CONTACT INFORMATION

DEVELOPER
MATTAMY HOMES, LLC.
NC 27 E
COATS, NC 27521

REFERENCES

SURVEY
ROBINSON & PLANTE, P.C.
970 TRINITY ROAD
RALEIGH, NC 27607
CONTACT: NAME
PHONE: 919.859.6030

ENVIRONMENTAL ENGINEER
SAGE ECOLOGICAL SERVICES, INC.
3707 SWIFT DRIVE
RALEIGH, NC 27606
CONTACT: SEAN CLARK, PWS
PHONE:(919)-559-1537

REVIEW AGENCIES / UTILITY CONTACTS

PLANNING APPROVAL
TOWN OF COATS PLANNING ZONING & INSPECTIONS
25 EAST MAIN STREET
COATS, NC 27521
PHONE: 910.897.5183

SEWER
HARNETT REGIONAL WATER
700 MCKINNEY PARKWAY
LILLINGTON, NC27546
CONTACT: KATHERINE MOORE, SENIOR ENGINEER TECH
PHONE: 910.893.7575

ROADS - OFFSITE
NCDOT - DIVISION 6 DISTRICT 2
600 SOUTHERN AVENUE
FAYETTEVILLE, NC 28306
PHONE: 910.364.0601

EROSION CONTROL/STORMWATER
NCDEQ
225 GREEN STREET, SUITE 714
FAYETTEVILLE, NC 28301
PHONE: 910.433.3300

WATER
TOWN OF COATS PUBLIC WORKS
25 EAST MAIN STREET
COATS, NC 27521
PHONE: 910.591.4132

SITE DATA

PARCEL IDENTIFICATION NUMBER	0757-01-06-9581		
ADDRESS	NC 27 E, COATS NC 27521		
EXISTING PARCEL ACREAGE (AC.)	49.32		
EXISTING USE	VACANT		
PROPOSED USE	RESIDENTIAL - SINGLE FAMILY TOWNHOMES		
EXISTING ZONING	RA		
REZONED TO	SFR-3-TNDO		
PROPOSED DENSITY	3 DU/AC.		
PROPOSED SINGLE FAMILY UNITS	148		
WATERSHED	STIRRUP IRON CREEK WATERSHED		
FEMA FIRM PANEL	3720075700K, EFFECTIVE 3/31/2015		
REQUIRED OPEN SPACE (AC.)	2.52		
PROVIDED OPEN SPACE (AC.)	16.80		
PARKING REQUIREMENTS (SEC. 5.11.6 OF COATS ZONING ORDINANCE)	2 SPACES / DU * 148 UNITS = 296 SPACES		
PROPOSED PARKING	2 SPACES * 148 UNITS + 12 AMENITY SPACES = 308 SPACES		
SUBDIVISION INFORMATION (SECTION 6.9 CZO):		REQUIRED	PROPOSED
SUBDIVISION LOTS		-	148
MINIMUM LOT SIZE		6,000 SF	6,000 SF
MINIMUM LOT WIDTH		50 FT	50 FT
STREET YARDS			
	FRONT SETBACK (FT)	20	20
	REAR SETBACK (FT)	20	20
	SIDE SETBACK (FT)	8	8
	CORNER SETBACK (FT)	12	12
MAX BUILDING HEIGHT (FT)		35	35 MAX
PARKING REQUIREMENTS			
	MINIMUM VEHICULAR PARKING (SPACES/DU)	296	296
	BICYCLE PARKING	-	3
	ADA PARKING	-	1
INFRASTRUCTURE QUANTITIES			
	STREETS (LF)		6,333
	6" DOMESTIC WATERLINE (FT)		104
	8" DOMESTIC WATERLINE (FT)		6,199
	12" DOMESTIC WATERLINE (FT)		954
	FIRE HYDRANTS		8
	8" SANITARY SEWER LINE		5,710
	MANHOLES		32
	DOMESTIC SEWER TAPS		148
	DOMESTIC WATER TAPS		148
	AVERAGE SEWER FLOW	148 DU * 360 GPD/DU = 53280 GPD	
IMPERVIOUS SURFACES		SF	AC
	OFFSITE IMPERVIOUS	77428	1.78
	SIDEWALKS	56364	1.29
	STREETS	177882	4.08
	LOT IMPERVIOUS	333000	7.64
	TOTAL	644674	14.80
DISTURBED AREA		SF	AC
	DISTURBED AREA ONSITE	183251	4.21
	DISTURBED AREA OFFSITE	1801423	41.35
	TOTAL DISTURBED AREA	1984674	45.56

ROAD NAME LEGEND

ROAD NUMBERS	ROAD NAMES
R001	KINGFISFHER PL.
R002	STARLING DR.
R003	HAWK CREST CT.
R004	OSPREY LANE
R005	NIGHTHAWK WAY
R006	FINCH NEST DR.
R007	FINCH NEST DR.

PROJECT NOTES

APPROVAL OF THIS PLAT/PLAN DOES NOT GUARANTEE SEWER CAPACITY. CURRENT/FUTURE CAPACITY MAY NOT BE AVAILABLE. THIS DEVELOPMENT MAY REQUIRE ADDITIONAL IMPROVEMENTS TO THE EXISTING SEWER SYSTEM TO MEET FUTURE SEWER DEMANDS PRIOR TO A PRELIMINARY PLAT, CONSTRUCTION PLAN AND/OR FINAL PLAT APPROVAL.

ISSUED FOR CONSTRUCTION

SIGNATURE DATE

SIGNATURE DATE

THIS DOCUMENT IS NOT ISSUED FOR CONSTRUCTION BY UNDERFOOT ENGINEERING WITHOUT TWO SIGNATURES ABOVE

PROJECT #: C22008.00

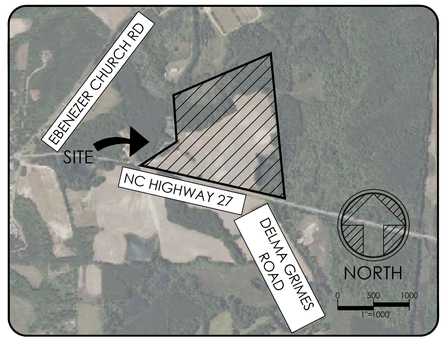
REVISION DATE:

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW ALL DRAWINGS AND SPECIFICATIONS PRIOR TO CONSTRUCTION, AND NOTIFY THE ENGINEER OF RECORD IN WRITING PRIOR TO STARTING CONSTRUCTION IF DISCREPANCIES ARE FOUND.

CARDINAL LANDING CONSTRUCTION DRAWINGS

UNDERFOOT PROJECT - C22008

LOCATION:
NC 27 E
COATS, NC 27521



PROJECT CONSTRUCTION SEQUENCE

- THERE WILL BE NO FUTURE PLANNED DEVELOPMENT FOR THIS PROJECT.
- THIS PROJECT WILL BE CONSTRUCTED IN ONE PHASE.

PROJECT NARRATIVE

- THIS PROJECT INVOLVES THE PROPOSED CONSTRUCTION OF 148 SINGLE FAMILY LOTS ALONG WITH ASSOCIATED STREETS, NC HWY 27 ROAD WIDENING, SIDEWALK, UTILITIES, GRADING, STORMWATER SYSTEM AND SCM, AND LANDSCAPING.

PREPARED BY:

underfoot ENGINEERING
1149 EXECUTIVE CIRCLE
CARY, NC 27511
919.576.9733
NCBELS C3847 | NCBOLA C683

CONTACT: MIKE ROSELLI, PE, PLA
MROSELLI@UNDERFOOTENGINEERING.COM

NOTICE TO CONTRACTOR:
All construction must comply with current NC Building Codes and is subject to field inspection and verification.

Reviewed for Code Compliance

06/05/2025

Harnett COUNTY NORTH CAROLINA

SHEET INDEX

ALL CONSTRUCTION MUST BE PERFORMED IN ACCORDANCE WITH CURRENT TOWN OF COATS, NCDOT, NCDEQ, HARNETT COUNTY STANDARDS, SPECIFICATIONS AND DETAILS IN PLACE AT TIME OF PLAN APPROVAL

PLAN REVISIONS

#	DATE	REVISION	BY
1	2024.01.04	HRW COMMENTS	JT
2	2024.02.28	TOWN OF COATS & HRW COMMENTS	JT
3	2024.04.05	TOWN OF COATS COMMENTS	JT

811 KNOW WHAT'S BELOW ALWAYS CALL 811 **BEFORE YOU DIG** It's fast. It's free. It's the law.

PROJECT:

CARDINAL LANDING CONSTRUCTION DRAWINGS

NC 27 E
COATS, NC 27521

PROJECT #:	C22008
DRAWN BY:	JT
REVIEWED BY:	MAR
1ST SUBMITTAL:	2023.06.05
SCALE:	AS NOTED

FOR REVIEW AND APPROVAL

PREPARED FOR:

mattamyHOMES

PREPARED BY:

underfoot ENGINEERING
1149 EXECUTIVE CIRCLE
CARY, NC 27511
919.576.9733
NCBELS C3847 | NCBOLA C683

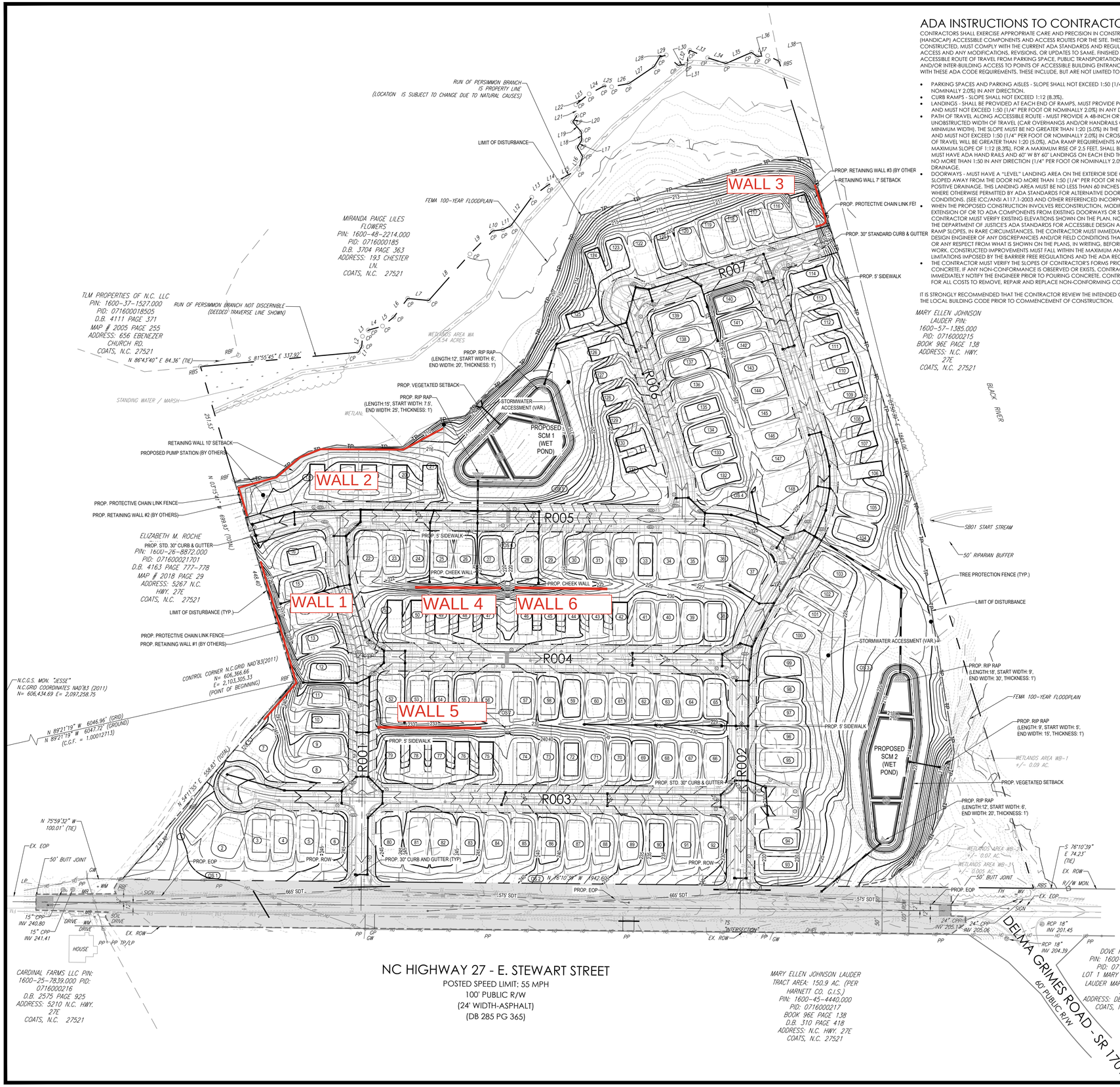
SEALED:

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040768 MICHAEL A. ROSELLI 2024.04.05

SHEET:

COVER SHEET

C-000



ADA INSTRUCTIONS TO CONTRACTOR

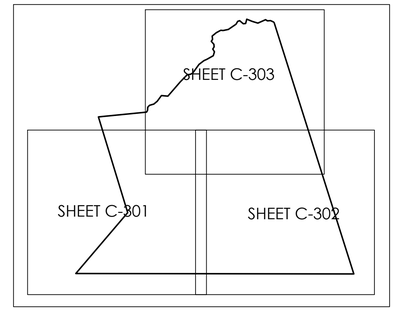
CONTRACTORS SHALL EXERCISE APPROPRIATE CARE AND PRECISION IN CONSTRUCTION OF ADA (HANDICAP) ACCESSIBLE COMPONENTS AND ACCESS ROUTES FOR THE SITE. THESE COMPONENTS, AS CONSTRUCTED, MUST COMPLY WITH THE CURRENT ADA STANDARDS AND REGULATIONS' BARRIER FREE ACCESS AND ANY MODIFICATIONS, REVISIONS, OR UPDATES TO SAME. FINISHED SURFACES ALONG THE ACCESSIBLE ROUTE OF TRAVEL FROM PARKING SPACE, PUBLIC TRANSPORTATION, PEDESTRIAN ACCESS, AND/OR INTER-BUILDING ACCESS TO POINTS OF ACCESSIBLE BUILDING ENTRANCE/EXIT MUST COMPLY WITH THESE ADA CODE REQUIREMENTS. THESE INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING:

- PARKING SPACES AND PARKING AISLES - SLOPE SHALL NOT EXCEED 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) IN ANY DIRECTION.
- CURB RAMPS - SLOPE SHALL NOT EXCEED 1:12 (8.3%).
- LANDINGS - SHALL BE PROVIDED AT EACH END OF RAMPS, MUST PROVIDE POSITIVE DRAINAGE, AND MUST NOT EXCEED 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) IN ANY DIRECTION.
- PATH OF TRAVEL ALONG ACCESSIBLE ROUTE - MUST PROVIDE A 48-INCH OR GREATER UNOBSTRUCTED WIDTH OF TRAVEL (CAR OVERHANGS AND/OR HANDRAILS CANNOT REDUCE THIS MINIMUM WIDTH). THE SLOPE MUST BE NO GREATER THAN 1:20 (5.0%) IN THE DIRECTION OF TRAVEL, AND MUST NOT EXCEED 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) IN CROSS SLOPE. WHERE PATH OF TRAVEL WILL BE GREATER THAN 1:20 (5.0%), ADA RAMP REQUIREMENTS MUST BE ADHERED TO. A MAXIMUM SLOPE OF 1:12 (8.3%). FOR A MAXIMUM RISE OF 2.5 FEET, SHALL BE PROVIDED. THE RAMP MUST HAVE ADA HAND RAILS AND 40" W BY 60" LANDINGS ON EACH END THAT ARE CROSS SLOPED NO MORE THAN 1:50 IN ANY DIRECTION (1/4" PER FOOT OR NOMINALLY 2.0%) FOR POSITIVE DRAINAGE.
- DOORWAYS - MUST HAVE A "LEVEL" LANDING AREA ON THE EXTERIOR SIDE OF THE DOOR THAT IS SLOPED AWAY FROM THE DOOR NO MORE THAN 1:50 (1/4" PER FOOT OR NOMINALLY 2.0%) FOR POSITIVE DRAINAGE. THIS LANDING AREA MUST BE NO LESS THAN 60 INCHES (5 FEET) LONG, EXCEPT WHERE OTHERWISE PERMITTED BY ADA STANDARDS FOR ALTERNATIVE DOORWAY OPENING CONDITIONS. (SEE ICC/ANSI A117.1-2003 AND OTHER REFERENCED INCORPORATED BY COD.)
- WHEN THE PROPOSED CONSTRUCTION INVOLVES RECONSTRUCTION, MODIFICATION, REVISION OR EXTENSION OF OR TO ADA COMPONENTS FROM EXISTING DOORWAYS OR SURFACES, CONTRACTOR MUST VERIFY EXISTING ELEVATIONS SHOWN ON THE PLAN. NOTE THAT TABLE 405.2 OF THE DEPARTMENT OF JUSTICE'S ADA STANDARDS FOR ACCESSIBLE DESIGN ALLOWS FOR STEEPER RAMP SLOPES, IN RARE CIRCUMSTANCES. THE CONTRACTOR MUST IMMEDIATELY NOTIFY THE DESIGN ENGINEER OF ANY DISCREPANCIES AND/OR FIELD CONDITIONS THAT DIFFER IN ANY WAY OR ANY RESPECT FROM WHAT IS SHOWN ON THE PLANS, IN WRITING, BEFORE COMMENCEMENT OF WORK. CONSTRUCTED IMPROVEMENTS MUST FALL WITHIN THE MAXIMUM AND MINIMUM LIMITATIONS IMPOSED BY THE BARRIER FREE REGULATIONS AND THE ADA REQUIREMENTS.
- THE CONTRACTOR MUST VERIFY THE SLOPES OF CONTRACTOR'S FORMS PRIOR TO POURING CONCRETE. IF ANY NON-CONFORMANCE IS OBSERVED OR EXISTS, CONTRACTOR MUST IMMEDIATELY NOTIFY THE ENGINEER PRIOR TO POURING CONCRETE. CONTRACTOR IS RESPONSIBLE FOR ALL COSTS TO REMOVE, REPAIR AND REPLACE NON-CONFORMING CONCRETE.

IT IS STRONGLY RECOMMENDED THAT THE CONTRACTOR REVIEW THE INTENDED CONSTRUCTION WITH THE LOCAL BUILDING CODE PRIOR TO COMMENCEMENT OF CONSTRUCTION.

GRADING AND DRAINAGE NOTES

1. REFER TO GENERAL NOTES ON SHEET C-100.
2. ALL SITE GRADING MUST BE PERFORMED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS AS WELL AS RECOMMENDATIONS SET FORTH IN THE GEOTECHNICAL REPORT. THE CONTRACTOR IS RESPONSIBLE FOR MOVING AND REPLACING UNSUITABLE MATERIALS WITH SUITABLE MATERIALS AS SPECIFIED IN THE GEOTECHNICAL REPORT.
3. ALL FILL, COMPACTION, AND BACKFILL MATERIALS REQUIRED SHALL BE PER THE RECOMMENDATIONS PROVIDED IN A GEOTECHNICAL REPORT. WHEN THE PROJECT DOES NOT HAVE A GEOTECHNICAL REPORT, FILL AND COMPACTION MUST, AT A MINIMUM, COMPLY WITH STATE DOT REQUIREMENTS AND SPECIFICATIONS. THE ENGINEER SHALL HAVE NO LIABILITY OR RESPONSIBILITY FOR OR AS RELATED TO FILL, COMPACTION, AND BACKFILL.
4. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING TOPOGRAPHIC INFORMATION AND UTILITY INVERT ELEVATIONS PRIOR TO COMMENCING ANY CONSTRUCTION. CONTRACTOR MUST CONFIRM, AND ENSURE 0.75% MINIMUM SLOPE AGAINST ALL BLAND, GUTTERS, AND CURBS; 1.0% ON ALL CONCRETE SURFACES; AND 1.5% MINIMUM ON ASPHALT (EXCEPT WHERE ADA REQUIREMENTS LIMIT GRADES), TO PREVENT PONDING.
2. GRADE ELEVATIONS
   - 2.1. ALL PROPOSED CONTOURS IN ROADWAYS, DRIVES, AND SIDEWALKS AND SPOT ELEVATIONS REFLECT FINISHED GRADES. THE TOPS OF EXISTING AND PROPOSED MANHOLES, INLET STRUCTURES, AND CLEANOUTS MUST BE ADJUSTED AS NECESSARY TO MATCH PROPOSED GRADES IN ACCORDANCE WITH ALL APPLICABLE STANDARDS, REQUIREMENTS, RULES, STATUES, LAWS, ORDINANCES, AND CODES.
   - 2.2. DWELLING AND ADJACENT SPOT ELEVATIONS ARE SCHEMATIC FOR THE GENERAL BUILDING FOOTPRINTS AND REPRESENT PAD GRADES ACCOUNTING FOR A SLAB FOUNDATION OF 8". GRADES MUST BE ADJUSTED BASED ON FINAL ARCHITECTURAL PLANS TO PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDING FOUNDATIONS IN ACCORDANCE WITH THE LATEST LOCAL AND STATE BUILDING CODE.
   - 2.3. REFER TO PAVEMENT CROSS SECTION DATA TO ESTABLISH CORRECT SUBBASE OR AGGREGATE BASE COURSE ELEVATIONS TO BE CONSTRUCTED UNDER THIS CONTRACT.
   - 2.4. WHERE RETAINING WALLS ARE IDENTIFIED ON PLANS, ELEVATIONS IDENTIFIED REPRESENT THE FINISHED GRADES OF THE EXPOSED PORTION OF THE WALL. FOOTING/FOUNDATION ELEVATIONS ARE NOT IDENTIFIED AND ARE TO BE DETERMINED BY THE WALL DESIGNER AND/OR THE CONTRACTOR BASED ON FINAL DESIGN DRAWINGS PREPARED BY THE APPROPRIATE PROFESSIONAL LICENSED IN THE STATE WHERE THE CONSTRUCTION OCCURS.
   - 2.5. WHERE TURN DOWN SLABS ARE SHOWN FOR LOTS ON THE PLAN, CONTOURS ARE APPROXIMATE AND SHALL BE FIELD COORDINATED BY THE BUILDER UPON PRODUCT SELECTION, PLACEMENT, AND ANY FINAL CHANGES TO THE FOUNDATION BY THE BUILDER.
3. UNLESS OTHERWISE NOTED, ALL STORM DRAINAGE PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP) CLASS III WITH SILT TIGHT JOINTS. WATERTIGHT RCP SHALL MEET ASTM C443 WITH JOINTS DOUBLE WRAPPED IN NON-WOVEN FILTER FABRIC AND UPSTREAM STRUCTURES CONSTRUCTED WATERTIGHT. WHEN HIGH-DENSITY POLYETHYLENE PIPE (HDPE) IS NOTED, IT MUST CONFORM TO AASHTO M294 TYPE S (SMOOTH INTERIOR) WITH GASKETS FOR WATERTIGHT JOINTS, AND BE INSTALLED ACCORDING TO ASTM D2321, D3212, AND F477 SPECIFICATIONS. PVC PIPE, WHEN USED FOR ROOF DRAIN CONNECTIONS, MUST BE SDR 26 OR SCHEDULE 40, CONFORM TO ASTM F949-93A, INSTALLED WITH WATERTIGHT, WELDED JOINTS, AND TIED TO THE STORMWATER SYSTEM WITH WATERTIGHT JOINTS UNLESS OTHERWISE NOTED. PIPE LENGTHS ARE NOMINAL AND MEASURED CENTER OF STRUCTURE TO CENTER OF STRUCTURE.
4. STORMWATER DISCHARGES INTO THE BLACK RIVER WATERSHED, CAPE FEAR BASIN. THIS PROJECT IS FALLS UNDER THE STORMWATER REQUIREMENTS OF NCDEQ AND MEETS THESE REQUIREMENTS BY MEANS OF TWO (2) ON-SITE WET POND DETENTION BASINS.
5. A PRE-CONSTRUCTION MEETING SHALL BE REQUIRED FOR THIS PROJECT.
6. THIS PROJECT INCLUDES CLEARING AND GRADING ONLY AS NECESSARY TO CONSTRUCT ROADWAYS, UTILITIES, AND OTHER RELATED INFRASTRUCTURE AS SHOWN IN THESE PLANS.
7. THE TREE PROTECTION FENCE SHALL BE MAINTAINED ON THE SITE UNTIL ALL SITE WORK IS COMPLETED AND THE FINAL SITE INSPECTION IS SCHEDULED PRIOR TO THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY (CO). THE FENCING SHALL BE REMOVED IMMEDIATELY PRIOR TO THE FINAL SITE INSPECTION FOR THE SITE.
8. RETAINING WALL 1 IS A CUT WALL AND WILL BE BUILT AS A GRAVITY WALL PRODUCT WITH NO GRID. RETAINING WALLS 2 AND 3 ARE FILL WALLS AND SETBACKS EQUAL TO THE HIGHEST WALL HEIGHT FOR EACH RESPECTIVE WALL.
9. NO BUILDING EXCAVATION SHALL OCCUR IN RETAINING WALL SETBACK AREA, INCLUDING STORM DRAINS.
10. ALL WALLS OVER 5-FEET IN HEIGHT WILL BE CONSTRUCTED WITH A 4' TALL BLACK CHAIN LINK PROTECTIVE FENCE, PER DETAIL FOUND ON SITE DETAILS (2 OF 2) SHEET C-801.
11. ALL WALLS OVER 5-FEET IN HEIGHT SHALL BE DESIGNED, INSPECTED, AND CERTIFIED BY A LICENSED PROFESSIONAL ENGINEER IN ACCORDANCE WITH N.C. GENERAL STATUTE 89C AND BE REQUIRED TO OBTAIN A BUILDING PERMIT IN ACCORDANCE WITH THE NORTH CAROLINA BUILDING CODE.



KEY SHEET MAP

TOTAL DISTURBED AREA: 43.53 AC.

GRADING LEGEND

EXISTING NOTE	TYPICAL NOTE TEXT	PROPOSED NOTE
320	CONTOUR LINE	320
325		325
349.5	SPOT ELEVATIONS	TC 348.00 / TC 349.50 BC 349.00
SANITARY LABEL	SANITARY LABEL	MH XXX
STORM LABEL	STORM LABEL	STM XXX
	STORM SEWER	
	STORM JUNCTION BOX	
	TYPICAL END SECTION	
	HEADWALL OR ENDWALL	
	CATCH BASIN	
	MONITORING WELL	N/A
	BORING	N/A
	BENCHMARK	N/A
N/A	TEST PIT	
N/A	LIMITS OF DISTURBANCE	

100 50 0 100 200
GRAPHIC SCALE

NORTH

PLAN REVISIONS

#	DATE	REVISION	BY
1	2024.01.04	HRW COMMENTS	JT
2	2024.02.28	TOWN OF COATS & HRW COMMENTS	JT
3	2024.04.05	TOWN OF COATS COMMENTS	JT

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It's fast. It's free. It's the law.

PROJECT:

CARDINAL LANDING CONSTRUCTION DRAWINGS

NC 27 E
COATS, NC 27521

PROJECT #:	C22008
DRAWN BY:	JT
REVIEWED BY:	MAR
1ST SUBMITTAL:	2023.06.05
SCALE:	1"=100

FOR REVIEW AND APPROVAL

PREPARED FOR:

mattamyHOMES

PREPARED BY:

underfoot ENGINEERING
1149 EXECUTIVE CIRCLE
CARY, NC 27511
919.576.9733
NCBELS C3847 | NCBOLA C683

SEALED:

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040768 MICHAEL A. ROSELLI
2024.04.05

SHEET:

OVERALL GRADING & DRAINAGE PLAN

C-300

RETAINING WALL CONSTRUCTION DOCUMENTS FOR

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA

SCHEDULE OF SPECIAL INSPECTIONS

IT-4 MODULAR RETAINING WALLS (NCBC SECTION 1704 AND 1807.2.5)

ITEM	MONITORING	NOTES AND SCOPE
MATERIAL VERIFICATION	PERIODIC	• *PERFORM SOIL TESTING OF THE RETAINED, FOUNDATION AND PROPOSED FILL MATERIALS TO DETERMINE IF PROPERTIES MEET ASSUMED VALUES SPECIFIED.*
	PERIODIC	• *VERIFY BLOCK TYPE, GRID TYPE, DRAINAGE MATERIALS, AND/OR FILTER FABRIC.*
FOUNDATIONS	PERIODIC	• *PERFORM SOIL TESTING OF FOUNDATION AREA (FOOTING FOR BLOCK AND REINFORCED ZONE) TO VERIFY ADEQUATE BEARING CAPACITY.*
	CONTINUOUS	• *VERIFY THICKNESS AND WIDTH OF RETAINING WALL LEVELING PAD.*
STRUCTURAL FILL	CONTINUOUS	• *VERIFY USE OF PROPER SOIL, DENSITIES, MOISTURE CONTENT, AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF STRUCTURAL FILL.*
WALL CONSTRUCTION	CONTINUOUS	• *VERIFY INSTALLATION OF BLOCK INFILL, DRAINAGE LAYER, DRAIN PIPE, AND DRAIN OUTLETS.*
	PERIODIC	• *VERIFY BLOCK TO BLOCK AND BLOCK TO GRID CONNECTION METHODS, AND SPECIFIED SETBACK REQUIREMENTS.*
	CONTINUOUS	• *VERIFY GRID ELEVATION, LENGTH, AND PROPER INSTALLATION.*
	PERIODIC	• *VERIFY INSTALLATION OF CAP BLOCK AND LOW PERMEABLE SOIL AT TOP OF WALL.*

IN ACCORDANCE WITH SECTION 1704 OF THE NORTH CAROLINA BUILDING CODE, RETAINING WALLS WITH A CUMULATIVE VERTICAL RELIEF GREATER THAN 5 FEET IN HEIGHT WITHIN A HORIZONTAL SEPARATION DISTANCE OF 50 FEET OR RETAINING WALLS LESS THAN 5 FEET IN CUMULATIVE VERTICAL RELIEF AND ADJACENT TO STRUCTURES LOCATED CLOSER THAN THE VERTICAL RELIEF REQUIRE SPECIAL INSPECTION TESTING. THE OWNER SHALL ENGAGE A QUALIFIED 3RD PARTY INDEPENDENT TESTING AGENCY TO CONDUCT SPECIAL INSPECTIONS IN ACCORDANCE WITH SECTION 1807.2.5 OF THE NORTH CAROLINA BUILDING CODE FOR THE SITE RETAINING WALL(S) PROVIDED ON THESE PLANS. AFTER CONSTRUCTION, A SUMMARY OF THE SPECIAL INSPECTION TESTING SHALL BE PROVIDED BY THE TESTING AGENCY TO THE BUILDING OFFICIAL AND THE DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE FOR FINAL REVIEW.

SHEET INDEX

TITLE SHEET

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

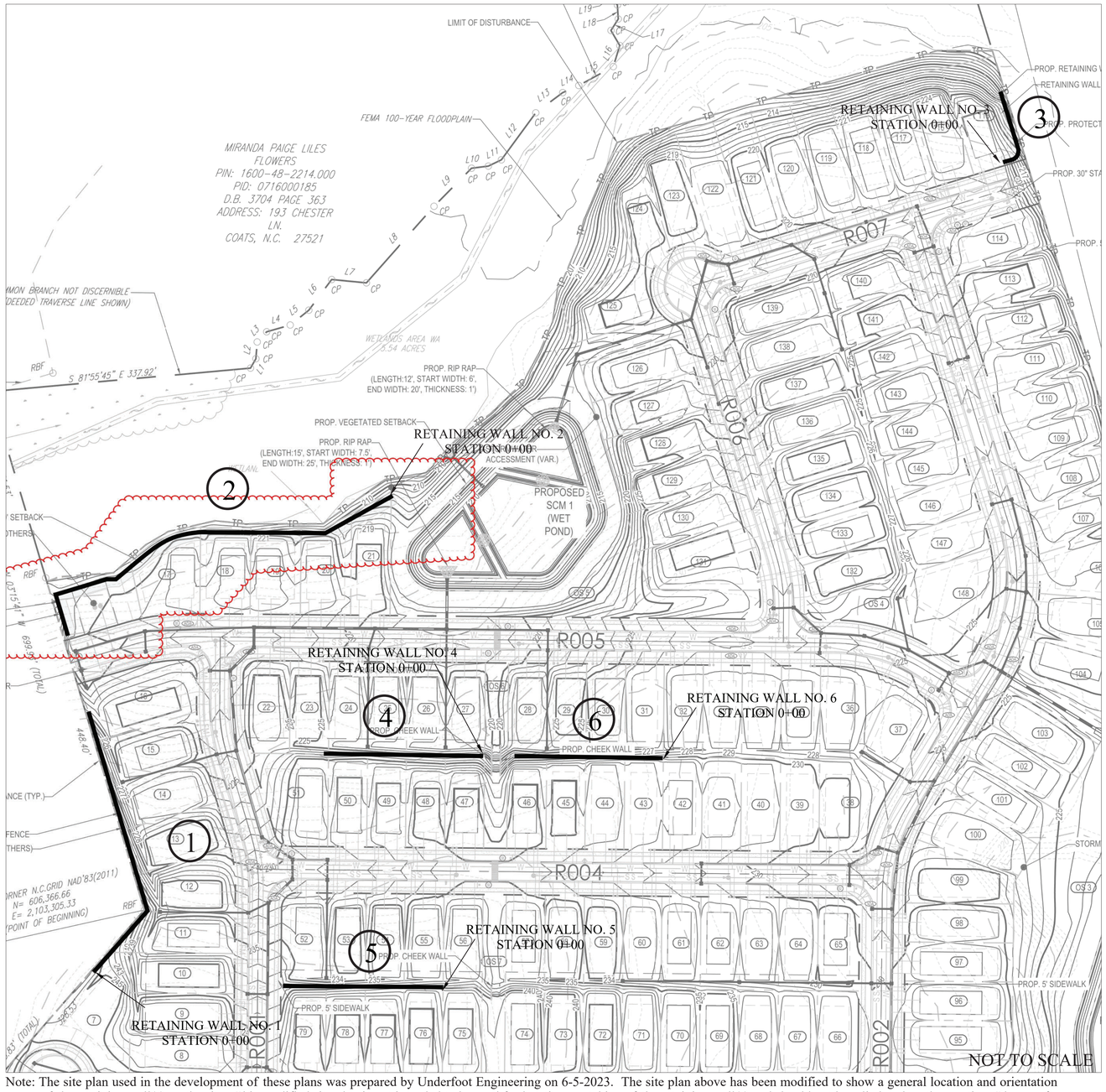
CARDINAL LANDING
NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL
Date: 2025.03.05 17:02:40-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-1.0



Note: The site plan used in the development of these plans was prepared by Underfoot Engineering on 6-5-2023. The site plan above has been modified to show a general location and orientation of the retaining wall(s) on the site. This modified site plan is not intended to be used for locating or staking of the retaining wall(s) and should not be relied on by other parties. Please refer to the original site plan (Revision dated 1-31-2025) prepared by Underfoot Engineering for the location and layout of the retaining wall(s).

Construction Notes

Prior to Construction:

1. A pre-construction meeting should be scheduled by the owner/owners' representative and/or general contractor prior to the start of construction and include all pertinent parties involved in the construction and testing of the retaining wall. This should also include any contractors that will be installing utilities in the reinforced zone of the retaining wall.
2. Confirmation of the location of property lines, limits of disturbances, watersheds, wetlands, easements, buffers, curb and gutter, and/or buildings to the proposed retaining wall should be performed by the general contractor to verify that the distances shown on the provided site plan are available.
3. Confirmation of existing utility line locations (Stormwater, Sewer, Water, Electrical, and Gas) and the locations of future utility lines that are in close proximity of the planned retaining wall(s) shall be performed by the general contractor to verify that proper clearances are available.
4. Confirmation of the in-situ and proposed grades shall be performed to verify that site grades shown on the provided site plan are accurate. The Retaining Wall Design Engineer shall be notified if the actual grades differ than those on the provided site plan.

During Construction:

5. Structures located in close proximity to the excavation area of the retaining wall shall be properly supported so as not to undermine or cause damage to the structure. If existing structures do not allow the proper installation of the retaining wall design specified, the Retaining Wall Design Engineer shall be notified to review the impact to the retaining wall design.
6. Utility structures and underground utility lines located within the reinforced zone of the retaining wall(s) shall be installed prior to or during construction of the retaining wall(s) to prevent damage to the reinforcement layers. If the presence of utility structures interfere with the integrity of the reinforcement, the Retaining Wall Design Engineer shall be notified during construction to review the impact to the retaining wall design.

Post Construction

7. Construction activities in the vicinity of the retaining walls should be monitored by the general contractor to verify that it does not result in damage to the retaining wall. Heavy equipment should not be allowed operate within 3 feet of the retaining wall(s) to prevent from impacting the structural integrity of the retaining wall(s). The Retaining Wall Design Engineer shall be notified if any damage to the retaining wall or wall units occurs during post construction activities.
8. Construction activities in the vicinity of the reinforced zone of the retaining wall(s) should be monitored by the general contractor to verify that it does not result in damage to the retaining wall geogrid. Installation of light poles, signs, handrails, guardrails, shrubs, or trees (etc) in the reinforced zone of the retaining wall(s) shall not damage the upper layers of reinforcement. The Retaining Wall Design Engineer shall be notified if any damage to the reinforcement occurs during post construction activities.
9. Placement of low permeable soil at the top and in front of the retaining wall(s) should be performed by the site contractor immediately after final construction activities. Proper erosion control at the top and bottom portions of the retaining wall(s) is critical to wall performance. Any portion of the retaining wall(s) where geogrid or wall units are exposed due to excessive erosion shall be removed and reconstructed in accordance with the retaining wall plans.
10. Excessive surface water flowing towards the top of the retaining wall(s) should be properly managed or diverted by permanent diversion ditches to prevent overtopping the front face of the retaining wall. Excessive surface water that flows over the top of retaining walls can lead to undermining of the foundation system over time. Catch inlets can be installed as needed in low areas of the retaining wall to help collect and channel surface water from the retaining wall.
11. Since segmental retaining walls are flexible reinforced soil masses, differential movement and strain of the reinforced and retained soil matrix could result in minor cracking of the ground surface. This cracking can lead to reflective cracks in pavement sections and/or separation of concrete curbs and aprons that are located in the vicinity of the retaining wall. In addition, cracking and gapping of the segmental wall units, especially in cut corners and curves may also occur during post construction activities. High quality backfill with low fine contents, proper backfill compaction, and firm foundations can limit the amount of post construction movement of retaining walls. Any cracks that develop in soil or pavement areas should be sealed as soon as possible to prevent the infiltration of surface water. Cracking or gapping observed in wall units should be sealed with grout as soon as possible to prevent the loss of drainage aggregate from behind the wall(s).

SITE LAYOUT

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

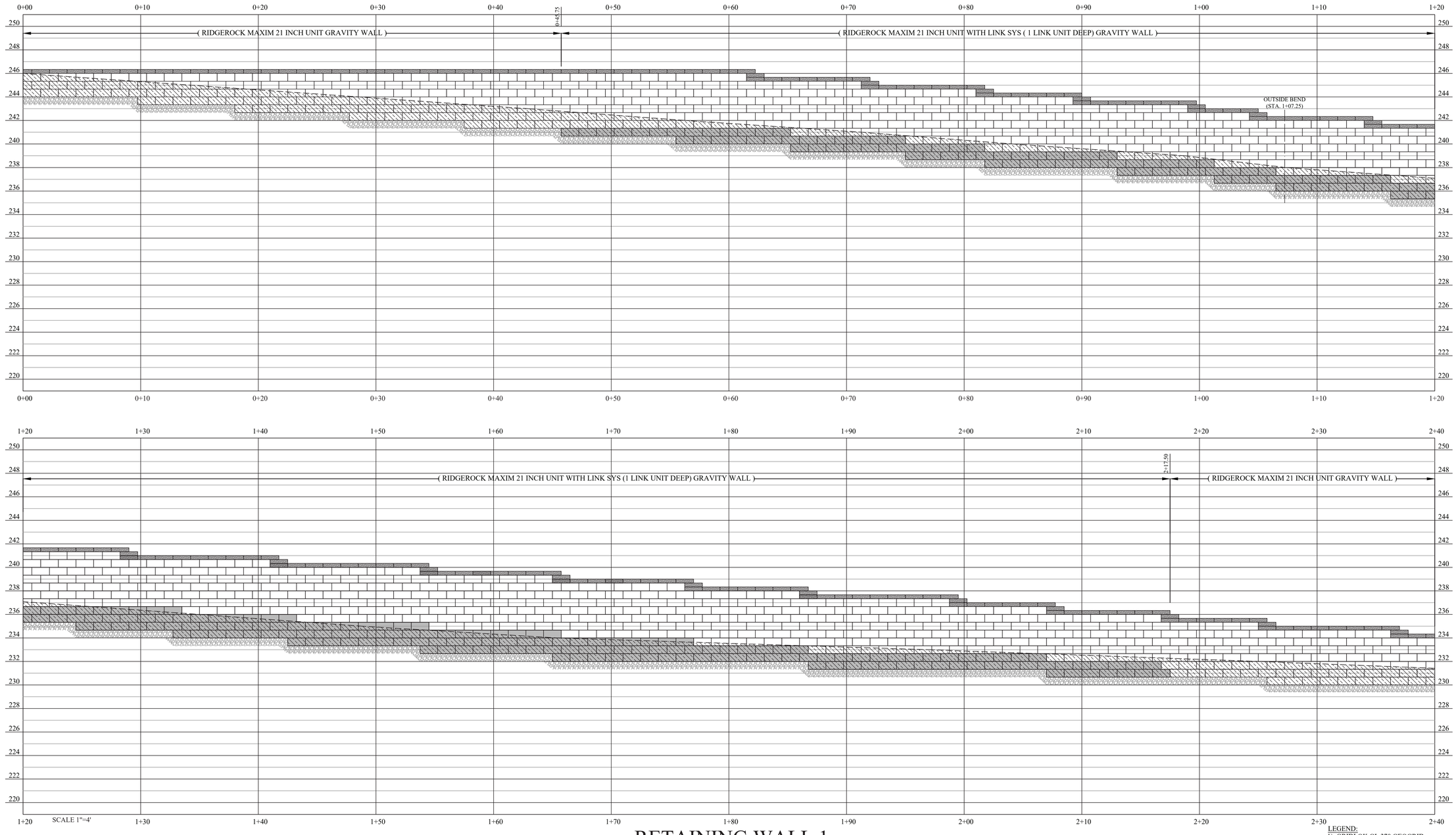
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL
Date: 2025.03.06 17:02:46-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-2.0

2 OF 15



RETAINING WALL 1

RETAINING WALL NO. 1 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL

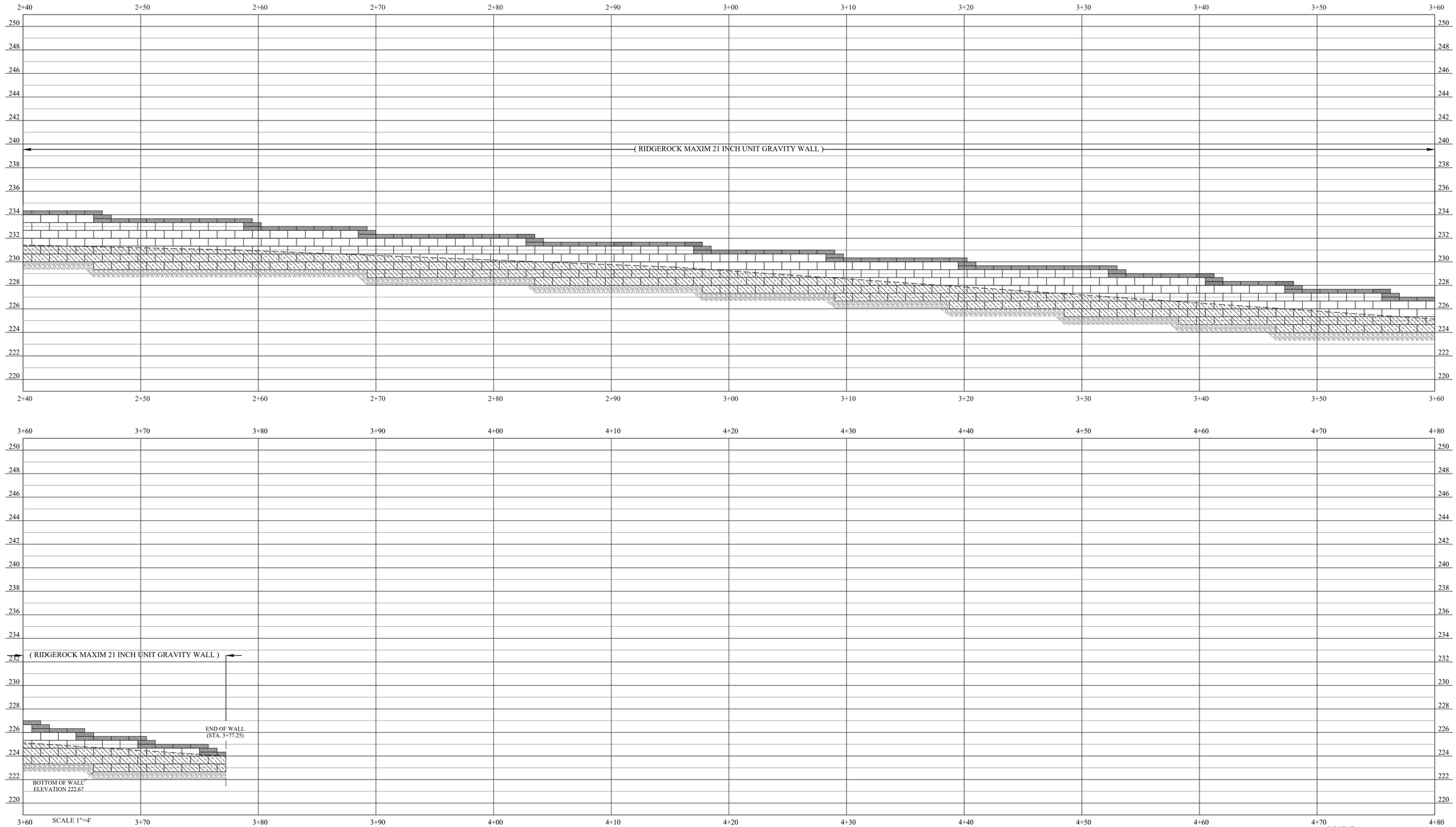
Date: 2025.03.05 11:02:53-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET

RW-3.0

3 OF 15



RETAINING WALL 1

LEGEND:
1). GRIDLOK GL 370 GEOGRID
2). EMBEDDED BLOCK
3). LEVELING PAD

RETAINING WALL NO. 1 PROFILE CONT.

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

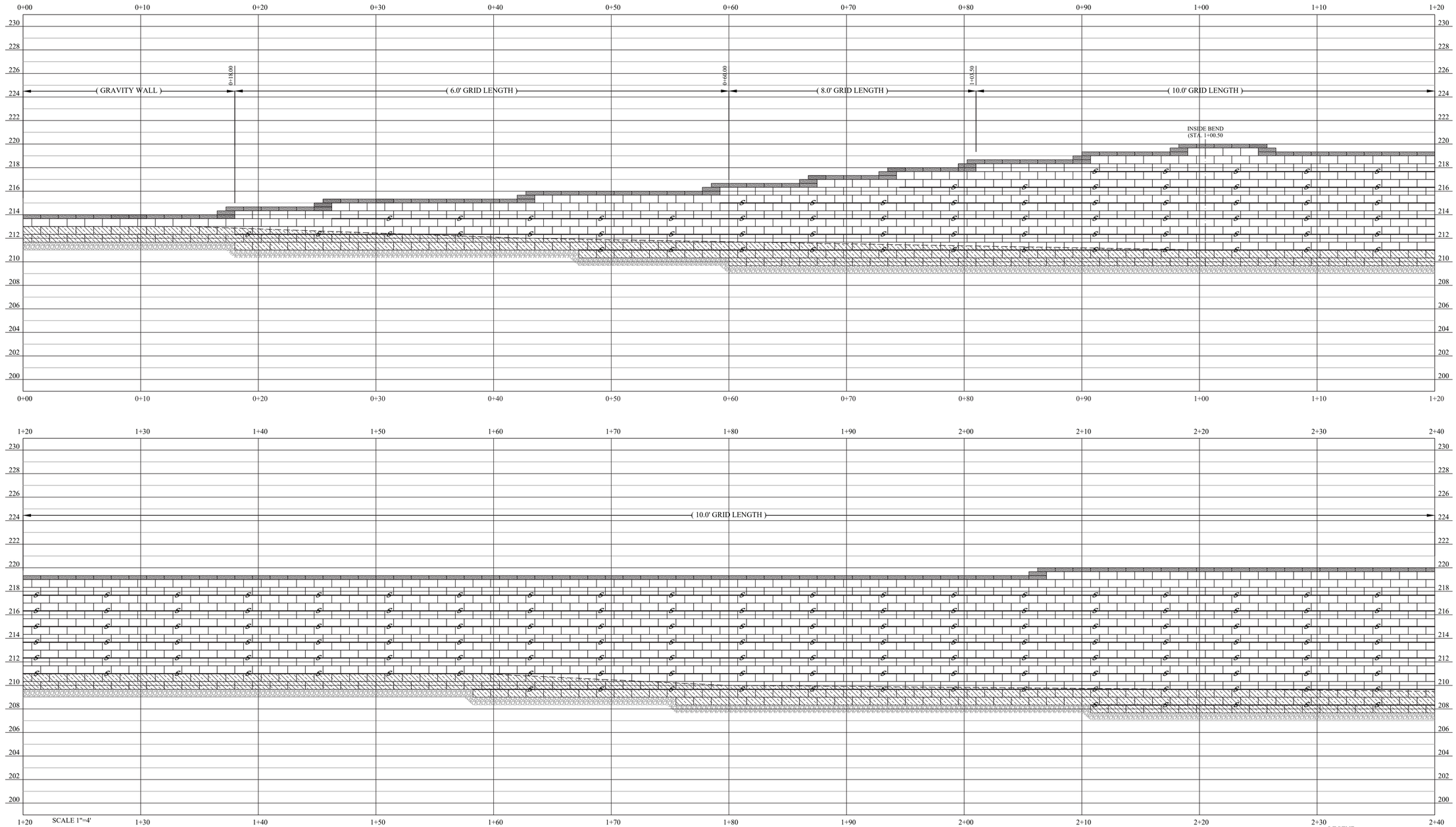
NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL

Date: 2025.03.09 11:02:58-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET

RW-3.1



RETAINING WALL 2

LEGEND:
1). GRIDLOK GL 370 GEOGRID
2). EMBEDDED BLOCK
3). LEVELING PAD

RETAINING WALL NO. 2 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL
Date: 2025.03.03 11:03:03-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-4.0

RETAINING WALL 2

RETAINING WALL NO. 2 PROFILE CONT.

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

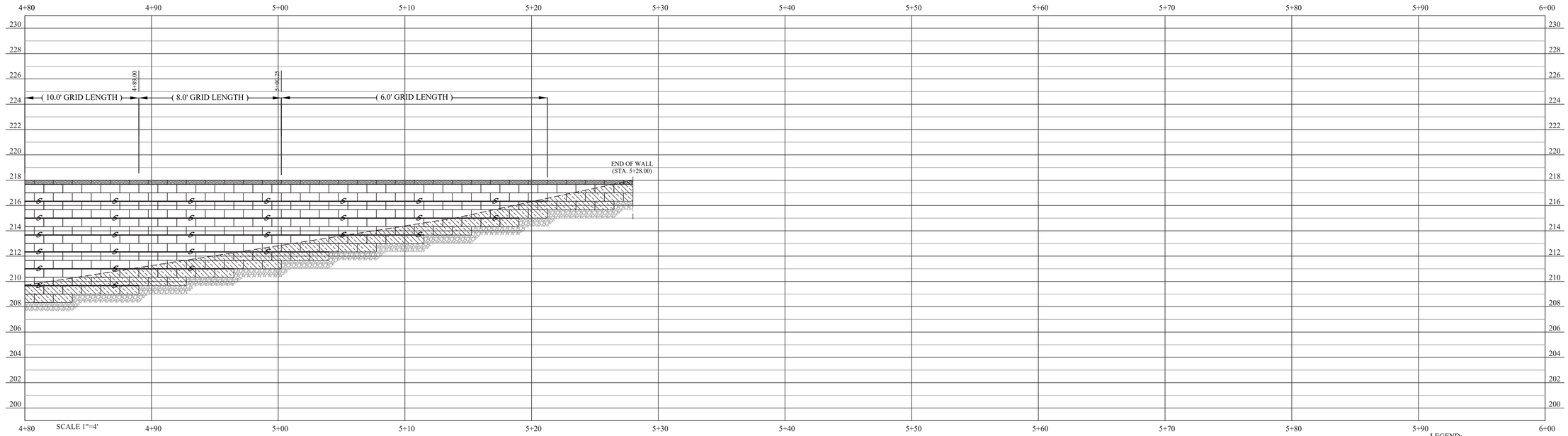
NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL

Date: 2025.03.09 11:03:08-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET

RW-4.1



RETAINING WALL 2

LEGEND:
1). GRIDLOK GL 370 GEOGRID
2). EMBEDDED BLOCK
3). LEVELING PAD

RETAINING WALL NO. 2 PROFILE CONT.

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

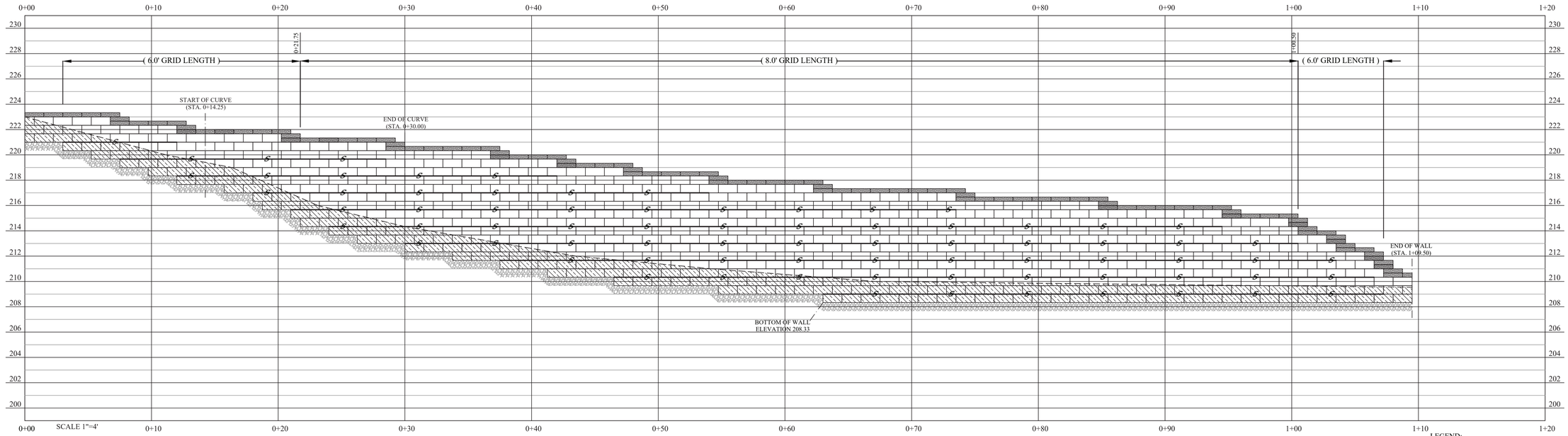
CARDINAL LANDING
NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL
Date: 2025.03.09 17:03:13-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-4.2



RETAINING WALL 3

LEGEND:
1). GRIDLOK GL 370 GEOGRID
2). EMBEDDED BLOCK
3). LEVELING PAD

RETAINING WALL NO. 3 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

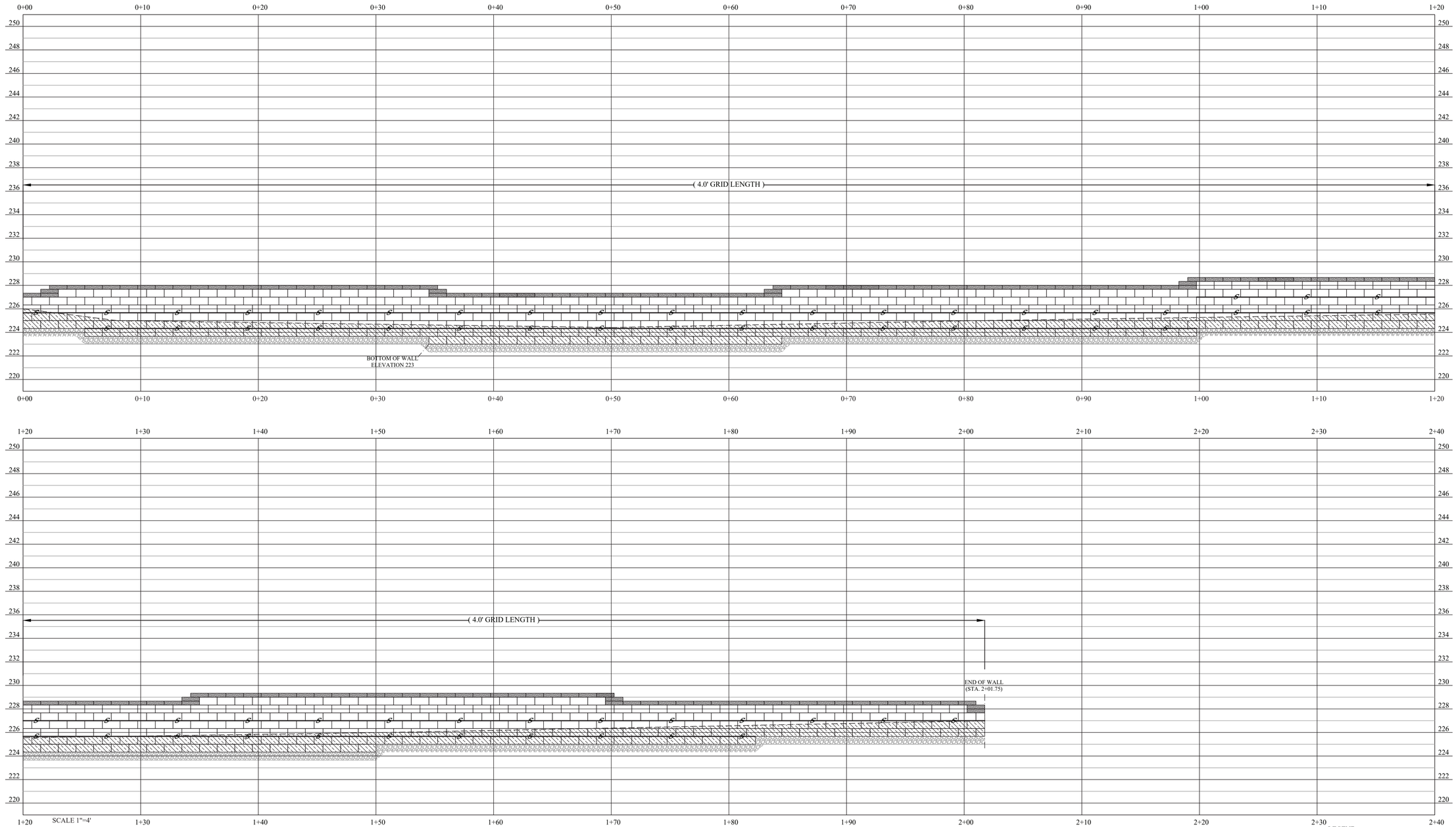
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL

Date: 2025.03.09 17:03:18-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-5.0



RETAINING WALL 4

LEGEND:
1). GRIDLOK GL 370 GEOGRID
2). EMBEDDED BLOCK
3). LEVELING PAD

RETAINING WALL NO. 4 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

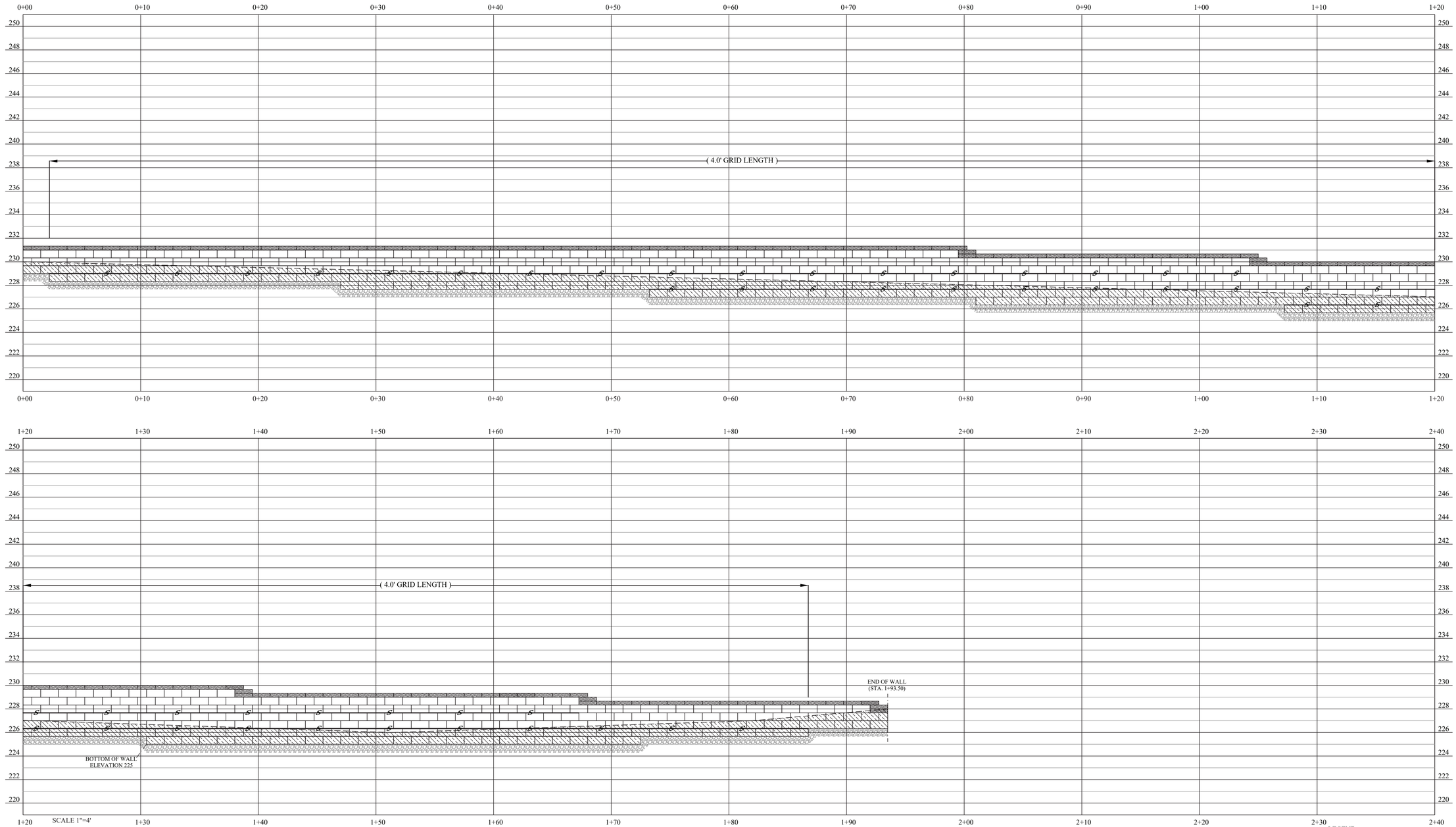
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL

Date: 2025.03.05 11:03:23-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-6.0



RETAINING WALL 5

LEGEND:
1). GRIDLOK GL 370 GEOGRID
2). EMBEDDED BLOCK
3). LEVELING PAD

RETAINING WALL NO. 5 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

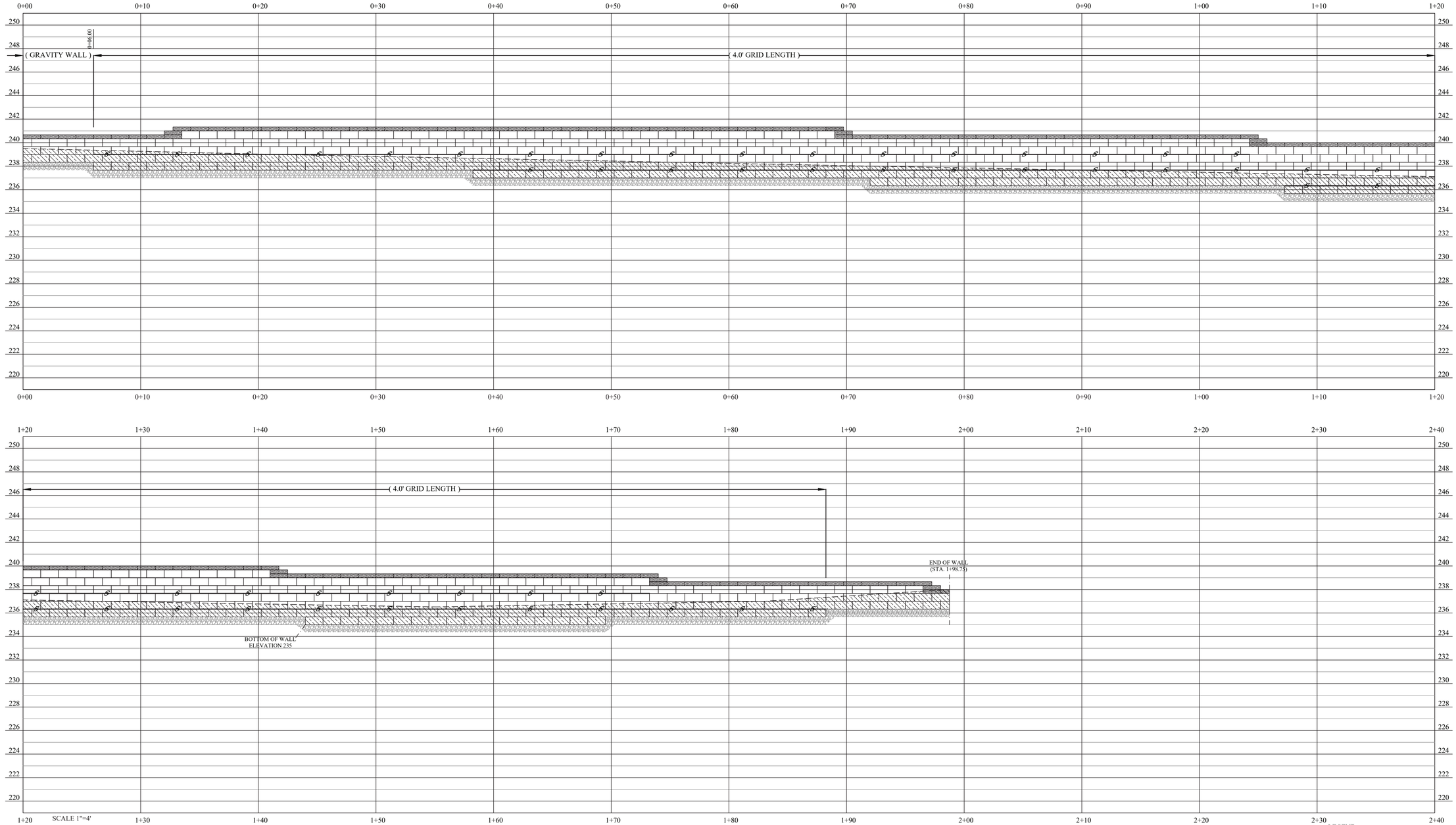
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL

Date: 2025.03.05 11:03:29-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-7.0



RETAINING WALL 6

LEGEND:
1). GRIDLOK GL 370 GEOGRID
2). EMBEDDED BLOCK
3). LEVELING PAD

RETAINING WALL NO. 6 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

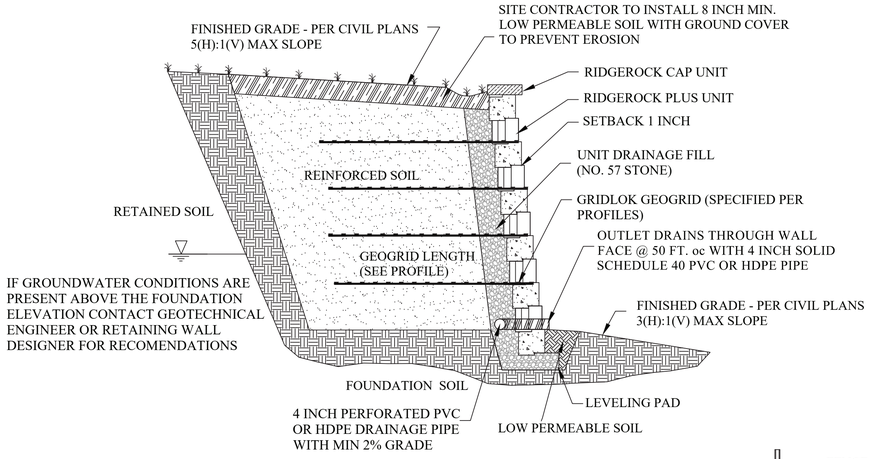
NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRYAN D. HALL

Date: 2025.09.09 17:03:34-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

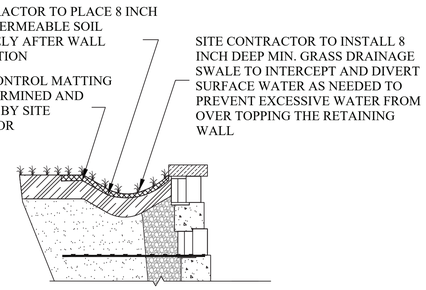
SHEET

RW-8.0



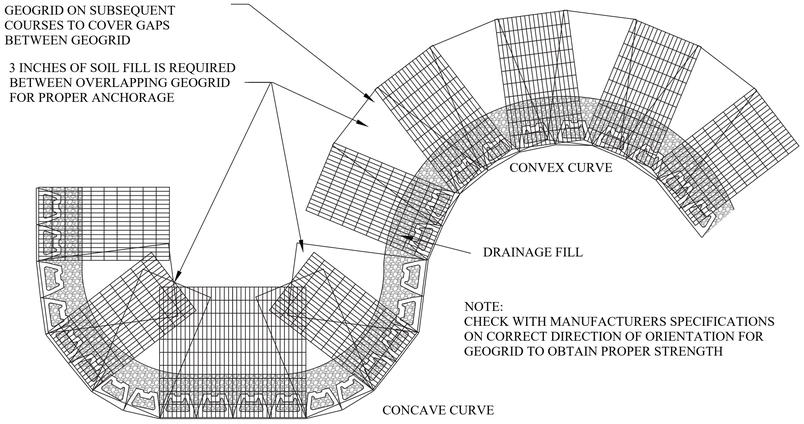
RIDGEROCK RETAINING WALL DETAIL

SCALE: NONE



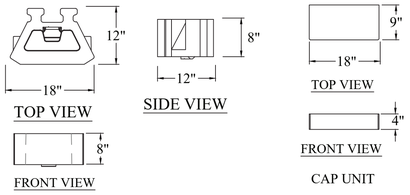
DRAINAGE SWALE DETAIL (AS NEEDED)

SCALE: NONE



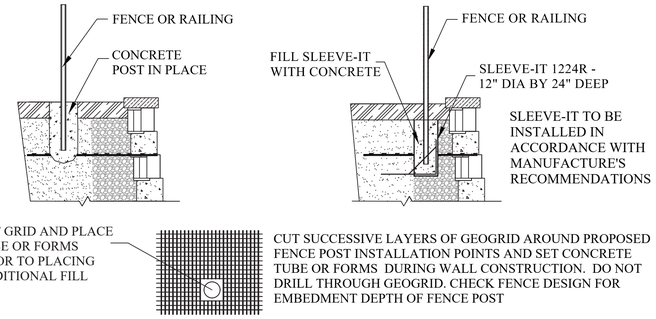
GEOGRID INSTALLATION AT CURVES

SCALE: NONE



RIDGEROCK PLUS BLOCK DETAILS

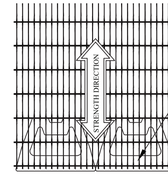
SCALE: NONE



RAILING REQUIREMENTS FOR THE RETAINING WALL SHALL BE DETERMINED BY THE SITE CIVIL ENGINEER AND OWNER. THE RAILING SHOULD BE DESIGNED IN ACCORDANCE WITH THE NORTH CAROLINA BUILDING CODE BY A REGISTERED DESIGN PROFESSIONAL, SUCH THAT IT DOES NOT ADD ANY ADDITIONAL LATERAL FORCES TO THE RETAINING WALL. THE CONCRETE TUBES OR SLEEVE-IT FORMS FOR THE RAILINGS SHALL BE INSTALLED BY THE SITE CONTRACTOR AND COORDINATED WITH THE RETAINING WALL CONTRACTOR DURING CONSTRUCTION OF THE RETAINING WALL.

TYPICAL HAND RAILING DETAIL

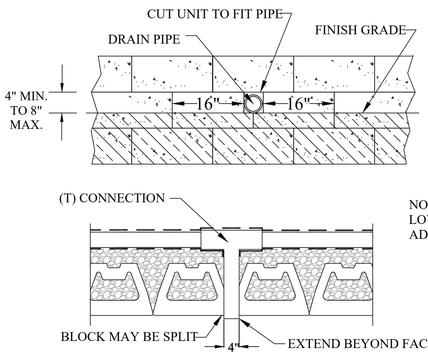
SCALE: NONE



GEOGRID IS TO BE PLACED ON LEVEL BACKFILL AND EXTENDED TO FRONT FACE OF UNITS. PLACE NEXT UNIT. PULL GRID TAUGHT AND BACKFILL. STAKE AS REQUIRED.

GRID CONNECTION

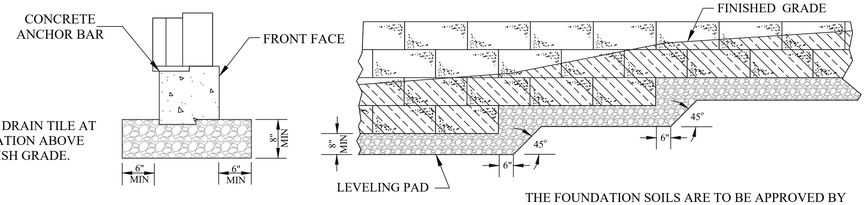
SCALE: NONE



NOTE: LOCATE DRAIN TILE AT LOWEST ELEVATION ABOVE ADJACENT FINISH GRADE.

FACE OUTLET DRAIN DETAIL

SCALE: NONE

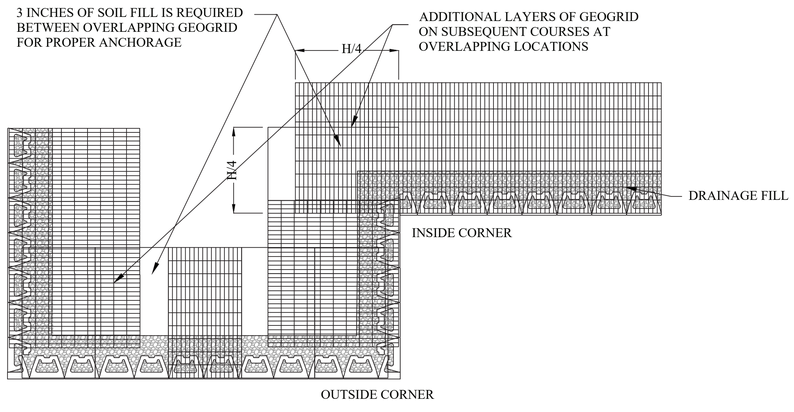


THE LEVELING PAD IS TO BE CONSTRUCTED OF TAMPED NO. 57 STONE, COMPACTED ABC STONE, OR UNREINFORCED CONCRETE.

THE FOUNDATION SOILS ARE TO BE APPROVED BY THE SITE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF THE LEVELING PAD

LEVELING PAD DETAILS

SCALE: NONE



GEOGRID INSTALLATION AT CORNERS

SCALE: NONE

RIDGEROCK PLUS UNIT DETAILS

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

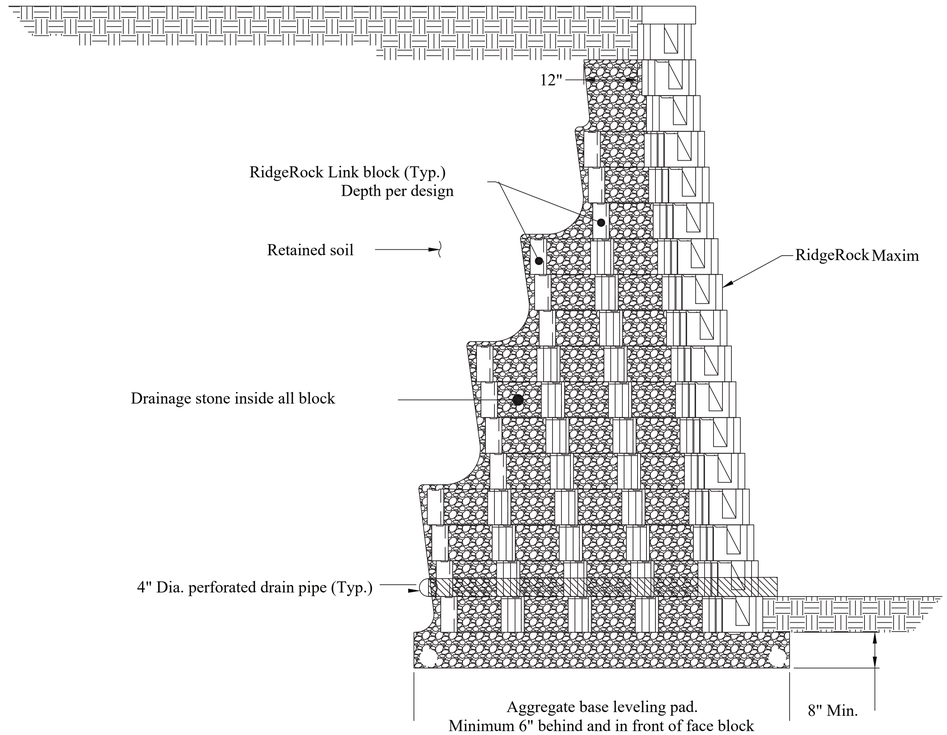
NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

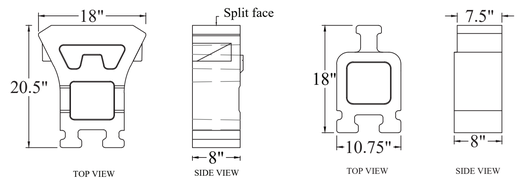
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL
Date: 2025.09.17 10:39:05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-9.0





RIDGEROCK BLOCK DETAILS

SCALE: NONE

RIDGEROCK MAXIM UNIT DETAILS

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION
9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

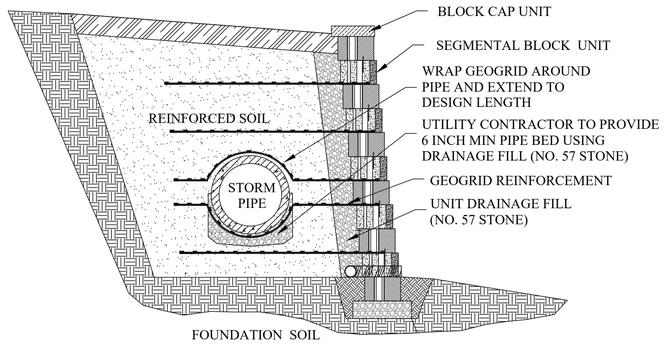
NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL

Date: 2025.09.08 17:03:44-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

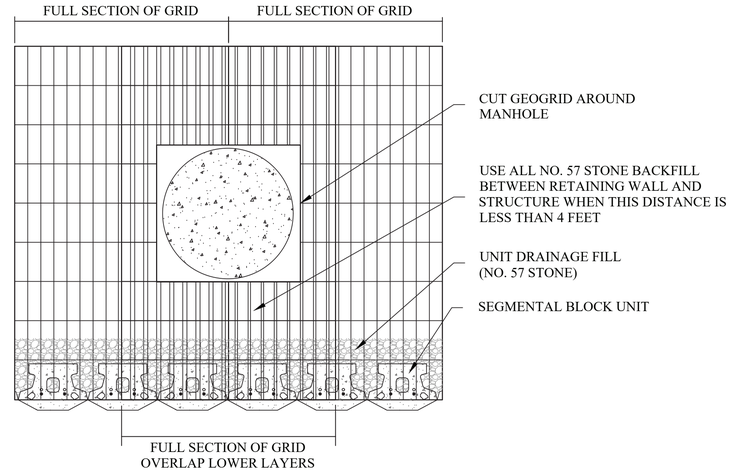
SHEET
RW-9.1

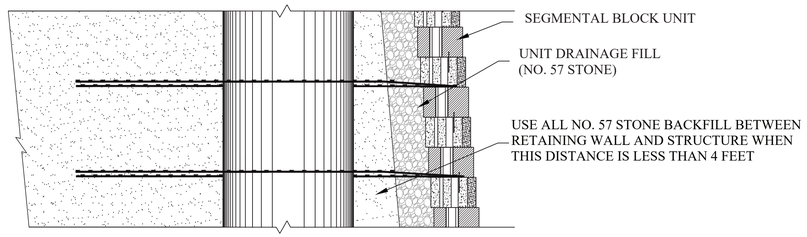
13 OF 15



SEGMENTAL WALL WITH PIPE IN REINFORCED ZONE

SCALE: NONE





SEGMENTAL WALL AT PIER / MANHOLE

SCALE: NONE

GENERAL SEGMENTAL WALL DETAILS

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
DESIGNED BY:	BDH
REVIEWED BY:	

CARDINAL LANDING

NC HIGHWAY 27 E
COATS, NORTH CAROLINA
MARVEL PROJECT NO. 24-17810

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032726 ENGINEER BRIAN D. HALL
Date: 2025.09.09 11:03:49-05'00'

MARVEL ENGINEERING & CONSULTING
PO BOX 1955
GARNER, NORTH CAROLINA 27529
(919) 812-1375 • LICENSE NO. P-1332

SHEET
RW-9.2

1.0 GENERAL

REINFORCED SOIL SEGMENTAL RETAINING WALLS (SRW'S) ARE GRAVITY WALLS WITH AN EXPANDED WIDTH CREATED BY A GEOSYNTHETIC REINFORCED SOIL MASS LOCATED BEHIND A COLUMN OF DRY STACKED SRW CONCRETE UNITS. THE DRY-STACKED COLUMN OF SRW UNITS AND GEOSYNTHETIC REINFORCED SOIL ZONE ACT TOGETHER TO RESIST THE DESTABILIZING FORCES GENERATED BY THE RETAINED SOIL AND SURCHARGE LOADS.

1.1 DESIGN

THE DESIGN FOR THE RETAINING WALL(S) PRESENTED IN THESE PLANS WAS PRIMARILY DEVELOPED USING THE METHODS OUTLINED IN THE *DESIGN MANUAL FOR SEGMENTAL RETAINING WALLS - 3RD EDITION* FROM THE NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA). THE NCMA METHOD USES COULOMB'S GENERAL EQUATION FOR THE ACTIVE EARTH PRESSURE COEFFICIENT (Ka) WITH SPECIFIC INTERPRETATIONS TO ANALYZE THE EXTERNAL, INTERNAL, AND FACING STABILITY OF SEGMENTAL RETAINING WALLS. IN CERTAIN CIRCUMSTANCES, WE HAVE UTILIZED THE METHODS OUTLINED IN THE *MECHANICALLY STABILIZED EARTH WALLS AND REINFORCED SOIL SLOPES DESIGN & CONSTRUCTION GUIDELINES (PUBLICATION NO. FHWA-NHI-00-043)* FROM THE U.S. DEPARTMENT OF TRANSPORTATION - FEDERAL HIGHWAY ADMINISTRATION. THE FHWA METHOD USES RANKINE'S GENERAL EQUATION FOR THE ACTIVE EARTH PRESSURE COEFFICIENT (Ka) WITH SPECIFIC INTERPRETATIONS TO ANALYZE THE EXTERNAL, INTERNAL, AND FACING STABILITY OF SEGMENTAL RETAINING WALLS.

1.2 SOIL ASSUMPTIONS

THE SOIL PARAMETERS USED IN THE DESIGN OF THE RETAINING WALL(S) ARE ASSUMED VALUES BASED ON OUR EXPERIENCE WITH THE PROPERTIES OF LOCAL MATERIALS AND LOCALLY AVAILABLE FILL MATERIALS. ADEQUATE LABORATORY TESTING, AS DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER, SHOULD BE PERFORMED ON THE EXISTING SOILS IN THE AREA OF THE PROPOSED RETAINING WALL(S) AND OF THE PROPOSED BACKFILL MATERIAL TO DETERMINE IF THE ASSUMED SOIL PARAMETERS REPRESENT THE ACTUAL ONSITE CONDITIONS. THE RESULTS OF THE SOIL TESTING SHALL BE PROVIDED TO THE RETAINING WALL DESIGN ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION OF THE RETAINING WALL. THE TESTED SOILS SHALL, AT A MINIMUM, HAVE THE FOLLOWING PROPERTIES:

1) REINFORCED SOILS **ϕ = 30 DEGREES; COHESION = 0 PSF; WET UNIT WEIGHT = 120 LBS/CU.FT**

2) RETAINED SOILS **ϕ = 28 DEGREES; COHESION = 50 PSF; WET UNIT WEIGHT = 115 LBS/CU.FT**

3) FOUNDATION SOILS **ϕ = 28 DEGREES; COHESION = 50 PSF; WET UNIT WEIGHT = 115 LBS/CU.FT**

IF THE SOIL MATERIALS DO NOT MEET THESE MINIMUM VALUES, THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY FOR REVIEW WITH REGARDS TO THE FINAL RETAINING WALL DESIGN.

1.3 GROUNDWATER CONDITIONS

THIS RETAINING WALL DESIGN ASSUMES THAT GROUNDWATER IS PRESENT AT A DEPTH THAT WILL NOT AFFECT THE SUPPORT CHARACTERISTICS OF THE RETAINING WALL(S). DUE TO THE POTENTIAL FOR ADVERSE EFFECTS OF HYDROSTATIC PRESSURE ON THE RETAINING WALL SYSTEM, THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY IF GROUNDWATER IS ENCOUNTERED ABOVE THE FOUNDATION LEVEL OF THE RETAINING WALL, WATER OR WETNESS IS OBSERVED DURING CONSTRUCTION FROM OR IN A CUT SOIL BANK, OR IF LOCAL SPRINGS ARE ENCOUNTERED BELOW OR BEHIND THE RETAINING WALL(S).

1.4 LOADING CONDITIONS

THIS RETAINING WALL DESIGN TAKES INTO ACCOUNT THE ASSUMED LOADING CONDITIONS THAT ARE LOCATED WITHIN THE PLANE OF INFLUENCE OF THE RETAINING WALL(S). FOR THIS DESIGN, WE HAVE INCLUDED NO LIVE LOAD SURCHARGE CONDITIONS, NO DEAD LOAD SURCHARGE CONDITIONS, AND NO LATERAL LOAD SURCHARGE CONDITIONS. ALTERATIONS TO THE PROVIDED SITE DESIGN, AND/OR STRUCTURES SUCH AS LIGHT POLES, GUARDRAILS, HANDRAILS, UTILITY STRUCTURES, AND LANDSCAPING INSTALLED IN CLOSE PROXIMITY TO THE RETAINING WALL CAN SIGNIFICANTLY ALTER THE ASSUMED LOADING CONDITIONS. THE PROJECT STRUCTURAL ENGINEER SHALL REVIEW THE ASSUMED LOADING CONDITIONS, AND NOTIFY THE RETAINING WALL DESIGN ENGINEER REGARDING LOADING CONDITIONS CONCERNS WITH THE FINAL RETAINING WALL DESIGN. ADDITIONALLY, IF FUTURE CONDITIONS ARISE THAT MAY ALTER THE ASSUMED LOADING CONDITIONS, THE RETAINING WALL ENGINEER SHALL BE NOTIFIED FOR REVIEW.

1.5 RETAINING WALL SETBACK

THE SETBACK ASSUMED FOR THE RETAINING WALL(S) IS **1 INCH PER BLOCK**. THE SITE CIVIL ENGINEER SHALL DETERMINE THE FINAL RETAINING WALL LOCATION BASED ON THE TOTAL HORIZONTAL DISTANCE BETWEEN THE TOP AND BOTTOM UNITS OF THE RETAINING WALL.

1.6 FOUNDATION REQUIREMENTS

BASED ON THE CALCULATIONS PERFORMED FOR THE RETAINING WALL(S) PROVIDED IN THESE PLANS, THE MAXIMUM BEARING PRESSURE EXERTED BY THE RETAINING WALL(S) ON THE FOUNDATION SOIL IS **2,000** POUNDS PER SQUARE FOOT (PSF). THE ALLOWABLE SOIL BEARING CAPACITY SHOULD BE DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER USING THE ULTIMATE BEARING CAPACITY OF THE FOUNDATION SOILS DIVIDED BY A MINIMUM FACTOR OF SAFETY OF 2.0. THE BEARING CAPACITY, SETTLEMENT, AND OVERALL GLOBAL STABILITY SHOULD BE ADDRESSED BY A QUALIFIED GEOTECHNICAL ENGINEER.

2.0 MATERIALS

2.1 CONCRETE MASONRY WALL UNITS

THE CONCRETE WALL UNITS SHALL BE SEGMENTAL UNITS MANUFACTURED IN ACCORDANCE WITH ASTM C-1372 AND ASTM C-140. THE UNITS SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,000 PSI. THE UNITS SHALL BE INTERLOCKED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. THE UNITS SHALL BE USED AND KEPT FREE OF DEFECTS THAT WOULD INTERFERE WITH THE PLACING OR POSITIONING OF THE UNIT OR IMPAIR ITS STRENGTH. THE CONTRACTOR SHALL PREVENT EXCESS MUD, WET CEMENT, EPOXY, AND THE LIKE MATERIALS FROM COMING IN CONTACT WITH AND AFFIXING TO THE UNITS. MINOR CRACKS INCIDENTAL TO THE USUAL METHOD MANUFACTURING OR MINOR CHIPPING RESULTING FROM SHIPMENT AND DELIVERY ARE NOT GROUNDS FOR REJECTION.

2.2 GEOGRID REINFORCEMENT

GEOGRID REINFORCEMENT SHALL CONSIST OF HIGH TENACITY GEOGRID MANUFACTURED FOR THE SOIL REINFORCEMENT APPLICATIONS. THE TYPE, LENGTH, AND PLACEMENT OF THE REINFORCING GEOSYNTHETIC SHALL BE AS SHOWN ON THE RETAINING WALL PROFILE. GEOGRID SHALL BE REJECTED IF 20% OR MORE OF A STRUCTURAL RIB HAS BEEN CUT OR DAMAGED. THE CONTRACTOR SHALL INSPECT ALL GEOGRID DELIVERED TO THE JOBSITE AND REJECT MATERIALS THAT MEET THIS CRITERIA. THE CONTRACTOR SHALL PREVENT EXCESS MUD, WET CEMENT, EPOXY, AND THE LIKE MATERIALS FROM COMING IN CONTACT WITH AND AFFIXING TO THE GEOGRID MATERIAL. IF THE GEOGRID IS DAMAGED ONSITE OR DURING PLACEMENT, IT SHALL BE REPLACED.

2.3 DRAINAGE PIPE

THE DRAINAGE COLLECTION PIPE SHALL BE A MINIMUM OF 4 INCH DIAMETER PERFORATED OR SLOTTED, PVC OR CORRUGATED HDPE PIPE. THE PIPE MAY BE COVERED WITH A KNITTED OR NON-WOVEN GEOTEXTILE SOCK TO FUNCTION AS A FILTER. DRAINAGE PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM D-3034 OR AASHTO M 252.

2.4 GEOTEXTILE FILTER FABRIC / GEOCOMPOSITE DRAIN (IF REQUIRED)

GEOTEXTILE FILTER FABRIC SHALL CONSIST OF NEEDLE PUNCHED NON-WOVEN POLYPROPYLENE MATERIAL WHICH MEETS THE AASHTO M288-2006 CLASS 3 STRENGTH CRITERIA. IT SHALL HAVE A MAXIMUM AVERAGE ROLL VALUE OF 0.30 MM FOR ITS APPARENT OPENING SIZE AND PERMITIVITY OF AT LEAST 0.2/SEC. PRE-APPROVED NON-WOVEN GEOTEXTILES INCLUDE AMOCO 4546, CARTHAGE MILLS FX-40HS, HANES GEO TERRATEX N04, AND TENCATE MIRAFI 140N. GEOCOMPOSITE DRAINS SHALL CONSIST OF A FORMED POLYSTYRENE CORE COVERED ON ONE SIDE WITH A NON-WOVEN NEEDLE-PUNCHED POLYPROPYLENE FILTER FABRIC. PRE-APPROVED GEOCOMPOSITE DRAINS INCLUDE TENCATE MIRAFI G200N, HAYNES GEO TERRADRAIN 101, AND STRATA SYSTEMS STRATADRAIN.

2.5 STRUCTURAL FILL SOILS IN THE REINFORCED ZONE

THE STRUCTURAL FILL USED IN THE REINFORCED ZONE OF THE RETAINING WALL(S) SHALL HAVE A USCS CLASSIFICATION OF GW, GP, GM, SW, SP, SP-SM, SP-SC, OR SM. SILTS AND CLAYS (ML, MH, CL OR CH) ARE NOT ACCEPTABLE. IF AGGREGATE BASE COURSE (ABC) OR NO. 57 STONE IS SPECIFIED, IT SHALL MEET THE CLASSIFICATION AND GRADATION REQUIREMENTS OF THE NCDOT. STRUCTURAL FILL MATERIALS SHALL HAVE A MAXIMUM PARTICLE SIZE NOT EXCEEDING 1.5 INCH, AND AN ORGANIC CONTENT LESS THAN 0.5 PERCENT. AT A MINIMUM, THESE MATERIALS SHALL HAVE NO MORE THAN 35 PERCENT FINES PASSING THE NO. 200 SIEVE, AND SHALL NOT HAVE A LIQUID LIMIT GREATER THAN 40 AND A PLASTICITY INDEX GREATER THAN 15, UNLESS APPROVED BY THE DESIGN ENGINEER. SELECT GRANULAR FILL SHALL BE USED FOR ALL RETAINING WALLS IF SPECIFIED, WALLS EXCEEDING 20 FEET IN HEIGHT, AND/OR WALLS SUPPORTING STRUCTURES. SELECT GRANULAR FILL SHALL HAVE NO MORE THAN 15 PERCENT FINES PASSING THE NO. 200 SIEVE AND SHALL HAVE A PLASTICITY INDEX OF LESS THAN 6 UNLESS WRITTEN CONSENT IS OBTAINED FROM THE RETAINING WALL DESIGN ENGINEER PRIOR TO PLACEMENT. THE MINIMUM INTERNAL ANGLE OF FRICTION, COHESION, AND WET UNIT WEIGHT SHALL BE EQUAL TO OR GREATER THAN THE DESIGN VALUES PROVIDED IN SECTION 1.2, AS DETERMINED BY THE ONSITE GEOTECHNICAL ENGINEER. SOILS CONTAINING ROOTS, BRUSH, SOD, OR OTHER ORGANIC MATERIAL OR FROZEN SOILS, SNOW, ICE, HEAVY CLAYS, OR WET SOILS SHALL ALSO NOT BE PERMITTED AS STRUCTURAL FILL. ONSITE MATERIALS MAY BE UTILIZED PROVIDED IT COMPLIES WITH THESE SPECIFICATIONS AS DETERMINED BY THE ONSITE GEOTECHNICAL ENGINEER.

3.0 INSTALLATION NOTES

3.1 LEVELING PAD

THE LEVELING PAD SHALL CONSIST OF COMPACTED AGGREGATE BASE COURSE (ABC) STONE, TAMPED NO. 57 STONE, OR UNREINFORCED CONCRETE. THE PAD SHALL BE A MINIMUM OF 8 INCHES THICK (UNO). THE ABC STONE SHALL BE COMPACTED TO 95 % OF THE STANDARD PROCTOR (ASTM D-698) MAXIMUM DRY DENSITY. AGGREGATE MATERIAL SHALL RECEIVE A MINIMUM OF ONE PASS OF THE COMPACTION EQUIPMENT. THE TOP OF THE LEVELING PAD FOR THE WALL SECTIONS SHALL BE MAINTAINED AT A MINIMUM DEPTH OF 10% OF THE TOTAL WALL HEIGHT, UNLESS OTHERWISE SHOWN ON THE PROFILE SHEETS. THE RETAINING WALL ENGINEER SHALL BE NOTIFIED IMMEDIATELY IF THE LEVELING PAD DEPTH OF THE RETAINING WALL IS FOUND TO BE 6 INCHES OR LESS BELOW THE PLANNED FINAL SUBGRADE ELEVATION.

3.2 FIRST BLOCK COURSE

THE FIRST COURSE OF BLOCK SHALL BE PLACED ON TOP OF AND IN FULL CONTACT WITH THE LEVELING PAD. THE UNITS SHALL MAINTAIN A MINIMUM DISTANCE OF 6 INCHES FROM THE FRONT AND BACK OF THE LEVELING PAD. PROPER ALIGNMENT MAY BE ACHIEVED WITH THE AID OF A STRING LINE. PROCEED TO THE NEXT COURSE OF BLOCK. EACH UNIT SHALL BE IN CONTACT WITH THE UNITS ON BOTH SIDES AS WELL AS ABOVE AND BELOW. SOME ADJUSTMENTS MAY BE REQUIRED FOR WALLS WITH CURVES AND A BATTER.

3.3 UNIT FILL

THE VOID WITHIN EACH UNIT AND BETWEEN THE UNITS SHALL BE COMPLETELY FILLED WITH COURSE AGGREGATE MEETING THE GRADATION REQUIREMENTS FOR NO. 57 OR NO. 67 STONE IN ACCORDANCE WITH ASTM C-33. A MINIMUM THICKNESS OF 12 INCHES OF NO. 57 STONE SHALL BE PLACED AT THE BACK OF EACH BLOCK AS INDICATED ON THE DETAILS. EACH COURSE SHALL BE COMPLETELY FILLED AND EXCESS MATERIAL SWEPT CLEAN FROM THE TOP BLOCK BEFORE INSTALLING THE SUBSEQUENT GEOGRID LAYER.

3.4 GEOGRID INSTALLATION

THE GEOGRID REINFORCEMENT SHALL BE LAID HORIZONTALLY ON NATIVE MATERIAL OR COMPACTED BACK FILL AND CONNECTED TO THE CONCRETE WALL UNITS IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. GEOGRID SHALL BE ROLLED OUT WITH THE MACHINE DIRECTION (MD) DESIGN STRENGTH PERPENDICULAR TO THE WALL FACE. GEOGRID SHALL BE PULLED TAUT REMOVING ALL SLACK FROM THE MATERIAL AND ANCHORED BEFORE ADDING FILL. GEOGRID SHALL BE INSTALLED AT THE ELEVATIONS AND LENGTHS REQUIRED AS SHOWN ON THE WALL PROFILE(S). THE SOIL SURFACE SHALL BE SMOOTH AND LEVEL AND HAVE BEEN COMPACTED BEFORE INSTALLING THE GEOGRID.

3.5 STRUCTURAL FILL PLACEMENT

STRUCTURAL FILL MATERIAL SHALL BE PLACED IN LIFTS NOT EXCEEDING 8 INCHES IN COMPACTED THICKNESS. THE REINFORCED STRUCTURAL FILL SHALL BE COMPACTED TO **95% OF THE STANDARD PROCTOR (ASTM D-698)** MAXIMUM DRY DENSITY AT A MOISTURE CONTENT OF +/- **3% OF THE OPTIMUM MOISTURE CONTENT**. ONLY HAND OPERATED EQUIPMENT SHALL BE ALLOWED WITHIN 3 FEET OF THE SEGMENTAL UNITS. STRUCTURAL FILL SHALL BE PLACED FROM THE WALL UNITS REARWARD TO INSURE TAUTNESS OF THE GEOGRID. CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE GEOGRID.

3.6 RETAINING WALL CAPS

APPLY A CONSTRUCTION ADHESIVE TO THE RETAINING WALL UNITS AND CAPS TO PREVENT THEIR REMOVAL.

4.0 QUALITY ASSURANCE

IN ACCORDANCE WITH SECTION 1704 OF THE NORTH CAROLINA BUILDING CODE, THE OWNER SHALL CONTRACT WITH A QUALIFIED CONSTRUCTION MATERIALS TESTING AGENCY CAPABLE OF PROVIDING THE REQUIRED SPECIAL INSPECTIONS DURING CONSTRUCTION OF THE RETAINING WALL(S). THE TESTING AGENCY SHALL PROVIDE QUALIFIED PERSONNEL TO PERFORM CONTINUOUS MONITORING AS NECESSARY TO ENSURE COMPLIANCE WITH THE RETAINING WALL PLANS. THE SPECIAL INSPECTION TESTING AGENCY SHALL COMPLY WITH SECTION 1807.2.5 OF THE NORTH CAROLINA BUILDING CODE AND AT A MINIMUM PROVIDE THE FOLLOWING:

1. SOIL BEARING CAPACITY TESTING OF THE FOUNDATION AREA, INCLUDING THE AREA IN THE REINFORCING ZONE, TO VERIFY THAT THE FOUNDATION SOILS ARE ACCEPTABLE FOR THE SPECIFIED SOIL BEARING PRESSURE IN SECTION 1.6 PRIOR TO PLACEMENT OF THE LEVELING BASE COURSE. IF THE SOIL BEARING CAPACITY IS NOT ADEQUATE, THE TESTING AGENCY SHALL PROVIDE RECOMMENDATIONS TO REMEDIATE THE SUBGRADE SOILS TO ACHIEVE THE REQUIRED BEARING CAPACITY..
2. COMPACTION TESTING SHALL BE PERFORMED IN ACCORDANCE WITH THE PROVISIONS OF THE NORTH CAROLINA BUILDING CODE AND AS DETERMINED BY THE SPECIAL INSPECTION TESTING AGENCY. AT A MINIMUM , TESTING SHALL BE PERFORMED AT EACH SPECIFIED GRID LAYER ELEVATION, AND NO MORE THAN 100 FEET INTERVALS ALONG THE LENGTH OF THE RETAINING WALL(S). COMPACTION TESTS THAT DO NOT MEET THE MINIMUM REQUIREMENTS ABOVE, SHALL BE REMEDIATED IN ACCORDANCE WITH THE SPECIAL INSPECTION TESTING AGENCY'S RECOMMENDATIONS.
3. MONITORING DURING THE INSTALLATION OF THE GEOGRID REINFORCEMENT FOR TYPE, LENGTH, AND ELEVATION TO VERIFY COMPLIANCE WITH THE RETAINING WALL PROFILES.
4. MONITORING DURING THE INSTALLATION OF THE DRAINAGE PIPE / LAYER OR BACKDRAIN TO VERIFY PROPER INSTALLATION WITH THE PROJECT PLANS.
5. THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY PRIOR TO MODIFYING WALL CONSTRUCTION IF THE EXISTING SITE CONDITIONS DEVIATE FROM THE CONDITIONS OR ASSUMPTIONS PROVIDED FOR IN THE RETAINING WALL PLANS.

AS REQUIRED BY SECTION 1704.1.2 OF THE NORTH CAROLINA BUILDING CODE, THE RESULTS OF THE SPECIAL INSPECTION TESTING SHOULD BE PROVIDED TO THE LOCAL BUILDING OFFICIAL AND THE RETAINING WALL DESIGN ENGINEER AFTER CONSTRUCTION OF THE RETAINING WALL(S) IS COMPLETE FOR A FINAL REVIEW. THE RETAINING WALL DESIGN ENGINEER SHALL NOT SIGN ANY DOCUMENT, NO MATTER BY WHOM REQUESTED, IN WHICH HE IS REQUIRED TO CERTIFY, GUARANTEE, OR WARRANT CONDITIONS OF WHICH THAT HE HAS NOT OR CANNOT ASCERTAIN.

5.0 ADDITIONAL CONSIDERATIONS

1. A BUILDING PERMIT MAY BE REQUIRED PRIOR TO CONSTRUCTION OF THE RETAINING WALL(S). THE OWNER / CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS PRIOR TO BEGINNING CONSTRUCTION OF THE RETAINING WALL(S) IN ACCORDANCE WITH THE NORTH CAROLINA BUILDING CODE.
2. STABILITY OF ANY EXCAVATIONS OR TEMPORARY SLOPES REQUIRED BY THE INSTALLATION OF RETAINING WALL(S) SHALL BE ADDRESSED BY A QUALIFIED GEOTECHNICAL ENGINEER. RESPONSIBILITY OF THESE TEMPORARY MEASURES RESTS WITH THE OWNER AND/OR THE GENERAL CONTRACTOR. ALL SLOPES AND EXCAVATIONS SHALL MEET CURRENT OSHA STANDARDS.
3. HANDRAILS/GUARDRAILS SHALL BE INSTALLED AS REQUIRED BY SECTION 1013 OF THE NORTH CAROLINA BUILDING CODE. THE TYPE AND LOCATION OF THE HANDRAIL/GUARDRAIL SHALL BE DETERMINED BY THE OWNER AND/OR GENERAL CONTRACTOR AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
4. THE RETAINING WALL HAS BEEN DESIGNED WITH THE ASSUMPTION THAT THE REINFORCED STRUCTURAL FILL MATERIAL SHALL BE FREE OF SUBSURFACE DRAINAGE OR WATER SEEPAGE. TEMPORARY OR LONG TERM SURFACE DRAINAGE, SITE GRADING, AND/OR SURFACE OR SUBSURFACE WATER COLLECTION OR DIVERSION SYSTEMS SHALL BE DETERMINED AND INSTALLED BY THE OWNER AND/OR GENERAL CONTRACTOR.
5. THIS RETAINING WALL DESIGN IS BASED UPON THE PROPERTIES OF THE MATERIALS SPECIFICALLY SPECIFIED IN THESE RETAINING WALL PLANS. THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY OF ANY CHANGES TO THE SPECIFIED MATERIALS FOR REVIEW WITH THE FINAL RETAINING WALL DESIGN.

RETAINING WALL SPECIFICATIONS

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION 9-27-2024

DRAWN BY:	BDH
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