

Slope Erosion Control Details

*9809 Mira Del Rio
Sacramento, California*

Sheet Index

1. Cover Sheet
2. General Notes
3. Location Maps
4. Typical Cross-Section and Elevation Detail
5. Self-Drilling SuperNail® Detail
6. Sculpted Shotcrete

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Sheet Revision	
Date:	By:

Cover Sheet	
Project: 9809 Mira Del Rio	Drawn By: JDP
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The intent of this erosion control project is to prevent further weathering, slabbing and erosion of the top nominal 15 vertical feet of the existing bluff face. Based on the location and type of erosion that has been experienced at the project site, gabion baskets, grading or traditional retaining wall methods (cantilever, MSE, heavy concrete block) would require significant excavation and disruption to the bluff face and surrounding area. The least distributive and most esthetically pleasing technique currently available to halt bluff slabbing, weathering and erosion is soil nails and sculpted / stained shotcrete. This project is designed with soil nail anchors to secure the shotcrete to the bluff face.

The existing condition of the top of the bluff face, as noted in the River Bluff Area Engineering Geologic Study prepared by Youngdahl Consulting Group, Inc. dated December 2003, suggests that the bluff is composed of a cemented silt with fine sand (ML) or possibly silty sand with trace clay (SM). The report describes the slope stability of the bluff as follows; "The existing slopes of the project site were observed to have adequate vegetation on the slope face, appropriate drainage away from the slope face, and no apparent tension cracks or slump blocks in the slope face or at the head of the slope. Although the vertical standing portion of the slope at the top of the bluff north of the house area appears to have been stable for a considerable amount of time, it is probable that a gradient of 40 to 60 degrees (typical of Bluff Erosion Zone 4) is a more long-term stable condition." Due to the relative stability of the existing bluff, a structural slope stability analysis was not determined to be necessary and as such the soil nails and sculpted shotcrete shall not be considered a "retaining" structure but rather an erosion control measure.

Construction Sequence/Work Schedule:

- The owner or its contractor will clear, excavate, haul off excavated material and provide access to the top of the proposed erosion control area.
- GSI will provide and install the specified soil nails and surface treatment per the construction documents.

Size and Spacing of Nails:

- GSI will mark the locations of the proposed soil nails with survey marking paint.
- The Soil Nails will be injected with grout. The grout will be a Type I,II,or III Portland Cement. The water/cement ratio will be 0.40 to 0.60. No additional aggregate or admixtures will be added to the grout.

Facing and Drainage System:

- Drain strips will be provided and installed between the soil nails every 5-feet along the face of the existing slope. The drain strips shall be placed with the geotextile side against the ground. Drain strips will be continuous and any splices shall be made with a one-foot minimum overlap such that the flow of water is not impeded. Drain strips shall extend beyond the face of the shotcrete at the downhill face.

Reinforcing Steel Placement:

- Welded wire mesh will be placed along the face of the proposed erosion control area with a separation of approximately 2 inches between the wire mesh and the soil.
- No. 4 Rebar will be tied to the wire mesh. Vertical bars will extend for approximately 24 inches and the horizontal bars will be continuous (with overlap splices) in the shotcrete.

Bearing Plate Placement:

- 8" x 8" x 3/8" Steel Bearing Plates will be placed over the nails and attached with a hex nut to the nail to secure the wire mesh and rebar during shotcrete placement. If the soil nails extend beyond the hex nuts, they will be trimmed using a gas powered demolition saw.

Shotcrete Application:

- Shotcrete will be placed from the lower part of the area upwards to prevent accumulation of rebound. The nozzle will be oriented a proper distance from and approximately perpendicular to the working face so that rebound will be minimal and compaction will be maximized. Care will be taken while encasing reinforcing steel and mesh to keep the front face of the reinforcement clean during placement operations, so that shotcrete builds up from behind, to encase the reinforcement and prevent voids or pockets from forming.

GSI Employee Certifications:

- ACI Shotcrete Nozzlemen Certification
- 10-hour Occupational Safety and Health Training Course in Construction Safety & Health
- American Red Cross Standard First Aid Training
- American Red Cross Bloodborne Pathogens Training: PDT
- Erosion Control Supervisor Training

House Keeping:

- The site will be organized and clear of any trash or debris. All trash will be placed in a proper container and removed at the end of each work day.

Safety:

- All safety plans for lifting, hearing, dust control, PPE etc. are in place and will be followed accordingly. PPE will include safety vest, steel toed shoes, hard hat, safety glasses, and gloves.

Shotcrete Mix Design:

Shotcrete shall comply with the requirements of ACI 506.2, "Specifications for Materials, Proportioning and Application of Shotcrete", except as otherwise specified. Shotcreting consists of applying one or more layers of concrete conveyed through a hose pneumatically projected at a high velocity against a prepared surface.

The wet-mix process consists of thoroughly mixing all the ingredients, introducing the mixture into the delivery equipment and delivering it, by positive displacement, to the nozzle. Air jet the wet-mix shotcrete from the nozzle at high velocity onto the surface.

Material	Weight per Cubic Yard
3/8" Rock	650 lbs
Sand	1800 lbs
Cement	750 lbs
Water	275 lbs
Fly Ash	150 lbs
Air Entrainment	6% (1.6 cubic feet)

0.40 to 0.50 water/cement ratio

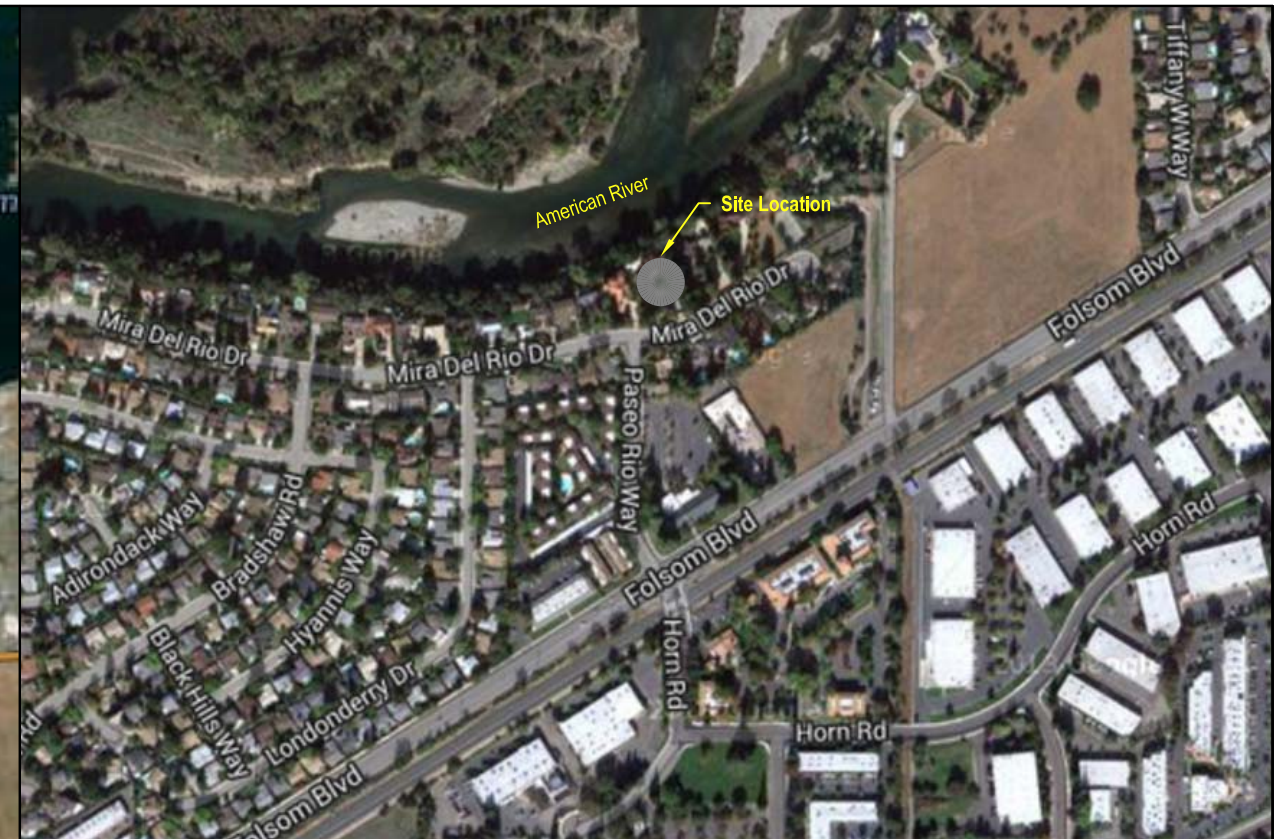
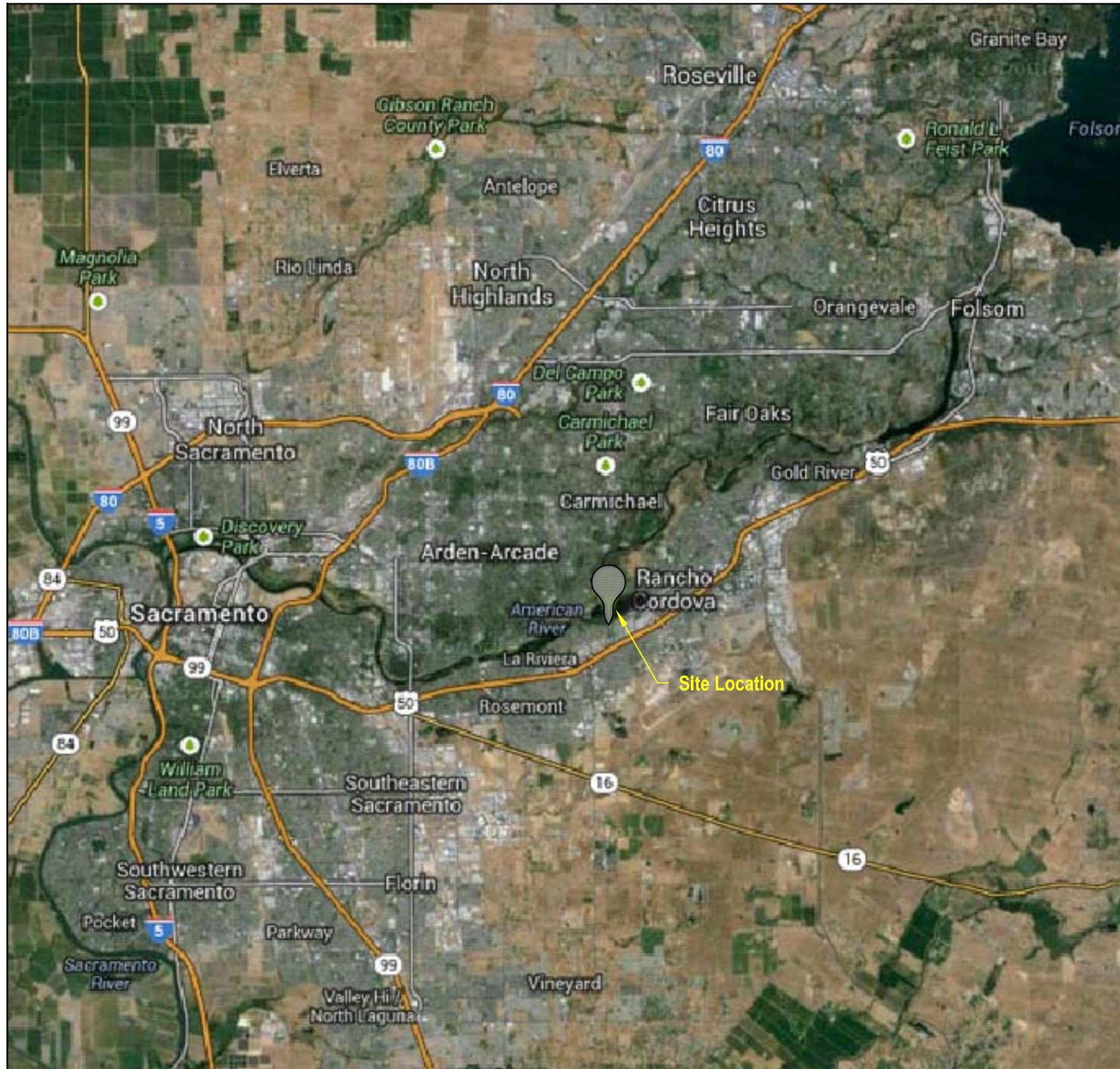
Grout Mix Design:

Water/Cement Ratio (0.5 - 0.6)

(Batch Weight Per Cubic Yard)			
Material	Weight	Volume	
Cement	2061 lbs	10.6 Cubic Feet	21.9 bags (94#)
Water	1030.5 lbs	16.5 Cubic Feet	123.4 gallons
Total		1 Cubic Yard	

(Per 94# Bag of Cement)			
Material	Weight	Volume	
Cement	94 lbs	0.48 Cubic Feet	1 bag (94#)
Water	47 lbs	0.75 Cubic Feet	5.6 gallons
Total Volume		1.23 Cubic Feet	

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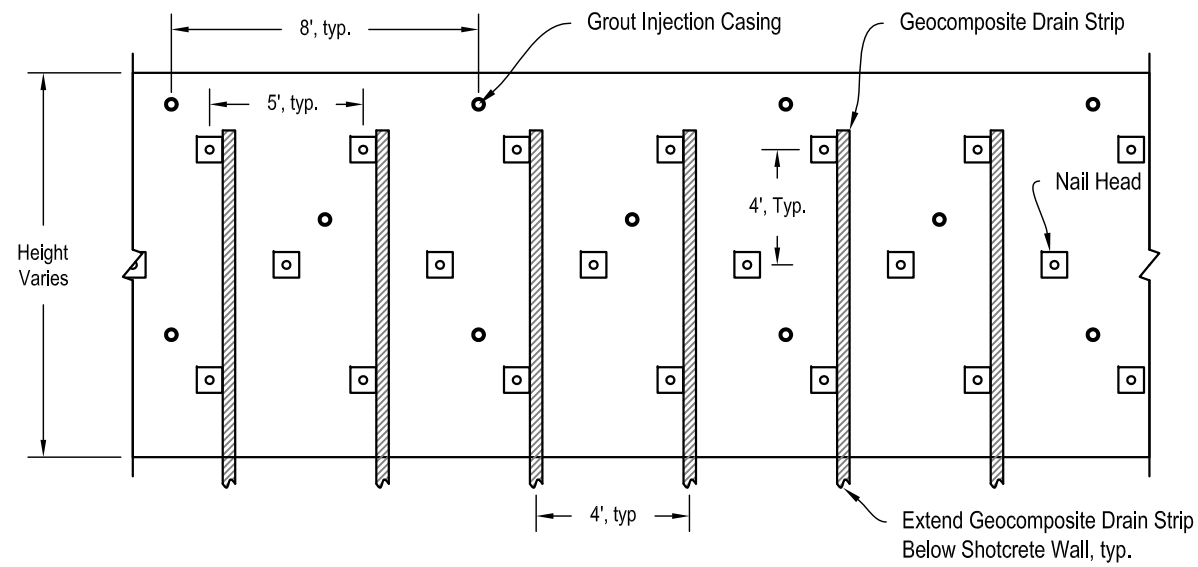
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Location/Vicinity Maps	
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Project No./Code:	---
Sheet No.:	3

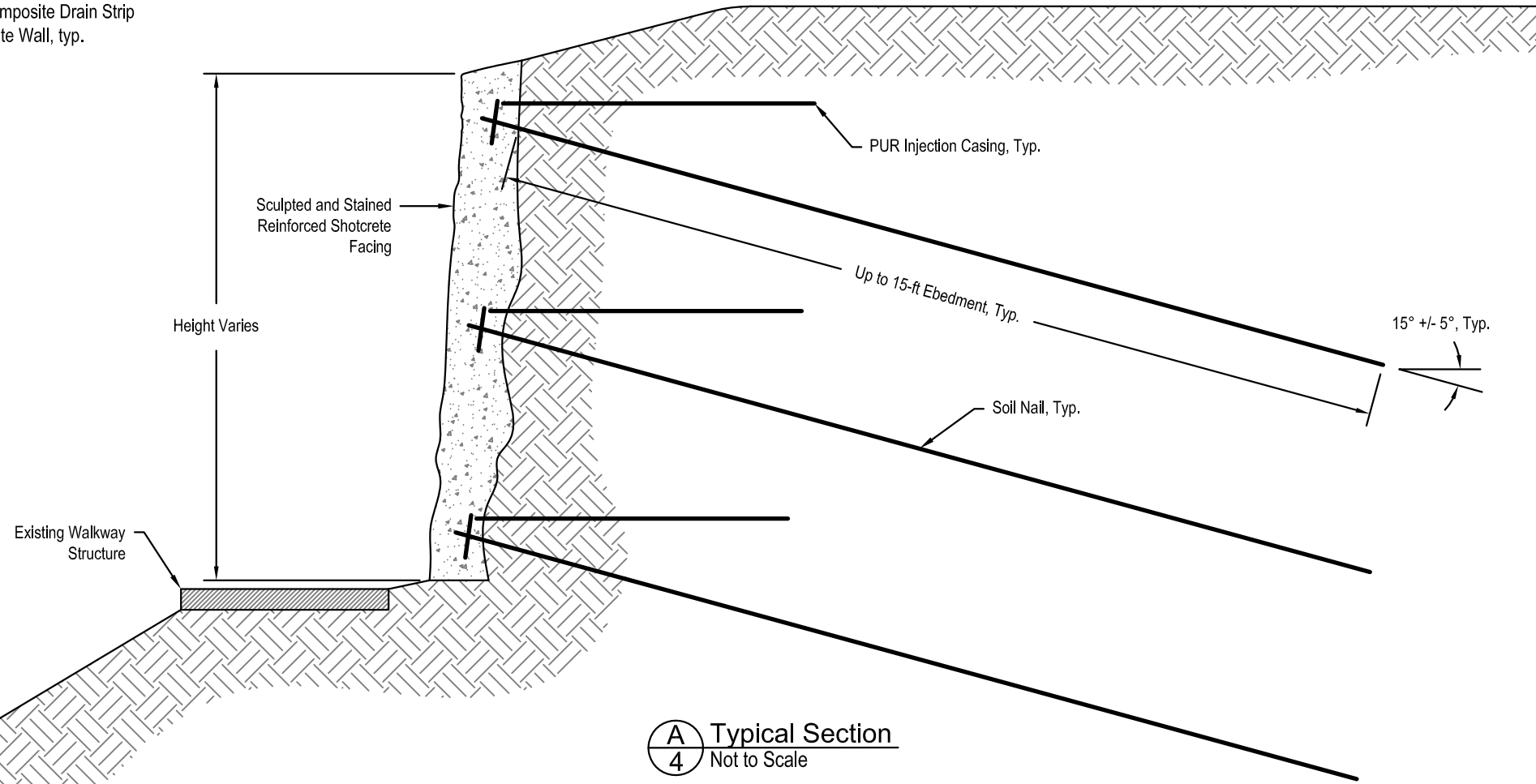


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B Elevation Detail
4 Not to Scale

Note: 25 L.F. of Stabilization As Shown



A Typical Section
4 Not to Scale

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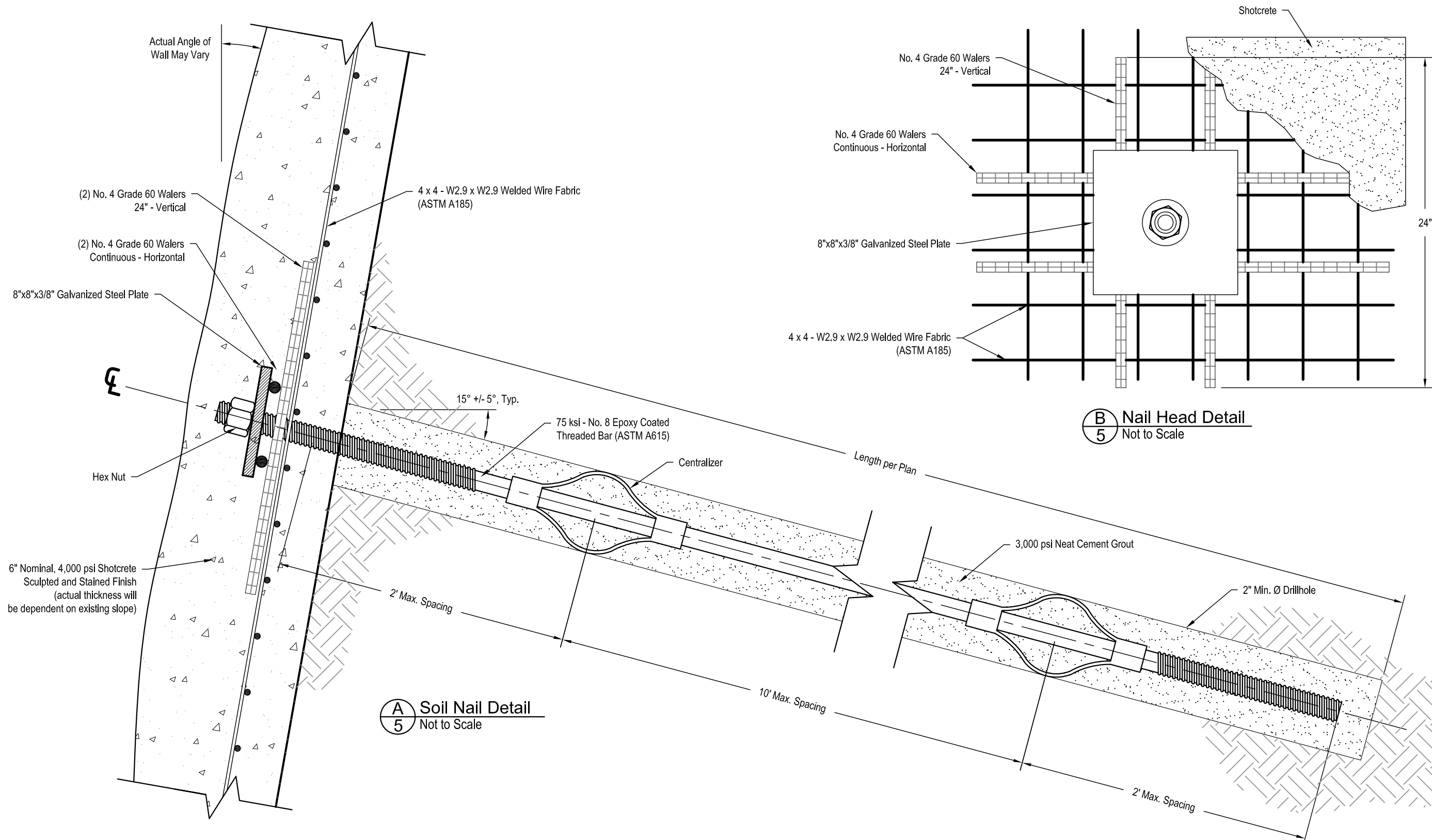
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Typical Cross-Section & Elevation Detail	
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Soil Nail Detail	
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Sheet No.:	5



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Sculpted Shotcrete	
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Sheet No.:	6



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