
STORMWATER OPERATION & MAINTENANCE MANUAL

for

CRESTMONT COUNTRY CLUB & EAGLE ROCK AVE IMPROVEMENTS

BLOCK No. 174, LOT No. 1.01

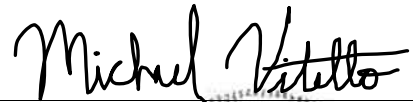
TOWNSHIP OF WEST ORANGE, ESSEX COUNTY, NEW JERSEY

Prepared For:

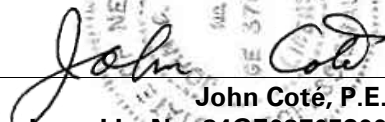
Crestmont Country Club, Inc.
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West Orange, New Jersey 07052

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February 12, 2026
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1.0 INTRODUCTION

The New Jersey Administrative Code NJAC 7:8-5.8 entitled "Maintenance Requirements" sets forth rules and refers to the New Jersey Stormwater Best Practices Manual (the BMP manual) by the New Jersey Department of Environmental Protection (NJDEP). Chapter 8 of the BMP manual entitled "Maintenance and Retrofit of Stormwater Management Measures" specifically addresses the requirements for maintenance of a major development. Major development is defined in the aforementioned administrative code as any development that provides for ultimately disturbing one or more acres of land or increasing the amount of impervious surface by one-quarter of an acre. This report is prepared to address the maintenance component of the herein described development to ensure the effective, efficient, and enduring service of a particular stormwater measure. This plan contains preventative and corrective maintenance tasks and procedures.

The party responsible for the preventative and corrective maintenance of the stormwater measures described herein is:

Crestmont Country Club, Inc.
750 Eagle Rock Avenue
West Orange, New Jersey 07052
Contact: Dana Cancellaro
Phone: 973-731-2060 x256
Email: dana@crestmontcountryclub.com

2.0 PROJECT DESCRIPTION

The project site is comprised of Block No.174, Lot No. 1.01 in the Township of West Orange, Essex County, New Jersey. The 146.76± acre tract is the location of Crestmont Country Club and predominantly covered by the grassed golf course, along with some wooded areas. The site is bound by Laurel Avenue and Eagle Rock Avenue to the north, undeveloped wooded area to the east and south, and a continuation of the Crestmont Country Club golf course to the west. The proposed work will only impact 3.93± acres of the site, located along Eagle Rock Avenue and Laurel Avenue in the north side of the property.

The proposed development includes the construction of:

- Installation of a new traffic signal at Eagle Rock Avenue & Oval Road intersection;
- Widening along Eagle Rock Avenue to support the new lane geometry required at the new signal;

- Re-alignment of the Crestmont egress driveway to connect into the new intersection; and,
- Onsite improvements to both increase the number of parking spaces and re-design the parking around the new egress driveway.

The proposed development disturbs more than one acre of land; therefore, this project is considered a “major development” from a stormwater management perspective, and the proposed design is required to address stormwater quantity, quality, and groundwater recharge requirements. The proposed stormwater management system consists of the following:

- A subsurface conveyance system consisting of inlets, manholes, and pipes to convey stormwater runoff from the 25-year design storm event;
- 2 small-scale bioretention basins; and,
- 1 porous asphalt pavement system.

3.0 STORMWATER MAINTENANCE OBJECTIVE

The stormwater management system for the proposed development is intended to collect and convey the stormwater runoff. Regular maintenance procedures are required to ensure the consistent operation and safe conditions of the stormwater management facilities and prevent the occurrence of problems and malfunctions. The maintenance program provides the stormwater maintenance procedures for the site. The maintenance plan shall be evaluated and adjusted as needed.

Funding shall be allocated to cover costs of preventive and corrective maintenance. Such funding must cover the costs of staffing, equipment, materials, maintenance, emergency repairs, replacement of equipment, training of employees, administrative costs, disposal costs and permit fees.

Regularly scheduled inspection and maintenance is necessary to ensure long-term operation and safety of stormwater management facilities. Inspection and maintenance procedure shall be recorded through detailed logs. Copies of maintenance related work orders shall be retained. Logs, work orders, the maintenance plan, and documentation of its evaluation shall be made available, upon request by any public entity with administrative, health, environmental or safety authority of the site.

Maintenance personnel shall be trained about the purpose and operation of the stormwater management facilities. They must understand the importance of the maintenance of such facilities and the consequences of neglect. The training shall include maintenance and inspection techniques, proper record keeping, and emergency procedures. Sample

maintenance work order and inspection checklist and logs have been provided in Appendix A and B of this manual. Actual maintenance work order and inspection checklists and logs shall be developed as part of the site stormwater facilities maintenance program.

4.0 CONSTRUCTED STORMWATER MANAGEMENT SYSTEM ELEMENTS

The on-site stormwater management system includes best management practices (BMPs) designed to meet the stormwater quantity, quality, and groundwater recharge requirements for the project site, as well as series of subsurface conveyance systems comprised of precast inlets, manhole structures, drainage pipes, and riprap aprons, which convey stormwater runoff to and from the stormwater management BMPs and ultimately to the proposed off-site discharge points.

4.1 Stormwater Management BMPs

The proposed redevelopment incorporates the following BMPs into the stormwater management design: 2 small-scale bioretention basins and 1 porous asphalt pavement system. Refer to Drawings CG103 and CG104 for the location of each proposed BMP; the table below lists each BMP proposed on the property that is subject to the requirements set forth in this maintenance plan.

Table 1 – Summary of Proposed BMPs		
BMP Designation	Type of BMP	Location on Project Site
SSBB-1	Small-scale under-drained bioretention basin	Southeast of the Laurel Ave and Eagle Rock Ave intersection
SSBB-2	Small-scale under-drained bioretention basin	East of the proposed driveway connection to Eagle Rock Ave
PAPS-1	Porous Pavement	Parking Spaces south of SSBB-2

4.1.1 Small-Scale Bioretention Basins

There are 2 small-scale bioretention basins proposed on the project site. The basins are comprised of a 24-inch thick soil media layer, underlain by a 6" thick sand layer and an underdrain collection system comprised of perforated 6" diameter HDPE pipes encased by a minimum of 3 inches of AASHTO #57 stone aggregate both above and below the collection system piping. A variety of ornamental grasses, plants, and shrubs are planted within the basin to promote uptake of pollutants and evapotranspiration. An outlet control structure maintains specific water levels within the basins for each design storm event.

The bioretention basins are designed to store and percolate the volume of stormwater generated by the water quality design storm event, which is defined as 1.25 inches of rainfall over a period of 2 hours. For each basin, the first outlet opening within the outlet control is set a maximum 12" above the bottom of the storage area of the basin in order to promote infiltration through the soil media layer and achieve 80% or 90% TSS removal.

4.1.2 Porous Pavement Systems

There is 1 porous pavement systems proposed on the project site. Porous pavement systems consist of a porous asphalt surface layer, a choker course that filters pollutants, subbase aggregate that acts as the stormwater runoff storage component of the BMP, and an underdrain collection system comprised of perforated 4" diameter HDPE pipes encased by stone aggregate both above and below the collection system piping. The depth of the subbase aggregate has been designed to store the volume of stormwater generated by the water quality design storm event in order to achieve 80% TSS removal credit. The underdrain collection system prevents runoff from infiltrating into the native subsoils; instead, the runoff is captured and discharged into the proposed subsurface conveyance network.

4.2 Stormwater Conveyance Network

The proposed project utilizes various series of subsurface conveyance networks to facilitate the collection and conveyance of stormwater runoff for the 25-year design storm event. The conveyance networks consist of precast concrete inlet structures, precast concrete manhole structures, drainage piping, and riprap aprons. Refer to Drawings CG103 and CG104 – Partial Drainage Plans – for an overview of the conveyance network and location of various pipes and structures.

4.2.1 Storm Sewer Conveyance Piping

High Density Polyethylene (HDPE) Pipe is proposed for the conveyance of stormwater where the proposed cover over the top of the pipe is a minimum 2 feet. Class V reinforced concrete pipe (RCP) is proposed within the right-of-way. Perforated HDPE pipe is proposed to be utilized as the underdrain collection system piping for the BMPs specified to utilize an underdrain collection system as part of their design. An HDPE flared-end section is proposed in bioretention basin SSBB-2.

4.2.2 Precast Concrete Structures

Precast concrete inlets utilized throughout the site generally consist of NJDOT Type A, Type B, and Type E inlets. Type B curb inlets will be fitted with Type N Eco curb pieces to prevent trash and floatables from entering the conveyance network. All inlet grates shall be bicycle-safe, and

rated to meet heavy-duty H-20 traffic loading requirements. Precast storm manhole structures and inlet box sizes are to be sized to accommodate the largest proposed pipe connections, and polypropylene steps shall be provided for maintenance access. Precast concrete headwalls are proposed at the outfall pipe to Small-Scale Bioretention Basin 1 (SSBB-1) and at an outfall pipe to Small-Scale Bioretention Basin 2 (SSBB-2). Precast concrete outlet control structures are proposed at the small-scale bioretention basins and the porous asphalt pavement system.

5.0 INSPECTION AND MAINTENANCE PROCEDURES

The owner is responsible for maintenance identified in the maintenance manual and shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater system measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders. The owner is to evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan as needed.

Maintenance and inspection access to all proposed stormwater BMPs shall be maintained at all times. All components of the stormwater management measures must be readily accessible; trees, shrubs, and ornamental grasses must be pruned or trimmed as necessary to maintain access, and areas adjacent to these BMPs shall be made clear during scheduled maintenance activities to allow for ease of access for maintenance vehicles.

5.1 Preventative Maintenance Measures

The frequency and type of preventative maintenance prescribed is adopted from the New Jersey Best Management Practices Manual.

5.1.1 Conveyance Networks

The conveyance systems, including inlets, manholes, and pipes are expected to receive and/or accumulate debris and sediment. These systems shall be inspected for clogging and sediment accumulation at least bi-annually, and shall be inspected for trash and debris removal at least quarterly, and may require cleaning to prevent the loss of discharge capacity storage volume. Sediment removal should take place when all runoff has drained from the pipe networks and the systems are reasonably dry. 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.

All structural components must be inspected for cracking, subsidence, breaching, wearing and deterioration at least annually. The conditions of surrounding and above lying materials shall be inspected for evidence of potential failures or deterioration.

Two people may be needed to perform routine maintenance of the conveyance systems. The routine equipment expected to be utilized for the maintenance tasks may include a jet vacuum vehicle, shovels, lighting equipment and a wheelbarrow or truck for the hauling off of debris.

All inspections and maintenance operations shall be documented and logged. All documentations and logs shall be retained for future review.

5.1.2 Small-Scale Bioretention Basins

The small-scale bioretention basins shall be inspected for sediment accumulation at least quarterly, and shall be inspected for trash and debris removal at least quarterly. The bottom elevation and design storage volume of each basin must be maintained in order to maintain adequate capacity; sediment and debris build-up shall be removed upon inspection. The basins and associated riprap aprons should be inspected for signs of erosion at least quarterly, and after each major rainfall event in excess of 2 inches. Structural components associated with the outlet control structure, including any trash racks, should be inspected at least annually. The underdrain collection piping shall be inspected at least annually for any sediment or debris build-up, and shall be jet-vacuum cleaned if necessary.

Bioretention basins planted with ornamental grasses, shrubs, and trees shall be inspected at least quarterly for plant health. Dead vegetation shall be re-planted during the spring and fall growing seasons in order to maintain a minimum 90% of healthy plants at any time in order to continue promoting adequate uptake of pollutants via the root systems. Leaves and other vegetative debris shall be raked and collected on an as-needed basis in order to maintain adequate basin storage volumes.

Meadow mix seeding is utilized along the bottom and embankment sides of the proposed bioretention basins. After the first growing season, and if the meadow mix seeding is well established, the meadow mix native vegetation shall be mowed only once annually in order to promote sustained growth. If the meadow mix is not fully established, the meadow mix areas shall be supplemented with additional seeding to ensure re-establishing all meadow mix areas. The annual maintenance mowing shall be done in late winter during the month of March.

5.1.3 Porous Pavement Systems

All components of the porous asphalt pavement system should be inspected at least twice annually unless otherwise noted. The perforated HDPE underdrain system should be inspected for clogging and jet-cleaned as necessary to remove sediment. The porous asphalt layer should be inspected for clogging at least quarterly, and after each major rain event in excess of 2 inches, for signs of clogging, sediment build-up, and weed growth. Sediment be removed and jet-cleaned as necessary, in order to maintain adequate permeability for runoff to percolate into the storage bed below. The underdrain collection piping shall be inspected at least annually for any sediment or debris build-up, and shall be jet-vacuum cleaned if necessary.

5.2 Corrective Maintenance Measures

Depending on many factors, such as the performance of preventative maintenance actions, weather, or unexpected incidents, corrective maintenance requirements may not be precisely anticipated. Corrective maintenance is required on an emergency or non-routine basis to correct problems or malfunctions and to restore the components of the stormwater management system to its intended operations and safe conditions.

Standing water within the proposed basins more than 72 hours after a storm event has ended is a sign that there is inadequate infiltration and/or discharge through the outlet control structure is occurring. The outlet control structure orifice openings, soil media layer, and underdrain collection piping within bioretention basins shall be inspected for sediment build-up, clogging, or debris and corrected immediately. The outlet control structure and sand layer within infiltration basins shall be inspected sediment build-up, clogging, or debris and corrected immediately.

Sediment, debris, and trash which threaten the discharge capacity and storage volume of a stormwater facility should be removed immediately and properly disposed of in a timely manner. Equipment and personnel must be available to perform the removal work on short notice. Disposal of debris, trash, sediments and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations. The lack of an available disposal site should not delay the removal of trash, debris, and sediment. Temporary storage shall be utilized until an approved disposal site is available.

Structural damage to precast structures, pipes, and trash racks must be repaired promptly. Equipment, materials and personnel must be available to perform these repairs on short notice. The immediacy of the repairs will depend upon the nature of the damage and its effects on the

safety and operations of the facility. The analysis of structural damage and the design and performance of structural repairs should only be undertaken by qualified personnel.

All corrective maintenance operation shall be documented and logged. All documentation and logs shall be retained for future review.

6.0 ESTIMATED COST FOR MAINTENANCE PROCEDURES

Storm Sewer Conveyance Systems sediment removal by jet vacuum truck (2-man crew) performed annually:

\$6,000 per session X 1 = \$6,000.00 annual cost (if required)

Bioretention basin preventative maintenance performed annually:

\$5,000 per session X 1 = \$5,000.00 annual cost (if required)

Porous Asphalt Pavement System sediment removal by jet vacuum truck (2-man crew) performed annually:

\$10,000 per session X 1 = \$10,000.00 annual cost (if required)

Trash and Debris removal by manual labor (2-man crew) performed Bi-annually

\$1,000.00 per session X 2 = \$2,000.00 annual cost

Total = \$23,000.00 annual cost (if required)

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DRAWINGS

LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW		
CONTOUR		
SPOT ELEVATION		
STORM MANHOLE		
SANITARY MANHOLE		
CATCH BASIN		
STORM SEWER		
SANITARY SEWER		
RETAINING WALL		
ROOF DRAIN/UNDERDRAIN		
TURF REINFORCEMENT LINER		
POROUS ASPHALT PAVEMENT		

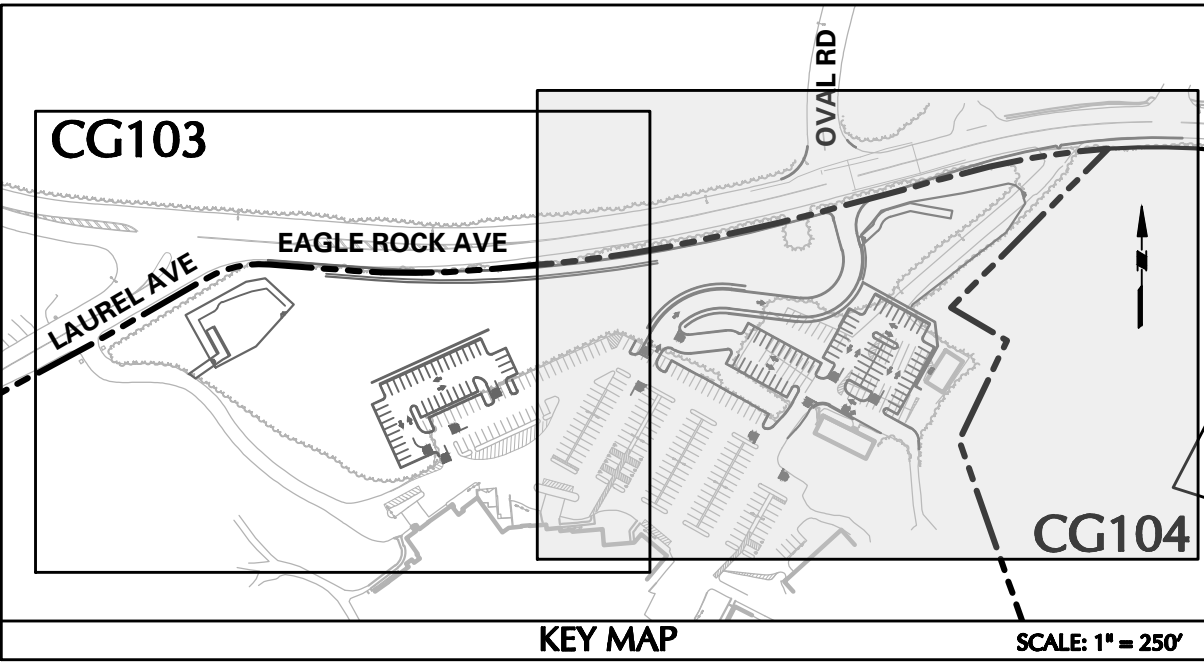
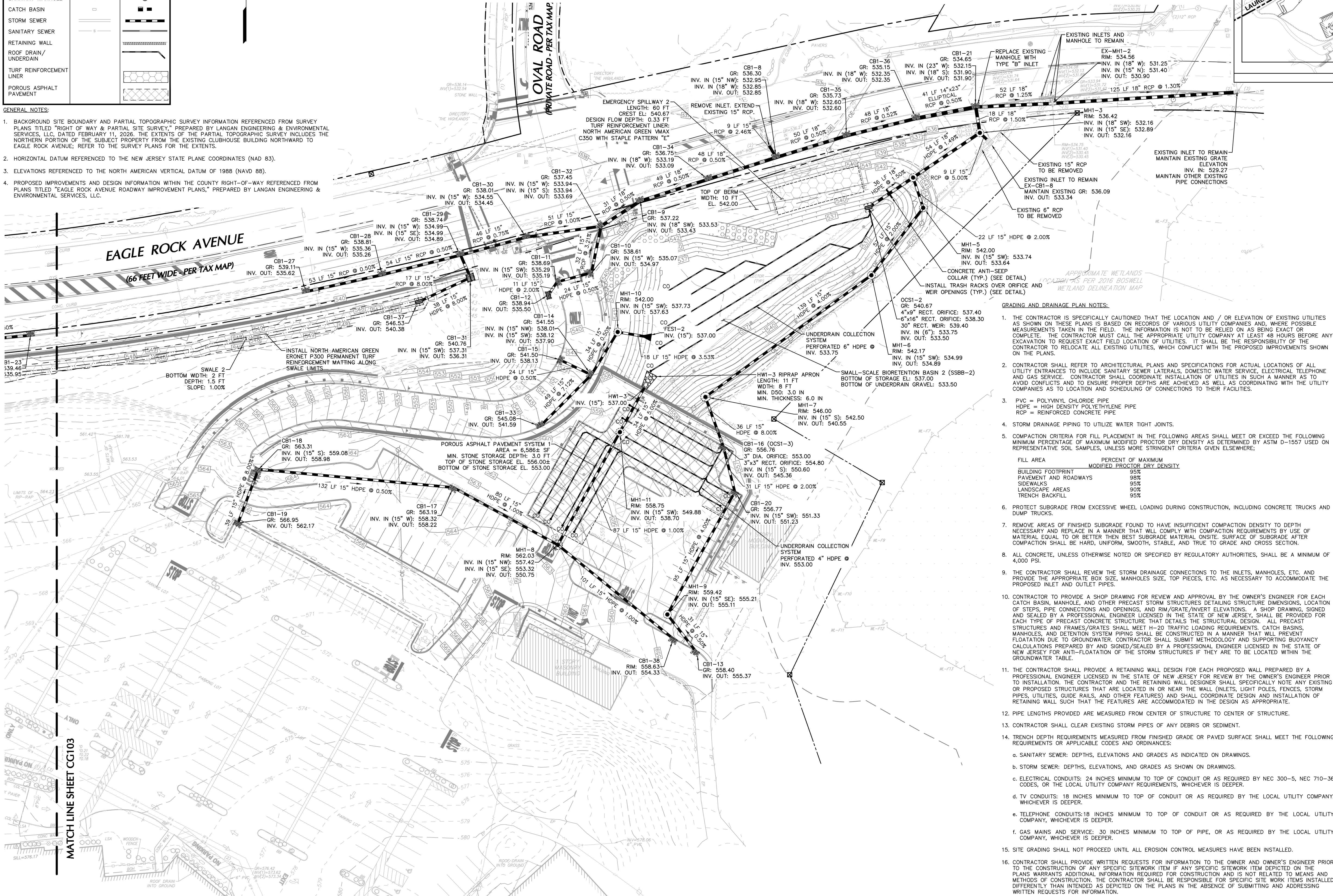
GENERAL NOTES:

1. BACKGROUND SITE BOUNDARY AND PARTIAL TOPOGRAPHIC SURVEY INFORMATION REFERENCED FROM SURVEY PLANS TITLED "RIGHT OF WAY & PARTIAL SITE SURVEY," PREPARED BY LANGAN ENGINEERING & ENVIRONMENTAL SERVICES, LLC, DATED FEBRUARY 11, 2026. THE EXTENTS OF THE PARTIAL TOPOGRAPHIC SURVEY INCLUDES THE NORTHERN PORTION OF THE SUBJECT PROPERTY FROM THE EXISTING CLUBHOUSE BUILDING NORTHWARD TO EAGLE ROCK AVENUE; REFER TO THE SURVEY PLANS FOR THE EXTENTS.

2. HORIZONTAL DATUM REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATES (NAD 83).

3. ELEVATIONS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

4. PROPOSED IMPROVEMENTS AND DESIGN INFORMATION WITHIN THE COUNTY RIGHT-OF-WAY REFERENCED FROM PLANS TITLED "EAGLE ROCK AVENUE ROADWAY IMPROVEMENT PLANS," PREPARED BY LANGAN ENGINEERING & ENVIRONMENTAL SERVICES, LLC.



- GRADING AND DRAINAGE PLAN NOTES:
1. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND / OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES, WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

2. CONTRACTOR SHALL REFER TO ARCHITECTURAL PLANS AND SPECIFICATIONS FOR ACTUAL LOCATIONS OF ALL UTILITY ENTRANCES TO INCLUDE SANITARY SEWER LATERALS, DOMESTIC WATER SERVICE, ELECTRICAL TELEPHONE AND GAS SERVICE. CONTRACTOR SHALL COORDINATE INSTALLATION OF UTILITIES IN SUCH A MANNER AS TO AVOID CONFLICTS AND TO ENSURE PROPER DEPTHS ARE ACHIEVED AS WELL AS COORDINATING WITH THE UTILITY COMPANIES AS TO LOCATION AND SCHEDULING OF CONNECTIONS TO THEIR FACILITIES.

3. PVC = POLYVINYL CHLORIDE PIPE
HDPE = HIGH DENSITY POLYETHYLENE PIPE
RCP = REINFORCED CONCRETE PIPE

4. STORM DRAINAGE PIPING TO UTILIZE WATER TIGHT JOINTS.

5. COMPACTION CRITERIA FOR FILL PLACEMENT IN THE FOLLOWING AREAS SHALL MEET OR EXCEED THE FOLLOWING MINIMUM PERCENTAGE OF MAXIMUM MODIFIED PROCTOR DRY DENSITY AS DETERMINED BY ASTM D-1557 USED ON REPRESENTATIVE SOIL SAMPLES, UNLESS MORE STRINGENT CRITERIA GIVEN ELSEWHERE:

FILL AREA	PERCENT OF MAXIMUM MODIFIED PROCTOR DRY DENSITY
BUILDING FOOTPRINT	95%
PAVEMENT AND ROADWAYS	98%
SIDEWALKS	95%
LANDSCAPE AREAS	90%
TRENCH BACKFILL	95%

6. PROTECT SUBGRADE FROM EXCESSIVE WHEEL LOADING DURING CONSTRUCTION, INCLUDING CONCRETE TRUCKS AND DUMP TRUCKS.

7. REMOVE AREAS OF FINISHED SUBGRADE FOUND TO HAVE INSUFFICIENT COMPACTION DENSITY TO DEPTH NECESSARY AND REPLACE IN A MANNER THAT WILL COMPLY WITH COMPACTION REQUIREMENTS BY USE OF MATERIAL EQUAL TO OR BETTER THEN BEST SUBGRADE MATERIAL ON-SITE. SURFACE OF SUBGRADE AFTER COMPACTION SHALL BE HARD, UNIFORM, SMOOTH, STABLE, AND TRUE TO GRADE AND CROSS SECTION.

8. ALL CONCRETE, UNLESS OTHERWISE NOTED OR SPECIFIED BY REGULATORY AUTHORITIES, SHALL BE A MINIMUM OF 4,000 PSI.

9. THE CONTRACTOR SHALL REVIEW THE STORM DRAINAGE CONNECTIONS TO THE INLETS, MANHOLES, ETC. AND PROVIDE THE APPROPRIATE BOX SIZE, MANHOLES SIZE, TOP PIECES, ETC. AS NECESSARY TO ACCOMMODATE THE PROPOSED INLET AND OUTLET PIPES.

10. CONTRACTOR TO PROVIDE A SHOP DRAWING FOR REVIEW AND APPROVAL BY THE OWNER'S ENGINEER FOR EACH CATCH BASIN, MANHOLE, AND OTHER PRECAST STORM STRUCTURES DETAILING STRUCTURE DIMENSIONS, LOCATION OF STEPS, PIPE CONNECTIONS AND OPENINGS, AND RIM/GRATE/INVERT ELEVATIONS. A SHOP DRAWING, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY, SHALL BE PROVIDED FOR EACH TYPE OF PRECAST CONCRETE STRUCTURE THAT DETAILS THE STRUCTURAL DESIGN. ALL PRECAST STRUCTURES AND FRAMES/GRATES SHALL MEET H-20 TRAFFIC LOADING REQUIREMENTS, CATCH BASINS, MANHOLES, AND DETENTION SYSTEM PIPING SHALL BE CONSTRUCTED IN A MANNER THAT WILL PREVENT FLOATION DUE TO GROUNDWATER. CONTRACTOR SHALL SUBMIT METHODOLOGY AND SUPPORTING BUOYANCY CALCULATIONS PREPARED BY AND SIGNED/SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY FOR ANTI-FLOATION OF THE STORM STRUCTURES IF THEY ARE TO BE LOCATED WITHIN THE GROUNDWATER TABLE.

11. THE CONTRACTOR SHALL PROVIDE A RETAINING WALL DESIGN FOR EACH PROPOSED WALL PREPARED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY FOR REVIEW BY THE OWNER'S ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR AND THE RETAINING WALL DESIGNER SHALL SPECIFICALLY NOTE ANY EXISTING OR PROPOSED STRUCTURES THAT ARE LOCATED IN OR NEAR THE WALL (INLETS, LIGHT POLES, FENCES, STORM PIPES, UTILITIES, GUIDE RAILS, AND OTHER FEATURES) AND SHALL COORDINATE DESIGN AND INSTALLATION OF RETAINING WALL SUCH THAT THE FEATURES ARE ACCOMMODATED IN THE DESIGN AS APPROPRIATE.

12. PIPE LENGTHS PROVIDED ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE.

13. CONTRACTOR SHALL CLEAR EXISTING STORM PIPES OF ANY DEBRIS OR SEDIMENT.

14. TRENCH DEPTH REQUIREMENTS MEASURED FROM FINISHED GRADE OR PAVED SURFACE SHALL MEET THE FOLLOWING REQUIREMENTS OR APPLICABLE CODES AND ORDINANCES:

a. SANITARY SEWER: DEPTHS, ELEVATIONS AND GRADES AS INDICATED ON DRAWINGS.
b. STORM SEWER: DEPTHS, ELEVATIONS, AND GRADES AS SHOWN ON DRAWINGS.
c. ELECTRICAL CONDUITS: 24 INCHES MINIMUM TO TOP OF CONDUIT OR AS REQUIRED BY NEC 300-5, NEC 710-36 CODES, OR THE LOCAL UTILITY COMPANY REQUIREMENTS, WHICHEVER IS DEEPER.
d. TV CONDUITS: 18 INCHES MINIMUM TO TOP OF CONDUIT OR AS REQUIRED BY THE LOCAL UTILITY COMPANY, WHICHEVER IS DEEPER.
e. TELEPHONE CONDUITS: 18 INCHES MINIMUM TO TOP OF CONDUIT OR AS REQUIRED BY THE LOCAL UTILITY COMPANY, WHICHEVER IS DEEPER.
f. GAS MAINS AND SERVICE: 30 INCHES MINIMUM TO TOP OF PIPE, OR AS REQUIRED BY THE LOCAL UTILITY COMPANY, WHICHEVER IS DEEPER.

15. SITE GRADING SHALL NOT PROCEED UNTIL ALL EROSION CONTROL MEASURES HAVE BEEN INSTALLED.

16. CONTRACTOR SHALL PROVIDE WRITTEN REQUESTS FOR INFORMATION TO THE OWNER AND OWNER'S ENGINEER PRIOR TO THE CONSTRUCTION OF ANY SPECIFIC SITEWORK ITEM IF ANY SPECIFIC SITEWORK IS DEPICTED ON THE PLANS WARRANTS ADDITIONAL INFORMATION REQUIRED FOR CONSTRUCTION AND IS NOT RELATED TO MEANS AND METHODS OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SPECIFIC SITE WORK ITEMS INSTALLED DIFFERENTLY THAN INTENDED AS DEPICTED ON THE PLANS IN THE ABSENCE OF SUBMITTING AND ADDRESSING WRITTEN REQUESTS FOR INFORMATION.

17. PROPOSED SIDEWALKS SHALL BE CONSTRUCTED WITH CROSS-SLOPES THAT DO NOT EXCEED 1.5%.

18. PROPOSED RCP PIPE IS TO BE CLASS V PIPE.

19. ALL PIPE WITH A BURIAL DEPTH OF 20 FEET OR GREATER SHALL BE SMOOTH INTERIOR CORRUGATED METAL PIPE.

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Date	Description	No.

REVISIONS

STATE OF NEW JERSEY
JANUARY 11, 2026

SIGNATURE:
DATE SIGNED: 2/12/2026
PROFESSIONAL ENGINEER NJ Lic. No. 24GE03705800

LANGAN
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NJ Certificate of Authorization No. 24GA27996400

Project

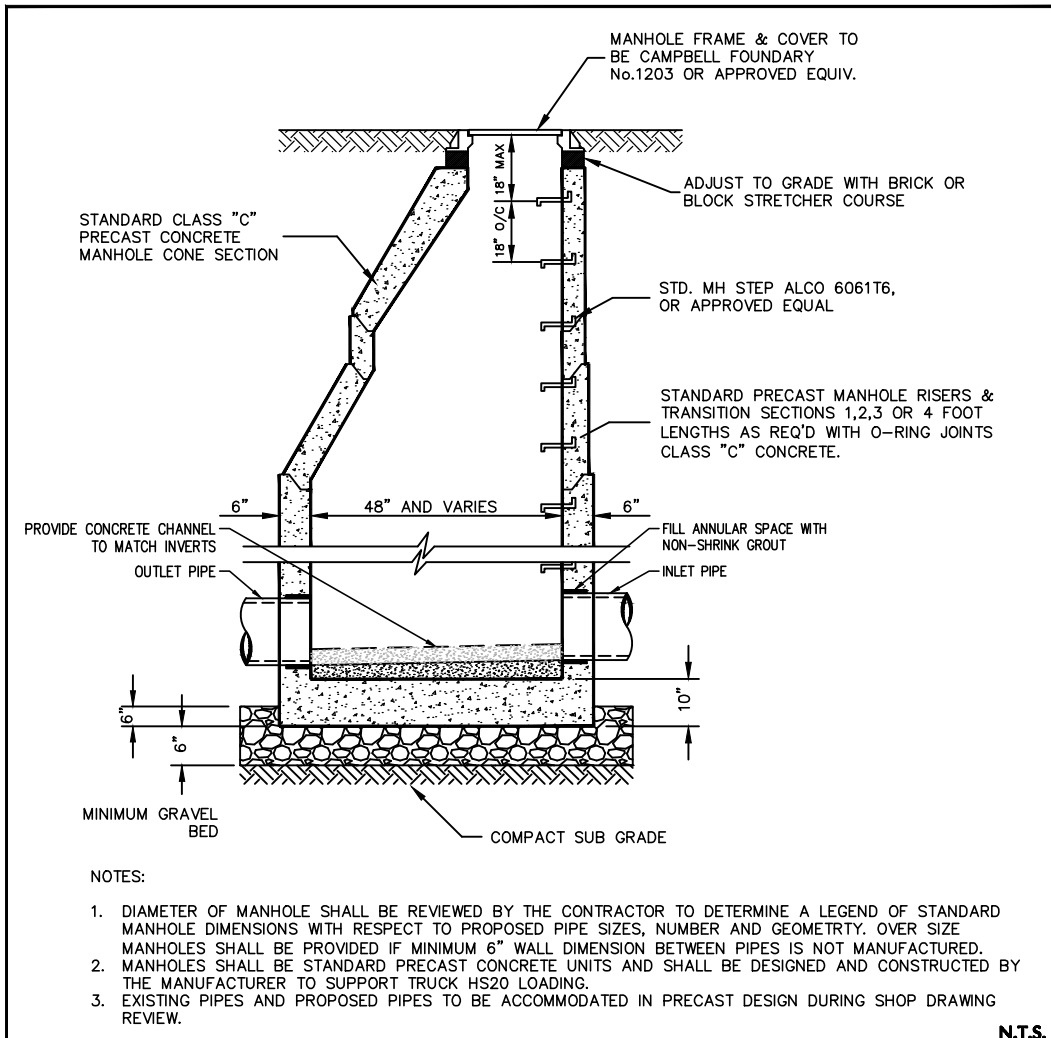
CRESTMONT COUNTRY CLUB & EAGLE ROCK AVE IMPROVEMENTS
BLOCK No. 174, LOT No. 1.01
TOWNSHIP OF WEST ORANGE

ESSEX COUNTY NEW JERSEY
Drawing Title

PARTIAL DRAINAGE PLAN

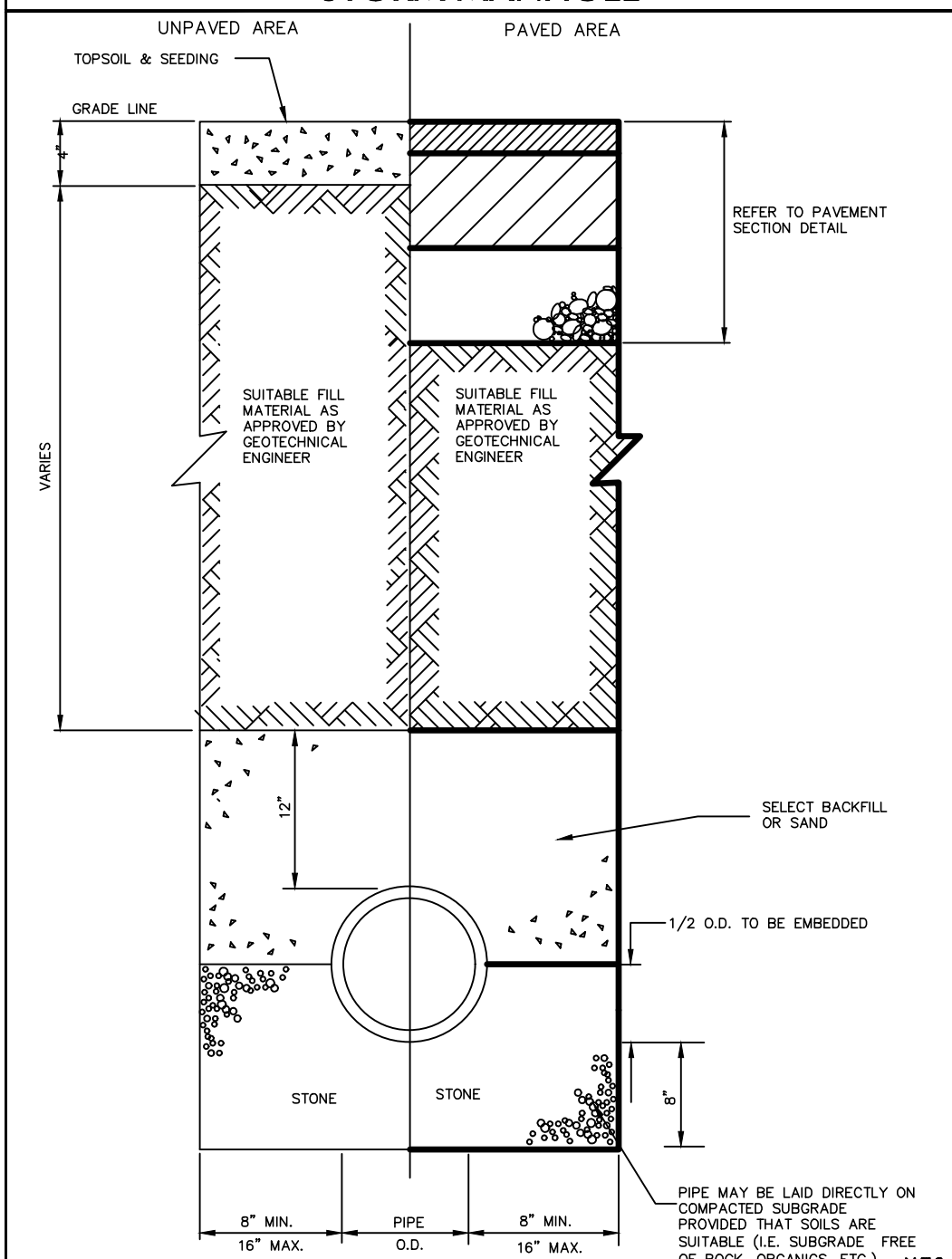
Project No. 101049802
Date FEBRUARY 12, 2026
Drawn By TEG
Checked By MV

Drawing No. CG104
Sheet 15 of 36

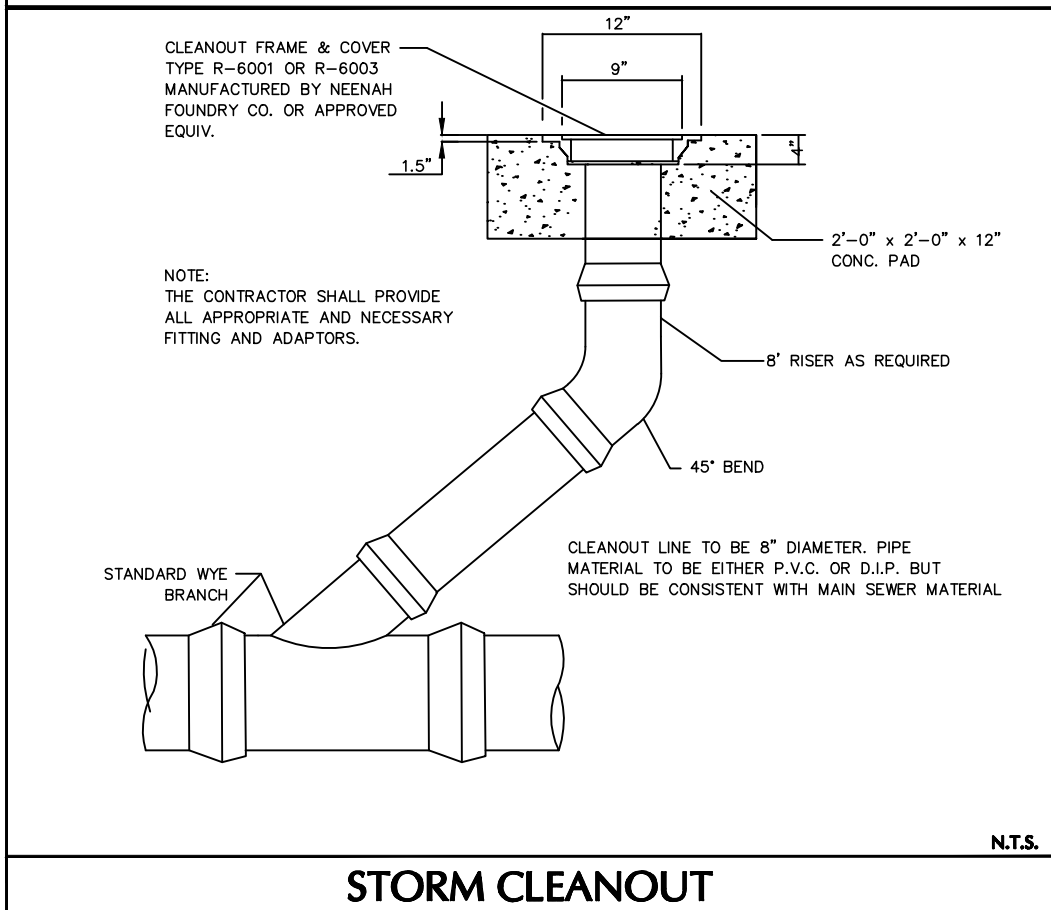


- NOTES:
- DIAMETER OF MANHOLE SHALL BE REVIEWED BY THE CONTRACTOR TO DETERMINE A LEGEND OF STANDARD MANHOLE DIMENSIONS WITH RESPECT TO PROPOSED PIPE SIZES, NUMBER AND GEOMETRY. OVER SIZE MANHOLES SHALL BE PROVIDED IF MINIMUM 6" WALL DIMENSION BETWEEN PIPES IS NOT MANUFACTURED.
 - MANHOLES SHALL BE STANDARD PRECAST CONCRETE UNITS AND SHALL BE DESIGNED AND CONSTRUCTED BY THE MANUFACTURER TO SUPPORT TRUCK HEAD LOADING.
 - EXISTING PIPES AND PROPOSED PIPES TO BE ACCOMMODATED IN PRECAST DESIGN DURING SHOP DRAWING REVIEW.

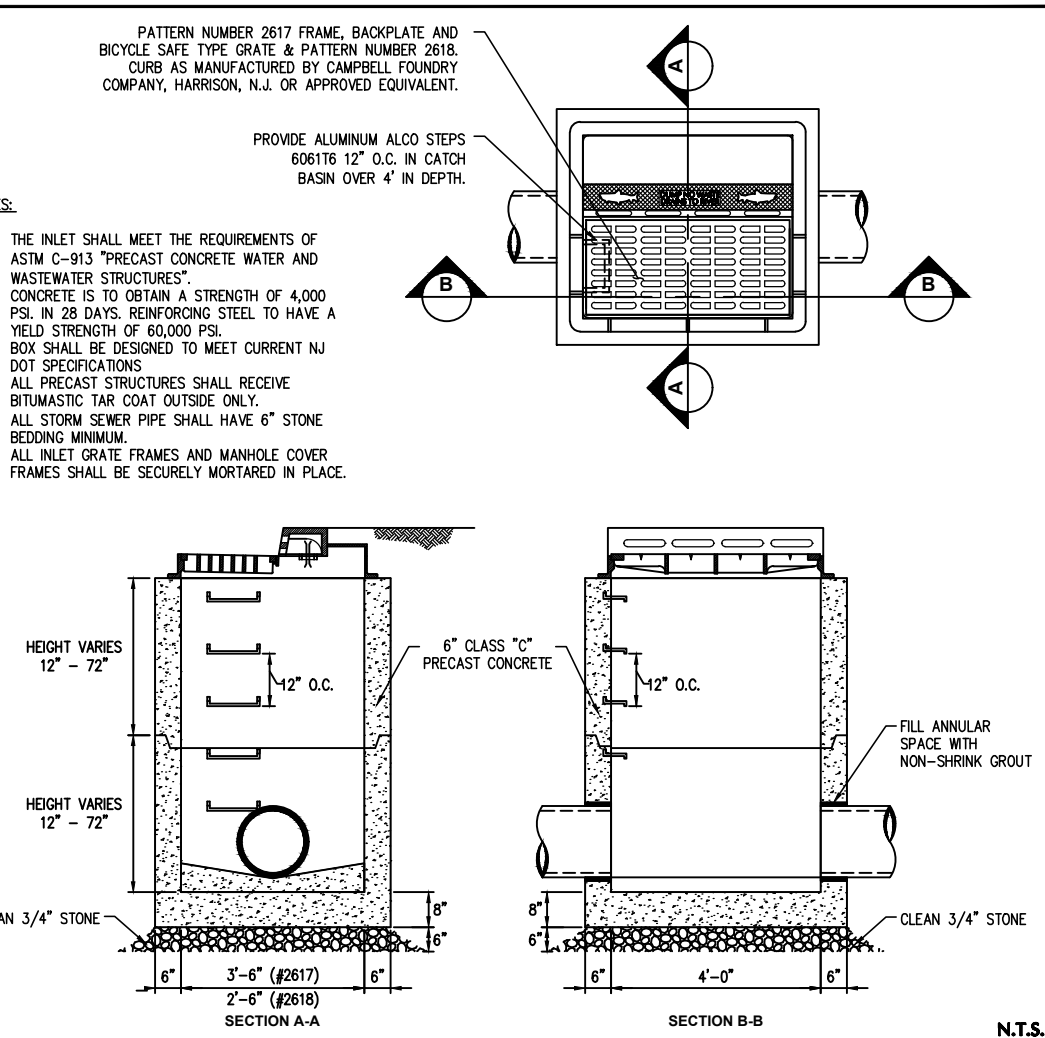
STORM MANHOLE



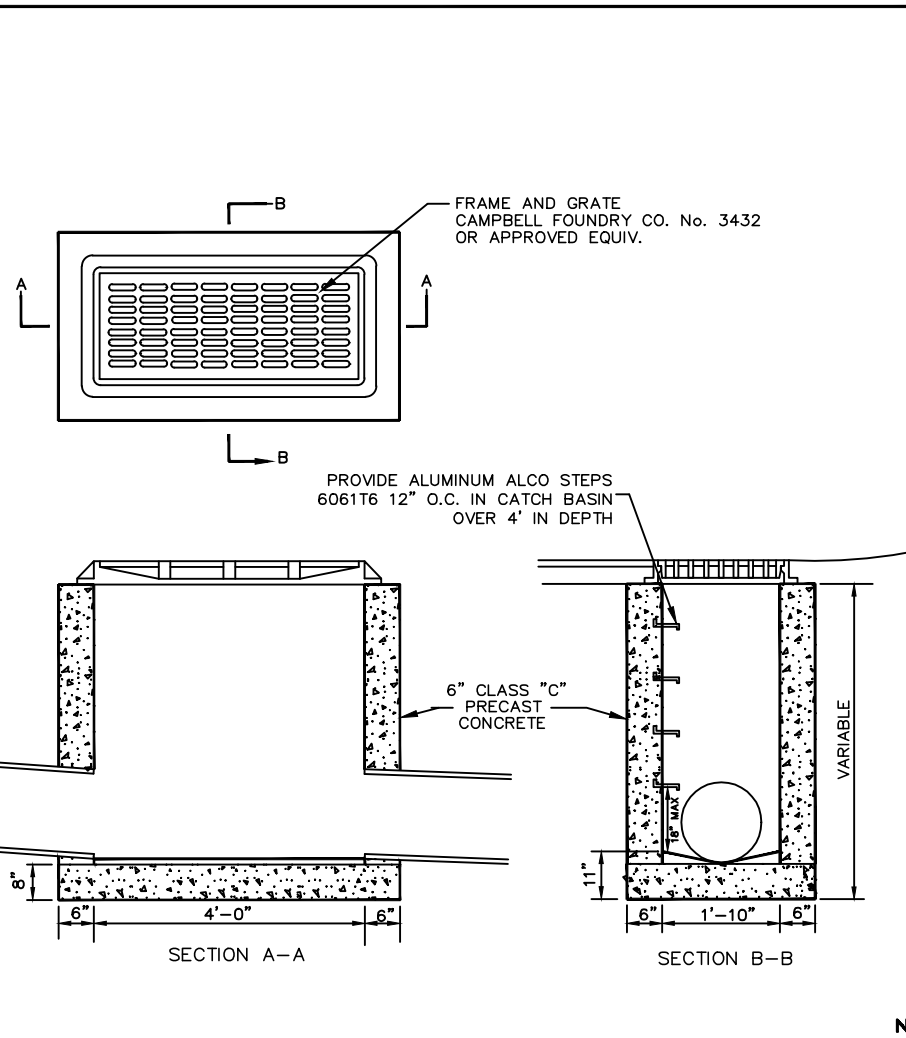
STORM SEWER TRENCH AND BEDDING



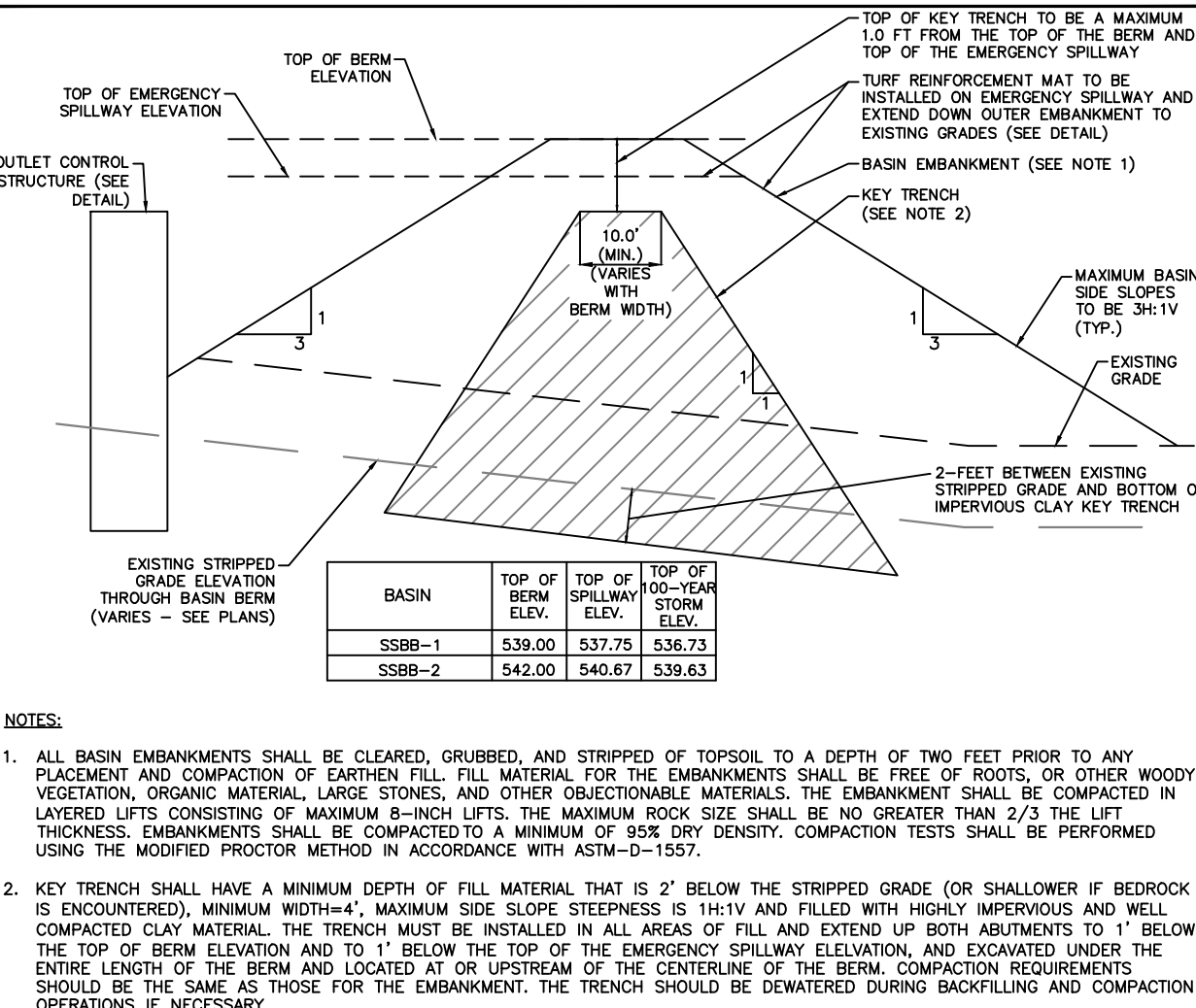
STORM CLEANOUT



TYPE B INLET

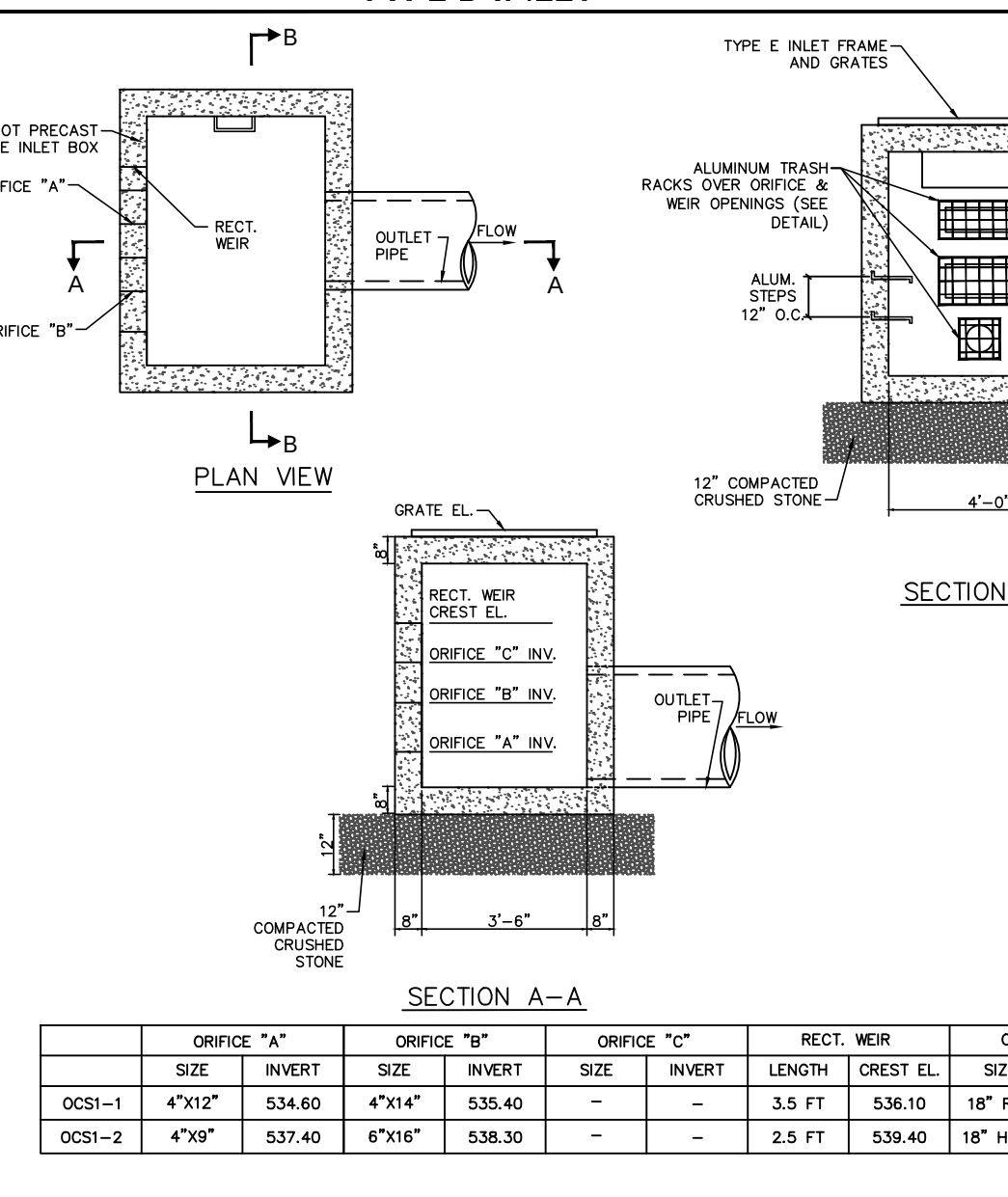


TYPE A INLET

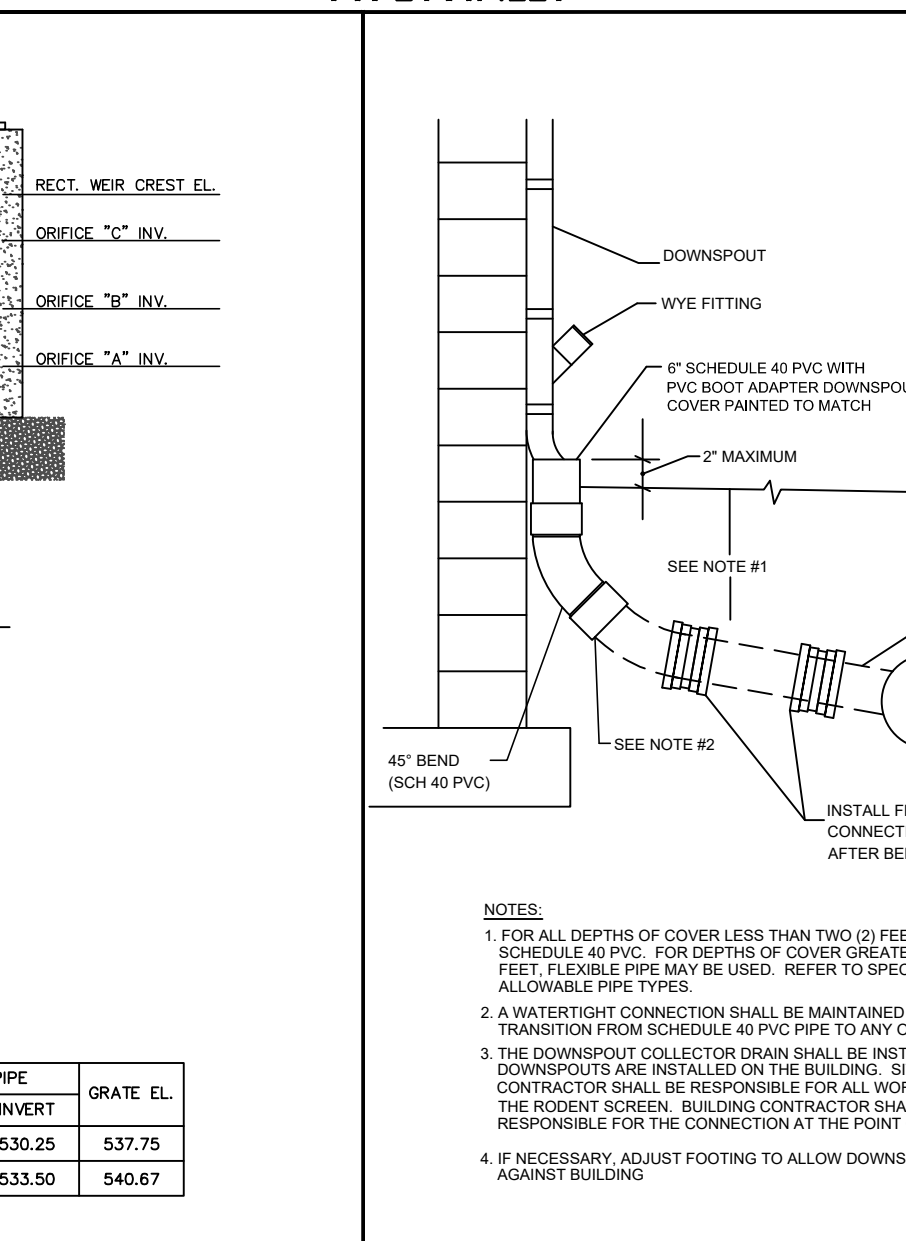


- NOTES:
- ALL BASIN EMBANKMENTS SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO A DEPTH OF TWO FEET PRIOR TO ANY PLACEMENT AND COMPACTION OF EARTHEN FILL MATERIAL FOR THE EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGES STONES, AND OTHER OBSTRUCTABLE MATERIALS. THE EMBANKMENT SHALL BE COMPLETED IN LAYERED LIFTS CONSISTING OF MAXIMUM 8-INCH LIFTS. THE MAXIMUM ROCK SIZE SHALL BE NO GREATER THAN 2/3 THE LIFT THICKNESS. EMBANKMENTS SHALL BE COMPACTIONED TO A MINIMUM OF 95% DRY DENSITY. COMPACTION TESTS SHALL BE PERFORMED USING THE MODIFIED PROCTOR METHOD IN ACCORDANCE WITH ASTM-D-1557.
 - KEY TRENCH SHALL HAVE A MINIMUM DEPTH OF FILL MATERIAL THAT IS 2' BELOW THE STRIPPED GRADE (OR SHALLOWER IF BEDROCK IS ENCOUNTERED). MINIMUM WIDTH=4'. MINIMUM SIDE SLOPE STEEPNESS IS 1H:1V AND FILLED WITH HIGHLY IMPERVIOUS AND WELL COMPACTED CLAY MATERIAL. THE TRENCH MUST BE INSTALLED IN ALL AREAS OF FILL AND EXTEND UP BOTH ADJUTMENTS TO 1' BELOW THE TOP OF BERM ELEVATION AND TO 1' BELOW THE TOP OF THE EMERGENCY SPILLWAY ELEVATION, AND EXCAVATED UNDER THE ENTIRE LENGTH OF THE BERM AND LOCATED AT OR UPSTREAM OF THE CENTERLINE OF THE BERM. COMPACTION REQUIREMENTS SHOULD BE THE SAME AS THOSE FOR THE EMBANKMENT. THE TRENCH SHOULD BE DETERMINED DURING BACKFILLING AND COMPACTION OPERATIONS IF NECESSARY.

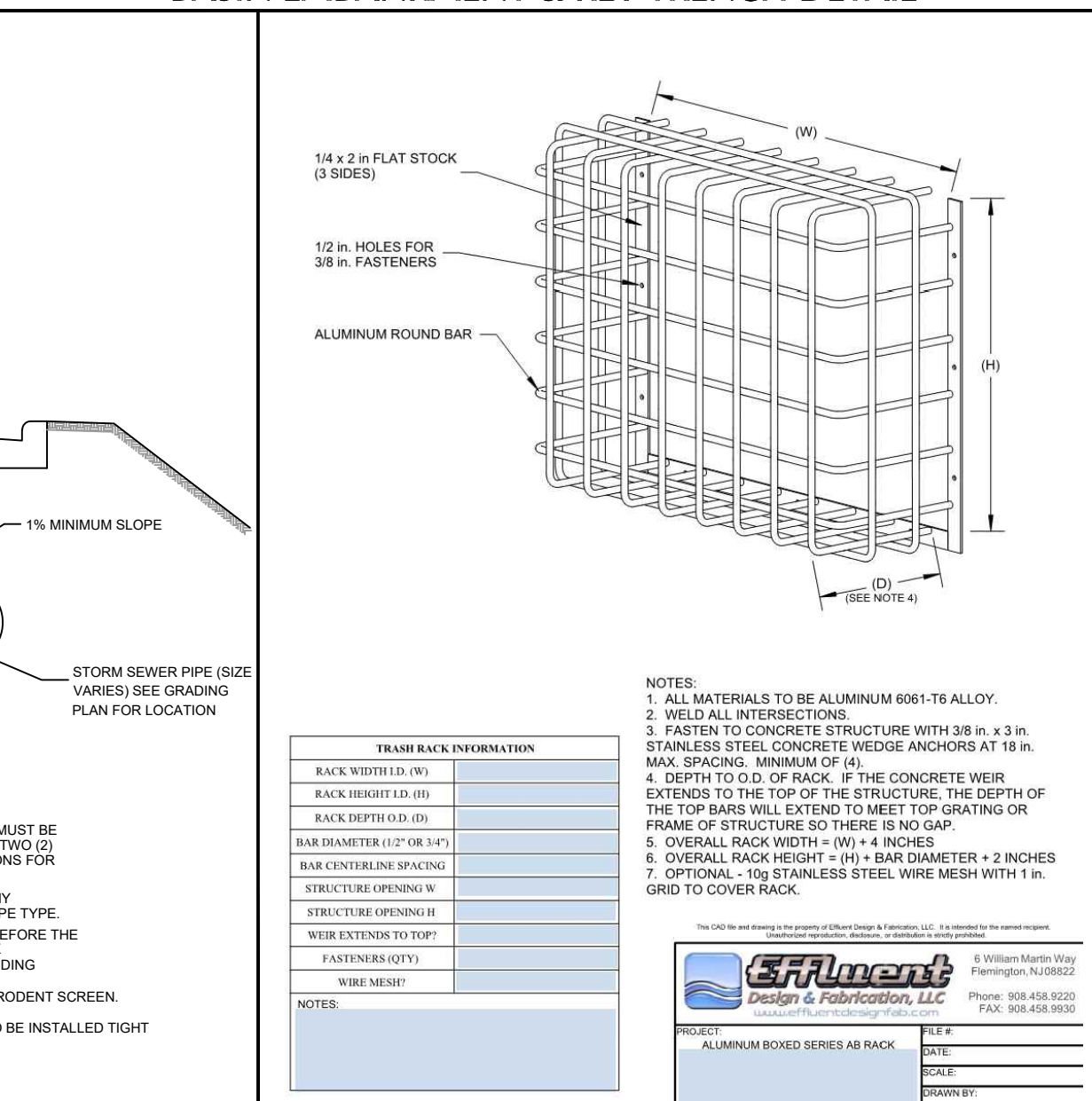
BASIN EMBANKMENT & KEY TRENCH DETAIL



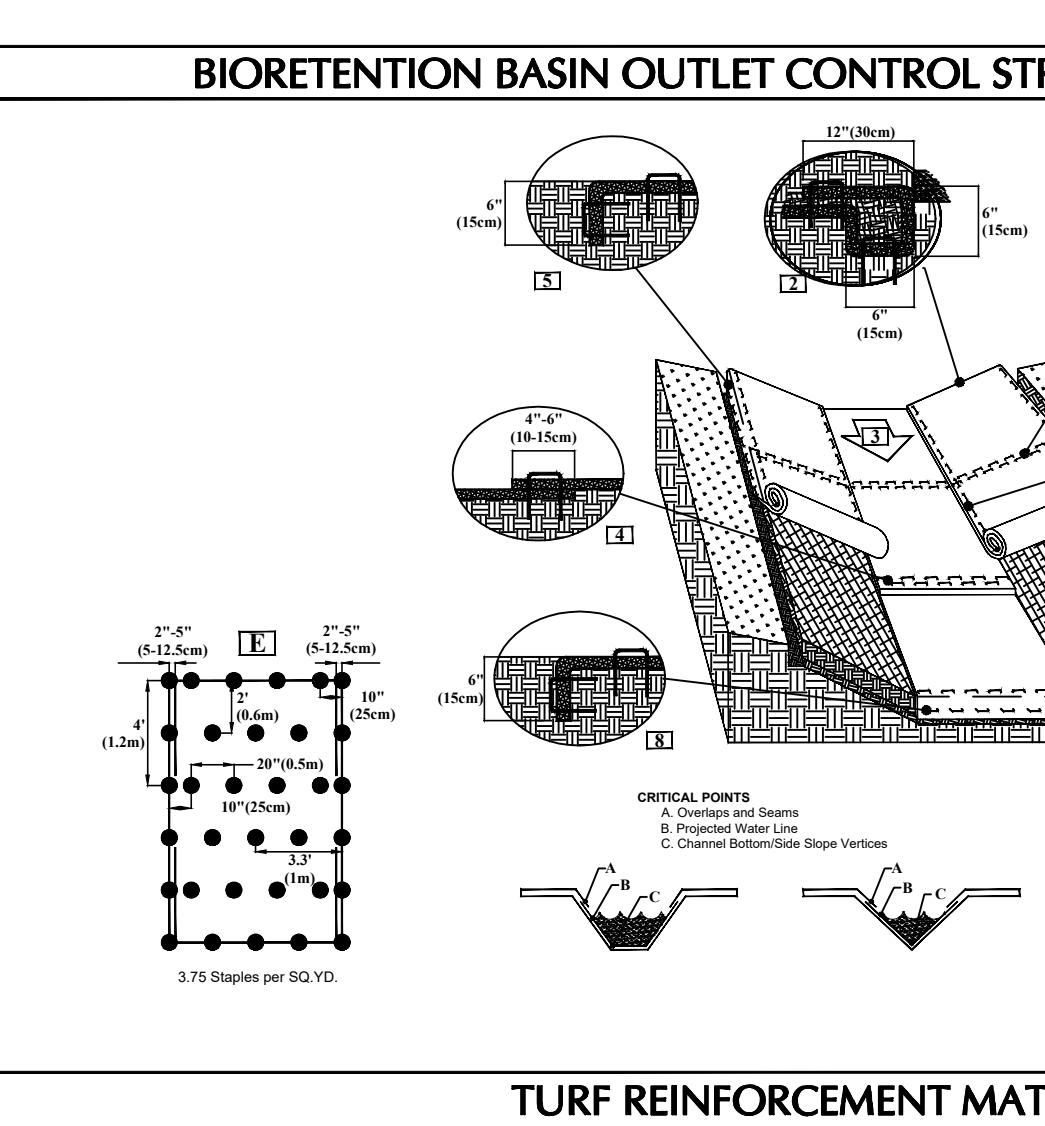
BIORETENTION BASIN OUTLET CONTROL STRUCTURE



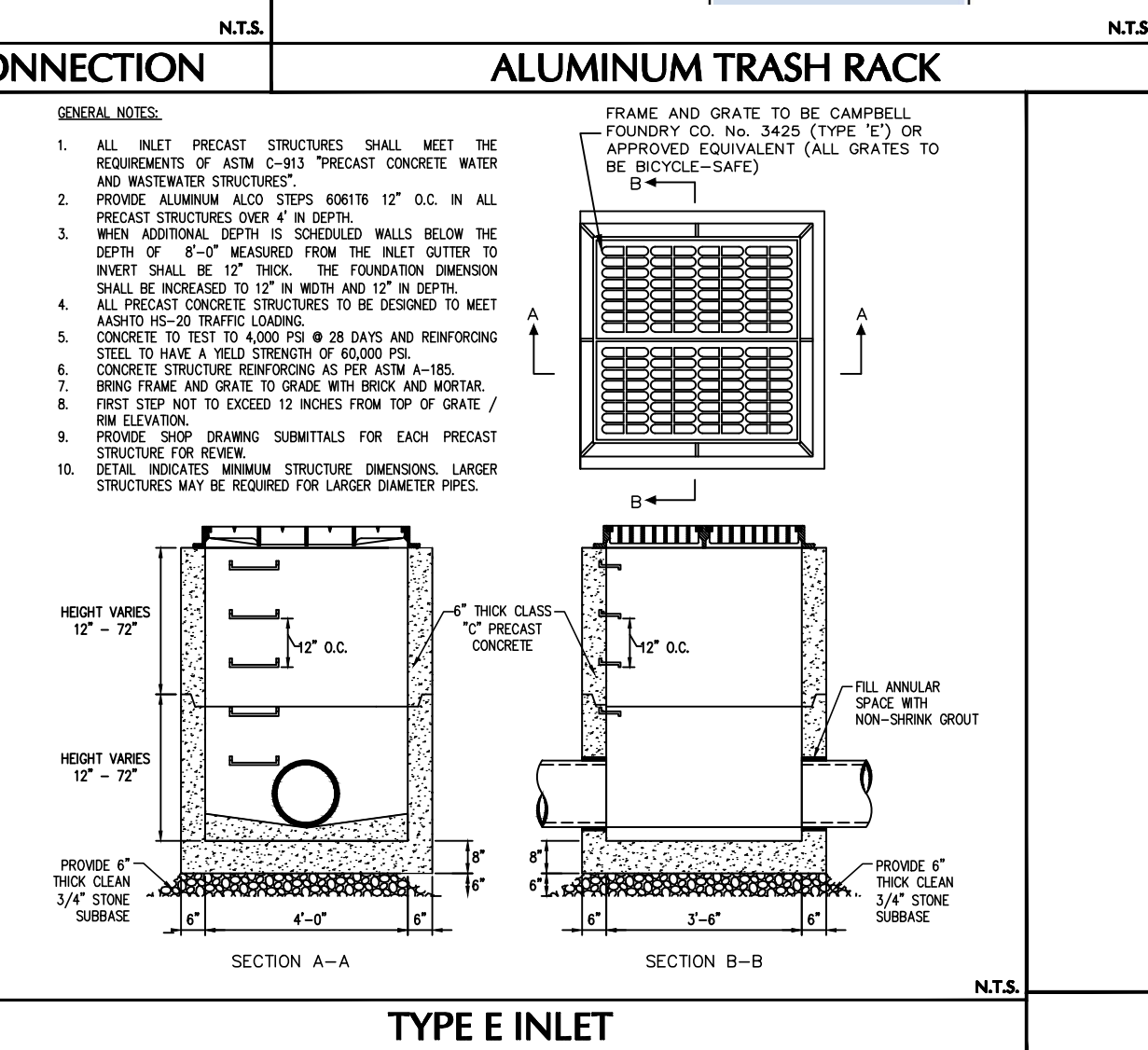
BUILDING DOWNSPOUT CONNECTION



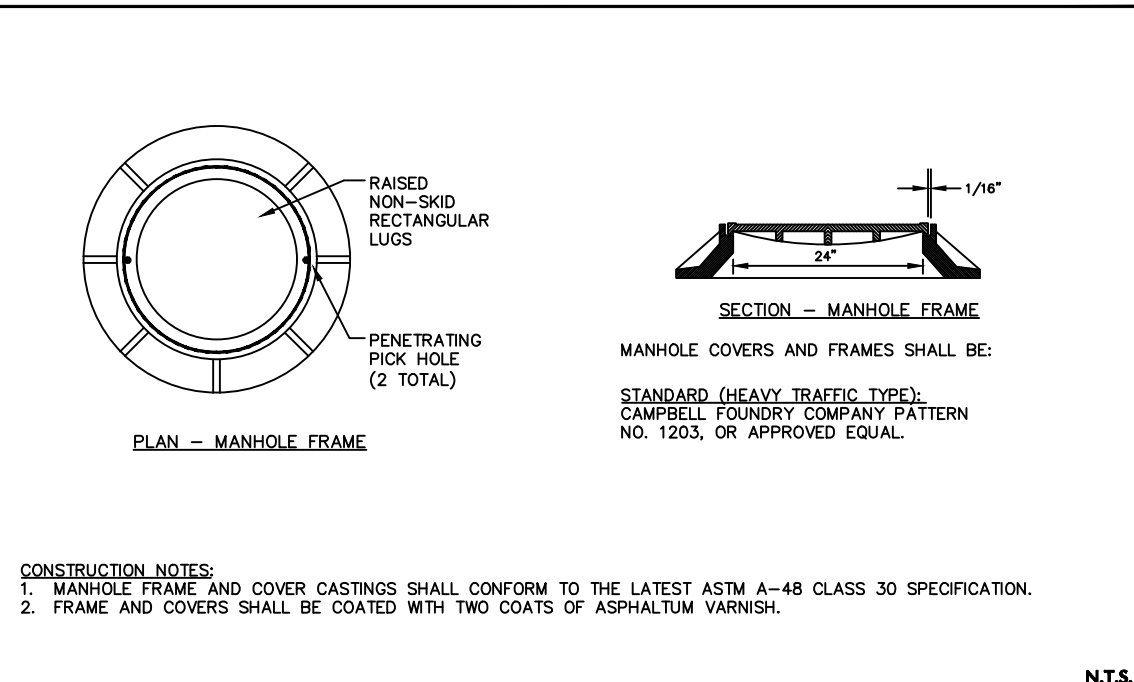
ALUMINUM TRASH RACK



TURF REINFORCEMENT MAT INSTALLATION DETAIL



TYPE E INLET



MANHOLE FRAME AND COVER

ROLLMAX
ROLLED EROSION CONTROL

Specification Sheet
VMax[®] C350[®] Turf Reinforcement Mat

DESCRIPTION
The composite turf reinforcement mat (CTRM) shall be a machine-produced mat of 100% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch banded between super heavy duty UV stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings; an ultra heavy duty UV-stabilized, chemically corrugated (cimped) intermediate netting with 0.5 x 0.5 in. (1.27 x 1.27 cm) openings; and covered by a super heavy duty UV-stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 in. (3.81 cm) centers with UV-stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with colored thread stitched along both outer edges as an overlap guide for adjacent mats.

Material Content

Material	Quantity
Matrix	100% Coconut Fiber 0.33 lb/yd (0.27 kg/m)
Top and Bottom, UV-Stabilized Polypropylene	8 lb/1000 ft (0.34 kg/100 m)
Middle, Corrugated UV-Stabilized Polypropylene	26 lb/1000 ft (1.14 kg/100 m)
Thread	Polypropylene, UV Stable

Standard Roll Sizes

Width	Length	Weight
6.5 ft (2.0 m)	8 ft (2.4 m)	37 lbs (16.8 kg)
55.5 ft (16.9 m)	90 ft (27.4 m)	74 lbs (33.6 kg)
40 ft (12.2 m)	80 ft (24.4 m)	80 lb (36.3 kg)

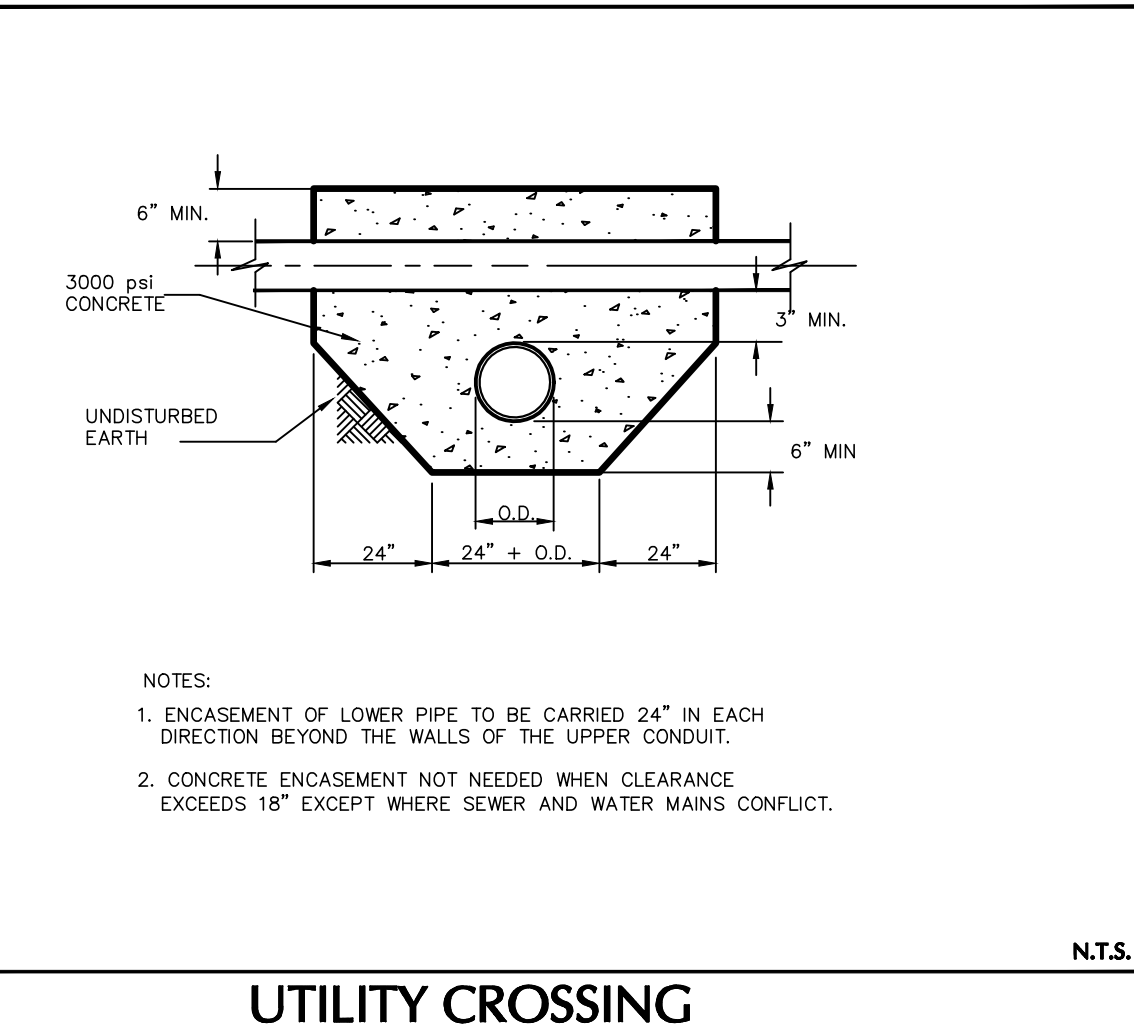
Design Permissible Shear Stress

Phase	Short Duration	Long Duration
Phase 1 Unvegetated	3.2 psf (153 Pa)	3.0 psf (144 Pa)
Phase 2 Partially Veg.	10.0 psf (480 Pa)	10.0 psf (480 Pa)
Phase 3 Fully Veg.	12.0 psf (576 Pa)	10.0 psf (480 Pa)
Unvegetated Velocity	20 ft/s (6.1 m/s)	20 ft/s (6.1 m/s)

INDEX

Index Property	Test Method	Typical
Thickness	ASTM D625	0.75 in. (19.0 mm)
Density	ASTM D624	90%
UV Stability	ASTM D6972	0.97 g/m ²
Mass/Unit Area	ASTM D6656	78.16 oz/yd ² (3.24 g/m ²)
UV Stability	ASTM D4105	100% RH
Porosity	ECT Guidelines	99%
Stiffness	ASTM D6988	0.24 in.-lb (27000 mg-cm)
Light Penetration	ASTM D6987	10%
Tensile Strength - MD	ASTM D6988	56.5 lb/ft (8.19 kN/m)
Elongation - MD	ASTM D6988	45.3%
Tensile Strength - TD	ASTM D6988	68.7 lb/ft (10.00 kN/m)
Elongation - TD	ASTM D6988	19.5%
Biomass Improvement	ASTM D7932	380%

EMERGENCY SPILLWAY TURF REINFORCEMENT MAT



UTILITY CROSSING

LANGAN
Langan Engineering and Environmental Services, LLC

300 Kimball Drive
Parsippany, NJ 07054

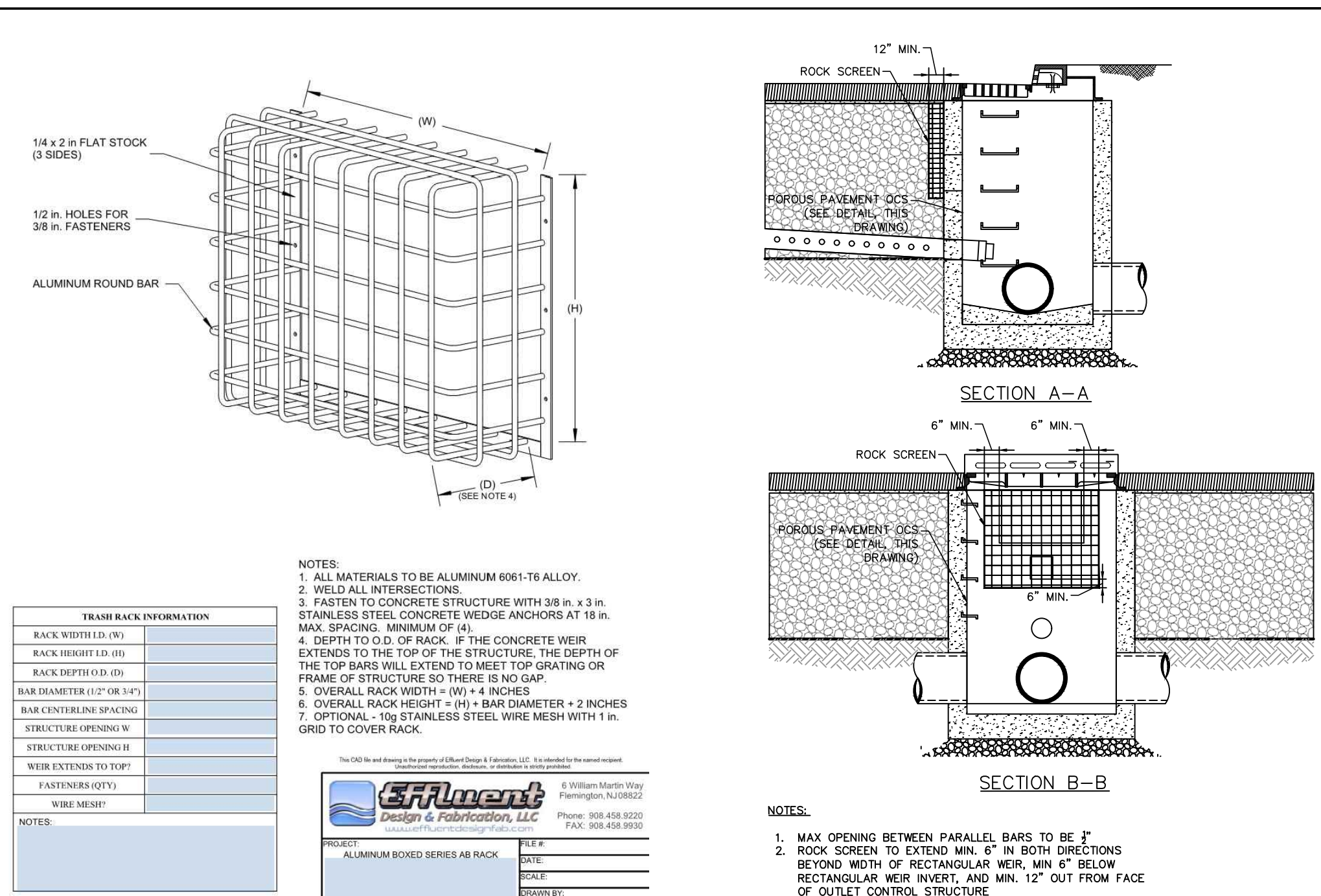
T: 973.560.4900 F: 973.560.4901 www.langan.com
NJ Certificate of Authorization No. 24GA27996400

Project: **CRESTMONT COUNTRY CLUB & EAGLE ROCK AVE IMPROVEMENTS**
BLOCK No. 174, LOT No. 1.01
TOWNSHIP OF WEST ORANGE

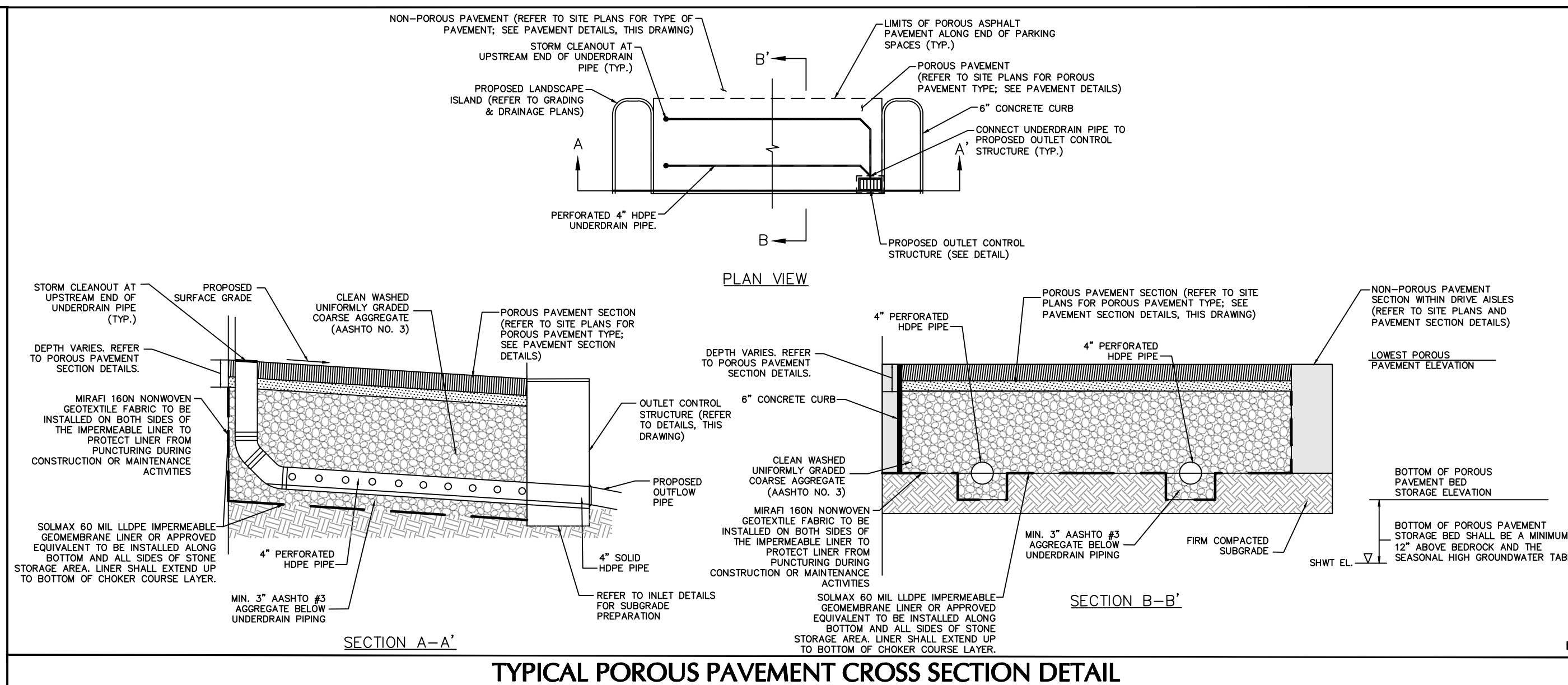
ESSEX COUNTY NEW JERSEY
Drawing Title

Project No. **101049802**
Date **FEBRUARY 12, 2026**
Drawn By **JS**
Checked By **MV**

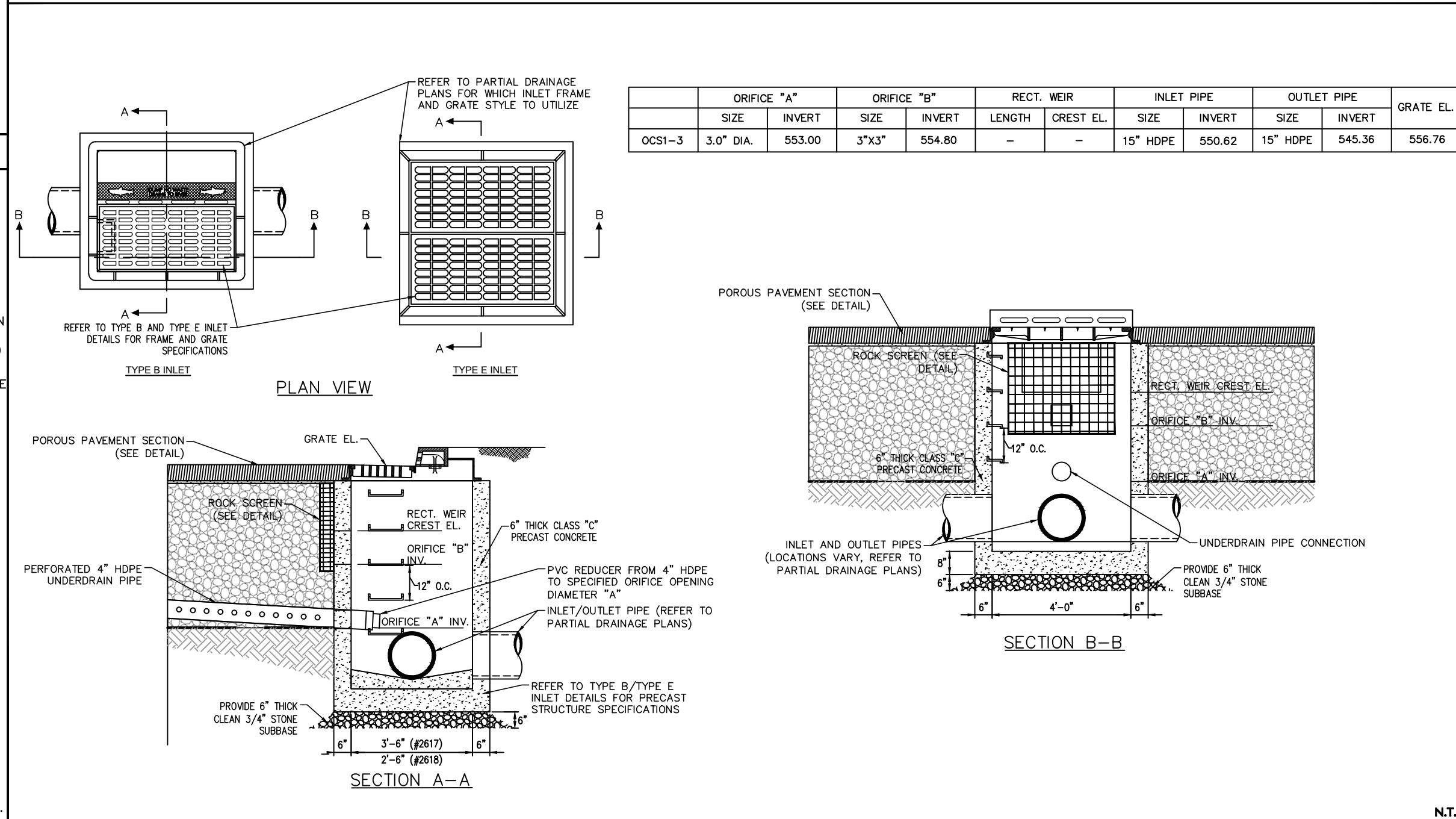
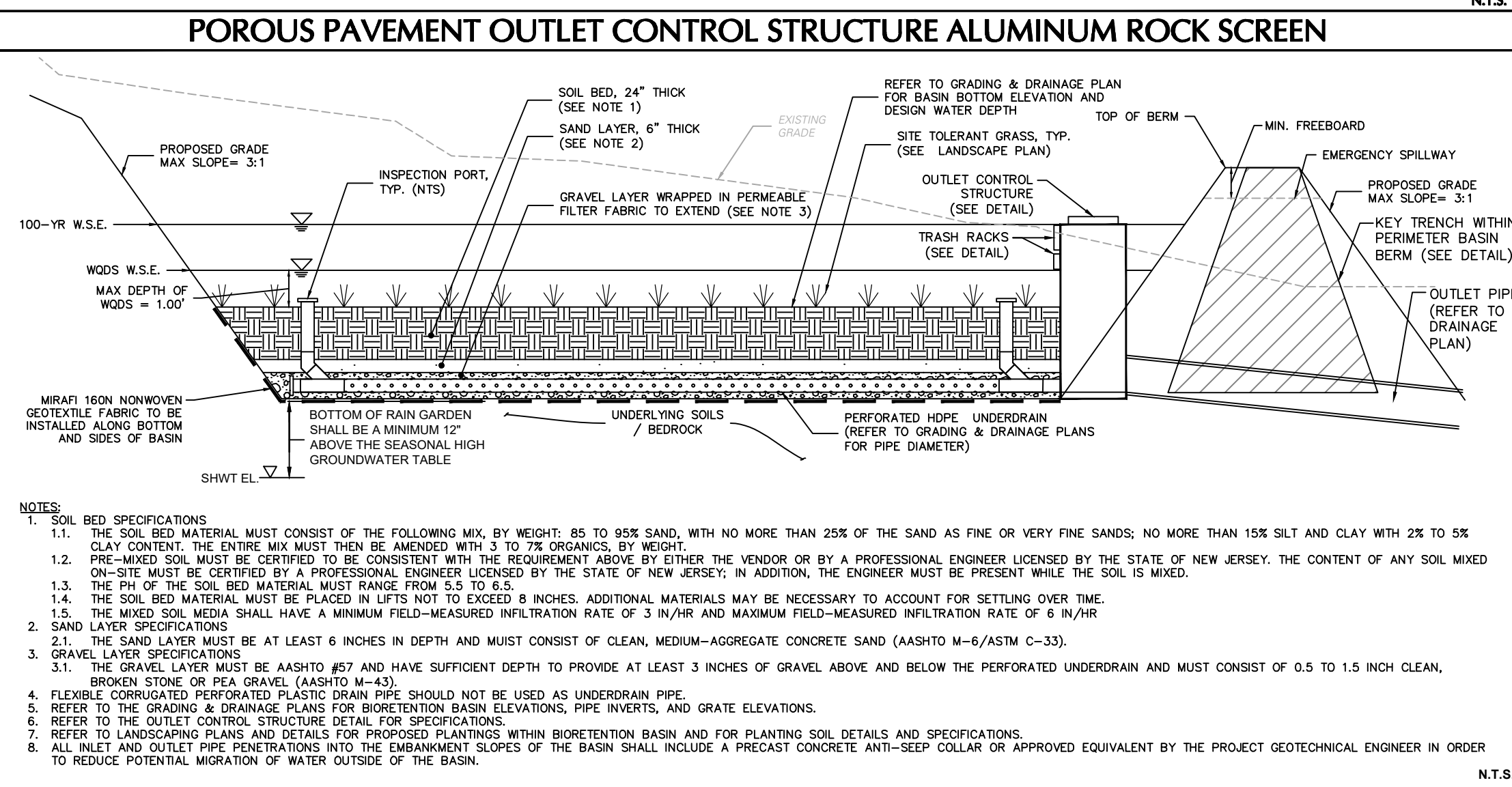
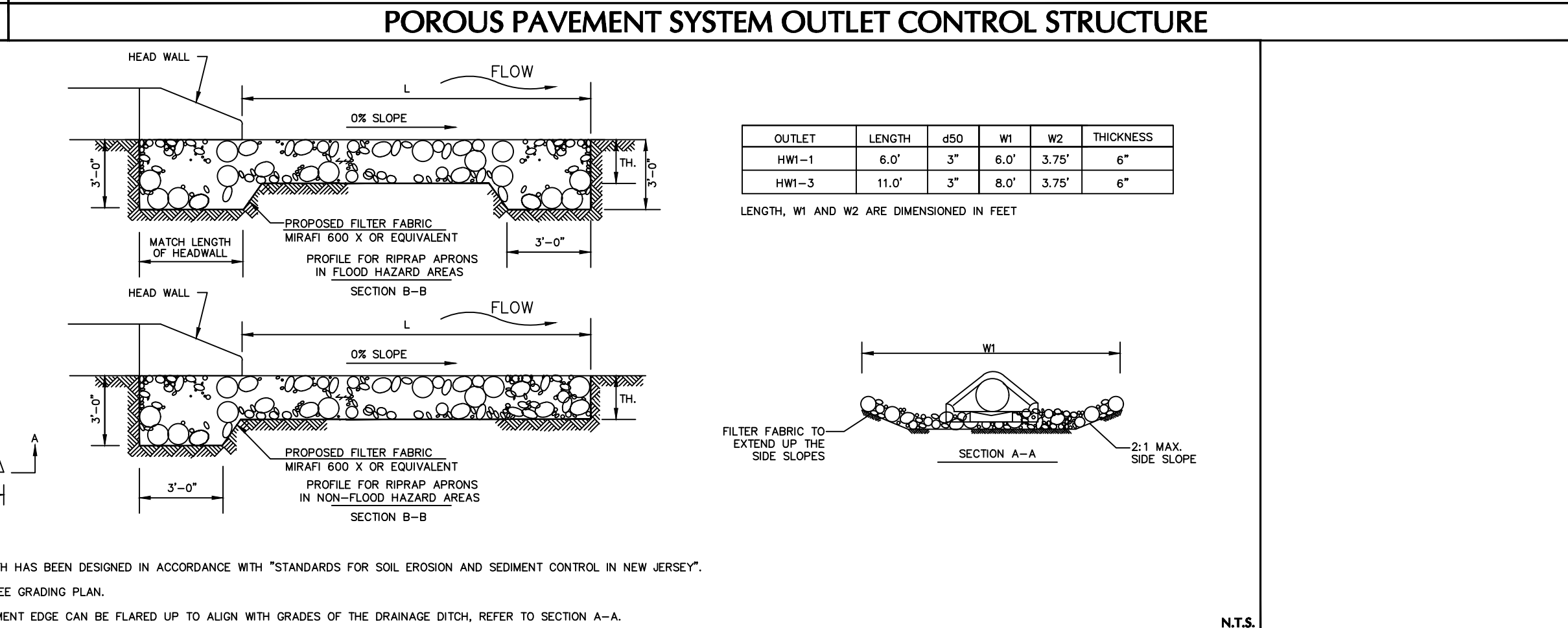
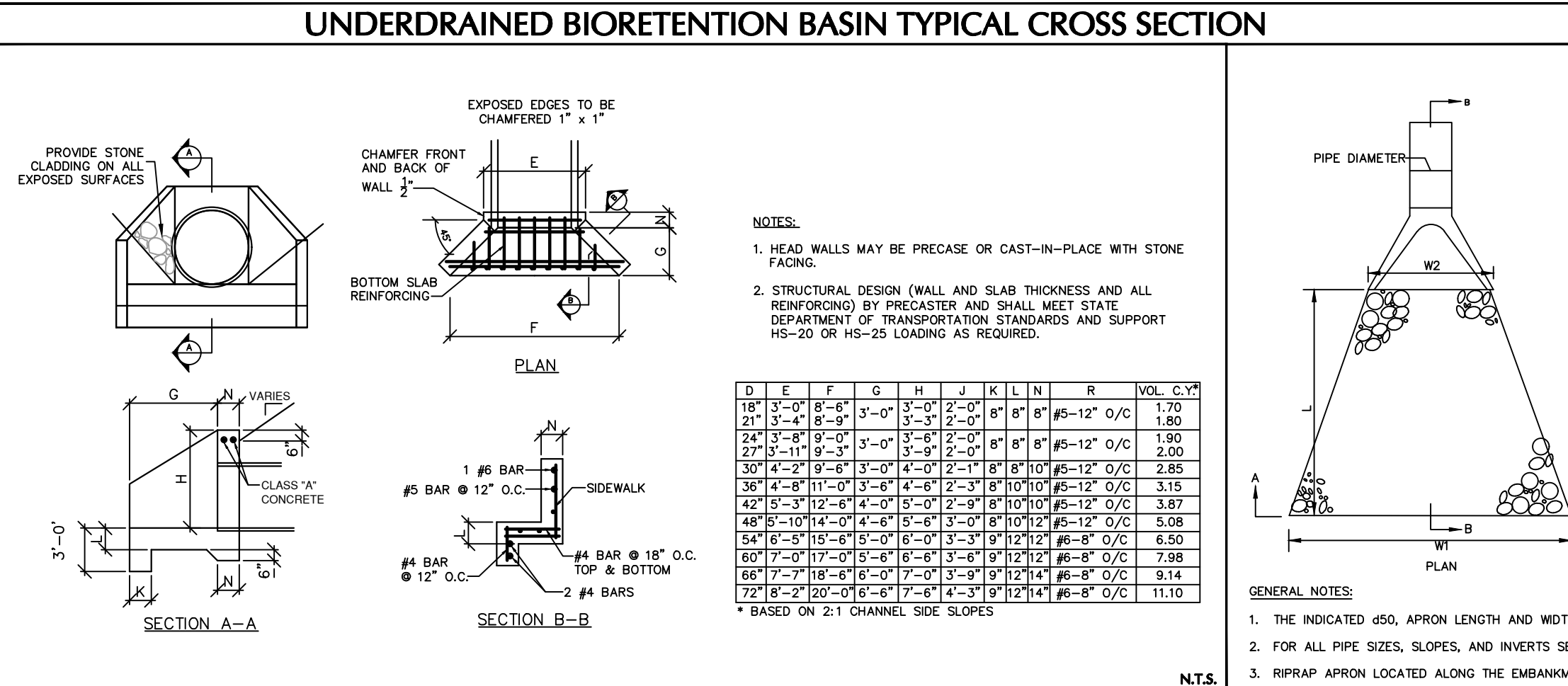
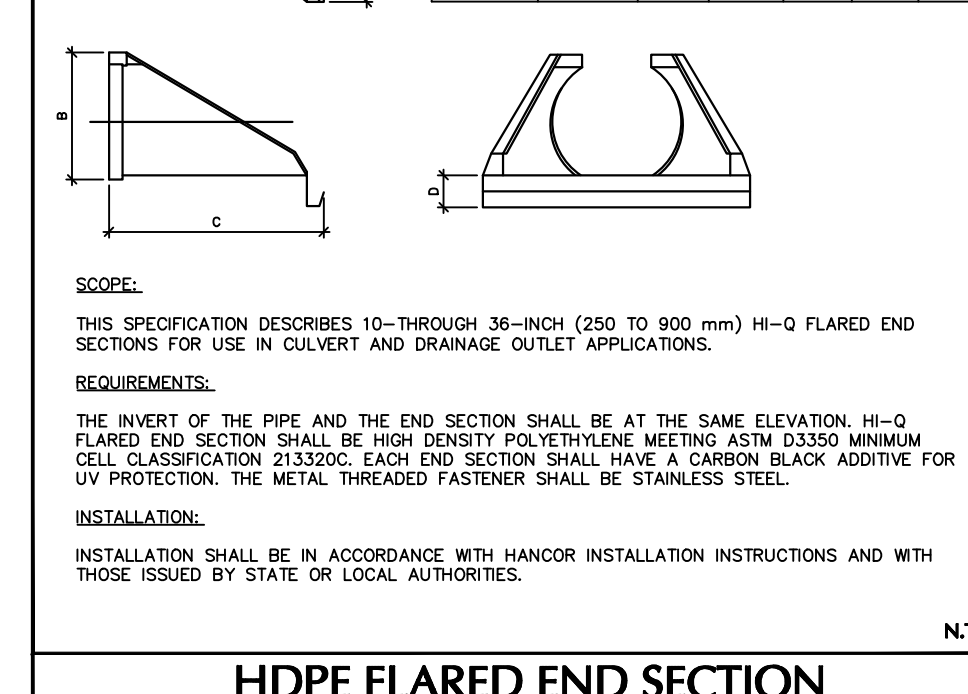
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Sheet **21** of **36**



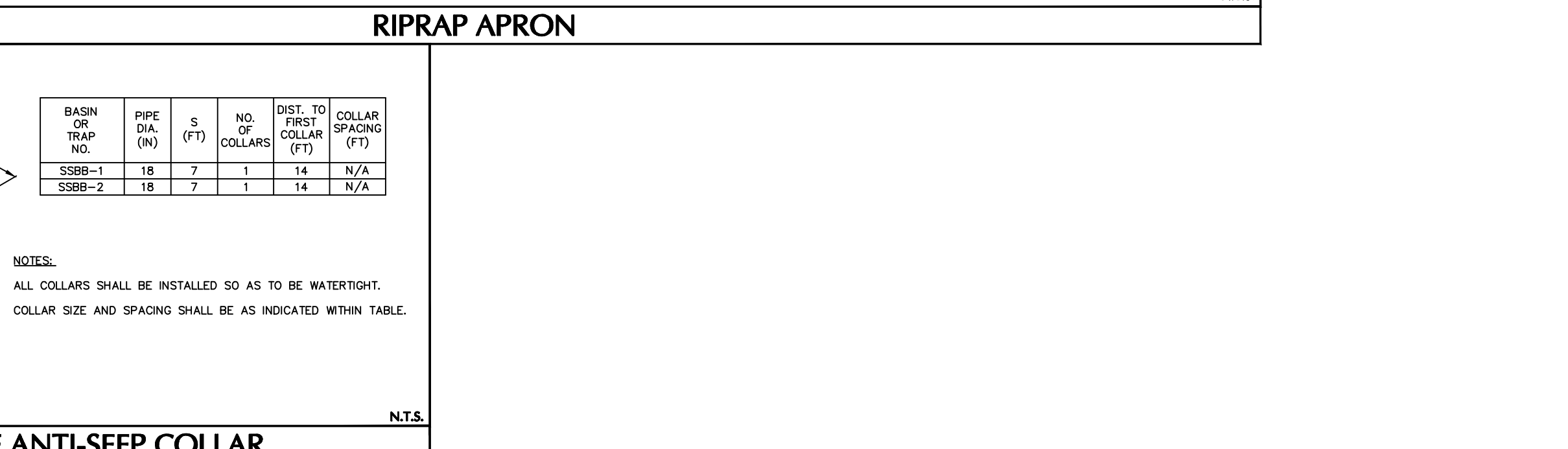
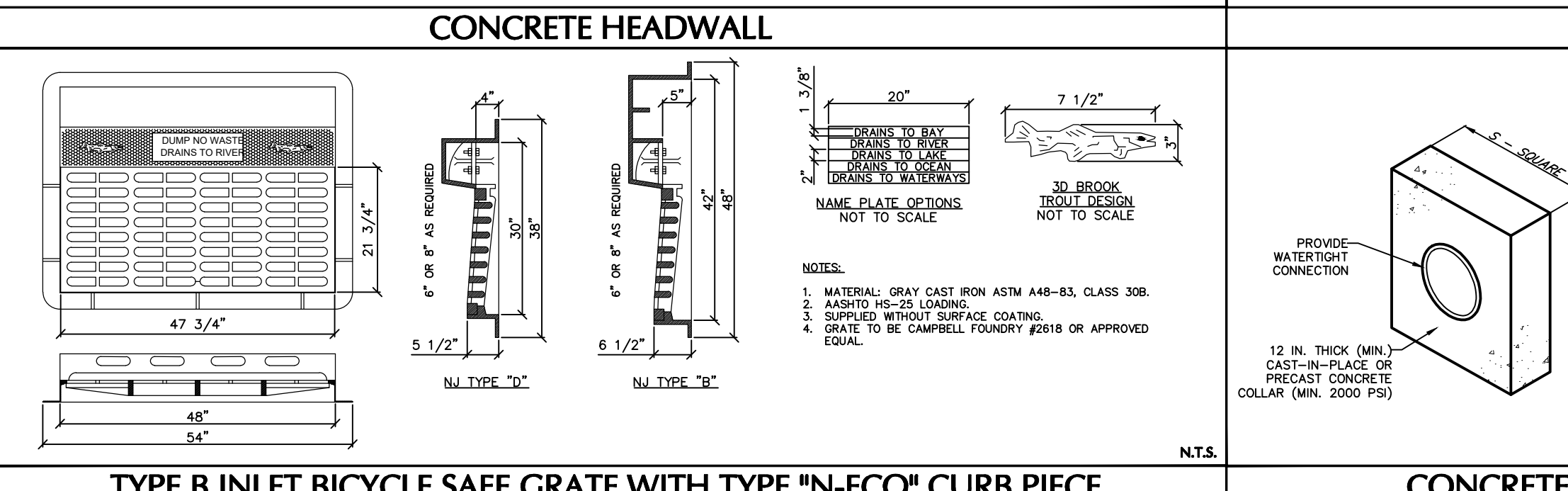
TRASH RACK INFORMATION	
RACK WIDTH I.D. (W)	
RACK HEIGHT I.D. (H)	
RACK DEPTH O.D. (D)	
BAR DIAMETER (1/2" OR 3/4")	
BAR CENTERLINE SPACING	
STRUCTURE OPENING W	
STRUCTURE OPENING H	
WEIR EXTENSION TO TOP	
FASTENERS (QTY)	
WIRE MESH?	
NOTES:	



	ORIFICE "A"		ORIFICE "B"		RECT. WEIR		INLET PIPE		OUTLET PIPE		GRATE EL.
	SIZE	INVERT	SIZE	INVERT	LENGTH	CREST EL.	SIZE	INVERT	SIZE	INVERT	
OCS1-3	3.0" DIA.	553.00	3"X3"	554.80	-	-	15" HDPE	550.62	15" HDPE	545.36	556.76

[illegible]

OUTLET	LENGTH	d50	W1	W2	THICKNESS
HW1-1	6.0'	3"	6.0'	3.75'	6"
HW1-3	11.0'	3"	8.0'	3.75'	6"



BASIN OR TRAP NO.	PIPE DIA. (IN)	S (FT)	NO. OF COLLARS	DIST. TO FIRST COLLAR (FT)	COLLAR SPACING (FT)
SSBB-1	18	7	1	14	N/A
SSBB-2	18	7	1	14	N/A

[illegible]

Date	Description	No.
REVISIONS		

OFFICE OF NEW JERSEY

2/12/2026

SIGNATURE JOHN COTE DATE SIGNED _____
PROFESSIONAL ENGINEER NJ Lic. No. _____
24GE03705800

LANGAN
Langan Engineering and

Environmental Services, LLC
300 Kimball Drive
Parsippany, NJ 07054

T: 973.560.4900 F: 973.560.4901 www.langan.com
NJ Certificate of Authorization No. 24GA27996400

Project

CRESTMONT COUNTRY
CLUB & EAGLE ROCK AVE

IMPROVEMENTS

ESSEX COUNTY	NEW JERSEY
Drawing Title	

DRAINAGE DETAILS

DATE OF FIRST DETAILS

Project No.	Drawing No.
101049802	
Rev.	

Date	CG502
FEBRUARY 12, 2026	
Drawn By	

JS	Sheet 22 of 36
Checked By MJV	

APPENDIX A

Stormwater Management Facilities – Inspection Checklist

Inspection Checklist for Stormwater Management Facilities

Name of Facility: _____

Location: _____

	O.K	Routine	Urgent	Comments
1. Small-Scale Bioretention Basins				
A. Standing Water				
B. Trash & Debris				
C. Sediment				
D. Other				

	O.K	Routine	Urgent	Comments
2. Outlet Control Structures				
A. Condition of Structure				
B. Trash & Debris				
C. Sediment				
D. Condition of Trash Racks				
E. Other				

	O.K	Routine	Urgent	Comments
3. Inlet Structures				
A. Condition of Structure				
B. Trash & Debris				
C. Sediment				
D. Other				

	O.K	Routine	Urgent	Comments
4. Manhole Structures				
A. Condition of Structure				
B. Trash & Debris				
C. Sediment				
D. Other				

5. Porous Pavement				
A. Condition of Outlet Structures				
B. Trash & Debris				
C. Sediment within Porous Asphalt				
D. Condition of Trash Racks on Outlets				
E. Condition of Underdrain Piping				

	O.K	Routine	Urgent	Comments
6. Miscellaneous				
A. Effectiveness of Exist. Maint. Program				
B. Potential Mosquito Habitats				
C. Potential Rodent Habitats				

APPENDIX B

Stormwater Management Facilities – Maintenance Log

Maintenance Log for Stormwater Facilities

Name of Facility: _____

Location: _____

Preventative Maintenance:

Date: _____

Work Item: _____

--	--	--	--

(X) - Completed

1	Trash and Debris Removal				
	A. Small-Scale Bioretention Basins				
	B. Outlet Control Structures				
	C. Inlets/Manholes				
	D. Conveyance Pipes				
	E. Riprap Aprons				
	F. Porous Pavement				

2	Sediment				
	A. Small-Scale Bioretention Basins				
	B. Outlet Control Structures				
	C. Inlets/Manholes				
	D. Conveyance Pipes				
	E. Riprap Aprons and Scour Hole				
	F. Porous Pavement				

3	Elimination of Potential Insect and Rodent Habitats				
	A. Potential Mosquito Habitats - Eliminate Standing Water				
	B. Potential Rodent Habitats - Fill Burrows and Remove Debris				

4	Other Preventative Maintenance				
	A.				

Corrective Maintenance:

Date: _____

Work Item: _____

--	--	--	--

(X) - Completed

1	Removal of Debris and Sediment				
2	Structural Repairs				
3	Dewatering				
4	Erosion Repair				
5	Elimination of Trees, Brush, Roots & Animal Burrows				
6	Snow & Ice Removal				
7	Other				