



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

NICHOLAS J. TENNYSON
SECRETARY

August 10, 2015

Addendum No. 1

RE: Contract ID C203632

WBS # 41099.3.2

State Funded

Robeson County (P-4900A)

Railroad Bypass of Pembroke

August 18, 2015 Letting

To Whom It May Concern:

Reference is made to the plans and proposal form furnished to you on this project.

The following revision has been made to the Structure Subsurface plans:

The Structure Subsurface plans (seven sheets) for the bridge over Bear Swamp were inadvertently omitted from the original plan set. Please add these seven sheets to the original Structure Subsurface plans.

The following revisions have been made to the Roadway plans:

| Sheet No. | Revisions |
|-----------|---|
| EC-07A | New sheet added to describe the culvert phasing for the culvert constructed at Bear Swamp Tributary. Please add new sheet No. EC-07A after existing Sheet No. EC-07 |

The following revisions have been made to the proposal:

| Page No. | Revisions |
|----------------|---|
| Proposal Cover | Note added that reads "Includes Addendum No. 1 Dated August 10, 2015". Please void the existing Proposal Cover sheet and staple the revised Proposal Cover sheet thereto. |
| R-1 | Deleted the project special provision entitled "Clearing and Grubbing Method III". Please strike through this special provision. |
| R-2 thru R-4 | Delete the project special provision entitled "Coal Combustion Products in Embankments". Please strike through this special provision on Pages R-2 thru R-4 |

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
CONTRACT STANDARDS AND DEVELOPMENT UNIT
1591 MAIL SERVICE CENTER
RALEIGH NC 27699-1591

TELEPHONE: 919-707-6900
FAX: 919-250-4119

WEBSITE: www.NCDOT.GOV

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

| Page No. | Revisions |
|-------------------|--|
| GT-3.1 and GT-3.2 | Various changes were made to section "2.0 Construction Methods" and section "3.0 Measurement and Payment" within the project special provision entitled "Preparation of Existing Ground". Please void Page Nos. GT-3.1 and GT-3.2 in your proposal and staple the revised pages thereto. |
| EC-2 thru EC-28 | Expanded the list of "Approved Tall Fescue Cultivars" and added the project special provision entitled "Concrete Washout Structure". Please void Pages Nos. EC-2 thru EC-24 and replace with revised Page Nos. EC-2 thru EC-28 |
| ST-31 | Revised Section F "Dampproofing" within the project special provision entitled "Cast-In-Place Concrete". Please void Page No. ST-31 in your proposal and staple the revised Page No. ST-31 thereto |
| RR-2 | Revised the project special provision entitled "Clearing and Grubbing-Method III". Please void Page No. RR-2 in your proposal and staple the revised Page No. RR-2 thereto. |
| RR-9 | Removed the 4 th paragraph of the project special provision entitled "Embankment". Please void Page No. RR-9 in your proposal and staple the revised Page No. RR-9 thereto. |


On the item sheets the following pay item has been added, deleted or quantity revised:

| <u>Item</u> | <u>Description</u> | <u>Old Quantity</u> | <u>New Quantity</u> |
|---------------------|---------------------------------------|---------------------|---------------------|
| 123-8881000000-E-SP | Cast-In-Place Concrete (4,000 PSI) | 90.7 CY | 611.0 CY |
| 124-88810000-E-SP | Cast-In-Place Concrete (4,500 PSI) | 520.3 CY | DELETED |
| 128-6132000000-N-SP | Concrete Washout Structure | NEW ITEM | 2 EA |

The Contractor's bid must not include these pay item changes. The contract will be prepared accordingly.

The Expedite File has been updated to reflect these revisions. Please download the Expedite Addendum File and follow the instructions for applying the addendum. Bid Express will not accept your bid unless the addendum has been applied.

Sincerely,



R. A. Garris, PE
Contract Officer

RAG/jag
Attachments

C203632

P-4900A
Robeson County

cc: Mr. Ron Hancock, PE
Mr. Greg Burns, PE
Ms. D. M. Barbour, PE
Mr. Rodger Rochelle, PE
Mr. Mike Gwyn
Ms. Marsha Sample
Ms. Penny Higgins
Project File (2)

Mr. Ray Arnold, PE
Ms. Theresa Canales, PE
Mr. Paul Worley
Mr. R.E. Davenport, PE
Mr. Ken Kennedy, PE
Ms. Jaci Kincaid
Ms. Lori Strickland

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

PROPOSAL

INCLUDES ADDENDUM No. 1 DATED 08-10-15

DATE AND TIME OF BID OPENING: **AUGUST 18, 2015 AT 2:00 PM**

CONTRACT ID C203632
WBS 41099.3.2

FEDERAL-AID NO. STATE FUNDED
COUNTY ROBESON
T.I.P. NO. P-4900A
MILES 2.410
ROUTE NO.
LOCATION RAILROAD BYPASS OF PEMBROKE.

TYPE OF WORK GRADING, DRAINAGE, RAILROAD BED & STRUCTURES.

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS \$30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A RAIL PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PREPARATION OF EXISTING GROUND**(SPECIAL)****1.0 GENERAL**

Perform the work covered by this section on all portions of the project except for undercut station ranges as shown on the plans and as directed by the Engineer. Construct ditches and allow to drain for 90 days, clear and grub under footprint of proposed embankments regardless of embankment height, compact top 8" of existing ground under footprint of proposed embankments, and proof roll compacted existing ground under proposed embankment footprints prior to constructing embankments.

2.0 CONSTRUCTION METHODS

Fully construct and maintain drainage ditches shown on plans to outfalls and allow to drain for 90 days before beginning compaction of existing ground.

Except for undercut station ranges as shown on the plans, clear and grub under footprint of proposed embankments in accordance with Article 200 of the *Standard Specifications* except grub all proposed embankment footprints regardless of embankment height. Remove all stumps from proposed embankment footprints to be compacted and proof rolled under this special provision.

Except for undercut station ranges as shown on the plans, compact all material within proposed embankment footprints to a depth of 8" below the existing ground surface to a density equal to at least 95% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department. Copies of the modified procedures are available on request from the Department's Materials and Tests Unit.

Except for undercut station ranges as shown on the plans, compact the existing ground within proposed embankment footprints at a moisture content which is approximately equal to that required to produce the maximum density indicated by the above test method. Dry or add moisture to the existing ground when required to achieve the required soil density and to provide a uniformly compacted and acceptable ground surface prior to embankment formation.

Except for undercut station ranges as shown on the plans, proof roll the compacted existing ground surface within embankment footprints in accordance with Section 260 of the *Standard Specifications* except use a 35 ton proof roller.

3.0 MEASUREMENT AND PAYMENT

Preparation of Existing Ground will be measured and paid at the contract lump sum price. Such payment will be considered full compensation for materials, labor, equipment, and incidentals needed for drainage ditch waiting time, to control of moisture of existing ground within proposed embankment footprints as necessary to achieve compaction requirements, and to compact existing ground within embankment footprints to the minimum required density requirements. Any clearing and grubbing needed to perform the

work of this special provision will be considered incidental to the *Clearing and Grubbing* line item.

Proof Rolling will be measured and paid by the actual number of hours of roller operation in accordance with Article 260-4 of the *Standard Specifications*.

Payment will be made under:

Pay Item
Preparation of Existing Ground
Proof Rolling

Pay Unit
Lump Sum
Hour



DocuSign Envelope by:
Michael Valiquette 8/4/2015
20FDC306E2F640B...

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

| | | | |
|----------------------------|-----------------|-----------------|--------------------|
| 06 Dust | Escalade | Justice | Scorpion |
| 2 nd Millennium | Essential | Kalahari | Serengeti |
| 3 rd Millennium | Evergreen 2 | Kentucky 31* | Shelby |
| Apache III | Falcon IV | Kitty Hawk 2000 | Sheridan |
| Avenger | Falcon NG | Legitimate | Signia |
| Barlexas | Falcon V | Lexington | Silver Hawk |
| Barlexas II | Faith | LSD | Sliverstar |
| Bar Fa | Fat Cat | Magellan | Shenandoah Elite |
| Barrera | Festnova | Matador | Sidewinder |
| Barrington | Fidelity | Millennium SRP | Skyline |
| Barrobusto | Finelawn Elite | Monet | Solara |
| Barvado | Finelawn Xpress | Mustang 4 | Southern Choice II |
| Biltmore | Finesse II | Ninja 2 | Speedway |
| Bingo | Firebird | Ol' Glory | Spyder LS |
| Bizem | Firecracker LS | Olympic Gold | Sunset Gold |
| Blackwatch | Firenza | Padre | Taccoa |
| Blade Runner II | Five Point | Patagonia | Tanzania |
| Bonsai | Focus | Pedigree | Trio |
| Braveheart | Forte | Picasso | Tahoe II |
| Bravo | Garrison | Piedmont | Talladega |
| Bullseye | Gazelle II | Plantation | Tarheel |
| Cannavaro | Gold Medallion | Proseeds 5301 | Terrano |
| Catalyst | Grande 3 | Prospect | Titan Ltd |
| Cayenne | Greenbrooks | Pure Gold | Titanium LS |
| Cessane Rz | Greenkeeper | Quest | Tracer |
| Chipper | Gremlin | Raptor II | Traverse SRP |
| Cochise IV | Greystone | Rebel Exeda | Tulsa Time |
| Constitution | Guardian 21 | Rebel Sentry | Turbo |
| Corgi | Guardian 41 | Rebel IV | Turbo RZ |
| Corona | Hemi | Regiment II | Tuxedo RZ |
| Coyote | Honky Tonk | Regenerate | Ultimate |
| Darlington | Hot Rod | Rendition | Venture |
| Davinci | Hunter | Rhambler 2 SRP | Umbrella |
| Desire | Inferno | Rembrandt | Van Gogh |
| Dominion | Innovator | Reunion | Watchdog |
| Dynamic | Integrity | Riverside | Wolfpack II |
| Dynasty | Jaguar 3 | RNP | Xtremegreen |
| Endeavor | Jamboree | Rocket | |

***Note: Kentucky 31 will no longer be an approved NCDOT Tall Fescue Cultivar after December 31, 2015.**

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

Native Grass Seeding and Mulching (East)

Native Grass Seeding and Mulching shall be performed on the disturbed areas of wetlands and riparian areas, and adjacent to Stream Relocation construction within a 50 foot zone on both sides of the stream or depression, measured from top of stream bank or center of depression. The stream bank of the stream relocation shall be seeded by a method that does not alter the typical cross section of the stream bank. Native Grass Seeding and Mulching shall also be performed in the permanent soil reinforcement mat section of preformed scour holes, and in other areas as directed.

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

| March 1 - August 31 | | September 1 - February 28 | |
|----------------------------|---------------------|----------------------------------|---------------------|
| 18# | Creeping Red Fescue | 18# | Creeping Red Fescue |
| 6# | Indiangrass | 6# | Indiangrass |
| 8# | Little Bluestem | 8# | Little Bluestem |
| 4# | Switchgrass | 4# | Switchgrass |
| 25# | Browntop Millet | 35# | Rye Grain |
| 500# | Fertilizer | 500# | Fertilizer |
| 4000# | Limestone | 4000# | Limestone |

Approved Creeping Red Fescue Cultivars:

- Aberdeen
- Boreal
- Epic
- Cindy Lou

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

Native Grass Seeding and Mulching shall be performed in accordance with Section 1660 of the *Standard Specifications* and vegetative cover sufficient to restrain erosion shall be installed immediately following grade establishment.

Measurement and Payment

Native Grass *Seeding and Mulching* will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

All areas seeded and mulched shall be tacked with asphalt. Crimping of straw in lieu of asphalt tack shall not be allowed on this project.

CRIMPING STRAW MULCH:

Crimping shall be required on this project adjacent to any section of roadway where traffic is to be maintained or allowed during construction. In areas within six feet of the edge of pavement, straw is to be applied and then crimped. After the crimping operation is complete, an additional application of straw shall be applied and immediately tacked with a sufficient amount of undiluted emulsified asphalt.

Straw mulch shall be of sufficient length and quality to withstand the crimping operation.

Crimping equipment including power source shall be subject to the approval of the Engineer providing that maximum spacing of crimper blades shall not exceed 8".

TEMPORARY SEEDING:

Fertilizer shall be the same analysis as specified for *Seeding and Mulching* and applied at the rate of 400 pounds and seeded at the rate of 50 pounds per acre. Sweet Sudan Grass, German Millet or Browntop Millet shall be used in summer months and Rye Grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

FERTILIZER TOPDRESSING:

Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper shall be 10-20-20 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis and as directed.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis and as directed.

SUPPLEMENTAL SEEDING:

The kinds of seed and proportions shall be the same as specified for *Seeding and Mulching*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in

writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

MOWING:

The minimum mowing height on this project shall be 4 inches.

RESPONSE FOR EROSION CONTROL:

Description

Furnish the labor, materials, tools and equipment necessary to move personnel, equipment, and supplies to the project necessary for the pursuit of any or all of the following work as shown herein, by an approved subcontractor.

| Section | Erosion Control Item | Unit |
|----------------|----------------------------------|-------------|
| 1605 | Temporary Silt Fence | LF |
| 1606 | Special Sediment Control Fence | LF/TON |
| 1615 | Temporary Mulching | ACR |
| 1620 | Seed - Temporary Seeding | LB |
| 1620 | Fertilizer - Temporary Seeding | TN |
| 1631 | Matting for Erosion Control | SY |
| SP | Coir Fiber Mat | SY |
| 1640 | Coir Fiber Baffles | LF |
| SP | Permanent Soil Reinforcement Mat | SY |
| 1660 | Seeding and Mulching | ACR |
| 1661 | Seed - Repair Seeding | LB |
| 1661 | Fertilizer - Repair Seeding | TON |
| 1662 | Seed - Supplemental Seeding | LB |
| 1665 | Fertilizer Topdressing | TON |
| SP | Safety/Highly Visible Fencing | LF |
| SP | Response for Erosion Control | EA |

Construction Methods

Provide an approved subcontractor who performs an erosion control action as described in the NPDES Inspection Form SPPP30. Each erosion control action may include one or more of the above work items.

Measurement and Payment

Response for Erosion Control will be measured and paid for by counting the actual number of times the subcontractor moves onto the project, including borrow and waste sites, and satisfactorily completes an erosion control action described in Form 1675. The provisions of Article 104-5 of the *Standard Specifications* will not apply to this item of work.

Payment will be made under:

| Pay Item | Pay Unit |
|------------------------------|-----------------|
| Response for Erosion Control | Each |

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation within project limits to the maximum extent practicable. Vegetation along stream banks and adjacent to other jurisdictional resources outside the construction limits shall only be removed upon approval of Engineer. No additional payment will be made for this minimization work.

STOCKPILE AREAS:

The Contractor shall install and maintain erosion control devices sufficient to contain sediment around any erodible material stockpile areas as directed.

ACCESS AND HAUL ROADS:

At the end of each working day, the Contractor shall install or re-establish temporary diversions or earth berms across access/haul roads to direct runoff into sediment devices. Silt fence sections that are temporarily removed shall be reinstalled across access/haul roads at the end of each working day.

WASTE AND BORROW SOURCES:

Payment for temporary erosion control measures, except those made necessary by the Contractor's own negligence or for his own convenience, will be paid for at the appropriate contract unit price for the devices or measures utilized in borrow sources and waste areas.

No additional payment will be made for erosion control devices or permanent seeding and mulching in any commercial borrow or waste pit. All erosion and sediment control practices that may be required on a commercial borrow or waste site will be done at the Contractor's expense.

All offsite Staging Areas, Borrow and Waste sites shall be in accordance with "Borrow and Waste Site Reclamation Procedures for Contracted Projects" located at:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/ContractedReclamationProcedures.pdf

All forms and documents referenced in the "Borrow and Waste Site Reclamation Procedures for Contracted Projects" shall be included with the reclamation plans for offsite staging areas, and borrow and waste sites.

TEMPORARY DIVERSION:

This work consists of installation, maintenance, and cleanout of *Temporary Diversions* in accordance with Section 1630 of the *Standard Specifications*. The quantity of excavation for installation and cleanout will be measured and paid for as *Silt Excavation* in accordance with Article 1630-4 of the *Standard Specifications*.

CLEAN WATER DIVERSION:

Description

This work consists of installing, maintaining, and removing any and all material required for the construction of clean water diversions. The clean water diversions shall be used to direct water flowing from offsite around/away from specific area(s) of construction.

Materials

Refer to Division 10

Item

Geotextile for Soil Stabilization, Type 4

Section

1056

Construction Methods

The Contractor shall install the clean water diversions in accordance with the details in the plans and at locations indicated in the plans, and as directed. Upon installation, the excavated material shall be immediately stabilized as provided in Section 1620 of the *Standard Specifications*. Other stabilization methods may be utilized with prior approval from the Engineer.

Line clean water diversion with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp securely. Make vertical overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile.

Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 6" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Stabilization of the excavated material will be paid for as *Temporary Seeding* as provided in Section 1620 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of the clean water diversions.

SAFETY FENCE AND JURISDICTIONAL FLAGGING:

Description

Safety Fence shall consist of furnishing materials, installing and maintaining polyethylene or polypropylene fence along the outside riparian buffer, wetland, or water boundary, or other boundaries located within the construction corridor to mark the areas that have been approved to infringe within the buffer, wetland, endangered vegetation, culturally sensitive areas or water. The fence shall be installed prior to any land disturbing activities.

Interior boundaries for jurisdictional areas noted above shall be delineated by stakes and highly visible flagging.

Jurisdictional boundaries at staging areas, waste sites, or borrow pits, whether considered outside or interior boundaries shall be delineated by stakes and highly visible flagging.

Materials

(A) Safety Fencing

Polyethylene or polypropylene fence shall be a highly visible preconstructed safety fence approved by the Engineer. The fence material shall have an ultraviolet coating.

Either wood posts or steel posts may be used. Wood posts shall be hardwood with a wedge or pencil tip at one end, and shall be at least 5 ft. in length with a minimum nominal 2" x 2" cross section. Steel posts shall be at least 5 ft. in length, and have a minimum weight of 0.85 lb/ft of length.

(B) Boundary Flagging

Wooden stakes shall be 4 feet in length with a minimum nominal 3/4" x 1-3/4" cross section. The flagging shall be at least 1" in width. The flagging material shall be vinyl and shall be orange in color and highly visible.

Construction Methods

No additional clearing and grubbing is anticipated for the installation of this fence. The fence shall be erected to conform to the general contour of the ground.

(A) Safety Fencing

Posts shall be set at a maximum spacing of 10 ft., maintained in a vertical position and hand set or set with a post driver. Posts shall be installed a minimum of 2 ft. into the ground. If hand set, all backfill material shall be thoroughly tamped. Wood posts may be sharpened to a dull point if power driven. Posts damaged by power driving shall be removed and replaced prior to final acceptance. The tops of all wood posts shall be cut at a 30-degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

The fence geotextile shall be attached to the wood posts with one 2" galvanized wire staple across each cable or to the steel posts with wire or other acceptable means.

Place construction stakes to establish the location of the safety fence in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications*. No direct pay will be made for the staking of the safety fence. All stakeouts for safety fence shall be considered incidental to the work being paid for as "Construction Surveying", except that where there is no pay item for construction surveying, all safety fence stakeout will be performed by state forces.

The Contractor shall be required to maintain the safety fence in a satisfactory condition for the duration of the project as determined by the Engineer.

(B) Boundary Flagging

Boundary flagging delineation of interior boundaries shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Interior boundaries may be staked on a tangent that runs parallel to buffer but must not encroach on the buffer at any location. Interior boundaries of hand clearing shall be identified with a different colored flagging to distinguish it from mechanized clearing.

Boundary flagging delineation of interior boundaries will be placed in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications*. No direct pay will be made for delineation of the interior boundaries. This delineation will be considered incidental to the work being paid for as *Construction Surveying*, except that where there is no pay item or construction

surveying the cost of boundary flagging delineation shall be included in the unit prices bid for the various items in the contract. Installation for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Additional flagging may be placed on overhanging vegetation to enhance visibility but does not substitute for installation of stakes.

Installation of boundary flagging for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall be performed in accordance with Subarticle 230-4(B)(5) or Subarticle 802-2(F) of the *Standard Specifications*. No direct pay will be made for this delineation, as the cost of same shall be included in the unit prices bid for the various items in the contract.

The Contractor shall be required to maintain alternative stakes and highly visible flagging in a satisfactory condition for the duration of the project as determined by the Engineer.

Measurement and Payment

Safety Fence will be measured and paid as the actual number of linear feet of polyethylene or polypropylene fence installed in place and accepted. Such payment will be full compensation including but not limited to furnishing and installing fence geotextile with necessary posts and post bracing, staples, tie wires, tools, equipment and incidentals necessary to complete this work.

Payment will be made under:

Pay Item
Safety Fence

Pay Unit
Linear Foot

PERMANENT SOIL REINFORCEMENT MAT:

Description

This work consists of furnishing and placing *Permanent Soil Reinforcement Mat*, of the type specified, over previously prepared areas as directed.

Materials

The product shall be a permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three-dimensional structure. The mat shall have the following minimum physical properties:

| Property | Test Method | Value | Unit |
|--|------------------------|-------|--------------------|
| Light Penetration | ASTM D6567 | 9 | % |
| Thickness | ASTM D6525 | 0.40 | in |
| Mass Per Unit Area | ASTM D6566 | 0.55 | lb/sy |
| Tensile Strength | ASTM D6818 | 385 | lb/ft |
| Elongation (Maximum) | ASTM D6818 | 49 | % |
| Resiliency | ASTM D1777 | >70 | % |
| UV Stability * | ASTM D4355 | ≥80 | % |
| Porosity (Permanent Net) | ECTC Guidelines | ≥85 | % |
| Maximum Permissible Shear Stress (Vegetated) | Performance Bench Test | ≥8.0 | lb/ft ² |
| Maximum Allowable Velocity (Vegetated) | Performance Bench Test | ≥16.0 | ft/s |

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

- (A) the chemical and physical properties of the mat used, and
- (B) conformance of the mat with this specification.

Construction Methods

Matting shall be installed in accordance with Subarticle 1631-3(B) of the *Standard Specifications*.

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Permanent Soil Reinforcement Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which Permanent Soil Reinforcement Mat is installed and accepted. Overlaps will not be included in the measurement, and will be considered as incidental to the work. Such payment shall be full compensation for furnishing and installing the mat, including overlaps, and for all required maintenance.

Payment will be made under:

| Pay Item | Pay Unit |
|----------------------------------|-------------|
| Permanent Soil Reinforcement Mat | Square Yard |

SKIMMER BASIN WITH BAFFLES:**(East)****Description**

Provide a skimmer basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Skimmer Basin with Baffles Detail sheet provided in the erosion control plans. Work includes constructing sediment basin, installation of temporary slope drain pipe and coir fiber baffles, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, providing and placing a geotextile spillway liner, providing coir fiber mat stabilization for the skimmer outlet, disposing of excess materials, removing temporary slope drain, coir fiber baffles, geotextile liner and skimmer device, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Materials

| Item | Section |
|---|----------------|
| Stone for Erosion Control, Class B | 1042 |
| Geotextile for Soil Stabilization, Type 4 | 1056 |
| Fertilizer for Temporary Seeding | 1060-2 |
| Seed for Temporary Seeding | 1060-4 |
| Seeding and Mulching | 1060-4 |
| Matting for Erosion Control | 1060-8 |
| Staples | 1060-8 |
| Coir Fiber Mat | 1060-14 |
| Temporary Slope Drain | 1622-2 |
| Coir Fiber Baffle | 1640 |

Provide appropriately sized and approved skimmer device.

Provide Schedule 40 PVC pipe with a length of 6 ft. to attach to the skimmer and the coupling connection to serve as the arm pipe. For skimmer sizes of 2.5 in. and smaller, the arm pipe diameter shall be 1.5 inches. For skimmer sizes of 3 in. and larger, refer to manufacturer recommendation.

Provide 4" diameter Schedule 40 PVC pipe to attach to coupling connection of skimmer to serve as the barrel pipe through the earthen dam.

The geotextile for the spillway liner shall meet the following minimum physical properties for low permeability, woven polypropylene geotextiles:

| Property | Test Method | Value | Unit |
|------------------------------|--------------------|--------------|-------------|
| Tensile Strength | ASTM D-4632 | 315 | lb. |
| Tensile Elongation (Maximum) | ASTM D-4632 | 15 | % |
| Trapezoidal Tear | ASTM D-4533 | 120 | lbs. |
| CBR Puncture | ASTM D-6241 | 900 | lbs. |

| | | | |
|---|-------------|------|-------------------------|
| UV Resistance (% retained at 500 hrs.) | ASTM D-4355 | 70 | % |
| Apparent Opening Size (AOS) | ASTM D-4751 | 40 | US Std. Sieve |
| Permittivity | ASTM D-4491 | 0.05 | sec ⁻¹ |
| Water Flow Rate | ASTM D-4491 | 4 | gal/min/ft ² |

Anchors: Staples, stakes, or reinforcement bars shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate basin according to the erosion control plans with basin surface free of obstructions, debris, and pockets of low-density material. Install temporary slope drain pipe and construct the primary spillway according to the Skimmer Basin with Baffles Detail sheet in the erosion control plans. Temporary slope drain pipe at inlet of basin may be replaced by Type 4 geotextile as directed. Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*.

Install skimmer device according to manufacturer recommendations. Install 4" Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4" and 12" in length. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath the skimmer device at bottom of basin. The pad shall be a minimum of 12" in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

Line primary spillway with low permeability polypropylene geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury edges of geotextile in a trench at least 5" deep and tamp firmly. If geotextile for the primary spillway is not one continuous piece of material, make horizontal overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile. Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 12" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically. Geotextile shall be placed to the bottom and across the entire width of the basin according to the Skimmer Basin with Baffles detail. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the details in the plans and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart.

All bare side slope sections of the skimmer basin shall be seeded with a temporary or permanent seed mix as directed and in accordance with Articles 1620-3, 1620-4, 1620-5, 1660-4, 1660-5 and 1660-7 of the *Standard Specifications*. Straw or excelsior matting shall be installed on all bare side slope sections immediately upon the completion of seeding and in accordance with Article 1631-3 of the *Standard Specifications*.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*, as calculated from the typical section throughout the length of the basin as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Low Permeability Geotextile will be measured and paid for as the actual number of square yards measured along the surface of the spillway over which the geotextile is installed and accepted.

Coir Fiber Baffles will be measured and paid for in accordance with Article 1640-4 of the *Standard Specifications*.

___" *Skimmer* will be measured in units of each. ___" *Skimmer* will be measured and paid for as the maximum number of each size skimmer acceptably installed and in use at any one time during the life of the project. Barrel and arm pipe, cleanout, relocation and reinstallation of ___" *Skimmer* is considered incidental to the measurement of the quantity of ___" *Skimmer* and no separate payment will be made. No separate payment shall be made if ___" *Skimmer*, barrel and/or arm pipe(s) are damaged by ice accumulation.

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

Temporary Slope Drain will be measured and paid for in accordance with Article 1622-4 of the *Standard Specifications*.

Stone for Erosion Control, Class ___ will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

Seeding and Mulching will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

Seed for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Fertilizer for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Matting for Erosion Control will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

| Pay Item | Pay Unit |
|-----------------------------|-----------------|
| ___" Skimmer | Each |
| Coir Fiber Mat | Square Yard |
| Low Permeability Geotextile | Square Yard |

COIR FIBER WATTLES WITH POLYACRYLAMIDE (PAM):

Description

Coir Fiber Wattles are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting. Coir Fiber Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Coir Fiber Wattles are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of coir fiber wattles, matting installation, PAM application, and removing wattles.

Materials

Coir Fiber Wattle shall meet the following specifications:

| | |
|----------------------------|--------------------------------|
| 100% Coir (Coconut) Fibers | |
| Minimum Diameter | 12 in. |
| Minimum Density | 3.5 lb/ft ³ +/- 10% |
| Net Material | Coir Fiber |
| Net Openings | 2 in. x 2 in. |
| Net Strength | 90 lbs. |
| Minimum Weight | 2.6 lbs./ft. +/- 10% |

Anchors: Stakes shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes a minimum of 2-ft. long with a 2 in. x 2 in. nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving down into the underlying soil.

Matting shall meet the requirements of Article 1060-8 of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the wattles will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each wattle. The PAM product used shall be listed on the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) web site as an approved PAM product for use in North Carolina.

Construction Methods

Coir Fiber Wattles shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each section of wattle. A minimum of 4 stakes shall be installed on the downstream side of the wattle with a maximum spacing of 2 linear feet along the wattle, and according to the detail. Install a minimum of 2 stakes on the upstream side of the wattle according to the detail provided in the plans. Stakes shall be driven into the ground a minimum of 10 in. with no more than 2 in. projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Only install coir fiber wattle(s) to a height in ditch so flow will not wash around wattle and scour ditch slopes and according to the detail provided in the plans and as directed. Overlap adjoining sections of wattles a minimum of 6 in.

Installation of matting shall be in accordance with the detail provided in the plans, and in accordance with Article 1631-3 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Apply PAM over the lower center portion of the coir fiber wattle where the water is going to flow over at a rate of 2 ounces per wattle, and 1 ounce of PAM on matting on each side of the wattle. PAM applications shall be done during construction activities after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the coir fiber wattles until the project is accepted or until the wattles are removed, and shall remove and dispose of silt accumulations at the wattles when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Coir Fiber Wattles will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Coir Fiber Wattles*.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the coir fiber wattles. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------|-----------------|
| Polyacrylamide(PAM) | Pound |
| Coir Fiber Wattle | Linear Foot |

SILT FENCE COIR FIBER WATTLE BREAK:
(8-21-12) 1605,1630

Description

Silt fence coir fiber wattle breaks are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting and used in conjunction with temporary silt fence at the toe of fills to intercept runoff. Silt fence coir fiber wattle breaks are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation, maintenance and removing Silt fence coir fiber wattle breaks.

Materials

Coir fiber wattle shall meet the following specifications:

| 100% Coir (Coconut) Fibers | |
|----------------------------|---------------------|
| Minimum Diameter | 12" |
| Minimum Length | 10 ft |
| Minimum Density | 3.5 lb/cf \pm 10% |
| Net Material | Coir Fiber |
| Net Openings | 2" x 2" |
| Net Strength | 90 lb. |
| Minimum Weight | 2.6 lb/ft \pm 10% |

Stakes shall be used as anchors. Provide hardwood stakes a minimum of 2-ft long with a 2" x 2" nominal square cross section. One end of the stake shall be sharpened or beveled to facilitate driving down into the underlying soil.

Provide staples made of 0.125" diameter new steel wire formed into a U-shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate a trench the entire length of each wattle with a depth of 1" to 2" for the wattle to be placed. Secure silt fence coir fiber wattle breaks to the soil by wire staples approximately every linear foot and at the end of each wattle. Install at least 4 stakes on the downslope side of the wattle with a maximum spacing of 2 linear feet and according to the detail. Install at least 2 stakes on the upslope side of the silt fence coir fiber wattle break according to the detail provided in the plans. Drive stakes into the ground at least 10" with no more than 2" projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Install temporary silt fence in accordance with Section 1605 of the *2012 Standard Specifications* and overlap each downslope side of silt fence wattle break by 6".

Maintain the silt fence coir fiber wattle breaks until the project is accepted or until the silt fence coir fiber wattle breaks are removed, and remove and dispose of silt accumulations at the silt fence coir fiber wattle breaks when so directed in accordance with Section 1630 of the *2012 Standard Specifications*.

Measurement and Payment

Coir Fiber Wattle will be measured and paid as the actual number of linear feet of wattles installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the silt fence coir fiber wattle break.

Payment will be made under:

| | |
|--------------------------------------|--------------------------------|
| Pay Item Coir Fiber Wattle | Pay Unit Linear Foot |
|--------------------------------------|--------------------------------|

BORROW PIT DEWATERING BASIN:

(3-17-09) (Rev 3-2-11)

Description

Water discharge from borrow pit sites shall not cause surface waters to exceed 50 NTUs (nephelometric turbidity unit) in streams not designated as trout waters and 10 NTUs in streams, lakes or reservoirs designated as trout waters. For lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTUs. If the turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.

Construct, maintain and remove earth embankments used to reduce turbidity from dewatering borrow sites. Work includes providing porous coir fiber baffle, filtration geotextile, stone and outlet structures; cleaning out, maintaining, removing and disposing of the borrow pit dewatering basin and all components; and reshaping, dressing, seeding and mulching the area.

Materials

Refer to Division 10

| Item | Section |
|---------------------------------|----------------|
| Riprap, Class A, B, 1, and 2 | 1042 |
| Geotextile for Drainage, Type 2 | 1056 |
| Coir Fiber Baffle | 1640-2 |

Use suitable excavated materials, as specified in Sections 225, 230 and 240 of the *Standard Specifications* in the construction of earth embankments for borrow pit dewatering basins, except where otherwise specified.

Construction Methods

Construct borrow pit dewatering basins according to the detail in the erosion control plans, and at locations shown on Reclamation Plans or in areas as directed.

The volume of the borrow pit dewatering basin will be based on a 2 hour retention time. The pump rate shall not exceed 1,000 GPM. The Contractor, at his option, may use a greater retention time for managing turbidity.

The straight line distance between the inlet and outlet shall be divided to include a forebay chamber in the upper quarter cell. Install one porous coir fiber baffle across the full width of the

basin to delineate the forebay chamber. Do not use earthen or rock baffle. Install filtration geotextile on the interior side slopes and the floor of the forebay.

The water pumped from the borrow pit into the dewatering basin shall be obtained from the top of the water column and shall be discharged into the forebay in a non-erodible manner.

The borrow pit dewatering basin outlet shall be a vertical non-perforated riser pipe or flash board riser attached with a watertight connection to a barrel that carries the water through the embankment.

Maintenance and Removal

Maintain the borrow pit dewatering basin, coir fiber baffle, and remove and dispose of silt accumulations in accordance with Article 1630-3 of the *Standard Specifications*. The Contractor may include a drain device for maintenance and removal at his discretion.

Remove the borrow pit dewatering basin once dewatering operations are completed. Grade, seed, and mulch the area after removal of the borrow pit dewatering basin in accordance with Section 1660 of the *Standard Specifications*. The area shall be stabilized with an approved groundcover before final acceptance of the site.

Measurement and Payment

No direct payment will be made for borrow pit dewatering basins with the exception of the work of silt removal during dewatering basin operation and the work of seeding and mulching after removal of the dewatering basin. All other work and materials required for installation, maintenance and removal of borrow pit dewatering basins shall be incidental to *Borrow Excavation*. Such price and payments will be full compensation for the work of constructing, maintaining and removing the borrow pit dewatering basin including, but not limited to, the construction and removal of the borrow pit dewatering basin; furnishing of the outlet structure, baffle, filtration geotextile, stone and optional drain devices; and removal of all such items once dewatering operations are completed.

Removal and disposal of silt accumulations during dewatering operations will be measured and paid at the contract unit price per cubic yard for *Silt Excavation* in accordance with Article 1630-4 of the *Standard Specifications*.

Grading, seeding, and mulching the area after removal of the borrow pit dewatering basin will be measured and paid at the contract unit price per acre for *Seeding and Mulching* in accordance with Section 1660-8 of the *Standard Specifications*.

CULVERT DIVERSION CHANNEL:**Description**

This work consists of providing a *Culvert Diversion Channel* to detour the existing stream around the culvert construction site at locations shown on the plans. Work includes constructing the diversion channel, disposing of excess materials, providing and placing geotextile liner, maintaining the diversion area in an acceptable condition, removing geotextile liner, backfilling diversion channel area with suitable material, and providing proper drainage when diversion channel area is abandoned.

Materials

Refer to Division 10

| Item | Section |
|---|----------------|
| Geotextile for Soil Stabilization, Type 4 | 1056 |

Construction Methods

Grade channel according to the plans with channel surface free of obstructions, debris, and pockets of low-density material. Utilize suitable material and provide disposal area for unsuitable material.

Line channel with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp securely. Make vertical overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile.

Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 6" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically.

Measurement and Payment

Culvert Diversion Channel will be measured and paid for as the actual number of cubic yards excavated, as calculated from the typical section throughout the length of the diversion channel as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of *Culvert Diversion Channel*.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------------|-----------------|
| Culvert Diversion Channel | Cubic Yard |

IMPERVIOUS DIKE:

Description

This work consists of furnishing, installing, maintaining, and removing an *Impervious Dike* for the purpose of diverting normal stream flow around the construction site. The Contractor shall construct an impervious dike in such a manner approved by the Engineer. The impervious dike shall not permit seepage of water into the construction site or contribute to siltation of the stream. The impervious dike shall be constructed of an acceptable material in the locations noted on the plans or as directed.

Materials

Acceptable materials shall include but not be limited to sheet piles, sandbags, and/or the placement of an acceptable size stone lined with polypropylene or other impervious geotextile.

Earth material shall not be used to construct an impervious dike when it is in direct contact with the stream unless vegetation can be established before contact with the stream takes place.

Measurement and Payment

Impervious Dike will be measured and paid as the actual number of linear feet of impervious dike(s) constructed, measured in place from end to end of each separate installation that has been completed and accepted. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance, and removal of the impervious dike.

Payment will be made under:

| Pay Item | Pay Unit |
|-----------------|-----------------|
| Impervious Dike | Linear Foot |

COIR FIBER MAT:

Description

Furnish material, install and maintain coir fiber mat in locations shown on the plans or in locations as directed. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat with stakes, steel reinforcement bars or staples as directed.

Materials

| Item | Section |
|----------------|----------------|
| Coir Fiber Mat | 1060-14 |

Anchors: Stakes, reinforcement bars, or staples shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Place the coir fiber mat immediately upon final grading. Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the mat with the soil. Unroll the mat and apply without stretching such that it will lie smoothly but loosely on the soil surface.

For stream relocation applications, take care to preserve the required line, grade, and cross section of the area covered. Bury the top slope end of each piece of mat in a narrow trench at least 6 in. deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 in. overlap. Construct check trenches at least 12 in. deep every 50 ft. longitudinally along the edges of the mat or as directed. Fold over and bury mat to the full depth of the trench, close and tamp firmly. Overlap mat at least 6 in. where 2 or more widths of mat are installed side by side.

Place anchors across the mat at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the mat 3 ft. apart.

Adjustments in the trenching or anchoring requirements to fit individual site conditions may be required.

Measurement and Payment

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

No measurement will be made for anchor items.

Payment will be made under:

| Pay Item | Pay Unit |
|-----------------|-----------------|
| Coir Fiber Mat | Square Yard |

FLOATING TURBIDITY CURTAIN:

Description

This work consists of furnishing a *Floating Turbidity Curtain* to deter silt suspension and movement of silt particles during construction. The floating turbidity curtain shall be constructed at locations as directed.

Materials

The curtain material shall be made of a tightly woven nylon, plastic or other non-deteriorating material meeting the following specifications:

| Property | Value |
|-------------------------|----------------------------|
| Grab tensile strength | *md-370 lbs *cd-250 lbs |
| Mullen burst strength | 480 psi |
| Trapezoid tear strength | *md-100 lbs *cd-60 lbs |
| Apparent opening size | 70 US standard sieve |
| Percent open area | 4% permittivity 0.28 sec-1 |

- *md - machine direction
- *cd - cross machine direction

In the event that more than one width of fabric is required, a 6" overlap of the material shall also be required.

The curtain material shall be supported by a flotation material having over 29 lbs/ft buoyancy. The floating curtain shall have a 5/16" galvanized chain as ballast and dual 5/16" galvanized wire ropes with a heavy vinyl coating as load lines.

Construction Methods

The Contractor shall maintain the *Floating Turbidity Curtain* in a satisfactory condition until its removal is requested by the Engineer. The curtain shall extend to the bottom of the jurisdictional resource. Anchor the curtain according to manufacturer recommendations.

Measurement and Payment

Floating Turbidity Curtain will be measured and paid for as the actual number of square yards of curtain furnished as specified and accepted. Such price and payment will be full compensation for the work as described in this section including but not limited to furnishing all materials, tools, equipment, and all incidentals necessary to complete the work.

Payment will be made under:

| Pay Item | Pay Unit |
|----------------------------|-----------------|
| Floating Turbidity Curtain | Square Yard |

CONCRETE WASHOUT STRUCTURE:

Description

Concrete washout structures are watertight enclosures constructed above or below grade to contain concrete waste on construction sites. Concrete waste can include concrete waste water from washing out ready-mix trucks, drums, pumps, or other equipment. Concrete waste also includes concrete slurries from concrete saw cutting, coring, grinding, grooving operations, or hydro-concrete demolition. Concrete washouts must prevent the discharge of concrete waste materials to storm drainage systems, surface waters, wetlands, and buffers. Work for above grade washout structures includes gathering high cohesive and low infiltration soil to construct an above grade earthen berm basin. Work also includes preparing a rock and debris free soil base inside this earthen basin, installing a geomembrane liner in the basin, and then placing sandbags along the entire polypropylene liner basin perimeter. Work for below grade washout structures includes preparing a rock and debris free soil base, excavation of a basin with non-vertical side slopes, installing a geomembrane liner in the basin, and then placing sandbags along the entire polypropylene liner excavation perimeter. Construct a gravel pad with Class A stone and a geotextile under liner to provide a defined access path to the concrete washout structures. Install safety fence around the perimeter of the concrete washout structures.

Materials

| Item | Section |
|------------------------------------|----------------|
| Borrow Material | 1018 |
| Stone for Erosion Control, Class A | 1042 |
| Geotextile for Drainage, Type 2 | 1056 |

The geomembrane basin liner shall meet the following minimum physical properties for low permeability, polypropylene or polyethylene geomembranes:

| Property | Test Method | Value | Unit |
|-------------------------------|--------------------------|-------|-----------------------------|
| Thickness, nominal | | 10 | mil |
| Weight | | 0.04 | lbs./ft ² |
| *1" Tensile Strength | ASTM D-751 | 52 | lbf. |
| Elongation at Break | ASTM D-751 | 600 | % |
| *Grab Tensile | ASTM D-751 | 70 | lbf. |
| *Trapezoid Tear | ASTM D-4533 | 55 | lbf. |
| Hydrostatic Resistance | ASTM D-751 | 70 | lb./in ² |
| Water Vapor Transmission Rate | ASTM E-96 Procedure B | 0.03 | gal/100in ² /day |
| Perm Rating | ASTM E-96 Procedure B | 0.066 | U.S. Perms |

***Tests are an average of diagonal directions.**

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Construction Methods

Above Grade Structures

Assemble high cohesive and low infiltration soil to build an enclosed earthen berm for an above grade concrete washout basin in accordance with the details and as directed. Construct the height, length, and width of the earthen berm according to the detail. Slope the interior and exterior walls of the earthen berm at 1:1 and then compact to provide structural stability and contain concrete washout liquids and solid materials until evaporation, curing, extraction, or final removal.

The geomembrane liner will be of sufficient width and length so there will be no seams. Install the geomembrane lining by overlaying it in the basin to completely cover any exposed soil to create a water tight concrete washout basin. Extend the geomembrane lining from inside the basin floor, up the earth slope of the basin and extend, overlay, and wrap outside the earthen berm. Trench the toe of the geomembrane lining into an eight inch depth trench and then backfill and tamper with soil.

Below Grade Structures

Excavate an area for concrete washout in accordance with the details and as directed. Excavate to a minimum depth of 3 feet. Slope the interior walls of the excavated area at 1:1 and then compact to provide structural stability and contain concrete washout liquids and solid materials until evaporation, curing, extraction, or final removal.

The geomembrane liner will be of sufficient width and length so there will be no seams. Install the geomembrane lining by overlaying it in the excavated area to completely cover any exposed soil to create a watertight impoundment. Extend the geomembrane lining from the excavation

floor, up the interior slope of the excavated basin and beyond the outside perimeter of the excavation.

Prepare the soil base to be free of rocks or other debris that may cause holes or tears in the geomembrane lining.

Install safety fence around the perimeter of the concrete washout structures in accordance with the *Safety Fence and Jurisdictional Flagging* special provision.

Construct a stone gravel pad with Class A stone (or other approved aggregate material) and a geotextile liner to provide a defined access path to the concrete washout structure. Construct the stone gravel pad according to *Roadway Standard Drawings* No. 1607.01 and Section 1607 of the *Standard Specifications*. Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/details/

Maintenance and Removal

Maintain the concrete washout structure(s) to provide adequate holding capacity plus a minimum freeboard of 12 inches. Remove and dispose of hardened concrete and return the structure to a functional condition after reaching 75% capacity.

Inspect concrete washout structures for damage (i.e. tears in geomembrane liner, missing sand bags) and maintain for effectiveness.

Remove the concrete washout structures and sign upon project completion. If appropriate and possible, reuse the geomembrane liner, the sandbags, orange safety fence, the Class A stone, and the geotextile. Otherwise, properly dispose of items. Grade the earth material to match the existing contours and permanently seed and mulch area.

Measurement and Payment

Concrete Washout Structure will be measured and paid for by counting the actual number of washout structures installed and maintained on the project. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance and removal of concrete washout structures, grading and seeding and mulching area. The provisions of Article 104-5 of the *Standard Specifications* will not apply to this item of work.

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Robeson County

Payment will be made under:

Pay Item

Concrete Washout Structure

Pay Unit

Each

ST-31

Project P-4900A

Robeson County

3. Epoxy coated reinforcing bars, where specified or shown on the Plans, shall conform to ASTM A775, "Standard Specification for Epoxy-Coated Reinforcing Bars". Epoxy coated reinforcing bars shall be tied with plastic or epoxy coated wires or approved plastic clips, and shall be set on plastic or epoxy coated wire chairs.

E. INTERFACING WITH EXISTING CONCRETE

1. Surface preparation and anchorage shall be as specified in AREMA Specifications, Chapter 8, Part 14, unless otherwise indicated on the Plans. Dowels shall be made of deformed bars, ASTM A615, Grade 60, and shall be spaced as shown on the Plans. Dowels shall be grouted in place with an Epoxy Grout intended for dowel bars and shall be applied in accordance with the manufacturer's recommendations. Horizontal dowel holes shall be drilled downward on a slope of approximately one-inch per foot or as otherwise indicated on the Plans.
2. The surface of the existing material to which the new concrete will be bonded shall be cleaned by either sandblasting, waterblasting, hammers or wire brushes, so that all foreign material and loose or unsound concrete is removed and that a clean sound surface remains. The exposed surface shall be washed with clean water or air cleaned with oil free air to remove all loose dust. Grease and oil shall be scrubbed and removed with a detergent and the surface washed with clean potable water.
3. New concrete shall be bonded to clean sound material with an Epoxy Bonding compound. Bonding System shall meet the requirements of ASTM C881, Type II Grade 1 or 2, and shall be subject to approval by the Engineer. Bonding System shall be applied in accordance with manufacturer's recommendations. It is further recommended that Bonding compound be applied as a spray application by use of a Binks bottom discharge pressure vessel operating at approximately 100-psi. Bonding Compound shall not be applied to surfaces that have visible or standing water.

F. DAMPPROOFING

All surfaces of concrete masonry, which will be in contact with backfill or embankment, shall be dampproofed as noted in the plans, with Asphalt Primer and Asphalt, in accordance with AREMA Specifications, Chapter 29, Part 3.

G. CONSTRUCTION JOINTS

Construction joints shall be made only where shown on the Plans, unless otherwise approved by the Engineer, and shall be adequately keyed and, if required by the Engineer, be provided with 6" flexible P.V.C. waterstops.

H. FORMED SURFACE FINISH

All unformed surfaces shall be constructed to lines and contours shown on the drawings with a wood or hard rubber float finish. Formed surfaces shall be made with plywood faced wood forms or with steel faced forms.

I. CURING

Concrete shall be protected as required by AREMA Specification, Chapter 8, Section 1.17, for a minimum of 7 days. Membrane curing compounds are permitted, on all cast-in-place concrete surfaces except those that will abut other new concrete or as noted

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RAILROAD ROADBED

The Standard Specifications for Roads and Structures, January 2012 of the North Carolina Department of Transportation, hereinafter referred to as the Standard Specifications, shall apply to the articles of the Project Special Provisions. The latest edition of the CSXT Standard Specifications is applicable for items not covered in these Special Provisions or the NCDOT 2012 Standard Specifications.

CLEARING AND GRUBBING - METHOD III

Perform clearing on this project to the limits established by Method "III" shown on Standard Drawing No. 200.03 of the *2012 Roadway Standard Drawings*.

The work shall be performed in accordance with Section 200, "Clearing and Grubbing", of the Standard Specifications, except as follows.

Where excavation is required, the site shall be grubbed to a depth equal to a minimum of two (2) feet below the proposed subgrade or slope surfaces except at locations where the depth of excavation precludes the execution of this item.

The site shall be grubbed where fill is required.

All low-hanging and/or unsound branches on trees or shrubs shall be removed. All branches overhanging the railroad roadbed are to be trimmed so as to provide a twenty-three (23) foot vertical clearance above the top of rail at all distances within twenty-five (25) feet from the centerline of proposed track.

Additional clearing and trimming required to provide adequate railroad signal preview distances shall be coordinated with CSXT.

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County: Robeson

EMBANKMENT

This work shall be performed in accordance with Section 235, "EMBANKMENTS", of the Standard Specifications including the following:

Soil shall include all durable inorganic earth materials having a maximum particle size of three inches (as determined by current ASTM Designation D 422); a plasticity index between 0 and 35 (as determined by current ASTM Designation D 422); and that can be readily placed and compacted to the required density in loose 8-inch layers. Organic soils will not be permitted for use in embankment construction.

Fine grained soils which are moisture sensitive may be placed and compacted only during periods of dry weather. Where such soils are used and become wetted, due to natural causes or by fault of CONTRACTOR or by accident, to the extent they exhibit rutting and/or weaving characteristics, when subject to construction traffic, they shall either be removed and replaced with suitable materials or dried as specified herein, as directed by ENGINEER. Any such materials removed may be stockpiled and dried to the required moisture content for later placement and compaction.

All soil which is placed on embankment foundation to a plane three feet below the subgrade plane, and to the Plan slope limits shall be compacted to at least 95% of its maximum density and within 2% of its optimum moisture content as determined by current ASTM Designation D 1557, Modified Proctor. All soil placed from the top of subgrade and to a plane three feet below the subgrade plane, shall have less than 20% passing a #200 sieve (as determined by current ASTM Designation D 1140). **All soil placed from the top of subgrade to a plane three feet below the subgrade plane shall be compacted to at least 100% of its maximum density** or to a relative density of 75% of its maximum, whichever is higher, as determined respectively by current ASTM Designation D 1557 or current ASTM Designation D 2049. The top three feet of all embankments shall be formed of granular material or soil.

The Contractor shall notify the Engineer of when fill layers are ready for compaction testing. Successive layers shall not be placed prior to an acceptable density being obtained on each layer. The moisture content of the soil shall be controlled as necessary to obtain the specified densities based upon the optimum moisture content for each material. Water shall be added to the soil when, in the opinion of the Engineer, additional moisture may be necessary to obtain the specified density. Soil that is too wet shall be allowed to dry or be worked by plowing, discing, harrowing, or other means to dry the material to a workable moisture content.

In the event a specified density is not obtained, the Engineer may order additional rolling, watering, or drying of the soil as necessary to obtain the specified density. Fill layers not meeting a specified density after additional working shall be removed and new material shall be placed and compacted to the specified density at no cost to the Department.

County: Robeson

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|----------------------|--------------|-------|---|---------------|-----------|--------|
| ROADWAY ITEMS | | | | | | |
| 0001 | 0000100000-N | 800 | MOBILIZATION | Lump Sum | L.S. | |
| 0002 | 0000400000-N | 801 | CONSTRUCTION SURVEYING | Lump Sum | L.S. | |
| 0003 | 0001000000-E | 200 | CLEARING & GRUBBING .. ACRE(S) | Lump Sum | L.S. | |
| 0004 | 0008000000-E | 200 | SUPPLEMENTARY CLEARING & GRUB- BING | 3 ACR | | |
| 0005 | 0022000000-E | 225 | UNCLASSIFIED EXCAVATION | 61,500 CY | | |
| 0006 | 0036000000-E | 225 | UNDERCUT EXCAVATION | 16,000 CY | | |
| 0007 | 0106000000-E | 230 | BORROW EXCAVATION | 289,100 CY | | |
| 0008 | 0127000000-N | SP | EMBANKMENT SETTLEMENT GAUGES | 12 EA | | |
| 0009 | 0134000000-E | 240 | DRAINAGE DITCH EXCAVATION | 620 CY | | |
| 0010 | 0156000000-E | 250 | REMOVAL OF EXISTING ASPHALT PAVEMENT | 80 SY | | |
| 0011 | 0192000000-N | 260 | PROOF ROLLING | 11 HR | | |
| 0012 | 0196000000-E | 270 | GEOTEXTILE FOR SOIL STABILIZA- TION | 10,200 SY | | |
| 0013 | 0199000000-E | SP | TEMPORARY SHORING | 790 SF | | |
| 0014 | 0248000000-N | SP | GENERIC GRADING ITEM PREPARATION OF EXISTING GROUND | Lump Sum | L.S. | |
| 0015 | 0255000000-E | SP | GENERIC GRADING ITEM SURGE STONE | 35,000 TON | | |
| 0016 | 0314000000-E | SP | SELECT MATERIAL, CLASS ***** (VI) | 3,000 TON | | |
| 0017 | 0318000000-E | 300 | FOUNDATION CONDITIONING MATE- RIAL, MINOR STRUCTURES | 70 TON | | |
| 0018 | 0320000000-E | 300 | FOUNDATION CONDITIONING GEO- TEXTILE | 200 SY | | |

County: Robeson

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|----------|-----------|--------|
| 0019 | 0378000000-E | 310 | 24" RC PIPE CULVERTS, CLASS III | 32 | LF | |
| 0020 | 0450000000-E | SP | **** RC PIPE CULVERTS, CLASS ** (UNDER RR) (36", V) | 326 | LF | |
| 0021 | 0450000000-E | SP | **** RC PIPE CULVERTS, CLASS ** (UNDER RR) (42", V) | 92 | LF | |
| 0022 | 0450000000-E | SP | **** RC PIPE CULVERTS, CLASS ** (UNDER RR) (48", V) | 68 | LF | |
| 0023 | 0450000000-E | SP | **** RC PIPE CULVERTS, CLASS ** (UNDER RR) (60", V) | 80 | LF | |
| 0024 | 0986000000-E | SP | GENERIC PIPE ITEM 36" WELDED STEEL PIPE, 0.532" THICK, GRADE B IN SOIL | 39 | LF | |
| 0025 | 0986000000-E | SP | GENERIC PIPE ITEM 36" WELDED STEEL PIPE, 0.532" THICK, GRADE B NOT IN SOIL | 39 | LF | |
| 0026 | 1011000000-N | 500 | FINE GRADING | Lump Sum | L.S. | |
| 0027 | 1519000000-E | 610 | ASPHALT CONC SURFACE COURSE, TYPE S9.5B | 30 | TON | |
| 0028 | 1575000000-E | 620 | ASPHALT BINDER FOR PLANT MIX | 5 | TON | |
| 0029 | 2000000000-N | 806 | RIGHT OF WAY MARKERS | 58 | EA | |
| 0030 | 2209000000-E | 838 | ENDWALLS | 48.2 | CY | |
| 0031 | 2220000000-E | 838 | REINFORCED ENDWALLS | 11.2 | CY | |
| 0032 | 3628000000-E | 876 | RIP RAP, CLASS I | 552 | TON | |
| 0033 | 3656000000-E | 876 | GEOTEXTILE FOR DRAINAGE | 2,390 | SY | |
| 0034 | 3804000000-E | SP | AGGREGATE BASE COURSE (SUB-BALLAST) | 14,400 | TON | |
| 0035 | 4400000000-E | 1110 | WORK ZONE SIGNS (STATIONARY) | 80 | SF | |

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| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|-------------------------------------|----------|-----------|--------|
| 0036 | 4405000000-E | 1110 | WORK ZONE SIGNS (PORTABLE) | 160 | SF | |
| 0037 | 4410000000-E | 1110 | WORK ZONE SIGNS (BARRICADE MOUNTED) | 20 | SF | |
| 0038 | 4420000000-N | 1120 | PORTABLE CHANGEABLE MESSAGE SIGN | 2 | EA | |
| 0039 | 4430000000-N | 1130 | DRUMS | 50 | EA | |
| 0040 | 4435000000-N | 1135 | CONES | 50 | EA | |
| 0041 | 4445000000-E | 1145 | BARRICADES (TYPE III) | 48 | LF | |
| 0042 | 4450000000-N | 1150 | FLAGGER | 320 | HR | |
| 0043 | 4465000000-N | 1160 | TEMPORARY CRASH CUSHIONS | 2 | EA | |
| 0044 | 4485000000-E | 1170 | PORTABLE CONCRETE BARRIER | 508 | LF | |
| 0045 | 4650000000-N | 1251 | TEMPORARY RAISED PAVEMENT MARKERS | 4 | EA | |
| 0046 | 4810000000-E | 1205 | PAINT PAVEMENT MARKING LINES (4") | 2,840 | LF | |
| 0047 | 5325600000-E | 1510 | 6" WATER LINE | 601 | LF | |
| 0048 | 5326200000-E | 1510 | 12" WATER LINE | 761 | LF | |
| 0049 | 5538000000-E | 1515 | 4" VALVE | 1 | EA | |
| 0050 | 5540000000-E | 1515 | 6" VALVE | 3 | EA | |
| 0051 | 5558000000-E | 1515 | 12" VALVE | 2 | EA | |
| 0052 | 5648000000-N | 1515 | RELOCATE WATER METER | 1 | EA | |
| 0053 | 5672000000-N | 1515 | RELOCATE FIRE HYDRANT | 2 | EA | |
| 0054 | 5685000000-E | 1515 | 12" LINE STOP WITH BYPASS | 4 | EA | |
| 0055 | 5709200000-E | 1520 | 4" FORCE MAIN SEWER | 173 | LF | |

County: Robeson

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---------------------------------------|--------------|-----------|--------|
| 0056 | 5798000000-E | 1530 | ABANDON *** UTILITY PIPE (4") | 171 LF | | |
| 0057 | 5800000000-E | 1530 | ABANDON 6" UTILITY PIPE | 480 LF | | |
| 0058 | 5804000000-E | 1530 | ABANDON 12" UTILITY PIPE | 561 LF | | |
| 0059 | 5835000000-E | 1540 | *** ENCASEMENT PIPE (10") | 100 LF | | |
| 0060 | 5835000000-E | 1540 | *** ENCASEMENT PIPE (14") | 100 LF | | |
| 0061 | 5835000000-E | 1540 | *** ENCASEMENT PIPE (22") | 91 LF | | |
| 0062 | 6000000000-E | 1605 | TEMPORARY SILT FENCE | 15,800 LF | | |
| 0063 | 6006000000-E | 1610 | STONE FOR EROSION CONTROL, CLASS A | 150 TON | | |
| 0064 | 6009000000-E | 1610 | STONE FOR EROSION CONTROL, CLASS B | 3,700 TON | | |
| 0065 | 6012000000-E | 1610 | SEDIMENT CONTROL STONE | 1,650 TON | | |
| 0066 | 6015000000-E | 1615 | TEMPORARY MULCHING | 42 ACR | | |
| 0067 | 6018000000-E | 1620 | SEED FOR TEMPORARY SEEDING | 3,000 LB | | |
| 0068 | 6021000000-E | 1620 | FERTILIZER FOR TEMPORARY SEED- ING | 15 TON | | |
| 0069 | 6024000000-E | 1622 | TEMPORARY SLOPE DRAINS | 5,000 LF | | |
| 0070 | 6029000000-E | SP | SAFETY FENCE | 2,200 LF | | |
| 0071 | 6030000000-E | 1630 | SILT EXCAVATION | 13,600 CY | | |
| 0072 | 6036000000-E | 1631 | MATTING FOR EROSION CONTROL | 70,000 SY | | |
| 0073 | 6037000000-E | SP | COIR FIBER MAT | 335 SY | | |
| 0074 | 6038000000-E | SP | PERMANENT SOIL REINFORCEMENT MAT | 13,925 SY | | |

County: Robeson

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|-------------------------------|--------------|-----------|--------|
| 0075 | 6042000000-E | 1632 | 1/4" HARDWARE CLOTH | 200 LF | | |
| 0076 | 6043000000-E | SP | LOW PERMEABILITY GEOTEXTILE | 1,050 SY | | |
| 0077 | 6048000000-E | SP | FLOATING TURBIDITY CURTAIN | 40 SY | | |
| 0078 | 6069000000-E | 1638 | STILLING BASINS | 33 CY | | |
| 0079 | 6071012000-E | SP | COIR FIBER WATTLE | 3,200 LF | | |
| 0080 | 6071020000-E | SP | POLYACRYLAMIDE (PAM) | 600 LB | | |
| 0081 | 6071030000-E | 1640 | COIR FIBER BAFFLE | 4,600 LF | | |
| 0082 | 6071050000-E | SP | *** SKIMMER (1-1/2") | 34 EA | | |
| 0083 | 6071050000-E | SP | *** SKIMMER (2") | 2 EA | | |
| 0084 | 6084000000-E | 1660 | SEEDING & MULCHING | 60 ACR | | |
| 0085 | 6087000000-E | 1660 | MOWING | 18 ACR | | |
| 0086 | 6090000000-E | 1661 | SEED FOR REPAIR SEEDING | 560 LB | | |
| 0087 | 6093000000-E | 1661 | FERTILIZER FOR REPAIR SEEDING | 1.75 TON | | |
| 0088 | 6096000000-E | 1662 | SEED FOR SUPPLEMENTAL SEEDING | 1,525 LB | | |
| 0089 | 6108000000-E | 1665 | FERTILIZER TOPDRESSING | 45.25 TON | | |
| 0090 | 6111000000-E | SP | IMPERVIOUS DIKE | 50 LF | | |
| 0091 | 6114500000-N | 1667 | SPECIALIZED HAND MOWING | 30 MHR | | |
| 0092 | 6117000000-N | SP | RESPONSE FOR EROSION CONTROL | 60 EA | | |
| 0093 | 6120000000-E | SP | CULVERT DIVERSION CHANNEL | 90 CY | | |

County: Robeson

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|-------------|-------|-------------|----------|-----------|--------|
|--------|-------------|-------|-------------|----------|-----------|--------|

| | | | | | | |
|------|--------------|----|--|---------|--|--|
| 0128 | 6132000000-N | SP | GENERIC EROSION CONTROL ITEM CONCRETE WASHOUT STRUCTURE | 2 EA | | |
|------|--------------|----|--|---------|--|--|

CULVERT ITEMS

| | | | | | | |
|------|--------------|-----|---|----------|------|--|
| 0094 | 8126000000-N | 414 | CULVERT EXCAVATION, STA ***** (55+31.95 -L-) | Lump Sum | L.S. | |
|------|--------------|-----|---|----------|------|--|

| | | | | | | |
|------|--------------|-----|---|------------|--|--|
| 0095 | 8133000000-E | 414 | FOUNDATION CONDITIONING MATERIAL, BOX CULVERT | 107 TON | | |
|------|--------------|-----|---|------------|--|--|

| | | | | | | |
|------|--------------|-----|-----------------------------|--------------|--|--|
| 0096 | 8245000000-E | 425 | REINFORCING STEEL (CULVERT) | 42,510 LB | | |
|------|--------------|-----|-----------------------------|--------------|--|--|

| | | | | | | |
|------|--------------|-----|--------------------------|-----------|--|--|
| 0097 | 8590000000-E | 876 | RIP RAP, CLASS ** (I) | 64 TON | | |
|------|--------------|-----|--------------------------|-----------|--|--|

| | | | | | | |
|------|--------------|----|---|-------------|--|--|
| 0098 | 8825000000-E | SP | GENERIC CULVERT ITEM CAST-IN-PLACE CONCRETE (4,500 PSI) | 229.9 CY | | |
|------|--------------|----|---|-------------|--|--|

STRUCTURE ITEMS

| | | | | | | |
|------|--------------|-----|--|----------|------|--|
| 0099 | 8091000000-N | 410 | FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (PIER NO 1, 38+93.39 -L-) | Lump Sum | L.S. | |
|------|--------------|-----|--|----------|------|--|

| | | | | | | |
|------|--------------|-----|--|----------|------|--|
| 0100 | 8091000000-N | 410 | FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (PIER NO 2, 38+93.39 -L-) | Lump Sum | L.S. | |
|------|--------------|-----|--|----------|------|--|

| | | | | | | |
|------|--------------|-----|-------------|---------|--|--|
| 0101 | 8112730000-N | 450 | PDA TESTING | 7 EA | | |
|------|--------------|-----|-------------|---------|--|--|

| | | | | | | |
|------|--------------|-----|----------------------------|--------------|--|--|
| 0102 | 8217000000-E | 425 | REINFORCING STEEL (BRIDGE) | 79,015 LB | | |
|------|--------------|-----|----------------------------|--------------|--|--|

| | | | | | | |
|------|--------------|-----|--|--------------|--|--|
| 0103 | 8224000000-E | 425 | EPOXY COATED REINFORCING STEEL (BRIDGE) | 12,688 LB | | |
|------|--------------|-----|--|--------------|--|--|

| | | | | | | |
|------|--------------|-----|---------------------|-------------|--|--|
| 0104 | 8364000000-E | 450 | HP12X53 STEEL PILES | 3,700 LF | | |
|------|--------------|-----|---------------------|-------------|--|--|

| | | | | | | |
|------|--------------|-----|---|-------------|--|--|
| 0105 | 8385000000-E | 450 | PP ** X **** STEEL PILES (14 X 0.50) | 1,800 LF | | |
|------|--------------|-----|---|-------------|--|--|

County: Robeson

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|-------------|-----------|--------|
| 0106 | 8387000000-E | 450 | PP 18 X 0.50 GALVANIZED STEEL PILES | 520 LF | | |
| 0107 | 8392000000-N | 450 | PIPE PILE PLATES | 38 EA | | |
| 0108 | 8393000000-N | 450 | PILE REDRIVES | 60 EA | | |
| 0109 | 8531000000-E | 462 | 4" SLOPE PROTECTION | 269 SY | | |
| 0110 | 8608000000-E | 876 | RIP RAP CLASS II (2'-0" THICK) | 623 TON | | |
| 0111 | 8622000000-E | 876 | GEOTEXTILE FOR DRAINAGE | 691 SY | | |
| 0112 | 8657000000-N | 430 | ELASTOMERIC BEARINGS | Lump Sum | L.S. | |
| 0113 | 8741000000-N | SP | STRUCTURE DRAINAGE SYSTEM AT STA***** (22+07.07 -L-) | Lump Sum | L.S. | |
| 0114 | 8741000000-N | SP | STRUCTURE DRAINAGE SYSTEM AT STA***** (38+93.36 -L-) | Lump Sum | L.S. | |
| 0115 | 8860000000-N | SP | GENERIC STRUCTURE ITEM APPLICATION OF BRIDGE COATING | Lump Sum | L.S. | |
| 0116 | 8860000000-N | SP | GENERIC STRUCTURE ITEM APPROX 329,519 LBS STRUCTURAL STEEL | Lump Sum | L.S. | |
| 0117 | 8860000000-N | SP | GENERIC STRUCTURE ITEM PAINTING OF STRUCTURAL STEEL | Lump Sum | L.S. | |
| 0118 | 8860000000-N | SP | GENERIC STRUCTURE ITEM SELF-LUBRICATING EXPANSION BEARING ASSEMBLIES | Lump Sum | L.S. | |
| 0119 | 8867000000-E | SP | GENERIC STRUCTURE ITEM 4'-0" X 4'-6" P/S CONC BOX BEAMS | 556.5 LF | | |
| 0120 | 8867000000-E | SP | GENERIC STRUCTURE ITEM CONCRETE BALLAST CURB | 222.6 LF | | |
| 0121 | 8867000000-E | SP | GENERIC STRUCTURE ITEM CONCRETE PARAPET | 260.8 LF | | |

County: Robeson

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|-------------|-----------|--------|
| 0122 | 8867000000-E | SP | GENERIC STRUCTURE ITEM STEEL HANDRAIL | 300.2 LF | | |
| 0123 | 8881000000-E | SP | GENERIC STRUCTURE ITEM CAST-IN-PLACE CONCRETE (4,000 PSI) | 611 CY | | |
| 0125 | 8881000000-E | SP | GENERIC STRUCTURE ITEM CAST-IN-PLAST CONCRETE (5,000 PSI) | 94.8 CY | | |
| 0126 | 8893000000-E | SP | GENERIC STRUCTURE ITEM DAMPPROOFING | 371.1 SY | | |
| 0127 | 8893000000-E | SP | GENERIC STRUCTURE ITEM WATERPROOFING | 392.5 SY | | |
| | | | Total Amount Of Bid For Entire Project : | | | |

1525/Aug07/Q728694.5/D650034892000/E127

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C. | 41099.1.2 (P-4900) | 1 | 7 |

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 41099.1.2 (P-4900) F.A. PROJ. TCSP-0635(5)

COUNTY ROBESON

PROJECT DESCRIPTION RAILROAD BYPASS OF PEMBROKE TO
ALLOW NORTH TO SOUTH SHIPMENTS TO TURN EAST

SITE DESCRIPTION BRIDGE ON PROPOSED CONNECTING TRACK
OVER BEAR SWAMP BETWEEN ST. ANNA RD. AND UNION
CHAPEL RD.

CONTENTS

| <u>SHEET</u> | <u>DESCRIPTION</u> |
|--------------|--------------------|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE(S) |
| 5-6 | BORE LOGS |
| 7 | SOIL TEST RESULTS |

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE, THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PROJECT: 41099.1.2 ID: P-4900

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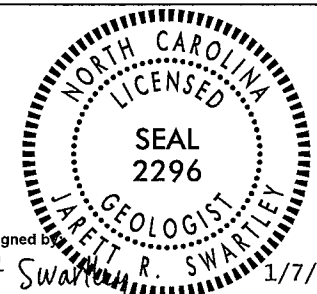
J.R. SWARTLEY

INVESTIGATED BY J.R. SWARTLEY

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE SEPTEMBER 2014



DocuSigned by
 Jarett Swartley
 1/7/2015

DRAWN BY: T.T. WALKER, J.R. SWARTLEY

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

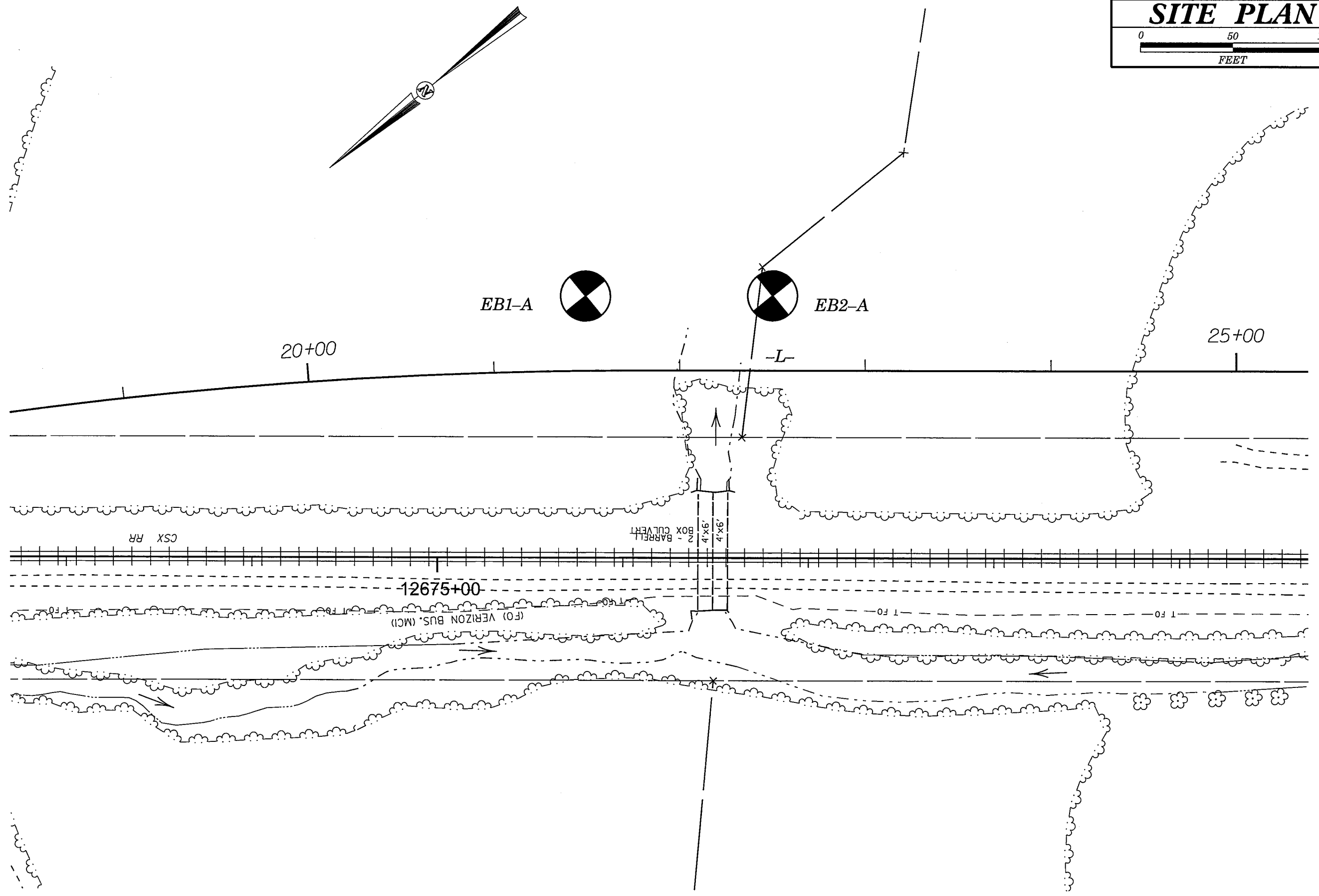
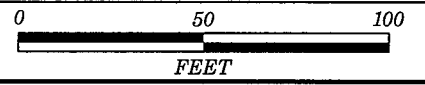
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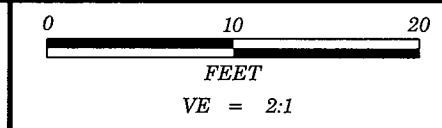
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

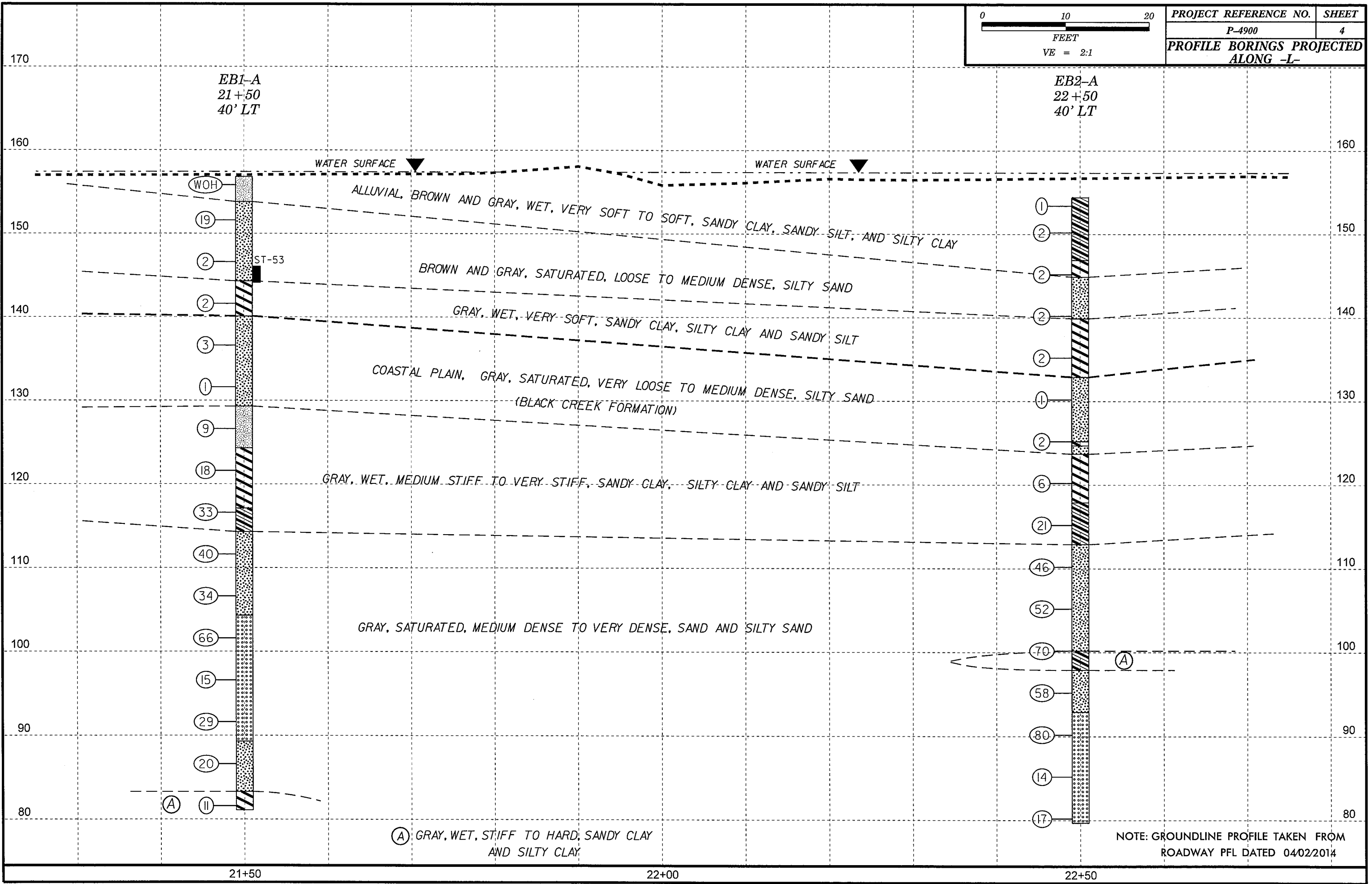
| SOIL DESCRIPTION | GRADATION | ROCK DESCRIPTION | TERMS AND DEFINITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRAN. SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HEAVY PLASTIC, A-7-6</i></p> | <p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)</p> <p>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p> | <p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p>WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>CRYSTALLINE ROCK (CR) - FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p>NON-CRYSTALLINE ROCK (INCR) - FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP) - COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p> | <p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p>ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.</p> <p>STRATA CORE RECOVERY (SCRC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.</p> <p>TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p style="text-align: center;">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>GENERAL CLASS.</th> <th>GRANULAR MATERIALS (<= 35% PASSING #200)</th> <th>SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th>ORGANIC MATERIALS</th> </tr> </thead> <tbody> <tr> <td>GROUP CLASS.</td> <td>A-1, A-1-b, A-3</td> <td>A-2, A-2-4, A-2-5, A-2-6, A-2-7</td> <td>A-1, A-2, A-3, A-4, A-5, A-6, A-7</td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING</td> <td>50 MX, 30 MX, 50 MX, 51 MN, 40, 20</td> <td>35 MX, 35 MX, 35 MX, 35 MX, 35 MX, 35 MN, 35 MN, 35 MN, 35 MN</td> <td>GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT</td> </tr> <tr> <td>LIQUID LIMIT PLASTIC INDEX</td> <td>6 MX</td> <td>40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN</td> <td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td> <td>0, 4 MX, 8 MX, 12 MX, 16 MX, No MX</td> <td></td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS, GRAVEL, AND SAND</td> <td>FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY SOILS, CLAYEY SOILS</td> </tr> <tr> <td>GENERAL RATING AS A SUBGRADE</td> <td>EXCELLENT TO GOOD</td> <td>FAIR TO POOR</td> <td>FAIR TO POOR, POOR, UNSUITABLE</td> </tr> </tbody> </table> <p style="text-align: center;">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p> | GENERAL CLASS. | GRANULAR MATERIALS (<= 35% PASSING #200) | SILT-CLAY MATERIALS (> 35% PASSING #200) | ORGANIC MATERIALS | GROUP CLASS. | A-1, A-1-b, A-3 | A-2, A-2-4, A-2-5, A-2-6, A-2-7 | A-1, A-2, A-3, A-4, A-5, A-6, A-7 | SYMBOL | | | | % PASSING | 50 MX, 30 MX, 50 MX, 51 MN, 40, 20 | 35 MX, 35 MX, 35 MX, 35 MX, 35 MX, 35 MN, 35 MN, 35 MN, 35 MN | GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT | LIQUID LIMIT PLASTIC INDEX | 6 MX | 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS | GROUP INDEX | 0 | 0, 4 MX, 8 MX, 12 MX, 16 MX, No MX | | USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS, GRAVEL, AND SAND | FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND | SILTY SOILS, CLAYEY SOILS | GENERAL RATING AS A SUBGRADE | EXCELLENT TO GOOD | FAIR TO POOR | FAIR TO POOR, POOR, UNSUITABLE | <p style="text-align: center;">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> </thead> <tbody> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>> 10%</td> <td>> 20%</td> <td>HIGHLY</td> </tr> </tbody> </table> <p style="text-align: center;">GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p style="text-align: center;">MISCELLANEOUS SYMBOLS</p> <p> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p> SOIL SYMBOL</p> <p> ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p> INFERRED SOIL BOUNDARY</p> <p> INFERRED ROCK LINE</p> <p> ALLUVIAL SOIL BOUNDARY</p> <p> DIP & DIP DIRECTION OF ROCK STRUCTURES</p> <p> SPT TEST BORING</p> <p> AUGER BORING</p> <p> CORE BORING</p> <p> MONITORING WELL</p> <p> PIEZOMETER INSTALLATION</p> <p> SLOPE INDICATOR INSTALLATION</p> <p> CONE PENETROMETER TEST</p> <p> SOUNDING ROD</p> | ORGANIC MATERIAL | GRANULAR SOILS | SILT-CLAY SOILS | OTHER MATERIAL | TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | HIGHLY ORGANIC | > 10% | > 20% | HIGHLY | <p style="text-align: center;">ROCK HARDNESS</p> <p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.</p> <p>MEDIUM HARD - CAN BE GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p> | <p style="text-align: center;">ABBREVIATIONS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>AR - AUGER REFUSAL</td> <td>MED. - MEDIUM</td> <td>VST - VANE SHEAR TEST</td> </tr> <tr> <td>BT - BORING TERMINATED</td> <td>MICA - MICACEOUS</td> <td>WEA. - WEATHERED</td> </tr> <tr> <td>CL - CLAY</td> <td>MOD. - MODERATELY</td> <td>W - UNIT WEIGHT</td> </tr> <tr> <td>CPT - CONE PENETRATION TEST</td> <td>NP - NON PLASTIC</td> <td>W_u - DRY UNIT WEIGHT</td> </tr> <tr> <td>CSE - COARSE</td> <td>ORG. - ORGANIC</td> <td></td> </tr> <tr> <td>DMT - DILATOMETER TEST</td> <td>PMT - PRESSUREMETER TEST</td> <td>SAMPLE ABBREVIATIONS</td> </tr> <tr> <td>DPT - DYNAMIC PENETRATION TEST</td> <td>SAP. - SAPROLITIC</td> <td>S - BULK</td> </tr> <tr> <td>o - VOID RATIO</td> <td>SD. - SAND, SANDY</td> <td>SS - SPLIT SPOON</td> </tr> <tr> <td>F - FINE</td> <td>SL. - SILT, SILTY</td> <td>ST - SHELBY TUBE</td> </tr> <tr> <td>FOSS. - FOSSILIFEROUS</td> <td>SLI. - SLIGHTLY</td> <td>RS - ROCK</td> </tr> <tr> <td>FRAC. - FRACTURED, FRACTURES</td> <td>TCR - TRICONE REFUSAL</td> <td>RT - RECOMPACTED TRIAXIAL</td> </tr> <tr> <td>FRACS. - FRAGMENTS</td> <td>w - MOISTURE CONTENT</td> <td>CR - CALIFORNIA BEARING RATIO</td> </tr> <tr> <td>HI. - HIGHLY</td> <td>V - VERY</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">EQUIPMENT USED ON SUBJECT PROJECT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DRILL UNITS:</th> <th>ADVANCING TOOLS:</th> <th>HAMMER TYPE:</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> MOBILE B-</td> <td><input type="checkbox"/> CLAY BITS</td> <td><input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> BK-51</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td></td> </tr> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> 6" HOLLOW AUGERS</td> <td></td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input type="checkbox"/> HARD FACED FINGER BITS</td> <td></td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> TUNG.-CARBIDE INSERTS</td> <td></td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> CME-45B</td> <td><input type="checkbox"/> TRICONE 2 3/8" TUNG.-CARB.</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> CORE BIT</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">HAND TOOLS:</p> <p><input type="checkbox"/> POST HOLE DIGGER</p> <p><input type="checkbox"/> HAND AUGER</p> <p><input type="checkbox"/> SOUNDING ROD</p> <p><input type="checkbox"/> VANE SHEAR TEST</p> | AR - AUGER REFUSAL | MED. - MEDIUM | VST - VANE SHEAR TEST | BT - BORING TERMINATED | MICA - MICACEOUS | WEA. - WEATHERED | CL - CLAY | MOD. - MODERATELY | W - UNIT WEIGHT | CPT - CONE PENETRATION TEST | NP - NON PLASTIC | W _u - DRY UNIT WEIGHT | CSE - COARSE | ORG. - ORGANIC | | DMT - DILATOMETER TEST | PMT - PRESSUREMETER TEST | SAMPLE ABBREVIATIONS | DPT - DYNAMIC PENETRATION TEST | SAP. - SAPROLITIC | S - BULK | o - VOID RATIO | SD. - SAND, SANDY | SS - SPLIT SPOON | F - FINE | SL. - SILT, SILTY | ST - SHELBY TUBE | FOSS. - FOSSILIFEROUS | SLI. - SLIGHTLY | RS - ROCK | FRAC. - FRACTURED, FRACTURES | TCR - TRICONE REFUSAL | RT - RECOMPACTED TRIAXIAL | FRACS. - FRAGMENTS | w - MOISTURE CONTENT | CR - CALIFORNIA BEARING RATIO | HI. - HIGHLY | V - VERY | | DRILL UNITS: | ADVANCING TOOLS: | HAMMER TYPE: | <input type="checkbox"/> MOBILE B- | <input type="checkbox"/> CLAY BITS | <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL | <input type="checkbox"/> BK-51 | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER | | <input type="checkbox"/> CME-45C | <input type="checkbox"/> 6" HOLLOW AUGERS | | <input type="checkbox"/> CME-550 | <input type="checkbox"/> HARD FACED FINGER BITS | | <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> TUNG.-CARBIDE INSERTS | | | <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER | | <input checked="" type="checkbox"/> CME-45B | <input type="checkbox"/> TRICONE 2 3/8" TUNG.-CARB. | | | <input type="checkbox"/> CORE BIT | | | | |
| GENERAL CLASS. | GRANULAR MATERIALS (<= 35% PASSING #200) | SILT-CLAY MATERIALS (> 35% PASSING #200) | ORGANIC MATERIALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP CLASS. | A-1, A-1-b, A-3 | A-2, A-2-4, A-2-5, A-2-6, A-2-7 | A-1, A-2, A-3, A-4, A-5, A-6, A-7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SYMBOL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| % PASSING | 50 MX, 30 MX, 50 MX, 51 MN, 40, 20 | 35 MX, 35 MX, 35 MX, 35 MX, 35 MX, 35 MN, 35 MN, 35 MN, 35 MN | GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LIQUID LIMIT PLASTIC INDEX | 6 MX | 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN, 40 MX, 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP INDEX | 0 | 0, 4 MX, 8 MX, 12 MX, 16 MX, No MX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS, GRAVEL, AND SAND | FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND | SILTY SOILS, CLAYEY SOILS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERAL RATING AS A SUBGRADE | EXCELLENT TO GOOD | FAIR TO POOR | FAIR TO POOR, POOR, UNSUITABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ORGANIC MATERIAL | GRANULAR SOILS | SILT-CLAY SOILS | OTHER MATERIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HIGHLY ORGANIC | > 10% | > 20% | HIGHLY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AR - AUGER REFUSAL | MED. - MEDIUM | VST - VANE SHEAR TEST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BT - BORING TERMINATED | MICA - MICACEOUS | WEA. - WEATHERED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CL - CLAY | MOD. - MODERATELY | W - UNIT WEIGHT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CPT - CONE PENETRATION TEST | NP - NON PLASTIC | W _u - DRY UNIT WEIGHT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CSE - COARSE | ORG. - ORGANIC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMT - DILATOMETER TEST | PMT - PRESSUREMETER TEST | SAMPLE ABBREVIATIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DPT - DYNAMIC PENETRATION TEST | SAP. - SAPROLITIC | S - BULK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| o - VOID RATIO | SD. - SAND, SANDY | SS - SPLIT SPOON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F - FINE | SL. - SILT, SILTY | ST - SHELBY TUBE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FOSS. - FOSSILIFEROUS | SLI. - SLIGHTLY | RS - ROCK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRAC. - FRACTURED, FRACTURES | TCR - TRICONE REFUSAL | RT - RECOMPACTED TRIAXIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRACS. - FRAGMENTS | w - MOISTURE CONTENT | CR - CALIFORNIA BEARING RATIO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HI. - HIGHLY | V - VERY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DRILL UNITS: | ADVANCING TOOLS: | HAMMER TYPE: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> MOBILE B- | <input type="checkbox"/> CLAY BITS | <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> BK-51 | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> CME-45C | <input type="checkbox"/> 6" HOLLOW AUGERS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> CME-550 | <input type="checkbox"/> HARD FACED FINGER BITS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> TUNG.-CARBIDE INSERTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> CME-45B | <input type="checkbox"/> TRICONE 2 3/8" TUNG.-CARB. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <input type="checkbox"/> CORE BIT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p style="text-align: center;">TEXTURE OR GRAIN SIZE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> </thead> <tbody> <tr> <td></td> <td>4.76</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CS, SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> </thead> <tbody> <tr> <td>GRAIN SIZE MM</td> <td>305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> </tr> <tr> <td>IN.</td> <td>12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CS, SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) | GRAIN SIZE MM | 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 | IN. | 12 | 3 | | | | | | | <p style="text-align: center;">ROCK HARDNESS</p> <p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.</p> <p>MEDIUM HARD - CAN BE GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CS, SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRAIN SIZE MM | 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IN. | 12 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p style="text-align: center;">SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PL - PLASTIC LIMIT</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </tbody> </table> | SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION | LL - LIQUID LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | PL - PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | OM - OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | SL - SHRINKAGE LIMIT | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | <p style="text-align: center;">FRACTURE SPACING</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> </thead> <tbody> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>> 4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FEET</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </tbody> </table> <p style="text-align: center;">INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p> | TERM | SPACING | TERM | THICKNESS | VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | > 4 FEET | WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | CLOSE | 0.16 TO 1 FEET | VERY THINLY BEDDED | 0.03 - 0.16 FEET | VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | THINLY LAMINATED | < 0.008 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LL - LIQUID LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PL - PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OM - OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL - SHRINKAGE LIMIT | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TERM | SPACING | TERM | THICKNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | > 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLOSE | 0.16 TO 1 FEET | VERY THINLY BEDDED | 0.03 - 0.16 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | THINLY LAMINATED | < 0.008 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p style="text-align: center;">PLASTICITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NONPLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> </thead> <tbody> <tr> <td>LOW PLASTICITY</td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>MED. PLASTICITY</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>HIGH PLASTICITY</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </tbody> </table> <p style="text-align: center;">COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p> | NONPLASTIC | PLASTICITY INDEX (PI) | DRY STRENGTH | LOW PLASTICITY | 0-5 | VERY LOW | MED. PLASTICITY | 6-15 | SLIGHT | HIGH PLASTICITY | 16-25 | MEDIUM | | 26 OR MORE | HIGH | | | <p style="text-align: center;">NOTES:</p> <p>BENCH MARK: BY2-12, N: 341486.6412 E: 1945040.0808</p> <p style="text-align: right;">ELEVATION: 165.99 FT.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NONPLASTIC | PLASTICITY INDEX (PI) | DRY STRENGTH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LOW PLASTICITY | 0-5 | VERY LOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MED. PLASTICITY | 6-15 | SLIGHT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HIGH PLASTICITY | 16-25 | MEDIUM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 26 OR MORE | HIGH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

SITE PLAN





| | |
|--|-------|
| PROJECT REFERENCE NO. | SHEET |
| P-4900 | 4 |
| PROFILE BORINGS PROJECTED ALONG -L- | |



EB1-A
21+50
40' LT

EB2-A
22+50
40' LT

WATER SURFACE

WATER SURFACE

ALLUVIAL, BROWN AND GRAY, WET, VERY SOFT TO SOFT, SANDY CLAY, SANDY SILT, AND SILTY CLAY

BROWN AND GRAY, SATURATED, LOOSE TO MEDIUM DENSE, SILTY SAND

GRAY, WET, VERY SOFT, SANDY CLAY, SILTY CLAY AND SANDY SILT

COASTAL PLAIN, GRAY, SATURATED, VERY LOOSE TO MEDIUM DENSE, SILTY SAND
(BLACK CREEK FORMATION)

GRAY, WET, MEDIUM STIFF TO VERY STIFF, SANDY CLAY, SILTY CLAY AND SANDY SILT

GRAY, SATURATED, MEDIUM DENSE TO VERY DENSE, SAND AND SILTY SAND

(A) GRAY, WET, STIFF TO HARD, SANDY CLAY AND SILTY CLAY

NOTE: GROUNDLINE PROFILE TAKEN FROM ROADWAY PFL DATED 04/02/2014

21+50

22+00

22+50

| WBS 41099.1.2 | | TIP P-4900 | | COUNTY ROBESON | | GEOLOGIST Contract Geologist | | | | | | | | | | |
|--|-----------------|---------------------|------------|-------------------------|-------|------------------------------|-----------------|----|----|-----|-----------|-------|---------------------------|------------|--|--|
| SITE DESCRIPTION BR. ON PROP. CONNECTING TRACK OVER BEAR SWAMP BETWEEN ST. ANNA RD. AND UNION CHAPEL RD. | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. EB2-A | | STATION 22+50 | | OFFSET 40 ft LT | | ALIGNMENT -L- | 0 HR. N/A | | | | | | | | | |
| COLLAR ELEV. 154.4 ft | | TOTAL DEPTH 74.7 ft | | NORTHING 343,053 | | EASTING 1,945,837 | 24 HR. N/A | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE CME-45C | | | | DRILL METHOD Mud Rotary | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Contract Driller | | START DATE 03/10/14 | | COMP. DATE 03/10/14 | | SURFACE WATER DEPTH 0.3ft | | | | | | | | | | |
| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | L O G | SOIL AND ROCK DESCRIPTION | | | |
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | ELEV. (ft) | DEPTH (ft) | | |
| 155 | 154.4 | 0.0 | 1 | 0 | 1 | | | | | | | | 154.4 | 0.0 | WATER SURFACE (03/10/14) | |
| 150 | 151.2 | 3.2 | WOR | | | | | | | | SS-159 | M | | | ALLUVIAL GRAY, SANDY CLAY AND SILTY CLAY WITH TRACE ORGANIC MATTER | |
| 145 | 146.2 | 8.2 | 1 | 1 | 1 | | | | | | | W | 146.9 | 7.5 | | |
| 140 | 141.2 | 13.2 | 1 | 1 | 1 | | | | | | | W | 144.9 | 9.5 | GRAY, SILTY SAND | |
| 135 | 136.2 | 18.2 | 1 | 1 | 1 | | | | | | SS-161 | Sat. | 139.9 | 14.5 | GRAY, SILTY CLAY | |
| 130 | 131.2 | 23.2 | 1 | 0 | 1 | | | | | | | W | 132.9 | 21.5 | COASTAL PLAIN GRAY, SILTY SAND (BLACK CREEK FORMATION) | |
| 125 | 126.2 | 28.2 | 1 | 1 | 1 | | | | | | | Sat. | 125.2 | 29.2 | GRAY, SILTY CLAY | |
| 120 | 121.2 | 33.2 | 2 | 2 | 4 | | | | | | | W | 124.7 | 29.7 | GRAY, SILTY SAND | |
| 115 | 116.2 | 38.2 | 3 | 9 | 12 | | | | | | | Sat. | 123.7 | 30.7 | GRAY, SILTY CLAY AND SANDY CLAY | |
| 110 | 111.2 | 43.2 | 9 | 19 | 27 | | | | | | SS-162 | Sat. | 117.9 | 36.5 | | |
| 105 | 106.2 | 48.2 | 12 | 22 | 30 | | | | | | | W | 112.9 | 41.5 | GRAY, SILTY SAND | |
| 100 | 101.2 | 53.2 | 16 | 20 | 50 | | | | | | | W | 100.2 | 54.2 | GRAY, SANDY CLAY | |
| 95 | 96.2 | 58.2 | 11 | 26 | 32 | | | | | | | Sat. | 97.9 | 56.5 | GRAY, SILTY SAND AND SAND | |
| 90 | 91.2 | 63.2 | 28 | 40 | 40 | | | | | | | Sat. | 92.9 | 61.5 | | |
| 85 | 86.2 | 68.2 | 4 | 7 | 7 | | | | | | | Sat. | | | | |
| 80 | 81.2 | 73.2 | 4 | 6 | 11 | | | | | | | Sat. | 79.7 | 74.7 | Boring Terminated at Elevation 79.7 ft MED. DENSE SILTY SAND | |

NCDOT BORE DOUBLE P4900_GEO_RDWY_SPT BORINGS.GPJ NC_DOT.GDT 1/5/15

SOIL TEST RESULTS

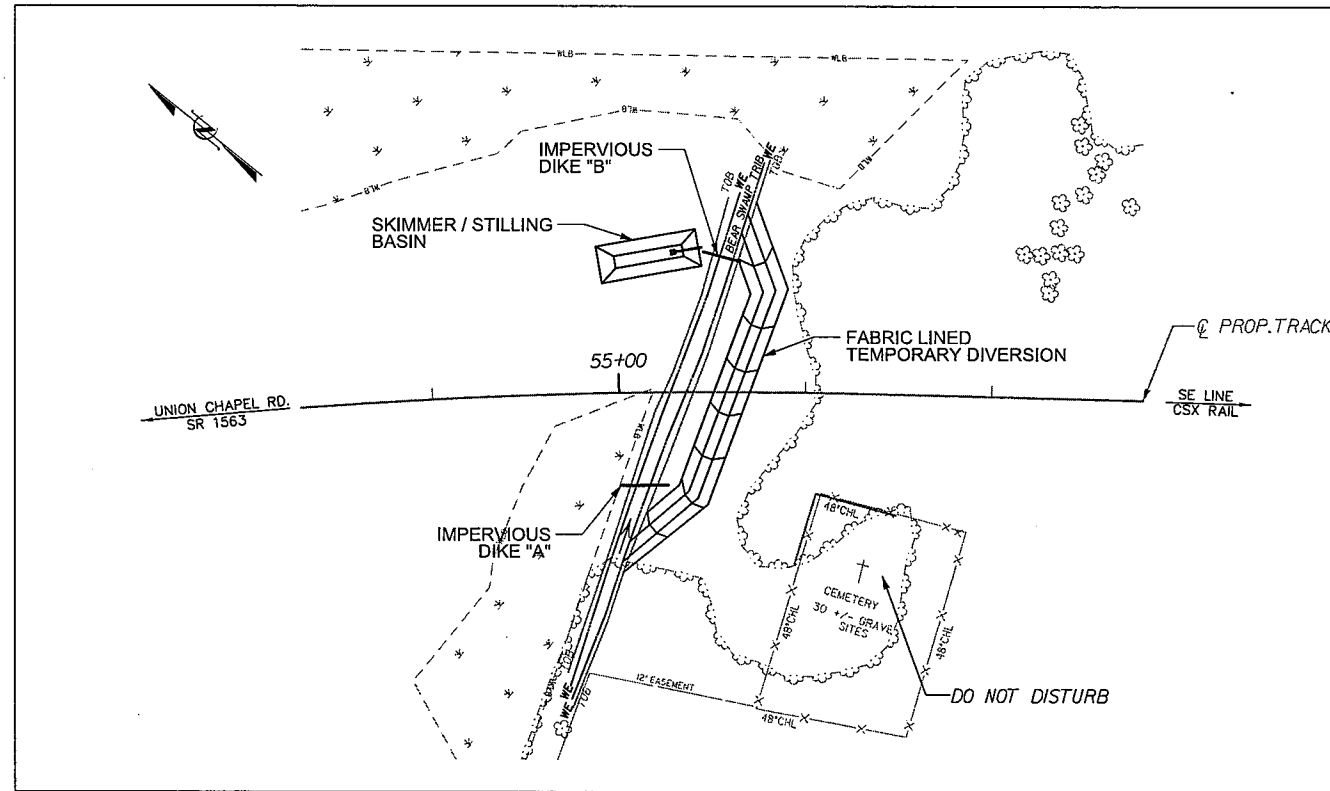
| SAMPLE NO. | OFFSET | STATION | DEPTH INTERVAL | AASHTO CLASS. | L.L. | P.I. | % BY WEIGHT | | | | % PASSING (SIEVES) | | | % MOISTURE | % ORGANIC |
|------------|--------|---------|----------------|---------------|------|------|-------------|--------|------|------|--------------------|-----|-----|------------|-----------|
| | | | | | | | C.SAND | F.SAND | SILT | CLAY | 10 | 40 | 200 | | |
| SS- 162A | 40' LT | 21+50 | 0.0- 1.5 | A- 4(0) | 15 | NP | 23.0 | 39.9 | 19.0 | 18.1 | 100 | 92 | 42 | - | - |
| SS- 163 | 40' LT | 21+50 | 9.2- 10.7 | A- 2- 4(0) | 25 | NP | 4.2 | 73.3 | 14.4 | 8.1 | 100 | 98 | 30 | 39.9 | - |
| SS- 164 | 40' LT | 21+50 | 29.2- 30.7 | A- 4(0) | 17 | 2 | 16.7 | 35.6 | 27.5 | 20.1 | 100 | 90 | 57 | - | - |
| SS- 165 | 40' LT | 21+50 | 39.7- 40.7 | A- 6(9) | 32 | 15 | 0.8 | 30.4 | 26.5 | 42.3 | 100 | 100 | 75 | - | - |
| SS- 159 | 40' LT | 22+50 | 0.5- 1.5 | A- 6(6) | 28 | 15 | 19.3 | 26.2 | 22.3 | 32.2 | 100 | 92 | 59 | - | - |
| SS- 160 | 40' LT | 22+50 | 3.2- 4.7 | A- 6(4) | 26 | 13 | 19.1 | 27.8 | 22.9 | 30.2 | 100 | 91 | 58 | - | - |
| SS- 161 | 40' LT | 22+50 | 13.2- 14.7 | A- 2- 4(0) | 27 | NP | 6.4 | 73.7 | 14.8 | 5.0 | 100 | 96 | 26 | - | - |
| SS- 162 | 40' LT | 22+50 | 38.2- 39.7 | A- 6(10) | 35 | 15 | 1.6 | 33.2 | 26.9 | 38.3 | 100 | 99 | 76 | - | - |

P-4900A (PEMBROKE) CULVERT PHASING BEAR SWAMP TRIBUTARY

HNTB HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

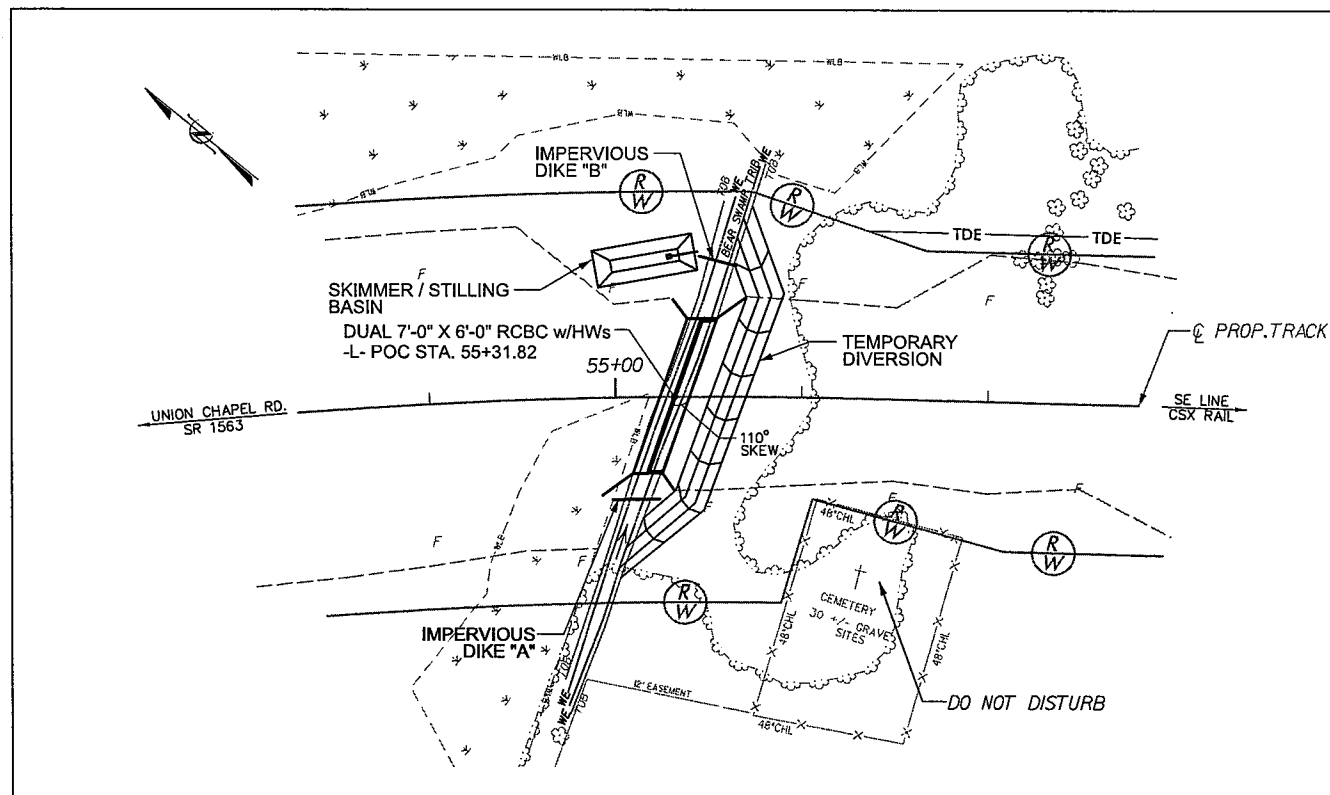
| | |
|--------------------------|---------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| P-4900A | EC-07A |
| RW SHEET NO. | |
| RAILROAD DESIGN ENGINEER | HYDRAULICS ENGINEER |

DATE: January 19, 2015



PHASE I

1. INSTALL IMPERVIOUS DIKES "A" AND "B" AS SHOWN.
2. INSTALL TEMPORARY DIVERSION, WITH 2' BASE AND 2:1 SIDE SLOPES, AS SHOWN AND DIVERT BEAR SWAMP TRIBUTARY AROUND THE CONSTRUCTION AREA. LINE TEMPORARY DIVERSION WITH SOIL STABILIZATION GEOTEXTILE FABRIC.
3. DEWATER CONSTRUCTION AREA INTO SPECIAL SKIMMER / STILLING BASIN.



PHASE II

1. CONSTRUCT REINFORCED CONCRETE BOX CULVERT. LINE DOWNSTREAM CHANNEL BANKS WITH CLASS I RIP RAP AS SHOWN.
2. UPON COMPLETION OF CULVERT, REMOVE TEMPORARY DIVERSION AND DIKES.

REVISIONS

REVISION #1 DATED 7/31/15: NEW SHEET