

DESIGN DATA				
Traffic	Average Daily			
Current 2018	Pass: 2,955	Trucks: 1,725	Total: 4,680	
Forecast 2038	Pass: 3,725	Trucks: 2,175	Total: 5,900	
Clear Zone Distance: NA		Design Speed: 65 mph		
Minimum Sight Dist. for Stopping: 645 ft		Bridges: NA		
Sight Dist. for No Passing Zone: 1100 ft				
Pavement Design Life NA (years)				
Design Accumulated One-way Flexible ESALs: NA				

JOB # 31
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

SOIB-NH-7-085(110)127

McKenzie County

1 Mile North of Long X Bridge at Horseshoe Bend

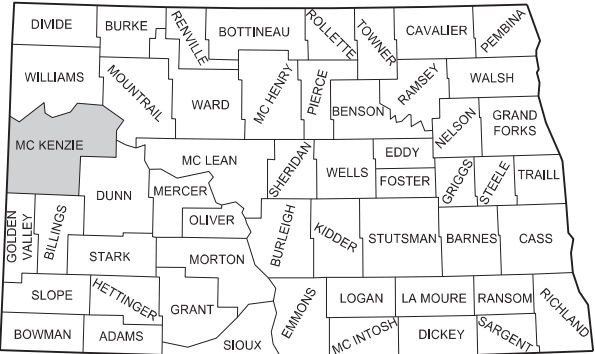
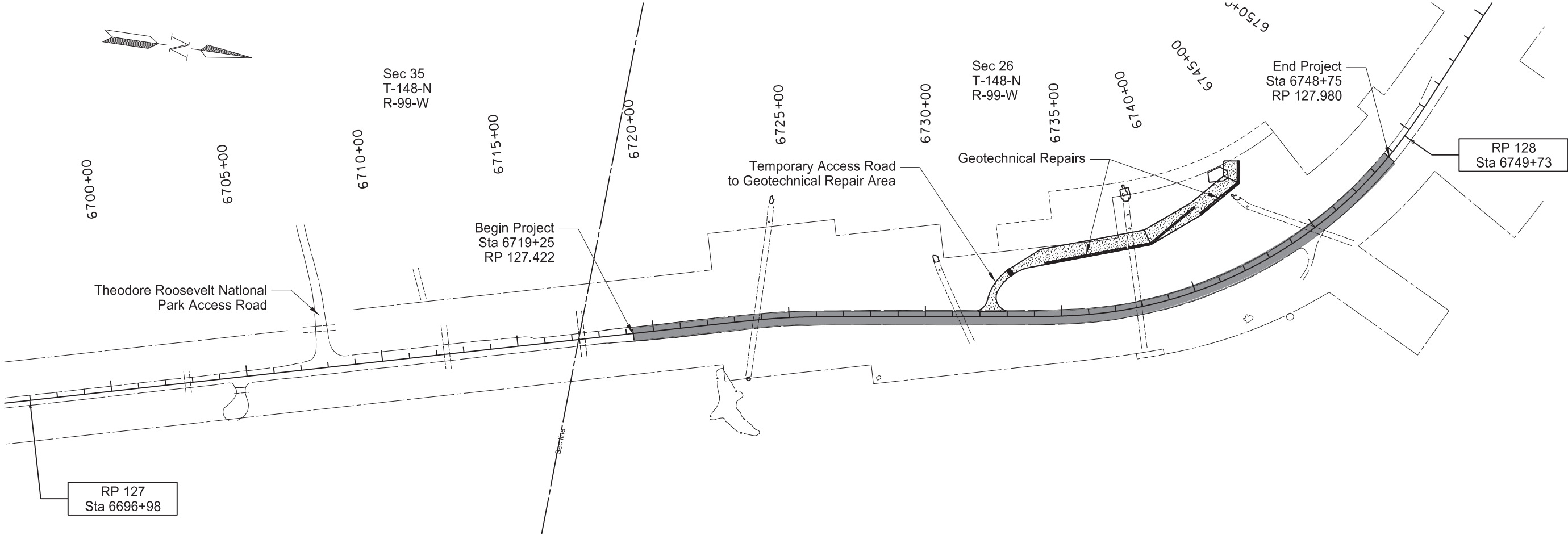
Geotechnical Repairs Utilizing Drilled Shafts, Ground Anchors, and Slope Grading
Pipe Repairs, Jacked or Bored Pipe, and HMA Mill & Overlay

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	22304	1	1

GOVERNING SPECIFICATIONS:

2020 Standard Specifications adopted by the North Dakota
Department of Transportation and the Supplemental Specifications
effective on the date the project is advertised.

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SOIB-NH-7-085(110)127	0.558	0.558



STATE COUNTY MAP

DESIGNER Jeffrey R. Rensch
DESIGNER
DESIGNER

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT
Orn, Chad M.
08 24 2020

Chad M. Orn

DocuSign

NDDOT DIV-DIST OR
CONSULTANT FIRM

JAMES DOUGLAS
REGISTERED
PROFESSIONAL
PE-4288
ENGINEER
NORTH DAKOTA
08/24/20

James Douglas

TABLE OF CONTENTS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	2	1

PLAN SECTIONS

Section	Page(s)	Description
1	1	Title Sheet
2	1 - 2	Table of Contents
4	1 - 2	Scope of Work
6	1 - 5	Notes
6	6	Environmental Notes
8	1 - 3	Quantities
10	1 - 2	Basis of Estimate
20	1 - 25	General Details
30	1 - 6	Typical Sections
50	1	Hydraulic Data
51	1	Allowable Pipe List
60	1 - 8	Plan & Profile
70	1 - 4	Contours
75	1 - 3	Wetland Impacts
76	1 - 5	Temporary Erosion Control
77	1 - 2	Permanent Erosion Control
80	1 - 2	Layouts
81	1	Survey Coordinate and Curve Data
82	1	Survey Data Layouts
100	1 - 6	Work Zone Traffic Control
175	1 - 2	Soil Boring Logs
200	1 - 115	Cross Sections

SPECIAL PROVISIONS

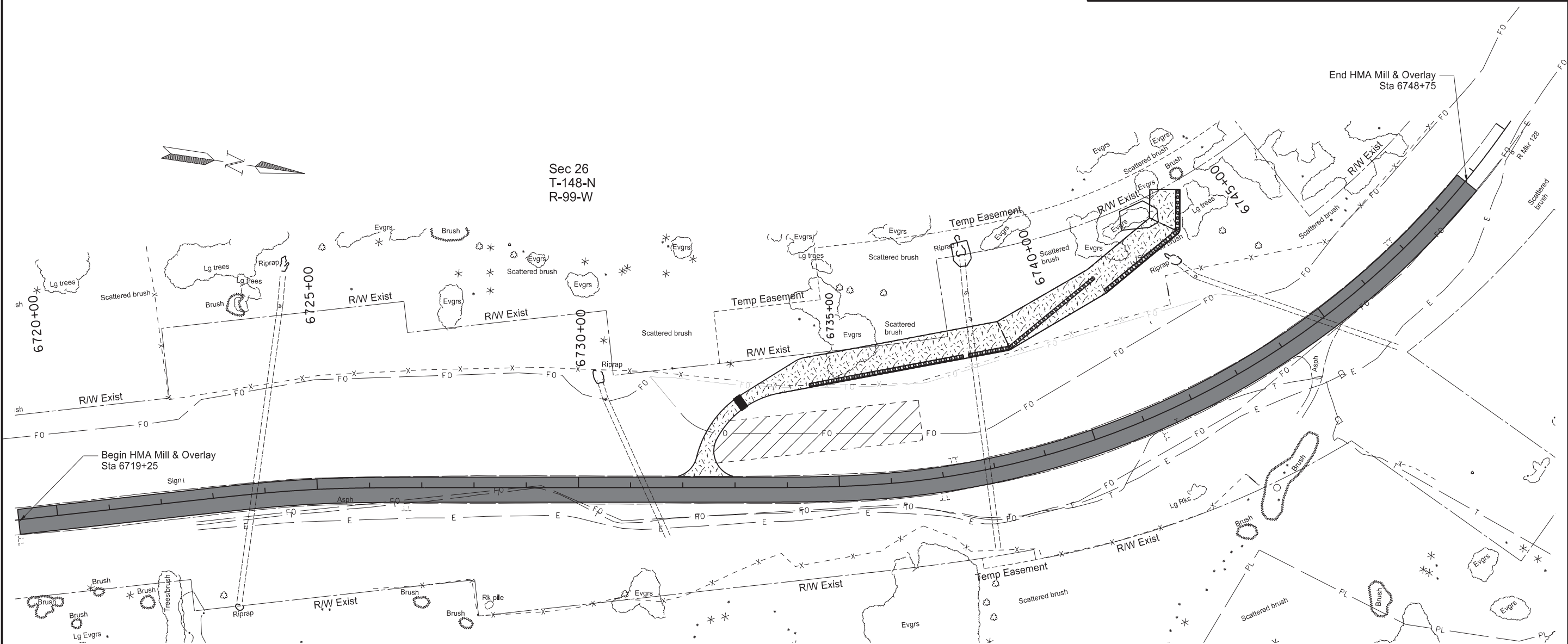
Number	Description
PSP 1(20)	Permits and Environmental Considerations
SP 1(20)	Ground Anchor
SP 11(20)	Erionite Containment
SP 13(20)	Machine Hygiene & Noxious Weed Control
SP 2(20)	Crosshole Sonic Log Tests
SP 3(20)	Drilled Shaft
SP 4(20)	Instrumentation
SP 5(20)	Thermal Integrity Profiling
SP 51(20)	Winter Suspension
SP 6(20)	Mass Concrete
SSP 1	Temporary Erosion and Sediment Best Management Practices
SSP 4	Longitudinal Joint Density in HMA Pavements

TABLE OF CONTENTS
LIST OF STANDARD DRAWINGS

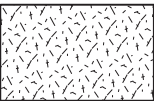
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	2	2

Number	Description	Number	Description
D-101-1, 2, 3	NDDOT Abbreviations		
D-101-10	NDDOT Utility Company and Organization Abbreviations		
D-101-20, 21	Line Styles		
D-101-30, 31, 32	Symbols		
D-101-40	Cross Section Legend		
D-255-2	Erosion And Siltation Control - Erosion Control Blanket Installation		
D-261-1	Erosion Control - Fiber Roll Placement Details		
D-704-2	Traffic Control For Coring Of Hot Bituminous Pavement		
D-704-7	Breakaway Systems For Construction Zone Signs - Perforated Tube		
D-704-8	Breakaway Systems For Construction Zone Signs - U-Channel Post		
D-704-9	Construction Sign Details - Terminal And Guide Signs		
D-704-10	Construction Sign Details - Regulatory Signs		
D-704-11, 11A	Construction Sign Details - Warning Signs		
D-704-12	Shoulder Closure Tapers		
D-704-13	Barricade And Channelizing Device Details		
D-704-14	Construction Sign Punching And Mounting Details		
D-704-15	Road Closure Layouts		
D-704-22	Construction Truck And Temporary Detour Layouts		
D-704-34	Sign Layout For One Lane Closure		
D-704-50	Portable Sign Support Assembly		
D-704-56	Mobile Operation - Grinding Shoulder Rumble Strips		
D-706-1	Bituminous Laboratory		
D-714-1	Reinforced Concrete Pipe Culverts And End Sections (Round Pipe)		
D-714-4	Round Corrugated Steel Pipe Culverts And End Sections		
D-714-22	Concrete Pipe, Cattle Pass, or Precast Concrete Box Culvert Ties		
D-714-27	Pipe Installation Detail for Longitudinal Mainline Pipe or Pipe Not Under the Roadway		
D-722-5	Manhole Details		
D-752-1	Standard Barbed Wire Fence		
D-754-83	Object Markers - Culverts		
D-760-3	Rumble Strips Undivided Highways (Shoulders 4' Or Greater)		
D-762-4	Pavement Marking		
D-762-11	Short-Term Pavement Marking		

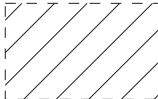
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	4	1



1" Mill / 3" HMA Overlay



Temp Access / Temp Work Road
for Geotechnical Repair



Staging Area



Drilled Shaft & Cap Beam
Geotechnical Structure



US Hwy 85
Horseshoe Bend Landslide Repair
HMA Mill/Overlay Scope of Work

NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	6	1

- 100-P01 COORDINATION OF PROJECTS: Other projects will be occurring in the vicinity of this project during the 2021 construction season. Coordinate scheduling, work activities and traffic control devices to minimize confusion and delay to the public.
- US Hwy 85 Long X Bridge Reconstruction – RP 125.688 to south project termini.
- 100-P02 TIMING RESTRICTIONS: Timing of construction activities are limited in proximity to the Theodore Roosevelt National Park (TRNP) – North Unit. Timing restrictions extend from RP 126 to RP 130. This area has been identified as a noise sensitive area. In this area, regular construction activities are limited to 8 am to 10 pm central time. Regular construction activities include any activity that adds additional noise to the environment such as movement of heavy equipment.
- Construction activities involving the placement of concrete may require work outside of these times. Submit a written request to the Engineer at least 30 calendar days prior to working outside of the restricted time frame. The Engineer will notify the National Park Service (NPS) Management Assistant, [PH: 701-623-4730 ext. 1436; Medora, ND] of the request. Requests that do not add substantial ambient noise will be considered.
- The Department bears no liability for costs or delays resulting from the Engineer's approval or rejection of a request to perform outside the restricted time frame.
- 100-P03 LIGHTING: Short-term, fixed and/or mobile lighting may be used to light the work area and staging area during the time period from 8 am to 10 pm central time. Submit a written request in accordance with Note 100-P02 TIMING RESTRICTIONS for lighting to be used outside the hours listed. If lighting is approved to be used outside the hours listed, the lighting shall consist of downcast, shielded lighting to minimize artificial lighting impacts.
- 105-200 UTILITY COORDINATION: A utility coordination meeting is required. Contact information for utility companies located within the project area has been provided below.

McKenzie Electric Cooperative
Kevin Bone
PO Box 649
3817 23rd Ave NE
Watford City, ND 58854
(701) 444-9288 Ext. 6745

Reservation Communications Coop.
Tim Jarske
timj@rtc.email
P.O. Box 68
Parshall, ND 58770-0068
(701) 862-5228

Nemot
Phil Brockmeier
421 Main St.
Williston, ND 58801
(701) 571-5711

Western Area Power Administration
Gerald Paulson
North Dakota Maintenance Office
P.O. Box 1173
707 N. Bismarck Expressway
Bismarck, ND 58502-1173
(701) 221-4531

- 105-P01 ORDER OF OPERATIONS: Complete the geotechnical and pipe repairs in accordance with the phasing shown below. Complete all bulleted items listed in a phase prior to beginning the work listed in the following phase, i.e., complete all work listed in Phase 1a prior to beginning work listed in Phase 1b. Install the inclinometers shown in Section 175 of the Plans prior to beginning Phase 1a construction. Construct the erosion control associated with each phase of construction per Sections 76 and 77 of the Plans.
- The Contractor may complete any item listed within a phase of construction concurrently with the other items listed in that phase. If the contractor elects to construct the repair in an alternate manner, approval from the Engineer is required.
- Phase 1a Construction:
- Install woven wire (Bison) fence and cattle guard as shown in the Phase 1 Fencing Layout
 - Construct the temp access road from Sta 17+60 to Sta 20+60
 - Construct the lower temp work road, work road transition, and upper temp work road from Sta 20+60 to Sta 29+20
 - Construct the lower drilled shafts from Sta 20+60 to Sta 24+50, excluding drilled shafts DS-29 to DS 32
 - Complete the north pipe repairs and extension utilizing the temporary pipe for drainage while the upper temp work road is in place
- Phase 1b Construction:
- Construct the upper drilled shafts and cap beam from Sta 26+60 to Sta 29+20
 - Backfill behind the upper cap beam and install ground anchors from Sta 26+60 to Sta 29+20
 - Install trench drain from Sta 26+80 to Sta 28+40
 - Complete ditch grading and erosion repairs north of the upper drilled shaft structure from Ditch Sta 11+00 to Sta 16+00
 - Install woven wire (Bison) fence from Hwy 85 Sta 6742+50.3 to Sta 6743+69.20 as shown in the Final Layout
- Phase 2 Construction:
- Remove the upper temp work road and complete final site grading from Sta 26+80 to Sta 29+20
 - Remove temporary pipe extension from north pipe, place end section and riprap at north pipe outlet
 - Remove the work road transition and construct the lower temp work road from Sta 24+50 to Sta 26+60
 - Complete south pipe and manhole work and install riprap at outlet
 - Construct all remaining drilled shafts and cap beam from Sta 20+60 to Sta 26+60
 - Backfill behind lower cap beam and install ground anchors from Sta 20+60 to Sta 26+60
 - Install trench drain from Sta 20+40.5 to Sta 26+60
- Phase 3 Construction:
- Remove the temp access road and lower temp work road and complete remaining final site grading
 - Remove cattle guard, complete remaining fencing and reset vehicle gate.



NOTES

- 108-P01 BIWEEKLY PLANNING & REPORTING MEETING: A biweekly planning (every other week) and reporting meeting is required.
- 108-P02 PRECONSTRUCTION CONFERENCE: Invite the National Park Service Management Assistant, PH: 701-623-4730, ext. 1436 and the U.S. Forest Service, Oil and Resource Specialist – Dickinson, PH: 701-227-7821 to the preconstruction conference.
- 201-P01 CLEARING & GRUBBING: Remove existing brush and trees within the limits of construction. All tree removals will be paid under the “Clearing and Grubbing” bid item regardless of size.

Do not remove trees from temporary easement areas unless marked by the Engineer. The Engineer will coordinate tree removals with the landowner prior to marking trees to be removed. Provide 7 days advance notice to the Engineer for tree marking. Take precaution to protect trees that are to remain in place. Trees identified for removal by the Engineer in the field will be paid for under the “Clearing and Grubbing” bid item regardless of size.
- 202-P01 FENCE REMOVAL: Notify landowners in writing, with a copy to the Engineer, a minimum of 30 days in advance of fence removal. Just prior to removing fence, coordinate verbally with the adjacent landowners. Additional information, including the property owners’ contact information, will be available from the Engineer.
- 203-010 SHRINKAGE: 25 percent additional volume is included for shrinkage in earth embankment.
- 203-P01 COMMON EXCAVATION WASTE: Common Excavation-Waste is defined as the work required to remove and dispose the temporary access road and work platform at the location of the drilled shafts. If the Contractor elects to waste earthen material at the borrow site, allow the Engineer to measure/cross section the borrow site before placing waste material. Notify the Engineer 1 week prior to placing any waste material at the borrow site.
- 203-P02 DRILLING SPOILS: Remove drilling spoils and other construction generated soils from the project site by the end of each construction day.
- 251-P01 ORDER OF OPERATIONS FOR SEEDING: Due to the spring seeding restriction for Seeding Class III, perform seeding as follows:

Year 1:
 - Seed temporary cover crop and place erosion control in disturbed areas as shown in Sec 76.
Year 2: Prior to June 15th:
 - Seed Class III and place erosion control as shown in Sec 77.
 - In areas not designated for ECB or TRM, seed Class III through the established vegetation and bonded fiber.
 - In areas designated for ECB or TRM, prepare the seedbed in accordance with NDDOT Specification 251.04.A, “General” and 251.04.B, “Seedbed Preparation”. Cultivate or disc all areas, even if the temporary cover crop has

achieved greater than 25% vegetative coverage. Seed Class III and install permanent erosion and sediment control measures as shown in Section 77.

Include all costs for additional work for seedbed preparation, as described above, in the price bid for “Seeding Class III”.

- 251-P02 SEEDING CLASS III: Use the following seed mix for all permanent seeding. Include the cost for seeding in the contract unit price bid for “Seeding Class III”.

	Species	Variety	PLS Lbs/Acre
Grasses	Thickspike Wheatgrass (c)	Critana	1.4
	Blue Grama (w)	Bad River	0.2
	Sideoats Grama (w)	Killdeer	0.6
	Green Needlegrass (c)	Lodorm	1.2
	Western Wheatgrass (c)	Rodan	2
	Slender Wheatgrass (c)	Revenue	1.3
	Prairie Junegrass (c)	Local	0.05
	Buffalograss (w)	Tatanka	3.5
	Prairie Sandreed (w)	Bowman	0.4
	Canada Wildrye(c)	Mandan	0.65
Forbs	Black Samson Echinacea	Bismarck	0.27
	Prairie (yellow) coneflower	Local	0.05
	Western Yarrow	Local	0.004
	Stiff Sunflower	Bismarck	0.08
	White Prairie Clover	Antelope	0.16
Companion	Oats		10
	(c) – Cool Season (w) – Warm Season	Totals	21.864

If any of the species or varieties are not available, contact Environmental and Transportation Services (ETS) Section I (701-328-2592) for a replacement. Plant the Class III seed mix between May 1st and June 15th.

- 302-P01 DRAINAGE AGGREGATE: Drainage Aggregate will consist of class 45 aggregate as defined in 816.03.

The requirements of 302.04B “Placement and Compaction” do not apply.

- 411-P01 TEMPORARY ASPHALT WEDGES: Place temporary asphalt or milled material wedges at the milled straight vertical edge locations to allow for a smooth passage of vehicles. Place wedges at these milled areas prior to traffic being allowed on the milled roadway section. Include all costs associated with the installation, maintenance and removal of the asphalt wedges in the contract price for “Milling Pavement Surface”.



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	6	3

NOTES

430-P01 HMA LEVELING COURSE: Pave a leveling course before the 3" HMA overlay is paved. The bituminous material can be placed with a motor grader or paver. Compact the leveling course with a pneumatic roller. The leveling course has been provided to improve the roadway profile where needed. The depth of the leveling course varies. An additional 586 Tons of HMA has been provided (1" average depth) to be used as a leveling course. Locations to be determined in the field by the Engineer. Payment for the leveling course work will be paid for at contract unit prices for "Tack Coat", "Superpave FAA 45", and "PG 58H-28 Asphalt Cement."

602-P01 SECONDARY GROUND ANCHOR LOCATIONS: Fill all unused secondary ground anchor blockouts in the cap beam with Class AAE-3 concrete, flush with the cap beam. Pay for the additional concrete at the unit price for "Class AAE-3 Concrete".

602-P02 SURFACE FINISH "D": Apply Surface Finish "D" to all exposed surfaces of the cap beam extending 1' below finished grade. Use brown surface finish color number 30475 meeting Federal Standard 595A for all surface finish "D" locations. Submit to the Engineer a 3" x 5" FED-STD-595A color chip card for color number 30475 with a declaration of conformity along with a 1' x 1' sample of the surface finish. Include this work in the unit price bid for "Class AAE-3 Concrete".

704-255 TRAFFIC CONTROL FOR SHOULDER DROP-OFF: If the shoulder and adjacent driving lane are not even at the end of the day, the following criteria will apply:

Place the following sign assembly at the locations listed below.

Sign Assembly: Sign No. W8-17-48 "Shoulder Drop Off" and supplemental plate Sign No. W20-52P-54 to identify the distance.

Locations:

- In advance of the drop off;
- Spaced at each mile from the advance sign; and
- At major intersections (CMC routes, state and US highways, and Interstate Ramps).

If the difference in elevation between the shoulder and the driving lane is 2" or greater, construct a slough on the driving lane that is 4:1 or flatter.

If the difference in elevation between the shoulder and driving lane is less than 2", no slough is required.

Sign assemblies will be measured and paid for according to Section 704 "Temporary Traffic Control".

704-500 PORTABLE RUMBLE STRIPS (PRS): Use PRS made of rubber or engineered polymers.

Install PRS that meet the following criteria:

- Have no adhesives or fasteners required for placement;
- Have a manufacture's speed rating that meets or exceeds the posted speed limit; and
- Each strip in the array must weigh a minimum of 100 pounds.

Use individual PRS constructed in one of the following manners:

- A single piece;
- Inter-locking segments; or
- Two pieces hinged at the midpoint.

An installed array of PRS consists of a minimum of 3 individual strips.

Move rumble strips with the flagging operation. Do not place rumble strips on horizontal curves.

The Engineer will count and measure each array as one unit. Include the cost of providing, installing, maintaining, and relocating PRS in the unit price bid for "Portable Rumble Strips".

704-P01 TRAFFIC CONTROL DEVICES: The traffic control devices list has been developed using the layouts shown in the plans and the following layouts shown on the Standard Drawings:

D-704-22, Type K and Type L: For construction trucks hauling material.

704-P02 TRAFFIC CONTROL: The traffic control details, as indicated on the plans, have been developed for the work activities described below.

Geotechnical Repairs: Drilled Shafts, Concrete Cap Beam, Ground Anchors and Final Site Grading.

- Maintain traffic on the existing lanes of Hwy 85. Keep all lanes open to traffic during Geotechnical Repair Work. Use Work Zone Traffic Control Layout for Geotechnical Work provided in Section 100.

HMA Mill & Overlay

- Provide closure of NB climbing lane as shown in Work Zone Traffic Control Layout for HMA Mill & Overlay provided in Section 100.
- Maintain one lane of traffic with a lane closure, pilot car and flagging operation as needed during milling and paving operation.



NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	6	4

706-P01 FIELD OFFICE: Provide a field office which meets the following requirements:

1. Be completely insulated and weather tight.
2. Minimum total area of 450 square feet.
3. Indoor bathroom facilities, sewer and potable water.
4. Have a dependable source of electricity for power and lights with a minimum of 6 electrical outlets spaced throughout the building and light fixtures spaced to uniformly light the entire interior (lumens required 110 foot-candles).
5. Be wired for DSL Broadband internet with wireless Wi-Fi and have the capability to allow for hard wiring the computer. Include the cost of the installation and monthly fees.
6. A heating and cooling system that is capable of maintaining the temperature between 65°F and 78°F year around.
7. A minimum of 3 desks and 3 desk chairs, 3 extra chairs, a drawer file cabinet with at least two drawers, one table minimum of 2.5 ft x 5 ft.
8. Photocopy machine/Printer capable of 11x17 photocopies/prints and toner to last the duration of the project. Engineer will provide paper. Other features to include digital coping & scanning. (Fax capabilities can be included but not necessary).
9. The location of the field office will be on, or as close to the project as possible and approved by the Engineer. Any rental fees will be paid by the Contractor.
10. Make the field office available for occupancy one week before the start of the project.
11. Heat, electric, internet service, sewer, and water hookups to be furnished by Contractor, Contractor to pay utility bills.

All requirements of the Field Office are subject to approval by the Engineer. Include the costs for the field office in the bid item "Field Office" and the Schedule for Payment is as follows:

- 25% when set up on site.
- 50% when 30% of the work is complete.
- 75% when 60% of the work is complete.
- 100% when project is complete.

706-P02 FIELD OFFICE AND LABORATORIES: Supply the Field Office and Aggregate Lab for Year 1 of Construction. Supply the Bituminous Lab and Contractor's Lab for Year 2 of Construction.

714-P01 PIPE CONDUIT JACKED OR BORED: Bore or jack pipe indicated as jacked on the plans. If the boring method is used, use of smooth wall steel pipe in lieu of RCP is acceptable. For jacked concrete pipe sections, use the class required for the height of fill, but with a minimum concrete compressive strength of 6,000 psi.

Install bored or jacked pipe culverts in accordance with section 714 and section 830 of the standard specifications.

Supply pipe meeting Section 830.02 F, "Smooth Wall Steel Pipe"; pipe meeting ASTM A 252, Grade 2; or pipe meeting ASTM A 53, Grade B.

Provide pipes with a minimum wall thickness as specified in Table 830-01 of the Standard Specifications.

Protect the traveling public with proper traffic control and traffic safety measures during the jacking or boring process (while extending the pipe through the undisturbed fill) without disrupting traffic, or damaging roadway grade and surface

Bore or jack pipe culverts with equipment that encases the hole as the earth is removed and installs the pipe concurrently. Use an encased hole a maximum of 0.1 foot greater than the outside diameter of the pipe. Do not use water in the boring or jacking process. Use proper cushioning material between the jack and pipe. Remove damaged sections with an unsatisfactory joint and install a new section.

Start the boring or jacking from the low or downstream end and proceed in straight lines to the grade and alignment as shown on the plans. Maintain flow line elevation at the starting point for boring or jacking within 0.1 ft. of staked grade; do not reverse the flow line at any point; and do not vary the line and grade at any point within the pipe more than 0.5 ft. from the designated line and grade.

Once the pipe jacking has begun, proceed with the operation without interruption to prevent the pipe from becoming firmly set in the embankment.

Fill openings greater than 1/4 inch in width between adjacent sections of concrete pipe with 1:2 cement/sand mortar. Tie all concrete pipe sections and end sections in accordance with standard drawing D-714-22. Weld all steel sections continuously around their periphery.

Include temporary removal and replacement of embankment in the price bid for Pipe Conduit – Jacked or Bored. Use a maximum 2:1 slope beyond the existing pavement section (base, pavement, etc.) for any temporary removal of embankment. Protect and stabilize the slope throughout the jacking or boring process.

The culvert consists of separate bid items for each portion: "Pipe Conduit 60IN – Jacked or Bored" and "Pipe Conduit 60IN". The pay lengths of the pipe bid items are as shown for the type and size specified per linear foot. Include all costs for required materials, labor, and equipment (including connecting bands or Couplers) in the unit price bid for "Pipe Conduit 60IN – Jacked or Bored".

714-P02 PIPE BENDS: Pipe bends are required at the following locations:

Location	Type	Degree Bend
Sta 28+62.3 (PR GEO90_1)	30 IN Pipe Conduit	2.5 Degree

Include the cost of the pipe bends in the contract unit price for "Remove & Relay Pipe – All Types and Sizes".

714-P03 PLUG PIPE–ALL TYPES & SIZES: Plug and abandon pipes at the locations designated in the plans. Pump the pipe full of controlled density backfill to prevent any future collapse or failure of the abandoned pipe. Include all costs for labor, materials, and equipment in the unit price bid for "Plug Pipe – All Types and Sizes".



NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	6	5

722-P01 ADJUST MANHOLE SPECIAL: Remove and Salvage the existing manhole casting and covers at two existing manhole locations as shown in the Plans. Perform additional work as noted below:

- Existing 84 IN Manhole: Sta 23+87.73 – 116.68’ LT (PR_GEO80_1)
Core new openings in existing manhole riser to accommodate proposed 60 IN Conduit (east) and proposed 66 IN Conduit (southwest). Plug openings for existing conduits. Fill base of manhole with mortar and slope to drain to proposed manhole invert.
- Existing 60 IN Manhole: Sta 28+10.50 – 89.46’ RT (PR_GEO90_1)
Core new opening in existing manhole riser to accommodate invert adjustment to existing 30 IN Conduit (northeast). Plug the existing opening for the 30 IN Conduit (northeast).

Include all labor, materials, and equipment necessary to complete the modification to the existing manholes in the price bid for “Adjust Manhole Special”.

752-P01 TEMPORARY FENCE: Place temporary fencing located east of Hwy 85 prior to removing the existing fencing. Place temporary fencing around temporary construction easement east of Hwy 85 where existing fence is removed until permanent fencing is in place. The temporary fence consists of 3 strand barb wire. Field fit temporary fencing in areas of deep draws or wooded areas, with the approval of the Engineer. The cost to install, maintain and remove temporary fencing is included in the price bid for “Temporary Fence”.

752-P02 NATIONAL PARK SERVICE (NPS) FENCING: The woven wire fencing located on or adjacent to NPS property must remain functional at all times during construction. Phase construction of the new fencing to accommodate work activities. Construct the woven wire fence prior to removing the existing fencing. Include all costs associated with this described work in the price bid for “Fence Woven Wire”.

762-050 PAVEMENT MARKING: If the Engineer and Contractor agree, plan quantity will be used as the measurement for payment for pavement marking items.

930-P01 PROTECTION OF INCLINOMETER TUBES: Exercise care in the construction operations to protect the existing inclinometer tubes.

930-P02 SEQUENCING FOR DRILLED SHAFTS AND CONSTRUCTION PLATFORM: Commence drilled shaft construction within two weeks of starting the earthwork for the construction platform. Proceed with drilled shaft installation after placement of the construction bench. Stops in production are not allowed, other than holidays and weekends, without approval from the Engineer.

930-P03 DRILLED SHAFT CONSTRUCTION: Drilled Shaft DS-32 may penetrate the existing 30” RCP at a depth of approximately 20 feet below the work road. The exact location of the RCP is not known. Be prepared with appropriate drill tooling and utilize appropriate drilling techniques to drill through this RCP if encountered. Plug the existing 30” RCP in accordance with Note 714-P03 before installing the drilled shaft.

930-P04 TEMPORARY SHORING: Install temporary shoring from Station 27+14 to Station 27+31 to permit construction of the full width temp work road. Design and construct the temporary shoring to the lines and grades shown in the plans. Remove the temporary shoring when the upper temp work road is removed.

Submit working drawings to the Engineer for review 14 days prior to installing the temporary shoring. Include all costs for designing, constructing and removing the temporary shoring in the unit price bid for “Shoring”.



ENVIRONMENTAL NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	6	6

ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation has made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

EN-1 TEMPORARY WETLAND IMPACT: Temporary impact areas within wetlands and or other waters are incorporated into the plans for this project. Remove temporary fill placed and sedimentation in wetlands or other waters. Restore these wetlands to preconstruction contours.

EN-2 AQUATIC NUISANCE SPECIES (ANS): Equipment that was last used outside of North Dakota or within a Class I infested waterbody (identified on the North Dakota Game and Fish Department (NDGFD) website) requires an inspection by NDGFD. Notify the NDGFD at least 10 business days prior to pumps, watercraft, or any equipment entering a public water to allow the NDGFD sufficient time to inspect any and all such equipment for ANS. Contact NDGFD ANS Coordinator Ben Holen (PH: 701-253-6418 or Email: bholen@nd.gov) for equipment inspections. Supply one of the following to the engineer as proof of compliance prior to work taking place in the water: (1) the NDGFD inspection report, (2) documented NDGFD correspondence (email or signed letter). If an inspection is not required, no follow up documentation is required.

EN-3 THREATENED AND ENDANGERED SPECIES: The project is located near/within suitable habitat for the species listed in the following table.

SPECIES	HABITAT	PRESENCE
Whooping Crane	Cropland/Wetland Associations	Spring: April 1 - May 15 Fall: September 15 - November 15
Gray Wolf	Forested/Wooded Areas, Open Areas	Year-Round
Dakota Skipper	Native Prairie	Year-Round
Northern Long-Eared Bat	Forested/Wooded Areas/Bridges/Box Culverts/Caves/Mines	Active Season: April 1 - September 30 Inactive Season: October 1 - March 31

If any of the threatened/endangered species are identified within 1 mile of the project, the Contractor will notify the Engineer immediately and cease construction activities in the vicinity until an avoidance area is established. The Engineer will establish an avoidance area that is at least a 0.5 mile and immediately coordinate with the USFWS (701-355-8513), FHWA (701-221-9464), and NDDOT Environmental and Transportation Services (701-328-2592). The Contractor will not resume work within the avoidance area until the Engineer has confirmed with the agencies that work may proceed (either the species have left the area, or approved avoidance/minimization measures have been implemented).

EN-4 EAGLE AND RAPTOR SURVEY: The NDDOT will hire a biologist to conduct pre-construction pedestrian field surveys for eagle and raptor nests. The survey will be conducted within a 1 mile buffer from the limits of construction and will be completed during March 15 – May 1 to coincide with the breeding and nesting season and also timed to survey prior to leaf-out of trees. Surveys would be completed once annually for each year of construction.

If active bald or golden eagle nests are discovered within the survey area, the USFWS would be contacted by the Project Engineer to determine the appropriate avoidance buffer or timing restriction in accordance with the National Bald Eagle Management Guidelines (NBEMG). Avoidance buffers ranging from 330 feet up to 1 mile may be needed to avoid impacts depending on the work activities (e.g. a larger avoidance buffer would be needed for pile driving activities compared to clearing and grading), as well as presence of visual screening such as topography or vegetation.

Direct impacts to raptor nests (e.g. nest/tree removal) must be avoided.

EN-5 MIGRATORY BIRD NEST SURVEY: The breeding and nesting season for migratory birds occurs between February 1 and July 15. The Contractor may mow and grub (remove and dispose of trees, shrubs, stumps, roots, brush and other surface objects) the site prior to the nesting and breeding season to deter birds from nesting in project areas, with continued mowing throughout the nesting season to continually deter nesting. If mowing and grubbing prior to and throughout the nesting season are not completed, the Contractor will provide the Project Engineer a seven-day notice prior to commencing any work within this time frame. The Project Engineer will have a qualified biologist conduct field surveys for migratory birds and their nests within five days prior to the initiation of any construction activities. In the event that the biologist identifies nesting migratory birds within the project area during the breeding and nesting season, the Project Engineer will establish an avoidance area sufficient to preserve the bird(s) and/or nest(s), and will immediately notify the Department. The Contractor will not resume work within the avoidance area until notified by the Project Engineer. Measures to avoid or minimize harm to migratory bird species may be necessary prior to resuming work, including, but not limited to suspending construction activities where necessary and/or maintaining adequate buffers as directed by the Department to protect birds until the young have fledged from the nest.

In preparation of this project, the NDDOT Williston District will mow the existing roadway ditches in late fall of 2020 to lessen the chance of nesting.

EN-6 PALEONTOLOGICAL SURVEY: The NDDOT will hire a paleontologist to monitor earthwork activity and inspect waste material excavated from the drilled shafts. Paleontological monitoring will follow earth-moving equipment and examine excavated sediments and road cuts for evidence of significant fossil resources. Provide notice to the Engineer at least 48 hours before beginning earthmoving activities or drilled shaft excavation to allow the paleontologist to travel to the site. Provide access to the waste area for inspection of excavated materials from the drilled shafts. Do not perform shaping of the waste area before paleontological inspection has occurred.

In the event that significant fossils are uncovered during earthmoving activities, work will be halted within 100 feet of the discovery site until the fossils are assessed and mitigation measures are discussed amongst the NDDOT, a qualified paleontologist, and an authorized agency representative for resources located on public land. If located on private land, the landowner will be included in the assessment and mitigation. Work will not be halted if fossil resources are found within waste material excavated from drilled shafts.

EN-7 EQUIPMENT HYGIENE: Prior to allowing any equipment on the construction site, inspect it for oil, gas, diesel, antifreeze, hydraulic fluid, and other petroleum leaks. Properly repair all such leaks, and clean equipment prior to allowing it on the site. Equipment leaks that occur during the project must be fixed within 24 hours, or the equipment must be removed from the project area. Equipment is not allowed to continue operating once a leak is discovered.

EN-8 TREE SURVEY: The NDDOT will hire a biologist to monitor tree impacts. Impacts to trees/woody vegetation will be recorded. Mark the trees to be removed. Notify the Engineer and Biologist of the marked trees a minimum of 7 working days prior to removing trees. Remove trees outside of the active nesting season for migratory birds.

Trees can also be removed during the active nesting season as long as a nest survey is completed to check for active nests prior to the trees being removed. The active nesting season for migratory bird extends from February 1 to July 15.



ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	8	1

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
----	----	-----	----	-----	-----
103	0100	CONTRACT BOND	L SUM	1	1
201	0330	CLEARING & GRUBBING	L SUM	1	1
202	0169	REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	2	2
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF	164	164
202	0210	REMOVAL OF MANHOLES	EA	1	1
202	0312	REMOVE EXISTING FENCE	LF	1,341	1,341
203	0102	COMMON EXCAVATION-TYPE B	CY	25,325	25,325
203	0109	TOPSOIL	CY	3,558	3,558
203	0113	COMMON EXCAVATION-WASTE	CY	5,455	5,455
203	0140	BORROW-EXCAVATION	CY	7,914	7,914
216	0100	WATER	M GAL	380	380
251	0300	SEEDING CLASS III	ACRE	5.2	5.2
251	2000	TEMPORARY COVER CROP	ACRE	7.9	7.9
253	0301	BONDED FIBER MATRIX	ACRE	9.2	9.2
255	0103	ECB TYPE 3	SY	18,399	18,399
255	0201	TRM TYPE 1	SY	120	120
256	0200	RIPRAP GRADE II	CY	330	330
261	0112	FIBER ROLLS 12IN	LF	3,830	3,830
261	0113	REMOVE FIBER ROLLS 12IN	LF	3,830	3,830
302	0050	TRAFFIC SERVICE AGGREGATE	TON	5,080	5,080
302	0251	DRAINAGE AGGREGATE	CY	117	117
401	0050	TACK COAT	GAL	1,468	1,468
411	0105	MILLING PAVEMENT SURFACE	SY	16,061	16,061
430	0045	SUPERPAVE FAA 45	TON	3,007	3,007
430	1000	CORED SAMPLE	EA	21	21
430	5806	PG 58H-28 ASPHALT CEMENT	TON	180.4	180.4
602	0130	CLASS AAE-3 CONCRETE	CY	1,291.1	1,291.1
612	0115	REINFORCING STEEL-GRADE 60	LBS	67,414	67,414
702	0100	MOBILIZATION	L SUM	1	1
704	0100	FLAGGING	MHR	80	80
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1,060	1,060
704	1048	PORTABLE RUMBLE STRIPS	EA	2	2
704	1060	DELINEATOR DRUMS	EA	22	22

ESTIMATE OF QUANTITIES				STATE	PROJECT NO.	SECTION NO.	SHEET NO.
				ND	SOIB-NH-7-085(110)127	8	2
SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL		
-----	-----	-----	----	-----	-----		
704	1067	TUBULAR MARKERS	EA	60	60		
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	1	1		
704	1185	PILOT CAR	HR	40	40		
706	0400	FIELD OFFICE	EA	1	1		
706	0500	AGGREGATE LABORATORY	EA	1	1		
706	0550	BITUMINOUS LABORATORY	EA	1	1		
706	0600	CONTRACTOR'S LABORATORY	EA	1	1		
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	501	501		
709	0161	GEOSYNTHETIC MATERIAL TYPE S1	SY	358	358		
714	3151	HEADWALL-PRECAST CONCRETE 6IN	EA	4	4		
714	4125	PIPE CONDUIT 48IN	LF	100	100		
714	4128	PIPE CONDUIT 48IN-APPROACH	LF	44	44		
714	4135	PIPE CONDUIT 60IN	LF	158	158		
714	4140	PIPE CONDUIT 66IN	LF	58	58		
714	4168	PIPE CONDUIT 60IN-JACKED OR BORED	LF	330	330		
714	9659	REMOVE & RELAY PIPE-ALL TYPES & SIZES	LF	100	100		
714	9680	PLUG PIPE-ALL TYPES & SIZES	EA	1	1		
714	9730	UNDERDRAIN PIPE PVC PERFORATED 6IN	LF	760	760		
714	9771	UNDERDRAIN PIPE PVC NON-PERFORATED 6IN	LF	89	89		
722	0120	MANHOLE 72IN	EA	1	1		
722	0130	MANHOLE 84IN	EA	2	2		
722	0315	MANHOLE CASTING	EA	1	1		
722	1120	MANHOLE RISER 72IN	LF	20.25	20.25		
722	1130	MANHOLE RISER 84IN	LF	20	20		
722	6201	ADJUST MANHOLE SPECIAL	EA	2	2		
752	0200	FENCE BARBED WIRE 4 STRAND	LF	150	150		
752	0700	FENCE WOVEN WIRE	LF	1,219	1,219		
752	0905	TEMPORARY FENCE	LF	150	150		
752	2110	RESET VEHICLE GATE	EA	1	1		
752	3120	CORNER ASSEMBLY WOVEN WIRE	EA	8	8		
752	4120	DOUBLE BRACE ASSEMBLY WOVEN WIRE	EA	2	2		
754	0805	OBJECT MARKERS - CULVERTS	EA	3	3		
760	0005	RUMBLE STRIPS - ASPHALT SHOULDER	MILE	1.06	1.06		

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	8	3

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
-----	-----	-----	----	-----	-----
760	0007	RUMBLE STRIPS - ASPHALT CENTERLINE	MILE	0.53	0.53
762	0113	EPOXY PVMT MK 4IN LINE	LF	23,800	23,800
762	0430	SHORT TERM 4IN LINE-TYPE NR	LF	2,100	2,100
902	0400	MACHINE HYGIENE	L SUM	1	1
930	3995	5.0FT DIAMETER DRILLED SHAFT	LF	2,784	2,784
930	3996	5.0FT DIAMETER DRILLED SHAFT (MOD)	LF	3,728	3,728
930	3997	6.0FT DIAMETER DRILLED SHAFT	LF	1,961	1,961
930	4150	GROUND ANCHOR	LF	15,455	15,455
930	4155	SACRIFICIAL GROUND ANCHOR LOAD TEST	EA	2	2
930	4200	INSTRUMENTATION-INCLINOMETER	LF	450	450
930	4210	INSTRUMENTATION-STRAIN GAUGE	EA	16	16
930	4221	INSTRUMENTATION-DRILLED SHAFT MOVEMENT SENSOR	LF	432	432
930	4225	INSTRUMENTATION-DATA LOGGING EQUIPMENT	L SUM	1	1
930	4250	CROSS-HOLE SONIC LOG TEST	EA	13	13
930	4251	CROSS-HOLE SONIC LOG TEST - MOD 1	EA	2	2
930	4260	THERMAL INTEGRITY PROFILING TEST	EA	4	4
930	4261	THERMAL INTEGRITY PROFILING TEST - MOD 1	EA	1	1
930	8230	SHORING	EA	1	1
980	0100	CATTLE GUARD 8FT X 28FT	EA	2	2
980	0171	REMOVE CATTLE GUARD	EA	2	2

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	10	1

Water

50 MGal for Dust Palliative
20 Gal/Ton for Aggregates
10 Gal/CY for Embankments

Materials

Traffic Service Aggregate 1.5 Ton/CY + 25%
Superpave FAA 45 2.0 Ton/CY
PG 58H-28 Asphalt Cement 6.0% of Superpave FAA 45
Tack Coat 0.05 Gal/SY

HMA Paving Basis					
		Station Range			# of Stations
Segment Length		6720+00	to	6748+00	28.00
Material	Unit	Area (SF)	Avg Width (Ft)	Quantity/Sta	Quantity
Milling Pavement Surface (PAY ITEM)	SY	-	49	544.4	15,244.4
Millings @ 2 Tons/CY (NOT A PAY ITEM)	TON	4.05	-	30.0	840.0
3" Superpave FAA 45 @ 2 Tons/CY	TON	11.30	44	83.7	2,343.7
Additional Superpave FAA 45 Leveling Course @ 2 Tons/CY	TON	2.83	-	20.9	585.9
PG 58H-28 Asphalt Cement @ 6.0%	TON	-	-	-	175.8
Tack Coat @ 0.05 Gal/SY (1st Lift)	Gal	-	46.5	25.8	723.3
Tack Coat @ 0.05 Gal/SY (2nd Lift)	Gal	-	45	25.0	700.0

HMA Cored Samples							
Specification Section	A	B		C	Quantity (A x B x C)	Quantity (1 per mile)	Unit
	Distance (Ft)/1000	Lanes	Joints	Lifts			
430.04 I.2.b(1), "General"	2	3	N/A	2	12	N/A	EA
SSP 4 Longitudinal Joint Density in HMA Pavements (Centerline)	2	N/A	2	2	8	N/A	EA
430.04 I.2.b(2), "Pavement Thickness Determination Cores"					N/A	1	EA
				Totals	20	1	EA

Object Markers - Culverts	
Location	Quantity
Sta 23+54.7 - 371.8' RT Chain: PR_GEO80_1	1
Sta 23+91.7 - 176.5' LT Chain: PR_GEO80_1	1
Sta 28+04.9 - 49.5' LT Chain: PR_GEO90_1	1

Permanent Pavement Marking			
Type	Basis	Quantity	Units
Epoxy Pvmt Mk 4IN Line	Centerline Skips @ 1,320 LF/mile	700	LF
	Double Barrier @ 10,560 LF/mile	5,600	LF
	Edge Lines @ 10,560 LF/mile	5,600	LF
	Total	11,900	LF

Short Term 4 IN Line-Type NR			
Location	Basis	Quantity	Units
Top of Milled Surface	Centerline Skips @ 1,320 LF/mile	700	LF
Top of 1 st Lift	Centerline Skips @ 1,320 LF/mile	700	LF
Top of 2 nd Lift	Centerline Skips @ 1,320 LF/mile	700	LF
Total		2,100	LF

Rumble Strips			
Type	Basis	Quantity	Units
Asphalt Shoulder	2 Shoulders / Mile	1.061	Miles
Asphalt Centerline	1 Centerline / Mile	0.530	Miles



US Hwy 85
Horseshoe Bend Landslide Repair

Basis of Estimate

PHASE 1 CONSTRUCTION			
Location	EXCAVATION	EMBANKMENT	BORROW (+) / WASTE (-)
	(CY)	(CY)	(CY)
Phase 1 Geotech Work	14,311	22,225	7,914
Earthwork for Phase 1	14,311	22,225	7,914

PHASE 2 CONSTRUCTION			
Location	EXCAVATION	EMBANKMENT	BORROW (+) / WASTE (-)
	(CY)	(CY)	(CY)
Phase 2 Geotech Work	4,703	3,062	-1,641
Earthwork for Phase 2	4,703	3,062	-1,641

PHASE 3 CONSTRUCTION			
Location	EXCAVATION	EMBANKMENT	BORROW (+) / WASTE (-)
	(CY)	(CY)	(CY)
Phase 3 Geotech Work	11,655	7,810	-3,845
Phase 3 US 85 Ditch Regrading	111	142	31
Earthwork for Phase 3	11,766	7,952	-3,814

Construction Phase	EXCAVATION	EMBANKMENT	203-0102 COMMON EXCAVATION - TYPE B	203-0113 COMMON EXCAVATION - WASTE	203-0140 BORROW EXCAVATION
			Pay Item	Pay Item	Pay Item
	(CY)	(CY)	(CY)	(CY)	(CY)
Phase 1	14,311	22,225	14,311	0	7,914
Phase 2	4,703	3,062	3,062	1,641	0
Phase 3	11,766	7,952	7,952	3,814	0
TOTALS	30,780	33,239	25,325	5,455	7,914

Disposal of Drilled Shaft Drilling Spoils	Estimated Quantity
	(CY)
Phase 1	5,027
Phase 2	2,000
Phase 3	0
TOTALS	7,027

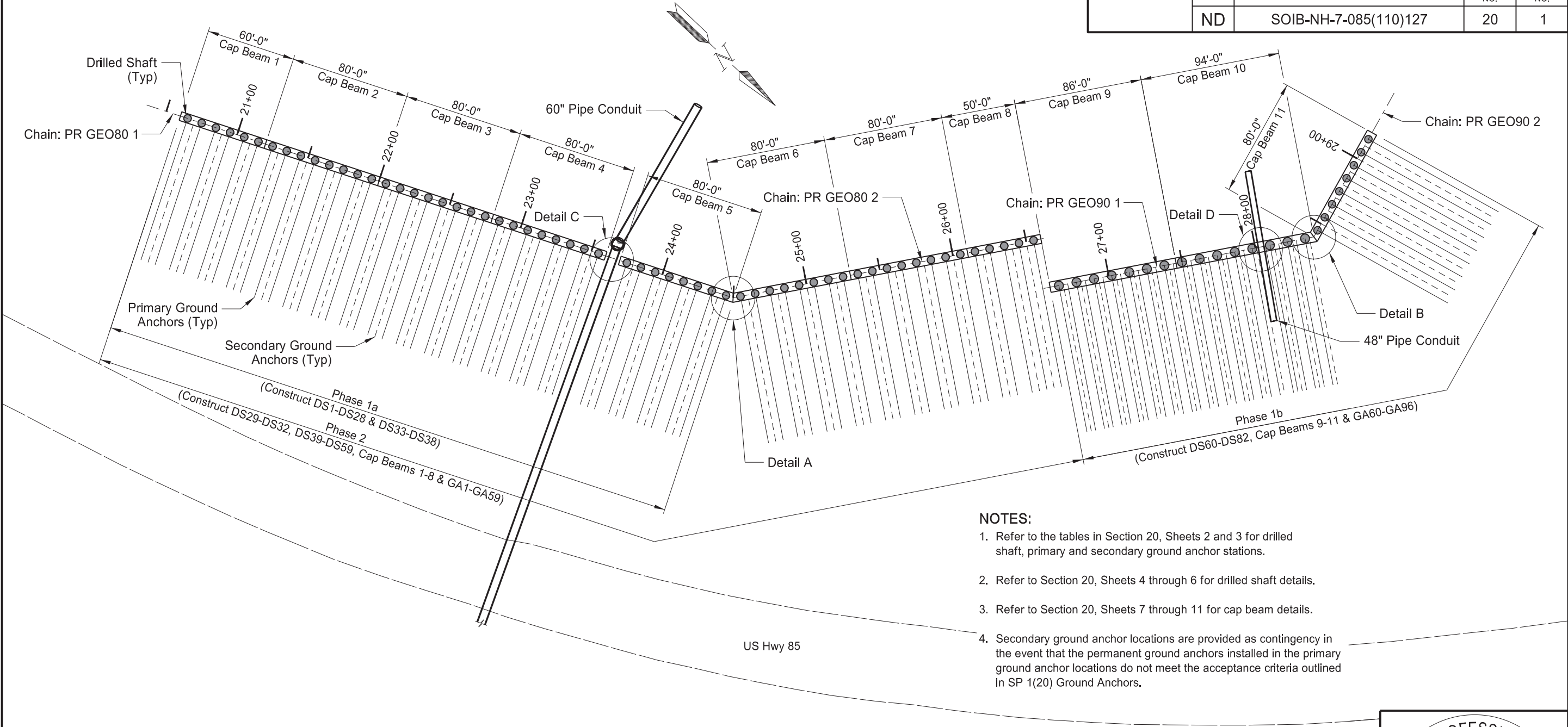
Note: Estimated quantity of Drilling Spoils has not been included in earthwork quantities. Dispose of Drilling Spoils in accordance with SP 3(20) Drilled Shaft.



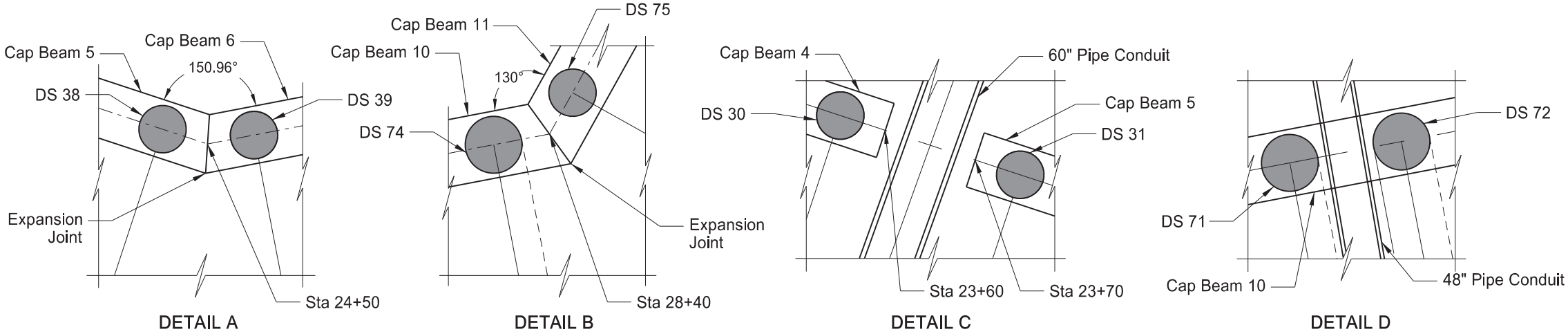
US Hwy 85
Horseshoe Bend Landslide Repair

Basis of Estimate
Earthwork

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	1



- NOTES:**
1. Refer to the tables in Section 20, Sheets 2 and 3 for drilled shaft, primary and secondary ground anchor stations.
 2. Refer to Section 20, Sheets 4 through 6 for drilled shaft details.
 3. Refer to Section 20, Sheets 7 through 11 for cap beam details.
 4. Secondary ground anchor locations are provided as contingency in the event that the permanent ground anchors installed in the primary ground anchor locations do not meet the acceptance criteria outlined in SP 1(20) Ground Anchors.



HORSESHOE BEND LANDSLIDE REPAIR

DRILLED SHAFT AND
GROUND ANCHOR LAYOUT

NOTES:

- 1. DSMS = Drilled Shaft Movement Sensor
- 2. Pay lengths of DSMSs will be equal to the pay length of the drilled shaft in which the DSMS is installed.
- 3. Drilled shafts receiving DSMSs will also be CSL tested. Additional shafts to receive CSL testing and access tubes and TIP testing will be designated by the Engineer during construction.

DRILLED SHAFT				
Alignment	Cap Beam	Shaft No.	Station	Comment
Chain: PR GEO80 1	Cap 1	DS 1	20+65	
		DS 2	20+75	
		DS 3	20+85	
		DS 4	20+95	
		DS 5	21+05	
		DS 6	21+15	
	Cap 2	DS 7	21+25	
		DS 8	21+35	
		DS 9	21+45	
		DS 10	21+55	
		DS 11	21+65	
		DS 12	21+75	
		DS 13	21+85	
		DS 14	21+95	
	Cap 3	DS 15	22+05	DSMS
		DS 16	22+15	
		DS 17	22+25	
		DS 18	22+35	
		DS 19	22+45	
		DS 20	22+55	
		DS 21	22+65	
		DS 22	22+75	
	Cap 4	DS 23	22+85	
		DS 24	22+95	
		DS 25	23+05	
		DS 26	23+15	
		DS 27	23+25	
		DS 28	23+35	
		DS 29	23+45	
	Cap 5	DS 30	23+55	
		DS 31	23+75	
		DS 32	23+85	
		DS 33	23+95	
		DS 34	24+05	
		DS 35	24+15	
		DS 36	24+25	
		DS 37	24+35	
		DS 38	24+45	
Chain: PR GEO80 2	Cap 6	DS 39	24+55	
		DS 40	24+65	
		DS 41	24+75	
		DS 42	24+85	
		DS 43	24+95	
		DS 44	25+05	DSMS
		DS 45	25+15	
		DS 46	25+25	
	Cap 7	DS 47	25+35	
		DS 48	25+45	
		DS 49	25+55	
		DS 50	25+65	
		DS 51	25+75	
		DS 52	25+85	
		DS 53	25+95	
		DS 54	26+05	
	Cap 8	DS 55	26+15	
		DS 56	26+25	
		DS 57	26+35	
		DS 58	26+45	
		DS 59	26+55	

DRILLED SHAFT				
Alignment	Cap Beam	Shaft No.	Station	Comment
Chain: PR GEO90 1	Cap 9	DS 60	26+66	
		DS 61	26+78	
		DS 62	26+90	
		DS 63	27+02	
		DS 64	27+14	
		DS 65	27+26	
		DS 66	27+38	
	Cap 10	DS 67	27+50	DSMS
		DS 68	27+62	
		DS 69	27+74	
		DS 70	27+86	
		DS 71	27+98	
		DS 72	28+10	
		DS 73	28+22	
Chain: PR GEO90 2	Cap 11	DS 74	28+34	
		DS 75	28+45	
		DS 76	28+55	
		DS 77	28+65	DSMS
		DS 78	28+75	
		DS 79	28+85	
		DS 80	28+95	
		DS 81	29+05	
		DS 82	29+15	

SPEC	CODE	BID ITEM	QTY	UNIT
930	4221	INSTRUMENTATION-DRILLED SHAFT MOVEMENT SENSOR	432	LF



HORSESHOE BEND LANDSLIDE REPAIR

DRILLED SHAFT TABLES

PRIMARY GROUND ANCHOR				
Alignment	Cap Beam	Anchor No.	Station	Comment
Chain: PR GEO80 1	Cap 1	GA 1	20+65	
		GA 2	20+75	
		GA 3	20+85	
		GA 4	20+95	
		GA 5	21+05	
		GA 6	21+15	
	Cap 2	GA 7	21+25	
		GA 8	21+35	
		GA 9	21+45	
		GA 10	21+55	
		GA 11	21+65	
		GA 12	21+75	
		GA 13	21+85	
		GA 14	21+95	
	Cap 3	GA 15	22+05	SG / EC
		GA 16	22+15	
		GA 17	22+25	
		GA 18	22+35	
		GA 19	22+45	
		GA 20	22+55	
		GA 21	22+65	
		GA 22	22+75	
	Cap 4	GA 23	22+85	
		GA 24	22+95	
		GA 25	23+05	
		GA 26	23+15	
		GA 27	23+25	
		GA 28	23+35	
		GA 29	23+45	
		GA 30	23+55	
	Cap 5	GA 31	23+75	
		GA 32	23+85	
		GA 33	23+95	
		GA 34	24+05	
		GA 35	24+15	
		GA 36	24+25	
		GA 37	24+35	
		GA 38	24+45	
Chain: PR GEO80 2	Cap 6	GA 39	24+55	
		GA 40	24+65	
		GA 41	24+75	
		GA 42	24+85	
		GA 43	24+95	
		GA 44	25+05	SG / P
		GA 45	25+15	
		GA 46	25+25	
	Cap 7	GA 47	25+35	
		GA 48	25+45	
		GA 49	25+55	
		GA 50	25+65	
		GA 51	25+75	
		GA 52	25+85	
		GA 53	25+95	
		GA 54	26+05	
	Cap 8	GA 55	26+15	
		GA 56	26+25	
		GA 57	26+35	
		GA 58	26+45	
		GA 59	26+55	

PRIMARY GROUND ANCHOR				
Alignment	Cap Beam	Anchor No.	Station	Comment
Chain: PR GEO90 1	Cap 9	GA 60	26+66	TR
		GA 61	26+72	BR
		GA 62	26+78	TR
		GA 63	26+84	BR
		GA 64	26+90	TR
		GA 65	26+96	BR
		GA 66	27+02	TR
		GA 67	27+08	BR
		GA 68	27+14	TR
		GA 69	27+20	BR
	Cap 10	GA 70	27+26	TR
		GA 71	27+32	BR
		GA 72	27+38	TR
		GA 73	27+44	BR
		GA 74	27+50	SG / EC / TR
		GA 75	27+56	BR
		GA 76	27+62	TR
		GA 77	27+68	BR
		GA 78	27+74	TR
		GA 79	27+80	BR
Chain: PR GEO90 2	Cap 11	GA 80	27+86	TR
		GA 81	27+92	BR
		GA 82	27+98	TR
		GA 83	28+07	BR
		GA 84	28+10	TR
		GA 85	28+16	BR
		GA 86	28+22	TR
		GA 87	28+28	BR
		GA 88	28+34	TR
		GA 89	28+45	
	Cap 12	GA 90	28+55	
		GA 91	28+65	SG / P
		GA 92	28+75	
		GA 93	28+85	
		GA 94	28+95	
		GA 95	29+05	
		GA 96	29+15	

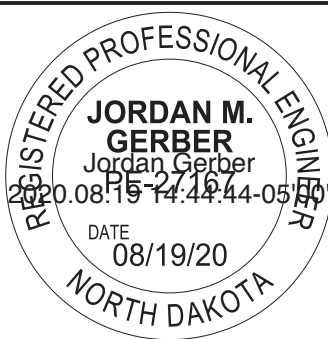
NOTES:

1. SG = Strain Guage
2. P = Performance Test
3. EC = Extended Creep Test
4. TR = Top Row of Anchors (40° inclination)
5. BR = Bottom Row of Anchors (45° inclination)

SECONDARY GROUND ANCHOR				
Alignment	Cap Beam	Anchor No.	Station	Comment
Chain: PR GEO80 1	Cap 1	SGA 1	20+70	
		SGA 2	20+90	
		SGA 3	21+10	
	Cap 2	SGA 4	21+30	
		SGA 5	21+50	
		SGA 6	21+70	
		SGA 7	21+90	
	Cap 3	SGA 8	22+10	
		SGA 9	22+30	
		SGA 10	22+50	
		SGA 11	22+70	
	Cap 4	SGA 12	22+90	
		SGA 13	23+10	
		SGA 14	23+30	
		SGA 15	23+50	
Chain: PR GEO80 2	Cap 5	SGA 16	23+80	
		SGA 17	24+00	
		SGA 18	24+20	
		SGA 19	24+40	
	Cap 6	SGA 20	24+60	
		SGA 21	24+80	
		SGA 22	25+00	
		SGA 23	25+20	
	Cap 7	SGA 24	25+40	
		SGA 25	25+60	
		SGA 26	25+80	
		SGA 27	26+00	
	Cap 8	SGA 28	26+20	
		SGA 29	26+40	
		SGA 30	26+50	

SECONDARY GROUND ANCHOR				
Alignment	Cap Beam	Anchor No.	Station	Comment
Chain: PR GEO90 1	Cap 9	SGA 31	26+69	BR
		SGA 32	26+81	BR
		SGA 33	26+93	BR
		SGA 34	27+05	BR
		SGA 35	27+17	BR
		SGA 36	27+29	BR
		SGA 37	27+41	BR
	Cap 10	SGA 38	27+53	BR
		SGA 39	27+65	BR
		SGA 40	27+77	BR
		SGA 41	27+89	BR
		SGA 42	28+01	BR
		SGA 43	28+13	BR
		SGA 44	28+25	BR
		SGA 45	28+37	BR
Chain: PR GEO90 2	Cap 11	SGA 46	28+50	
		SGA 47	28+60	
		SGA 48	28+70	
		SGA 49	28+80	
		SGA 50	28+90	
		SGA 51	29+00	
		SGA 52	29+10	

SPEC	CODE	BID ITEM	QTY	UNIT
930	4210	INSTRUMENTATION-STRAIN GUAGE	16	EA
930	4225	INSTRUMENTATION-DATA LOGGING EQUIPMENT	1	L SUM



HORSESHOE BEND LANDSLIDE REPAIR

GROUND ANCHOR TABLES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	20	4

BAR LIST - (PER SHAFT, STA 20+60 TO 23+00)				
SIZE	MARK	NO.	LENGTH	WEIGHT (LBS)
11	AA100	13	84'-1"	5,808
5	SPL100	1	1038'-0"	1,083

ESTIMATED MATERIAL QUANTITIES (PER SHAFT)	
REINFORCING STEEL (LBS)	CONCRETE (CY)
6,891	55.6

BAR LIST - (PER SHAFT, STA 28+40 TO 29+20)				
SIZE	MARK	NO.	LENGTH	WEIGHT (LBS)
11	AA101	13	130'-6"	9,014
5	SPL101	1	1,578'-5"	1,646

ESTIMATED MATERIAL QUANTITIES (PER SHAFT)	
REINFORCING STEEL (LBS)	CONCRETE (CY)
10,660	86.2

STATION	"A"	"B"	BAR 1	BAR 2
20+00 TO 23+00	76'-6"	79'-8"	11AA100	5SPL100
28+40 TO 29+20	118'-6"	121'-8"	11AA101	5SPL101

DESIGN STRENGTHS:

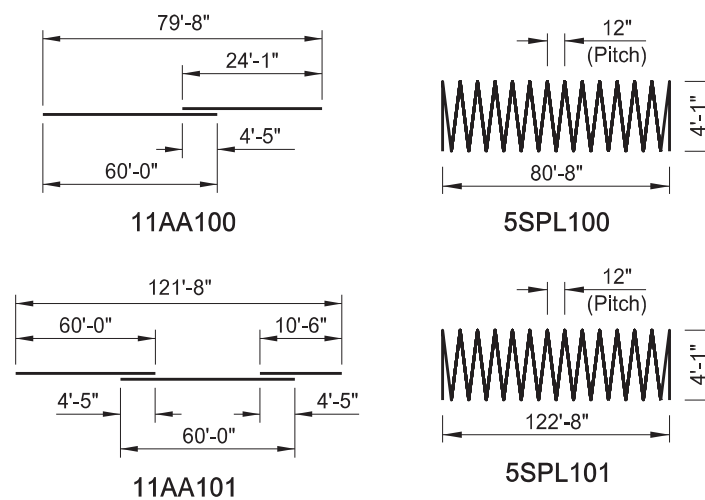
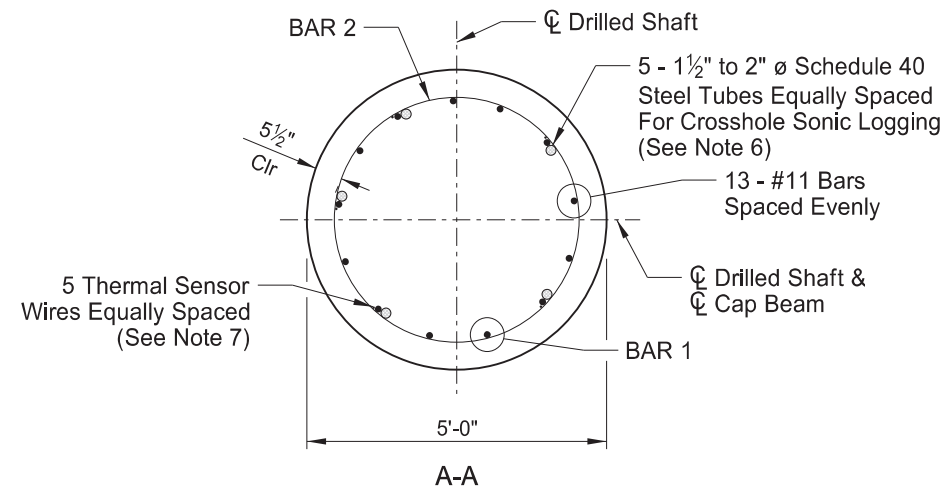
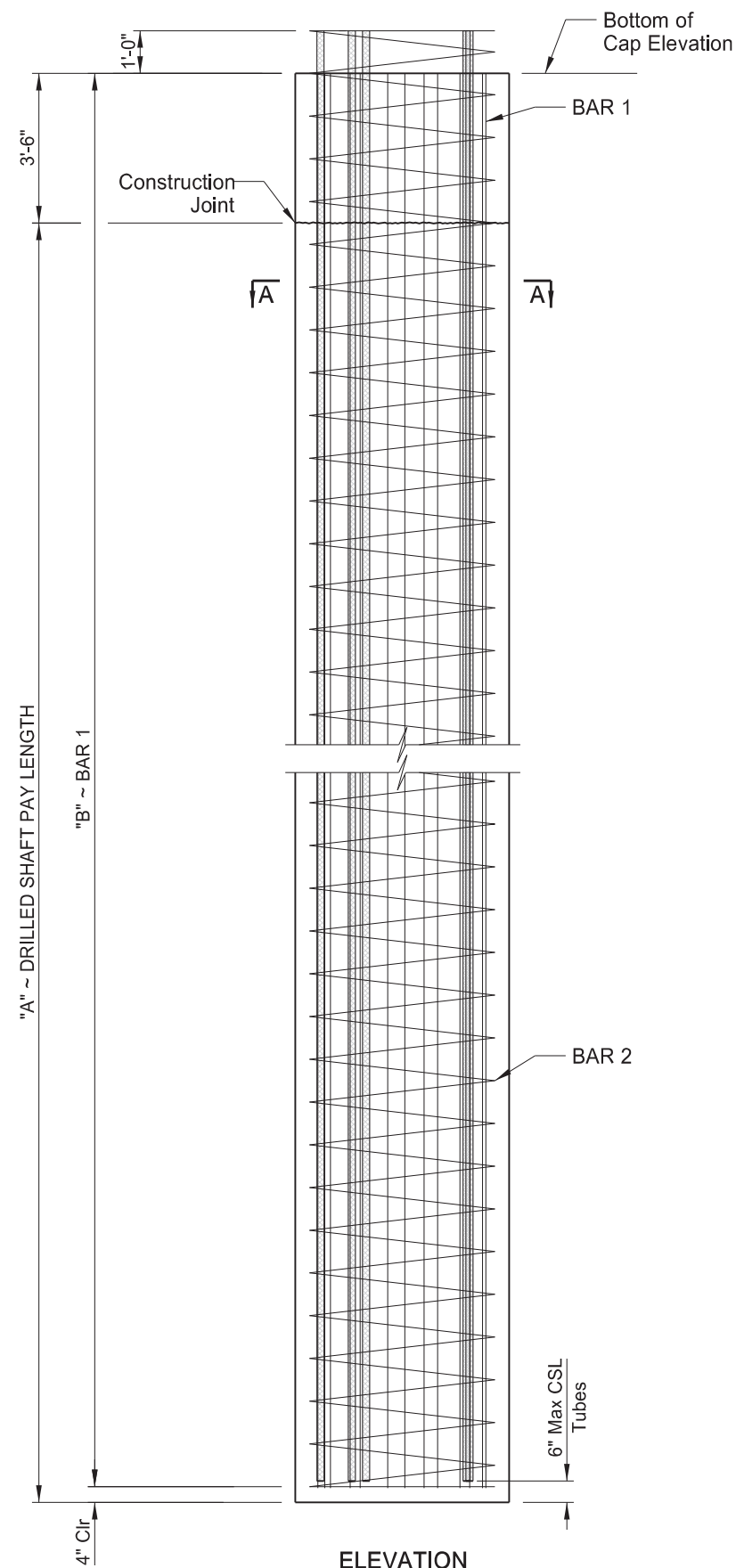
$f'_c = 5,000$ psi ~ Class AAE-5 Concrete
 $f_y = 60,000$ psi ~ Reinforcing Steel

Load & Resistance Factor Design



HORSESHOE BEND LANDSLIDE REPAIR

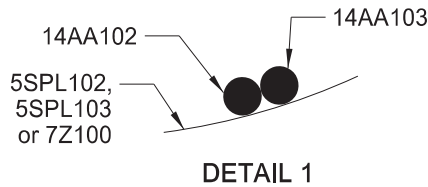
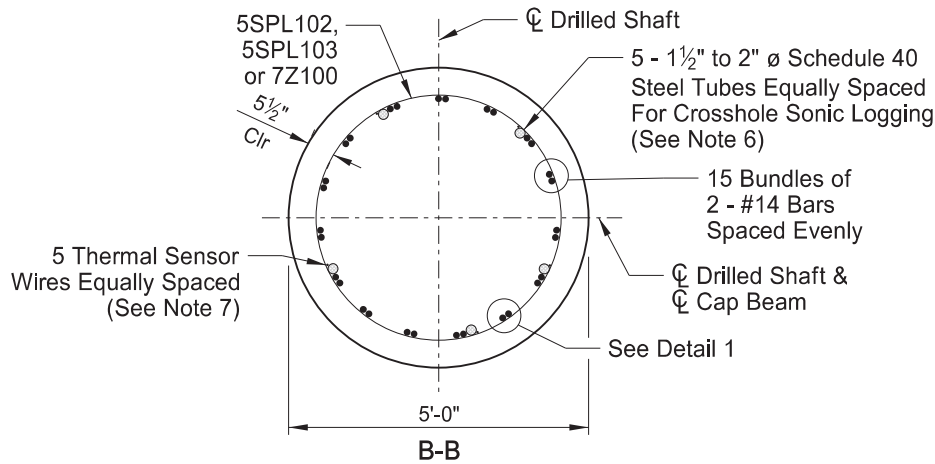
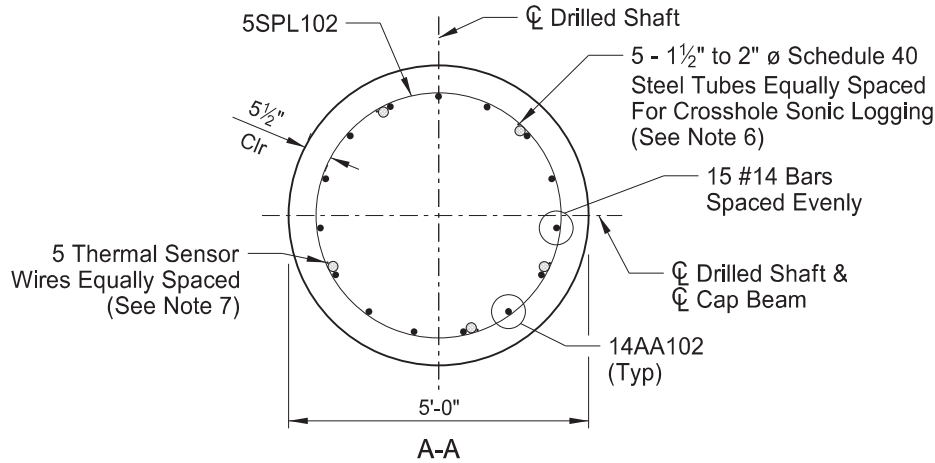
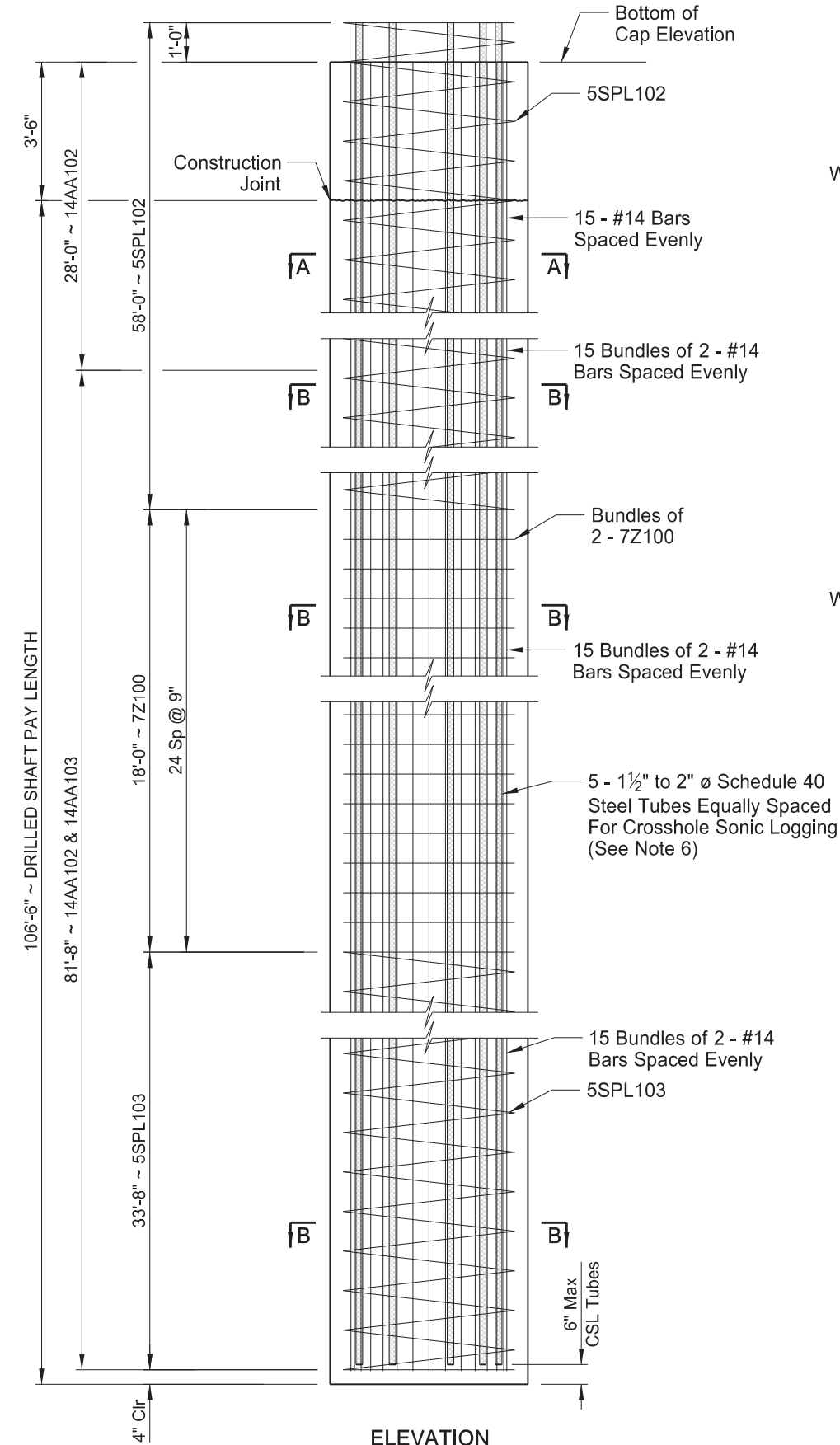
5FT DIAMETER DRILLED SHAFT DETAILS STA 20+60 TO 23+00, 28+40 TO 29+20



NOTES:

1. All dimensions are out to out of bars.
2. All lap splices or mechanical couplers in bundles will be staggered a minimum of 10'-0".
3. Spiral reinforcement quantities assume continuous reinforcement without splices. Payment will be made based on this quantity and no additional payment will be made for lap splices or mechanical couplers
4. If mechanical splices are used, the coupler will be an approved mechanical connector capable of developing 125% of the specified yield strength of the reinforcing steel.
5. The estimated quantities shown are for information purposes only. All materials including concrete, reinforcing bars and couplers and all labor required to build the drilled shafts will be included in the pay item "5.0FT DIAMETER DRILLED SHAFT".
6. Include Crosshole Sonic Log Access tubes in accordance with SP 2(20).
7. Include Thermal Sensor Wires in accordance with SP 5(20).
8. After acceptance of drilled shafts by Engineer, install Drilled Shaft Movement Sensors in a Crosshole Sonic Log Access Tube in drilled shafts designated in Section 20, Sheet 2. Payment for this work will be in accordance with SP 4(20).

SPEC	CODE	BID ITEM	QTY	UNIT
930	3995	5.0FT DIAMETER DRILLED SHAFT	2,784	LF
930	4250	CROSS-HOLE SONIC LOG TEST	13	EA
930	4260	THERMAL INTEGRITY PROFILING TEST	4	EA



NOTES:

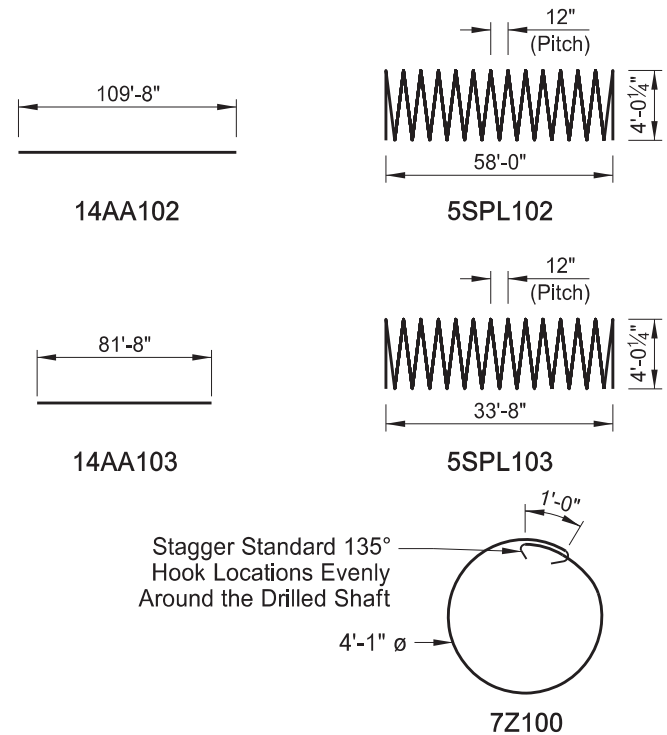
- All dimensions are out to out of bars.
- Stagger all mechanical splices in bundles a minimum of 10'-0".
- Spiral reinforcement quantities assume continuous reinforcement without splices. Payment will be made based on this quantity and no additional payment will be made for lap splices or mechanical couplers.
- If mechanical splices are used, the coupler will be an approved mechanical connector capable of developing 125% of the specified yield strength of the reinforcing steel.
- The estimated quantities shown are for information purposes only. All materials including concrete, reinforcing bars and couplers and all labor required to build the drilled shafts will be included in the pay item "5.0FT DIAMETER DRILLED SHAFT(MOD)".
- Include Crosshole Sonic Log Access tubes in accordance with SP 2(20).
- Include Thermal Sensor Wires in accordance with SP 5(20).
- After acceptance of drilled shafts by Engineer, install Drilled Shaft Movement Sensors in a Crosshole Sonic Log Access Tube in drilled shafts designated in Section 20, Sheet 2. Payment for this work will be in accordance with SP 4(20).

SPEC	CODE	BID ITEM	QTY	UNIT
930	3996	5.0FT DIAMETER DRILLED SHAFT (MOD)	3,728	LF

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	20	5

BAR LIST - (PER SHAFT)				
SIZE	MARK	NO.	LENGTH	WEIGHT (LBS)
14	AA102	15	109'-8"	12,584
14	AA103	15	81'-8"	9,371
5	SPL102	1	735'-0"	767
5	SPL103	1	426'-8"	445
7	Z100	50	15'-3"	1,567

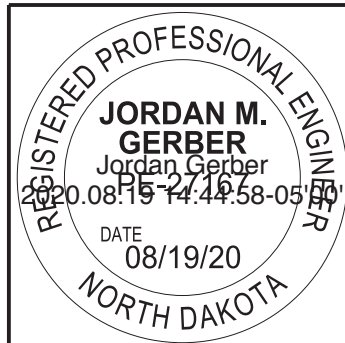
ESTIMATED MATERIAL QUANTITIES (PER SHAFT)	
REINFORCING STEEL (LBS)	CONCRETE (CY)
24,734	77.4



DESIGN STRENGTHS:

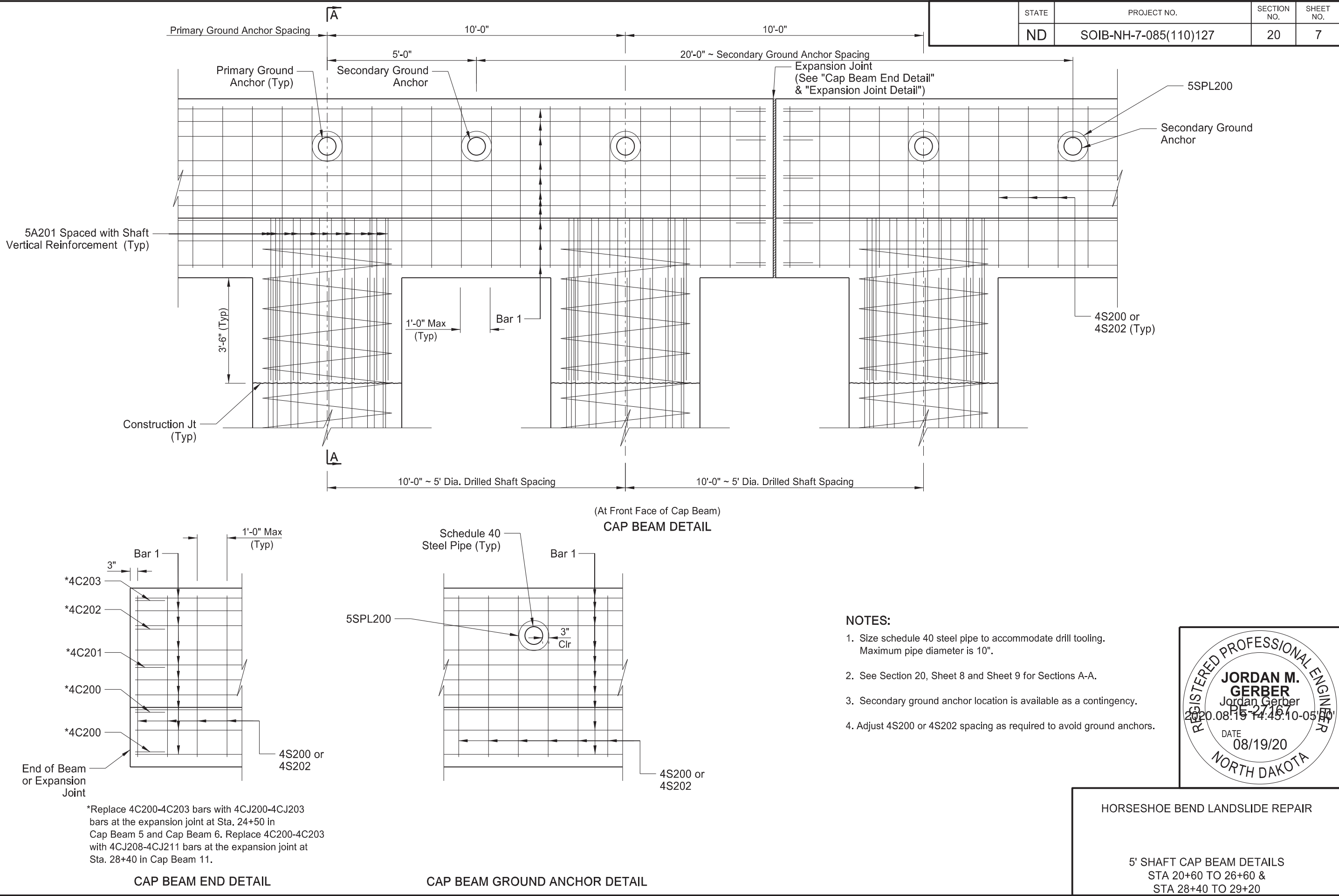
f'c = 5,000 psi ~ Class AAE-5 Concrete
fy = 60,000 psi ~ Reinforcing Steel

Load & Resistance Factor Design

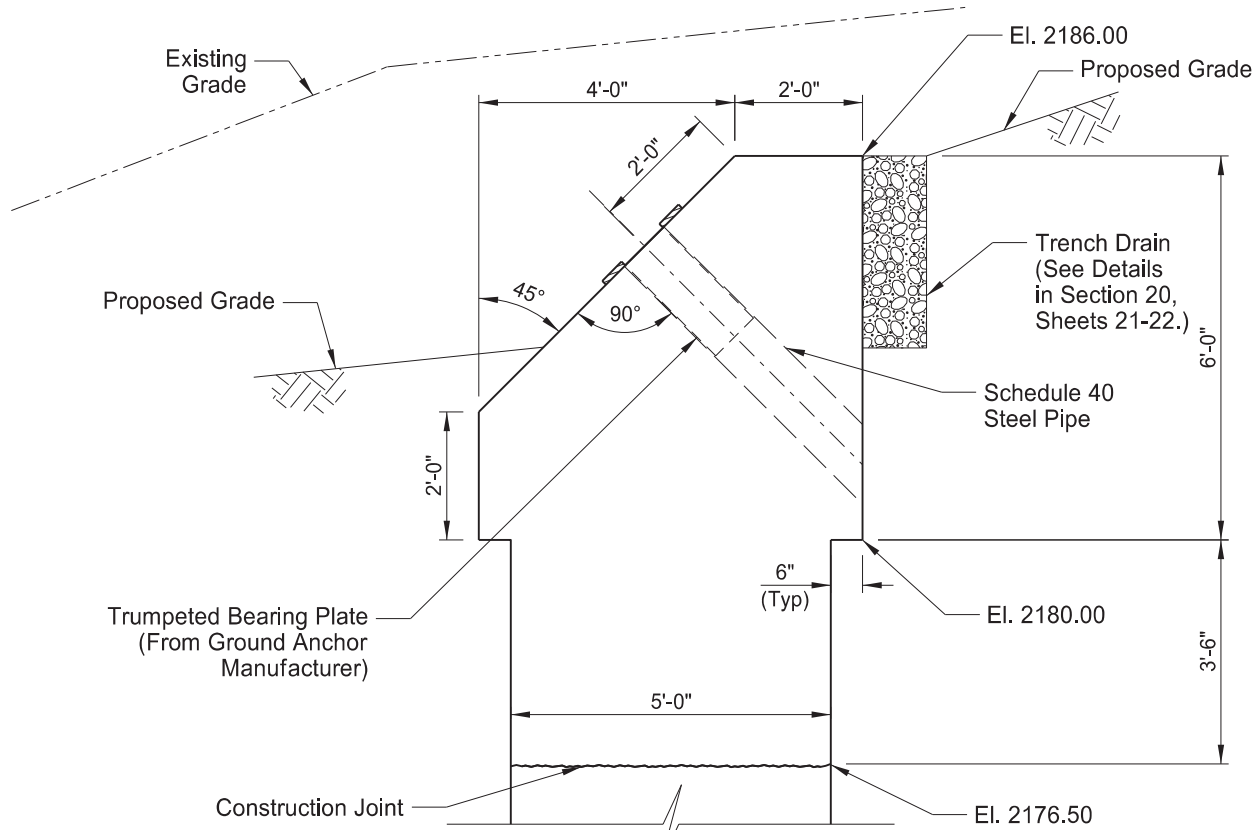


HORSESHOE BEND LANDSLIDE REPAIR

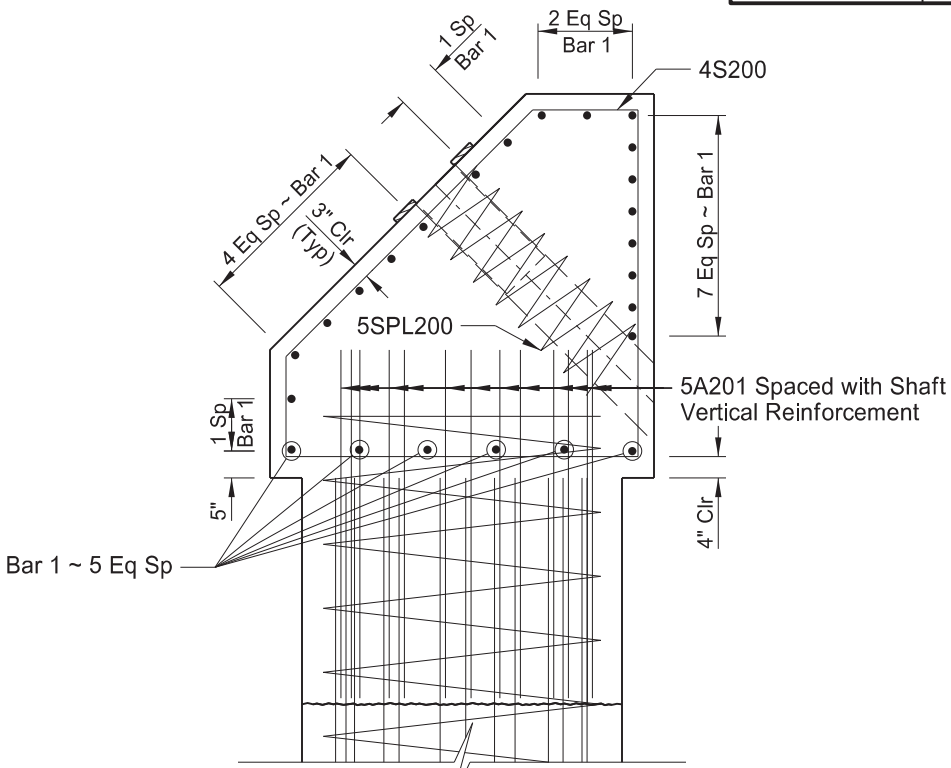
5FT DIAMETER DRILLED SHAFT DETAILS
STA 23+00 TO 26+60



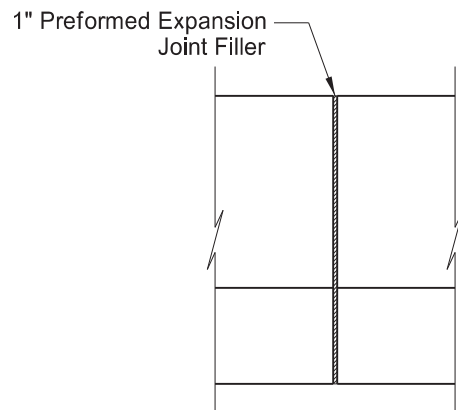
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	8



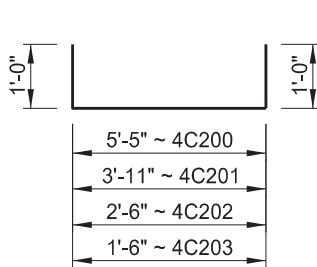
(SHOWING DIMENSIONS)
A-A



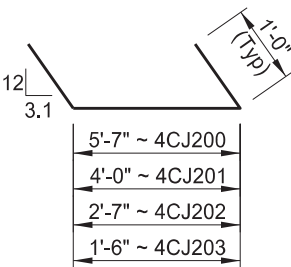
(SHOWING REINFORCING)
A-A



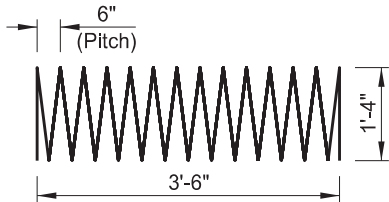
EXPANSION JOINT DETAIL



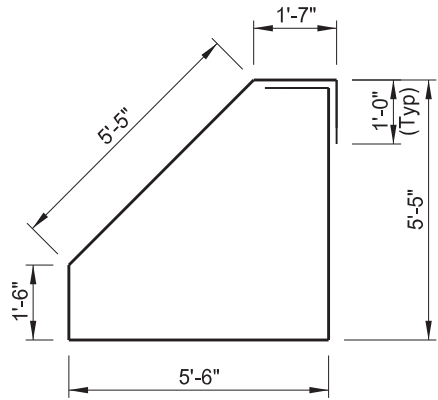
4C200 - 4C203



4CJ200 - 4CJ203

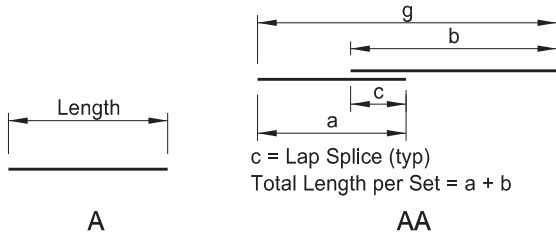


5SPL200



4S200

BAR LIST - 5' SHAFT CAP BEAM			
SIZE	MARK	NO.	LENGTH
6	A200	24	59'-6"
5	A201	837	5'-5"
5	A202	24	49'-6"
6	AA200	96	82'-7"
6	AA201	48	83'-4"
4	C200	28	7'-5"
4	C201	14	5'-11"
4	C202	14	4'-6"
4	C203	14	3'-6"
4	CJ200	4	7'-7"
4	CJ201	2	6'-0"
4	CJ202	2	4'-7"
4	CJ203	2	3'-6"
4	S200	598	21'-5"
5	SPL200	89	29'-6"



AA BARS DETAILING DIMENSIONS				
MARK	a	b	c	g
AA200	22'-7"	60'-0"	3'-1"	79'-6"
AA201	23'-4"	60'-0"	*3'-1"	**80'-3"

* Minimum splice length
** Total length will vary across the top, bottom and front face of Cap 5 and Cap 6 due to the skewed expansion joint at Sta 24+50

EXPANSION JOINT LOCATIONS	
21+20	24+50
22+00	25+30
22+80	26+10

5' SHAFT CAP BEAM REINFORCEMENT DETAILS							
CAP BEAM	BEGIN	END	CAP LENGTH	NO. OF 4S200 BARS	BAR 1 MARK	CONCRETE (CY)	REINFORCING STEEL (LBS)
1	20+60	21+20	60'-0"	61	6A200	77.5	3,774
2	21+20	22+00	80'-0"	81	6AA200	103.3	5,131
3	22+00	22+80	80'-0"	81	6AA200	103.3	5,131
4	22+80	23+60	80'-0"	81	6AA200	103.3	5,199
5	23+70	24+50	80'-0"	81	6AA201	103.3	5,249
6	24+50	25+30	80'-0"	81	6AA201	103.3	5,249
7	25+30	26+10	80'-0"	81	6AA200	103.3	5,221
8	26+10	26+60	50'-0"	51	6A202	64.6	3,222

SPEC	CODE	BID ITEM	QTY	UNIT
602	0130	CLASS AAE-3 CONCRETE	761.9	CY
612	0115	REINFORCING STEEL-GRADE 60	38,176	LBS

DESIGN STRENGTHS:
f'c = 4,000 psi ~ Class AAE-5 Concrete
fy = 60,000 psi ~ Reinforcing Steel
Load & Resistance Factor Design

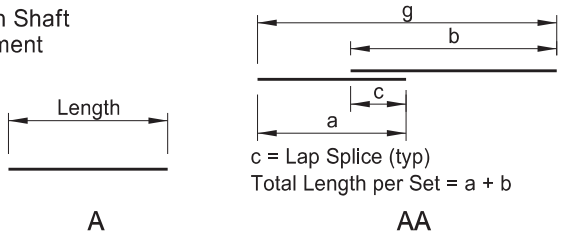
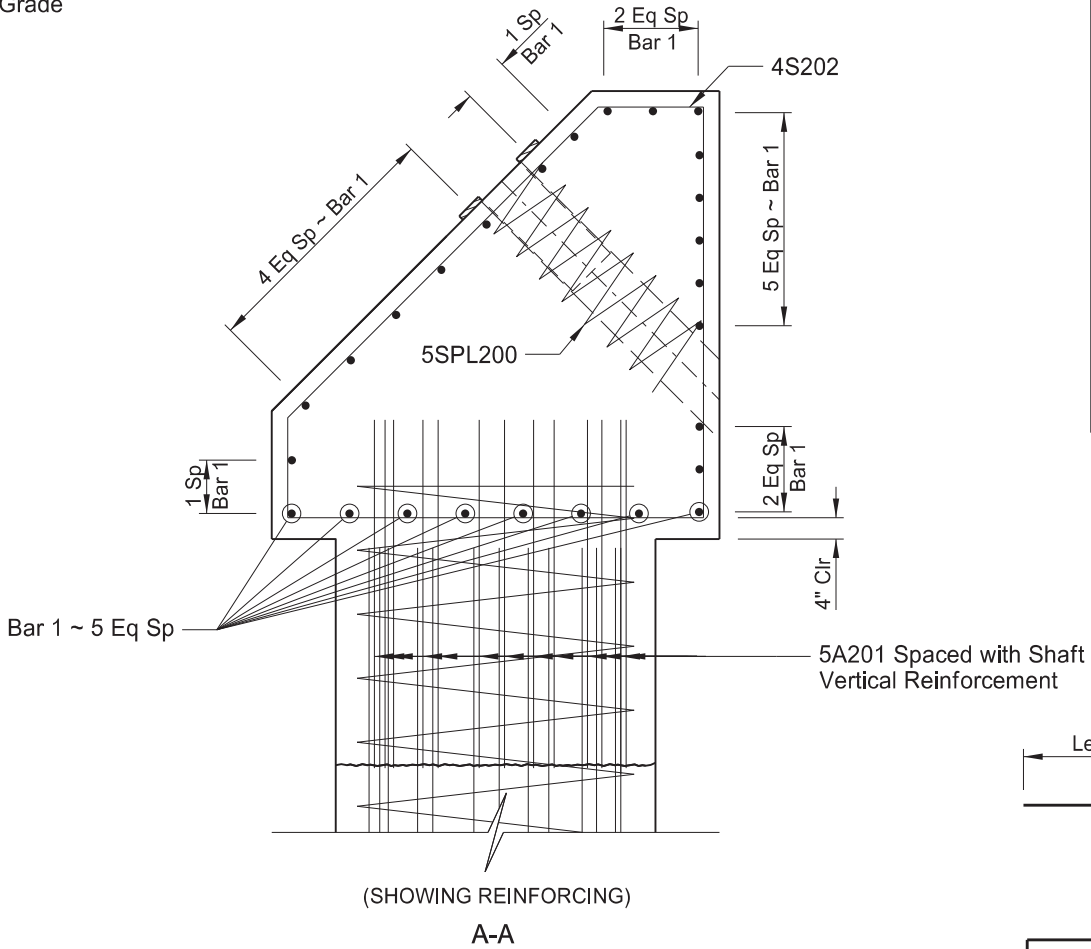
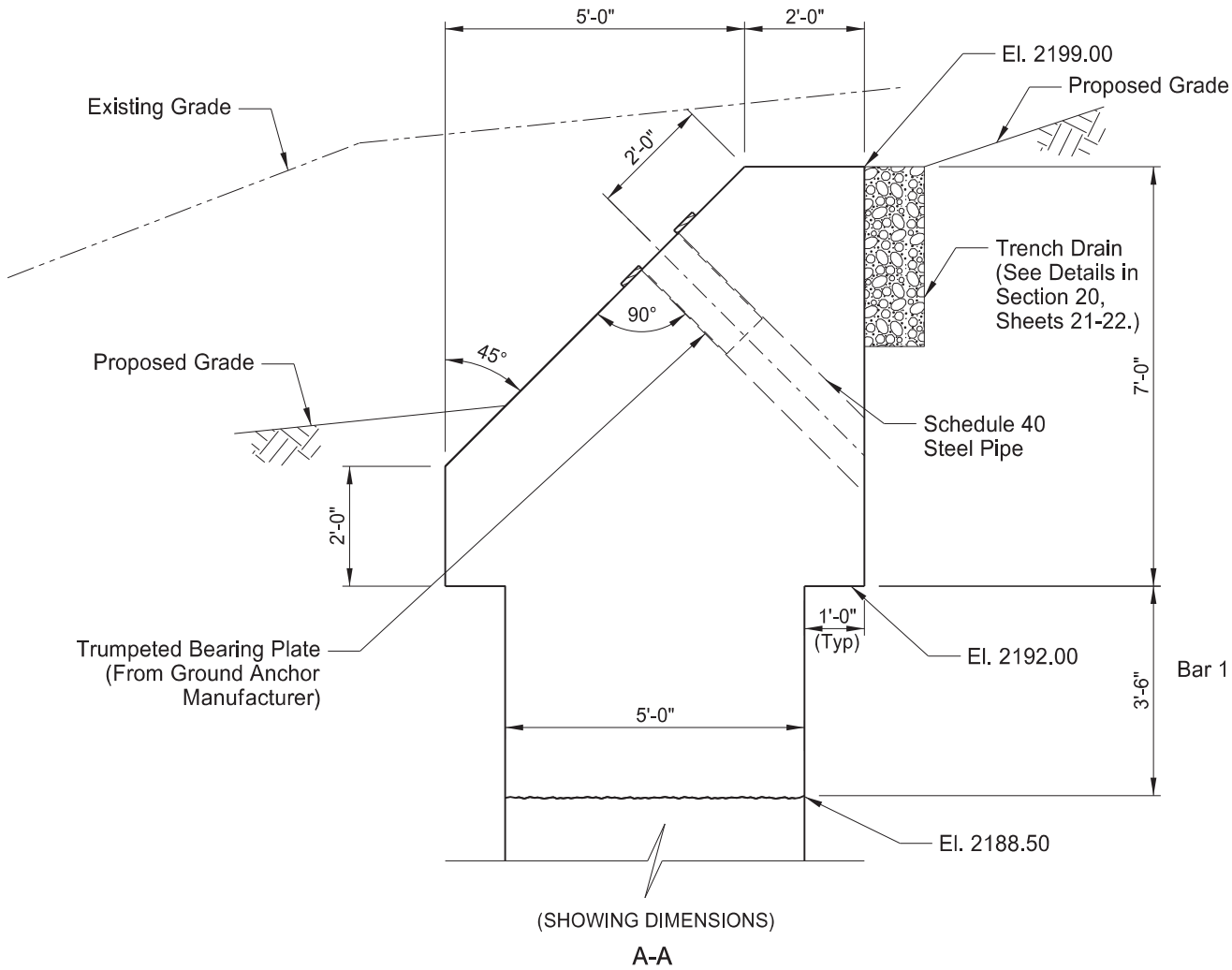


HORSESHOE BEND LANDSLIDE REPAIR

5' SHAFT CAP BEAM DETAILS
STA 20+60 TO 26+60

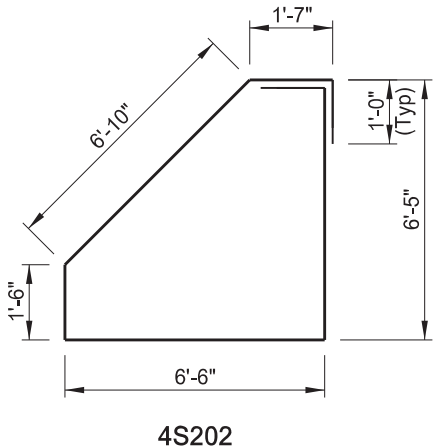
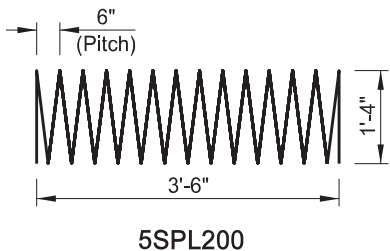
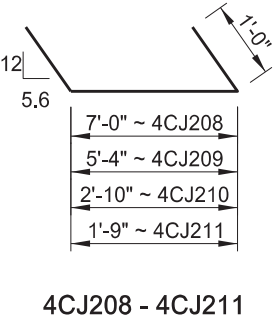
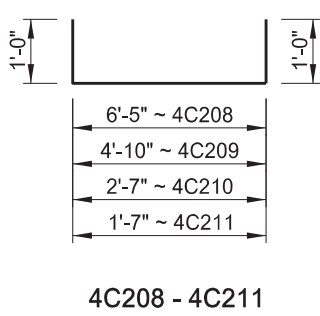
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	9

BAR LIST - 5' SHAFT CAP BEAM			
SIZE	MARK	NO.	LENGTH
5	A201	104	5'-5"
6	AA206	26	84'-1"
4	C208	2	8'-5"
4	C209	1	6'-10"
4	C210	1	4'-7"
4	C211	1	3'-7"
4	CJ208	2	9'-0"
4	CJ209	1	7'-4"
4	CJ210	1	4'-10"
4	CJ211	1	3'-9"
4	S202	81	24'-11"
5	SPL200	15	29'-6"



AA BARS DETAILING DIMENSIONS				
MARK	a	b	c	g
AA206	24'-1"	60'-0"	*3'-1"	**81'-0"

* Minimum splice length
** Total length will vary across the top, bottom and front face of Cap 11 due to the skewed expansion joint at Sta 28+40

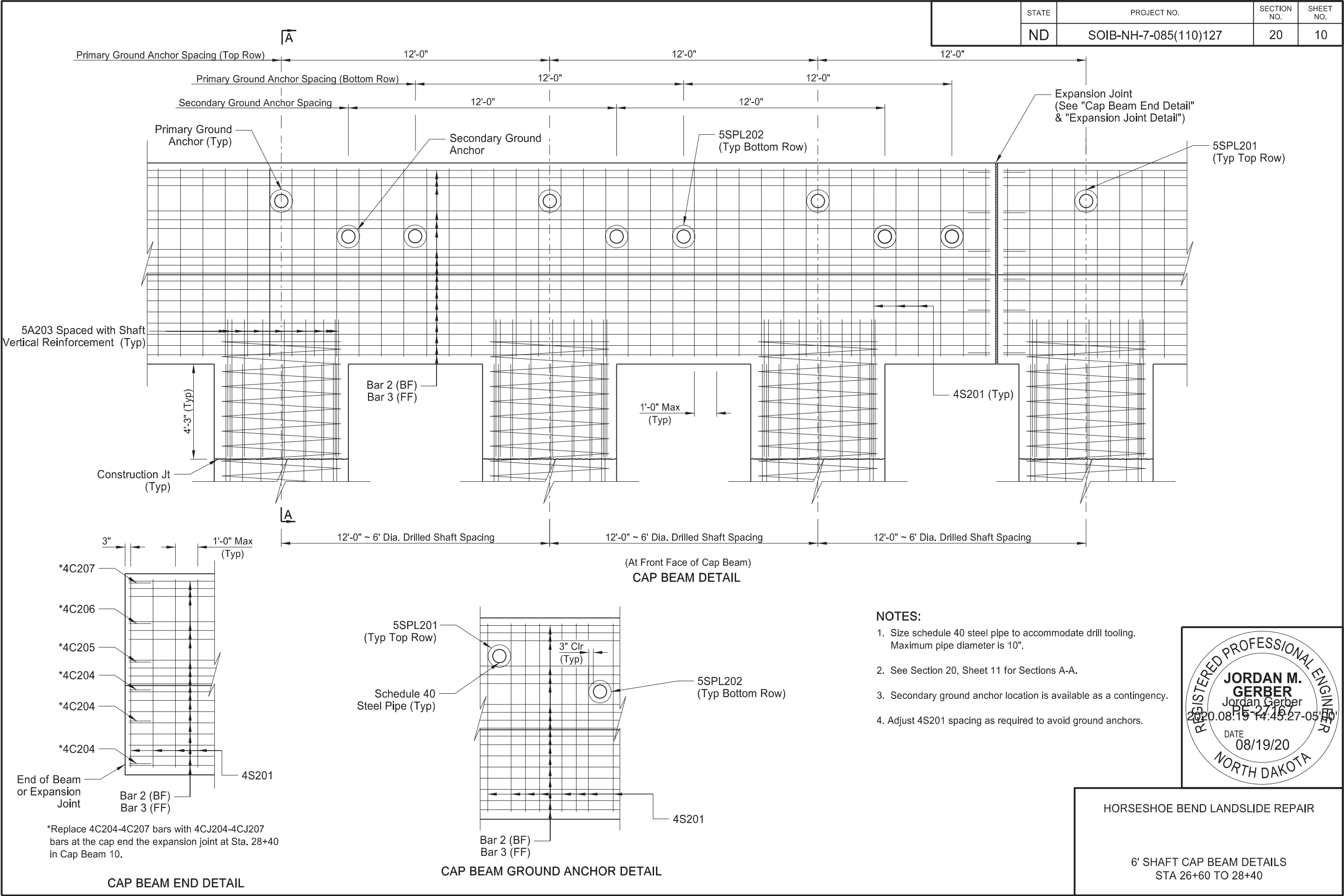


EXPANSION JOINT LOCATIONS	5' SHAFT CAP BEAM REINFORCEMENT DETAILS							
	CAP BEAM	BEGIN	END	CAP LENGTH	NO. OF 4S202 BARS	BAR 1 MARK	CONCRETE (CY)	REINFORCING STEEL (LBS)
28+40	11	28+40	29+20	80'-0"	81	6AA206	128.5	5,725

SPEC	CODE	BID ITEM	QTY	UNIT
602	0130	CLASS AAE-3 CONCRETE	128.5	CY
612	0115	REINFORCING STEEL-GRADE 60	5,725	LBS

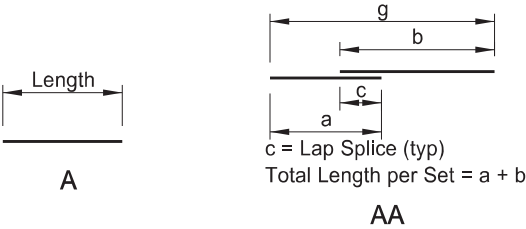
HORSESHOE BEND LANDSLIDE REPAIR

5' SHAFT CAP BEAM DETAILS
STA 28+40 TO 29+20



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	11

BAR LIST - 6' SHAFT CAP BEAM			
SIZE	MARK	NO.	LENGTH
5	A203	270	6'-2"
7	AA202	14	89'-1"
8	AA203	22	89'-7"
7	AA204	14	98'-7"
8	AA205	22	98'-3"
4	C204	9	8'-5"
4	C205	3	6'-10"
4	C206	3	5'-2"
4	C207	3	3'-3"
4	CJ204	3	9'-1"
4	CJ205	1	7'-4"
4	CJ206	1	5'-6"
4	CJ207	1	3'-4"
4	S201	182	28'-9"
5	SPL201	15	27'-5"
5	SPL202	29	44'-3"



AA BARS DETAILING DIMENSIONS				
MARK	a	b	c	g
AA202	29'-1"	60'-0"	3'-7"	85'-6"
AA203	29'-7"	60'-0"	4'-1"	85'-6"
AA204	38'-7"	60'-0"	*3'-7"	**95'-0"
AA205	38'-3"	60'-0"	*4'-1"	**94'-2"

* Minimum splice length
** Total length will vary across the top, bottom and front face of Cap 10 due to the skewed expansion joint at Sta 28+40



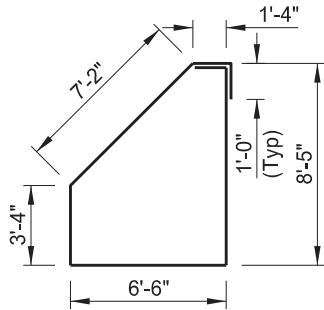
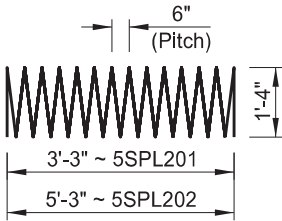
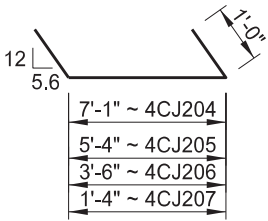
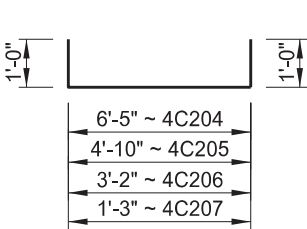
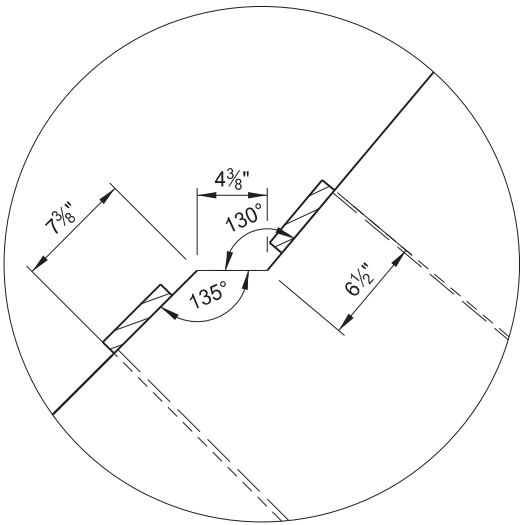
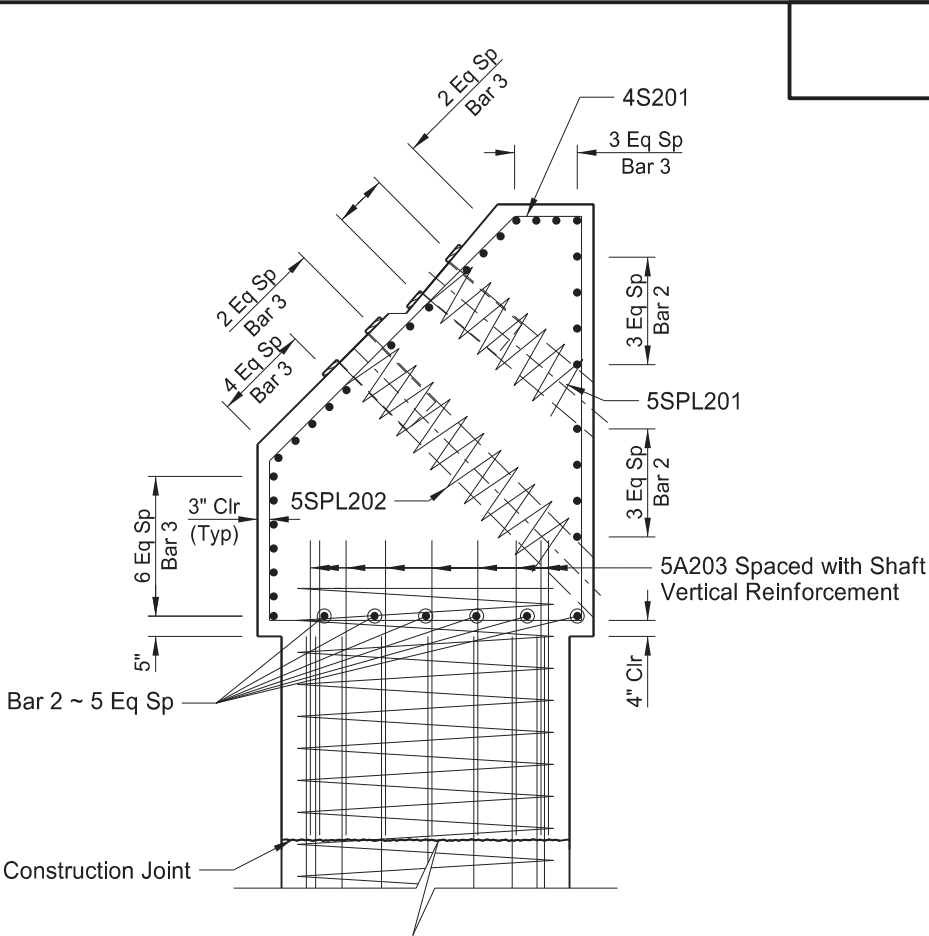
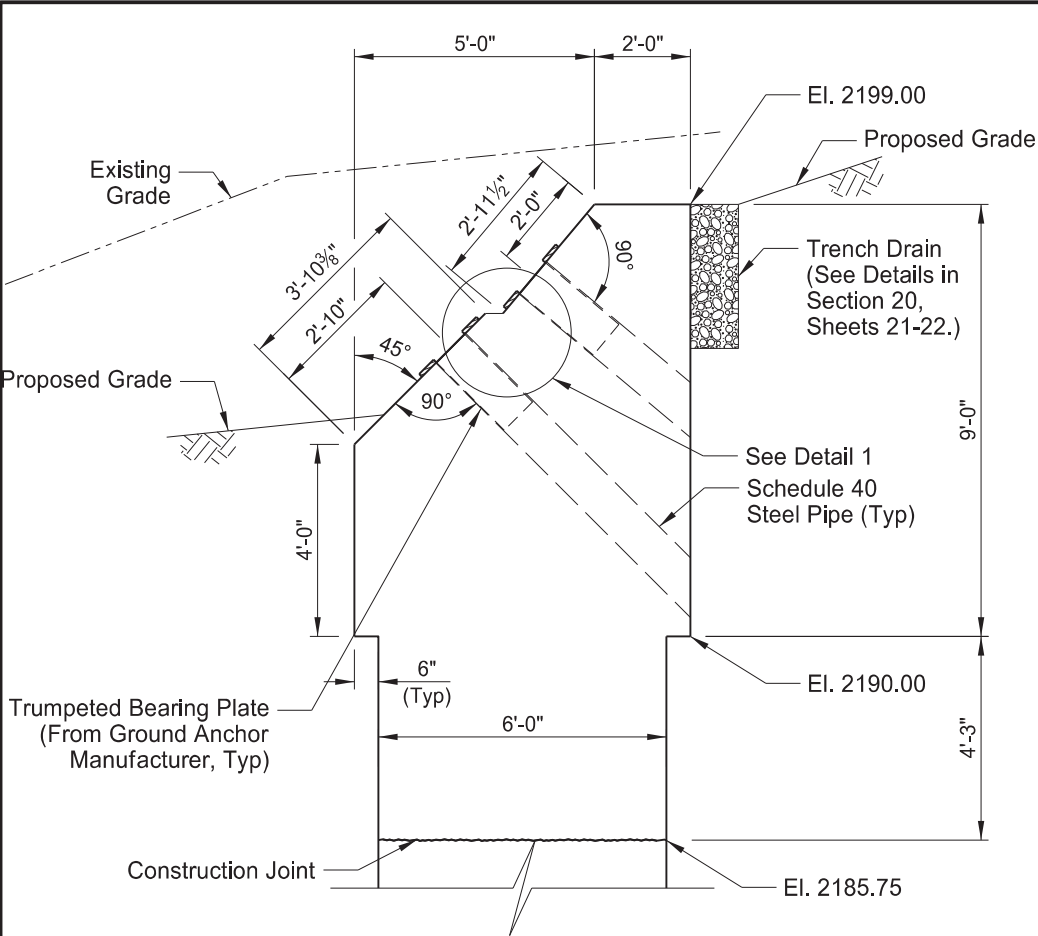
DESIGN STRENGTHS:

f'c = 4,000 psi ~ Class AAE-5 Concrete
fy = 60,000 psi ~ Reinforcing Steel

Load & Resistance Factor Design

HORSESHOE BEND LANDSLIDE REPAIR

6' SHAFT CAP BEAM DETAILS
STA 26+60 TO 28+40



6' SHAFT CAP BEAM REINFORCEMENT DETAILS

CAP BEAM	BEGIN	END	CAP LENGTH	NO. OF 4S201 BARS	BAR 2 MARK	BAR 3 MARK	CONCRETE (CY)	REINFORCING STEEL (LBS)
9	26+60	27+46	86'-0"	87	7AA202	8AA203	190.7	11,193
10	27+46	28+40	94'-0"	95	7AA204	8AA205	210.0	12,320

EXPANSION JOINT LOCATIONS	
27+46	28+40

SPEC	CODE	BID ITEM	QTY	UNIT
602	0130	CLASS AAE-3 CONCRETE	400.7	CY
612	0115	REINFORCING STEEL-GRADE 60	23,513	LBS

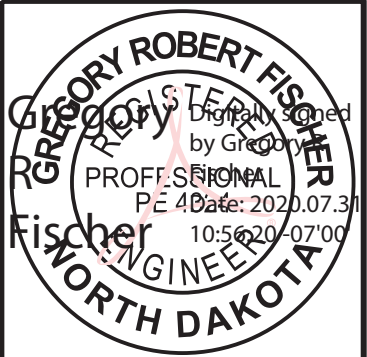
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	12

SPEC	CODE	BID ITEM	QTY	UNIT
930	4150	GROUND ANCHOR	15,455	LF
930	4155	SACRIFICIAL GROUND ANCHOR LOAD TEST	2	EA

GROUND ANCHOR DESIGN SUMMARY TABLE							
Design Section	From Sta.	To Sta.	Ground Anchor Inclination (deg)	Free Length (ft)	Bond Length (ft)	Factored Design Load (kips)	Lock-off Load (kips)
1	20+60	23+00	45	110	40	238	176
2	23+00	26+65	45	120	40	238	176
3	26+65	28+40	40 / 45	135 / 125	40	281	200
4	28+40	29+20	45	125	40	238	176

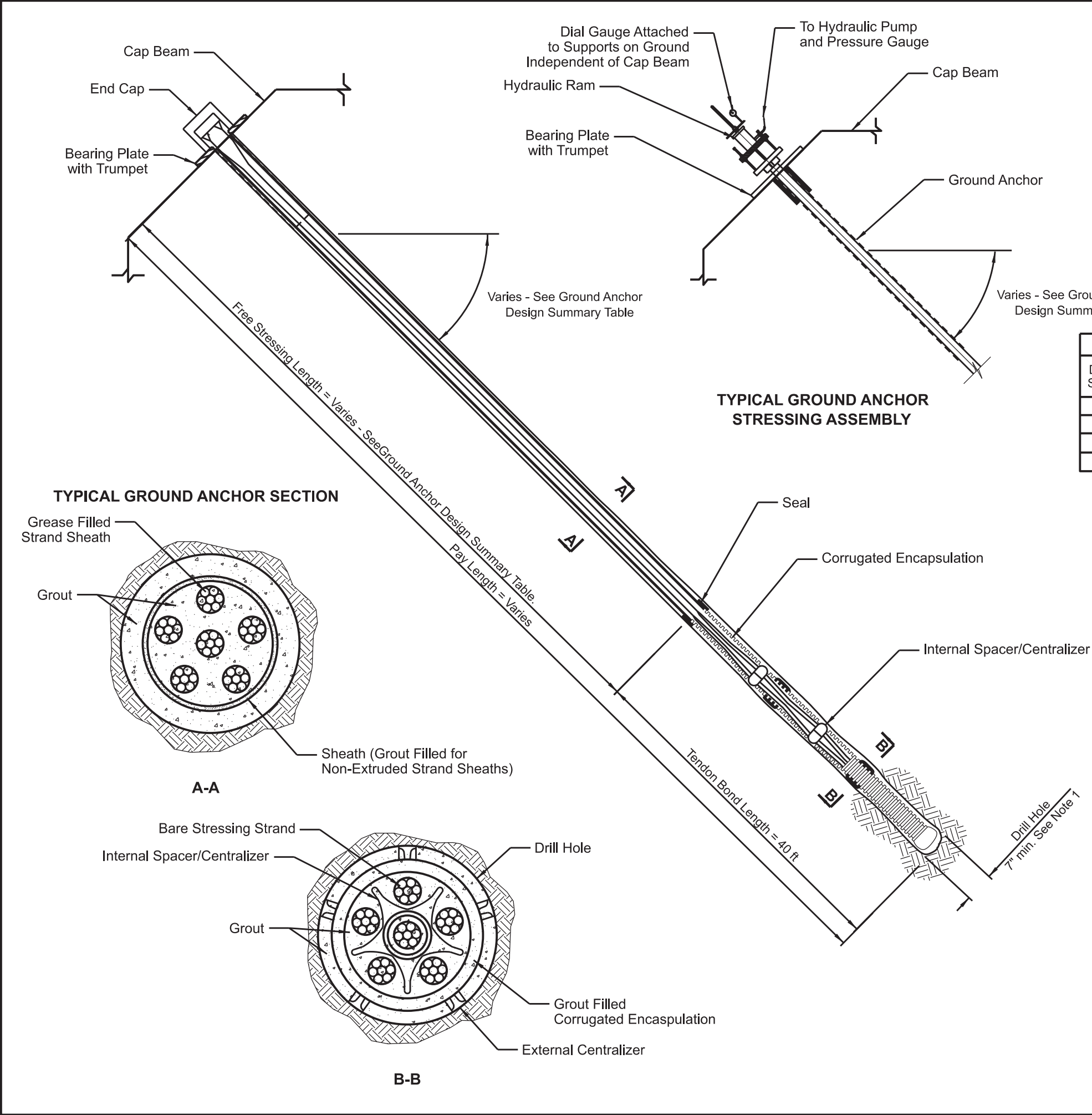
NOTES

1. Contractor to determine the drill hole diameter necessary to achieve the Factored Design Loads as indicated in Ground Anchor Design Summary Table while meeting grout cover requirements.
2. In Design Section 3, alternate inclination of adjacent anchors. Use Free Length of 135 ft for inclination of 40 deg (Pay Length = 175 ft) and Free Length of 125 ft for inclination of 45 deg (Pay Length = 165 ft).
3. Lock off anchors at lock-off loads indicated in Ground Anchor Design Summary Table.
4. Install ground anchor strain gauges in accordance with SP 4(20). See Section 20, Sheet 2 for ground anchors to receive instrumentation.



Ground Anchor Details

Horseshoe Bend Landslide

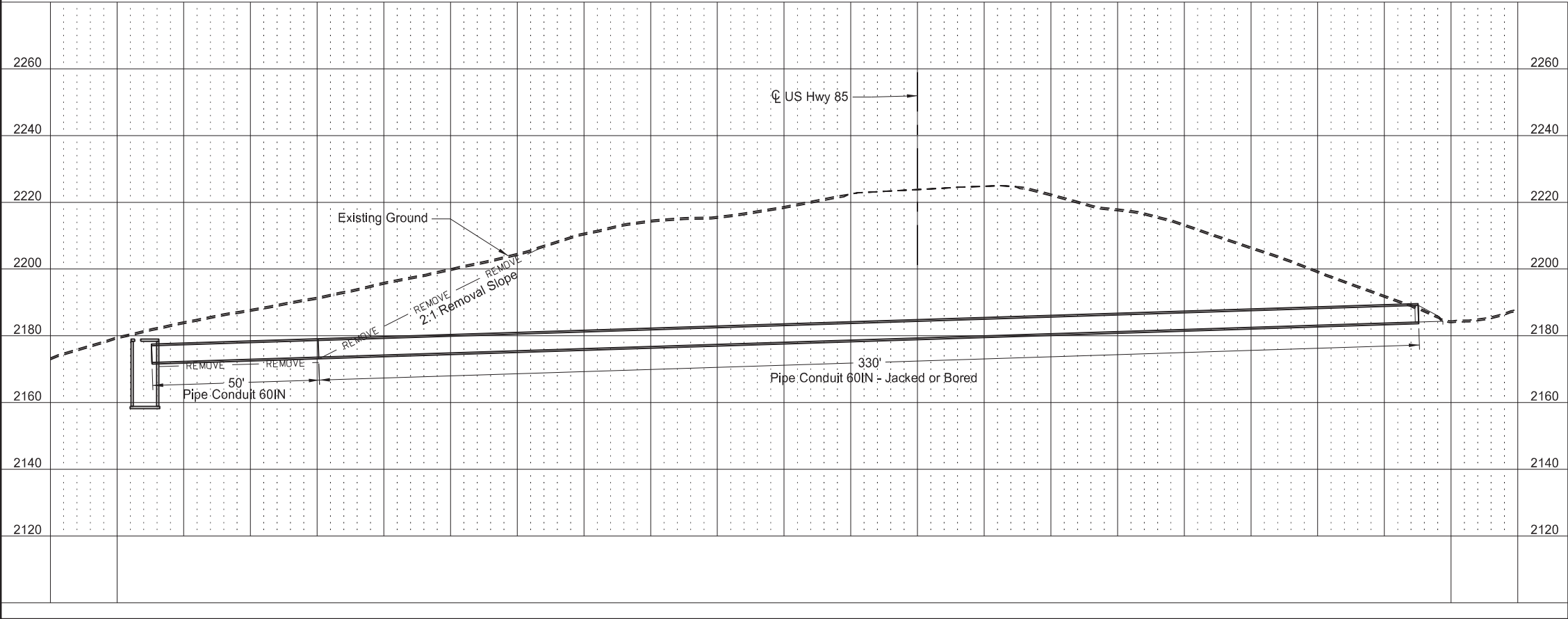
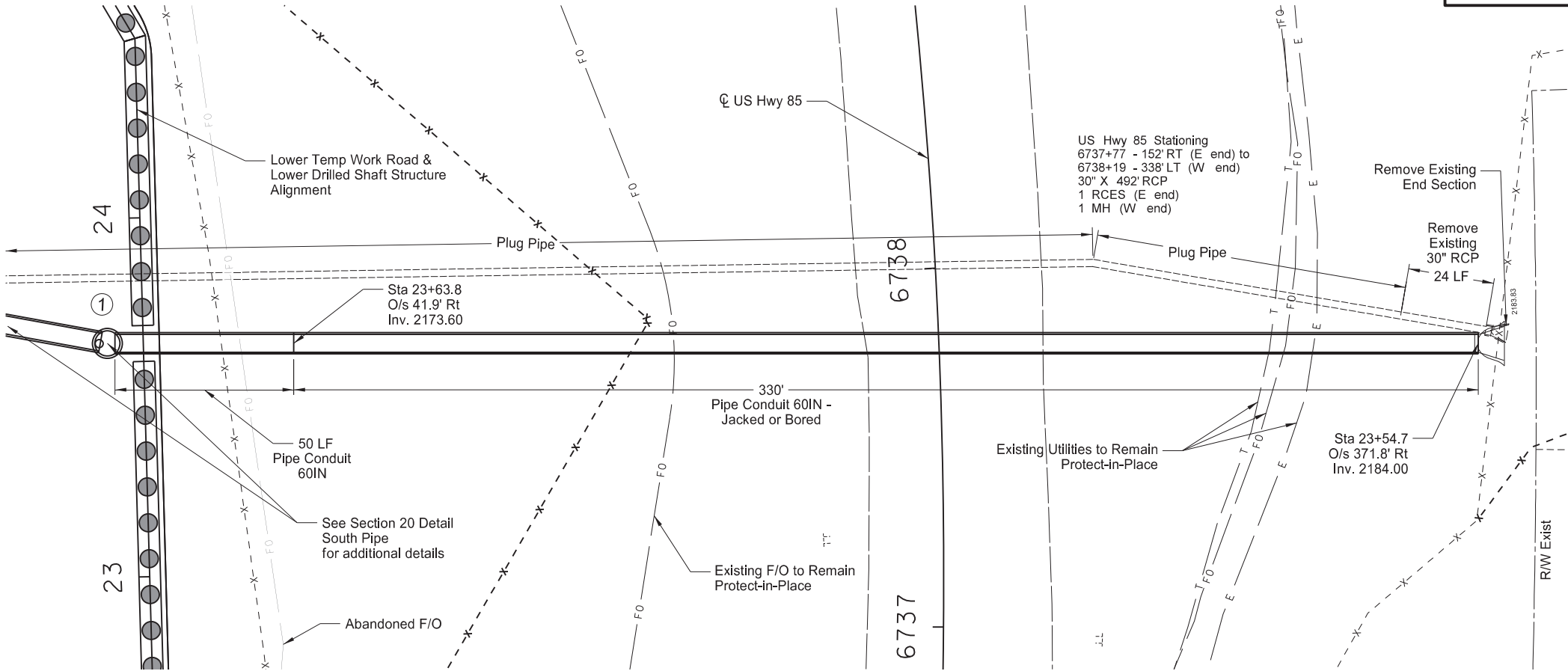


STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	20	14

SPEC CODE	BID ITEM	QTY	UNIT
202 0169	REMOVAL OF END SECTION - ALL TYPES & SIZES		
	Existing 30" RCP End Section - Rt of US 85	1	EA
202 0174	REMOVAL OF PIPE ALL TYPES & SIZES		
	Existing 30" RCP - Rt of US 85	24	LF
714 4135	PIPE CONDUIT 60IN		
	Sta 23+63.8 - 41.9' Rt to MH1	50	LF
714 4168	PIPE CONDUIT 60IN - JACKED OR BORED		
	Sta 23+54.7 - 371.8' Rt to 23+63.8 - 41.9' Rt	330	LF
714 9680	PLUG PIPE - ALL TYPES & SIZES		
	Existing 30" RCP	1	EA

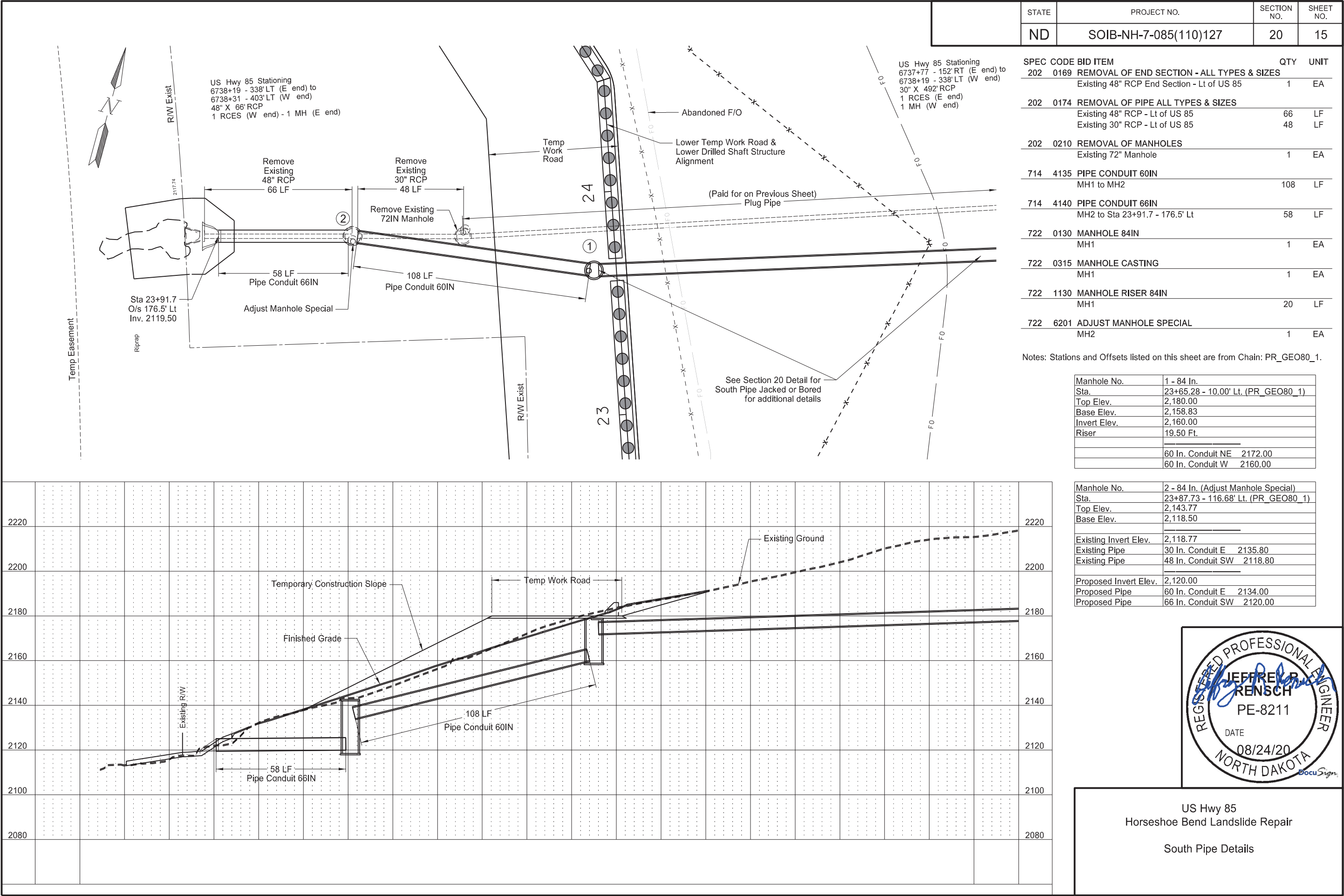
Notes: Payment for "Pipe Conduit 60IN - Jacked or Bored" includes End Section.

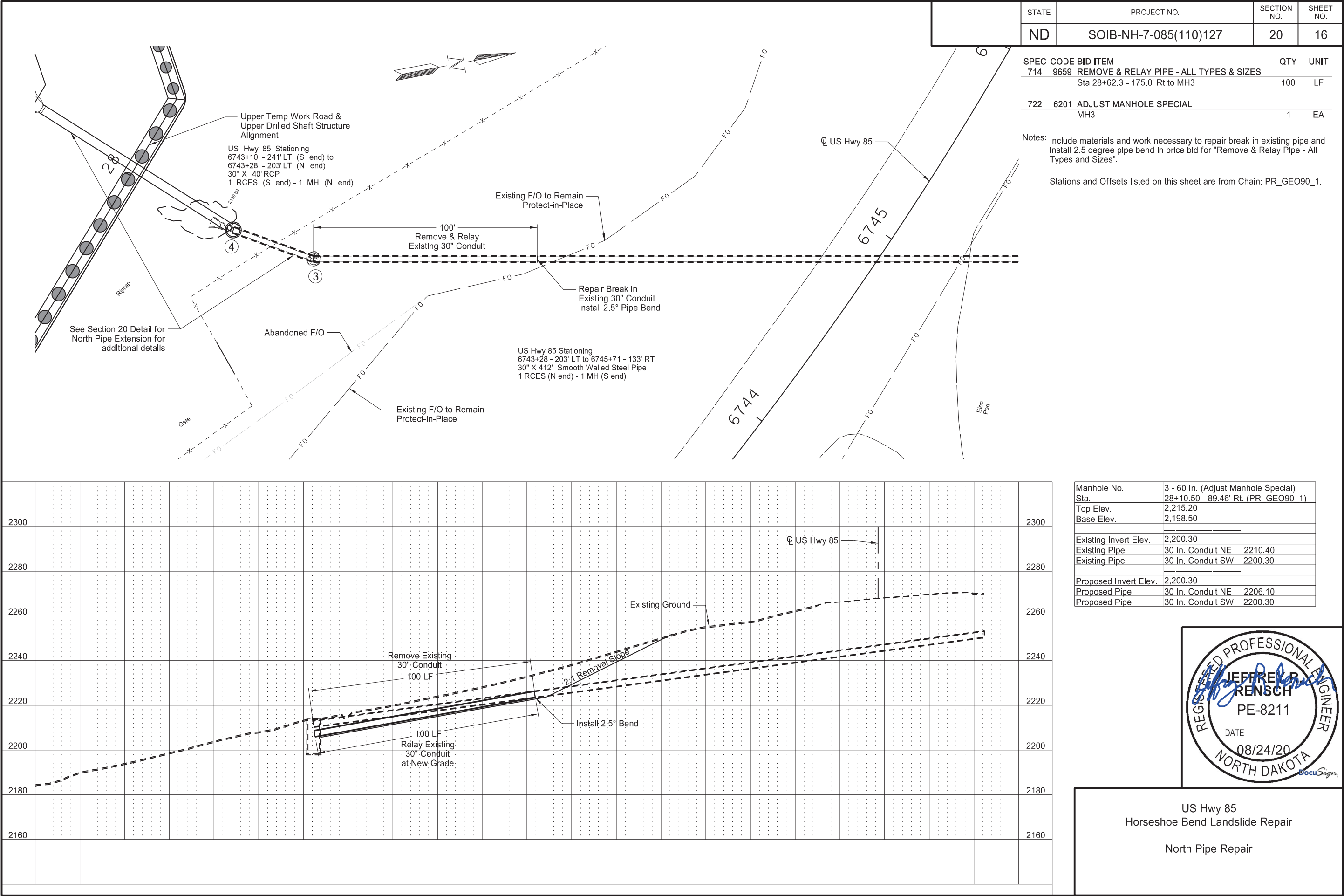
Stations and Offsets listed on this sheet are from Chain: PR_GEO80_1.



US Hwy 85
Horseshoe Bend Landslide Repair

South Pipe
Jacked or Bored Pipe Detail





US Hwy 85

Horseshoe Bend Landslide Repair

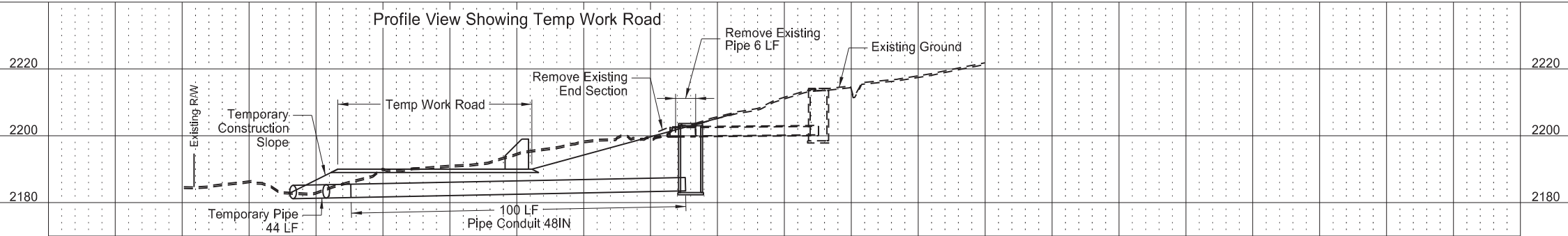
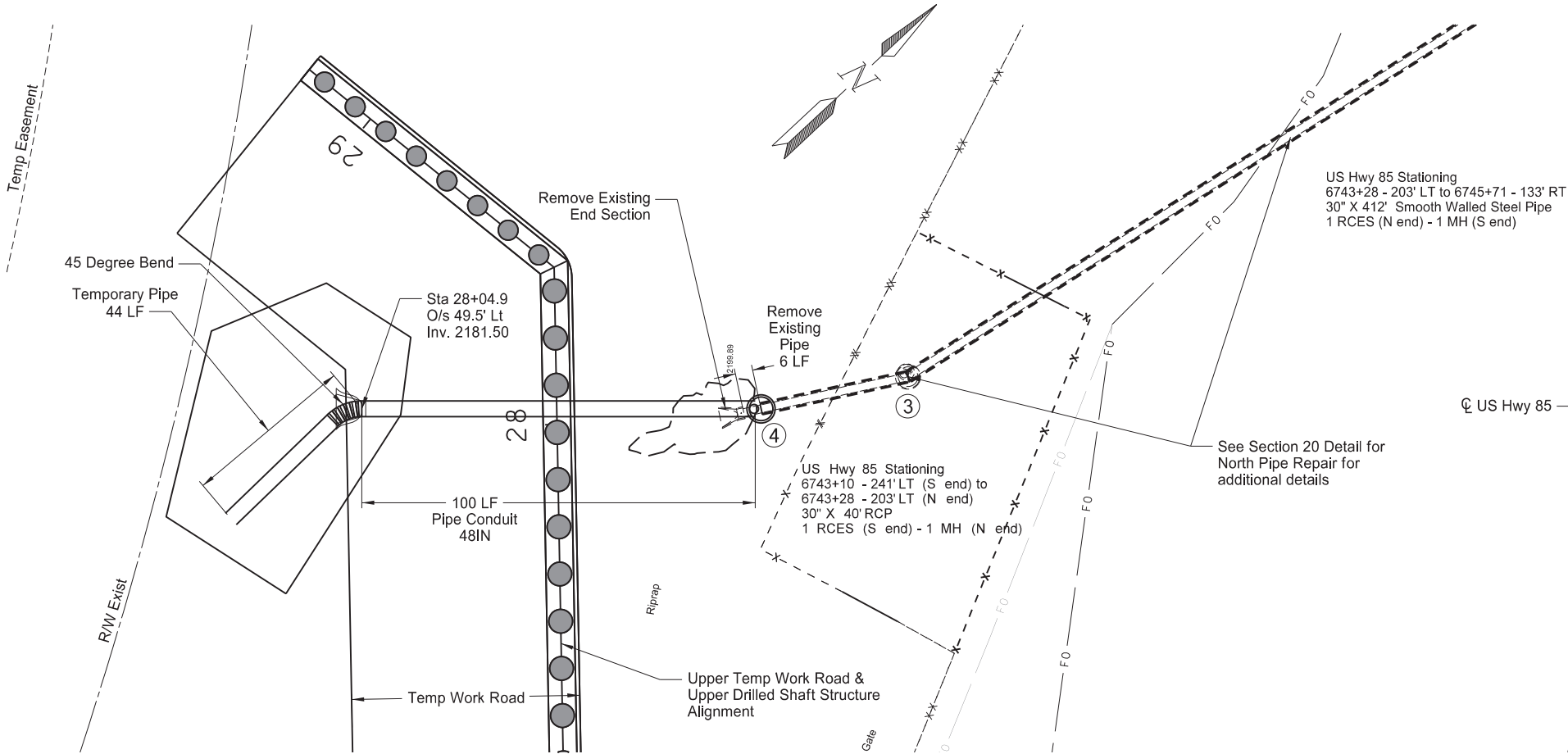
North Pipe Repair

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	20	17

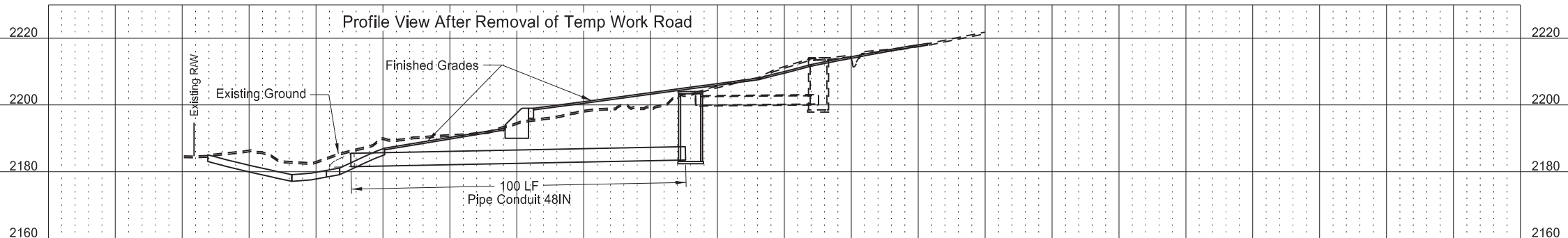
SPEC	CODE	BID ITEM	QTY	UNIT
202	0169	REMOVAL OF END SECTION - ALL TYPES & SIZES		
		Existing 30" RCP End Section	1	EA
202	0174	REMOVAL OF PIPE ALL TYPES & SIZES		
		Existing 30" RCP	6	LF
		Temporary 48" Pipe Conduit	44	LF
714	4125	PIPE CONDUIT 48IN		
		MH4 to Sta 28+04.9 - 49.5' Lt	100	LF
714	4128	PIPE CONDUIT 48IN - APPROACH		
		Temporary Pipe	44	EA
		Sta 28+04.9 - 49.5' Lt to 27+77.5 - 82' Lt		
722	0120	MANHOLE 72IN		
		MH4	1	EA
722	0315	MANHOLE CASTING		
		MH4	1	EA
722	1120	MANHOLE RISER 72IN		
		MH4	20	LF

Note: Include materials and work necessary to construct 45 degree pipe bend for temporary pipe in price bid for "Pipe Conduit 48IN - Approach".

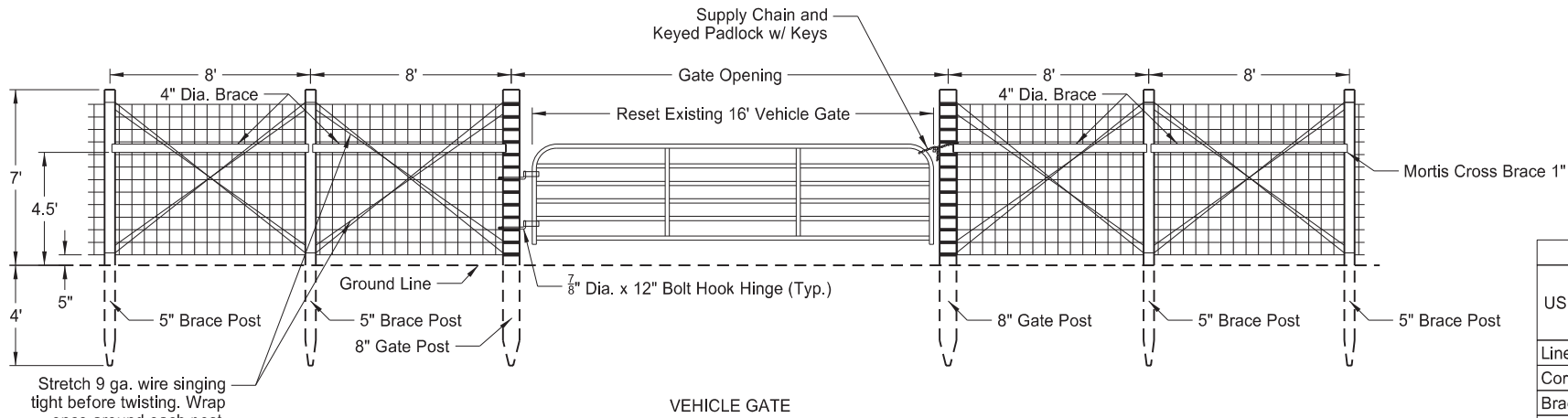
Stations and Offsets listed on this sheet are from Chain: PR_GEO90_1.



Manhole No.	4 - 72 In.
Sta.	28+03.03 - 51.96' Rt. (PR_GEO90_1)
Top Elev.	2,205.00
Base Elev.	2,183.08
Invert Elev.	2,183.50
Riser	20.25 Ft.
	30 In. Conduit NE 2200.00
	48 In. Conduit SW 2183.50

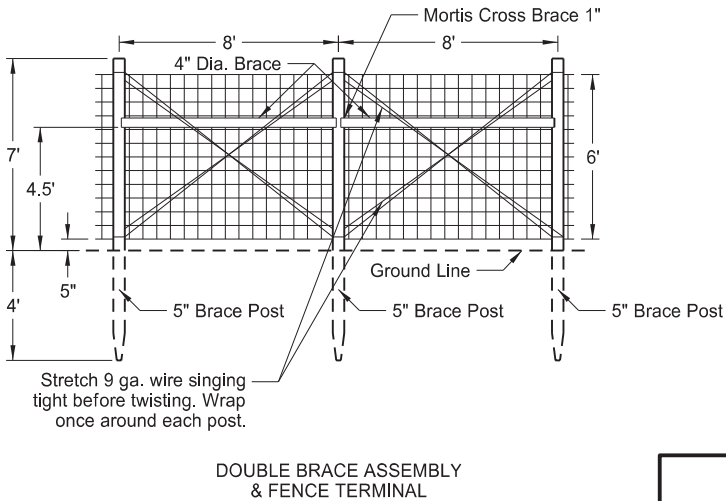
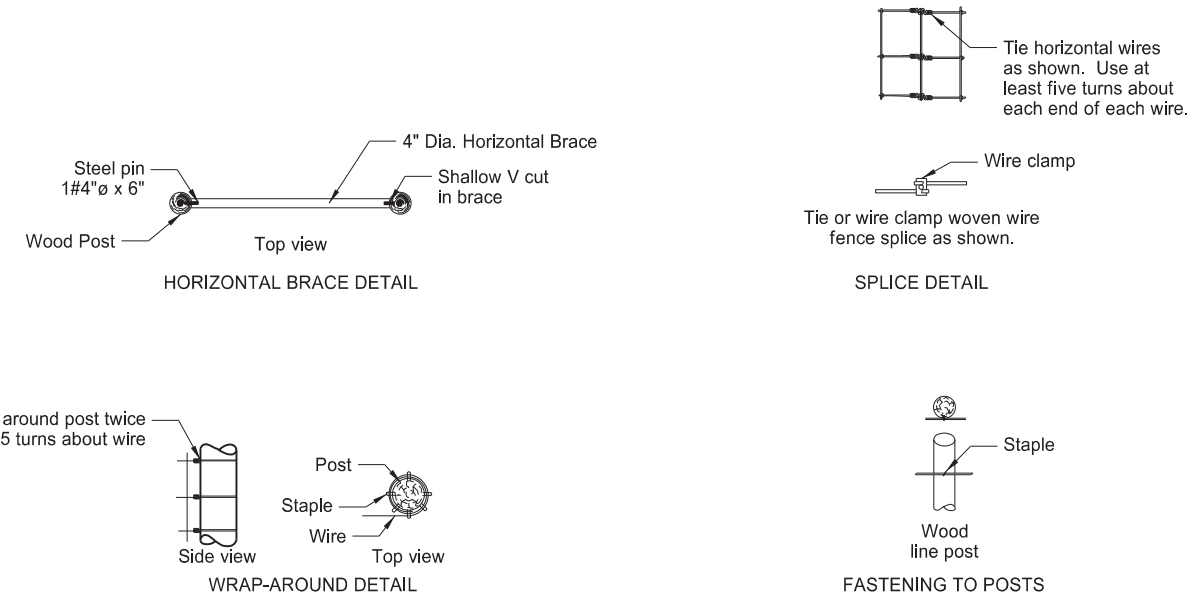
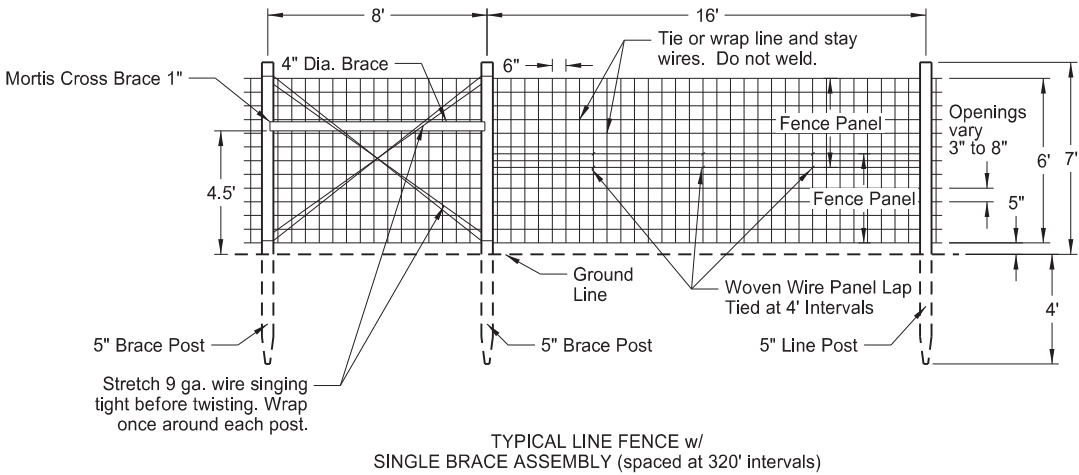
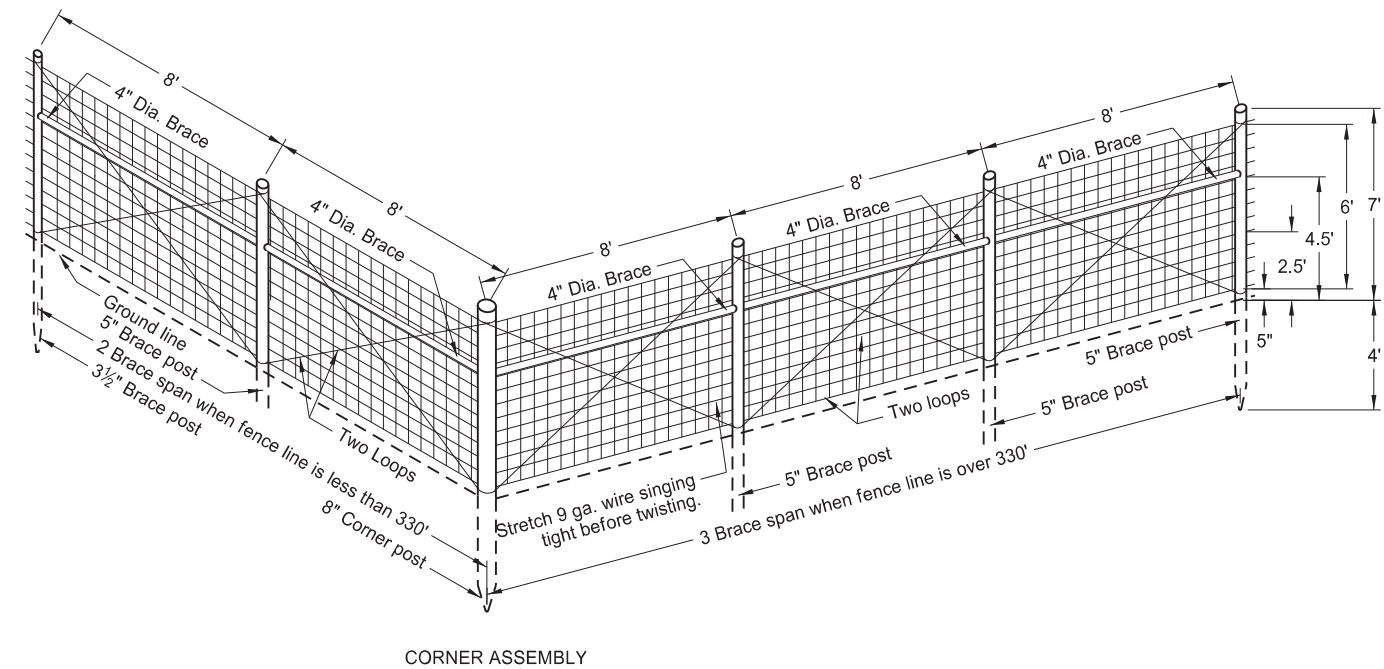


US Hwy 85
Horseshoe Bend Landslide Repair
North Pipe Extension



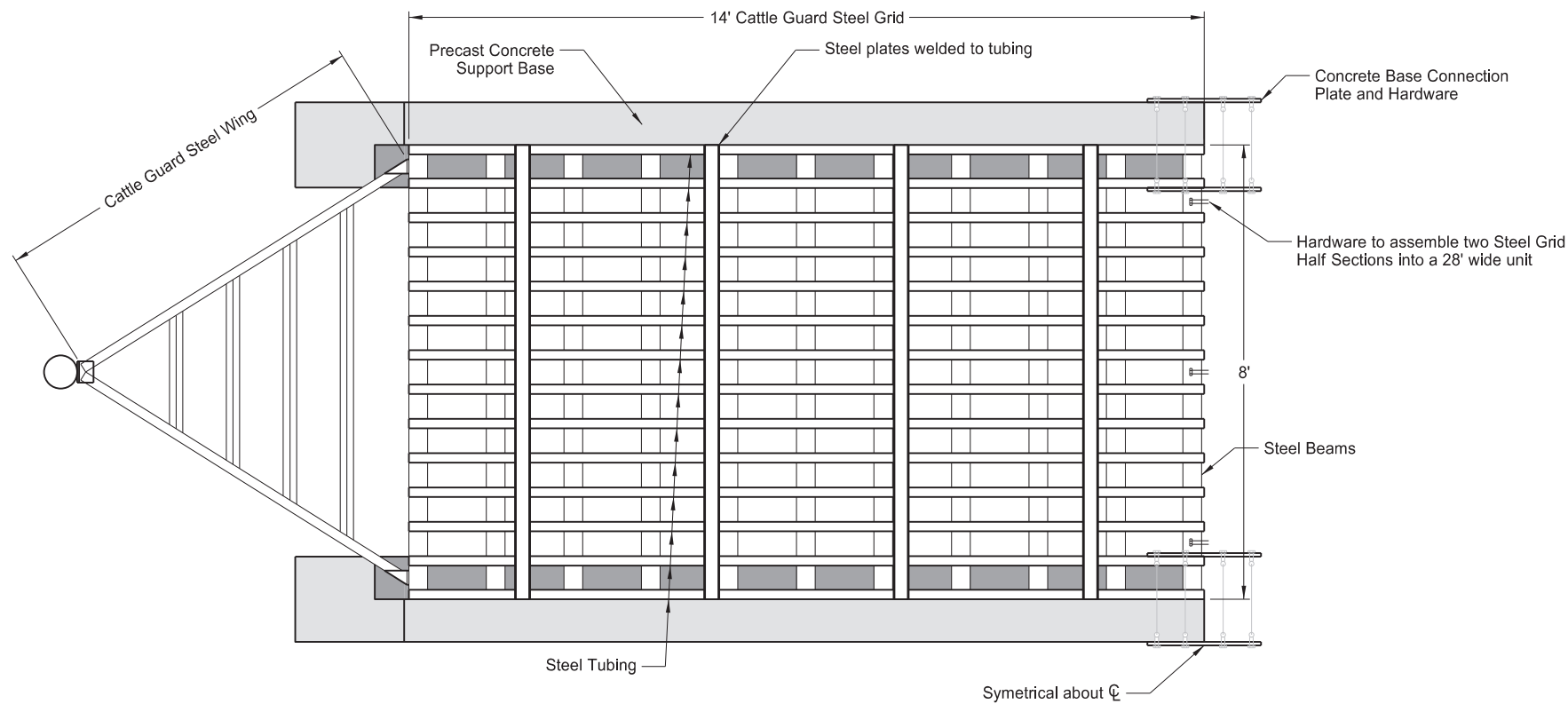
USE OF POST	Treated wood	
	Post dia.	Post length
Line post	5"	11'
Corner post	8"	11'
Brace post	5"	11'
Gate post	8"	11'

- NOTES
1. No deduction in measured pay length of woven wire fence for corner assemblies, single brace assemblies, double brace assemblies or fence terminals.
 2. Additional material and labor for each corner assembly, single brace, double brace, or fence terminal will be paid for at the bid price for that Assembly or Terminal.
 3. Install Assemblies or Terminals at locations shown on the plans or established by the Engineer.
 4. Staple the top wire of woven wire fence separately. Staple intermediate wires a maximum spacing of 10" apart. Staple bottom wire.
 5. If in the opinion of the Engineer the change in grade is so sharp that woven wire will not conform to the grade, install a double brace.

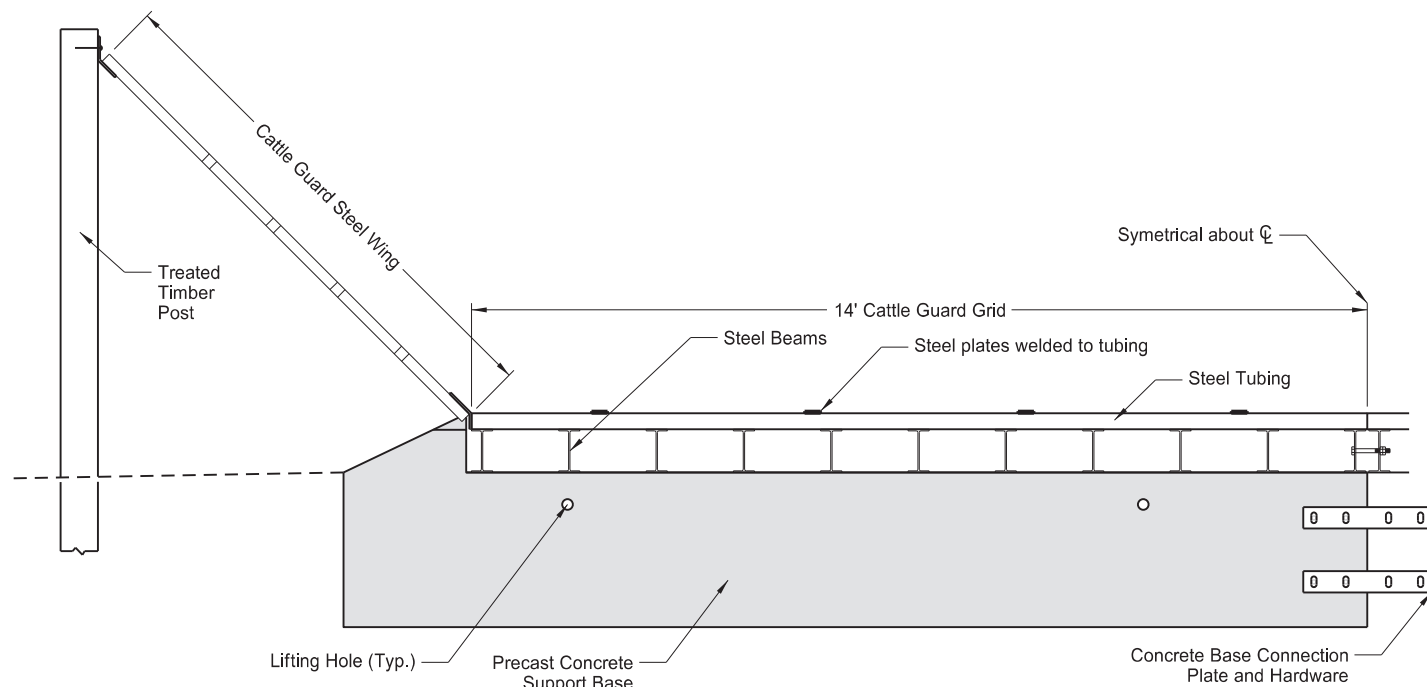


US Hwy 85
Horseshoe Bend Landslide Repair
Woven Wire Fence Details

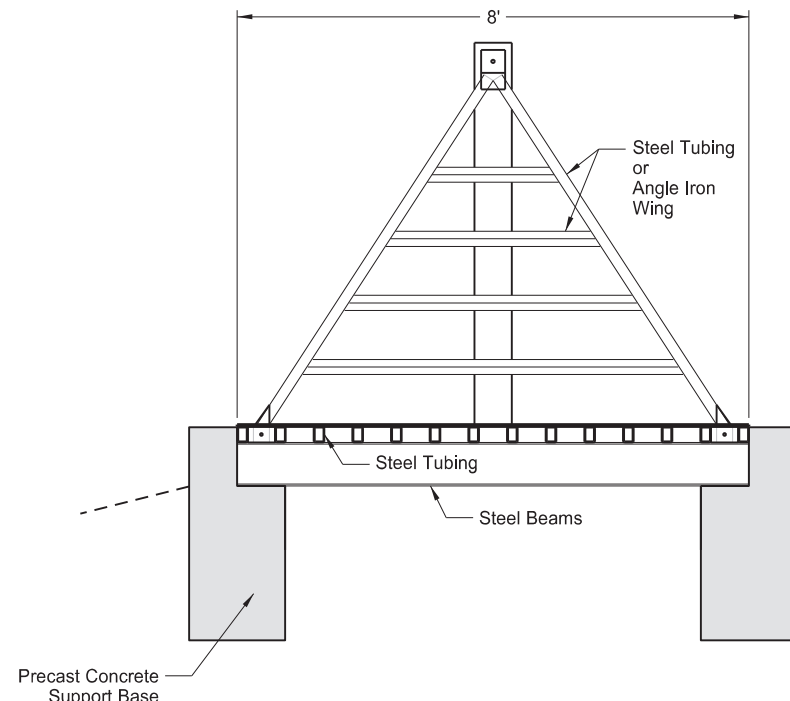
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	20	19



Plan View (Half Section)



Section View (Half Section)



End View

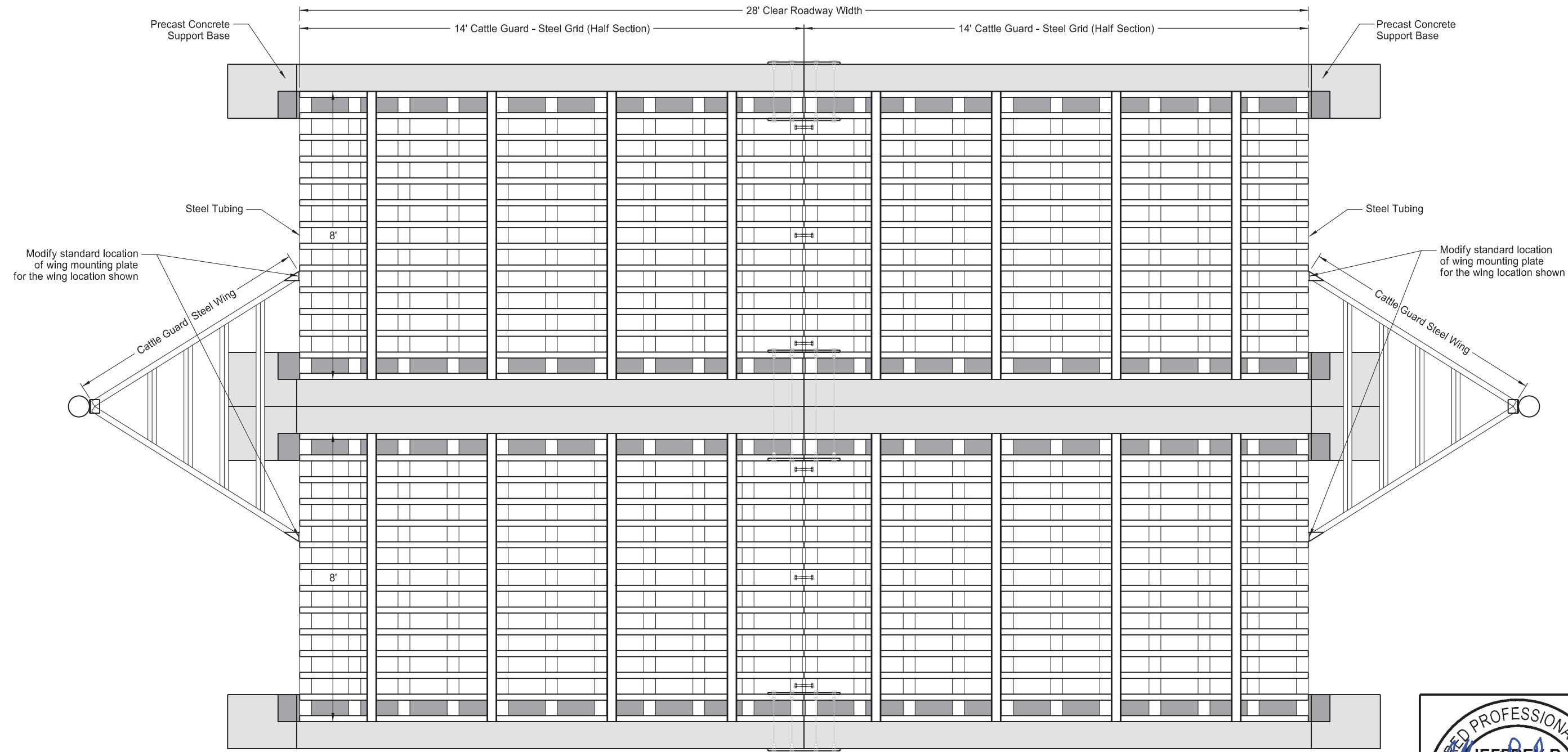
GENERAL NOTES:

1. Manufacture and install heavy duty cattle guard that meets Bureau of Land Management (BLM), US Forest Service (USFS) specifications or equal.
2. Prime and paint the cattle guard steel grid any shade of tan/brown color, or the cattle guard can remain unpainted.
3. Design, fabricate, and install precast concrete support bases to fit the supplied cattle guard steel grid. Chamfer exposed concrete edges.
4. Fabricate the cattle guard steel grid and precast concrete support bases in two (2) sections to meet the 28' clear roadway width.
5. Include all costs for labor, equipment and materials to supply and install cattle guards and bases at locations shown in the plans or as directed by the Engineer in the unit price bid for "CATTLE GUARD 8FT X 28FT".



US Hwy 85
Horseshoe Bend Landslide Repair
Std. Cattle Guard Detail
8' x 28' Clear Roadway Width

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	20



Plan View

NOTES:

1. Assemble two Std Cattle Guard units (8' x 28') back-to-back to contain bison within the Theodore Roosevelt National Park (TRNP).
2. Install the temporary cattle guard units at the location shown in Sec 80 Fencing Layout - Phase 1.
3. The two Std Cattle Guard units assembled back-to-back to be paid for as "CATTLE GUARD 8FT X 28 FT" - 2 EA
4. Remove temporary cattle guard after completion of the pipe, drilled shafts, cap beam, ground anchors, temp access/work road removal, and earthwork. The removed cattle guard to remain property of the Contractor. Include all work to remove the temporary cattle guard and concrete bases in the unit price bid for "REMOVE CATTLE GUARD" - 2 EA.
5. Install woven wire fence and reset vehicle gate at the location where the cattle guard was removed as shown in Sec 80 Fencing Layout - Phase 2.



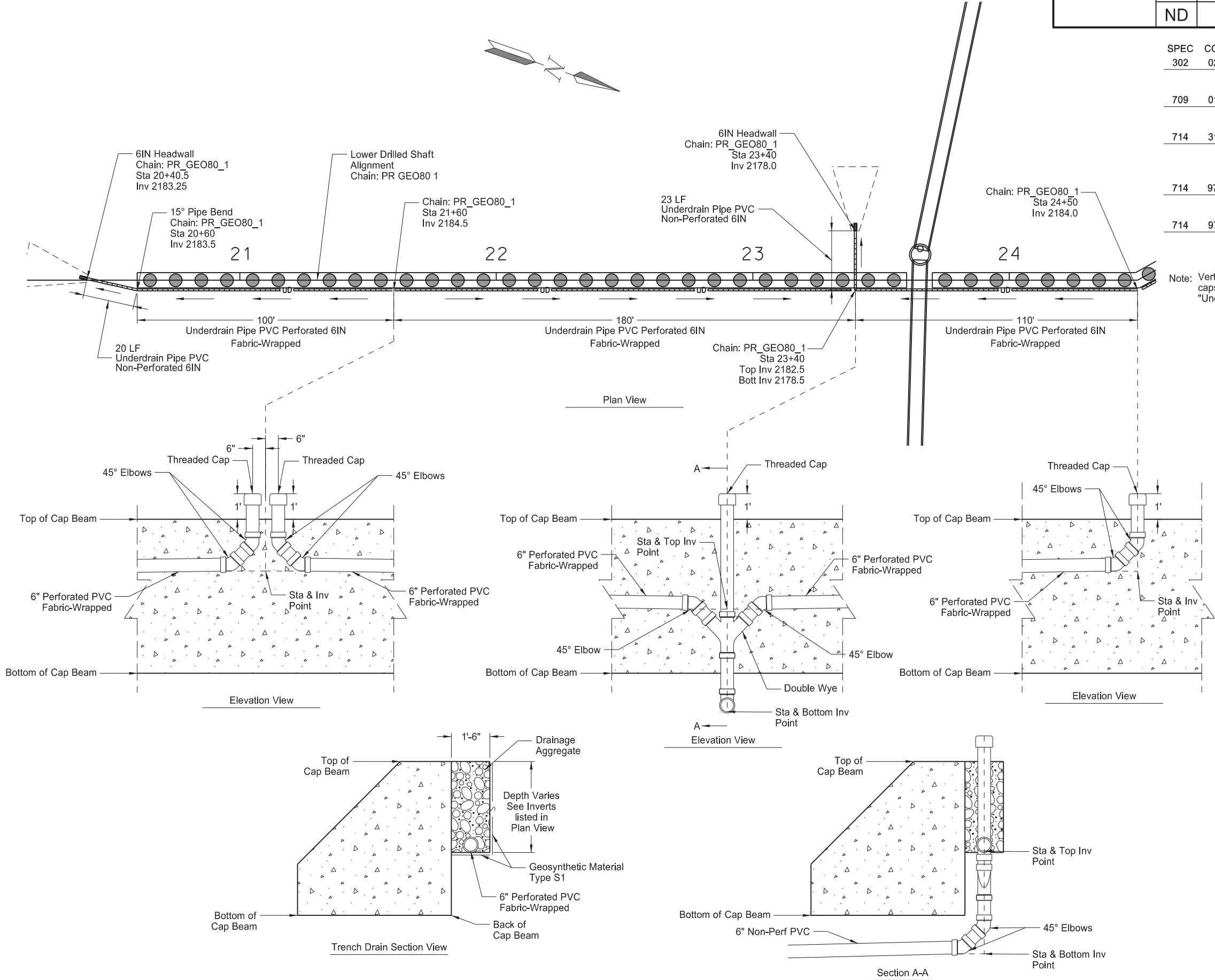
US Hwy 85
Horseshoe Bend Landslide Repair

Std. Cattle Guard to be used for Bison
(2 Units assembled back-to-back)

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	20	21

SPEC	CODE	BID ITEM	QTY	UNIT
302	0251	DRAINAGE AGGREGATE		
		PR_GEO80_1 Sta 20+60 to 24+50	55	CY
709	0161	GEOSYNTHETIC MATERIAL TYPE S1		
		PR_GEO80_1 Sta 20+60 to 24+50	172	SY
714	3151	HEADWALL - PRECAST CONCRETE 6IN		
		PR_GEO80_1 Sta 20+40.5	1	EA
		PR_GEO80_1 Sta 23+40	1	EA
714	9730	UNDERDRAIN PIPE PVC PERFORATED 6IN		
		PR_GEO80_1 Sta 20+60 to 24+50	390	LF
714	9771	UNDERDRAIN PIPE PVC NON-PERFORATED 6IN		
		PR_GEO80_1 Sta 20+40.5 to 20+60	20	LF
		PR_GEO80_1 Sta 23+40	23	LF

Note: Vertical lengths of non-perforated pipe, pipe bends, fittings and threaded caps have not been measured for payment. Include in price bid for "Underdrain Pipe PVC Non-Perforated 6IN".

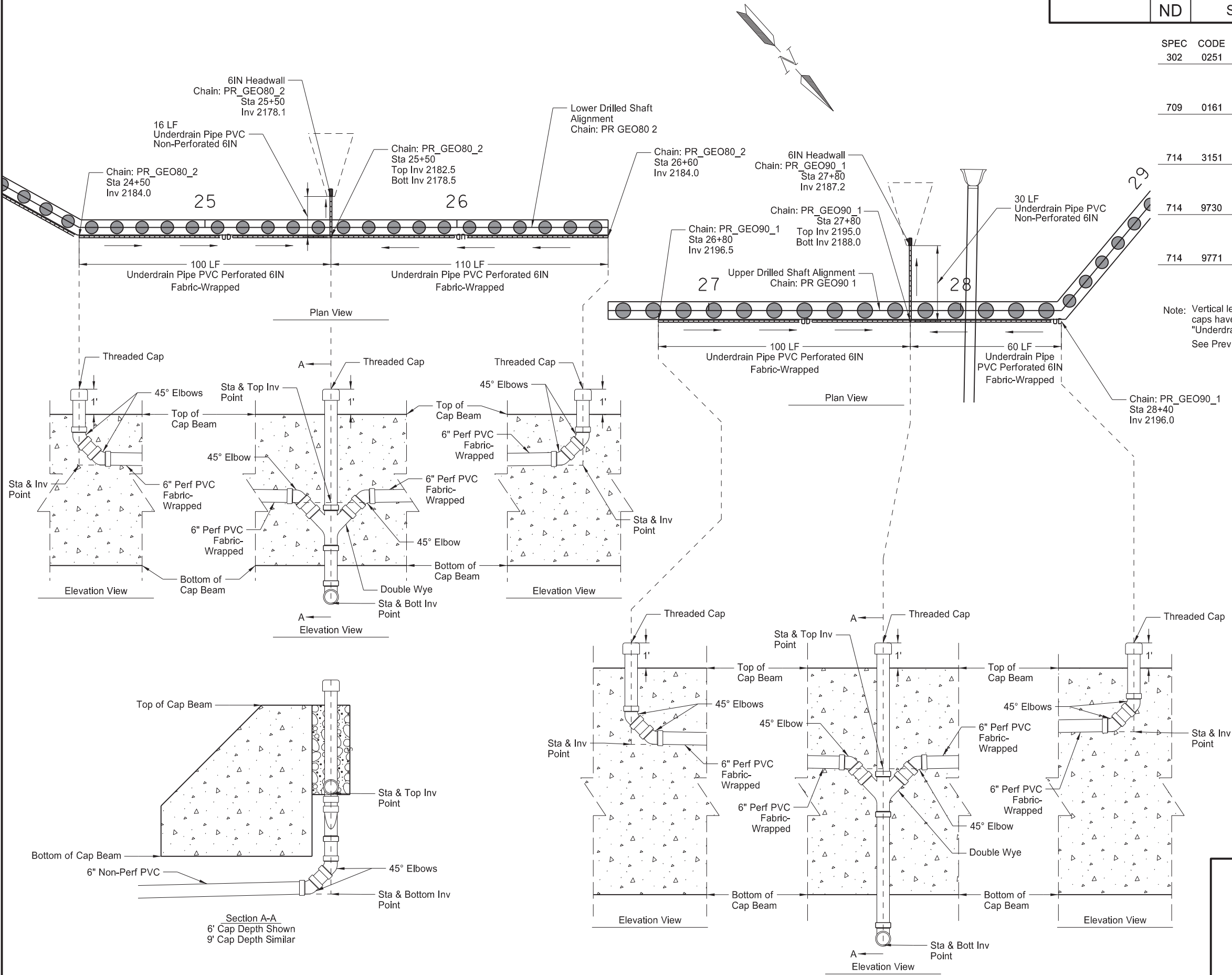


US Hwy 85
Horseshoe Bend Landslide Repair
Trench Drain Details

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	20	22

SPEC	CODE	BID ITEM	QTY	UNIT
302	0251	DRAINAGE AGGREGATE		
		PR_GEO80_2 Sta 24+50 to 26+60	32	CY
		PR_GEO90_1 Sta 26+80 to 28+40	30	CY
709	0161	GEOSYNTHETIC MATERIAL TYPE S1		
		PR_GEO80_2 Sta 24+50 to 26+60	100	SY
		PR_GEO90_1 Sta 26+80 to 28+40	86	SY
714	3151	HEADWALL - PRECAST CONCRETE 6IN		
		PR_GEO80_2 Sta 25+50	1	EA
		PR_GEO90_1 Sta 27+80	1	EA
714	9730	UNDERDRAIN PIPE PVC PERFORATED 6IN		
		PR_GEO80_2 Sta 24+50 to 26+60	210	LF
		PR_GEO90_1 Sta 26+80 to 28+40	160	LF
714	9771	UNDERDRAIN PIPE PVC NON-PERFORATED 6IN		
		PR_GEO80_2 Sta 25+50	16	LF
		PR_GEO90_1 Sta 27+80	30	LF

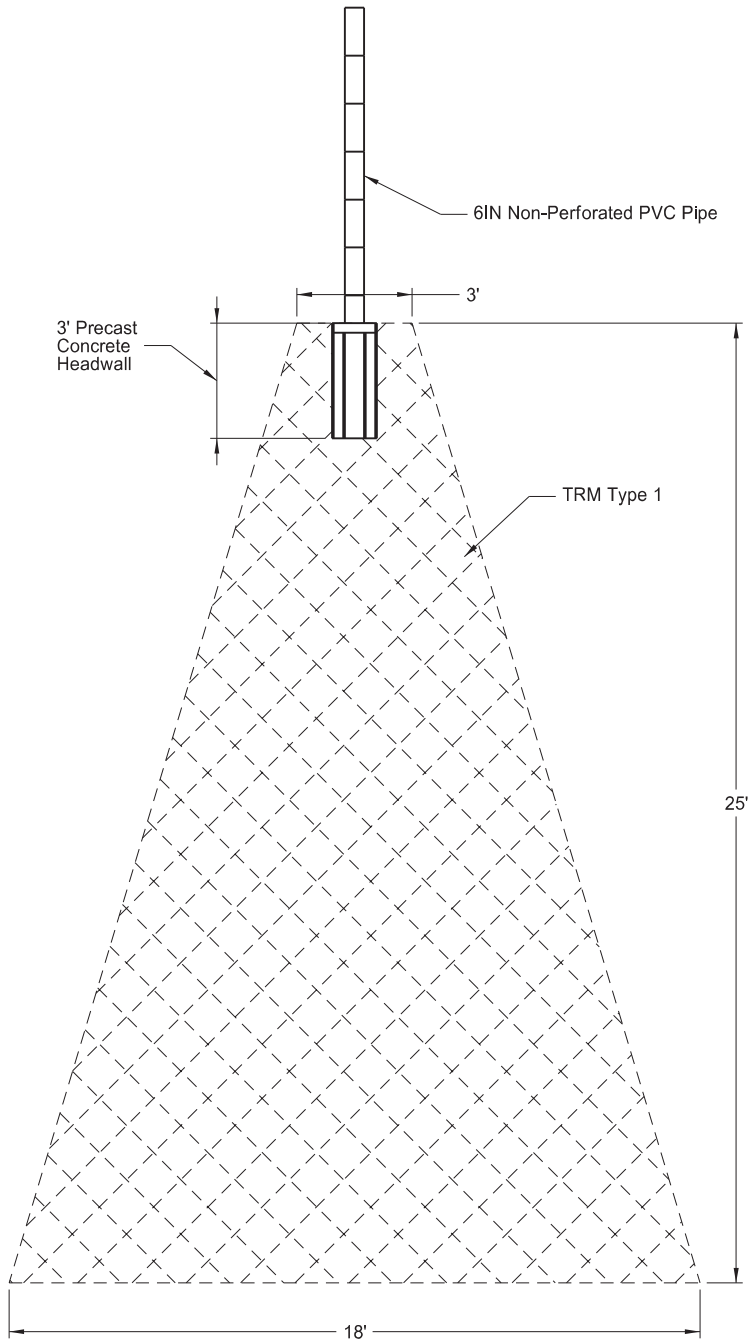
Note: Vertical lengths of non-perforated pipe, pipe bends, fittings and threaded caps have not been measured for payment. Include in price bid for "Underdrain Pipe PVC Non-Perforated 6IN".
See Previous Sheet for Trench Drain Section View



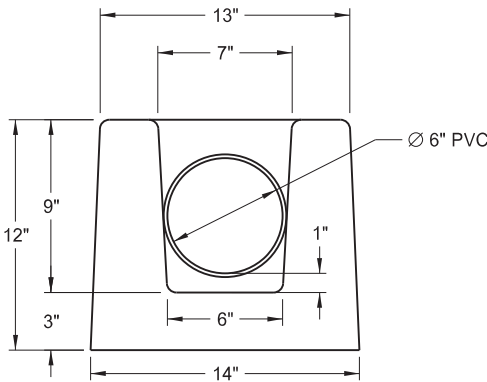
US Hwy 85
Horseshoe Bend Landslide Repair
Trench Drain Details

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	23

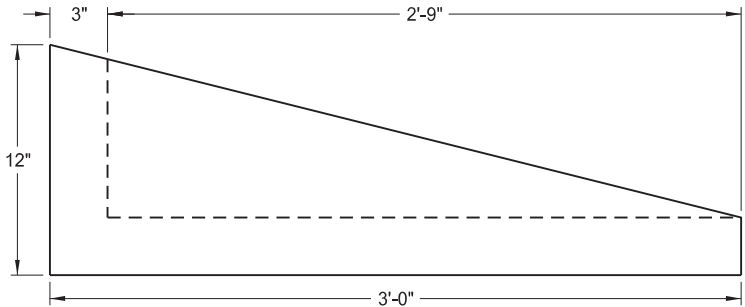
SPEC	CODE	BID ITEM	QTY	UNIT
255	0201	TRM TYPE 1		
		PR_GEO80_1 Sta 20+40.5	30	SY
		PR_GEO80_1 Sta 23+40	30	SY
		PR_GEO80_2 Sta 25+50	30	SY
		PR_GEO90_1 Sta 27+80	30	SY



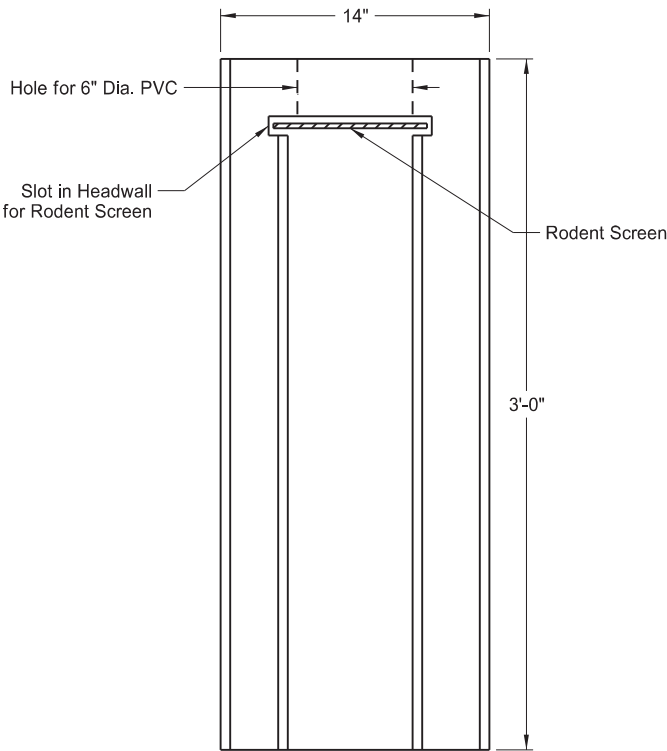
TRM Layout at Precast Concrete Headwall



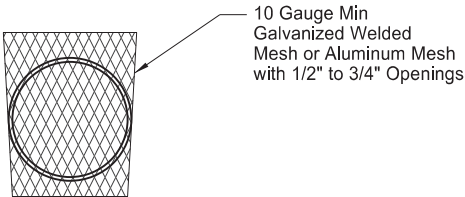
6IN Precast Concrete Headwall - End View



6IN Precast Concrete Headwall - Side View



6IN Precast Concrete Headwall - Top View

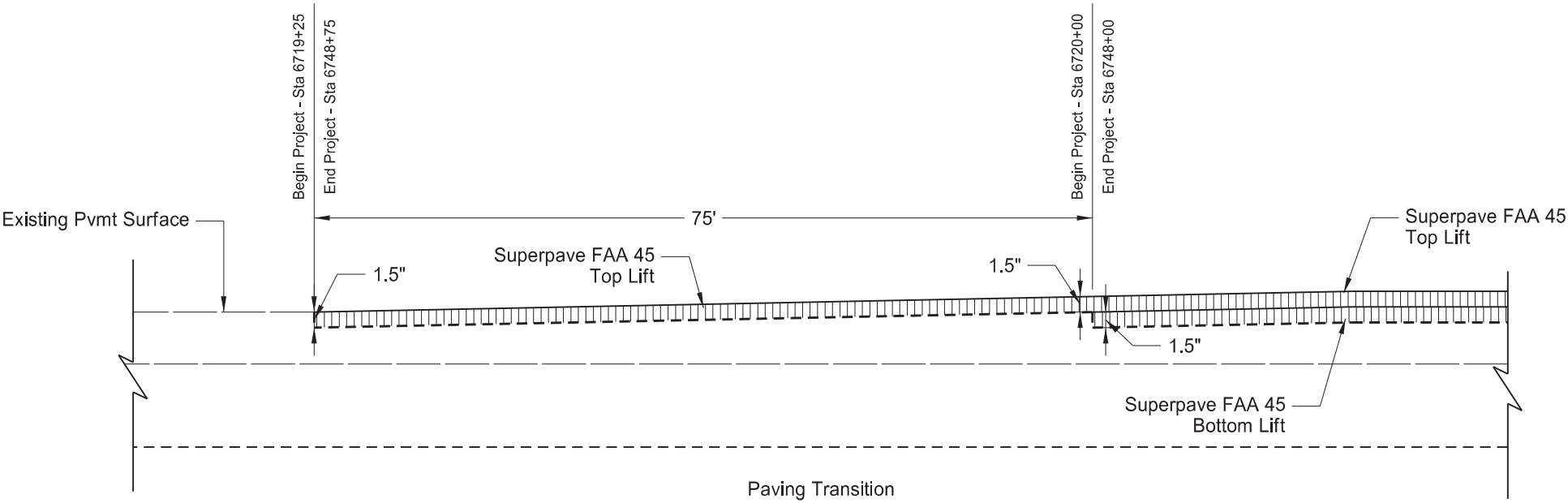
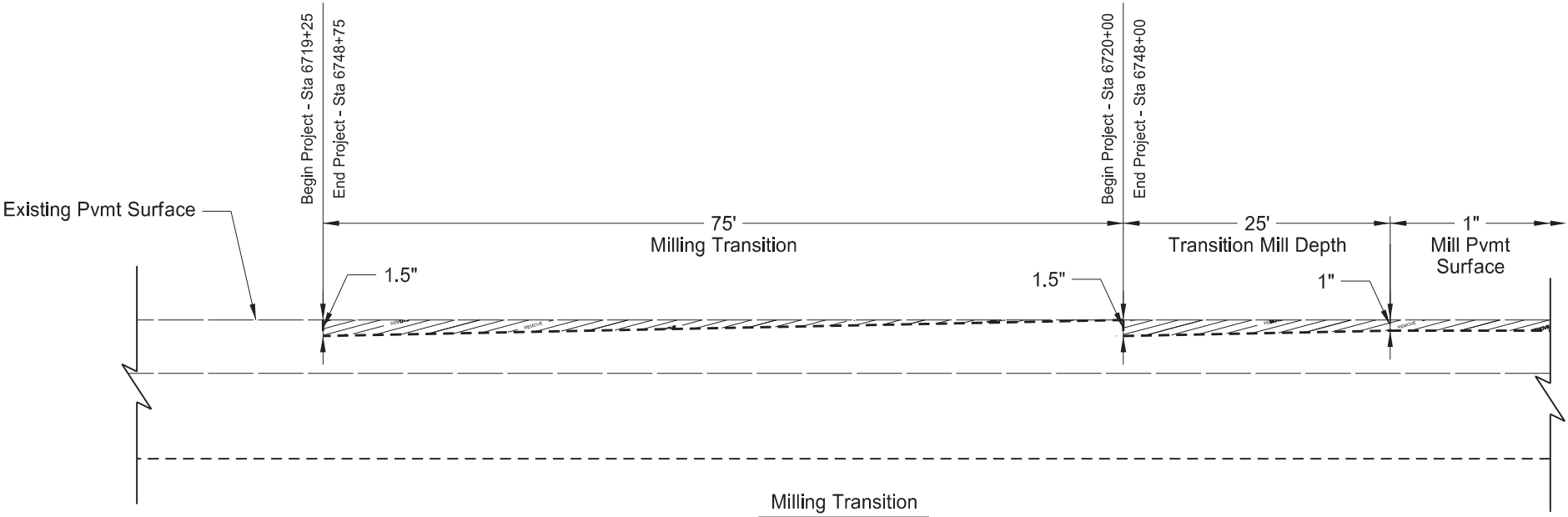


Rodent Screen - Front View



US Hwy 85
Horseshoe Bend Landslide Repair
Headwall Details

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	24

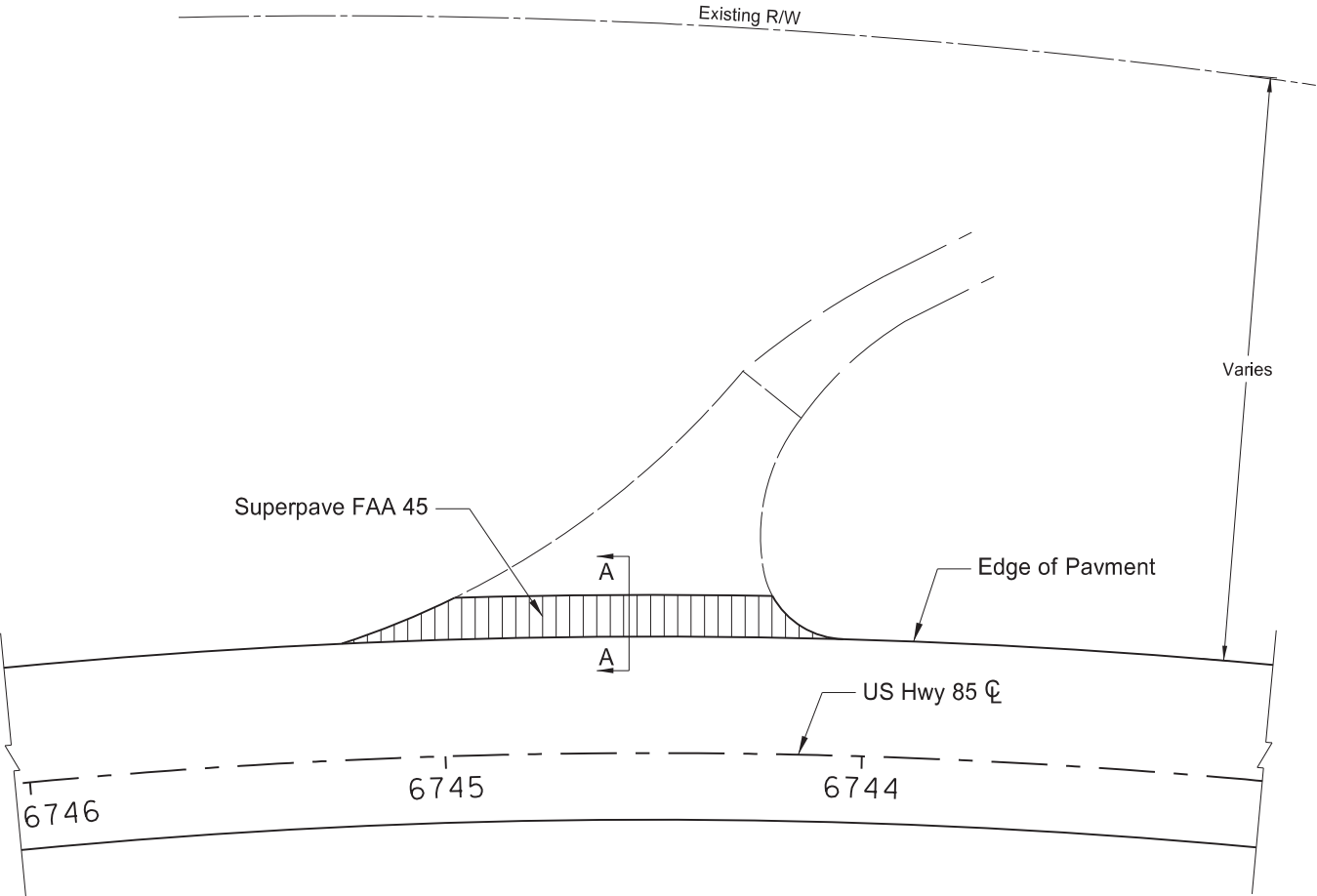


Pay Item	Unit	Begin Project Transition			End Project Transition		
		Begin Sta	End Sta	Quantity	Begin Sta	End Sta	Quantity
Milling Pavement Surface	SY	6719+25	6720+00	408.3	6748+00	6748+75	408.3
1.5" Superpave FAA 45 @ 2 Tons/CY	TON	6719+25	6720+00	34.0	6748+00	6748+75	34.0
PG 58H-28 Asphalt Cement @ 6.0%	TON	6719+25	6720+00	2.0	6748+00	6748+75	2.0
Tack Coat @ 0.05 Gal/SY	Gal	6719+25	6720+00	19.4	6748+00	6748+75	19.4



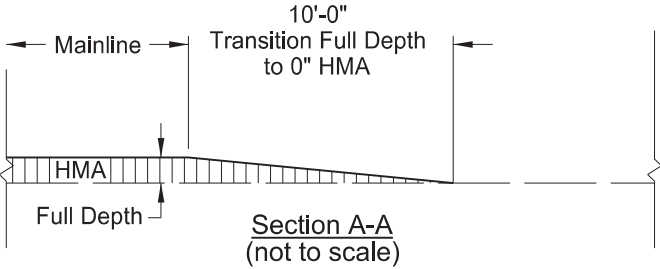
US Hwy 85
Horseshoe Bend Landslide Repair
Milling & Paving End Transition

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	20	25



Gravel Approach
Sta 6744+53.5

- Notes:
- Quantity totals have been included in the bid items of the "Estimate of Quantities" of the plans.

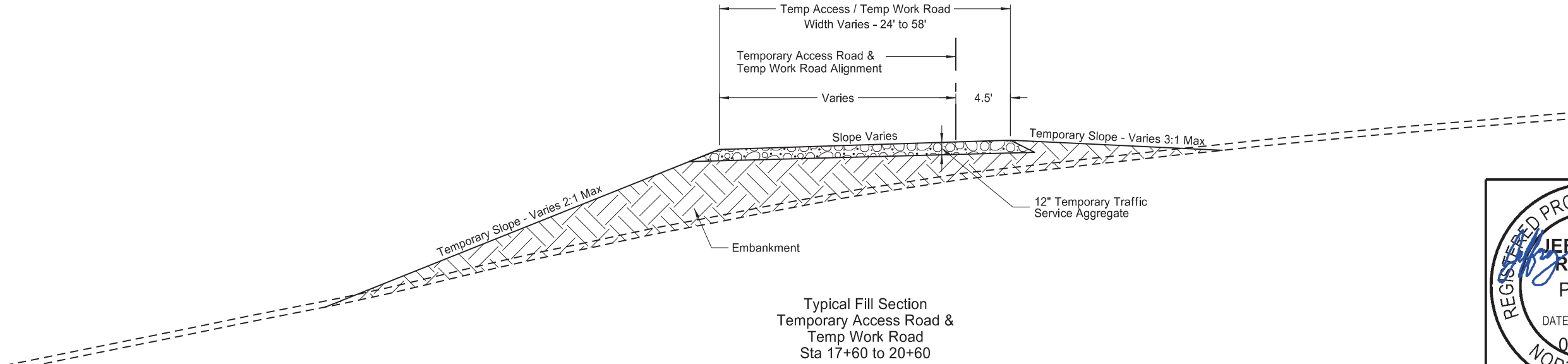
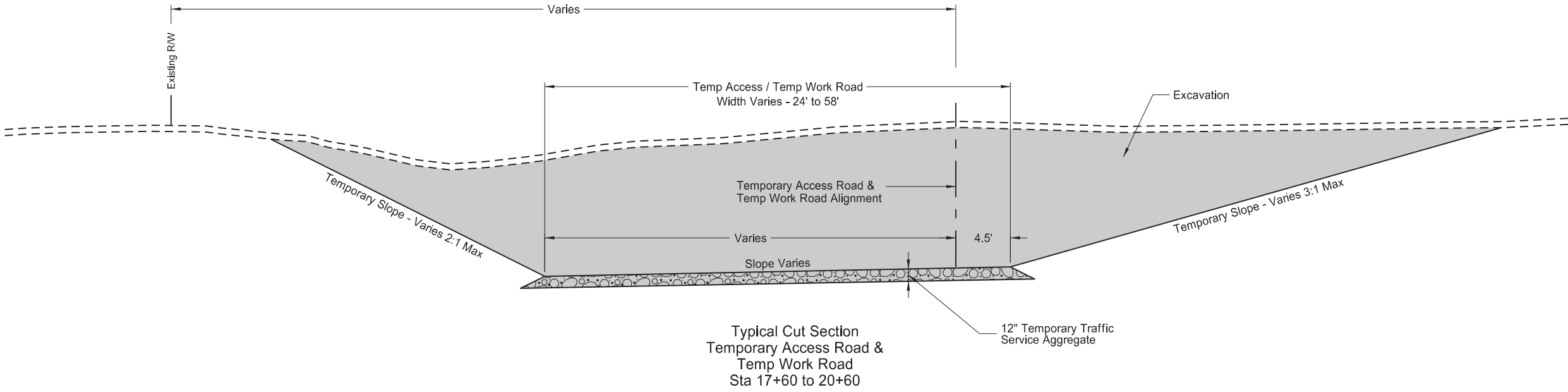


BASIS OF ESTIMATE		
ITEM	UNIT	TOTALS
Approach Location		Sta 6744+53.5 RT
Tack Coat	GAL	6.0
Superpave FAA 45	TON	9.8
PG 58H-28 Asphalt Cement	TON	0.6



US Hwy 85
Horseshoe Bend Landslide Repair
Approach Paving Details

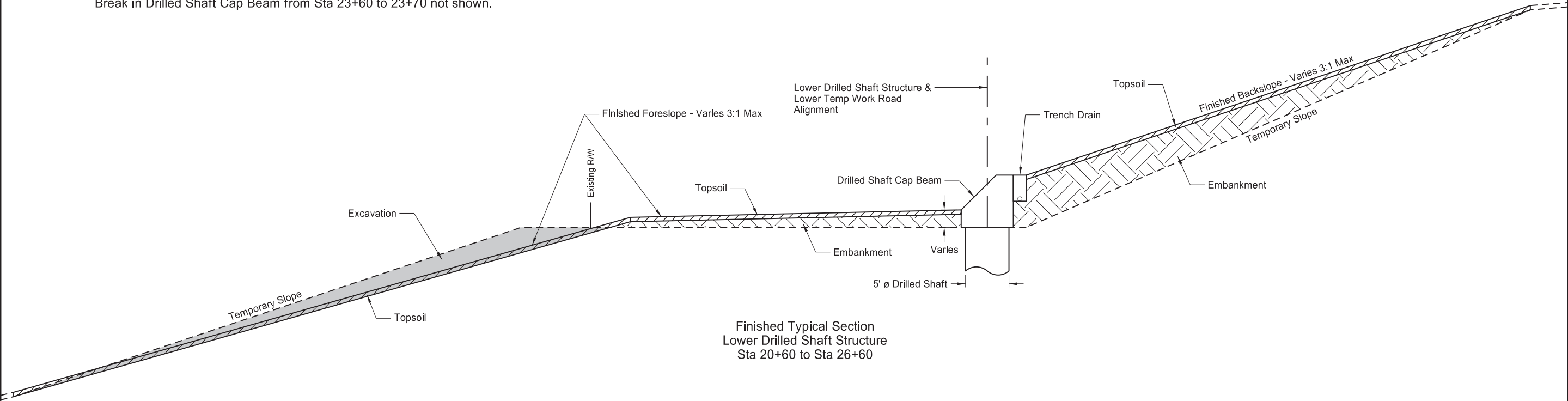
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	30	1



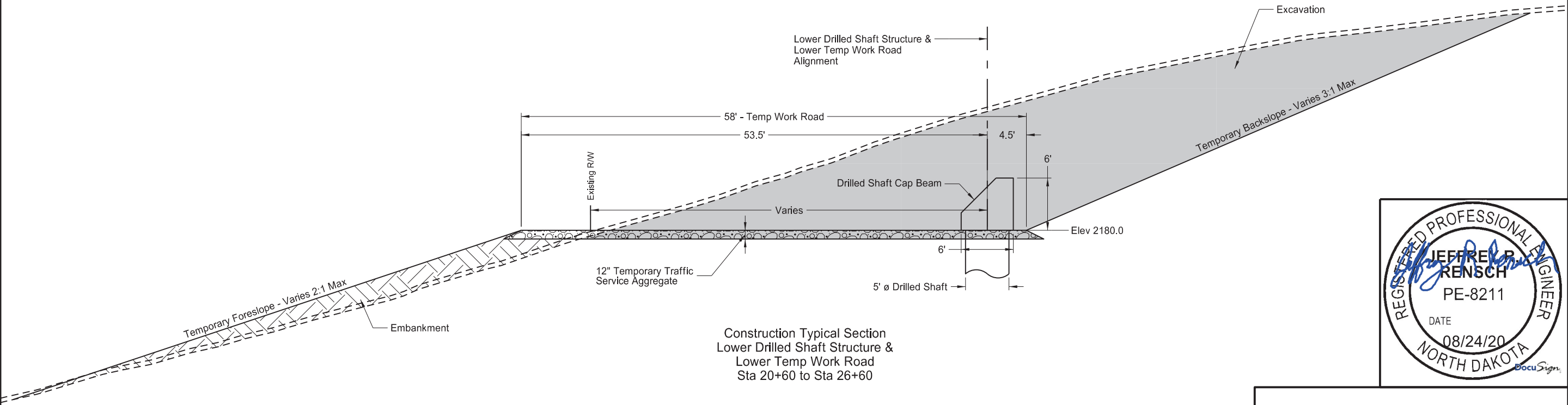
US Hwy 85
Horseshoe Bend Landslide Repair
Typical Sections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	30	2

Notes:
Break in Drilled Shaft Cap Beam from Sta 23+60 to 23+70 not shown.



Finished Typical Section
Lower Drilled Shaft Structure
Sta 20+60 to Sta 26+60

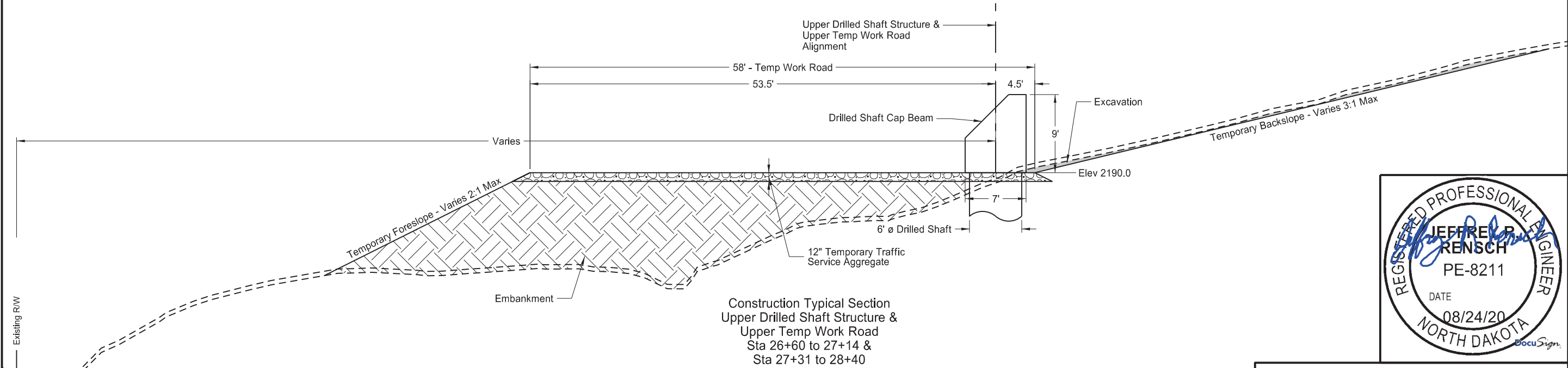
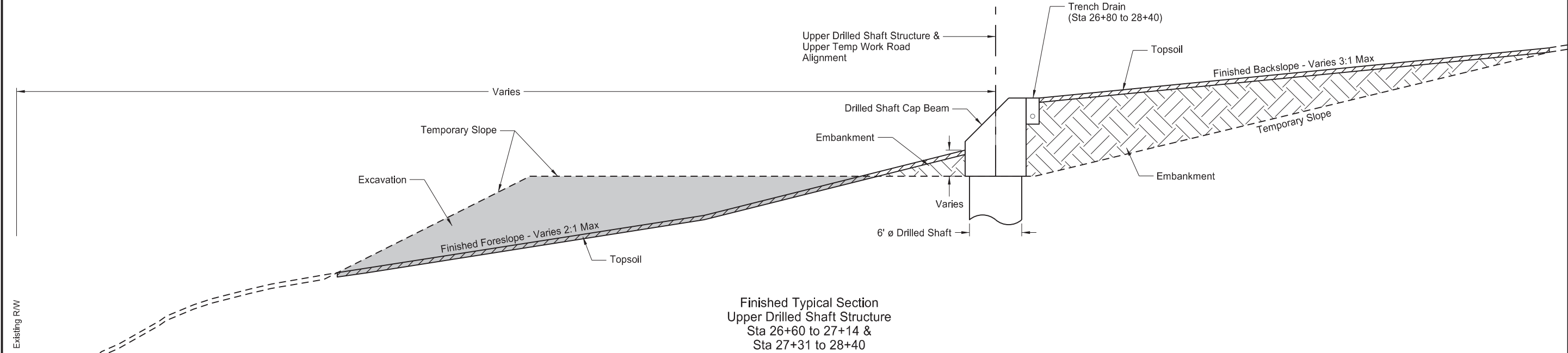


Construction Typical Section
Lower Drilled Shaft Structure &
Lower Temp Work Road
Sta 20+60 to Sta 26+60



US Hwy 85
Horseshoe Bend Landslide Repair
Typical Sections

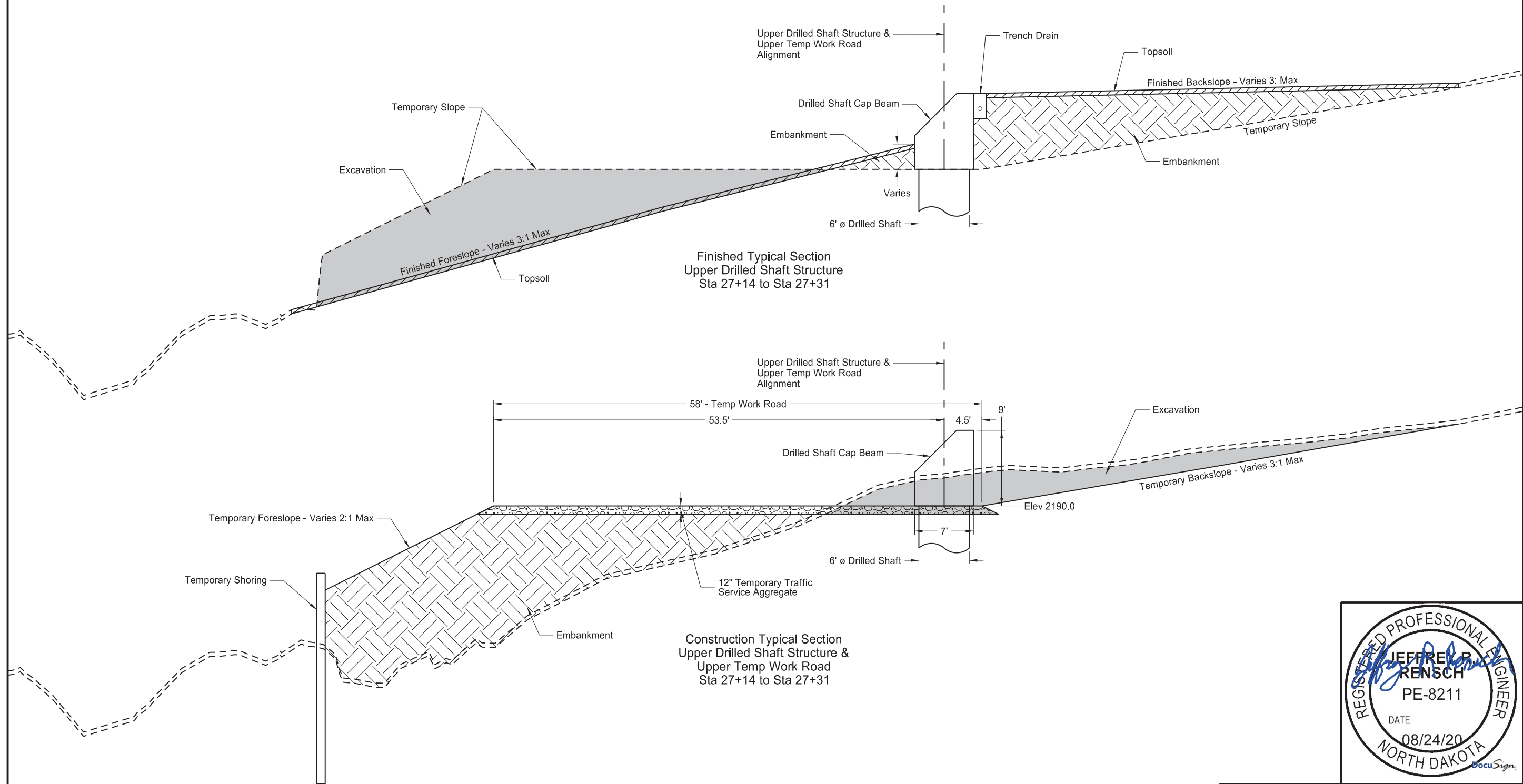
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	30	3



US Hwy 85
Horseshoe Bend Landslide Repair

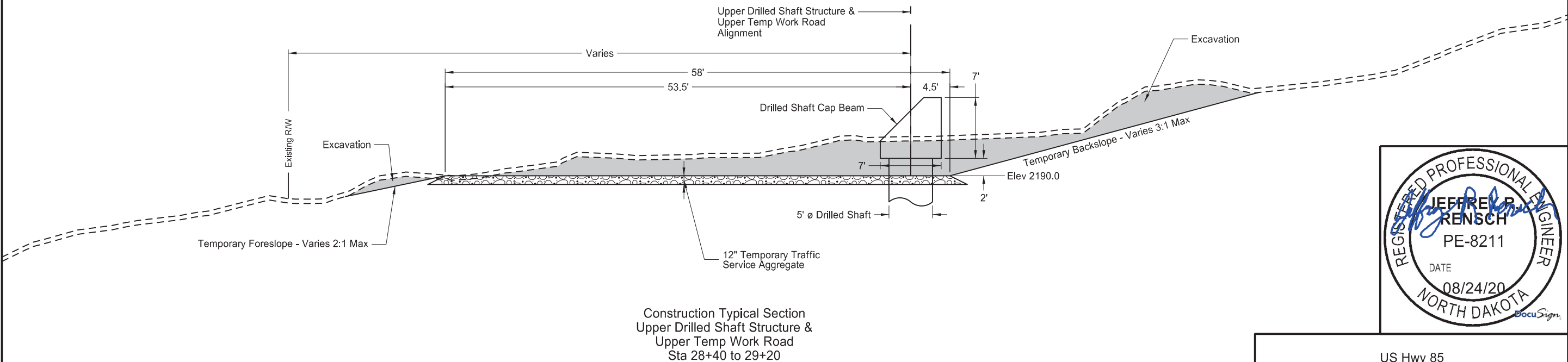
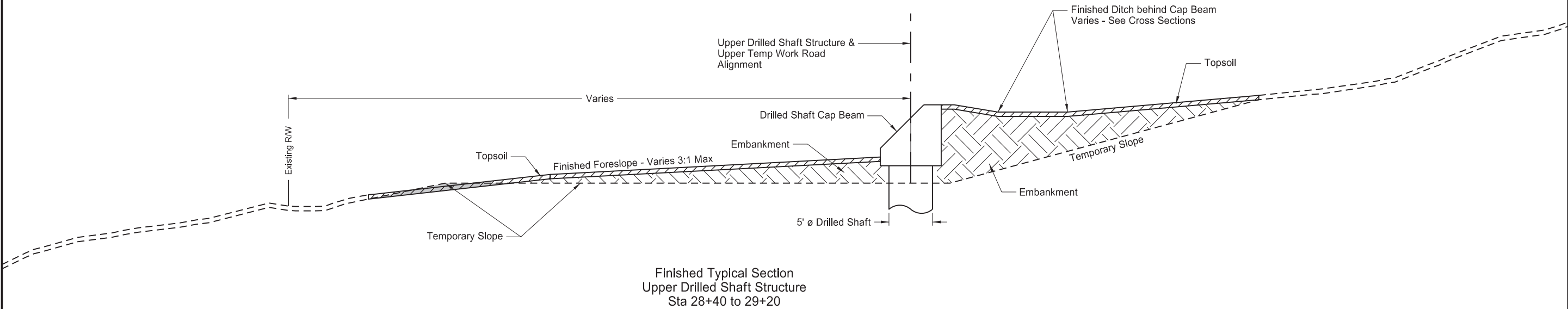
Typical Sections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	30	4



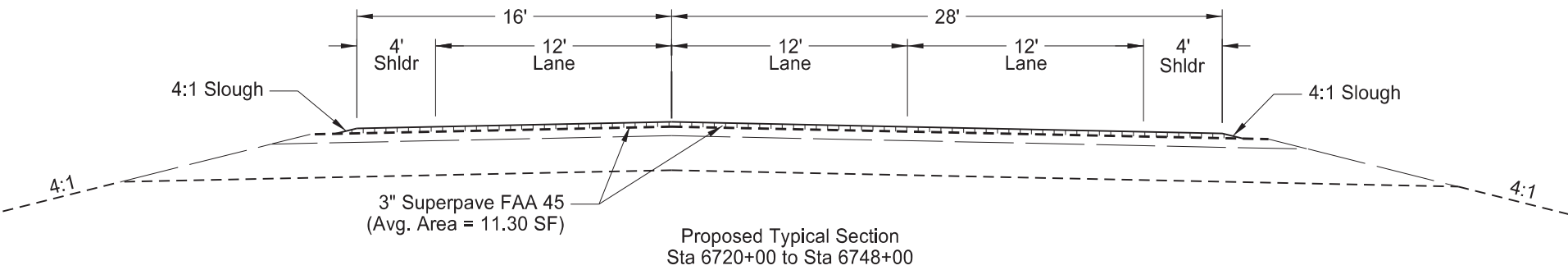
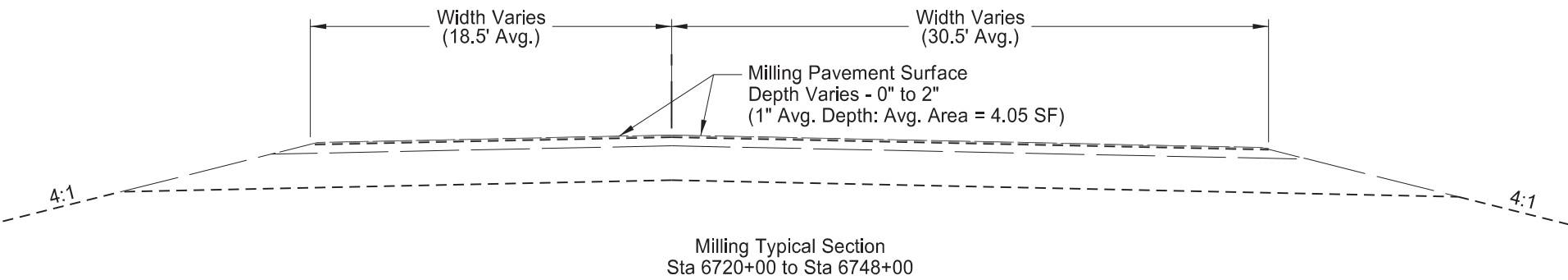
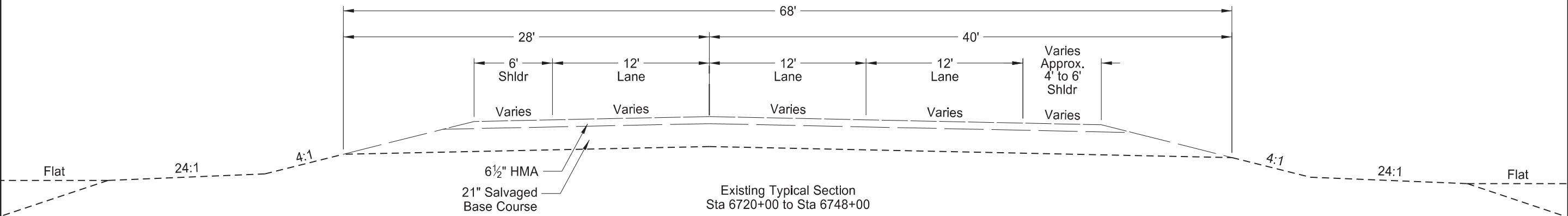
US Hwy 85
Horseshoe Bend Landslide Repair
Typical Sections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	30	5



US Hwy 85
Horseshoe Bend Landslide Repair
Typical Sections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	30	6



US Hwy 85
Horseshoe Bend Landslide Repair
Hwy 85 Milling & Paving Typical Sections

HYDRAULIC DATA FOR SOIB-NH-7-085(110)127 (A)									
STATION	EXISTING PIPE	PROPOSED PIPE SIZE	DRAINAGE AREA (ACRES)	50-YEAR DATA				100-YEAR DATA	
				DESIGN DISCHARGE (CFS)	DESIGN HEADWATER (FT)	DESIGN VELOCITY (FPS)	DESIGN STAGE (NAVD 88)	100-YEAR DISCHARGE (CFS)	100-YEAR STAGE (NAVD 88)
23+65 (PR_GEO80_1)	30" RCP	60" (B)	71.5	186.1	6.84	7.83	2190.84	303.4	2196.74
(A) Hydraulic data provided is for smooth-walled (Manning's n=0.012) type conduits. (B) Crossing includes drop manholes and CSP outlet culvert. See Section 20 for manhole and pipe location details.									



Culvert Hydraulic Data

US Hwy 85 - RP 127

Horseshoe Bend Landslide Repair

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation (Pay Item)			Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	R1 Fabric (Pay Item)	(*) End Sections		Applicable Backfill
				In	Bid Item	LF							Begin	End	
								In	Type		In	SY	EA	EA	
23+54.7 (Chain: PR_GEO80_1)	371.8' Rt	23+63.8 (Chain: PR_GEO80_1)	41.9' Rt	60	Pipe Conduit - Jacked or Bored	330	Reinforced Concrete Pipe - Class III (barrel length = 330 LF)	60					FES		Section 20 Detail
							Smooth Walled Steel	60			0.719				
23+63.8 (Chain: PR_GEO80_1)	41.9' Rt	MH1		60	Pipe Conduit	50	Reinforced Concrete Pipe - Class III (barrel length = 50 LF)	60							Standard D-714-27
MH1		MH2		60	Pipe Conduit	108	Reinforced Concrete Pipe - Class III (barrel length = 108 LF)	60							Standard D-714-27
MH2		23+91.7 (Chain: PR_GEO80_1)	176.5' Lt	66	Pipe Conduit	58	Corrugated Steel Pipe	66	P	2	0.138			FES	Standard D-714-27
							Corrugated Steel Pipe	66	P	3, 5	0.064				
28+62.3 (Chain: PR_GEO90_1)	175.0' Rt	MH3			Remove & Relay Pipe - All Types & Sizes	100	Existing Pipe Material - Smooth Walled Steel	Existing Diameter - 30 In							Standard D-714-27
MH4		28+04.9 (Chain: PR_GEO90_1)	49.5' Lt	48	Pipe Conduit	100	Corrugated Steel Pipe	48	P	2	0.064			FES	Standard D-714-27
							Corrugated Steel Pipe	48	P	3, 5	0.064				
28+04.9 (Chain: PR_GEO90_1)	49.5' Lt	27+77.5 (Chain: PR_GEO90_1)	82.0' Lt	48	Pipe Conduit - Approach	44	Corrugated Steel Pipe	48	Z, A, P	2	0.064				
							Spiral Rib Steel Pipe	48	Z, A, P	3/4, 1	0.064				
							High-Density Polyethylene	48							
							Polypropylene Pipe (AASHTO M330, Type S)	48							

Coatings: Z = Zinc

A = Aluminum

P = Polymeric (over Zinc or Aluminum)

Corrugations: 2 = 2-2/3"x1/2"

3 = 3"x1"

5 = 5"x1"

Spiral Ribs: 3/4 = 3/4"x3/4"@7-1/2"

1 = 3/4"x1"@11-1/2"

(*) End sections are measured and paid for separately for pipe extensions.

FES = Flared End Section

TES = Traversable End Section

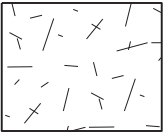
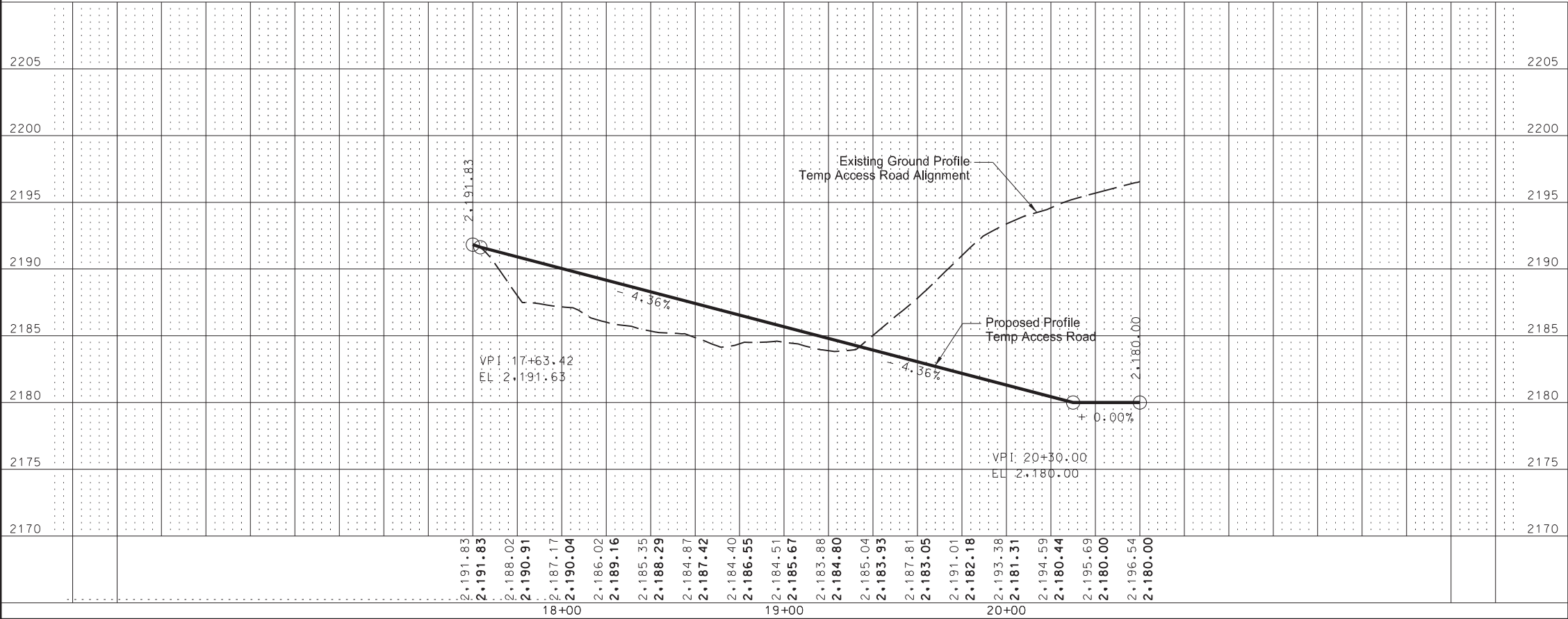
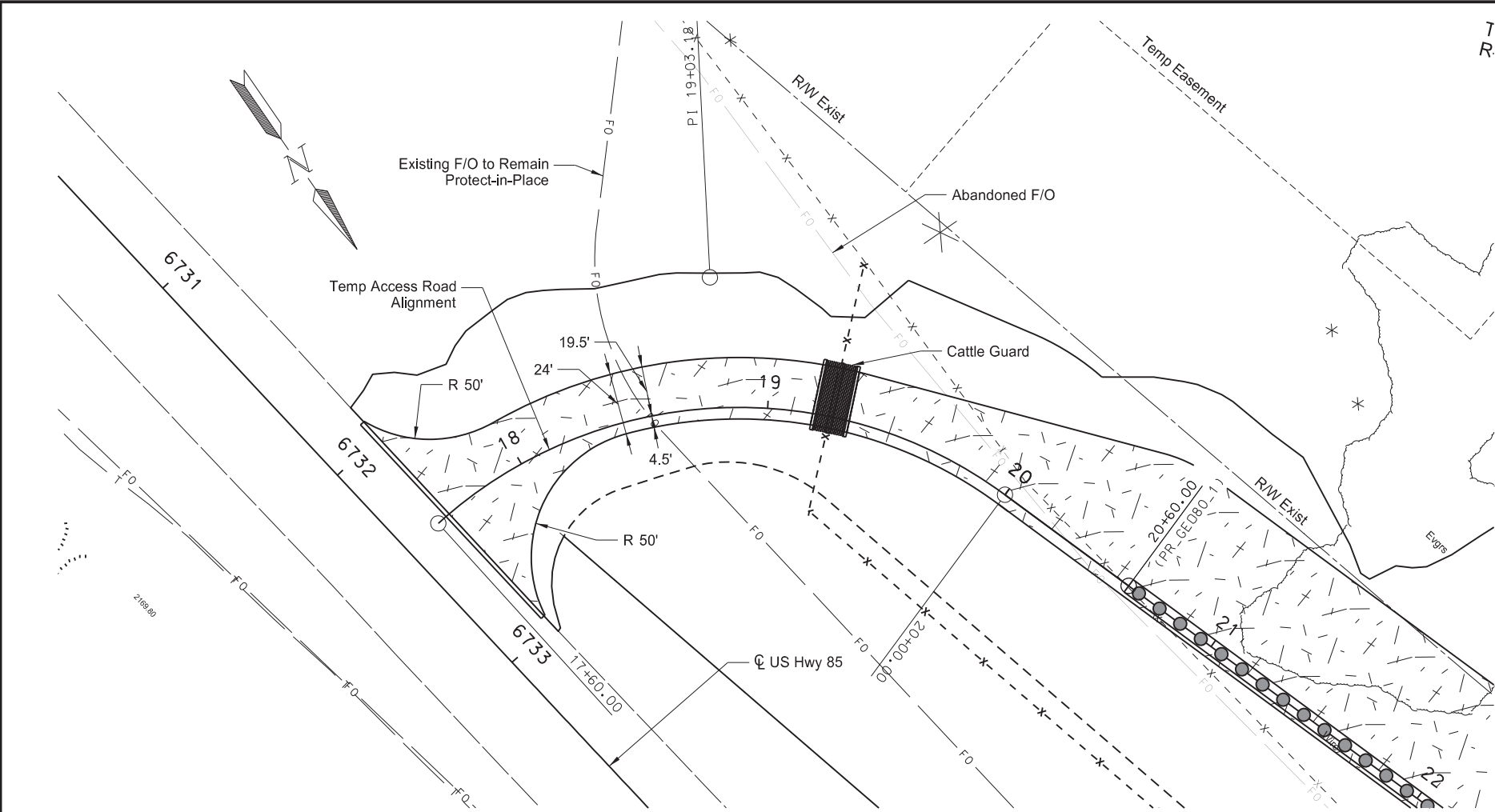


US Hwy 85
Horseshoe Bend Landslide Repair

Allowable Pipe List

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	60	1

SPEC	CODE	BID ITEM	QTY	UNIT
302	0050	TRAFFIC SERVICE AGGREGATE		
		Temp Access Road	787	TON
		Sta 17+60 to 20+60		

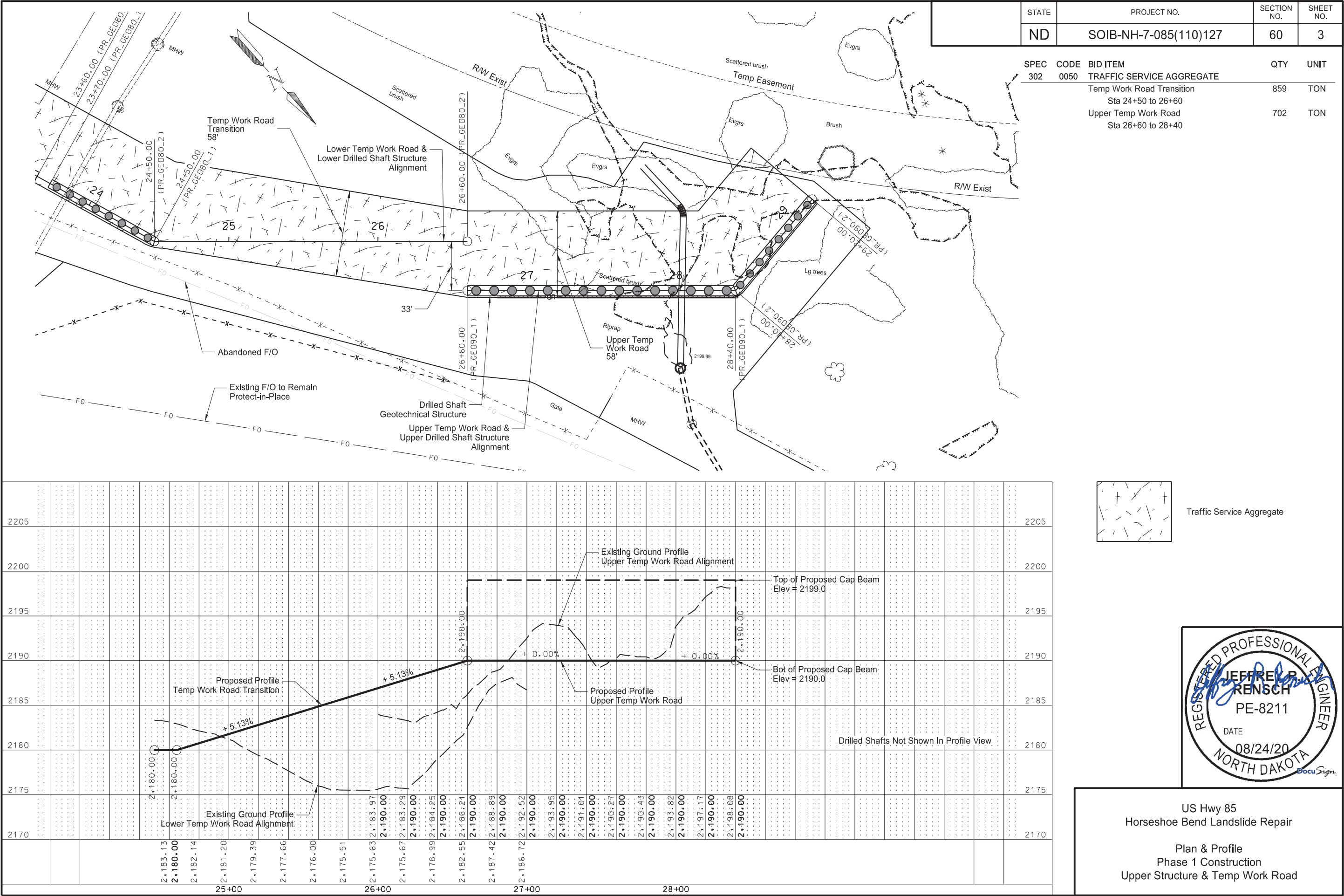


Traffic Service Aggregate



US Hwy 85
Horseshoe Bend Landslide Repair

Plan & Profile
Phase 1 & 2 Construction
Temp Access Road



Traffic Service Aggregate

2205

2200

2195

2190

2185

2180

2175

2170

Existing Ground Profile
Upper Temp Work Road Alignment

Top of Proposed Cap Beam
Elev = 2199.0

Proposed Profile
Temp Work Road Transition

Proposed Profile
Upper Temp Work Road

Bot of Proposed Cap Beam
Elev = 2190.0

Drilled Shafts Not Shown In Profile View

Existing Ground Profile
Lower Temp Work Road Alignment

25+00

26+00

27+00

28+00

2,183.13

2,180.00

2,182.14

2,181.20

2,179.39

2,177.66

2,176.00

2,175.51

2,175.63

2,175.67

2,183.97

2,183.29

2,184.25

2,186.21

2,188.89

2,190.00

2,192.52

2,193.95

2,191.01

2,190.27

2,190.43

2,193.82

2,197.17

2,198.08

2,190.00

REGISTERED PROFESSIONAL ENGINEER

JEFFREY P. RENSCH

PE-8211

DATE

08/24/20

NORTH DAKOTA

US Hwy 85

Horseshoe Bend Landslide Repair

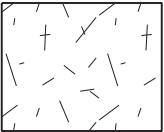
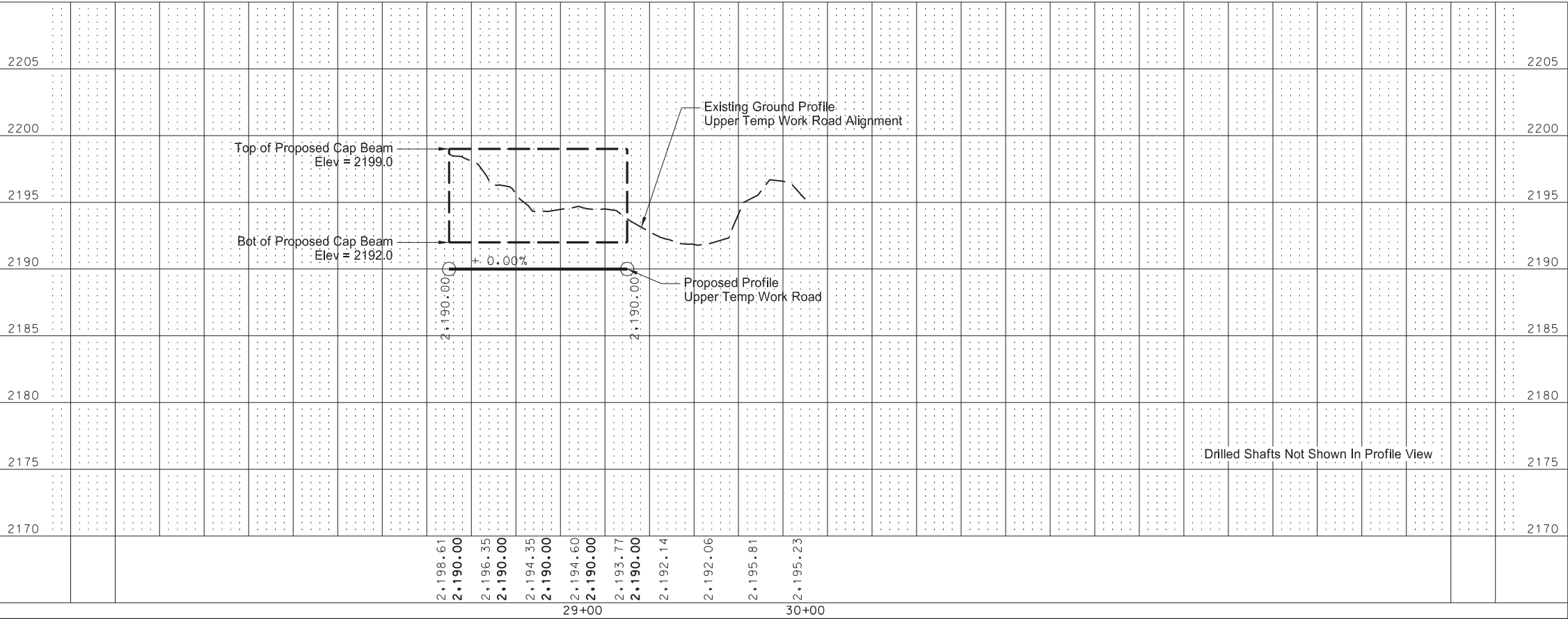
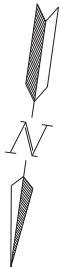
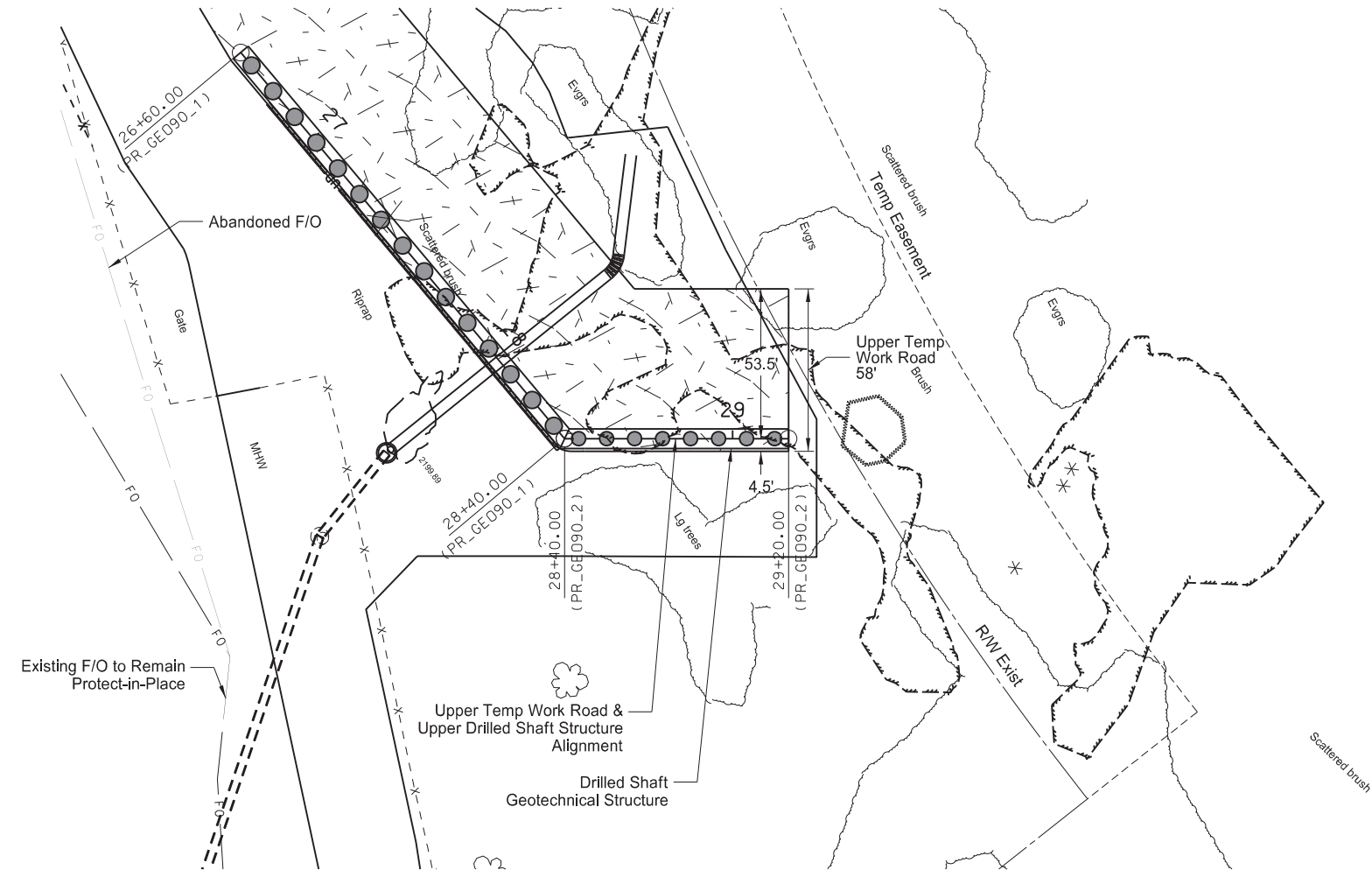
Plan & Profile

Phase 1 Construction

Upper Structure & Temp Work Road

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	60	4

SPEC	CODE	BID ITEM	QTY	UNIT
302	0050	TRAFFIC SERVICE AGGREGATE		
		Upper Temp Work Road	286	TON
		Sta 28+40 to 29+20		



Traffic Service Aggregate

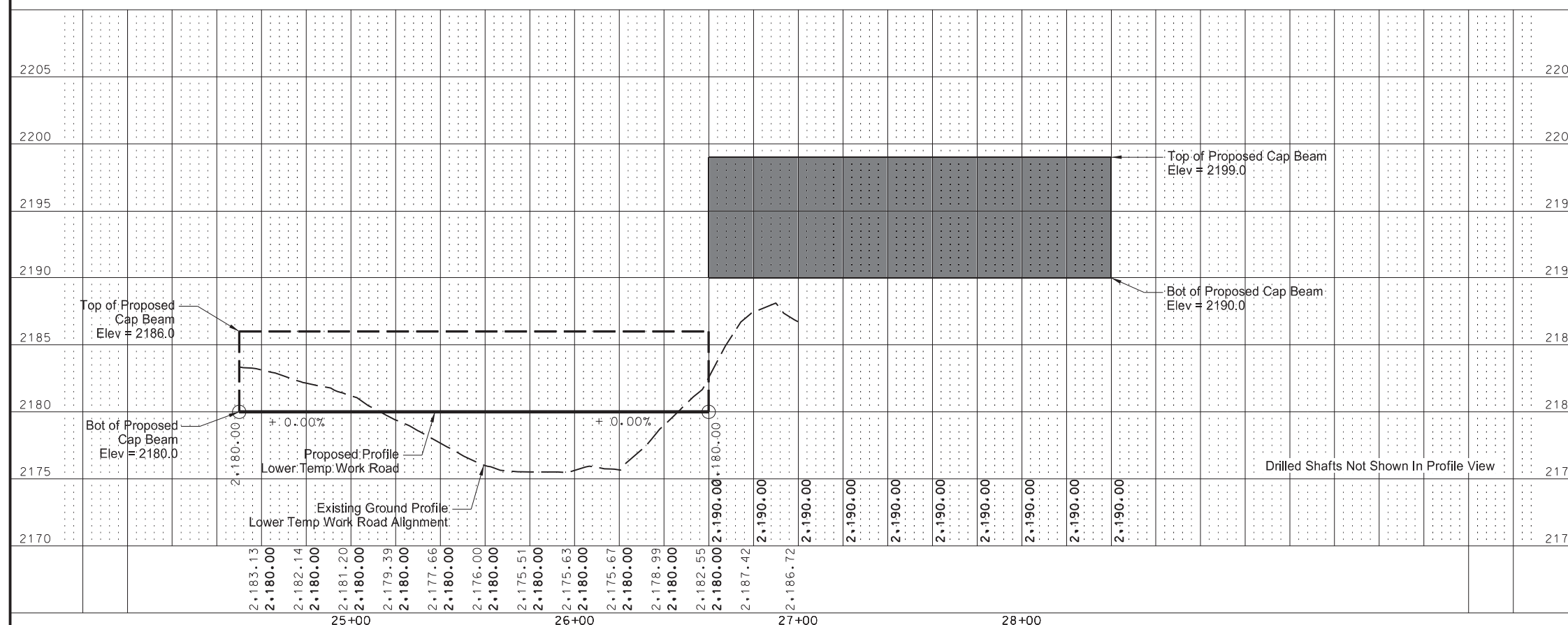
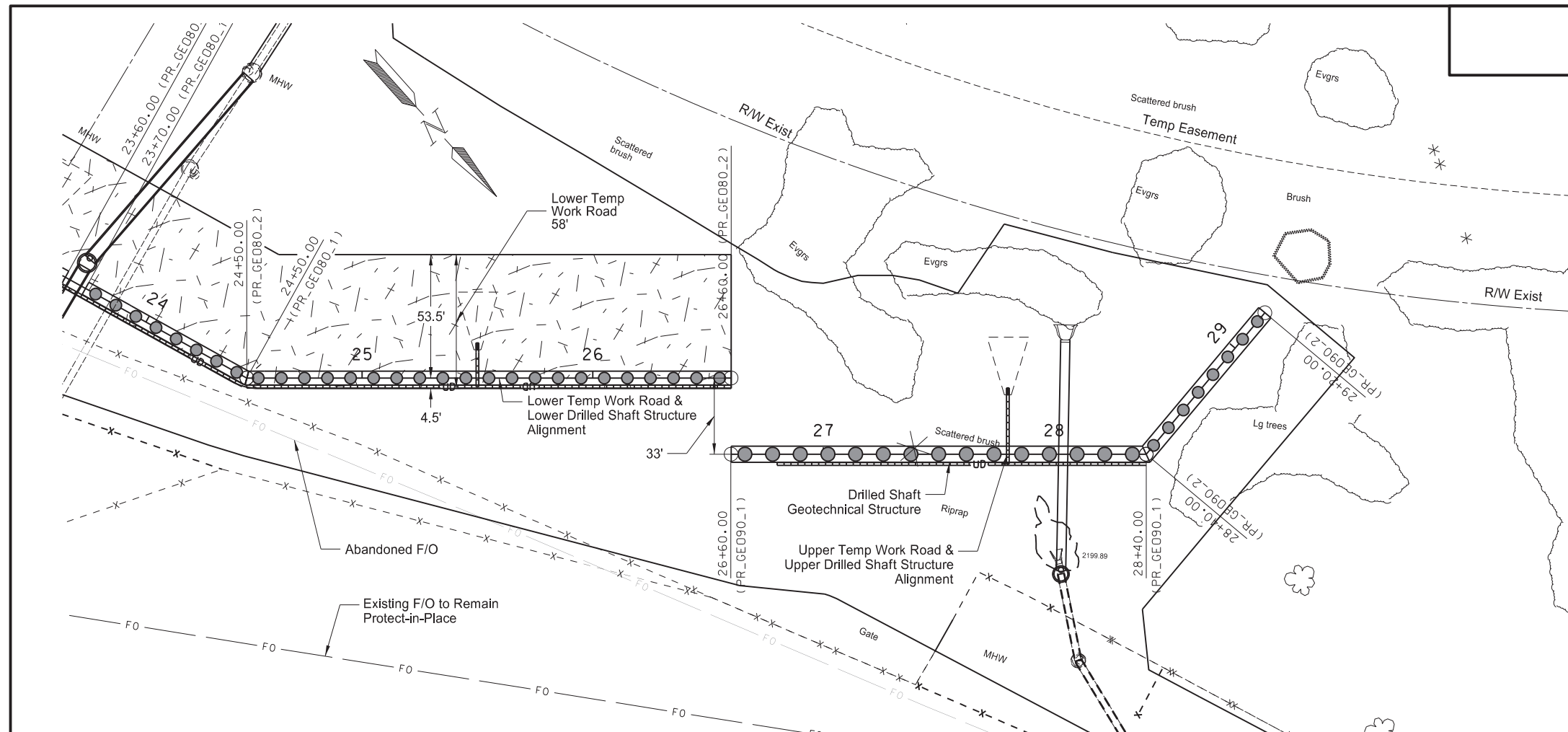


US Hwy 85
Horseshoe Bend Landslide Repair

Plan & Profile
Phase 1 Construction
Upper Structure & Temp Work Road

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	60	5

SPEC	CODE	BID ITEM	QTY	UNIT
302	0050	TRAFFIC SERVICE AGGREGATE		
		Lower Temp Work Road	848	TON
		Sta 24+50 to 26+60		



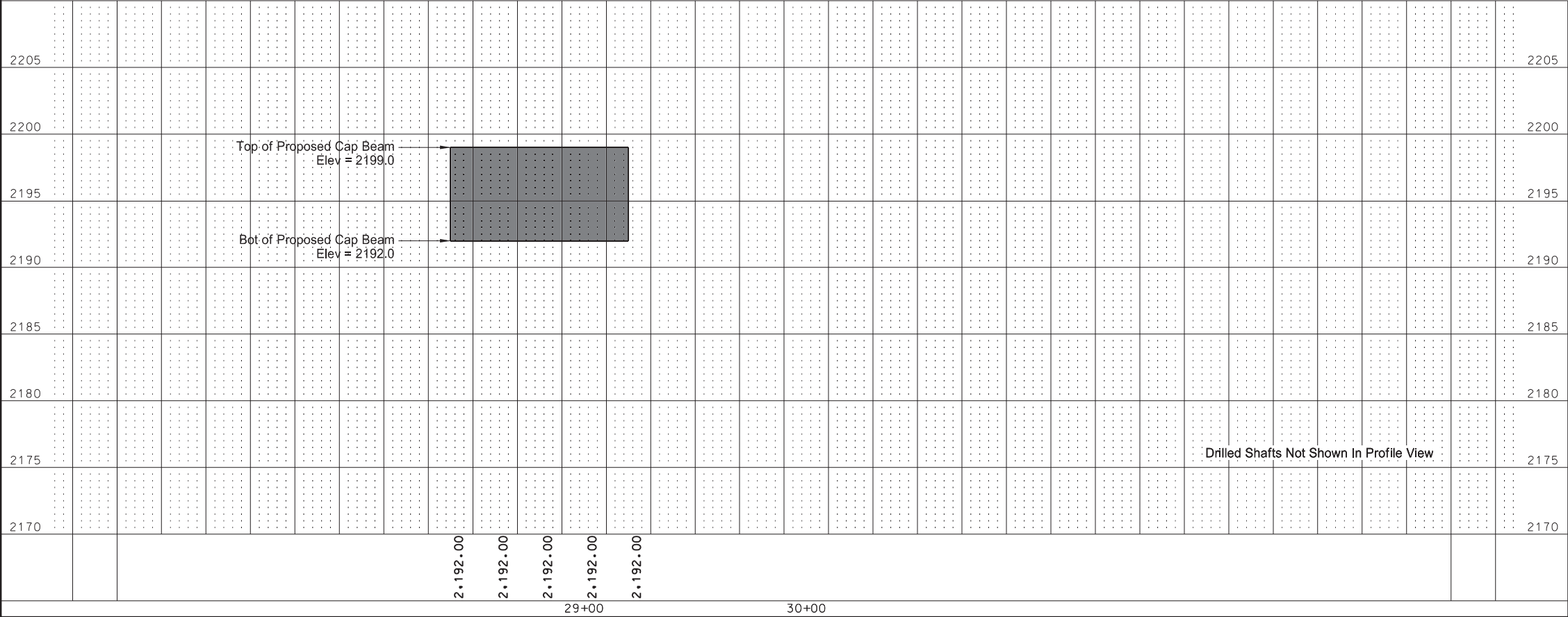
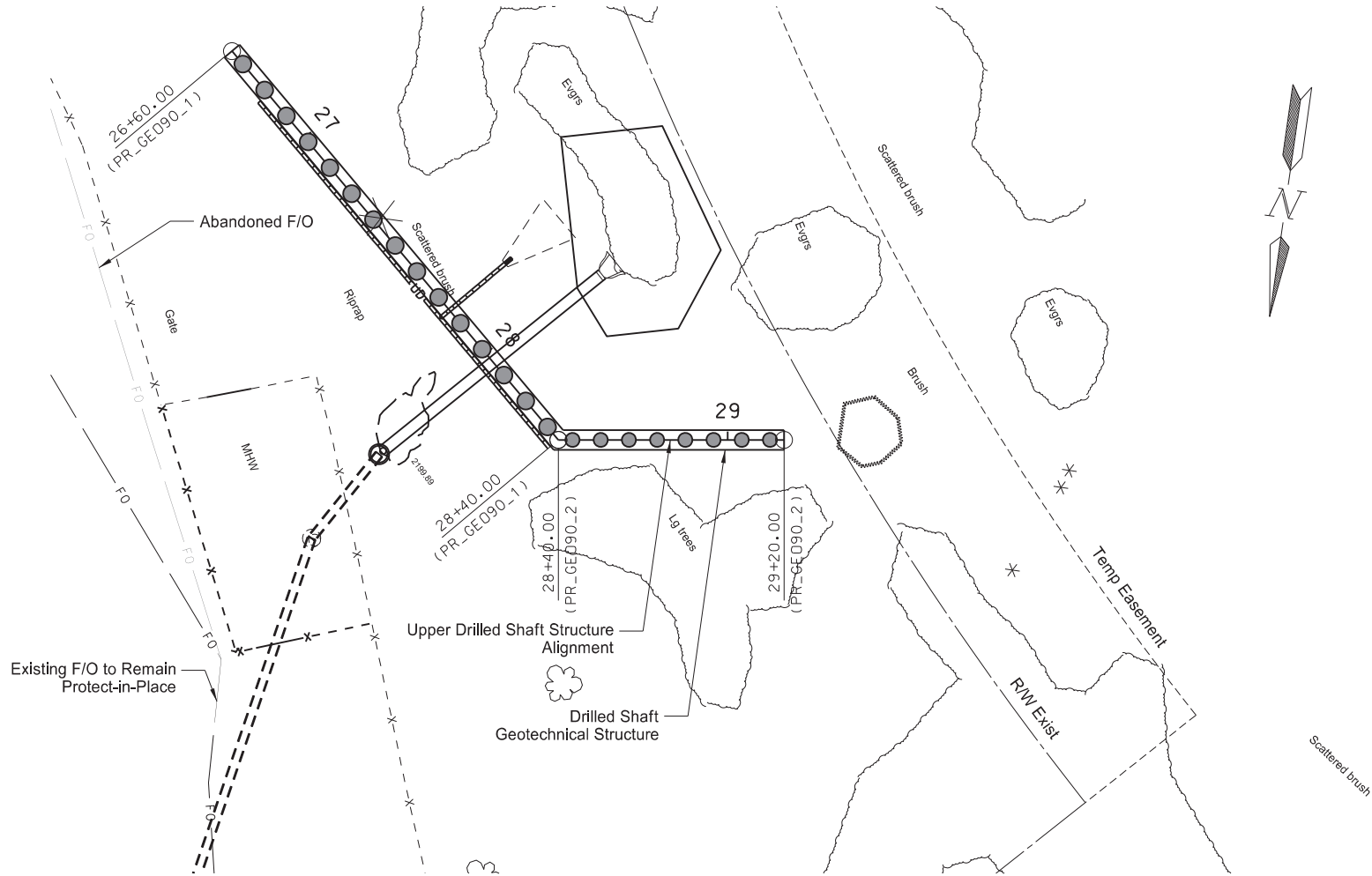
Traffic Service Aggregate



US Hwy 85
Horseshoe Bend Landslide Repair

Plan & Profile
Phase 2 Construction
Lower Structure & Temp Work Road

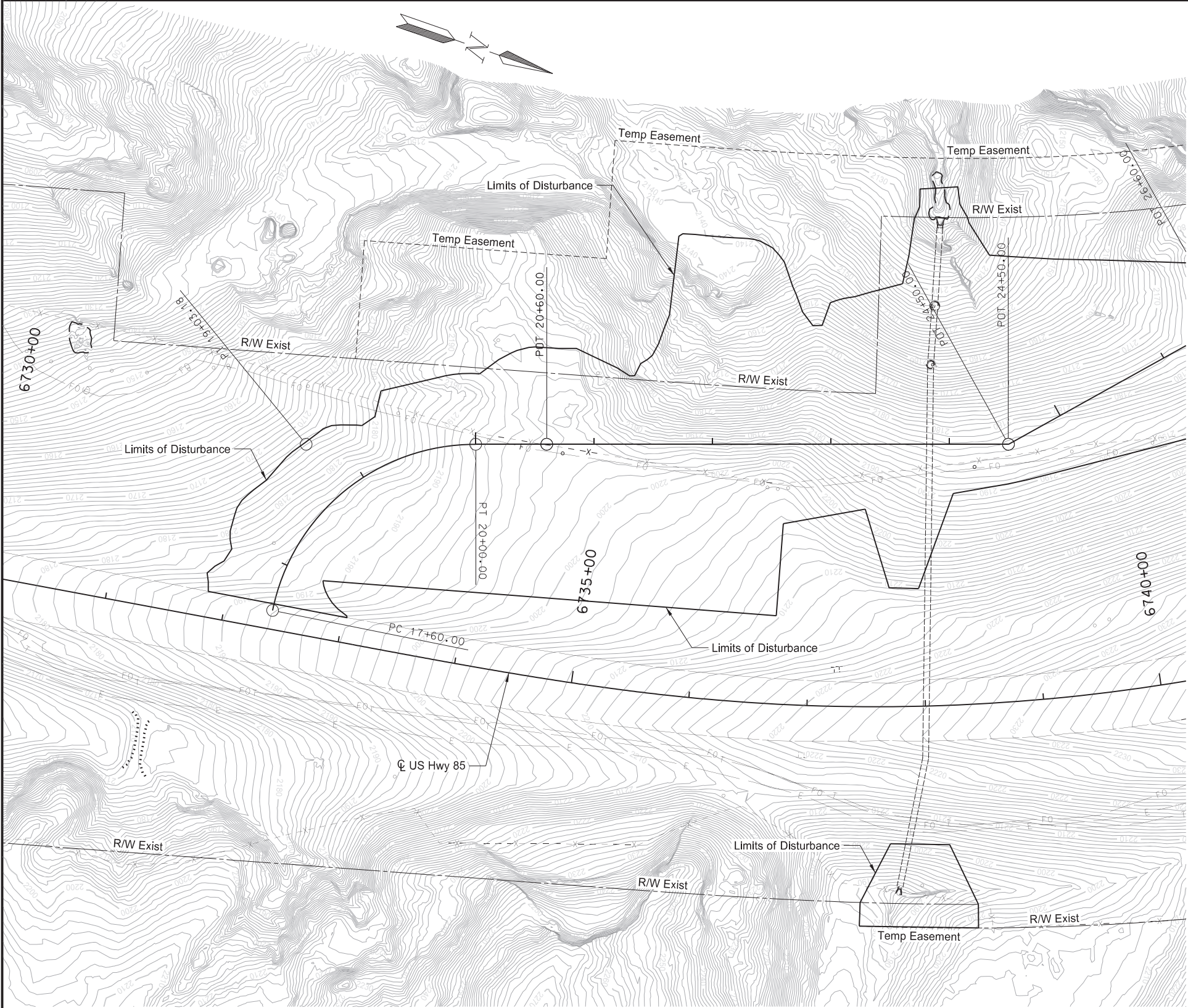
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	ND	SOIB-NH-7-085(110)127	60	8



US Hwy 85
Horseshoe Bend Landslide Repair

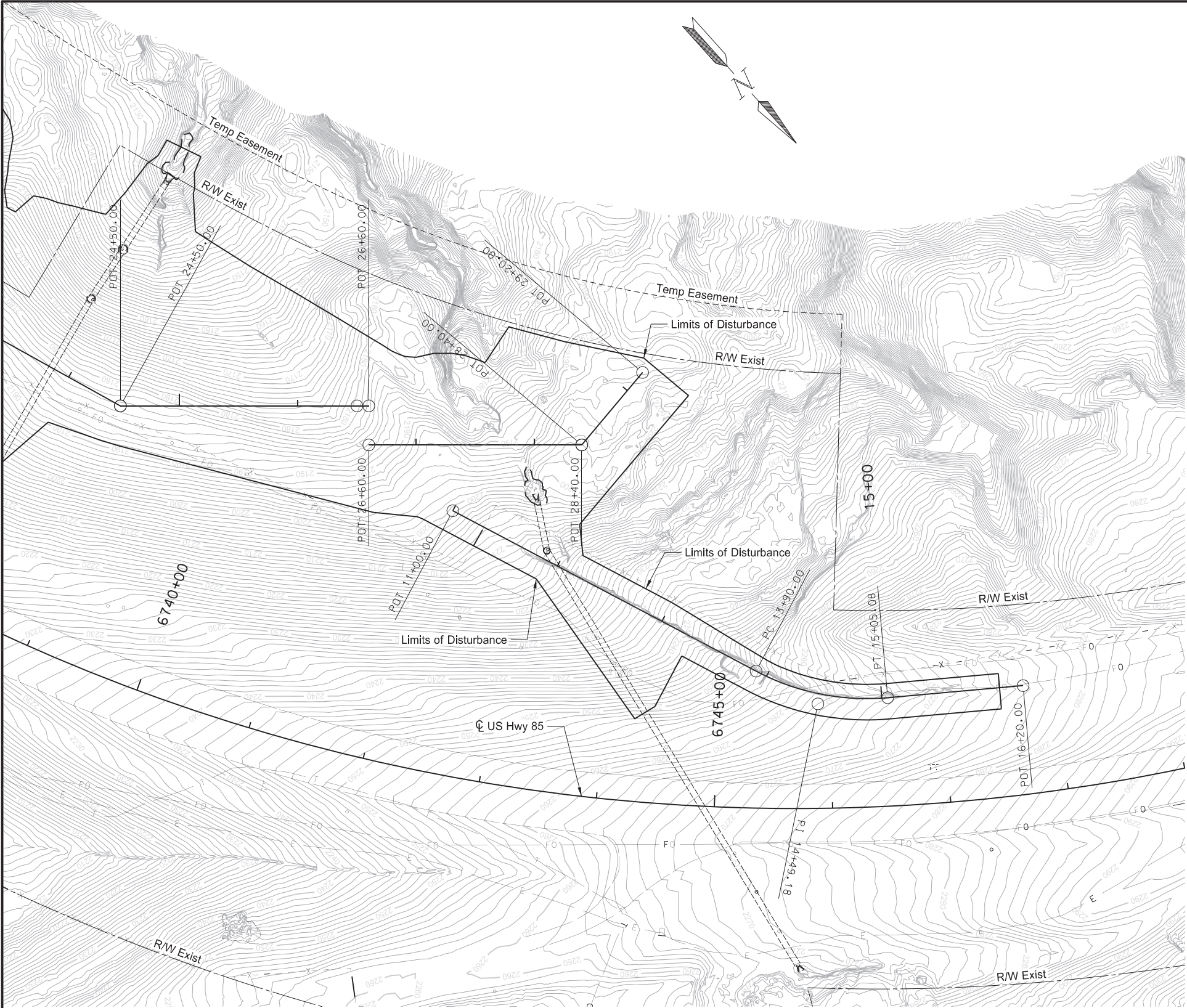
Plan & Profile
Finished Structure

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	70	1



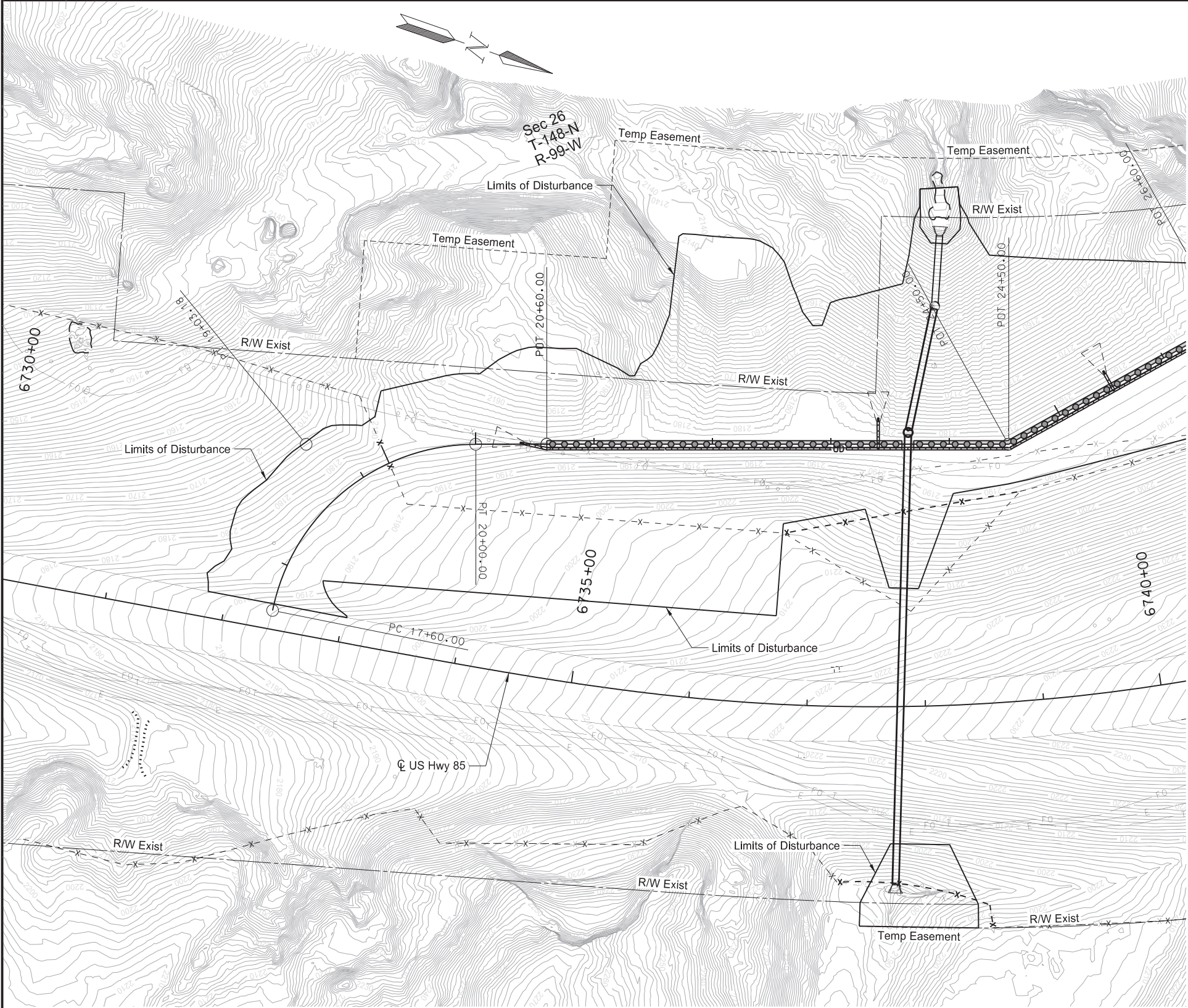
US Hwy 85
Horseshoe Bend Landslide Repair
Existing Ground Contours

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	70	2



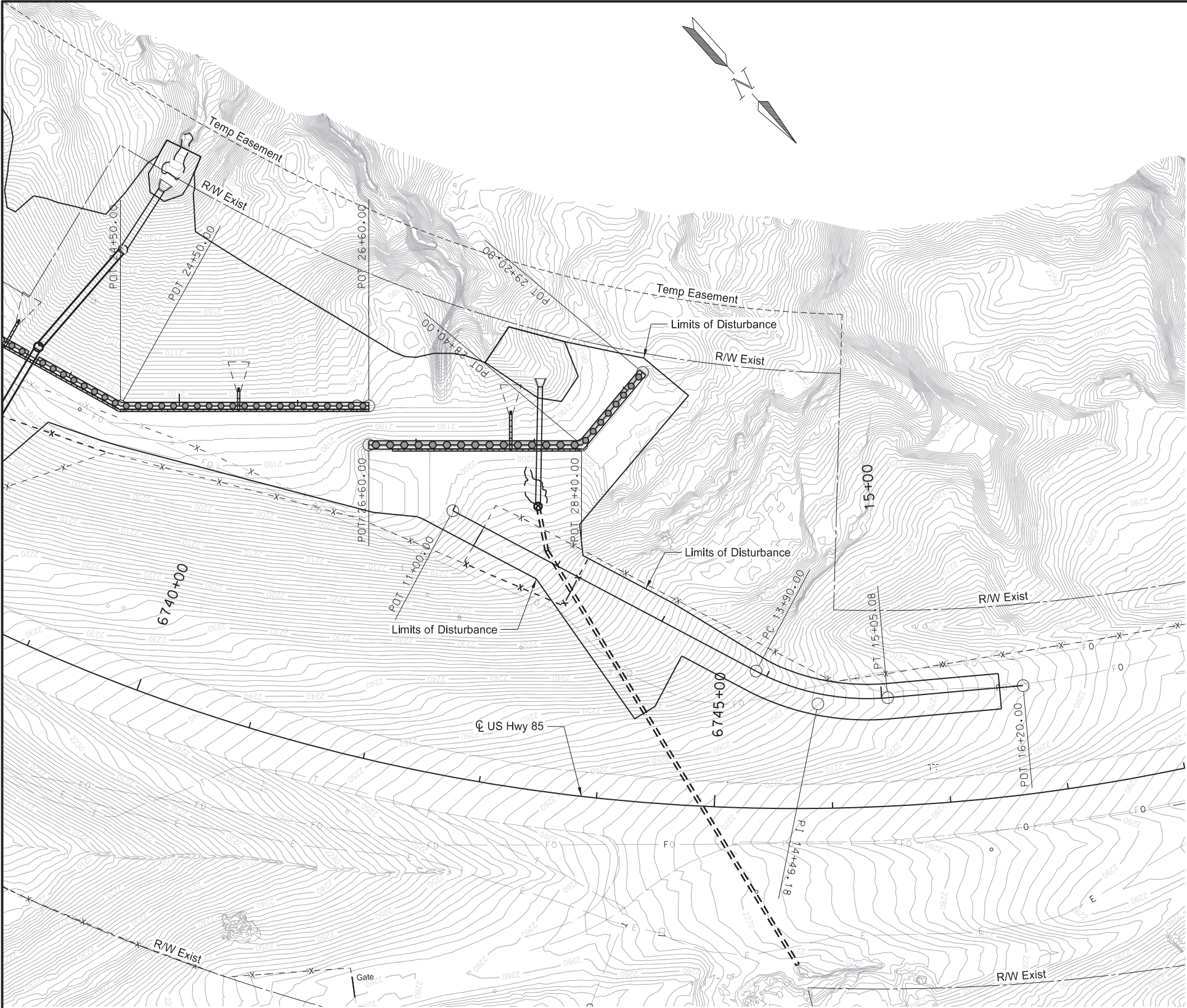
US Hwy 85
Horseshoe Bend Landslide Repair
Existing Ground Contours

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	70	3



US Hwy 85
Horseshoe Bend Landslide Repair
Proposed Ground Contours

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	70	4



US Hwy 85
Horseshoe Bend Landslide Repair
Proposed Ground Contours

Wetland Impact Table																		
Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands	Wetland Impacts Acre(s)			USFWS Easement Impacts Acre(s)		Wetland Mitigation			USACE/11990 Bank		Onsite			
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	Mitigation Required			Location	Acre(s)	Mitigation Location; Ratio	Acre(s)	Constructed Site #	Constructed Size Acre(s)
										EO 11990	USACE	USFWS						
234	Sec 26 T148N R99W	Slope	Created	No	0.000	0.000	0.000	0	0	N	N	N						
235	Sec 26 T148N R99W	Slope	Natural	No	0.044	0.000	0.000	0	0	N	N	N						
236	Sec 26 R148N R99W	Slope	Natural	Yes	0.019	0.158	0.000	0	0	Y	N	N	Vollrath 15/21	0.050				
237	Sec 26 R148N R99W	Slope	Natural	Yes	0.005	0.000	0.000	0	0	N	N	N						
238	Sec 26 R148N R99W	Slope	Natural	Yes	0.000	0.000	0.000	0	0	N	N	N						
240	Sec 26 R148N R99W	Slope	Natural	No	0.000	0.000	0.000	0	0	N	N	N						
Totals					0.068	0.158	0.000	0	0					0.050				

¹ A wetland Jurisdictional Determination was issued by the USACE on 11/03/2016; NWO-2015-0767-BIS.

Impact Summary Table			
Permanent Impact Summary		Temporary Impacts and additional Information	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres/Lf)
Natural/JD (Fill/Drain)	0.158	Temporary JD	0.024
Natural/Non-JD (Fill/Drain)	0.000	Non-JD Temporary	0.044
Created/JD (Fill/Drain)	0.000	Permanent JD > 0.10	0.158
Created /Non-JD (Fill/Drain))	0.000	Permanent OW	0
Total	0.158	Temporary OW	0.00
JD Natural (Cut)	0.000		
JD Created (Cut)	0.000		
Non-JD Natural (Cut)	0.000		
Non-JD Created (Cut)	0.000		
Total	0.158		

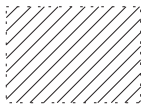
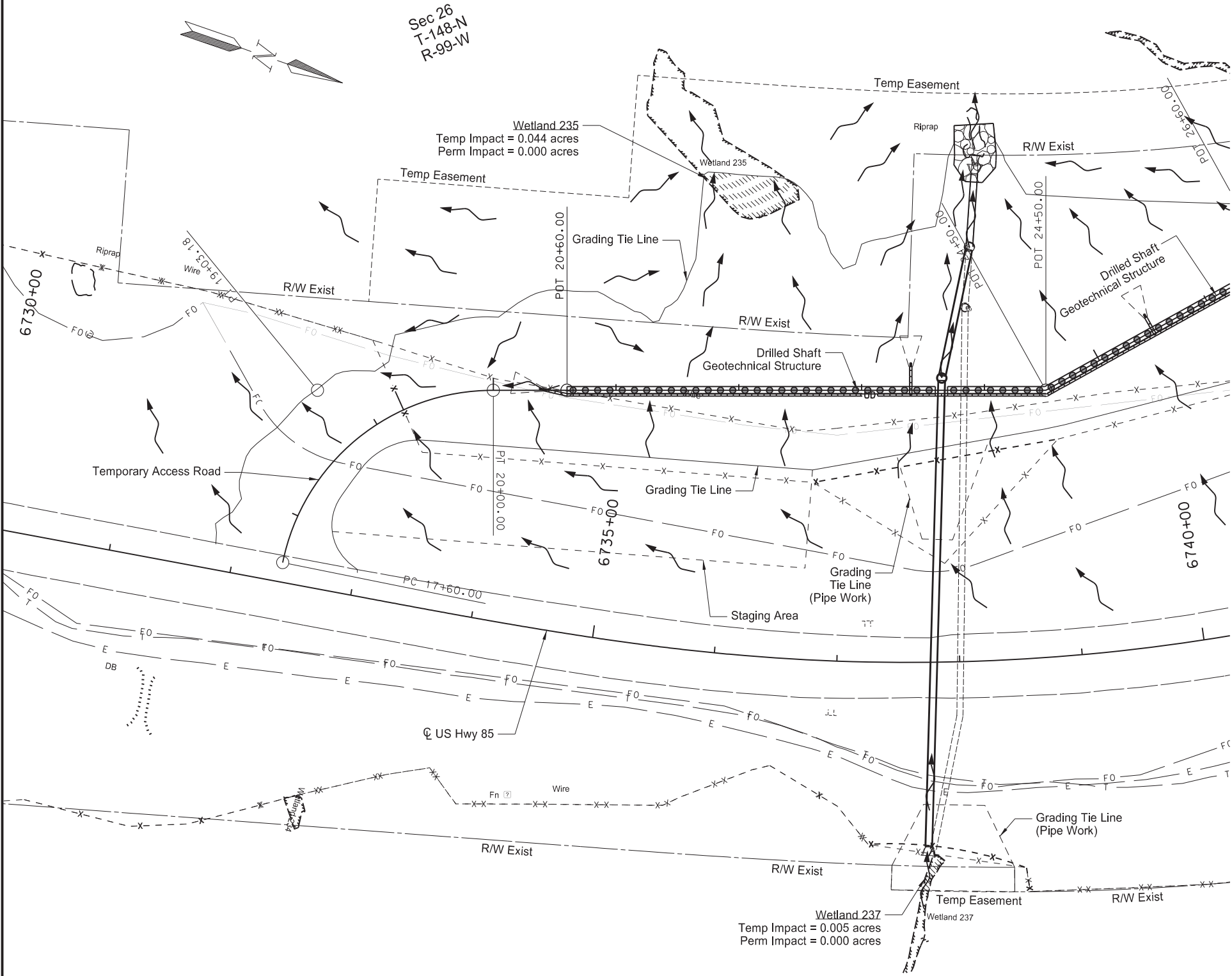
Mitigation Summary Table					
	Location	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only					
EO 11990 Only	Vollrath 15/21	0	0.050		
USACE/11990					
USFWS					
Total		0	0.050	0	0



US Hwy 85
Horseshoe Bend Landslide Repair

Wetland Impact Table

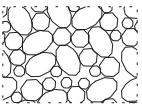
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	75	2



Permanent Wetland Impact



Temporary Wetland Impact

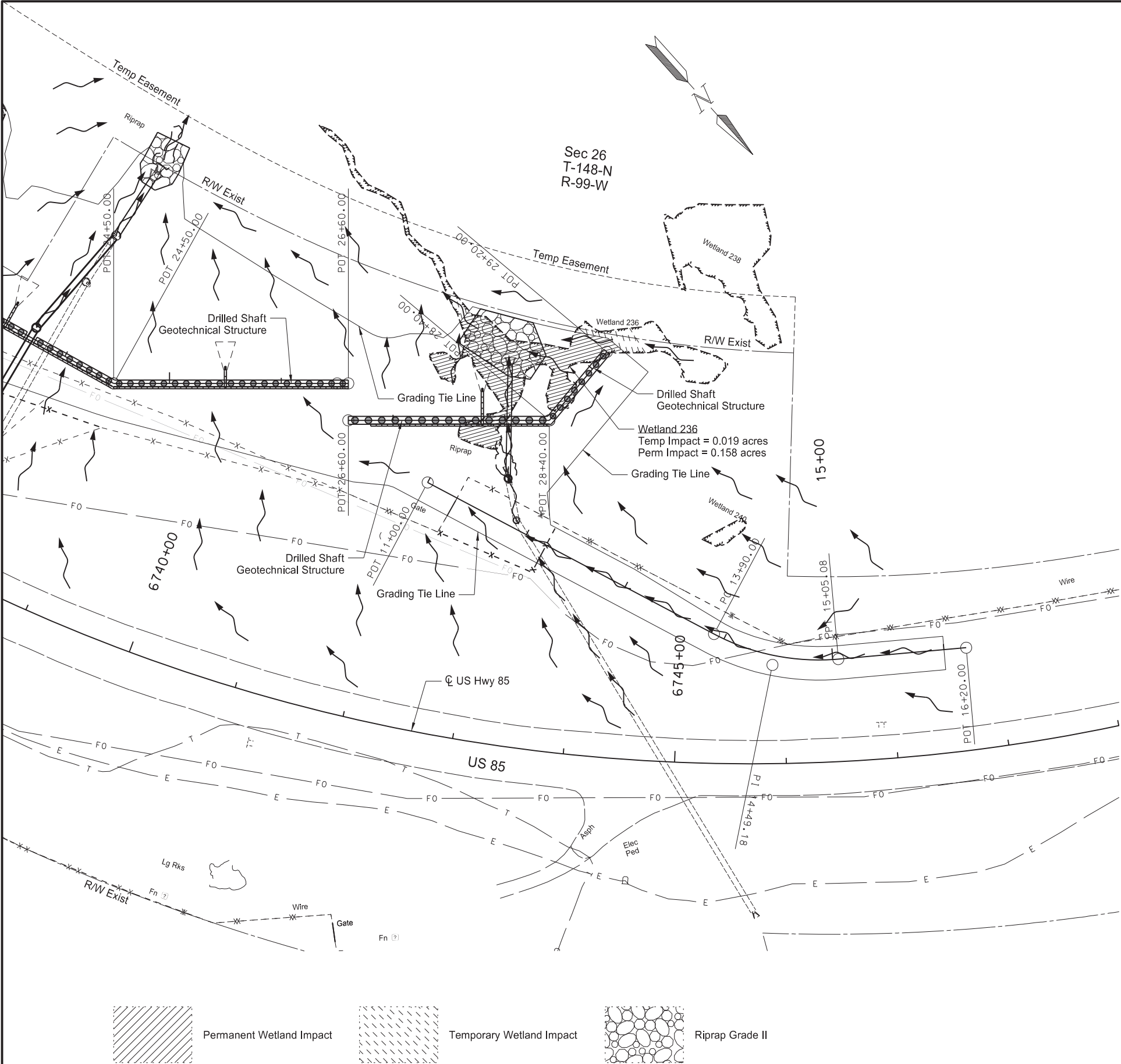


Riprap Grade II

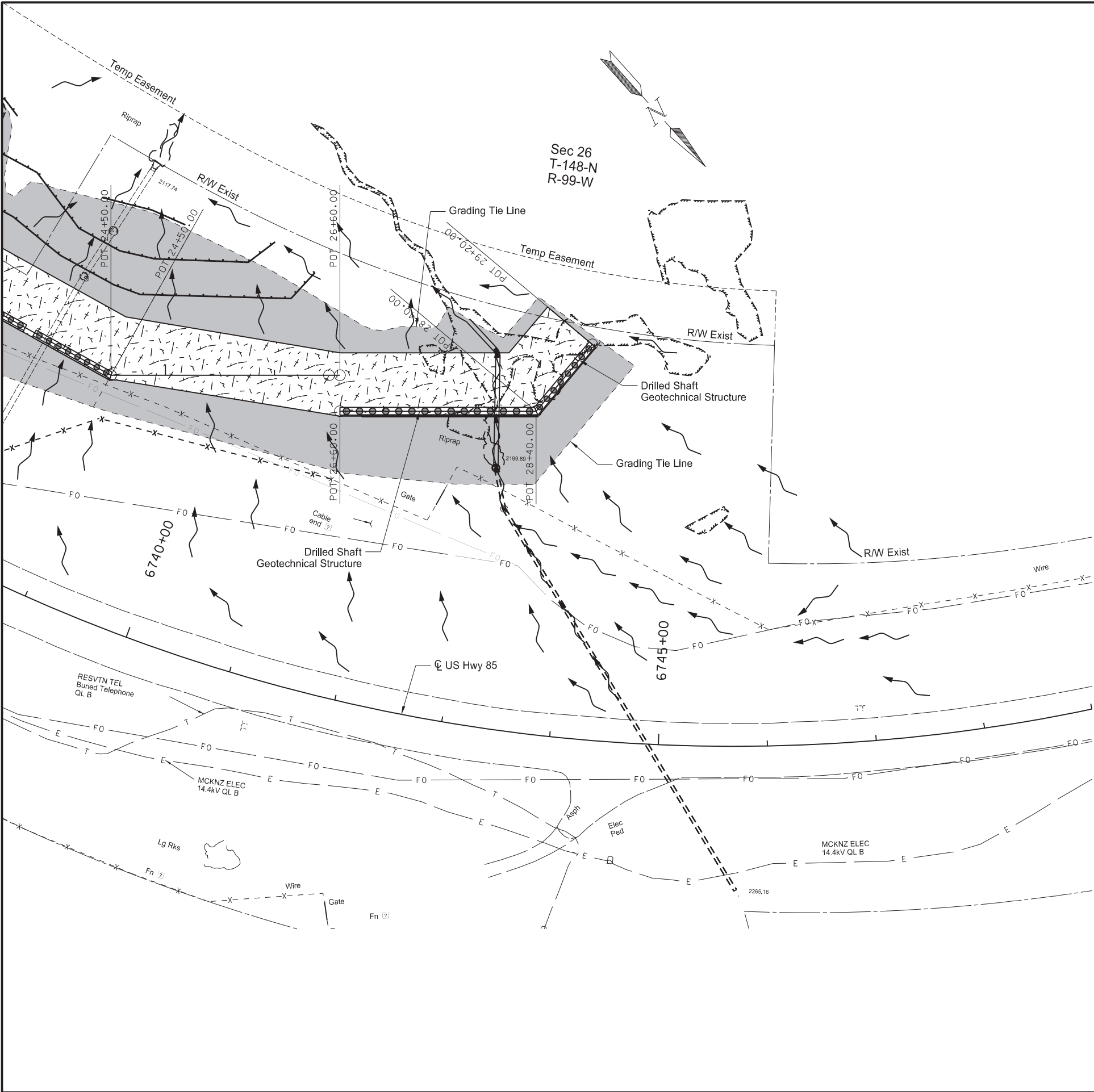


US Hwy 85
Horseshoe Bend Landslide Repair
Wetland Impacts

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	75	3

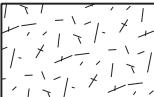
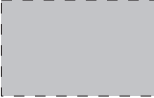


US Hwy 85
Horseshoe Bend Landslide Repair
Wetland Impacts



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	76	2

SPEC	CODE	BID ITEM	QTY	UNIT
251	2000	TEMPORARY COVER CROP		
		Geotech Structure	0.914	ACRE
		Sta 24+50 to 29+25		
253	0301	BONDED FIBER MATRIX		
		Geotech Structure	0.914	ACRE
		Sta 24+50 to 29+25		
261	0112	FIBER ROLLS 12IN		
		Sta 24+50 to 26+00 - Lt	100	LF
		Sta 24+50 to 26+40 - Lt	160	LF
261	0113	REMOVE FIBER ROLLS 12IN		
		Sta 24+50 to 26+00 - Lt	100	LF
		Sta 24+50 to 26+40 - Lt	160	LF

-  Fiber Rolls - 12IN
-  Traffic Service Aggregate
(Paid for in Section 60)
-  Temporary Cover Crop
& Bonded Fiber Matrix

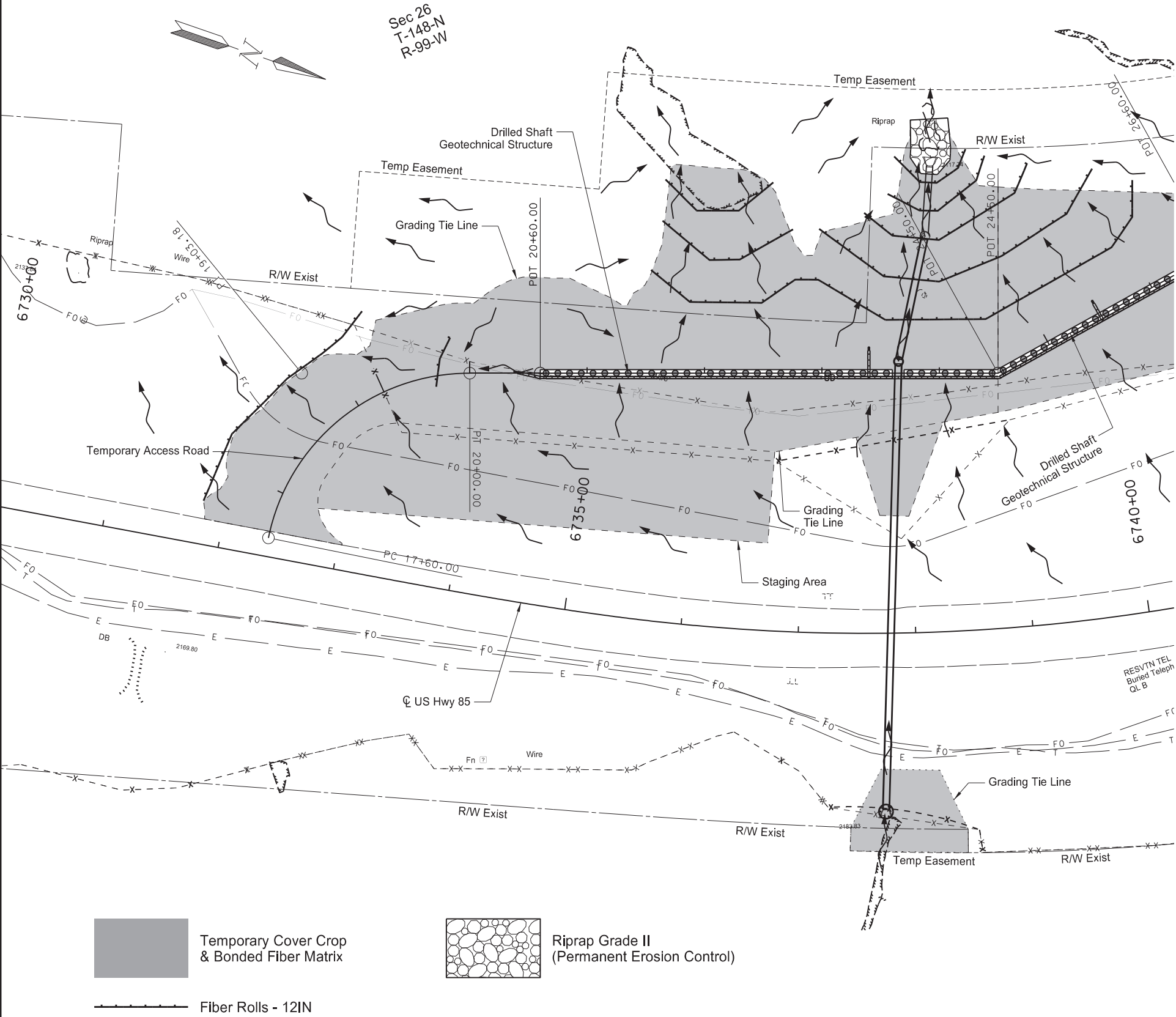


US Hwy 85
Horseshoe Bend Landslide Repair

Temporary Erosion Control
Phase 1 Construction

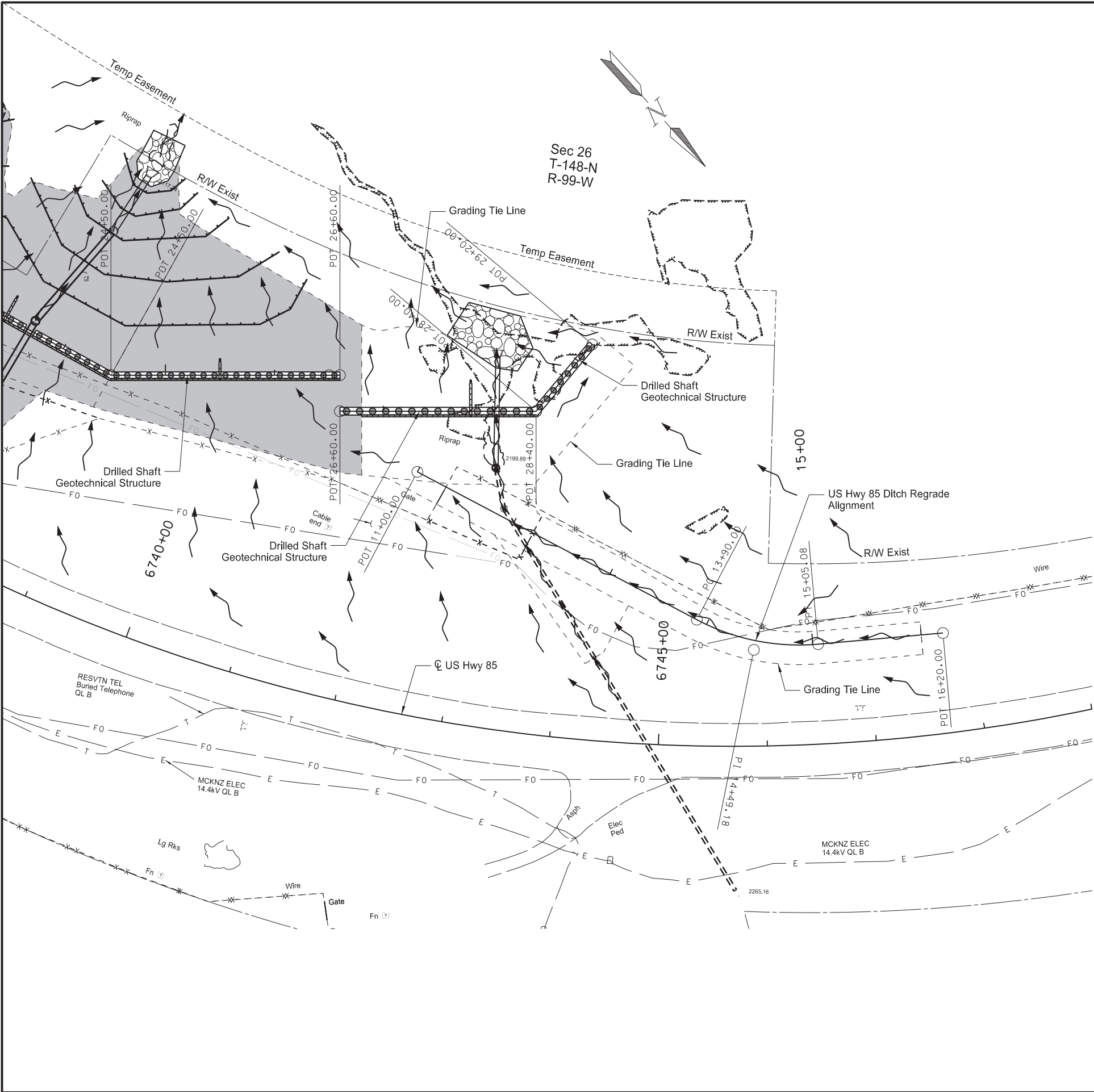
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	76	4

SPEC	CODE	BID ITEM	QTY	UNIT
251	2000	TEMPORARY COVER CROP		
		Temp Access Road, Geotech Structure & Pipe Work Sta 17+60 to 24+50	2.369	ACRE
		Staging Area	0.661	ACRE
		Pipe Installation East of US 85	0.132	ACRE
253	0301	BONDED FIBER MATRIX		
		Temp Access Road, Geotech Structure & Pipe Work Sta 17+60 to 24+50	2.369	ACRE
		Staging Area	0.661	ACRE
		Pipe Installation East of US 85	0.132	ACRE
261	0112	FIBER ROLLS 12IN		
		Sta 17+60 to 19+30 - Lt	215	LF
		Sta 19+80 - Ditch Check	45	LF
		Sta 21+55 to 24+50 - Lt	320	LF
		Sta 21+65 to 22+75 - Lt	130	LF
		Sta 21+65 to 22+60 - Lt	110	LF
		Sta 23+00 to 24+50 - Lt	170	LF
		Sta 23+35 to 24+50 - Lt	130	LF
		Sta 23+55 to 24+40 - Lt	110	LF
		Sta 23+60 to 24+20 - Lt	85	LF
261	0113	REMOVE FIBER ROLLS 12IN		
		Sta 17+60 to 19+30 - Lt	215	LF
		Sta 19+80 - Ditch Check	45	LF
		Sta 21+55 to 24+50 - Lt	320	LF
		Sta 21+65 to 22+75 - Lt	130	LF
		Sta 21+65 to 22+60 - Lt	110	LF
		Sta 23+00 to 24+50 - Lt	170	LF
		Sta 23+35 to 24+50 - Lt	130	LF
		Sta 23+55 to 24+40 - Lt	110	LF
		Sta 23+60 to 24+20 - Lt	85	LF



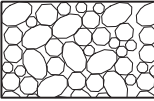
US Hwy 85
Horseshoe Bend Landslide Repair

Temporary Erosion Control
Winter Suspension



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	76	5

SPEC	CODE	BID ITEM	QTY	UNIT
251	2000	TEMPORARY COVER CROP		
		Geotech Structure	0.752	ACRE
		Sta 24+50 to 26+80		
253	0301	BONDED FIBER MATRIX		
		Geotech Structure	0.752	ACRE
		Sta 24+50 to 26+80		
261	0112	FIBER ROLLS 12IN		
		Sta 24+50 to 25+60 - Lt	45	LF
		Sta 24+50 to 26+05 - Lt	115	LF
		Sta 24+50 to 26+30 - Lt	175	LF
261	0113	REMOVE FIBER ROLLS 12IN		
		Sta 24+50 to 25+60 - Lt	45	LF
		Sta 24+50 to 26+05 - Lt	115	LF
		Sta 24+50 to 26+30 - Lt	175	LF

-  Fiber Rolls - 12IN
-  Riprap Grade II
(Permanent Erosion Control)
(Paid for in Section 77)
-  Temporary Cover Crop
& Bonded Fiber Matrix

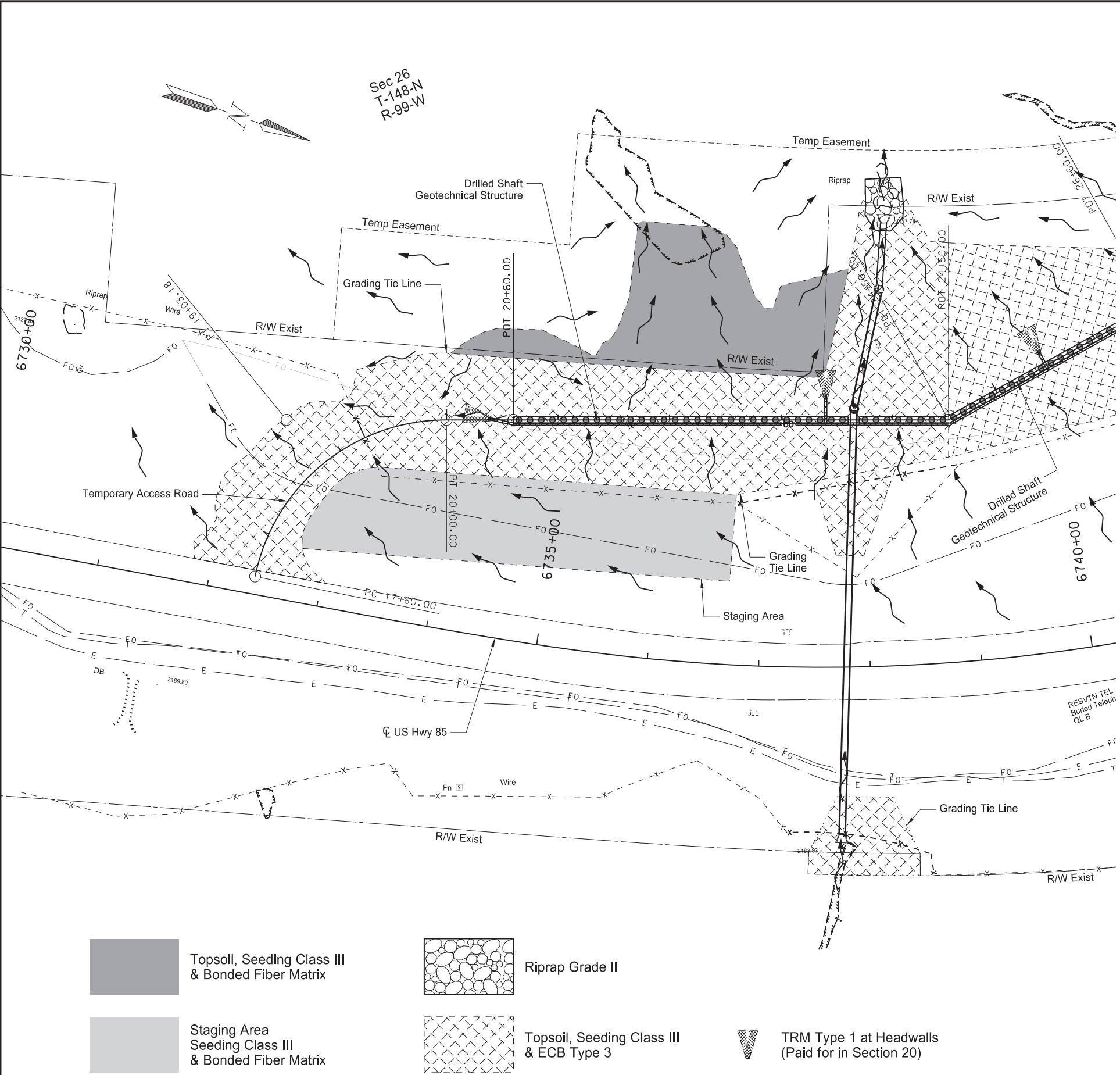


US Hwy 85
Horseshoe Bend Landslide Repair

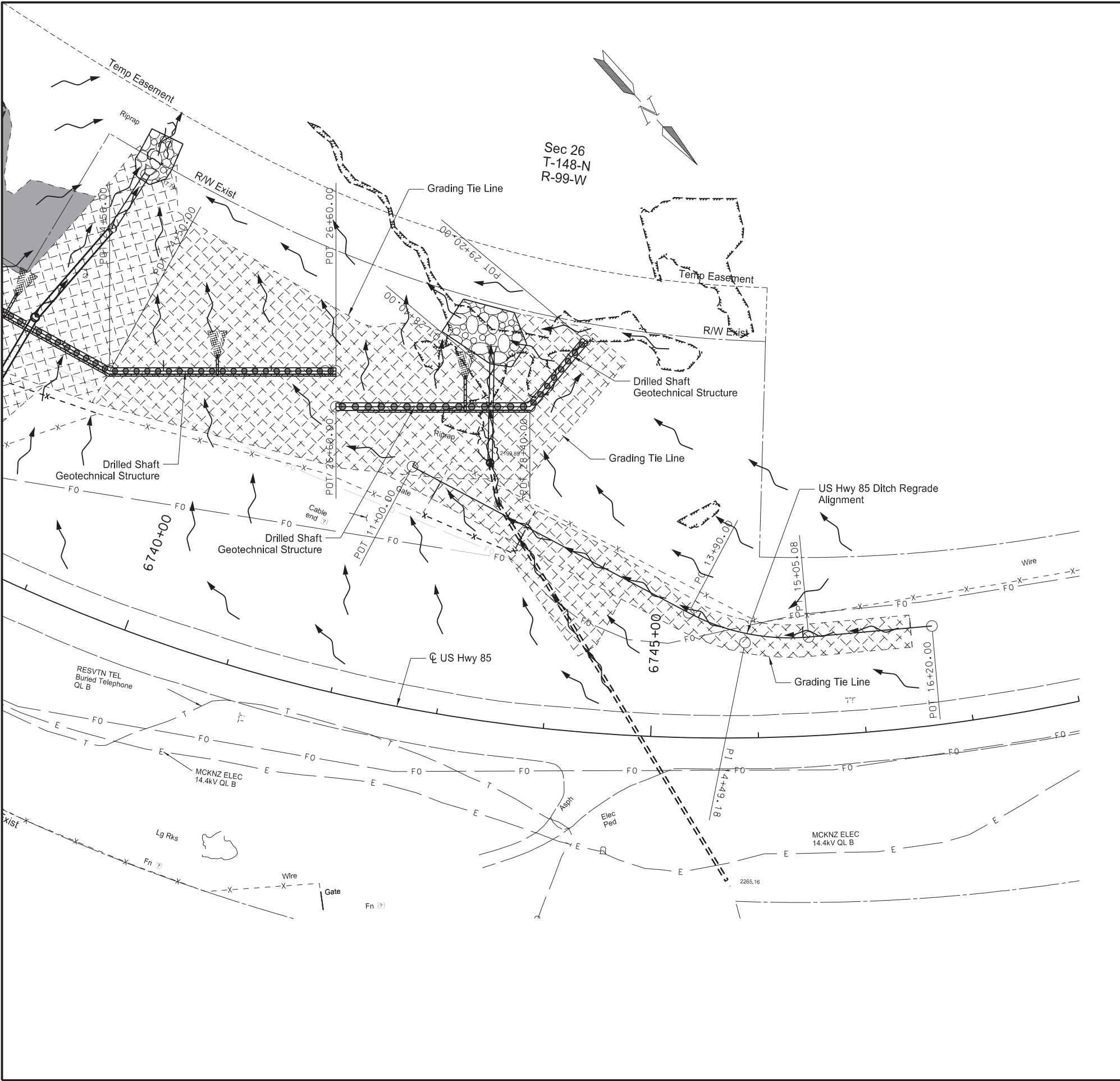
Temporary Erosion Control
Winter Suspension

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	77	1

SPEC	CODE	BID ITEM	QTY	UNIT
203	0109	TOPSOIL		
		Temp Access Road, Geotech Structure & Pipe Work Sta 17+60 to 24+50 within R/W	1566	CY
		Geotech Structure Sta 20+00 to 23+60 outside R/W	424	CY
		Pipe Installation East of US 85	107	CY
251	0300	SEEDING CLASS III		
		Temp Access Road, Geotech Structure & Pipe Work Sta 17+60 to 24+50 within R/W	1.942	ACRE
		Geotech Structure Sta 20+00 to 23+60 outside R/W	0.526	ACRE
		Staging Area	0.661	ACRE
		Pipe Installation East of US 85	0.132	ACRE
253	0301	BONDED FIBER MATRIX		
		Geotech Structure Sta 20+00 to 23+60 outside R/W	0.609	ACRE
		Staging Area	0.661	ACRE
255	0103	ECB TYPE 3		
		Temp Access Road, Geotech Structure & Pipe Repair Sta 17+60 to 24+50 within R/W	8997	SY
		Pipe Installation East of US 85	640	SY
256	0200	RIPRAP GRADE II		
		66 IN Pipe Outlet: Sta 23+90 - Lt	110	CY
709	0155	GEOSYNTHETIC MATERIAL TYPE RR		
		66 IN Pipe Outlet: Sta 23+90 - Lt	161	SY



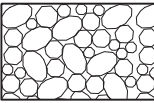
US Hwy 85
Horseshoe Bend Landslide Repair
Permanent Erosion Control

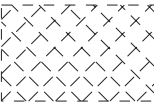


STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	77	2

SPEC	CODE	BID ITEM	QTY	UNIT
203	0109	TOPSOIL		
		Geotech Structure Sta 24+50 to 29+25	1156	CY
		US Hwy 85 Ditch Regrading & Pipe Repair Sta 11+00 to 16+00	305	CY
251	0300	SEEDING CLASS III		
		Geotech Structure Sta 24+50 to 29+25	1.433	ACRE
		US Hwy 85 Ditch Regrading & Pipe Repair Sta 11+00 to 16+00	0.488	ACRE
255	0103	ECB TYPE 3		
		Geotech Structure Sta 24+50 to 29+25	6933	SY
		US Hwy 85 Ditch Regrading & Pipe Repair Sta 11+00 to 16+00	1829	SY
256	0200	RIPRAP GRADE II		
		42 IN Pipe Outlet: Sta 28+05 - Lt	220	CY
709	0155	GEOSYNTHETIC MATERIAL TYPE RR		
		42 IN Pipe Outlet: Sta 28+05 - Lt	340	SY

 TRM Type 1 at Headwalls
(Paid for in Section 20)

 Riprap Grade II

 Topsoil, Seeding Class III
& ECB Type 3



US Hwy 85
Horseshoe Bend Landslide Repair

Permanent Erosion Control

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - N OF LONG X BRIDGE - HORSESHOE BEND											STATE	PROJECT NO.	SECTION NO.	SHEET NO.						
										ND		SOIB-NH-7-085(110)127	81	1						
HORIZONTAL ALIGNMENT				CURVE DATA		US PUBLIC LAND SURVEY DATA				SURVEY CONTROL POINTS										
PNT	STATION	NORTHING	EASTING	ARC DEFINITION		CORNER	IRN	NORTHING	EASTING	PNT	NORTHING	EASTING	ELEV	STATION OFFSET	ALIGN					
US 85				Curve C34	Curve C37	T-148-N R-99-W				MONUMENT DESCRIPTION										
N OF LONG X BRIDGE - HORSESHOE BEND				PI = 6724+84.24	PI = 6775+33.06	W 1/4 Cor Sec 35	9-M	229,379.11	1,285,517.87											
(GPK: job001, Chain: SCL85)				Delta = 6° 19' 27" (RT)	Delta = 42° 33' 11" (RT)	E 1/4 Cor Sec 35	11-M	229,159.77	1,290,781.60	PRIMARY CONTROL										
Begin	6694+29.58	229,657.04	1,289,468.09	Da = 2° 36' 16"	Da = 3° 59' 57"	NW Cor Sec 35	9-L	232,017.38	1,285,604.97	GPS 12	136,845.26	1,303,165.82	2,659.58	5684+24 - 195' Lt	SCL85					
TS	6722+62.67	232,396.40	1,288,745.35	R = 2,200.00	R = 1,432.69	N 1/4 Cor Sec 35	10-L	231,901.36	1,288,233.81	Rebar and Alum cap										
SC	6724+62.67	232,590.51	1,288,697.26	L = 42.83	L = 804.05	NE Cor Sec 35	11-L	231,795.30	1,290,870.02	GPS 14	168,816.15	1,288,812.13	2,654.41	6060+10 - 204' Rt	SCL85					
PI C34	6724+84.24	232,610.64	1,288,688.82	Ls = 200.00	Ls = 260.00	W 1/4 Cor Sec 26	9-K	234,653.40	1,285,689.21	Rebar and Alum cap										
CS	6725+05.50	232,632.46	1,288,688.64	Sc = 2° 36' 16"	Sc = 5° 11' 56"	Center 1/4 Cor Sec 26	10-K	234,541.76	1,288,323.88	GPS 15	184,760.21	1,288,952.26	2,533.66	6219+71 - 217 Lt	SCL85					
ST	6727+05.50	232,829.80	1,288,656.24	Ts = 221.57	Ts = 688.64	E 1/4 Cor Sec 26	11-K	234,430.13	1,290,958.42	Rebar and Alum cap										
TS	6733+12.24	233,429.95	1,288,567.02			S 1/4 Cor Sec 22	8-J	237,401.57	1,283,138.50	GPS 19	245,296.16	1,286,127.21	2,427.66	6864+24 - 86' Rt	SCL85					
SC	6736+12.24	233,725.05	1,288,513.68	Curve C35		NW Cor Sec 26	9-J	237,289.36	1,285,773.46	Rebar and Alum cap										
PI C35	6743+37.90	234,444.46	1,288,416.20	PI = 6743+37.90		N 1/4 Cor Sec 26	10-J	237,178.73	1,288,413.82	GPS 21	271,634.98	1,283,845.91	2,209.61	7132+66 - 273' Rt	SCL85					
CS	6749+12.76	234,733.83	1,287,750.38	Delta = 57° 18' 52" (LT)		NE Cor Sec 26	11-J	237,068.10	1,291,054.18	Rebar and Alum cap										
ST	6752+12.76	234,865.38	1,287,480.89	Da = 3° 34' 52"						GPS 22	284,997.26	1,281,461.64	2,178.55	N/A	N/A					
TS	6753+72.35	234,930.87	1,287,335.36	R = 1,600.00						Rebar and Alum cap										
SC	6756+72.35	235,060.15	1,287,064.71	L = 1,300.52																
PI C36	6760+12.21	235,193.47	1,286,751.87	Ls = 300.00						SECONDARY CONTROL										
CS	6763+35.66	235,455.75	1,286,535.40	Sc = 5° 22' 17"						RTK 30000	234,881.52	1,287,290.47	2,322.62	6753+93 - 63' LT	SCL85					
ST	6766+35.66	235,678.70	1,286,334.77	Ts = 1,025.66						Mag nail										
TS	6768+44.42	235,837.01	1,286,198.69							RTK 30002	235,772.19	1,286,878.36	2,518.40	6763+16 - 466' RT	SCL85					
SC	6771+04.42	236,039.14	1,286,035.30	Curve C36						#4 Rebar ROW Mkr										
PI C37	6775+33.06	236,359.23	1,285,749.79	PI = 6760+12.21						RTK 30003	237,344.29	1,285,593.58	2,424.88	N/A	N/A					
CS	6779+08.47	236,787.59	1,285,771.64	Delta = 25° 05' 17" (RT)						1 1/4" Yellow plastic cap										
ST (End)	6781+68.47	237,047.50	1,285,772.27	Da = 2° 36' 16"						RTK 30004	237,350.94	1,285,621.66	2,423.48	N/A	N/A					
				R = 2,200.00						2" Alum cap										
				L = 663.32						REFERENCE MARKERS										
				Ls = 300.00						R Mkr #	NORTHING	EASTING	STATION	OFFSET	ALIGNMENT					
				Sc = 3° 54' 24"						127	229,923.01	1,289,422.07	6696+98	23'Rt	SCL85					
				Ts = 639.86						128	234,796.71	1,287,715.20	6749+73	38'Rt	SCL85					
										All coordinates and measurements on this document derived from the International Foot definition. INITIALIZING BENCH MARK NDGPS Stations (OPUS) ☒ NAVD-88 ☐ _____ ☒ GEOID12B ☐ _____ ☐ GEOID18 ☐ _____ REGISTERED PROFESSIONAL LAND SURVEYOR KRISTOFOR JOHNSON LS-10169 DATE 08/04/20 NORTH DAKOTA DocuSign										
NOTES: Sheet 1 of 1 Alignment and Control per NDDOT Project # NH 9-085(085)075				Date Survey Completed 10/31/2018		☐ Assumed Coordinates ☒ All coordinates on this sheet are McKenzie County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota North Zone Combination Factor (cf) = 0.9998485														

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	82	1

Beginning chain PR GEO90 1 description
Feature: Alignment 5 S

Point 338 N 233,889.6671 E 1,288,285.5536 Sta 24+00.00
Course from 338 to 339 N 48° 04' 58.88" W Dist 250.0000
Point 339 N 234,056.6804 E 1,288,099.5252 Sta 26+50.00
Course from 339 to 340 N 48° 04' 58.88" W Dist 250.0000
Point 340 N 234,223.6936 E 1,287,913.4967 Sta 29+00.00

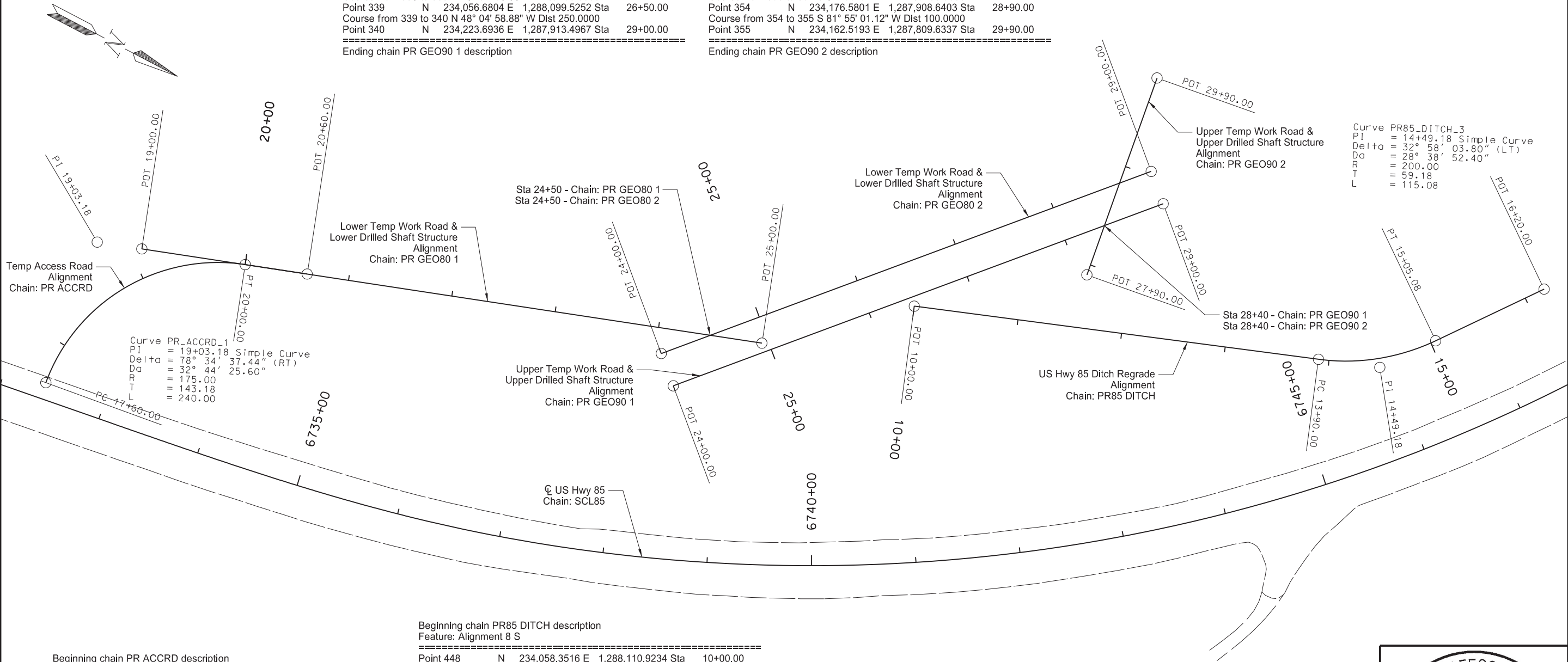
Ending chain PR GEO90 1 description

Beginning chain PR GEO90 2 description
Feature: Alignment 6 S

Point 353 N 234,190.6408 E 1,288,007.6468 Sta 27+90.00
Course from 353 to 354 S 81° 55' 01.12" W Dist 100.0000
Point 354 N 234,176.5801 E 1,287,908.6403 Sta 28+90.00
Course from 354 to 355 S 81° 55' 01.12" W Dist 100.0000
Point 355 N 234,162.5193 E 1,287,809.6337 Sta 29+90.00

Ending chain PR GEO90 2 description

Curve PR85_DITCH_3
PI = 14+49.18 Simple Curve
Delta = 32° 58' 03.80" (LT)
Da = 28° 38' 52.40"
R = 200.00
T = 59.18
L = 115.08



Beginning chain PR ACCRD description
Feature: Alignment 2 S

Curve Data
Curve PR ACCRD 1
P.I. Station 19+03.18 N 233,337.7909 E 1,288,419.8395
Delta = 78° 34' 37.44" (RT)
Degree = 32° 44' 25.60"
Tangent = 143.1774
Length = 240.0000
Radius = 175.0000
External = 51.1078
Long Chord = 221.6291
Mid. Ord. = 39.5558
P.C. Station 17+60.00 N 233,356.7782 E 1,288,561.7523
P.T. Station 20+00.00 N 233,473.1322 E 1,288,373.1225
C.C. N 233,530.2325 E 1,288,538.5448
Back = S 82° 22' 45.63" W
Ahead = N 19° 02' 36.93" W
Chord Bear = N 58° 19' 55.65" W

Course from PT PR ACCRD 1 to 392 N 19° 02' 36.93" W Dist 60.0000
Point 392 N 233,529.8485 E 1,288,353.5452 Sta 20+60.00

Ending chain PR ACCRD description

Beginning chain PR85 DITCH description
Feature: Alignment 8 S

Point 448 N 234,058.3516 E 1,288,110.9234 Sta 10+00.00
Course from 448 to PC PR85 DITCH 3 N 20° 11' 49.48" W Dist 390.0000

Curve Data
Curve PR85 DITCH 3
P.I. Station 14+49.18 N 234,479.9132 E 1,287,955.8433
Delta = 32° 58' 03.80" (LT)
Degree = 28° 38' 52.40"
Tangent = 59.1814
Length = 115.0791
Radius = 200.0000
External = 8.5724
Long Chord = 113.4981
Mid. Ord. = 8.2201
P.C. Station 13+90.00 N 234,424.3708 E 1,287,976.2757
P.T. Station 15+05.08 N 234,515.3934 E 1,287,908.4767
C.C. N 234,355.3208 E 1,287,788.5736
Back = N 20° 11' 49.48" W
Ahead = N 53° 09' 53.28" W
Chord Bear = N 36° 40' 51.38" W

Course from PT PR85 DITCH 3 to 449 N 53° 09' 53.28" W Dist 114.9209
Point 449 N 234,584.2903 E 1,287,816.4982 Sta 16+20.00

Ending chain PR85 DITCH description

Beginning chain PR GEO80 1 description
Feature: Alignment 3 S

Point 320 N 233,378.6052 E 1,288,405.7512 Sta 19+00.00
Course from 320 to 321 N 19° 02' 36.93" W Dist 300.0000
Point 321 N 233,662.1864 E 1,288,307.8650 Sta 22+00.00
Course from 321 to 322 N 19° 02' 36.92" W Dist 300.0000
Point 322 N 233,945.7675 E 1,288,209.9788 Sta 25+00.00

Ending chain PR GEO80 1 description

Beginning chain PR GEO80 2 description
Feature: Alignment 4 S

Point 329 N 233,865.1014 E 1,288,263.4988 Sta 24+00.00
Course from 329 to 330 N 48° 04' 58.88" W Dist 250.0000
Point 330 N 234,032.1146 E 1,288,077.4704 Sta 26+50.00
Course from 330 to 331 N 48° 04' 58.88" W Dist 250.0000
Point 331 N 234,199.1279 E 1,287,891.4420 Sta 29+00.00

Ending chain PR GEO80 2 description



US Hwy 85
Horseshoe Bend Landslide Repair

Alignment Data

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SOIB-NH-7-085(110)127	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED		TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
			BY PHASE NO.				
			1	2			
E5-1-48	48"x48"	EXIT GORE				35	
G20-1-60	60"x24"	ROAD WORK NEXT MILES				28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)				18	
G20-2-48	48"x24"	END ROAD WORK	2	2	2	26	52
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)	1		1	18	18
G20-10-108	108"x48"	CONTRACTOR SIGN				70	
G20-50a-72	72"x36"	ROAD WORK NEXT MILES RT & LT ARROWS				43	
G20-52a-72	72"x24"	ROAD WORK NEXT MILES RT or LT ARROW				36	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE \$80 WHEN WORKERS PRESENT				59	
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)				10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)				10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)				10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)				7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)				7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)				7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)				7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)				7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT				15	
M4-10-48	48"x18"	DETOUR (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)				7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)				7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)				9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)				7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)				9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)				7	
R1-1-48	48"x48"	STOP	5	4	5	32	160
R1-2-60	60"x60"	YIELD				29	
R2-1-36	36"x48"	SPEED LIMIT (Portable only)				30	
R2-1-48	48"x60"	SPEED LIMIT	5		5	39	195
R2-1aP-24	24"x18"	MINIMUM FEE \$80 (Mounted on Speed Limit post)	3		3	10	30
R3-2-48	48"x48"	NO LEFT TURN				35	
R4-1-48	48"x60"	DO NOT PASS				39	
R4-7-48	48"x60"	KEEP RIGHT				39	
R5-1-48	48"x48"	DO NOT ENTER				35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)				14	
R7-1-12	12"x18"	NO PARKING ANY TIME				11	
R10-6-24	24"x36"	STOP HERE ON RED				16	
R11-2-48	48"x30"	ROAD CLOSED (Mounted on barricade)				12	
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)				12	
R11-3a-60	60"x30"	ROAD CLOSED MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)				15	
R11-3c-60	60"x30"	STREET CLOSED MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)				15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)				15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT				35	
W1-4-48	48"x48"	REVERSE CURVE RIGHT or LEFT				35	
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT				35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW				26	
W3-1-48	48"x48"	STOP AHEAD				35	
W3-3-48	48"x48"	SIGNAL AHEAD				35	
W3-4-48	48"x48"	BE PREPARED TO STOP	1		1	35	35
W3-5-48	48"x48"	SPEED REDUCTION AHEAD	2		2	35	70
W4-2-48	48"x48"	LANE ENDS RIGHT or LEFT	1		1	35	35
W5-1-48	48"x48"	ROAD NARROWS				35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE				35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW				35	
W6-3-48	48"x48"	TWO WAY TRAFFIC				35	
W8-1-48	48"x48"	BUMP				35	
W8-3-48	48"x48"	PAVEMENT ENDS				35	
W8-7-48	48"x48"	LOOSE GRAVEL				35	
W8-11-48	48"x48"	UNEVEN LANES				35	
W8-12-48	48"x48"	NO CENTER LINE				35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL				35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY				35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or FT or MILE	4	2	4	35	140
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or FT or MILE	2	2	2	35	70
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY				35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL				35	
W12-2-48	48"x48"	LOW CLEARANCE				35	
W13-1P-30	30"x30"	MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)				14	
W14-3-64	64"x48"	NO PASSING ZONE				28	
W16-2P-30	30"x24"	FEET PLAQUE (Mounted on warning sign post)				10	
W20-1-48	48"x48"	ROAD WORK AHEAD or FT or MILE	2	2	2	35	70
W20-2-48	48"x48"	DETOUR AHEAD or FT or MILE				35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or FT or MILE				35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or FT or MILE				35	
W20-5-48	48"x48"	RIGHT or CENTER or LEFT LANE CLOSED AHEAD or FT or MILE	1		1	35	35
W20-7-48	48"x48"	FLAGGER	2		2	35	70
W20-8-18	18"x18"	STOP - SLOW PADDLE Back to Back	2		2	5	10
W20-52P-54	54"x12"	NEXT MILES (Mounted on warning sign post)				12	
W21-1-48	48"x48"	WORKERS				35	
W21-2-48	48"x48"	FRESH OIL				35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or FT or MILE				35	
W21-5-48	48"x48"	SHOULDER WORK				35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED				35	

[illegible][illegible]

SPEC & CODE			
704-1000	TRAFFIC CONTROL SIGNS	TOTAL UNITS	1060

[illegible]

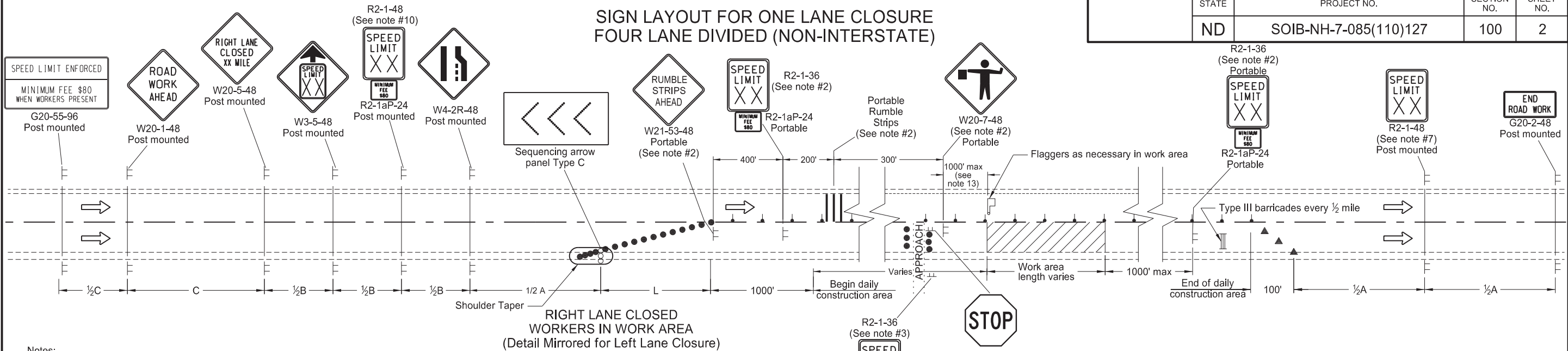
NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
<http://www.dot.nd.gov/>



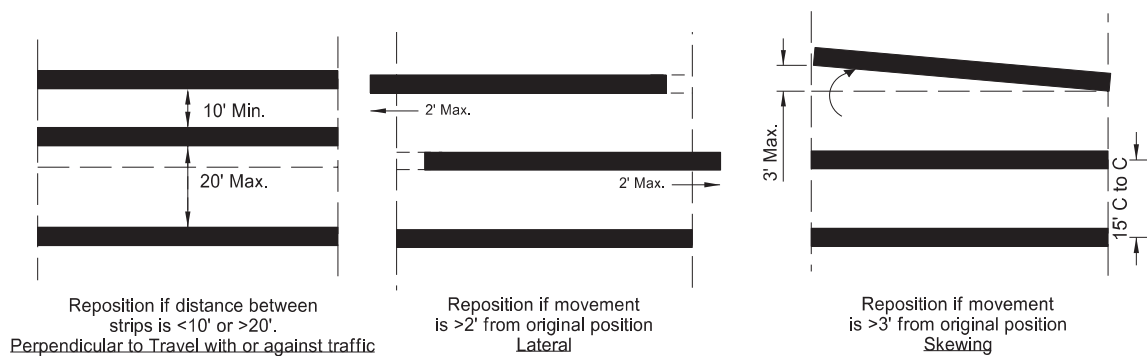
Traffic Control Devices List

SIGN LAYOUT FOR ONE LANE CLOSURE
FOUR LANE DIVIDED (NON-INTERSTATE)

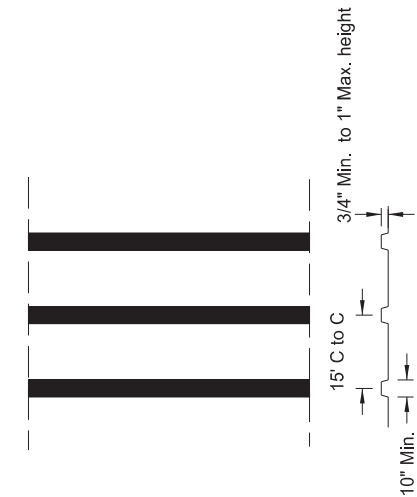
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	100	2



- Notes:
1. Install advance signs for flagging when flaggers are flagging.
 2. Move the portable rumble strips, rumble strips ahead sign, advanced flagger sign, and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Cover or remove the rumble strips ahead sign, 40 mph speed limit and Minimum Fee \$80 signs and the 60 mph speed limit sign upon completion of the work day or when workers are not present. Remove the portable rumble strips upon completion of the work day.
 3. Approaches: When the work area encompasses an approach, install a 40 mph speed limit sign to control the approach. Cover the existing stop sign and install a new portable stop sign when the approach is on the side of the lane closure. Remove the approach speed limit sign once the main line 40 mph speed zone is moved past the approach.
 4. Variables:
S=Numerical value of speed limit or 85th percentile
W=The width of taper.
L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or (WxSxS)/60 for urban, residential, and other streets with speeds of 40 mph or less.
 5. Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
 6. Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
 7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
 8. Cover existing speed limit signs within a reduced speed zone.
 9. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.
 10. Determine the reduced speed limit dependent on the in place speed limit before construction. Where speed limits are to be reduced more than 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2B.
 11. As an option use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 12. Sign G20-55-96 is not required if this standard is part of other traffic control layouts or the work is less than 15 days.
 13. For a stationary operation, maximum distance is 1000'. For a moving operation, maximum distance is 3000'.



PORTABLE RUMBLE STRIPS ARRAY - TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES



PORTABLE RUMBLE STRIPS ARRAY DETAIL

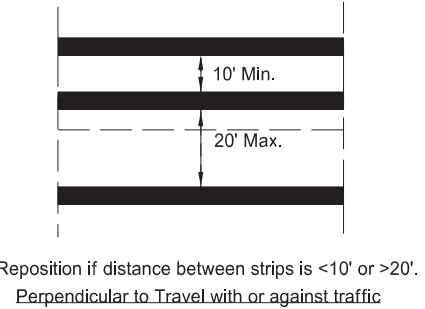
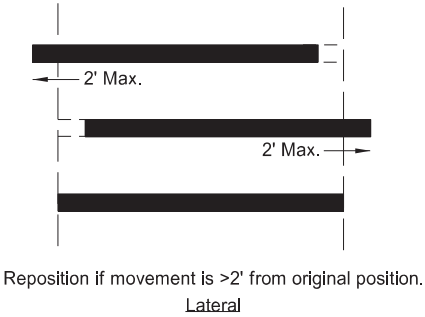
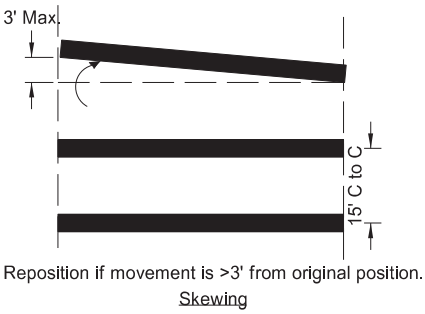
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

KEY	
	Type I barricade
	Type II barricade
	Type III barricade
	Sign
	Delineator drum
	Work area
	Flagger
	Sequencing arrow panel
	Tubular marker
	Cone



US Hwy 85
Horseshoe Bend Landslide Repair

Portable Rumble Strip Detail
for 4-Lane Highways



PORTABLE RUMBLE STRIPS ARRAY
TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES

- Notes:
1. Number of devices were calculated using 40 mph. Speed determined in the field based on location and conditions.
 2. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
 3. Sign R2-1aP-24 is not required when pilot car operation is used.
 4. Rumble strips are not used on a non paved surface or in a pre-construction speed zone of 25 mph or less.

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720

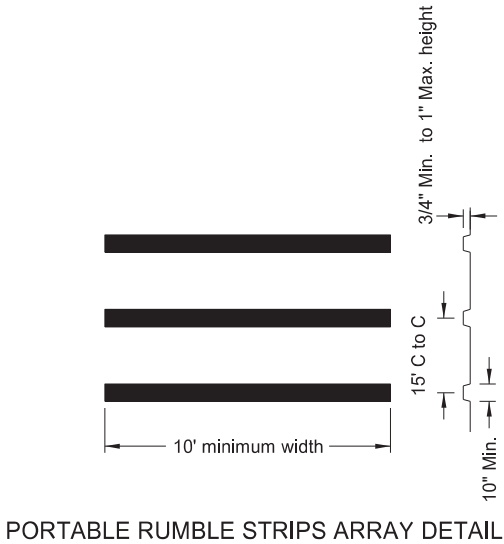


KEY

- Work area
- Flagger
- Sign
- S = Numerical value of speed limit or 85th percentile.

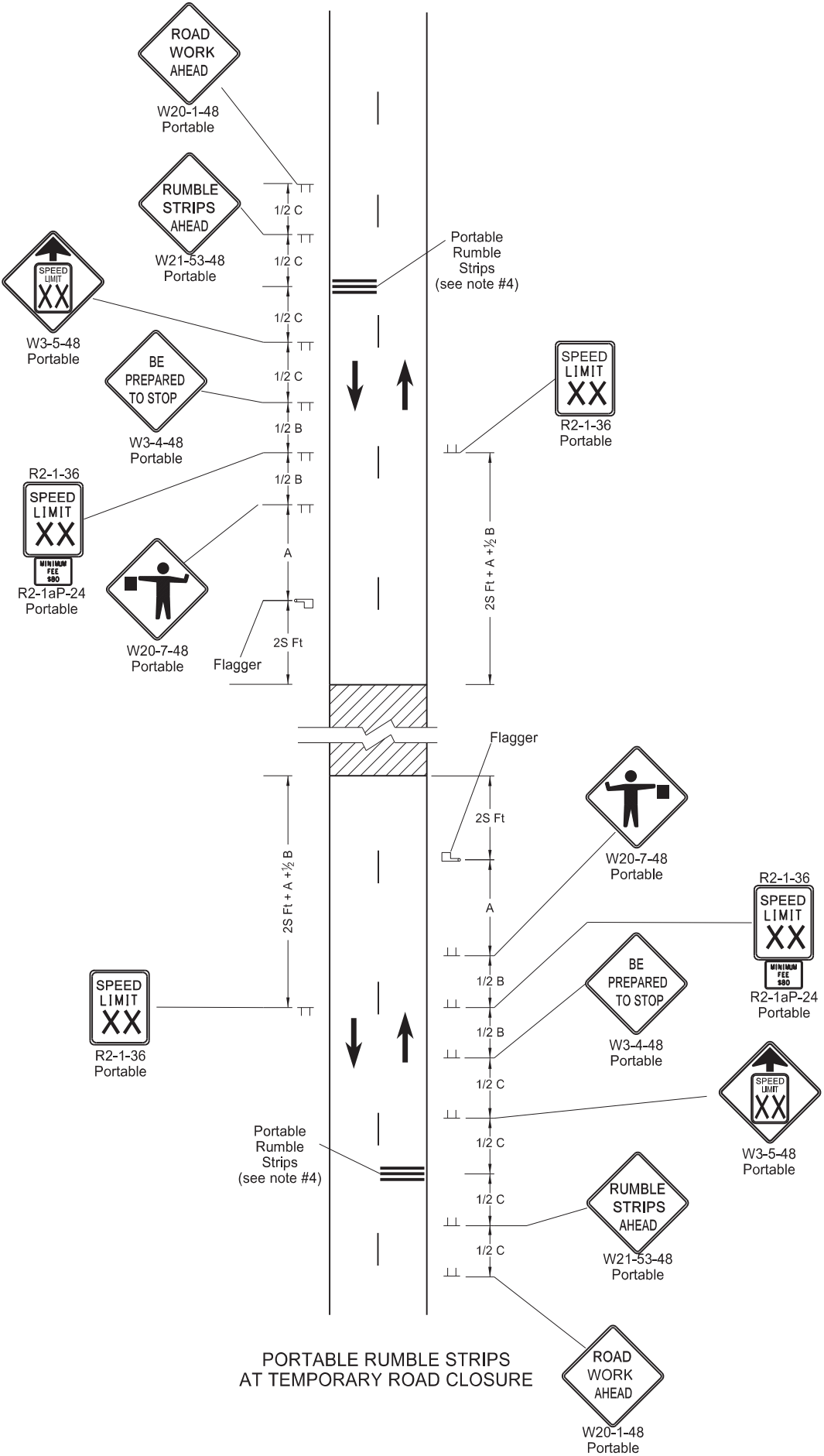
US Hwy 85
Horseshoe Bend Landslide Repair

Portable Rumble Strip Detail
for 2-Lane Highways

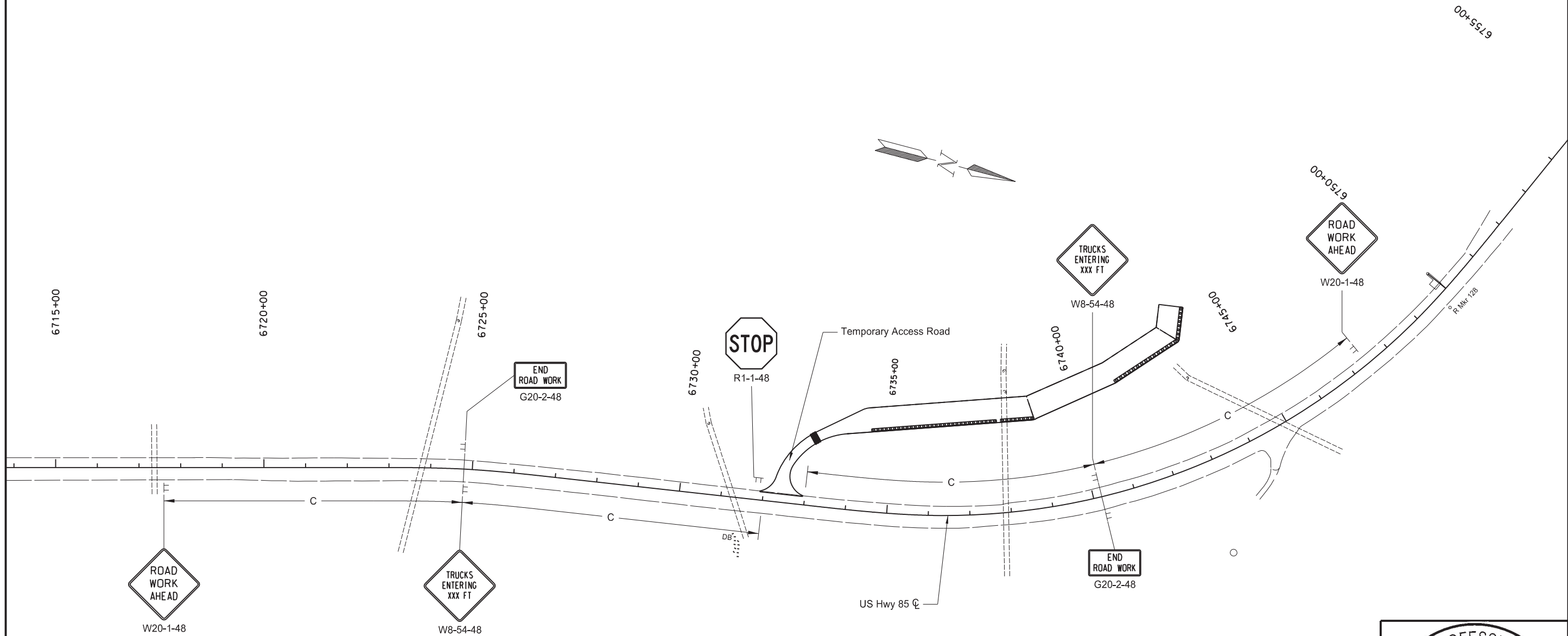


PORTABLE RUMBLE STRIPS ARRAY DETAIL

PORTABLE RUMBLE STRIPS
AT TEMPORARY ROAD CLOSURE



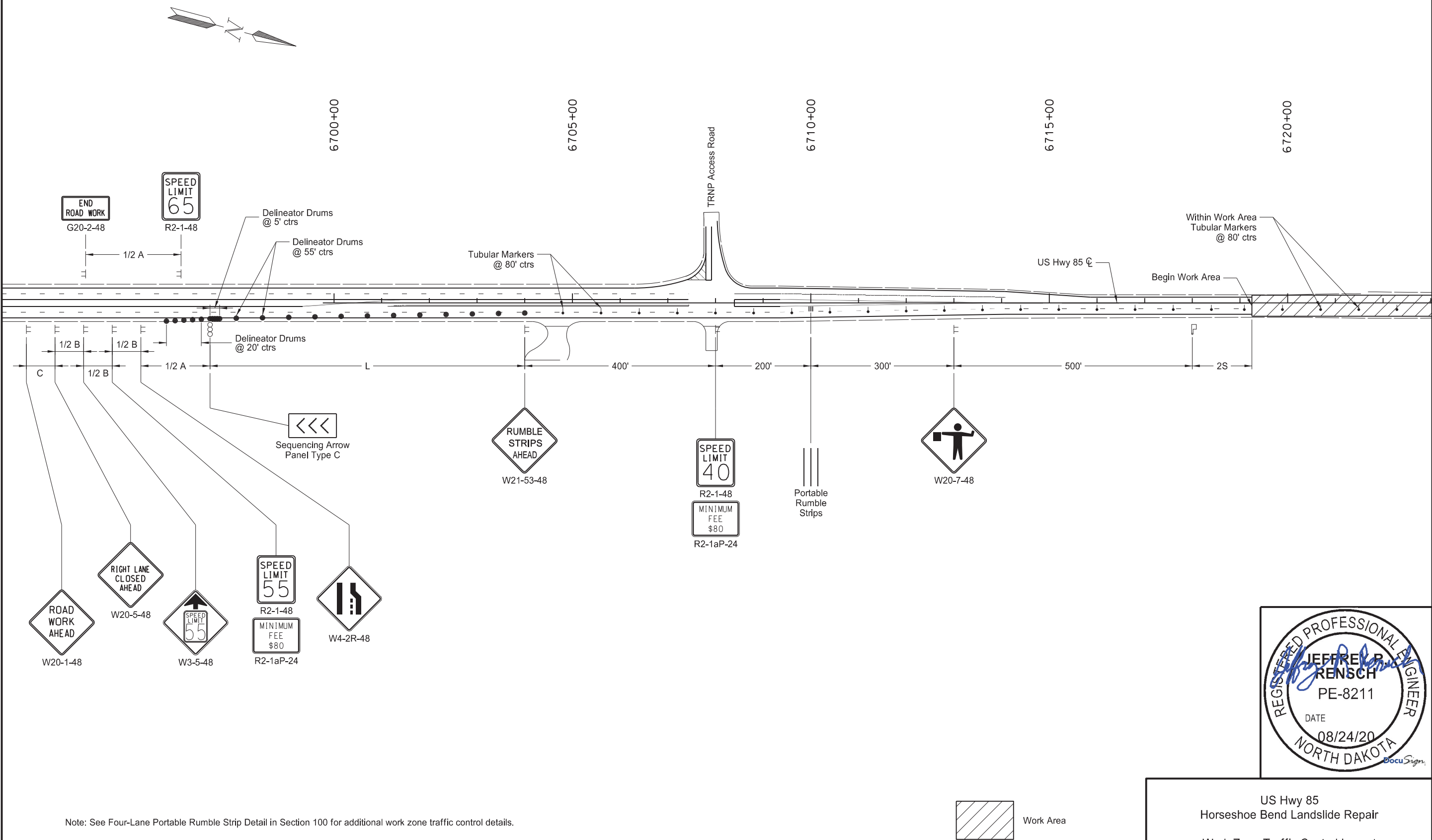
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	100	4



US Hwy 85
Horseshoe Bend Landslide Repair

Work Zone Traffic Control Layout
for Geotechnical Work

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	100	5



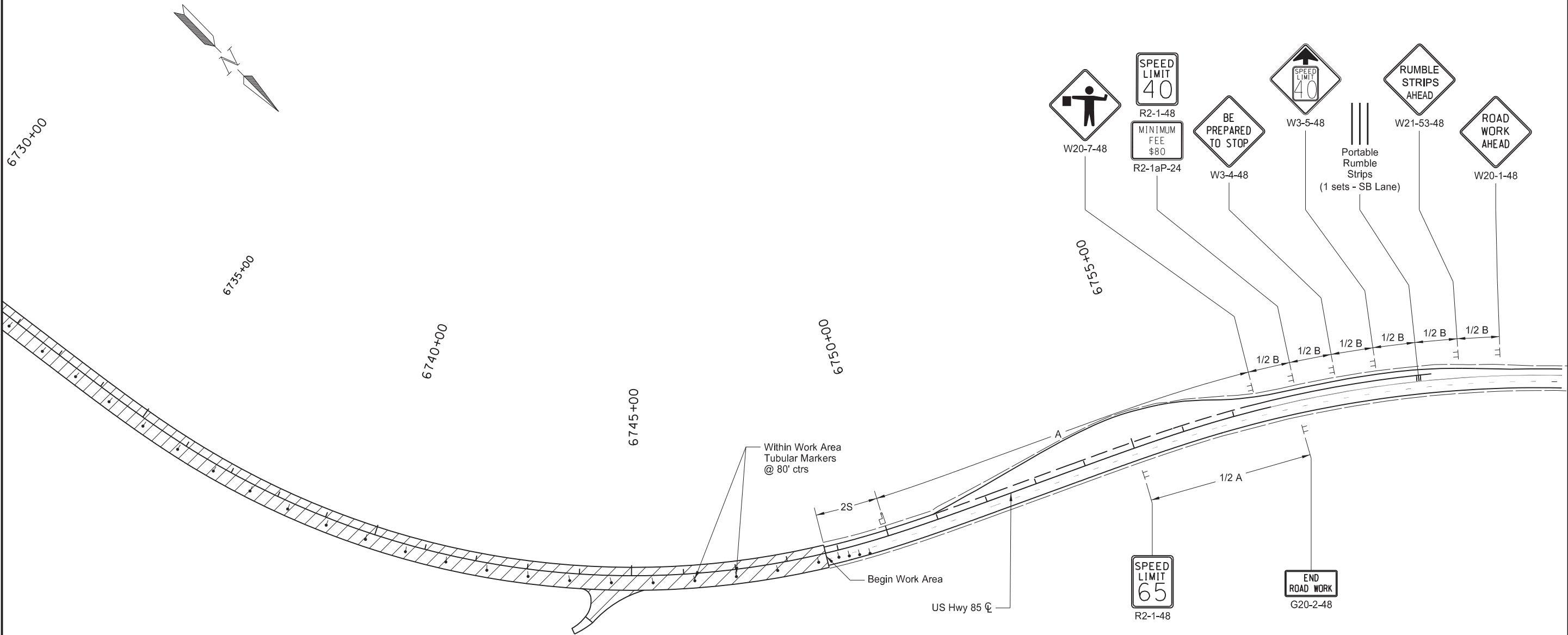
Note: See Four-Lane Portable Rumble Strip Detail in Section 100 for additional work zone traffic control details.



US Hwy 85
Horseshoe Bend Landslide Repair

Work Zone Traffic Control Layout
for HMA Mill & Overlay

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SOIB-NH-7-085(110)127	100	6



Note: See Portable Rumble Strip Detail in Section 100 for additional work zone traffic control details.



US Hwy 85
Horseshoe Bend Landslide Repair

Work Zone Traffic Control Layout
for HMA Mill & Overlay

