# Proposed Subdivision Road & Office Building Development

## Portsmouth, New Hampshire

### Permit Drawings

**March 20, 2017**

**Last Revised: May 20, 2019**

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### List of Drawings

<table>
<thead>
<tr>
<th>Sheet No.</th>
<th>Sheet Title</th>
<th>Last Revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Cover Sheet</td>
<td>05/20/2019</td>
</tr>
<tr>
<td>001.1</td>
<td>Lot Consolidation &amp; Resubdivision Plan</td>
<td>05/04/2018</td>
</tr>
<tr>
<td>001.2</td>
<td>Lot Consolidation &amp; Resubdivision Plan</td>
<td>05/04/2018</td>
</tr>
<tr>
<td>001.3</td>
<td>Lot Consolidation &amp; Resubdivision Plan</td>
<td>05/04/2018</td>
</tr>
<tr>
<td>001.4</td>
<td>Lot Consolidation &amp; Resubdivision Plan</td>
<td>05/04/2018</td>
</tr>
<tr>
<td>001.5</td>
<td>Lot Consolidation &amp; Resubdivision Plan</td>
<td>05/04/2018</td>
</tr>
<tr>
<td>G-101</td>
<td>General Notes, Abbreviations &amp; Legend Sheet</td>
<td>03/20/2019</td>
</tr>
<tr>
<td>C-101</td>
<td>Overall Existing Conditions Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-101.1</td>
<td>Existing Conditions/Depreciation Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-102</td>
<td>Overall Site Plan</td>
<td>05/20/2019</td>
</tr>
<tr>
<td>C-102.1</td>
<td>Site Plan &amp; roadway profile</td>
<td>05/20/2019</td>
</tr>
<tr>
<td>C-102.2</td>
<td>Site Plan</td>
<td>05/20/2019</td>
</tr>
<tr>
<td>C-103</td>
<td>Grading, Drainage &amp; Erosion Control Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-103.1</td>
<td>Grading, Drainage &amp; Erosion Control Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-103.2</td>
<td>Grading, Drainage &amp; Erosion Control Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-104</td>
<td>Utility Plan &amp; Profiles</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-104.1</td>
<td>Utility Plan &amp; Profiles</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-104.2</td>
<td>Utility Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-105</td>
<td>Landscape Plan</td>
<td>05/20/2019</td>
</tr>
<tr>
<td>C-105.1</td>
<td>Landscape Plan</td>
<td>05/20/2019</td>
</tr>
<tr>
<td>C-105.2</td>
<td>Landscape Plan</td>
<td>05/20/2019</td>
</tr>
<tr>
<td>C-106</td>
<td>Buffer Restoration &amp; Planting Sequencing Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-106.1</td>
<td>Buffer Restoration &amp; Planting Sequencing Plan</td>
<td>06/20/2019</td>
</tr>
<tr>
<td>C-107</td>
<td>Grading Control Notes Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-107.1</td>
<td>Grading Control Notes Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-107.2</td>
<td>Grading Control Notes Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-108</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-108.1</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-108.2</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-108.3</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
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<td>C-109</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-109.1</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-109.2</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-109.3</td>
<td>Details Sheet</td>
<td>02/24/2019</td>
</tr>
<tr>
<td>C-110</td>
<td>Photometric Plan</td>
<td>06/12/2019</td>
</tr>
<tr>
<td>C-110.1</td>
<td>Photometric Plan</td>
<td>06/12/2019</td>
</tr>
<tr>
<td>C-110.2</td>
<td>Photometric Plan</td>
<td>06/12/2019</td>
</tr>
<tr>
<td>A3-01</td>
<td>Exterior Elevations</td>
<td>06/12/2019</td>
</tr>
<tr>
<td>A3-02</td>
<td>Exterior Elevations</td>
<td>06/12/2019</td>
</tr>
</tbody>
</table>

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### Construction Notes

- CLEARANCES SHALL NOT BE USED ON BUILT DIMENSIONS AND SHALL CONTACT THE INSPECTOR FOR CLEARANCES IF A RECEIPTED DIMENSION IS NOT PROVIDED ON THE PLANS.
- THE CONTRACTOR SHALL RELY ON SCALED DIMENSIONS AND SHALL CONTACT THE ENGINEER FOR CLARIFICATION IF A REQUIRED DIMENSION IS NOT PROVIDED ON THE PLANS.
- 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.
- TIGHE & BOND. ASSUMES NO RESPONSIBILITY FOR ANY ISSUES LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION OF TIGHE & BOND.

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## Complete Set 34 Sheets
APPROXIMATE NUMBER AND TYPE OF EXISTING TREES TO BE REMOVED WITHIN WETLAND BUFFER:

C-506 FOR PLANTINGS)

(SEE DETAIL ON SHEET)

LIMITS OF PROPOSED GRAVEL WETLAND

1+00

O

CHERRY - 7

MAPLE - 8

PINE - 20

OAK - 16

1. BUFFER PLANTINGS:

2. PLANTINGS OF THE FOLLOWING TREE SPECIES SHALL BE DONE AT A SPACING OF 15' OC, 24 EACH OF THE FOLLOWING. THAT ARE TO BE NO LESS THAN 2' TALL AND CONTAINER GROWN:

ABIES BALSAMEA (BALSAM FIR)

ACER RUBRUM (RED MAPLE)

BETULA ALLEGHANIENSIS (YELLOW BIRCH)

CORYLUS AMERICANA (AMERICAN HAZELNUT)

CORNUS ALTERNIFOLIA (ALTERNATE-LEAVED DOGWOOD)

COMPTONIA PEREGRINA (SWEET FERN)

JUNIPERUS COMMUNIS (COMMON JUNIPER)

VIBURNUM ACERIFOLIUM (MAPLE LEAF VIBURNUM)

VACCINIUM ANGUSTIFOLIUM (LOWBUSH BLUEBERRY)

B. THE FOLLOWING SHRUB SPECIES SHALL BE PLANTED AT A SPACING OF 8' OC WHERE EACH OF THE FOLLOWING. THAT ARE TO BE NO LESS THAN 2' TALL AND CONTAINER GROWN:

CORAL BERRY

VIBURNUM ACERIFOLIUM (MAPLE LEAF VIBURNUM)

CORAL BERRY

OHIO CRAPSEED (OHIO CRAPSEED)

OCTOCOTONEUM (OHIO CRAPSEED)

PORTSMOUTH CONSERVATION COMMISSION)

ENVIRONMENTAL SERVICES AND THE CITY OF

PROPOSED PLANTING OF 30 PINE TREES (PINUS STROBUS)

(3' TALL AND CONTAINER GROWN)

APPROXIMATELY 20' OC

RESTORATION AREA = ±21,500 SF

TOTAL PROPOSED RESTORATION AREA = ±32,300 SF

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ENVIRONMENTAL SERVICES AND THE CITY OF
STABILIZED CONSTRUCTION EXIT

SILT SOD
NO SEAL

\[\text{PLAN VIEW}\]

\[\text{ELEVATION VIEW}\]

\[\text{LONG SECTION}\]

\[\text{TRANSVERSE SECTION}\]

NOTES:
- The pathways shall be conditioned by the installer and shall be maintained as required by the owner.
- The pathways are to be the responsibility of the owner.
- The pathways shall remain accessible for emergency, maintenance, or other public use.
- The pathways shall be maintained in a manner consistent with the conditions specified in the project specifications.
- The pathways shall be designed to accommodate the intended use and shall be constructed in accordance with the approved plans.

PROPOSED SUBDIVISION ROAD & OFFICE BUILDING DEVELOPMENT

Northworth Forest, LLC
Portsmouth, New Hampshire

\[\text{SUBDIVISION ROAD & OFFICE BUILDING DEVELOPMENT}\]

\[\text{SCALE AS SHOWN}\]

C-501

\[\text{FILE:}\]

\[\text{REV:}\]

\[\text{DATE:}\]

\[\text{FILE:}\]

\[\text{GMP SUBMISSION}\]

\[\text{K0076-13}\]
1. Extended beyond the upslope portion of the trench. Anchor the blanket blanket in a 6" deep x 6" wide trench with approximately 12" of blanket begin at the top of the slope, 36" over the grade break, by anchoring the secure blanket over compacted soil with a row of staples spaced 12" apart with a row of tapers/stakes 12" apart in the bottom of the trench. Backfill application of lime, fertilizer and seed.

2. The staple pattern guide. To the soil surface by placing staples in appropriate locations as shown on the staple pattern guide.

3. Refer to general staple pattern guide for horizontal staple spacing should be altered note:

4. Correct staple recommendations for channels. Critical points along the channel surface.

5. Erosion control blankets shall be North American Green C125 BN or equal. Blanks on side slopes must be overlapped 4" over the center blanket and stapled. Full length edge of blankets at top of side slopes must be anchored in 6" deep x 6" wide trench. Backfill and compact the trench after stapling.

6. Terminal end of the blankets must be anchored in a 6" deep x 6" wide trench. Backfill and compact the trench after stapling.

7. Washout area

8. Containment shall be structurally sound and leak free and contain all liquid wastes. Containment devices must be of sufficient quantity or volume to contain the liquid wastes generated. Properly sited and constructed and ready to use. Containment is to be at least 20" wide and 30" high in low flow channel applications, a staple check slot is recommended at 30 to 40 foot intervals. Use a row of staples 4' apart over the entire width of the channel. Place a second staggered staples 4" apart to secure blankets.

9. Terminal end of the blanks must be anchored in a 6" deep x 6" wide trench. Backfill and compact the trench after stapling.

10. Erosion control blankets shall be North American Green C125 BN or equal.
PIPE ELEVATIONS SHOWN ON PLANS SHALL BE FIELD VERIFIED PRIOR TO PRECASTING.

FITTING FRAME TO GRADE MAY BE DONE WITH PREFABRICATED ADJUSTMENT RINGS OR CLAY BRICKS (2 COURSES MAX.).

SUMPS FOR CATCH BASINS WITHIN THE FUTURE CITY OF PORTSMOUTH RIGHT OF WAY SHALL BE 4'. THERE SHALL BE NO SUMPS FOR CATCH BASINS ON SITE OF WAY.

OUTSIDE EDGES OF PIPES SHALL PROJECT NO MORE THAN 3" BEYOND INSIDE CONE SECTIONS MAY BE EITHER CONCENTRIC OR ECCENTRIC, OR FLAT SLAB TOPS MAY BE USED WHERE PIPE WOULD OTHERWISE ENTER INTO THE 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.

ASSEMBLED USING AN APPROVED FLEXIBLE SEALANT IN JOINTS.

ALL SECTIONS SHALL BE 4,000 PSI CONCRETE.

THE STRUCTURES SHALL BE DESIGNED FOR H2O LOADING.

NOTES:

1. MATERIALS SHALL BE DISTRIBUTED AT THE SITE.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR DELIVERING AND PLACING THE MATERIALS AT THE SITE.

3. CONTRACTOR SHALL BE RESPONSIBLE FOR THE QUALITY OF THE CONCRETE, AND SHALL MEET ALL SPECIFICATIONS.

4. ALL JOINTS SHALL BE SEALED WITH BUTYL RUBBER SEALANT.

5. THE TONGUE AND GROOVE JOINT SHALL BE SEALED WITH ONE STRIP OF BUTYL RUBBER SEALANT.

6. THE STRUCTURES SHALL BE DESIGNED FOR H2O LOADING.

7. ALL JOINTS SHALL BE SEALED WITH BUTYL RUBBER SEALANT.

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11. ALL JOINTS SHALL BE SEALED WITH BUTYL RUBBER SEALANT.

12. ALL JOINTS SHALL BE SEALED WITH BUTYL RUBBER SEALANT.
ANCHOR RODS
MATCH PAVEMENT FINISH

NOTE:

5.

3.

1.

NOTE:

5.

3.

1.

NOTE:

5.

3.

1.
WEATHERED CLAY SOIL
WETLAND GRATE
HAALA MC36X36 GRATE
24"

NOTES:
1. PIPE TO MANHOLE JOINTS SHALL BE PER
HORIZONTAL JOINTS BETWEEN THE SECTIONS OF PRECAST CONCRETE BARRELS SHALL BE PER
STANDARD AND SHALL BE SEALED FOR WATERTIGHTNESS USING A DOUBLE ROW ELASTOMERIC OR MASTIC-LIKE GASKET.

NOTES:
3. MORTAR
ALL SECTIONS AND SHALL BE PLACED IN THE CENTER OF THE THIRD WALL.

NOTES:
2. PIPE SHALL BE FULLY EMBEDDED IN CORE TO ELIMINATE SEEPAGE

NOTES:
4. PERFORATED PVC RISERS SHALL HAVE VERTICAL SLOTS CUT INTO PVC RISERS ABOVE GRADE MEASURING 3"x1/8".

NOTES:
5. PERMEABILITY RATE OF 0.03 FT/DAY OR IF EXCESSIVELY FRACTURED BEDROCK IS ENCOUNTERED THE SOILS SHOULD AMENDED OR LINER ADDED PRIOR TO THE INSTALLATION OF THE GRAVEL WETLAND AND SHALL BE COORDINATED WITH THE ENGINEER. IF THE NATIVE SOILS EXCEED A
THAN 15% BY VOLUME. CLAY CONTENT SHALL BE LESS THAN 15% BY VOLUME.

NOTES:
6. AASHTO #8 STONE
CRUSHED STONE
3/4" WASHED

NOTES:
3. WET METHOD SOIL SHALL BE A CLEAN CLAY WITH A HORIZONTAL CLASSIFICATION OF CH, CL, OL, or ML, AND HAVE A
MAXIMUM PARTICLE SIZE OF 3" AND A PERMEABILITY LESS THAN 0.000005 CM/S, AND
MEET THE FOLLOWING GRADATION:

NOTES:
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NOTES:
1. PIPE JOINTS MUST BE MADE IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATION.
2. MINIMUM INSTALLATION DISTANCE BETWEEN TWO CONSECUTIVE Joints SHOULD BE AT LEAST 4".
3. ALL GASKETS, SEALANTS, MORTAR, ETC. SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATION.
4. ALL JOINTS MUST BE FILLED IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATION.
5. NO CONVEYOR BELTS WILL BE INSTALLED IN THE JOINTS.
6. NO JOINTS WILL BE INSTALLED IN THE JOINTS.
7. ALL JOINTS MUST BE FILLLED IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATION.

MANHOLE DETAILS:
1. BRICK LINED MANHOLE SHAL BE INSTALLED PER INV.
2. MANHOLE JOINTS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATION.
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UTILITY PIPELINE SLEEVE DETAIL (CARRIER PIPE)
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2. MINIMUM INSTALLATION DISTANCE BETWEEN TWO CONSECUTIVE Joints SHOULD BE AT LEAST 4".
3. ALL GASKETS, SEALANTS, MORTAR, ETC. SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATION.
NOTE: PROVIDE TOOLED CONTROL JOINTS @ 5'-0" O/C AND AT ALL SIDEWALK INTERSECTIONS, T's, L's AND CORNERS. DO NOT USE PRE-FORMED KEY COLD JOINTS. JOINTS SHALL ALSO LINE UP WITH BOTH SIDES OF T SLAB INTERSECTION.

PROVIDE WIRE MESH CHAIR SUPPORTS TO MAINTAIN WWF MESH DEPTH & SPACED TO ELIMINATE SAG OF MESH.

FLATWORK DETAIL - SIDEWALK TOOLED JOINT

FLATWORK DETAIL - SIDEWALK EXPANSION JOINT

FLATWORK DETAIL - SIDEWALK SECTION @ GRANITE CURB

FILTER MEDIA COMPOSITION:

<table>
<thead>
<tr>
<th>COMPONENT MATERIAL</th>
<th>PERCENT OF MIXTURE</th>
<th>GRADATION OF MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOAMY SAND TOPSOIL</td>
<td>20-30</td>
<td>200</td>
</tr>
<tr>
<td>MODERATELY FINE SHREDDED BARK OR WOOD FIBER MULCH</td>
<td>20-30</td>
<td>5 MAX</td>
</tr>
<tr>
<td>3/8&quot; PEA GRAVEL (AASHTO #8 STONE)</td>
<td>50-55</td>
<td>SEE NOTE #5</td>
</tr>
<tr>
<td>AASHTO NO. 57 STONE</td>
<td>20-30</td>
<td>200</td>
</tr>
<tr>
<td>ASTM C-33 CONCRETE SAND</td>
<td>50-55</td>
<td>SEE NOTE #5</td>
</tr>
</tbody>
</table>

NOTES:
1. RAIN GARDENS SHALL NOT BE PLACED INTO SERVICE UNTIL THE PRACTICE HAS BEEN PLANTED AND ITS CONTRIBUTING AREAS HAVE BEEN FULLY STABILIZED.
2. DO NOT TRAFFIC EXPOSED SOIL SURFACES WITH CONSTRUCTION EQUIPMENT. CONTRACTOR SHALL KEEP ALL EXCAVATION EQUIPMENT OUTSIDE OF THE LIMIT OF THE RAIN GARDEN.
3. SEE GRADING, DRAINAGE & EROSION CONTROL PLAN FOR LOCATIONS, LAYOUTS, AND ELEVATIONS.

<table>
<thead>
<tr>
<th>SIEVE SIZE</th>
<th>PERCENT PASSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot;</td>
<td>100</td>
</tr>
<tr>
<td>#4</td>
<td>95-100</td>
</tr>
<tr>
<td>#8</td>
<td>80-100</td>
</tr>
<tr>
<td>#16</td>
<td>50-85</td>
</tr>
<tr>
<td>#30</td>
<td>25-60</td>
</tr>
<tr>
<td>#50</td>
<td>5-30</td>
</tr>
<tr>
<td>#100</td>
<td>0-10</td>
</tr>
</tbody>
</table>

SECTION VIEW
### D-Series Size 2 LED Area Luminaires

#### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>21.5 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Width</td>
<td>88.9 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Speaker Size</td>
<td>150 x 150 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Weight</td>
<td>5 kg</td>
<td>Micronal (calculated)</td>
</tr>
</tbody>
</table>

#### Capable Luminaires

- **LED Area Luminaires**: Suitable for industrial and commercial applications, offering high efficiency and long-lasting performance.

#### Accessories

- **LED Area Luminaires**: Various mounting options and accessories available for different installation scenarios.

---

### D-Series Size 2 LED Wall Luminaires

#### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>21.5 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Width</td>
<td>88.9 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Speaker Size</td>
<td>150 x 150 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Weight</td>
<td>5 kg</td>
<td>Micronal (calculated)</td>
</tr>
</tbody>
</table>

#### Capable Luminaires

- **LED Wall Luminaires**: Ideal for outdoor applications, providing durable and reliable illumination.

#### Accessories

- **LED Wall Luminaires**: Includes weather-resistant covers and mounting brackets for secure installation.

---

### D-Series Size 1 LED Wall Luminaires

#### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>21.5 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Width</td>
<td>88.9 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Speaker Size</td>
<td>150 x 150 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Weight</td>
<td>5 kg</td>
<td>Micronal (calculated)</td>
</tr>
</tbody>
</table>

#### Capable Luminaires

- **LED Wall Luminaires**: Suitable for general lighting needs, offering a balance between performance and energy efficiency.

#### Accessories

- **LED Wall Luminaires**: Various mounting options available for different preferences.

---

### Lithonia Lighting

#### LDN6

- **LED Wall Pack**: Designed for indoor and outdoor applications, providing reliable and efficient lighting solutions.

#### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>21.5 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Width</td>
<td>88.9 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Speaker Size</td>
<td>150 x 150 mm</td>
<td>Micronal (calculated)</td>
</tr>
<tr>
<td>Weight</td>
<td>5 kg</td>
<td>Micronal (calculated)</td>
</tr>
</tbody>
</table>

#### Accessories

- **LED Wall Packs**: Includes weather-resistant covers and mounting brackets for secure installation.

---

**Note**: The information provided is a summary of the technical specifications and features of the D-Series Size 2 LED Area Luminaires, D-Series Size 2 LED Wall Luminaires, D-Series Size 1 LED Wall Luminaires, and Lithonia Lighting LDN6 LED Wall Pack. For detailed specifications and product information, please refer to the manufacturer's official documentation.
Drainage Analysis

TO: City of Portsmouth Technical Advisory Committee (TAC)
FROM: Patrick M. Crimmins, P.E., Tighe & Bond
CC: Borthwick Forest, LLC
DATE: March 20, 2017
LAST REVISED: May 20, 2019

1.0 Project Description

The proposed project is for a subdivision and site development that includes the construction of a 1,100-foot roadway with 50-foot cul-de-sac off Borthwick Avenue, a public access path from Islington Street at the location of the existing WBBX Road to the proposed cul-de-sac, as well as the construction of a, four (4) story, 67,000 SF office building. The proposed project includes the former WBBX radio station property off Islington Street, three undeveloped parcels of land adjacent to WBBX, a residential property along Islington Street, and an access easement located on an undeveloped parcel of land along Borthwick Avenue. The proposed project will result in approximately 9 acres of disturbance.

The site consists of terrain that slopes from the south to north at grades of ±0 - 50 percent. The topography of the site has a high point of elevation 60 on Islington Street and a low point of elevation 30 in unnamed wetlands on the northern side of the proposed road.

For the purposes of this analysis, runoff generated by the site has been analyzed at two (2) distinct points of analysis (PA-1 and PA-2). PA-1 is located in the northwestern side of the Boston Maine Railroad PA-2 is located in an unnamed wetland on the southeast side of the proposed development. The proposed project includes the use of multiple stormwater Best Management Practices (BMP’s), including three (3) treatment swales, a gravel wetland, two (2) rain gardens, and deep sump catch basins.

The proposed project will disturb over 100,000 SF of the site. Thus, the project will require a New Hampshire Department of Environmental Services (NHDES) Alteration of Terrain (AoT) Permit.

2.0 Drainage Analysis

2.1 Calculation Methods

The parcels on-site watersheds were analyzed under this section. The design storms analyzed in this study are the 2-year, 10-year, 25-year, and 50-year 24-hour duration storm as per NHDES AoT Regulations (Env-Wq 1500), last revised August 15, 2017. The stormwater modeling system, HydroCAD 10.0 was utilized to predict the peak runoff rates from these storm events. A Type III storm pattern was used in the model.

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


2.2 Pre-Development Conditions

To analyze the pre-development condition, the site has been divided into two (2) distinct points of analysis (PA-1 and PA-2). These points of analysis and watersheds are depicted on the plan entitled “Pre-Development Watershed Plan”, Sheet WS-1.

Each of the points of analysis and their contributing watershed areas are described below:

**Point of Analysis One (PA-1)**

Pre-Development Watershed Area 1 has been divided into one area (Pre-1) in order to separate areas with proposed disturbance from areas not scheduled to be disturbed. This area includes the areas within the existing access easements as well as the remainder of the areas proposed to be disturbed.

**Point of Analysis Two (PA-2)**

Pre-Development Watershed Area 2 has been divided into one area (Pre-2) in order to separate areas with proposed disturbance from areas not scheduled to be disturbed. This watershed area is located in the mostly grass area to the west of the existing WBBX development.

2.3 Post-Development Conditions

The post-development drainage condition is characterized by six (6) watershed areas modeled at the same two (2) points of analysis as the pre-development condition. These points of analysis and watersheds are depicted on the plan entitled ”Post Development Watershed Plan”, Sheets WS-2.

Each of the points of analysis and their contributing watershed areas are described below:

**Point of Analysis One (PA-1)**

Point of analysis 1 is comprised of Post; 1.1, 1.2, 1.3, 1.4, & 1.5, as depicted on the plan entitled ”Post Development Watershed Plan”, Sheets WS-2.

**Point of Analysis One (PA-2)**

Point of analysis 2 is comprised of Post; 2, 2A, & 2B, as depicted on the plan entitled ”Post Development Watershed Plan”, Sheets WS-2.
2.4 Peak Rate Comparisons

Table 2.4.1 summarizes and compares the pre- and post-development peak runoff rates for the 1-year, 2-year, 10-year, 25-year, and 50-year storm events at each discharge point.

<table>
<thead>
<tr>
<th>Point of Analysis</th>
<th>Pre/Post 2-Year Storm Peak Flow (cfs)</th>
<th>Pre/Post 10-Year Storm Peak Flow (cfs)</th>
<th>Pre/Post 25-Year Storm Peak Flow (cfs)</th>
<th>Pre/Post 50-Year Storm Peak Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA1</td>
<td>4.28/3.46</td>
<td>11.42/8.45</td>
<td>17.9/13.75</td>
<td>24.31/18.36</td>
</tr>
<tr>
<td>PA2</td>
<td>1.17/0.83</td>
<td>3.96/3.90</td>
<td>6.63/5.86</td>
<td>9.34/6.74</td>
</tr>
</tbody>
</table>

As depicted in Table 2.4.1, the post-development peak runoff rates are less than the pre-development rates.

2.4 Stormwater Treatment

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).

The stormwater management system includes Best Management Practices (BMP) to provide stormwater treatment. These BMP’s have been designed in accordance with the New Hampshire Stormwater Manual. Pretreatment for the roadway and office building development will be provided by catch basins equipped with deep sumps and oil separator hoods. Stormwater treatment will be provided by three (3) treatment swales, one (1) gravel wetland, and two (2) rain gardens. Runoff generated by the proposed roadway and cul-de-sac will be conveyed into a closed drainage system and directed to the stormwater treatment swales. The proposed Gravel Wetland will treat runoff generated from the proposed office building and associated parking areas.

3.0 Conclusion

The proposed project will result in a reduction in post-development peak runoff rates from the pre-development condition. The impervious area resulting from the proposed project will be treated by proposed treatment swales a gravel wetland, and two (2) rain gardens. The project will require an amendment to an NHDES AoT Permit. A copy of the amended AoT Permit Application will be provided to the City of Portsmouth when it is submitted to NHDES.
NOTES:
1. SS... PREPARED BY GOVE ENVIRONMENTAL SERVICES, INC., DATED AUGUST 25, 2015.

SITE SPECIFIC SOIL SURVEY HYDROLOGIC SOIL GROUP (HSG) LEGEND

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SOIL TYPE</th>
<th>SLOPE RATING</th>
<th>HSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>BOXFORD</td>
<td>8-15%</td>
<td>C</td>
</tr>
<tr>
<td>256</td>
<td>CHATFIELD-CANTON COMPLEX</td>
<td>3-8%</td>
<td>B</td>
</tr>
<tr>
<td>194/VP</td>
<td>CATDEN</td>
<td>15-25%</td>
<td>D</td>
</tr>
<tr>
<td>900/P</td>
<td>ENDOAQUENTS, SANDY OR GRAVELLY (INTERPRETED)</td>
<td>15-25%</td>
<td>D</td>
</tr>
<tr>
<td>656/P</td>
<td>RIDGEBURY</td>
<td>8-15%</td>
<td>C</td>
</tr>
<tr>
<td>33</td>
<td>SCITICO</td>
<td>8-15%</td>
<td>C</td>
</tr>
<tr>
<td>300</td>
<td>UDIPSAMMENTS</td>
<td>0-3%</td>
<td>A (INTERPRETED)</td>
</tr>
<tr>
<td>350</td>
<td>UDIPSAMMENTS, WET SUBSTRATUM</td>
<td>15-25%</td>
<td>D (INTERPRETED)</td>
</tr>
<tr>
<td>29</td>
<td>UDORTHENTS, SMOOTHED</td>
<td>3-8%</td>
<td>B (INTERPRETED)</td>
</tr>
<tr>
<td>299</td>
<td>WOODBRIDGE</td>
<td>8-15%</td>
<td>C</td>
</tr>
</tbody>
</table>

POINT OF ANALYSIS

PRE-DEVELOPMENT WATERSHED PLAN

PORTSMOUTH, NEW HAMPSHIRE

PROPOSED
SUBDIVISION ROAD & OFFICE BUILDING DEVELOPMENT

BORTHWICK FOREST, LLC

POINT OF ANALYSIS

PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

PRE-DEVELOPMENT WATERSHED PLAN

ENGINEERS | ENVIRONMENTAL SPECIALISTS

LAST SAVE DATE: MAY 14, 2019

T&B FILE LOCATION: J:\K\K0076 THE KANE COMPANY - GENERAL PROPOSALS\0076-13 BORTHWICK FOREST\DRAWINGS\FIGURES\AUTOCADE\SHEET\20190520_WATERSHED PLANS.DWG

MARK | DATE | DESCRIPTION
--- | --- | ---
PRE-DEVELOPMENT | 3/20/2017 | CML
PRE-DEVELOPMENT | 6/2/2017 | AoT Submission
PRE-DEVELOPMENT | 8/21/2017 | Revised Planning Board Submission
PRE-DEVELOPMENT | 5/20/2019 | Amended Site Plan Approval

NOTES:
1. SS... PREPARED BY GOVE ENVIRONMENTAL SERVICES, INC., DATED AUGUST 25, 2015.
## Area Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (acres)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.306</td>
<td>69</td>
<td>50-75% Grass cover, Fair, HSG B (299) (PRE-1, PRE-2)</td>
</tr>
<tr>
<td>1.810</td>
<td>61</td>
<td>&gt;75% Grass cover, Good, HSG B (256) (PRE-1, PRE-2)</td>
</tr>
<tr>
<td>0.822</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C (29) (PRE-1, PRE-2)</td>
</tr>
<tr>
<td>0.125</td>
<td>96</td>
<td>Gravel surface, HSG C (Rail Road) (PRE-1)</td>
</tr>
<tr>
<td>0.444</td>
<td>98</td>
<td>Paved parking, HSG C (PRE-1)</td>
</tr>
<tr>
<td>0.078</td>
<td>60</td>
<td>Woods, Fair, HSG B (299) (PRE-1)</td>
</tr>
<tr>
<td>1.539</td>
<td>55</td>
<td>Woods, Good, HSG B (256) (PRE-1, PRE-2)</td>
</tr>
<tr>
<td>0.558</td>
<td>55</td>
<td>Woods, Good, HSG B (256) - Additional Area (PRE-1, PRE-2)</td>
</tr>
<tr>
<td>0.755</td>
<td>70</td>
<td>Woods, Good, HSG C (29) (PRE-1)</td>
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<td>70</td>
<td>Woods, Good, HSG C (29) - Additional Area (PRE-1)</td>
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<tr>
<td>0.577</td>
<td>70</td>
<td>Woods, Good, HSG C (29) - Amended Site Plan (PRE-1)</td>
</tr>
<tr>
<td><strong>8.511</strong></td>
<td>66</td>
<td><strong>TOTAL AREA</strong></td>
</tr>
<tr>
<td>Area (acres)</td>
<td>Soil Group</td>
<td>Subcatchment Numbers</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>0.000</td>
<td>HSG A</td>
<td></td>
</tr>
<tr>
<td>5.290</td>
<td>HSG B</td>
<td>PRE-1, PRE-2</td>
</tr>
<tr>
<td>3.221</td>
<td>HSG C</td>
<td>PRE-1, PRE-2</td>
</tr>
<tr>
<td>0.000</td>
<td>HSG D</td>
<td></td>
</tr>
<tr>
<td>0.000</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td><strong>8.511</strong></td>
<td><strong>TOTAL AREA</strong></td>
<td></td>
</tr>
</tbody>
</table>
Time span=0.00-48.00 hrs, dt=0.10 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:
Runoff Area=255,559 sf  7.57% Impervious  Runoff Depth=0.74"
Flow Length=288'  Slope=0.0594 '/'  Tc=5.0 min  CN=68  Runoff=4.28 cfs  0.363 af

Subcatchment PRE-2:
Runoff Area=115,185 sf  0.00% Impervious  Runoff Depth=0.53"
Flow Length=391'  Slope=0.0588 '/'  Tc=5.0 min  CN=63  Runoff=1.17 cfs  0.116 af

Link PA-1:
Inflow=4.28 cfs  0.363 af
Primary=4.28 cfs  0.363 af

Link PA-2:
Inflow=1.17 cfs  0.116 af
Primary=1.17 cfs  0.116 af

Total Runoff Area = 8.511 ac  Runoff Volume = 0.480 af  Average Runoff Depth = 0.68"
94.78% Pervious = 8.067 ac  5.22% Impervious = 0.444 ac
Type III 24-hr 10-YR Rainfall=4.88"

Time span=0.00-48.00 hrs, dt=0.10 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:
- Runoff Area=255,559 sf 7.57% Impervious Runoff Depth=1.79"
- Flow Length=288' Slope=0.0594 '/' Tc=5.0 min CN=68 Runoff=11.42 cfs 0.877 af

Subcatchment PRE-2:
- Runoff Area=115,185 sf 0.00% Impervious Runoff Depth=1.43"
- Flow Length=391' Slope=0.0588 '/' Tc=5.0 min CN=63 Runoff=3.96 cfs 0.316 af

Link PA-1:
- Inflow=11.42 cfs 0.877 af
- Primary=11.42 cfs 0.877 af

Link PA-2:
- Inflow=3.96 cfs 0.316 af
- Primary=3.96 cfs 0.316 af

Total Runoff Area = 8.511 ac Runoff Volume = 1.193 af Average Runoff Depth = 1.68"
94.78% Pervious = 8.067 ac 5.22% Impervious = 0.444 ac
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:  Runoff Area=255,559 sf  7.57% Impervious  Runoff Depth=2.77"
Flow Length=288'  Slope=0.0594 '/'  Tc=5.0 min  CN=68  Runoff=17.90 cfs  1.353 af

Subcatchment PRE-2:  Runoff Area=115,185 sf  0.00% Impervious  Runoff Depth=2.31"
Flow Length=391'  Slope=0.0588 '/'  Tc=5.0 min  CN=63  Runoff=6.63 cfs  0.509 af

Link PA-1:  
Inflow=17.90 cfs  1.353 af
Primary=17.90 cfs  1.353 af

Link PA-2:  
Inflow=6.63 cfs  0.509 af
Primary=6.63 cfs  0.509 af

Total Runoff Area = 8.511 ac  Runoff Volume = 1.862 af  Average Runoff Depth = 2.63"
94.78% Pervious = 8.067 ac   5.22% Impervious = 0.444 ac
Type III 24-hr  50-YR Rainfall=7.41"

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:
Runoff Area=255,559 sf   7.57% Impervious   Runoff Depth=3.74"
Flow Length=288'   Slope=0.0594 '/'   Tc=5.0 min   CN=68   Runoff=24.31 cfs  1.831 af

Subcatchment PRE-2:
Runoff Area=115,185 sf   0.00% Impervious   Runoff Depth=3.21"
Flow Length=391’   Slope=0.0588 '/'   Tc=5.0 min   CN=63   Runoff=9.34 cfs  0.708 af

Link PA-1:
Inflow=24.31 cfs  1.831 af
Primary=24.31 cfs  1.831 af

Link PA-2:
Inflow=9.34 cfs  0.708 af
Primary=9.34 cfs  0.708 af

Total Runoff Area = 8.511 ac   Runoff Volume = 2.538 af   Average Runoff Depth = 3.58"
94.78% Pervious = 8.067 ac   5.22% Impervious = 0.444 ac
### Area Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (acres)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.673</td>
<td>69</td>
<td>50-75% Grass cover, Fair, HSG B (299) (Post 1.1, Post 1.2, Post 1.3, Post 1.4, Post 2)</td>
</tr>
<tr>
<td>1.712</td>
<td>61</td>
<td>&gt;75% Grass cover, Good, HSG B (256) (Post 1.1, Post 1.2, Post 1.3, Post 1.4, Post 2)</td>
</tr>
<tr>
<td>1.455</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C (29) (Post 1.1, Post 1.2, Post 1.3, Post 1.4, Post 2, Post 2A, Post 2B)</td>
</tr>
<tr>
<td>0.349</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C (29) - Additional Area (Post 1.4)</td>
</tr>
<tr>
<td>0.055</td>
<td>96</td>
<td>Gravel surface, HSG C (Rail Road) (Post 1.1, Post 1.2)</td>
</tr>
<tr>
<td>3.280</td>
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<td>Paved parking, HSG C (Post 1.1, Post 1.2, Post 1.3, Post 1.4, Post 2, Post 2A, Post 2B)</td>
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<td>Woods, Good, HSG C (29) (Post 1.4)</td>
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<tr>
<td><strong>8.511</strong></td>
<td>81</td>
<td><strong>TOTAL AREA</strong></td>
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## Soil Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (acres)</th>
<th>Soil Group</th>
<th>Subcatchment Numbers</th>
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<tr>
<td>0.000</td>
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<td>HSG B</td>
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<td>0.000</td>
<td>Other</td>
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<tr>
<td>8.511</td>
<td>TOTAL AREA</td>
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</table>
Subcatchment Post 1.1: Runoff Area=47,167 sf  50.65% Impervious  Runoff Depth=1.55”
Flow Length=483’  Tc=5.0 min  CN=82  Runoff=1.86 cfs  0.140 af

Subcatchment Post 1.2: Runoff Area=28,752 sf  31.34% Impervious  Runoff Depth=1.17”
Flow Length=213’  Tc=5.0 min  CN=76  Runoff=0.83 cfs  0.064 af

Subcatchment Post 1.3: Runoff Area=42,156 sf  28.79% Impervious  Runoff Depth=1.23”
Flow Length=229’  Tc=5.0 min  CN=77  Runoff=1.29 cfs  0.099 af

Subcatchment Post 1.4: Runoff Area=61,172 sf  7.80% Impervious  Runoff Depth=0.94”
Flow Length=238’  Tc=5.0 min  CN=72  Runoff=1.38 cfs  0.110 af

Subcatchment Post 2: Runoff Area=154,617 sf  61.84% Impervious  Runoff Depth=1.77”
Flow Length=951’  Tc=5.0 min  CN=85  Runoff=6.97 cfs  0.525 af

Subcatchment Post 2A: Runoff Area=19,925 sf  57.73% Impervious  Runoff Depth=2.01”
Flow Length=951’  Tc=5.0 min  CN=88  Runoff=1.01 cfs  0.077 af

Subcatchment Post 2B: Runoff Area=16,954 sf  56.89% Impervious  Runoff Depth=2.01”
Flow Length=951’  Tc=5.0 min  CN=88  Runoff=0.86 cfs  0.065 af

Reach TS-1: Treatment Swale #1
Avg. Flow Depth=0.44’  Max Vel=0.36 fps  Inflow=1.86 cfs  0.140 af
n=0.150  L=150.0’  S=0.0050 '/'  Capacity=6.46 cfs  Outflow=1.49 cfs  0.140 af

Reach TS-2: Treatment Swale #2
Avg. Flow Depth=0.30’  Max Vel=0.29 fps  Inflow=0.83 cfs  0.064 af
n=0.150  L=110.0’  S=0.0050 '/'  Capacity=5.79 cfs  Outflow=0.67 cfs  0.064 af

Reach TS-3: Treatment Swale #3
Avg. Flow Depth=0.12’  Max Vel=0.17 fps  Inflow=0.35 cfs  0.049 af
n=0.150  L=115.0’  S=0.0052 '/'  Capacity=6.60 cfs  Outflow=0.18 cfs  0.049 af

Pond FBV: Forebay Volume
12.0” Round Culvert  n=0.013  L=1.0’  S=0.0500 '/'  Primary=0.00 cfs  0.000 af

Pond GW-1: Gravel Wetland #1
Peak Elev=38.55’  Storage=11,740 cf  Inflow=6.97 cfs  0.539 af
Outflow=0.83 cfs  0.517 af

Pond GWB1WQV: GW Bay 1 WQV
Peak Elev=0.00’  Storage=0 cf  Primary=0.00 cfs  0.000 af

Pond GWB2WQV: GW Bay 2 WQV
Peak Elev=0.00’  Storage=0 cf  Primary=0.00 cfs  0.000 af

Pond PPV: Permanent Pool Volume
8.0” Round Culvert  n=0.013  L=1.0’  S=0.0000 '/'  Primary=0.00 cfs  0.000 af

Pond PRG-01:
Peak Elev=51.0’  Storage=2,342 cf  Inflow=1.01 cfs  0.077 af
Discarded=0.02 cfs  0.065 af  Primary=0.02 cfs  0.002 af  Outflow=0.04 cfs  0.067 af
Pond PRG-02:  Peak Elev=51.03' Storage=1,639 cf  Inflow=0.86 cfs  0.065 af  Discarded=0.02 cfs  0.046 af  Primary=0.08 cfs  0.012 af  Outflow=0.09 cfs  0.058 af

Pond SF-1: Sediment Forebay  Peak Elev=40.15' Storage=1,951 cf  Inflow=1.29 cfs  0.099 af  Discarded=0.01 cfs  0.031 af  Primary=0.35 cfs  0.049 af  Outflow=0.36 cfs  0.080 af

Link FES1:  Inflow=6.97 cfs  0.539 af  Primary=6.97 cfs  0.539 af

Link FES3:  Inflow=0.83 cfs  0.064 af  Primary=0.83 cfs  0.064 af

Link FES4:  Inflow=1.86 cfs  0.140 af  Primary=1.86 cfs  0.140 af

Link FES5:  Inflow=1.29 cfs  0.099 af  Primary=1.29 cfs  0.099 af

Link FES6:  Inflow=0.83 cfs  0.517 af  Primary=0.83 cfs  0.517 af

Link PA1:  Inflow=3.46 cfs  0.363 af  Primary=3.46 cfs  0.363 af

Link PA2:  Inflow=0.83 cfs  0.517 af  Primary=0.83 cfs  0.517 af

Total Runoff Area = 8.511 ac  Runoff Volume = 1.081 af  Average Runoff Depth = 1.52"
55.07% Pervious = 4.687 ac  44.93% Impervious = 3.824 ac
Time span=0.00-60.00 hrs, dt=0.10 hrs, 601 points x 2
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 1.1: 
Runoff Area=47,167 sf   50.65% Impervious   Runoff Depth=2.97"
Flow Length=483’   Tc=5.0 min   CN=82   Runoff=3.54 cfs  0.268 af

Subcatchment Post 1.2: 
Runoff Area=28,752 sf   31.34% Impervious   Runoff Depth=2.44"
Flow Length=213’   Tc=5.0 min   CN=76   Runoff=2.70 cfs  0.203 af

Subcatchment Post 1.3: 
Runoff Area=42,156 sf   28.79% Impervious   Runoff Depth=2.52"
Flow Length=229’   Tc=5.0 min   CN=77   Runoff=2.70 cfs  0.203 af

Subcatchment Post 1.4: 
Runoff Area=61,172 sf   7.80% Impervious   Runoff Depth=2.11"
Flow Length=576’   Tc=5.0 min   CN=85   Runoff=3.25 cfs  0.246 af

Subcatchment Post 2: 
Runoff Area=154,617 sf   61.84% Impervious   Runoff Depth=3.26"
Flow Length=951’   Tc=5.0 min   CN=85   Runoff=12.59 cfs  0.963 af

Subcatchment Post 2A: 
Runoff Area=19,925 sf   57.73% Impervious   Runoff Depth=3.56"
Flow Length=951’   Tc=5.0 min   CN=88   Runoff=1.74 cfs  0.136 af

Subcatchment Post 2B: 
Runoff Area=16,954 sf   56.89% Impervious   Runoff Depth=3.56"
Flow Length=951’   Tc=5.0 min   CN=88   Runoff=1.48 cfs  0.115 af

Reach TS-1: Treatment Swale #1
Avg. Flow Depth=0.65’   Max Vel=0.46 fps   Inflow=3.54 cfs  0.268 af
n=0.150   L=150.0’   S=0.0050 '/'   Capacity=6.46 cfs   Outflow=2.99 cfs  0.268 af

Reach TS-2: Treatment Swale #2
Avg. Flow Depth=0.48’   Max Vel=0.38 fps   Inflow=1.78 cfs  0.134 af
n=0.150   L=110.0’   S=0.0050 '/'   Capacity=5.79 cfs   Outflow=1.52 cfs  0.134 af

Reach TS-3: Treatment Swale #3
Avg. Flow Depth=0.45’   Max Vel=0.38 fps   Inflow=2.27 cfs  0.152 af
n=0.150   L=115.0’   S=0.0052 '/'   Capacity=6.60 cfs   Outflow=1.60 cfs  0.152 af

Pond FBV: Forebay Volume
12.0" Round Culvert  n=0.013  L=1.0’  S=0.0500 '/'   Primary=0.00 cfs  0.000 af
Peak Elev=0.00'  Storage=0 cf

Pond GW-1: Gravel Wetland #1
Peak Elev=39.58' Storage=21,743 cf   Inflow=13.20 cfs  1.079 af
Outflow=3.90 cfs  1.056 af

Pond GWB1WQV: GW Bay 1 WQV
Peak Elev=0.00' Storage=0 cf
Primary=0.00 cfs  0.000 af

Pond GWB2WQV: GW Bay 2 WQV
Peak Elev=0.00' Storage=0 cf
Primary=0.00 cfs  0.000 af

Pond PPV: Permanent Pool Volume
8.0" Round Culvert  n=0.013  L=1.0’  S=0.0000 '/'   Primary=0.00 cfs  0.000 af
Peak Elev=0.00' Storage=2,582 cf   Inflow=1.74 cfs  0.136 af
Discarded=0.02 cfs  0.069 af   Primary=0.83 cfs  0.056 af   Outflow=0.86 cfs  0.125 af

Pond PRG-01:
Peak Elev=51.16' Storage=2,582 cf   Inflow=1.74 cfs  0.136 af
Type III 24-hr 10-YR Rainfall = 4.88"

Pond PRG-02:
Peak Elev = 51.21'  Storage = 1,837 cf  Inflow = 1.48 cfs  0.115 af
Discarded = 0.02 cfs  0.048 af  Primary = 1.20 cfs  0.060 af  Outflow = 1.22 cfs  0.108 af

Pond SF-1: Sediment Forebay
Peak Elev = 40.56'  Storage = 2,511 cf  Inflow = 2.70 cfs  0.203 af
Discarded = 0.01 cfs  0.032 af  Primary = 2.27 cfs  0.152 af  Outflow = 2.28 cfs  0.184 af

Link FES1:
Inflow = 13.20 cfs  1.079 af
Primary = 13.20 cfs  1.079 af

Link FES3:
Inflow = 1.78 cfs  0.134 af
Primary = 1.78 cfs  0.134 af

Link FES4:
Inflow = 3.54 cfs  0.268 af
Primary = 3.54 cfs  0.268 af

Link FES5:
Inflow = 2.70 cfs  0.203 af
Primary = 2.70 cfs  0.203 af

Link FES6:
Inflow = 3.90 cfs  1.056 af
Primary = 3.90 cfs  1.056 af

Link PA1:
Inflow = 8.45 cfs  0.801 af
Primary = 8.45 cfs  0.801 af

Link PA2:
Inflow = 3.90 cfs  1.056 af
Primary = 3.90 cfs  1.056 af

Total Runoff Area = 8.511 ac  Runoff Volume = 2.066 af  Average Runoff Depth = 2.91"
55.07% Pervious = 4.687 ac  44.93% Impervious = 3.824 ac
Subcatchment Post 1.1: Runoff Area=47,167 sf  50.65% Impervious  Runoff Depth=4.16"
Flow Length=483'  Tc=5.0 min  CN=82  Runoff=4.90 cfs  0.376 af

Subcatchment Post 1.2: Runoff Area=28,752 sf  31.34% Impervious  Runoff Depth=3.54"
Flow Length=213'  Tc=5.0 min  CN=76  Runoff=2.58 cfs  0.195 af

Subcatchment Post 1.3: Runoff Area=42,156 sf  28.79% Impervious  Runoff Depth=3.65"
Flow Length=229'  Tc=5.0 min  CN=77  Runoff=3.89 cfs  0.294 af

Subcatchment Post 1.4: Runoff Area=61,172 sf  7.80% Impervious  Runoff Depth=3.15"
Flow Length=238'  Tc=5.0 min  CN=82  Runoff=4.89 cfs  0.369 af

Subcatchment Post 2: Runoff Area=154,617 sf  61.84% Impervious  Runoff Depth=4.48"
Flow Length=951'  Tc=5.0 min  CN=85  Runoff=17.09 cfs  1.326 af

Subcatchment Post 2A: Runoff Area=19,925 sf  57.73% Impervious  Runoff Depth=4.81"
Flow Length=951'  Tc=5.0 min  CN=88  Runoff=2.32 cfs  0.183 af

Subcatchment Post 2B: Runoff Area=16,954 sf  56.89% Impervious  Runoff Depth=4.81"
Flow Length=951'  Tc=5.0 min  CN=88  Runoff=1.98 cfs  0.156 af

Reach TS-1: Treatment Swale #1 Avg. Flow Depth=0.79'  Max Vel=0.51 fps  Inflow=4.90 cfs  0.376 af
n=0.150  L=150.0'  S=0.0050 '/'  Capacity=6.46 cfs  Outflow=4.22 cfs  0.376 af

Reach TS-2: Treatment Swale #2 Avg. Flow Depth=0.60'  Max Vel=0.43 fps  Inflow=2.58 cfs  0.195 af
n=0.150  L=110.0'  S=0.0050 '/'  Capacity=5.79 cfs  Outflow=2.26 cfs  0.195 af

Reach TS-3: Treatment Swale #3 Avg. Flow Depth=0.65'  Max Vel=0.47 fps  Inflow=3.50 cfs  0.242 af
n=0.150  L=115.0'  S=0.0052 '/'  Capacity=6.60 cfs  Outflow=3.03 cfs  0.242 af

Pond FBV: Forebay Volume Peak Elev=0.00'  Storage=0 cf
12.0" Round Culvert  n=0.013  L=1.0'  S=0.0500 '/'  Primary=0.00 cfs  0.000 af

Pond GW-1: Gravel Wetland #1 Peak Elev=40.18'  Storage=28,765 cf
Inflow=20.61 cfs  1.527 af
Outflow=5.86 cfs  1.504 af

Pond GWB1WQV: GW Bay 1 WQV Peak Elev=0.00'  Storage=0 cf
Primary=0.00 cfs  0.000 af

Pond GWB2WQV: GW Bay 2 WQV Peak Elev=0.00'  Storage=0 cf
Primary=0.00 cfs  0.000 af

Pond PPV: Permanent Pool Volume Peak Elev=0.00'  Storage=0 cf
8.0" Round Culvert  n=0.013  L=1.0'  S=0.0000 '/'  Primary=0.00 cfs  0.000 af

Pond PRG-01: Peak Elev=51.30'  Storage=2,815 cf
Inflow=2.32 cfs  0.183 af
Discarded=0.02 cfs  0.070 af  Primary=2.01 cfs  0.102 af
Outflow=2.03 cfs  0.173 af
Pond PRG-02:  
Peak Elev=51.27'  Storage=1,915 cf  
Inflow=1.98 cfs  0.156 af  
Discarded=0.02 cfs  0.049 af  Primary=1.81 cfs  0.099 af  Outflow=1.83 cfs  0.149 af

Pond SF-1: Sediment Forebay  
Peak Elev=40.74'  Storage=2,784 cf  
Inflow=3.89 cfs  0.294 af  
Discarded=0.01 cfs  0.033 af  Primary=3.50 cfs  0.242 af  Outflow=3.51 cfs  0.275 af

Link FES1:  
Inflow=20.61 cfs  1.527 af  
Primary=20.61 cfs  1.527 af

Link FES3:  
Inflow=2.58 cfs  0.195 af  
Primary=2.58 cfs  0.195 af

Link FES4:  
Inflow=4.90 cfs  0.376 af  
Primary=4.90 cfs  0.376 af

Link FES5:  
Inflow=3.89 cfs  0.294 af  
Primary=3.89 cfs  0.294 af

Link FES6:  
Inflow=5.86 cfs  1.504 af  
Primary=5.86 cfs  1.504 af

Link PA1:  
Inflow=13.75 cfs  1.181 af  
Primary=13.75 cfs  1.181 af

Link PA2:  
Inflow=5.86 cfs  1.504 af  
Primary=5.86 cfs  1.504 af

Total Runoff Area = 8.511 ac  
Runoff Volume = 2.898 af  
Average Runoff Depth = 4.09''

55.07% Pervious = 4.687 ac  
44.93% Impervious = 3.824 ac
Type III 24-hr 50-YR Rainfall=7.41"

Time span=0.00-60.00 hrs, dt=0.10 hrs, 601 points x 2
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 1.1:
- Runoff Area=47,167 sf  50.65% Impervious  Runoff Depth=5.30"
- Flow Length=483’  Tc=5.0 min  CN=82  Runoff=6.18 cfs  0.478 af

Subcatchment Post 1.2:
- Runoff Area=28,752 sf  31.34% Impervious  Runoff Depth=4.62"
- Flow Length=213’  Tc=5.0 min  CN=76  Runoff=3.35 cfs  0.254 af

Subcatchment Post 1.3:
- Runoff Area=42,156 sf  28.79% Impervious  Runoff Depth=4.74"
- Flow Length=229’  Tc=5.0 min  CN=77  Runoff=5.02 cfs  0.382 af

Subcatchment Post 1.4:
- Runoff Area=61,172 sf  7.80% Impervious  Runoff Depth=4.18"
- Flow Length=238’  Tc=5.0 min  CN=82  Runoff=6.49 cfs  0.489 af

Subcatchment Post 2:
- Runoff Area=154,617 sf  61.84% Impervious  Runoff Depth=5.65"
- Flow Length=951’  Tc=5.0 min  CN=85  Runoff=21.26 cfs  1.670 af

Subcatchment Post 2A:
- Runoff Area=19,925 sf  57.73% Impervious  Runoff Depth=5.99"
- Flow Length=951’  Tc=5.0 min  CN=88  Runoff=2.86 cfs  0.228 af

Subcatchment Post 2B:
- Runoff Area=16,954 sf  56.89% Impervious  Runoff Depth=5.99"
- Flow Length=951’  Tc=5.0 min  CN=88  Runoff=2.43 cfs  0.194 af

Reach TS-1: Treatment Swale #1
- Avg. Flow Depth=0.91’  Max Vel=0.55 fps  Inflow=6.18 cfs  0.478 af
- n=0.150  L=150.0’  S=0.0050 '/'  Capacity=6.46 cfs  Outflow=5.39 cfs  0.478 af

Reach TS-2: Treatment Swale #2
- Avg. Flow Depth=0.69’  Max Vel=0.47 fps  Inflow=3.35 cfs  0.254 af
- n=0.150  L=110.0’  S=0.0050 '/'  Capacity=5.79 cfs  Outflow=2.97 cfs  0.254 af

Reach TS-3: Treatment Swale #3
- Avg. Flow Depth=0.77’  Max Vel=0.52 fps  Inflow=4.22 cfs  0.329 af
- n=0.150  L=115.0’  S=0.0052 '/'  Capacity=6.60 cfs  Outflow=4.09 cfs  0.329 af

Pond FBV: Forebay Volume
- Peak Elev=0.00’  Storage=0 cf
- 12.0” Round Culvert  n=0.013  L=1.0’  S=0.0500 '/'  Primary=0.00 cfs  0.000 af

Pond GW-1: Gravel Wetland #1
- Peak Elev=40.81’ Storage=36,961 cf
- Inflow=25.93 cfs  1.953 af  Outflow=6.74 cfs  1.930 af

Pond GWB1WQV: GW Bay 1 WQV
- Peak Elev=0.00’ Storage=0 cf
- Primary=0.00 cfs  0.000 af

Pond GWB2WQV: GW Bay 2 WQV
- Peak Elev=0.00’ Storage=0 cf
- Primary=0.00 cfs  0.000 af

Pond PPV: Permanent Pool Volume
- Peak Elev=0.00’ Storage=0 cf
- 8.0” Round Culvert  n=0.013  L=1.0’  S=0.0000 '/'  Primary=0.00 cfs  0.000 af

Pond PRG-01:
- Peak Elev=51.34’ Storage=2,889 cf
- Inflow=2.86 cfs  0.228 af
- Discarded=0.02 cfs  0.072 af  Primary=2.54 cfs  0.146 af  Outflow=2.57 cfs  0.218 af
Pond PRG-02:  
- Peak Elev=51.31’  Storage=1,966 cf  
- Inflow=2.43 cfs  0.194 af  
- Discarded=0.02 cfs  0.050 af  
- Primary=2.24 cfs  0.137 af  
- Outflow=2.26 cfs  0.187 af  

Pond SF-1: Sediment Forebay  
- Peak Elev=40.86’  Storage=2,967 cf  
- Inflow=5.02 cfs  0.382 af  
- Discarded=0.01 cfs  0.033 af  
- Primary=4.22 cfs  0.329 af  
- Outflow=4.23 cfs  0.362 af  

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<td>PA2</td>
<td>6.74 cfs</td>
<td>1.930 af</td>
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**Total Runoff Area = 8.511 ac  Runoff Volume = 3.697 af  Average Runoff Depth = 5.21”**

- 55.07% Pervious = 4.687 ac  
- 44.93% Impervious = 3.824 ac
Owner’s/Agent Letter of Authorization

I, Michael Kane, of Borthwick Forest, LLC c/o The Kane Company (Applicant) hereby give Tighe & Bond (Civil Engineer) permission to be my agent in all matters concerning all state and local permitting for the proposed project off Borthwick Avenue in Portsmouth, New Hampshire. This project includes the construction of a ±67,000 SF office building and subdivision road with associated site improvements. This authorization shall include any required signatures for all state and local permit applications.

[Signature]  [Print Name]  [Date]
Michael Kane  May 17, 2019
Owner’s/Agent Letter of Authorization

I, Michael Kane, of Borthwick Forest, LLC c/o The Kane Company (Applicant) hereby give
Tighe & Bond (Civil Engineer) permission to be my agent in all matters concerning all state
and local permitting for the proposed project off Borthwick Avenue in Portsmouth, New
Hampshire. This project includes the construction of a ±67,000 SF office building and
subdivision road with associated site improvements. This authorization shall include any
required signatures for all state and local permit applications.

[Signature]  [Print Name]  [May 17, 2019]