K0076-065
September 24, 2025

Samantha Collins, Chair
City of Portsmouth Conservation Commission
1 Junkins Avenue
Portsmouth, New Hampshire 03801

Re: **Request for Wetlands Conditional Use Permit Review**
150 Portsmouth Boulevard – Proposed Multi-Family Development

Dear Chair Collins,

On behalf of Brora, LLC (Owner) and The Kane Company (Applicant) we are pleased to submit one (1) set of hard copies and one electronic file (.pdf) of the following information to support the request for a Wetland Conditional Use Permit for the above referenced project.

Documents for the attention of the Conservation Commission:

- One (1) 22x34 & one (1) 11x17 copy of the Site Plan Set, last revised September 22, 2025;
- Historical Site Overlay Exhibit, dated July 30, 2025;
- Wetland Buffer Exhibit, dated September 22, 2025;
- Community Space Exhibit, dated September 22, 2025;
- Green Building Statement, dated September 18, 2025;
- Drainage Analysis, dated September 22, 2025;
- Long-Term Operation & Maintenance Plan, dated September 22, 2025;
- Hillside Multifamily Development Project Resource Area Delineation Memo, dated September 17, 2025;
- Wetland Conditional Use Permit Checklist, dated September 22, 2025;
- Authorization Form

PROJECT SUMMARY

Existing Conditions

The proposed project is located on a parcel of land along Portsmouth Boulevard that is identified as Map 213 Lot 12 on the City of Portsmouth Tax Maps. The property is bound to the north by Portsmouth Boulevard, to the west by the Hilton Homewood Suites, to the south by residences on Osprey Drive and to the east by residences on Dunlin Way. The site is currently undeveloped. This property is an 8.4-acre parcel of land located in the Office Research District and the Gateway Neighborhood Overly District (GNOD). The northern portion of the parcel along Portsmouth Boulevard, that contained multiple housing structures and parking areas prior to the mid-1990's, gently slopes up from north to south, and then approximately one-third of the way into the parcel the topography changes to a steep slope that plateaus in the south corner of the site after grade change of approximately 50- feet in elevation.

Proposed Redevelopment

The proposed project will be permitted under the recently adopted GNOD Overlay District regulations. As currently designed, the project will include three (3), six (6) story multifamily residential buildings consisting of approximately 274 dwelling units. With approval from the

City Council, the Applicant will be proposing a Land Transfer to the City on separate property in order to achieve the Density Bonus offered by the Land Transfer Incentive Option (Section 10.686.30) and allow for six (6) story construction with up to 120 dwelling units per building.

The three (3) proposed buildings will be located along the frontage of Portsmouth Boulevard with associated parking located at the rear of buildings. Tenant amenity areas are anticipated to be provided on the first floor of the buildings with the primary amenities being centrally located in the middle building. The buildings will be connected by attractively landscaped and hardscaped outdoor amenity areas. The south portion of the site, where there is a significant change in grade, will remain undeveloped to provide a buffer between the proposed development and the existing residences along Osprey Drive. This south portion of the site is anticipated to be improved with walking paths and landscape features for outdoor recreation and will be the location of the required community space area. The section of Portsmouth Boulevard along the frontage of the subject property is proposed to be reconstructed with a new sidewalk and parking spaces to promote connection between the development and the surrounding neighborhood. Approximately 59% of the parcel is proposed to remain as open space post-construction.

Wetland Buffers

The proposed project results in work within the 100-foot wetland buffer. Therefore, a Wetland Conditional Use Permit is required for demolition and construction activities.

Wetlands are not located on the development parcel (Map 213 Lot 12), but rather on parcels located on the opposite side of Portsmouth Boulevard (Map 216, Lot 1-8A, Map 213 Lot 11). The 100-foot buffer in the vicinity of the project site extends across the right-of-way and into the development site. The buffer consists of the paved roadway of Portsmouth Boulevard and degraded, roadside habitat with disturbed areas of compacted gravel in addition to forested and open meadow areas with a moderate density of invasive vegetation. Stormwater flow from this section of the 100-foot buffer currently flows untreated into the wetlands as Portsmouth Boulevard lacks a stormwater treatment system.

Existing impervious areas within the buffer can be seen on the "Wetland Buffer Impervious Surface Exhibit" included under this submission. Under Section 10.1016(2) of the City of Portsmouth Zoning Ordinance, improvements to existing public rights-of-way and sidewalks are permitted in wetlands and wetland buffers. The reconstruction of Portsmouth Boulevard and its sidewalks within the wetland buffers are therefore considered permissible, and resulting impacts are not quantified.

Existing impervious areas within the development parcel include a compacted gravel drive. Impervious areas under the proposed condition within the buffer include a portion of Building A, a retaining wall, and a small portion of stairs connecting the site to the pedestrian sidewalk proposed along Portsmouth Boulevard. A comparison of the existing and proposed impervious areas within the buffer are numerically summarized in the following table (Table 1).

Table 1: 150 Portsmouth Boulevard, Wetland Buffer Impervious Surfaces

Buffer Segment	Existing Impervious (SF)	Final Impervious (SF)
0-25 feet	0	0
25-50 feet	0	0
50-100 feet	965	5,940
Total	965	5,940
Net Impervious Surface	**+4,975**	

The proposed site development includes a net increase in impervious areas within the 100-foot buffer (+4,975 sf). In order to offset this impact, the entirety of stormwater runoff within the right-of-way along the frontage of the development is proposed to be treated prior to discharge into the wetland using surface-level biofiltration systems. This amounts to almost 1 acre (42,250 sf) of treated impervious area within the right-of-way which does not contain stormwater treatment under the existing condition. The north edge of Portsmouth Boulevard is proposed to be planted with low-maintenance native grasses and trees in order to enhance the buffer and right-of-way.

LAND USE PERMIT APPLICATIONS

Local Permitting Timeline

The proposed project will require the following site-related approvals from the Planning Board:

- Site Plan Review Permit
- Wetland Conditional Use Permit

To date the applicant has attended the following meetings with the local land-use boards related to the Site Plan:

- March 20th, 2025 – Planning Board Conceptual Consultation
- June 18th, 2025 – Planning Board Design Review
- August 6th, 2025 – Conservation Commission Site Walk
- August 12th, 2025 – Technical Advisory Committee Work Session
- August 13th, 2025 – Conservation Commission Work Session

Wetland Conditional Use Permit

Jurisdictional wetland areas are located on a separate property located north of the adjacent right-of-way (Map 216, Lot 1-8A, Map 213 Lot 11). The associated wetland buffer extends across the right-of-way and into the subject development parcel. A Conditional Use Permit for Wetland Buffer Impact will be required for the project for on-site work within the 100 ft wetland buffer.

Wetland Conditional Use Permit Criteria

Based on the above described and enclosed materials, the following addresses how the proposed project warrants the granting of a Wetland Conditional Use Permit by satisfying the following six (6) criteria for approval in Section 10.1017.50 of the Zoning Ordinance:

(1) The land is reasonably suited to the use, activity or alteration.

The proposed project design is an allowed use within the Gateway Neighborhood Overlay District. Prior to the mid-1990's, the land was home to multiple housing structures and parking areas within the proposed development area. Additionally, there were houses on the opposite side of the road within the areas now identified as wetlands which impose the wetland buffer on the subject property. Sometime between 1992 and 1998, these structures were removed from the site. The buffer area proposed to be impacted as part of the project is across a public Right-of-Way from the subject wetland area and consists of degraded, roadside habitat with compacted gravel soils. Stormwater runoff from the new impervious surfaces within the proposed buffer area will be collected and treated prior to discharge into the surrounding area.

(2) There is no alternative location outside the wetland buffer that is feasible and reasonable for the proposed use, activity or alteration.

The location of the buildings in close proximity to lot frontage is driven by steep changes in topography into the southern portions of the parcel, consideration of building height and sight impacts with respect to abutters, and the restriction of location of parking facilities between principal buildings and the street (Section 10.1113.20). The placement of the proposed buildings and parking areas were sited in a way to reduce the areas of impervious surface within the wetland buffers while minimizing the impacts to the vegetated woodland area in the southern portion of the site which provides wildlife habitat and a natural screening buffer to the abutting residences. Impacts inside of the public right-of-way within the wetland buffer are a permitted use under Section 10.1016(2) of the City of Portsmouth Zoning Ordinance.

(3) There will be no adverse impact on the wetland functional values of the site or surrounding properties;

The buffer consists of the paved roadway of Portsmouth Boulevard and degraded, roadside habitat with compacted gravel surfaces, in addition to forested and open meadow areas with a moderate density of invasive vegetation. The proposed site development is not anticipated to create an adverse impact to the wetland function values or surrounding properties, as stormwater from additional impervious areas will be collected, detained, and treated prior to discharge to wetlands. Additionally, the entirety of stormwater runoff within the public right-of-way along the frontage of the development, which currently discharges untreated surface runoff into the wetlands, is proposed to be collected and treated prior to discharge using surface-level biofiltration systems. Additional native vegetation and trees are also proposed within buffer areas.

(4) Alteration of the natural vegetative state or managed woodland will occur only to the extent necessary to achieve construction goals; and

The natural vegetative state and managed woodland on the north side of the right-of-way will be impacted only temporarily to the extent necessary in order to construct right-of-way improvements. Minimal removal of trees and vegetation within the managed woodland will be required to construct a stormwater outlet at

the east edge of the development. Any temporary disturbances of the wetland buffer will be restored following construction.

(5) The proposal is the alternative with the least adverse impact to areas and environments under the jurisdiction of this Section.

The proposed development is not anticipated to create an adverse impact on the existing buffer areas. The entirety of stormwater runoff within the right-of-way along the frontage of the development is proposed to be treated prior to discharge into the wetland using surface-level biofiltration systems, providing stormwater treatment within the right-of-way that it does not contain under the existing condition. All stormwater from the development parcel will be treated in accordance with City and State requirements. The northern edge of Portsmouth Boulevard is proposed to be planted with low-maintenance native grasses and trees in order to enhance the buffer and right-of-way, improving the existing condition which consists of a moderate density of invasive vegetation.

(6) Any area within the vegetated buffer strip will be returned to a natural state to the extent feasible.

The proposed work within the vegetated buffer strip is limited to the reconstruction of Portsmouth Boulevard within similar limits that it exists today. Areas temporarily disturbed for the removal and reconstruction of paved areas within the vegetated buffer strip will be restored following construction. These impacts are inside of the public right-of-way within the wetland buffer are a permitted use under Section 10.1016(2) of the City of Portsmouth Zoning Ordinance.

CONCLUSION

As shown in the enclosed information, the proposed project is expected to create distinctive, appealing, and high-quality housing connected to the community while respecting abutting properties, surrounding natural resources, and development goals within the City.

We respectfully request to be placed on the Conservation Commission meeting agenda for October 8th, 2025. If you have any questions or need any additional information, please contact us by phone at (603) 294-9213 or by email at NAHansen@tighebond.com.

Sincerely,

TIGHE & BOND, INC.

Patrick M. Crimmins, PE
Vice President

Neil A. Hansen, PE
Project Manager

Copy: Brora LLC

\\tighebond.com\data\Data\Projects\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Reports\Applications\City of Portsmouth\20250924_CC Submission\K0076-065 CC Submission Letter.docx

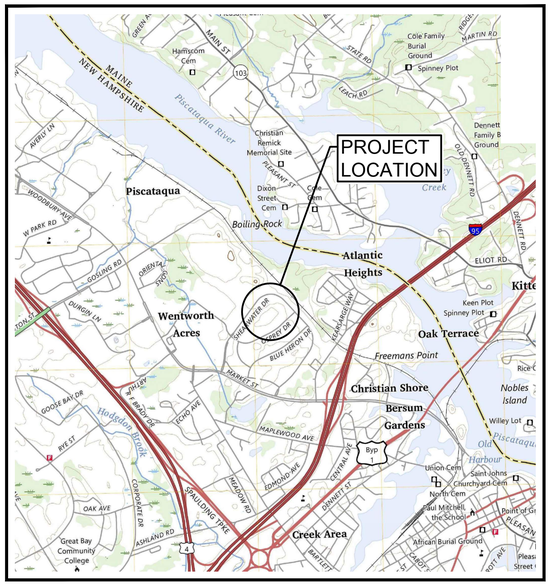
PROPOSED MULTI-FAMILY DEVELOPMENT

150 PORTSMOUTH BOULEVARD

PORTSMOUTH, NEW HAMPSHIRE

SEPTEMBER 22, 2025

SHEET NO.	SHEET TITLE	LAST REVISED
-	COVER SHEET	2025-09-22
1 OF 2	EXISTING CONDITIONS PLAN FOR DUNLIN WAY & PORTSMOUTH BOULEVARD	2025-09-03
2 OF 2	EXISTING CONDITIONS PLAN FOR DUNLIN WAY & PORTSMOUTH BOULEVARD	2025-09-03
C-101	GENERAL NOTES AND LEGEND	2025-09-22
C-201	DEMOLITION PLAN	2025-09-22
C-301	SITE PLAN	2025-09-22
C-401	GRADING. DRAINAGE, AND EROSION CONTROL PLAN	2025-09-22
C-501	UTILITIES PLAN	2025-09-22
L-101	LANDSCAPE PLANTING PLAN	2025-09-22
C-601	EROSION CONTROL NOTES AND DETAILS SHEET	2025-09-22
C-602	DETAILS SHEET	2025-09-22
C-603	DETAILS SHEET	2025-09-22
C-604	DETAILS SHEET	2025-09-22
C-605	DETAILS SHEET	2025-09-22
C-606	DETAILS SHEET	2025-09-22
C-607	DETAILS SHEET	2025-09-22
C-608	DETAILS SHEET	2025-09-22
L-501	LANDSCAPE DETAILS	2025-09-22
L01	PHOTOMETRICS PLAN	2025-07-16
1 OF 5	BUILDING A OVERALL ELEVATIONS	2025-09-22
2 OF 5	BUILDING B OVERALL ELEVATIONS	2025-09-22
3 OF 5	BUILDING C OVERALL ELEVATIONS	2025-09-22
4 OF 5	OVERALL FLOOR PLANS - GROUND FLOOR PLAN	2025-09-22
5 OF 5	OVERALL FLOOR PLANS - LEVELS 2 - 6 PLAN	2025-09-22



LOCATION MAP
SCALE: 1" = 2000'

LIST OF PERMITS		
LOCAL	STATUS	DATE
SITE PLAN REVIEW PERMIT	UNDER REVIEW	
CONDITIONAL USE PERMIT - WETLAND BUFFER	UNDER REVIEW	
STATE		
NHDES - SEWER CONNECTION PERMIT	NOT SUBMITTED	
NHDES - ALTERATION OF TERRAIN PERMIT	NOT SUBMITTED	
FEDERAL		
NPDES - CONSTRUCTION GENERAL PERMIT	NOT SUBMITTED	

CONSTRUCTION NOTES:
1. THE CONTRACTOR SHALL NOT RELY ON SCALED DIMENSIONS AND SHALL CONTACT THE ENGINEER FOR CLARIFICATION IF A REQUIRED DIMENSION IS NOT PROVIDED ON THE PLANS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION MEANS AND METHODS, AND FOR SITE CONDITIONS THROUGHOUT CONSTRUCTION. NEITHER THE PLANS NOR THE SEAL OF THE ENGINEER AFFIXED HEREON EXTEND TO OR INCLUDE SYSTEMS REQUIRED FOR THE SAFETY OF THE CONTRACTOR, THEIR EMPLOYEES, AGENTS OR REPRESENTATIVES IN THE PERFORMANCE OF THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING AND IMPLEMENTING SAFETY PROCEDURES AND SYSTEMS AS REQUIRED BY THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), AND ANY STATE OR LOCAL SAFETY REGULATIONS.
3. TIGHE & BOND ASSUMES NO RESPONSIBILITY FOR ANY ISSUES LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION OF TIGHE & BOND.

PREPARED BY:
Tighe&Bond
177 CORPORATE DRIVE
PORTSMOUTH, NEW HAMPSHIRE 03801
603-433-8818

STATE OF NEW HAMPSHIRE – PROFESSIONAL ENGINEER – PATRICK CRIMMINS No. 12378 LICENSED
9/22/2025

STATE OF NEW HAMPSHIRE – PROFESSIONAL ENGINEER – NEIL A. HANSEN No. 15227 LICENSED
9/22/2025

OWNER/APPLICANT:
BRORA LLC
210 COMMERCE WAY, SUITE 300
PORTSMOUTH, NH 03801

ARCHITECT:
PROCON, INC.
PO BOX 4430
MANCHESTER, NH 03108

SURVEYOR:
DOUCET SURVEY, LLC.
102 KENT PLACE
NEWMARKET, NH 03857

TAC SUBMISSION SET
COMPLETE SET (24) SHEETS

Last Saved: 9/18/2025
Plotted: Sep 22, 2025 - 11:27am By: BCurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-COVER.dwg

TBM 9009B
MAG NAIL SET UP 8"
IN POLE EVERSOURECE237/33
ELEV.=48.81'

TBM 9009A
'X' CUT IN BONNET
BOLT OF HYDRANT
ELEV.=54.83'

TBM 9009C
MAG NAIL SET UP 6"
IN POLE PSNH/237/35S
ELEV.=45.71'

TAX MAP 216, LOT 1-8A

TAX MAP 213, LOT 11

TAX MAP 213, LOT 12
364,581 Sq. Ft.
8.37 Acres

TAX MAP 213, LOT 2

TAX MAP 213, LOT 3

TAX MAP 213, LOT 4

TAX MAP 213, LOT 2-15

PORTSMOUTH BLVD. / DUNLIN WAY
(SEE NOTES 14&16)

OFFICE RESEARCH
GENERAL RESIDENCE B

NO SERVICE

2" METAL HYDRANT WITNESS

2" METAL HYDRANT WITNESS
OUT OF SERVICE

VGC IN DISREPAIR

CONC. BARRIERS

CONC. BLOCK BARRIERS (TYP.)

PAVEMENT BURIED UNDER GRAVEL

PAVEMENT BURIED

VGC BURIED

VGC GOES UNDERGROUND

FILL PILE (TYP.)

~FILL PILE~

TRAIL

EP BURIED

CURB BROKEN

CURB BURIED

APPROX. COVERED IN FILL DIRT/HAY

BROKEN SECTION OF CURB

ASPHALT SIDEWALK BROKEN/CRACKED

6' WOODEN STOCKADE FENCE

5/8" REBAR FND. FLUSH W/CAP LLS 844

5/8" REBAR FND. FLUSH W/CAP LLS 989

5/8" REBAR FND. UP 1" W/CAP LLS 989

5/8" REBAR FND. UP 3" NO CAP

5/8" REBAR FND. UP 4" W/CAP LLS 844 (SEE NOTE 15)

5/8" REBAR FND. UP 5" W/CAP LLS 844 (SEE NOTE 15)

5/8" REBAR FND. UP 6" W/CAP LLS 989

5/8" REBAR FND. UP 6" W/CAP LLS 844

5/8" REBAR FND. UP 18" NO CAP

1-1/2" I.P.F. FLUSH (S59°31'24"E, 1.86 TO CORNER)

1-1/4" I.P.F. UP 15"

5/8" REBAR FND. UP 8" W/CAP LLS 844 (SEE NOTE 15)

TP-X

N35°35'16"E 134.16'

N55°26'41"W 198.97'

N00°58'19"W 404.20'

S61°52'28"W 156.37'

S50°45'51"W 287.68'

S45°52'15"W 241.31'

S46°11'15"W 156.89'

S43°48'45"E 51.60'

S44°15'17"E 141.39'

L=762.51'
R=434.28'
Δ=100°35'00"
CB=S85°53'15"W
CL=668.27'

SMH 1993
RIM ELEV.=52.9'
SHELF ELEV.=46.1'
(1967) 8" VCP INV.=45.7'
(2090) 8" VCP INV.=45.7'

SMH 2090
RIM ELEV.=62.0'
SHELF ELEV.=56.3'
(A) 6" VCP INV.=56.4'
(B) 8" PVC INV.=56.3'
(199.3) 8" VCP INV.=56.0'

SMH 1967
RIM ELEV.=48.6'
SHELF ELEV.=41.5'
(A) 4" UNK INV.=43.7'
(1013) 10" VCP INV.=41.0'
(199.3) 8" VCP INV.=41.0'

CB 2118
RIM ELEV.=46.1'
WATER ELEV.=43.5'
SUMP ELEV.=42.3'
(2120) 8" ACP INV.=43.4'
(A) 15" ACP INV.=43.4'

CBR 2119
RIM ELEV.=46.5'
WATER ELEV.=45.0'
DEBRIS ELEV.=43.3'
*NO PIPES VISIBLE
*FILLED WITH DEBRIS

DCB 2120
RIM ELEV.=44.7'
WATER ELEV.=42.9'
DEBRIS ELEV.=42.4'
(A) 8" VCP INV.=43.0'
(2118) 12" VCP INV.=42.6'
*COLLAPSED
*NO OTHER PIPES VISIBLE

SMH 1013
RIM ELEV.=45.8'
SHELF ELEV.=38.6'
(A) 6" VCP INV.=38.3'
(1267) 10" VCP INV.=38.2'
(1967) 10" VCP INV.=38.2'

CBR 1304
RIM ELEV.=44.0'
WATER ELEV.=39.9'
SUMP ELEV.=39.4'
(1303) 8" VCP INV.=39.8'
(A) 8" VCP INV.=39.8'
*OFL NOT FOUND

CBR 1303
RIM ELEV.=43.9'
WATER ELEV.=40.1'
SUMP ELEV.=39.3'
(1304) 8" VCP INV.=39.1'

SMH 1267
RIM ELEV.=43.9'
SHELF ELEV.=38.5'
(1273) 8" PVC INV.=37.7'
(1013) 10" VCP INV.=37.7'

SMH 1273
RIM ELEV.=42.8'
SHELF ELEV.=36.8'
(A) 12" PVC INV.=37.4'
(1267) 8" PVC INV.=35.9'
(2115) 8" PVC INV.=35.9'

CB 1290
RIM ELEV.=42.7'
DEBRIS ELEV.=39.9'
(1291) 10" PVC INV.=40.4'
(A) 8" HDPE INV.=40.0'

DCB 1291
RIM ELEV.=42.6'
(1290) 12" CMP INV.=38.9'
(A) 12" UNK INV.=37.5'
(B) 12" CMP INV.=36.5'
(C) 12" UNK INV.=35.7'
(OFL) 12" UNK INV.=35.6'

SMH 2115
RIM ELEV.=43.6'
SHELF ELEV.=36.4'
(1273) 8" PVC INV.=35.6'
(1398) 8" PVC INV.=35.5'

SMH 1398
RIM ELEV.=45.5'
SHELF ELEV.=35.4'
(A) 4" PVC INV.=42.4'
(B) 4" PVC INV.=41.0'
(C) 4" PVC INV.=41.0'
(D) 4" PVC INV.=39.0'
(2115) 8" PVC INV.=34.7'
(E) 8" PVC INV.=34.5'

CB 2122
RIM ELEV.=44.8'
WATER ELEV.=40.0'
(A) 12" CMP INV.=41.0'
(B) 12" CMP INV.=40.1'
(C) 12" HDPE INV.=40.0'

PSNH237-34
PSNH237/32
PSNH27/37/10T
PSNH246/2/15E
100E/PSNH/246/1

STATE OF NEW HAMPSHIRE
STEFANIE M. TETREAULT
No. 315
CERTIFIED WETLAND SCIENTIST
09/17/2025

STATE OF NEW HAMPSHIRE
JAMES P. GOVE
No. 0051
CERTIFIED WETLAND SCIENTIST
09-04-2025

NHSPC (NAD83 / 2011)

LEGEND

- EXISTING LOT LINE
- BUILDING SETBACK LINE
- 100 MAJOR CONTOUR LINE
- 98 MINOR CONTOUR LINE
- STONE WALL
- STOCKADE FENCE
- OHW OVERHEAD WIRE
- SD DRAIN LINE
- SS SEWER LINE
- G GAS LINE
- TREE LINE
- SHRUB LINE
- EDGE OF DELINEATED WETLAND
- WETLAND AREA
- CONCRETE
- CRUSHED STONE
- PILE
- LEDGE OUTCROP
- × 100.0 SPOT GRADE
- UTILITY POLE
- UTILITY POLE & GUY WIRE
- UTILITY POLE W/LIGHT
- UTILITY POLE STUMP
- CATCH BASIN
- DOUBLE CATCH BASIN
- SEWER MANHOLE
- FIRE HYDRANT
- PIPE/ROD FOUND
- SIGN
- POST
- DECIDUOUS TREE 10" DIA. OR GREATER
- TEST PIT LOCATION
- A-1 WETLAND FLAG
- ACP ASBESTOS CONCRETE PIPE
- CONC. CONCRETE
- CMP CORRUGATED METAL PIPE
- EP EDGE OF PAVEMENT
- HDPE HIGH DENSITY POLYETHYLENE PIPE
- I.P.F. IRON PIPE FOUND
- PVC POLYVINYL CHLORIDE PIPE
- SGC SLOPED GRANITE CURB
- TYP. TYPICAL
- UNK UNKNOWN
- VCP VITREOUS CLAY PIPE
- VGC VERTICAL GRANITE CURB
- (X) INVERT I.D. CONNECTION UNKNOWN

40 0 40 80
SCALE: 1 INCH = 40 FT.

EXISTING CONDITIONS PLAN
FOR
THE KANE COMPANY
LAND OF
BRORA LLC
(TAX MAP 213, LOT 12)
DUNLIN WAY & PORTSMOUTH BOULEVARD
PORSTMOUTH, NEW HAMPSHIRE

NO.	DATE	DESCRIPTION	BY
1	9/3/25	REVISE WETLAND NOTE	MWF

DRAWN BY: G.A.N.	DATE: MARCH 2025
CHECKED BY: M.W.F.	DRAWING NO. 9009A
JOB NO. 9009	SHEET 1 OF 2

DOUCET SURVEY | A SAM Company
102 Kent Place, Newmarket, NH 03857 (603) 659-6560
Offices in Bedford & Keene, NH and Kennebunk, ME
Locations Nationwide | http://www.sam.biz

FILE NAME: V:\PROJECTS\2009 CSV\DWG\2009A (TMS).dwg LAYOUT NAME: 22X34 TOPO PLAN (1) PLOTTED: Wednesday, September 03, 2025 - 1:17pm

NOTES:

1. REFERENCE: TAX MAP 213, LOT 12
   DUNLIN WAY & PORTSMOUTH BOULEVARD
   PORTSMOUTH, NEW HAMPSHIRE 03801
   D.S. PROJECT NO. 9009

2. TOTAL PARCEL AREA: 364,581 SQ. FT. OR 8.37 AC.

3. OWNER OF RECORD: BRORA LLC
   210 COMMERCE WAY, SUITE 300
   PORTSMOUTH, NH 03801
   R.C.R.D. BOOK 3465, PAGE 462

4. ZONE: OR – DIMENSIONAL REQUIREMENTS:

MIN. LOT AREA	3 AC.
MIN. FRONTAGE	300 ft.
MIN. FRONT SETBACK	50 ft.
MIN. SIDE SETBACK	75 ft.
MIN. REAR SETBACK	50 ft.
MIN. BUILDING HEIGHT	60 ft.

ZONING INFORMATION LISTED HEREON IS BASED ON THE CITY OF PORTSMOUTH ZONING ORDINANCE AMENDED NOVEMBER 18, 2024 AS AVAILABLE ON THE CITY'S WEBSITE ON MARCH 25, 2025. ADDITIONAL REGULATIONS MAY APPLY, AND REFERENCE IS HEREBY MADE TO THE EFFECTIVE ZONING ORDINANCE. THE LAND OWNER IS RESPONSIBLE FOR VERIFYING AND COMPLYING WITH ALL APPLICABLE MUNICIPAL, STATE, AND FEDERAL REGULATIONS.

5. FIELD SURVEY PERFORMED BY J.P.E. & D.W.D. DURING FEBRUARY AND MARCH 2025 USING A TRIMBLE S6 TOTAL STATION AND A TRIMBLE R10 SURVEY GRADE GPS WITH A TRIMBLE TSC5 DATA COLLECTOR AND A TRIMBLE DINI DIGITAL LEVEL. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.

6. HORIZONTAL DATUM BASED ON NAD83(2011) NEW HAMPSHIRE STATE PLANE COORDINATE ZONE (2800) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.

7. VERTICAL DATUM IS BASED ON APPROXIMATE NAVD88(GEOID18) (±.2') DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.

8. <u>WETLAND DELINEATION ON MAP 213, LOT 11 AND MAP 216, LOT 1-8A</u>

WETLANDS AND AREAS UNDER THE JURISDICTION OF THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES, PURSUANT TO NH ADMINISTRATIVE RULES CHAPTER ENV-WT 100-900, WERE DELINEATED BY TIGHE & BOND ON MAP 213 LOT 11 AND MAP 216 LOT 1-8A ON MARCH 21, 2025 USING THE FOLLOWING METHODOLOGY AND STANDARDS:

a) REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, (VERSION 2.0) JANUARY 20212, U.S. ARMY CORPS OF ENGINEERS.
b) NEW ENGLAND HYDRIC SOILS TECHNICAL COMMITTEE. 2019 VERSION 4, FIELD INDICATORS FOR IDENTIFYING HYDRIC OILS IN NEW ENGLAND. NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION, LOWELL, MA.
c) U.S. ARMY CORPS OF ENGINEERS. (2023). 2022 NATIONAL WETLAND PLANT LIST, VERSION 3.6. U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER, VICKSBURG, MS. HTTP://WETLAND-PLANTS.USACE.ARMY.MIL/
d) NEW HAMPSHIRE ADMINISTRATIVE RULE CHAPTER ENV-WT 602.23, DEFINITIONS: HIGHEST OBSERVABLE TIDE LINE (HOTL) AND ENV-WT 406, DELINEATION AND CLASSIFICATION OF JURISDICTIONAL AREAS, EFFECTIVE DECEMBER 15, 2019.

<u>WETLAND DELINEATION ON MAP 213, LOT 12</u>

WETLANDS ON MAP 213 LOT 12 WERE DELINEATED BY GOVE ENVIRONMENTAL SERVICES, INC.: JAMES P. GOVE, CWS 051, CSS 004, SENIOR SOIL SCIENTIST ON 06-06-2025. NO WETLANDS WERE OBSERVED. WETLANDS WERE DELINEATED USING THE FOLLOWING STANDARDS:

a) US ARMY CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL, TECHNICAL REPORT Y-87-1 (JAN 1987).
b) REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, VERSION 2.0, JANUARY 2012
c) FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND, VERSION 4, NEW ENGLAND HYDRIC SOILS TECHNICAL COMMITTEE.

9. FLOOD HAZARD ZONE: "X", PER FIRM MAP #33015C0259F, DATED 1/29/21.

10. PROPER FIELD PROCEDURES WERE FOLLOWED IN ORDER TO GENERATE CONTOURS AT 2' INTERVALS. ANY MODIFICATION OF THIS INTERVAL WILL DIMINISH THE INTEGRITY OF THE DATA, AND DOUCET SURVEY WILL NOT BE RESPONSIBLE FOR ANY SUCH ALTERATION PERFORMED BY THE USER.

11. THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES/TYPES IS SUBJECT TO NUMEROUS FIELD CONDITIONS, INCLUDING: THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS, MANHOLE CONFIGURATION, ETC.

12. THE INTENT OF THIS PLAN IS TO SHOW THE LOCATION OF BOUNDARIES IN ACCORDANCE WITH AND IN RELATION TO THE CURRENT LEGAL DESCRIPTION, AND IS NOT AN ATTEMPT TO DEFINE UNWRITTEN RIGHTS, DETERMINE THE EXTENT OF OWNERSHIP, OR DEFINE THE LIMITS OF TITLE.

13. ALL UNDERGROUND UTILITIES (ELECTRIC, GAS, TEL. WATER, SEWER DRAIN SERVICES) ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.

14. DUE TO THE COMPLEXITY OF RESEARCHING ROAD RECORDS AS A RESULT OF INCOMPLETE, UNORGANIZED, INCONCLUSIVE, OBLITERATED, OR LOST DOCUMENTS, THERE IS AN INHERENT UNCERTAINTY INVOLVED WHEN ATTEMPTING TO DETERMINE THE LOCATION AND WIDTH OF A ROADWAY RIGHT OF WAY. THE EXTENT OF DUNLIN WAY AS DEPICTED HEREON IS/ARE BASED ON RESEARCH CONDUCTED AT THE CITY OF PORTSMOUTH AND THE ROCKINGHAM COUNTY REGISTRY OF DEEDS. PORTSMOUTH BOULEVARD IS A 50 FOOT WIDE RIGHT OF WAY PER REFERENCE PLAN 7.

15. MONUMENT OF BOUNDARY LINE ABANDONED BY R.C.R.D. PLAN D-38784 (REF. PLANS 1).

16. **AT TIME OF SURVEY PORTIONS OF PORTSMOUTH BOULEVARD ALONG THE SUBJECT PARCEL WAS OVERGROWN AND COVERED IN DEBRIS. THE LIMITS OF PAVEMENT AND SIDEWALK AS SHOWN IS BASED ON THE BEST AVAILABLE SURVEY LOCATIONS UNDER THE CURRENT STATE OF THE ROADWAY.**

REFERENCE PLANS:

1. "BOUNDARY LINE ADJUSTMENT PLAN, LAND OF DOAKS, LLC (TAX MAP 213, LOT 2) AND BRORA, LLC (TAX MAP 213, LOT 12), PORTSMOUTH, NEW HAMPSHIRE" BY DOUCET SURVEY, INC., DATED DECEMBER 31, 2014, R.C.R.D. PLAN D-38784.

2. "PRELIMINARY CONCEPT PLAN AT SCHILLER STATION, PORTSMOUTH, NEW HAMPSHIRE", BY PUBLIC SERVICE OF NEW HAMPSHIRE GENERAL ENGINEERING DIVISION, DATED 2/3/97.

3. "SUBDIVISION PLAN FOR BRORA, LLC", BY MILLETTE, SPRAGUE & COLWELL, INC., DATED AUGUST 27, 2003, R.C.R.D. PLAN #D-31583.

4. "SUBDIVISION/CONSOLIDATION PLAN MAP R-16/LOTS 1, 1-5 & 1-8B, MAP R-17/LOTS 2-1838 THRU 2-1844, MAP R-17/LOT 2-0300", BY CLD CONSULTING ENGINEERS, INC., DATED DEC. 1999 R.C.R.D. PLAN #D-28385.

5. "RESUBDIVISION PLAN OSPREY LANDING", BY CLD CONSULTING ENGINEERS, INC., DATED FEB. 1999, R.C.R.D. PLAN #D-27099.

6. "LOT LINE RELOCATION PLAN OSPREY LANDING", BY CLD CONSULTING ENGINEERS, INC., DATED FEB. 1999, R.C.R.D. PLAN #D-27029.

7. "SUBDIVISION PLAN OF MARINERS VILLAGE & SPINNAKER POINT CONDOMINIUM", BY ASSOCIATED ENGINEERING SERVICES, DATED OCTOBER 23, 1993, R.C.R.D. PLAN #D-23202.

<u>ABUTTERS INFORMATION:</u>

TAX MAP 213, LOT 2
NEP PORTSMOUTH OWNER LLC
& COLONY CAPITAL
545 E JOHN CARPENTER FREEWAY SUITE 1400
IRVING, TX 75062
R.C.R.D. BOOK 5627, PAGE 702

TAX MAP 213, LOT 2-15
INISHMAAN ASSOC. LTD. PARTNERSHIP
& JCM MANAGEMENT CO.
540 NORTH COMMERCIAL STREET
MANCHESTER, NH 03101
R.C.R.D. BOOK 3078, PAGE 1947

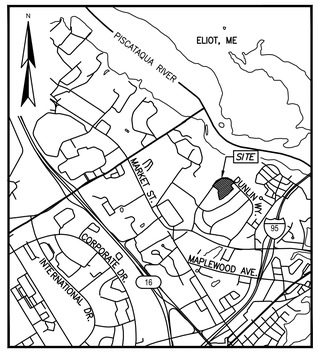
TAX MAP 213, LOT 3
THOM GRAEME
1518 SUMMER AVE
JUPITER, FL 33469
R.C.R.D. BOOK 3453, PAGE 2213

TAX MAP 213, LOT 4
DAVID S. ROGERS DECLARATION OF TRUST
15 DUNLIN WAY
PORTSMOUTH, NH 03801
R.C.R.D. BOOK 5539, PAGE 146

TAX MAP 213, LOT 10
MUKHLIS & ALABDULLA FAMILY TRUST
20 DUNLIN WAY
PORTSMOUTH, NH 03801
R.C.R.D. BOOK 6579, PAGE 466

TAX MAP 213, LOT 11
GSP SCHILLER, LLC
431 RIVER RD.
BOW, NH 03304
R.C.R.D. BOOK 5887, PAGE 823

TAX MAP 216, LOT 1-8A
BEACON HARBOR TRUST, LLC
210 COMMERCE WAY SUITE 300
PORTSMOUTH, NH 03801
R.C.R.D. BOOK 5877, PAGE 2905



LOCATION MAP (n.t.s.)

EXISTING CONDITIONS PLAN

FOR

THE KANE COMPANY

LAND OF

BRORA LLC

(TAX MAP 213, LOT 12)

DUNLIN WAY & PORTSMOUTH BOULEVARD

PORSTMOUTH, NEW HAMPSHIRE

NO.	DATE	DESCRIPTION	BY
1	9/3/25	REVISE WETLAND NOTE	MWF

DRAWN BY:	G.A.N.	DATE:	MARCH 2025
CHECKED BY:	M.W.F.	DRAWING NO.	9009A
JOB NO.	9009	SHEET	2 OF 2

DOUCET SURVEY LLC
Serving Your Professional Surveying & Mapping Needs
102 Kent Place, Newmarket, NH 03857 (603) 659-6560
Offices in Bedford & Keene, NH and Kennebunk, ME
http://www.doucetsurvey.com

FILE NAME: Y:\PROJECTS\9000 CSD\DWG\9009A (TAB).dwg LAYOUT NAME: 22X34 TOPO PLAN (2) PLOTTED: Wednesday, September 03, 2025 - 1:17pm

EXISTING CONDITIONS PLAN NOTES:

1. EXISTING CONDITIONS ARE BASED ON A FIELD SURVEY BY DOUCET SURVEY, LLC., DATED MARCH 2025.
2. WETLAND DELINEATION ON MAP 213, LOT 11 AND MAP 216, LOT 1-8A
   WETLANDS AND AREAS UNDER THE JURISDICTION OF THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES, PURSUANT TO NH ADMINISTRATIVE RULES CHAPTER ENV-WT 100-900, WERE DELINEATED BY TIGHE & BOND ON MAP 213 LOT 11 AND MAP 216 LOT 1-8A ON MARCH 21, 2025 USING THE FOLLOWING METHODOLOGY AND STANDARDS:
   a. REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, (VERSION 2.0) JANUARY 2012, U.S. ARMY CORPS OF ENGINEERS.
   b. NEW ENGLAND HYDRIC SOILS TECHNICAL COMMITTEE. 2019 VERSION 4, FIELD INDICATORS FOR IDENTIFYING HYDRIC OILS IN NEW ENGLAND. NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION, LOWELL, MA.
   c. U.S. ARMY CORPS OF ENGINEERS. (2023). 2022 NATIONAL WETLAND PLANT LIST, VERSION 3.6. U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER, VICKSBURG, MS. HTTP://WETLAND-PLANTS.USACE.ARMY.MIL/
   d. NEW HAMPSHIRE ADMINISTRATIVE RULE ENV-WT 406, DELINEATION AND CLASSIFICATION OF JURISDICTIONAL AREAS, EFFECTIVE DECEMBER 15, 2019.
3. WETLAND DELINEATION ON MAP 213, LOT 12
   WETLANDS DELINEATED BY GOVE ENVIRONMENTAL SERVICES, INC.: JAMES P. GOVE, CWS 051, CSS 004, SENIOR SOIL SCIENTIST ON 06-06-2025. NO WETLANDS WERE OBSERVED. WETLANDS WERE DELINEATED USING THE FOLLOWING STANDARDS:
   a. US ARMY CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL, TECHNICAL REPORT Y-87-1 (JAN 1987).
   b. REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, VERSION 2.0, JANUARY 2012
   c. FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND, VERSION 4, NEW ENGLAND HYDRIC SOILS TECHNICAL COMMITTEE.
4. OFF-SITE GRADES DERIVED FROM THE FOLLOWING SEPARATE PLANS:
   a. "ATLANTIC HEIGHTS EMERGENCY ACCESS" FOR THE CITY OF PORTSMOUTH, BY TIGHE & BOND, DATED 10/7/2016.

GENERAL NOTES:

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE CONDITIONS OF ALL OF THE PERMIT APPROVALS.
2. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE AND THE LOCATIONS ARE NOT GUARANTEED BY THE OWNER OR ENGINEER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES, ANTICIPATE CONFLICTS, REPAIR EXISTING UTILITIES, AND RELOCATE EXISTING UTILITIES REQUIRED TO COMPLETE THE WORK AT NO ADDITIONAL COST TO THE OWNER.
3. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UTILITIES. CALL DIG SAFE AT LEAST 72 HOURS PRIOR TO THE COMMENCEMENT OF ANY DEMOLITION/CONSTRUCTION ACTIVITIES.
4. THE ACCURACY AND COMPLETENESS OF SUBSURFACE INFORMATION (E.G., EXISTING UTILITIES) SHOWN ON THESE DRAWINGS IS NOT GUARANTEED AND SOME SUBSURFACE INFORMATION MAY NOT BE SHOWN. DETERMINE THE LOCATIONS AND ELEVATIONS OF ALL SUBSURFACE FEATURES WHICH MAY AFFECT CONSTRUCTION OPERATIONS BY TEST PIT OR OTHER METHODS, AS NECESSARY TO PREVENT DAMAGE TO UTILITIES AND OTHER SUBSURFACE FEATURES, AND/OR INTERRUPTIONS IN UTILITY SERVICE. PROVIDE DATA COLLECTED THROUGH THESE INVESTIGATIONS TO THE ENGINEER PRIOR TO CONSTRUCTING THE PROPOSED IMPROVEMENTS.
5. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY UTILITIES IDENTIFIED DURING CONSTRUCTION THAT ARE NOT SHOWN ON THE DRAWINGS OR THAT DIFFER IN SIZE OR MATERIAL
6. THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY; COORDINATION WITH THE OWNER, ALL SUBCONTRACTORS, AND WITH OTHER CONTRACTORS WORKING WITHIN THE LIMITS OF WORK, THE MEANS AND METHODS OF CONSTRUCTING THE PROPOSED WORK.
7. THE CONTRACTOR SHALL OBTAIN AND PAY FOR AND COMPLY WITH ADDITIONAL PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK AND ARRANGE FOR AND PAY FOR NECESSARY INSPECTIONS AND APPROVALS FROM THE AUTHORITIES HAVING JURISDICTION.
8. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM WITH APPLICABLE FEDERAL, STATE, AND LOCAL CODES & SPECIFICATIONS.
9. THE CONTRACTOR SHALL COORDINATE ALL WORK WITHIN PUBLIC RIGHT OF WAY WITH THE CITY OF PORTSMOUTH.
10. ALL WORK SHALL CONFORM TO THE CITY OF PORTSMOUTH DEPARTMENT OF PUBLIC WORKS, STANDARD SPECIFICATIONS AND WITH THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION, "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION", CURRENT EDITION.
11. THE CONTRACTOR TO SUBMIT AS-BUILT PLANS IN DIGITAL FORMAT (.DWG AND .PDF FILES) ON DISK TO THE OWNER AND ENGINEER UPON COMPLETION OF THE PROJECT. AS-BUILTS SHALL BE PREPARED AND CERTIFIED BY A NEW HAMPSHIRE LICENSED LAND SURVEYOR.
12. BEFORE ANY DEWATERING IS PERFORMED A TEMPORARY DISCHARGE PERMIT FROM THE NHDES IS REQUIRED.
13. THE CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR AND PEDESTRIAN ACCESS THROUGH THE WORK AREA, OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA. PERFORM TRAFFIC CONTROL IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED TRAFFIC CONTROL PLAN.
14. WHEN WORKING IN THE RIGHT OF WAY, THE CONTRACTOR SHALL PROVIDE THE OWNER AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES A DETAILED PLAN OF APPROACH INDICATING METHODS OF PROPOSED TRAFFIC ROUTING ON A DAILY BASIS, AND COORDINATION TO ENSURE COMMUNICATION AND COORDINATION BETWEEN THE OWNER, THE CONTRACTOR AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES THROUGHOUT THE CONSTRUCTION PERIOD.
15. THE CONTRACTOR SHALL MAINTAIN EMERGENCY ACCESS TO ALL PROPERTIES WITHIN THE PROJECT AREA AT ALL TIMES DURING CONSTRUCTION.
16. NOTIFY THE ENGINEER IN WRITING OF ANY CONFLICT, ERROR, AMBIGUITY, OR DISCREPANCY WITH THE PLANS OR BETWEEN THE PLANS AND ANY APPLICABLE LAW, REGULATION, CODE, STANDARD SPECIFICATION, OR MANUFACTURER'S INSTRUCTIONS.
17. TIGHE & BOND ASSUMES NO RESPONSIBILITY FOR ANY ISSUES, LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM TIGHE & BOND.
18. REMOVAL OR CUTTING OF VEGETATION WITHIN WETLAND BUFFER AREAS SHALL BE ONLY BE COMPLETED UNDER THE REQUIREMENTS AND RESTRICTIONS SET FORTH BY THE CITY OF PORTSMOUTH ZONING ORDINANCE SECTION 10.1018.23.
19. THE USE OF FERTILIZERS, PESTICIDES, AND HERBICIDES WITHIN WETLAND BUFFER AREAS SHALL BE LIMITED BY THE RESTRICTIONS SET FORTH BY THE CITY OF PORTSMOUTH ZONING ORDINANCE SECTIONS 10.1018.24 AND 10.1018.25.

DEMOLITION NOTES:

1. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF ANY CLEARING OR DEMOLITION ACTIVITIES.
2. THE CONTRACTOR IS RESPONSIBLE FOR SUPPORT OF EXISTING UTILITIES AND REPAIR OR REPLACEMENT COSTS OF UTILITIES DAMAGED DURING CONSTRUCTION, WHETHER ABOVE OR BELOW GRADE. REPLACE DAMAGED UTILITIES IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER AND AT NO COST TO THE PROPERTY OWNER.
3. ANY EXISTING WORK OR PROPERTY DAMAGED OR DISRUPTED BY CONSTRUCTION/ DEMOLITION ACTIVITIES SHALL BE REPLACED OR REPAIRED TO MATCH ORIGINAL EXISTING CONDITIONS BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
4. CONTRACTOR SHALL VERIFY ORIGIN OF ALL DRAINS AND UTILITIES PRIOR TO REMOVAL/TERMINATION TO DETERMINE IF DRAINS OR LINES ARE ACTIVE, AND SERVICES ANY ON OFF-SITE STRUCTURE TO REMAIN. THE CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY OF ANY SUCH UTILITY FOUND AND SHALL MAINTAIN THESE UTILITIES UNTIL PERMANENT SOLUTION IS IN PLACE.
5. ALL MATERIALS SCHEDULED TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR UNLESS OTHERWISE SPECIFIED. THE CONTRACTOR SHALL DISPOSE OF ALL MATERIALS OFF-SITE IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS, ORDINANCES AND CODES.
6. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL EXISTING STRUCTURES, CONCRETE PADS, UTILITIES AND PAVEMENT WITHIN THE WORK LIMITS SHOWN UNLESS SPECIFICALLY IDENTIFIED TO REMAIN. ITEMS TO BE REMOVED INCLUDE BUT ARE NOT LIMITED TO: CONCRETE, PAVEMENT, CURBS, LIGHTING, MANHOLES, CATCH BASINS, UNDER GROUND PIPING, POLES, AND TREES .
7. REMOVE TREES AND BRUSH AS REQUIRED FOR COMPLETION OF WORK. CONTRACTOR SHALL GRUB AND REMOVE ALL STUMPS WITHIN LIMITS OF WORK AND DISPOSE OF OFF-SITE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEMOLITION AND OFF-SITE DISPOSAL OF MATERIALS REQUIRED TO COMPLETE THE WORK, EXCEPT FOR WORK NOTED TO BE COMPLETED BY OTHERS.
9. THE CONTRACTOR SHALL COORDINATE REMOVAL, RELOCATION, DISPOSAL OR SALVAGE OF UTILITIES WITH THE OWNER AND APPROPRIATE UTILITY COMPANY.
10. UTILITIES SHALL BE TERMINATED AT THE MAIN LINE PER UTILITY COMPANY STANDARDS. THE CONTRACTOR SHALL REMOVE ALL ABANDONED UTILITIES LOCATED WITHIN THE LIMITS OF WORK.
11. SAW CUT AND REMOVE PAVEMENT ONE (1) FOOT OFF PROPOSED EDGE OF PAVEMENT OR EXISTING CURB LINE IN ALL AREAS WHERE PAVEMENT TO BE REMOVED ABUTS EXISTING PAVEMENT OR CONCRETE TO REMAIN.
12. PAVEMENT REMOVAL LIMITS ARE SHOWN FOR CONTRACTOR'S CONVENIENCE. ADDITIONAL PAVEMENT REMOVAL MAY BE REQUIRED DEPENDING ON THE CONTRACTOR'S OPERATION. CONTRACTOR TO VERIFY FULL LIMITS OF PAVEMENT REMOVAL PRIOR TO BID.
13. SAW CUT AND REMOVE PAVEMENT AND CONSTRUCT PAVEMENT TRENCH PATCH FOR ALL UTILITIES TO BE REMOVED AND PROPOSED UTILITIES LOCATED IN EXISTING PAVEMENT AREAS TO REMAIN.
14. THE CONTRACTOR SHALL REMOVE AND SALVAGE EXISTING GRANITE CURB FOR REUSE.
15. THE CONTRACTOR SHALL PHASE DEMOLITION AND CONSTRUCTION AS REQUIRED TO PROVIDE CONTINUOUS SERVICE TO EXISTING BUSINESSES AND HOMES THROUGHOUT THE CONSTRUCTION PERIOD. EXISTING BUSINESS AND HOME SERVICES INCLUDE, BUT ARE NOT LIMITED TO ELECTRICAL, COMMUNICATION, FIRE PROTECTION, DOMESTIC WATER AND SEWER SERVICES. TEMPORARY SERVICES, IF REQUIRED, SHALL COMPLY WITH ALL FEDERAL, STATE, LOCAL AND UTILITY COMPANY STANDARDS. CONTRACTOR SHALL PROVIDE DETAILED CONSTRUCTION SCHEDULE TO OWNER PRIOR TO ANY DEMOLITION/CONSTRUCTION ACTIVITIES AND SHALL COORDINATE TEMPORARY SERVICES TO ABUTTERS WITH THE UTILITY COMPANY AND AFFECTED ABUTTER.
16. THE CONTRACTOR SHALL PROTECT ALL PROPERTY MONUMENTATION THROUGHOUT DEMOLITION AND CONSTRUCTION OPERATIONS. SHOULD ANY MONUMENTATION BE DISTURBED BY THE CONTRACTOR, THE CONTRACTOR SHALL EMPLOY A NEW HAMPSHIRE LICENSED SURVEYOR TO REPLACE DISTURBED MONUMENTS.
17. THE CONTRACTOR SHALL PAY ALL COSTS NECESSARY FOR TEMPORARY PARTITIONING, BARRICADING, FENCING, SECURITY AND SAFETY DEVICES REQUIRED FOR THE MAINTENANCE OF A CLEAN AND SAFE CONSTRUCTION SITE.
18. BOLD LINETYPES SHOWN WITHIN THE LIMITS OF WORK INDICATE SITE FEATURES TO BE REMOVED, UNLESS SPECIFICALLY IDENTIFIED TO REMAIN.

SITE NOTES:

1. PAVEMENT MARKINGS, INCLUDING BUT NOT LIMITED TO; PARKING SPACES, STOP BARS, ADA SYMBOLS, PAINTED ISLANDS, CROSS WALKS, ARROWS, LEGENDS, AND CENTERLINES, SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWINGS AND DETAILS, AND SHALL MEET THE FOLLOWING REQUIREMENTS:
   - ALL ON-SITE PAVEMENT MARKINGS EXCEPT CENTERLINES, MEDIAN ISLANDS, FOG/SHOULDER LINES, AND LANE LINES SHALL BE CONSTRUCTED USING WHITE TRAFFIC PAINT, MEETING THE REQUIREMENTS OF AASHTO M248 TYPE "F".
   - ALL ON-SITE CENTERLINES AND MEDIAN ISLANDS SHALL BE CONSTRUCTED USING YELLOW THERMOPLASTIC STRIPING MATERIAL, MEETING THE REQUIREMENTS OF AASHTO M249.
   - ALL ON-SITE FOG/SHOULDER LINES AND LANE LINES SHALL BE CONSTRUCTED USING WHITE THERMOPLASTIC STRIPING MATERIAL, MEETING THE REQUIREMENTS OF AASHTO M249.
   - ALL PAVEMENT MARKINGS WITHIN PUBLIC RIGHT OF WAY SHALL CONFORM TO THE CITY OF PORTSMOUTH DEPARTMENT OF PUBLIC WORKS, AND APPLICABLE DEPARTMENT OF TRANSPORTATION (DOT), STANDARD SPECIFICATIONS.
2. ALL PAVEMENT MARKINGS AND SIGNS SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" CURRENT EDITION, "STANDARD ALPHABETS FOR HIGHWAY SIGNS AND PAVEMENT MARKINGS" CURRENT EDITION, AND THE REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT (ADA) AS APPLICABLE.
3. THE CONTRACTOR SHALL EMPLOY A NEW HAMPSHIRE LICENSED LAND SURVEYOR TO DETERMINE ALL LINES AND GRADES.
4. CLEAN AND COAT VERTICAL FACE OF EXISTING PAVEMENT AT SAW CUT LINE WITH RS-1 EMULSION IMMEDIATELY PRIOR TO PLACING NEW BITUMINOUS CONCRETE.
5. THE CONTRACTOR TO PROVIDE BACKFILL AND COMPACTION AT CURB LINE AFTER CONCRETE FORMS FOR SIDEWALKS AND PADS HAVE BEEN STRIPPED.
6. COORDINATE ALL WORK ADJACENT TO BUILDINGS WITH BUILDING DRAWINGS/CONTRACTOR.
7. SEE ARCHITECTURAL/BUILDING DRAWINGS FOR ALL CONCRETE PADS & SIDEWALKS ADJACENT TO BUILDING.
8. ALL LIGHT POLE BASES NOT PROTECTED BY A RAISED CURB SHALL BE PAINTED YELLOW.
9. ALL DIMENSIONS ARE TO THE FACE OF CURB UNLESS OTHERWISE NOTED.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING RETAINING WALL DESIGN FROM STRUCTURAL ENGINEER AND/OR WALL MANUFACTURER. CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO CONSTRUCT WALL IN ACCORDANCE WITH DESIGN APPROVED BY THE ENGINEER. RETAINING WALL SHALL BE SEGMENTAL BLOCK WALL SYSTEM AS OUTLINED IN THE DETAILS.
11. PROPERTY MANAGER WILL BE RESPONSIBLE FOR TIMELY SNOW REMOVAL FROM ALL PUBLIC WALKS, DRIVES, AND PARKING AREAS ON-SITE. SNOW SHALL BE HAULED OFF-SITE AND LEGALLY DISPOSED OF, WHEN NECESSARY, WHEN SNOW STORAGE AREAS HAVE REACHED CAPACITY.

GRADING AND DRAINAGE NOTES:

1. GENERAL COMPACTION REQUIREMENTS:
   - BELOW PAVED OR CONCRETE AREAS: 95%
   - TRENCH BEDDING MATERIAL AND SAND BLANKET BACKFILL: 95%
   - BELOW LOAM AND SEED AREAS: 90%
   - * ALL PERCENTAGES OF COMPACTION SHALL BE OF THE MAXIMUM DRY DENSITY AT THE OPTIMUM MOISTURE CONTENT AS DETERMINED AND CONTROLLED IN ACCORDANCE WITH ASTM D-1557, METHOD C FIELD DENSITY TESTS SHALL BE MADE IN ACCORDANCE WITH ASTM D-1556 OR ASTM-2922.
2. ALL STORM DRAINAGE PIPES SHALL BE HIGH DENSITY POLYETHYLENE (HANCOR HI-Q, ADS N-12 OR EQUAL) OR RCP CLASS IV, UNLESS OTHERWISE SPECIFIED.
3. SEE UTILITY PLAN FOR ALL SITE UTILITY INFORMATION.
4. ADJUST ALL MANHOLES, CATCH BASINS, CURB BOXES, ETC. WITHIN LIMITS OF WORK TO FINISH GRADE.
5. THE CONTRACTOR SHALL PROVIDE A FINISH PAVEMENT SURFACE AND LAWN AREAS FREE OF LOW SPOTS AND PONDING AREAS. CRITICAL AREAS INCLUDE BUILDING ENTRANCES, EXITS, RAMPS AND LOADING DOCK AREAS ADJACENT TO THE BUILDING.
6. PROVIDE SITE GRADING AT ACCESSIBLE SIDEWALK RAMPS, SIDEWALKS, AND BUILDING ENTRANCES THAT IS CONSISTENT WITH THE RELEVANT ACCESS REQUIREMENTS OF THE ARCHITECTURAL BARRIERS ACT (ABA), THE AMERICANS WITH DISABILITIES ACT (ADA), AND MA ARCHITECTURAL ACCESS BOARD REQUIREMENTS (AAB). SMALL CHANGES IN GRADE OVER RELATIVELY SHORT DISTANCES (E.G. AT PARKING SPACES, ACCESSIBLE ROUTES, AND RAMPS) MIGHT NOT BE CLEARLY DEPICTED WITHIN THE CONTOUR INTERVAL SHOWN. COMPLY WITH THE CRITERIA IN THESE STANDARDS. SELECT MAXIMUM SLOPE CRITERIA ARE REPRODUCED BELOW:
   - ACCESSIBLE PARKING STALLS AND PASSENGER LOADING ZONES (IN ANY DIRECTION) SHALL BE < 2.0%
   - LONGITUDINAL SLOPE ALONG ACCESSIBLE ROUTES SHALL BE < 5.0%
   - CROSS SLOPE ALONG ACCESSIBLE ROUTES SHALL BE < 2.0%
7. THE CONTRACTOR SHALL THOROUGHLY CLEAN ALL CATCH BASINS AND DRAIN LINES, WITHIN THE LIMIT OF WORK, OF SEDIMENT IMMEDIATELY UPON COMPLETION OF CONSTRUCTION.
8. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM WITH APPLICABLE FEDERAL, STATE AND LOCAL CODES.
9. ALL DISTURBED AREAS NOT TO BE PAVED OR OTHERWISE TREATED SHALL RECEIVE 6" LOAM, SEED FERTILIZER AND MULCH.
10. ALL PROPOSED CATCH BASINS SHALL BE EQUIPPED WITH OIL/GAS SEPARATOR HOODS AND 4' SUMPS.
11. THE CONTRACTOR SHALL VERIFY INVERTS OF EXISTING DRAIN LINES AND STRUCTURES AT PROPOSED DRAINAGE CONNECTION LOCATIONS PRIOR TO CONSTRUCTION AND IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES.

GENERAL EROSION CONTROL NOTES:

1. REFER TO SHEET C-601 FOR GENERAL EROSION CONTROL NOTES AND DETAILS.

UTILITY NOTES:

1. COORDINATE ALL UTILITY WORK WITH APPROPRIATE UTILITY COMPANY.
   - NATURAL GAS - UNITIL
   - WATER - CITY OF PORTSMOUTH
   - SEWER - CITY OF PORTSMOUTH
   - ELECTRIC - EVERSOURCE
   - COMMUNICATIONS - CONSOLIDATED COMM/FAIRPOINT/COMCAST
3. SEE EXISTING CONDITIONS PLAN FOR BENCHMARK INFORMATION.
4. SEE GRADING, DRAINAGE & EROSION CONTROL PLAN FOR PROPOSED GRADING AND EROSION CONTROL MEASURES.
5. ALL WATER MAIN INSTALLATIONS SHALL BE CLASS 52, CEMENT LINED DUCTILE IRON PIPE.
6. ALL WATER MAIN INSTALLATIONS SHALL BE PRESSURE TESTED AND CHLORINATED AFTER CONSTRUCTION PRIOR TO ACTIVATING THE SYSTEM. CONTRACTOR SHALL COORDINATE CHLORINATION AND TESTING WITH THE CITY OF PORTSMOUTH WATER DEPARTMENT.
7. ALL BELOW GRADE WATER VALVES AND FITTINGS SHALL HAVE MECHANICAL JOINT (MJ) ENDS. RESTRAIN ALL WATER VALVES AND FITTINGS JOINTS WITH RETAINER GLANDS, OR AS REQUIRED BY THE CITY OF PORTSMOUTH WATER DEPARTMENT STANDARDS.
8. CONNECTION TO EXISTING WATER MAIN SHALL BE CONSTRUCTED TO THE CITY OF PORTSMOUTH WATER DEPARTMENT STANDARDS.
9. HYDRANTS, GATE VALVES, FITTINGS, ETC. SHALL MEET THE REQUIREMENTS OF THE CITY OF PORTSMOUTH FIRE AND/OR WATER DEPARTMENT.
10. ALL SEWER PIPE SHALL BE PVC SDR 35 UNLESS OTHERWISE STATED.
11. THE CONTRACTOR SHALL MAINTAIN UTILITY SERVICES TO ABUTTING PROPERTIES THROUGHOUT CONSTRUCTION.
12. EXISTING UTILITIES TO BE REMOVED SHALL BE CAPPED AT THE MAIN AND MEET THE DEPARTMENT OF PUBLIC WORKS STANDARDS FOR CAPPING OF WATER AND SEWER SERVICES.
13. ALL ELECTRICAL MATERIAL WORKMANSHIP SHALL CONFORM TO THE NATIONAL ELECTRIC CODE, CURRENT EDITION, AND ALL APPLICABLE STATE AND LOCAL CODES.
14. THE EXACT LOCATION OF NEW UTILITY SERVICES AND CONNECTIONS SHALL BE COORDINATED WITH THE BUILDING DRAWINGS AND THE APPLICABLE UTILITY COMPANIES.
15. ADJUST ALL MANHOLES, CATCH BASINS, CURB BOXES, ETC. WITHIN LIMITS OF WORK TO FINISH GRADE.
16. ALL UNDERGROUND CONDUITS SHALL HAVE NYLON PULL ROPES TO FACILITATE PULLING CABLES.
17. THE CONTRACTOR SHALL OBTAIN, PAY FOR, AND COMPLY WITH ALL REQUIRED PERMITS, ARRANGE FOR ALL INSPECTIONS, AND SUBMIT COPIES OF ACCEPTANCE CERTIFICATES TO THE OWNER PRIOR TO THE COMPLETION OF THIS PROJECT.
18. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL MANHOLES, BOXES, FITTINGS, CONNECTORS, COVER PLATES, AND OTHER MISCELLANEOUS ITEMS NOT NECESSARILY DETAILED ON THESE DRAWINGS TO RENDER INSTALLATION OF UTILITIES COMPLETE AND OPERATIONAL.
19. THE CONTRACTOR SHALL PROVIDE EXCAVATION, BEDDING, BACKFILL AND COMPACTION FOR NATURAL GAS SERVICES.
20. A 10-FOOT MINIMUM EDGE TO EDGE HORIZONTAL SEPARATION SHALL BE PROVIDED BETWEEN ALL WATER AND SANITARY SEWER LINES. AN 18-INCH MINIMUM OUTSIDE TO OUTSIDE VERTICAL SEPARATION SHALL BE PROVIDED AT ALL WATER/SANITARY SEWER CROSSINGS.
21. SAW CUT AND REMOVE PAVEMENT AND CONSTRUCT PAVEMENT TRENCH PATCH FOR ALL PROPOSED UTILITIES LOCATED IN EXISTING PAVEMENT AREAS TO REMAIN.
22. COORDINATE TESTING OF SEWER CONSTRUCTION WITH THE CITY OF PORTSMOUTH SEWER DEPARTMENT.
23. ALL SEWER PIPE WITH LESS THAN 6' OF COVER IN PAVED AREAS OR LESS THAT 4' OF COVER IN UNPAVED AREAS SHALL BE INSULATED.
24. CONTRACTOR SHALL COORDINATE ALL ELECTRIC WORK INCLUDING BUT NOT LIMITED TO: CONDUIT CONSTRUCTION, MANHOLE CONSTRUCTION, UTILITY POLE CONSTRUCTION, OVERHEAD WIRE RELOCATION, AND TRANSFORMER CONSTRUCTION WITH POWER COMPANY.
25. THE CONTRACTOR SHALL PHASE UTILITY CONSTRUCTION, PARTICULARLY WATER MAIN AND GAS MAIN CONSTRUCTION AS TO MAINTAIN CONTINUOUS SERVICE TO ABUTTING PROPERTIES. CONTRACTOR SHALL COORDINATE TEMPORARY SERVICES TO ABUTTERS WITH THE UTILITY COMPANY AND AFFECTED ABUTTER.
26. SITE LIGHTING SPECIFICATIONS, CONDUIT LAYOUT AND CIRCUITRY FOR PROPOSED SITE LIGHTING AND SIGN ILLUMINATION SHALL BE PROVIDED BY THE PROJECT ELECTRICAL ENGINEER.
27. THE CONTRACTOR SHALL CONSTRUCT ALL UTILITIES AND DRAINS TO WITHIN 10' OF THE FOUNDATION WALLS AND CONNECT THESE TO SERVICE STUBS FROM THE BUILDING.
28. FINAL LOCATION OF ALL WATER METER AND VALVE SHALL BE COORDINATED WITH THE CITY OF PORTSMOUTH WATER DEPARTMENT PRIOR TO CONSTRUCTION.
29. THE CONTRACTOR SHALL VERIFY INVERTS OF EXISTING SEWER LINES AND STRUCTURES AT PROPOSED SEWER CONNECTION LOCATIONS PRIOR TO CONSTRUCTION AND IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES.

ABBREVIATIONS

ABDN('D)	ABANDON(ED)
AC	ASBESTOS CEMENT PIPE
APPROX	APPROXIMATE
BC	BITUMINOUS CURB
BFP	BACK FLOW PREVENTOR
BIT	BITUMINOUS
BL	BASELINE
BLDG	BUILDING
BND	BOUND
BOC	BOTTOM OF CURB
BOT	BOTTOM
BS	BOTTOM OF STEP
BW	BOTTOM OF WALL
CATV	CABLE TELEVISION
CB	CATCH BASIN
CCW	CEMENT CONCRETE WALK
CEM	CEMENT
CI	CAST IRON PIPE
CL	CENTERLINE
CLF	CHAIN LINK FENCE
CO	CLEAN OUT
CONC	CONCRETE
CPP	CORRUGATED POLYETHYLENE PIPE
CY	CUBIC YARD
DH	DRILL HOLE
DI	DUCTILE IRON PIPE
DIA	DIAMETER
DMH	DRAIN MANHOLE
E	EAST
EF	EACH FACE
EG	EXISTING GRADE
EL/ELEV	ELEVATION
ELEC	ELECTRIC
EMH	ELECTRIC MANHOLE
EOP	EDGE OF PAVEMENT
EW	EACH WAY
EXIST	EXISTING
FES	FLARED END SECTION
FF	FINISH FLOOR
FM	FORCE MAIN
G	GAS
GG	GAS GATE
GRAN	GRANITE
HC	HANDICAP
HDPE	HIGH DENSITY POLYETHYLENE
HMA	HOT MIX ASPHALT
HYD	HYDRANT
IN	INCHES
INV	INVERT
IP	IRON PIN
L	LENGTH OF CURB
LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MON	MONUMENT
MJ	MECHANICAL JOINT
N	NORTH
NITC	NOT IN THIS CONTRACT
NTS	NOT TO SCALE
N/A	NOT APPLICABLE
N/F	NOW OR FORMERLY
OC	ON CENTER
OCS	OUTLET CONTROL STRUCTURE
OH	OVERHEAD
PB	PLANT BED
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCPP	PERFORATED CORRUGATED POLYETHYLENE PIPE
PERF	PERFORATED
PI	POINT OF INTERSECTION
PRC	POINT OF REVERSE CURVATURE
PROT	PROTECT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PVC	POLYVINYLCHLORIDE
PVMT	PAVEMENT
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
REV	REVISION
ROW	RIGHT OF WAY
RT	RIGHT
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
S	SOUTH
SAN	SANITARY
SCH	SCHEDULE
SF	SQUARE FOOT
SMH	SEWER MANHOLE
SS	STAINLESS STEEL
STA	STATION
STL	STEEL
STRM	STORM
T	TANGENT LENGTH
TC	TOP OF CURB
TEL	TEL-DATA
TP	TEST PIT
TS	TOP OF STEP
TW	TOP OF WALL
TYP	TYPICAL
UP	UTILITY POLE
W	WATER
WG	WATER GATE
WV	WATER VALVE
XFMR	TRANSFORMER

LEGEND

DESCRIPTION	EXISTING	PROPOSED
PROPERTY LINE		
ADJACENT PROPERTY LINE		
RIGHT OF WAY (ROW) LINE		
EASEMENT LINE		
ZONING DISTRICT BOUNDARY LINE (APPROX)		
BUILDING SETBACK LINE		
INTERMEDIATE CONTOURS	-8-	8
INDEX CONTOURS	-10-	10
SPOT SPOT GRADE	x 44.45	x 44.45
MAGNITUDE & DIRECTION OF SLOPE		2%
LIMIT OF WETLANDS WATER COURSE		
LIMIT OF LOCAL WETLAND BUFFER		
LOCATION OF BORING (APPROX)	B-XX	
LOCATION OF TEST PIT (APPROX)	TP-XX	
LIMIT OF WORK (APPROX)		
LIMIT OF SAWCUT (APPROX)		
LIMIT OF EROSION CONTROL (APPROX)		
INLET PROTECTION		
PAVEMENT / CONCRETE SECTION TO BE REMOVED (APPROX)		
LIMIT OF CLEARING & GRUBBING (APPROX)		
EDGE OF PAVEMENT		
VERTICAL GRANITE CURB	VGC	VGC
SLOPED GRANITE CURB	SGC	SGC
CURB RADIUS		15'R
PAVEMENT SECTION		
FENCE		
GUARDRAIL		
LIGHT POLE / BASE		
SIGN		
BOLLARD		
SNOW STORAGE (APPROX)		
PAVEMENT STRIPING		STOP
TREE LINE (APPROX)		
STONE WALL		
RETAINING WALL		
STORM DRAIN	SD	SD
STORM DRAIN (APPROX)	XD	XD
STORM DRAIN MANHOLE	D	D
STORM DRAIN INLETS		
GRAVITY SANITARY SEWER	SS	PS
SLIP-LINED SEWER		SS
SANITARY SEWER STRUCTURES	S	S
WATER SERVICE	W	PW
WATER SERVICE STRUCTURES		
UNDERGROUND ELECTRIC	E	PE
OVERHEAD UTILITY (UNSPECIFIED)	OHW	POHW
UNDERGROUND COMMUNICATIONS SERVICE	COM	PC&T
UNDERGROUND ELECTRIC & COMMUNICATION SERVICES		PE&C
UNDERGROUND ELECTRIC / COMMUNICATIONS SERVICE STRUCTURES	E T	
UTILITY POLES	

EXISTING VGC TO BE REMOVED (TYP.)

EXISTING CONC. BARRIERS TO BE REMOVED (TYP.)

EXISTING HYDRANT TO REMAIN

EXISTING OVERHEAD UTILITIES WITHIN L.O.W. TO BE REMOVED (TYP.)

PROPOSED SAWCUT LINE (TYP.)

EXISTING FILL PILES TO BE REMOVED (TYP.)

WATER MAIN SHOWN IS APPROXIMATE, BASED ON CITY GIS. CONTRACTOR SHALL VERIFY EXACT LOCATION OF WATER LINE AS FIRST ORDER OF WORK

EXISTING SEWER TO REMAIN (COORDINATE REPAIR & SLIPLINE WITH CITY OF PORTSMOUTH DPW)

EXISTING 8" ACP DRAIN TO BE STUBBED & CAPPED

EXISTING PAVEMENT TO BE REMOVED (TYP.)

EXISTING HYDRANT TO BE REMOVED (TYP.)

EXISTING CB'S & PIPE TO BE REMOVED (TYP.)

EXISTING SHRUBS TO BE REMOVED (TYP.)
43,766 SF (1 ACRE)

STONE WALLS TO BE REMOVED (TYP.)

APPROXIMATE LIMITS OF CLEARING (TYP.)

EXISTING TREES TO BE REMOVED (TYP.)
±193,720 SF (4.45 ACRES)

EXISTING STONE WALL TO REMAIN

50' WETLAND BUFFER

25' WETLAND BUFFER

100' WETLAND BUFFER

EXISTING 8" VCP TO BE STUBBED & CAPPED

PROPOSED SILT SOCK

EXISTING SEWER TO REMAIN (COORDINATE REPAIR & SLIPLINE WITH CITY OF PORTSMOUTH DPW)

EXISTING 12" CMP TO BE STUBBED & CAPPED

EXISTING CONC. BARRIERS TO BE REMOVED (TYP.)

EXISTING HYDRANT TO BE REMOVED (TYP.)

EXISTING OVERHEAD UTILITIES WITHIN LOW TO BE REMOVED (TYP.)

EXISTING CB'S & PIPE TO BE REMOVED (TYP.)

EXISTING OVERHEAD UTILITIES WITHIN L.O.W. TO BE REMOVED (TYP.)

STOCKADE FENCE TO REMAIN

EXISTING TREES AND VEGETATION ALONG ABUTTING PROPERTY TO BE RETAINED TO MAXIMUM EXTENT POSSIBLE

PROPOSED SAWCUT LINE (TYP.)

PROPOSED INLET PROTECTION BARRIER

PROPOSED SILT SOCK

TAX MAP 213, LOT 2

TAX MAP 213, LOT 3

TAX MAP 213, LOT 4

TAX MAP 213, LOT 10

TAX MAP 213, LOT 2-15

OFFICE RESEARCH
GENERAL RESIDENCE B

SEE SHEET C-101 FOR PLAN NOTES & LEGEND

0 40' 80'
GRAPHIC SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE
PATRICK CRIMMINS
No. 12378
LICENSED
PROFESSIONAL ENGINEER
9/22/2025

STATE OF NEW HAMPSHIRE
NEIL A. HANSEN
No. 15227
LICENSED
PROFESSIONAL ENGINEER
9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

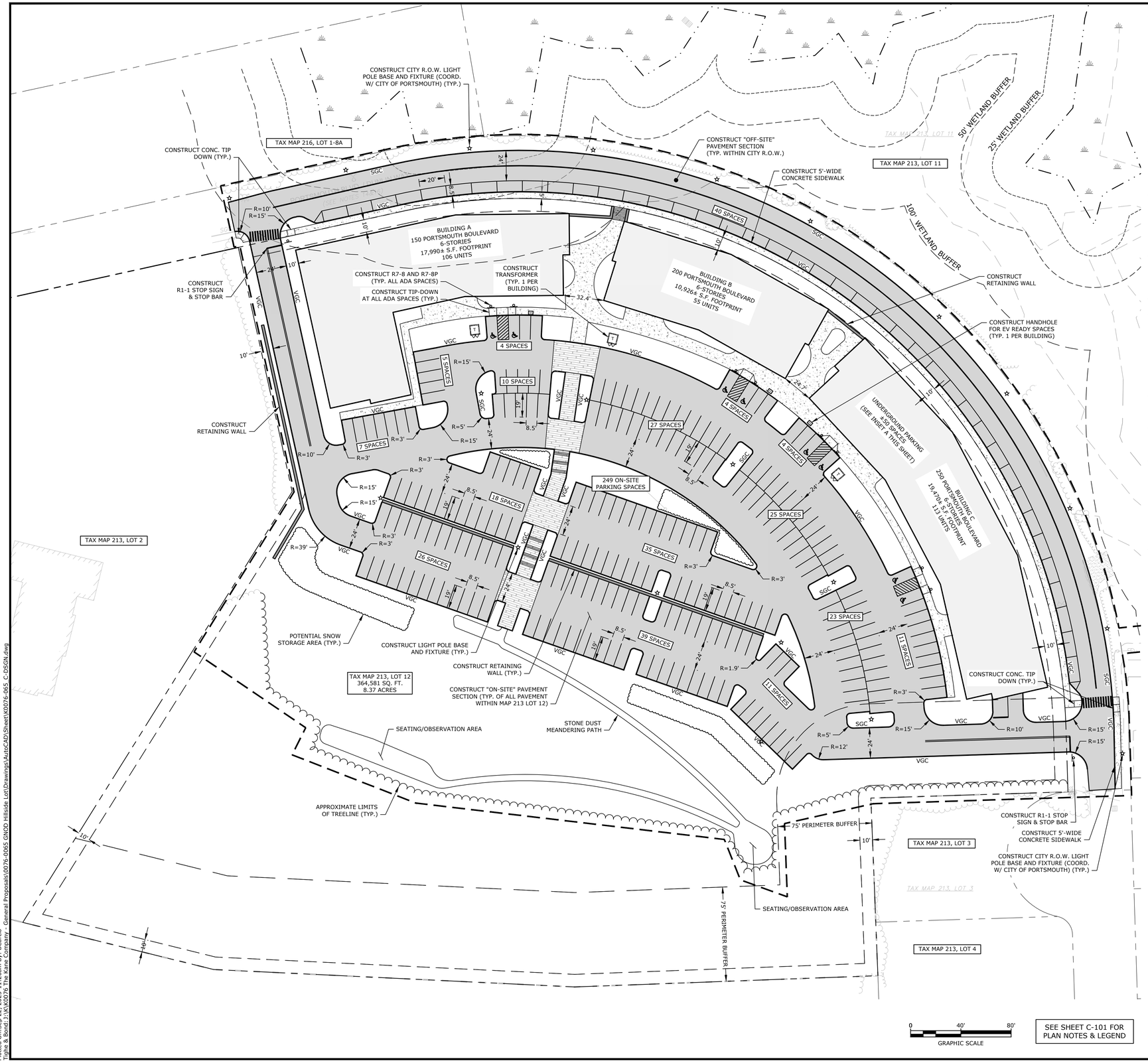
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DSGN.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DEMOLITION PLAN

SCALE: AS SHOWN

C-201

Last Saved: 9/22/2025
Plotted: Sep 22, 2025 - 11:19am By: BCurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DSGN.dwg



SITE DATA:

LOCATION: TAX MAP 118 LOT 28

OWNER: BRORA LLC
210 COMMERCE WAY
SUITE 300
PORTSMOUTH, NH 03801

ZONING DISTRICT: OFFICE RESEARCH (OR)
GATEWAY NEIGHBORHOOD OVERLAY DISTRICT (GNOD)

PROPOSED USE: MULTI-FAMILY RESIDENTIAL

EXISTING LOT SIZE: 364,581 SQ. FT. (8.37 ACRES)

DEVELOPMENT STANDARDS

BUILDING PLACEMENT:	REQUIRED	PROPOSED
MINIMUM FRONT YARD:	10 FT	10 FT
MINIMUM SIDE YARD:	10 FT	10 FT
MINIMUM REAR YARD:	10 FT	450 FT±
MINIMUM PERIMETER BUFFER:	75 FT	75 FT

BUILDING AND LOT OCCUPATION:	REQUIRED	PROPOSED
MAXIMUM BUILDING COVERAGE:	75%	13%
MAXIMUM BUILDING FOOTPRINT:	NR	19,470 SQ FT
MAXIMUM BUILDING LENGTH:	400'	321 FT
MINIMUM SITE FRONTAGE:	300 FT	948 FT
MINIMUM SITE DEPTH:	100 FT	855 FT
MINIMUM OPEN SPACE:	10%	59%

BUILDING FORM (PRINCIPAL BUILDING):	REQUIRED	PROPOSED
MAXIMUM DWELLINGS PER BUILDING:	120 UNITS(1)	113(1)
MAXIMUM BUILDING HEIGHT:	6 STORIES(2) 80 FT	6 STORIES(2) <80 FT(2)

OFF-STREET PARKING REQUIREMENTS

PARKING SPACES REQUIRED:

DWELLING UNITS:		
RESIDENTIAL UNITS (LESS THAN 500 SQ FT)	45 UNITS X 0.5 SPACES	22.5 SPACES
RESIDENTIAL UNITS (500 - 750 SQ FT)	126 UNITS X 1 SPACE	126 SPACES
RESIDENTIAL UNITS (>750 SQ FT)	103 X UNITS X 1.3 SPACES	133.9 SPACES
VISITOR PARKING, 1.0 SPACE PER 5 UNITS	274 UNITS	54.8 SPACES
TOTAL MINIMUM PARKING SPACES REQUIRED =		337.2 SPACES
AFTER PUBLIC TRANSIT PROXIMITY REDUCTION (20%)		270 SPACES

PARKING SPACES	REQUIRED	PROPOSED
	270 SPACES	299 SPACES*

*INCLUDES 50 UNDERGROUND PARKING SPACES UNDER BUILDING C. DOES NOT INCLUDE 40 OFF-SITE SPACES.

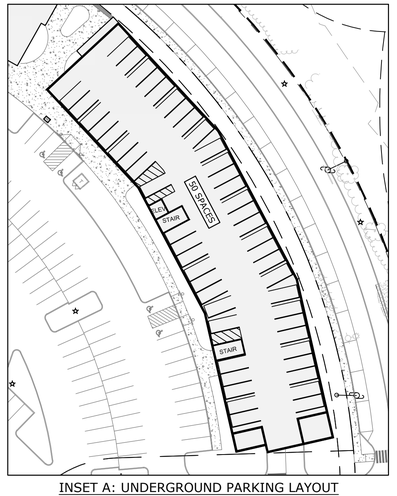
ADA PARKING SPACES	REQUIRED	PROPOSED
	8 SPACES (2 VAN SPACE)	8 SPACES (8 VAN SPACES)

PARKING SPACE DIMENSIONAL REQUIREMENTS:		
STANDARD 90° STALL:		
WIDTH	8.5 FT MIN	8.5 FT
LENGTH	19 FT MIN	19 FT
STANDARD 0° STALL:		
WIDTH	8.5 FT MIN	8.5 FT
LENGTH	20 FT MIN	20 FT
DRIVE AISLE WIDTH:		
90° (2-WAY TRAFFIC)	24 FT	24 FT
0° (2-WAY TRAFFIC)	24 FT	24 FT

COMMUNITY SPACE:	REQUIRED	PROPOSED
	10% 36,458 SF	10% 36,500 SF

NOTES:
(1) - UP TO 120 DWELLING UNITS PER BUILDING SHALL BE ALLOWED WITH CITY COUNCIL APPROVAL PER SECTION 10.686.30.
(2) - MAXIMUM BUILDING HEIGHT FOR ANY APARTMENT BUILDING OR MIXED USE BUILDING SHALL BE 6-STORIES OR 80 FT WITH CITY COUNCIL APPROVAL PER SECTION 10.686.30.

SITE RECORDING NOTES:
1. THIS SITE PLAN SHALL BE RECORDED IN THE ROCKINGHAM COUNTY REGISTRY OF DEEDS.
2. ALL IMPROVEMENTS SHOWN ON THIS SITE PLAN SHALL BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE PLAN BY THE PROPERTY OWNER AND ALL FUTURE PROPERTY OWNERS. NO CHANGES SHALL BE MADE TO THIS SITE PLAN WITHOUT THE EXPRESS APPROVAL OF THE PORTSMOUTH PLANNING DIRECTOR.
3. ALL CONDITIONS ON THIS PLAN SHALL REMAIN IN EFFECT IN PERPETUITY PURSUANT TO THE REQUIREMENTS OF THE SITE PLAN REVIEW REGULATIONS.
4. THIS IS NOT A BOUNDARY SURVEY AND SHALL NOT BE USED AS SUCH.



INSET A: UNDERGROUND PARKING LAYOUT
SCALE: 1:50

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PATRICK CRIMMINS No. 12378 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

STATE OF NEW HAMPSHIRE – NEIL A. HANSEN No. 15227 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

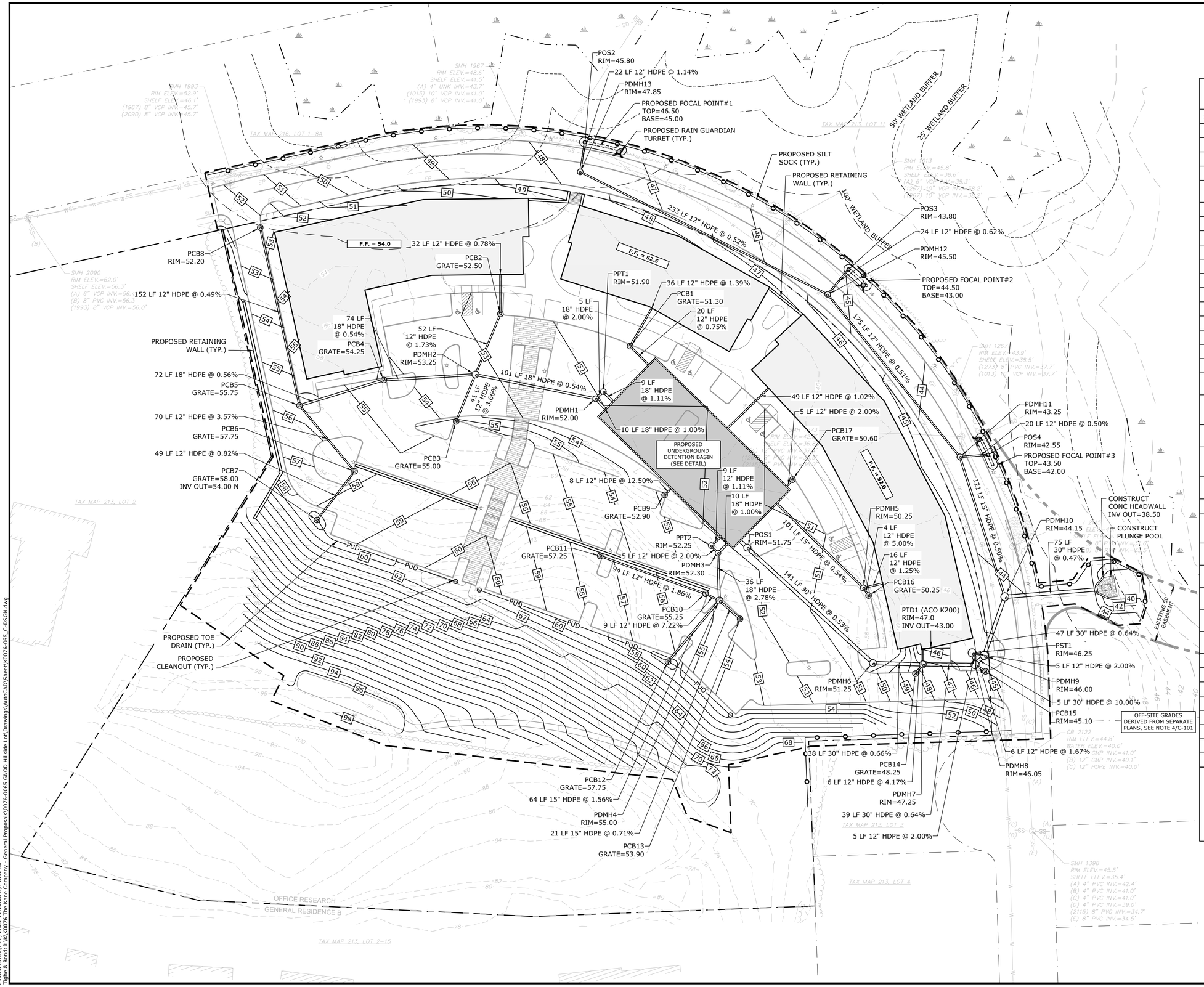
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DSGN.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

SITE PLAN

SCALE: AS SHOWN

C-301

Last Saved: 9/22/2025
Plotted: Sep 22, 2025 - 11:20am By: BCurcio
Tighe & Bond J:\KK\K0076 The Kane Company\ - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DSGN.dwg



STORM SEWER STRUCTURE TABLE			
STRUCTURE	RIM	INV. IN	INV. OUT
PCB1	51.30	46.50 N	46.40 E
PCB2	52.50	48.25 NW	48.15 S
PCB3	55.00		50.50 N
PCB4	54.25	47.75 SW	47.65 NE
PCB5	55.75	48.25 NW 51.00 E	48.15 NE
PCB6	57.75	53.60 S	53.50 W
PCB7	58.00		54.00 N
PCB8	52.20		49.00 SE
PCB9	52.90		48.00 N
PCB10	55.25	51.25 W	51.15 E
PCB11	57.25		53.00 E
PCB12	57.75		51.50 N
PCB13	53.90		50.00 W
PCB14	48.25		43.50 N
PCB15	45.10		41.15 W
PCB16	50.25		46.50 W
PCB17	50.60		46.50 S
PDMH1	52.00	46.60 SW	46.50 N 47.50 E
PDMH2	53.25	47.25 N 49.00 S 47.25 SW	47.15 NE
PDMH3	52.30	47.50 SE	48.00 N 47.40 W
PDMH4	55.00	50.50 W 49.85 E 50.50 S	48.50 NW
PDMH5	50.25	46.30 NE 46.30 E	46.20 W
PDMH6	51.25	41.75 W	41.65 NE
PDMH7	47.25	41.40 SW 42.50 NW 43.25 S	41.30 NE
PDMH8	46.05	41.05 SW 41.05 E	41.50 N 40.95 NW
PDMH9	46.00	40.25 SW 41.00 S	39.25 NW
PDMH10	44.15	38.95 SE 38.90 NW	38.85 NE
PDMH11	43.25	39.65 NE 39.60 W	39.50 SE
PDMH12	45.50	40.60 N 40.80 W	40.50 E
PDMH13	47.85	42.50 NW	42.00 E
POS1	51.75	42.50 W	42.50 E
POS2	45.80		42.75 SE
POS3	43.80		40.75 S
POS4	42.55		39.75 SW
PPT1	51.90	46.40 S	46.30 E
PPT2	52.25	47.30 E	47.20 N
PST1	46.25	40.85 SE	40.35 NE

SEE SHEET C-101 FOR
PLAN NOTES & LEGEND

0 40' 80'
GRAPHIC SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE
PATRICK CRIMMINS
No. 12378
LICENSED
PROFESSIONAL ENGINEER
9/22/2025

STATE OF NEW HAMPSHIRE
NEIL A. HANSEN
No. 15227
LICENSED
PROFESSIONAL ENGINEER
9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

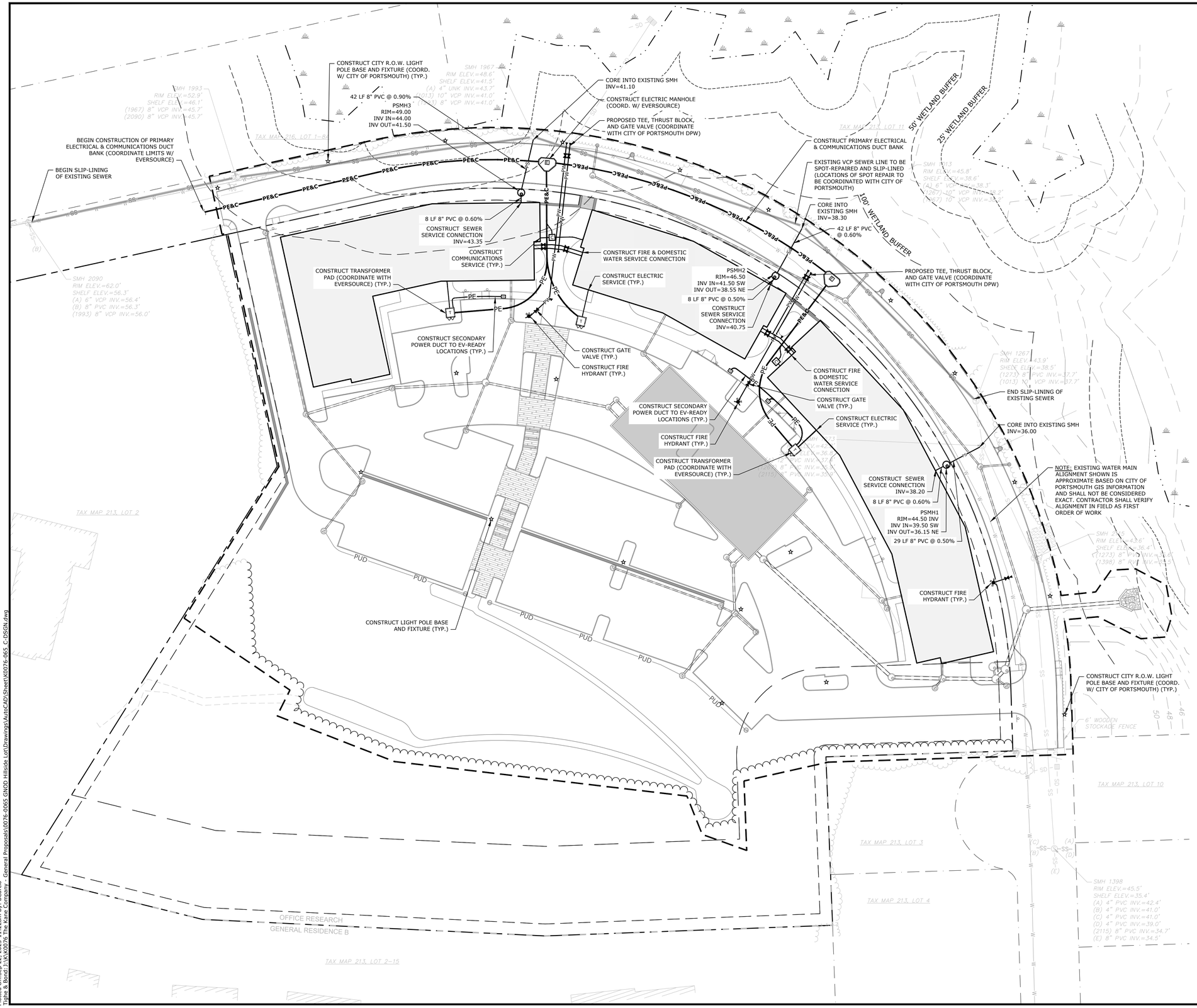
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DSGN.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

GRADING, DRAINAGE, AND EROSION CONTROL PLAN

SCALE: AS SHOWN

C-401

Last Saved: 9/22/2025
Plotted: Sep 22, 2025 - 11:22am By: BCurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DSGN.dwg



Last Saved: 9/22/2025
Plotted: Sep 22, 2025 - 11:22am By: BCurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DSGN.dwg

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE
PATRICK CRIMMINS
No. 12378
LICENSED PROFESSIONAL ENGINEER
9/22/2025

STATE OF NEW HAMPSHIRE
NEIL A. HANSEN
No. 15227
LICENSED PROFESSIONAL ENGINEER
9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DSGN.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

UTILITIES PLAN

SCALE: AS SHOWN

C-501

BUILDING A

BUILDING B

BUILDING C

EXISTING TREES

EXISTING STONE WALL TO REMAIN

PROPOSED OVERLOOK

EXISTING PEAK TO REMAIN

PROPERTY LINE (TYP)

EXISTING WOODS TO REMAIN

APPROX. LIMIT OF EXISTING CANOPY TO REMAIN, REFER TO CIVIL DRAWINGS FOR LIMIT OF GRADING

PROPOSED STABILIZED STONE DUST TRAIL

PROPOSED OVERLOOK

EXISTING WOODS TO REMAIN

0 40' 80'

GRAPHIC SCALE

PLANTING LEGEND

TAG	DESCRIPTION	SYMBOL(S)
TREES, SHRUBS & PERENNIALS		
P1	DECIDUOUS SHADE TREE	
P2	ORNAMENTAL TREE	
P3	EVERGREEN TREE	
P4	SHRUBS / PERENNIALS	
SEEDED AREAS		
S1	LAWN SEED MIX[1]	
S2	RESTORATION SEED MIX[2]	
S3	WET MEADOW SEED MIX[3]	

[1] 100% 5311 CONSERVATION MIX (ERNMX-114) BY ERNST CONSERVATION SEEDS

[2] 50% NEW ENGLAND EROSION CONTROL/ RESTORATION MIX FOR DRY SITES BY NEW ENGLAND WETLAND PLANTS, INC.
50% NEW ENGLAND CONSERVATION/ WILDLIFE MIX BY NEW ENGLAND WETLAND PLANTS, INC.

[3] 100% NEW ENGLAND ROADSIDE MATRIX WET MEADOW SEED MIX BY NEW ENGLAND WETLAND PLANTS, INC.

REPRESENTATIVE TREE SPECIES

ABIES SPP.	FIR
ACER SPP.	MAPLE
AMELANCHIER SPP.	SERVICEBERRY
BETULA SPP.	BIRCH
CARPINUS SPP.	HORNBEAM
CERCIS SPP.	REDBUD
GLEDITSIA SPP.	HONEYLOCUST
JUNIPERUS SPP.	CEDAR
NYSSA SPP.	TUPELO
PICEA SPP.	SPRUCE
PINUS SPP.	PINE
QUERCUS SPP.	OAK
THUJA SPP.	ARBORVITAE

Tighe&Bond
Engineers | Environmental Specialists

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_L-DSGN.DWG
DRAWN BY:	JDG
CHECKED:	RU/NAH
APPROVED:	PMC

PLANTING PLAN

SCALE: AS SHOWN

L-101

Last Saved: 9/21/2025
Date/Time Plotted: 9/22/2025 11:38am By: JGonga
Tighe & Bond J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_L-DSGN.dwg

GENERAL PROJECT INFORMATION
PROJECT APPLICANT: BRORA LLC

PROJECT NAME: PROPOSED MULTI-FAMILY DEVELOPMENT

PROJECT ADDRESS: DUNLIN WAY & PORTSMOUTH BOULEVARD
PORTSMOUTH, NH 03801

PROJECT LATITUDE: 43°-05'-29" N
PROJECT LONGITUDE: 70°-46'-48" W

PROJECT DESCRIPTION
THE PROPOSED PROJECT INCLUDES THREE 6-STORY MULTI-FAMILY BUILDINGS. THE PROJECT WILL ALSO CONSIST OF ASSOCIATED SITE IMPROVEMENTS SUCH AS PAVING, STORMWATER MANAGEMENT, UTILITIES AND LIGHTING.

DISTURBED AREA
THE TOTAL AREA TO BE DISTURBED IS APPROXIMATELY 6.8 ACRES.

SOIL CHARACTERISTICS
BASED ON THE SITE SPECIFIC SOIL SURVEY, THE SOILS ON SITE PRIMARILY CONSIST OF CHATFIELD AND UDORTHENTS SOILS WITH A HYDROLOGIC SOIL GROUP RATINGS OF B AND C, RESPECTIVELY.

NAME OF RECEIVING WATERS
THE STORMWATER RUNOFF FROM THE SITE WILL BE DISCHARGED VIA A CLOSED DRAINAGE SYSTEM TO AN UNNAMED ON SITE WETLANDS WHICH ULTIMATELY FLOWS TO THE PISCATAQUA RIVER.

CONSTRUCTION SEQUENCE OF MAJOR ACTIVITIES:
1. CONSTRUCT TEMPORARY AND PERMANENT SEDIMENT, EROSION AND DETENTION CONTROL FACILITIES. EROSION, SEDIMENT AND DETENTION MEASURES SHALL BE INSTALLED PRIOR TO ANY EARTH MOVING OPERATIONS THAT WILL INFLUENCE STORMWATER RUNOFF SUCH AS:
   - NEW CONSTRUCTION
   - CONTROL OF DUST
   - CONSTRUCTION DURING LATE WINTER AND EARLY SPRING
3. ALL PERMANENT DITCHES, SWALES, DETENTION, RETENTION AND SEDIMENTATION BASINS TO BE STABILIZED USING THE VEGETATIVE AND NON-STRUCTURAL BMPS PRIOR TO DIRECTING RUNOFF TO THEM.
4. CLEAR AND DISPOSE OF DEBRIS.
5. CONSTRUCT TEMPORARY CULVERTS AND DIVERSION CHANNELS AS REQUIRED.
6. GRADE AND GRAVEL ROADWAYS AND PARKING AREAS - ALL ROADS AND PARKING AREA SHALL BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
7. BEGIN PERMANENT AND TEMPORARY SEEDING AND MULCHING. ALL CUT AND FILL SLOPES SHALL BE SEEDED AND MULCHED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
8. DAILY, OR AS REQUIRED, CONSTRUCT TEMPORARY BERMS, DRAINS, DITCHES, PERIMETER EROSION CONTROL MEASURES, SEDIMENT TRAPS, ETC., MULCH AND SEED AS REQUIRED.
9. SEDIMENT TRAPS AND/OR BASINS SHALL BE USED AS NECESSARY TO CONTAIN RUNOFF UNTIL SOILS ARE STABILIZED.
10. FINISH PAVING ALL ROADWAYS AND PARKING LOTS.
11. INSPECT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES.
12. COMPLETE PERMANENT SEEDING AND LANDSCAPING.
13. REMOVE TRAPPED SEDIMENTS FROM COLLECTOR DEVICES AS APPROPRIATE AND THEN REMOVE TEMPORARY EROSION CONTROL MEASURES.

SPECIAL CONSTRUCTION NOTES:
1. THE CONSTRUCTION SEQUENCE MUST LIMIT THE DURATION AND AREA OF DISTURBANCE. THE AREA OF DISTURBANCE SHALL NOT EXCEED 5 ACRES AT ANY ONE TIME BEFORE DISTURBED AREAS ARE STABILIZED UNLESS FURTHER APPROVAL IS RECEIVED FROM THE NEW HAMPSHIRE LAND RESOURCES MANAGEMENT BUREAU.
2. THE PROJECT IS TO BE MANAGED IN A MANNER THAT MEETS THE REQUIREMENTS AND INTENT OF RSA 430:53 AND CHAPTER AGR 3800 RELATIVE TO INVASIVE SPECIES.

EROSION CONTROL NOTES:
1. ALL EROSION CONTROL MEASURES AND PRACTICES SHALL CONFORM TO THE "NEW HAMPSHIRE STORMWATER MANUAL VOLUME 3: EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION" PREPARED BY THE NHDES.
2. PRIOR TO ANY WORK OR SOIL DISTURBANCE, CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR EROSION CONTROL MEASURES AS REQUIRED IN THE PROJECT MANUAL.
3. CONTRACTOR SHALL INSTALL TEMPORARY EROSION CONTROL BARRIERS, INCLUDING HAY BALES, SILT FENCES, MULCH BERMS, SILT SACKS AND SILT SOCKS AS SHOWN IN THESE DRAWINGS AS THE FIRST ORDER OF WORK.
4. SILT SACK INLET PROTECTION SHALL BE INSTALLED IN ALL EXISTING AND PROPOSED CATCH BASIN INLETS WITHIN THE WORK LIMITS AND BE MAINTAINED FOR THE DURATION OF THE PROJECT.
5. TEMPORARY WATER DIVERSION AND PERIMETER CONTROLS INCLUDING SILT FENCES, MULCH BERM, SILT SOCK, AND/OR HAY BALE BARRIERS SHALL BE MAINTAINED FOR THE DURATION OF THE PROJECT UNTIL NON-PAVED AREAS HAVE BEEN STABILIZED.
6. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL TEMPORARY EROSION CONTROL DEVICES UPON COMPLETION OF CONSTRUCTION.
7. ALL DISTURBED AREAS NOT OTHERWISE BEING TREATED SHALL RECEIVE 6" LOAM, SEED AND FERTILIZER.
8. INSPECT ALL INLET PROTECTION AND PERIMETER CONTROLS WEEKLY AND AFTER EACH RAIN STORM OF 0.25 INCH OR GREATER. REPAIR/MODIFY PROTECTION AS NECESSARY TO MAXIMIZE EFFICIENCY OF FILTER. REPLACE ALL FILTERS WHEN SEDIMENT IS 1/3 THE FILTER HEIGHT.
9. CONSTRUCT EROSION CONTROL BLANKETS ON ALL SLOPES STEEPER THAN 3:1.

STABILIZATION:
1. AN AREA SHALL BE CONSIDERED STABLE WHEN ONE OF THE FOLLOWING HAS OCCURRED:
   A. BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
   B. A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
   C. A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIPRAP HAS BEEN INSTALLED;
   D. EROSION CONTROL BLANKETS HAVE BEEN PROPERLY INSTALLED.;
   E. IN AREAS TO BE PAVED, "STABLE" MEANS THAT BASE COURSE GRAVELS MEETING THE REQUIREMENTS OF NHDOT STANDARD FOR ROAD AND BRIDGE CONSTRUCTION, 2016, ITEM 304.2 HAVE BEEN INSTALLED.
2. WINTER STABILIZATION PRACTICES:
   A. ALL PROPOSED VEGETATED AREAS THAT DO NOT EXHIBIT A MINIMUM OF 85 PERCENT VEGETATIVE GROWTH BY OCTOBER 15, OR WHICH ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED BY SEEDING AND INSTALLING EROSION CONTROL BLANKETS ON SLOPES GREATER THAN 3:1, AND SEEDING AND PLACING 3 TO 4 TONS OF MULCH PER ACRE, SECURED WITH ANCHORED NETTING, ELSEWHERE. THE INSTALLATION OF EROSION CONTROL BLANKETS OR MULCH AND NETTING SHALL NOT OCCUR OVER ACCUMULATED SNOW OR ON FROZEN GROUND AND SHALL BE COMPLETED IN ADVANCE OF THAW OR SPRING MELT EVENTS;
   B. ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85 PERCENT VEGETATIVE GROWTH BY OCTOBER 15, OR WHICH ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED TEMPORARILY WITH STONE OR EROSION CONTROL BLANKETS APPROPRIATE FOR THE DESIGN FLOW CONDITIONS;
   C. AFTER OCTOBER 15, INCOMPLETE ROAD OR PARKING SURFACES, WHERE WORK HAS STOPPED FOR THE WINTER SEASON, SHALL BE PROTECTED WITH A MINIMUM OF 3 INCHES OF CRUSHED GRAVEL PER NHDOT ITEM 304.3, OR IF CONSTRUCTION IS TO CONTINUE THROUGH THE WINTER SEASON BE CLEARED OF ANY ACCUMULATED SNOW AFTER EACH STORM EVENT;
3. STABILIZATION SHALL BE INITIATED ON ALL LOAM STOCKPILES, AND DISTURBED AREAS, WHERE CONSTRUCTION ACTIVITY SHALL NOT OCCUR FOR MORE THAN TWENTY-ONE (21) CALENDAR DAYS BY THE FOURTEENTH (14TH) DAY AFTER CONSTRUCTION ACTIVITY HAS PERMANENTLY OR TEMPORARILY CEASED IN THAT AREA. STABILIZATION MEASURES TO BE USED INCLUDE:
   A. TEMPORARY SEEDING;
   B. MULCHING.
4. ALL AREAS SHALL BE STABILIZED WITHIN 45 DAYS OF INITIAL DISTURBANCE.
5. WHEN CONSTRUCTION ACTIVITY PERMANENTLY OR TEMPORARILY CEASES WITHIN 100 FEET OF NEARBY SURFACE WATERS OR DELINEATED WETLANDS, THE AREA SHALL BE STABILIZED WITHIN SEVEN (7) DAYS OR PRIOR TO A RAIN EVENT. ONCE CONSTRUCTION ACTIVITY CEASES PERMANENTLY IN AN THESE AREAS, SILT FENCES, MULCH BERMS, HAY BALE BARRIERS AND ANY EARTH/DIKES SHALL BE REMOVED ONCE PERMANENT MEASURES ARE ESTABLISHED.
6. DURING CONSTRUCTION, RUNOFF WILL BE DIVERTED AROUND THE SITE WITH EARTH DIKES, PIPING OR STABILIZED CHANNELS WHERE POSSIBLE. SHEET RUNOFF FROM THE SITE WILL BE FILTERED THROUGH SILT FENCES, MULCH BERMS, HAY BALE BARRIERS, OR SILT SOCKS. ALL STORM DRAIN BASIN INLETS SHALL BE PROVIDED WITH FLARED END SECTIONS AND TRASH RACKS. THE SITE SHALL BE STABILIZED FOR THE WINTER BY OCTOBER 15.

DUST CONTROL:
1. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTROL DUST THROUGHOUT THE CONSTRUCTION PERIOD.
2. DUST CONTROL METHODS SHALL INCLUDE, BUT BE NOT LIMITED TO SPRINKLING WATER ON EXPOSED AREAS, COVERING LOADED DUMP TRUCKS LEAVING THE SITE, AND TEMPORARY MULCHING.
3. DUST CONTROL MEASURES SHALL BE UTILIZED SO AS TO PREVENT THE MIGRATION OF DUST FROM THE SITE TO ABUTTING AREAS.

STOCKPILES:
1. LOCATE STOCKPILES A MINIMUM OF 50 FEET AWAY FROM CATCH BASINS, SWALES, AND CULVERTS.
2. ALL STOCKPILES SHOULD BE SURROUNDED WITH TEMPORARY EROSION CONTROL MEASURES PRIOR TO THE ONSET OF PRECIPITATION.
3. PERIMETER BARRIERS SHOULD BE MAINTAINED AT ALL TIMES, AND ADJUSTED AS NEEDED TO ACCOMMODATE THE DELIVERY AND REMOVAL OF MATERIALS FROM THE STOCKPILE. THE INTEGRITY OF THE BARRIER SHOULD BE INSPECTED AT THE END OF EACH WORKING DAY.
4. PROTECT ALL STOCKPILES FROM STORMWATER RUN-OFF USING TEMPORARY EROSION CONTROL MEASURES SUCH AS BERMS, SILT SOCK, OR OTHER APPROVED PRACTICE TO PREVENT MIGRATION OF MATERIAL BEYOND THE IMMEDIATE CONFINES OF THE STOCKPILES.

OFF SITE VEHICLE TRACKING:
1. THE CONTRACTOR SHALL CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE(S) PRIOR TO ANY EXCAVATION ACTIVITIES.

VEGETATION:
1. TEMPORARY GRASS COVER:
   A. SEEDBED PREPARATION:
      a. APPLY FERTILIZER AT THE RATE OF 600 POUNDS PER ACRE OF 10-10-10. APPLY LIMESTONE (EQUIVALENT TO 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF THREE (3) TONS PER ACRE;
   B. SEEDING:
      a. UTILIZE ANNUAL RYE GRASS AT A RATE OF 40 LBS/ACRE;
      b. WHERE THE SOIL HAS BEEN COMPACTED BY CONSTRUCTION OPERATIONS, LOOSEN SOIL TO A DEPTH OF TWO (2) INCHES BEFORE APPLYING FERTILIZER, LIME AND SEED;
      c. APPLY SEED UNIFORMLY BY HAND, CYCLONE SEEDER, OR HYDROSEEDER (SLURRY INCLUDING SEED AND FERTILIZER). HYDROSEEDINGS, WHICH INCLUDE MULCH, MAY BE LEFT ON SOIL SURFACE. SEEDING RATES MUST BE INCREASED 10% WHEN HYDROSEEDING;
   C. MAINTENANCE:
      a. TEMPORARY SEEDING SHALL BE PERIODICALLY INSPECTED. AT A MINIMUM, 95% OF THE SOIL SURFACE SHOULD BE COVERED BY VEGETATION. IF ANY EVIDENCE OF EROSION OR SEDIMENTATION IS APPARENT, REPAIRS SHALL BE MADE AND OTHER TEMPORARY MEASURES USED IN THE INTERIM (MULCH, FILTER BARRIERS, CHECK DAMS, ETC.).
2. VEGETATIVE PRACTICE:
   A. FOR PERMANENT MEASURES AND PLANTINGS:
      a. LIMESTONE SHALL BE THOROUGHLY INCORPORATED INTO THE LOAM LAYER AT A RATE OF THREE (3) TONS PER ACRE IN ORDER TO PROVIDE A PH VALUE OF 5.5 TO 6.5;
      b. FERTILIZER SHALL BE SPREAD ON THE TOP LAYER OF LOAM AND WORKED INTO THE SURFACE. FERTILIZER APPLICATION RATE SHALL BE 800 POUNDS PER ACRE OF 10-20-20 FERTILIZER;
      c. SOIL CONDITIONERS AND FERTILIZER SHALL BE APPLIED AT THE RECOMMENDED RATES AND SHALL BE THOROUGHLY WORKED INTO THE LOAM. LOAM SHALL BE RAKED UNTIL THE SURFACE IS FINELY PULVERIZED, SMOOTH AND EVEN, AND THEN COMPACTED TO AN EVEN SURFACE CONFORMING TO THE REQUIRED LINES AND GRADES WITH APPROVED ROLLERS WEIGHING BETWEEN 4-1/2 POUNDS AND 5-1/2 POUNDS PER INCH OF WIDTH;
      d. SEED SHALL BE SOWN AT THE RATE SHOWN BELOW. SOWING SHALL BE DONE ON A CALM, DRY DAY, PREFERABLY BY MACHINE, BUT IF BY HAND, ONLY BY EXPERIENCED WORKMEN. IMMEDIATELY BEFORE SEEDING, THE SOIL SHALL BE LIGHTLY RAKED. ONE HALF THE SEED SHALL BE SOWN IN ONE DIRECTION AND THE OTHER HALF AT RIGHT ANGLES TO THE ORIGINAL DIRECTION. IT SHALL BE LIGHTLY RAKED INTO THE SOIL TO A DEPTH NOT OVER 1/4 INCH AND ROLLED WITH A HAND ROLLER WEIGHING NOT OVER 100 POUNDS PER LINEAR FOOT OF WIDTH;
      e. HAY MULCH SHALL BE APPLIED IMMEDIATELY AFTER SEEDING AS INDICATED ABOVE;
      f. THE SURFACE SHALL BE WATERED AND KEPT MOIST WITH A FINE SPRAY AS REQUIRED, WITHOUT WASHING AWAY THE SOIL, UNTIL THE GRASS IS WELL ESTABLISHED. ANY AREAS WHICH ARE NOT SATISFACTORILY COVERED WITH GRASS SHALL BE RESEEDED, AND ALL NOXIOUS WEEDS REMOVED;
      g. THE CONTRACTOR SHALL PROTECT AND MAINTAIN THE SEEDED AREAS UNTIL ACCEPTED;
      h. A GRASS SEED MIXTURE CONTAINING THE FOLLOWING SEED REQUIREMENTS SHALL BE APPLIED AT THE INDICATED RATE:

SEED MIX	APPLICATION RATE
CREEPING RED FESCUE	20 LBS/ACRE
TALL FESCUE	20 LBS/ACRE
REDTOP	2 LBS/ACRE

IN NO CASE SHALL THE WEED CONTENT EXCEED ONE (1) PERCENT BY WEIGHT. ALL SEED SHALL COMPLY WITH STATE AND FEDERAL SEED LAWS. SEEDING SHALL BE DONE NO LATER THAN SEPTEMBER 15. IN NO CASE SHALL SEEDING TAKE PLACE OVER SNOW.

3. DORMANT SEEDING (SEPTEMBER 15 TO FIRST SNOWFALL):
   A. FOLLOW PERMANENT MEASURES SLOPE, LIME, FERTILIZER AND GRADING REQUIREMENTS. APPLY SEED MIXTURE AT TWICE THE INDICATED RATE. APPLY MULCH AS INDICATED FOR PERMANENT MEASURES.

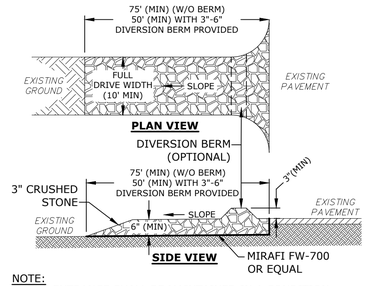
CONCRETE WASHOUT AREA:
   A. THE CONCRETE DELIVERY TRUCKS SHALL, WHENEVER POSSIBLE, USE WASHOUT FACILITIES AT THEIR OWN PLANT OR DISPATCH FACILITY;
   B. IF IT IS NECESSARY, SITE CONTRACTOR SHALL DESIGNATE SPECIFIC WASHOUT AREAS AND DESIGN FACILITIES TO HANDLE ANTICIPATED WASHOUT WATER;
   C. CONTRACTOR SHALL LOCATE WASHOUT AREAS AT LEAST 150 FEET AWAY FROM STORM DRAINS, SWALES AND SURFACE WATERS OR DELINEATED WETLANDS;
   D. INSPECT WASHOUT FACILITIES DAILY TO DETECT LEAKS OR TEARS AND TO IDENTIFY WHEN MATERIALS NEED TO BE REMOVED.

ALLOWABLE NON-STORMWATER DISCHARGES:
1. THE FOLLOWING ARE THE ONLY NON-STORMWATER DISCHARGES ALLOWED. ALL OTHER NON-STORMWATER DISCHARGES ARE PROHIBITED ON SITE:
   1.1. FIRE-FIGHTING ACTIVITIES;
   1.2. FIRE HYDRANT FLUSHING;
   1.3. WATERS USED TO WASH VEHICLES WHERE DETERGENTS ARE NOT USED;
   1.4. WATER USED TO CONTROL DUST;
   1.5. POTABLE WATER INCLUDING UNCONTAMINATED WATER LINE FLUSHING;
   1.6. ROUTINE EXTERNAL BUILDING WASH DOWN WHERE DETERGENTS ARE NOT USED;
   1.7. PAVEMENT WASH WATERS WHERE DETERGENTS ARE NOT USED;
   1.8. UNCONTAMINATED AIR CONDITIONING/COMPRESSOR CONDENSATION;
   1.9. UNCONTAMINATED GROUND WATER OR SPRING WATER;
   1.10. FOUNDATION OR FOOTING DRAINS WHICH ARE UNCONTAMINATED;
   1.11. UNCONTAMINATED EXCAVATION DEWATERING;
   1.12. LANDSCAPE IRRIGATION.

WASTE DISPOSAL:
4. WASTE MATERIAL:
   A. ALL WASTE MATERIALS SHALL BE COLLECTED AND STORED IN SECURELY LIDDED RECEPTACLES. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE SHALL BE DEPOSITED IN A DUMPSTER;
   B. NO CONSTRUCTION WASTE MATERIALS SHALL BE BURIED ON SITE;
   C. ALL PERSONNEL SHALL BE INSTRUCTED REGARDING THE CORRECT PROCEDURE FOR WASTE DISPOSAL BY THE SUPERINTENDENT.
2. HAZARDOUS WASTE:
   A. ALL HAZARDOUS WASTE MATERIALS SHALL BE DISPOSED OF IN THE MANNER SPECIFIED BY LOCAL OR STATE REGULATION OR BY THE MANUFACTURER;
   B. SITE PERSONNEL SHALL BE INSTRUCTED IN THESE PRACTICES BY THE SUPERINTENDENT.
3. SANITARY WASTE:
   A. ALL SANITARY WASTE SHALL BE COLLECTED FROM THE PORTABLE UNITS A MINIMUM OF ONCE PER WEEK BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

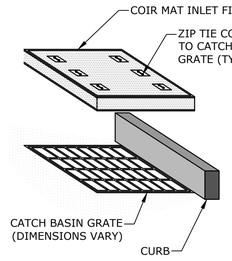
SPILL PREVENTION:
1. CONTRACTOR SHALL BE FAMILIAR WITH SPILL PREVENTION MEASURES REQUIRED BY LOCAL, STATE AND FEDERAL AGENCIES. AT A MINIMUM, CONTRACTOR SHALL FOLLOW THE BEST MANAGEMENT SPILL PREVENTION PRACTICES OUTLINED BELOW.
2. THE FOLLOWING ARE THE MATERIAL MANAGEMENT PRACTICES THAT SHALL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURE OF MATERIALS AND SUBSTANCES DURING CONSTRUCTION TO STORMWATER RUNOFF:
   A. GOOD HOUSEKEEPING - THE FOLLOWING GOOD HOUSEKEEPING PRACTICE SHALL BE FOLLOWED ON SITE DURING CONSTRUCTION:
      a. ONLY SUFFICIENT AMOUNTS OF PRODUCTS TO DO THE JOB SHALL BE STORED ON SITE;
      b. ALL REGULATED MATERIALS STORED ON SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER IN THEIR PROPER (ORIGINAL IF POSSIBLE) CONTAINERS AND, IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE, ON AN IMPERVIOUS SURFACE;
      c. MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL SHALL BE FOLLOWED;
      d. THE SITE SUPERINTENDENT SHALL INSPECT DAILY TO ENSURE PROPER USE AND DISPOSAL OF MATERIALS;
      e. SUBSTANCES SHALL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER;
      f. WHENEVER POSSIBLE ALL OF A PRODUCT SHALL BE USED UP BEFORE DISPOSING OF THE CONTAINER.
      g. THE TRAINING OF ON-SITE EMPLOYEES AND THE ON-SITE POSTING OF RELEASE RESPONSE INFORMATION DESCRIBING WHAT TO DO IN THE EVENT OF A SPILL OF REGULATED SUBSTANCES.
   B. HAZARDOUS PRODUCTS - THE FOLLOWING PRACTICES SHALL BE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS:
      a. PRODUCTS SHALL BE KEPT IN THEIR ORIGINAL CONTAINERS UNLESS THEY ARE NOT RESEALABLE;
      b. ORIGINAL LABELS AND MATERIAL SAFETY DATA SHALL BE RETAINED FOR IMPORTANT PRODUCT INFORMATION;
      c. SURPLUS PRODUCT THAT MUST BE DISPOSED OF SHALL BE DISCARDED ACCORDING TO THE MANUFACTURER'S RECOMMENDED METHODS OF DISPOSAL.
   C. PRODUCT SPECIFIC PRACTICES - THE FOLLOWING PRODUCT SPECIFIC PRACTICES SHALL BE FOLLOWED ON SITE:
      a. PETROLEUM PRODUCTS:
      i. ALL ON SITE VEHICLES SHALL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTIVE MAINTENANCE TO REDUCE LEAKAGE;
      ii. PETROLEUM PRODUCTS SHALL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. ANY ASPHALT BASED SUBSTANCES USED ON SITE SHALL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
      iii. SECURE FUEL STORAGE AREAS AGAINST UNAUTHORIZED ENTRY;
      iv. INSPECT FUEL STORAGE AREAS WEEKLY;
      v. WHEREVER POSSIBLE, KEEP REGULATED CONTAINERS THAT ARE STORED OUTSIDE MORE THAN 50 FEET FROM SURFACE WATER AND STORM DRAINS, 75 FEET FROM PRIVATE WELLS, AND 400 FEET FROM PUBLIC WELLS;
      vi. COVER REGULATED CONTAINERS IN OUTSIDE STORAGE AREAS;
      vii. SECONDARY CONTAINMENT IS REQUIRED FOR CONTAINERS CONTAINING REGULATED SUBSTANCES STORED OUTSIDE, EXCEPT FOR ON PREMISE USE HEATING FUEL TANKS, OR ABOVEGROUND OR UNDERGROUND STORAGE TANKS OTHERWISE REGULATED.
      viii. THE FUEL HANDLING REQUIREMENTS SHALL INCLUDE:
         (1) EXCEPT WHEN IN USE, KEEP CONTAINERS CONTAINING REGULATED SUBSTANCES CLOSED AND SEALED;
         (2) PLACE DRIP PANS UNDER SPIGOTS, VALVES, AND PUMPS;
         (3) HAVE SPILL CONTROL AND CONTAINMENT EQUIPMENT READILY AVAILABLE IN ALL WORK AREAS;
         (4) USE FUNNELS AND DRIP PANS WHEN TRANSFERRING REGULATED SUBSTANCES;
         (5) PERFORM TRANSFERS OF REGULATED SUBSTANCES OVER AN IMPERVIOUS SURFACE.
      ix. FUELING AND MAINTENANCE OF EXCAVATION, EARTHMOVING AND OTHER CONSTRUCTION RELATED EQUIPMENT SHALL COMPLY WITH THE REGULATIONS OF THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES THESE REQUIREMENTS ARE SUMMARIZED IN WD-DWGB-22-6 BEST MANAGEMENT PRACTICES FOR FUELING AND MAINTENANCE OF EXCAVATION AND EARTHMOVING EQUIPMENT, OR ITS SUCCESSOR DOCUMENT.
      HTTPS://WWW.DES.NH.GOV/ORGANIZATION/COMMISSIONER/PIP/FACTSHEETS/DWGB/DOCUMENTS/DWGB-22-6.PDF
      b. FERTILIZERS:
      i. FERTILIZERS USED SHALL BE APPLIED ONLY IN THE MINIMUM AMOUNTS DIRECTED BY THE SPECIFICATIONS;
      ii. ONCE APPLIED FERTILIZER SHALL BE WORKED INTO THE SOIL TO LIMIT EXPOSURE TO STORMWATER;
      iii. STORAGE SHALL BE IN A COVERED SHED OR ENCLOSED TRAILERS. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER SHALL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO AVOID SPILLS.
      c. PAINTS:
      i. ALL CONTAINERS SHALL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE;
      ii. EXCESS PAINT SHALL NOT BE DISCHARGED TO THE STORM SEWER SYSTEM;
      iii. EXCESS PAINT SHALL BE DISPOSED OF PROPERLY ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR STATE AND LOCAL REGULATIONS.
   D. SPILL CONTROL PRACTICES - IN ADDITION TO GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES DISCUSSED IN THE PREVIOUS SECTION, THE FOLLOWING PRACTICES SHALL BE FOLLOWED FOR SPILL PREVENTION AND CLEANUP:
      a. MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP SHALL BE CLEARLY POSTED AND SITE PERSONNEL SHALL BE MADE AWARE OF THE PROCEDURES AND THE LOCATION OF THE INFORMATION AND CLEANUP SUPPLIES;
      b. MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEANUP SHALL BE KEPT IN THE MATERIAL STORAGE AREA ON SITE. EQUIPMENT AND MATERIALS SHALL INCLUDE BUT NOT BE LIMITED TO BROOMS, DUSTPANS, MOPS, RAGS, GLOVES, GOGGLES, KITTY LITTER, SAND, SAWDUST AND PLASTIC OR METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE;
      c. ALL SPILLS SHALL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY;
      d. THE SPILL AREA SHALL BE KEPT WELL VENTILATED AND PERSONNEL SHALL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH A HAZARDOUS SUBSTANCE;
      e. SPILLS OF TOXIC OR HAZARDOUS MATERIAL SHALL BE REPORTED TO THE APPROPRIATE LOCAL, STATE OR FEDERAL AGENCIES AS REQUIRED;
      f. THE SITE SUPERINTENDENT RESPONSIBLE FOR DAY-TO-DAY SITE OPERATIONS SHALL BE THE SPILL PREVENTION AND CLEANUP COORDINATOR.
   E. VEHICLE FUELING AND MAINTENANCE PRACTICE:
      a. CONTRACTOR SHALL MAKE AN EFFORT TO PERFORM EQUIPMENT/VEHICLE FUELING AND MAINTENANCE AT AN OFF-SITE FACILITY;
      b. CONTRACTOR SHALL PROVIDE AN ON-SITE FUELING AND MAINTENANCE AREA THAT IS CLEAN AND DRY;
      c. IF POSSIBLE THE CONTRACTOR SHALL KEEP AREA COVERED;
      d. CONTRACTOR SHALL KEEP A SPILL KIT AT THE FUELING AND MAINTENANCE AREA;
      e. CONTRACTOR SHALL REGULARLY INSPECT VEHICLES FOR LEAKS AND DAMAGE;
      f. CONTRACTOR SHALL USE DRIP PANS, DRIP CLOTHS, OR ABSORBENT PADS WHEN REPLACING SPENT FLUID.

EROSION CONTROL OBSERVATIONS AND MAINTENANCE PRACTICES
   A. THIS PROJECT EXCEEDS ONE (1) ACRE OF DISTURBANCE AND THUS REQUIRES A SWPPP.



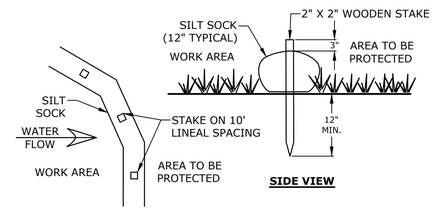
NOTE:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OF SEDIMENT FROM THE SITE. WHEN WASHING IS REQUIRED, IT SHALL BE DONE SO RUNOFF DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING STORM DRAINS, DITCHES, OR WATERWAYS

STABILIZED CONSTRUCTION EXIT
NO SCALE



NOTES:
1. COIR MAT INLET FILTER SHALL BE STORM WATER INLET FILTER BY BLOCKSOM & CO. OR APPROVED EQUAL.
2. INSTALL AND MAINTAIN INLET PROTECTION IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

INLET PROTECTION BARRIER
NO SCALE



NOTES:
1. SILT SOCK SHALL BE SILT SOXX BY FILTREXX OR APPROVED EQUAL.
2. INSTALL SILT SOCK IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

SILT SOCK
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PATRICK CRIMMINS No. 12378 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

STATE OF NEW HAMPSHIRE – NEIL A. HANSEN No. 15227 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

EROSION CONTROL NOTES AND DETAILS

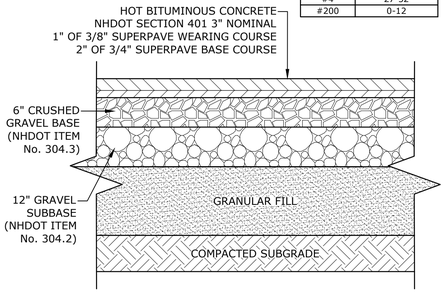
SCALE: AS SHOWN

C-601

Last Saved: 9/19/2025
Printed On: 9/22/2025 11:25am By: BCurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg

NHDOT ITEM No. 304.2 (GRAVEL)	
SIEVE SIZE	% PASSING
6"	100
#4	25-70
#200	0-12

NHDOT ITEM No. 304.3 (CRUSHED GRAVEL)	
SIEVE SIZE	% PASSING
3"	100
2"	95-100
1"	55-85
#4	27-52
#200	0-12

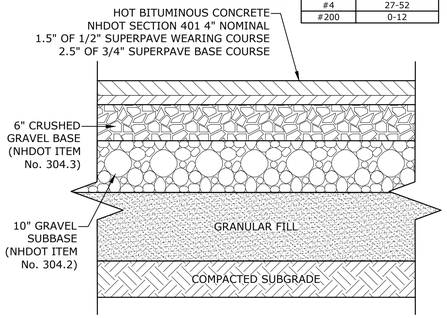


NOTES:
1. SEE SITE PLAN FOR PAVEMENT WIDTH AND LOCATION.
2. SEE GRADING, DRAINAGE AND EROSION CONTROL PLAN FOR PAVEMENT SLOPE AND CROSS-SLOPE.
3. A TACK COAT SHALL BE PLACED ON TOP OF BINDER COURSE PAVEMENT PRIOR TO PLACING WEARING COURSE.
4. FINAL PAVEMENT DESIGN TO BE DETERMINED BY GEOTECHNICAL ENGINEER.

ON-SITE PAVEMENT SECTION
NO SCALE

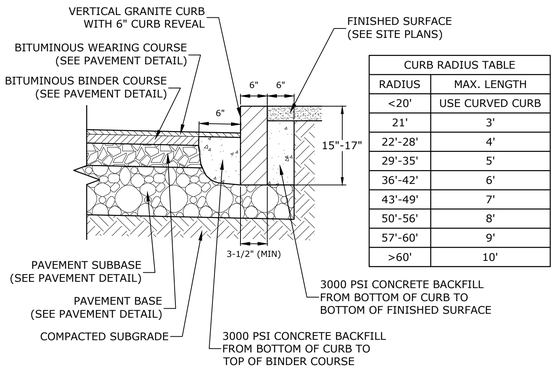
NHDOT ITEM No. 304.2 (GRAVEL)	
SIEVE SIZE	% PASSING
6"	100
#4	25-70
#200	0-12

NHDOT ITEM No. 304.3 (CRUSHED GRAVEL)	
SIEVE SIZE	% PASSING
3"	100
2"	95-100
1"	55-85
#4	27-52
#200	0-12



NOTES:
1. SEE SITE PLAN FOR PAVEMENT WIDTH AND LOCATION.
2. SEE GRADING, DRAINAGE AND EROSION CONTROL PLAN FOR PAVEMENT SLOPE AND CROSS-SLOPE.
3. A TACK COAT SHALL BE PLACED ON TOP OF BINDER COURSE PAVEMENT PRIOR TO PLACING WEARING COURSE.

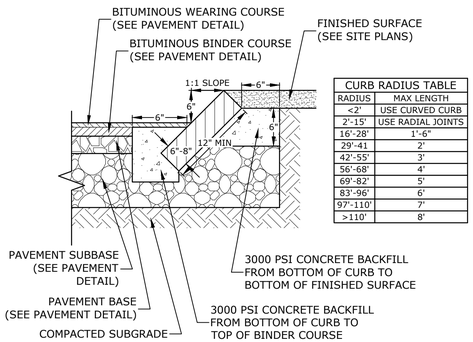
CITY RIGHT-OF-WAY PAVEMENT SECTION
NO SCALE



CURB RADIUS TABLE	
RADIUS	MAX. LENGTH
<20'	USE CURVED CURB
21'	3'
22'-28'	4'
29'-35'	5'
36'-42'	6'
43'-49'	7'
50'-56'	8'
57'-60'	9'
>60'	10'

NOTES:
1. SEE SITE PLAN(S) FOR LIMITS OF VERTICAL GRANITE CURB (VGC).
2. ADJOINING STONES SHALL HAVE THE SAME OR APPROXIMATELY THE SAME LENGTH.
3. MINIMUM LENGTH OF STRAIGHT CURB STONES = 3'
4. MAXIMUM LENGTH OF STRAIGHT CURB STONES = 10'
5. MAXIMUM LENGTH OF STRAIGHT CURB STONES LAID ON CURVES (SEE TABLE).
6. ALL RADII 20 FEET AND SMALLER SHALL BE CONSTRUCTED USING CURVED SECTIONS.
7. JOINTS BETWEEN STONES SHALL HAVE A MAXIMUM SPACING OF 1/2" AND SHALL BE MORTARED.

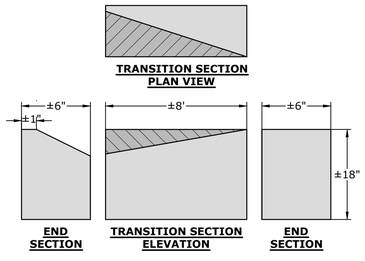
VERTICAL GRANITE CURB
NO SCALE



CURB RADIUS TABLE	
RADIUS	MAX LENGTH
<2'	USE CURVED CURB
2'-15'	USE RADIAL JOINTS
16'-28'	1'-6"
29'-41	2'
42'-55'	3'
56'-68'	4'
69'-82'	5'
83'-96'	6'
97'-110'	7'
>110'	8'

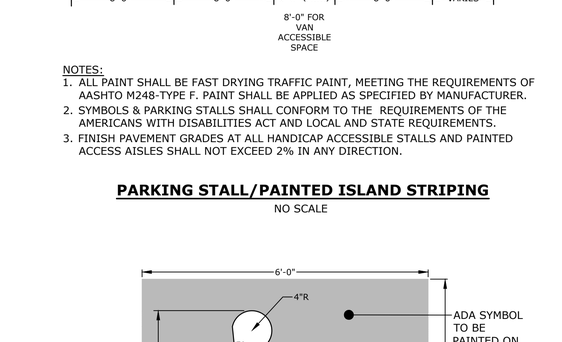
NOTES:
1. SEE SITE PLAN(S) FOR LIMITS OF SLOPED GRANITE CURB (SGC).
2. ADJOINING STONES SHALL HAVE THE SAME OR APPROXIMATELY THE SAME LENGTH.
3. MINIMUM LENGTH OF STRAIGHT CURB STONES = 18"
4. MAXIMUM LENGTH OF STRAIGHT CURB STONES = 8'
5. MAXIMUM LENGTH OF STRAIGHT CURB STONES LAID ON CURVES (SEE TABLE).
6. JOINTS BETWEEN STONES SHALL HAVE A MAXIMUM SPACING OF 1/2" AND SHALL BE MORTARED.

SLOPED GRANITE CURB
NO SCALE



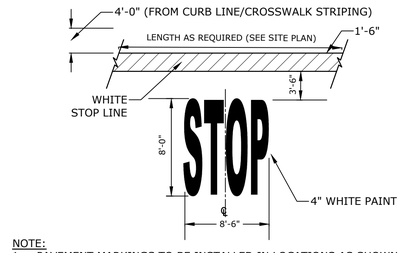
NOTES
1. THE INTENT OF THIS DETAIL IS TO PROVIDE A SMOOTH TRANSITION BETWEEN VERTICAL GRANITE CURB (VGC) AND SLOPE GRANITE CURB (SGC) WITHOUT REQUIRING FIELD CHIPPING DURING INSTALLATION.
2. THE SGC MAY REQUIRE ADJUSTMENTS TO MEET THE TRANSITION PIECE HEIGHT. TRANSITION SGC TO STANDARD REVEAL VGC AS QUICKLY AS POSSIBLE TO PROVIDE FOR THIS SMOOTH TRANSITION.

GRANITE CURB TRANSITION
NO SCALE



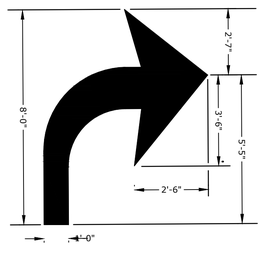
NOTES:
1. ALL PAINT SHALL BE FAST DRYING TRAFFIC PAINT, MEETING THE REQUIREMENTS OF AASHTO M248-TYPE F. PAINT SHALL BE APPLIED AS SPECIFIED BY MANUFACTURER.
2. SYMBOLS & PARKING STALLS SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT AND LOCAL AND STATE REQUIREMENTS.
3. FINISH PAVEMENT GRADES AT ALL HANDICAP ACCESSIBLE STALLS AND PAINTED ACCESS AISLES SHALL NOT EXCEED 2% IN ANY DIRECTION.

PARKING STALL/PAINTED ISLAND STRIPING
NO SCALE



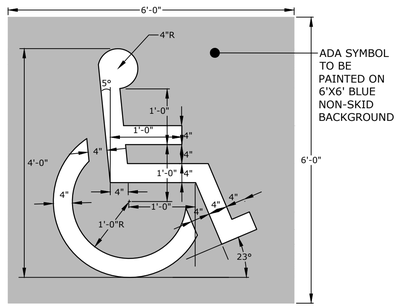
NOTE:
1. PAVEMENT MARKINGS TO BE INSTALLED IN LOCATIONS AS SHOWN ON SITE PLAN.
2. STRIPING SHALL BE CONSTRUCTED USING USING FAST DRYING TRAFFIC PAINT, MEETING THE REQUIREMENTS OF AASHTO M248-TYPE F. PAINT SHALL BE APPLIED AS SPECIFIED BY MANUFACTURER.

STOP BAR AND LEGEND
NO SCALE



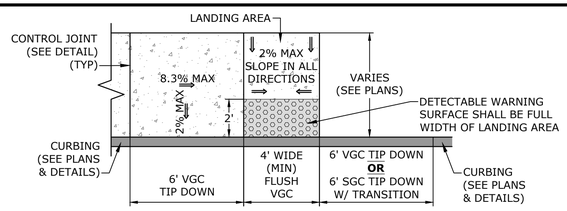
NOTES:
1. SYMBOLS SHALL BE PAINTED USING FAST DRYING TRAFFIC PAINT, MEETING THE REQUIREMENTS OF AASHTO M248-TYPE F. PAINT SHALL BE APPLIED AS SPECIFIED BY MANUFACTURER.
2. PREFORMED WORDS AND SYMBOLS SHALL BE PRE-CUT BY THE MANUFACTURER.

TURN ARROW
NO SCALE

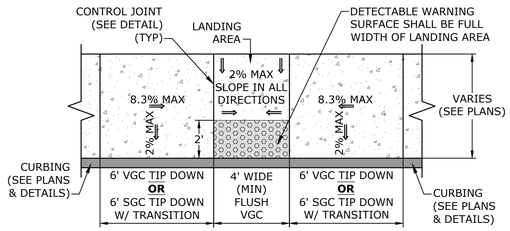


NOTES:
1. SYMBOL SHALL BE CONSTRUCTED IN ALL ACCESSIBLE SPACES USING FAST DRYING TRAFFIC PAINT, MEETING THE REQUIREMENTS OF AASHTO M248-TYPE F. PAINT SHALL BE APPLIED AS SPECIFIED BY MANUFACTURER.
2. SYMBOL SHALL BE CONSTRUCTED TO THE LATEST ADA, STATE AND LOCAL REQUIREMENTS.

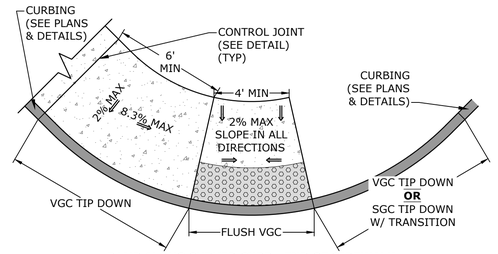
ACCESSIBLE SYMBOL
NO SCALE



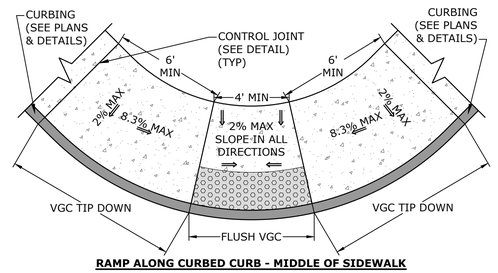
RAMP ALONG CURB - END OF SIDEWALK



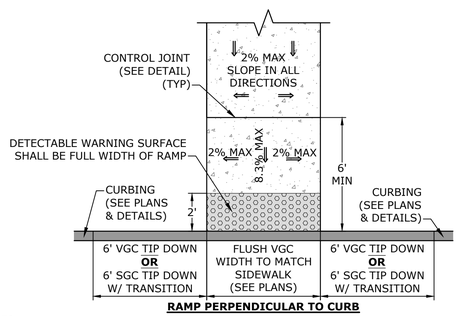
RAMP ALONG CURB - MIDDLE OF SIDEWALK



RAMP ALONG CURVED CURB - END OF SIDEWALK



RAMP ALONG CURBED CURB - MIDDLE OF SIDEWALK



RAMP PERPENDICULAR TO CURB

NOTES:
1. DETECTABLE WARNING PANELS SHALL ONLY BE INSTALLED AT SPECIFIC LOCATIONS AS IDENTIFIED ON THE SITE PLANS, NOT ON ALL TIP-DOWNS. SEE SEPARATE DETAIL FOR WARNING PANEL REQUIREMENTS.
2. RAMPS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT AND LOCAL AND STATE REQUIREMENTS.
3. A 6" CRUSHED GRAVEL BASE (NHDOT ITEM No. 304.3) SHALL BE PROVIDED BENEATH RAMPS.
4. THE MAXIMUM RUNNING SLOPE OF ANY SIDEWALK CURB RAMP IS 12:1, THE MAXIMUM CROSS SLOPE IS 2%. THE SLOPE OF THE LANDING SHALL NOT EXCEED 2% IN ANY DIRECTION.
5. TRANSITIONS SHALL BE FLUSH AND FREE OF ABRUPT CHANGES. THERE SHALL BE A 0" REVEAL BETWEEN PAVEMENT, CURB, AND CONCRETE TIP-DOWN SURFACES.
6. ROADWAY SHOULDER SLOPES ADJOINING SIDEWALK CURB RAMPS SHALL BE A MAXIMUM OF 5% (FULL WIDTH) FOR A DISTANCE OF 2 FT. FROM THE ROADWAY CURBLINE.
7. THE BOTTOM OF THE SIDEWALK CURB RAMP OR LANDING, EXCLUSIVE OF THE FLARED SIDES, SHALL BE WHOLLY CONTAINED WITHIN THE CROSSWALK MARKINGS.

CONCRETE TIP DOWN RAMP WITH DETECTABLE WARNING SURFACE
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PATRICK CRIMMINS No. 12378 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

STATE OF NEW HAMPSHIRE – NEIL A. HANSEN No. 15227 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DETAILS SHEET

SCALE: AS SHOWN

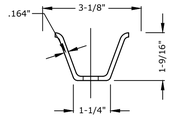
C-602

Last Saved: 9/19/2025
Plotted: 09/22/2025 11:25am By: BCurcio
Tighe & Bond:J:\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg

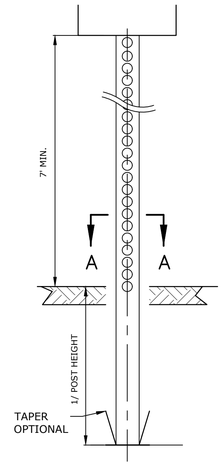
R1-1
30"X30"
WHITE ON RED

R7-8P
18" X 9"
GREEN ON WHITE

R7-8
12" X 18"
BLUE AND GREEN
ON WHITE



SECTION A-A



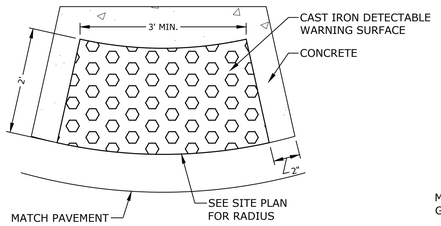
* IN LEDGE DRILL & GROUT TO A MIN OF 2'

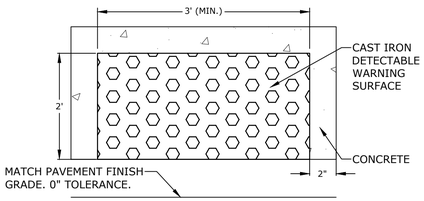
LENGTH: AS REQUIRED
WEIGHT PER LINEAR FOOT: 2.50 LBS (MIN.)
HOLES: 3/8" DIAMETER, 1" C-C FULL LENGTH
STEEL: SHALL CONFORM TO ASTM A-499 (GRADE 60) OR ASSTM A-576 (GRADE 1070 - 1080)

FINISH: SHALL BE PAINTED WITH TWO COATS OF AN APPROVED BLACK BAKED ON OR DRIED, PAINT OF WEATHER RESISTANT QUALITY. ALL FABRICATION SHALL BE COMPLETE BEFORE PAINTING.

NOTE:
ALL SIGNS TO BE INSTALLED AS INDICATED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.

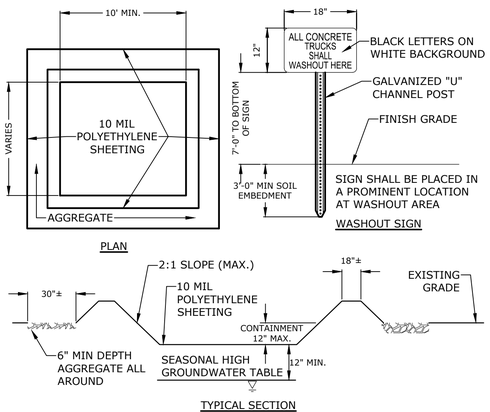
SIGN LEGEND AND SIGN POST
NO SCALE





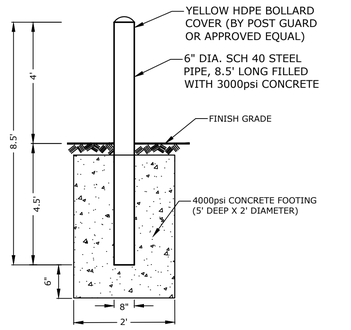
NOTES:
1. DETECTABLE WARNING SURFACE SHALL BE CAST IRON PANEL SET IN CONCRETE.
2. CONCRETE THAT PLATES ARE SET IN SHALL BE NO LESS THAN 6" THICK, NHDOT TYPE AA (4000 PSI) WITH FIBER.
3. THE WARNING SURFACE SHALL EXTEND FULLY ACROSS AND WITHIN 2" OF THE EDGES OF THE SIDEWALK.
4. DETECTABLE WARNING SURFACES SHALL BE INSTALLED AT ALL MAJOR DRIVEWAYS AND STREET CROSSINGS.
5. DETECTABLE WARNING SURFACE SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

CAST IRON DETECTABLE WARNING SURFACE
NO SCALE



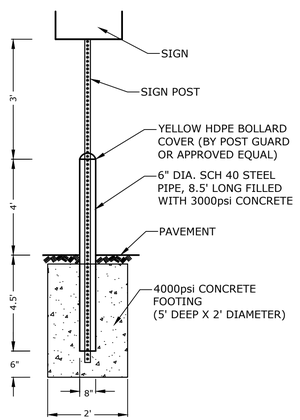
NOTES:
1. CONTAINMENT MUST BE STRUCTURALLY SOUND AND LEAK FREE AND CONTAIN ALL LIQUID WASTES.
2. CONTAINMENT DEVICES MUST BE OF SUFFICIENT QUANTITY OR VOLUME TO COMPLETELY CONTAIN THE LIQUID WASTES GENERATED.
3. WASHOUT MUST BE CLEANED OR NEW FACILITIES CONSTRUCTED AND READY TO USE ONCE WASHOUT IS 75% FULL.
4. WASHOUT AREA(S) SHALL BE INSTALLED IN A LOCATION EASILY ACCESSIBLE BY CONCRETE TRUCKS.
5. ONE OR MORE AREAS MAY BE INSTALLED ON THE CONSTRUCTION SITE AND MAY BE RELOCATED AS CONSTRUCTION PROGRESSES.
6. AT LEAST WEEKLY REMOVE ACCUMULATION OF SAND AND AGGREGATE AND DISPOSE OF PROPERLY.

CONCRETE WASHOUT AREA
NO SCALE

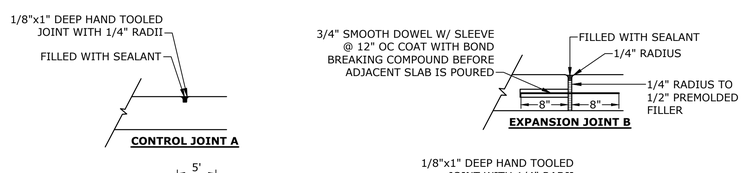


NOTE:
1. COORDINATE WITH EVERSOURCE TO VERIFY THAT BOLLARD, FOOTING, AND BOLLARD COVER MEET EVERSOURCE REQUIREMENTS.

BOLLARD DETAIL
NO SCALE

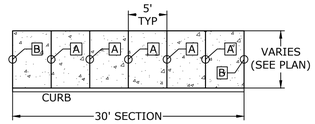


BOLLARD MOUNTED SIGN DETAIL
NO SCALE

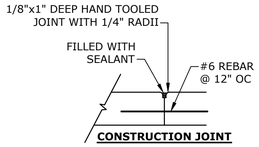


CONTROL JOINT A

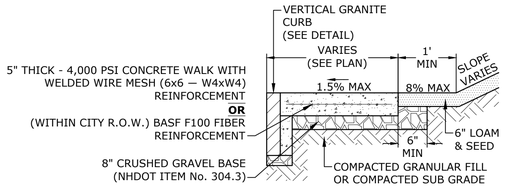
EXPANSION JOINT B



PLAN VIEW



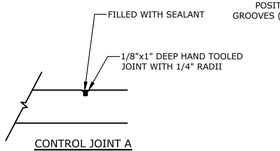
CONSTRUCTION JOINT



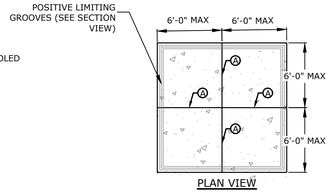
SECTION VIEW

NOTES:
1. SEE SITE PLAN FOR SIDEWALK WIDTH AND LOCATIONS.
2. SIDEWALKS WITHIN THE CITY RIGHT-OF-WAY SHALL BE CONSTRUCTED USING FIBER REINFORCEMENT.
3. SEE GRADING, DRAINAGE & EROSION CONTROL PLAN FOR WALK AND SIDE SLOPE GRADES.
4. SIDEWALK SURFACE SHALL GIVEN A BROOM FINISH.
5. ISOLATION JOINTS ADJACENT TO BUILDING SHALL BE COORDINATED WITH BUILDING DRAWINGS.
6. CONTRACTOR SHALL SUBMIT THE PROPOSED CONCRETE MIX DESIGN FOR APPROVAL PRIOR TO CONSTRUCTION.
7. ALL WORK SHALL CONFORM TO THE CITY OF PORTSMOUTH DEPARTMENT OF PUBLIC WORKS, STANDARD SPECIFICATIONS AND WITH THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION, "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION", CURRENT EDITION.

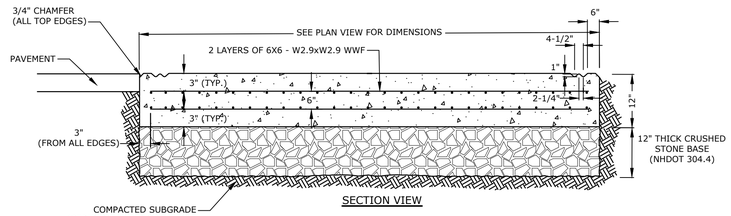
CONCRETE SIDEWALK
NO SCALE



CONTROL JOINT A



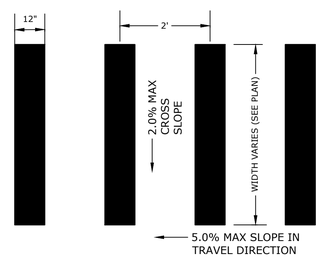
PLAN VIEW



SECTION VIEW

NOTES:
1. CONCRETE TO BE 4500 PSI, 7% AIR ENTRAINED
2. STANDARD BROOM FINISH.

DUMPSTER PAD
NO SCALE



NOTE:
STRIPING SHALL BE CONSTRUCTED USING FAST DRYING TRAFFIC PAINT, MEETING THE REQUIREMENTS OF AASHTO M248-TYPE F. PAINT SHALL BE APPLIED AS SPECIFIED BY MANUFACTURER.

CROSSWALK STRIPING
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE
PATRICK CRIMMINS
No. 12378
LICENSED
PROFESSIONAL ENGINEER
9/22/2025

STATE OF NEW HAMPSHIRE
NEIL A. HANSEN
No. 15227
LICENSED
PROFESSIONAL ENGINEER
9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

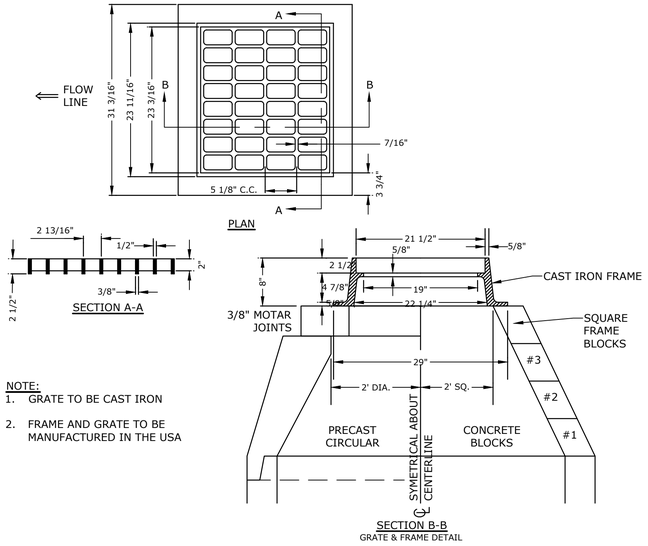
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DETAILS SHEET

SCALE: AS SHOWN

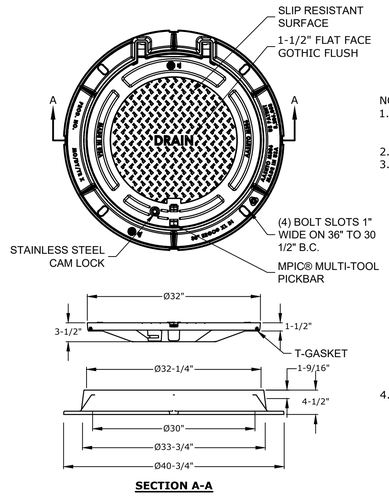
C-603

Last Saved: 9/19/2025
Plotted: Friday, September 19, 2025 11:25am By: BCurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg



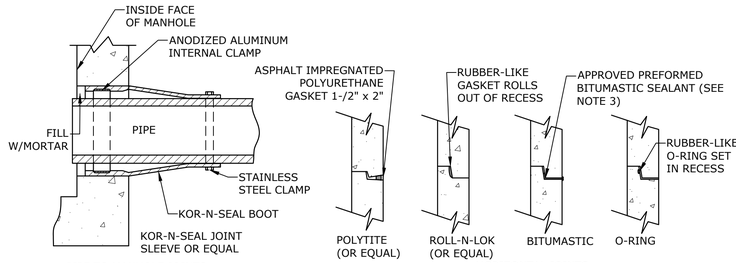
NOTE:
1. GRATE TO BE CAST IRON
2. FRAME AND GRATE TO BE MANUFACTURED IN THE USA

CATCH BASIN FRAME & GRATE
NO SCALE



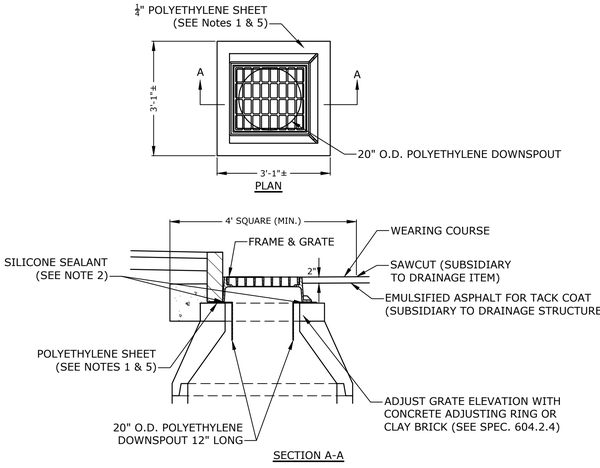
NOTES:
1. MANHOLE FRAME AND COVER SHALL BE 32" HINGED ERGO XL BY EJ CO.
2. ALL DIMENSIONS ARE NOMINAL.
3. FRAMES USING NARROWER DIMENSIONS FOR THICKNESS ARE ALLOWED PROVIDED:
   A. THE FRAMES MEET OR EXCEED THE SPECIFIED LOAD RATING.
   B. THE INTERIOR PERIMETER (SEAT AREA) DIMENSIONS OF THE FRAMES REMAIN THE SAME TO ALLOW CONTINUED USE OF EXISTING GRATES/COVERS AS THE EXISTING FRAMES ALLOW, WITHOUT SHIMS OR OTHER MODIFICATIONS OR ACCOMMODATIONS.
   C. ALL OTHER PERTINENT REQUIREMENTS OF THE SPECIFICATIONS ARE MET.
4. LABEL TYPE OF MANHOLE WITH 3" HIGH LETTERS IN HE CENTER OF THE COVER.

DRAIN MANHOLE FRAME & COVER
NO SCALE



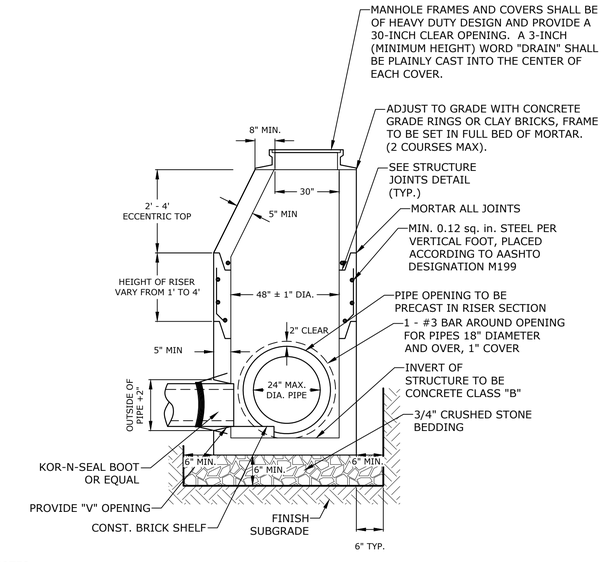
NOTES:
1. HORIZONTAL JOINTS BETWEEN THE SECTIONS OF PRECAST CONCRETE BARRELS SHALL BE PER CITY OF PORTSMOUTH DPW STANDARD AND SHALL BE SEALED FOR WATERTIGHTNESS USING A DOUBLE ROW ELASTOMERIC OR MASTIC-LIKE GASKET.
2. PIPE TO MANHOLE JOINTS SHALL BE PER CITY OF PORTSMOUTH STANDARD.
3. FOR BITUMASTIC TYPE JOINTS THE AMOUNT OF SEALANT SHALL BE SUFFICIENT TO FILL AT LEAST 75% OF THE JOINT CAVITY.
4. ALL GASKETS, SEALANTS, MORTAR, ETC. SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS' WRITTEN INSTRUCTIONS.

MANHOLE JOINTS
NO SCALE



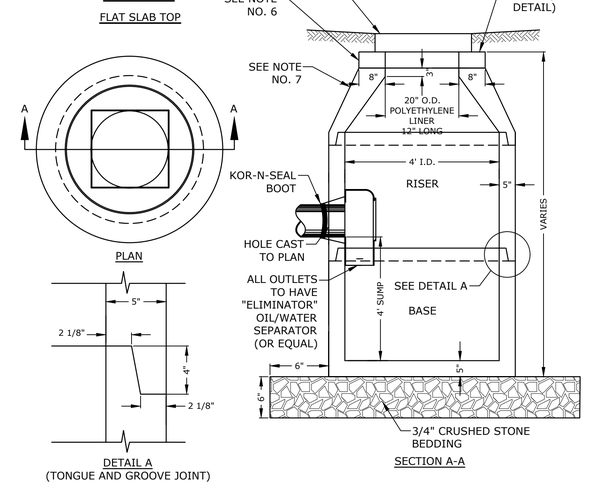
NOTES:
1. POLYETHYLENE LINER (ITEM 604.0007) SHALL BE FABRICATED AT THE SHOP. DOWNSPOUT SHALL BE EXTRUSION FILLET WELDED TO THE POLYETHYLENE SHEET.
2. PLACE A CONTINUOUS BEAD OF AN APPROVED SILICONE SEALANT (SUBSIDIARY TO ITEM 604.0007) BETWEEN FRAME AND POLYETHYLENE SHEET.
3. PLACE CLASS AA CONCRETE TO 2" BELOW THE TOP OF THE GRATE ELEVATION (SUBSIDIARY TO DRAINAGE STRUCTURE).
4. USE ON DRAINAGE STRUCTURES 4' MIN. DIAMETER ONLY.
5. TRIM POLYETHYLENE SHEET A MAXIMUM OF 4" OUTSIDE THE FLANGE ON THE FRAME FOR THE CATCH BASIN BEFORE PLACING CONCRETE (EXCEPT AS SHOWN WHEN USED WITH 3-FLANGE FRAME AND CURB).
6. THE CENTER OF THE GRATE & FRAME MAY BE SHIFTED A MAXIMUM OF 6" FROM THE CENTER OF THE DOWNSPOUT IN ANY DIRECTION.
7. PLACED ONLY IN DRAINAGE STRUCTURES IN PAVEMENT.
8. SEE NHDOT DR-04, "DI-DB, UNDERDRAIN FLUSHING BASIN AND POLYETHYLENE LINER DETAILS", FOR ADDITIONAL INFORMATION.
9. CATCHBASINS WITHIN CITY RIGHT OF WAY SHALL HAVE A POLYETHYLENE LINER

POLYETHYLENE LINER
NO SCALE



NOTES:
1. ALL SECTIONS SHALL BE 4,000 PSI CONCRETE.
2. CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQUARE INCHES PER LINEAR FOOT IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER THIRD OF THE WALL.
3. THE TONGUE AND THE GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQUARE INCHES PER LINEAR FOOT.
4. THE STRUCTURES SHALL BE DESIGNED FOR H20 LOADING.
5. CONSTRUCT CRUSHED STONE BEDDING AND BACKFILL UNDER (6" MINIMUM THICKNESS)
6. THE TONGUE AND GROOVE JOINT SHALL BE SEALED WITH ONE STRIP OF BUTYL RUBBER SEALANT.
7. PIPE ELEVATIONS SHOWN ON PLANS SHALL BE FIELD VERIFIED PRIOR TO PRECASTING.
8. OUTSIDE EDGES OF PIPES SHALL PROJECT NO MORE THAN 3" BEYOND INSIDE WALL OF STRUCTURE.
9. PRECAST SECTIONS SHALL HAVE A TONGUE AND GROOVE JOINT 4" HIGH AT AN 11° ANGLE CENTERED IN THE WIDTH OF THE WALL AND SHALL BE ASSEMBLED USING AN APPROVED FLEXIBLE SEALANT IN JOINTS.
10. ALL STRUCTURES WITH MULTIPLE PIPES SHALL HAVE A MINIMUM OF 12" OF INSIDE SURFACE BETWEEN HOLES, NO MORE THAN 75% OF A HORIZNTAL CROSS SECTION SHALL BE HOLES, AND THERE SHALL BE NO HOLES CLOSER THAN 3" TO JOINTS.

4' DIAMETER DRAIN MANHOLE
NO SCALE



NOTES:
1. ALL SECTIONS SHALL BE CONCRETE CLASS AA(4000 psi).
2. CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQ.IN. PER LINEAR FT. IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER THIRD OF THE WALL.
3. THE TONGUE AND GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQ. IN. PER LINEAR FT.
4. RISERS OF 1', 2', 3' & 4' CAN BE USED TO REACH DESIRED DEPTH.
5. THE STRUCTURES SHALL BE DESIGNED FOR H20 LOADING.
6. FITTING FRAME TO GRADE MAY BE DONE WITH PREFABRICATED ADJUSTMENT RINGS OR CLAY BRICKS (2 COURSES MAX.).
7. CONE SECTIONS MAY BE EITHER CONCENTRIC OR ECCENTRIC, OR FLAT SLAB TOPS MAY BE USED WHERE PIPE WOULD OTHERWISE ENTER INTO THE CONE SECTION OF THE STRUCTURE AND WHERE PERMITTED.
8. PIPE ELEVATIONS SHOWN ON PLANS SHALL BE FIELD VERIFIED PRIOR TO PRECASTING.
9. OUTSIDE EDGES OF PIPES SHALL PROJECT NO MORE THAN 3" BEYOND INSIDE WALL OF STRUCTURE.
10. PRECAST SECTIONS SHALL HAVE A TONGUE AND GROOVE JOINT 4" HIGH AT AN 11° ANGLE CENTERED IN THE WIDTH OF THE WALL AND SHALL BE ASSEMBLED USING AN APPROVED FLEXIBLE SEALANT IN JOINTS.
11. THE TONGUE AND GROOVE JOINT SHALL BE SEALED WITH ONE STRIP OF BUTYL RUBBER SEALANT.
12. "ELIMINATOR" OIL/WATER SEPARATOR SHALL BE INSTALLED TIGHT TO INSIDE OF CATCHBASIN.

4' DIAMETER CATCHBASIN
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PATRICK CRIMMINS No. 12378 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

STATE OF NEW HAMPSHIRE – NEIL A. HANSEN No. 15227 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

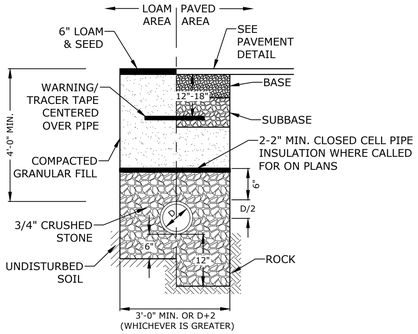
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DETAILS SHEET

SCALE: AS SHOWN

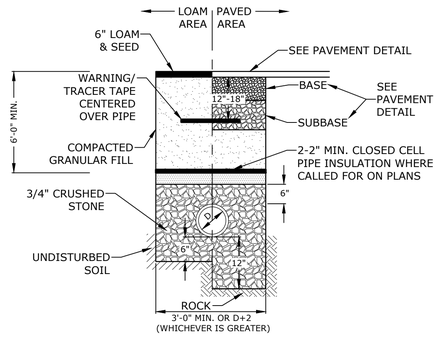
C-604

Last Saved: 9/19/2025
Plotted: Sep 22, 2025 - 11:25am By: BGurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg



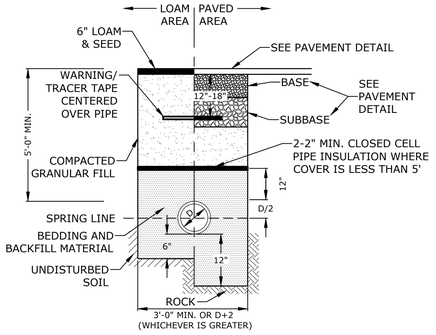
NOTES:
1. CRUSHED STONE BEDDING AND BACKFILL FOR FULL WIDTH OF THE TRENCH FROM 6" BELOW PIPE IN EARTH AND 12" BELOW PIPE IN ROCK UP TO 6" ABOVE TOP OF PIPE.
2. ALL UTILITIES SHALL BE INSTALLED PER THE INDIVIDUAL UTILITY COMPANY STANDARDS. COORDINATE ALL INSTALLATIONS WITH INDIVIDUAL UTILITY COMPANIES AND THE CITY OF PORTSMOUTH.

STORM DRAIN TRENCH
NO SCALE



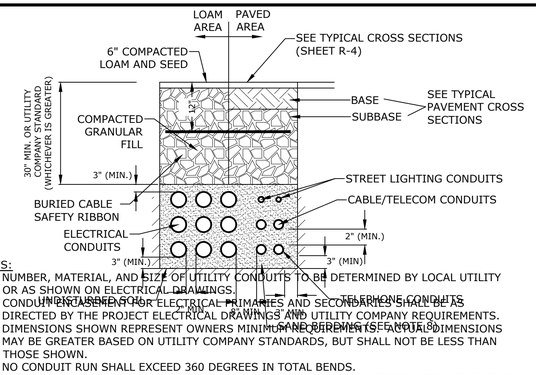
NOTES:
1. CRUSHED STONE BEDDING FOR FULL WIDTH OF THE TRENCH FROM 6" BELOW PIPE IN EARTH AND 12" BELOW PIPE IN ROCK. CRUSHED STONE SHALL ALSO COMPLETELY ENCASE THE PIPE AND COVER THE PIPE TO A GRADE 6" OVER THE TOP OF THE PIPE FOR THE ENTIRE WIDTH OF THE TRENCH.
2. COORDINATE ALL INSTALLATIONS WITH THE CITY OF PORTSMOUTH.

SEWER SERVICE TRENCH
NO SCALE



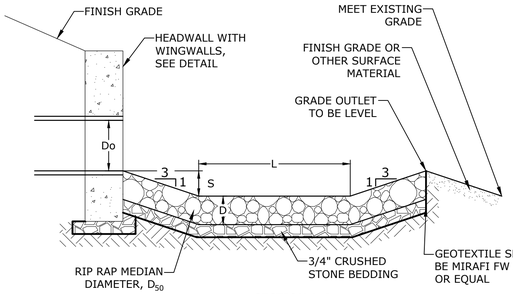
NOTES:
1. SAND BEDDING AND BACKFILL FOR FULL WIDTH OF THE TRENCH FROM 6" BELOW PIPE IN EARTH AND 12" BELOW PIPE IN ROCK UP TO 12" ABOVE TOP OF PIPE.
2. WATER MAIN SHALL BE INSTALLED PER CITY OF PORTSMOUTH STANDARDS. COORDINATE ALL INSTALLATIONS WITH THE CITY OF PORTSMOUTH.

WATER TRENCH
NO SCALE



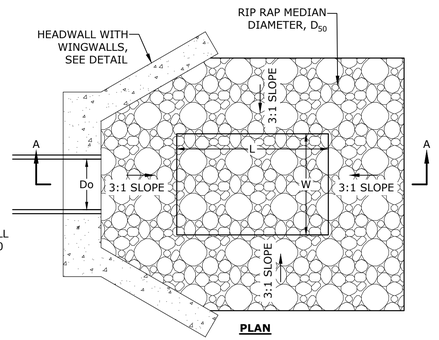
NOTES:
1. NUMBER, MATERIAL, AND SIZE OF UTILITY CONDUITS TO BE DETERMINED BY LOCAL UTILITY OR AS SHOWN ON ELECTRICAL DRAWINGS.
2. CONDUIT ARRANGEMENT FOR ELECTRICAL PRIMARIES AND SECONDARIES SHALL BE AS DIRECTED BY THE PROJECT ELECTRICAL DRAWINGS AND UTILITY COMPANY REQUIREMENTS.
3. DIMENSIONS SHOWN REPRESENT OWNERS MINIMUM REQUIREMENTS. ACTUAL DIMENSIONS MAY BE GREATER BASED ON UTILITY COMPANY STANDARDS, BUT SHALL NOT BE LESS THAN THOSE SHOWN.
3. NO CONDUIT RUN SHALL EXCEED 360 DEGREES IN TOTAL BENDS.
4. A SUITABLE PULLING STRING, CAPABLE OF 200 POUNDS OF PULL, MUST BE INSTALLED IN THE CONDUIT BEFORE UTILITY COMPANY IS NOTIFIED TO INSTALL CABLE. THE STRING SHOULD BE BLOWN INTO THE CONDUIT AFTER THE RUN IS ASSEMBLED TO AVOID BONDING THE STRING TO THE CONDUIT.
5. UTILITY COMPANY MUST BE GIVEN THE OPPORTUNITY TO INSPECT THE CONDUIT PRIOR TO BACKFILL. THE CONTRACTOR IS RESPONSIBLE FOR ALL REPAIRS SHOULD THE UTILITY COMPANY BE UNABLE TO INSTALL ITS CABLE IN A SUITABLE MANNER.
6. ALL CONDUIT INSTALLATIONS MUST CONFORM TO THE CURRENT EDITION OF THE NATIONAL ELECTRIC SAFETY CODE, STATE AND LOCAL CODES AND ORDINANCES, AND, WHERE APPLICABLE, THE NATIONAL ELECTRIC CODE.
7. ALL 90° SWEEPS WILL BE MADE USING RIGID GALVANIZED STEEL. SWEEPS WITH A 36 TO 48 INCH RADIUS.

ELECTRICAL AND COMMUNICATION CONDUIT
NO SCALE



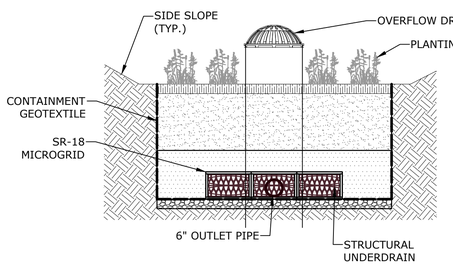
SECTION A-A

OUTLET PLUNGE POOL SIZING						
	Do	S	W	L	D_{50}	D
HW1	30"	2.0'	5.0'	8.0'	6"	1.13'



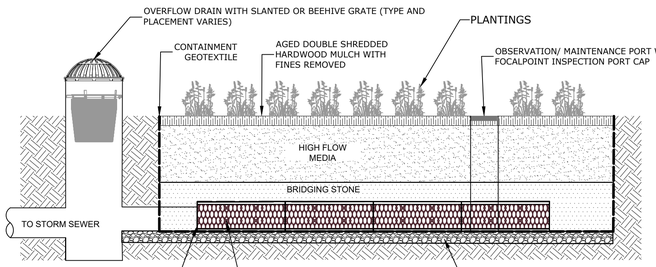
PLAN

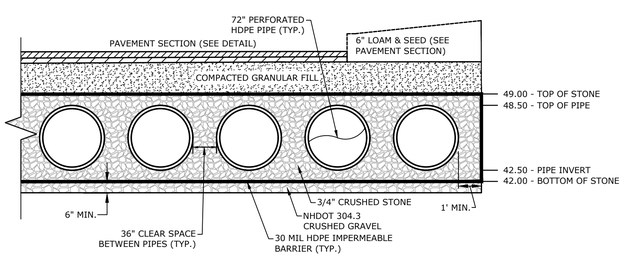
OUTLET PLUNGE POOL
NO SCALE



NOTES:
1. ALL INSTALLATIONS TO BE COORDINATED WITH FOCAL POINT PRIOR TO CONSTRUCTION

FOCAL POINT BIORETENTION CELL
NO SCALE

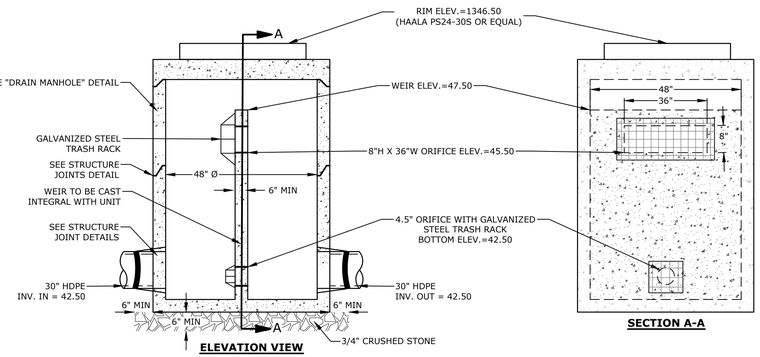




SECTION VIEW

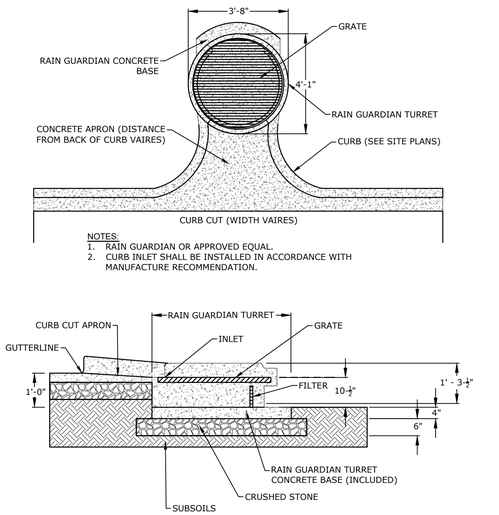
NOTE:
1. THE UNDERGROUND DETENTION BASIN (UDB) SYSTEM SHALL BE HDPE PIPE DESIGNED FOR H-20 LOADING. CONTRACTOR TO SUBMIT PIPE SPECIFICATIONS AND FINAL MANUFACTURES DESIGN TO ENGINEER FOR REVIEW AND APPROVAL.
2. THE CONTRACTOR SHALL SUBMIT PLANS STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW HAMPSHIRE.
3. THE DESIGN ENGINEER SHALL PROVIDE SUFFICIENT INSPECTION TO CERTIFY THAT THE SYSTEM HAS BEEN INSTALLED PER THE PROPOSED DESIGN PLAN.
4. THE DESIGN SHALL REQUIRE INSPECTION PORTS/COVERS SUCH THAT SYSTEM CAN BE CLEANED BY VACUUM TRUCK WITH A MINIMUM OF ONE IN EACH CORNER.
5. APPROXIMATE LENGTH OF 72" PERFORATED HDPE = 1,280 LF
6. APPROXIMATE LENGHT OF 72" PERFORATED HDPE HEADER = 138 LF

UNDERGROUND DETENTION BASIN (UDB)
NO SCALE



NOTES:
1. ALL SECTIONS SHALL BE 4,000 PSI CONCRETE (TYPE II CEMENT).
2. CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQUARE INCHES PER LINEAR FOOT IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER OF THE THIRDE WALL.
3. THE TONGUE OR THE GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQUARE INCHES PER LINEAR FOOT.
4. THE STRUCTURES SHALL BE DESIGNED FOR H20 LOADING.
5. ALL JOINTS ON THE STRUCTURE AND PIPING SHALL BE WATERTIGHT.

UDB OUTLET CONTROL STRUCTURE (POCS1)
NO SCALE



NOTES:
1. RAIN GUARDIAN OR APPROVED EQUAL.
2. CURB INLET SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURE RECOMMENDATION.

RAIN GUARDIAN TURRET
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PATRICK CRIMMINS No. 12378 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

STATE OF NEW HAMPSHIRE – NEIL A. HANSEN No. 15227 LICENSED PROFESSIONAL ENGINEER – 9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

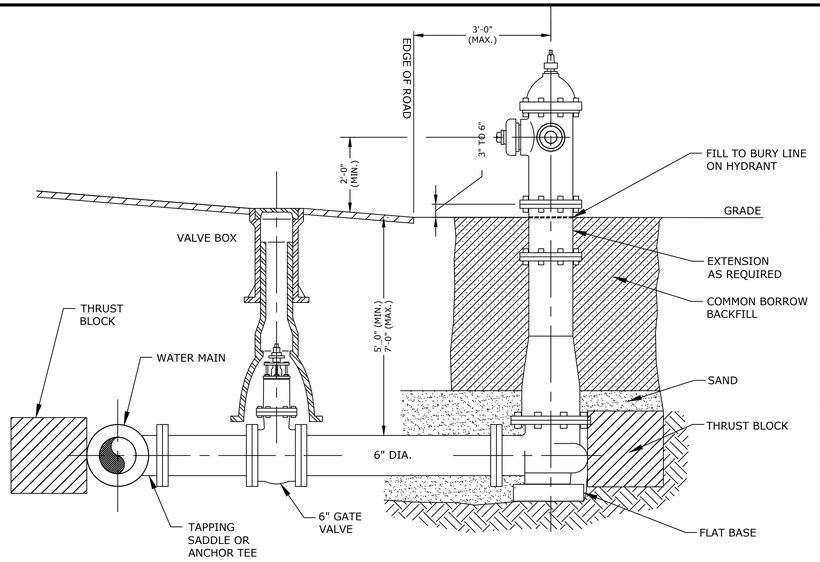
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DETAILS SHEET

SCALE: AS SHOWN

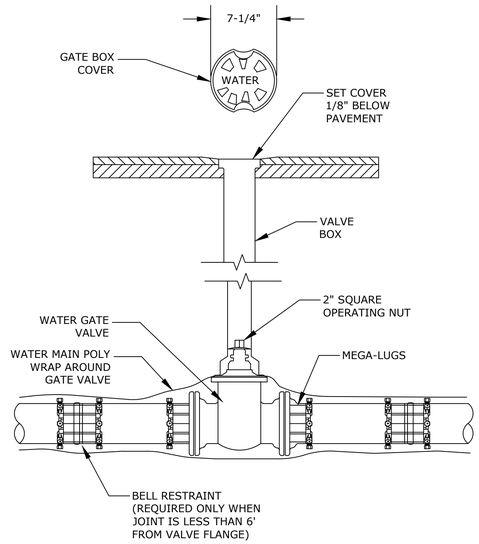
C-605

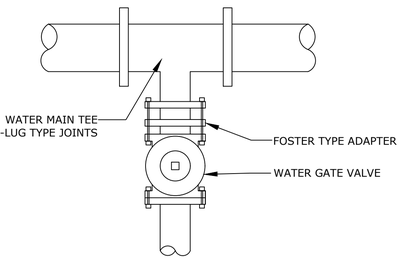
Last Saved: 9/19/2025
Plotted: 9/22/2025 11:25am By: BCurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg



NOTES:
1. HYDRANT TO BE KENNEDY TYPE K-81A (NO EQUAL). COORDINATE WITH CITY OF PORTSMOUTH WATER AND FIRE DEPARTMENT.
2. HYDRANT SHALL OPEN RIGHT (CITY OF PORTSMOUTH) AND OPEN LEFT (PEASE TRADEPORT).
3. HYDRANT SHALL BE PAINTED IN ACCORDANCE WITH CITY OF PORTSMOUTH STANDARDS.
4. AREA AROUND HYDRANT SHALL BE GRADED TO ALLOW SURFACE WATER TO DRAIN AWAY.
5. CONTRACTOR SHALL INSTALL AN INDICATOR ATTACHED TO THE HYDRANT IN ACCORDANCE TO CITY OF PORTSMOUTH STANDARDS.
6. HYDRANT ASSEMBLY SHALL BE POLY WRAPPED FROM MAIN TO HYDRANT AT GROUND LEVEL, 6" (MIN.) OF SAND FOR BEDDING AND COVER, WARNING TAPE 18" ABOVE PIPE.
7. DRAIN HOLES ARE NOT PERMITTED.

FIRE HYDRANT
NO SCALE

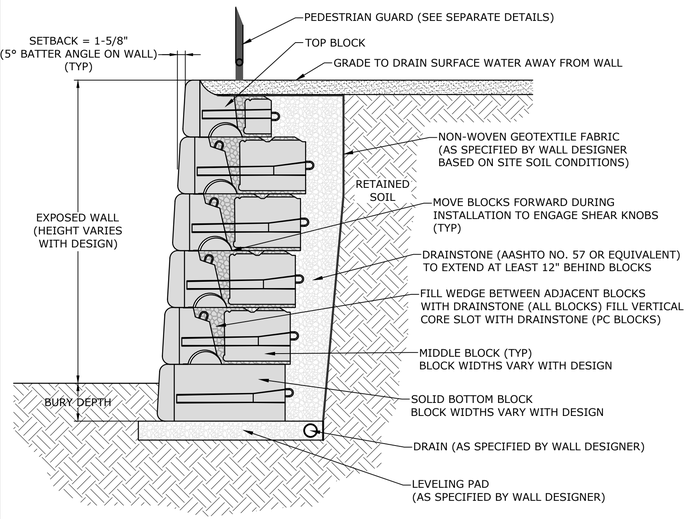




GATE VALVE AT TEE

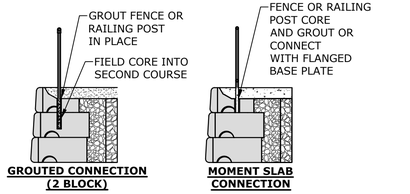
NOTES:
1. WATER GATE VALVES SHALL OPEN RIGHT (CITY OF PORTSMOUTH) AND OPEN LEFT (PEASE TRADEPORT).
2. VALVE BOXES SHALL BE HEAVY PATTERN CAST IRON, TWO PIECE, SLIP TYPE, 5-INCH DIAMETER SHAFT WITH EXTENSIONS PIECES TO ALLOW FOR SUFFICIENT COVER.
3. THE UPPER SECTION OF THE BOX SHALL BE TOP-FLANGE TYPE TO PREVENT SETTLEMENT.
4. THE LOWER SECTION OF THE BOX SHALL BE BELLED-TYPE TO ENCLOSE THE OPERATING NUT OF THE VALVE.
5. THE COVER SHALL BE CAST IRON WITH THE WORD "WATER" PLAINLY CAST.
6. WHEN A PROJECT REQUIRES GATE BOX TOP TO TEMPORARILY BE SET TO BINDER DEPTH, THEN RAISED TO FINAL GRADE, RISER RINGS ARE NOT PERMITTED. CONTRACTOR SHALL RAISE THE ENTIRE TOP SECTION OF THE VALVE BOX TO FINAL GRADE. ASPHALT MATCHING THE THICKNESS OF THE BINDER SHALL BE PLACED AND COMPACTED BENEATH THE GATE BOX TOP FLANGE.
7. WHEN RISER RINGS ARE THE ONLY OPTION, ONLY FLANGED RISERS WILL BE PERMITTED.
8. WHEN FOSTER ADAPTOR CONNECTION IS NOT POSSIBLE, VALVES SHALL BE ANCHORED BACK TO MECHANICAL JOINTS WITH THREADED RODS.

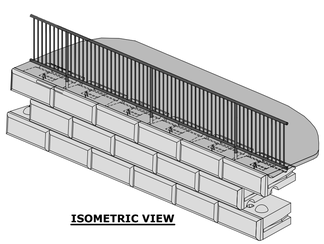
WATER GATE VALVE
NO SCALE



TYPICAL BLOCK RETAINING WALL SECTION
NO SCALE

NOTES
1. RETAINING WALL SHALL BE REDI ROCK (BASIS OF DESIGN), VERSA-LOK, RECON WALL SYSTEMS, OR EQUAL.
2. THE CONTRACTOR SHALL SUBMIT DESIGN AND CALCULATIONS FOR THE RETAINING WALL THAT SHALL BE STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW HAMPSHIRE. CALCULATIONS SHALL INCLUDE A GLOBAL STABILITY ANALYSIS.
3. MINIMUM DESIGN PARAMETERS:
   - GLOBAL STABILITY FACTOR OF SAFETY = 1.3
   - OVERTURNING FACTOR OF SAFETY UNDER STATIC LOADS = 1.5
   - SLIDING FACTOR OF SAFETY UNDER STATIC LOADS = 1.5
   - GEOGRID PULLOUT FACTOR OF SAFETY = 1.5
   - SEISMIC FACTOR OF SAFETY = 1.1
   - EQUIVALENT FLUID PRESSURE = 40 POUNDS PER CUBIC FOOT (PCF) FOR GRAVITY AND CANTILEVERED WALLS ABOVE GROUNDWATER AND WALLS WITH APPROPRIATE DRAINAGE BEHIND THE WALL.
   - HYDROSTATIC WATER PRESSURE ALONG THE HEIGHT OF THE WALL BELOW GROUNDWATER SHOULD BE INCLUDED IF DRAINAGE IS NOT PROVIDED.
   - WHERE THE CALCULATED EARTH PRESSURE BEHIND THE WALL IS LESS THAN 250 POUNDS PER SQUARE FOOT (PSF), IT SHOULD BE INCREASED TO 250 PSF TO ACCOUNT FOR STRESSES CREATED BY COMPACTION WITHIN 5 FEET OF THE WALL.
   - WALLS SHOULD BE DESIGNED FOR APPROPRIATE SLOPING BACKFILL.
   - WALLS SHOULD BE DESIGNED TO RESIST AN EARTHQUAKE FORCE IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE (IBC), CURRENT EDITION.
4. WALL DESIGNS SHALL CONSIDER EFFECTS OF SLOPE, TRAFFIC LOADS, BUILDING LOADS, STRUCTURES, UTILITIES, GUARDRAIL AND/OR FENCING AS REQUIRED.
5. WALL DESIGN ENGINEER SHALL CONSIDER HEIGHT AND SPECIFY SAFETY RAIL WHERE REQUIRED.
6. ALL INSTALLATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION MANUAL AND THE WALL DESIGN ENGINEER'S DESIGN PLANS AND SPECIFICATIONS.
7. THE WALL DESIGN ENGINEER SHALL COMPLETE SUFFICIENT INSPECTIONS DURING CONSTRUCTION TO CERTIFY WORK IS COMPLETED IN ACCORDANCE WITH DESIGN.
8. CONTRACTOR SHALL DIRECT SURFACE RUNOFF AWAY FROM THE WALL DURING CONSTRUCTION.
9. ANY SURFACE DRAINAGE FEATURES, FINISH GRADING, PAVEMENT OR OTHER SURFACE TREATMENT SHALL BE INSTALLED IN THE AREA OF THE WALL IMMEDIATELY AFTER THE WALL IS COMPLETE OR OTHER MEASURES SHALL BE TAKEN TO PROTECT THE WALL FROM RUNOFF.
10. CONTRACTOR SHALL SUPPLY PRODUCT INFORMATION FOR BLOCK TYPE / TEXTURE AND COLOR CHOICE TO THE OWNER FOR APPROVAL PRIOR TO ORDERING MATERIALS.
11. RETAINING WALL DESIGN PLANS AND CALCULATIONS SHALL BE FROM THE WALL MANUFACTURER AND SHALL INCLUDE A GLOBAL STABILITY ANALYSIS.
12. FINAL STRUCTURAL DESIGN TO BE SUBMITTED TO THE ENGINEER WITH ALL REQUIRED CALCULATIONS AND PLANS.
13. STRUCTURAL DESIGN TO BE COMPLETED AND STAMPED BY A NEW HAMPSHIRE LICENSED STRUCTURAL ENGINEER. DESIGN ENGINEER SHALL INSPECT WALL DURING CONSTRUCTION AND CERTIFY THAT IT HAS BEEN INSTALLED IN ACCORDANCE WITH APPROVED PLANS AND SPECIFICATIONS SUBMITTED AS PART OF THE BUILDING PERMIT.
14. AN AS-BUILT PLAN SHOWING WALL LOCATION AND DIMENSIONS SHALL BE SUBMITTED TO THE OWNER AND ENGINEER UPON COMPLETION.
15. ANY UNSUITABLE SOIL SUCH AS FROZEN OR ORGANIC SOILS SHOULD BE REMOVED FROM BEHIND THE PROPOSED RETAINING WALLS AND REPLACED WITH FREE DRAINING BACKFILL SUCH AS GRAVEL BORROW.
16. EXISTING FILL SHOULD NOT BE USED WITHIN FIVE (5) FEET OF CANTILEVERED OR GRAVITY WALLS.
17. THESE DETAILS ARE FOR REFERENCE ONLY. DETERMINATION OF THE SUITABILITY AND/OR MANNER OF USE OF ANY DETAILS CONTAINED IN THIS DOCUMENT IS THE SOLE RESPONSIBILITY OF THE WALL DESIGN ENGINEER OF RECORD. FINAL PROJECT DESIGNS, INCLUDING ALL CONSTRUCTION DETAILS, SHALL BE PREPARED BY A NEW HAMPSHIRE LICENSED PROFESSIONAL ENGINEER USING THE ACTUAL CONDITIONS OF THE PROPOSED SITE.

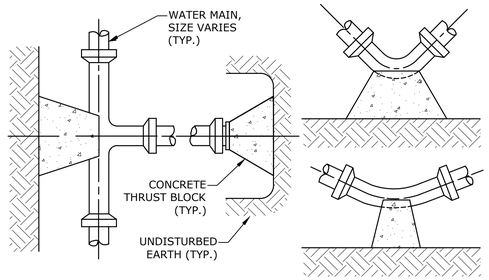




ISOMETRIC VIEW

NOTE
1. THESE GENERIC PEDESTRIAN GUARD AND FENCE DETAILS SHOW POTENTIAL OPTIONS FOR INSTALLATION ON THE TOP OF RETAINING WALL. IT IS THE WALL DESIGN ENGINEER'S RESPONSIBILITY TO FULLY DESIGN AND DETAIL THE CONNECTION OF THE GUARD POSTS TO THE RETAINING WALL BLOCKS AND ASSURE ACCEPTABLE RESISTANCE TO THE APPLIED FORCES.

TYPICAL FENCE OR PEDESTRIAN GUARD CONNECTION OPTIONS
NO SCALE



TEST PRESSURE = 200psi	SQUARE FEET OF CONCRETE THRUST BLOCKING BEARING ON UNDISTURBED MATERIAL					
	REACTION TYPE	PIPE SIZE				
		4"	6"	8"	10"	12"
	A 90°	0.89	2.19	3.82	11.14	17.24
	B 180°	0.65	1.55	2.78	8.38	12.00
	C 45°	0.48	1.19	2.12	6.02	9.32
	D 22-1/2°	0.25	0.60	1.06	3.08	4.74
	E 11-1/4°	0.13	0.30	0.54	1.54	2.38

NOTES:
1. POUR THRUST BLOCKS AGAINST UNDISTURBED MATERIAL, WHERE TRENCH WALL HAS BEEN DISTURBED, EXCAVATE LOOSE MATERIAL AND EXTEND THRUST BLOCK TO UNDISTURBED MATERIAL. NO JOINTS SHALL BE COVERED WITH CONCRETE.
2. ON BENDS AND TEES, EXTEND THRUST BLOCKS FULL LENGTH OF FITTING.
3. PLACE BOARD IN FRONT OF ALL PLUGS BEFORE POURING THRUST BLOCKS.
4. WHERE M.J. PIPE IS USED, M.J. PLUG WITH RETAINER GLAND MAY BE SUBSTITUTED FOR END BLOCKINGS.
5. INSTALLATION AND STANDARD DIMENSIONAL REQUIREMENTS SHALL BE WITH CITY OF PORTSMOUTH WATER DEPARTMENT STANDARDS.

THRUST BLOCKING DETAIL
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PATRICK CRIMMINS No. 12378 LICENSED PROFESSIONAL ENGINEER –
9/22/2025

STATE OF NEW HAMPSHIRE – NEIL A. HANSEN No. 15227 LICENSED PROFESSIONAL ENGINEER –
9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

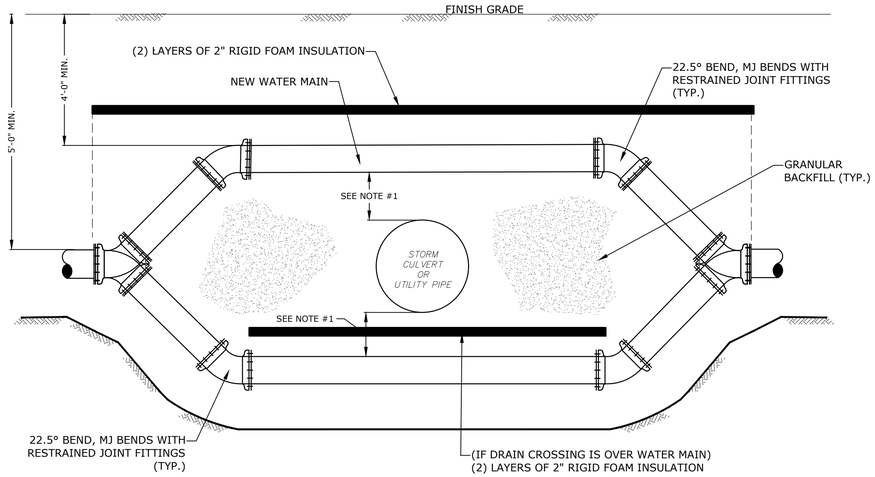
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DETAILS SHEET

SCALE: AS SHOWN

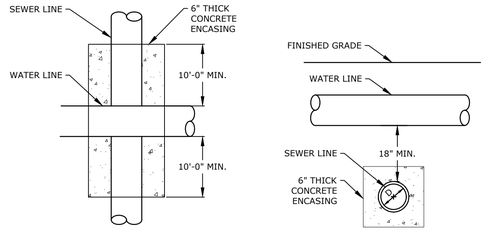
C-606

Last Saved: 9/19/2025
Plotted: 9/22/2025 11:25am By: BGurcio
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg



NOTES:
1. INSTALL WATER MAIN 12" VERTICALLY FROM DRAINAGE OR OTHER UTILITIES, AND 18" VERTICALLY FROM SEWER. WATER MUST BE INSTALLED ABOVE SEWER.
2. SUPPORT THE UTILITY PIPE WHILE INSTALLING WATER MAIN.
2. ALL BENDS SHALL BE 22.5° M.J. BENDS WITH RESTRAINED JOINT FITTINGS.
3. PIPE SHALL BE FULLY RESTRAINED MINIMUM 18" EACH SIDE OF ELBOWS.
4. REFER TO "WATER TRENCH" DETAIL FOR ADDITIONAL WATER MAIN INSTALLATION REQUIREMENTS.

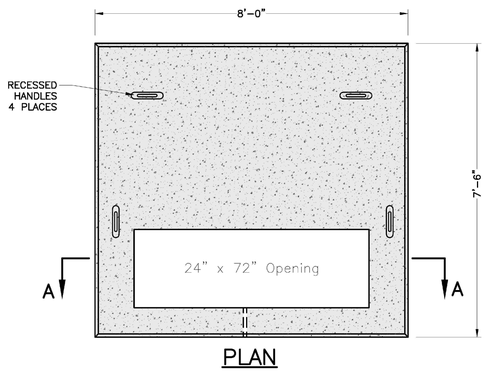
WATER MAIN VERTICAL UTILITY CROSSING
NO SCALE



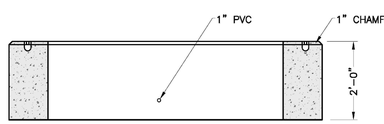
PLAN VIEW **PROFILE VIEW**

NOTES:
1. A 10 FOOT MINIMUM EDGE TO EDGE HORIZONTAL SEPARATION SHALL BE PROVIDED FROM ANY EXISTING OR PROPOSED WATER LINE.
2. AN 18" MINIMUM EDGE TO EDGE VERTICAL SEPARATION SHALL BE PROVIDED, WITH WATER ABOVE SEWER, AT ALL CROSSINGS.
3. SEWER PIPE JOINTS SHALL BE LOCATED AT LEAST 6 FEET HORIZONTALLY FROM ANY EXISTING OR PROPOSED WATER MAIN.
4. WHERE AN 18" VERTICAL SEPARATION CANNOT BE PROVIDED, SEWER PIPE SHALL BE CONSTRUCTED USING A SDR 26 PVC PIPE OR ENCASED CONCRETE FOR A MINIMUM DISTANCE OF 10 FEET ON BOTH SIDES OF THE LINE BEING CROSSED, AS SHOWN ABOVE.
5. CROSSINGS SHALL CONFORM TO THE CITY OF PORTSMOUTH STANDARDS AND SPECIFICATIONS.

WATER & SEWER CROSSING
NO SCALE



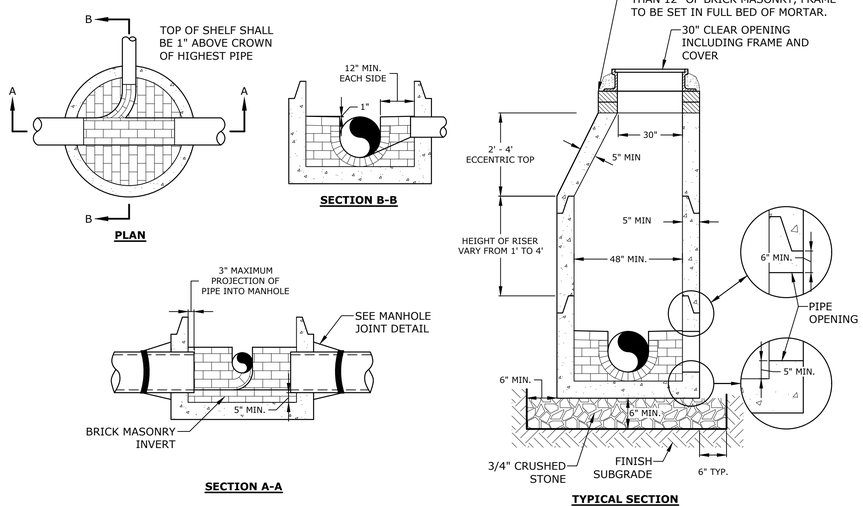
PLAN



SECTION A–A

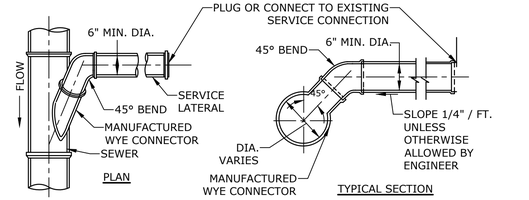
NOTES:
1. DIMENSIONS SHOWN REPRESENT TYPICAL REQUIREMENTS. MANHOLE LOCATIONS AND REQUIREMENTS SHALL BE COORDINATED WITH EVERSOURCE PRIOR TO CONSTRUCTION
2. CONCRETE MINIMUM STRENGTH - 4,000 PSI @ 28 DAYS
3. STEEL REINFORCEMENT - ASTM A615, GRADE 60
4. PAD MEETS OR EXCEEDS EVERSOURCE SPECIFICATIONS

3-PHASE TRANSFORMER PAD
NO SCALE

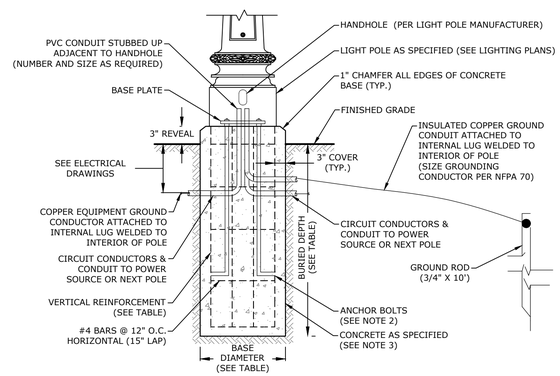


NOTES:
1. ALL SEWER MANHOLES SHALL BE CONSTRUCTED TO CITY AND STATE STANDARDS.
2. INVERT AND SHELF TO BE PLACED AFTER EACH LEAKAGE TEST.
3. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT.
4. INVERT BRICKS SHALL BE LAID ON EDGE.
5. TWO (2) COATS OF BITUMINOUS WATERPROOF COATING SHALL BE APPLIED TO ENTIRE EXTERIOR OF MANHOLE.
6. FRAMES AND COVERS: MANHOLE FRAMES AND COVERS WITHIN CITY RIGHT OF WAY SHALL BE CITY STANDARD HINGE COVERS MANUFACTURED BY EJ. FRAMES AND COVERS WILL BE PURCHASED FROM THE CITY OF PORTSMOUTH DEPARTMENT OF PUBLIC WORKS. ALL OTHER MANHOLE FRAMES AND COVERS SHALL BE OF HEAVY DUTY DESIGN AND PROVIDE A 30-INCH CLEAR OPENING. A 3-INCH (MINIMUM HEIGHT) WORD "SEWER" SHALL BE PLAINLY CAST INTO THE CENTER OF EACH COVER.
7. HORIZONTAL JOINTS SHALL BE SEALED FOR WATER TIGHTNESS USING A DOUBLE ROW OF ELASTOMERIC OR MASTIC-LIKE SEALANT.
8. BARREL AND CONE SECTIONS SHALL BE PRECAST REINFORCED CONCRETE DESIGNED FOR H20 LOADING, AND CONFORMING TO ASTM C478-06.

SEWER MANHOLE
NO SCALE



STANDARD SERVICE LATERAL CONNECTION
NO SCALE



POLE HEIGHT	DEPTH (BURIED)	BASE DIAMETER	VERTICAL REINFORCEMENT
<16'	72" (MIN.)	18"	6 - #6
>16'	72" (MIN.)	24"	6 - #8

NOTES:
1. ALL LIGHT POLES, LUMINARIES AND WIRE TO BE FURNISHED BY THE CONTRACTOR UNLESS OTHERWISE DIRECTED.
2. CONTRACTOR SHALL VERIFY BOLT TEMPLATE AND ANCHOR BOLT SIZE WITH POLE MANUFACTURER PRIOR TO CONSTRUCTION.
3. CONCRETE SHALL BE 4,000 PSI CLASS A, PRE-CAST CONCRETE.
4. REINFORCEMENT SHALL BE ASTM A615, GRADE 60.
5. FOR LIGHT POLES GREATER THAN 20' IN HEIGHT, THE LIGHT POLE BASE SHALL BE DESIGNED AND STAMPED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF NEW HAMPSHIRE.

TYPICAL LIGHT POLE BASE (ON-SITE)
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PATRICK CRIMMINS No. 12378 LICENSED PROFESSIONAL ENGINEER –
9/22/2025

STATE OF NEW HAMPSHIRE – NEIL A. HANSEN No. 15227 LICENSED PROFESSIONAL ENGINEER –
9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

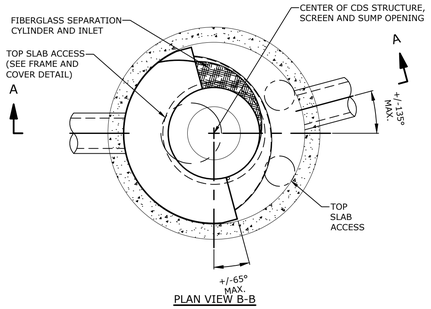
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DETAILS SHEET

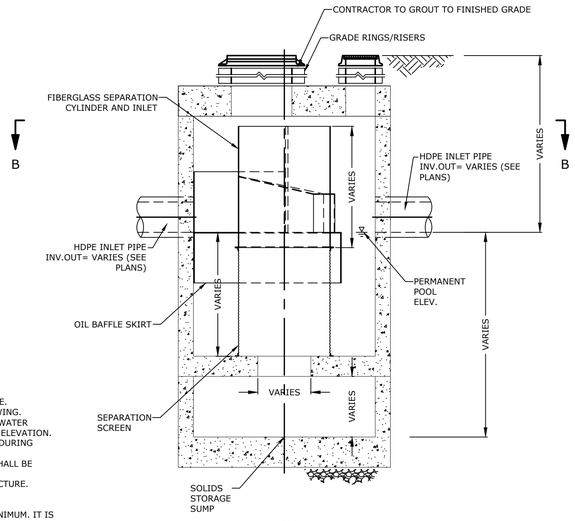
SCALE: AS SHOWN

C-607

Last Saved: 9/19/2025
Printed: Sep 22, 2025 - 11:25am By: BCurcio
Tighe & Bond J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg



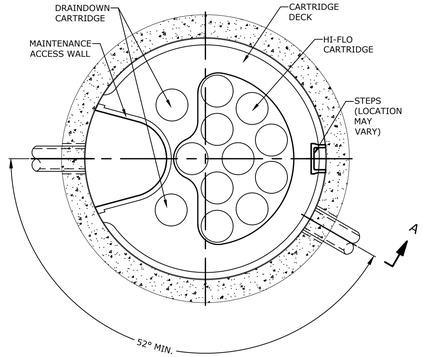
PLAN VIEW B-B



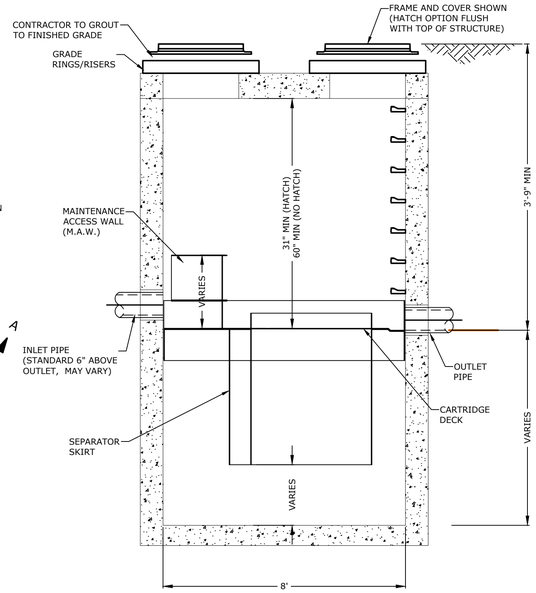
ELEVATION A-A

GENERAL NOTES:
1. MANUFACTURER TO PROVIDE FINAL DIMENSIONS BASED ON APPROVED FLOWS AND ALL MATERIALS UNLESS NOTED OTHERWISE.
2. WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
3. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
4. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
5. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
6. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE MANHOLE STRUCTURE.
7. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
8. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN ON GRADING PLAN.
9. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

TYPICAL FLOW-THROUGH PRE-TREATMENT UNIT
NO SCALE



PLAN VIEW



SECTION A-A

GENERAL NOTES:
1. MANUFACTURER TO PROVIDE FINAL DIMENSIONS BASED ON APPROVED FLOWS AND ALL MATERIALS UNLESS NOTED OTHERWISE.
2. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
3. STRUCTURE SHALL MEET AASHTO HS-20 LOADING REQUIREMENTS. CASTINGS SHALL MEET AASHTO M306 LOAD RATING.
4. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.
5. CONTRACTOR SHALL PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.

B. CONTRACTOR SHALL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT).

C. CONTRACTOR SHALL TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

D. CARTRIDGE INSTALLATION, BY MANUFACTURER, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE TREATMENT UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT MANUFACTURER TO COORDINATE CARTRIDGE INSTALLATION.

TYPICAL FLOW-THROUGH TREATMENT UNIT
NO SCALE

Last Saved: 9/19/2025
Plotted On: 9/22/2025 11:25am By: BCurcio
Plotted Device: DWG To PDF.pc3
Tighe & Bond: J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-DTLS.dwg

Tighe&Bond
Engineers | Environmental Specialists

STATE OF NEW HAMPSHIRE – PROFESSIONAL ENGINEER – PATRICK CRIMMINS No. 12378 LICENSED
9/22/2025

STATE OF NEW HAMPSHIRE – PROFESSIONAL ENGINEER – NEIL A. HANSEN No. 15227 LICENSED
9/22/2025

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

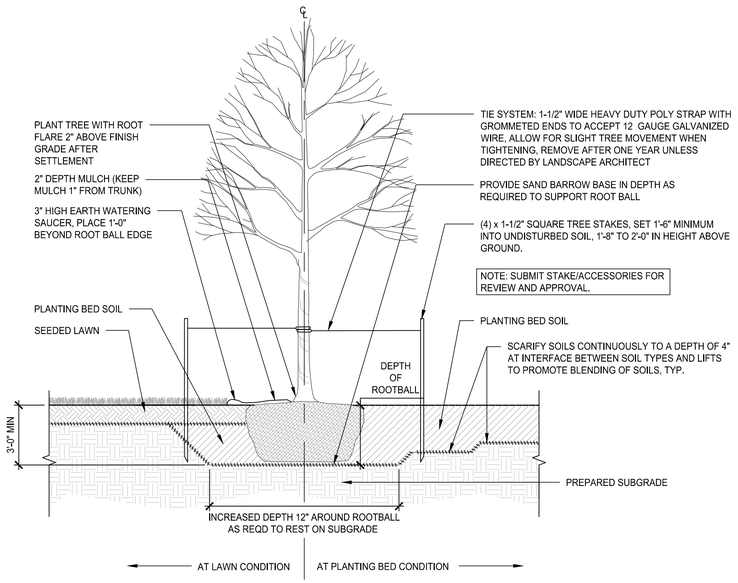
MARK	DATE	DESCRIPTION

PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-DTLS.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

DETAILS SHEET

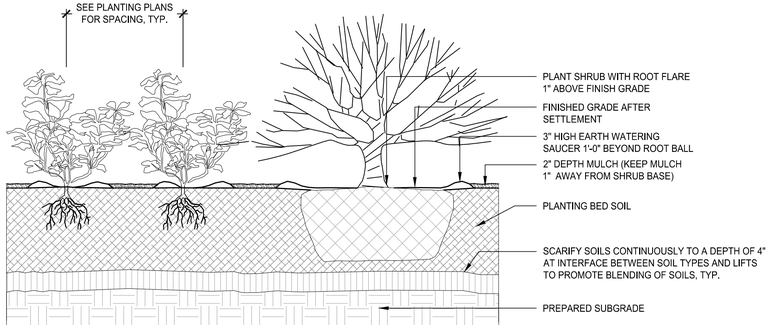
SCALE: AS SHOWN

C-608



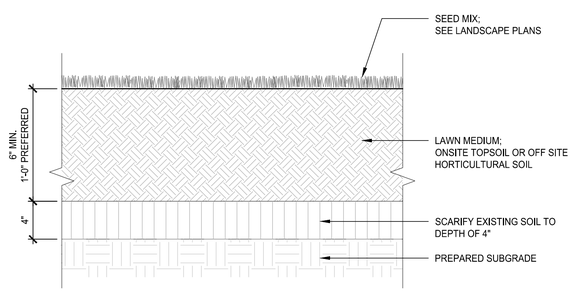
TREE PLANTING

DETAIL 1 / - — 1/4" = 1'-0"



PLANT BED

DETAIL 2 / - — 3/4" = 1'-0"



SEEDED LAWN

DETAIL 3 / - — 1" = 1'-0"

Last Saved: 9/18/2025
Plotted On: Sep 22, 2025 - 11:38am By: JGenga
Tighe & Bond (A\K0076 The Gate Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_L-DTLS.dwg

Tighe&Bond
Engineers | Environmental Specialists

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

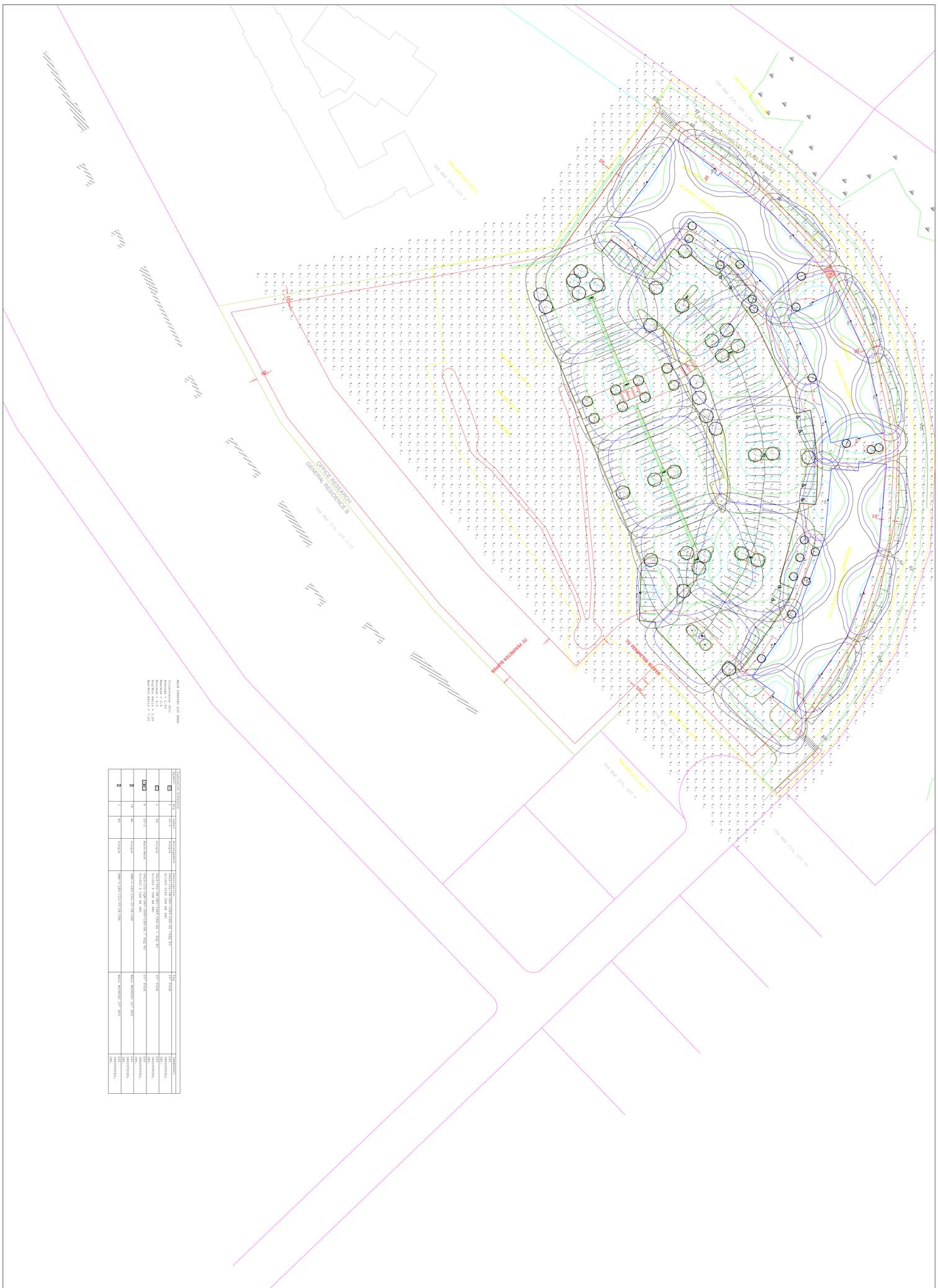
MARK	DATE	DESCRIPTION

PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_L-DTLS.DWG
DRAWN BY:	JDG
CHECKED:	RU/NAH
APPROVED:	PMC

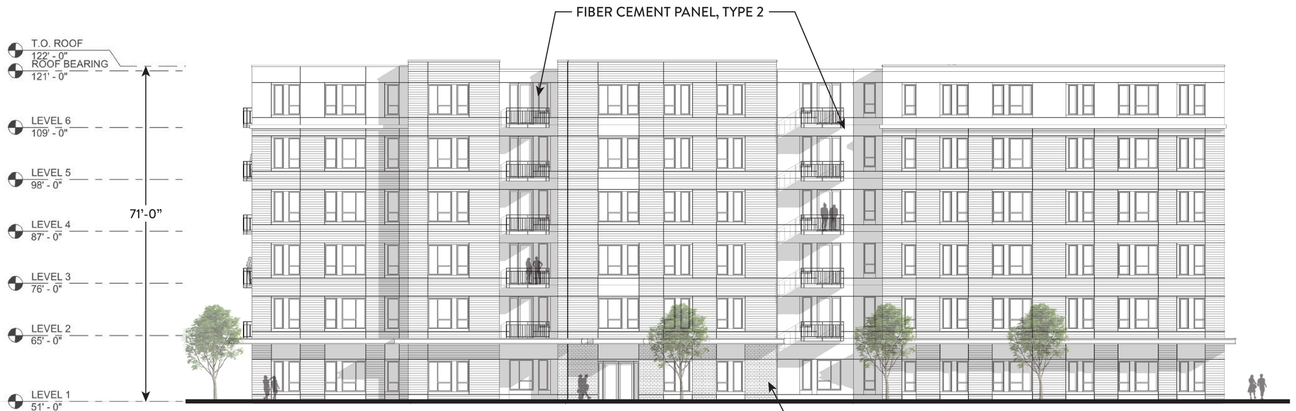
LANDSCAPE DETAILS

SCALE: AS SHOWN

L-501


OFFICE RESEARCH
GENERAL RESIDENCE B
75' REMOTE EXPOSE
75' REMOTE EXPOSE
10'
10'
10'

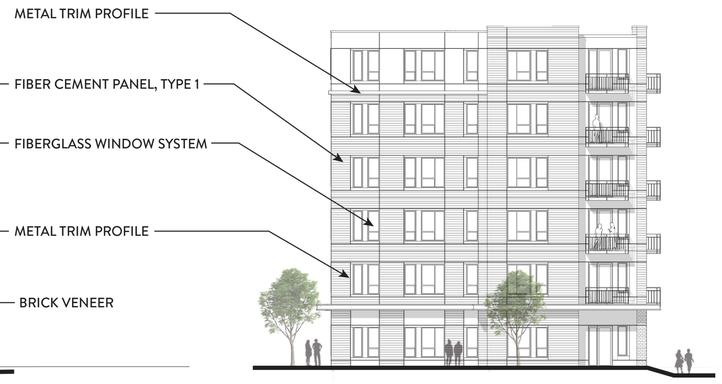
BUILDING A - Overall Elevations



BUILDING A - SOUTH ELEVATION

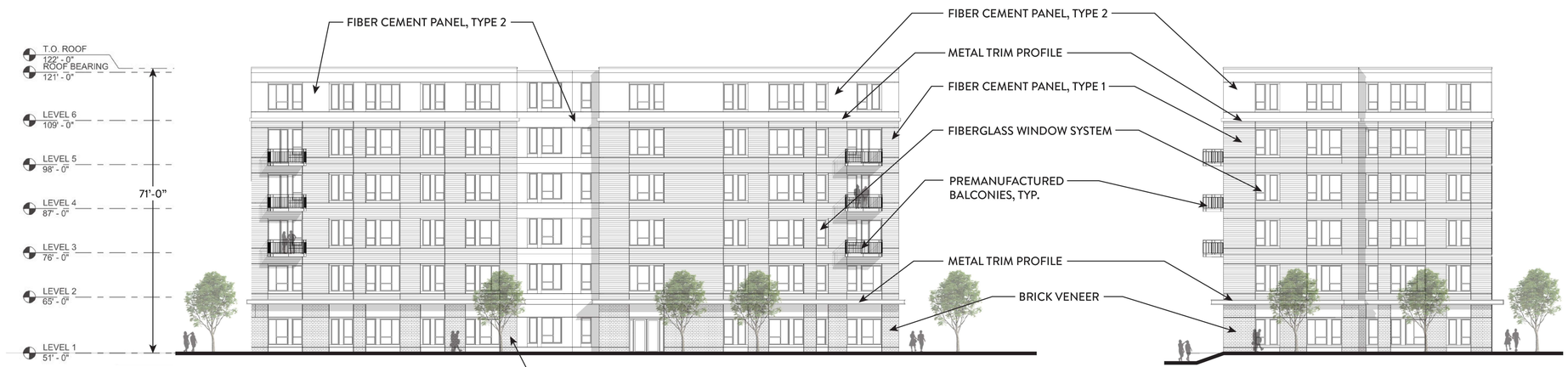
BUILDING A - WEST ELEVATION

BUILDING A - NORTH ELEVATION



BUILDING A - EAST ELEVATION

BUILDING B - Overall Elevations



BUILDING B - SOUTH ELEVATION

BUILDING B - WEST ELEVATION

BUILDING B - NORTH ELEVATION

BUILDING B - EAST ELEVATION

BUILDING C - Overall Elevations

BUILDING C - SOUTH ELEVATION

BUILDING C - WEST ELEVATION

BUILDING C - NORTH ELEVATION

BUILDING C - EAST ELEVATION

OVERALL FLOOR PLANS

Ground Floor Plan

OVERALL FLOOR PLANS

Typical Floor Plan - Levels 2-6

NOTES:
1. IMAGE UNDERLAY DERIVED FROM GOOGLE EARTH IMAGERY DATED APRIL 1992.

0 50' 100'
GRAPHIC SCALE

N

PROPOSED MULTI-FAMILY DEVELOPMENT
PORTSMOUTH, NH

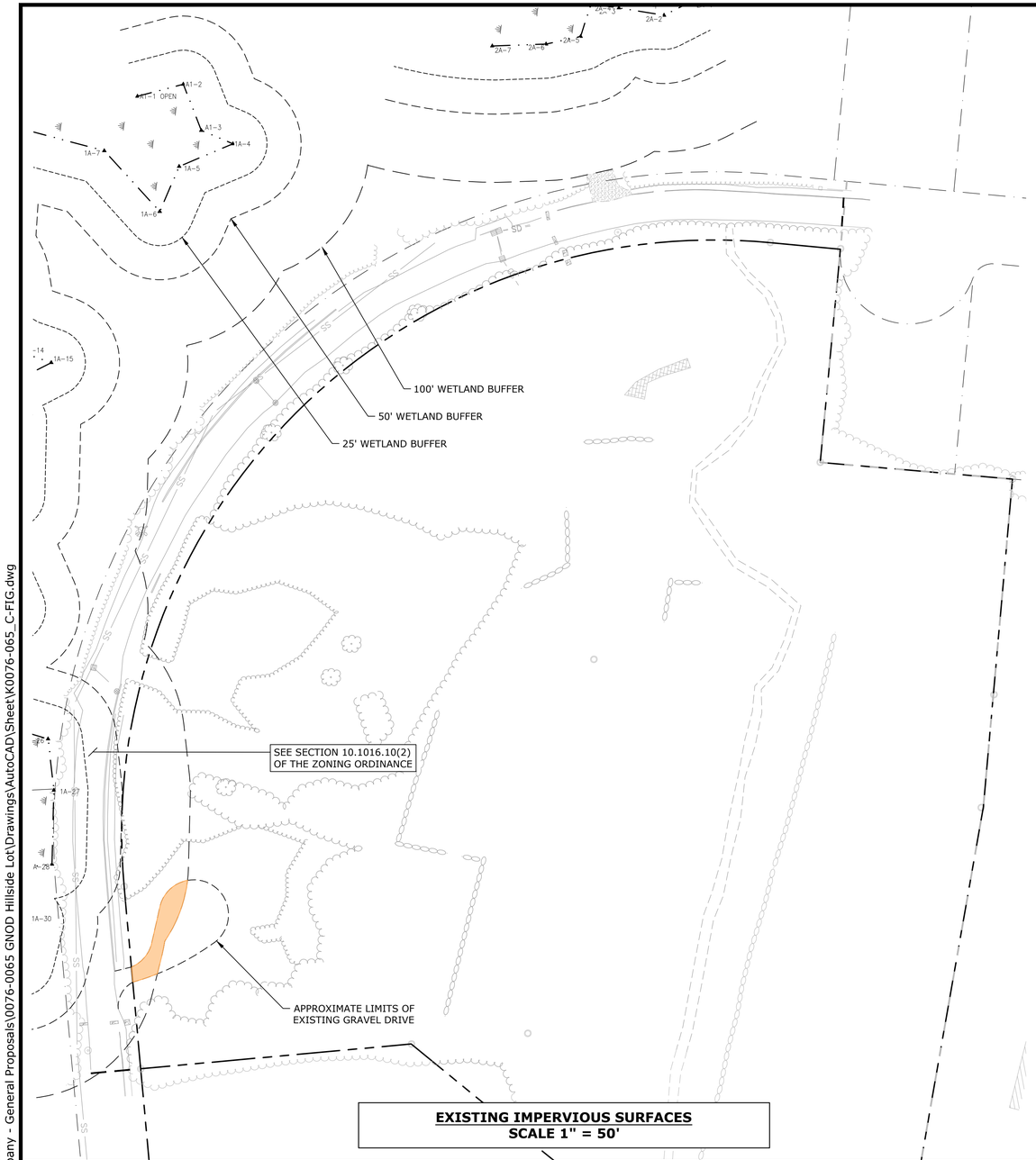
HISTORICAL SITE OVERLAY EXHIBIT

DATE: 07/30/25
SCALE: AS SHOWN
FIGURE: 1 OF 1

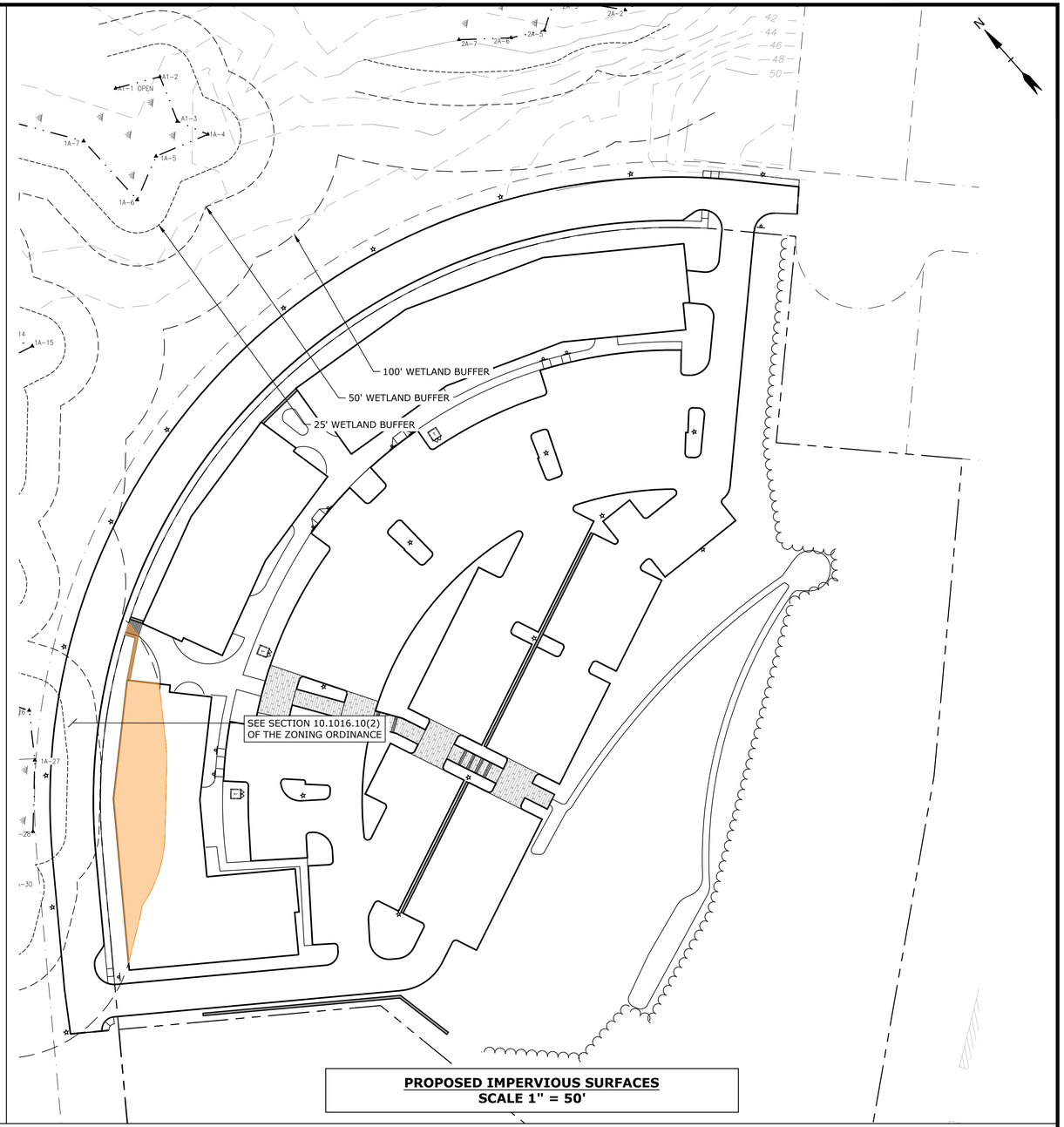
Tighe&Bond
Engineers | Environmental Specialists

1992 SITE IMAGERY

Plotted On:Jul 15, 2025-4:50pm By: BCurcio
Tighe & Bond:J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-FIG.dwg



EXISTING IMPERVIOUS SURFACES
SCALE 1" = 50'



PROPOSED IMPERVIOUS SURFACES
SCALE 1" = 50'

10.1016 Permitted Uses

10.1016.10 The following **use**s, activities and **alteration**s are permitted in **wetland**s and **wetland buffer**s:

(1) Any **use** that does not involve the erection or construction of any **structure** or **impervious surface**, will not alter the natural surface configuration by the addition of fill or by dredging, will not result in site **alteration**s, and is otherwise permitted by the Zoning Ordinance. Examples of such **use**s include forestry and tree farming, wildlife refuges, parks and recreational **use**s, conservation and nature trails, and **open space**s as permitted or required by the Zoning Ordinance or Subdivision Regulations.

(2) Improvements to existing public rights-of-way and **sidewalk**s.

IMPERVIOUS SURFACES WITHIN WETLAND BUFFERS		
LOCAL WETLAND BUFFER SETBACK	WITHIN DEVELOPMENT PARCEL	
	EXISTING (SF)	PROPOSED (SF)
0 - 25 FT	0	0
25 - 50 FT	0	0
50 - 100 FT	965	5,940
TOTAL IMPERVIOUS SURFACE	965	5,940
NET IMPERVIOUS SURFACE	+4,975	

0 50' 100'
GRAPHIC SCALE

PROPOSED MULTI-FAMILY DEVELOPMENT
PORTSMOUTH, NH

WETLAND BUFFER
IMPERVIOUS SURFACE EXHIBIT

DATE: 9/22/2025
SCALE: AS SHOWN
FIGURE: 1 OF 1

Tighe&Bond

Plotted On:Sep 18, 2025-2:42pm By: BCurcio
Tighe & Bond:J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-FIG.dwg

"PARK" AREA = 36,500 SF

6' WOODEN STOCKADE FENCE

FIGURE 10.5A45.10 COMMUNITY SPACES

An area of natural, semi-natural, or planted space set aside for human enjoyment and recreation or for the protection of wildlife or natural habitats. A **park** may consist of grassy areas, trees and other natural or planted landscape features, and may also contain walking **path**s and trails, monuments, fountains, playground equipment, benches, picnic tables and similar amenities.

Permitted Districts: All Districts

COMMUNITY SPACE:	REQUIRED	PROPOSED
	10%	10%
	36,458 SF	36,500 SF

0 30' 60'
GRAPHIC SCALE

N

PROPOSED MULTI-FAMILY DEVELOPMENT
PORTSMOUTH, NH

COMMUNITY SPACE EXHIBIT

DATE: 9/22/2025
SCALE: AS SHOWN
FIGURE: 1 OF 1

Tighe&Bond

Plotted On:Sep 19, 2025-9:57am By: MCurley
Tighe & Bond:J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-FIG.dwg

PROCON
CONNECT • CREATE • CONSTRUCT

T 603.623.8811
F 603.623.7250
P.O. Box 4430
Manchester, NH 03108
info@proconinc.com

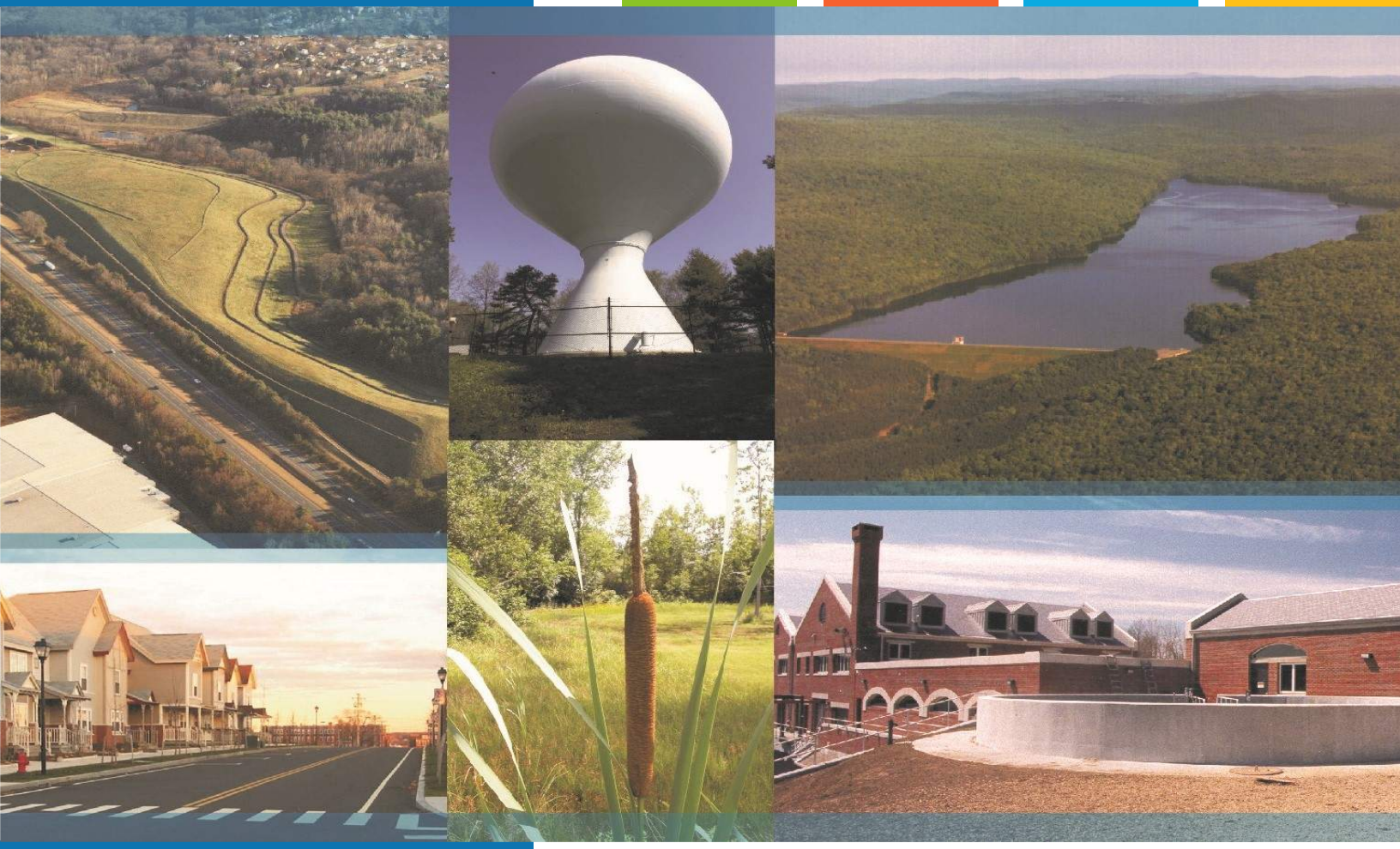
September 18, 2025

Portsmouth Planning Board

GREEN BUILDING STATEMENT
Portsmouth Boulevard Apartments – 150, 200, 250

The Core and Shell of these multi-family buildings at 150, 200, and 250 Portsmouth Boulevard are designed to meet or exceed current Energy Code requirements. A U.S. Department of Energy "COMcheck" will be submitted with the building permit application. Currently the State of New Hampshire has adopted the 2018 International Energy Code with amendments. These buildings will be built to current best practices and will exceed the 2018 IECC requirements when appropriate.

- Site: This site is a redevelopment on a site previously developed by the Air Force for residential uses. Parking is accommodated both on the surface and underneath one of the structures, reducing the total impervious footprint. This site provides good access to local businesses – by foot or bicycle. Landscaped open community space is provided on the perimeter. Bicycle storage (both outdoor and indoor) is provided for the residents. Parking lots are equipped with conduits for future installation of EV charging stations.
- Exterior Wall System: they will consist of continuous insulation outside the framing system at the podium levels and high R-value batt insulation at wood framed sections above. These insulation levels along with a continuous air barrier will provide high thermal performance. The exterior skin of is a combination of masonry, cementitious panel and lap siding. Some metal wall panel systems are provided as an accent. Interior vapor barriers are to be provided to allow for moisture management. These products are durable and have sustainable characteristics.
- Window Systems: windows have a thermally broken composite framing system with insulated, high-performance glazing to provide enhanced thermal performance and solar control. Large windows provide an abundance of daylight access for the residents.
- Roofing System: Includes a high reflectance light colored single-ply membrane system over continuous rigid insulation that exceeds the base energy code requirements. The roof structures are designed to handle the loads of adding solar panels in the future and the electrical systems are designed for adding solar components at a later date.
- HVAC System: all proposed systems are to be electric, reducing local fossil fuel emissions. High-efficiency, heat pump units with fresh air to residential units and common spaces. Bathroom exhaust is individually ducted to the exterior to avoid moisture collection points. Dryers in units are heat-pump types with condensate drains. Garage ventilation will feature variable speed fans with CO2 detectors to minimize energy usage when no vehicles are running.
- Plumbing System: fixtures are low flow. Individual water heaters are provided for each unit, allowing individual unit control.
- Lighting System: LED cutoff fixtures at exterior locations for energy efficiency and to minimize light pollution. Interior lighting is LED provided throughout – using less that 1 watt / sf. Perimeter daylight sensors to be used in common amenity spaces. Occupancy sensors to be utilized as required by code.
- Landscaping: local species that are drought tolerant and non-invasive species to be incorporated into the plantings list. Water Saving irrigation system provided.

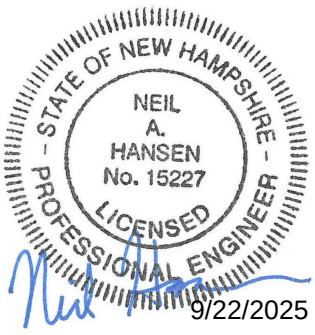


Proposed Multi-Family Development
150 Portsmouth Boulevard
Portsmouth, NH

Drainage Analysis

Brora, LLC

September 22, 2025



9/22/2025

Tighe&Bond

100% Recyclable

Table of Contents

Section 1 Project Description

1.1 On-Site Soil Description 1-1
1.2 Pre- and Post-Development Comparison 1-2
1.3 Calculation Methods.....1-2

Section 2 Pre-Development Conditions

2.1 Pre-Development Watershed Plan 2-1
2.2 Pre-Development Calculations.....2-1

Section 3 Post-Development Conditions

3.1 Post-Development Watershed Plan 3-2
3.2 Post-Development Calculations 3-2

Section 4 Peak Rate Comparison

Section 5 Mitigation Description

5.1 Pre-Treatment Methods for Protecting Water Quality 5-2
5.2 Treatment Methods for Protecting Water Quality. 5-2

Section 6 BMP Worksheets

Section 7 Groundwater Recharge Volume Calculations

Appendices

A Web Soil Survey Report
B Site Specific Soil Survey Report & Test Pits
C Extreme Precipitation Tables
D Coastal Precipitation Increase

Section 1
Project Description

The proposed project is located on a parcel of land along Portsmouth Boulevard that is identified as Map 213 Lot 12 on the City of Portsmouth Tax Maps. The property is bound to the north by Portsmouth Boulevard, to the west by the Hilton Homewood Suites, to the south by residences on Osprey Drive and to the east by residences on Dunlin Way. The site is currently undeveloped. This property is an 8.4-acre parcel of land located in the Office Research District and the Gateway Neighborhood Overly District (GNOD). The northern portion of the parcel along Portsmouth Boulevard gently slopes up from north to south and then approximately one-third of the way into the parcel the topography changes to a steep slope that plateaus in the south corner of the site after grade change of approximately 50- feet in elevation.

As currently designed, the project will include three (3), six (6) story multifamily residential buildings consisting of approximately 274 dwelling units. The three (3) proposed buildings will be located along the frontage of Portsmouth Boulevard with associated parking located at the rear of buildings. The buildings will be connected by attractively landscaped and hardscaped outdoor amenity areas. The south portion of the site, where there is a significant change in grade, will remain undeveloped to provide a buffer between the proposed development and the existing residences along Osprey Drive. This south portion of the site is anticipated to be improved with walking paths and landscape features for outdoor recreation. The section of Portsmouth Boulevard along the frontage of the subject property is proposed to be reconstructed with a new sidewalk and parking spaces to promote connection between the development and the surrounding neighborhood.

1.1 On-Site Soil Description

Based on the site-specific soil survey completed by Gove Environmental Services, Inc (attached as Appendix B), the site is largely composed of Chatfield and Udorthents soils with Hydrologic Soil Group (HSG) ratings of HSG B and HSG C, respectively. The ground cover within the area of study consists mostly of wooded and grassed areas, with a section of dilapidated paved roadway along the northern extents. There is a wetland system on the other side of the road (under separate property ownership) which is presumed to ultimately flow to the Piscataqua River. The site contains a wooded high point in the southern half which generally slopes both north and south down steep wooded slopes.

1.2 Pre- and Post-Development Comparison

The pre-development and post-development watershed areas have been analyzed at two (2) distinct points of analysis (PA-1, PA-2). While the points of analysis have remained unchanged, the contributing sub-catchment areas vary between pre-development and post-development conditions. These adjustments were made to reflect the differences in drainage patterns between the existing and proposed conditions. The overall area analyzed as part of this drainage analysis was held constant.

Point of Analysis 2 (PA-1) is located to south of the site, and assesses flows to southerly neighboring abutters. **Point of Analysis 2 (PA-2)** is located to the north of site, and assesses flows discharging to an existing wetland on the other side of the right-of-way owned by the City of Portsmouth.

The peak discharge rates at these points of analysis were determined by analyzing Type III, 24-hour storm events. The rainfall data for these storm events were obtained from the data published by the Northeast Regional Climate Center at Cornell University, which can be found in Appendix B.

Furthermore, the site is located within a Coastal and Great Bay Community, therefore an added factor of safety of 15% was included as required by Env-Wq 1503.08(l).

1.3 Calculation Methods

The design storms analyzed in this study are the 1-year, 2-year, 10-year, 25-year and 50-year 24-hour duration storm events. The stormwater modeling system, HydroCAD 10.0 was utilized to predict the peak runoff rates from these storm events. The peak discharge rates were determined by analyzing Type III 24-hour storm events. The rainfall data for these storm events were obtained from the data published by the Northeast Regional Climate Center at Cornell University, with an additional 15% added factor of safety as required by Env-Wq 1503.08(l).

The time of concentration was computed using the TR-55 Method, which provides a means of determining the time for an entire watershed to contribute runoff to a specific location via sheet flows, shallow concentrated flow, and channel flow. Runoff curve numbers were calculated by estimating the coverage areas and then summing the curve number for the coverage area as a percent of the entire watershed.

References:

1. HydroCAD Stormwater Modeling System, by HydroCAD Software Solutions LLC, Chocorua, New Hampshire.
2. New Hampshire Stormwater Management Manual, Volume 2, Post-Construction Best Management Practices Selection and Design, December 2008.
3. "Extreme Precipitation in New York & New England." Extreme Precipitation in New York & New England by Northeast Regional Climate Center (NRCC), 26 June 2012.

Section 2
Pre-Development Conditions

To analyze the pre-development condition, the site has been modeled utilizing the three (3) distinct points of analysis described in Section 1. These points of analysis and watersheds are depicted on the plan entitled "Pre-Development Watershed Plan", Sheet C-701.

The point of analysis and its contributing watershed areas under the *pre-development conditions* are described below:

Point of Analysis 1 (PA-1)

Point of Analysis 1 (PA-1) is comprised of a single subcatchment area (PRE-1.0) that consists of runoff from the southern portion of the site's high point. The area is entirely wooded. Runoff generally discharges across the southern edge of the property into the wooded boundaries of abutting properties.

Point of Analysis 2 (PA-2)

Point of Analysis 2 (PA-2) is comprised of two (2) subcatchment areas (PRE-2.0 and PRE-2.1).

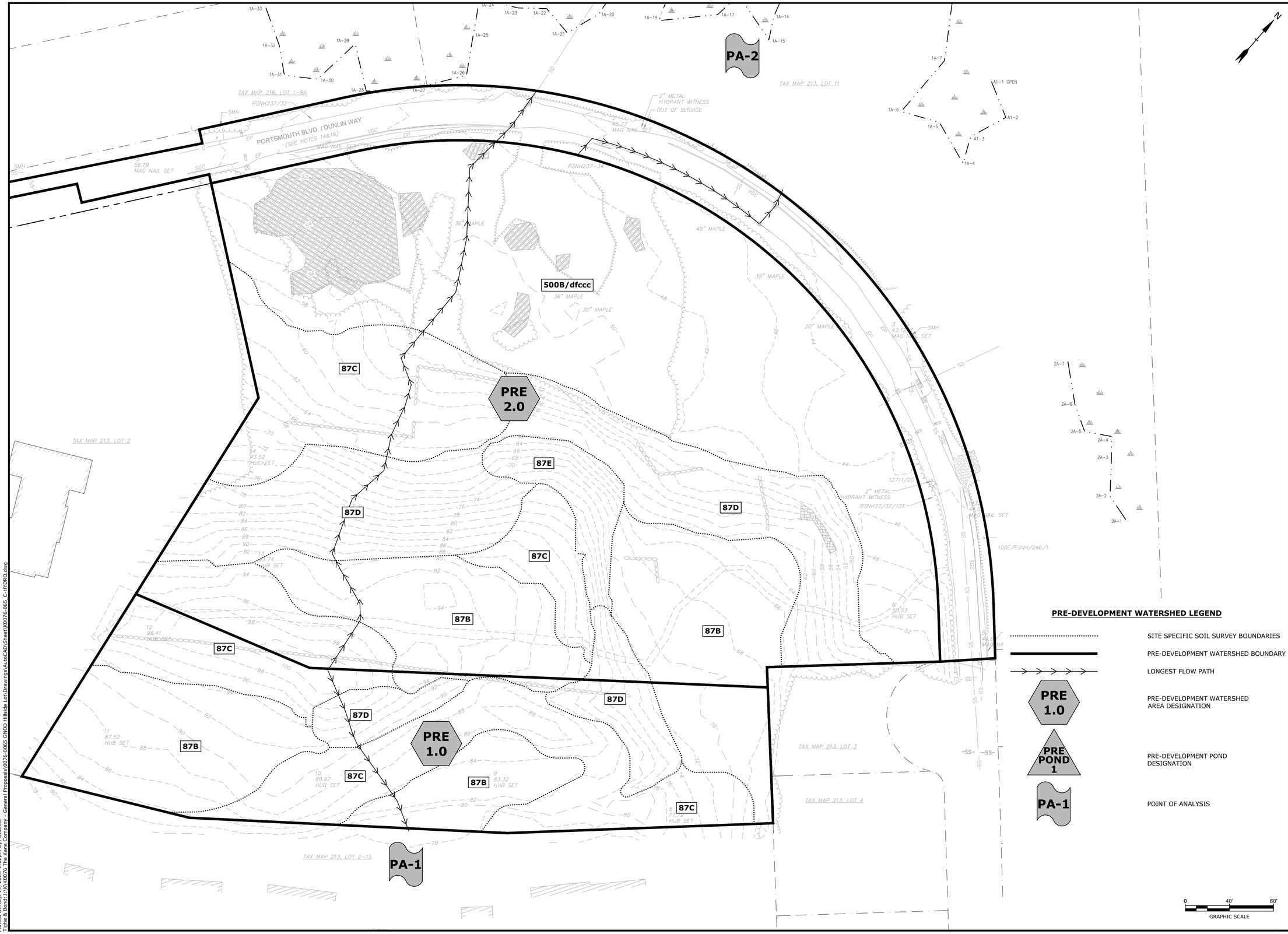
PRE-2.0 is characterized primarily of wooded and low-groundcover areas. Runoff from this subcatchment generally travels via overland flow from the wooded high point into the roadway, where runoff either flows into catch basins or directly sheets into the wetlands on the northern abutting properties.

PRE-2.1-is consists primarily of paved roadway, bituminous walkways and curb, with some contributing grassed and wooded areas. Runoff flows into catch basins with 8" and 12" pipe outlets, or directly sheets into the adjacent wetlands. There is no stormwater treatment for the site or right-of-way.

Two (2) intermediate points of analysis (PA-2.1 and PA-2.2) are included in the drainage model in order to demonstrate how channel protection requirements are met between the proposed development and the improvements within the City of Portsmouth right-of-way.

2.1 Pre-Development Watershed Plan

2.2 Pre-Development Calculations



Tighe&Bond
Engineers | Environmental Specialists

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

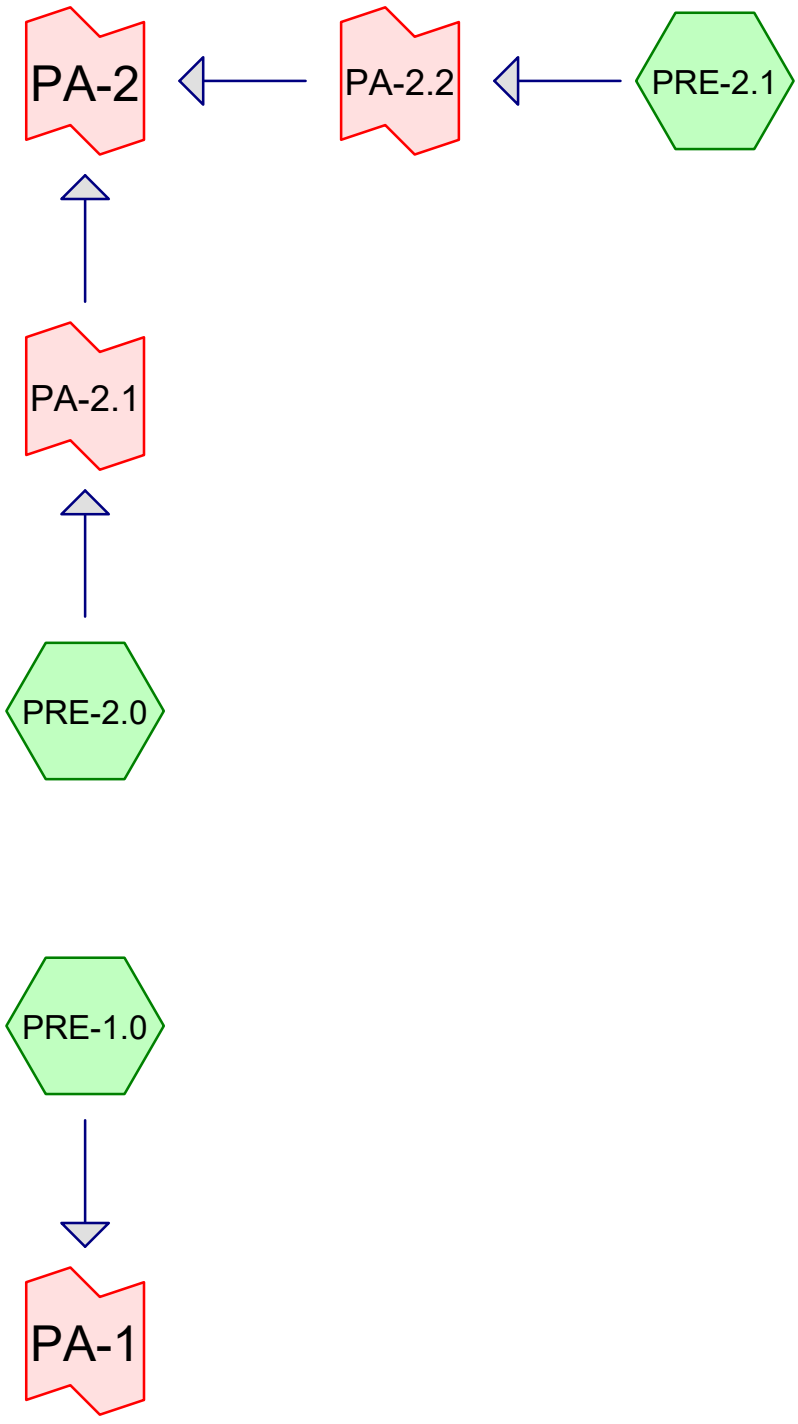
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-HYDRO.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.701

Last Saved: 9/19/2025
Plotted: Oct 09, 2025 - 1:02pm By: BCurcio
Tighe & Bond J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-HYDRO.dwg



Subcat Reach Pond Link

Routing Diagram for K0076-065_PRE
Prepared by Tighe & Bond, Printed 9/19/2025
HydroCAD® 10.20-4c s/n 01453 © 2024 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
28,389	74	>75% Grass cover, Good, HSG C (PRE-2.0, PRE-2.1)
790	48	Brush, Good, HSG B (PRE-2.0)
42,362	65	Brush, Good, HSG C (PRE-2.0, PRE-2.1)
13,671	91	Fallow, bare soil, HSG C (PRE-2.0)
700	96	Gravel surface, HSG C (PRE-2.0, PRE-2.1)
30,641	98	Paved parking, HSG C (PRE-2.1)
244,270	55	Woods, Good, HSG B (PRE-1.0, PRE-2.0)
59,402	70	Woods, Good, HSG C (PRE-2.0, PRE-2.1)
420,225	**64**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
245,060	HSG B	PRE-1.0, PRE-2.0
175,165	HSG C	PRE-2.0, PRE-2.1
0	HSG D	
0	Other	
420,225		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 PRE-1.0: Runoff Area=93,327 sf 0.00% Impervious Runoff Depth>0.21"
Flow Length=165' Tc=7.0 min CN=55 Runoff=0.16 cfs 1,615 cf

Subcatchment PRE-2.0: Runoff Area=271,248 sf 0.00% Impervious Runoff Depth>0.42"
Flow Length=601' Tc=12.3 min CN=62 Runoff=1.52 cfs 9,418 cf

Subcatchment PRE-2.1: Runoff Area=55,650 sf 55.06% Impervious Runoff Depth>1.70"
Flow Length=231' Tc=6.0 min CN=86 Runoff=2.50 cfs 7,902 cf

Link PA-1: Inflow=0.16 cfs 1,615 cf
Primary=0.16 cfs 1,615 cf

Link PA-2: Inflow=3.24 cfs 17,320 cf
Primary=3.24 cfs 17,320 cf

Link PA-2.1: Inflow=1.52 cfs 9,418 cf
Primary=1.52 cfs 9,418 cf

Link PA-2.2: Inflow=2.50 cfs 7,902 cf
Primary=2.50 cfs 7,902 cf

Total Runoff Area = 420,225 sf Runoff Volume = 18,935 cf Average Runoff Depth = 0.54"
92.71% Pervious = 389,584 sf 7.29% Impervious = 30,641 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 PRE-1.0: Runoff Area=93,327 sf 0.00% Impervious Runoff Depth>0.41"
Flow Length=165' Tc=7.0 min CN=55 Runoff=0.48 cfs 3,169 cf

Subcatchment PRE-2.0: Runoff Area=271,248 sf 0.00% Impervious Runoff Depth>0.70"
Flow Length=601' Tc=12.3 min CN=62 Runoff=3.23 cfs 15,804 cf

Subcatchment PRE-2.1: Runoff Area=55,650 sf 55.06% Impervious Runoff Depth>2.26"
Flow Length=231' Tc=6.0 min CN=86 Runoff=3.30 cfs 10,465 cf

Link PA-1: Inflow=0.48 cfs 3,169 cf
Primary=0.48 cfs 3,169 cf

Link PA-2: Inflow=5.57 cfs 26,268 cf
Primary=5.57 cfs 26,268 cf

Link PA-2.1: Inflow=3.23 cfs 15,804 cf
Primary=3.23 cfs 15,804 cf

Link PA-2.2: Inflow=3.30 cfs 10,465 cf
Primary=3.30 cfs 10,465 cf

Total Runoff Area = 420,225 sf Runoff Volume = 29,438 cf Average Runoff Depth = 0.84"
92.71% Pervious = 389,584 sf 7.29% Impervious = 30,641 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 PRE-1.0: Runoff Area=93,327 sf 0.00% Impervious Runoff Depth>1.28"
Flow Length=165' Tc=7.0 min CN=55 Runoff=2.63 cfs 9,958 cf

Subcatchment PRE-2.0: Runoff Area=271,248 sf 0.00% Impervious Runoff Depth>1.80"
Flow Length=601' Tc=12.3 min CN=62 Runoff=10.00 cfs 40,761 cf

Subcatchment PRE-2.1: Runoff Area=55,650 sf 55.06% Impervious Runoff Depth>4.01"
Flow Length=231' Tc=6.0 min CN=86 Runoff=5.76 cfs 18,589 cf

Link PA-1: Inflow=2.63 cfs 9,958 cf
Primary=2.63 cfs 9,958 cf

Link PA-2: Inflow=14.25 cfs 59,351 cf
Primary=14.25 cfs 59,351 cf

Link PA-2.1: Inflow=10.00 cfs 40,761 cf
Primary=10.00 cfs 40,761 cf

Link PA-2.2: Inflow=5.76 cfs 18,589 cf
Primary=5.76 cfs 18,589 cf

Total Runoff Area = 420,225 sf Runoff Volume = 69,309 cf Average Runoff Depth = 1.98"
92.71% Pervious = 389,584 sf 7.29% Impervious = 30,641 sf

Summary for Subcatchment PRE-1.0:

Runoff = 2.63 cfs @ 12.12 hrs, Volume= 9,958 cf, Depth> 1.28"
Routed to Link PA-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
93,327	55	Woods, Good, HSG B
93,327		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	115	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.0	165	Total			

Summary for Subcatchment PRE-2.0:

Runoff = 10.00 cfs @ 12.19 hrs, Volume= 40,761 cf, Depth> 1.80"
Routed to Link PA-2.1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
790	48	Brush, Good, HSG B
150,943	55	Woods, Good, HSG B
10,715	74	>75% Grass cover, Good, HSG C
56,407	70	Woods, Good, HSG C
38,372	65	Brush, Good, HSG C
0	98	Paved parking, HSG C
350	96	Gravel surface, HSG C
13,671	91	Fallow, bare soil, HSG C
271,248	62	Weighted Average
271,248		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
3.7	347	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	172	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	12	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	601	Total			

Summary for Subcatchment PRE-2.1:

Runoff = 5.76 cfs @ 12.09 hrs, Volume= 18,589 cf, Depth> 4.01"
Routed to Link PA-2.2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
17,674	74	>75% Grass cover, Good, HSG C
2,995	70	Woods, Good, HSG C
3,990	65	Brush, Good, HSG C
30,641	98	Paved parking, HSG C
350	96	Gravel surface, HSG C
0	91	Fallow, bare soil, HSG C
55,650	86	Weighted Average
25,009		44.94% Pervious Area
30,641		55.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	20	0.0500	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.4	175	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	36	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
3.5	231	Total, Increased to minimum Tc = 6.0 min			

Summary for Link PA-1:

Inflow Area = 93,327 sf, 0.00% Impervious, Inflow Depth > 1.28" for 10-yr event
Inflow = 2.63 cfs @ 12.12 hrs, Volume= 9,958 cf
Primary = 2.63 cfs @ 12.12 hrs, Volume= 9,958 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2:

Inflow Area = 326,898 sf, 9.37% Impervious, Inflow Depth > 2.18" for 10-yr event
Inflow = 14.25 cfs @ 12.15 hrs, Volume= 59,351 cf
Primary = 14.25 cfs @ 12.15 hrs, Volume= 59,351 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2.1:

Inflow Area = 271,248 sf, 0.00% Impervious, Inflow Depth > 1.80" for 10-yr event
Inflow = 10.00 cfs @ 12.19 hrs, Volume= 40,761 cf
Primary = 10.00 cfs @ 12.19 hrs, Volume= 40,761 cf, Atten= 0%, Lag= 0.0 min
Routed to Link PA-2 :

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2.2:

Inflow Area = 55,650 sf, 55.06% Impervious, Inflow Depth > 4.01" for 10-yr event
Inflow = 5.76 cfs @ 12.09 hrs, Volume= 18,589 cf
Primary = 5.76 cfs @ 12.09 hrs, Volume= 18,589 cf, Atten= 0%, Lag= 0.0 min
Routed to Link PA-2 :

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 PRE-1.0: Runoff Area=93,327 sf 0.00% Impervious Runoff Depth>2.17"
Flow Length=165' Tc=7.0 min CN=55 Runoff=4.86 cfs 16,840 cf

Subcatchment PRE-2.0: Runoff Area=271,248 sf 0.00% Impervious Runoff Depth>2.85"
Flow Length=601' Tc=12.3 min CN=62 Runoff=16.36 cfs 64,312 cf

Subcatchment PRE-2.1: Runoff Area=55,650 sf 55.06% Impervious Runoff Depth>5.43"
Flow Length=231' Tc=6.0 min CN=86 Runoff=7.69 cfs 25,177 cf

Link PA-1: Inflow=4.86 cfs 16,840 cf
Primary=4.86 cfs 16,840 cf

Link PA-2: Inflow=22.11 cfs 89,489 cf
Primary=22.11 cfs 89,489 cf

Link PA-2.1: Inflow=16.36 cfs 64,312 cf
Primary=16.36 cfs 64,312 cf

Link PA-2.2: Inflow=7.69 cfs 25,177 cf
Primary=7.69 cfs 25,177 cf

Total Runoff Area = 420,225 sf Runoff Volume = 106,329 cf Average Runoff Depth = 3.04"
92.71% Pervious = 389,584 sf 7.29% Impervious = 30,641 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 PRE-1.0: Runoff Area=93,327 sf 0.00% Impervious Runoff Depth>3.10"
Flow Length=165' Tc=7.0 min CN=55 Runoff=7.20 cfs 24,100 cf

Subcatchment PRE-2.0: Runoff Area=271,248 sf 0.00% Impervious Runoff Depth>3.91"
Flow Length=601' Tc=12.3 min CN=62 Runoff=22.78 cfs 88,308 cf

Subcatchment PRE-2.1: Runoff Area=55,650 sf 55.06% Impervious Runoff Depth>6.77"
Flow Length=231' Tc=6.0 min CN=86 Runoff=9.48 cfs 31,411 cf

Link PA-1: Inflow=7.20 cfs 24,100 cf
Primary=7.20 cfs 24,100 cf

Link PA-2: Inflow=29.92 cfs 119,718 cf
Primary=29.92 cfs 119,718 cf

Link PA-2.1: Inflow=22.78 cfs 88,308 cf
Primary=22.78 cfs 88,308 cf

Link PA-2.2: Inflow=9.48 cfs 31,411 cf
Primary=9.48 cfs 31,411 cf

Total Runoff Area = 420,225 sf Runoff Volume = 143,818 cf Average Runoff Depth = 4.11"
92.71% Pervious = 389,584 sf 7.29% Impervious = 30,641 sf

Section 3
Post-Development Conditions

To analyze the post-development condition, the site has been modeled utilizing the same three (3) distinct points of analysis as the Pre-Development condition with revised watershed areas to reflect the post-construction conditions.

The points of analysis and their sub-catchment areas are depicted on the plan entitled "Post-Development Watershed Plan," Sheet C-702.

Point of Analysis 1 (PA-1)

Point of Analysis 1 (PA-1) is comprised of a single subcatchment area (POST-1.0) that closely emulates the pre-development PRE-1.0 subcatchment area. Site clearing and development extend into this subcatchment area slightly, and development is proposed such that POST 1.0 will have a reduced watershed. Therefore, flows from this subcatchment and to this point of analysis are expected to be equivalent or less than the pre-development condition.

Point of Analysis 2 (PA-2)

Point of Analysis 2 (PA-2) is comprised of six (6) subcatchment areas (POST-2.0, POST 2.1, POST-2.2, POST-2.3, POST-2.4, and POST-2.5).

POST-2.0 comprises the majority of the development area on the subject parcel, collecting runoff from all parking areas, roofs, and sidewalks, as well as the southern grass hill. Runoff is collected by deep-sump catch basins and conveyed via closed drainage to an underground detention basin (UDB-1) with outlet control structure that detains and meters increased stormwater flows and volumes from added impervious areas. Stormwater is pre-treated prior to detention by means of both off-line deep sump catch basins and flow-through pre-treatment structures. Once discharged from the outlet control structure, stormwater is treated by a flow-through filtration treatment structure prior to discharging into a plunge pool on the eastern portion of the site. The plunge pool is located within an easement area granted to the City of Portsmouth.

POST-2.1 is a small subcatchment which is comprised of the eastern driveway access into the site, as well as some vegetated slopes. Runoff is collected by an off-line deep sump catch basin prior to discharge into the junction structure upstream of the flow-through filtration structure.

POST-2.2, POST-2.3, and POST-2.4 are comprised primarily of the paved roadways and sidewalks within the reconstructed limits of Portsmouth Boulevard, in addition to improved landscaped areas along its southern edge. Flows from each of these three (3) subcatchment areas are directed to three (3) bioretention systems (FP-1, FP-2, and FP-3). Rain guardian turret inlets provide pre-treatment prior to conveying flows the bioretention systems for treatment. Structural underdrains and overflow structures convey flows back into a closed drainage network under Portsmouth Boulevard for eventual discharge at the same plunge pool outlet described under Point of Analysis (PA-2).

POST-2.5 is comprised of a 10’ to 12’-wide grassed strip between Portsmouth Boulevard and the northern right-of-way line. The grassed strip, proposed to be planted with native grasses and trees, sheets north into the adjacent wetlands.

Two (2) intermediate points of analysis (PA-2.1 and PA-2.2) are included in the drainage model in order to demonstrate how channel protection requirements are met between the proposed development and the improvements within the City of Portsmouth right-of-way.

3.1 Post-Development Watershed Plan

3.2 Post-Development Calculations

POST 2.5
POST POND FP-1
PA-2
POST 2.2
POST 2.3
POST POND FP-2
POST POND FP-3
POST 2.4
500B/dfccc
POST POND UDB-1
POST 2.0
87C
87E
87D
87B
POST 2.1
POST 1.0
PA-1
TAX MAP 216, LOT 1-8A
TAX MAP 213, LOT 11
TAX MAP 213, LOT 2
TAX MAP 213, LOT 3
TAX MAP 213, LOT 4
TAX MAP 213, LOT 2-15
OFFICE RESEARCH
GENERAL RESIDENCE B
PUD
SGC
SS

POST-DEVELOPMENT WATERSHED LEGEND

- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- POST-DEVELOPMENT WATERSHED BOUNDARY
- POST-DEVELOPMENT LONGEST FLOW PATH
- POST 1.0 — POST-DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

0 40' 80'
GRAPHIC SCALE

Tighe&Bond
Engineers | Environmental Specialists

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

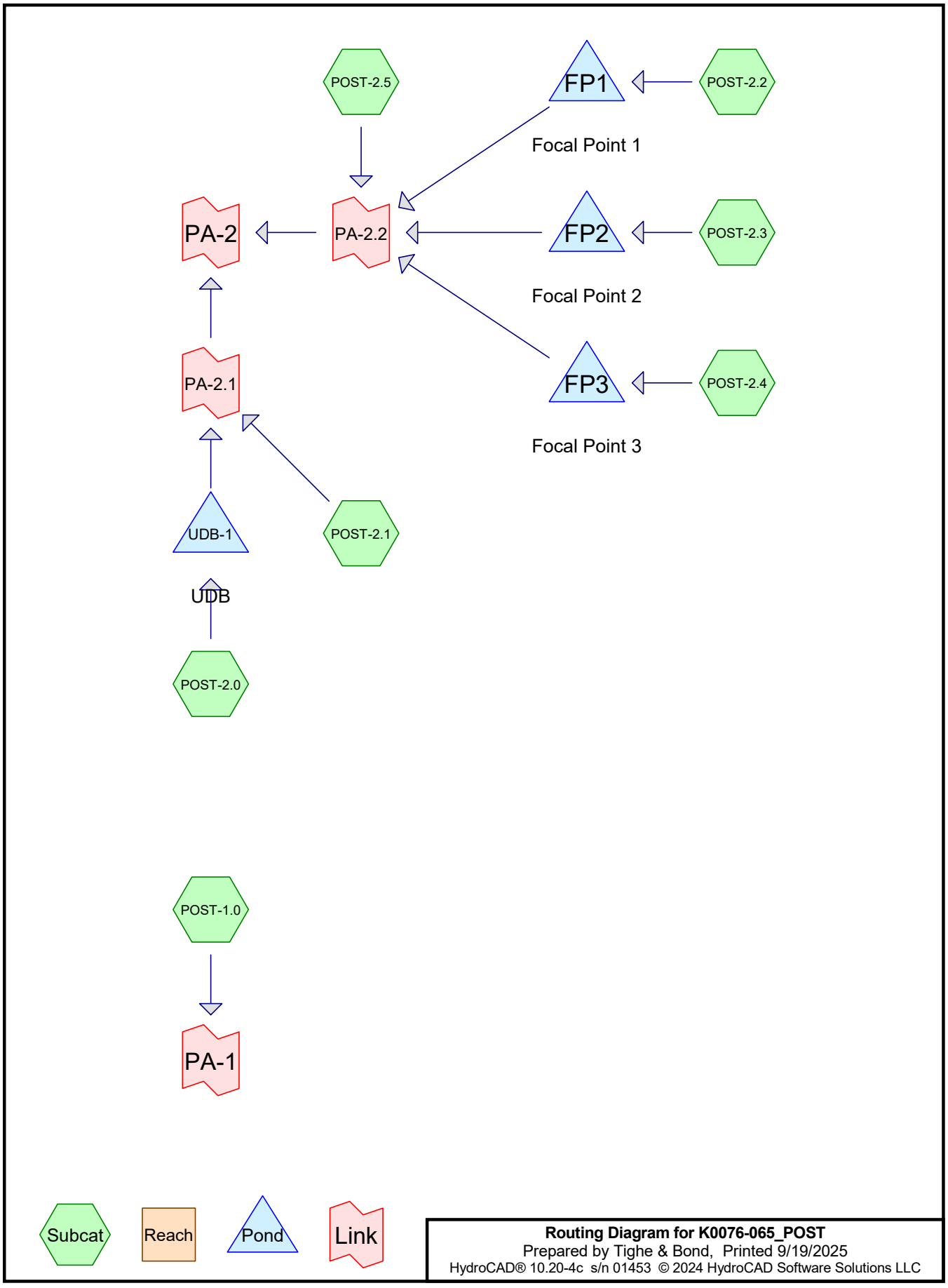
PROJECT NO:	K0076-065
DATE:	9/22/2025
FILE:	K0076-065_C-HYDRO.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.702

Last Saved: 9/19/2025
Printed: Sep 22, 2025 - 1:03pm By: BCurcio
Tighe & Bond J:\KK\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-HYDRO.dwg



Routing Diagram for K0076-065_POST
Prepared by Tighe & Bond, Printed 9/19/2025
HydroCAD® 10.20-4c s/n 01453 © 2024 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
74,567	61	>75% Grass cover, Good, HSG B (POST-2.0, POST-2.1)
37,764	74	>75% Grass cover, Good, HSG C (POST-2.0, POST-2.1, POST-2.2, POST-2.3, POST-2.4, POST-2.5)
72,917	98	Paved parking, HSG B (POST-2.0, POST-2.1)
90,607	98	Paved parking, HSG C (POST-2.0, POST-2.1, POST-2.2, POST-2.3, POST-2.4)
950	98	Roofs, HSG B (POST-2.0)
46,794	98	Roofs, HSG C (POST-2.0)
96,626	55	Woods, Good, HSG B (POST-1.0, POST-2.0)
420,225	**79**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
245,060	HSG B	POST-1.0, POST-2.0, POST-2.1
175,165	HSG C	POST-2.0, POST-2.1, POST-2.2, POST-2.3, POST-2.4, POST-2.5
0	HSG D	
0	Other	
420,225		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 POST-1.0: Runoff Area=89,289 sf 0.00% Impervious Runoff Depth>0.21"
Flow Length=165' Tc=7.0 min CN=55 Runoff=0.16 cfs 1,545 cf

Subcatchment POST-2.0: Runoff Area=255,686 sf 63.99% Impervious Runoff Depth>1.63"
Flow Length=535' Tc=8.4 min CN=85 Runoff=10.18 cfs 34,688 cf

Subcatchment POST-2.1: Runoff Area=10,317 sf 38.33% Impervious Runoff Depth>1.22"
Flow Length=345' Tc=6.0 min CN=79 Runoff=0.33 cfs 1,052 cf

Subcatchment POST-2.2: Runoff Area=22,946 sf 85.51% Impervious Runoff Depth>2.50"
Flow Length=345' Tc=6.0 min CN=95 Runoff=1.43 cfs 4,774 cf

Subcatchment POST-2.3: Runoff Area=11,432 sf 77.85% Impervious Runoff Depth>2.30"
Flow Length=345' Tc=6.0 min CN=93 Runoff=0.67 cfs 2,191 cf

Subcatchment POST-2.4: Runoff Area=19,180 sf 79.14% Impervious Runoff Depth>2.30"
Flow Length=345' Tc=6.0 min CN=93 Runoff=1.13 cfs 3,676 cf

Subcatchment POST-2.5: Runoff Area=11,375 sf 0.00% Impervious Runoff Depth>0.94"
Flow Length=10' Slope=0.3300 '/' Tc=6.0 min CN=74 Runoff=0.27 cfs 890 cf

Pond FP1: Focal Point 1 Peak Elev=45.95' Storage=225 cf Inflow=1.43 cfs 4,774 cf
Outflow=1.41 cfs 4,774 cf

Pond FP2: Focal Point 2 Peak Elev=43.89' Storage=94 cf Inflow=0.67 cfs 2,191 cf
Outflow=0.65 cfs 2,191 cf

Pond FP3: Focal Point 3 Peak Elev=42.68' Storage=145 cf Inflow=1.13 cfs 3,676 cf
Outflow=1.12 cfs 3,676 cf

Pond UDB-1: UDB Peak Elev=44.50' Storage=19,373 cf Inflow=10.18 cfs 34,688 cf
Outflow=0.72 cfs 26,392 cf

Link PA-1: Inflow=0.16 cfs 1,545 cf
Primary=0.16 cfs 1,545 cf

Link PA-2: Inflow=4.20 cfs 38,975 cf
Primary=4.20 cfs 38,975 cf

Link PA-2.1: Inflow=0.77 cfs 27,444 cf
Primary=0.77 cfs 27,444 cf

Link PA-2.2: Inflow=3.45 cfs 11,531 cf
Primary=3.45 cfs 11,531 cf

Total Runoff Area = 420,225 sf Runoff Volume = 48,817 cf Average Runoff Depth = 1.39"
49.73% Pervious = 208,957 sf 50.27% Impervious = 211,268 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 POST-1.0: Runoff Area=89,289 sf 0.00% Impervious Runoff Depth>0.41"
Flow Length=165' Tc=7.0 min CN=55 Runoff=0.46 cfs 3,032 cf

Subcatchment POST-2.0: Runoff Area=255,686 sf 63.99% Impervious Runoff Depth>2.17"
Flow Length=535' Tc=8.4 min CN=85 Runoff=13.58 cfs 46,259 cf

Subcatchment POST-2.1: Runoff Area=10,317 sf 38.33% Impervious Runoff Depth>1.71"
Flow Length=345' Tc=6.0 min CN=79 Runoff=0.46 cfs 1,466 cf

Subcatchment POST-2.2: Runoff Area=22,946 sf 85.51% Impervious Runoff Depth>3.11"
Flow Length=345' Tc=6.0 min CN=95 Runoff=1.76 cfs 5,954 cf

Subcatchment POST-2.3: Runoff Area=11,432 sf 77.85% Impervious Runoff Depth>2.91"
Flow Length=345' Tc=6.0 min CN=93 Runoff=0.84 cfs 2,769 cf

Subcatchment POST-2.4: Runoff Area=19,180 sf 79.14% Impervious Runoff Depth>2.91"
Flow Length=345' Tc=6.0 min CN=93 Runoff=1.41 cfs 4,646 cf

Subcatchment POST-2.5: Runoff Area=11,375 sf 0.00% Impervious Runoff Depth>1.36"
Flow Length=10' Slope=0.3300 '/' Tc=6.0 min CN=74 Runoff=0.40 cfs 1,293 cf

Pond FP1: Focal Point 1 Peak Elev=45.98' Storage=233 cf Inflow=1.76 cfs 5,954 cf
Outflow=1.78 cfs 5,954 cf

Pond FP2: Focal Point 2 Peak Elev=43.91' Storage=96 cf Inflow=0.84 cfs 2,769 cf
Outflow=0.86 cfs 2,769 cf

Pond FP3: Focal Point 3 Peak Elev=42.70' Storage=151 cf Inflow=1.41 cfs 4,646 cf
Outflow=1.43 cfs 4,646 cf

Pond UDB-1: UDB Peak Elev=45.26' Storage=26,894 cf Inflow=13.58 cfs 46,259 cf
Outflow=0.85 cfs 33,065 cf

Link PA-1: Inflow=0.46 cfs 3,032 cf
Primary=0.46 cfs 3,032 cf

Link PA-2: Inflow=5.47 cfs 49,194 cf
Primary=5.47 cfs 49,194 cf

Link PA-2.1: Inflow=1.03 cfs 34,531 cf
Primary=1.03 cfs 34,531 cf

Link PA-2.2: Inflow=4.46 cfs 14,663 cf
Primary=4.46 cfs 14,663 cf

Total Runoff Area = 420,225 sf Runoff Volume = 65,420 cf Average Runoff Depth = 1.87"
49.73% Pervious = 208,957 sf 50.27% Impervious = 211,268 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 POST-1.0: Runoff Area=89,289 sf 0.00% Impervious Runoff Depth>1.28"
Flow Length=165' Tc=7.0 min CN=55 Runoff=2.52 cfs 9,527 cf

Subcatchment POST-2.0: Runoff Area=255,686 sf 63.99% Impervious Runoff Depth>3.90"
Flow Length=535' Tc=8.4 min CN=85 Runoff=24.09 cfs 83,163 cf

Subcatchment POST-2.1: Runoff Area=10,317 sf 38.33% Impervious Runoff Depth>3.30"
Flow Length=345' Tc=6.0 min CN=79 Runoff=0.90 cfs 2,841 cf

Subcatchment POST-2.2: Runoff Area=22,946 sf 85.51% Impervious Runoff Depth>4.99"
Flow Length=345' Tc=6.0 min CN=95 Runoff=2.75 cfs 9,544 cf

Subcatchment POST-2.3: Runoff Area=11,432 sf 77.85% Impervious Runoff Depth>4.77"
Flow Length=345' Tc=6.0 min CN=93 Runoff=1.34 cfs 4,540 cf

Subcatchment POST-2.4: Runoff Area=19,180 sf 79.14% Impervious Runoff Depth>4.77"
Flow Length=345' Tc=6.0 min CN=93 Runoff=2.24 cfs 7,616 cf

Subcatchment POST-2.5: Runoff Area=11,375 sf 0.00% Impervious Runoff Depth>2.83"
Flow Length=10' Slope=0.3300 '/' Tc=6.0 min CN=74 Runoff=0.85 cfs 2,685 cf

Pond FP1: Focal Point 1 Peak Elev=46.05' Storage=252 cf Inflow=2.75 cfs 9,544 cf
Outflow=2.76 cfs 9,544 cf

Pond FP2: Focal Point 2 Peak Elev=43.96' Storage=102 cf Inflow=1.34 cfs 4,540 cf
Outflow=1.34 cfs 4,540 cf

Pond FP3: Focal Point 3 Peak Elev=42.77' Storage=164 cf Inflow=2.24 cfs 7,616 cf
Outflow=2.25 cfs 7,616 cf

Pond UDB-1: UDB Peak Elev=46.35' Storage=37,800 cf Inflow=24.09 cfs 83,163 cf
Outflow=7.81 cfs 64,170 cf

Link PA-1: Inflow=2.52 cfs 9,527 cf
Primary=2.52 cfs 9,527 cf

Link PA-2: Inflow=10.30 cfs 91,395 cf
Primary=10.30 cfs 91,395 cf

Link PA-2.1: Inflow=8.06 cfs 67,011 cf
Primary=8.06 cfs 67,011 cf

Link PA-2.2: Inflow=7.20 cfs 24,385 cf
Primary=7.20 cfs 24,385 cf

Total Runoff Area = 420,225 sf Runoff Volume = 119,917 cf Average Runoff Depth = 3.42"
49.73% Pervious = 208,957 sf 50.27% Impervious = 211,268 sf

Summary for Subcatchment POST-1.0:

Runoff = 2.52 cfs @ 12.12 hrs, Volume= 9,527 cf, Depth> 1.28"
Routed to Link PA-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
89,289	55	Woods, Good, HSG B
89,289		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	115	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.0	165	Total			

Summary for Subcatchment POST-2.0:

Runoff = 24.09 cfs @ 12.12 hrs, Volume= 83,163 cf, Depth> 3.90"
Routed to Pond UDB-1 : UDB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
0	48	Brush, Good, HSG B
7,337	55	Woods, Good, HSG B
71,577	98	Paved parking, HSG B
71,423	61	>75% Grass cover, Good, HSG B
950	98	Roofs, HSG B
13,314	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
0	65	Brush, Good, HSG C
44,291	98	Paved parking, HSG C
46,794	98	Roofs, HSG C
0	96	Gravel surface, HSG C
0	91	Fallow, bare soil, HSG C
255,686	85	Weighted Average
92,074		36.01% Pervious Area
163,612		63.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.5	115	0.3300	4.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	310	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
8.4	535	Total			

Summary for Subcatchment POST-2.1:

Runoff = 0.90 cfs @ 12.09 hrs, Volume= 2,841 cf, Depth> 3.30"
Routed to Link PA-2.1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
3,218	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
2,615	98	Paved parking, HSG C
0	98	Roofs, HSG C
3,144	61	>75% Grass cover, Good, HSG B
1,340	98	Paved parking, HSG B
10,317	79	Weighted Average
6,362		61.67% Pervious Area
3,955		38.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	30	0.5000	0.48		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	135	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	180	0.0050	5.91	29.00	**Pipe Channel,** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
2.0	345	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment POST-2.2:

Runoff = 2.75 cfs @ 12.09 hrs, Volume= 9,544 cf, Depth> 4.99"
Routed to Pond FP1 : Focal Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
3,325	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
19,621	98	Paved parking, HSG C
0	98	Roofs, HSG C
22,946	95	Weighted Average
3,325		14.49% Pervious Area
19,621		85.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	30	0.5000	0.48		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	135	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	180	0.0050	5.91	29.00	**Pipe Channel,** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
2.0	345	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment POST-2.3:

Runoff = 1.34 cfs @ 12.09 hrs, Volume= 4,540 cf, Depth> 4.77"
Routed to Pond FP2 : Focal Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
2,532	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
8,900	98	Paved parking, HSG C
0	98	Roofs, HSG C
11,432	93	Weighted Average
2,532		22.15% Pervious Area
8,900		77.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	30	0.5000	0.48		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	135	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	180	0.0050	5.91	29.00	**Pipe Channel,** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
2.0	345	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment POST-2.4:

Runoff = 2.24 cfs @ 12.09 hrs, Volume= 7,616 cf, Depth> 4.77"
Routed to Pond FP3 : Focal Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
4,000	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
15,180	98	Paved parking, HSG C
0	98	Roofs, HSG C
19,180	93	Weighted Average
4,000		20.86% Pervious Area
15,180		79.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	30	0.5000	0.48		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	135	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	180	0.0050	5.91	29.00	**Pipe Channel,** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
2.0	345	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment POST-2.5:

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 2,685 cf, Depth> 2.83"
Routed to Link PA-2.2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.58"

Area (sf)	CN	Description
11,375	74	>75% Grass cover, Good, HSG C
11,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	10	0.3300	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	10	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond FP1: Focal Point 1

Inflow Area = 22,946 sf, 85.51% Impervious, Inflow Depth > 4.99" for 10-yr event
Inflow = 2.75 cfs @ 12.09 hrs, Volume= 9,544 cf
Outflow = 2.76 cfs @ 12.09 hrs, Volume= 9,544 cf, Atten= 0%, Lag= 0.4 min
Primary = 2.76 cfs @ 12.09 hrs, Volume= 9,544 cf
Routed to Link PA-2.2 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 46.05' @ 12.09 hrs Surf.Area= 81 sf Storage= 252 cf
Flood Elev= 46.50' Surf.Area= 81 sf Storage= 394 cf

Plug-Flow detention time= 3.6 min calculated for 9,544 cf (100% of inflow)
Center-of-Mass det. time= 3.6 min (768.6 - 765.0)

Volume	Invert	Avail.Storage	Storage Description
#1	42.92'	34 cf	**3.00'W x 27.00'L x 2.08'H Focal Point 1** 168 cf Overall x 20.0% Voids
#2	45.00'	361 cf	**surface bowl (Prismatic)** Listed below (Recalc) -Impervious
		394 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
45.00	136	0	0
46.00	273	205	205
46.50	352	156	361

Device	Routing	Invert	Outlet Devices
#1	Primary	42.75'	**12.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 42.75' / 42.50' S= 0.0114 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	42.92'	**100.000 in/hr Exfiltration FP over Surface area** Phase-In= 0.10'
#3	Device 1	45.80'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.71 cfs @ 12.09 hrs HW=46.05' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.71 cfs of 6.32 cfs potential flow)
  └**2=Exfiltration FP** (Exfiltration Controls 0.19 cfs)
  └**3=Orifice/Grate** (Weir Controls 2.52 cfs @ 1.62 fps)

Summary for Pond FP2: Focal Point 2

Inflow Area = 11,432 sf, 77.85% Impervious, Inflow Depth > 4.77" for 10-yr event
Inflow = 1.34 cfs @ 12.09 hrs, Volume= 4,540 cf
Outflow = 1.34 cfs @ 12.09 hrs, Volume= 4,540 cf, Atten= 0%, Lag= 0.3 min
Primary = 1.34 cfs @ 12.09 hrs, Volume= 4,540 cf
Routed to Link PA-2.2 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 43.96' @ 12.09 hrs Surf.Area= 39 sf Storage= 102 cf
Flood Elev= 45.50' Surf.Area= 39 sf Storage= 188 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 3.3 min (777.9 - 774.6)

Volume	Invert	Avail.Storage	Storage Description
#1	40.92'	16 cf	**3.00'W x 13.00'L x 2.08'H Focal Point 1** 81 cf Overall x 20.0% Voids
#2	43.00'	172 cf	**surface bowl (Prismatic)** Listed below (Recalc) -Impervious
		188 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
43.00	50	0	0
44.00	133	92	92
44.50	187	80	172

Device	Routing	Invert	Outlet Devices
#1	Primary	40.75'	**12.0" Round Culvert** L= 24.0' Ke= 0.500 Inlet / Outlet Invert= 40.75' / 40.60' S= 0.0062 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	40.92'	**100.000 in/hr Exfiltration FP over Surface area** Phase-In= 0.10'
#3	Device 1	43.80'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.32 cfs @ 12.09 hrs HW=43.95' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 1.32 cfs of 6.22 cfs potential flow)
↑**2=Exfiltration FP** (Exfiltration Controls 0.09 cfs)
3=Orifice/Grate (Weir Controls 1.23 cfs @ 1.28 fps)

Summary for Pond FP3: Focal Point 3

Inflow Area = 19,180 sf, 79.14% Impervious, Inflow Depth > 4.77" for 10-yr event
Inflow = 2.24 cfs @ 12.09 hrs, Volume= 7,616 cf
Outflow = 2.25 cfs @ 12.09 hrs, Volume= 7,616 cf, Atten= 0%, Lag= 0.3 min
Primary = 2.25 cfs @ 12.09 hrs, Volume= 7,616 cf
Routed to Link PA-2.2 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 42.77' @ 12.09 hrs Surf.Area= 77 sf Storage= 164 cf
Flood Elev= 43.50' Surf.Area= 77 sf Storage= 366 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.3 min (776.9 - 774.6)

Volume	Invert	Avail.Storage	Storage Description
#1	39.92'	32 cf	**3.00'W x 25.67'L x 2.08'H Focal Point 1** 160 cf Overall x 20.0% Voids
#2	42.00'	334 cf	**surface bowl (Prismatic)** Listed below (Recalc) -Impervious
		366 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
42.00	122	0	0
43.00	253	188	188
43.50	331	146	334

Device	Routing	Invert	Outlet Devices
#1	Primary	39.75'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 39.75' / 39.65' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	39.92'	**100.000 in/hr Exfiltration FP over Surface area** Phase-In= 0.10'
#3	Device 1	42.55'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.21 cfs @ 12.09 hrs HW=42.76' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.21 cfs of 6.00 cfs potential flow)
  └─**2=Exfiltration FP** (Exfiltration Controls 0.18 cfs)
  └─**3=Orifice/Grate** (Weir Controls 2.03 cfs @ 1.51 fps)

Summary for Pond UDB-1: UDB

Inflow Area = 255,686 sf, 63.99% Impervious, Inflow Depth > 3.90" for 10-yr event
Inflow = 24.09 cfs @ 12.12 hrs, Volume= 83,163 cf
Outflow = 7.81 cfs @ 12.46 hrs, Volume= 64,170 cf, Atten= 68%, Lag= 20.8 min
Primary = 7.81 cfs @ 12.46 hrs, Volume= 64,170 cf
Routed to Link PA-2.1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 46.35' @ 12.46 hrs Surf.Area= 12,354 sf Storage= 37,800 cf
Flood Elev= 48.50' Surf.Area= 12,354 sf Storage= 56,176 cf

Plug-Flow detention time= 218.0 min calculated for 64,170 cf (77% of inflow)
Center-of-Mass det. time= 137.1 min (941.9 - 804.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	42.00'	18,554 cf	**71.00'W x 174.00'L x 7.00'H Field A** 86,478 cf Overall - 40,093 cf Embedded = 46,385 cf x 40.0% Voids
#2A	42.50'	40,093 cf	**CMP Round 72** x 64 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L 64 Chambers in 8 Rows 69.00' Header x 28.27 sf x 2 = 3,901.9 cf Inside
		58,647 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	42.50'	**30.0" Round Culvert** L= 146.0' Ke= 0.500 Inlet / Outlet Invert= 42.50' / 41.75' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf
#2	Device 1	42.50'	**4.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	45.50'	**36.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	47.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=7.79 cfs @ 12.46 hrs HW=46.35' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 7.79 cfs of 33.78 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.02 cfs @ 9.21 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 6.77 cfs @ 3.38 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link PA-1:

Inflow Area = 89,289 sf, 0.00% Impervious, Inflow Depth > 1.28" for 10-yr event
Inflow = 2.52 cfs @ 12.12 hrs, Volume= 9,527 cf
Primary = 2.52 cfs @ 12.12 hrs, Volume= 9,527 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2:

Inflow Area = 330,936 sf, 63.84% Impervious, Inflow Depth > 3.31" for 10-yr event
Inflow = 10.30 cfs @ 12.37 hrs, Volume= 91,395 cf
Primary = 10.30 cfs @ 12.37 hrs, Volume= 91,395 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2.1:

Inflow Area = 266,003 sf, 62.99% Impervious, Inflow Depth > 3.02" for 10-yr event
Inflow = 8.06 cfs @ 12.45 hrs, Volume= 67,011 cf
Primary = 8.06 cfs @ 12.45 hrs, Volume= 67,011 cf, Atten= 0%, Lag= 0.0 min
Routed to Link PA-2 :

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2.2:

Inflow Area = 64,933 sf, 67.30% Impervious, Inflow Depth > 4.51" for 10-yr event
Inflow = 7.20 cfs @ 12.09 hrs, Volume= 24,385 cf
Primary = 7.20 cfs @ 12.09 hrs, Volume= 24,385 cf, Atten= 0%, Lag= 0.0 min
Routed to Link PA-2 :

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 POST-1.0: Runoff Area=89,289 sf 0.00% Impervious Runoff Depth>2.17"
Flow Length=165' Tc=7.0 min CN=55 Runoff=4.65 cfs 16,111 cf

Subcatchment POST-2.0: Runoff Area=255,686 sf 63.99% Impervious Runoff Depth>5.31"
Flow Length=535' Tc=8.4 min CN=85 Runoff=32.37 cfs 113,214 cf

Subcatchment POST-2.1: Runoff Area=10,317 sf 38.33% Impervious Runoff Depth>4.64"
Flow Length=345' Tc=6.0 min CN=79 Runoff=1.25 cfs 3,993 cf

Subcatchment POST-2.2: Runoff Area=22,946 sf 85.51% Impervious Runoff Depth>6.47"
Flow Length=345' Tc=6.0 min CN=95 Runoff=3.51 cfs 12,374 cf

Subcatchment POST-2.3: Runoff Area=11,432 sf 77.85% Impervious Runoff Depth>6.24"
Flow Length=345' Tc=6.0 min CN=93 Runoff=1.72 cfs 5,941 cf

Subcatchment POST-2.4: Runoff Area=19,180 sf 79.14% Impervious Runoff Depth>6.24"
Flow Length=345' Tc=6.0 min CN=93 Runoff=2.89 cfs 9,968 cf

Subcatchment POST-2.5: Runoff Area=11,375 sf 0.00% Impervious Runoff Depth>4.10"
Flow Length=10' Slope=0.3300 '/' Tc=6.0 min CN=74 Runoff=1.23 cfs 3,886 cf

Pond FP1: Focal Point 1 Peak Elev=46.10' Storage=266 cf Inflow=3.51 cfs 12,374 cf
Outflow=3.53 cfs 12,374 cf

Pond FP2: Focal Point 2 Peak Elev=43.99' Storage=106 cf Inflow=1.72 cfs 5,941 cf
Outflow=1.73 cfs 5,941 cf

Pond FP3: Focal Point 3 Peak Elev=42.81' Storage=174 cf Inflow=2.89 cfs 9,968 cf
Outflow=2.90 cfs 9,968 cf

Pond UDB-1: UDB Peak Elev=47.27' Storage=46,592 cf Inflow=32.37 cfs 113,214 cf
Outflow=12.67 cfs 91,529 cf

Link PA-1: Inflow=4.65 cfs 16,111 cf
Primary=4.65 cfs 16,111 cf

Link PA-2: Inflow=17.70 cfs 127,692 cf
Primary=17.70 cfs 127,692 cf

Link PA-2.1: Inflow=13.10 cfs 95,523 cf
Primary=13.10 cfs 95,523 cf

Link PA-2.2: Inflow=9.38 cfs 32,169 cf
Primary=9.38 cfs 32,169 cf

Total Runoff Area = 420,225 sf Runoff Volume = 165,488 cf Average Runoff Depth = 4.73"
49.73% Pervious = 208,957 sf 50.27% Impervious = 211,268 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 POST-1.0: Runoff Area=89,289 sf 0.00% Impervious Runoff Depth>3.10"
Flow Length=165' Tc=7.0 min CN=55 Runoff=6.89 cfs 23,057 cf

Subcatchment POST-2.0: Runoff Area=255,686 sf 63.99% Impervious Runoff Depth>6.65"
Flow Length=535' Tc=8.4 min CN=85 Runoff=40.07 cfs 141,702 cf

Subcatchment POST-2.1: Runoff Area=10,317 sf 38.33% Impervious Runoff Depth>5.93"
Flow Length=345' Tc=6.0 min CN=79 Runoff=1.59 cfs 5,101 cf

Subcatchment POST-2.2: Runoff Area=22,946 sf 85.51% Impervious Runoff Depth>7.85"
Flow Length=345' Tc=6.0 min CN=95 Runoff=4.23 cfs 15,020 cf

Subcatchment POST-2.3: Runoff Area=11,432 sf 77.85% Impervious Runoff Depth>7.61"
Flow Length=345' Tc=6.0 min CN=93 Runoff=2.08 cfs 7,254 cf

Subcatchment POST-2.4: Runoff Area=19,180 sf 79.14% Impervious Runoff Depth>7.61"
Flow Length=345' Tc=6.0 min CN=93 Runoff=3.49 cfs 12,170 cf

Subcatchment POST-2.5: Runoff Area=11,375 sf 0.00% Impervious Runoff Depth>5.33"
Flow Length=10' Slope=0.3300 '/' Tc=6.0 min CN=74 Runoff=1.59 cfs 5,057 cf

Pond FP1: Focal Point 1 Peak Elev=46.14' Storage=278 cf Inflow=4.23 cfs 15,020 cf
Outflow=4.24 cfs 15,019 cf

Pond FP2: Focal Point 2 Peak Elev=44.01' Storage=109 cf Inflow=2.08 cfs 7,254 cf
Outflow=2.09 cfs 7,254 cf

Pond FP3: Focal Point 3 Peak Elev=42.85' Storage=182 cf Inflow=3.49 cfs 12,170 cf
Outflow=3.50 cfs 12,170 cf

Pond UDB-1: UDB Peak Elev=48.07' Storage=53,261 cf Inflow=40.07 cfs 141,702 cf
Outflow=21.04 cfs 117,892 cf

Link PA-1: Inflow=6.89 cfs 23,057 cf
Primary=6.89 cfs 23,057 cf

Link PA-2: Inflow=26.77 cfs 162,493 cf
Primary=26.77 cfs 162,493 cf

Link PA-2.1: Inflow=21.72 cfs 122,993 cf
Primary=21.72 cfs 122,993 cf

Link PA-2.2: Inflow=11.42 cfs 39,500 cf
Primary=11.42 cfs 39,500 cf

Total Runoff Area = 420,225 sf Runoff Volume = 209,361 cf Average Runoff Depth = 5.98"
49.73% Pervious = 208,957 sf 50.27% Impervious = 211,268 sf

Section 4
Peak Rate Comparison

The following table summarizes and compares the pre- and post-development peak runoff rates from the 2-year, 10-year, 25-year and 50-year storm events at the points of analysis. The 1-year event has been included in order to demonstrate compliance with the Channel Protection requirements of Env-Wq 1507.05 for select points of analysis.

Note: PA-2.1 and PA-2.2 are not included within this table as they are intermediate points of analysis included exclusively to demonstrate compliance with channel protection requirements in accordance with Env-Wq 1507.05.

Table 4.1

Comparison of Pre- and Post-Development Flows (CFS)

	1-Year Storm	2-Year Storm	10-Year Storm	25-Year Storm	50-Year Storm
Pre-Development Watershed					
PA-1	0.16	0.48	2.63	4.86	7.20
PA-2	-	5.92	14.91	23.00	31.03
Post-Development Watershed					
PA-1	0.16	0.46	2.52	4.65	6.89
PA-2	-	5.47	10.30	17.70	26.77

Each of the points of analysis meets the channel protection requirements of Env-Wq 105.05 as follows:

PA-1: The 2-year, 24-hour post-development runoff volume (3,032 cf) has not increased over the 2-year, 24 hour pre-development runoff volume (3,169 cf)by more than 0.1 ac-ft (or 4,356 cf).

PA-2: Channel protection requirements are unable to be met under assessment of PA-2 on its own. Although runoff within the development is overdetained during the lower storm events, it cannot make up for increased impervious areas within the right-of-way that cannot be effectively detained due to lack of space and elevation constraints. Channel protection requirements are therefore proposed d to be met under the following additional assessments of intermediate points-of-analysis PA-2.1 and PA-2.2. PA-2.1 demonstrates how runoff from the development site during the 2-year storm event is negligible, and PA-2.2 demonstrates how the small increase in impervious area within the right-of-way does not amount to more than a 0.1 ac-ft increase in stormwater volume under the 2-year storm event:

> PA-2: The 2-year, 24-hour post-development peak flow rate generated from the proposed disturbance (5.47 cfs) is less than the 2-year, 24-hour pre-development peak flow rate (5.92 cfs), and;

PA-2.1: The 2-year, 24-hour post-development peak flow rate is less than 2 cfs (1.02 cfs).

PA-2.2: The 2-year, 24-hour post-development runoff volume (14,663 cf) has not increased over the 2-year, 24 hour pre-development runoff volume (10,465 cf) by more than 0.1 ac-ft (or 4,356 cf).

Section 5
Mitigation Description

The stormwater management system has been designed to provide stormwater treatment as required by the City of Portsmouth Site Review Regulations and NHDES AoT Regulations (Env-Wq 1500).

5.1 Pre-Treatment Methods for Protecting Water Quality

Pre-treatment for the stormwater filtration systems consists of off-line deep sump catch basins and flow-through pre-treatment units.

5.2 Treatment Methods for Protecting Water Quality.

The runoff from proposed impervious areas will be treated by flow-through filtration systems and bioretention systems. Treatment systems are sized to treat the Water Quality Flow of their respective sub catchment areas. The BMP worksheets for the treatment practices have been included in Section 6 of this report.

The proposed stormwater management system is required to remove 80% of the annual Total Suspended Soils (TSS) loads and 50% of the annual Total Nitrogen (TN) loads per the City of Portsmouth's Site Plan regulations, Section 7.6.2.1.a.i. As shown in Table 5.1 the pollutant removal efficiencies for the proposed treatment systems exceed the City of Portsmouth's removal requirements.

Table 5.1 – Pollutant Removal Efficiencies

BMP	Total Suspended Solids	Total Nitrogen	Total Phosphorus
Flow-Through Filter w/Pretreatment[1]	85%	50%	55%
Bioretention w/ Pretreatment[2]	90%	65%	65%

1. Pollutant removal efficiencies from Contech Engineered Solutions, Jellyfish Filter Stormwater Treatment standard performance specifications. Pre-treatment upstream of the unit is assumed to be accounted for.
2. Pollutant removal efficiencies from NH Stormwater Manual Volume 2, Appendix E. Per the descriptions listed in the Appendix, pre-treatment is already accounted for in the efficiencies cited.

Section 6
BMP Worksheets

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.08)

Type/Node Name: **FP-1 (Focal Point Bioretention System)**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.08(a).	
0.51	ac	A = Area draining to the practice	
0.43	ac	A_I = Impervious area draining to the practice	
0.84	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.81	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.41	ac-in	WQV= 1" x Rv x A	
1,497	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
374	cf	25% x WQV (check calc for sediment forebay volume)	
1,123	cf	75% x WQV (check calc for surface sand filter volume)	
Rain Guardian		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
43.25	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
42.75	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
0.50	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
43.25	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
43.25	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
46.14	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
46.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
See notes	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet C.605		Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet		Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes: Focal point system has been sized by manufacturer in accordance with WQF requirements.

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.08)

Type/Node Name: **FP-2 (Focal Point Bioretention System)**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.08(a).	
0.26	ac	A = Area draining to the practice	
0.20	ac	A_I = Impervious area draining to the practice	
0.77	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.74	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.19	ac-in	WQV= 1" x Rv x A	
701	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
175	cf	25% x WQV (check calc for sediment forebay volume)	
525	cf	75% x WQV (check calc for surface sand filter volume)	
Rain Guardian		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
41.25	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
40.75	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
0.50	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
41.25	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
41.25	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
44.01	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
44.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
See notes	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet C.605		Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet		Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes: Focal point system has been sized by manufacturer in accordance with WQF requirements.

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.08)

Type/Node Name: **FP-3 (Focal Point Bioretention System)**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.08(a).	
0.44	ac	A = Area draining to the practice	
0.34	ac	A_I = Impervious area draining to the practice	
0.77	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.75	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.33	ac-in	WQV= 1" x Rv x A	
1,191	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
298	cf	25% x WQV (check calc for sediment forebay volume)	
893	cf	75% x WQV (check calc for surface sand filter volume)	
Rain Guardian		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
40.25	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
39.75	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
0.50	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
40.25	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
40.25	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
42.85	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
43.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
See Notes	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet C.605		Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**> 3:1**
Sheet		Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes: Focal point system has been sized by manufacturer in accordance with WQF requirements.

GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

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

Water Quality Volume (WQV)

0.82	ac	A = Area draining to the practice
0.41	ac	A_I = Impervious area draining to the practice
0.50	decimal	I = Percent impervious area draining to the practice, in decimal form
0.50	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)
0.41	ac-in	WQV= 1" x Rv x A
1,488	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")

Water Quality Flow (WQF)

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

Designer's Notes: Flow-through Pre-Treatment Structure #1

GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

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

Water Quality Volume (WQV)

2.19	ac	A = Area draining to the practice
1.31	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)
1.29	ac-in	WQV= 1" x Rv x A
4,677	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")

Water Quality Flow (WQF)

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

Designer's Notes: Flow-Though Pre-Treatment Structure #2

GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

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

Water Quality Volume (WQV)

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

Water Quality Flow (WQF)

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

Designer's Notes: Post-Detention Treatment #1

For treatment systems located downstream of detention facilities, the surrogate for the WQF is the discharge from a detention facility during a 2-year storm event (per NHDES).

UDB#1 2-year outflow = 0.85 CFS

Section 7
Groundwater Recharge Volume Calculations

The proposed project is requesting a waiver from the Groundwater Recharge Requirements described in Env-Wq 1507.04. This request is being made due to the presence of shallow bedrock and shallow Estimated Seasonal High Water Table (SHWT), evidenced by geotechnical borings and the site-specific soil survey. Most notably, the Udorthents series soils within lower elevations of the site where infiltration areas may be feasible are noted to have a potential ESHWT 20" below existing grade. As such, stormwater systems will be installed with liners and/or underdrains which limit the feasibility of groundwater recharge.

Tighe&Bond

APPENDIX A

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Rockingham County, New Hampshire

August 27, 2025

Preface

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

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

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

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

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

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

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

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

Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....11
Rockingham County, New Hampshire.....13
140C—Chatfield-Hollis-Canton complex, 8 to 15 percent slopes, rocky.....13
799—Urban land-Canton complex, 3 to 15 percent slopes.....16
Soil Information for All Uses.....18
Soil Properties and Qualities.....18
Soil Qualities and Features.....18
Hydrologic Soil Group.....18
References.....23

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,130 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Rockingham County, New Hampshire
Survey Area Data: Version 27, Sep 3, 2024

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

Date(s) aerial images were photographed: Jun 19, 2020—Sep 20, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
140C	Chatfield-Hollis-Canton complex, 8 to 15 percent slopes, rocky	4.2	42.5%
799	Urban land-Canton complex, 3 to 15 percent slopes	5.7	57.5%
Totals for Area of Interest		**9.8**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Rockingham County, New Hampshire

140C—Chatfield-Hollis-Canton complex, 8 to 15 percent slopes, rocky

Map Unit Setting

National map unit symbol: 2w82s
Elevation: 0 to 980 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Chatfield, very stony, and similar soils: 35 percent
Canton, very stony, and similar soils: 25 percent
Hollis, very stony, and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chatfield, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands

Hydric soil rating: No

Description of Hollis, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Canton, Very Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Newfields, very stony

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Freetown

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

Scarboro, very stony

Percent of map unit: 3 percent
Landform: Depressions, outwash terraces, drainageways, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Rock outcrop

Percent of map unit: 2 percent
Landform: Ridges, hills
Hydric soil rating: Unranked

799—Urban land-Canton complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9cq0
Elevation: 0 to 1,000 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 55 percent
Canton and similar soils: 20 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Parent material: Till

Typical profile

H1 - 0 to 5 inches: gravelly fine sandy loam
H2 - 5 to 21 inches: gravelly fine sandy loam
H3 - 21 to 60 inches: loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

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

Boxford and eldridge
Percent of map unit: 4 percent
Hydric soil rating: No

Squamscott and scitico
Percent of map unit: 4 percent
Landform: Marine terraces
Hydric soil rating: Yes

Scituate and newfields
Percent of map unit: 4 percent
Hydric soil rating: No

Chatfield
Percent of map unit: 4 percent
Hydric soil rating: No

Walpole
Percent of map unit: 4 percent
Landform: Depressions
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

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

Soil Qualities and Features

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

Hydrologic Soil Group

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

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

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

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

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

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

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

Custom Soil Resource Report
Map—Hydrologic Soil Group

Map Scale: 1:2,130 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Rockingham County, New Hampshire
Survey Area Data: Version 27, Sep 3, 2024

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

Date(s) aerial images were photographed: Jun 19, 2020—Sep 20, 2020

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
140C	Chatfield-Hollis-Canton complex, 8 to 15 percent slopes, rocky	B	4.2	42.5%
799	Urban land-Canton complex, 3 to 15 percent slopes		5.7	57.5%
Totals for Area of Interest			**9.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B

GOVE ENVIRONMENTAL SERVICES, INC

SITE-SPECIFIC SOIL SURVEY REPORT
For
Dunlin Way, Portsmouth, NH
By
GES, Inc.
Project # 2025043
Date: 06-17-2025

1. MAPPING STANDARDS

Site-Specific Soil Mapping Standards for New Hampshire and Vermont. SSSNNE Special Publication No. 3, Version 7.0, July, 2021.

This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, intended for infiltration requirements by the NH DES Alteration of Terrain Bureau. The soil map was produced by a professional soil scientist and is not a product of the USDA Natural Resources Conservation Service. This report accompanies the soil map.

The site-specific soil map (SSSM) was produced 06-17-2025; prepared by JP Gove, CSS #004, GES, Inc.

Soils were identified with the New Hampshire State-wide Numerical Soils Legend, USDA NRCS, Durham, NH. Issue # 10, January 2011.

Hydrologic Soil Group was determined using SSSNNE Special Publication No. 5, Ksat Values for New Hampshire Soils, September 2009.

High Intensity Soil Map symbols, based upon SSSNNE Special Publication 1, December 2017, were added to the Soil Legend.

Scale of soil map: Approximately 1" = 40"

Contours Interval: 2 feet

2. LANDFORMS & EXISTING CONDITIONS:

The site is located on two landforms. The northern portion of the site was originally housing, which has been demolished. This portion of the site was used for material storage and mixing of soil materials. The northern portion of the site is relatively flat and is underlain with marine silts and clays. The upper soil layers are a variable mix of loams, gravels, stone, etc. The upper layers of fill material range from 3 to 5 feet deep.

The southern portion of the site is a steep hill that is relatively undisturbed. It is primarily bedrock with a thin layer of soil over the rock. The rock appears to be slate or phyllite, maybe rippable in spots, but has hard outcrops. The depth to bedrock is somewhat variable, but most of the pits conducted had bedrock present between 20 and 40 inches deep.

3. DATE SOIL MAP PRODUCED

Date(s) of on-site field work: 06-06 and 06-17- 2025 (Wetlands (lack of) evaluated earlier by GES, Inc.).

Date(s) of test pits: 04-02-2025

Test pits recorded by: SW Cole

4. GEOGRAPHIC LOCATION AND SIZE OF SITE

City or town where soil mapping was conducted: Portsmouth

Location: Tax Map 213, Lot 12

Size of area: Approximately 8.4 acres

Was the map for the entire lot? Yes

If no, where was the mapping conducted on the parcel: N/A

5. PURPOSE OF THE SOIL MAP

Was the map prepared to meet the requirement of Alteration of Terrain? Yes

If no, what was the purpose of the map? n/a

Who was the map prepared for? BRORA LLC

6. SOIL IDENTIFICATION LEGEND

Map Unit Symbol	Map Unit Name	HISS Symbol	Hydrologic Soil Group
87	Chatfield (well drained, very stony	227	B
500/dfccc	Udorthents, loamy	363	C

Supplemental Symbols: d = moderately well drained, f =marine silt and clay, c = mineral restrictive layer, c = low estimated Ksat, c = hydrologic group C.

SLOPE PHASE:

0-8%	B	8-15%	C	15-25%	D
25%-50%	E	50%+	F		

7. NARRATIVE MAP UNIT DESCRIPTIONS

SITE-SPECIFIC MAP UNIT: 87

CORRELATED SOIL SERIES: Chatfield (well drained) very stony

LANDSCAPE SETTING: Hillside

CHARACTERISTIC SURFACE FEATURES: Forested, steeply sloping, outcrops

DRAINAGE CLASS: Well drained

PARENT MATERIAL: Bedrock controlled till

NATURE OF DISSIMILAR INCLUSIONS: Hollis, Outcrops, Canton

ESTIMATED PERCENTAGE OF DISSIMILAR INCLUSIONS: 10%

SOIL PROFILE DESCRIPTIONS- horizon designation, depth, soil texture, Munsell color notation, Munsell color of redox features, soil structure, soil consistence, estimated coarse fragments, estimated seasonal high water table (ESHWT), observed water table (OBSWT), kind of water table (perched, apparent, or both), depth to lithic or paralithic contact:

A 0 to 16" 10YR3/2 fsl, gr, fr
B 6 to 30" 10YR4/6, fsl, gr, fr
R=30"
ESHWT = N/A, no OBSWT, perched water table, lithic contact, numerous coarse fragments

SITE-SPECIFIC MAP UNIT: 500/dfccc

CORRELATED SOIL SERIES: Udorthents, loamy

LANDSCAPE SETTING: Excavated/graded area

CHARACTERISTIC SURFACE FEATURES: Smooth, fill hummocks

DRAINAGE CLASS: Moderately well drained

PARENT MATERIAL: Fill over marine

NATURE OF DISSIMILAR INCLUSIONS: Natural soil

ESTIMATED PERCENTAGE OF DISSIMILAR INCLUSIONS: 5%

SOIL PROFILE DESCRIPTIONS- horizon designation, depth, soil texture , Munsell color notation, Munsell color of redox features, soil structure, soil consistence, estimated coarse fragments, estimated seasonal high water table (ESHWT), observed water table (OBSWT), kind of water table (perched, apparent, or both), depth to lithic or paralithic contact:

Fill 0 to 40" 10YR4/2 to 4/4 Loam/silt/gravel massive friable

Possible redox features at 20".

C 40 to 52" 2,5Y5/3, silt loam, blocky, firm, 5YR5/6 redox

ESHWT = 20", OBSWT = 30", perched water table, no lithic contact, many coarse fragments in fill

8. RESPONSIBLE SOIL SCIENTIST

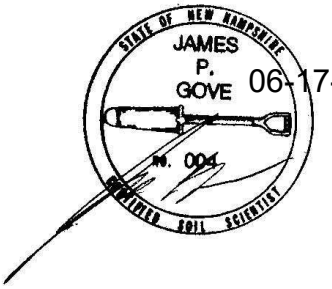
Name: James Gove

Certified Soil Scientist Number: 004

9. OTHER DISTINGUISHING FEATURES OF SITE

Northern portion of site was disturbed many years ago. Some of the site has been remained in active storage, but other areas have had volunteer shrubs take over. However, all of that portion, whether currently cleared or in shrubs, are disturbed soils – Udorthents, loamy.

10. CERTIFIED SOIL SCIENTIST STAMP


STATE OF NEW HAMPSHIRE
JAMES
P.
GOVE
06-17-2025
NO. 004
CERTIFIED SOIL SCIENTIST

8 Continental Dr Unit H, Exeter, NH 03833-7507
Ph (603) 778 0644 / *Fax* (603) 778 0654
www.gesinc.biz
info@gesinc.biz

LEGEND

SITE-SPECIFIC SOIL SURVEY BOUNDARIES

NOTE:
THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, INTENDED FOR INFILTRATION REQUIREMENTS BY THE NH DES ALTERATION OF TERRAIN BUREAU. IT WAS PRODUCED BY A PROFESSIONAL SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE. THERE IS A REPORT THAT ACCOMPANIES THIS MAP.

THE SITE SPECIFIC SOIL MAP WAS PRODUCED 6-17-2025, AND WAS PREPARED BY JAMES P. GROVE, CSS #004, GOVE ENVIRONMENTAL SERVICES, INC.

SOIL IDENTIFICATION LEGEND

Map Unit Symbol	Map Unit Name	HISS Symbol	Hydrologic Soil Group
87	Chatfield (well drained, very stony	227	B
500/dfccc	Udorthents, loamy	363	C

Supplemental Symbols: d = moderately well drained, f =marine silt and clay, c = mineral restrictive layer, c = low estimated Ksat, c = hydrologic group C.

SLOPE PHASE:

0-8%	B	8-15%	C	15-25%	D
25%-50%	E	50%+	F		

STATE OF NEW HAMPSHIRE
JAMES P. GROVE
No. 004
CERTIFIED SOIL SCIENTIST
06-17-2025

Tighe&Bond
Engineers | Environmental Specialists

PROPOSED MULTI-FAMILY DEVELOPMENT

Brora LLC

Portsmouth, NH

MARK	DATE	DESCRIPTION

PROJECT NO:	K0076-065
DATE:	7/30/2025
FILE:	K0076-065_C-HYDRO.DWG
DRAWN BY:	MDC/BKC
CHECKED:	NAH
APPROVED:	PMC

SITE-SPECIFIC SOIL SURVEY PLAN

SCALE: AS SHOWN

1 OF 1

Last Saved: 7/22/2025
Plotted On: July 28, 2025 - 3:25pm By: BCurcio
Tighe & Bond :) \\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-HYDRO.dwg

APPENDIX C

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Metadata for Point

Smoothing	Yes
State	
Location	
Latitude	43.090 degrees North
Longitude	70.776 degrees West
Elevation	10 feet
Date/Time	Mon Jul 14 2025 16:33:15 GMT-0400 (Eastern Daylight Time)

Note: 15% Great Bay Region coastal precipitation increase applied to values in drainage model.

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day
1yr	0.26	0.40	0.50	0.65	0.81	1.04	**1yr**	0.70	0.98	1.21	1.56	2.02	2.65	2.91	**1yr**	2.35	2.80	3.21	3.93
2yr	0.32	0.50	0.62	0.81	1.02	1.30	**2yr**	0.88	1.18	1.51	1.93	2.48	3.20	3.56	**2yr**	2.83	3.42	3.92	4.66
5yr	0.37	0.58	0.73	0.97	1.24	1.60	**5yr**	1.07	1.46	1.88	2.42	3.13	4.05	4.56	**5yr**	3.59	4.39	5.02	5.91
10yr	0.41	0.65	0.82	1.11	1.44	1.88	**10yr**	1.25	1.72	2.22	2.88	3.74	4.85	5.51	**10yr**	4.29	5.30	6.06	7.08
25yr	0.48	0.76	0.96	1.33	1.76	2.32	**25yr**	1.52	2.13	2.76	3.61	4.72	6.15	7.07	**25yr**	5.44	6.80	7.76	8.98
50yr	0.53	0.85	1.09	1.53	2.06	2.74	**50yr**	1.77	2.51	3.27	4.30	5.63	7.36	8.55	**50yr**	6.51	8.22	9.37	10.76
100yr	0.60	0.97	1.25	1.76	2.40	3.22	**100yr**	2.07	2.96	3.86	5.11	6.72	8.82	10.34	**100yr**	7.80	9.94	11.31	12.89
200yr	0.67	1.09	1.41	2.03	2.80	3.80	**200yr**	2.41	3.49	4.58	6.09	8.04	10.56	12.50	**200yr**	9.35	12.02	13.66	15.46
500yr	0.79	1.30	1.69	2.46	3.44	4.72	**500yr**	2.97	4.34	5.71	7.64	10.16	13.42	16.08	**500yr**	11.88	15.46	17.53	19.66

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day
1yr	0.23	0.36	0.44	0.59	0.73	0.88	**1yr**	0.63	0.87	0.92	1.32	1.67	2.21	2.48	**1yr**	1.96	2.39	2.85	3.16
2yr	0.31	0.49	0.60	0.81	1.00	1.19	**2yr**	0.86	1.16	1.37	1.82	2.34	3.05	3.44	**2yr**	2.70	3.31	3.81	4.53
5yr	0.35	0.54	0.67	0.92	1.17	1.40	**5yr**	1.01	1.37	1.61	2.12	2.74	3.78	4.17	**5yr**	3.34	4.01	4.70	5.51
10yr	0.38	0.59	0.73	1.02	1.32	1.60	**10yr**	1.14	1.56	1.81	2.40	3.07	4.36	4.84	**10yr**	3.86	4.66	5.41	6.38
25yr	0.44	0.67	0.83	1.18	1.56	1.90	**25yr**	1.34	1.86	2.10	2.77	3.55	4.67	5.87	**25yr**	4.13	5.64	6.61	7.75
50yr	0.48	0.73	0.91	1.31	1.76	2.16	**50yr**	1.52	2.12	2.35	3.09	3.95	5.27	6.77	**50yr**	4.66	6.51	7.67	8.99
100yr	0.53	0.81	1.01	1.46	2.00	2.47	**100yr**	1.73	2.41	2.62	3.44	4.38	5.91	7.82	**100yr**	5.23	7.52	8.91	10.43
200yr	0.59	0.89	1.12	1.63	2.27	2.81	**200yr**	1.96	2.75	2.93	3.81	4.83	6.61	9.02	**200yr**	5.85	8.67	10.34	12.13
500yr	0.68	1.02	1.31	1.90	2.70	3.36	**500yr**	2.33	3.29	3.40	4.36	5.51	7.66	10.89	**500yr**	6.78	10.47	12.58	14.82

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day
1yr	0.28	0.44	0.54	0.72	0.89	1.08	**1yr**	0.77	1.06	1.25	1.74	2.21	2.98	3.15	**1yr**	2.64	3.03	3.57	4.37
2yr	0.33	0.52	0.64	0.86	1.06	1.26	**2yr**	0.92	1.24	1.48	1.96	2.51	3.42	3.69	**2yr**	3.03	3.55	4.07	4.82
5yr	0.40	0.61	0.76	1.05	1.33	1.61	**5yr**	1.15	1.58	1.88	2.53	3.24	4.32	4.94	**5yr**	3.83	4.75	5.36	6.35
10yr	0.47	0.72	0.89	1.24	1.60	1.97	**10yr**	1.38	1.92	2.27	3.10	3.94	5.32	6.18	**10yr**	4.71	5.94	6.79	7.81
25yr	0.57	0.87	1.08	1.55	2.03	2.55	**25yr**	1.75	2.50	2.94	4.06	5.13	7.79	8.31	**25yr**	6.89	7.99	9.10	10.29
50yr	0.67	1.01	1.26	1.81	2.44	3.10	**50yr**	2.11	3.04	3.58	4.98	6.28	9.76	10.41	**50yr**	8.64	10.01	11.37	12.67
100yr	0.78	1.18	1.48	2.14	2.93	3.78	**100yr**	2.53	3.69	4.35	6.13	7.70	12.22	13.05	**100yr**	10.81	12.55	14.22	15.62
200yr	0.91	1.37	1.74	2.52	3.52	4.61	**200yr**	3.03	4.50	5.31	7.54	9.45	15.34	16.37	**200yr**	13.57	15.74	17.80	19.26
500yr	1.13	1.68	2.16	3.15	4.47	5.97	**500yr**	3.86	5.84	6.89	9.95	12.41	20.74	22.11	**500yr**	18.36	21.26	23.96	25.39

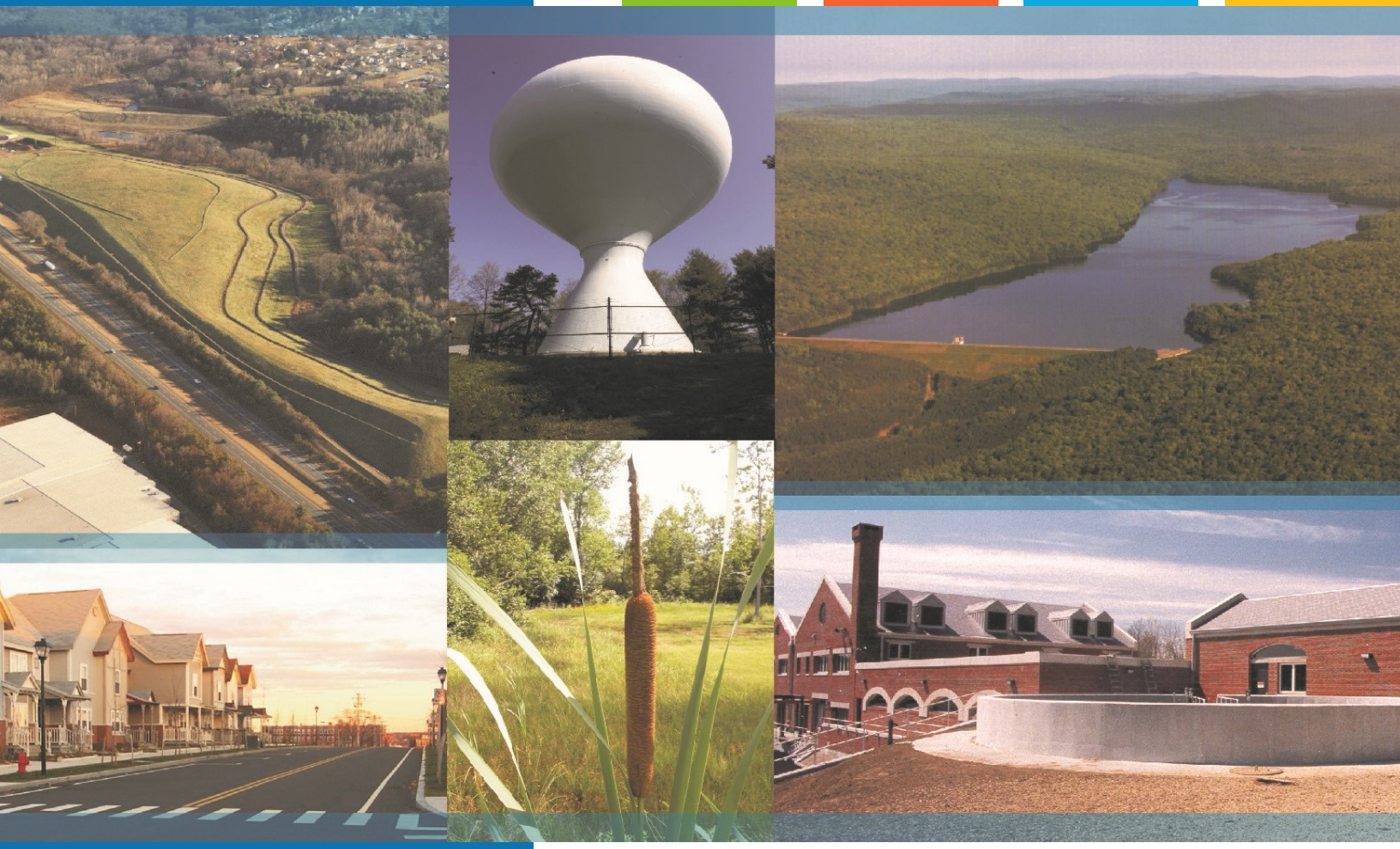
Powered by ACIS
Northeast Regional Climate Center

APPENDIX D

Coastal and Great Bay Region Precipitation Increase		
	24-hr Storm Event (in.)	24-hr Storm Event + 15% (in.)
1 Year	2.65	3.05
2 Year	3.20	3.68
10 Year	4.85	5.58
25 Year	6.15	7.07
50 Year	7.36	8.46
100 Year	8.82	10.14

www.tighebond.com

100% Recyclable



Proposed Multi-Family Development
150 Portsmouth Boulevard
Portsmouth, NH

Long-Term Operation & Maintenance Plan

Brora, LLC

September 22, 2025

Tighe&Bond

100% Recyclable

Section 1 Long-Term Operation & Maintenance Plan

1.1 Contact/Responsible Party 1-1
1.2 Maintenance Items 1-1
1.3 Overall Site Operation & Maintenance Schedule 1-2
1.3.1 Disposal Requirements 1-2
1.4 Snow & Ice Management for Standard Asphalt and Walkways 1-3

Section 2 Invasive Species

Section 3 Annual Updates and Log Requirements

Section 1
Long-Term Operation & Maintenance Plan

It is the intent of this Operation and Maintenance Plan to identify the areas of this site that need special attention and consideration, as well as implementing a plan to assure routine maintenance. By identifying the areas of concern as well as implementing a frequent and routine maintenance schedule the site will maintain a high-quality stormwater runoff.

1.1 Contact/Responsible Party

Brora, LLC
210 Commerce Way, Suite 300
Portsmouth, NH 03801

(Note: The contact information for the Contact/Responsible Party shall be kept current. If ownership changes, the Operation and Maintenance Plan must be transferred to the new party.)

1.2 Maintenance Items

Maintenance of the following items shall be recorded:

- Litter/Debris Removal
- Landscaping
- Catchbasin Cleaning
- Pavement Sweeping
- Bioretention Systems
- Underground Detention Basin
- Flow-Through Pre-treatment and Treatment Units
- Rip Rap Outlets

The following maintenance items and schedule represent the minimum action required. Periodic site inspections shall be conducted, and all measures must be maintained in effective operating condition. The following items shall be observed during site inspection and maintenance:

- Inspect vegetated areas, particularly slopes and embankments for areas of erosion. Replant and restore as necessary
- Inspect catch basins for sediment buildup
- Inspect site for trash and debris

1.3 Overall Site Operation & Maintenance Schedule

Maintenance Item	Frequency of Maintenance
Litter/Debris Removal	Weekly
Pavement Sweeping - Sweep impervious areas to remove sand and litter.	Annually
Landscaping - Landscaped islands to be maintained and mulched.	Maintained as required and mulched each Spring
Catch Basin (CB) Cleaning - CB to be cleaned of solids and oils.	Annually
Bioretention Systems - Trash and debris to be removed. - Any required maintenance shall be addressed.	In accordance with Manufacturer's Recommendations Two (2) times annually After any rainfall event exceeding 2.5" in a 24-hr period
Flow-Through Pre-treatment Units -Visually inspect for blockages or obstruction in the inlet chamber, flumes or outlet channel -Sediment removal once 50% of maximum storage has been reached	In accordance with Manufacturer's Recommendations
Flow-Through Treatment Units - Inspect vault for sediment build up, static water, plugged media and bypass condition - Replace Cartridges	In accordance with Manufacturer's Recommendations
Underground Detention Basin - Visually inspect sediment levels within system	Annually
Rip-Rap Outlets - Visually inspect for damage and deterioration	Annually

1.3.1 Disposal Requirements

Disposal of debris, trash, sediment and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.

1.4 Snow & Ice Management for Standard Asphalt and Walkways

Snow storage areas shall be located such that no direct untreated discharges are possible to receiving waters from the storage site (snow storage areas have been shown on the Site Plan). Salt storage areas shall be covered or located such that no direct untreated discharges are possible to receiving waters from the storage site. Salt and sand shall be used to the minimum extent practical (refer to the attached for de-icing application rate guideline from the New Hampshire Stormwater Management Manual, Volume 2,).

Deicing Application Rate Guidelines

24' of pavement (typcial two-lane road)

These rates are not fixed values, but rather the middle of a range to be selected and adjusted by an agency according to its local conditions and experience.

			Pounds per two-lane mile			
Pavement Temp. (°F) and Trend (↑↓)	Weather Condition	Maintenance Actions	Salt Prewetted / Pretreated with Salt Brine	Salt Prewetted / Pretreated with Other Blends	Dry Salt*	Winter Sand (abrasives)
> 30° ↑	Snow	Plow, treat intersections only	80	70	100*	Not recommended
	Freezing Rain	Apply Chemical	80 - 160	70 - 140	100 - 200*	Not recommended
30° ↓	Snow	Plow and apply chemical	80 - 160	70 - 140	100 - 200*	Not recommended
	Freezing Rain	Apply Chemical	150 - 200	130 - 180	180 - 240*	Not recommended
25° - 30° ↑	Snow	Plow and apply chemical	120 - 160	100 - 140	150 - 200*	Not recommended
	Freezing Rain	Apply Chemical	150 - 200	130 - 180	180 - 240*	Not recommended
25° - 30° ↓	Snow	Plow and apply chemical	120 - 160	100 - 140	150 - 200*	Not recommended
	Freezing Rain	Apply Chemical	160 - 240	140 - 210	200 - 300*	400
20° - 25° ↑	Snow or Freezing Rain	Plow and apply chemical	160 - 240	140 - 210	200 - 300*	400
20° - 25° ↓	Snow	Plow and apply chemical	200 - 280	175 - 250	250 - 350*	Not recommended
	Freezing Rain	Apply Chemical	240 - 320	210 - 280	300 - 400*	400
15° - 20° ↑	Snow	Plow and apply chemical	200 - 280	175 - 250	250 - 350*	Not recommended
	Freezing Rain	Apply Chemical	240 - 320	210 - 280	300 - 400*	400
15° - 20° ↓	Snow or Freezing Rain	Plow and apply chemical	240 - 320	210 - 280	300 - 400*	500 for freezing rain
0° - 15° ↑↓	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	300 - 400	Not recommended	500 - 750 spot treatment as needed
< 0°	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	400 - 600**	Not recommended	500 - 750 spot treatment as needed

* Dry salt is not recommended. It is likely to blow off the road before it melts ice.

** A blend of 6 - 8 gal/ton $MgCl_2$ or $CaCl_2$ added to NaCl can melt ice as low as -10°.

Anti-icing Route Data Form				
Truck Station:				
Date:				
Air Temperature	Pavement Temperature	Relative Humidity	Dew Point	Sky
Reason for applying:				
Route:				
Chemical:				
Application Time:				
Application Amount:				
Observation (first day):				
Observation (after event):				
Observation (before next application):				
Name:				

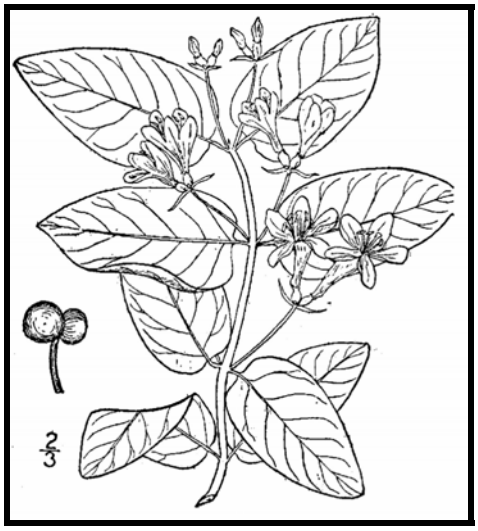
Section 2
Invasive Species

With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem is classified as an invasive species. Refer to the following fact sheet prepared by the University of New Hampshire Cooperative Extension entitled Methods for Disposing Non-Native Invasive Plants for recommended methods to dispose of invasive plant species.

UNIVERSITY of NEW HAMPSHIRE COOPERATIVE EXTENSION

Methods for Disposing Non-Native Invasive Plants

Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle
Lonicera tatarica
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

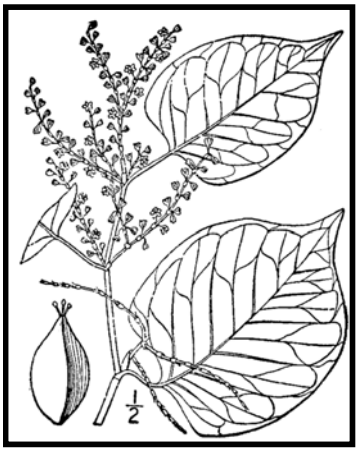
Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag "head first" at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can't be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn't be burned as the seeds may disperse by the hot air created by the fire.



Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don't reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn't used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don't compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.

Be diligent looking for seedlings for *years* in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

<table>
<tr><th>Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">Norway maple
(Acer platanoides)
European barberry
(Berberis vulgaris)
Japanese barberry
(Berberis thunbergii)
autumn olive
(Elaeagnus umbellata)
burning bush
(Euonymus alatus)
Morrow's honeysuckle
(Lonicera morrowii)
Tatarian honeysuckle
(Lonicera tatarica)
showy bush honeysuckle
(Lonicera x bella)
common buckthorn
(Rhamnus cathartica)
glossy buckthorn
(Frangula alnus)</td><td rowspan="2">Fruit and Seeds
 </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Use as firewood.
▪ Make a brush pile.
▪ Chip.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip once all fruit has dropped from branches.
▪ Leave resulting chips on site and monitor.</td></tr>
<tr><td rowspan="2">oriental bittersweet
(Celastrus orbiculatus)
multiflora rose
(Rosa multiflora)</td><td rowspan="2">Fruits, Seeds, Plant Fragments
 </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Make a brush pile.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.</td></tr>
</table>

<table>
<tr><th>Non-Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">garlic mustard
(Alliaria petiolata)
spotted knapweed
(Centaurea maculosa)
▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling.
black swallow-wort
(Cynanchum nigrum)
▪ May cause skin rash. Wear gloves and long sleeves when handling.
pale swallow-wort
(Cynanchum rossicum)
giant hogweed
(Heracleum mantegazzianum)
▪ Can cause major skin rash. Wear gloves and long sleeves when handling.
dame’s rocket
(Hesperis matronalis)
perennial pepperweed
(Lepidium latifolium)
purple loosestrife
(Lythrum salicaria)
Japanese stilt grass
(Microstegium vimineum)
mile-a-minute weed
(Polygonum perfoliatum)</td><td rowspan="2">Fruits and Seeds
 </td><td>Prior to flowering
Depends on scale of infestation
Small infestation
▪ Pull or cut plant and leave on site with roots exposed.

Large infestation
▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting).
▪ Monitor. Remove any re-sprouting material.</td></tr>
<tr><td>During and following flowering
Do nothing until the following year or remove flowering heads and bag and let rot.

Small infestation
▪ Pull or cut plant and leave on site with roots exposed.

Large infestation
▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting).
▪ Monitor. Remove any re-sprouting material.</td></tr>
<tr><td>common reed
(Phragmites australis)
Japanese knotweed
(Polygonum cuspidatum)
Bohemian knotweed
(Polygonum x bohemicum)</td><td>Fruits, Seeds, Plant Fragments
Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn’t materially influence disposal activities.</td><td>Small infestation
▪ Bag all plant material and let rot.
▪ Never pile and use resulting material as compost.
▪ Burn.

Large infestation
▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile.
▪ Monitor and remove any sprouting material.
▪ Pile, let dry, and burn.</td></tr>
</table>

January 2010

UNH Cooperative Extension programs and policies are consistent with pertinent Federal and State laws and regulations, and prohibits discrimination in its programs, activities and employment on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sex, sexual orientation, or veteran’s, marital or family status. College of Life Sciences and Agriculture, County Governments, NH Dept. of Resources and Economic Development, Division of Forests and Lands, NH Fish and Game ,and U.S. Dept. of Agriculture cooperating.

Managing Invasive Plants
Methods of Control

by Christopher Mattrick

They're out there. The problem of invasive plants is as close as your own backyard.

Maybe a favorite dogwood tree is struggling in the clutches of an Oriental bittersweet vine. Clawlike canes of multiflora rose are scratching at the side of your house. That handsome burning bush you planted few years ago has become a whole clump in practically no time … but what happened to the azalea that used to grow right next to it?

If you think controlling or managing invasive plants on your property is a daunting task, you're not alone. Though this topic is getting lots of attention from federal, state, and local government agencies, as well as the media, the basic question for most homeowners is simply, "How do I get rid of the invasive plants in my own landscape?" Fortunately, the best place to begin to tackle this complex issue is in our own backyards and on local conservation lands. We hope the information provided here will help you take back your yard. We won't kid you—there's some work involved, but the payoff in beauty, wildlife habitat, and peace of mind makes it all worthwhile.

PLAN OF ATTACK

Three broad categories cover most invasive plant control: mechanical, chemical, and biological. Mechanical control means physically removing plants from the environment through cutting or pulling. Chemical control uses herbicides to kill plants and inhibit regrowth. Techniques and chemicals used will vary depending on the species. Biological controls use plant diseases or insect predators, typically from the targeted species' home range. Several techniques may be effective in controlling a single species, but there is usually one preferred method—the one that is most resource efficient with minimal impact on non-target species and the environment.

Spraying chemicals to control invasive plants.

MECHANICAL CONTROL METHODS

Mechanical treatments are usually the first ones to look at when evaluating an invasive plant removal project. These procedures do not require special licensing or introduce chemicals into the environment. They do require permits in some situations, such as wetland zones. [See sidebar on page 23.] Mechanical removal is highly labor intensive and creates a significant amount of site disturbance, which can lead to rapid reinvasion if not handled properly.

Pulling and digging

Many herbaceous plants and some woody species (up to about one inch in diameter), if present in limited quantities, can be pulled out or dug up. It's important to remove as much of the root system as possible; even a small portion can restart the infestation. Pull plants by hand or use a digging fork, as shovels can shear off portions of the root system, allowing for regrowth. To remove larger woody stems (up to about three inches in diameter), use a Weed Wrench™, Root Jack, or Root Talon. These tools, available from several manufacturers, are designed to remove the aboveground portion of the plant as well as the entire root system. It's easiest to undertake this type of control in the spring or early summer when soils are moist and plants come out more easily.

Using tools to remove woody stems.

Volunteers hand pulling invasive plants.

Suffocation

Try suffocating small seedlings and herbaceous plants. Place double or triple layers of thick UV-stabilized plastic sheeting, either clear or black (personally I like clear), over the infestation and secure the plastic with stakes or weights. Make sure the plastic extends at least five feet past the edge of infestation on all sides. Leave the plastic in place for at least two years. This technique will kill everything beneath the plastic—invasive and non-invasive plants alike. Once the plastic is removed, sow a cover crop such as annual rye to prevent new invasions.

Cutting or mowing

This technique is best suited for locations you can visit and treat often. To be effective, you will need to mow or cut infested areas three or four times a year for up to five years. The goal is to interrupt the plant's ability to photosynthesize by removing as much leafy material as possible. Cut the plants at ground level and remove all resulting debris from the site. With this treatment, the infestation may actually appear to get worse at first, so you will need to be as persistent as the invasive plants themselves. Each time you cut the plants back, the root system gets slightly larger, but must also rely on its energy reserves to push up new growth. Eventually, you will exhaust these reserves and the plants will die. This may take many years, so you have to remain committed to this process once you start; otherwise the treatment can backfire, making the problem worse.

CHEMICAL CONTROL METHODS

Herbicides are among the most effective and resource-efficient tools to treat invasive species. Most of the commonly known invasive plants can be treated using only two herbicides—glyphosate (the active ingredient in Roundup™ and Rodeo™) and triclopyr (the active ingredient in Brush-B-Gone™ and Garlon™). Glyphosate is non-selective, meaning it kills everything it contacts. Triclopyr is selective and does not injure monocots (grasses, orchids, lilies, etc.). Please read labels and follow directions precisely for both environmental and personal safety. These are relatively benign herbicides, but improperly used they can still cause both short- and long-term health and environmental problems. Special aquatic formulations are required when working in wetland zones. You are required to have a state-issued pesticide applicator license when applying these chemicals on land you do not own. To learn more about the pesticide regulations in your state, visit or call your state's pesticide control division, usually part of the state's Department of Agriculture. In wetland areas, additional permits are usually required by the Wetlands Protection Act. [See sidebar on page 23.]

Foliar applications

When problems are on a small scale, this type of treatment is usually applied with a backpack sprayer or even a small handheld spray bottle. It is an excellent way to treat large monocultures of herbaceous plants, or to spot-treat individual plants that are difficult to remove mechanically, such as goutweed, swallowwort, or purple loosestrife. It is also an effective treatment for some woody species, such as Japanese barberry, multiflora rose, Japanese honeysuckle, and Oriental bittersweet that grow in dense masses or large numbers over many acres. The herbicide mixture should contain no more than five percent of the active ingredient, but it is important to follow the instructions on the product label. This treatment is most effective when the plants are actively growing, ideally when they are flowering or beginning to form fruit. It has been shown that plants are often more susceptible to this type of treatment if the existing stems are cut off and the regrowth is treated. This is especially true for Japanese knotweed. The target plants should be thoroughly wetted with the herbicide on a day when there is no rain in the forecast for the next 24 to 48 hours.

Cut stem treatments

There are several different types of cut stem treatments, but here we will review only the one most commonly used. All treatments of this type require a higher concentration of the active ingredient than is used in foliar applications. A 25 to 35 percent solution of the active ingredient should be used for cut stem treatments, but read and follow all label instructions. In most cases, the appropriate herbicide is glyphosate, except for Oriental bittersweet, on which triclopyr should be used. This treatment can be used on all woody stems, as well as phragmites and Japanese knotweed.

For woody stems, treatments are most effective when applied in the late summer and autumn—between late August and November. Stems should be cut close to the ground, but not so close that you will lose track of them. Apply herbicide directly to the cut surface as soon as possible after cutting. Delaying the application will reduce the effectiveness of the treatment. The herbicide can be applied with a sponge, paintbrush, or spray bottle.

Cut stem treatment tools.

For phragmites and Japanese knotweed, treatment is the same, but the timing and equipment are different. Plants should be treated anytime from mid-July through September, but the hottest, most humid days of the summer are best for this method. Cut the stems halfway between two leaf nodes at a comfortable height. Inject (or squirt) herbicide into the exposed hollow stem. All stems in an infestation should be treated. A wash bottle is the most effective application tool, but you can also use an eyedropper, spray bottle, or one of the recently developed high-tech injection systems.

It is helpful to mix a dye in with the herbicide solution. The dye will stain the treated surface and mark the areas that have been treated, preventing unnecessary reapplication. You can buy a specially formulated herbicide dye, or use food coloring or laundry dye.

There is not enough space in this article to describe all the possible ways to control invasive plants. You can find other treatments, along with more details on the above-described methods, and species-specific recommendations on The Nature Conservancy Web site (tncweeds.ucdavis.edu). An upcoming posting on the Invasive Plant Atlas of New England (www.ipane.org) and the New England Wild Flower Society (www.newfs.org) Web sites will also provide further details.

Hollow stem injection tools.

Biological controls—still on the horizon

Biological controls are moving into the forefront of control methodology, but currently the only widely available and applied biocontrol relates to purple loosestrife. More information on purple loosestrife and other biological control projects can be found at www.invasiveplants.net.

DISPOSAL OF INVASIVE PLANTS

Proper disposal of removed invasive plant material is critical to the control process. Leftover plant material can cause new infestations or reinfest the existing project area. There are many appropriate ways to dispose of invasive plant debris. I've listed them here in order of preference.

1. **Burn it**—Make a brush pile and burn the material following local safety regulations and restrictions, or haul it to your town's landfill and place it in their burn pile.

2. **Pile it**—Make a pile of the woody debris. This technique will provide shelter for wildlife as well.

3. **Compost it**—Place all your herbaceous invasive plant debris in a pile and process as compost. Watch the pile closely for resprouts and remove as necessary. Do not use the resulting compost in your garden. The pile is for invasive plants only.

Injecting herbicide into the hollow stem of phragmites.

4. **Dry it/cook it**—Place woody debris out on your driveway or any asphalt surface and let it dry out for a month. Place herbaceous material in a doubled-up black trash bag and let it cook in the sun for one month. At the end of the month, the material should be non-viable and you can dump it or dispose of it with the trash. The method assumes there is no viable seed mixed in with the removed material.

Care should be taken in the disposal of all invasive plants, but several species need extra attention. These are the ones that have the ability to sprout vigorously from plant fragments and should ideally be burned or dried prior to disposal: Oriental bittersweet, multiflora rose, Japanese honeysuckle, phragmites, and Japanese knotweed.

Christopher Mattrick is the former Senior Conservation Programs Manager for New England Wild Flower Society, where he managed conservation volunteer and invasive and rare plant management programs. Today, Chris and his family work and play in the White Mountains of New Hampshire, where he is the Forest Botanist and Invasive Species Coordinator for the White Mountain National Forest.

Controlling Invasive Plants in Wetlands

Special concerns; special precautions

Control of invasive plants in or around wetlands or bodies of water requires a unique set of considerations. Removal projects in wetland zones can be legal and effective if handled appropriately. In many cases, herbicides may be the least disruptive tools with which to remove invasive plants. You will need a state-issued pesticide license to apply herbicide on someone else's property, but all projects in wetland or aquatic systems fall under the jurisdiction of the Wetlands Protection Act and therefore require a permit. ***Yes, even hand-pulling that colony of glossy buckthorn plants from your own swampland requires a permit.*** Getting a permit for legal removal is fairly painless if you plan your project carefully.

1. Investigate and understand the required permits and learn how to obtain them. The entity charged with the enforcement of the Wetlands Protection Act varies from state to state. For more information in your state, contact:

   ME: Department of Environmental Protection
   www.state.me.us/dep/blwq/docstand/nrpapage.htm

   NH: Department of Environmental Services
   www.des.state.nh.us/wetlands/

   VT: Department of Environmental Conservation
   www.anr.state.vt.us/dec/waterq/permits/htm/pm_cud.htm

   MA: Consult your local town conservation commission

   RI: Department of Environmental Management
   www.dem.ri.gov/programs/benviron/water/permits/fresh/index.htm

   CT: Consult your local town Inland Wetland and Conservation Commission

2. Consult an individual or organization with experience in this area. Firsthand experience in conducting projects in wetland zones and navigating the permitting process is priceless. Most states have wetland scientist societies whose members are experienced in working in wetlands and navigating the regulations affecting them. A simple Web search will reveal the contact point for these societies. Additionally, most environmental consulting firms and some nonprofit organizations have skills in this area.

3. Develop a well-written and thorough project plan. You are more likely to be successful in obtaining a permit for your project if you submit a project plan along with your permit application. The plan should include the reasons for the project, your objectives in completing the project, how you plan to reach those objectives, and how you will monitor the outcome.

4. Ensure that the herbicides you plan to use are approved for aquatic use. Experts consider most herbicides harmful to water quality or aquatic organisms, but rate some formulations as safe for aquatic use. Do the research and select an approved herbicide, and then closely follow the instructions on the label.

5. If you are unsure—research, study, and most of all, ask for help. Follow the rules. The damage caused to aquatic systems by the use of an inappropriate herbicide or the misapplication of an appropriate herbicide not only damages the environment, but also may reduce public support for safe, well-planned projects.

Section 3
Annual Updates and Log Requirements

The Owner and/or Contact/Responsible Party shall review this Operation and Maintenance Plan once per year for its effectiveness and adjust the plan and deed as necessary.

A log of all preventative and corrective measures for the stormwater system shall be kept on-site and be made available upon request by any public entity with administrative, health environmental or safety authority over the site including NHDES.

Copies of the Stormwater Maintenance report shall be submitted to the City of Portsmouth on an annual basis.

Stormwater Management Report						
Multifamily Development		**150 Portsmouth Boulevard**				
BMP Description	**Date of Inspection**	**Inspector**	**BMP Installed and Operating Properly?**	**Cleaning / Corrective Action Needed**	**Date of Cleaning / Repair**	**Performed By**
Deep Sump CB's			❑Yes ❑No			
Flow-Through Treatment Unit #1			❑Yes ❑No			
Flow-Through Pre-Treatment Unit #1			❑Yes ❑No			
Flow-Through Pre-Treatment Unit #2			❑Yes ❑No			
Bioretention System #1			❑Yes ❑No			
Bioretention System #2			❑Yes ❑No			
Bioretention System #3			❑Yes ❑No			
Underground Detention Basin			❑Yes ❑No			
Rip-Rap Outlet #1						

FocalPoint

BIOFILTRATION SYSTEMS

Operations & Maintenance

FERGUSON WATERWORKS

Ferguson.com/waterworks | 800.721.2590

GENERAL DESCRIPTION

The following general specifications describe the general operations and maintenance requirements for the FocalPoint® High Performance Modular Biofiltration System (HPMBS). The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, modular, constructed in place system designed to treat contaminated runoff.

Stormwater enters the HPMBS, is filtered by the High Performance Biofiltration Media and passes through to the underdrain/storage system where the treated water is detained, retained or infiltrated to sub-soils, prior to discharge to the storm sewer system of any remaining flow.

Higher flows bypass the FocalPoint® via a downstream inlet or other overflow conveyance. Maintenance is a simple, inexpensive and safe operation that does not require confined space entry, pumping or vacuum equipment, or specialized tools. Properly trained landscape personnel can effectively maintain FocalPoint® Stormwater systems by following instructions in this manual.

BASIC OPERATIONS

FocalPoint® is a modular, high performance biofiltration system that often works in tandem with other integrated management practices (IMP). Contaminated stormwater runoff enters the biofiltration bed through a conveyance swale, planter box, or directly through a curb cut or false inlet. Energy is dissipated by a rock or vegetative dissipation device and is absorbed by a 3-inch layer of aged, double shreddded hardwood mulch, with fines removed, (when specified) on the surface of the biofiltration media.

As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the biofiltration media where the finer particles are removed and numerous chemical reactions take place to immobilize and capture pollutants in the soil media.

The cleansed water passes into the underdrain/storage system and remaining flows are directed to a storm sewer system or other appropriate discharge point. Once the pollutants are in the soil, bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a variety of very complex biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

DESIGN AND INSTALLATION

Each project presents different scopes for the use of FocalPoint® system. To ensure the safe and specified function of this stormwater BMP, Convergent Water Technologies and/or its Value Added Resellers (VAR) review each application before supply. Information and design assistance is available to the design engineer during the planning process. Correct FocalPoint® sizing is essential to optimum performance. The engineer shall submit calculations for approval by the local jurisdiction when required. The contractor and/or VAR is responsible for the correct installation of FocalPoint units as described in approved plans. A comprehensive installation manual is available at www.convergentwater.com.

MAINTENANCE

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons for maintenance include:

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the lifespan of your FocalPoint HPMBS.
- Avoid costly repairs.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the FocalPoint® is required to continue effective pollutant removal from stormwater runoff before any discharge into downstream waters. This procedure will also extend the longevity of the living biofiltration system. The unit will recycle and accumulate pollutants within the biomass, but may also subjected to other materials entering the surface of the system. This may include trash, silt and leaves etc. which will be contained above the mulch and/or biofiltration media layer. Too much silt may inhibit the FocalPoint's® flow rate, which is a primary reason for system maintenance. Removal of accumulated silt/sediment and/or replacement of the mulch layer (when specified), is an important activity that prevents overaccumulation of such silt/sediment.

When to Maintain?

The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as when the site is appropriately stabilized and the unit is installed and activated (i.e., when mulch and plantings are added).

Activation should be avoided until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after storm events of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the VAR/Maintenance contractor and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the VAR/Maintenance contractor of any damage to the plant(s), which constitute(s) an integral part of the biofiltration technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance of the HPMBS to the VAR/Maintenance contractor (i.e. no pruning or fertilizing).

EXCLUSION OF SERVICES

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant(s) in the FocalPoint® system.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the VAR/Maintenance contractor maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the FocalPoint® (where the cleaned runoff drains to, such as drop-inlet) and block off the point where water enters of the FocalPoint®. The VAR/Maintenance contractor should be informed immediately.

MAINTENANCE VISIT SUMMARY

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of FocalPoint® and surrounding area
2. Removal of debris, trash and mulch
3. Mulch replacement
4. Plant health evaluation (including measurements) and pruning or replacement as necessary
5. Clean area around FocalPoint®
6. Complete paperwork, including date stamped photos of the tasks listed above.

MAINTENANCE TOOLS, SAFETY EQUIPMENT AND SUPPLIES

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes.

MAINTENANCE VISIT PROCEDURE

Inspection of FocalPoint® and surrounding area

Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

- Standing Water yes | no
- Is Bypass Inlet Clear? yes | no
- Damage to HPMBS System yes | no
- to Overflow conveyance yes | no

Removal of Silt / Sediment / Clay

Dig out silt (if any) and mulch and remove trash & foreign items.

- Silt / Clay Found? yes | no
- Cups / Bags Found? yes | no
- Leaves? yes | no
- Volume of material removed _____ (volume or weight)

Removal of debris, trash and mulch

After removal of mulch and debris, measure distance from the top of the FocalPoint® engineered media soil to the flow line elevation of the adjacent overflow conveyance. If this distance is greater than that specified on the plans (typ. 6" - 12"), add FocalPoint® media (not top soil or other) to recharge to the distance specified.

- Distance to media surface to flow line of overflow conveyance (inches) _____
- # of Buckets of Media Added _____

Mulch Replacement

Most maintenance visits require only replacement mulch (if utilized). Bags of clean, double shredded hardwood mulch are typically used for smaller biofiltration beds, however larger systems may require truck loads of mulch. For smaller projects, one cubic foot of mulch will cover four square feet of biofiltration bed, and for larger projects, one cubic yard of mulch will cover 108 square feet of biofiltration bed. Some visits may require additional FocalPoint® engineered soil media available from the VAR/Contractor.

- Add double shredded, aged hardwood mulch which has been screened to remove fines, evenly across the entire biofiltration media bed to a depth of 3".
- Clean accumulated sediment from energy dissipation system at the inlet to the FocalPoint® system to allow for entry of trash during a storm event.

Plant health evaluation and pruning or replacement as necessary

Examine the plant's health and replace if dead or dying.
Prune as necessary to encourage growth in the correct directions

- Height above Grade (feet) _____
- Width at Widest point (feet) _____
- Health alive | dead
- Damage to Plant yes | no

Clean area around FocalPoint®

- Clean area around unit and remove all refuse to be disposed of appropriately.

Complete paperwork

- Deliver Maintenance Report and photographs as appropriate.
- Some jurisdictions may require submission of maintenance reports in accordance with approvals.
- It is the responsibility of the Owner to comply with local regulations.

FocalPoint

BIOFILTRATION SYSTEM

FocalPoint Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.

Maintenance Checklist

Element	Problem	What To Check	Should Exist	Action
Inlet	Excessiver sediment or trash accumulation	Accumulation of sediment or trash impair free flow of water into FocalPoint	Inlet free of obstructions allowing free flow into FocalPoint System	Sediments or trash should be removed
Mulch Cover	Trash and floatable debris accumulation	Excessive trash or debris accumulation.	Minimal trash or other debris on mulch cover	Trash and debris should be removed and mulch cover raked level. Ensure that bark nugget
Mulch Cover	Ponding of water on mulch cover	Ponding in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils	Stormwater should drain freely and evenly over mulch cover.	Contact VAR for advice.
Plants	Plants not growing, or in poor condition	Soil/mulch too wet, evidence of spill. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact VAR for advice.
Plants	Plant growth excessive	Plants should be appropriate to the species and location of FocalPoint		Trim/prune plants in accordance with typical landscaping and

www.tighebond.com

100% Recyclable

Hillside Multifamily Development Project Resource Area Delineation

TO: Kimery Poldrack, SVP, Development & Construction

FROM: Stefanie Tetreault, CWS, PWS, Tighe & Bond
Lucas Acaba, Tighe & Bond

COPY: Patrick Crimmins, PE, Vice President
Neil Hansen, PE, Project Manager

DATE: September 17, 2025

The Kane Company has contracted with Tighe & Bond to provide wetland science services to support the design and permitting of the Hillside Multifamily Development Project on Portsmouth Boulevard and Dunlin Way in Portsmouth, New Hampshire. This memorandum describes Tighe & Bond's delineation and characterization of the existing wetland resource areas and condition of the 100-foot buffer to address the requirements of Section 10.1017.22(3) of the City of Porsmouth Zoning Ordinance (Chapter 10).

1 Site Location

The wetland delineation performed by Tighe & Bond was limited to the north side of Portsmouth Boulevard within 215 Commerce way (Map 216, Lot 1-8A) and off Dunlin Way (Map 213, Lot 11). The surrounding area consists of commercial properties to the west, moderate density residences to the east and south, and the Boston and Maine Railroad to the northeast. The Piscataqua River is located approximately 800 feet to the north. The development project is located on the south side of Portsmouth Boulevard (150 Portsmouth Boulevard; City of Portsmouth Tax Map 213 Lot 12; delineated by others). A Site Location Map is provided as Figure 1 in Attachment 1.

2 Wetland Resource Area Investigation

2.1 Methodology of Resource Area Investigation

On March 14, 2025, a Tighe & Bond New Hampshire Certified Wetland Scientist (CWS) visited the site to identify and delineate wetland resource areas and evaluate the jurisdictional status of each relative to local, state, and federal criteria. Jurisdictional wetland resource areas in the vicinity of the proposed work were delineated in accordance with the United States Army Corps of Engineers' (USACE) *Wetlands Delineation Manual and Regional Supplement* (2012), Field Indicators for Identifying Hydric Soils in New England (Version 4, 2017), and the New Hampshire Code of Administrative Rules: Delineation and Classification of Jurisdictional Areas (Chapter Env-Wt 400). The evaluation also included a review of publicly available resources such as LiDAR elevation data and historic aerial imagery.

Wetland resources were marked with survey flagging that was sequentially labeled alphanumerically. Flags were located using traditional survey methods. Local weather yielded

approximately 1.33-inches of rain in the week prior to the field delineation.[1] The site conditions were not considered atypical or problematic at the time of the delineation.

A Site Map showing the wetland delineation flag locations in provided as Figure 2 in Attachment 1. Representative photographs of the site are provided in Attachment 2.

2.2 Summary of Wetland Resource Areas

The following wetland resource areas were observed within the site: non-tidal wetlands and 100-foot buffer which are subject to jurisdiction under New Hampshire Statutes Title L – Water Management and Protection, Fill and Dredge in Wetlands (Chapter 482-A) and the City of Portsmouth Zoning Ordinance (Chapter 10), respectively.

The wetland resource areas observed in the field are described herein. A summary of wetland flag series is presented in Table 1-1.

TABLE 1-1
Summary of Wetland Delineation Series

Series	Points	Wetland Classification
1A	1A-1 through 1A-33	PSS1E[1]
2A	2A-1 through 2A-7	PEM1E[1]

[1] Classification of Wetlands and Deepwater Habitats of the United States by Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979.

2.2.1 Non-tidal Wetland

Wetlands are defined at RSA 482-A:2, X as "…an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal conditions does support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

2.2.1.1 Series 1A

Series 1A defines the southeastern boundary of a non-tidal wetland to the northwest of Portsmouth Boulevard. The wetland is classified as palustrine, scrub-shrub, broad-leaved deciduous, seasonally flooded/saturated (PSS1E). Wetland vegetation observed included common winterberry (*Ilex verticilata*; FACW), speckled alder (*Alnus incana*; FACW), silky dogwood (*Swida amomum*; FACW), common reed (*Phragmites australis*; FACW), sensitive fern (*Onoclea sensibilis*; FACW), jewelweed (*Impatiens capensis*; FACW), and common wrinkle-leaved goldenrod (*Solidago rugosa*; FAC). Soil observed within the wetland consisted of 6 inches of sandy loam (10YR 2/1) underlain by 6 inches of sandy loam (10YR 2/1) with prominent redoximorphic concentrations (10YR 4/6).

The boundary between the wetland and adjacent uplands to the southeast was delineated by a transition to sandy loam (10YR 3/1) over compacted gravel soil and a transition to upland

[1] Weather Station ID: KMEELIOT27 (43.097° N, 70.768° W; Eliot, ME). Accessed via Weather Underground on 9/17/2025; https://www.wunderground.com/dashboard/pws/KMEELIOT27.

vegetation such as autumn olive (*Elaeagnus umbellata*; NC), staghorn sumac (*Rhus hirta*; NC), and Norway spruce (*Picea abies*; NC).

2.2.1.2 Series 2A

Series 2A defines the southwestern boundary of a non-tidal wetland to the northeast of Portsmouth Boulevard. The wetland is classified as palustrine, emergent, persistent, seasonally flooded/saturated (PEM1E). Wetland vegetation observed included red-osier dogwood (*Swida sericea*; FACW), smooth arrowwood (*Viburnum dentatum*; FAC), cattail (*Typha latifolia.*; OBL), sensitive fern (*O. sensibilis*; FACW), jewelweed (*I. capensis*; FACW), purple loosestrife (*Lythrum salicaria*; OBL), common grass-leaved goldenrod (*Euthamia gramnifolia*; FAC), and Devil's beggar-ticks (*Bidens frondosa*; FACW). Soil observed within the wetland consisted of 6 inches of sandy clay (10YR 5/1) underlain by 10 inches of sandy clay (10YR 6/1) with prominent redoximorphic concentrations (10YR 4/6).

The boundary between the wetland and adjacent uplands to the southwest was delineated by a transition to compacted sandy loam (10YR 4/4) and a transition to a forested plant community dominated by Norway maple (*Acer platanoides*; UPL), European privet (*Ligustrum vulgare*; FACU), European buckthorn (*Rhamnus cathartica*; FAC), and Japanese knotweed (*Fallopia japonica*; FACU).

2.2.2 100-foot Buffer

The 100-foot buffer from Wetlands 1A and 2A within the delineated area includes both forested areas and open meadows to the north and south of Portsmouth Boulevard as well as the paved roadway of Portsmouth Boulevard. Approximately 6% of the 100-foot buffer within the delineated area consists of the paved roadway of Portsmouth Boulevard.

Dominant vegetation observed within the forested areas included sugar maple (*Acer saccharum*; FACU), Norway maple (*A. platanoides*; UPL), staghorn sumac (*R. hirta*; NC), quaking aspen (*Populus tremuloides*; FACU), box elder (*Acer negundo*; FAC), crab apple (*Malus sp.*; NC), autumn olive (*E. umbellata*; NC), and European buckthorn (*R. cathartica*; FAC). Dominant vegetation observed within the open meadow areas included Canada goldenrod (*Solidago canadensis*; FACU), mugwort (*Artemisia vulgaris*; UPL), Queen Anne's Lace (*Daucus carota*; NC), common tansy (*Tancetum vulgare*; FACU), purple loosestrife (*L. salicaria*; OBL), common ragweed (*Ambrosia artemisiifolia*; FACU), and awl American-aster (*Symphyotrichum pilosum*; FACU). Overall, the observed vegetative community consisted of approximately 35% percent cover of invasive plant species.

2.2.2.1 100-foot Buffer Within Project Area

Approximately 29,000 square feet (sf) of the proposed project area is located within the 100-foot buffer of Wetland 1A. This includes approximately 20,000 sf (69%) within the Portsmouth Boulevard Right-of-Way which consists of the paved roadway and shoulders. Approximately 9,000 sf (31%) of the 100-foot buffer to Wetland 1A is located within 150 Portsmouth Boulevard (Map 213, Lot 12). This area is separated from Wetland 1A by Portsmouth Boulevard and consists of degraded, roadside habitat with compacted gravel soils and is dominated by Canada goldenrod (*S. canadensis*; FACU), Queen Anne's Lace (*D. carota*; NC), common ragweed (*A. artemisiifolia*; FACU), and awl American-aster (*S. pilosum*; FACU). Stormwater flow from this section of the 100-foot buffer currently sheet flows untreated into Wetland 1A as Portsmouth Boulevard lacks a stormwater management system.

3 Invasive Vegetation

Invasive species of vegetation present throughout the site at the time of the delineation included Norway maple (*A. platanoides*; UPL), Japanese knotweed (*F. japonica*; FACU), common reed (*P. australis*; FACW), European privet (*L. vulgare*, FACU), multiflora rose (Rosa multiflora; FACU), glossy buckthorn (*Frangula alnus*; FAC), common buckthorn (*R. cathartica*; FAC), autumn olive (*E. umbellata*; NC), Morrow's honeysuckle (*Lonicera morrowii*; FACU), Asiatic bittersweet (*Celastrus orbiculatus*; FACU), purple loosestrife (*L. salicaria*; OBL), and garlic-mustard (*Alliaria petiolata*; FACU). The primary populations of invasive species were located along the boundaries of wetlands 1A and 2A.

These species may provide refuge and food sources for small mammals and birds; however, their abundance in an area disturbed by human activity threatens the integrity of the native community. Invasive plant species generally prefer disturbed habitats and possess high dispersal abilities, enabling them to out-compete native vegetation.

Preventative measures should be taken during the project design and development to limit the potential for introduction or spread of invasive species during the project, such as:

- Limiting the areas of disturbance to avoid unnecessary disturbance of existing colonies of invasive species.
- Not importing materials such as fill, loam, mulch, haybales or gravel from sites where invasive species are known to occur.
- Immediately stabilizing exposed soils where work is complete or has temporarily ceased to prevent spread or further invasion of non-native species.
- Cleaning equipment of soil and plant material prior to mobilization and demobilization to and from the project site to limit spread of invasive species.

4 Summary

Two palustrine (non-tidal) wetlands were delineated north of Portsmouth Boulevard which are subject to jurisdiction under New Hampshire Statutes Title L – Water Management and Protection, Fill and Dredge in Wetlands (RSA 482-A). No direct impacts are proposed to Wetlands 1A or 2A as a result of the project. The project is located on the south side of Portsmouth Boulevard (City of Portsmouth Tax Map/Lot #213/12) and proposes permanent impacts within 100-feet of Wetland 1A.

The City of Portsmouth regulates the 100-foot buffer pursuant to the City of Portsmouth Zoning Ordinance (Chapter 10). The 100-foot buffer in the vicinity of the project site consists of disturbed forested and open meadow areas with a moderate density of invasive vegetation, as well as the paved roadway of Portsmouth Boulevard.

Attachments

A Site Figures
- Figure 1 – Site Location
- Figure 2 – Aerial Site Map

B Photographic Log

Tighe&Bond

ATTACHMENT A

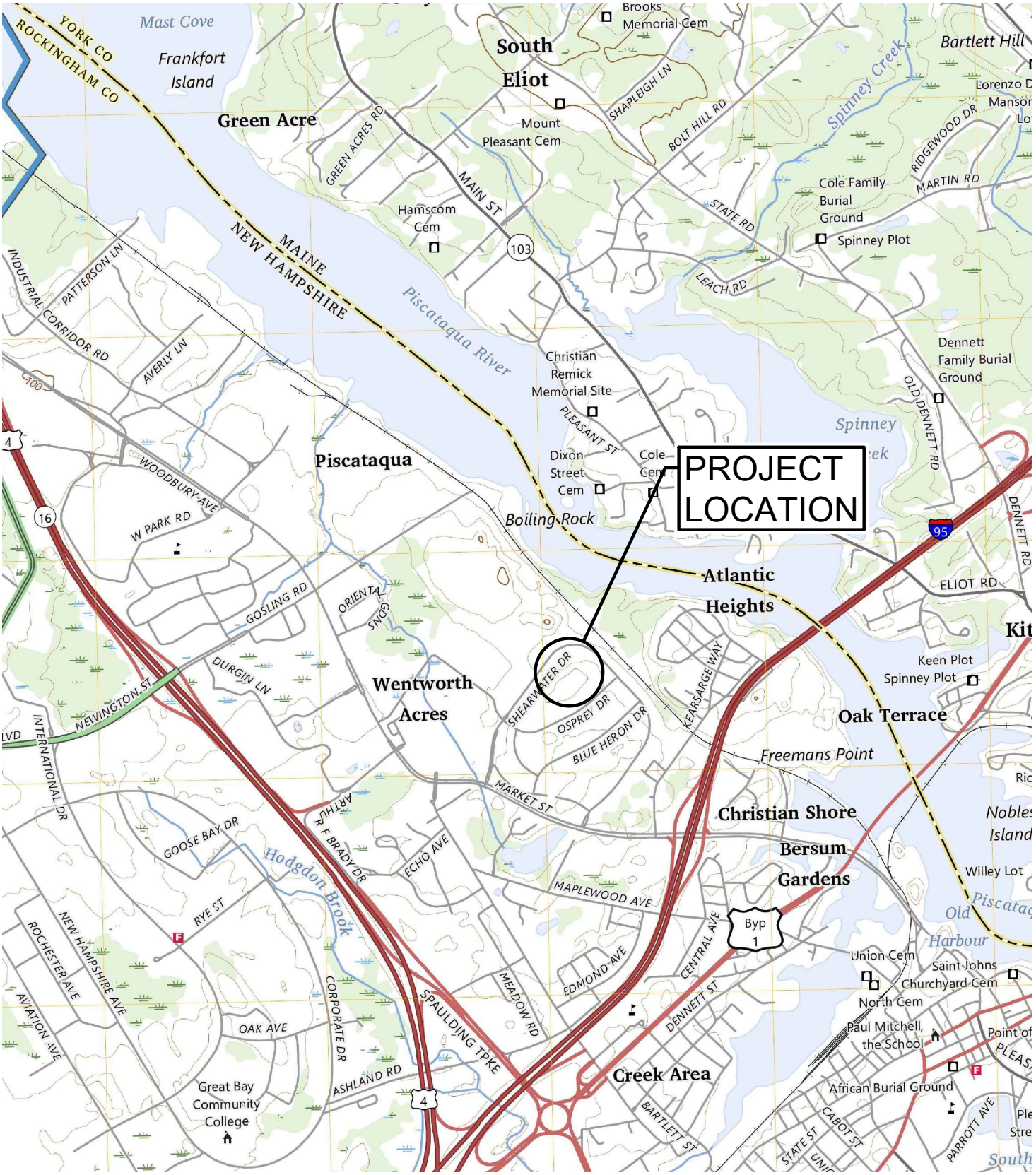


FIGURE 1
USGS AERIAL MAP

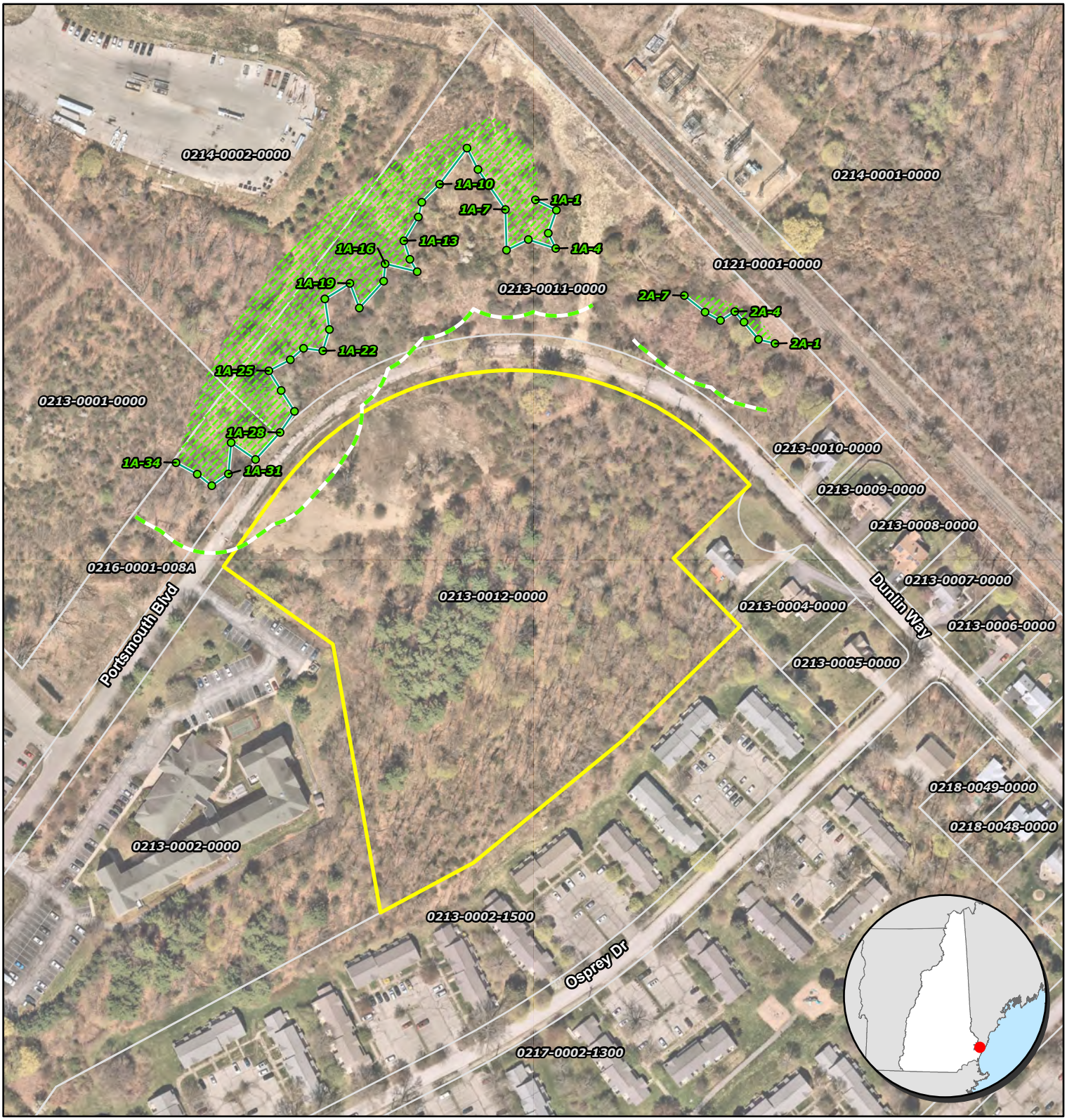
PROPOSED MULTI-FAMILY DEVELOPMENT
150 COMMERCE WAY
PORTSMOUTH, NH

DATE: 9/16/2025	Tighe&Bond
SCALE: 1" = 2000'	www.tighebond.com
FIGURE: 1	

Sep 16, 2025-4:44pm Plotted By: BCurcio
Tighe & Bond, Inc. J:\K\K0076 The Kane Company - General Proposals\0076-0065 GNOD Hillside Lot\Drawings\AutoCAD\Sheet\K0076-065_C-COVER.dwg

FIGURE 2
AERIAL
September 2025

Hillside Multi-Family Development
Dunlin Way and Portsmouth Boulevard,
Portsmouth, New Hampshire



- Wetland Flag
- Delineated Wetland Boundary
- 100-Foot Buffer Zone
- Wetland Area
- Approximate Subject Property
- Approximate Parcel Boundary

Tighe&Bond

Based on Nearmap Imagery (April 2025).
Wetland data was provided by Doucet Survey, surveyed in March 2025.
Parcel boundaries were provided by NH GRANIT and are approximate.

N

1:2,400
0 100 200
Feet

Tighe&Bond

ATTACHMENT B

Photographic Log

Client: Kane Company **Job Number:** K-0076-0065

Site: Hillside Multifamily Development Project
Portsmouth, New Hampshire

Photograph No.: 1	**Date:** 09/12/2025	**Direction Taken:** Northeast

Description: Typical view of Portsmouth Boulevard within the 100-foot buffer of Wetland 1A. Wetland 1A visible on the left side of the photo.

Photograph No.: 2	**Date:** 09/12/2025	**Direction Taken:** North

Description: Typical view of the boundary of Wetland 1A.

Photographic Log

Client: Kane Company **Job Number:** K-0076-0065

Site: Hillside Multifamily Development Project
Portsmouth, New Hampshire

Photograph No.: 3	**Date:** 09/12/2025	**Direction Taken:** North
Description: Representative view of the 100-foot buffer to Wetland 1A, north of Portsmouth Boulevard.		

Photograph No.: 4	**Date:** 09/12/2025	**Direction Taken:** East
Description: Representative view of the 100-foot buffer to Wetland 1A, south of Portsmouth Boulevard.		

Photographic Log

Client: Kane Company **Job Number:** K-0076-0065

Site: Hillside Multifamily Development Project
Portsmouth, New Hampshire

Photograph No.: 5	**Date:** 09/12/2025	**Direction Taken:** Northwest

Description: Representative view of Wetland 2A.

Photograph No.: 6	**Date:** 09/12/2025	**Direction Taken:** Northwest

Description: Representative view of the 100-foot buffer to Wetland 2A, north of Portsmouth Boulevard.

City of Portsmouth, New Hampshire

Wetland Conditional Use Permit Application Checklist

This wetland conditional use permit application checklist is a tool designed to assist the applicant in the planning process and for preparing the application for Conservation Commission and Planning Board review. The checklist is required to be uploaded as part of your wetland conditional use permit application to ensure a full and complete application is submitted to the Planning and Sustainability Department and to the online portal. A pre-application conference with a member of the Planning and Sustainability Department is encouraged as additional project information may be required depending on the size and scope of the project. The applicant is cautioned that this checklist is only a guide and is not intended to be a complete list of all wetland conditional use permit requirements. Please refer to Article 10 of the City of Portsmouth Zoning Ordinance for full details.

Applicant Responsibilities: Applicable fees are due upon application submittal to the Planning Board (no fees are required for Conservation Commission submission). The application will be reviewed by Planning and Sustainability Department staff to determine completeness. Incomplete applications which do not provide required information for the evaluation of the proposed site development shall not be provided review by the Conservation Commission or Planning Board.

Name of Applicant: Brora, LLC Date Submitted: 9/22/2025

Application # (in City's online permitting): LU 25-114

Site Address: 150, 200, 250 Portsmouth Boulevard Map: 213 Lot: 12

☑	Required Items for Submittal	Item Location (e.g. Page or Plan Sheet/Note #)
✔	Complete application form submitted via the City's web-based permitting program	Enclosed
✔	All application documents, plans, supporting documentation, this checklist and other materials uploaded to the application form in OpenGov in digital **Portable Document Format (PDF)**. One hard copy of all plans and materials shall be submitted to the Planning and Sustainability Department by the published deadline.	Enclosed

☑	Required Items for Submittal	Item Location (e.g. Page/line or Plan Sheet/Note #)
✔	Basic property and wetland resource information. **(10.1017.21)**	Existing Conditions Plans
✔	Additional information required for projects proposing greater than 250 square feet of permanent or temporary impacts. **(10.1017.22)**	Cover Letter
✔	Demonstrate impacts as they relate to the criteria for approval set forth in Section 10.1017.50 (or Section 10.1017.60 in the case of utility installation in a right-of-way). **(10.1017.23)**	Cover Letter
✔	Balance impervious surface impacts with removal and/or wetland buffer enhancement plan. **(10.1017.24)**	Cover Letter, Wetland Buffer Impervious Surface Exhibit

☑	Required Items for Submittal	Item Location (e.g. Page/line or Plan Sheet/Note #)
✔	Wetland buffer enhancement plan. **(10.1017.25)**	Landscape Plan L-101
☐	Living shoreline strategy provided for tidal wetland and/or tidal buffer impacts. **(10.1017.26)**	N/A
✔	Stormwater management must be in accordance with Best Management Practices including but not limited to: *1. New Hampshire Stormwater Manual, NHDES, current version.* *2. Best Management Practices to Control Non-point Source Pollution: A Guide for Citizens and City Officials, NHDES, January 2004.* **(10.1018.10)**	Drainage Report Grading, Drainage, and Erosion Control Plan C-401
☐	Vegetated Buffer Strip slope of greater than or equal to 10%. **(10.1018.22)**	N/A
✔	Removal or cutting of vegetation, use of fertilizers, pesticides and herbicides. **(10.1018.23/10.1018.24/10.1018.25)**	General Notes C-101 #18 and #19
☐	All new pavement within a wetland buffer shall be porous pavement. **(10.1018.31)**	N/A
☐	An application that proposes porous pavement in a wetland buffer shall include a pavement maintenance plan. **(10.1018.32)**	N/A
☐	Permanent wetland boundary markers shall be shown on the plan submitted with an application for a conditional use permit and shall be installed during project construction. **(10.1018.40)**	TBD
☑	**Requested Items for Submittal**	**Item Location (e.g. Page or Plan Sheet/Note #)**
✔	A narrative/letter addressed to the Conservation Commission Chair (if recommended to Planning Board then an additional narrative addressed to the Planning Board Chair at that time) describing the project and any proposed wetland and/or wetland buffer impacts. Please visit the WCUP instruction page for further application instructions.	Cover Letter
☐	If New Hampshire Department of Environmental Services (NHDES) Standard Dredge and Fill Permit is required for this work, please provide this permit application at the same time as your submission for a Wetland Conditional Use Permit.	N/A

Applicant's Signature: _____ **Date:** 9/22/2025

Letter of Authorization
Dunlin Way & Portsmouth Boulevard, Portsmouth
Map 213 Lot 12

The undersigned owner and applicant of the above-referenced property hereby authorize representatives of Tighe & Bond, Inc. to represent their interests, and to submit any and all materials related thereto on their behalf for any local and state permitting applications solely in connection with the multifamily development thereof.

Brora, LLC

Date: 4/21/2025

By: _____

Name: Jennifer Stebbins Thomas

Title: Manager

The Kane Company

Date: 4/21/2025

By: _____

Name: Kimery Poldrack

Title: SVP Development & Construction