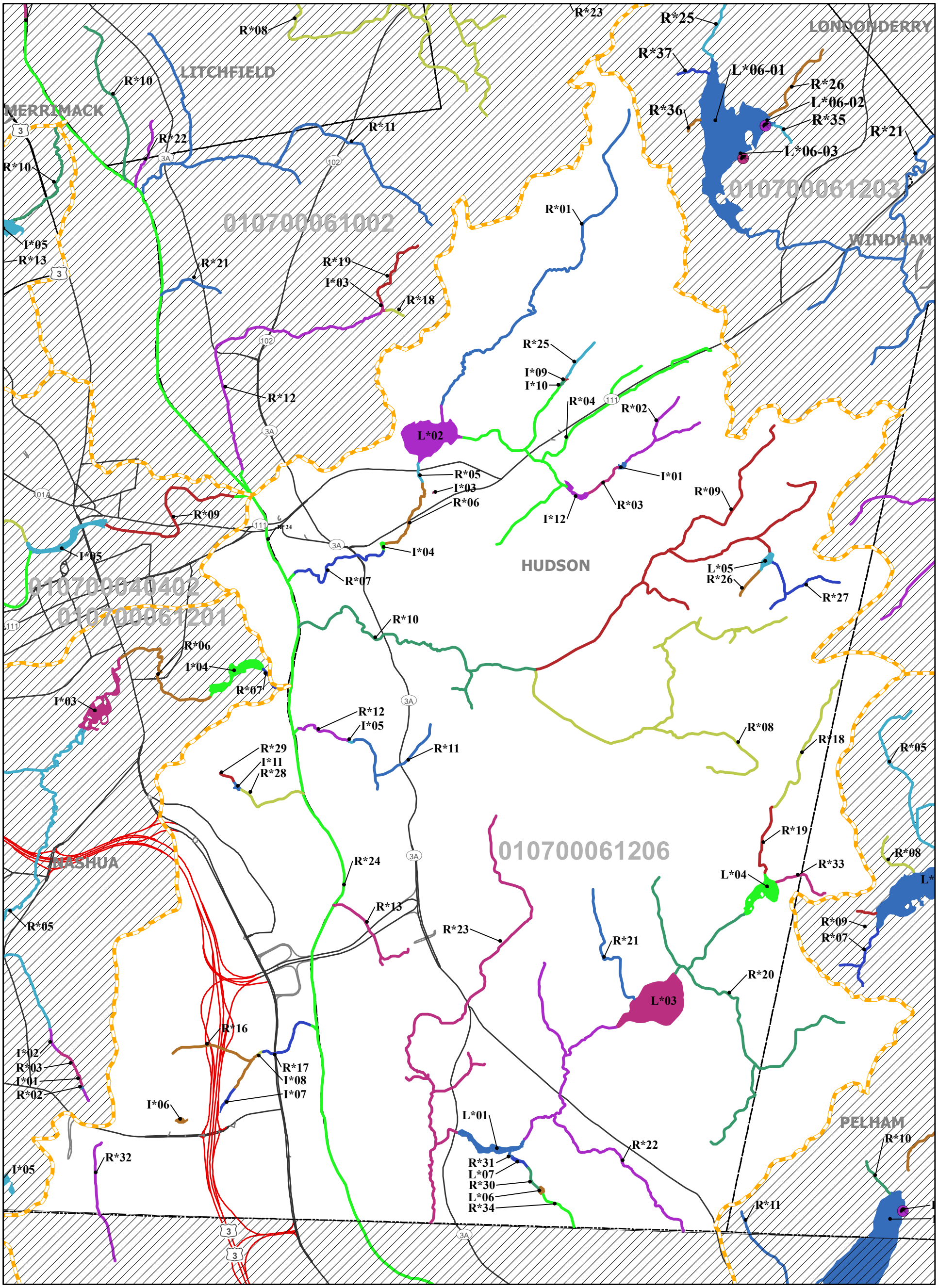
(Locator map on next page only applies to this HUC12)

Assessment Cycle 2018

Good		Full Support Good
Marginal		Full Support Marginal
Likely Good		Insufficient Information – Potentially Full Support
No Data		No Data
Likely Bad		Insufficient Information – Potentially Not Support
Poor		Not Support Marginal
Severe		Not Support Severe

ASSESSMENT UNIT ID	MAP LABEL	ASSESSMENT UNIT NAME	AQUATIC LIFE	SWIMMING	BOATING	FISH CONSUMP.
NHRIV700061206-11	R*11	UNNAMED BROOK - TO FIRE POND	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-12	R*12	UNNAMED BROOK - FROM FIRE POND TO MERRIMACK RIVER	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-13	R*13	UNNAMED BROOK - TO MERRIMACK RIVER	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-16	R*16	SPIT BROOK - UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-17	R*17	SPIT BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-18	R*18	MUSQUASH BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-19	R*19	MUSQUASH BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-20	R*20	MUSQUASH BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-21	R*21	UNNAMED BROOK - TO UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-22	R*22	MUSQUASH BROOK - LAWRENCE BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-23	R*23	MUSQUASH BROOK - LIMIT BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-24	R*24	MERRIMACK RIVER	5-M	5-M	4A-M	4A-M
NHRIV700061206-25	R*25	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-26	R*26	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-27	R*27	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-28	R*28	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-29	R*29	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-30	R*30	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-31	R*31	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-32	R*32	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-33	R*33	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV700061206-34	R*34	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M

AUIDs For HUC12: 010700061206 - Merrimack mainstem-Nashua River to Concord River



HUC12 Boundaries
Town Boundaries
Major Roads
Interstate Highway
US Highway
State Highway

Assessment Unit Coloring
AUs Ending with:
0 =
1 =
2 =
3 =
4 =
5 =
6 =
7 =
8 =
9 =

N
W E
S

Abbrv. Label	HUC 12
L* 03	010 700060201

AUID = NH L AK 700060201 - 03

Assessment Unit IDs are derived from the HUC12 they reside within. The labels have been shortened on this map for presentation purposes.
Example: the Label "L*03" in HUC12 = 010700060201 represents AUID = "NHLAK700060201-03"
In rare cases where an AUID extends beyond the boundary of a single HUC12, additional portions of the end of the HUC 12 number have also been replaced.

0 0.35 0.7 1.05 1.4 Miles

Scale:1:37,190

S:\WD-Watershed\WQ_Planning\305b_303d\2018\AUIDs\HUC12Maps

Assessment Unit ID NHRIV700061206-24
Assessment Unit Name MERRIMACK RIVER
Primary Town NASHUA

Size 5.1510 MILES
Beach N
Assessment Unit Category*~ 5-M

2018, 305(b)/303(d) - All Reviewed Parameters by Assessment Unit

Designated Use Description	*Desig. Use Category	Parameter Name	Parameter Threatened (Y/N)	Last Sample	Last Exceed	Parameter Category*	TMDL Priority
Aquatic Life Integrity	5-M	ALKALINITY, CARBONATE AS CACO3	N	2012	2012	3-PNS	
		AMMONIA (TOTAL)	N	2012	N/A	3-PAS	
		ARSENIC	N	1995	N/A	3-ND	
		Aluminum	N	2017	2014	5-M	LOW
		CADMIUM	N	2005	2005	3-ND	
		CHLORIDE	N	2018	N/A	3-PAS	
		COPPER	N	2016	2004	3-PAS	
		DISSOLVED OXYGEN SATURATION	N	2018	N/A	3-PAS	
		IRON	N	1995	N/A	3-ND	
		LEAD	N	2005	2005	3-ND	
		NICKEL	N	2005	2005	3-ND	
		Nonnative Fish, Shellfish, or Zooplankton	N			3-PNS	
		OXYGEN, DISSOLVED	N	2018	N/A	2-G	
		PHOSPHORUS (TOTAL)	N	2017	NLV	3-PAS	
		SELENIUM	N	1995	N/A	3-ND	
		TURBIDITY	N	2017	2012	3-PAS	
		ZINC	N	2004	2004	3-ND	
		pH	N	2018	2017	5-M	LOW
Fish Consumption	4A-M	ARSENIC	N	1995	N/A	3-ND	
		COPPER	N	2016	N/A	3-PNS	
		MANGANESE	N	1994	N/A	3-ND	
		Mercury	N			4A-M	
		NICKEL	N	2005	N/A	3-ND	
		SELENIUM	N	1995	N/A	3-ND	
		ZINC	N	2004	N/A	3-ND	
Potential Drinking Water Supply	2-G	ARSENIC	N	1995	N/A	3-ND	
		COPPER	N	2016	N/A	3-PAS	
		ESCHERICHIA COLI	N	2017	2017	3-PNS	
		FECAL COLIFORM	N	2004	2004	3-ND	

Severe	Poor	Likely Bad	No Data	Likely Good	Marginal	Good
Not Supporting, Severe	Not Supporting, Marginal	Insufficient Information – Potentially Full Supporting	No Data	Insufficient Information – Potentially Full Supporting	Full Support, Marginal	Full Support, Good

*DES Categories; 2-G = Supports Parameter well above criteria, 2-M = Supports Parameter marginally above criteria, 2-OBS = Exceeds WQ criteria but natural therefore not a WQ exceedence, 3-ND = Insufficient Information/No data, 3-PAS= Insufficient Information/Potentially Attaining Standard, 3-PNS= Insufficient Information/Potentially Not Attaining Standard, (4A=Impaired/TMDL Completed, 4B=Impaired/Other Measure will rectify Impairment, 4C=Impaired/Non-Pollutant, 5=Impaired/TMDL needed) M=Marginal Impairment, P=Severe Impairment, T=Threatened (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm)

Assessment Unit ID NHRIV700061206-24
Assessment Unit Name MERRIMACK RIVER
Primary Town NASHUA

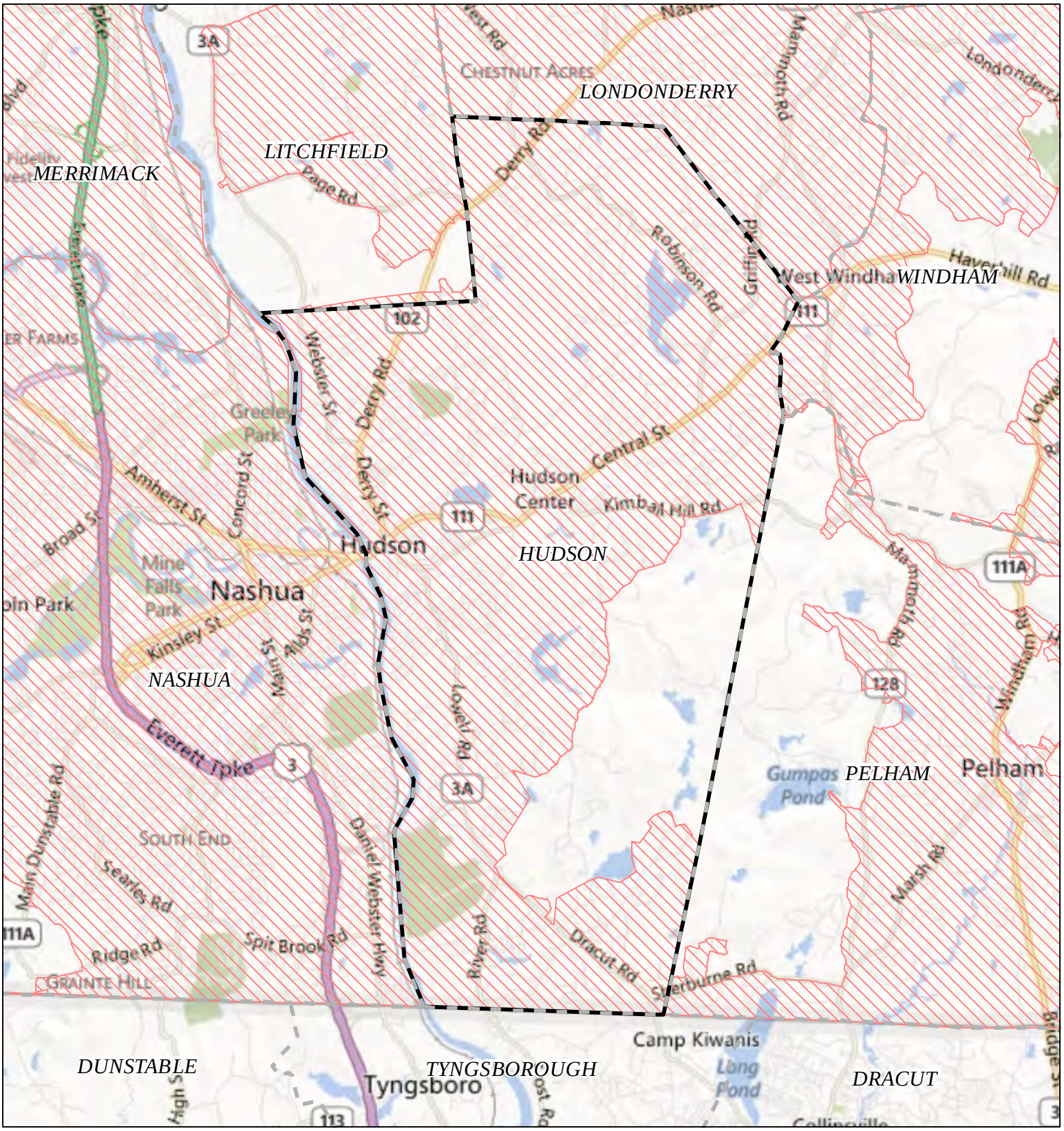
Size 5.1510 MILES
Beach N
Assessment Unit Category*~ 5-M

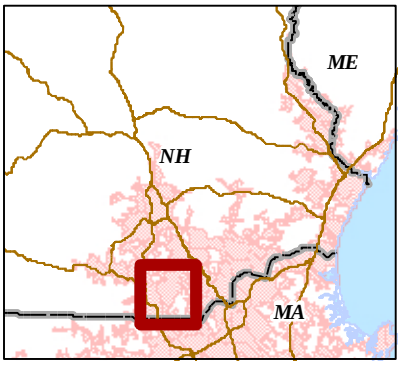
2018, 305(b)/303(d) - All Reviewed Parameters by Assessment Unit

Designated Use Description	*Desig. Use Category	Parameter Name	Parameter Threatened (Y/N)	Last Sample	Last Exceed	Parameter Category*	TMDL Priority
Potential Drinking Water Supply	2-G	IRON	N	1995	1995	3-ND	
		MANGANESE	N	1994	1994	3-ND	
		NICKEL	N	2005	N/A	3-ND	
		SELENIUM	N	1995	N/A	3-ND	
		SULFATES	N	2016	N/A	3-PAS	
		ZINC	N	2004	N/A	3-ND	
Primary Contact Recreation	5-M	Chlorophyll-a	N	2017	2011	5-M	LOW
		Escherichia coli	N	2017	2015	4A-M	
Secondary Contact Recreation	4A-M	Escherichia coli	N	2017	2015	4A-M	
Wildlife	3-ND						

Severe	Poor	Likely Bad	No Data	Likely Good	Marginal	Good
Not Supporting, Severe	Not Supporting, Marginal	Insufficient Information – Potentially Full Supporting	No Data	Insufficient Information – Potentially Full Supporting	Full Support, Marginal	Full Support, Good

*DES Categories; 2-G = Supports Parameter well above criteria, 2-M = Supports Parameter marginally above criteria, 2-OBS = Exceeds WQ criteria but natural therefore not a WQ exceedence, 3-ND = Insufficient Information/No data, 3-PAS= Insufficient Information/Potentially Attaining Standard, 3-PNS= Insufficient Information/Potentially Not Attaining Standard, (4A=Impaired/TMDL Completed, 4B=Impaired/Other Measure will rectify Impairment, 4C=Impaired/Non-Pollutant, 5=Impaired/TMDL needed) M=Marginal Impairment, P=Severe Impairment, T=Threatened (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm)





NPDES Phase II Stormwater Program
Automatically Designated MS4 Areas

Hudson NH

Regulated Area (2000 + 2010 Urbanized Area)

0 1 2 3 4 5 Kilometers

0 1 2 3 4 5 Miles

Town Population: 24351

Regulated Population: 23373

(Populations estimated from 2010 Census)

Urbanized Areas, Town Boundaries:
US Census (2000, 2010)
Base map © 2010 Microsoft Corporation
and its data suppliers

US EPA Region 1 GIS Center Map #8824, 11/19/2012

New Hampshire

NPDES Phase II Stormwater Program
Automatically Designated MS4 Areas

Regulated Area:

UA Based on 2000 Census

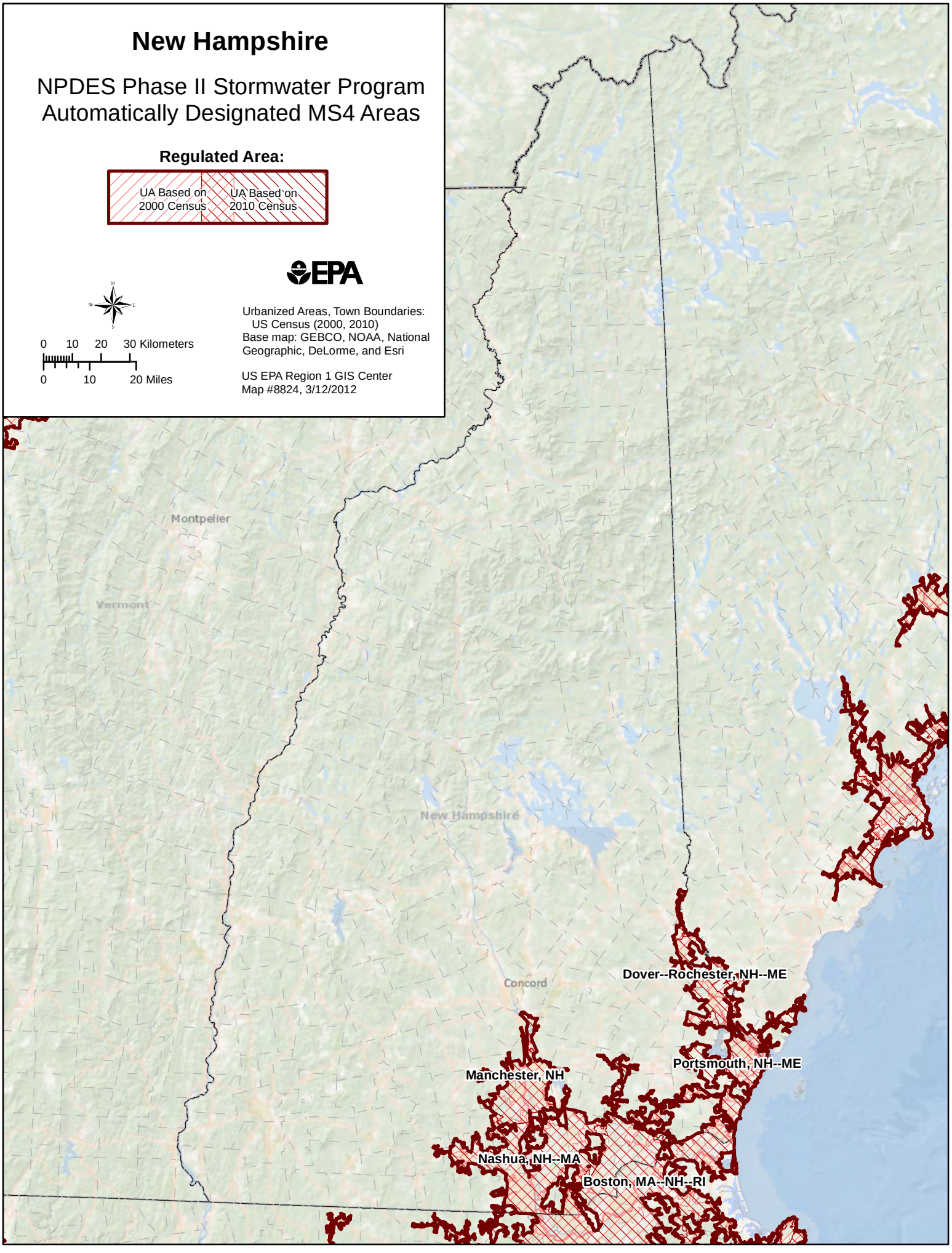
UA Based on 2010 Census

0 10 20 30 Kilometers

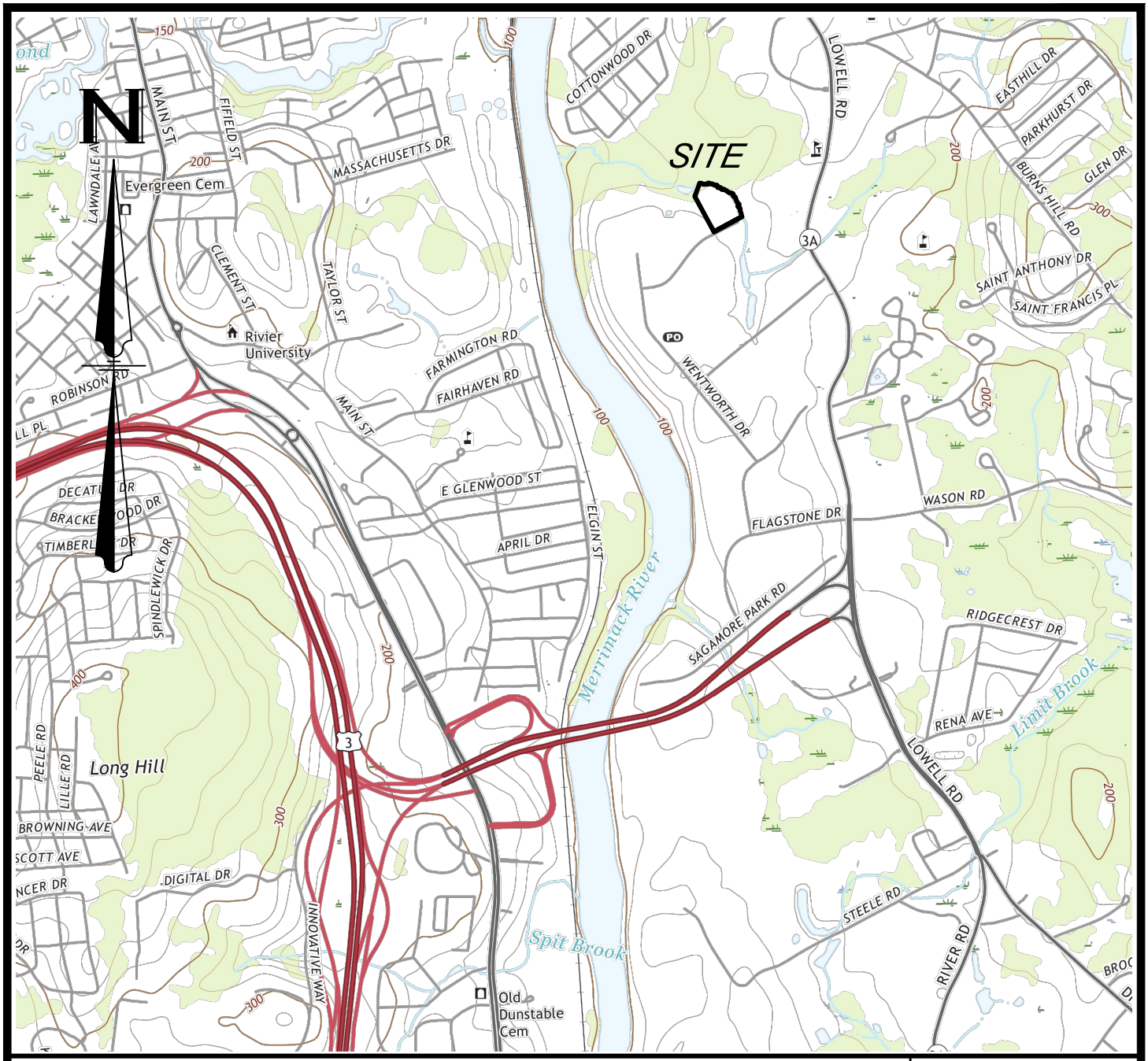
0 10 20 Miles

Urbanized Areas, Town Boundaries: US Census (2000, 2010)
Base map: GEBCO, NOAA, National Geographic, DeLorme, and Esri

US EPA Region 1 GIS Center
Map #8824, 3/12/2012



EXHIBITS



1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

NASHUA SOUTH, NH, MA
QUAD MAP (2021)

FIG. 1

VICINITY PLAN

PROPOSED BUILDING ADDITION

22 FRIARS DRIVE

HUDSON, NH

PREPARED FOR:

INTEGRA BIOSCIENCE CORP.

2 WENTWORTH DRIVE, HUDSON, NH 03051

JULY 2021

HSI *Hayner/Swanson, Inc.*
3 Congress Street Nashua, NH 03062 (603) 883-2057
131 Middlesex Turnpike Burlington, MA 01803 (781) 203-1501
www.hayner-swanson.com

Drawing: 5734 USGS

Location: J:\5000\5734\DWG

5734

File Number

0 200 400 600 FEET

SOIL SURVEY STAFF, NATURAL RESOURCES CONSERVATION SERVICE, UNITED STATES DEPT. OF AGRICULTURE. WEB SOIL SURVEY. AVAILABLE ONLINE AT http://websoilsurvey.nrcs.usda.gov/ ACCESSED JULY 29, 2021.

NRCS SOILS MAP

PROPOSED BUILDING ADDITION

22 FRIARS DRIVE

HUDSON, NH

FIG. 2

PREPARED FOR:

INTEGRA BIOSCIENCE CORP.

2 WENTWORTH DRIVE, HUDSON, NH 03051

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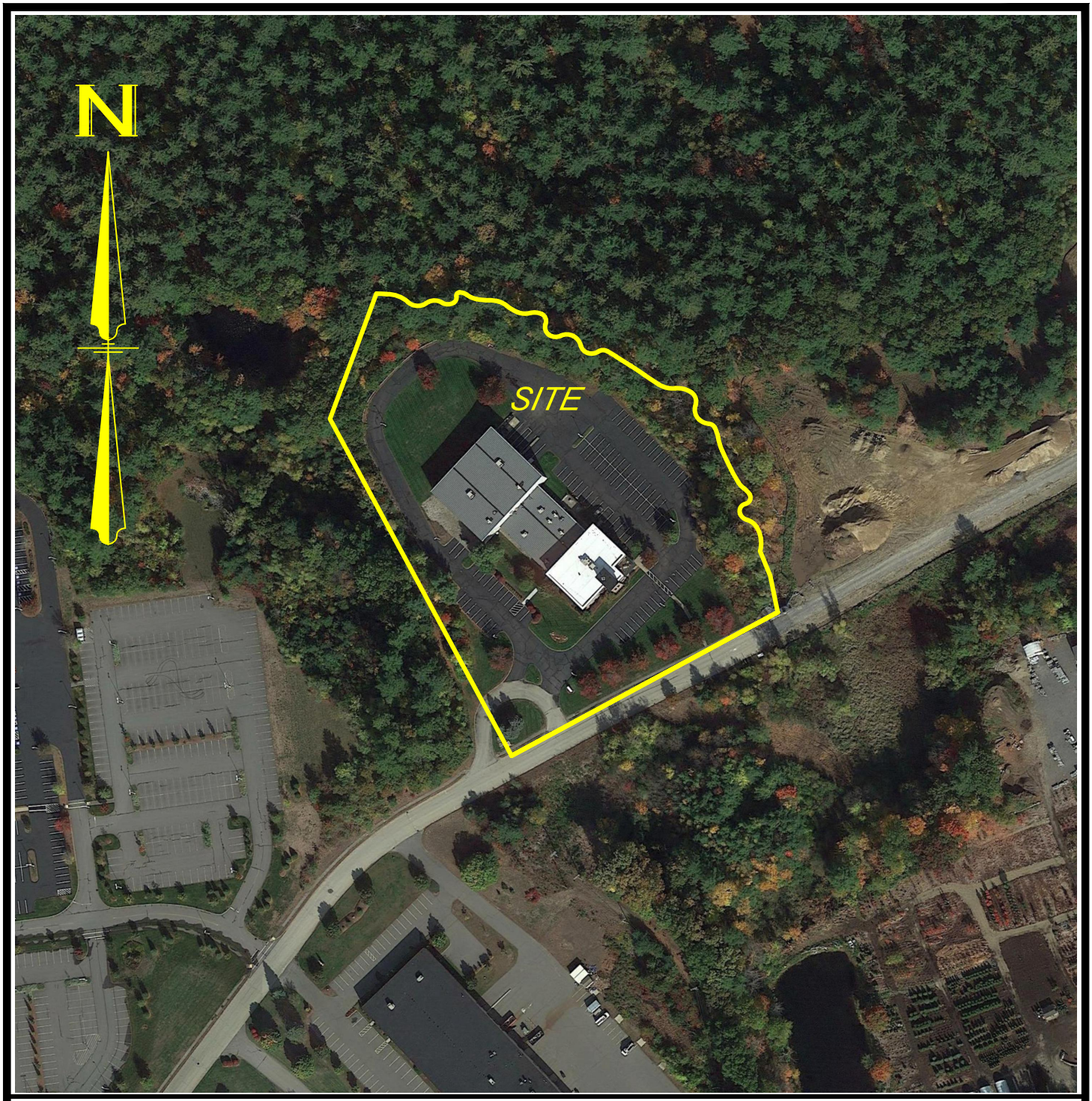
File Number



0 200 400 600 FEET

AERIAL DISPLAY PLAN

PROPOSED BUILDING ADDITION

22 FRIARS DRIVE

HUDSON, NH

FIG. 3

PREPARED FOR:

INTEGRA BIOSCIENCE CORP.

2 WENTWORTH DRIVE, HUDSON, NH 03051

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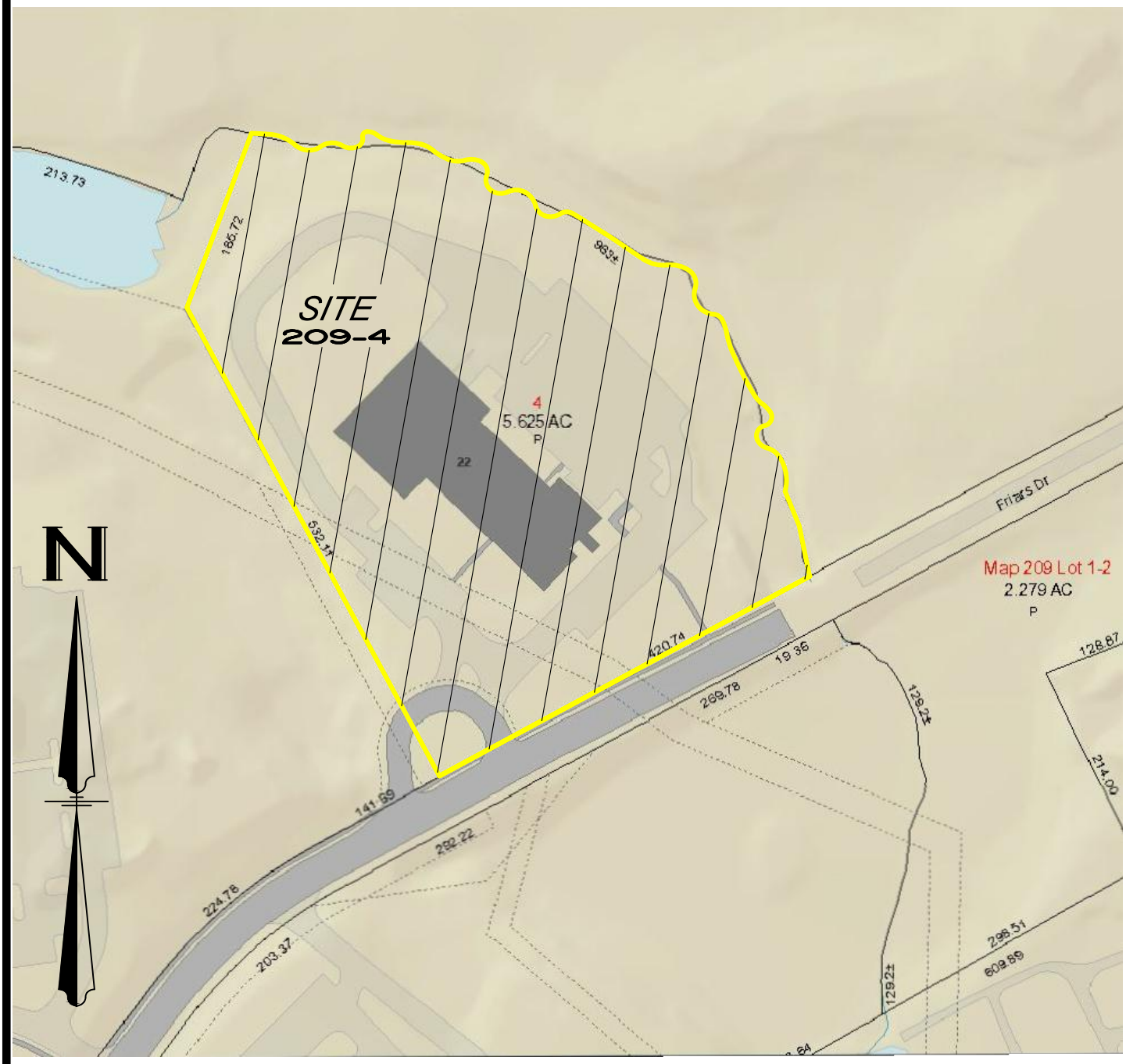
5734

File Number



TAX MAP

PROPOSED BUILDING ADDITION

22 FRIARS DRIVE

HUDSON, NH

FIG. 4

PREPARED FOR:

INTEGRA BIOSCIENCE CORP.

2 WENTWORTH DRIVE, HUDSON, NH 03051

JULY 2021

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131 Middlesex Turnpike Burlington, MA 01803 (781) 203-1501
www.hayner-swanson.com

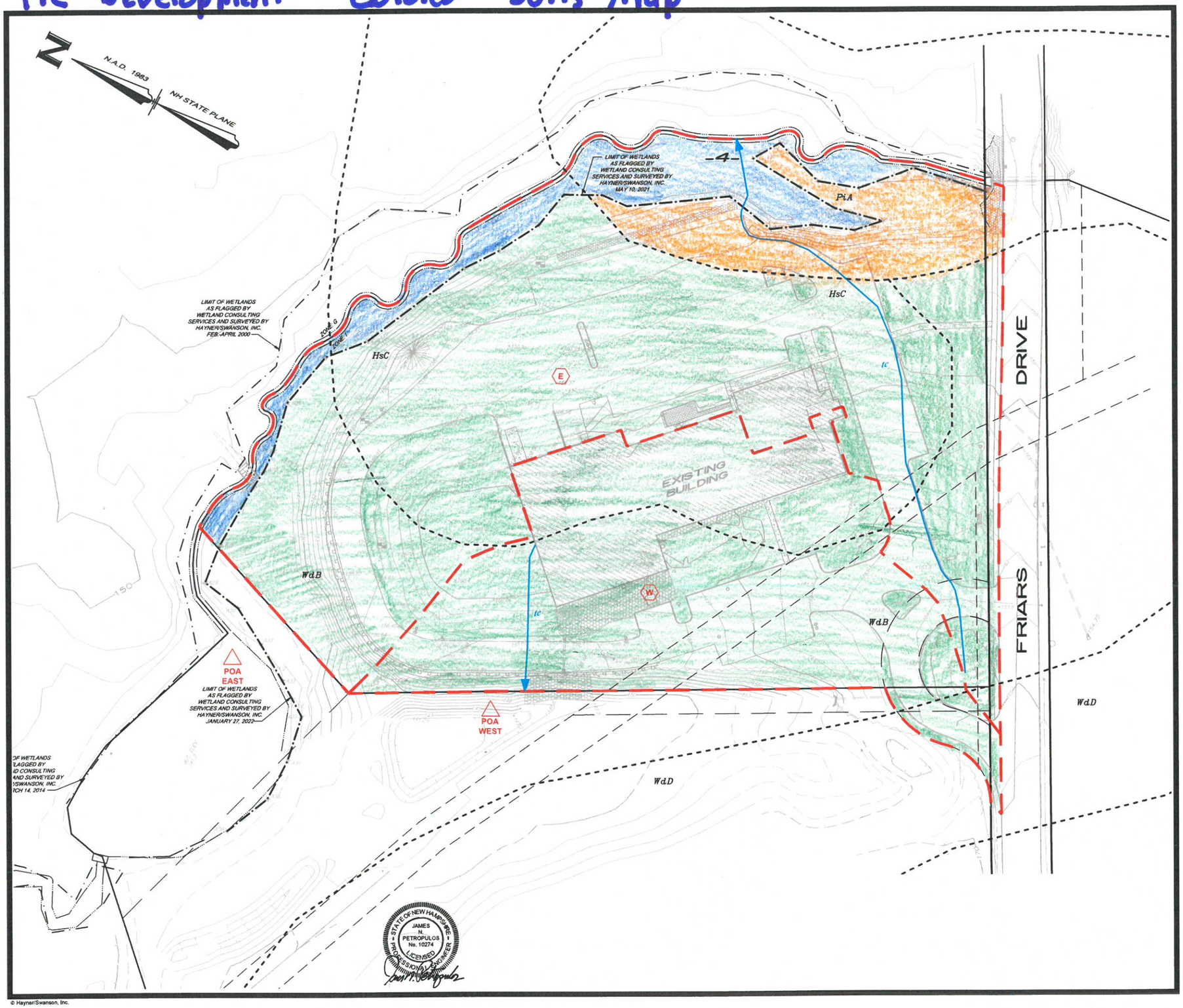
Drawing: 5734 USGS

Location: J:\5000\5734\DWG

5734

File Number

Pre-Development Colored Soils Map



LEGEND

- tc — TIME OF CONCENTRATION LINE
- SUBCATCHMENT BOUNDARY
- 11 — SUBCATCHMENT IDENTIFIER
- POA — POINT OF ANALYSIS
- WETLAND FLAGGING LIMIT
- SOIL TYPE BOUNDARY
- 447B — SOIL TYPE

SOIL SURVEY STAFF, NATURAL RESOURCES CONSERVATION SERVICE, UNITED STATES DEPT. OF AGRICULTURE. WEB SOIL SURVEY. AVAILABLE ONLINE AT http://websoilsurvey.nrcs.usda.gov/ ACCESSED 09/01/20

SOILS DATA

HsC	HINCKLEY LOAMY SAND
WdB	WINDSOR LOAMY SAND
PiA	PIPESTONE LOAMY SAND
- - -	SOIL BOUNDARY

No.	DATE	REVISION	BY

PRE-DEVELOPMENT
DRAINAGE AREA MAP
(MAP 209, LOT 4)

PROPOSED BUILDING ADDITIONS
22 FRIARS DRIVE
HUDSON, NEW HAMPSHIRE

PREPARED FOR/RECORD OWNER:

INTEGRA BIOSCIENCES CORP.
2 WENTWORTH DRIVE HUDSON, NEW HAMPSHIRE 03051 (603) 578-5800

40 0 40 80 120 160 FEET
20 0 20 40 METERS
SCALE: 1"=40 Feet
1"=12.192 Meters

27 JANUARY 2022

HSI Hayner/Swanson, Inc.
Civil Engineers/Land Surveyors
3 Congress Street, Nashua, NH 03062, (603) 883-2057
131 Middlesex Turnpike, Burlington, MA 01803, (781) 203-1501
www.hayner-swanson.com

FIELD BOOK: 1234	DRAWING NAME: 5734 SITE-DAMAP	5734	FIGURE 4
DRAWING LOC: J:\5000\5734\DWG\5734 SITE 2021		File Number	Sheet

Post - Development Colored Soils Map

N
N.A.D. 1983
NH STATE PLANE

LIMIT OF WETLANDS AS FLAGGED BY WETLAND CONSULTING SERVICES AND SURVEYED BY HAYNER/SWANSON, INC. MAY 10, 2021

LIMIT OF WETLANDS AS FLAGGED BY WETLAND CONSULTING SERVICES AND SURVEYED BY HAYNER/SWANSON, INC. FEB.-APRIL 2000

LIMIT OF WETLANDS AS FLAGGED BY WETLAND CONSULTING SERVICES AND SURVEYED BY HAYNER/SWANSON, INC. JANUARY 27, 2022

OF WETLANDS FLAGGED BY D CONSULTING AND SURVEYED BY SWANSON, INC. CH 14, 2014

HsC
PiA
WdB
WdD

SMA A
SMA B
SMA C

POA EAST
POA WEST

OVERHEAD DOOR (TYP.)

DRIVE
FRIARS

JAMES N. PETROPULOS No. 10274 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

LEGEND

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	SOIL BOUNDARY

No.	DATE	REVISION	BY

POST-DEVELOPMENT
DRAINAGE AREA MAP
(MAP 209, LOT 4)

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FIELD BOOK: 1234	DRAWING NAME: 5734 SITE-DAMAP	5734	FIGURE 5
DRAWING LOC: J:\5000\5734\DWG\5734 SITE 2021		File Number	Sheet

N

N.A.D. 1983

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LIMIT OF WETLANDS AS FLAGGED BY WETLAND CONSULTING SERVICES AND SURVEYED BY HAYNER/SWANSON, INC. JANUARY 27, 2022

LIMIT OF WETLANDS AS FLAGGED BY WETLAND CONSULTING SERVICES AND SURVEYED BY HAYNER/SWANSON, INC. MARCH 14, 2014

ZONE G

ZONE I

EXISTING BUILDING

DRIVE

FRIARS

HsC

PiA

WdB

WdD

Tc

POA EAST

POA WEST

E

W

LEGEND

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- SUBCATCHMENT BOUNDARY
- 11 — SUBCATCHMENT IDENTIFIER
- POA — POINT OF ANALYSIS
- WETLAND FLAGGING LIMIT
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	SOIL BOUNDARY

No.	DATE	REVISION	BY

PRE-DEVELOPMENT
DRAINAGE AREA MAP
(MAP 209, LOT 4)

PROPOSED BUILDING ADDITIONS

22 FRIARS DRIVE
HUDSON, NEW HAMPSHIRE

PREPARED FOR/RECORD OWNER:

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FIELD BOOK: 1234	DRAWING NAME: 5734 SITE-DAMAP	5734	FIGURE 5
DRAWING LOC: J:\5000\5734\DWG\5734 SITE 2021		File Number	Sheet

N.A.D. 1983
NH STATE PLANE

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LIMIT OF WETLANDS AS FLAGGED BY WETLAND CONSULTING SERVICES AND SURVEYED BY HAYNER/SWANSON, INC. MARCH 14, 2014

ZONE G
ZONE I

DRIVE
FRIARS

OVERHEAD DOOR (TYP.)

SMA A
SMA B
SMA C

POA EAST
POA WEST

HsC
PiA
WdB
WdD

tc

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POST-DEVELOPMENT
DRAINAGE AREA MAP
(MAP 209, LOT 4)

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FIELD BOOK: 1234	DRAWING NAME: 5734 SITE-DAMAP	5734	FIGURE 6
DRAWING LOC: J:\5000\5734\DWG\5734 SITE 2021		File Number	Sheet