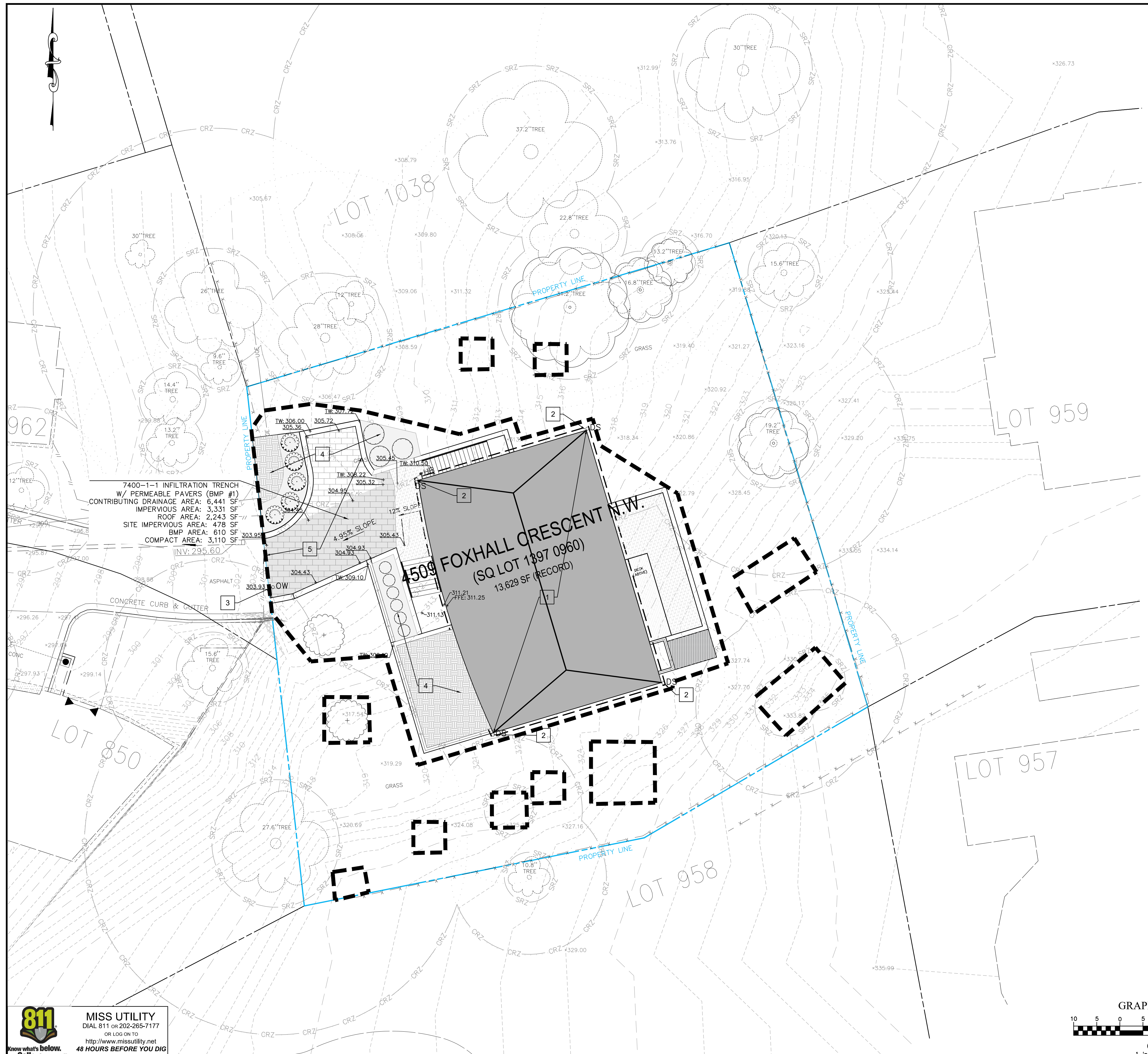


# EXHIBIT D



**SITE PLAN LEGEND**

- BUILDING
- PAVED AREA/CONCRETE WALK
- LANDSCAPED AREA
- PAVERS
- PERMEABLE PAVEMENT
- LIMITS OF GROUND COVER
- WOODEN UPPER DECK
- PERENNIALS PLANTER BOX
- LIMITS OF GRAVEL DIAPHRAGM
- FENCE
- EXISTING TREE
- NEW TREES ≥ 40' CANOPY [B4]
- NEW TREES < 40' CANOPY [B3]
- SHRUB & PLANTS ≥ 2" HEIGHT [B2]
- HOSE BIB
- DOWNSPOUT
- OBSERVATION WELL
- CLEANOUT
- WATER METER
- CURB STOP
- SANITARY CLEANOUT
- DISTURBED CONTRIBUTING DRAINAGE AREA

**STORMWATER MANAGEMENT KEY NOTES**

- 1** LIMITS OF NEW CONSTRUCTION BUILDING
- 2** DOWNSPOUT TO OUTFALL DRAIN
- 3** 4" OBSERVATION WELL
- 4** COMPACT/LANDSCAPED AREA
- 5** INFILTRATION TRENCH WITH PERMEABLE PAVERS (SEE CIV520 FOR DETAIL)

**STORMWATER PLAN NARRATIVE**  
 THE PROPERTY IS CURRENTLY VACANT AND WILL HAVE A THREE STORY SINGLE FAMILY HOME DEVELOPED WITH A PERMEABLE PAVEMENT COVERED INFILTRATION TRENCH DRIVEWAY AND LANDSCAPING.

THE PROJECT INCLUDES CLEARING TREES ON EXISTING SITE. THERE WILL BE UTILITY WORK ONLY IN PUBLIC SPACE.

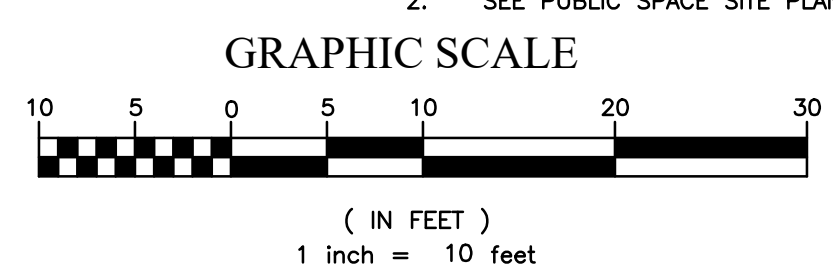
THE EXISTING BUILDING TO BE BUILT ARE CONSIDERED A MAJOR LAND DEVELOPMENT ACTIVITY (MLDA). THE TOTAL ON-SITE DEVELOPMENT IS 6,441 SF, SO THIS MEANS STORMWATER MANAGEMENT IS REQUIRED. A RAINFALL DEPTH OF 1.2" IS USED TO DETERMINE THE STORMWATER RETENTION VOLUME FOR PRIVATE PROPERTY FOR MLDA. THE PEAK STORMWATER RUNOFF FLOW RATES FROM THE SITE FOR THE 2 AND 15 YEAR STORM EVENTS MUST BE LESS THAN OR EQUAL TO THAT OF PREDEVELOPMENT CONDITIONS (MEADOW CONDITIONS) AND PRE-CONSTRUCTION CONDITIONS, RESPECTIVELY "QUANTITY CONTROL REQUIREMENTS."

PRIVATE PROPERTY STORMWATER MANAGEMENT REQUIREMENTS ARE ANTICIPATED TO BE NOT MET WITH BIORETENTION SYSTEM SO UNDRAINED STORM WATER WILL BE COLLECTED IN AN UNDERGROUND STORAGE FACILITY THEN DRAINED INTO THE STORM LINE ON CHANNING STREET.

**GREEN AREA RATIO NARRATIVE**  
 THIS SITE IS GAR EXEMPT

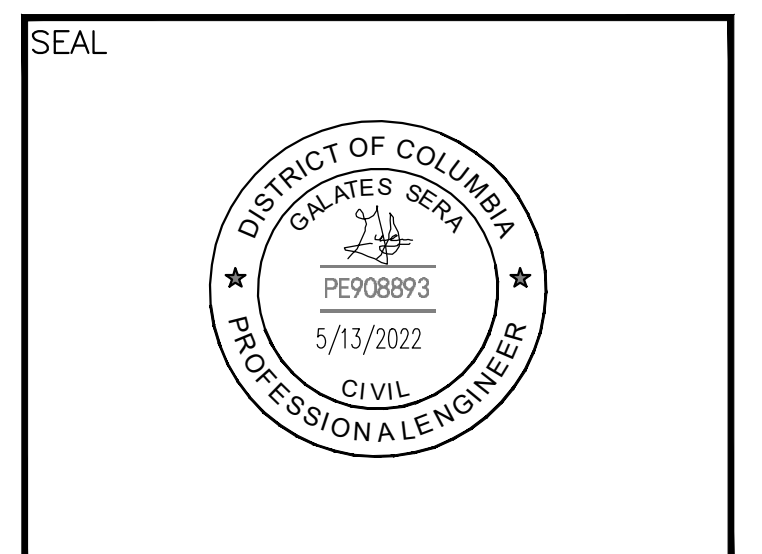
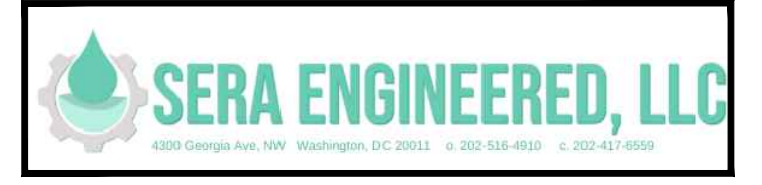
**STORMWATER MANAGEMENT PLAN NOTES**

1. ALL EXISTING FEATURES ARE NOT NECESSARILY DEPICTED ON THIS PLAN. SEE EXISTING CONDITIONS SHEETS.
2. SEE PUBLIC SPACE SITE PLAN FOR STORMWATER MANAGEMENT IN PUBLIC SPACE.



5/13/2022  
 THESE PLANS ARE ISSUED FOR AGENCY REVIEW. ALL APPLICABLE AGENCY PERMIT APPROVALS MUST BE OBTAINED PRIOR TO CONSTRUCTION. FINAL APPROVED "FOR CONSTRUCTION" PLANS WILL BE ISSUED UPON COMPLETION OF THE REVIEW AND APPROVAL PROCESS BY ALL DISTRICT AGENCIES.

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**REVISIONS**

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DATE: MAY 13, 2022  
 DRAWN BY: AC/DW CHECKED BY: GS  
 S.E. JOB NUMBER: 121-126

**PROJECT ADDRESS:**  
 4509 FOXHALL CRES NW  
 WASHINGTON DC, 20007

**PHASE:**  
 PERMIT DOCUMENTS

**SHEET NO.:**  
 CIV500

**SHEET TITLE:**  
 STORMWATER MANAGEMENT PLAN

**SHEET SCALE.:**  
 AS SHOWN

**Stormwater Management Plan Compliance Data**

Site Address 4509 Foxhall Crescent NW Plan number 7400  
 Stormwater Management Plan? Yes Green Area Ratio? No - GAR does not apply to this property  
 Soil Erosion and Sediment Control? Yes Floodplain Review? No  
 Type of Activity Major Land Disturbing AWDZ? Non-AWDZ  
 Is the entire site in the CSS? No

|            | Total Area (sf) | Site Area | PROW | Curve Numbers  |
|------------|-----------------|-----------|------|--|
| Natural    | 0               | 0         |      | <input type="checkbox"/> Additional Detention Provided |
| Compacted  | 3,110           | 3,110     |      | Pre-development 70 2-year storm adjusted CN 45         |
| Impervious | 2,721           | 2,721     |      | Pre-project 74 15-year storm adjusted CN 66            |
| BMP        | 610             | 610       |      | 100-year storm adjusted CN 71                          |
| Total      | 6,441           | 6,441     |      |  |

| Requirements Summary       | (total is the sum of PROW and Parcel) | PROW (ft <sup>3</sup> ) | Parcel (ft <sup>3</sup> ) | Total (ft <sup>3</sup> ) | Total (Gallons) |
|----------------------------|---------------------------------------|-------------------------|---------------------------|--------------------------|-----------------|
| SWRV                       |                                       | 394                     | 394                       | 2,949                    |                 |
| WQTV                       |                                       | 0                       | 0                         | 0                        |                 |
| On-site retention achieved |                                       | 558                     | 558                       | 4,177                    |                 |
| On-site treatment achieved |                                       | 0                       | 0                         | 0                        |                 |
| % of SWRV met on-site      |                                       | 142%                    | 141.67%                   | 141.67%                  |                 |
| SRC eligibility            |                                       |                         |                           | 1,229                    |                 |
| Offv                       |                                       |                         |                           | 0                        |                 |

Compliance data last updated: 05-13-2022 07:59 PM  
 Plan 7400 Page 1 of 2

**Site Drainage Area Compliance Data**

| Site Drainage Area ID | Public Right of Way      | Total area (square feet) | Natural (square feet) | Compacted (square feet) | Impervious (square feet) | BMP (square feet) | Vehicular access area | SWRV (cubic feet) | WQTV (cubic feet) | Volume retained (cubic feet) | Volume treated (cubic feet) | 2-year storm adjusted Curve Number | 15-year storm adjusted Curve Number | 100-year storm adjusted Curve Number | SDA Minimum Compliance |
|-----------------------|--------------------------|--------------------------|-----------------------|-------------------------|--------------------------|-------------------|-----------------------|-------------------|-------------------|------------------------------|-----------------------------|------------------------------------|-------------------------------------|--------------------------------------|------------------------|
| 7400-1                | <input type="checkbox"/> | 6,441                    | 0                     | 3,110                   | 2,721                    | 610               | 610                   | 394               | 0                 | 558                          | 0                           | 45                                 | 66                                  | 71                                   | Yes                    |

**Site BMP Compliance Data**

| BMP ID number | Type                | Total CDA (square feet) | Natural (square feet) | Compacted (square feet) | Impervious (square feet) | BMP (square feet) | Total Post project vehicular access area | Volume received from upstream BMPs (cubic feet) | Max volume received by BMP (cubic feet) | Storage volume (cubic feet) | Retention calculation  | Volume retained (cubic feet) | Volume treated (cubic feet) | Downstream BMP ID Numbers |
|---------------|---------------------|-------------------------|-----------------------|-------------------------|--------------------------|-------------------|--|---|---|-----------------------------|------------------------|------------------------------|-----------------------------|---------------------------|
| 7400-1-1      | Infiltration trench | 6,441                   |                       | 3,110                   | 2,721                    | 610               | 610                                      | 0   | 558                                     | 976                         | 100% of storage volume | 558                          | 0                           |                           |

**PROW Drainage Area Compliance Data**

No records were retrieved.

**PROW BMP Compliance Data**

No records were retrieved.

Compliance data last updated: 05-13-2022 07:59 PM  
 Plan 7400 Page 2 of 2

**Stormwater Management Requirements (SWMP 7400)**

Property Area = 13,629 SF  
 Areas Subject to SWM Requirement = 6,441 SF  
 Area Subject to MLDA Requirements = 6,441 SF  
 Disturbed Impervious Area (A<sub>i</sub>) = 3,331 SF  
 Total Compacted Cover Area (A<sub>c</sub>) = 3,110 SF  
 Total Natural Cover Area (A<sub>n</sub>) = 0 SF  
 Required Retention Depth (P1) = 1.2 in.  
 MLDA SWRV Required = **394 CF = 2949 GAL**  
 Area Subject to PROW Requirements = 0,000 SF  
 Disturbed Impervious Area (A<sub>i</sub>) = 0,000 SF  
 Total Compacted Cover Area (A<sub>c</sub>) = 0,000 SF  
 Total Natural Cover Area (A<sub>n</sub>) = 0 SF  
 Required Retention Depth (P1) = 1.2 in.  
 PROW SWRV Required = **0 CF = 0 GAL**  
 Private Property SWRV Required = **394 CF = 2949 GAL**  
 Public Space SWRV Required = **0 CF = 0 GAL**

**Peak Flowrate Attenuation Calculations**

**Step 1: Define the Existing Condition MLDA Area**  
 Total Drainage Area, A = 6,441 SF  
 Total Impervious Area, A<sub>ix</sub> = 0 SF  
 Total Compacted Cover Area, A<sub>cx</sub> = 6,441 SF  
 Total Natural Cover Area, A<sub>nx</sub> = 0 SF

**Step 2: Define the Post-development MLDA Area**  
 Total Drainage Area, A = 6,441 SF  
 Total Impervious Area, A<sub>ip</sub> = 3,331 SF  
 Total Compacted Cover Area, A<sub>cp</sub> = 3,110 SF  
 Total Natural Cover Area, A<sub>np</sub> = 0 SF

**STEP 3: Define Hydrologic Parameters**  
 Post-Development Curve Number, CN = 86.4  
 Existing Conditions Curve Number, CN = 74.0  
 Potential Abstraction, S = 1.57 IN  
 Meadow Conditions Runoff Coefficient, C<sub>pre</sub> = 0.20  
 Existing Condition Runoff Coefficient, C<sub>ex</sub> = 0.25  
 Post-Development Runoff Coefficient, C<sub>post</sub> = 0.61  
 2 Year Intensity, I<sub>2</sub> = 5.28 IN/HR  
 2 Year Rainfall Depth, P<sub>2</sub> = 3.16 IN  
 2 Year Pre-Development Peak Flowrate, q<sub>02</sub> = 0.16 CFS  
 2 Year Post-Development Peak Flowrate, q<sub>i2</sub> = 0.48 CFS  
 15 Year Intensity, I<sub>15</sub> = 7.56 IN/HR  
 15 Year Rainfall Depth, P<sub>15</sub> = 5.26 IN  
 15 Year Existing Condition Peak Flowrate, q<sub>015</sub> = 0.28 CFS  
 15 Year Post-Development Peak Flowrate, q<sub>i15</sub> = 0.68 CFS

**STEP 4: Calculate 2 Year Event Water Quantity Storage Volume**  
 2 Year Allowable Release Rate Ratio, q<sub>02</sub>/q<sub>i2</sub> = 0.327  
 2 Year Storage Volume Ratio, V<sub>s2</sub>/V<sub>r2</sub> = 0.363  
 2 Year Post-development Runoff, Q<sub>2</sub> = 1.83 IN  
 2 Year Runoff Volume, V<sub>r2</sub> = 0.02258 AC-FT  
 2 Year Storage Volume Required, V<sub>r2</sub> = 0.00820 AC-FT  
 2 Year Storage Volume Required, V<sub>s2</sub> = 357 CF

**STEP 5: Calculate 15 Year Event Water Quantity Storage Volume**  
 15 Year Allowable Release Rate Ratio, q<sub>015</sub>/q<sub>i15</sub> = 0.408  
 15 Year Storage Volume Ratio, V<sub>s15</sub>/V<sub>r15</sub> = 0.319  
 15 Year Potential Abstraction, S<sub>15</sub> = 1.57 IN  
 15 Year Runoff Value, Q<sub>15</sub> = 3.75 IN  
 15 Year Runoff Volume, V<sub>r15</sub> = 0.04620 AC-FT  
 15 Year Storage Volume Required, V<sub>r15</sub> = 0.01473 AC-FT  
 15 Year Storage Volume Required, V<sub>s15</sub> = 642 CF

**STEP 6: Determine Overall Storage Volume Requirement**  
 Flowrate Attenuation Storage Volume Required, V<sub>s</sub> = 642 CF  
 BMP Storage Volume = 976 CF = 7301 GAL  
 DESIGN ADEQUATE? YES

**Infiltration Trench (BMP #1)**

With Permeable Pavers on top

**Step 1: Define the Drainage Area**  
 Total Drainage Area (SA) = 6441 SF  
 Total Impervious Area (A<sub>i</sub>) = 3331 SF = 51.72%  
 Site Impervious Area = 478 SF  
 Roof Impervious Area = 2,243 SF = 100% of roof  
 BMP Area (SA) = 610 SF  
 Vehicle Accessible = 610 SF  
 Total Compacted Cover Area (A<sub>c</sub>) = 3110 SF = 48.28%  
 Total Natural Cover Area (A<sub>n</sub>) = 0 SF = 0.00%  
 Maximum Storm Event (D) = 1.7 in.  
 Runoff Available for Retention (V) = 558 CF = 4177 GAL

**STEP 2: Calculate Storage Volume Provided**

See Separate Infiltration Trench Storage Calculations

**Underground Reservoir Storage Volume**

Field Verified hydraulic Conductivity (K<sub>sat</sub>) = 0.700 in/hr  
 Field Verified hydraulic Conductivity (K<sub>sat</sub>) = 1.400 ft/day  
 Maximum Drawdown time (t<sub>d</sub>) = 3 days  
 Available Porosity (n<sub>v</sub>) = 0.4  
 Maximum Underground Depth (d<sub>max</sub>) = 4.00 FT

**Underground Reservoir Surface Area for Infiltration Trenches**

Design Storm = 558 CF  
 Time to Fill infiltration (t<sub>f</sub>) = 0.083 days  
 in Underground Surface Area for Trench (SA) = 325 SF  
 Minimum Surface Area Required = 343 SF  
 Surface area provided = 610 SF

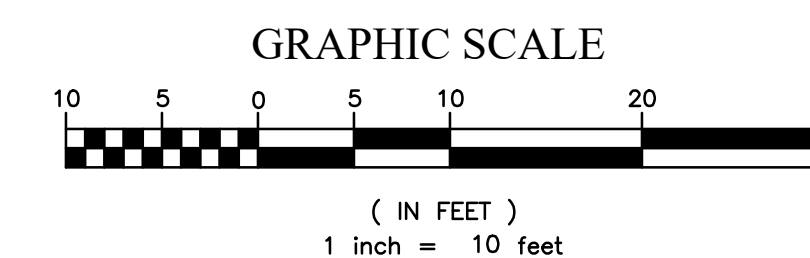
Storage Volume Calculations **976 CF**  
 Private Property SWRV Credited = 558 CF

**STEP 3: Confirm Drawdown Less Than 72 Hours**

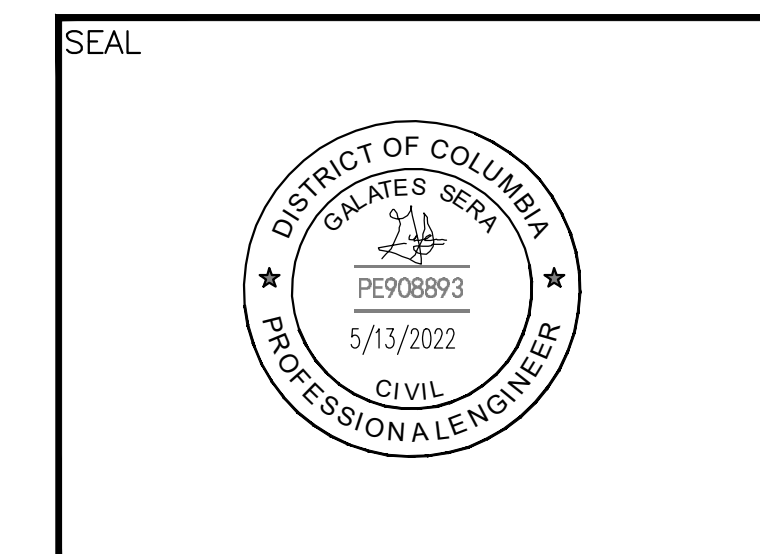
Storage Volume Provided (S<sub>v</sub>) = 976 CF  
 Facility Surface Area, SA = 610 SF  
 Design infiltration rate, i<sub>design</sub> = 1.40 in/hr  
 Drawdown Time (T<sub>D</sub>) = 13.72 HR

| K <sub>sat</sub> Calculations |                   |
|-------------------------------|-------------------|
| D (Casing Diameter)           | 4 in              |
| Dt (difference in time)       | 20 min            |
| H1                            | 0.722 FT          |
| H2                            | 0.558 FT          |
| K <sub>sat</sub>              | 0.882623776 in/hr |

| Stormwater Management Provided in Private Space |        |          |         |           |            |                 |
|---|--------|----------|---------|-----------|------------|-----------------|
|   | SWRV   | BMP Area | Natural | Compacted | Impervious | Storage         |
| Infiltration Trench (BMP #1)                    | 558 CF | 610      | 0       | 3109.9737 | 478        | 976             |
| Total   | 558 CF | 610      | 0       | 3,110     | 478        | 976             |
| Met (?)   | 164 CF | SURPLUS  |         |           |            | DESIGN ADEQUATE |



5/13/2022  
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DATE: MAY 13, 2022  
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 S.E. JOB NUMBER: 121-126

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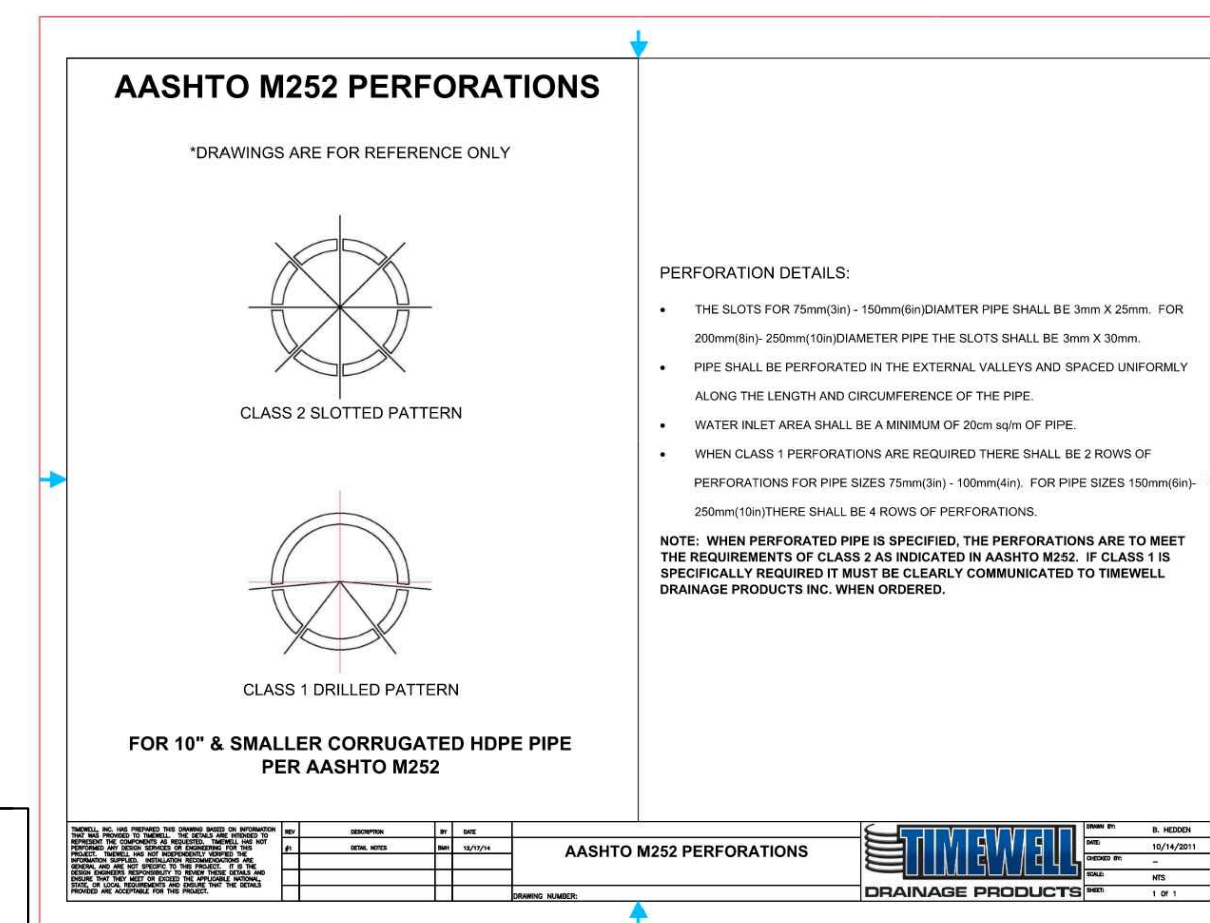
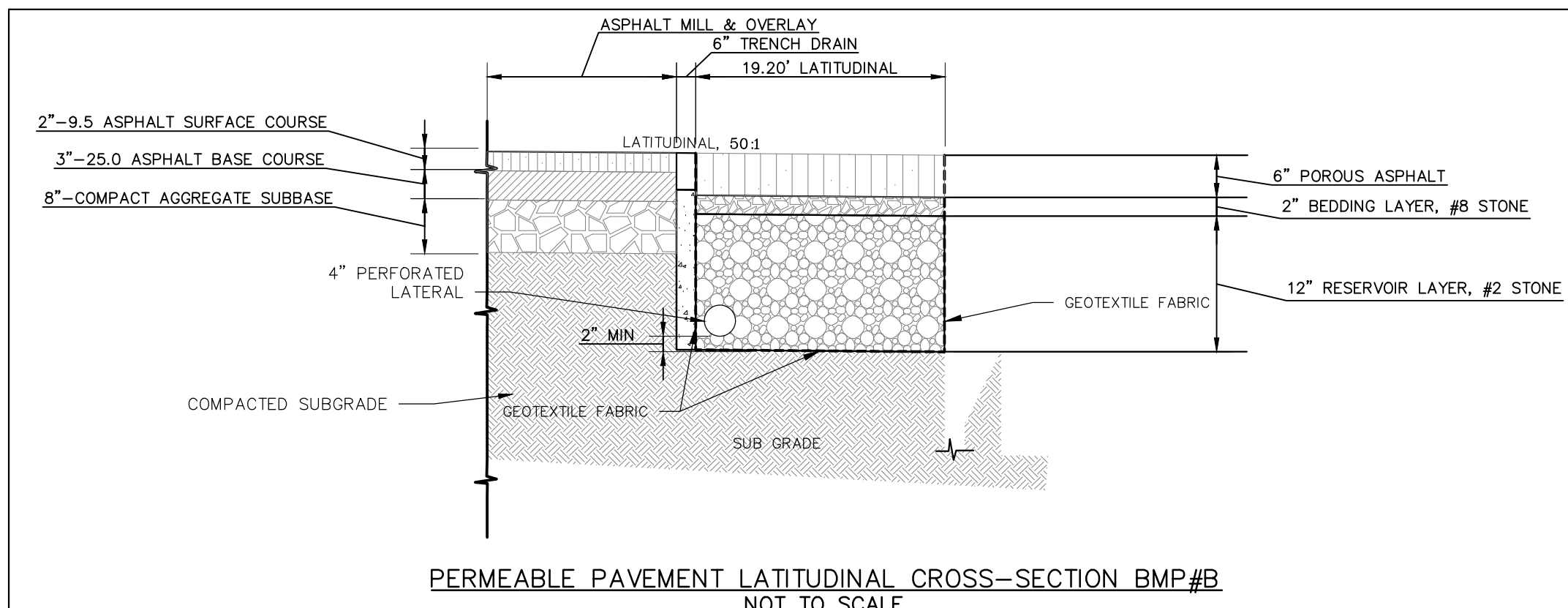
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SHEET TITLE:

SHEET SCALE.:  
 AS SHOWN





**WESTERN ENVIRONMENTAL LINER**  
**PVC**  
**DATA SHEET**

The combination of chemical resistance and good physical properties has led to PVC usage in numerous industrial applications such as **Landfill Liners, Secondary Waste Containment, Lagoons, Effluent Containment Ponds**, among others. PVC also works well in **water applications**.

| Continued Properties                 | ASTM                            | PVC 10                              | PVC 20                             | PVC 30                             | PVC 40                            | PVC 50                            | PVC 60                        |
|--------------------------------------|---------------------------------|-------------------------------------|------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|-------------------------------|
| Thickness                            | D-5199                          | 10.40 ± 0.10 mm<br>0.252 ± 0.013 mm | 20.21 ± 0.10 mm<br>0.51 ± 0.013 mm | 30.11 ± 0.10 mm<br>0.75 ± 0.014 mm | 40.21 ± 0.10 mm<br>1.02 ± 0.05 mm | 50.22 ± 0.10 mm<br>1.27 ± 0.08 mm | 60 ± 0.3 mm<br>1.52 ± 0.08 mm |
| Tensile Properties <sup>1</sup>      | D-582 <sup>2</sup><br>Min       |                                     |                                    |                                    |                                   |                                   |                               |
| Strength at Break                    |                                 | 26 lbf/in<br>4.2 kN/m               | 48 lbf/in<br>8.4 kN/m              | 73 lbf/in<br>12.8 kN/m             | 97 lbf/in<br>17.0 kN/m            | 118 lbf/in<br>20.3 kN/m           | 137 lbf/in<br>24.0 kN/m       |
| Elongation                           |                                 | 250%                                | 300%                               | 380%                               | 430%                              | 430%                              | 450%                          |
| Modulus at 100%                      |                                 | 10 lbf/in<br>1.8 kN/m               | 21 lbf/in<br>3.7 kN/m              | 32 lbf/in<br>5.4 kN/m              | 40 lbf/in<br>7.0 kN/m             | 50 lbf/in<br>8.9 kN/m             | 60 lbf/in<br>10.5 kN/m        |
| Tear Strength                        | D-1004 <sup>3</sup><br>Min      | 2.5 lbs<br>11 N                     | 6 lbs<br>27 N                      | 8 lbs<br>36 N                      | 8 lbs<br>44 N                     | 10 lbs<br>58 N                    | 15 lbs<br>67 N                |
| Dimensional Stability                | D-1594 <sup>4</sup><br>Max Chg  | 4%                                  | 4%                                 | 3%                                 | 3%                                | 3%                                | 3%                            |
| Low Temperature Impact               | D-1782 <sup>5</sup><br>Pass     | +10° F<br>-20° C                    | +15° F<br>-20° C                   | +20° F<br>-20° C                   | +20° F<br>-20° C                  | +20° F<br>-20° C                  | +20° F<br>-20° C              |
| Index Properties                     |                                 |                                     |                                    |                                    |                                   |                                   |                               |
| Specific Gravity                     | D-792<br>Typical                | 1.2 g/cc                            | 1.2 g/cc                           | 1.2 g/cc                           | 1.2 g/cc                          | 1.2 g/cc                          | 1.2 g/cc                      |
| Water Extraction Percent Loss (max)  | D-1295 <sup>6</sup><br>Max Loss | 0.15%                               | 0.15%                              | 0.15%                              | 0.20%                             | 0.20%                             | 0.20%                         |
| Average Plasticizer Molecular Weight | D-2124 <sup>7</sup>             | 400                                 | 400                                | 400                                | 400                               | 400                               | 400                           |
| Volatiles Loss Percent Loss (max)    | D-1202 <sup>8</sup><br>Max Loss | 1.5%                                | 0.8%                               | 0.7%                               | 0.5%                              | 0.5%                              | 0.5%                          |
| Soil Burial                          | D-1162 <sup>9</sup><br>Max Chg  |                                     |                                    |                                    |                                   |                                   |                               |
| Break Strength                       |                                 | 5%                                  | 5%                                 | 5%                                 | 5%                                | 5%                                | 5%                            |
| Elongation                           |                                 | 20%                                 | 20%                                | 20%                                | 20%                               | 20%                               | 20%                           |
| Modulus at 100%                      |                                 | 20%                                 | 20%                                | 20%                                | 20%                               | 20%                               | 20%                           |
| Hydrostatic Resistance               | D-751 <sup>10</sup><br>T/m      | 42 psi<br>290 kPa                   | 68 psi<br>470 kPa                  | 88 psi<br>610 kPa                  | 100 psi<br>680 kPa                | 120 psi<br>830 kPa                | 150 psi<br>1030 kPa           |
| Seam Strengths                       | ASTM                            | PVC 10                              | PVC 20                             | PVC 30                             | PVC 40                            | PVC 50                            | PVC 60                        |
| Shear Strength <sup>1</sup>          | D-2552 <sup>11</sup><br>Min     | 30 lbf/in<br>5.4 kN/m               | 58.4 lbf/in<br>10.4 kN/m           | 50.4 lbf/in<br>9.0 kN/m            | 77.0 lbf/in<br>14.0 kN/m          | 90 lbf/in<br>17.4 kN/m            | 110 lbf/in<br>20.6 kN/m       |
| Peel Strength <sup>1</sup>           | D-582 <sup>12</sup><br>Min      | 10 lbf/in<br>1.8 kN/m               | 12.5 lbf/in<br>2.2 kN/m            | 15 lbf/in<br>2.6 kN/m              | 15 lbf/in<br>2.6 kN/m             | 15 lbf/in<br>2.6 kN/m             | 15 lbf/in<br>2.6 kN/m         |

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Chapter 3 Stormwater Best Management Practices (BMPs)

**Table 3-11 Permeable Pavement Specifications for a Variety of Typical Surface Materials**

| Material               | Specification  | Notes  |
|------------------------|--|--|
| Permeable Pavers (PP)  | Void content, thickness, and compressive strength vary based on type and manufacturer<br>Open void fill media: aggregate, topsoil and grass, coarse sand, etc. | Reservoir layer required to support the structural load.   |
| Pervious Concrete (PC) | Void content: 15-20%<br>Thickness: Typically 4-4 inches<br>Compressive strength: 2.8-28 MPa<br>Open void fill media: None                                      | May not require a reservoir layer to support the structural load, but a layer may be included to increase the storage or infiltration. |
| Porous Asphalt (PA)    | Void content: 15-20%<br>Thickness: Typically 3-7 inches (depending on traffic load)<br>Open void fill media: None  | Reservoir layer required to support the structural load.   |

**Table 3-12 Material Specifications for Typical Layers Beneath the Pavement Surface**

| Material                     | Specification  | Notes   |
|------------------------------|--|---|
| Bedding Layer                | PC: 3-4 inches of No. 57 stone if No. 2 stone is used for Reservoir Layer<br>PA: 3-4 inches of No. 57 stone<br>PP: Follow manufacturer specifications  | ASTM D448 size No. 57 stone (i.e., 1/2 to 1 1/2 inches in size). Must be washed clean and free of fines (no more than 2% passing the No. 200 sieve)   |
| Reservoir Layer              | PC: No. 57 stone or No. 2 stone<br>PA: No. 2 stone<br>PP: Follow manufacturer specifications   | ASTM D448 size No. 57 stone; No. 2 Stone (i.e., 3/4 to 3 inches in size). Depth is based on the pavement structural and hydraulic requirements. Must be washed clean and free of fines. Other appropriate materials may be used if accepted by DOE. |
| Underdrain                   | Use 4- to 6-inch diameter perforated PVC pipe (or equivalent corrugated HDPE may be used for smaller load-bearing applications), with 3 or 4 rows of 3/8-inch perforations at 6 inches on center. Perforated pipe installed for the full length of the permeable pavement cell, and non-perforated pipe, as needed, used to connect with the storm drain system. T's and Y's should be installed as needed, depending on the underdrain configuration. Extend cleanout pipes to the surface. |   |
| Infiltration Sump (optional) | An aggregate storage layer below the underdrain invert. The material specifications are the same as Reservoir Layer.   |   |
| Filter Layer (optional)      | The underlying native soils should be separated from the stone reservoir by a 2- to 4-inch layer of choker stone (e.g., No. 8).  |   |
| Geotextile (optional)        | Use an appropriate geotextile fabric for both sides and/or bottom that complies with AASHTO M-288 Class 2 requirements and has a permeability of at least an order of magnitude (10 times) higher than the soil subgrade permeability. Low-permeability geotextile fabric may be used as a check dam material.   |   |
| Impermeable Liner (optional) | Where appropriate, use PVC geomembrane liner or equivalent.  |   |
| Observation Well             | Use a perforated 4- to 6-inch vertical PVC pipe (AASHTO M-252) with a lockable cap, installed flush with the surface.  |   |

90

ADS, Inc. Drainage Handbook Specifications • 1-5

**ADS N-12<sup>®</sup> ST IB PIPE (PER AASHTO) SPECIFICATION**

**Scope**  
This specification describes 4- through 60-inch (100 to 1500 mm) ADS N-12 ST IB pipe (per AASHTO) for use in gravity-flow land drainage applications.

**Pipe Requirements**  
ADS N-12 ST IB pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations.

- 4- through 10-inch (100 to 250 mm) pipe shall meet AASHTO M252, Type S or SP.
- 12- through 60-inch (300 to 1500 mm) pipe shall meet AASHTO M294, Type S or SP, or ASTM F2306.
- Manning's "n" value for use in design shall be 0.012.

**Joint Performance**  
Pipe shall be joined using a bell & spigot joint meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be soil-tight and gaskets, when applicable, shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

**Fittings**  
Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306.

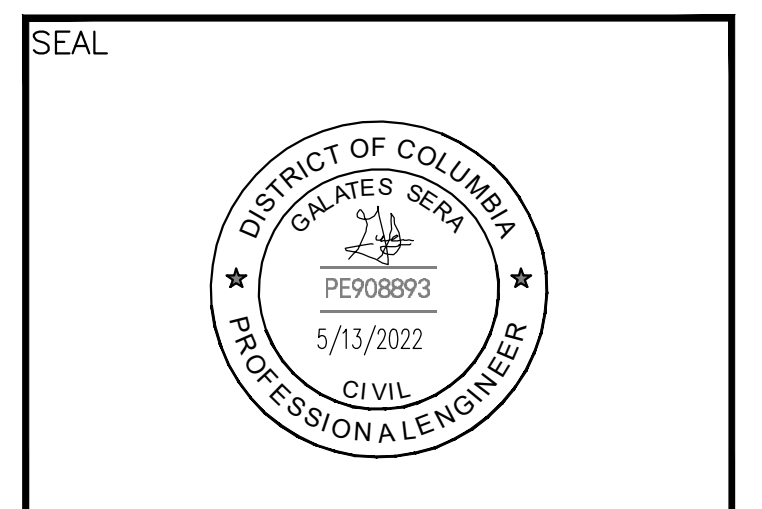
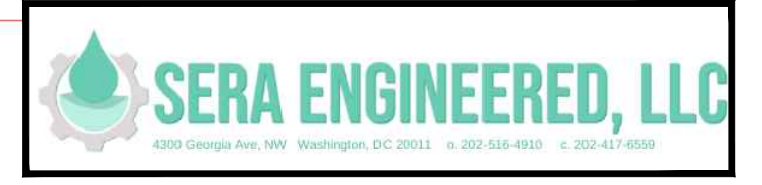
**Material Properties**  
Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters, and 435400C for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch (300 to 1500 mm) virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

**Installation**  
Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 48-inch (100 to 1200 mm) diameters shall be one foot (0.3 m) and for 60-inch (1500 mm) diameter the minimum cover shall be 2 ft (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted), Class 2 (minimum 90% SPD) or Class 3 (minimum 95% SPD) material. Maximum fill heights depend on embedment material and compaction level; please refer to Technical Note 2.01. Contact your local ADS representative or visit our website at [www.ads-usa.com](http://www.ads-usa.com) for a copy of the latest installation guidelines.

**Pipe Dimensions**

| Pipe ID<br>(in/mm)                | Nominal Diameter (in/mm) |       |       |       |       |       |       |       |       |        |        |        |        |  |  |  |
|-----------------------------------|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--|--|--|
|                                   | 4                        | 6     | 8     | 10    | 12    | 15    | 18    | 24    | 30    | 36     | 42     | 48     | 60     |  |  |  |
| Pipe O.D. <sup>1</sup><br>(in/mm) | 4.8                      | 6.9   | 9.1   | 11.4  | 14.5  | 18    | 24    | 30    | 36    | 42     | 48     | 54     | 60     |  |  |  |
|                                   | (122)                    | (175) | (231) | (290) | (368) | (457) | (609) | (761) | (914) | (1067) | (1219) | (1372) | (1524) |  |  |  |

<sup>1</sup>Pipe O.D. values are provided for reference purposes only; values stated for 12 through 60-inch are ± 1 inch. Contact a sales representative for exact values.  
<sup>2</sup>All diameters available with or without perforations.



REVISIONS

| No. | Date | Drawing Issue | By |
|-----|------|---------------|----|
|     |      |               |    |
|     |      |               |    |
|     |      |               |    |
|     |      |               |    |
|     |      |               |    |

DATE: MAY 13, 2022  
DRAWN BY: AC/DW CHECKED BY: GS  
S.E. JOB NUMBER: 121-126

PROJECT ADDRESS:  
4509 FOXHALL CRES NW  
WASHINGTON DC, 20007

PHASE:  
PERMIT DOCUMENTS

SHEET NO.:  
CIV520

SHEET TITLE:  
STORMWATER MANAGEMENT  
DETAILS

SHEET SCALE: AS SHOWN

**STORM DETAILS NOTES**

- THESE DETAILS ARE FOR STORM SEWER AND STORMWATER MANAGEMENT ON PRIVATE PROPERTY, AND FOR PRIVATELY OWNED & MAINTAINED STORM SEWER AND STORMWATER MANAGEMENT IN PUBLIC SPACE. ALL OTHER STORM SEWER IN PUBLIC SPACE SHALL BE IN ACCORDANCE WITH DDOT AND DC WATER STANDARDS.

5/13/2022  
THESE PLANS ARE ISSUED FOR AGENCY REVIEW. ALL APPLICABLE AGENCY PERMIT APPROVALS MUST BE OBTAINED PRIOR TO CONSTRUCTION. FINAL APPROVED "FOR CONSTRUCTION" PLANS WILL BE ISSUED UPON COMPLETION OF THE REVIEW AND APPROVAL PROCESS BY ALL DISTRICT AGENCIES.

