

REQUEST FOR BIDS

Upper Iowa River Flood Reduction Project

UI-BID-004

Winneshiek County, IA

Due:

2:00 PM

February 15, 2021

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WINNESHIEK COUNTY, IOWA

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PUBLIC NOTICE: ADVERTISEMENT FOR BIDS
Winneshiek County, Iowa

The County of Winneshiek is seeking bids for the following project:

Construction of flood reduction projects in the Upper Iowa River Watershed, UI-BID-004

Project Location:

This project consists of 2 on-road detention structures on 180th Street within the Upper Iowa River Watershed in Winneshiek County.

Project Information:

The project involves the construction of 2 on-road detention structures.

**Plans and Specifications Will be Available January 19 at 2:00 PM at/from the
Offices of:**

Winneshiek Soil and Water Conservation District
2296 Oil Well Rd
Decorah, IA, 52101

Electronic copies of the bid packet are available at Isqft.com and at upperiowariver.org

Questions regarding the bid packet can be sent to Paul Berland at pberland@northeastiowared.org or by phone at 563-864-7112.

Pre-Bid Meeting:

A Pre-Bid Meeting will be held February 3rd @ 10:00 AM at the Winneshiek Soil and Water Conservation District Office, 2296 Oil Well Road, Decorah, IA 52101. Engineer will be in attendance and site visits will occur dependent upon weather conditions.

Time and Place for Filing Sealed Proposals:

Sealed bids will be received from qualified contractors at the Northeast Iowa RC&D office, 101 E. Greene St., PO Box 916 Postville, IA 52162 until **February 15, 2021 at 2:00 PM.**

Time and Place Sealed Proposals Will be Opened and Considered:

Bids will be opened and tabulated at Northeast Iowa RC&D office at 2:00 PM on February 15, 2021 for consideration by the Winneshiek County Board of Supervisors at its meeting on February 22, 2021.

Section 3 Requirements

A. The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

C. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

G. With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

Section 3 Businesses are encouraged to respond to this proposal. A Section 3 business is a business that is:

51% owned by Section 3 residents*

Whose permanent, full-time staff is comprised of at least 30% Section 3 residents*

Has committed 25% of the dollar amount of its subcontracts to Section 3 businesses

*A Section 3 resident is defined as a public housing resident or someone with a household income that is less than 80% of the area median income.

Businesses that believe they meet the Section 3 criteria are encouraged to register as a Section 3 Business through HUD's website:

<https://portalapps.hud.gov/Sec3BusReg/BRegistry/RegisterBusiness>

BID INSTRUCTIONS & AWARD PROCEDURE

Please complete all documents properly. Failure to complete and sign all documents with respect to the requirements listed below may cause your bid not to be read.

BID BOND

- i. The bid security in the amount of five percent (5%) of the total bid price shall be in the form of a cashier's check, a certified check, or a bank money order drawn on a FDIC insured bank in Iowa or drawn on a FDIC insured bank chartered under the laws of the United States; or a certified share draft drawn on a credit union in Iowa or chartered under the laws of the United States; or a bid bond executed by a corporation authorized to contract as a surety in Iowa or satisfactory to the County of Winneshiek, hereinafter called the "Jurisdiction".
- ii. The bid bond must be submitted using the Bid Bond Form. All signatures on the bid bond must be original signatures in ink; facsimile (fax) of any signature on the bid bond is not acceptable.

PROPOSAL SUBMISSION

- i. The proposal shall be submitted in a sealed envelope properly identified as the Proposal with the project title and the name and address of the bidder. Proposals shall be delivered to Northeast Iowa RC&D, 101 E. Greene Street, P.O. Box 916, Postville, IA 52162 at or before 2:00 P.M., local time on February 15, 2021. It is the sole responsibility of the bidder to see that its proposal is delivered prior to the time for opening bids, along with the appropriate bid security sealed in the separate envelope identified as Bid Security or Bid Bond. Proposals received after the bid receipt deadline will be returned to the bidder unopened and will not be considered.
- ii. The following documents shall be completed, signed and returned in the Proposal envelope. The bid cannot be read if these documents are omitted from the Proposal envelope.
 - a. **UI-BID-004 BID FORM:** Signatures must be in original ink
 - b. **UI-BID-004 BID SCHEDULE (consisting of 3 pages):** the Bidder must provide the Unit Price, the Amount, the Division Subtotals and the Grand Total Bid. In case of discrepancy, the Unit Price governs. The quantities shown on the Proposal are approximate only, but are considered sufficiently adequate for the purpose of comparing bids. The Jurisdiction shall only use the Grand Total Bid for comparison of the bids.
 - c. **Intent to Comply with Section 3 Requirements**

SPECIAL NOTE ON BID INSTRUCTIONS

- i. The bidder should be sure to read and understand all required federal provisions, wage rate determinations, bonding requirements, contract requirements, labor standards and bid packet materials prior to submitting a bid.
- ii. The project consists of two (2) separate flood control structures at 2 locations. Bids should reflect the total cost to construct all of the structures. The Jurisdiction will enter into one (1) contract for the construction of both structures and will not sub-divide the projects and offer multiple contracts. The contractor awarded the contract may elect to hire sub-contractors, but will do so at their own desire and will be required to fulfill requirements and provisions related to sub-contracting.

AWARD PROCEDURE

- i. The Jurisdiction reserves the right to reject any bids, and to accept in whole or in part the bid which in the judgment of the bid evaluators is the lowest, most responsive and responsible bid. The Jurisdiction, reserves the right to reject any and all bids, to waive technicalities or irregularities and to enter into such contract as it shall deem to be in the best interests of the County.

UI-BID-004 BID FORM

Submitting Firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Authorized Representative (print): _____

Authorized Representative Signature: _____

Date: _____ Email: _____

Phone: _____

Our/My bid, as shown in the Grand Bid Total from the Bid Schedule submitted is

\$ _____.

The correct summation of actual bid tabulation figures will supersede any amounts shown on this page.

CERTIFICATIONS: By signing this form, the bidder certifies that they have read and understand all bid packet items related to this solicitation, including, but not limited to, contract language, bonding requirements, federal provisions, wage rate determination, labor standards, reporting and records maintenance and construction specifications.

FIRM PRICING. Offered prices shall remain firm for a minimum of 30 days after the due date of this solicitation unless indicated otherwise. Accepted prices shall remain firm for the duration of the contract.

ADDENDA (It is the Bidder's responsibility to check for issuance of any addenda). The authorized representative hereby acknowledges receipt of the following addenda:

Addenda Number _____ Date _____ Addenda Number _____ Date _____

Addenda Number _____ Date _____ Addenda Number _____ Date _____

UI-BID-004 BID SCHEDULEUPPER IOWA RIVER WATERSHED**SITE: UI-022-WESELMANN-HAGEMAN**IOWA

ITEM NO.	WORK OR MATERIAL	SPEC. NO.	QTY	UNIT	UNIT PRICE	AMOUNT
1	SITE CLEARING, PREPARATION, & WASTE DISPOSAL	1&3	1	LS	\$ _____	\$ _____
2	STRUCTURE SEEDING	6	2	AC	\$ _____	\$ _____
3	BUFFER SEEDING	6	7	AC	\$ _____	\$ _____
4	WETLAND SEEDING	6	1	AC	\$ _____	\$ _____
5	MOBILIZATION & DEMOBILIZATION	8	1	LS	\$ _____	\$ _____
6	TRAFFIC CONTROL	8	1	LS	\$ _____	\$ _____
7	EARTHFILL, EMBANKMENT FILL	23	21,880	CY	\$ _____	\$ _____
8	EARTHFILL, WASTE FILL	23	4,590	CY	\$ _____	\$ _____
9	SUBGRADE PREPARATION	23	1,472	SY	\$ _____	\$ _____
10	TOPSOIL, STRIP, SALVAGE, AND RESPREAD	26	5,838	CY	\$ _____	\$ _____
11	CMP PIPE, 24"	51	6	LF	\$ _____	\$ _____
12	CMP PIPE, 36"	51	135	LF	\$ _____	\$ _____
13	48" CMP RISER WITH TRASH RACK	51	1	LS	\$ _____	\$ _____
14	RIP RAP, CLASS 'E' WITH GEOTEXTILE FABRIC	61&95	213	TON	\$ _____	\$ _____
15	GRANULAR SURFACING, 8"	61&95	530	TON	\$ _____	\$ _____
16	FENCING, 5-STRANDS OF BARBED WIRE	92	694	LF	\$ _____	\$ _____
17	INTERCEPTOR DRAIN	620	1,304	LF	\$ _____	\$ _____
18	ROLLED EROSION CONTROL PRODUCT	5	1,255	SY	\$ _____	\$ _____

TOTAL BID-WESELMANN-HAGEMAN \$ _____

UPPER IOWA RIVER WATERSHED

ITEM NO.	WORK OR MATERIAL	SPEC. NO.	QTY	UNIT	UNIT PRICE	AMOUNT
1	SITE CLEARING, PREPARATION, & WASTE DISPOSAL	IA-01	1	LS	\$ _____	\$ _____
2	REMOVE AND DISPOSE 18' WIDE STEEL/WOOD BRIDGE, WING WALLS, AND FOUNDATION	IA-03	1	LS	\$ _____	\$ _____
3	ROLLED EROSION CONTROL PRODUCT, TYPE 2D	IA-05	1,368	SY	\$ _____	\$ _____
4	STRUCTURE & CHANNEL SEEDING	IA-06	2	AC	\$ _____	\$ _____
5	PASTURE SEEDING	IA-06	3	AC	\$ _____	\$ _____
6	MOBILIZATION & DEMOBILIZATION	IA-08	1	LS	\$ _____	\$ _____
7	CORE TRENCH OVEREXCAVATION	IA-21	1,642	CY	\$ _____	\$ _____
8	EARTHFILL, EMBANKMENT AND CORE TRENCH FILL (P)	IA-23	22,863	CY	\$ _____	\$ _____
9	SUBGRADE PREPARATION	IA-23 & SUDAS 2010	2,176	SY	\$ _____	\$ _____
10	TOPSOIL, STRIP, SALVAGE AND RESPREAD	IA-26	4,309	LS	\$ _____	\$ _____
11	24 INCH CMP CULVERT, 16GA ALUMINIZED STEEL	IA-51	180	LF	\$ _____	\$ _____
12	30 INCH CMP CULVERT, 16GA ALUMINIZED STEEL	IA-51	100	LF	\$ _____	\$ _____
13	RIP RAP, CLASS 'E' WITH GEOTEXTILE FABRIC	IA-61 & IA-95	495	TON	\$ _____	\$ _____
14	EROSION STONE DITCH CHECKS	IA-61	16	EACH	\$ _____	\$ _____
15	GRANULAR SURFACING, 8 INCH LAYER	IA-61 & IDOT 4120	783	TON	\$ _____	\$ _____
16	CULVERT BEDDING, 24 INCH LAYER, IDOT GRAD. 4115	IA-61 & IDOT 4115	180	TON	\$ _____	\$ _____
17	FENCING, (5-STRAND BARBED)	IA-92 & IA-03	1,012	LF	\$ _____	\$ _____
18	IOWA DOT STANDARD PRE CAST REINFORCED CONCRETE BOX CULVERT, 6' X 8'	IDOT 2415, IA-620, IA-23, IA-21	132	LF	\$ _____	\$ _____
19	REINFORCED CONCRETE BOX CULVERT STANDARD END SECTIONS	IDOT 2415	2	EACH	\$ _____	\$ _____
20	TRAFFIC CONTROL	IDOT 2528	1	LS	\$ _____	\$ _____
TOTAL BID-ROTHMEYER-NUMEDAHL BID						\$

UI-BID-004 BID SCHEDULE

UPPER IOWA RIVER WATERSHED

SUMMATION OF BIDS : PACKET C

TOTAL BID, WESELMANN-HAGEMAN SITE..... \$ _____

TOTAL BID, ROTHMEYER-NUMEDAHN SITE \$ _____

SUMMATION OF BIDS

UI-BID-004 GRAND TOTAL BID \$ _____

Firm: _____

Signature: _____

BID BOND

KNOW ALL BY THESE PRESENTS:

That we, _____, as Principal, and _____, as Surety, are held and firmly bound unto Winneshie County, Iowa, as Obligee, (hereinafter referred to as "the Jurisdiction"), in the penal sum of five percent (5%) of the total bid price \$_____, lawful money of the United States, for which payment said Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents.

WHEREAS, the Principal is submitting a sealed proposal to the Jurisdiction for the purpose of entering into a contract for the following project;

Upper Iowa River Flood Reduction Project: UI-BID-004

NOW, THEREFORE, if said proposal by the Principal be accepted, and the Principal shall enter into a contract with Jurisdiction in accordance with the terms of such proposal, including the provision of insurance and of a bond as may be specified in the contract documents, with good and sufficient surety for the faithful performance of such contract, for the prompt payment of labor and material furnished in the prosecution thereof, and for the maintenance of said improvements as may be required therein, then this obligation shall become null and void; otherwise, the Principal shall pay to the Jurisdiction the full amount of the bid bond, together with court costs, attorney's fees, and any other expense of recovery.

Signed and sealed this _____ day of _____, 20__.

SURETY:

PRINCIPAL:

Surety Company_____
BidderBy _____
Authorized Surety RepresentativeBy _____
Signature_____
Name (Print/Type)_____
Name (Print/Type)_____
Address, City, State, Zip_____
Address, City, State, Zip

INTENT TO COMPLY WITH SECTION 3 REQUIREMENTS

(To be provided with procurement documents and returned with all submitted bids)

Section 3 of the Housing and Urban Development Act of 1968 [12 U.S.C. 1701u and 24 CFR Part 135] is HUD's legislative directive for providing preference to low-income residents of the local community (regardless of race or gender), and the businesses that substantially employ these persons, for new employment, training and contracting opportunities resulting from HUD-funded projects. The regulations seek to ensure that low- and very low-income persons, and the businesses that employ these individuals, are notified about the expenditure of HUD funds in their community and encouraged to seek opportunities, if created.

A Section 3 resident is defined as a public housing resident or someone with a household income that is less than 80% of the area median income.

A Section 3 business is defined as a business that is:

51% owned by Section 3 residents

Whose permanent, full-time staff is comprised of at least 30% Section 3 residents**

Has committed 25% of the dollar amount of its subcontracts to Section 3 businesses

Note: If your business meets the definition of a Section 3 business, you may register as a Section 3 Business through HUD's website here:

<https://portalapps.hud.gov/Sec3BusReg/BRegistry/RegisterBusiness>

Businesses who self-certify that they meet one of the regulatory definitions of a Section 3 business will be included in a searchable online database. The database can be used by agencies that receive HUD funds, developers, contractors, and others to facilitate the award of covered construction and non-construction contracts to Section 3 businesses.

Please complete the following:

1. If awarded a contract for this CDBG funded project, do you anticipate hiring new employees to complete the project? (Hiring would be specific to this project)

☐ Yes ☐ No If yes, please estimate the number of employees to be hired: _____
2. Is your business a Section 3 Business? ☐ Yes ☐ No
3. Is the bidder willing to consider hiring Section 3 residents for future employment opportunities that are a direct result of this CDBG funded project?

☐ Yes ☐ No
4. Is the bidder willing to consider subcontracting with Section 3 Businesses for this project?

☐ Yes ☐ No

I understand that this contracting opportunity is subject to HUD Section 3 requirements (24 CFR Part 135). I have read and understand the Section 3 requirements as generally described above and presented in the Section 3 contract language included in the procurement documents for this project. If awarded a contract, the business commits to following Section 3 requirements, as they apply to this project. If awarded a contract for this project, the business agrees to provide reports to (insert City/County) on Section 3 efforts and accomplishments.

Name of Contractor/Subcontractor

Address

Print Name

Title

Signature

Date

Superseded General Decision Number: IA20200028

State: Iowa

Construction Types: Heavy and Highway

Counties: Adair, Adams, Allamakee, Appanoose, Audubon, Benton, Black Hawk, Boone, Bremer, Buchanan, Buena Vista, Butler, Calhoun, Carroll, Cass, Cedar, Cerro Gordo, Cherokee, Chickasaw, Clarke, Clay, Clayton, Clinton, Crawford, Dallas, Davis, Decatur, Delaware, Des Moines, Dickinson, Dubuque, Emmet, Fayette, Floyd, Franklin, Fremont, Greene, Grundy, Guthrie, Hamilton, Hancock, Hardin, Harrison, Henry, Howard, Humboldt, Ida, Iowa, Jackson, Jasper, Jefferson, Johnson, Jones, Keokuk, Kossuth, Lee, Linn, Louisa, Lucas, Lyon, Madison, Mahaska, Marion, Marshall, Mills, Mitchell, Monona, Monroe, Montgomery, Muscatine, O'Brien, Osceola, Page, Palo Alto, Plymouth, Pocahontas, Polk, Pottawattamie, Poweshiek, Ringgold, Sac, Shelby, Sioux, Story, Tama, Taylor, Union, Van Buren, Wapello, Warren, Washington, Wayne, Webster, Winnebago, Winneshiek, Woodbury, Worth and Wright Counties in Iowa.

EXCLUDES SCOTT COUNTY

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021

SUIA2020-001 10/18/2017

	Rates	Fringes
Carpenter & Piledrivermen		
ZONE 1.....	\$ 28.52	14.08
ZONE 2.....	\$ 26.73	14.08
ZONE 3.....	\$ 26.73	14.08
ZONE 4.....	\$ 26.25	11.50
ZONE 5**.....	\$ 25.15	9.90
CONCRETE FINISHER		
ZONE 1.....	\$ 28.10	7.40
ZONE 2.....	\$ 28.10	7.40
ZONE 3.....	\$ 28.10	7.40
ZONE 4.....	\$ 25.45	6.40
ZONE 5.....	\$ 24.40	6.40
ELECTRICIAN (STREET AND HIGHWAY LIGHTING AND TRAFFIC SIGNALS)		
ZONE 1, 2, AND 3.....	\$ 25.05	6.80
ZONE 4.....	\$ 23.75	6.80
ZONE 5.....	\$ 21.60	6.80
IRONWORKER (SETTING OF STRUCTURAL STEEL)		
ZONE 1.....	\$ 31.50	10.90
ZONE 2.....	\$ 29.41	10.90
ZONE 3.....	\$ 29.41	11.20
ZONE 4.....	\$ 27.35	9.90
ZONE 5**.....	\$ 25.50	9.45
LABORER		
ZONE 1, 2 AND 3		
GROUP A.....	\$ 23.75	9.68
GROUP AA.....	\$ 26.13	9.68
GROUP B.....	\$ 21.90	9.68
GROUP C.....	\$ 18.82	9.68
ZONE 4		
GROUP A.....	\$ 21.27	9.08
GROUP B.....	\$ 19.95	9.08
GROUP C.....	\$ 17.07	9.08
ZONE 5		
GROUP A.....	\$ 21.77	7.63

GROUP B.....	\$ 19.27	7.63
GROUP C.....	\$ 18.42	7.63

POWER EQUIPMENT OPERATOR

ZONE 1		
GROUP A.....	\$ 32.55	14.90
GROUP B.....	\$ 31.00	14.90
GROUP C.....	\$ 28.50	14.90
GROUP D.....	\$ 28.50	14.90
ZONE 2		
GROUP A.....	\$ 31.85	14.90
GROUP B.....	\$ 30.25	14.90
GROUP C.....	\$ 27.70	14.90
GROUP D.....	\$ 27.70	14.90
ZONE 3		
GROUP A.....	\$ 29.70	24.65
GROUP B.....	\$ 27.90	24.65
GROUP C.....	\$ 26.90	24.65
GROUP D.....	\$ 26.90	24.65
ZONE 4		
GROUP A.....	\$ 31.05	12.50
GROUP B.....	\$ 29.91	12.50
GROUP C.....	\$ 27.83	12.50
GROUP D.....	\$ 27.83	12.50
ZONE 5		
GROUP A.....	\$ 28.02	10.70
GROUP B.....	\$ 26.98	10.70
GROUP C.....	\$ 25.25	10.70
GROUP D.....	\$ 24.25	10.70

TRUCK DRIVER (AND PAVEMENT
MARKING DRIVER/SWITCHPERSON)

ZONE 1.....	\$ 24.45	11.15
ZONE 2		
.....	\$ 24.45	11.15
ZONE 3.....	\$ 24.45	11.15
ZONE 4.....	\$ 24.45	6.95
ZONE 5		
.....	\$ 22.50	6.95

ZONE DEFINITIONS

- ZONE 1 The Counties of Polk, Warren, and Dallas for all Crafts, and Linn County Carpenters only.
- ZONE 2 The Counties of Dubuque for all Crafts and Linn County for all Crafts except Carpenters.
- ZONE 3 The Cities of Burlington, Clinton, Fort Madison, Keokuk, and Muscatine (and abutting municipalities of any such cities).
- ZONE 4 Story, Black Hawk, Cedar, Jasper, Jones, Jackson, Louisa, Madison, and Marion Counties; Clinton County (except the City of Clinton), Johnson County, Muscatine County (except the City of Muscatine), the City of Council Bluffs, Lee County and Des Moines County.
- ZONE 5 All areas of the state not listed above.

LABORER CLASSIFICATIONS - ALL ZONES

- GROUP AA - {Skilled pipelayer (sewer, water and conduits) and tunnel laborers; asbestos abatement worker} (Zones 1, 2 and 3).
- GROUP A - Carpenter tender on bridges and box culverts; curb machine (without a seat); deck hand; diamond & core drills; drill operator on air tracs, wagon drills and similar drills; form setter/stringman on paving work; gunnite nozzleman; joint sealer kettleman; laser operator; powderman tender; powderman/blaster; saw operator; {pipelayer (sewer, water, and conduits); sign erector*; tunnel laborer; asbestos abatement worker (Zones 4 and 5)}, sign erector.
- GROUP B - Air, gas, electric tool operator; barco hammer; carpenter tender; caulker; chain sawman; compressor (under 400 cfm); concrete finisher tender; concrete processing materials and monitors; cutting torch on demolition; drill tender; dumpmen; electric drills; fence erectors; form line expansion joint assembler; form tamper; general laborer; grade checker; handling and placing metal mesh, dowel bars, reinforcing bars and chairs; hot asphalt laborer; installing temporary traffic control devices; jackhammerman; mechanical grouter; painter (all except stripers); paving breaker; planting trees, shrubs and flowers; power broom (not self-propelled); power buggyman; rakers; rodman (tying reinforcing steel); sandblaster; seeding and mulching; sewer utility topman/bottom man; spaders; stressor or stretcherman on pre or post tensioned concrete; stringman on re/surfacing/no grade control; swinging stage, tagline, or block and tackle; tampers; timberman; tool room men and checkers; tree climber; tree groundman; underpinning and shoring caissons over twelve feet deep; vibrators; walk behind trencher; walk behind paint stripers; walk behind vibrating compactor; water pumps (under three inch); work from bosun chair.
- GROUP C - Scale weigh person; traffic control/flagger, surveillance or monitor; water carrier.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS - ALL ZONES

- GROUP A - All terrain (off road) forklift; asphalt breakdown roller (vibratory); asphalt laydown machine; asphalt plant; asphalt screed; bulldozer (finish); central mix plant; concrete pump; crane; crawler tractor pulling scraper; directional drill (60,000 (lbs) pullback and above); dragline and power shovel; dredge engineer; excavator (over ♦ cu. yd.); front end loader (4 cy and over); horizontal boring machine; master mechanic; milling machine (over 350

hp); motor grader (finish); push cat; rubber tired backhoe (over ♦ cu. yd.); scraper (12 cu. yd. and over or finish); Self-propelled rotary mixer/road reclaimer; sidebroom tractor; slipform portland concrete paver; tow or push boat; trenching machine (Cleveland 80 or similar)

•

GROUP B - Articulated off road hauler, asphalt heater/planer; asphalt material transfer vehicle; asphalt roller; belt loader or similar loader; bulldozer (rough); churn or rotary drill; concrete curb machine; crawler tractor pulling ripper, disk or roller; deck hand/oiler; directional drill (less than 60,000 (lbs) pullback); distributor; excavator (1/2 cu. yd. and under); form riding concrete paver; front end loader (2 to less than 4 cu. yd.); group equipment greaser; mechanic; milling machine (350 hp. and less); paving breaker; portland concrete dry batch plant; rubber tired backhoe (1/2 cu. yd. and under); scraper (under 12 cu. yd.); screening, washing and crushing plant (mobile, portable or stationary); shoulder machine; skid loader (1 cu. yd. and over); subgrader or trimmer; trenching machine; water wagon on compaction.

GROUP C - Boom & winch truck; concrete spreader/belt placer; deep wells for dewatering; farm type tractor (over 75 hp.) pulling disc or roller; forklift; front end loader (under 2 cu. yd.); motor grader (rough); pile hammer power unit; pump (greater than three inch diameter); pumps on well points; safety boat; self-propelled roller (other than asphalt); self-propelled sand blaster or shot blaster, water blaster or striping grinder/remover; skid loader (under 1 cu. yd.); truck mounted post driver.

GROUP D - Boiler; compressor; cure and texture machine; dow box; farm type or utility tractor (under 75 hp.) pulling disk, roller or other attachments; group greaser tender; light plants; mechanic tender; mechanical broom; mechanical heaters; oiler; pumps (under three inch diameter); tree chipping machine; truck crane driver/oiler.

** CARPENTERS AND PILEDRIVERMEN, or IRONWORKERS (ZONE 5)
Setting of structural steel; any welding incidental to bridge or culvert construction; setting concrete beams.

* ADDED CRAFT - SIGN ERECTOR

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate

changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION
"

PERFORMANCE AND PAYMENT BOND

KNOW ALL BY THESE PRESENTS:

That we, _____ as Principal (hereinafter the "Contractor" or "Principal" and _____, as Surety are held and firmly bound unto the County of Winneshiek, Iowa (hereinafter referred to as "the Jurisdiction") and to all persons who may be injured by any breach of any of the conditions of this Bond in the penal sum of _____ Dollars(\$ _____) lawful money of the United States, for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, legal representatives and assigns, jointly or severally, firmly by these presents.

The conditions of the above obligations are such that whereas said Contractor entered into a contract with the Jurisdiction, bearing date the day of __, 202__, (hereinafter the "Contract") wherein said Contractor undertakes and agrees to construct the following described improvements: Upper Iowa River Flood Reduction Project – Bid Packet 004, UI-BID-004 unless modified herein, and to faithfully perform all the terms and requirements of said Contract within the time therein specified, in a good and workmanlike manner, and in accordance with the Contract Documents.

It is expressly understood and agreed by the Contractor and Surety in this bond that the following provisions are a part of this Bond and are binding upon said Contractor and Surety, to-wit:

1. PERFORMANCE: The Contractor shall well and faithfully observe, perform, fulfill and abide by each and every covenant, condition and part of said Contract and Contract Documents, by reference made a part hereof, for the above referenced improvements, and shall indemnify and save harmless the Jurisdiction from all outlay and expense incurred by the Jurisdiction by reason of the Contractor's default of failure to perform as required. The Contractor shall also be responsible for the default or failure to perform as required under the Contract and Contract Documents by all its subcontractors, suppliers, agents, or employees furnishing materials or providing labor in the performance of the Contract.

2. PAYMENT: The Contractor and the Surety on this Bond are hereby agreed to pay all just claims submitted by persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the performance of the Contract on account of which this Bond is given, including but not limited to claims for all amounts due for labor, materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used by the Contractor or any subcontractor, wherein the same are not satisfied out of the portion of the contract price which the Jurisdiction is required to retain until completion of the improvement, but the Contractor and Surety shall not be liable to said persons, firms, or corporations unless the claims of said claimants against said portion of the contract price shall have been established as provided by law. The Contractor and Surety hereby bind themselves to the obligations and conditions set forth in Chapter 573, Code of Iowa, which by this reference is made a part hereof as though fully set out herein.

3. GENERAL: Every Surety on this Bond shall be deemed and held bound, any contract to the contrary notwithstanding, to the following provisions:

A. To consent without notice to any extension of time to the Contractor in which to perform the Contract;

B. To consent without notice to any change in the Contract or Contract Documents, which thereby increases the total contract price and the penal sum of this bond, provided that all such changes do not, in the aggregate, involve an increase of more than twenty percent of the total contract price, and that this bond shall then be released as to such excess increase; and

C. To consent without notice that this Bond shall remain in full force and effect until the Contract is completed, whether completed within the specified contract period, within an extension thereof, or within a period of time after the contract period has elapsed and the liquidated damage penalty is being charged against the Contractor.

The Contractor and every Surety on the bond shall be deemed and held bound, any contract to the contrary notwithstanding, to the following provisions:

D. That no provision of this Bond or of any other contract shall be valid which limits to less than five years after the acceptance of the work under the Contract the right to sue on this Bond.

E. That as used herein, the phrase "all outlay and expense" is not to be limited in any way, but shall include the actual and reasonable costs and expenses incurred by the Jurisdiction including interest, benefits and overhead where applicable. Accordingly, "all outlay and expense" would include but not be limited to all contract or employee expense, all equipment usage or rental, materials, testing, outside experts, attorney's fees (including overhead expenses of the Jurisdiction's staff attorneys), and all costs and expenses of litigation as they are incurred by the Jurisdiction. It is intended the Contractor and Surety will defend and indemnify the Jurisdiction on all claims made against the Jurisdiction on account of Contractor's failure to perform as required in the Contract and Contract Documents, that all agreements and promises set forth in the Contract and Contract Documents, in approved change orders, and in this Bond will be fulfilled, and that the Jurisdiction will be fully indemnified so that it will be put into the position it would have been in had the Contract been performed in the first instance as required. In the event the Jurisdiction incurs any "outlay and expense" in defending itself with respect to any claim as to which the Contractor or Surety should have provided the defense, or in the enforcement of the promises given by the Contractor in the Contract, Contract Documents, or approved change orders, or in the enforcement of the promises given by the Contractor and Surety in this Bond, the Contractor and Surety agree that they will make the Jurisdiction whole for all such outlay and expense, provided that the Surety's obligation under this bond shall not exceed 125% of the penal sum of this bond.

In the event that any actions or proceedings are initiated with respect to this Bond, the parties agree that the venue thereof shall be Howard County, State of Iowa. If legal action is required by the Jurisdiction to enforce the provisions of this Bond or to collect the monetary obligation incurring to the benefit of the Jurisdiction, the Contractor and the Surety agree, jointly and

severally, to pay the Jurisdiction all outlay and expense incurred therefore by the Jurisdiction. All rights, powers, and remedies of the Jurisdiction hereunder shall be cumulative and not alternative and shall be in addition to Surety for any amount guaranteed hereunder whether action is brought against the Contractor or whether Contractor is joined in any such action or actions or not.

NOW THEREFORE, the condition of this obligation is such that if said Principal shall faithfully perform all the promises of the Principal, as set forth and provided in the Contract, in the Contract Documents, and in this Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

When a word, term, or phrase is used in this Bond, it shall be interpreted or construed first as defined in this Bond, the Contract, or the Contract Documents; second, if not defined in the Bond, Contract, or Contract Documents, it shall be interpreted or construed as defined in applicable provisions of the Iowa Code; third, if not defined in the Iowa Code, it shall be interpreted or construed according to its generally accepted meaning in the construction industry; and fourth, if it has no generally accepted meaning in the construction industry, it shall be interpreted or construed according to its common or customary usage.

Failure to specify or particularize shall not exclude terms or provisions not mentioned and shall not limit liability hereunder. The Contract and Contract Documents are hereby made a part of this Bond.

Witness our hands this day of _____, 2021.

SURETY:

PRINCIPAL:

Surety Company

Bidder

By _____
Authorized Surety Attorney in Fact Officer

By _____
Signature

Name (Print/Type)

Name (Print/Type)

Address, City, State, Zip

Address, City, State, Zip

NOTE: All signatures on this performance and payment bond must be original signatures in ink; copies or facsimile of any signature will not be accepted. This bond must be sealed with the Surety's raised, embossing seal. The Certificate or Power of Attorney accompanying this bond must be valid on its face and sealed with the Surety's raised, embossing seal.

CONTRACT AGREEMENT

THIS AGREEMENT made and entered into this ___ day of 2021, by and between the County of Winneshiek, Iowa (hereinafter referred to as the **COUNTY**) and _____. (hereinafter referred to as the **CONTRACTOR**) WITNESSES THAT:

WHEREAS, the COUNTY and the CONTRACTOR are desirous of entering into a contract to formalize their relationship, and

WHEREAS, pursuant to Title I of the Housing and Community Development Act of 1974, as amended, the Iowa Economic Development Authority (IEDA) is authorized by the federal Department of Housing and Urban Development (HUD) to provide State Community Development Block Grant Program funds (hereinafter referred to as CDBG funds) to units of local government selected to undertake and carry out certain programs and projects in compliance with all applicable local, state, and federal laws, regulations and policies, and

WHEREAS, IEDA submitted an application for funds from HUD under the Disaster Relief Appropriations Act, 2013, Public Law 113-2, for the Community Development Block Grant National Disaster Resilience (CDBG-NDR) competition on behalf of the Recipient and the Recipient agreed to abide by the application terms and conditions; and

WHEREAS, IEDA received funds under the Disaster Relief Appropriations Act, 2013. (Public Law 113-2) under the CDBG-NDR program; and

WHEREAS, Winneshiek County has been awarded a contract (13-NDRI-009) through IEDA for a grant of federal funds from HUD under the Disaster Relief Appropriations Act, 2013, Public Law 113-2; and

WHEREAS, CONTRACTOR submitted a bid for construction and has been selected to provide construction services for the project(s) identified in the bid packet,

WHEREAS, the Scope of Work included in this contract is authorized as part of the COUNTY's approved CDBG project, and

WHEREAS, it would be beneficial to the COUNTY to utilize the CONTRACTOR as an independent entity to accomplish the Scope of Work as set forth herein and such endeavor would tend to best accomplish the objectives of the local CDBG project;

WITNESSETH: That for and in consideration of the mutual covenants herein contained, the parties hereto agree with each other as follows:

CONTRACT AMOUNT: As outlined in the CONTRACTOR'S bid submitted _____ (herein as Attachment), the cost of services shall not exceed \$ _____.

I. GENERAL CONDITIONS

1. Time of Performance:

Time is of the essence in this project. The COUNTY is obligated to issue a written Proceed Order within ten (10) days from the acceptance of the CONTRACTOR'S Proposal. If the Proceed Order is not received by the CONTRACTOR, the CONTRACTOR has the option of withdrawing his or her Quote and Proposal.

The CONTRACTOR shall commence work in a timely manner upon issuance of the Proceed Order and only after a pre-construction meeting where the engineer and labor standards officer are present.

The CONTRACTOR shall achieve substantial completion by November 30, 2021.

Prior to, or at Contract execution, CONTRACTOR must provide: a) performance bond on the part of the CONTRACTOR for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the CONTRACTOR'S obligations under such contract; and b) payment bond on the part of the CONTRACTOR for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract

2. Contract:

The Contract consists of the:

- a. COUNTY'S Request for Bids (Attachment A)
- b. Written bid response submitted by CONTRACTOR (Attachment B)
- c. CONTRACTOR'S Payment and Performance Bond in the amount of \$_____
- d. County Board of Supervisor Approval of the Contract
- e. Notice to Proceed

3. Services:

The CONTRACTOR shall provide the work as outlined in the COUNTY's Request for Bids as outlined in the CONTRACTOR'S proposal.

4. Payment:

Payment under this Contract shall be progress payments and shall be made based on the work completed and invoiced. Payments will generally be made within 45 days of receipt of the invoice upon approval by the COUNTY Board of Supervisors. Invoices shall be directed to the Project Administrator:

Paul Berland
Northeast Iowa RC&D
101 E. GREENE ST., P.O. Box 916 Postville, IA 52162

5. Access and Maintenance of Records:

The contractor must maintain all required records for five years after final payments are made and all other pending matters are closed.

At any time during normal business hours and as frequently as is deemed necessary, the contractor shall make available to the Iowa Economic Development Authority, the State Auditor, the General Accounting Office, and the Department of Housing and Urban Development, for their examination, all of its records pertaining to all matters covered by this contract and permit these agencies to audit, examine, make excerpts or transcripts from such records, contract, invoices, payrolls, personnel records, conditions of employment, and all other matters covered by this contract..

6. Relationship:

The relationship of the CONTRACTOR to the COUNTY shall be that of an independent CONTRACTOR rendering professional services. The CONTRACTOR shall have no authority to

execute contracts or to make commitments on behalf of the COUNTY and nothing contained herein shall be deemed to create the relationship of employer and employee or principal and agent between the COUNTY and the CONTRACTOR.

7. Suspension, Termination, and Close Out:

If the CONTRACTOR fails to comply with the terms and conditions of this contract, the COUNTY may pursue such remedies as are legally available, including but not limited to, the suspension or termination of this contract in the manner specified herein:

- a. Suspension - If the CONTRACTOR fails to comply with the terms and conditions of this contract, or whenever the CONTRACTOR is unable to substantiate full compliance with provisions of this contract, the COUNTY may suspend the contract pending corrective actions or investigation, effective not less than seven (7) days following written notification to the CONTRACTOR or its authorized representative. The suspension will remain in full force and effect until the CONTRACTOR has taken corrective action to the satisfaction of the COUNTY and is able to substantiate its full compliance with the terms and conditions of this contract. No obligations incurred by the CONTRACTOR or its authorized representative during the period of suspension will be allowable under the contract except:
 - (1) Reasonable, proper and otherwise allowable costs which the CONTRACTOR could not avoid during the period of suspension;
 - (2) If upon investigation, the CONTRACTOR is able to substantiate complete compliance with the terms and conditions of this contract, otherwise allowable costs incurred during the period of suspension will be allowed; and
 - (3) In the event all or any portion of the work prepared or partially prepared by the CONTRACTOR is suspended, abandoned or otherwise terminated, the COUNTY shall pay the CONTRACTOR for work performed to the satisfaction of the COUNTY, in accordance with the percentage of the work completed.
- b. Termination for Cause – If the CONTRACTOR fails to comply with the terms and conditions of this contract and any of the following conditions exists:
 - (1) The lack of compliance with the provisions of this contract were of such scope and nature that the COUNTY deems continuation of the contract to be substantially detrimental to the interests of the COUNTY;
 - (2) The CONTRACTOR has failed to take satisfactory action as directed by the COUNTY or its authorized representative within the time period specified by same;
 - (3) The CONTRACTOR has failed within the time specified by the COUNTY or its authorized representative to satisfactorily substantiate its compliance with the terms and conditions of this contract; then,

The COUNTY may terminate this contract in whole or in part, and thereupon shall notify the CONTRACTOR of termination, the reasons therefore, and the effective date, provided such effective date shall not be prior to notification of the CONTRACTOR. Notification will be by certified letter and may be in effect immediately. After this effective date, no charges incurred under any terminated portions of the Scope of Work are allowable.

- c. Termination for Other Grounds – This contract may also be terminated in whole or in part:

- (1) By the COUNTY, with the consent of the CONTRACTOR, or by the CONTRACTOR with the consent of the COUNTY conditions of termination, including effective date and in case of termination in part, that portion to be terminated;
- (2) The COUNTY may terminate this contract at any time giving at least ten (10) days notice in writing to the CONTRACTOR. If the contract is terminated for convenience of the COUNTY as provided herein, the CONTRACTOR will be paid for time provided and expenses incurred up to the termination date.

8. Changes, Amendments, Modifications:

The COUNTY may, from time to time, require changes or modifications in the Scope of Work to be performed. Such changes, including any decrease or increase in the amount of compensation, which are mutually agreed upon by the COUNTY and the CONTRACTOR shall be incorporated in written amendments to this contract.

9. Personnel:

The CONTRACTOR represents that he/she has, or will secure at his/her own expense, all personnel and/or sub-contractors required in order to perform under this contract. Such personnel or sub-contractors shall not be employees of, or have any contractual relationship to, the COUNTY.

All services required hereunder will be performed by the CONTRACTOR, or under his/her supervision and all personnel, whether employee or sub-contractor, engaged in the work shall be fully qualified and shall be authorized or permitted under federal, state and local law to perform such services.

10. Assignability:

The CONTRACTOR shall not assign any interest on this contract, and shall not transfer any interest on this contract (whether by assignment or notation), without prior written consent of the COUNTY thereto; provided, however, that claims for money by the CONTRACTOR from the COUNTY under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Written notice of any such assignment or transfer shall be furnished promptly to the COUNTY by the CONTRACTOR.

11. Reports and Information:

The CONTRACTOR, at such times and in such forms as the COUNTY may require, shall furnish the COUNTY such periodic reports as it may request pertaining to the work or services undertaken pursuant to this contract, the costs and obligations incurred or to be incurred in connection therewith, and any other matters covered by this contract.

12. Copyright:

No report, maps or other documents produced in whole or in part under this contract shall be subject of an application for copyright by or on behalf of the CONTRACTOR.

13. Compliance with Local Laws:

The CONTRACTOR shall comply with all applicable laws, ordinances and codes of the state and local government and the CONTRACTOR shall save the COUNTY harmless with respect to any damages arising from any tort done in performing any of the work embraced by this contract.

II. CIVIL RIGHTS:

1. CONTRACTOR agrees to comply with the following laws and regulations:

a. Title VI of the Civil Rights Act of 1964 (P.L. 88-352)

States that no person may be excluded from participation in, denied the benefits of, or subjected to discrimination under any program or activity receiving Federal financial assistance on the basis of race, color, or national origin.

b. Title VIII of the Civil Rights Act of 1968 (Fair Housing Act), as amended

c. Iowa Civil Rights Act of 1965 (Iowa Code Chapter 216 and Iowa Code Chapter 19B.7)

This Act mirrors the Federal Civil Rights Act.

d. Section 109 of Title I of the Housing and Community Development Act of 1974, as amended (42 U.S.C. 5309)

Provides that no person shall be excluded from participation in, denied the benefits of, or subjected to discrimination on the basis of race, color, national origin, sex, age, or handicap under any program or activity funded in part or in whole under Title I of the Act.

e. The Age Discrimination Act of 1975, as amended (42 U.S.C. 1601 et seq.)

Provides that no person on the basis of age, be excluded from participation in, be denied the benefits of or be subjected to discrimination under any program or activity receiving Federal financial assistance.

f. Section 504 of the Rehabilitation Act of 1973, as amended (P.L. 93-112, 29 U.S.C. 794)

Provides that no otherwise qualified individual shall solely by reason of his/her handicap be excluded from participation in, be denied the benefits of, or be discriminated against under any program or activity receiving Federal financial assistance.

g. Americans with Disabilities Act (P.L. 101-336, 42 U.S.C. 12101-12213)

Provides comprehensive civil rights to individuals with disabilities in the areas of employment, public accommodations, state and local government services, and telecommunications.

h. Section 3 of the Housing and Urban Development Act of 1968, as amended (12 U.S.C. 1701u)

The purpose of section 3 of the Housing and Urban Development Act of 1968 (12 U.S.C. 1701u) (section 3) is to ensure that employment and other economic opportunities generated by certain HUD financial assistance shall, to the greatest extent feasible, and consistent with existing Federal, State and local laws and regulations, be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing, and to business concerns which provide economic opportunities to low- and very low-income persons.

i. Federal Executive Order 11063, as amended by Executive Order 12259.

III. Federal Executive Order 11246, as amended, by Federal Executive Order 11357

Provides that no one be discriminated in employment.

During the performance of this contract, CONTRACTOR agrees as follows:

a. CONTRACTOR will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. CONTRACTOR will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training,

including apprenticeship. CONTRACTOR agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

- b. CONTRACTOR will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- c. CONTRACTOR will send to each labor union or representative of workers with which they has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of CONTRACTOR's commitments under Section 202 of the Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- d. CONTRACTOR will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- e. CONTRACTOR will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- f. In the event of CONTRACTOR's non-compliance with the nondiscrimination clause of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and CONTRACTOR may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- g. CONTRACTOR will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. CONTRACTOR will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance. **Provided, however,** that in the event CONTRACTOR becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency; CONTRACTOR may request the United States to enter into such litigation to protect the interests of the United States.

IV. HOUSING AND URBAN DEVELOPMENT ACT OF 1968 (Section 3)

1. The work to be performed under this contract is on a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701 u. Section 3 requires that to the greatest extent feasible, opportunities for training and employment be given lower income residents of the project area and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the area of the project.
 - a. The parties to this contract will comply with the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary of Housing and Urban Development set forth in 24 CFR Section 3, and all applicable rules and orders of the Department issued there under prior to the execution of this contract. The parties to this contract certify and agree that they are under no contractual or other disability that would prevent them from complying with these requirements.

- b. CONTRACTOR will send to each labor organization or representative of workers with which they has a collective bargaining agreement or other contract or understanding if any, a notice advising said labor organization or workers' representative of their commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.
- c. CONTRACTOR will include this Section 3 clause in every subcontract; for work in connection with the project and will, at the direction of the applicant for or recipient of Federal financial assistance, take appropriate action pursuant to the Subcontract upon finding that the subcontractor is in violation of regulations issued by the Secretary of Housing and Urban Development, 24 CFR Section 3. CONTRACTOR will not subcontract with any subcontractor where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR Section 3 and will not let any subcontract unless the subcontractor has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.
- d. Compliance with the provisions of Section 3, the regulations set forth in 24 CFR Section 3, and all applicable rules and orders of the Department issued there under prior to the execution of the contract, shall be a condition of the Federal financial assistance provided to the project, binding upon the applicant or recipient for such assistance, its successors, and assigns. Failure to fulfill these requirements shall subject the applicant or recipient, its contractors and subcontractors, its successors, and assigns to those sanctions specified by the grant or loan agreement or contract through which Federal assistance is provide, and to such sanctions as are specified by 24 CFR Section 135.135.
- e. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.
- f. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
- g. With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

V. CERTIFICATION REGARDING GOVERNMENT-WIDE RESTRICTION ON LOBBYING:

- 1. CONTRACTOR certifies, to the best of their knowledge and belief that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the CONTRACTOR, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee, or an employee of a Member of Congress in connection with this Federal contract, grant, loan or cooperative agreement, CONTRACTOR shall complete and submit

Standard Form-LLL, "Disclosure Form to Report Federal Lobbying" in accordance with its instruction.

- c. CONTRACTOR shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure."

V. CLEAN AIR AND WATER ACTS COMPLIANCE: (APPLIES TO CONTRACTS ABOVE \$100,000)

In addition to the preceding provisions, contracts in excess of \$100,000 shall require compliance with the following laws and regulations:

Section 306 of the Clean Air Acts (42 U.S.C. 1857(h)).

Section 508 of the Clean Water Act (33 U.S.C. 1368).

Executive Order 11738. *Providing administration of the Clean Air and Water Acts*

Clean Air and Water Acts - required clauses:

This clause is required in all third-party contracts involving projects subject to the Clean Air Act (42 U.S.C. 1857 et seq.), the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), and the regulations of the Environmental Protection Agency with respect to 40 CFR Part 15, as amended. It should also be mentioned in the bid document.

During the performance of this contract, the CONTRACTOR agrees as follows:

1. CONTRACTOR will certify that any facility to be utilized in the performance of any nonexempt contract or subcontract is not listed on the Excluded Party Listing System pursuant to 40 CFR 32.
2. CONTRACTOR agrees to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 U.S.C. 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.
3. CONTRACTOR agrees that as a condition for the award of the contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, Environmental Protection Agency, indicating that a facility utilized or to be utilized for the contract is under consideration to be listed on the Excluded Party Listing System.
4. CONTRACTOR agrees that it will include or cause to be included the criteria and requirements in Paragraph (1) through (4) of this section in every nonexempt subcontract and require every subcontractor to take such action as the Government may direct as a means of enforcing such provisions.

VI. STANDARDS AND POLICIES RELATING TO ENERGY EFFICIENCY

Pub. L. 94-163, 89 Stat. 871

Mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

VII. NOTICE OF AWARING AGENCY REQUIREMENTS AND REGULATIONS PERTAINING TO REPORTING

The Contractor must provide information as necessary and as requested by the Iowa Economic Development Authority for the purpose of fulfilling all reporting requirements related to the CDBG program.

VIII. COMPREHENSIVE PROCUREMENT GUIDELINE: RECOVERED MATERIALS

The CONTRACTOR agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247.

IX. FEDERAL LABOR STANDARDS PROVISIONS

U.S. Department of Housing And Urban Development Office of Labor Relations

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A.1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii)(a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section I(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section I(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of... influencing in any way the action of such Administration... makes, utters or publishes any statement knowing the same to be false... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds \$100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds \$100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions

X: IN WITNESS WHEREOF, the COUNTY and the CONTRACTOR have executed this contract agreement as of the date and year last written below.

COUNTY OF WINNESHIEK

CONTRACTOR

By: _____

By: _____

Title: _____

Title: _____

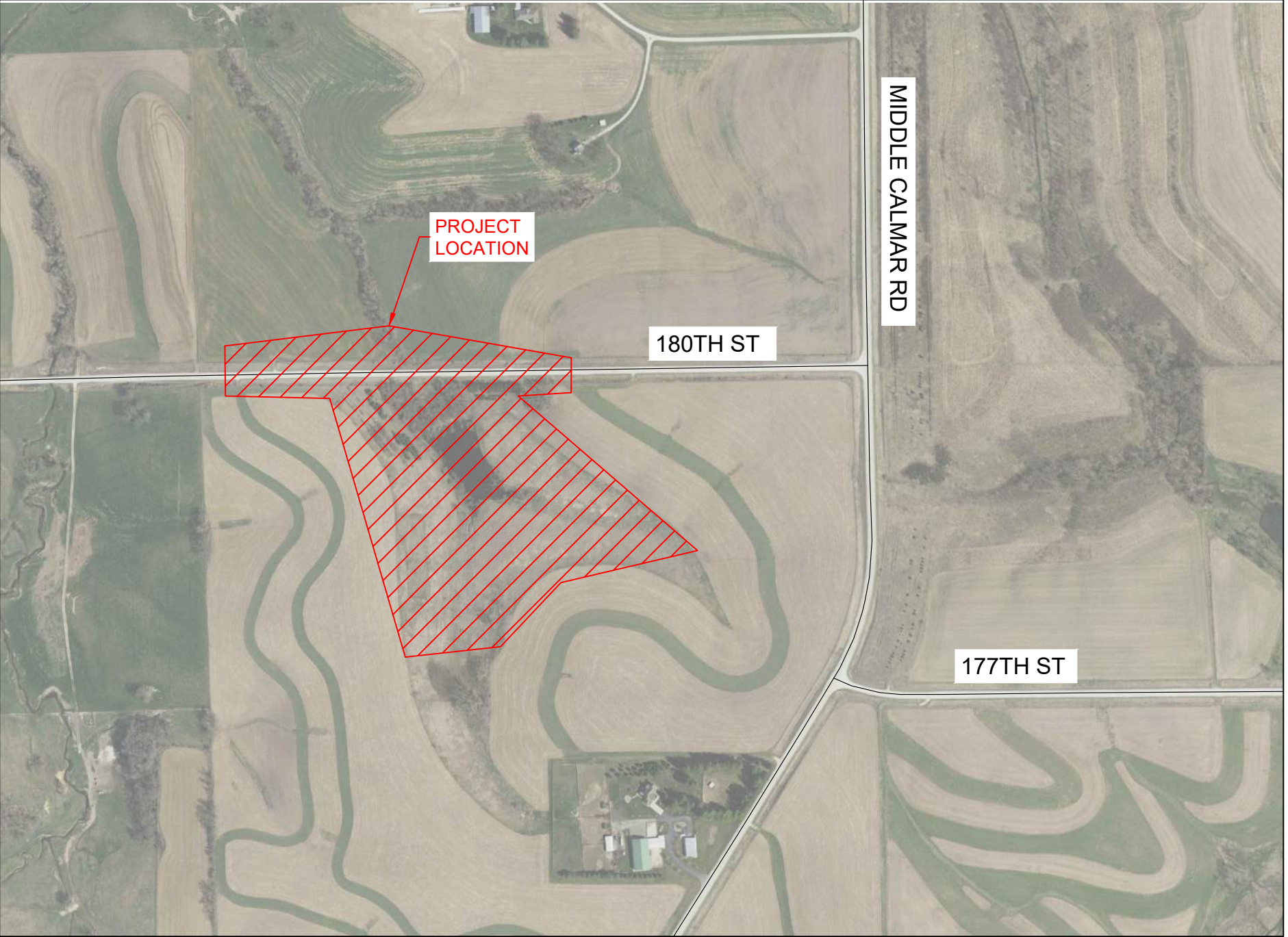
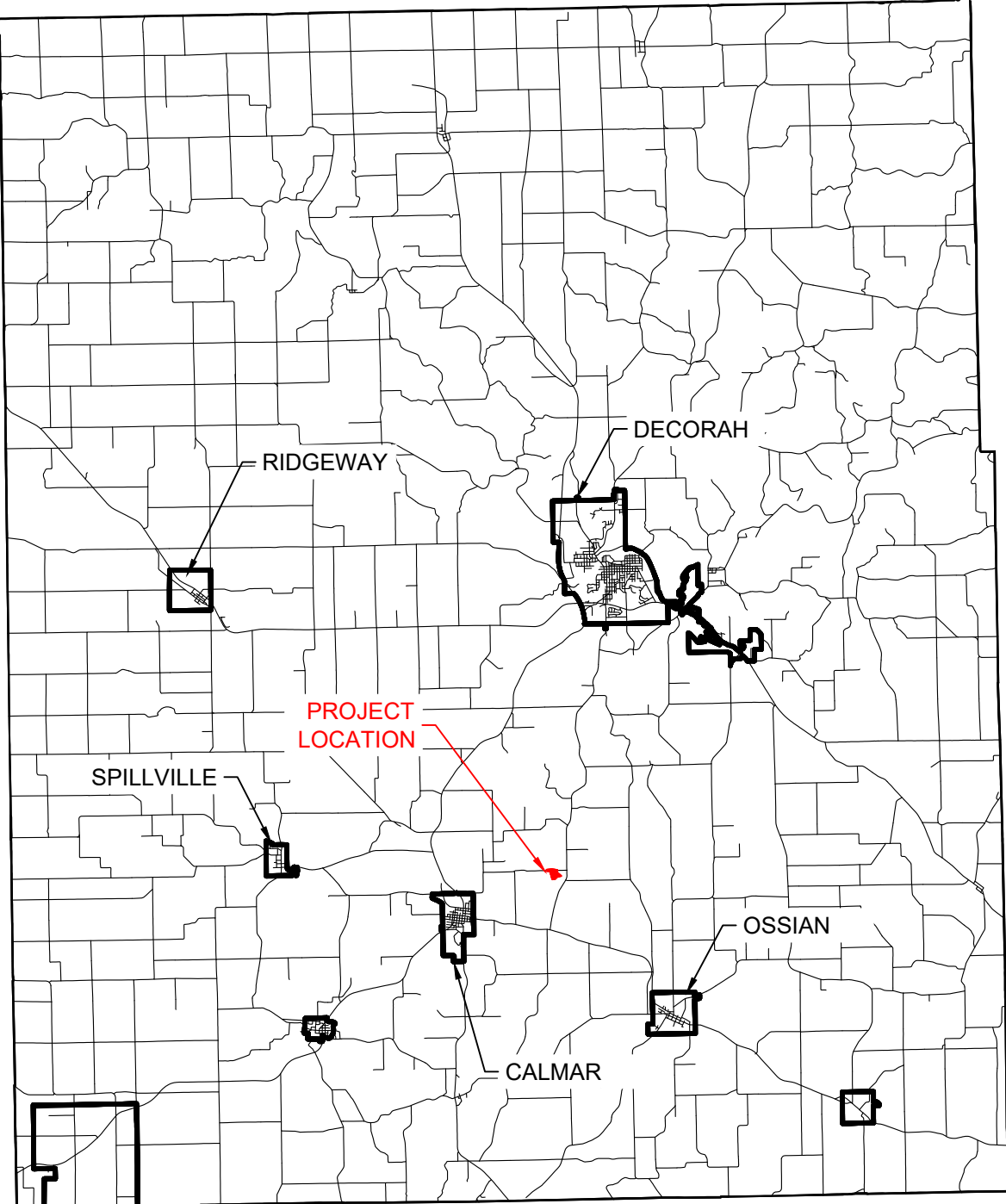
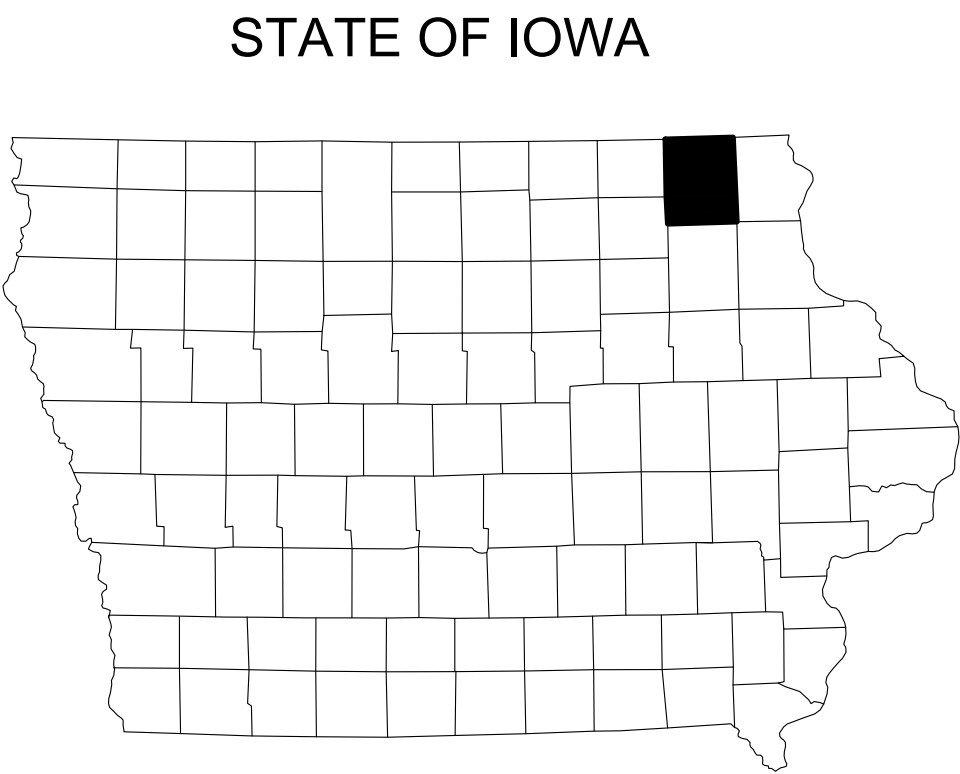
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Date: _____

UPPER IOWA RIVER WMA

UI - 022 - WESELMANN-HAGEMAN

WINNESHIEK COUNTY, IA



CONTACT INFORMATION:

ENGINEER SHIVE-HATTERY, INC ATTN: LUKE MONAT 4125 WESTOWN PARKWAY, SUITE 100 WEST DES MOINES, IOWA 50266 PH: (515) 223-8104 FX: (515) 223-0622	LANDOWNER BOB & TERRI WESELMANN 5125 EBERT CT NORTHFIELD, MN 55057 PHONE: (641) 381-0517
WATERSHED COORDINATOR MATT FRANA 2296 OIL WELL ROAD DECORAH IOWA, 52101 PH: (563) 382-4352	LANDOWNER FRANK AND JUDY HAGEMAN 1825 MIDDLE CALMAR RD DECORAH, IA 52101 PHONE: (563) 419-1857

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C000	COVER SHEET
C001	PROJECT QUANTITIES & NOTES
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CD01	EXISTING CONDITIONS AND REMOVALS PLAN
C201	OVERALL GRADING PLAN
C202	CUT-FILL PLAN
C203	DAM EMBANKMENT PLAN AND PROFILE
C301	PRINCIPAL SPILLWAY PLAN AND PROFILE
C501	CONSTRUCTION DETAILS
C502	CONSTRUCTION DETAILS
C601	SEEDING PLAN



CIVIL ENGINEER

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT DESCRIBED BELOW WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.

Luke Monat 1/12/2021
Signature: Date

Printed or typed name: LUKE MONAT
License Number: 22610
My License Renewal Date is: DECEMBER 31, 2022

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ALL SHEETS

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18	ROLLED EROSION CONTROL PRODUCT	IA-5	SY	1,255			
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	3						
4							

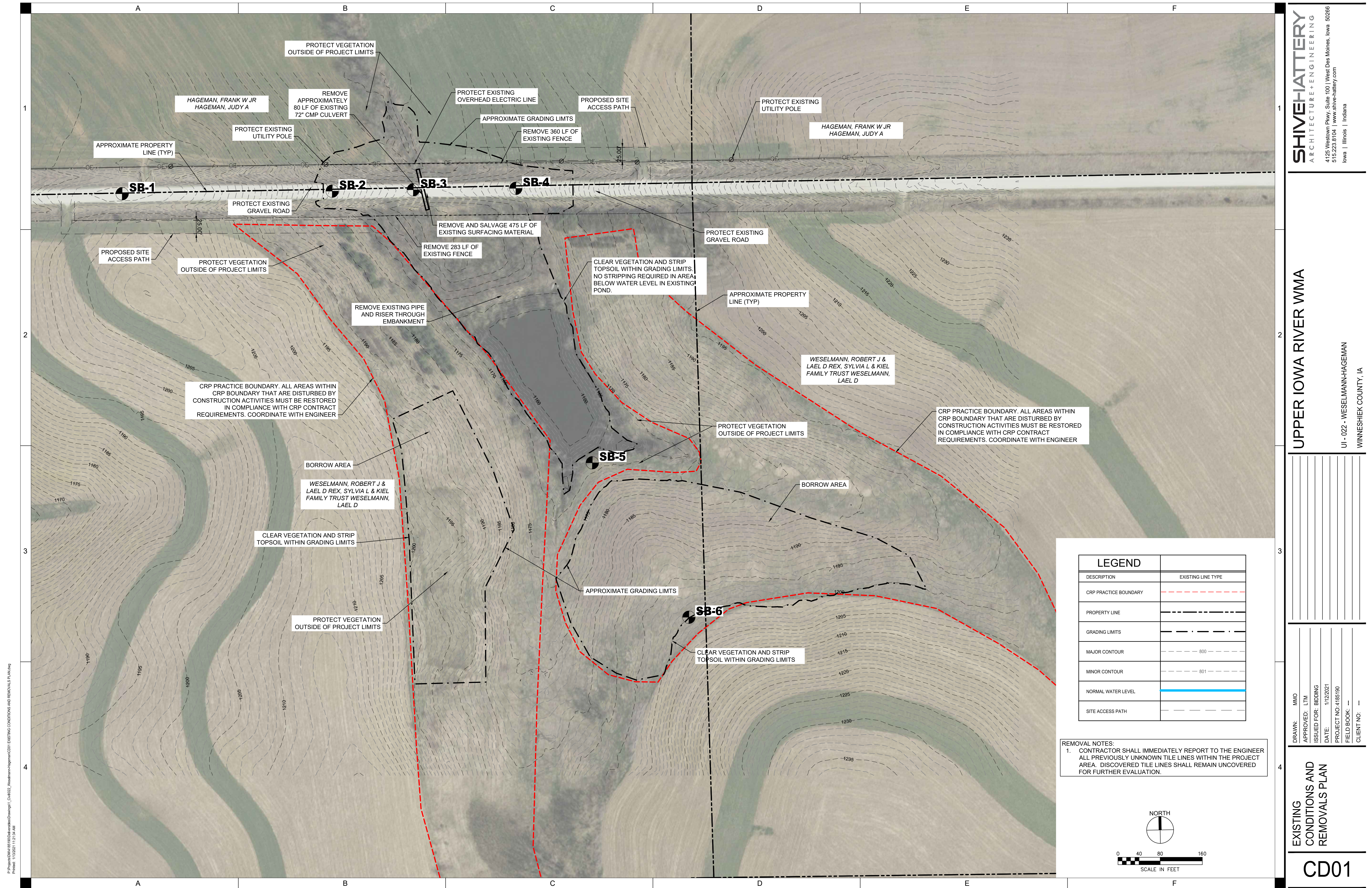
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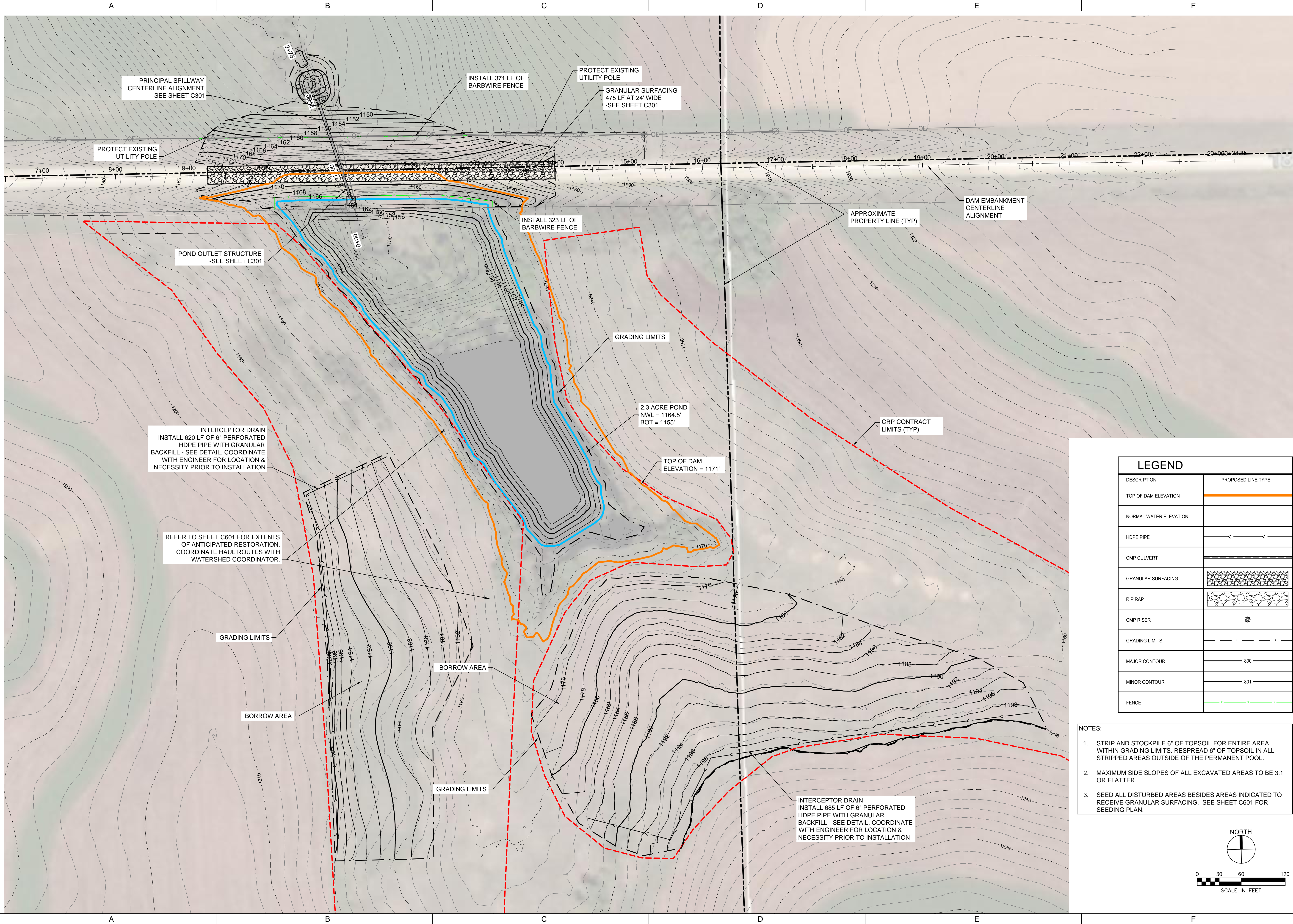
UPPER IOWA RIVER WMA
UI - 022 - WESELMANN-HAGEMAN
WINNESHEIK COUNTY, IA

DRAWN: MMO
APPROVED: LTM
ISSUED FOR: BIDDING
DATE: 1/12/2021
PROJECT NO.: 4165190
FIELD BOOK: --
CLIENT NO: --

PROJECT
QUANTITIES &
NOTES
C001

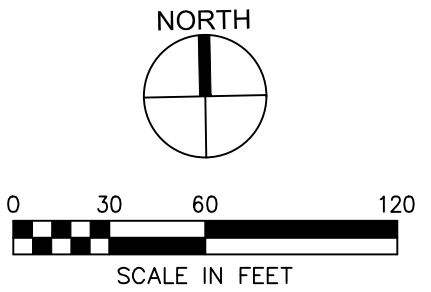


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LEGEND	
DESCRIPTION	PROPOSED LINE TYPE
TOP OF DAM ELEVATION	
NORMAL WATER ELEVATION	
HDPE PIPE	
CMP CULVERT	
GRANULAR SURFACING	
RIP RAP	
CMP RISER	
GRADING LIMITS	
MAJOR CONTOUR	
MINOR CONTOUR	
FENCE	

- NOTES:
- STRIP AND STOCKPILE 6" OF TOPSOIL FOR ENTIRE AREA WITHIN GRADING LIMITS. RESPREAD 6" OF TOPSOIL IN ALL STRIPPED AREAS OUTSIDE OF THE PERMANENT POOL.
 - MAXIMUM SIDE SLOPES OF ALL EXCAVATED AREAS TO BE 3:1 OR FLATTER.
 - SEED ALL DISTURBED AREAS BESIDES AREAS INDICATED TO RECEIVE GRANULAR SURFACING. SEE SHEET C601 FOR SEEDING PLAN.



UPPER IOWA RIVER WMA

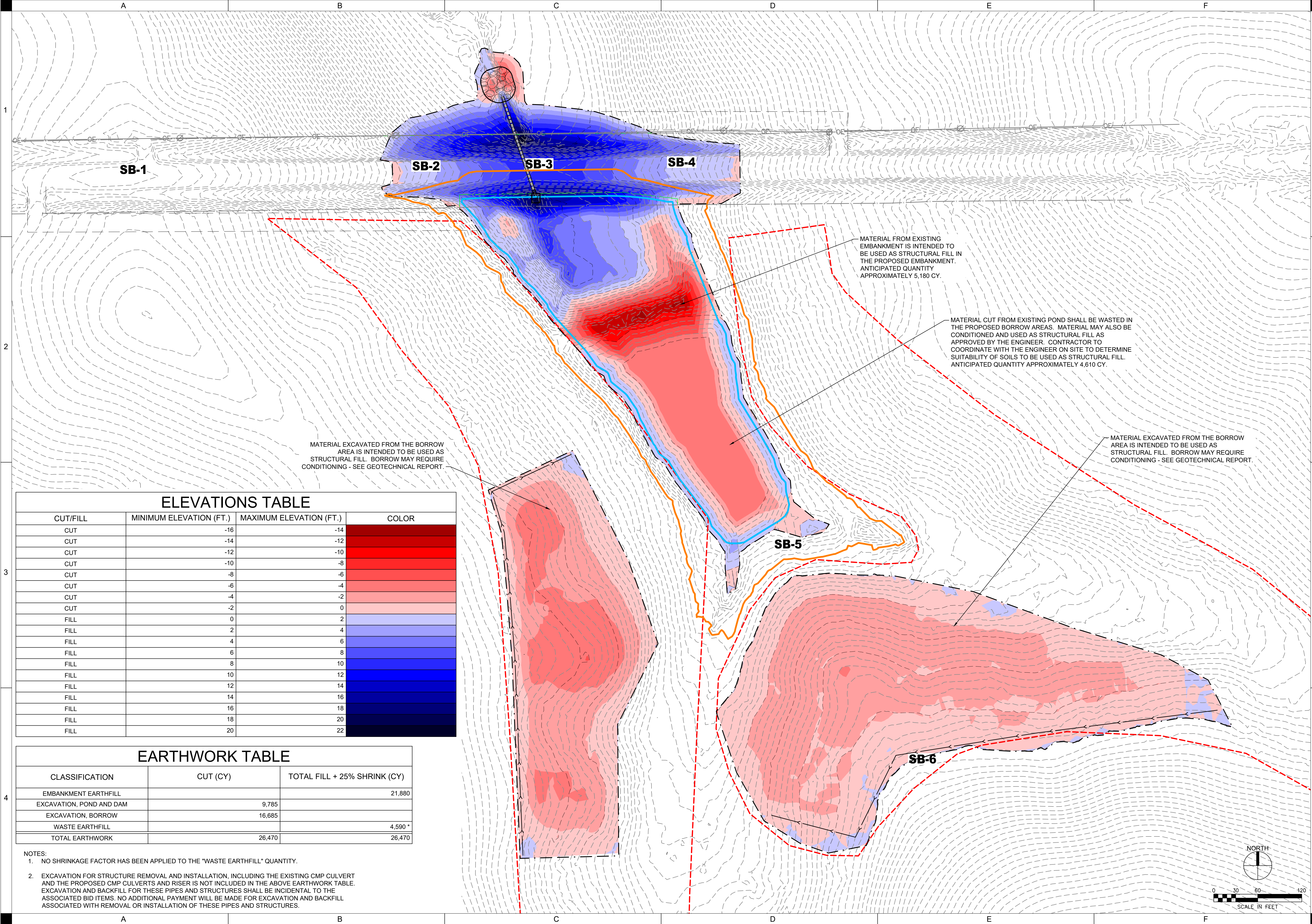
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UI - 022 - WESELMANN-HAGEMAN
WINNEBAGO COUNTY, IA

OVERALL GRADING PLAN

C201

DRAWN: MMO
APPROVED: LTM
ISSUED FOR: BIDDING
DATE: 11/22/2021
PROJECT NO: 4165180
FIELD BOOK: --
CLIENT NO: --



SB-1

SB-2

SB-3

SB-4

SB-5

SB-6

MATERIAL FROM EXISTING EMBANKMENT IS INTENDED TO BE USED AS STRUCTURAL FILL IN THE PROPOSED EMBANKMENT. ANTICIPATED QUANTITY APPROXIMATELY 5,180 CY.

MATERIAL CUT FROM EXISTING POND SHALL BE WASTED IN THE PROPOSED BORROW AREAS. MATERIAL MAY ALSO BE CONDITIONED AND USED AS STRUCTURAL FILL AS APPROVED BY THE ENGINEER. CONTRACTOR TO COORDINATE WITH THE ENGINEER ON SITE TO DETERMINE SUITABILITY OF SOILS TO BE USED AS STRUCTURAL FILL. ANTICIPATED QUANTITY APPROXIMATELY 4,610 CY.

MATERIAL EXCAVATED FROM THE BORROW AREA IS INTENDED TO BE USED AS STRUCTURAL FILL. BORROW MAY REQUIRE CONDITIONING - SEE GEOTECHNICAL REPORT.

MATERIAL EXCAVATED FROM THE BORROW AREA IS INTENDED TO BE USED AS STRUCTURAL FILL. BORROW MAY REQUIRE CONDITIONING - SEE GEOTECHNICAL REPORT.

ELEVATIONS TABLE

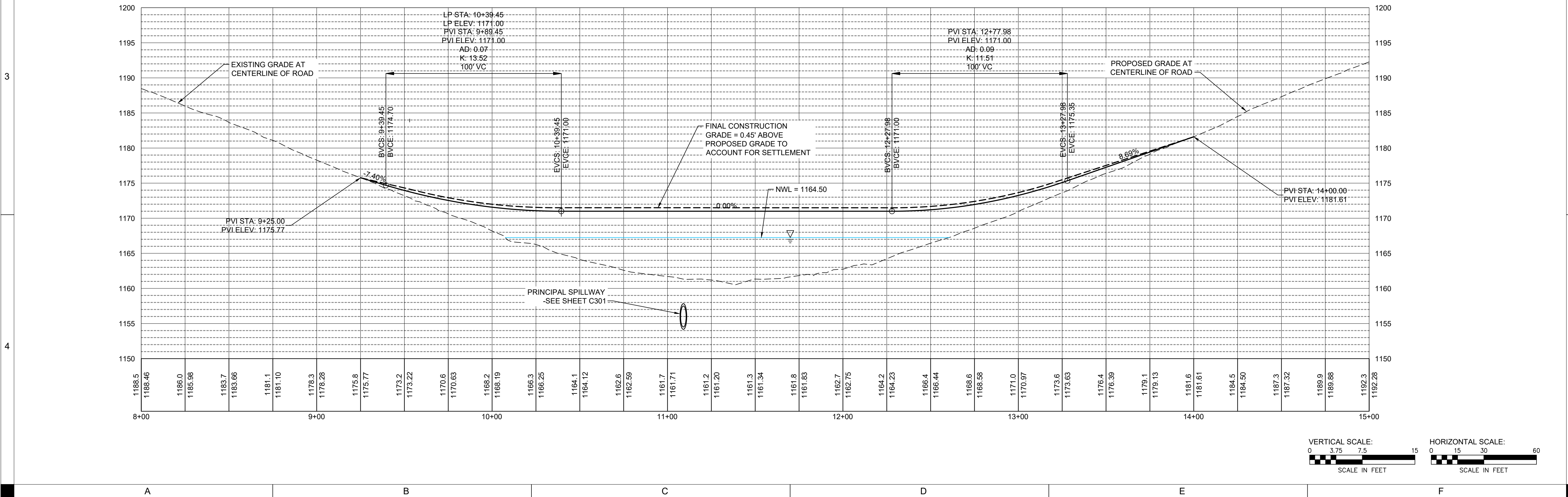
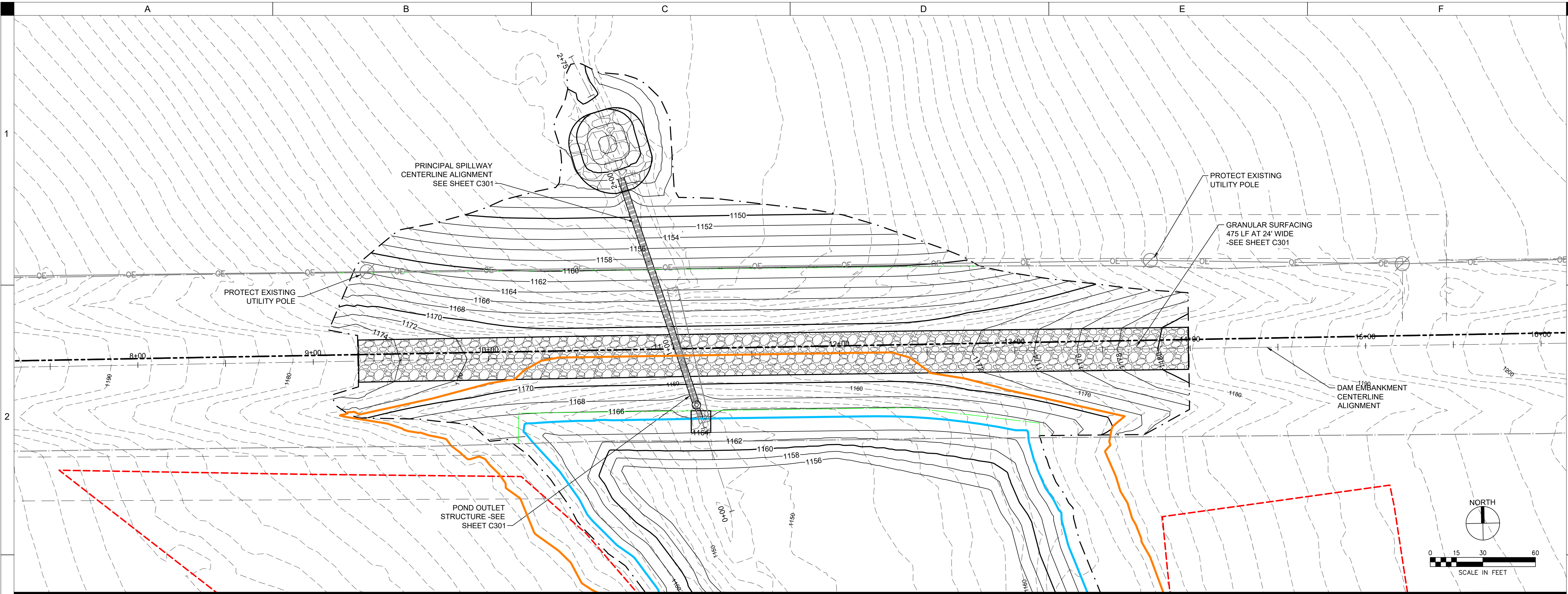
CUT/FILL	MINIMUM ELEVATION (FT.)	MAXIMUM ELEVATION (FT.)	COLOR
CUT	-16	-14	
CUT	-14	-12	
CUT	-12	-10	
CUT	-10	-8	
CUT	-8	-6	
CUT	-6	-4	
CUT	-4	-2	
CUT	-2	0	
FILL	0	2	
FILL	2	4	
FILL	4	6	
FILL	6	8	
FILL	8	10	
FILL	10	12	
FILL	12	14	
FILL	14	16	
FILL	16	18	
FILL	18	20	
FILL	20	22	

EARTHWORK TABLE

CLASSIFICATION	CUT (CY)	TOTAL FILL + 25% SHRINK (CY)
EMBANKMENT EARTHFILL		21,880
EXCAVATION, POND AND DAM	9,785	
EXCAVATION, BORROW	16,685	
WASTE EARTHFILL		4,590 *
TOTAL EARTHWORK	26,470	26,470

- NOTES:
- NO SHRINKAGE FACTOR HAS BEEN APPLIED TO THE "WASTE EARTHFILL" QUANTITY.
 - EXCAVATION FOR STRUCTURE REMOVAL AND INSTALLATION, INCLUDING THE EXISTING CMP CULVERT AND THE PROPOSED CMP CULVERTS AND RISER IS NOT INCLUDED IN THE ABOVE EARTHWORK TABLE. EXCAVATION AND BACKFILL FOR THESE PIPES AND STRUCTURES SHALL BE INCIDENTAL TO THE ASSOCIATED BID ITEMS. NO ADDITIONAL PAYMENT WILL BE MADE FOR EXCAVATION AND BACKFILL ASSOCIATED WITH REMOVAL OR INSTALLATION OF THESE PIPES AND STRUCTURES.

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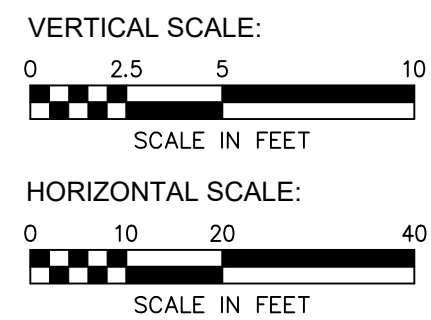
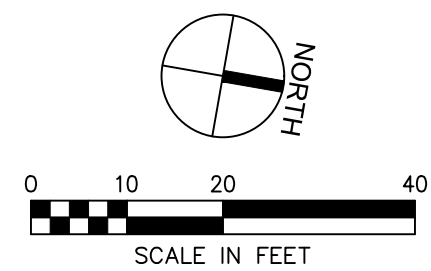
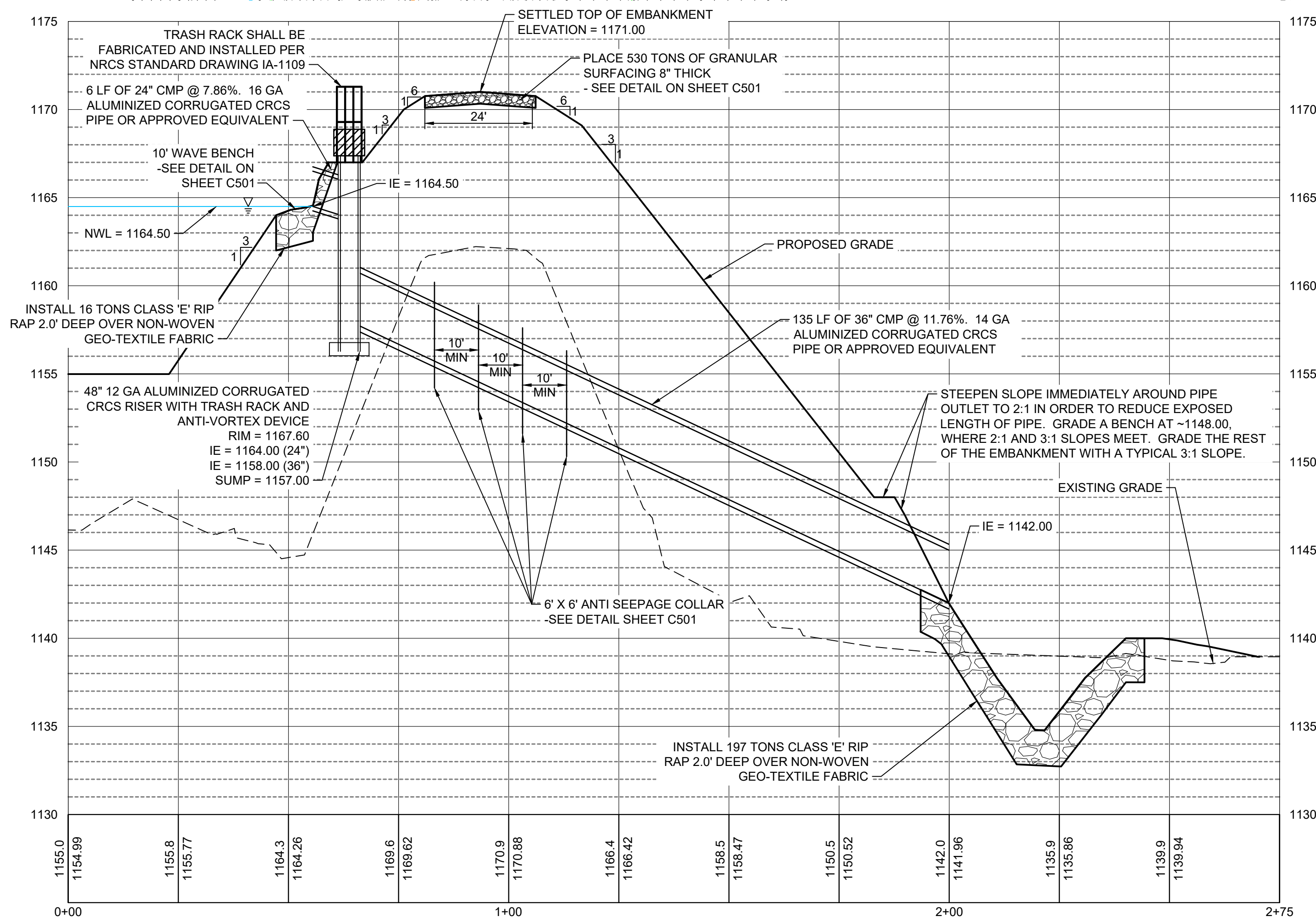
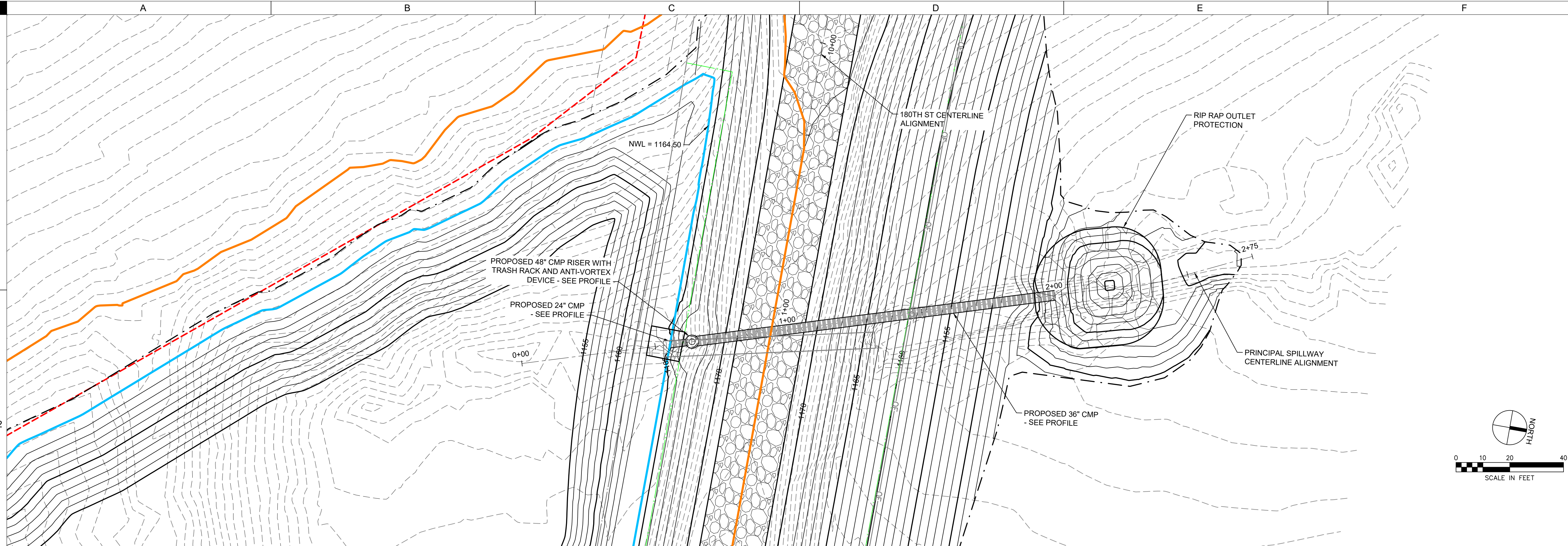
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UPPER IOWA RIVER WMA
UI - 022 - WESELMANN-HAGEMAN
WINNEBAGO COUNTY, IA

DRAWN:	MMO
APPROVED:	LTM
ISSUED FOR:	BIDDING
DATE:	11/2/2021
PROJECT NO:	4185185
FIELD BOOK:	--
CLIENT NO:	--

DAM EMBANKMENT
PLAN AND PROFILE
C203

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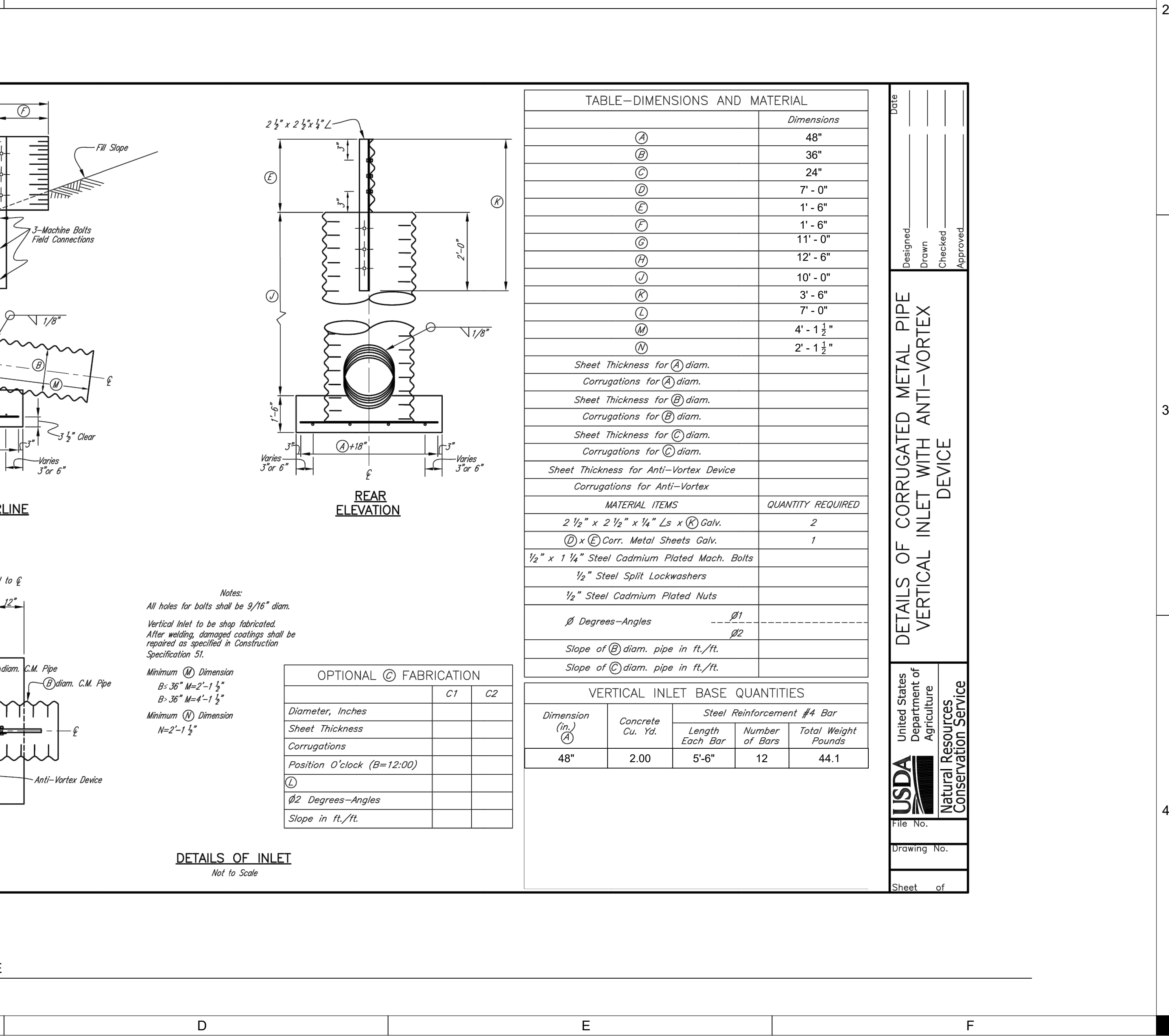
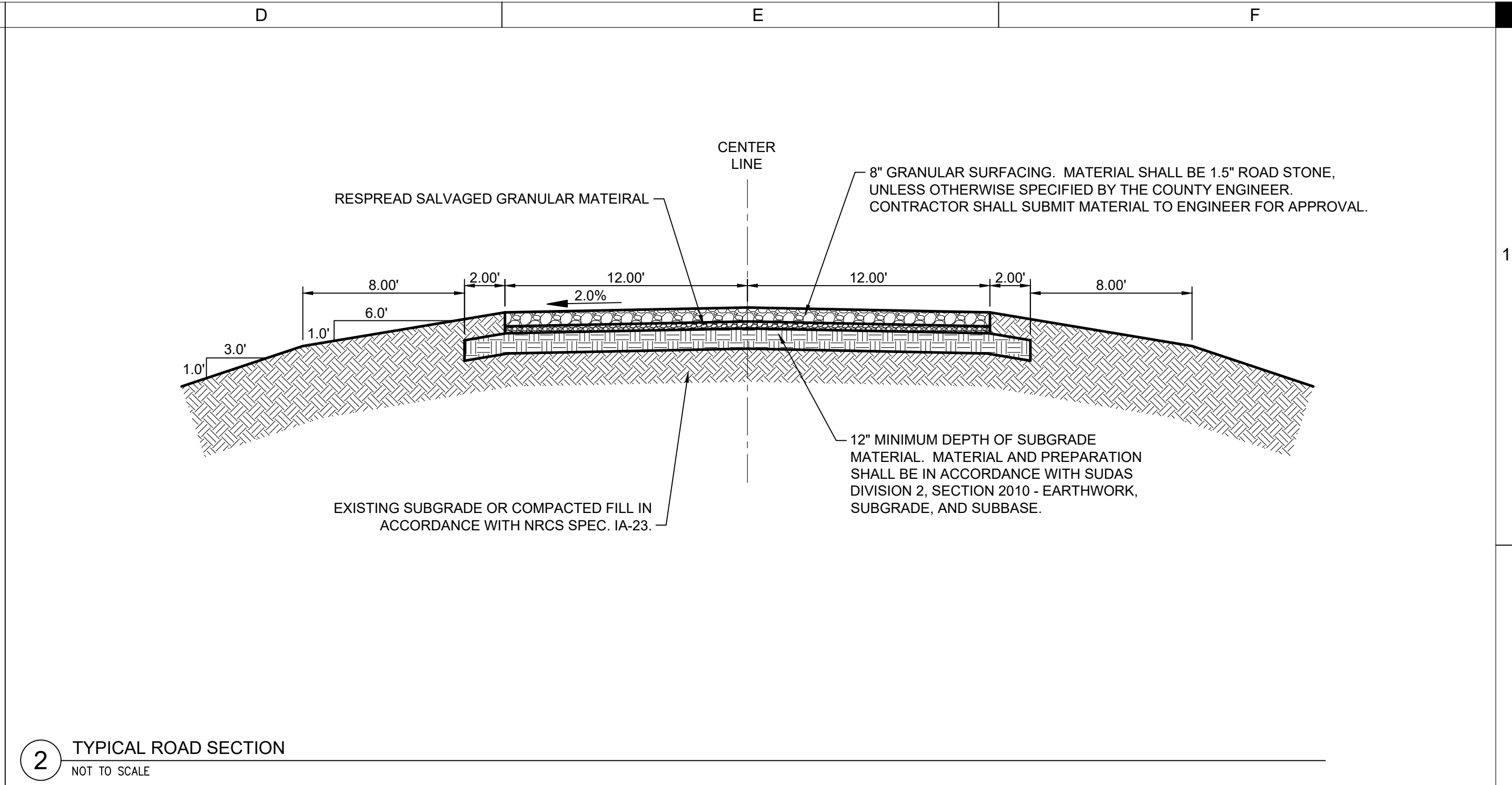
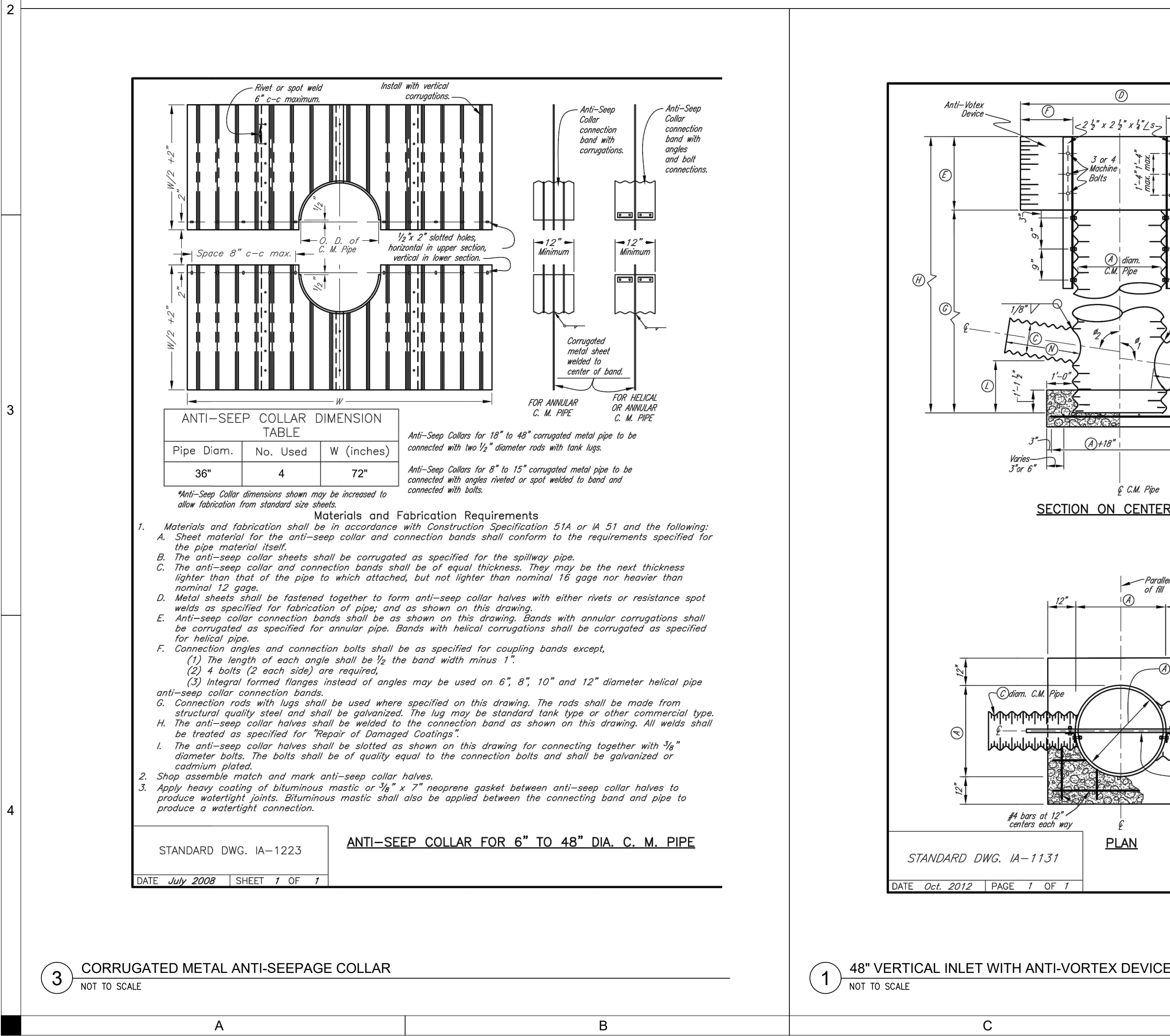
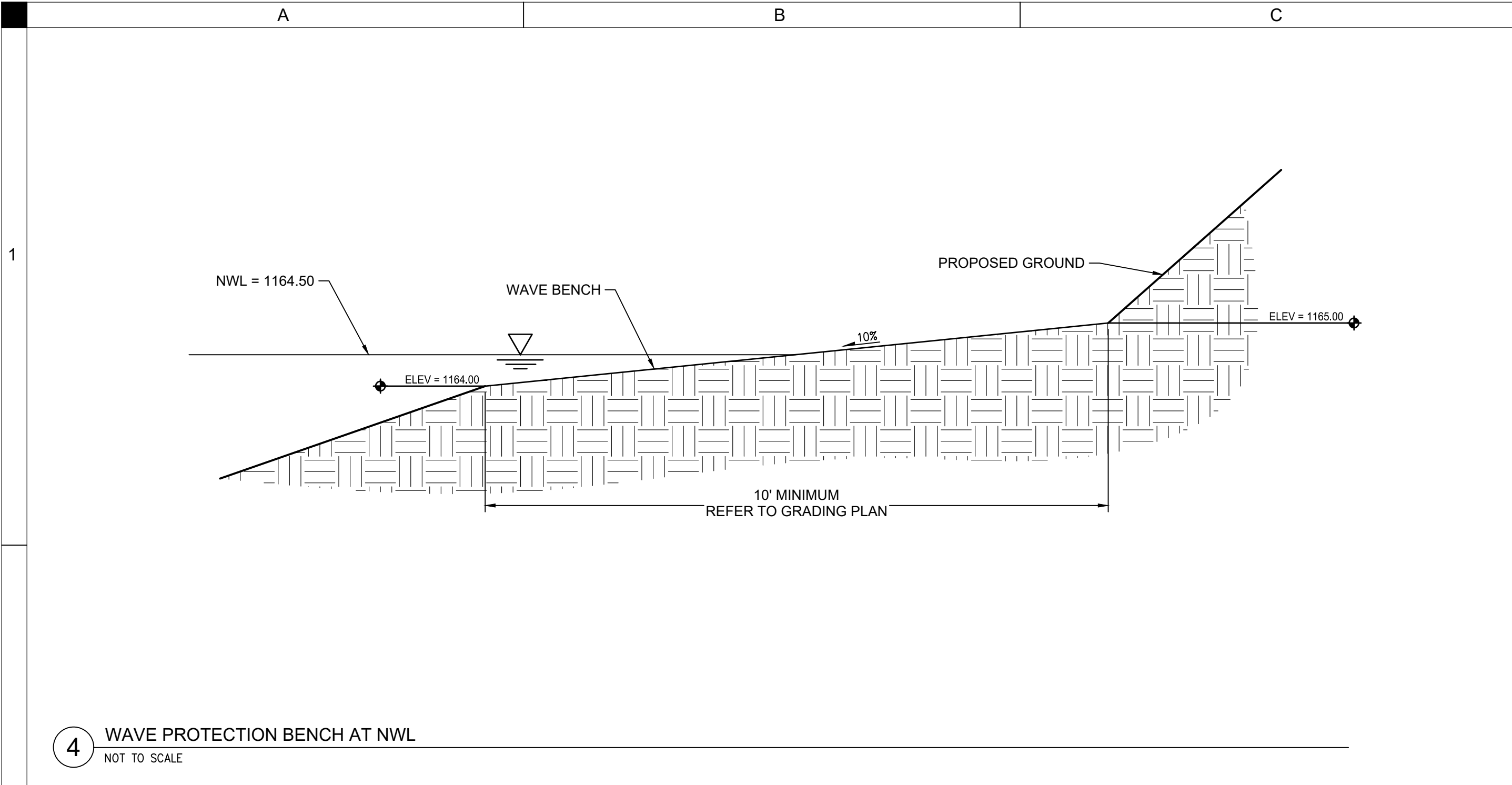
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UPPER IOWA RIVER WMA
UI - 022 - WESELMANN-HAGEMAN
WINNEBAGO COUNTY, IA

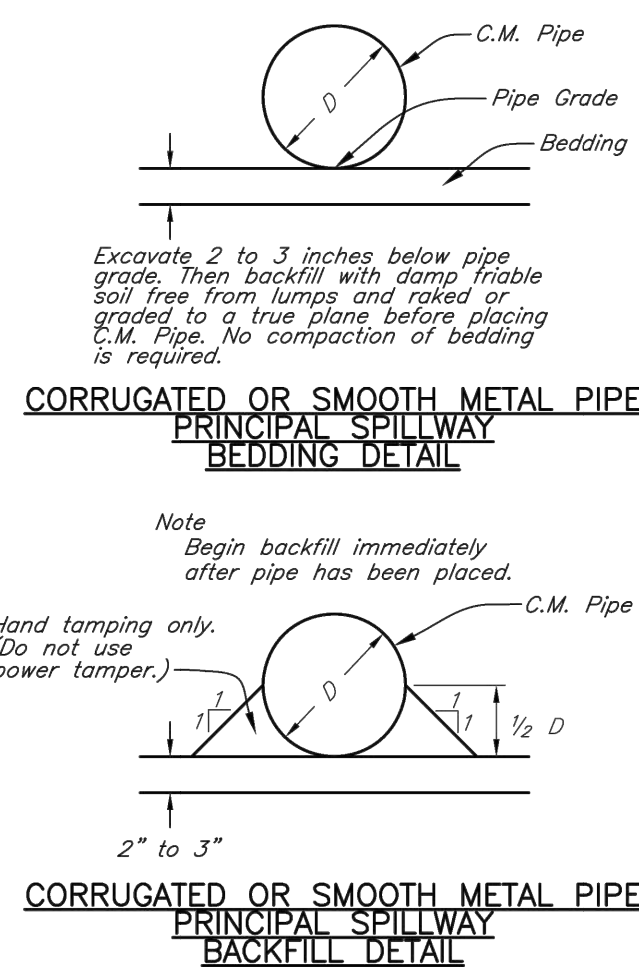
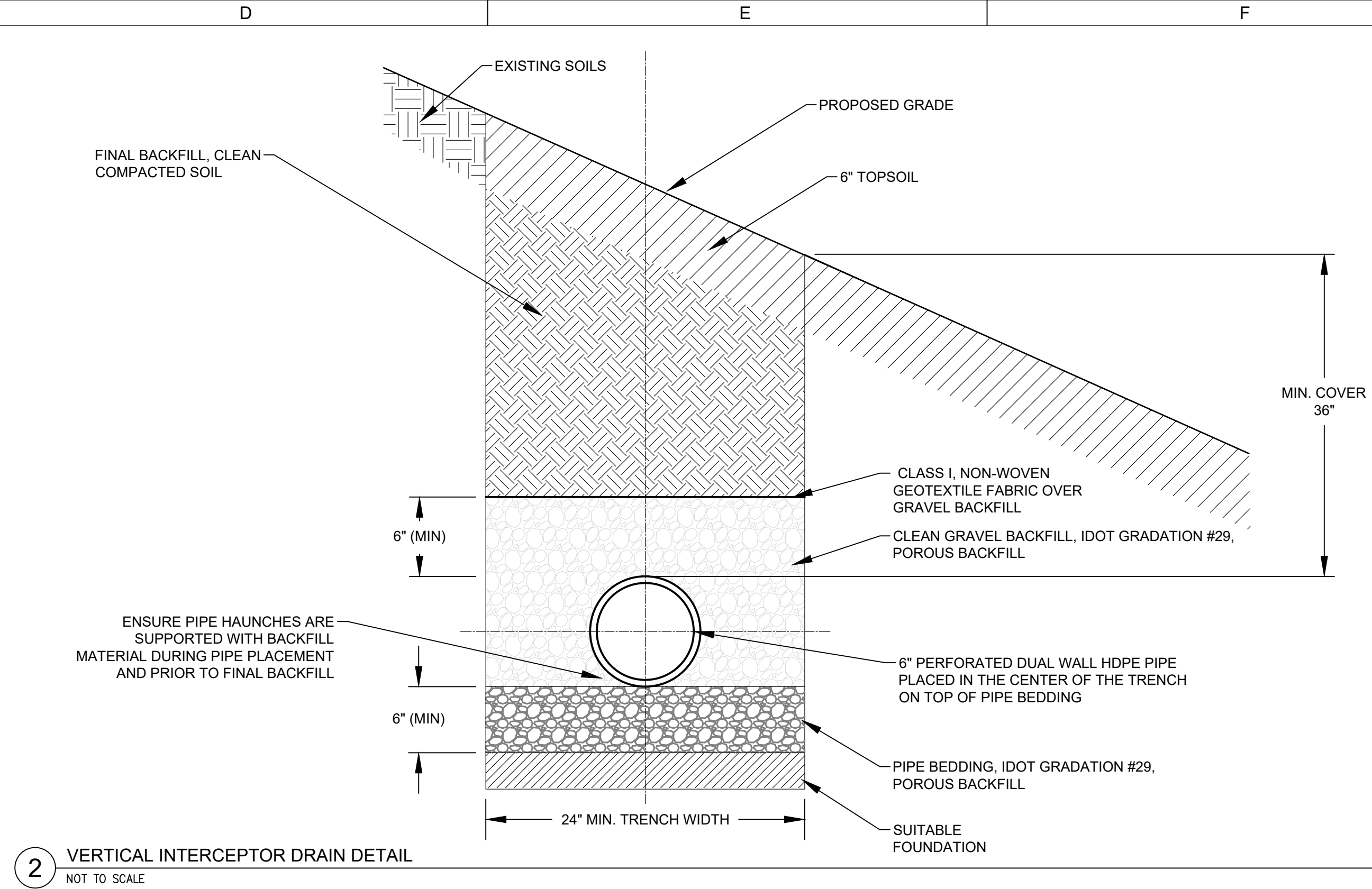
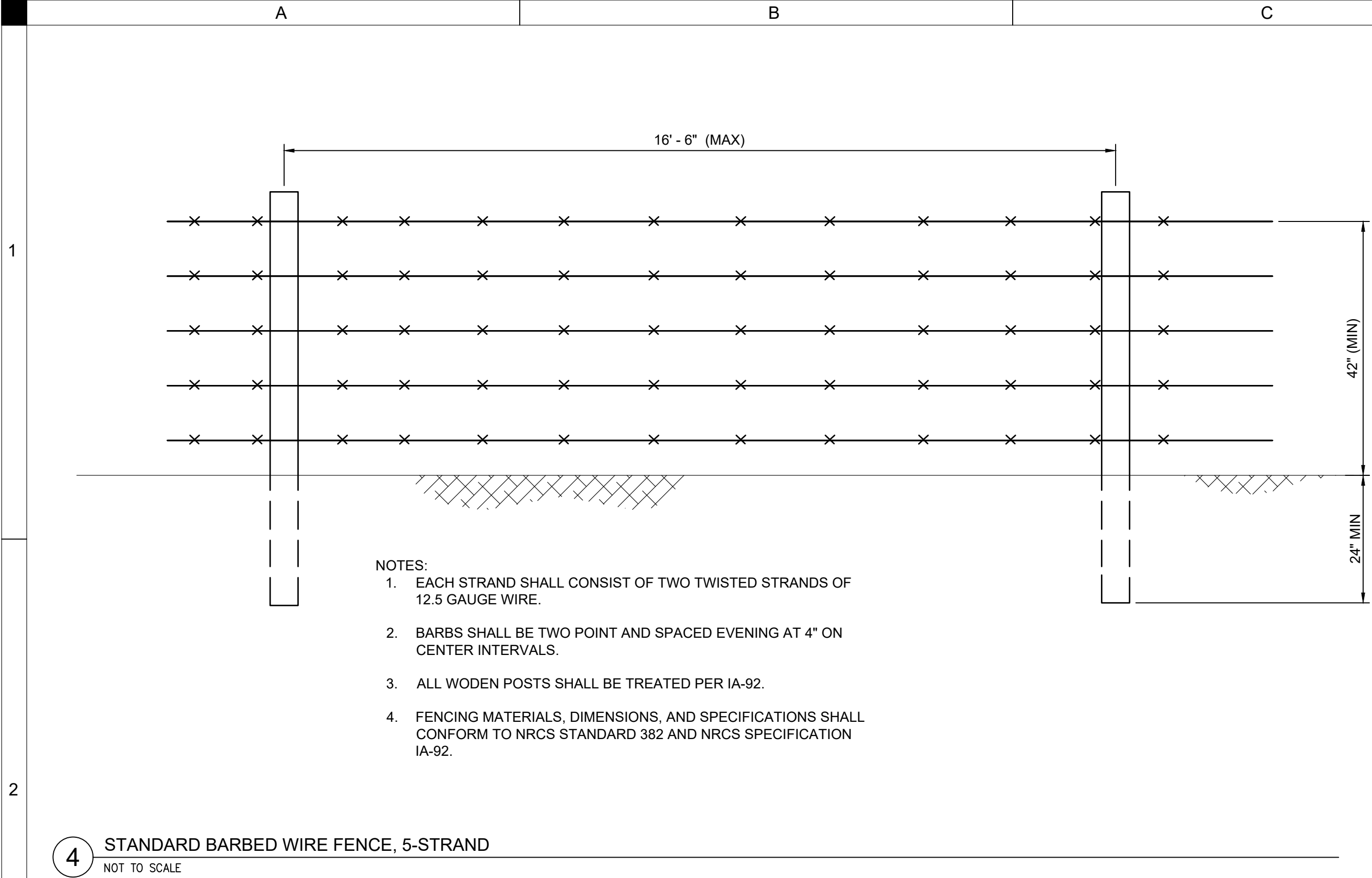
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APPROVED:	LTM
ISSUED FOR:	BIDDING
DATE:	11/2/2021
PROJECT NO:	4165190
FIELD BOOK:	--
CLIENT NO:	--

PRINCIPAL SPILLWAY PLAN AND PROFILE
C301

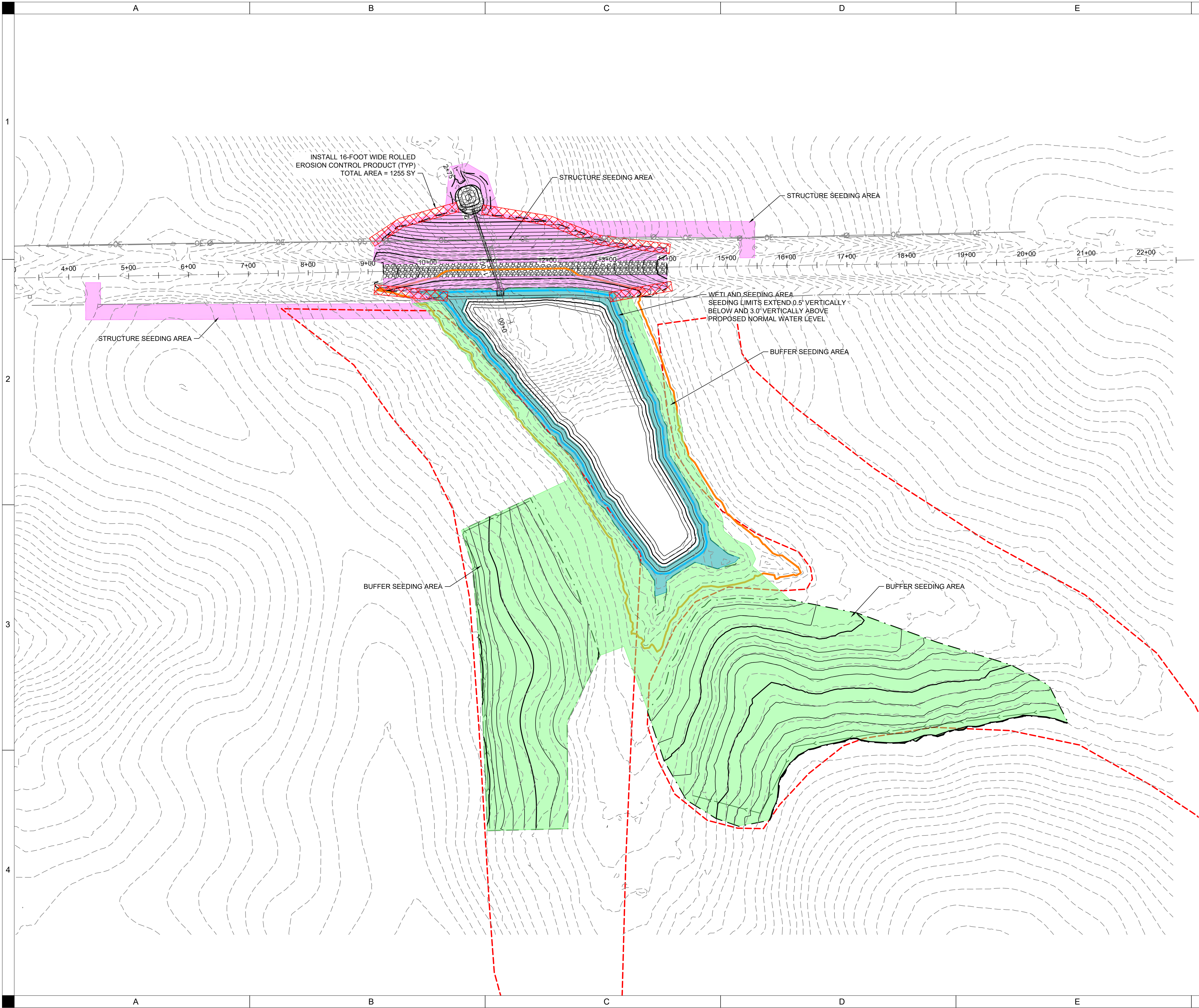
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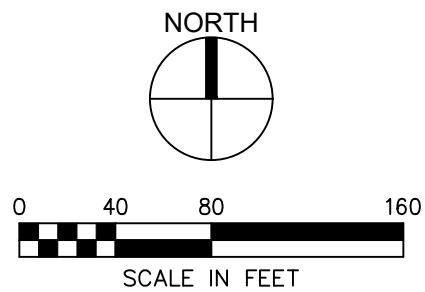
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SEEDING TABLE	
SEEDING TYPE	QUANTITY (ACRES)
BUFFER SEEDING	6.9
STRUCTURE SEEDING	1.6
WETLAND SEEDING	0.7

- NOTES:
- ALL AREAS WITHIN THE CRP BOUNDARY SHALL BE RESTORED TO PRE-CONSTRUCTION ACTIVITY CONDITIONS.

LEGEND	
DESCRIPTION	PROPOSED LINE TYPE
TOP OF DAM ELEVATION	
NORMAL WATER ELEVATION	
PRINCIPAL SPILLWAY	
RIP RAP	
WATER LEVELING STRUCTURE	
GRADING LIMITS	
MAJOR CONTOUR	
MINOR CONTOUR	
STRUCTURE AND CHANNEL SEEDING	
BUFFER SEEDING	
WETLAND SEEDING	
CRP LIMITS	
RIP RAP	

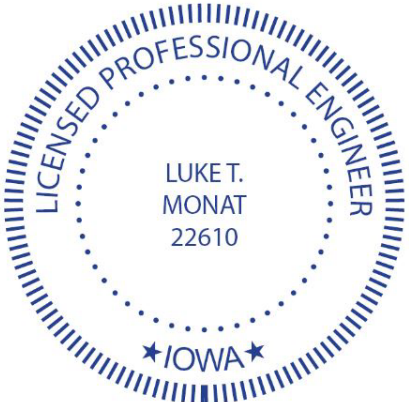



UPPER IOWA RIVER WMA

SEEDING PLAN

SECTION 02
CERTIFICATIONS PAGE
UI-BID-004
UI-022-WESELMANN-HAGEMAN
UPPER IOWA RIVER WATERSHED MANAGEMENT AUTHORITY
WATERSHED IMPROVEMENTS (13-NDRI-009)
WINNESHIEK COUNTY, IOWA

STATE OF IOWA

	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> <u>1/12/2021</u></p> <p>Signature Date</p> <p>Printed or typed name: Luke T. Monat, P.E. License Number: 22610 My license renewal date is: 12-31-2022</p> <p>Pages, Sheets, or Divisions covered by this Seal: Project Manual</p>
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SECTION A: NRCS CONSTRUCTION SPECIFICATIONS
SECTION B: SUPPLEMENTAL SPECIFICATIONS
SECTION C: NRCS CONSERVATION PRACTICE 382 - FENCING
SECTION D: GEOTECHNICAL REPORT

END OF SECTION

**SECTION A:
NRCS CONSTRUCTION SPECIFICATIONS
UPPER IOWA RIVER WMA
UI-022-WESELMANN-HAGEMAN**

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IA-1 SITE PREPARATION
IA-3 STRUCTURE REMOVAL
IA-5 POLLUTION CONTROL
IA-6 SEEDING AND MULCHING FOR PROTECTIVE COVER
IA-8 MOBILIZATION AND DEMOBILIZATION
IA-9 SUBSURFACE DRAIN INVESTIGATION, REMOVAL, AND REPAIR
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IA-21 EXCAVATION
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IA-45 PLASTIC PIPE
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IA-61 LOOSE ROCK RIPRAP
IA-81 METAL FABRICATION AND INSTALLATION
IA-92 FENCE
IA-95 GEOTEXTILE
IA-620 UNDERGROUND OUTLET

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-1 SITE PREPARATION

1. SCOPE

Site preparation work shall consist of clearing, grubbing, stripping, refuse removal, bank sloping and structure removal on the site as necessary to rid the site of all undesirable materials on or near the surface and prepare the site for the structure. All woody growth within the construction area shall be cleared and all stumps and roots one inch in diameter or larger shall be grubbed from the site. In addition, all areas within 25 feet of the footprint of the structure shall be cleared and grubbed except as directed by NRCS. The work shall also consist of the removal and disposal of structures (including fences) that must be removed to perform other items of work.

For wetland restoration, enhancement, or creation projects, the wetland area shall be disturbed as little as possible and existing naturally vegetated spillway areas shall not be disturbed.

2. FOUNDATION PREPARATION

The construction areas shall be stripped a minimum of 6 inches to remove all unsuitable materials such as organic matter, grasses, weeds, sod, debris, and stones larger than 6 inches in diameter.

In an earth embankment foundation area, all channel banks and sharp breaks shall be sloped to no steeper than 1.5 horizontal to 1 vertical.

The foundation area shall be thoroughly scarified before placement of fill material. The surface shall have moisture added or shall be compacted if necessary so that the first layer of fill material can be compacted and bonded to the foundation.

3. STRIPPED MATERIAL DISPOSAL

Suitable soil material shall be stockpiled for use as topsoil. The other stripped materials shall be buried, removed from the site, or disposed of as directed by the owner or NRCS. Whenever possible, material shall not be disposed of in the pool area created by the structure.

Stockpiled materials around a construction site should be placed so as not to hinder subsequent construction operations.

4. DISPOSAL OF REFUSE MATERIALS

Waste materials from clearing and structure removal shall be burned or buried at locations approved by the owner. Buried materials shall be covered with a minimum of 2 feet of earthfill. Whenever possible, material shall not be disposed of in any pool area created by the structure.

All refuse shall be disposed of in a manner which complies with all local and state regulations.

5. SALVAGE

Items to be salvaged shall be as shown on the drawings. Structures and fencing materials that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas.

6. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-3 STRUCTURE REMOVAL

1. SCOPE

The work shall consist of the removal, salvage and/or disposal of structures (including fences) from the designated areas and as indicated on the drawings.

2. MARKING

Each structure or item to be removed will be marked by means of stakes, flags, painted markers or other suitable methods.

3. REMOVAL

All structures designated for removal shall be removed to the specified extent and depth.

4. SALVAGE

Structures that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly match marked with paint prior to disassembly. All pins, nuts, bolts, washers, plates and other loose parts shall be marked or tagged to indicate their proper location in the structure and shall be fastened to the appropriate structural member or packed in suitable containers. Materials from fences designated to be salvaged shall be placed outside the work area on the property from which they are removed. Wire shall be rolled into uniform rolls of convenient size. Posts and rails shall be neatly piled.

5. DISPOSAL OF REFUSE MATERIALS

Refuse materials resulting from structure removal shall be burned or buried at locations shown on the drawings. Buried materials shall be covered with a minimum of 2 feet of earthfill. Whenever possible, material shall not be disposed of in the pool area created by the structure.

All refuse shall be disposed of in a manner which complies with all local and state regulations.

6. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-5 POLLUTION CONTROL

1. SCOPE

The work shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air during construction operations.

2. MATERIALS

All materials furnished shall meet the requirements shown on the drawings or in the specifications.

3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

The measures and works shall include, but are not limited to, the following:

Staging of Earthwork Activities: The excavation and moving of soil materials shall be scheduled so that areas unprotected from erosion will be minimized. These areas will be unprotected for the shortest time feasible.

Seeding: Structures and disturbed areas shall be seeded as soon as possible after construction is completed.

Temporary seedings may be used as an alternative to other stabilization measures as approved by NRCS.

Mulching: Construction areas that have been disturbed but have no construction activity scheduled for 21 days or more shall have erosion protection measures applied by the 14th day. This erosion protection may be mulching or other approved temporary measures. Construction areas shall not be left open during a winter shutdown period and shall be protected by mulching.

All seeding and mulching shall be completed in accordance with the seeding plan and Iowa Construction Specification IA-6, Seeding and Mulching for Protective Cover.

The following works may be temporary. If they are installed as a temporary measure, they shall be removed and the area restored to its original state when they are no longer needed or when permanent measures are installed.

Diversions: Diversions may be required to divert clean runoff water away from work areas and to collect runoff from work areas for treatment and safe disposition.

Stream Crossings: Culverts or bridges may be required where construction equipment must cross streams.

Sediment Basins: Sediment basins may be required to settle and filter out sediment from eroding areas to protect properties and streams below the construction site.

Sediment Filters: Straw bale filters, geotextile sediment fences, or other equivalent methods may be used to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under them.

Waterways: Waterways may be required for the safe removal of runoff from fields, diversions, and other structures or measures.

4. CHEMICAL POLLUTION

The Contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to be used to dispose of chemical pollutants, such as drained lubricating or transmission oils, greases, soaps, concrete mixer wash water, asphalt, etc., produced as a by-product of the construction work. At the completion of the construction work, sumps shall be removed and the area restored without causing pollution.

Sanitary facilities such as chemical toilets or septic tanks shall not be placed adjacent to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water sources. At the completion of construction work, facilities shall be disposed of without causing pollution.

5. AIR POLLUTION

The burning of brush or trash or disposal of other materials shall adhere to local and state regulations.

Fire prevention measures shall be taken to prevent the start or the spreading of wild fires, which result from project work. Fire breaks or guards shall be constructed at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall insure safe operations at all times. If chemical dust suppressants are used, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the Engineer five working days before use.

6. MAINTENANCE, REMOVAL, AND RESTORATION

All pollution control measures and works shall be adequately maintained in a functional condition as long as needed during the construction operation. All temporary measures shall be removed and the site restored to as near original conditions as practical.

7. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-6 SEEDING AND MULCHING FOR PROTECTIVE COVER

1. SCOPE

The work shall consist of seeding, mulching, and fertilizing all disturbed areas and other areas as indicated on the drawings or otherwise designated.

2. SEEDBED PREPARATION AND APPLICATION

The entire area to be seeded shall be reasonably smooth and all washes and gullies shall be filled to conform to the desired cross-section before actual seedbed preparation is begun. At this stage of the operation, the required fertilizer and lime shall be applied uniformly and incorporated into the top 3 inches of the soil with suitable tillage equipment. The seedbed preparation operation shall be suspended when the soil is too wet or too dry. The seedbed shall be loosened to a depth of at least three inches.

On side slopes steeper than 2-1/2 horizontal to 1 vertical, the 3 inch minimum depth of seedbed preparation is not required, but the soil shall be worked enough to insure sufficient loose soil to provide adequate seed cover.

Unless otherwise specified, the seeding operation shall be performed immediately after preparation of the seedbed. The seed shall be drilled or broadcast by equipment that will insure uniform distribution of the seed.

3. MATERIALS

The seeding, fertilizing, and mulching requirements are as specified on Form IA-CPA-4.

Straw from cereal grains or hay will be used as mulching material. It shall be relatively free of weeds.

4. MULCH APPLICATION

The required mulching shall be performed as soon as possible after seeding unless otherwise specified. The mulch shall be applied uniformly over the area. The type and rate shall be as specified. When mulching is required, all areas seeded during any one day shall be mulched within 24 hours. The mulch may be spread by any means that results in a uniform cover.

The mulch shall be anchored. Anchoring of the mulch may be performed by a mulch anchoring tool or regular farm disk weighted and set nearly straight, by installation of mulch netting, or by other methods approved by NRCS.

5. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-8 MOBILIZATION AND DEMOBILIZATION

1. SCOPE

This work shall consist of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the contract.

The work shall not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract.

Mobilization will not be considered as work in fulfilling the contract requirement for commencement of work.

2. EQUIPMENT AND MATERIALS

Mobilization shall include all activities and costs for transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary facilities for the Contractor's operations at the site; premiums paid for performance and payment bonds, including coinsurance and reinsurance agreements as applicable; and other items specified in Section 4.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not included in the contract from the site; including the disassembly, removal and site cleanup of offices, buildings, and other facilities assembled for this contract.

The work includes mobilization and demobilization activities required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted or added items of work for which the contractor is entitled to an adjustment in contract price, compensation of such costs will be included in the price adjustment for the item or items of work changed or added.

3. SPECIAL SPECIFICATIONS

A. Measurement and Payment

- a. Payment will be made as the work proceeds, after presentation of invoices by the contractor showing specific mobilization and demobilization costs and evidence of the charges of suppliers, subcontractors, and others. If the total of such payments is less than the lump sum contract price, the unpaid balance will be included in the final contract payment. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for the completion of the work.
- b. Payment will not be made under this item for the purchase costs of materials having a residual value, the cost of materials to be incorporated in the project, or the purchase costs of operating supplies.

B. Items of Work and Construction Details

- a. Items of work to be performed in conformance with this specification and the construction details therefor are:
 - i. **Bid Item 4, Mobilization & Demobilization**
 1. This item shall consist of mobilizing and demobilizing personnel and equipment in preparation to perform the work within the scope of this contract.

2. Any work that is necessary to provide access to the site including, but not limited to, grading, temporary culverts, and clearing will be included in this item. When construction is completed access areas will be restored, as close as practical, to its original condition.
3. Any fence removed for access and /or to provide work area shall be replaced with same or like materials as approved by the engineer.
4. The Contractor shall exercise caution to minimize the amount of damage caused by the grading and clearing operations.
5. Portable toilets shall be provided at the construction site and used for the sanitary facilities.
6. This item shall not include transportation of personnel, equipment and operating supplies within the work limits areas of this contract.
7. Payment will constitute full compensation for related subsidiary items.

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

**IA-9 SUBSURFACE DRAIN INVESTIGATION,
REMOVAL, AND REPAIR**

1. SCOPE

The work shall consist of investigation, location, repair, and/or removal of subsurface drains (tile) near new or existing animal waste storage facilities or in wetland restoration, enhancement, or creation project areas, or other situations where subsurface drains may be present.

2. INVESTIGATION AND LOCATION

An inspection trench at least 10 inches wide shall be dug at the location shown on the drawings or as directed by the engineer or his representative. The trench shall be at least 6 feet deep measured from the original ground line, unless otherwise shown on the plans. The Engineer or his representative shall examine the trench and excavated material to identify tile lines.

Size, material, operating condition and direction of flow of each conduit shall be documented. Location and flow line elevation of each conduit shall be surveyed with horizontal and vertical control based on benchmarks shown on the plans.

The inspection trench shall be documented by surveying the natural ground and trench bottom location and elevations at the beginning, end, and every 50 feet for trenches longer than 50 feet.

Backfilling shall not be started without approval of the Engineer. See Section 5 for backfill specifications.

Trench shields, shoring and bracing, or other methods necessary to safeguard the workers and work, and to prevent damage to the existing improvements shall be furnished, placed, and subsequently removed by the contractor.

3. TILE REPAIR

Unless designated for removal, replace damaged conduit with new conduit having equal or greater capacity using material specified in Section 6 or 7. When replacing short sections of clay or concrete tile with single-wall corrugated polyethylene pipe, use the next larger nominal size.

Make connections with manufactured fittings and tight joints. Where joints have gaps that would allow soil to enter, cover the joint with a permanent type material such as coal tar pitch treated roofing paper, fiber glass sheet or mat, or plastic sheet.

If the investigation trench has been excavated below the existing drain grade, backfill the trench with gravel or well-pulverized soil in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to provide a firm foundation for the conduit at the existing grade. Do not backfill with any soil containing broken tile fragments.

Using selected soil free of hard clods, rocks, or frozen soil, hand tamp the backfill material around the haunch of the pipe in layers not over four (4) inches thick to provide support. Hold the conduit in place mechanically while placing excavated material around and over the conduit to ensure proper alignment and grade is maintained. Complete the backfill operation according to Section 5.

4. TILE REMOVAL

Remove conduits as shown on the plans or directed by the Engineer or his representative, including envelope filter material or other flow enhancing material when present.

Cap or plug the open ends of the disconnected conduit to prevent soil entry when the conduit will continue to function downstream, or otherwise shown on the plans. For a minimum distance of two feet around each sealed conduit end, backfill in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to a density equal to or greater than the surrounding undisturbed soil. Do not backfill with any soil containing broken tile fragments, large stones, frozen material, or large dry clods.

Where tile are located beneath an existing animal waste facility, remove the tile or fill the entire length of tile with concrete or Portland cement grout as shown on the plans. When tile removal is specified, the owner shall contact the Iowa Department of Natural Resources (IDNR) for permission to remove the drainage tile under the structure. The structure shall be emptied of waste or lowered to a point below the tile prior to its removal. The structure must be retested for percolation and the results submitted to IDNR and approval received prior to reusing the structure.

If shown on the plans or directed by the engineer, reroute upstream drain lines so the capacity of the upstream drainage system is maintained. Install conduit in accordance with Iowa Construction Specification IA-46, Tile Drains for Land Drainage.

5. BACKFILL

Compact soil around disturbed tile as specified in Section 3 (Tile Repair) and Section 4 (Tile Removal). Keep the backfill within 5 feet of the conduit free from large stones, frozen material, and large dry clods. Unless otherwise shown on the plans, backfill the remainder of the trench as follows:

For trenches located under or near structures, backfill in 12 inch layers and compact each layer to a density equal to or greater than the surrounding undisturbed soil.

For other locations, backfill the remainder of each trench with the excavated soil material which shall extend above the ground surface and be well rounded over the trench.

6. MATERIALS

Unless otherwise shown on the plans, conduit and fittings used for repair shall conform to the specifications listed in Table 1. Perforated pipe shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the pipe. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

Table 1. Acceptable pipe for subsurface drain repair

Kind of Pipe [#]	Specification
Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 6 inch	ASTM F 405
Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 24 inch	ASTM F 667
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 2 to 60 inch	ASTM F 2648 ^{\$}
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 12 to 60 inch	ASTM F 2306 ^{\$}
Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120	ASTM D 1785
PVC Pressure-Rated Pipe (SDR Series)	ASTM D 2241
Clay drain tile	ASTM C 4
Concrete drain tile	ASTM C 412

[#] Pipe sizes are nominal and the ranges are inclusive

^{\$} Pipe conforming to AASHTO M 252 (3 to 10 inch), or AASHTO M 294 (12 to 60 inch) is acceptable

7. SPECIAL SPECIFICATIONS

None

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-11 REMOVAL OF WATER

1. SCOPE

The work shall consist of the removal of surface water and ground water as needed to perform the required construction in accordance with the plans and specifications.

2. DIVERTING SURFACE WATER

The Contractor shall build, maintain and operate all cofferdams, channels, diversions, flumes, sumps, and other temporary protective works needed to divert surface water away from the construction site while construction is in progress.

3. DEWATERING THE CONSTRUCTION SITE

Foundations, cutoff trenches, borrow areas and other parts of the construction site shall be dewatered as needed for proper execution of the construction work. The Contractor shall furnish, install, operate and maintain all works and equipment needed to perform the dewatering.

4. EROSION AND POLLUTION CONTROL

Removal of water from the construction site, including the borrow areas shall be accomplished in such a manner that erosion and the transmission of sediment and other pollutants are minimized.

5. REMOVAL OF TEMPORARY WORKS

After temporary works have served their purposes and before the Contractor leaves the site, they shall be removed.

6. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-21 EXCAVATION

1. SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials. The cutoff trench and any other required excavations shall be dug to the lines and grades shown on the drawings or as staked in the field. Structure or trench excavations will conform to all safety requirements of OSHA.

2. USE OF EXCAVATED MATERIALS

Suitable materials from the specified excavations shall be used in the construction of required permanent earth fill. The suitability of materials for specific purposes shall be determined by the NRCS Inspector.

3. DISPOSAL OF WASTE MATERIAL

All surplus or waste material shall be disposed of in areas shown on the drawings or as approved by the NRCS Inspector. The waste material shall be smoothed and sloped to provide drainage.

4. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavations will conform to all safety requirements of OSHA.

5. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas as shown on the drawings or as approved by NRCS and the landowner. On wetland projects, borrow shall not be taken from the wetland area within 10 feet of the embankment or as shown on the drawings.

Borrow areas shall be excavated and grading completed in a manner to eliminate steep or unstable side slopes or hazardous or unsightly conditions.

6. OVER-EXCAVATION

Excavation beyond the specified lines and grades shall be corrected by filling the resulting voids with compacted earthfill, except that if the earth is to become the subgrade for riprap, sand or gravel bedding or drainfill, the voids shall be filled with material conforming to the specifications for the riprap, bedding or drainfill, as appropriate.

7. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-23 EARTHFILL

1. SCOPE

The work shall consist of the construction of earth fills required by the drawings and specifications. The completed work shall conform to the lines, grades, and elevations shown on the drawings or as staked in the field.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. Fill materials shall contain no sod, brush, roots or other bio-degradable materials. Rocks larger than 6 inches in diameter shall be removed prior to compaction of the fill.

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped a minimum of 6 inches to remove vegetation and other unsuitable materials. Foundation surfaces shall be scarified to a minimum depth of 2 inches prior to placing fill material.

Foundation and abutment surfaces shall not be sloped steeper than 1.5 horizontal to 1 vertical unless otherwise shown on the drawings.

4. PLACEMENT

Fill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by NRCS. Fill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Adjacent to structures or pipes, fill shall be placed in a manner which will prevent damage. The height of the fill adjacent to structures or pipes shall be increased at approximately the same rate on all sides.

The materials used throughout the earth fill shall be essentially uniform. Selective placement shall be as shown on the drawings or approved by NRCS.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified to a minimum depth of 2 inches before the next layer is placed.

The top surfaces of embankments shall be maintained approximately level during construction, except that a cross-slope of approximately 2% shall be maintained to ensure effective drainage.

When moving fill material from the borrow area(s) to the embankment by use of bulldozers only, the following steps shall be followed:

- Immediately after the borrow material is pushed to the embankment, it shall be spread in horizontal lifts placed parallel to the centerline of the embankment.
- Compactive effort will then be applied by operating equipment parallel to the centerline of the fill or embankment.
- Lift thicknesses shall be in strict compliance with Clause 6, below.

Sectional fills are not allowed unless they are shown on the construction drawings.

5. CONTROL OF MOISTURE CONTENT

The moisture content of the fill material shall be adequate for obtaining the required compaction. Material that is too wet shall be dried to meet this requirement, and material that is too dry shall have water added and mixed until the requirement is met.

The moisture content of the fill material shall be such that a ball formed with the hands does not crack or separate when struck sharply with a pencil and will easily ribbon out between the thumb and finger.

Earth foundations under and adjacent to concrete structures shall be prevented from drying and cracking before concrete and backfill are placed.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as possible.

6. COMPACTION

Earth fill shall be compacted by one of the following methods as specified on the plans or in Section 8, Special Specifications. If no method is specified, compaction will be in accordance with Method 1.

- Method 1 - Earthfill shall be placed so that the wheels or tracks of the loaded hauling equipment, traveling in a direction parallel to the centerline of fill, pass over the entire surface of each layer being placed. Low ground pressure vehicles shall not be used for this purpose.
- Method 2 - Two (2) complete passes of a tamping-type roller will be made over each layer. The roller shall be capable of exerting a minimum force of two hundred (200) pounds per square inch.
- Method 3 - Minimum density shall be 90% of the maximum density as determined by ASTM D 698 and as shown on the plans.

The maximum thickness of a lift of fill before compaction shall be 9 inches, unless otherwise indicated on the drawings.

Fill adjacent to structures, pipe conduits, and appurtenances shall be placed in layers not more than 4 inches thick and compacted to a density equivalent to that of the surrounding fill. Methods used to obtain compaction for fine or coarse grained materials are as follows:

- For fine grained materials, hand tamping or manually directed power tampers may be used. Hand compaction only shall be used to compact the earthfill under the bottom half of circular pipes. Manually directed power tampers shall not be used in tight spaces where applying full compactive effort will result in direct contact of the tamper plate with the pipe. Care should be taken so that compaction around the spillway pipe does not cause uplift of the pipe resulting in a void beneath the pipe.
- For coarse grained materials (sands and gravels), vibratory plate compactors shall be used for obtaining compaction. However, hand tamping shall be used to compact the material under the bottom half of circular pipes.

In all cases, follow manufacturer instructions for the specific compaction equipment being used. Heavy equipment shall not be operated within 2 feet of any structure or pipe.

Compacting of fill adjacent to concrete structures shall not be started until the concrete is 7 days old.

7. ISLANDS, MOUNDS, AND LOAFING AREAS ON WETLAND RESTORATION, ENHANCEMENT, OR CREATION PROJECTS

Islands shall be randomly located within the wetland area at locations shown on the drawings or as staked in the field. The orientation of island shorelines shall be random with attention given to prevailing winds to limit wave damage. In general, the side of the island with the longest dimension shall be parallel to the prevailing wind direction. Side slopes of islands shall be as shown on the drawings, but in no case shall be steeper than 6 horizontal to 1 vertical. Island shapes shall be irregular.

Loafing areas shall be constructed in the areas shown on the drawings or as staked in the field and shall be graded to drain runoff water. The elevation of at least one loafing area should be above the maximum water level whenever possible.

Excavated material not suitable for embankments, wetland dikes, or islands can be used to create mounds or blended into surrounding topography to create a natural appearance. Spoil material shall not be spread on existing wetland areas.

Organic soils shall not be used to construct islands, loafing areas, dikes, or embankments.

8. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-26 TOPSOILING

1. SCOPE

The work shall consist of salvaging topsoil from borrow areas or required excavations and spreading it on the exposed disturbed areas.

2. QUALITY OF TOPSOIL

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, stones, or other foreign materials.

3. EXCAVATION

After the site has been cleared and grubbed, the topsoil shall be removed from borrow areas and required excavation areas to the depth as shown on the drawings. Topsoil shall be stockpiled at locations approved by NRCS.

4. SPREADING

Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Surfaces designated to be covered shall be lightly scarified just prior to the spreading operation. Where compacted fills are designated to be covered by topsoil, the topsoil shall be placed concurrently with the fill and shall be bonded to the compacted fill with the equipment.

Topsoil shall be placed to the minimum depth shown on the drawings. After the spreading operation is completed, the surface shall be finished to a reasonably smooth surface.

5. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-45 PLASTIC (PVC, PE) PIPE

1. SCOPE

The work shall consist of furnishing and installing plastic pipe and the necessary fittings specified herein or as shown on the drawings. This specification does not cover subsurface drainage systems.

2. MATERIALS

Corrugated Polyethylene (PE) Tubing. Corrugated PE tubing and fittings shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
Corrugated Polyethylene(PE) Tubing and Fittings, Nominal Sizes 3 to 6 inch, inclusive	ASTM F 405
Large Diameter Corrugated Polyethylene Tubing and Fittings, Nominal Sizes 8 to 24 inch, inclusive	ASTM F 667
Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe	ASTMF 894

Poly(Vinyl Chloride) (PVC) Plastic Pipe. PVC pipe and fittings shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
PVC Plastic Pipe, Schedules 40, 80 and 120.....	ASTM D 1785
PVC Pressure-Rated Pipe (SDR Series)	ASTM D 2241
PVC Pressure Pipe, 4 in. through 12 in., for Water Distribution	AWWA C900
PVC Water Transmission Pipe, Nominal Diameters 14 in through 36 in.	AWWA C905

PVC and PE Plastic Pipe. Plastic pipes meant for non-potable, livestock water supply shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
Polyethylene (PE) Plastic Pipe, (SIDR-PR) Based on Controlled Inside Diameter.....	ASTM D 2239
PVC Pressure-Rated Pipe (SDR Series)	ASTM D 2241

3. FITTINGS AND JOINTS

Pipe joints shall conform to the details shown on the drawings. Pipe shall be installed and joined in accordance with the manufacturer's recommendations.

Joints may be bell and spigot type with elastomeric gaskets, coupling type with elastomeric gasket on each end, or solvent cemented. Gaskets shall conform to ASTM D 1869. Solvent cemented joints shall not be used for pond spillway pipes. Solvent cemented joints for PVC pipe and fittings shall be in accordance with ASTM D 2855. When a lubricant is required to facilitate joint assembly, it shall be a type having no detrimental effect on the gasket or pipe material.

Mechanical joints (split couplings and snap couplings) may be used when joining PE pipe and fittings when the pipe is used for non-pressure flow and a free draining sand or gravel bedding material is provided. Elastomeric-sealed mechanical joints shall be used when joining PE pipe and

fittings under pressure flow or where seepage cannot be tolerated. Where non-pressure pipe is specified, the fittings shall be of the same or similar materials as the pipe and shall provide the same durability and strength as the pipe.

A special case of livestock water supply involves pipes through a dam or embankment. Only PE pipe meeting the above specification may be used. PE pipe, of 1 ¼, 1 ½, or 2-inch diameter shall be installed so that there are no joints within the embankment area.

Where pressure pipe is specified, fittings shall have a design capacity equal to or exceeding that specified for the pipe to which it is attached. Fittings shall be cast iron, steel, one piece injection molded plastic fitting or fabricated from plastic pipe and one piece injection molded plastic fittings. Pressure pipe fittings shall conform to the requirements of the applicable specification listed below.

<u>Kind of Fitting</u>	<u>Specification</u>
Threaded PVC Plastic Pipe Fittings, Schedule 80.....	ASTM D 2464
PVC Plastic Pipe Fittings, Schedule 40.....	ASTM D 2466
PVC Plastic Pipe Fittings, Schedule 80.....	ASTM D 2467
Butt Heat Fusion (PE) Plastic Fittings for PE Plastic Pipe and Tubing	ASTM D 3261
Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.....	ASTM D 3139
PVC Pressure Pipe, 4 in. through 12 in., for Water Distribution	AWWA C900
PVC Water Transmission Pipe, Nominal Diameters 14 in through 36 in.	AWWA C905

4. HANDLING AND STORAGE

Pipe shall be delivered to the job site and handled by means which provide adequate support to the pipe and does not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal surfaces or rocks). All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40 degrees F (4.4 degrees C) or less.

Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically coated to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for a period of 15 days or longer.

5. TRENCHING

Plastic pipe conduits shall be installed in trenches or plowed in according to the following methods:

- A. **Trencher Constructed** - When conditions permit, trenching for pipelines, which are buried from 5 to 6 feet deep, are usually done with a narrow 4 to 6 inch wide chain trencher. Where there is little gravel and the ground is not too wet, these trenchers bring up well pulverized soil that makes good backfill material. Where rocks are not present, any of this material may be backfilled directly around the pipe. There is no practical way to compact the fill in these narrow trenches. The owner must be made aware that this material normally consolidates to its maximum extent in two to five years, but depressions or low spots can be hazards to livestock, humans and equipment.
- B. **Backhoe Constructed Trench** – Backhoe trenches are usually a minimum of 12 inches wide. The material frequently comes out of the trench as clods, large chunks, and rocks. Immediately backfill over the pipe with 4 to 6 inches of soil that is free of these clods, large chunks, and rocks. If adequate excavated material is not available, then material such as sand or fine gravel should be imported and placed around the pipe to a depth of 4 to 6 inches over the top of the pipe. Fill the trench with the remaining excavated material.

- C. **Plowing** – Plowing, or ripping, is a trenchless method for installing plastic pipe. It is a multi-stage process consisting of positioning a vibrating or static (non-vibrating) plow equipped with a trailing product guide which feeds pipe to the depth setting of the plow as it moves forward. The pipe is inserted into the ground continuously along a predetermined path and depth. The vertical depth of installation is controlled by hydraulic adjustment of the plow shear head and the surface contours. The depth of insertion must be continually adjusted to compensate for changes in terrain.

6. LAYING AND BEDDING THE PIPE

Plastic pipe conduits and fittings shall be installed as shown on the drawings and specified herein. The pipe shall be laid so that there is no reversal of grade between joints, unless otherwise shown on the drawings. The pipe shall be placed with the bell end upstream, unless otherwise specified. The pipe shall be carefully placed on the bedding or into the pipe trench.

Care shall be taken to prevent distortion and damage during unusually hot (over 90 degrees F) or cold weather (under 40 degrees F). After the pipe has been assembled in the trench, it shall be allowed to reach ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

The pipe ends and the couplings shall be free of foreign material when assembled. During the placement of the pipe, each open end of the pipeline shall be closed off by a suitable cover or plug at the end of work on the pipeline each day and until work resumes or installation is complete.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions when the pipe is laid.

Pipe shall be firmly and uniformly supported throughout the entire length. Bell-holes shall be made in the bedding under bells or couplings and other fittings to prevent the pipe from being supported by fittings.

- a. Earth Bedding. When bedding is specified, the pipe shall be firmly and uniformly bedded in a shaped bedding groove that closely conforms to the bottom of the pipe for a depth equal to a minimum of 1 inch or 5 percent of the diameter of the pipe, whichever is greater. The bedding material shall be free of rocks or stones greater than 0.5 inch diameter and earth clods greater than 2 inch diameter.
- b. Sand or Gravel Bedding. When sand or gravel bedding is specified, the pipe shall be firmly and uniformly placed on a sand or gravel bed. Sand or gravel fill shall be carefully placed and compacted as specified herein and as shown on the drawings.

A few installations of above ground pipelines have been noted. These installations are normally laid directly on the ground and very close to an existing fence line for protection. Only those pipelines designed to withstand exposure to ultraviolet radiation may be utilized for these installations. Adequate thrust control shall be incorporated in these installations.

7. BACKFILL

The pipe shall be held down during backfilling to the top of the pipe to prevent its being lifted from its original placement.

Within 2 feet of the pipe, backfill shall be carefully placed and compacted by means of hand tamping or manually directed power tampers or plate vibrators to form a continuous uniform support around the pipe. Maximum thickness of layers before compaction within 2 feet of the pipe shall be 4 inches and at more than 2 feet from the pipe a maximum thickness before compaction shall be 9 inches. Unless otherwise specified, the initial backfill shall be compacted to a density equivalent to that of the adjacent fill or foundation materials.

The water content of cohesive backfill material shall be such that, kneaded in the hand, the soil will form a ball which does not readily separate. For non-cohesive sand and gravel backfill material, water content is not a concern for thin lifts.

8. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-51 CORRUGATED METAL PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and placing circular, arched or elliptical corrugated metal pipe and the necessary fittings.

2. MATERIALS

Metallic-coated steel corrugated pipe and fittings shall be zinc-coated or aluminized, Type 2, and shall conform to the requirements of ASTM A 760 and A 929 for the specified type and size of pipe. Aluminum corrugated pipe shall conform to the requirements of ASTM B 745 for the specified type and size of pipe. All pipe is subject to the following additional requirements:

- A. When polymer coating is specified, pipe, coupling bands and anti-seep collars shall be coated in accordance with ASTM A 762. All riveted joints shall be caulked as described in paragraph B.
- B. Pipe with annular corrugations shall be furnished with caulked seams. Riveted pipe joints shall be caulked with a bituminous mastic material during fabrication to provide a watertight joint. All circumferential and longitudinal seams shall be caulked before riveting. This shall be accomplished by applying a uniform bead of the mastic compound to the inner lap surface before riveting such that when the rivets are in place, all voids are filled and a coating of mastic is between the lap surfaces. The inner surface of coupling bands shall be asphalt coated in the field prior to installation. A neoprene gasket having a minimum thickness of 3/8 inch and a minimum width of 7 inches may be used in lieu of mastic coated coupling bands.
- C. Welded or lock seams in helical corrugated pipe are considered to be watertight.
- D. When close riveted pipe is specified: (1) the pipe shall be fabricated so that the rivet spacing in the circumferential seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe, and (2) in those portions of the longitudinal seams that will be covered by the coupling bands, the rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating off the coupling bands.
- E. Double riveting or double spot welding of pipe less than 42 inches in diameter may be required. If specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

3. COUPLING BANDS

Coupling bands shall meet the requirements of the table below or have detailed drawings submitted for approval by the State Conservation Engineer. Coupling bands shall be of the same minimum thickness (gage) as the pipe being connected.

Description of Coupling Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
24-inch wide coupling band with four 1/2-inch Diam. galvanized rods with tank lugs for annular or helical corrugated metal pipe. Bands shall have a minimum lap of 3 inches.	All	All
Hugger band from Armco Steel Corp. for helical corrugated metal pipe with reformed ends; and for annular corrugated pipe. Bands include O-ring gaskets and two 1/2-inch Diam. galvanized rods and lugs. ^{1/}	35	48
Hugger band without rods and lugs but including O-ring gaskets. ^{1/}	20	24
Angles riveted or welded to a coupling band and drawn tight with bolts. Bands shall be a minimum of 7 corrugations wide and have a minimum lap of 2 inches.	35	15
Flanged couplings for helical corrugated pipe welded to the ends of the pipe and field assembled by a minimum of 3/8-inch Diam. bolts. A joint sealer shall be placed between the flanges to ensure water tightness.	25	12

^{1/} Use is limited to sites where soft foundation and conduit elongation is not anticipated.

4. FABRICATION

Fabrication of all appurtenances shall be done as shown on the drawings. All appurtenances shall be made of metallic-coated steel when corrugated steel pipe is used and aluminum when used with aluminum pipe. Dissimilar metals shall not be installed in contact with each other.

5. REPAIR OF DAMAGED COATINGS

The Contractor shall place the pipe without damaging the pipe or coatings. The pipe shall be transported and handled in a manner to prevent damage to the pipe or coating.

Breaks, scuffs, or other damage to the various coatings shall be repaired as follows:

- A. Metallic Coating - by thoroughly wire brushing the damaged area and cleaning with solvent, and then painting two coats of one of the following paints:
 - (1) Zinc Dust - Zinc Oxide Primer conforming to ASTM D 79 and D 520.
 - (2) Single package, moisture cured urethane prime in silver metallic color.
 - (3) Zinc-rich cold galvanized compound, brush, or aerosol applications.

- B. Polymer Coating - apply two coats of polymer material similar to and compatible with the durability, adhesion and appearance of the original polymer coating. The repair coating shall be a minimum thickness of 0.010 (10 mils) after drying and shall bond securely to the pipe.

6. LAYING AND BEDDING THE PIPE

The pipe shall be laid to the line and grade shown on the drawings and shall be firmly and uniformly bedded throughout its entire length. Details of the bedding are as shown on the drawings.

The pipe shall be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides at approximately the vertical mid-height of the pipe. Field welding of corrugated galvanized steel pipe will not be permitted. The pipe sections shall be joined with coupling bands.

7. BACKFILLING

Special care shall be taken during backfill operations not to disturb the grade and alignment.

The pipe shall be tied down or loaded sufficiently during backfilling around the sides to prevent its being lifted from the bedding.

Backfill material shall have sufficient moisture so that optimum compaction can be obtained. Backfill around the pipe shall be placed in layers not more than 4 inches thick before compaction.

Each layer of backfill shall be compacted with power tampers, hand tampers, or plate vibrators to the same density requirements as specified for the adjacent embankment. Backfill over and around the pipe shall be brought up uniformly on all sides. The passage of earth moving equipment will not be allowed over the pipe until backfill has been placed above the top of the pipe surface to a depth of two (2) feet.

8. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-61 LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments, structures and blankets, including filter layers or bedding where specified.

2. MATERIALS

Rock for loose rock riprap, filter layers or bedding shall come from sources approved by NRCS. The rock shall be excavated, selected and handled as necessary to meet the quality and grading requirements of this specification and the construction drawings.

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to sub rounded in shape. The least dimension of an individual rock fragment shall not be less than 1/3 the greatest dimension of the fragment unless otherwise specified on the construction drawings.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap or bedding is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall be compacted to a density equal to the adjacent existing soil material.

Rock materials shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by NRCS.

4. EQUIPMENT-PLACED ROCK RIPRAP

Rock shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be constructed to the full thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact, one to another, with the smaller rocks and spalls filling the voids between the larger rocks. Placement of rock shall begin at the bottom of the slope or downstream end of the structure.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to adjacent structures.

5. HAND-PLACED RIPRAP

Rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact, one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge unless otherwise specified. Placement of rock shall begin at the bottom of the slope or downstream end of the structure.

6. FILTER LAYERS OR BEDDING

When the drawings specify filter layers or bedding beneath riprap, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

7. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-81 METAL FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of furnishing, fabricating, and installing metalwork including metal parts of composite structures.

2. MATERIALS

Steel shall be of structural quality. Finished surfaces shall be smooth and true to assure proper fit.

Bolts, nuts, washers, rods, rivets, etc., shall be of a material equal to the steel being fastened.

3. PROTECTIVE COATINGS

Protective coatings will consist of either galvanizing or painting and shall be applied by the fabricator.

Galvanizing shall consist of a zinc coating by the hot dip process, except that bolts, nuts, and washers may have a electrodeposited zinc coating.

Paint System for this specification shall consist of the application of one coat of Epoxy Polyamide Primer (lead and chromate free) and one or more coats of Epoxy Polyamide (intermediate or finish), lead free. When finished, it will have a minimum dry film thickness of 8.0 mils.

4. FABRICATION

Materials shall be carefully fabricated as shown on the drawings. The fabrication shall be smooth and true to assure proper fit. Galvanized items shall not be cut, welded, or drilled after the zinc coating is applied.

5. ERECTION

The metal shall be erected true and plumb, closely conforming to the drawings.

6. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-92. FENCES

1. SCOPE

The work shall consist of furnishing and installing fences, including gates and fittings.

2. STANDARD FENCE

Barbed wire fences shall have a minimum of 4 wires for farm borders. A minimum of three wires shall be used for interior fencing, cross fencing, or excluding livestock from special areas such as wildlife area, forested tracts or other special use areas. Wires shall be spaced approximately an equal distance apart. The top wire shall be at least 42 inches high and 2 inches below the top on wood posts and 1 inch below the top on steel posts. The bottom wire shall be 18 inches or less above the ground level. Wire shall be spaced no more than 12 inches apart.

Each barbed wire shall consist of 2 twisted strands of either 12 ½ gauge wire or 15 ½ gauge high tensile strength wire. The barbs shall be either 2-point barbs on approximately 4 inch centers or 4-point barbs on approximately 5 inch centers. Wire shall be stretched and attached after the posts are properly set and backfilled. Attach wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

Top and bottom strands of woven wire shall be a minimum of 12 ½ gauge. Wire for intermediate strands shall be 14 1/3 gauge or heavier. Fences with woven wire 32 inches or less in height shall have at least 2 barbed wires above the woven wire spaced 8 to 12 inches apart. Fences constructed with woven wire higher than 32 inches shall have at least 1 barbed wire 8 to 12 inches above the woven wire. The base of the woven wire shall be placed near the ground surface. The top wire shall be at least 42 inches above the ground level and 2 inches below the top of wood posts and 1 inch below the top of steel posts. All wire shall be galvanized. . Wire shall be stretched and attached after the posts are properly set and backfilled. Attach wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

Staples shall be 9 gauge steel or heavier with a minimum length of 1 ½ inches for soft woods and a minimum length of 1 inch for close grained hardwoods. Drive staples diagonal to the grain of the wood and at a slight downward angle. Space should be left between the staple and the post to permit free movement of the wire. Wires may be attached to steel posts by use of manufacturer's clips or by 14 gauge galvanized wire twisted at least two turns.

All wooden posts (except red cedar, Osage orange, or black locust) shall be treated with pentachlorophenol, creosote, or chromated copper arsenate (CCA) by a method that ensures complete penetration of the sapwood. At least half of the diameter of red cedar shall be heartwood. Quality of treated wood shall provide sufficient strength and quality to last for the expected life of the fence.

All corner posts, gate posts, end posts, pull posts and brace posts normally shall be wood with sufficient length for the construction of at least a 42 inch high fence and permit setting the post at least 36 inches deep. Earth backfill shall be thoroughly tamped. On areas where soil depth is restricted to less than 36 inches, additional anchors or deadman applied against the direction of pull may be needed. Wood posts shall have a minimum top diameter of 5 inches. A 2-½ inch steel pipe with appropriate bracing or set in concrete of sufficient depth also may be used. Reinforced concrete or metal posts of equivalent strength may be substituted if they have suitable means of attaching wires and braces.

The maximum spacing of line posts shall be one rod (16.5 feet). Wood line posts shall have a 3 inch top (2 ½ inch for Osage orange). Wood line posts shall have a minimum length of 6 ½ feet and shall be set or driven to a minimum depth of 24 inches where conditions permit. When posts are set, earth backfill shall be thoroughly tamped. Steel line posts shall weigh not less than 1.33 pounds per foot and shall have a steel anchor plate securely fastened to the plate. The posts shall be “T”, “U”, or “Y” shaped and have corrugations, knobs, studs, or grooves suitable for fastening fencing to the posts. Steel posts shall be rolled from high carbon steel and shall have a protective coating; either galvanized by the hot dip process, painted with one or more coats of high grade weather resistant paint for steel, or enameled and baked. Steel line posts shall be at least 6 feet in length and shall be set in the ground a minimum of 20 inches. Steel posts shall be used as line posts at least once every 6 rods (99 feet) to act as a ground for lightning protection.

End bracing will be installed at locations where the fence ends and on both sides of gate openings. Corner bracing should be installed where fence alignment changes 15 degrees or more. Bracing is required at all corner, gate, pull and end assemblies in a fence. The brace member shall be the equivalent of a wood post with at least a 3 ½ inch diameter at the top or standard weight 2 inch diameter galvanized steel pipe. The brace shall be at least 3 feet above the ground and at least 8 inches below the top of the post. The brace member shall be 6 to 8 feet in length. A brace wire consisting of 2 complete loops of 9 gauge smooth wire, 2 loops of barbed wire or a single loop of 12 ½ gauge high tensile strength wire shall be installed. “H” braces or angle braces as shown in figure 3 will be used in standard fences.

Pull post assemblies consisting of three posts with braces shall be installed in straight reaches of fence at intervals 660 feet (40 rods), at any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 percent and at the beginning and end of each curve.

For a narrow ditch or draw crossing with slopes steeper than 8 feet horizontal to 1 foot vertical, the fence shall be anchored with a concrete anchor weighing at least 150 pounds and buried with at least 18 inches of cover or a commercial screw-in type metal anchor 5 inches in diameter and not less than 48” long to position the fence to the contour of the ditch or draw.

Wire gates shall be made of the same materials as used for the fence. Panel or tube type gates shall be equivalent in quality to the fencing material and shall be fitted with at least two hinges and a latch or galvanized chain for fastening.

3. CHAIN LINK FENCE

Chain link fence, fabric, posts, top rails, braces, gates and accessories shall conform to the requirements of ASTM Specifications types, classes and materials listed below. The fence shall be constructed in a workmanlike manner.

Fabric shall be ASTM A392, 2-inch mesh, 9 gauge galvanized steel wire. Zinc coating shall be Class 2. Fabric shall be 60 inches in height. Fabric shall not be stretched until at least 4 days after the posts are set in concrete backfill or grouted in concrete walls. A stretcher bar of the same length as the fabric width shall secure each end of each run of fabric. The bar and fabric shall be stretched taut and secured to the end post by tension bands equally spaced not more than 15 inches apart. The fabric shall be attached to all braces; the top rail, all line posts and the tension wire by wire ties or clips at intervals not exceeding two feet.

Posts and fence framework shall conform to the requirements of ASTM F1043 Group 1A, for Heavy Industrial Fence. Coatings shall be type A galvanized coating both internal and external surfaces. Steel pipe for posts shall conform to the requirements of ASTM F1043 and F1083. The minimum diameter of end, corner, and pull posts shall be 2 3/8 inches. Line posts shall be at least 1.9 inches in diameter. Gate posts shall have a minimum diameter of 2 7/8 inches. The maximum spacing of line posts shall be ten feet. Post holes shall be at least 6 inches in diameter and 18 inches deep for line posts and 24 inches for corner, end, pull and gate posts. All posts shall be set in concrete backfill. Concrete shall completely fill the annular space around the posts and shall be neatly finished to slope

up to the post approximately 1 ½ inches above the ground surface. Pull posts shall be located in long straight runs of fence at intervals of 500 feet or less. Posts set in concrete walls shall be grouted into preformed holes at least 12 inches in depth. Where posts are installed in highly corrosive soils such as disturbed mine spoil, the posts shall be vinyl coated in addition to the above requirements and set in concrete poured inside a 6 inch clay tile or plastic tubing at least 24 inches long.

When used, **braces and top rails** shall be installed horizontally at the height shown on the drawings or recommended by the manufacturer. See previous paragraph for specifications. Braces and top rails shall be attached to the posts by suitable fittings, as recommended by the manufacturer. When the brace has been placed, a 6 gauge double truss galvanized steel wire with adjustable tightener and fittings shall be attached to the corner post just below the brace and to the brace post approximately 4 inches above ground level. A similar truss wire shall be attached to brace post just below the brace and to the corner post approximately 4 inches above ground level. A 7 gauge galvanized steel tension wire, tightened by mechanical means, shall be placed approximately 4 inches from the ground level. A similar tension wire shall be placed at the top of the fence if a top rail is not used.

Gates, gateposts and gate accessories shall conform to the requirements of ASTM F900. Coating shall be the same as the adjoining fence and framework.

4. HIGH TENSILE WIRE (HTW) FENCE

HTW fence shall have a minimum of eight smooth strands of galvanized 12 ½ gauge **wire** with not less than 0.8 ounce of zinc per square foot of wire surface and a tensile strength of 200,000 pounds per square inch. Each strand of wire shall be strung to a tension of not less than 250 pounds. The top wire shall be 48 to 54 inches above the ground surface. The bottom wire shall not be more than 6 inches above the ground surface. The wire shall be fastened on a direct line splice with enough nicopress sleeves that the accumulated strength of the sleeves exceeds the tensile strength of the wire. End wrap splices shall be fastened with two nicopress sleeves. Splices may also be made with other products used as directed by the manufacturer.

Posts shall be the same size and material as posts for standard fences. Line posts shall be spaced not more than 30 feet apart with spacer made of wood or fiberglass spaced at not more than 15 feet from either post. Corners, pull assemblies, ends and gates shall have a double assembly consisting of three driven posts with horizontal braces. Each assembly shall be further braced with a double wrap of high tensile wire (see attachment A).

5. PERMANENT HTW ELECTRIC FENCE

Permanent HTW electric fences are constructed with the intent of being in place for years. It is the equivalent of any non-electric permanent fence. Electric fences provide psychological deterrent rather than a physical barrier to livestock and wildlife. To be effective, a shock of at least 1,000 volts must be delivered to cattle, 2,000 volts to sheep and 2,500-3,000 volts to deer, dogs, and coyotes.

Wire shall be a single strand of 12 ½ gauge or larger with a minimum tensile strength of 110,000 pounds per square inch. The wire shall galvanized (Type III) or aluminum or copper clad. Barbed wire should not be used on electric fences because of safety hazard. Wire will be attached to the posts by a method that allows them to slip. Wires will be attached to stays in a manner that prevents stay slippage along the fence. The tension of each wire shall be sufficient to maintain the wires at the appropriate height. Suggested wire heights and spacing are shown by intended use in the following table:

Fence Description	Number of Wires	Wire Height (In.)
<u>Internal/Cross Fence</u>		
Cow /calf & stocker	1 wire	30 to 34
Hogs	1 wire	12
Cow /calf & stocker	2 wire	22;32
Sheep and cattle	3 wire	10; 20; 32
Sheep and cattle	4 wire	10; 20;32;46
<u>Perimeter Fence</u>		
Cattle, horses, sheep (Non-predator)	5 wire	10; 20; 30; 40; 50
Sheep, goats (Predator)	8 wire	4; 8; 12; 18; 24; 30; 40; 52

Electronic energizers of power fence controllers shall be installed according to manufacturer's recommendations. The energizers shall be high power, low impedance with 5,000 volt peak output and a pulse that is less than 300 mAmps in intensity, finished within 0.0003 of a second and at a rate of 35-65 pulses per minute. Energizers shall be provided with high impact, weather resistant cases. Circuitry shall be solid state. Service modules shall be snap-in for fast field repair. A safety fuse to prevent over pulsing shall be provided. The system shall be 110 volt, 220 volt or 12-volt battery powered. The battery-powered system shall be capable of working for at least 3 weeks without replacing the battery. If the length of the fence requires more than 4 joules (watts times seconds equals joules), a solar charger will be needed for 12 volt systems. The energizer shall be capable of producing one joule for each mile of planned fence when average energy loss is expected.

All electric fences must be properly grounded. The energizer ground wire should be connected to a galvanized pipe or rod ½ inch or larger in diameter. Bury 3 feet of ground rod for each joule of energy output. Ground rods should be buried where soil remains moist for best results. Ground rods should be driven into the ground at least 10 feet apart when multiple rods are necessary to provide the required length of ground rod. Normally individual ground rods will be driven no more than 6 to 8 feet into the ground. Connect a continuous ground wire from the energizer to each ground rod with aluminum or galvanized steel clamp. If energizer terminals are not stainless steel or copper, do not use copper ground rods due to corrosion at the connection and subsequent loss of electrical continuity. Copper rods with copper wire may be used if energizer terminals are stainless steel or copper. Use copper clamps with copper wire and copper rods.

The ground wire(s) of the fence may be connected to the same ground as the energizer or to a separate ground with the same size and depth requirements. More ground rods may be needed for the system to function properly. Do not use the grounding system for other existing applications, such as power poles, breaker boxes and milk barns,. At least 25 feet should separate the fence grounding system from any other grounding system.

Lightening can cause damage to the energizer. Most energizers are poorly protected from damage caused by lightning. External **lightning arrestors** and an induction loop (lightning choke) should be installed for added protection. Lightning arrestor grounding rods should be placed at least 65 feet from those of the energizer (See attachment B).

Install an additional set of ground rods and attach to a lightning arrestor. The lightning arrestor ground must be better than the energizer ground for it to function properly, because lightning will seek the path of least resistance to ground. Use at least 1 more ground rod on the arrestor than was used on the energizer. Attach the lightning arrestor to the wires of the fence. Install a lightning choke in the fence line immediately between the lightning arrestor and the energizer.

For protection of energizers, it is recommended that for 120 or 240-volt energizers that a voltage **spike protector** be used. Also, a ground rod should be installed at electric company's transformer pole (primary ground) and another ground rod installed at the electrical circuit breaker box (secondary ground), if they do not exist. Additionally, a surge protector should be installed between the energizer and power supply.

Insulation used for positive charged wire(s) must be high-density polyethylene with ultra-violet stabilizer or high-density polypropylene with ultra-violet stabilizer.

Braces and end assemblies are required at all corners, gates and angles in the fence line (See attachment A for criteria on corners, angles, and brace assemblies.)

For 1 and 2 wire fences, corner, gate, end and brace assemblies use one of the following:

- Steel "T" post that are a minimum of 1.25 pounds per foot of length, with appropriate knee, deadman, angle or H-brace.
- Wood posts with a minimum top diameter of 3.5 inches set two feet in the ground with appropriate knee, deadman, angle, or H-brace.
- Wood, steel pipe or fiberglass post with a minimum top diameter of 5 inches, set to a depth equal to, or greater than, the height of the post above the ground without bracing.
- Steel pipe or fiberglass posts with a minimum diameter of 2 inches, set 2 feet in the ground with appropriate knee, angle, or H-brace, deadman or anchor plate.
- Steel pipe or fiberglass posts with a minimum diameter of 2 inches and set in concrete to a depth of 2 feet.
- Steel pipe or fiberglass posts with a minimum diameter of 1 inch with appropriate angle bracing and sufficient ground anchoring to maintain wire tension while remaining erect and firmly anchored.

For 3 or more wire power fences; corner, gate, end and brace assemblies will be either a floating angle brace or H-brace assembly. Posts will be 4-inch nominal wood, 2-inch nominal steel pipe (capped), 2-inch fiberglass or steel "T" posts with appropriate appurtenances for corner and end bracing. Posts must be set a minimum of 2 feet in the ground.

All wood posts shall be at least 2 inches higher than the top wire of the fence. Posts of any other material shall be at least 1 inch higher than the top wire of the fence.

Line post and stays will be either:

- Australian ironwood (eucalyptus) at least 2 inches in diameter; fiberglass, rigid plastic and PVC solid round sucker rod of at least 5/8 inch diameter, or fiberglass "T" post and stays of at least 1 inch in cross-section. Attach wire to the post with loose wire clips or run the wire through holes in the post. Attach the wire to stays with tight clips.
- Wood posts at least 3 inches in diameter of black locust, red cedar, Osage orange, redwood, pressure treated pine or any other wood of equal life and strength may be used. At least one half of the diameter of the red cedar and redwood post shall be heartwood. Pressure treated posts shall be treated with pentachlorophenol, creosote, or chromated copper arsenate (CCA) by a method which ensures the complete penetration of the sapwood. Insulators shall attach wire.
- Steel "U" or "T" posts that are a minimum of 1.25 pounds per foot of length. Wire shall be attached with insulators.

Posts for one or two wire fences shall be long enough to be set at least 18 inches in the ground, except that in soils which are sandy loam or coarser in texture, the posts shall be set at least 24 inches into the ground. Posts for 3 or more wire fences shall be set at least 24 inches into the ground. Posts in dips shall be constructed so that they do not pull out of the soil. Posts 2 inch or smaller shall be anchored. Wood posts shall be set to a depth sufficient to resist pull out.

Wood posts shall be at least 2 inches higher than the top wire on the fence. All other posts shall be at least 1 inch higher than the top wire of the fence.

Spacing of the line posts and stays depends on the terrain and the number of wires. Maximum spacing is as follows

- One or two wire fences may have line posts spaced up to 100 feet apart with no stays. Line posts may be spaced 150 feet apart with stays every 50 feet between the posts
- For three and four wire fences, the line posts may be spaced every 50 feet with no stays or every 150 feet with stays at spacing of not more than every 50 feet.
- Fences with more than 4 wires shall have posts and stays spaced every 30 feet, with posts not further apart than every 90 feet.
- In undulating terrain, space posts and stays as needed to maintain the fence height.

Insulators for conductive material posts, end, corner and angle braces shall be high-density polyethylene with ultra-violet stabilizer, high density polypropylene with ultra-violet stabilizer, or porcelain. All insulators shall be capable of withstanding 10,000 volts or more of current leakage. Red insulators attract hummingbirds and should not be used.

Electrified **gates** may be constructed of a single straight wire, galvanized cable, or polytape with a insulated spring loaded handle or an expandable, coiled, high tensile, 12 ½ gauge wire attached to an insulated handle. The number of wires shall be determined by the objective of the fence. The gate shall be constructed so that it is non-electrified when the gate is open. Overhead or underground transmission lines will be used to carry electricity past the gate to the remainder of the fence.

Use insulated galvanized wire for crossing gates and areas where an electrical shock to livestock and humans is undesirable. All underground wires must be insulated for a minimum of 15,000 volts. Insulated underground wire should be specifically designed for high voltage electric fence. The insulation shall be high-density polyethylene with ultra-violet stabilizer or high-density polypropylene with ultra-violet stabilizer. Placing buried wire inside plastic pipe helps to decrease the likelihood of short-circuiting. Overhead transmission lines shall be at a height where the lines do not impeded movement of livestock or equipment.

An electrified **floodgate** may be used in lieu of a non-electrified gate if desired. The electrified floodgate should be constructed by stretching an electrified wire across the drainage above the high water level. Attach droppers of 12 ½ gauge high tensile fence wire, galvanized cable or galvanized chains to the electrified wire at a spacing of 6 inches for sheep and 12 inches for cattle. The droppers shall be extended to approximately 6 inches above normal water level. Connect gate to electric fence with a double insulated cable through a cutoff switch and flood control gate controller. If flooding is expected to last for an extended period of time, switch the floodgate off. (See attachment C).

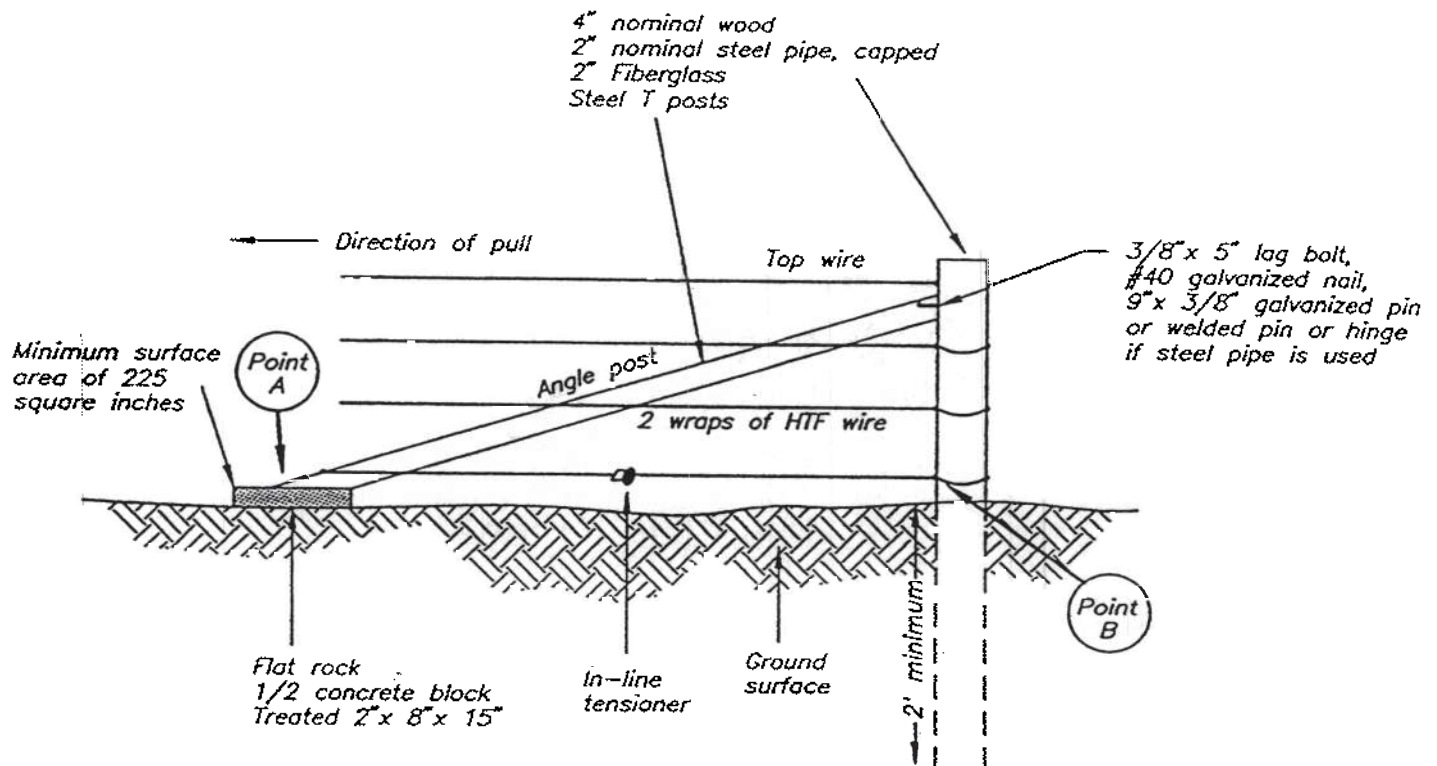
Other materials of equivalent strength, durability and design may be used.

6. TEMPORARY ELECTRIC FENCE

Temporary electric fencing is constructed with the intent of being left in place for only a short period of time. The fence is not intended as a substitute or equivalent of permanent fence. The temporary fence requires materials, design and construction that will accomplish the intended purpose and last for the planned time period with no more maintenance than is desired.

Many companies market portable fence systems that use materials such as polyethylene wire and tape with steel or aluminum wire woven into them, aluminum wire, plastic and fiberglass posts, reels to roll up wire, and battery operated energizers that are high voltage and low impedance (see previous section on energizers). A minimum of six strands of steel or aluminum wire should be woven into the polywire or polytape. Temporary fences may be attached to permanent fences to subdivide pasture. Follow manufacturer's directions for construction, use and operation of temporary electric fences

7. SPECIAL SPECIFICATIONS

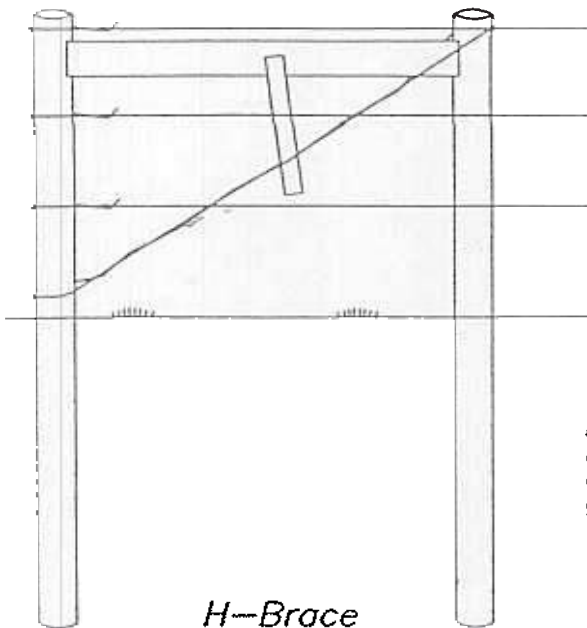


Note:
Distance from point A to B shall be a minimum twice the height between the top wire and the ground surface.

Single Post End Brace (Floating Angle Brace) Assembly

Figure 1

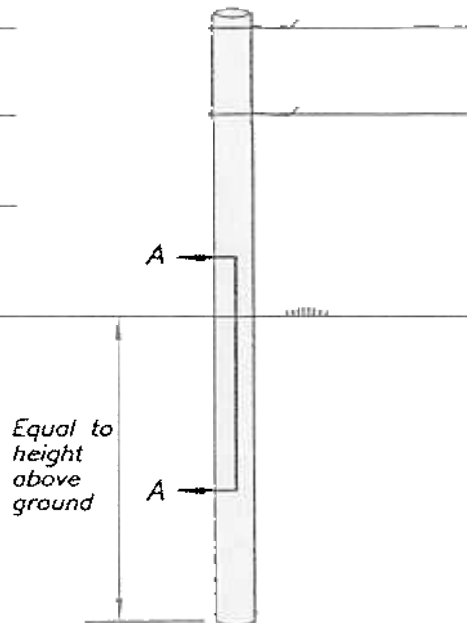
Attachment A



H-Brace

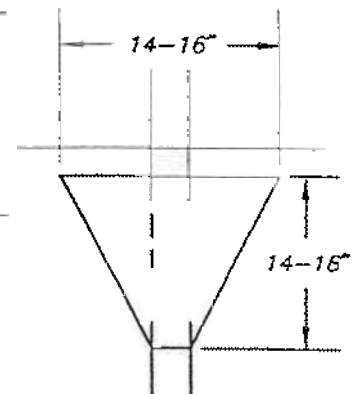
Note:
Same sizes
with bracing
(See Figure 1)

Use H or Diagonal Braces with fences
having over 2 wires or where pull
distances is > 660 feet.



Single Post Assembly

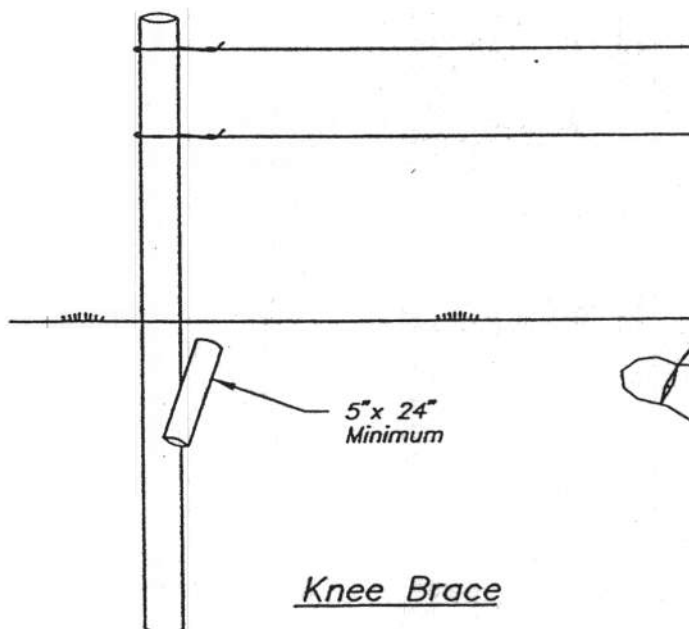
Single Post--No brace with
wood, fiberglass, or steel pipe
with a minimum top diameter
of 5" set to depth greater
than or equal to the height
of the post above ground.



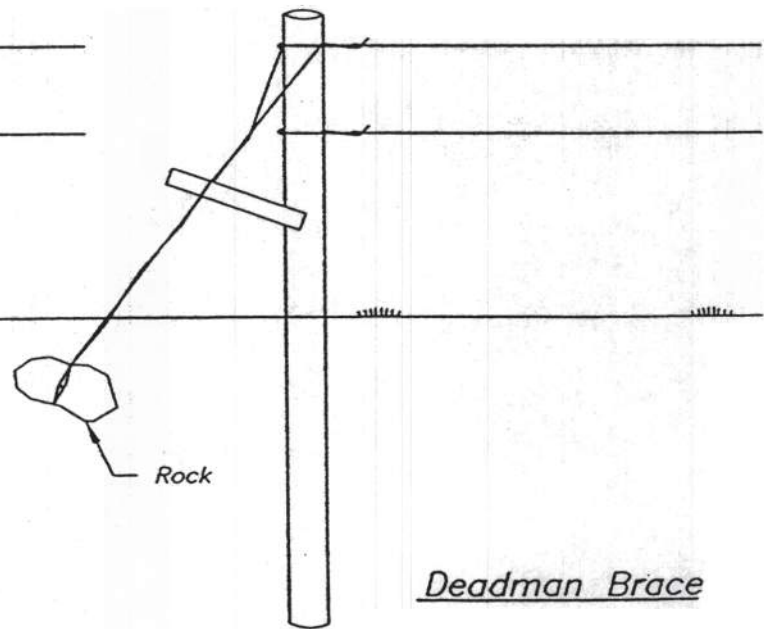
SECTION A-A

Alternate Single
Post Assembly

Single steel post with a
minimum nominal diameter
of 2" set in ground 1/2
the length of the post with
anchor plate, knee brace or
deadman.



Knee Brace

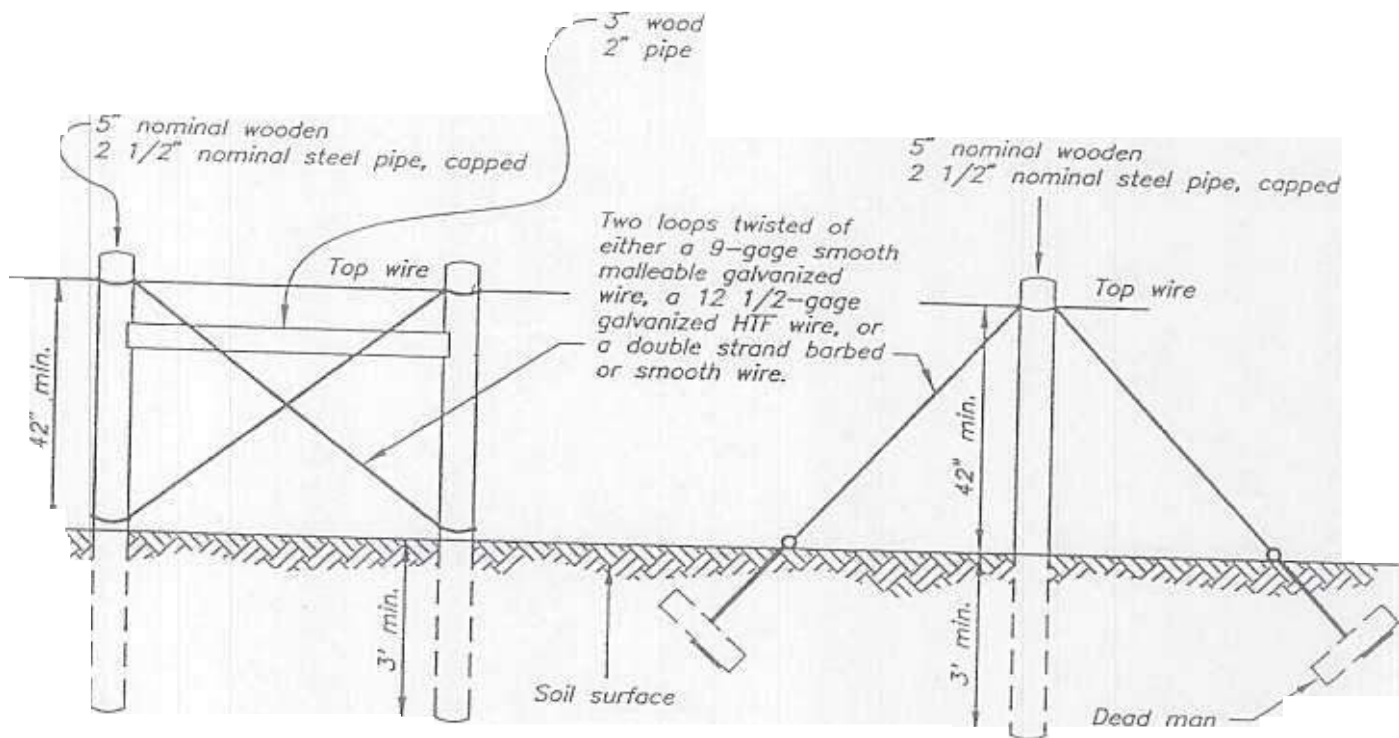


Deadman Brace

Knee or Deadman Braces may be used on fences with
2 wires or where pull distances is < 660 feet.

Electric Fencing Bracing Alternatives

Figure 2



H-Brace
Pull Assembly

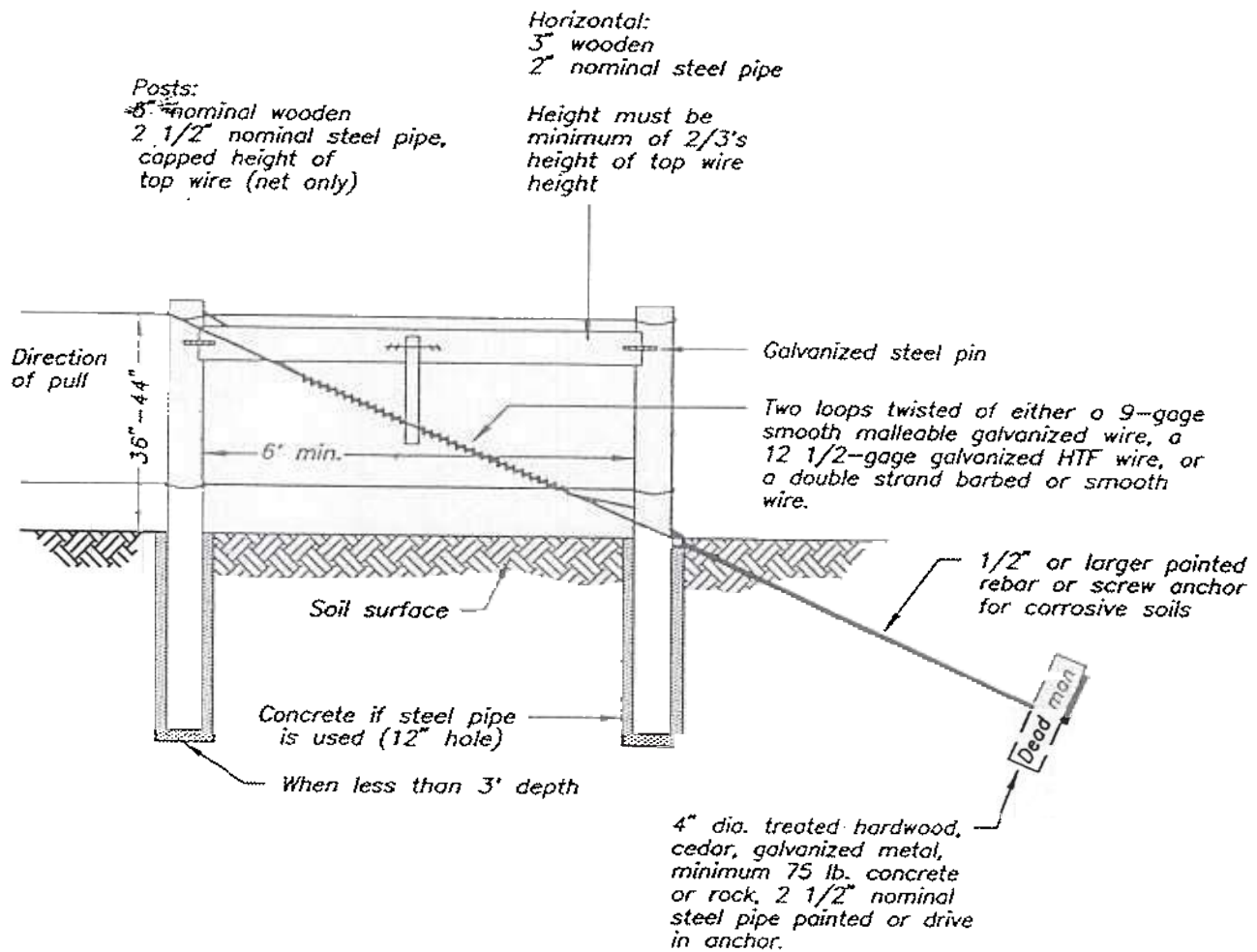
(a)

Single Post
Pull Assembly

(b)

*Standard Suspension Fence,
Corner and Pull Assembly*

Figure 3



Materials: Post must be new eastern red juniper, blueberry juniper, bois-d'arc, treated pine, treated hardwood, or steel pipe (cemented). Used steel pipe is acceptable and must be painted.

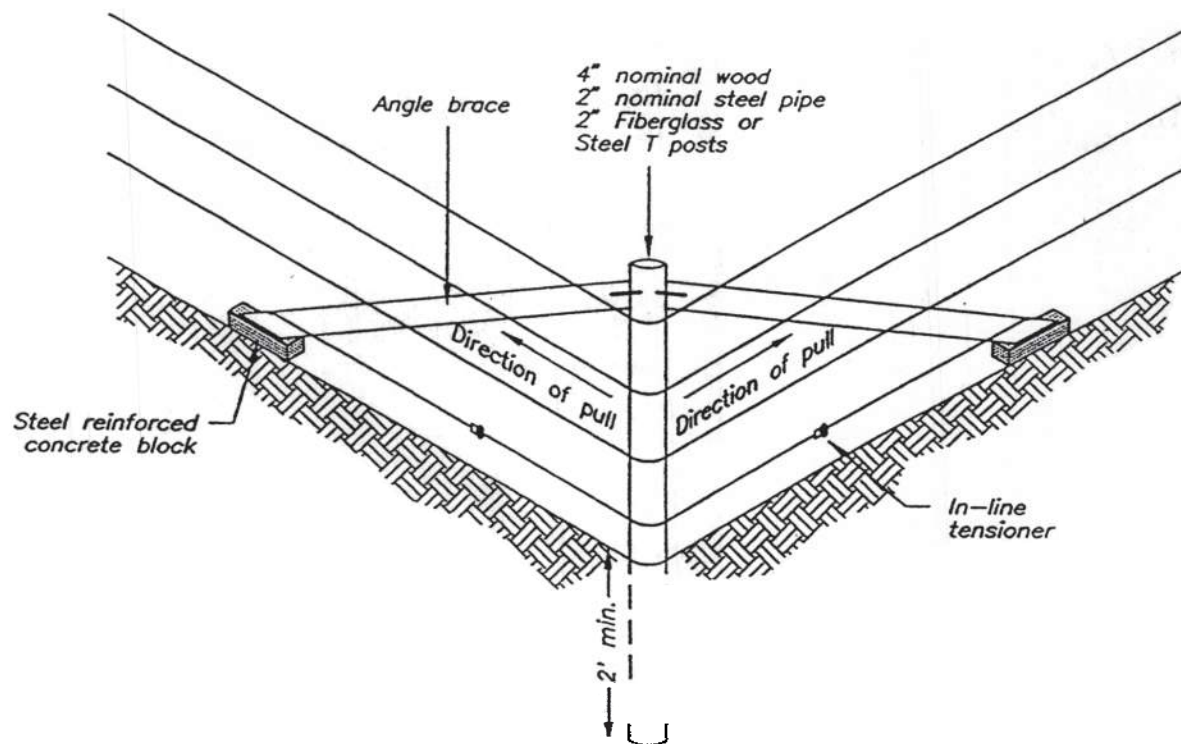
Splices: Use "western-union splices, figure "8" knots or crimping sleeves for malleable wire. Use crimping sleeves or figure "8" knot for high tensile strength wire.

2 Post Brace With Deadman

(c)

Standard Suspension Fence,
Corner and Pull Assembly

Figure 3

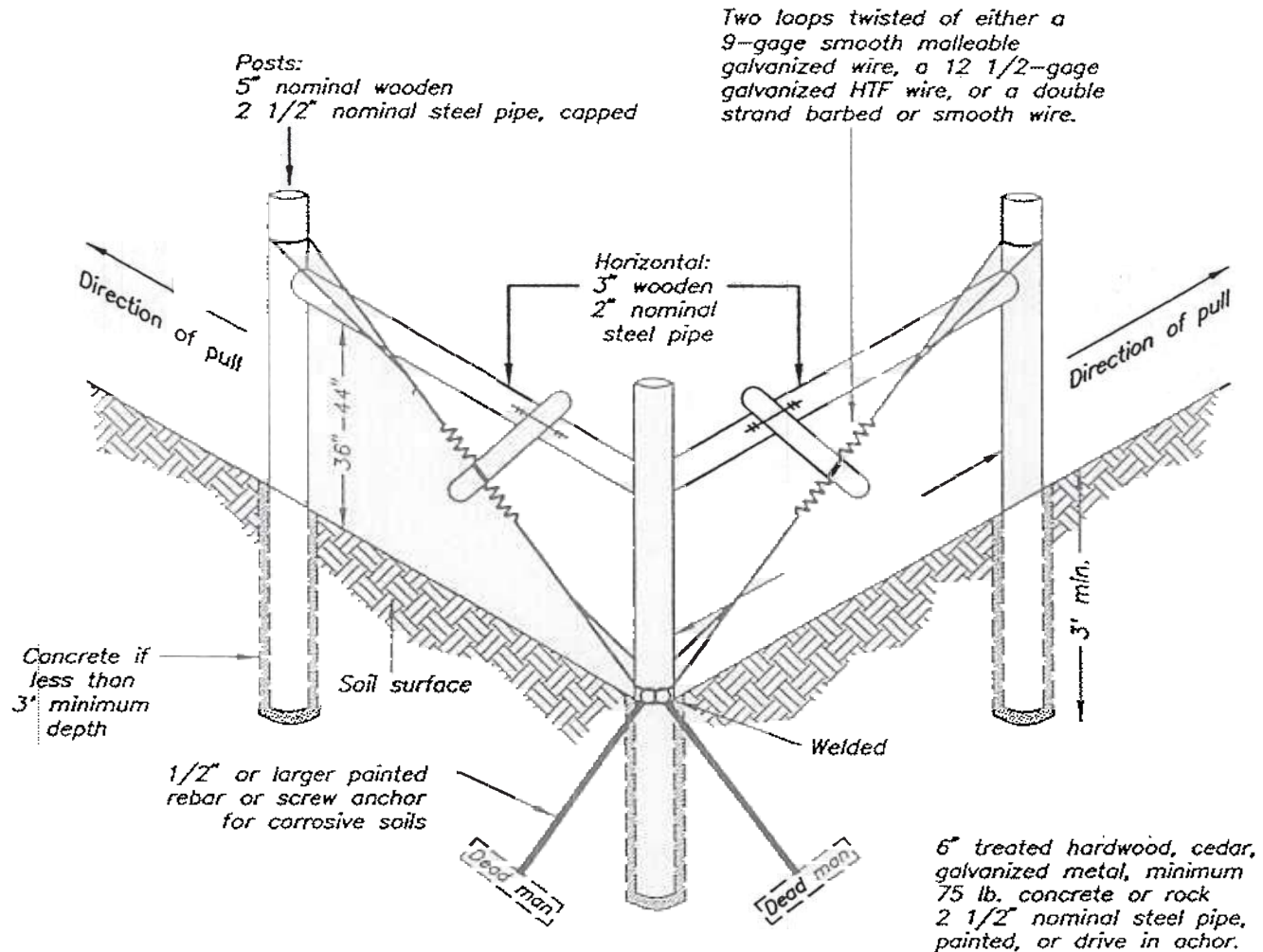


Single Post Corner or Angle Brace Assembly

(d)

Standard Suspension Fence,
Corner and Pull Assembly

Figure 3



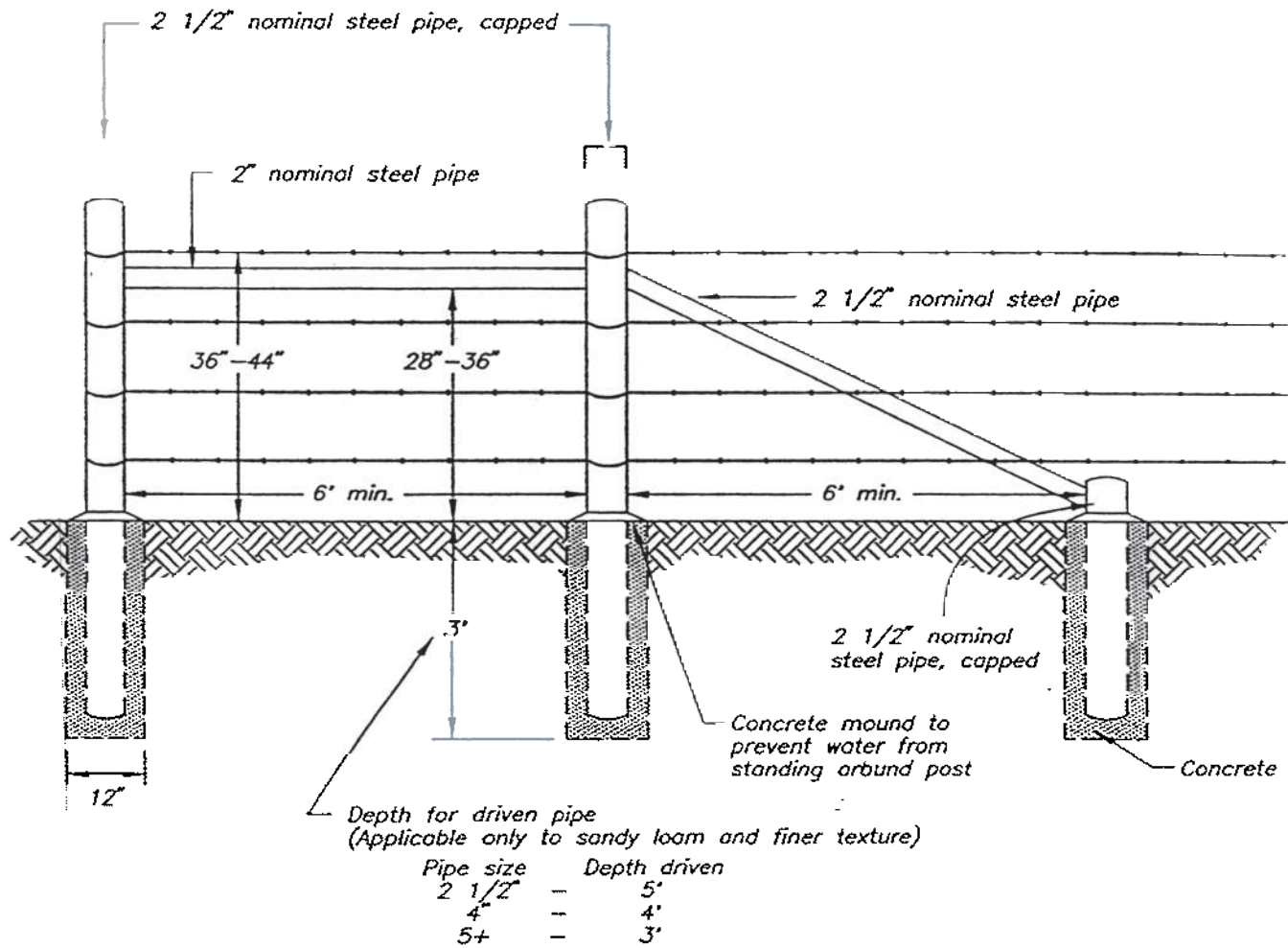
Materials: Post must be new eastern red juniper, blueberry juniper, bois-d'arc, treated pine, treated hardwood, or steel pipe. Used steel pipe is acceptable and must be painted.

Splices: Use "western-union splices, figure "8" knots or crimping sleeves for malleable wire.

Use crimping sleeves or figure "8" knot for high tensile strength wire.

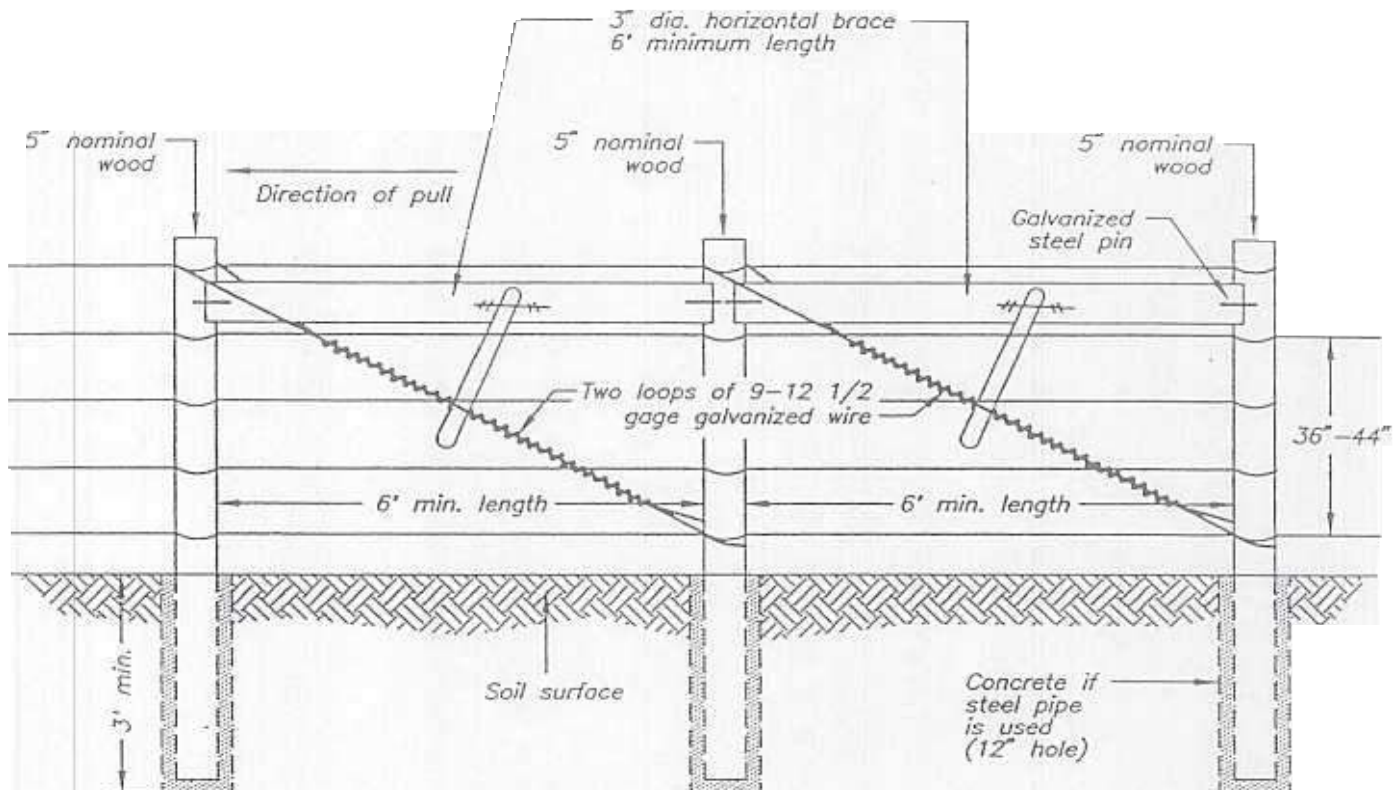
Deadmaned 3-Post Corner

Figure 4



Welded Steel 3-Post Diagonal
End Brace Assembly

Figure 5

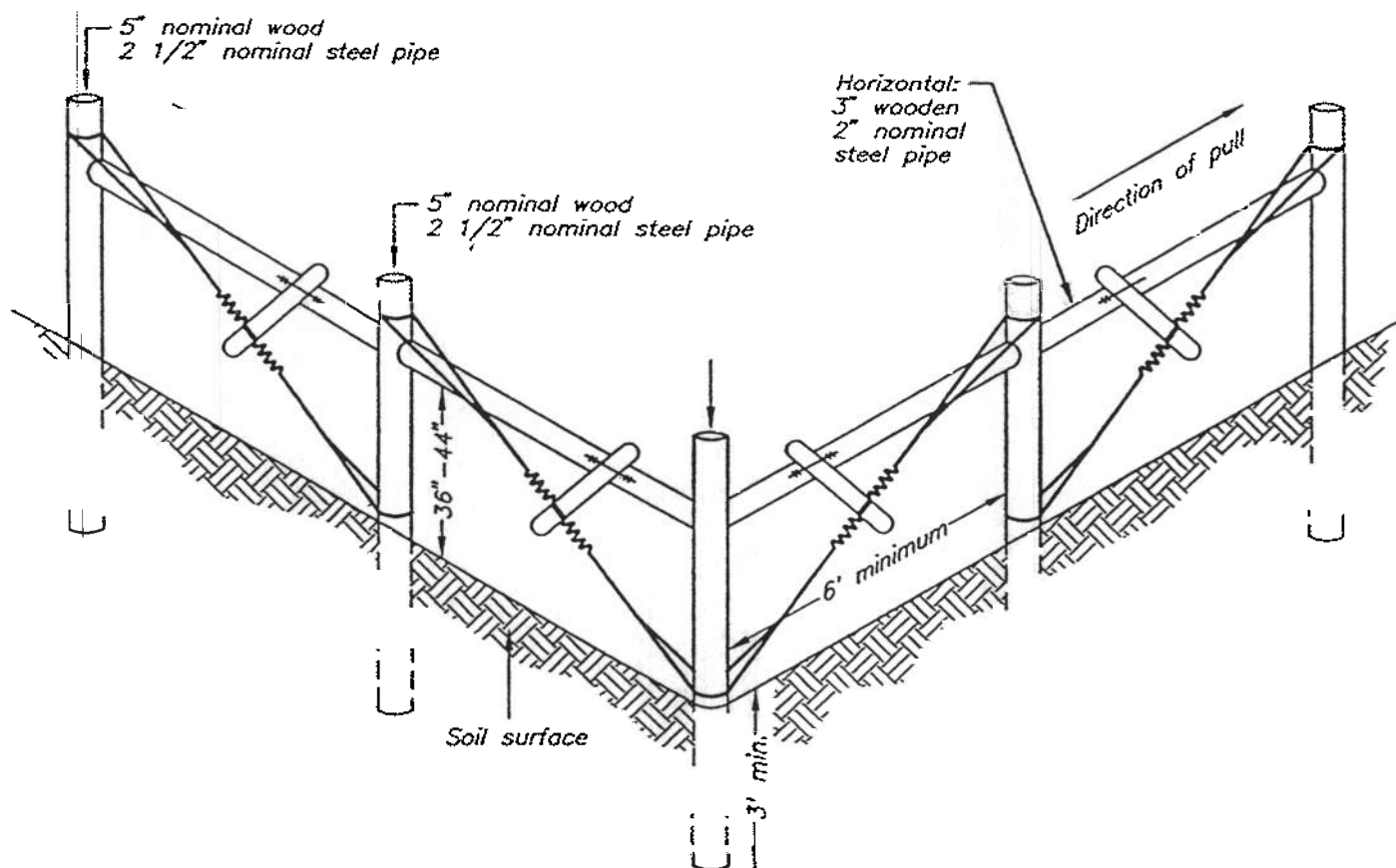


Note:

Materials shown above may be substituted using 2 1/2" nominal steel pipe, capped, set in concrete (12 in. diameter hole). Pipe must be painted.

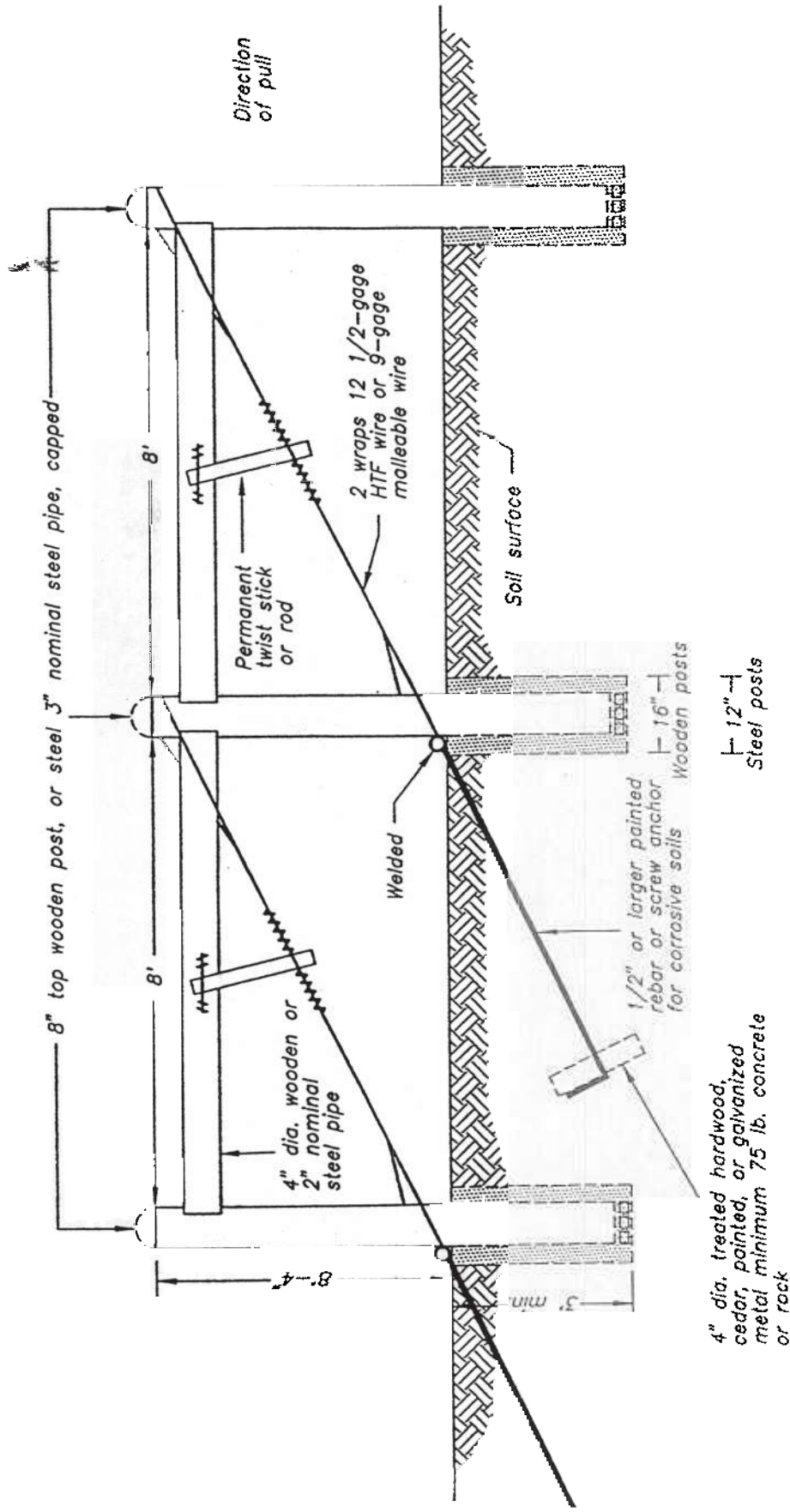
Wooden 3 Post Double "H" Brace
End Assembly Without Deadman

Figure 6

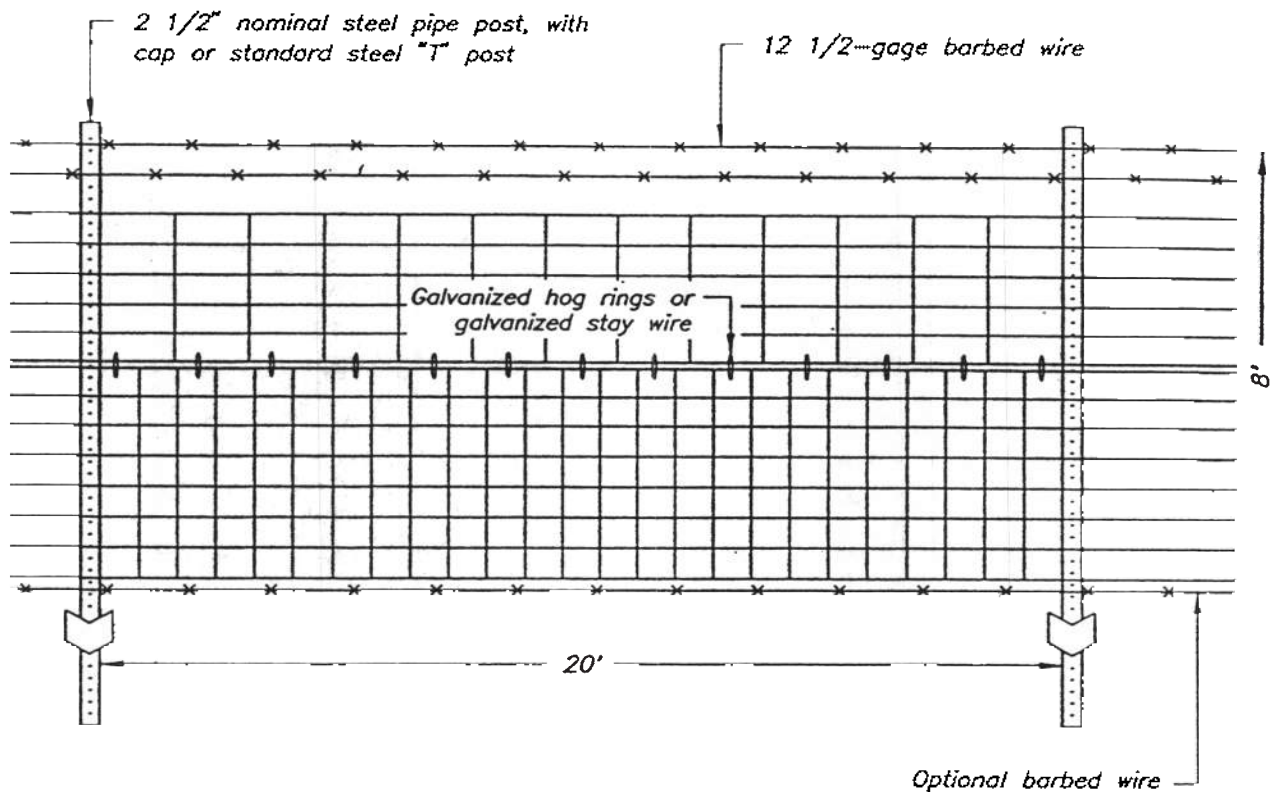


Without Deadman

Figure 7



End Brace Assembly Deer Management Fence

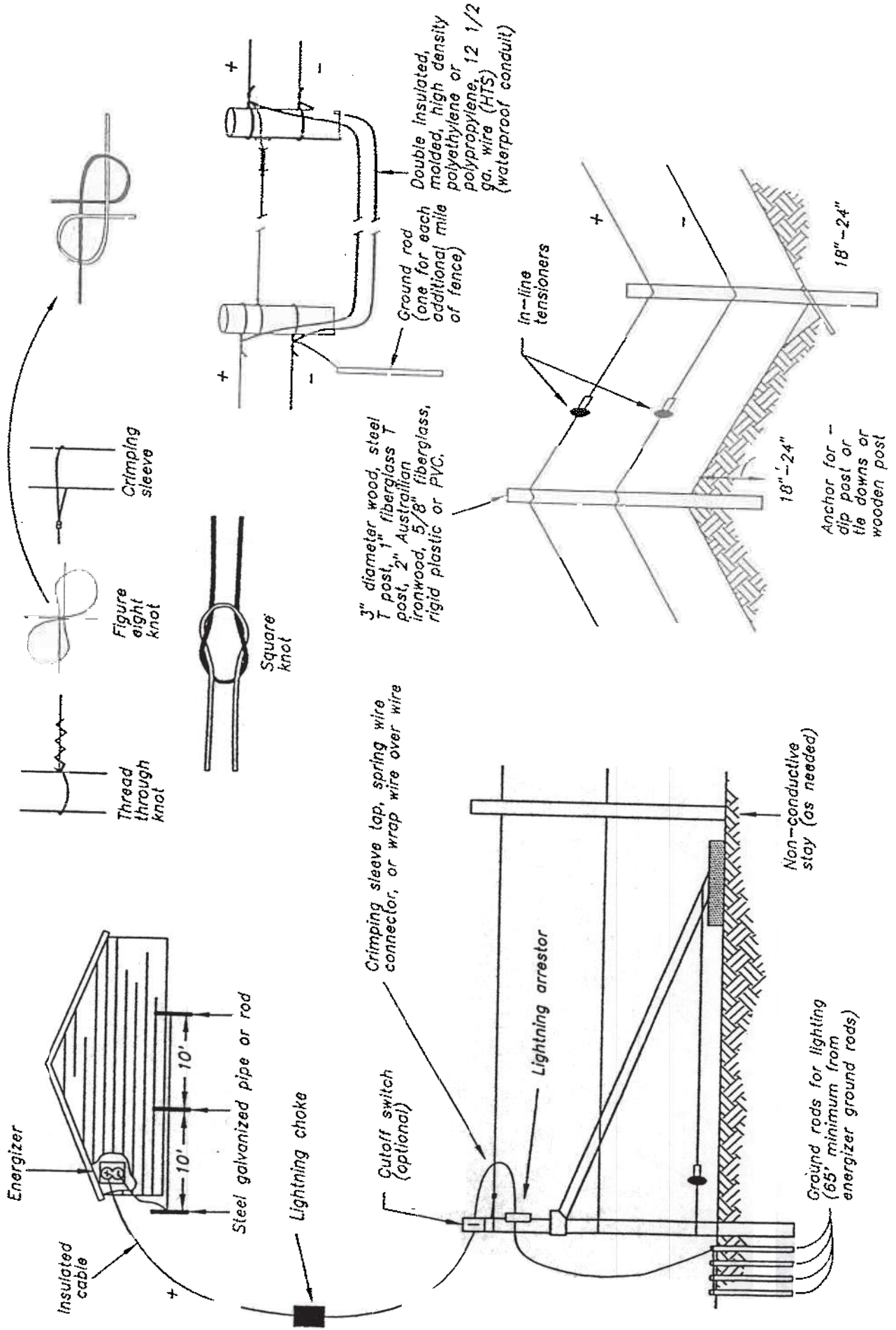


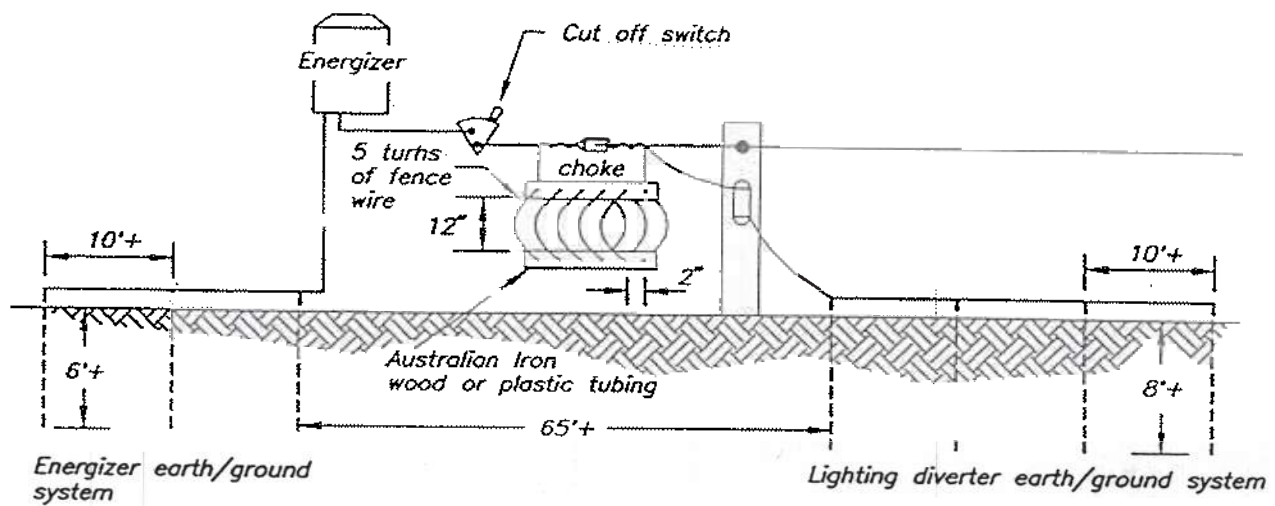
Note: If standard steel "T" posts are used, install 2 1/2" nominal steel pipe post, with cap or 6" top wooden post every 150' (Wooden stays may be placed between line post as needed.)

General Installation Specification For Deer Management Fence

Figure 9

Methods of tying HTS Wire



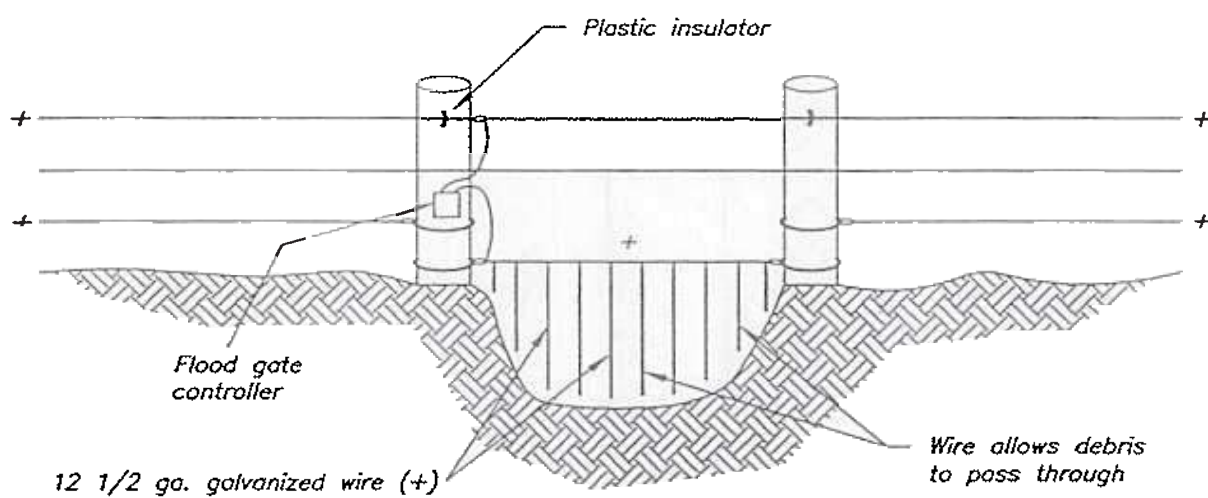


An induction loop may be as an alternative to a choke.

An induction loop is made by coiling 8 to 10 loops of heavily insulated 12 gage wire in 10–12" diameter circles and taping the loops together.

Electric Fence

Figure 2



Electric Flood Gate

Figure 1

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-95 GEOTEXTILE

1. SCOPE

This work shall consist of furnishing all materials, equipment, and labor necessary for the installation of geotextile.

2. MATERIAL QUALITY

Geotextile shall be manufactured from synthetic long chain or continuous polymeric filaments or yarns, having a composition of at least 95 percent, by weight, of polypropylene, polyester or polyvinylidene-chloride. The geotextile shall be formed into a stable network of filaments or yarns that retain their relative position to each other, are inert to commonly encountered chemicals and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents and insects. Unless otherwise specified, the class and type of geotextile shall be as shown on the drawings and shall meet the requirements for materials that follow:

- a. Woven Geotextile shall conform to the physical properties listed in Table 1. The woven geotextile shall be manufactured from monofilament yarns that are woven into a uniform pattern with distinct and measurable openings. The geotextile shall be manufactured so that the yarns will retain their relative position with regard to each other. The yarns shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure. The edges of the material shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.
- b. Nonwoven Geotextile shall conform to the physical properties listed in Table 2. Nonwoven geotextile shall be manufactured from randomly oriented fibers that have been mechanically bonded together by the needle-punched process. In addition, one side may be slightly heat bonded. Thermally bonded, nonwoven geotextile, in addition to mechanically bonded, nonwoven geotextile, may be used for Road Stabilization. The filaments shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure.
- c. The geotextile shall be shipped in rolls wrapped with a protective covering to keep out mud, dirt, dust, debris and direct sunlight. Each roll of geotextile shall be clearly marked to identify the brand, type and production run.

3. STORAGE

Prior to use, the geotextile shall be stored in a clean dry place, out of direct sunlight, not subject to extremes of either hot or cold, and with the manufacturer's protective cover in place. Receiving, storage, and handling at the job site shall be in accordance with the requirements in ASTM D 4873.

4. SURFACE PREPARATION

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. The surface shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions and standing or flowing water (unless otherwise shown on the drawings).

5. PLACEMENT

Prior to placement of the geotextile, the soil surface will be inspected for quality assurance of design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings. The geotextile shall be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when material is placed on or against it. The geotextile may be folded and overlapped to permit proper placement in the designated area.

The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified), and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a "U", "L", or "T" shape or contain "ears" to prevent total penetration. Steel washers shall be provided on all but the "U" shaped pins. The upstream or up-slope geotextile shall overlap the abutting down-slope geotextile. At vertical laps, securing pins shall be inserted through both layers along a line through approximately the midpoint of the overlap. At horizontal laps and across slope laps, securing pins shall be inserted through the bottom layer only. Securing pins shall be placed along a line approximately 2 inches in from edge of the of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate, to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to be left in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used, overlaying the existing geotextile. The patch shall extend a minimum of 2 feet from the edge of any damaged area.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. Geotextile shall be placed in accordance with the following applicable specification according to the use indicated in drawings:

Slope protection – Class I or II as indicated in Tables 1 and 2.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. Rock shall not be pushed or rolled over the geotextile.

Class I, unprotected – limit height for dropping stone onto bare geotextile to 3 feet.

Class II, protected – require the use of 6 inches a clean pit-run gravel over the geotextile to cushion the stone and limit the height of drop to 3 feet.

On slopes with strong seepage flow, the geotextile must be in intimate contact with the soil to prevent erosion of the soil surface. Use 6 inches of a clean pit-run gravel over the geotextile to hold it in place and minimize voids under the riprap. Embedment of the geotextile in a trench to form a cutoff at regular intervals down the slope will prevent erosion under the fabric. Place cutoffs more closely together in highly erodible soils and wider apart in more stable soils.

Subsurface drains – Class III as indicated in Tables 1 and 2.

The geotextile shall not be placed until drainfill or other material can be used to provide cover within the same working day. Drainfill material shall be placed in a manner that prevents damage to the geotextile. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet.

Road stabilization – Class IV as indicated in Tables 1 and 2.

The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting conformation to the surface irregularities when the roadway fill material is placed on its surface. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet. Unless otherwise specified, the minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended or provided by the manufacturer, but they shall be removed before the permanent covering material is placed.

6. SPECIAL SPECIFICATIONS

TABLE 1. REQUIREMENTS FOR WOVEN GEOTEXTILES ^{1/}

Property	Test Method	Class I	Class II	Class III	Class IV
Grab tensile strength (pounds)	ASTM D4632	247 minimum	180 minimum	180 minimum	315 minimum
Elongation at failure (%)	ASTM D4632	< 50	< 50	< 50	< 50
Trapezoidal tear strength (pounds)	ASTM D4533	90 minimum	67 minimum	67 minimum	112 minimum
Puncture strength (pounds)	ASTM D6241	495 minimum	371 minimum	371 minimum	618 minimum
Ultraviolet light (% retained strength)	ASTM D4355	50 minimum	50 minimum	50 minimum	70 minimum
Permittivity (sec ⁻¹)	ASTM D4491			as specified	
Apparent opening size (AOS) ^{2/}	ASTM D4751			as specified	
Percent open area (POA) (%)	USACE ^{3/} CWO-02215-86			as specified	

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Maximum average roll value.

3/ Note: CWO is a USACE reference.

TABLE 2. REQUIREMENTS FOR NONWOVEN GEOTEXTILES ^{1/}

Property	Test Method	Class I ^{2/}	Class II ^{2/}	Class III ^{2/}	Class IV ^{2/}
Grab tensile strength (pounds)	ASTM D4632 grab test	202 minimum	157 minimum	112 minimum	202 minimum
Elongation at failure (%)	ASTM D4632	50 minimum	50 minimum	50 minimum	50 minimum
Trapezoidal tear strength (pounds)	ASTM D4533	79 minimum	56 minimum	40 minimum	79 minimum
Puncture strength (pounds)	ASTM D6241	433 minimum	309 minimum	223 minimum	433 minimum
Ultraviolet light (retained strength) (%)	ASTM D4355	50 minimum	50 minimum	50 minimum	50 minimum
Permittivity (sec ⁻¹)	ASTM D4491		0.70 minimum or as specified		
Apparent opening size (AOS) (mm) ^{3/}	ASTM D4751		0.22 maximum or as specified		

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Needle punched geotextiles may be used for all classes. Heat-bonded or resin-bonded geotextiles may be used for class IV only.

3/ Maximum average roll value.

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATIONS

IA-620 UNDERGROUND OUTLET

1. SCOPE

This work shall consist of installation of underground outlets and any appurtenant water control structures in accordance with an approved plan and design.

2. MATERIALS

Materials for underground outlets shall meet the requirements as shown in the plans and specifications. They shall be field inspected for any deficiencies such as thin spots or cracking prior to installation.

Conduit

The following reference specifications pertain to products currently acceptable for use as underground outlets:

Plastic

Corrugated Polyethylene (PE) Pipe and Fittings (3-6 inch)	ASTM F 405
3 through 24 inch Corrugated Polyethylene (PE) Pipe and Fittings.....	ASTM F 667
Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings (4-36 inch)	ASTM F 949
Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.....	ASTM D 2729
Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.....	ASTM D 3034
Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)	ASTM D 2241
Polyethylene Plastics Pipe and Fittings Materials	ASTM D 335

Clay

Clay Drain Tile	ASTM C 4
Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.....	ASTM C 700
Vitrified Clay Pipe, test methods.....	ASTM C 301

Concrete

Concrete Drain Tile (4-36 inch).....	ASTM C 412
Concrete Pipe for Irrigation or Drainage	ASTM C 118
Concrete Pipe, Manhole Sections, or Tile (test methods).....	ASTM C 497
Concrete Sewer, Storm Drain and Culvert Pipe	ASTM C 14
Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.....	ASTM C 76
Perforated Concrete Pipe	ASTM C 444
Portland Cement	ASTM C 150

Other

Styrene-Rubber (SR) Plastic Drain Pipe and Fittings.....	ASTM D 2852
Corrugated Aluminum Pipe for Sewers and Drains	ASTM B 745
Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains.....	ASTM A 760

Inlet

The inlet shall be fabricated and installed as shown on the plans. Inlets must be of durable material, structurally sound, and resistant to damage by rodents or other animals. Inlets shall be of rigid material, which does not require supplemental support to remain in a vertical position. Materials, which meet these requirements, include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum,
2. Smooth steel pipe, with 3/16 inch minimum wall thickness,
3. Smooth plastic pipe, polyvinyl chloride (PVC), with an SDR of 43 or less,
4. High-density polyethylene pipe (PE). Round pipe shall have an SDR of 43 or less. Square intakes shall have minimum wall thickness as shown in the following table:

<u>Nominal Size</u>	<u>Minimum Thickness</u>
6 inch	0.16 inch
8 inch	0.21 inch
10 inch	0.26 inch
12 inch	0.31 inch

All plastic and polyethylene inlets shall include ultra-violet stabilizer to protect from solar degradation.

Perforations in the inlet shall be smooth and free of burrs. Unless otherwise specified, the above ground portion of the inlet shall have holes evenly spaced around the perimeter of the inlet in accordance with the following table:

<u>Inlet Size</u>	<u>Minimum Number of 1" Diameter Holes per Foot of Inlet</u>
4 inch	20
5 inch	24
6 inch	30
8 inch	40
10 inch	50
12 inch	60

If slots or round holes other than 1 inch in diameter are provided, the total cross sectional area of the openings per foot shall be equivalent to that provided by 1 inch diameter round holes meeting the above criteria.

The below ground portion of the inlet may be perforated with holes 5/16 of an inch in diameter or less to provide drainage around the inlet.

Appurtenances (i.e. tees and elbows) for polyvinyl chloride (PVC) inlets shall be schedule 40 or heavier.

Additional subsurface drainage tubing or tile may be used in conjunction with the surface inlet to improve access and farmability around the inlet. These underground extensions (when used) shall have a minimum length of 10 feet.

The inlet shall be offset from the main conduit except as noted below. A minimum of 8 feet of non-perforated conduit shall be installed between the inlet and the main conduit. The minimum diameter of the offset line shall be 3 inches. When conduit capacity is based on orifice flow from the inlet, such inlets shall be fabricated so that an orifice can easily be installed.

Only the top inlet in a terrace system may be placed directly on the main conduit. If the top most inlet in a terrace system is placed directly on the main conduit, the conduit shall be non-perforated from the inlet to the toe of the terrace back slope.

Outlet

A continuous section of non-perforated conduit at least 20 feet long shall be used at the outlet. Two-thirds of the outlet pipe shall be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or the side slope shall be protected from erosion. Acceptable materials for use at the outlet include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum;
2. Smooth steel pipe, with 3/16 inch minimum wall thickness;
3. Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 26 or less or schedule 40 or heavier; or
4. Corrugated profile wall (dual wall) polyethylene (PE) pipe meeting or exceeding the requirements of ASTM F 2648 (2" to 60"), ASTM F 2306 (12" to 60"). Pipe conforming to AASHTO M 252 (3" to 10"), or AASHTO M 294 (12" to 60") is acceptable.

All plastic and polyethylene pipe outlets shall include ultra-violet stabilizer. PVC and PE pipe outlets shall not be used where burning vegetation on the outlet ditch bank is likely to create a fire hazard.

Connections with the outlet pipe shall be made watertight.

The outlet shall be equipped with a flap-gate type rodent guard.

3. TRENCH EXCAVATION

Trench excavation shall be sufficient to provide required cover after other construction is completed.

The trench bottom shall be smooth and free of exposed rock. If rock is encountered in the trench bottom, over-excavate the trench and place at least 6 inches of compacted earth or sand bedding in the trench to bring it up to the conduit grade. In stable soils, the bottom of the trench shall be shaped to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. The groove shall be shaped to fit the size of conduit. The 90-degree "V" groove shall not be used on conduits greater than 6 inches in diameter.

Unless otherwise shown on the drawings, trench width at the top of the conduit should be the minimum required to permit installation and provide bedding conditions suitable to support the load on the conduit, but with not less than 3 inches of clearance on each side. Maximum trench width shall be the conduit diameter plus 12 inches measured at the top of the conduit, unless approved bedding is installed.

Plow installation is allowed except under the base width of the terrace or embankment. Trench width shall be at least two (2) inches wider than the conduit on each side to allow sufficient bedding to support the pipe.

4. INSTALLATION

The underground outlet system shall be installed to the line and grade shown in the plans or as staked in the field. Conduit lines shall be installed and properly blinded or bedded prior to placement of any other earthfill over the lines.

Conduit lines shall be joined with standard factory couplers, if applicable, to produce a continuous system. Internal couplers may be used if they do not cause excessive flow restrictions. Conduit ends shall be protected during installation.

All appurtenant structures, including trash and rodent guards, shall be installed promptly and provisions shall be made for protecting them during installation. All conduit ends except the outlet and inlets with screens shall be capped with standard factory end caps or concrete. When corrugated plastic tubing is used, no more than 5% stretch will be allowed.

Orifice plates, when specified, shall have smooth edges and fit tightly.

5. TRENCH BACKFILL

Conduits shall be bedded and backfilled throughout the base width of the basin embankment or terrace ridge. Friable soil material shall be placed in 4 inch layers and hand tamped to a depth of 2 feet above the conduit. The sides of the remaining trench shall be sloped no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

Water packing may be used as an alternative to mechanical compaction. If the conduit is non-perforated, it shall be filled with water during the water packing procedure. The initial backfill, before wetting, shall be of sufficient depth to ensure complete coverage of the pipe after consolidation has taken place. Water packing is accomplished by adding water in such quantity as to thoroughly saturate the initial backfill without inundation. The wetted fill shall be allowed to dry until firm before final backfill is begun. Final backfill shall be accomplished by placing friable soil material in 4 inch layers and hand tamping to a depth of 2 feet above the conduit. The sides of the remaining trench shall be sloped no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

Conduit which is not under the embankment or terrace ridge shall be backfilled with select bedding material containing no hard objects larger than 1½ inches in diameter to a minimum depth of 6 inches over the conduit. The conduit shall be held in place mechanically while select backfill material is placed around and over the conduit. This is to ensure that the proper conduit grade is maintained. All backfill material shall be placed so that deflection or displacement of the conduit will not occur. The remainder of the trench above the conduit shall be backfilled as rapidly as consistent with the soil conditions. Backfill shall extend above the ground surface and be well rounded over the trench. Large stones, frozen material, and large clods are not allowed in the backfill material.

6. FINISH

Work areas shall be smoothed and left in a workmanlike manner. Vegetation or other protective cover shall be established as specified.

7. SPECIAL SPECIFICATIONS

**SECTION B:
SUPPLEMENTAL SPECIFICATIONS
UPPER IOWA RIVER WMA
UI-022-WESELMANN-HAGEMAN**

EXPLANATION

- A. The purpose of this Section of the Specifications is to provide supplemental information which is required to complete the Standard Construction Specifications and to set forth supplementary requirements, modifications and/or deletions which are required to make the whole of the Construction Specifications project specific.
- C. Where there is any variance between the Standard Construction Specifications and these Supplemental Specifications, the Supplemental Specifications shall take precedence.
- D. Where any section of the Standard Construction Specifications is modified, or any Paragraph, Sub-paragraph or Clause thereof is changed or deleted by these Supplemental Specifications, the unaltered provisions of that Section, Paragraph, Sub-paragraph or Clause in the Standard Construction Specifications shall remain in effect. Unless these Supplemental Specifications make specific reference to the modification or deletion of a Paragraph, Sub-paragraph or Clause in the Standard Construction Specifications, no changes are intended, and paragraphs contained in these Supplemental Specifications are intended only to supplement, amplify, or clarify said Standard Construction Specifications.

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IOWA DOT SPECIFICATIONS

IA-1 SITE PREPARATION

A. Measurement and Payment

1. Compensation for Site Clearing, Preparation, & Waste Disposal (Bid Item 1) shall be made on a lump sum basis. Any work item described in the contract documents but not explicitly listed in the bid schedule will be included in the lump sum payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in the Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Bid Item 1-Site Clearing, Preparation, & Waste Disposal
 - (1) This item will consist of the removal and proper off-site disposal of all woody growth within the construction area. Trees may also be burned and buried onsite in an owner and engineer approved location and manner.
 - (2) This item includes the removal and proper off-site disposal of existing pipes/outlets through the road embankment and existing pond embankment. This includes the removal of any granular materials or other unsuitable backfill materials encountered during removal. Removal of all pipes/outlets shall be completed in accordance with IA-1 and IA-3. Payment for the removal or salvage of fence shall be incidental to Bid Item 1.
 - (3) This item includes the removal of field tile located during excavation or general grading activities. Any field tile encountered within the project grading limits shall be removed by the contractor in accordance to IA-1, IA-3, and IA-9. Payment for the removal or salvage of fence shall be incidental to Bid Item 1.
 - a. Tiles encountered within the pool area should be daylighted one vertical foot above the normal pool elevation if possible.
 - (4) This item includes stripping, salvaging, and replacing the existing gravel surfacing on the roadbed inside the grading limits.
 - (5) This item includes the removal and proper off-site disposal of all refuse and debris encountered on grade in areas being graded or seeded.
 - (1) This item includes the removal and proper off-site disposal of any fence indicated to be removed on the plans. Any fence removed for access and /or to provide work area shall be salvaged if practical or replaced with same or like materials as approved by the engineer and in accordance with specification IA-92. Removal or salvage shall be completed in accordance with IA-1 and IA-3. Payment for the removal or salvage of fence shall be incidental to Bid Item 1.
 - (6) All removals shall be completed in accordance with IA-5 Pollution Control.

IA-5 POLLUTION CONTROL

A. Measurement and Payment

1. Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with the specification and the construction details therefore are:
 - a. Subsidiary Item, Sediment Filters
 - (1) This item consists of all work to install, maintain, and remove sediment filters for the project. Sediment filters to be removed once vegetation is established.
 - (2) No separate payment will be made for sediment filters. Compensation for this item will be incidental to other items of work.
 - (3) Contractor shall perform all construction activities in a manner that will minimize water pollution, air pollution, and soil erosion. Sediment filters shall be placed as needed where off-site erosion could occur.
 - b. Subsidiary Item, Pollution Control
 - (1) This item will consist of applying and performing all construction activities in a manner that will minimize water pollution, air pollution and soil erosion and shall be completed in compliances with all state, local and federal regulations.
 - (2) No separate payment will be made for Pollution Control. Compensation for this item will be incidental to other items of work.
 - c. Rolled Erosion Control Product (Bid Item 18)
 - (1) Payment for this item shall include the cost to obtain, install, and maintain rolled erosion control products in the locations indicated in the plans.
 - (2) Rolled erosion control product shall be long term temporary double net rolled erosion control blanket consisting of processed degradable natural and/or polymer fibers, mechanically bound together between two degradable synthetic or natural fiber nettings. Product shall meet or exceed ECTC Standard Specifications for Type 2.D classification.
 - (3) Measurement and payment of this bid item will be based on the quantity (in square yards) listed on the plans unless the WMA or Engineer directs the contractor to install a different amount in the field. In that case, payment shall be made based on the actual quantity (measured in square yards) installed, at the bid unit price.

IA-6 SEEDING AND MULCHING FOR PROTECTIVE COVER

A. Measurement and Payment

1. For items of work for which specific prices are established in the contract each area treated is measured and the area calculated to the nearest 0.1 acre.
2. Payment for seeding is made at the contract unit price per acre for the designated treatment, which will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Seeding, Structure and Channel Mix (Bid Item 2)
 - (1) This item will consist of seeding the embankment, terrace flowlines, ditches, all concentrated flow paths, and any area steeper than 4:1 (H:V).
 - (2) All seed must be cleaned and weed free. Seeding rates are expressed in bulk pounds per acre. Seed quality shall not drop below 70% Pure Life Seed (PLS) where $PLS = (\% \text{ germination} + \% \text{ dormant seed}) \text{ times } \%$ purity.
 - (3) Seed mix shall be as specified in the road structure seed mix table on the following page.

Seeding Plan

Name ROAD STRUCTURE SEEDING PLAN
Prepared by Matt Frana

Date 12/21/2020
Tract No. _____
Field No. _____
Contract No. _____

Program: Upper Iowa Watershed Project

Acres: 1.00

Seeding Mix Summary

Grasses	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
1	<i>Elymus canadensis</i>	Canada Wildrye	10.000	5.236	5.24
2	<i>Andropogon gerardii</i>	Big Bluestem	5.000	1.361	1.36
3	<i>Elymus trachycaulus</i>	Slender Wheatgrass	6.000	2.367	2.37
4	<i>Sorghastrum nutans</i>	Indiangrass	5.000	1.134	1.13
5	<i>Panicum virgatum</i>	Switchgrass	10.000	1.945	1.94
6	<i>Elymus virginicus</i>	Virginia Wildrye	10.000	6.482	6.48
SUBTOTAL GRASSES			46.000	18.525	18.525
Forbs/Legumes	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
1	<i>Rudbeckia hirta</i>	Black-eyed Susan	1.500	0.044	0.044
2	<i>Astragalus canadensis</i>	Canadian Milkvetch	1.500	0.240	0.24
3	<i>Oenothera biennis</i>	Common Evening Primrose	1.500	0.045	0.045
4	<i>Ratibida pinnata</i>	Gray-headed Coneflower	1.500	0.136	0.14
5	<i>Asclepias syriaca</i>	Common Milkweed	1.500	0.953	0.95
6	<i>Pycnanthemum virginianum</i>	Common Mountain Mint	1.500	0.019	0.019
7	<i>Chamaecrista fasciculata</i>	Partridge Pea	1.500	1.513	1.51
8	<i>Oligoneuron rigidum</i>	Stiff Goldenrod	1.500	0.100	0.100
SUBTOTAL FORBS			13.500	3.108	3.108
Woody	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
SUBTOTAL VINES/WOODY			0.000	0.000	0.000
TOTAL			59.500	21.633	21.633

Estimated Cost/Acre

Estimated Total Cost

	Soil Test Information	Total Needed lbs
Lime (ECCE) (Actual Lime)		
Nitrogen		
Phosphate (P205)		
Potash (K20)		

Seeding Dates: Spring (April 1 - July 1)

Additional Seeding Criteria: TO BE USED ON STRUCTURE SIDE SLOPES.

REVIEW IOWA JOBSHEET (327) FOR ADDITIONAL SEEDING RECOMMENDATIONS

Seeding was completed by according to the above requirements.
(Date)

(Contractor's Signature)

(Date)

Certified by _____

- (4) Prepare a firm seedbed for all planting methods:
 - (a) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, till all areas to be seeded by disking or other approved methods; thoroughly loosen and pulverize the soil to a depth of three (3) inches. This may require multiple passes of the disk or other approved equipment. If the land was used for pasture and has a smooth surface, the preparation in non-disturbed areas to be seeded shall include mowing any vegetation taller than 12 inches and applying a burn down herbicide, such as glyphosate, at the labeled rates to emergent growth 2 to 4 weeks after mowing. After the vegetation has died, the area shall be disked as needed to thoroughly loosen and pulverize the soil to a depth of three (3) inches. If emergent growth occurs again prior to seeding, the area shall receive a second application of herbicide. Seeding shall not occur until the existing vegetation has died. If the pasture has a rough surface that would negatively impact the seeding, the area shall be thoroughly disked and the cultipacked prior to seeding.
 - (b) After the disking operation, and prior to seed application, firm the seedbed with a cultipacker or similar piece of equipment.
- (5) Fertilizer shall be applied on the entire seeding area at the following rate:
 - (a) Nitrogen: 30 lbs./acre
 - (b) Phosphorus (P₂O₅): 30 lbs./acre
 - (c) Potassium (K₂O): 40 lbs./acre
- (6) Hydraulic seeding and mulching:
 - (a) Complete hydraulic seeding in concurrence with hydro mulching. At the contractors preference and at no additional cost to the owner, conventional seeding may be performed separately to the hydro mulching operation.
- (7) Hydraulic mulch shall be wood cellulose or Bonded Fiber Matrix (BFM). Products and installation for hydro mulch shall be according to SUDAS Section 9010. Seeding will be completed during the follow seeding periods
 - Spring: March 1 to May 15
 - Summer: August 1 to September 15
 - Fall: November 15 to freeze up
- (8) Sow seeds with the contour using a grassland or rangeland drill set for the specified seeding rates. The drill shall be equipped with double coulter furrow openers. The drill shall be subject to acceptance by Engineer. Overlap each successive seeding pass to ensure complete coverage.
- (9) For seeding occurring in the spring, contractor shall ensure the seedbed remains moist until plant establishment. Moisture may be maintained during dry conditions through regular watering. Consult the engineer for recommended moisture control methods. Seeding should occur when rain is in the forecast when possible. Failure to make a good faith effort to maintain moisture may result in re-seeding by the Contractor at no additional expense to the Owner.
- (10) If seeding is completed during the spring seeding period, a companion crop of oats shall be seeded at ½ bushel per acre.
- (11) Plant seed using a drill between ¼ and ½ inch deep

- (12) Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall also be allowed in areas not accessible to drills or other equipment. Once broadcast, the seed must be covered with soil to a depth no greater than one half (1/2) inch by means of hand rakes or other approved methods.
 - (13) Upon completion of the seeding operation, cultipack the seedbed to provide a positive seed-soil contact. If the drill seeder is equipped with an approved cultipacker or press wheels, separate operations shall not be necessary. The type of cultipacker / seeder to be used shall be subject to acceptance by Engineer.
 - (14) Measurement and payment will be based on the area successfully seeded.
- b. Seeding, Buffer Seed Mix (Bid Item 3)
- (1) This item will consist of seeding buffer areas as shown in the drawings.
 - (2) All seed must be cleaned and weed free. Seeding rates are expressed in bulk pounds per acre. Seed quality shall not drop below 70% Pure Live Seed (PLS) where $PLS = (\% \text{ germination} + \% \text{ dormant seed}) \times \% \text{ purity}$.
 - (3) Seed mix shall be as specified in the buffer seed mix table on the following page.

SEEDING PLAN (NRCS FORM CPA-4)			
Weselmann CRP (buffer) Seeding Mix			
Scientific name	Common name	lbs. /acre PLS	
Grasses			
<i>Andropogon gerardii</i>	Big bluestem	0.32	lbs.
<i>Bouteloua curtipendula</i>	Sideoats grama	1.43	lbs.
<i>Carex brevior</i>	Shortbeak Sedge	0.04	lbs.
<i>Carex vulpinoidea</i>	Fox Sedge	0.03	lbs.
<i>Elymus virginicus</i>	Virginia wildrye	0.20	lbs.
<i>Schizachyrium scoparium</i>	Little bluestem	1.80	lbs.
<i>Sorghastrum nutans</i>	Indiangrass	0.29	lbs.
<i>Sporobolus compositus</i>	Composite dropseed	0.2	lbs.
<i>Sporobolus heterolepis</i>	Prairie dropseed	0.05	lbs.
<i>Tridens flavus</i>	Purpletop tridens	0.025	lbs.
Forbs			
<i>Agastache foeniculum</i>	Blue giant hyssop	0.01	lbs.
<i>Allium stellatum</i>	Autumn onion	0.01	lbs.
<i>Amorpha canescens</i>	Lead plant	0.01	lbs.
<i>Anemone virginiana</i>	Tall thimbleweed	0.005	lbs.
<i>Asclepias</i>	Common milkweed	0.01	lbs.
<i>Asclepias incarnata</i>	Swamp milkweed	0.02	lbs.
<i>Asclepias tuberosa</i>	Butterfly milkweed	0.02	lbs.
<i>Asclepias verticillate</i>	Whorled milkweed	0.01	lbs.
<i>Astragalus canadensis</i>	Canada milkvetch	0.10	lbs.
<i>Baptisia alba</i>	White wild indigo	0.01	lbs.
<i>Ceanothus Americanus</i>	New Jersey Tea	0.01	lbs.
<i>Chamaecrista fasciculata</i>	Partridge pea	0.30	lbs.
<i>Coreopsis tripteris</i>	Tall tickseed	0.01	lbs.
<i>Crotalaria</i>	Rattle box	0.10	lbs.
<i>Dalea Candida</i>	White prairie clover	0.05	lbs.
<i>Dalea purpurea</i>	Purple prairie clover	0.55	lbs.
<i>Desmanthus illinoensis</i>	Prairie mimosa	0.5	lbs.
<i>Desmodium canadense</i>	Showy tick-trefoil	0.02	lbs.
<i>Echinacea pallida</i>	Pale purple coneflower	0.05	lbs.
<i>Eryngium yuccifolium</i>	Rattlesnake Master	0.005	lbs.
<i>Eupatorium</i>	Boneset	0.01	lbs.
<i>Eupatorium altissimum</i>	Tall thoroughwort	0.01	lbs.
<i>Eupatorium maculatum</i>	Spotted trumpetweed	0.01	lbs.
<i>Euphorbia corollata</i>	Flowering spurge	0.01	lbs.
<i>Eutrochium purpureum</i>	Sweetscented Joe Pye Weed	0.05	lbs.
<i>Geranium maculatum</i>	Wild geranium	0.005	lbs.

<i>Helianthus occidentalis</i>	Western sunflower	0.02	lbs.
<i>Helianthus petiolaris</i>	Prairie sunflower	0.02	lbs.
<i>Heliopsis helianthoides</i>	Ox-eye sunflower	0.10	lbs.
<i>Hypericum ascyron</i>	Giant St. Johns wort	0.15	lbs.
<i>Kuhnia eupatoriodes</i>	False boneset	0.01	lbs.
<i>Lespedeza capitata</i>	Roundheaded bushclover	0.05	lbs.
<i>Liatris aspera</i>	Tall blazing star	0.01	lbs.
<i>Liatris pycnostachya</i>	Prairie blazing star	0.05	lbs.
<i>Lonactis linariifolia</i>	Stiff-leaved aster	0.005	lbs.
<i>Ludwigia alternifolia</i>	Seedbox	0.005	lbs.
<i>Mimulus</i>	Monkey Flower	0.001	lbs.
<i>Monarda fistulosa</i>	Wild bergamot	0.01	lbs.
<i>Oenothera biennis</i>	Common evening primrose	0.05	lbs.
<i>Oligoneuron rigidum</i>	Stiff goldenrod	0.03	lbs.
<i>Parthenium integrifolium</i>	Wild quinine	0.02	lbs.
<i>Penstemon digitalis</i>	Foxglove penstemon	0.02	lbs.
<i>Penstemon grandifloras</i>	Large-flowered beardtongue	0.02	lbs.
<i>Phlox pilosa</i>	Prairie phlox	0.005	lbs.
<i>Physostegia virginiana</i>	False dragonhead	0.02	lbs.
<i>Pycnanthemum</i>	Common mountain mint	0.01	lbs.
<i>Ratibida pinnata</i>	Grey-headed coneflower	0.25	lbs.
<i>Rosa arkansana</i>	Prairie wild rose	0.005	lbs.
<i>Rudbeckia hirta</i>	Black-eyed Susan	0.11	lbs.
<i>Rudbeckia triloba</i>	Brown-eyed Susan	0.01	lbs.
<i>Ruellia</i>	Wild petunia	0.10	lbs.
<i>Silphium</i>	Rosinweed	0.01	lbs.
<i>Silphium laciniatum</i>	Compass plant	0.01	lbs.
<i>Silphium perfoliatum</i>	Cup plant	0.01	lbs.
<i>Silphium pinnatifidum</i>	Prairie rosinweed	0.01	lbs.
<i>Solidago speciosa</i>	Showy Goldenrod	0.02	lbs.
<i>Symphyotrichum laeve</i>	Smooth blue aster	0.01	lbs.
<i>Symphyotrichum novae-angliae</i>	New England aster	0.01	lbs.
<i>Symphyotrichum novae-angliae</i>	New England aster	0.01	lbs.
<i>Symphyotrichum oolentangiense</i>	Skyblue aster	0.01	lbs.
<i>Tradescantia</i>	Common spiderwort	0.01	lbs.
<i>Verbena hastata</i>	Blue vervain	0.03	lbs.
<i>Verbena stricta</i>	Hoary vervain	0.05	lbs.
<i>Vernonia</i>	Ironweed	0.02	lbs.
<i>Veronicastrum virginicum</i>	Culvers root	0.005	lbs.
<i>Zizia aurea</i>	Golden Alexanders	0.10	lbs.

- (4) Prepare a firm seedbed for all planting methods:
 - (a) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, till all areas to be seeded by disking or other approved methods; thoroughly loosen and pulverize the soil to a depth of three (3) inches. This may require multiple passes of the disk or other approved equipment. If the land was used for pasture and has a smooth surface, the preparation in non-disturbed areas to be seeded shall include mowing any vegetation taller than 12 inches and applying a burn down herbicide, such as glyphosate, at the labeled rates to emergent growth 2 to 4 weeks after mowing. After the vegetation has died, the area shall be disked as needed to thoroughly loosen and pulverize the soil to a depth of three (3) inches. If emergent growth occurs again prior to seeding, the area shall receive a second application of herbicide. Seeding shall not occur until the existing vegetation has died. If the pasture has a rough surface that would negatively impact the seeding, the area shall be thoroughly disked and the cultipacked prior to seeding.
 - (b) After the disking operation, and prior to seed application, firm the seedbed with a cultipacker or similar piece of equipment.
- (5) Fertilizer shall be applied on the entire seeding area at the following rate:
 - (a) Nitrogen: 30 lbs./acre
 - (b) Phosphorus (P2O5): 30 lbs./acre
 - (c) Potassium (K2O): 40 lbs./acre
- (6) No mulch shall be applied.
- (7) Seeding will be completed during the follow seeding periods:
 - Spring: March 1 to May 15
 - Fall: November 15 to freeze up
- (8) For seeding occurring in the Spring seeding period, scarification of the seed must be completed by the seed provider.
- (9) Sow seeds using a broadcast seeder at the specified rates.
- (10) If seeding is completed during the spring seeding period, a companion crop of oats shall be seeded at ½ bushel per acre.
- (11) Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall also be allowed in areas no accessible to other equipment.
- (12) Upon completion of the seeding operation, lightly cultipack the seedbed to provide a positive seed-soil contact. The type of cultipacker / seeder to be used shall be subject to acceptance by Engineer.
- (13) Measurement and payment will be based on the area successfully seeded.

c. Seeding, Wetland Seed Mix (Bid Item 4)

- (1) This item will consist of seeding wetland areas as shown in the drawings.
- (2) All seed must be cleaned and weed free. Seeding rates are expressed in bulk pounds per acre. Seed quality shall not drop below 70% Pure Life Seed (PLS) where $PLS = (\% \text{ germination} + \% \text{ dormant seed}) \text{ times } \% \text{ purity}$.
- (3) Seed mix shall be as specified in the wetland seed mix table on the following page.
- (4) Prepare a firm seedbed for all planting methods:
 - (a) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, till all areas to be seeded by disking or other approved methods; thoroughly loosen and pulverize the soil to a depth of three (3) inches. This may require multiple passes of the disk or other approved equipment. If the land was used for pasture and has a smooth surface, the preparation in non-disturbed areas to be seeded shall include mowing any vegetation taller than 12 inches and applying a burn down herbicide, such as glyphosate, at the labeled rates to emergent growth 2 to 4 weeks after mowing. After the vegetation has died, the area shall be disked as needed to thoroughly loosen and pulverize the soil to a depth of three (3) inches. If emergent growth occurs again prior to seeding, the area shall receive a second application of herbicide. Seeding shall not occur until the existing vegetation has died. If the pasture has a rough surface that would negatively impact the seeding, the area shall be thoroughly disked and the cultipacked prior to seeding.
 - (b) After the disking operation, and prior to seed application, firm the seedbed with a cultipacker or similar piece of equipment.
- (5) Fertilizer shall be applied on the entire seeding area at the following rate:
 - (a) Nitrogen: 30 lbs./acre
 - (b) Phosphorus (P₂O₅): 30 lbs./acre
 - (c) Potassium (K₂O): 40 lbs./acre
- (6) No mulch shall be applied.
- (7) Seeding will be completed during the follow seeding periods:
 - Spring: March 1 to May 15
 - Fall: November 15 to freeze up
- (8) For seeding occurring in the Spring seeding period, scarification of the seed must be completed by the seed provider.
- (9) Sow seeds using a broadcast seeder at the specified rates.
- (10) If seeding is completed during the spring seeding period, a companion crop of oats shall be seeded at ½ bushel per acre.
- (11) Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall also be allowed in areas no accessible to other equipment.
- (12) Upon completion of the seeding operation, lightly cultipack the seedbed to provide a positive seed-soil contact. The type of cultipacker / seeder to be used shall be subject to acceptance by Engineer.
- (13) Measurement and payment will be based on the area successfully seeded.

Table 2 – Wetland Edge Seed Mix

Common Name	Botanical Name	Material	LB/AC	% of Total by Weight
Grasses, Sedges & Rushes				
Blue Joint Grass	<i>Calamagrostis canadensis</i>	Seed	0.25	1.98%
Bristly Sedge	<i>Carex comosa</i>	Seed	0.25	1.98%
Crested Oval Sedge	<i>Carex cristatella</i>	Seed	0.25	1.98%
Bristly Cattail Sedge	<i>Carex frankii</i>	Seed	0.125	0.99%
Porcupine Sedge	<i>Carex hystericina</i>	Seed	0.125	0.99%
Common Hop Sedge	<i>Carex lupulina</i>	Seed	1.50	11.87%
Lance Fruited Oval Sedge	<i>Carex scoparia</i>	Seed	0.185	1.46%
Common Fox Sedge	<i>Carex stipata</i>	Seed	0.125	0.99%
Brown Fox Sedge	<i>Carex vulpinoidea</i>	Seed	0.25	1.98%
Virginia Wild Rye	<i>Elymus virginicus</i>	Seed	3.00	23.73%
Common Rush	<i>Juncus effusus</i>	Seed	0.125	0.99%
Dark Green Rush	<i>Scirpus atrovirens</i>	Seed	0.25	1.98%
Prairie Cord Grass	<i>Spartina pectinata</i>	Seed	0.50	3.96%
		<i>Subtotal</i>	<i>6.935</i>	<i>54.87%</i>
Flowers & Broadleaves				
Common Water Plantain	<i>Alisma subcordatum</i>	Seed	0.25	1.98%
Swamp Milkweed	<i>Asclepias incarnata</i>	Seed	2.00	15.82%
Turtlehead	<i>Chelone glabra</i>	Seed	0.06	0.47%
Spotted Joe Pye Weed	<i>Eutrochicum maculatum</i>	Seed	0.185	1.46%
Virginia Iris	<i>Iris virginica</i>	Seed	2.00	15.82%
Great Blue Lobelia	<i>Lobelia siphilitica</i>	Seed	0.06	0.47%
Monkey Flower	<i>Mimulus ringens</i>	Seed	0.08	0.63%
Cup Plant	<i>Silphium perfoliatum</i>	Seed	0.06	0.47%
Riddell's Goldenrod	<i>Solidago riddellii</i>	Seed	0.13	1.03%
New England Aster	<i>Symphotrichum novae-angliae</i>	Seed	0.50	3.96%
Blue Vervain	<i>Verbena hastata</i>	Seed	0.38	3.01%
		<i>Subtotal</i>	<i>5.705</i>	<i>45.13%</i>
Seed Mix Totals			12.64	100.00%

IA-8 MOBILIZATION AND DEMOBILIZATION

B. Measurement and Payment

1. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.
2. Initial payment of 50% of the contract price will be made in the first pay application after mobilization of the contractor's equipment to the project site and commencement of the project work has started. Final payment of the remaining 50% of the contract price will be made in the pay application following when the project is considered substantially complete by the Engineer.

C. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Mobilization & Demobilization (Bid Item 5)
 - (1) This item shall consist of mobilizing and demobilizing personnel and equipment to and from the project location in preparation to perform the work within the scope of this contract.
 - (2) Any work that is necessary to provide access to the site including, but not limited to, grading, access road construction, temporary culverts, and clearing shall be included in this item. When construction is completed access areas will be restored, as close as practical, to its original condition unless approval is obtained from the Engineer and the landowner.
 - (3) The Contractor shall exercise caution to minimize the amount of damage caused by the grading and clearing operations.
 - (4) Portable toilets shall be provided at the construction site and used for the sanitary facilities. Toilets must be removed upon completion of the work.
 - (5) This item shall not include transportation of personnel, equipment and operating supplies within the work limits areas of this contract.
 - (6) Payment will constitute full compensation for related subsidiary items.
 - b. Traffic Control (Bid Item 6)
 - (1) This item includes all materials, equipment, and procedures for traffic control during construction.
 - (2) The costs to furnish, erect, operate, maintain, move, and remove all traffic control devices as required shall be included in this item.
 - (3) Execution of this item shall be according the Iowa Department of Transportation Standard Plans and Specifications.

IA-9 SUBSURFACE DRAIN INVESTIGATION, REMOVAL, AND REPAIR

A. MEASUREMENT AND PAYMENT

1. Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. ITEMS OF WORK AND CONSTRUCTION DETAILS

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Subsidiary Item, Drainage Tile Investigation and Removal
 - (1) Any drainage tiles encountered within the project area shall be traced to the upstream inlet or practice boundary, whichever is encountered first in accordance with this specification.
 - (2) This item shall consist of the excavation necessary to locate and remove all tile under the embankment, to remove tile at the other tile locations shown on the plans and locate the field tile lines in the practice. This item shall also consist of backfilling tile trenches if required.
 - (3) This item does not include the additional tile removal that occurs as part of the proposed project earthwork. Tile removal occurring in these areas is made subsidiary to specification IA-1, Site Preparation.
 - (4) The extent of tile investigation and removal shall be as required to locate and extend tiles as shown on the plans.
 - (5) The investigation should reveal where the tile crosses the embankment footprint or where it is located if it does not cross the embankment footprint.
 - (6) Removal shall be completed in accordance with IA-1, IA-3, IA-5, and IA-9.

IA-11 REMOVAL OF WATER

A. MEASUREMENT AND PAYMENT

1. Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Subsidiary Item, Dewatering
 - (1) This item shall include all costs to divert, pump, dam or other means to control water run-on, run-off, and accumulation within the construction site.
 - (2) No separate or additional payment will be made for control or removal of water from the project location. Compensation for this item shall be subsidiary to other work items.

IA-21 EXCAVATION

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section. Items of Work and Construction Details.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Subsidiary Item, Excavation for Earthfill
 - (1) This item will consist of the excavation of material in locations shown on the plans for use as Earthfill. All excavation required for the project will be balanced onsite, unless otherwise noted, in areas designated as Earthfill.
 - (2) No separate payment will be made for excavation.
 - (3) Compensation for this item will be included in the payment for Earthfill, Embankment Fill (Bid Item 7) and Earthfill, Waste Fill (Bid Item 8).

IA-23 EARTHFILL

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Earthfill, Embankment Fill (Bid Item 7)
 - (1) This item shall consist of excavating, placing, and compacting the earthfill necessary to construct the embankment and adjacent fill areas as shown on the plans.
 - (2) Earthfill approved soil material shall be taken from excavation and designated borrow areas unless other areas are approved by the engineer.
 - (3) Compaction shall be Method 2 unless otherwise noted on the plans.
 - (4) Rocks larger than 6" shall be removed prior to compaction.
 - (5) Measurement and payment for Earthfill, Embankment Fill shall be on a plan "P" cubic yard basis. Plan basis means that the plan quantity listed in the proposal will be used to measure and pay for the bid item regardless of the actual quantity.
 - (6) A 25% shrinkage factor was used to determine the plan quantity.
 - b. Earthfill, Waste Fill (Bid Item 8)
 - (1) This item shall consist of excavating and placing unsuitable fill material from the existing pond as shown on the plans.
 - (2) Unsuitable material shall be wasted in the borrow area, after all suitable borrow material has been moved to the embankment.
 - (3) Earthfill approved soil material that would otherwise be wasted may be used in lieu of material from the proposed borrow areas. Material must be reviewed and approved by engineer prior to use as Earthfill, Embankment Fill (Bid Item 7).
 - (4) Measurement and payment for Earthfill, Waste shall be on a plan "P" cubic yard basis. Plan basis means that the plan quantity listed in the proposal will be used to measure and pay for the bid item regardless of the actual quantity.
 - (5) A 0% shrinkage factor was used to determine the plan quantity, since compaction of the wasted material will not be required.

c. Subsidiary Item, Backfill Required Excavation

- (1) This item shall consist of backfilling the areas excavated to install other components related to the project such as piping or structures and to locate and remove the tile line.
- (2) Compaction adjacent to the structures shall be as indicated above. All other compaction shall be Method 1 or equivalent.
- (3) No separate payment will be made for Backfill of Structure Excavation. Compensation for this item will be included in payment for Corrugated Metal Pipe, Water Control Structure, Riser Inlet Structure, Tile Investigation and Removal, Corrugated Plastic Tubing Tile Drains, or Interceptor Drains if applicable.

d. Subgrade Preparation (Bid Item 9)

- (1) This item includes, but is not limited to, excavating, manipulating, replacing, compacting, and trimming to the proper grade.
- (2) Execution of this item shall be according to the following specifications:
 - (a) Uniform Composition: Provide uniform composition of at least 12 inches below top of subgrade under new paving or subbase, plus 2 feet on each side. Use select subgrade materials unless granular stabilization materials or subgrade treatment is specified.
 - 1) Construct in two 6 inch lifts.
 - 2) Remove stones over 3 inches from subgrade.
 - 3) Construct to elevation and cross-section such that, after rolling, surface will be above required subgrade elevation.
 - (b) Subgrade Stability:
 - 1) Perform proof rolling with a truck loaded to the maximum single legal axle gross weight of 20,000 pounds or the maximum tandem axle gross weight of 34,000 pounds. Operate trucks at less than 10 mph. Make multiple passes for every lane. The subgrade will be considered to be unstable if, under the operation of the loaded truck, the surface shows yielding (soil wave in front of the loaded tires) or rutting of more than 2 inches, measured from the top to the bottom of the rut at the outside edges.
 - 2) If soft or yielding areas are located, remove unstable materials and replace with suitable foundation materials as approved by the Engineer, meeting Section 2010, 2.04. Compact subgrade materials in cut sections as required by the Engineer. If stabilization material is used, place and compact as required for subbase.
 - (c) Final Subgrade: Complete final subgrade by excavation to grade by use of steel-shod template supported on side forms, support rollers, or by use of an automatically-controlled subgrade excavating machine.
 - (d) Subgrade Check: Check subgrade elevation and grade by method approved by Engineer prior to paving.

- (e) Ruts: If ruts or other objectionable irregularities form in subgrade during construction, reshape and re-roll subgrade before placing pavement. Fill ruts or other depressions with material similar to other subgrade material, and compact.
- (3) All soils required for subgrade materials must be approved by the Engineer. Approval of materials and their use will be based on SUDAS section 2010, subpart 2.03
 - (a) Density of 95 pcf or greater according to ASTM D 698 or AASHTO T 99 (Standard Proctor Density).
 - (b) AASHTO M 145 group index of less than 30.
 - (c) Liquid limit (LL) less than 50.
 - (d) Soils not meeting these requirements are considered unsuitable soils, regardless of classification.
- (4) The Engineer may authorize a change in subgrade materials subject to materials available locally at time of construction.

IA-26 TOPSOILING

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Topsoil, Strip, Salvage and Re-spread (Bid Item 10)
 - (1) This item will consist of stripping, salvaging, stockpiling and spreading salvaged (stockpiled) topsoil as the surface layer of all excavations and earth fills that will be disturbed as shown on the drawings.
 - (2) All other areas being excavated or receiving fill should be stripped of the top six (6) inches of topsoil and stockpiled.
 - (3) A minimum six (6) inch layer of topsoil shall be applied to all disturbed areas that will be seeded prior to project seeding.
 - (4) Measurement and payment for top soiling shall be on a plan "P" cubic yard basis. Plan basis means that the plan quantity listed in the proposal will be used to measure and pay for the bid item regardless of the actual quantity.

IA-45 PLASTIC PIPE

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Interceptor Drain (Bid Item 17)
 - (1) This item will consist of furnishing and installing the interceptor drains as shown on the plans.
 - (2) All costs to purchase, transport, and install the pipe, fittings, and appurtenances shall be included in this item. It is the contractor's responsibility to determine what fittings will be required.
 - (3) All costs to purchase, transport, and place backfill required for the interceptor drain, as shown on the plans, shall be included in this item.
 - (4) Installation of pipe shall also be in accordance with IA-45 Plastic Pipe.
 - (5) Installation shall include rodent guard as specified in IA-51.
 - (6) Linear foot measurement and payment will constitute full compensation for this bid item and related subsidiary items.
 - (7) No payment will be made for quantities of this item that are installed without the Engineer's approval.

IA-51 CORRUGATED METAL PIPE CONDUITS

C. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

D. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Corrugated Metal Pipe, 24" (Bid Item 11):
 - (1) This item will consist of furnishing and installing the corrugated metal pipe outlet, including rodent guard.
 - (2) The corrugated metal pipe shall be 16-gauge aluminum coated with annular or helical corrugations as noted on the drawings. The minimum corrugation size shall be 2-2/3"x1/2".
 - (3) Pipe materials with recycled content that meet ASTM A 760 and A 929 for the specified size of pipe are preferred and should be used where feasible. Post-consumer Steel Content of 15 to 70% and total recoverable steel material of 25-100% is recommended if available. Engineer may request information regarding recycled content of pipe materials for review.
 - (4) Coupling bands, repair of damaged coatings, and other appurtenances are subsidiary to this item and shall not warrant separate payment.
 - (5) Linear foot measurement and payment will constitute full compensation for this bid item and related subsidiary items.
 - b. Corrugated Metal Pipe, 36" (Bid Item 12):
 - (1) This item will consist of furnishing and installing the corrugated metal pipe outlet including anti-seepage collars and rodent guard.
 - (2) The corrugated metal pipe shall be 14-gauge aluminum coated with annular or helical corrugations as noted on the drawings. The minimum corrugation size shall be 3"x1".
 - (3) Pipe materials with recycled content that meet ASTM A 760 and A 929 for the specified size of pipe are preferred and should be used where feasible. Post-consumer Steel Content of 15 to 70% and total recoverable steel material of 25-100% is recommended if available. Engineer may request information regarding recycled content of pipe materials for review.
 - (4) Coupling bands, anti-seep collars, repair of damaged coatings, and other appurtenances are subsidiary to this item and shall not warrant separate payment.
 - (5) Linear foot measurement and payment will constitute full compensation for this bid item as related subsidiary items.

c. 48" CMP Riser with Trash Rack (Bid Item 13):

- (1) This item will consist of furnishing and installing the corrugated metal pipe riser as shown on the drawings.
- (2) The corrugated metal pipe shall be 12 gage aluminum coated with annular corrugations unless otherwise noted on the drawings. The minimum corrugation size shall be 3"x1".
- (3) Pipe materials with recycled content that meet ASTM A 760 and A 929 for the specified size of pipe are preferred and should be used where feasible. Post-consumer Steel Content of 15 to 70% and total recoverable steel material of 25-100% is recommended if available. Engineer may request information regarding recycled content of pipe materials for review.
- (4) Coupling bands, repair of damaged coatings, metal fabrication, trash rack, anti-vortex device, and other appurtenances are subsidiary to this item and shall not warrant separate payment.

IA-61 LOOSE ROCK RIPRAP

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Class E Revetment stone (Bid Item 14):
 - (1) This item shall consist of procurement and placement of rip-rap or revetment stone as shown on the drawings
 - (2) Rip-Rap Materials shall meet Iowa DOT Section 4130 Class E Revetment.
 - (3) Alternative materials, including natural field stone, may be substituted in place of rip-rap if the size, shape, and quantity is approved by the Engineer. Field stone may be sourced locally by the contractor or from the project landowner. Substitution requests shall be submitted to the Engineer and include photos showing the relative size and quantity of stone to be used.
 - (4) Measurement and payment shall be on an actual per ton basis of stone installed. Weigh tickets shall be provided to the Engineer.
 - (5) Subsidiary Item - Geotextile Fabric, IA-95
 - (a) Geotextile shall be installed under all rip rap as shown on the drawings.
 - (b) No separate payment will be made for geotextile.
 - b. Granular Surfacing (Bid Item 15):
 - (1) This item shall consist of procurement and placement of 1.5" roadstone to as depth of 8", as shown on the drawings
 - (2) Alternative materials may be substituted in place of 1.5" road stone if the size, shape, and quantity is approved by the Engineer. Substitution requests shall be submitted to the Engineer.
 - (3) Measurement and payment shall be on an actual per ton basis of stone installed. Weigh tickets shall be provided to the Engineer.
 - (4) Any costs associated with the resspreading of existing granular material stripped as part of Site Preparation (Bid Item 1) shall be considered incidental to this bid item. No additional compensation shall be given.
 - (5) No additional compensation shall be given for the procurement or placement of additional granular material required to restore disturbed areas beyond the grading/construction limits. Any additional material shall be provided at the Contractor's expense.

IA-81 Metal Fabrication and Installation

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Subsidiary Item- Metal and Metal Fabrication
 - (1) This item will consist of furnishing and installing all steel and aluminum shown on the drawings.
 - (2) No separate payment will be made for Steel, aluminum or metal fabrication. Payment for this item will be considered subsidiary to the following Bid Items:
 - (a) Corrugated Metal Pipe, 24" (Bid Item 11)
 - (b) Corrugated Metal Pipe, 36" (Bid Item 12)
 - (c) 48" CMP Riser with Trash Rack (Bid Item 13)

IA-92 FENCE

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Fencing, 5-Strands of Barbed Wire (Bid Item 16)
 - (1) This item will consist of furnishing and installation of fencing as shown on the project drawings.
 - (2) Fencing shall be 5 strands of barbed wire and in accordance with IA-92 (2) Standard Fence.
 - (3) Measurement and payment shall be on a per linear foot of fence installed and accepted.
 - b. Subsidiary Items – Fence repair or replacement
 - (1) This item is subsidiary to Bid Item 1: Site Preparation.
 - (2) Any fence damaged or removed by the contractor that was not specified in the project drawings shall be replaced per IA-92. The fence type shall be determined by the type of existing fence that was damaged. Sufficient length of fencing shall be replaced to provide a seamless transition between the existing and replacement fence.

IA-95 GEOTEXTILE

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Subsidiary Item - Geotextile Fabric
 - (1) This item shall consist of furnishing and placing geotextile on all earth surfaces that contact the rock riprap or roadstone as shown on the drawings.
 - (2) Geotextile shall be Class I, nonwoven.
 - (3) The geotextile shall be placed with the long dimension parallel to the channel.
 - (4) Geotextile shall not be measured and shall be considered subsidiary to Rock Riprap bid items.
 - (5) No additional payment will be made for geotextile.

TABLE 2. REQUIREMENTS FOR NONWOVEN GEOTEXTILES

Property	Test Method	Class I	Class II	Class III	Class IV ^{3/}
Tensile strength (pounds) ^{1/}	ASTM D 4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure (%) ^{1/}	ASTM D 4632	≥ 50	≥ 50	≥ 50	> 50
Puncture (pounds)	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent opening size – AOS	ASTM D 4751	As specified max. # 40 ^{2/}	As specified max. # 40 ^{2/}	As specified max. # 40 ^{2/}	As specified max. # 40 ^{2/}
Permittivity sec ⁻¹	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

1/ Minimum average roll value (weakest principal

direction). 2/ U.S. standard sieve size

3/ Heat-bonded or resin bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle punched geotextiles are required for all other classes.

IA-620 UNDERGROUND OUTLET

A. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the length of pipe will be computed to the nearest foot along the centerline of pipe and shall include the length of the aprons. Payment will be made to constitute full payment for all labor, materials, equipment, and all other items necessary and incidental to the completion of the work.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work

B. Items of Work and Construction Details

1. Each of the following items shall be completed in accordance with IA-51 and IA-620. Measurement and payment for the following items shall be according to IA-51:
 - a. Corrugated Metal Pipe, 24" (Bid Item 11)
 - b. Corrugated Metal Pipe, 36" (Bid Item 12)
 - c. 48" CMP Riser with Trash Rack (Bid Item 13)
2. Each of the following items shall be completed in accordance with IA-45 and IA-620. Measurement and payment for the following items shall be according to IA-45:
 - a. Interceptor Drain (Bid Item 17)

Section 2524. Highway Signing

2524.01 DESCRIPTION.

Erect traffic signs and delineators according to the contract documents.

2524.02 MATERIALS.

- A. Signing Materials: Apply [Section 4186](#).
- B. Wood Posts: Apply [Section 4164](#).
- C. Class A Crushed Stone: Apply [Article 4120.04](#).
- D. Concrete Footings: Apply the provisions of [Section 2403](#).

2524.03 CONSTRUCTION.

Ensure all parts used in construction of traffic signs and delineators are able to withstand a wind load of 30 pounds per square foot on the sign surface.

A. Fabrication of Signs.

1. Traffic Signs.

- a. Except as modified by the contract documents, fabricate signs according to the standards established in the Standard Highway Signs, 2004 edition, and 2012 Supplement as published by the US DOT.
- b. All traffic signs, except reference location signs and 6 inch by 6 inch route markers, are classified into two groups, Types A and B, as indicated in the contract documents.

1) Type A Signs.

- a) Comply with the following:
 - Aluminum, galvanized steel, plywood sheets mounted on wood posts or perforated square steel tubing.
 - Sign face material fabricated from reflective sheeting.
 - Sign legends accomplished with either the direct or reverse silk screen process, with black nonreflective sheeting that is direct applied, or transparent film, as approved for use by the retro reflective sheeting manufacturer.
- b) Ensure the finished signs comply with the details specified in the contract documents.

2) Type B Signs.

- a) Comply with the following:
 - Extruded aluminum highway sign panels mounted on either wood posts, perforated square steel tubing, or steel breakaway posts as specified in the contract documents.
 - Sign face material fabricated from reflective sheeting.
 - Sign legends accomplished through use of reflectorized or nonreflectorized letters, numerals, symbols, and borders that are direct applied.
 - b) Ensure the finished signs comply with the details specified in the contract documents.
 - c) Prior to fabrication, submit shop drawings for each Type B sign according to [Article 1105.03](#). Each drawing is to be a scale drawing of the sign face, showing the size, arrangement, and spacing of all letters, numerals, symbols, and borders.
- c. Digital printing shall comply with the following:
 - Sign manufacturer shall be certified for digital printing by the retro reflective sheeting manufacturer.
 - All digital printing shall be done in a workmanlike manner and as recommended by the manufacturer of the retro reflective sheeting.
 - Appropriate manufacturer's recommended overlamine films must be used in digital printing. Any noticeable deviation from the shades shall be cause for rejection of any sign.
 - Opaque or transparent inks shall be of the type and quality recommended by the manufacturer of the retro reflective sheeting.
 - A matched component system, recommended by the manufacturer shall be used in the digital printing process.

2. Reference Location Signs.

- a. Comply with the following:
 - Green reflectorized sheeting on flat aluminum or galvanized steel sheets as for Type A signs.
 - Reflectorized white message applied directly to the face material.
 - Dimensions as specified in the contract documents.
- b. Mount reference locations signs on posts of the type specified for delineators.
- c. Prior to fabrication, submit shop drawings for each reference location sign according to [Article 1105.03](#). Each drawing is to be a scale drawing of the sign face, showing the size, arrangement, and spacing of all letters, numerals, symbols, and borders.

3. Route Markers, 6 Inch by 6 Inch.

Comply with the following:

- Reflectorized sheeting on flat aluminum or galvanized steel sheets as for Type A signs.

- Details as specified in the contract documents.

4. Delineators.

- Install a hermetically sealed, acrylic plastic, prismatic, reflex reflector, appropriately housed and contained on [Materials I.M. 486.07](#).
- Mount above reference location signs on the same delineator post.

B. Erection of Signs, Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

1. Type A and B Signs.

- Accurately erect all Type A and B signs to comply with the dimensions and details shown in the contract documents. Obtain the Engineer's approval for all deviations from the contract documents before starting the work.
- After installation, modify each 4 inch by 6 inch wood sign post by field drilling holes as shown in the contract documents. All labor and equipment necessary for this modification is included in the price bid for the post and no separate payment will be made.
- Set wood posts in 12 inch diameter holes of the proper depth with a minimum embedment of 5.0 feet.
- Set posts to full depth at the required spacing. Align posts accurately both vertically and horizontally. Place backfill consisting of Class A crushed stone meeting the requirements of [Article 4120.04](#) into the post holes. Place material in layers no more than 6 inches in depth. Thoroughly compact each layer taking care to preserve the alignment of the posts.
- Where steel breakaway posts are specified in the contract documents, carefully drill or dig footing holes to the required size at the proper location. Spread the excavated earth within the right-of-way to blend uniformly with the existing surface to the Engineer's approval.
- Immediately before placing concrete, remove all loose and uncompacted material from the bottom of the hole. Some of the holes will be located in the bottoms of drainage ditches. In these cases conduct construction operations so that water will not enter excavated holes.
- For the breakaway base, tighten all bolts to maximum using a 12 inch to 15 inch wrench to bed washers and shims, and to clean bolt threads. Loosen each bolt in turn and retighten in systematic order to the torque specified in the contract documents. For the fuse plate assembly, tighten fuse bolts to the torque specified in the contract documents.
- Preposition stub posts and reinforcing to the proper depth as shown in the contract documents. Ensure stub posts and reinforcing are properly aligned and secured, complying with [Article 2405.03, H. 3](#). Cast the footing to the elevation shown in the contract documents. Rod the concrete in place to fill all the voids. Form the exposed portion of the footing as shown in the contract documents. Shape the cap of the footing so that drainage is away from the base plate of the post. Apply the provisions of Section 2403.
- After the concrete has developed the strength required by [Article 2403.03, N. 2](#), attach the post and adjust for correct alignment and elevation. Remove all excess concrete from around the holes.
- Erect extruded panels according to the details in the contract documents. Take necessary measures to prevent damage to sign faces. Repair (at no additional cost to the Contracting Authority) any mars, scratches, dents, or other damage to sign faces visible at a distance of 5 feet. Tighten locknuts on the post clip bolts by means of a torque wrench to 225 inch-pounds when using dry, clean, unlubricated threads. Draw the nuts on panel bolts tight.

2. Delineators, Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

- Drive the posts for delineators, reference locations signs, and 6 inch by 6 inch route markers. Provide a suitable driving cap. Attach signs and delineators after driving.
- Erect markers and delineators so that the signs and delineator reflectors will be at elevations called for in the contract documents. Ensure they are true to line and grade and are truly vertical. Where a reference locations sign is designated, attach the marker in place of a delineator. Where a 6 inch by 6 inch route marker is designated, attach it above the reference location sign on the same post.
- Ensure delineator posts for these signs are plumb and firm in the ground, spaced as shown in the contract documents, and driven to the required lines and grades. Ensure that after driving, the top of the post has substantially the same cross section dimensions as the body of the post. Battered heads will not be permitted. Remove from the site and replace (at no additional cost to the Contracting Authority) all posts which are bent or otherwise damaged to the extent that they are, in the Engineer's opinion, unfit in the finished work.

3. Perforated Square Steel Tube (PSST) Posts and Anchors.

- Position posts within anchor at furthest corner from likely point of impact from an errant vehicle.
- Embed post within anchor without any play.
- Provide minimum insertion length as required by manufacturer.
- Ensure inside of break-away and slip base anchors installed in concrete are free of concrete to allow drainage.
- Install triangular slip base assembly as required by manufacturer.

C. Sign Positioning.

The glossy surface on sign faces may produce specular reflection. Position signs to eliminate or minimize specular reflection in the following manner:

1. Overhead Signs.

- Adjust the sign face in the following manner, where the road grade approaching the sign is plus 2.0% or greater:
 - Vertical axis to be parallel to a plumb line.
 - Horizontal axis to be at right angles to the road.

- b. Adjust the sign face in the following manner, where the road grade approaching the sign is less than plus 2.0%:
 - Vertical axis inclined to face upward at the rate of 1/8 inch per foot of vertical sign surface for each 1% the road grade differs from plus 2.0%.
 - Horizontal axis to be at right angles with the road.

2. Ground Installations.

- a. Ground installations will be shown in the contract documents.
- b. After installation of signs is complete, the signs will be inspected at night by the Engineer. If specular reflection is apparent on any sign, adjust its positioning to eliminate or minimize this condition.

D. Sign Identification.

Identify the signs as specified in Section 4186, with the following additions:

Sign No..... (Filled in by Sign Fabricator)

Erection Date..... (Filled in by Sign Contractor)

2524.04 METHOD OF MEASUREMENT.

Measurement for signing, satisfactorily erected according to the contract documents, will be as follows:

A. Type A Signs.

- 1. Calculated in square feet of sign area completed in place based on the nominal dimensions of the signs.
- 2. The area of all regular, rectangular, triangular, octagonal, and circular shaped Type A signs will be measured from the nominal given dimensions. Cutouts for rounded corners, and so forth, will not be deducted. The area of all irregularly shaped Type A signs, such as U.S. and Interstate route markers, will be measured from the dimensions of a circumscribed rectangle around the route marker.

B. Type B Signs.

Calculated in square feet on the basis of area of the vertical, front face of the signs specified in the contract documents. Measurement will not be made for area in excess of this area.

C. Wood Posts for Type A or B Signs.

Each to the nearest foot for the various post sizes installed. When posts are placed to depths greater than the minimum depth specified, the measured length does not include any parts placed to depths greater than 1 foot more than the specified minimum.

D. Steel Breakaway Posts for Type A or B Signs.

- 1. Each to the nearest 0.1 foot for the various post sizes installed.
- 2. Unless specified otherwise in the contract documents, the measured length of steel breakaway posts includes no more than 1 foot over the length necessary to meet specified minimums.

E. Concrete Footings for Breakaway Posts for Type A or B Signs.

Each will be counted by the various sizes installed.

F. Delineators, Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

Each will be counted by the various types installed.

G. Perforated Square Steel Tube Posts.

Linear feet, to nearest foot, measured from top of anchor to top of post. Embedded length will not be measured separately, but included in price bid for Perforated Square Steel Tube Posts.

H. Perforated Square Steel Tube Post Anchors.

By count of each type installed.

2524.05 BASIS OF PAYMENT.

Payment for signing, satisfactorily erected according to the contract documents, will be at the contract unit price as follows:

A. Type A Signs.

- 1. Per square foot of sign area.
- 2. Payment is full compensation for furnishing, fabricating, and erecting the signs complete, including furnishing of the blank, application of reflective sheeting, application of the screened message, and all mounting hardware.

B. Type B Signs.

1. Per square foot of sign area.
2. Payment is full compensation for:
 - Furnishing, fabricating, and erecting the complete signs, including furnishing aluminum extrusions or formed steel panel,
 - Applying reflective sheeting,
 - Furnishing and applying all letters, numerals, symbols, and border to the sign
 - Applying the sign to the post,
 - Furnishing all labor, and
 - Furnishing all other details necessary to provide signs complete and erected in place, except for the required footings and posts.

C. Wood Posts for Type A or B Signs.

1. Per linear foot.
2. Payment is full compensation for furnishing and erecting the posts, including treatment and other details necessary to provide the sign posts complete and erected in place.

D. Steel Breakaway Posts for Type A or B Signs.

1. Per linear foot for the various post sizes.
2. Payment is full compensation for furnishing, fabricating, and erecting the posts, including galvanizing and other details necessary to provide the sign posts complete and erected in place.

E. Concrete Footings for Breakaway Posts for Type A or B Signs.

1. Each for the various sizes.
2. Payment is full compensation for:
 - Excavating the hole,
 - Furnishing and placing concrete, stub post, reinforcing bars, and so forth,
 - Finishing, and
 - All other details necessary to provide a complete concrete footing.

F. Delineators, Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

1. Delineators and Reference Location Signs:
 - a. Each for the various types.
 - b. Payment is full compensation for:
 - Furnishing, fabricating, and erecting the delineators or reference location sign complete, including posts, reflector units, and frames for delineators, posts and reference location signs,
 - Furnishing all necessary fittings and attachments, and
 - All labor necessary to complete the work.
2. 6 inch by 6 inch Route Markers:
 - a. Each.
 - b. Payment is full payment for furnishing, fabricating, and erecting the route marker to a reference location sign post previously measured for payment, including all necessary fittings and attachments and all labor necessary to complete the work.

G. Perforated Square Steel Tube Posts.

1. Per linear foot.
2. Payment is full compensation for furnishing, fabricating, and erecting posts.

H. Perforated Square Steel Tube Post Anchors.

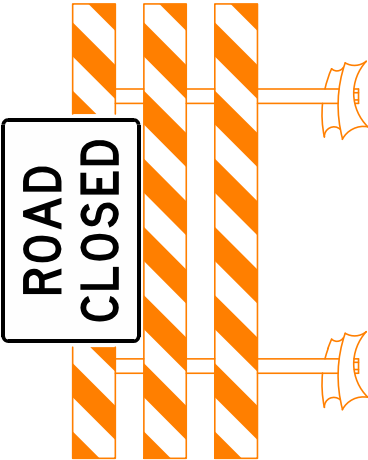
1. Each, by type.
2. Payment is full compensation for providing and installing anchor, coring pavement, backfilling with concrete, slip base hardware, and other details necessary to provide anchor complete and erected in place.

I. Excavation in Unexpected Rock.

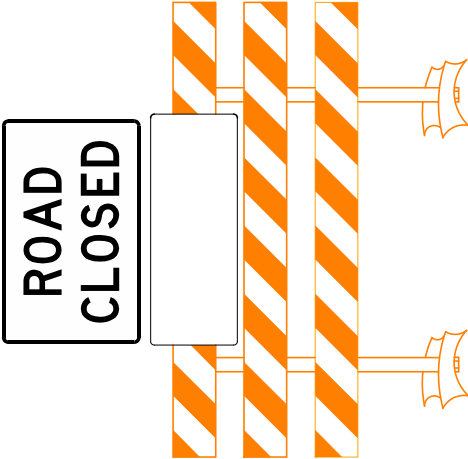
Excavation in unexpected rock for wood posts for Type A or B signs, steel posts for Type A or B signs, concrete footings for Type A or B signs, delineators, perforated square steel tube posts, and reference location signs will be paid for as extra work in

[Article 1109.03, B.](#) Unexpected rock will be considered as rock encountered during post erection, but neither visible from the roadway nor indicated in the contract documents.

SIGN PLACEMENT ON
TYPE III BARRICADES




Typical Sign Placement



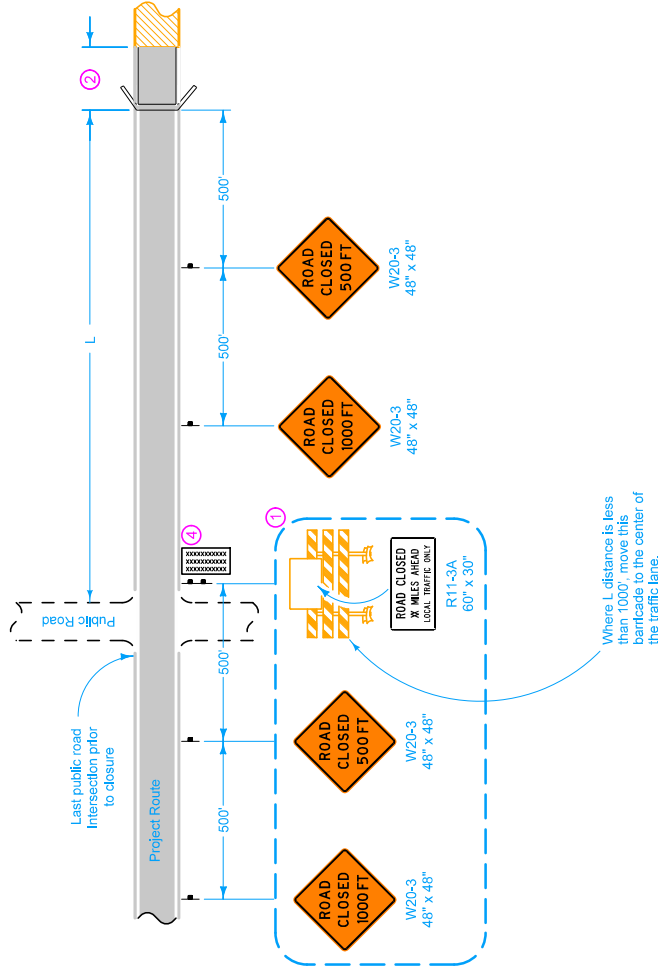
Sign Placement with
Supplemental Sign

Possible Contract Items:
Traffic Control
Safety Closures
Portable Dynamic Message Sign

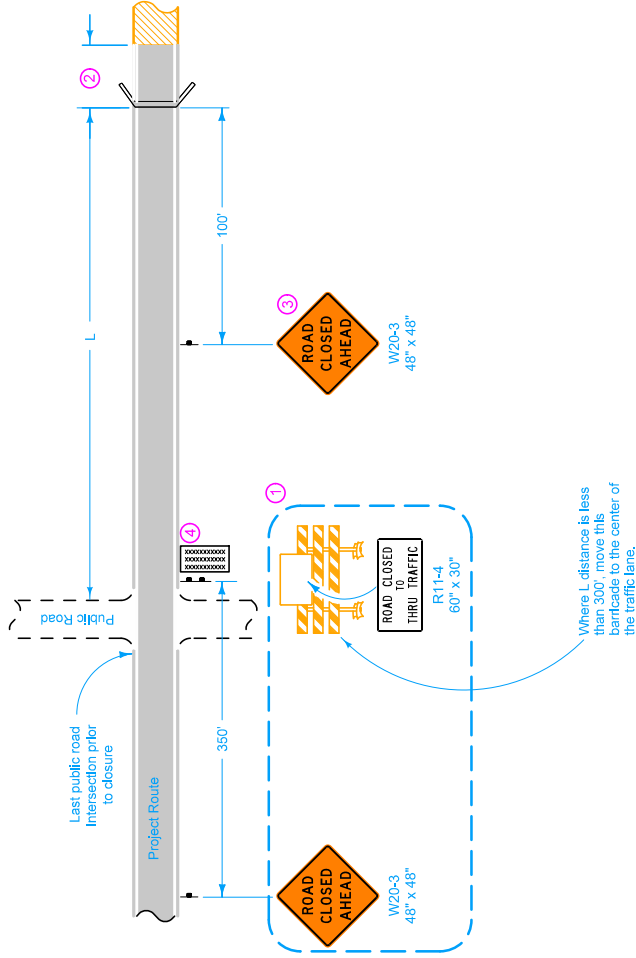
Possible Tabulation:
108-13A

 STANDARD ROAD PLAN	REVISION 6	04-21-20
	TC-252	
	SHEET 1 of 3	
REVISIONS: Added Portable Dynamic Message Sign and new note 4 on Sheet 2.		
<i>Handwritten Signature</i> APPROVED BY DESIGN METHODS ENGINEER		
ROUTES CLOSED TO TRAFFIC		

SITUATION 1 (RURAL)
Project Route Closure





SITUATION 1 (URBAN)
Project Route Closure



LEGEND

- Traffic Sign
- Type III Barricade
- Portable Dynamic Message Sign
- Work Area
- Road Closure

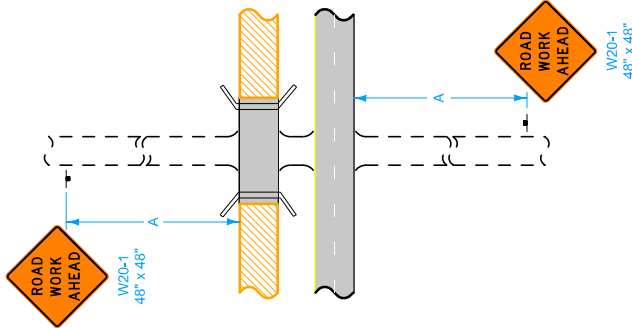
- ① In situation 1, if the intersection is the point of detour these signs and barricade will become the responsibility of the contracting authority and may be modified by the contracting authority to fit detour signing.
- ② When possible, a 100' buffer is desirable.
- ③ When L is less than 300 feet, omit the ROAD CLOSED AHEAD sign.
- ④ Place for 7 calendar days prior to closure. The Engineer will determine the message to display. Remove when road is closed. Use of Portable Dynamic Message Sign is optional on non-primary roadways.

 STANDARD ROAD PLAN	REVISION	6	04-21-20
	TC-252		
	SHEET 2 of 3		
	REVISIONS: Added Portable Dynamic Message Sign and new note 4 on Sheet 2.		
			
APPROVED BY DESIGN METHODS ENGINEER			

ROUTES CLOSED TO TRAFFIC

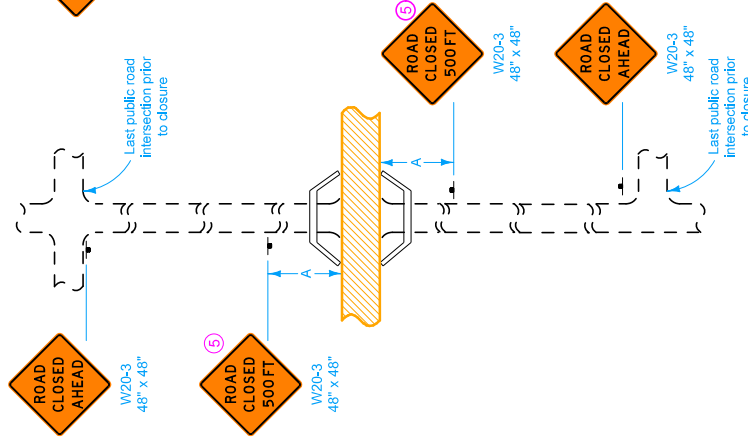
SITUATION 2

Public cross-traffic maintained.
No access to project.



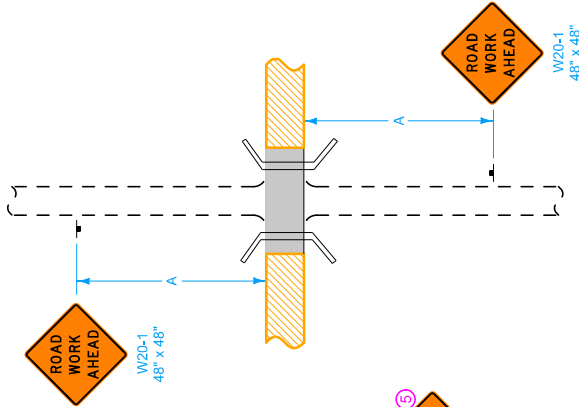
SITUATION 3

No access to project
(Applicable to T-Intersections)



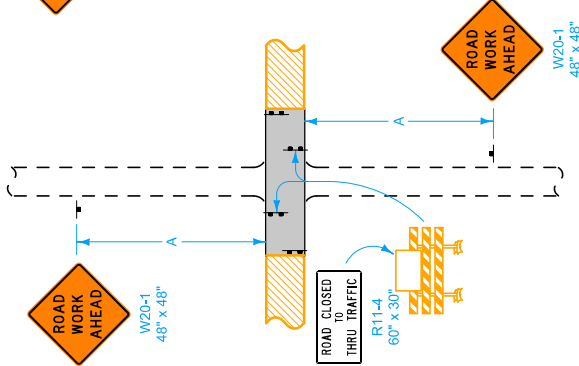
SITUATION 4

Public cross-traffic maintained.
No access to project.



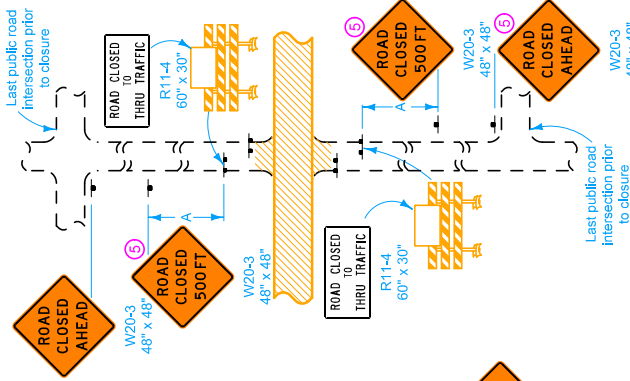
SITUATION 5

Public cross-traffic maintained.
Contractor and resident access only.



SITUATION 6

No public access. Contractor and resident access only. (Applicable to T-Intersections)



During suspension of work, (such as over winter):

- Use Situation 2 on two-lane to four-lane projects.
- Situation 5 is preferred where cross-traffic is maintained.

Ⓜ When the distance between the last public road intersection and the ROAD CLOSED or ROAD CLOSED TO THRU TRAFFIC barricade is less than 1,000 feet, omit the ROAD CLOSED 500 FT sign.

LEGEND	
	Traffic Sign
	Type III Barricade
	Work Area
	Road Closure

Location	A
Urban	200'
Rural	500'



STANDARD ROAD PLAN

TC-252

SHEET 3 of 3

REVISIONS: Added Portable Dynamic Message Sign and new note 4 on Sheet 2.

APPROVED BY DESIGN METHODS ENGINEER

ROUTES CLOSED TO TRAFFIC

END OF UI-022-WESELMANN-HAGEMAN SUPPLEMENTAL SPECIFICATIONS

SECTION C:
NRCS CONSERVATION PRACTICE 382: FENCING
UPPER IOWA RIVER WMA
UI-022-WESELMANN-HAGEMAN

Fence: Barbed & Woven Wire

Iowa Job Sheet

Natural Resources Conservation Service (NRCS)
Des Moines, Iowa

Iowa Conservation Practice 382
September 2018

Definition

A constructed barrier to animals or people.

Purpose

Facilitate the application of conservation practices by providing a means to control movement of animals and people.

Conditions Where Practice Applies

This practice may be applied on any area where management of animal or people movement is needed. Fences are not needed where natural barriers will serve the purpose.

General Criteria and Specifications

A. Barbed Wire

Barbed wire fences shall have a minimum of 4 wires for farm borders. A minimum of three wires shall be used for interior fencing, cross fencing, or excluding livestock from special areas such as wildlife areas, forested tracts, or other special use areas. Wires shall be placed approximately an equal distance apart. The top wire shall be at least 42 inches high and 2 inches below the top on wood posts and 1 inch below the top on steel posts. Wire shall be spaced no more than 12 inches apart.

Each barbed wire shall consist of 2 twisted strands of either 12 1/2 gauge wire or 15 1/2 gauge high tensile strength wire. The barbs shall be either 2-point barb or 4-point barb. Wire shall be stretched taut and attached after the posts are properly set and backfilled. Attached wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

Barb wire fences shall not be electrified.

B. Woven Wire

Top and bottom strands of woven wire shall be a minimum of 12 1/2 gauge. Wire for intermediate strands shall be 14 1/3 gauge or heavier. Woven wire fences 32 inches or less in height shall have at least 2 barbed wires above the woven wire, spaced 8 to 12 inches apart. Fences constructed with woven wire 33-47 inches shall have at least 1 barbed wire above the woven wire. Woven wire fence 48 inches are not required to have barbed wire above except if it is needed to contain livestock or deter predators. The base of the woven



wire shall be placed near the ground surface. Optional barbed wire may be ran near the ground. The top wire shall be at least 42 inches above the ground level and 2 inches below the top of wood posts and 1 inch below top of steel posts. All wire shall be galvanized (Class 3). Wire shall be stretched and attached after the posts are properly set and backfilled. Attach wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

C. Staples

Staples shall be 9 gauge steel or heavier with a minimum length of 1 1/2 inches for soft woods and a minimum length of 1 inch for close grained hardwoods. Space should be left between the staple and the post to permit free movement of the wire. Wires may be attached to steel posts by use of manufacturer's clips or by 14 gauge galvanized wire twisted at least two turns.

D. Posts

All wooden posts (except red cedar, osage orange, or black locust) shall be treated with creosote, pentachlorophenol, or chromate copper arsenate (CCA) by a method that ensures complete penetration of the sapwood. Quality of treated wood shall provide sufficient strength and quality to last for the expected life of the fence. At least half of the diameter of red cedar shall be heartwood.

E. Corner, Gate, Brace, and End Posts

Corner posts, gate posts, end posts, pull posts and brace posts shall be wood with sufficient length for the construction of at least a 42 inch high fence and permit setting the post at least 36 inches deep. Earth backfill shall be thoroughly tamped. Where soil depth is restricted to less than 36 inches, additional anchors or deadman applied against the direction of pull may be needed. Wood posts shall have a minimum top diameter of 5 inches. A 2 1/2-inch steel pipe with appropriate bracing or set in concrete of sufficient depth also may be used. Reinforced concrete or metal posts of equivalent strength may be substituted if they have suitable means of attaching wires and braces.

F. Line Posts

The maximum spacing of line posts shall be one rod (16 1/2 feet). Wood line posts shall have a minimum 3 inch top diameter. Wood line posts shall have a minimum length of 6 1/2 feet and shall be set or driven to a minimum depth of 24 inches where conditions permit. When posts are set, earth backfill shall be thoroughly tamped. Steel line posts shall not weigh less than 1 1/3 pounds per foot and shall have a steel anchor plate securely fastened to the plate. The posts shall be "T", "U", or "Y" shaped and have corrugations, knobs, studs, or grooves suitable for fastening fencing to the posts. Steel posts shall be rolled from high carbon steel and shall have a protective coating; either galvanized by the hot dip process, or painted with one or more coats of high grade weather resistant paint for steel, or enameled and baked. Steel line posts shall be at least 6 feet in length and shall be set in the ground a minimum of 20 inches. Steel posts shall be used as line posts at least once every 6 rods (99 feet) to act as a ground for lightning protection.

G. Bracing

End bracing will be installed at locations where the fence ends and on both sides of gate openings. Corner bracing should be installed where fence alignment changes 15 degrees or more. Bracing is required at all corner, gate, pull and end assemblies in a fence. The brace member shall be the equivalent of a wood post with a 3 1/2 inch diameter at

the top or a standard weight 2-inch diameter galvanized steel pipe. The brace shall be at least 3 feet above the ground and at least 8 inches below the top of the post. The brace member shall be 6 to 8 feet in length. A brace wire consisting of 2 complete loops of 9 gauge smooth wire, 2 loops of barbed wire or a single loop of 12 1/2 gauge high tensile strength wire shall be installed. "H" braces or angle braces will be used in standard fences.

Pull post assemblies consisting of three posts with braces shall be installed in straight reaches of fence at intervals of 660 feet (40 rods), at any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 percent and at the beginning and end of each curve.

H. Crossings

For a narrow ditch or draw crossing with slopes steeper than 8 feet horizontal to 1 foot vertical, the fence shall be anchored with a concrete anchor weighing at least 150 pounds and buried with at least 18 inches of cover or a commercial screw-in type metal anchor 5 inches in diameter and not less than 48" long to position the fence to the contour of the ditch or draw.

I. Gates

Gates weighing less than 100 lbs. may be hung from single end posts properly installed. Heavy metal or wood gates more than 6 ft. wide shall best be attached to the pull post of an H-brace or diagonal floating brace.

All gates must be substantial enough to withstand expected pressures from livestock, predators, and/or wildlife.

Wire gates shall be made of the same materials as used for the fence. Panel or tube type gates shall be equivalent in quality to the fencing material and fitted with at least two hinges and a latch or chain for fastening.

Electrified perimeter fence gates may consist of a pair of 12 1/2 gauge straight or coiled wires installed to be non-electrified when opened. A 12 1/2 gauge overhead or insulated underground transmission line will be used to carry electricity across all gate openings (including electrified gates to charge the remainder of the fence).

Operation and Maintenance

Regular inspection of fences should be part of an on-going management program. Inspection of fences at regular intervals and after storm events is needed to facilitate the function of the intended use of the fence. Maintenance and repairs will be performed as needed to facilitate the operation of the fence.

Specifications

Site-specific requirements are listed on the specifications sheet. Additional provisions are entered on the job sketch. Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See Conservation Practice Standard – Fence (382).

Client:		Farm #:	
Field(s):		Tract #:	
Planned By:		Location:	
Date:		Length of Fence (ft):	
Landowner Objectives:			
Purpose: (check all that apply)			
<input type="checkbox"/> Reduce erosion and improve water quality by controlling livestock access to streams, springs, wetlands, and ponds.		<input type="checkbox"/> Protect sensitive environmental areas and flora from vehicular, pedestrian, or animal traffic use.	
<input type="checkbox"/> Protect newly planted areas from disturbances until established.		<input type="checkbox"/> Protect the safety of people, livestock, and wildlife by limiting or denying access to hazardous areas.	
<input type="checkbox"/> Facilitate handling, movement, and feeding of livestock in the pasture environment.		<input type="checkbox"/> Improve distribution and timing of livestock grazing	
<input type="checkbox"/> Other (specify)			
Type of Fence – Barbed (check all that apply)			
<input type="checkbox"/> 3-strand barbed wire		<input type="checkbox"/> 4-strand barbed wire	
<input type="checkbox"/> 6-strand barbed wire		<input type="checkbox"/> 5-strand barbed wire	
		<input type="checkbox"/> 8-strand barbed wire	
		<input type="checkbox"/> Other: _____	
Wire Gauge and Barbs			
<input type="checkbox"/> 12 ½ gauge wire		<input type="checkbox"/> 2-point barbs on 4" or 5" centers	
<input type="checkbox"/> 15 ½ gauge wire		<input type="checkbox"/> 4-point barbs on 5" centers	
Type of Fence – Woven Wire			
Woven Wire Ht (ft): _____	# of Wire(s): _____	Top/Bottom Wire Gauge: _____	Wire Spacing (in): _____
		Intermediate Wire Gauge: _____	
Woven Wire Type: _____		Top Deterrent Type: _____	
Attachment to Posts			
Staple Gauge: _____	Staple length (in): _____	<input type="checkbox"/> Manufacturer clips	<input type="checkbox"/> 14 gauge wire
Line Posts (check all that apply)			
Type:		Size:	
<input type="checkbox"/> Red Cedar or Osage Orange or Black Locust or pressure treated or other preservative wood		<input type="checkbox"/> Line posts are wood 6 ½ feet or longer 3" minimum top diameter	
or		or	
<input type="checkbox"/> Standard steel line posts (1 ⅓ lb/ft posts)		<input type="checkbox"/> 6' Standard steel line post with anchor plate	
		Spacing:	
		<input type="checkbox"/> Wood line posts spaced a maximum of 16 ½ feet apart set 2 ft deep minimum with a steel post every 99 ft for lightning protection	
		or	
		<input type="checkbox"/> Steel line posts spaced a maximum of 16 ½ ft apart set to top of anchor plate or 20"	
Braces, Corners, Ends, & Gates (check all that apply)			
Corners, Ends, & Gates: (6 - 8 ft minimum length)		Brace Wire	
<input type="checkbox"/> 5" top diameter wood post or		<input type="checkbox"/> 2 complete loops of 9 gauge smooth wire	
<input type="checkbox"/> 2 ½" galvanized steel pipe.		or	
Braces		<input type="checkbox"/> 2 loops of barbed wire	
<input type="checkbox"/> 3 ½ top diameter wood post or		or	
<input type="checkbox"/> 2" galvanized steel pipe and		<input type="checkbox"/> Single loop of 12 ½ gauge high tensile, galvanized steel	
<input type="checkbox"/> Horizontal brace rails between 3' above ground and 8" below top of posts			

Iowa One Call

The contractor is required to follow Iowa One Call law.

IowaOneCall.com or Call 811

Ticket # _____

<p align="center">Layout Sketch and Drawing (Provide sketch, drawings, maps, and/or aerial photos)</p>	
---	--

Scale 1" = _____ ft. (NA indicates sketch not to scale: grid size = 1/2" by 1/2")

[illegible]

Attach IA-92 Fence Specifications and relevant fence drawings as needed.

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Helping People Help the Land
www.ia.nrcs.usda.gov

SECTION D:
GEOTECHNICAL REPORT
UPPER IOWA RIVER WMA
UI-022-WESELMANN-HAGEMAN



February 17, 2020

PN 191222A

GEOTECHNICAL EXPLORATION

**UI-022 WESELMANN-HAGEMAN
180TH STREET EAST OF MIDDLE CALMAR ROAD
SECTION 29, SPRINGFIELD TOWNSHIP (T-97N, R8W)
WINNESHIEK COUNTY, IOWA**

PERFORMED FOR

**SHIVE-HATTERY, INC.
4125 WESTOWN PARKWAY, SUITE 100
WEST DES MOINES, IA 50266**

ALLENDER BUTZKE ENGINEERS INC.

GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.



February 17, 2020

Shive-Hattery, Inc.
4125 Westown Parkway, Suite 100
West Des Moines, IA 50266
Attn: Luke Monat, P.E.

RE: Geotechnical Exploration
UI-022 Weselmann-Hageman
180th Street East of Middle Calmar Road
Section 29, Springfield Township
Winnebago County, Iowa
PN 191222A

Dear Mr. Monat:

As authorized, Allender Butzke Engineers Inc. (ABE) has completed the geotechnical exploration for the above referenced project. The geotechnical exploration was conducted to evaluate physical characteristics of subsurface conditions with respect to design and construction of this project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the borings and laboratory tests, discusses the observed subsurface conditions, and provides geotechnical engineering recommendations for this project.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience. We are also staffed and equipped to provide construction testing and inspection services on this project as well as environmental site assessments.

Respectfully submitted,
ALLENDER BUTZKE ENGINEERS INC.

Matt Drummond, P.E.
Project Engineer

David Logemann, P.E.
Principal Engineer

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.		
	2/17/2020		
	Matthew J. Drummond, P.E.	License Number 21407	Date
	My license renewal date is December 31, 2020.		
	Pages covered by this seal: <u> All Pages </u>		

1 PC and 1 Email Above

GEOTECHNICAL EXPLORATION

UI-022 WESELMANN-HAGEMAN
180TH STREET EAST OF MIDDLE CALMAR ROAD
SECTION 29, SPRINGFIELD TOWNSHIP (T-97N, R8W)
WINNESHIEK COUNTY, IOWA

PN 191222A

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GEOTECHNICAL EXPLORATION

**UI-022 WESELMANN-HAGEMAN
180TH STREET EAST OF MIDDLE CALMAR ROAD
SECTION 29, SPRINGFIELD TOWNSHIP (T-97N, R8W)
WINNESHIEK COUNTY, IOWA**

PN 191222A

February 17, 2020

PROJECT INFORMATION

The Upper Iowa River Water Management Authority (WMA) with design assistance from Shive-Hattery is planning water quality improvements at several sites in Winneshiek County, Iowa. The project at this site includes raising the roadway profile of 180th Street approximately 10 feet and flattening embankment slopes to 3:1 (horizontal:vertical) or flatter for construction of a low hazard class earthen dam and pond. An existing pond and dam are present at the site, located in the area approximately 200 to 500 feet south of the roadway depicted in the following Figure No. 1.



Figure No. 1 – Site Overview

Based on preliminary plans provided by Shive-Hattery, the design normal water level for the proposed pond will be near 1165 feet and the proposed pond bottom is near elevation 1155 feet. The profile of the roadway will be raised such that the top of the roadway/dam will be near elevation 1170 feet. We assume the roadway will be approximately 25 feet wide. Maximum fill thicknesses on the order of 15 to 20 feet over the existing roadway ditches and channel are anticipated for construction of the proposed earthen dam.

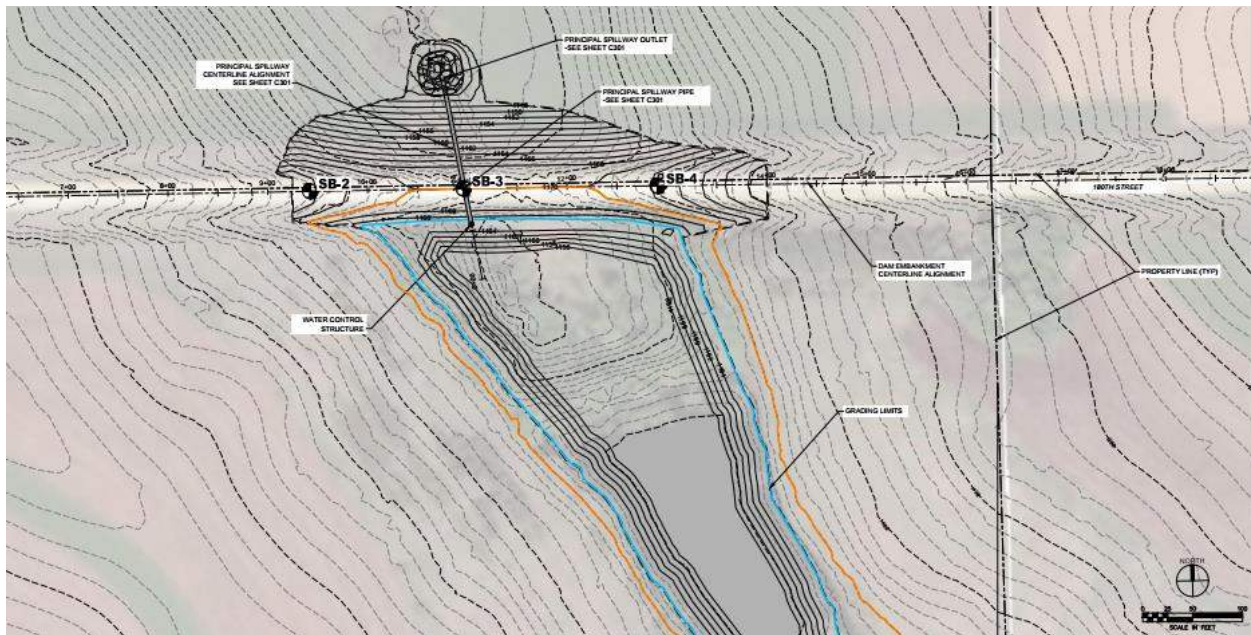


Figure No. 2 - Dam Embankment Site Plan (Shive-Hattery)

Potential borrow areas for earthen materials to construct the dam are located on the hillside south of the site. Cut depths on the order of 5 feet or less are anticipated in the borrow area. Maximum cut depths on the order of 10 to 15 feet are anticipated within the pool area of the pond to remove the earthen dam for the existing pond. It is our understanding that the property owner is interested in deepening the pond. Therefore, the existing pond will be temporarily dewatered during construction and the pond bottom lowered approximately 5 feet.

FIELD EXPLORATION

Six borings were conducted at this site to depths of 9.3 to 29.8 feet below existing grades on June 19 and 20, 2019. Approximate locations of test borings are shown on the enclosed Site Plan and were located and staked at the site by Erdman Engineering prior to the field exploration. Boring No. 5 was offset approximately 25 feet south from the staked location due to swampy ground conditions. The boring surface elevations, indicated on the enclosed Boring Logs were estimated from LiDAR

and provided by Shive-Hattery, Inc. The surface elevation of the offset boring location was estimated from the topographic contours (LiDAR). Methods of drilling, sampling, standard laboratory testing, and classifying of subsurface materials are discussed in the Boring Log Description/Legend pages of the Appendix.

SUBSURFACE CONDITIONS

Site Geology

Winneshiek County is located within a geomorphic region of Iowa referred to as the Paleozoic Plateau. The landscape in the Paleozoic Plateau region is dominated by bedrock outcroppings and deep narrow valleys that have formed as result of erosion into Paleozoic age rock strata. Overburden soil materials at the site have been deposited by different geomorphic processes including water, wind, gravity, and ice. As a result, soil stratigraphy at the site varies by geographic position.

Soil stratigraphy in upland areas generally consists of discontinuous loess cover underlain by bedrock. The loess is an eolian (wind-blown) deposit derived from flood plain sediments and tends to have relatively uniform silt and clay particle sizes.

Local alluvium has been deposited in valleys by water and is typically comprised of fine-grained silt and clay materials, similar to the upland loess soils from which the local alluvium has eroded and derived. Deeper alluvium soils are commonly stratified containing layers of silt, sand, and gravel. Colluvium is typically located on or near the base of steep to very steep side slopes along valleys and is typically comprised of silt and clay materials with various sized rock fragments eroded or moved from the upland areas and deposited in lower positions on the slopes.

The overburden soils are underlain by weathered shale, sandstone, and limestone bedrock formations of the Devonian and Ordovician bedrock systems.

Soil Profile

Detailed descriptions of soils encountered by this exploration are provided on the Boring Logs enclosed in the Appendix. The Profile of Borings (Plate A-1 and A-2) presented in the Appendix depicts the relative deposit elevations in borings located along the roadway/dam embankment (Plate A-1) and the pond and borrow area (Plate A-2). Following is a discussion of the subsurface materials encountered in the borings. Unless otherwise indicated, the depths of soil

stratum and groundwater levels are referenced from below existing grade at the individual boring locations at the time of drilling.

A crushed rock surface with fine materials was encountered at the surface in Boring Nos. 1 through 4 conducted on the existing roadway. The crushed rock surface was underlain by fill consisting primarily of lean clay (CL) with sand in Boring Nos. 2 through 4. The damp to moist and medium stiff to very stiff fill extended to depths of 5 to 12 feet. In Boring No. 3, conducted near the existing culvert which runs below the road, possible fill consisting of very moist and medium stiff dark gray lean clay (CL) was encountered between depths of 12 to 16 feet. Very dark gray fat clay (CH) local alluvium was encountered underlying the possible fill and extended to a depth of 19 feet in Boring No. 3.

Brown lean clay (CL) loess was encountered underlying the crushed rock surface in Boring No. 1, underlying the fill in Boring Nos. 2 and 3, and at the surface in the borrow area Boring No. 6. Boring No. 5, conducted near the south end of the existing pond encountered lean clay (CL) topsoil at the surface extending to a depth of 1.5 feet. The loess and topsoil were underlain by weathered bedrock consisting of sandy clay shale, weathered limestone with clay layers, and sandstone below depths of 7 to 9.5 feet in Boring Nos. 1, 2, and 6, below depths of 13 to 19 feet in Boring Nos. 3 and 4, and below a depth of 1.5 feet in Boring No. 5. The weathered bedrock was generally damp to moist. Harder limestone bedrock or stringers were encountered in the borings below various depths between 7 and 28.5 feet. All borings terminated in hard limestone bedrock near depths between 9.3 and 29.8 feet.

Shallow hand probing with a tile probe was conducted to depths of 4 feet or less in the low area between the existing roadway embankment and existing pond embankment. Soils in this area consisted primarily of very dark gray lean clay (CL) with occasional gravel or cobbles.

Groundwater Level Observations

The borings were monitored during and shortly after drilling operations to detect moisture seepage and groundwater accumulation. The results of our water level observations are noted on the Boring Logs enclosed in the Appendix.

During drilling operations, moisture seepage was noted within the roadway embankment fill or overburden soils near depths of 7 and 12 feet in Boring Nos. 6 and 3, and within the weathered bedrock near depths of 4 and 18 feet in Boring Nos. 5 and 4, respectively. Groundwater accumulation was observed near depths of 5 feet in the borrow area Boring Nos. 5 and 6, and near depths of 27 feet in roadway embankment Boring Nos. 3 and 4 at the completion of drilling

operations while no groundwater accumulation was observed in Boring Nos. 1 or 2. It should be recognized that these short-term water levels are not necessarily a true indication of the groundwater table. Long-term observations would be necessary to accurately define the groundwater variations at this site. Fluctuation of groundwater levels can occur due to seasonal variations in the amount of rainfall, surface drainage, subsurface drainage, site topography, irrigation practices, and ground cover (pavement or vegetation).

LABORATORY TESTING

Laboratory tests, including Standard Proctor and falling head permeability tests were conducted on soil samples from selected borings to determine physical characteristics of the onsite soils. Standard Proctor test results have been included in the Appendix of this report. Results of falling head permeability tests are provided in the following Table A. Laboratory testing provided on the Boring Logs also included moisture content, dry density and unconfined compressive strength tests of undisturbed samples obtained during drilling operations. The soil types shown on the Boring Logs were visually classified utilizing the Unified Soil Classification System (USCS).

**TABLE A
RESULTS OF FALLING HEAD PERMEABILITY TEST**

Soil Type (Sample Location)	Moisture Content (percent)	Dry Density (pcf)	Percent Compaction	Permeability (ft/day)
Lean Clay Loess Boring No. 1 (2.5' – 5.5')	20.7%	99.5	89.6%	2.6×10^{-5}
Lean Clay Loess Boring No. 1 (5.5' – 9')	18.2%	104.1	93.9%	1.5×10^{-4}

ANALYSES AND RECOMMENDATIONS

Summary

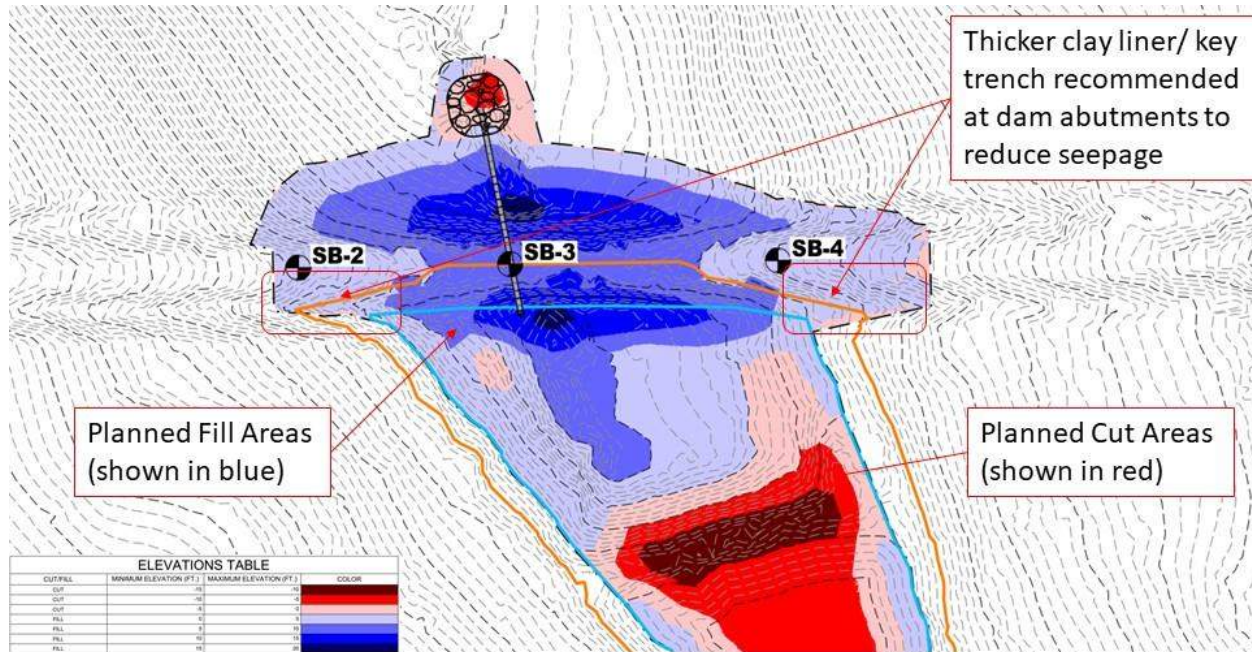
Analyses and recommendations for design of the proposed roadway embankment and earthfill dam at this site are based upon test boring data, laboratory test results, our experience with similar soil types, and our understanding of the project. In our opinion, the proposed dam and pond can be constructed at this site; however, appropriate design and construction measures should be implemented for construction of the dam considering on-site subsurface conditions. The following sections discuss design and construction considerations for the proposed dam and pond at this site.

Site Preparation

Stripping – Prior to site grading, the organic and loose materials in addition to all vegetation must be stripped. We expect that a minimum stripping depth of 6 inches will be required in the upland borrow areas and on the sideslopes. Stripping depths may vary due to localized variations in vegetation cover and subgrade stability and deeper stripping of one foot or more may be necessary to remove thicker organics or soft sediments that may be encountered in existing ditches and low lying areas within the upstream valley. Strippings could be used for landscaping purposes in non-critical areas. Root balls and large roots from mature trees should be completely removed prior to filling. Existing slopes to receive fill, such as the existing roadway embankments and abutment areas should be adequately benched and deeply scarified to integrate the new fill sections with the existing terrain. The subgrade should then be proof-rolled to delineate zones of soft soils present near the surface which may require additional removal or compaction.

Culvert Removal and Filling the Existing Channel – To reduce possible seepage through the dam and allow for construction of the new outlet structure, we recommend that the existing culvert below the roadway be completely removed and backfilled with engineered compacted cohesive fill. The existing channel north and south of the existing roadway embankment should also be filled with compacted cohesive fill beneath the entire width of the dam. Based on the proposed pond bottom near elevation 1155 feet, new fill thicknesses on the order of 5 to 10 feet will be placed for construction of the dam on the upstream and downstream side of existing roadway embankment and this will be coincidental to planned construction. We assume the former channel below the existing roadway was filled during past embankment construction. Although not encountered in the borings, granular soils (sand or aggregate), if any, associated with the culvert could act as a conduit for seepage through the dam and should be removed during demolition and removal of the existing culvert. Observation and test probing by a geotechnical engineer or other qualified engineer should be conducted during this process. Channel side slopes should be adequately benched and deeply scarified prior to filling in order to integrate the new fill sections with the existing terrain. Typically, benches on the order of 3 to 5 feet tall and 8 to 10 feet wide are required to accommodate construction equipment.

Key Trench/Clay Liner – Based on the proposed pond bottom near elevation 1155 feet and existing grades between approximate elevations 1146 and 1160 on the upstream side (south side) of the embankment, new fill thicknesses on the order of 5 to 10 feet or more will be placed on the upstream side of the dam for construction of the dam/roadway embankment. The following Figure No. 3 depicts fill thicknesses necessary for raising the roadway/dam embankment and flattening embankment slopes to 3:1 (H:V).



Seepage along the outlet structure should be controlled with anti-seep collars and/or an anti-seep chimney of granular material. The anti-seep granular chimney could be constructed integrally with the internal drainage system which would provide a controlled outlet for any seepage water along the outlet structure.

It may be beneficial to outlet the internal drainage system pipe in such a way that discharge rates could be monitored throughout the life of the structure. Flow rates could be monitored weekly or monthly while the pond is being filled and then semi-annually thereafter as a means of monitoring the integrity of the dam.

Embankment Settlement

The weight of the earthfill dam will consolidate the underlying compressible soils present within the drainage valley and cause the dam embankment to settle. Furthermore, consolidation settlement of new embankment fill compacted in accordance with NRCS Specification "IA-23 Earthfill" may also occur. Moisture conditioning and compacting embankment fill and new fill placed below the embankment foundation to a minimum 95 percent of the materials Standard Proctor (ASTM D698) maximum dry density would reduce potential consolidation settlement of the new embankment fill.

The magnitude of embankment settlement will depend upon the embankment fill height and thickness of the underlying compressible soil. Based on new fill thicknesses on the order of 5 to 15 feet, we estimate settlements on the order of 2 to 4 inches could occur in the deeper fill areas upstream and downstream of the dam where more than 5 feet of new fill will be placed. Embankment settlement will decrease toward the upstream and downstream limits of the embankment and at the abutments as the thickness of new embankment fill decreases. Depending upon the rate of fill placement, a significant portion (up to 50 percent) of the settlement could occur during the initial fill construction. We estimate that the majority of the settlement, possibly 75 percent or more, will take place within 2 months following fill placement and 90 percent or more will take place within 3 to 4 months following fill placement.

Outlet Pipe/Structure Considerations

Preliminary plans for the project indicate the outlet pipe structure will be constructed west of the location of the existing channel and roadway culvert. New fill thicknesses on the order of 10 feet or more are anticipated near the inlet, with fill thicknesses on the order of 5 to 15 feet anticipated along the outlet pipe alignment. Consolidation settlement of the dam could impact the performance of the outlet pipe/structure. We expect that the dam/roadway embankment along the outlet pipe

alignment could experience consolidation settlement of less than 3 inches. Settlements would decrease towards the upstream and downstream edges/toes of the embankment fill and over the existing roadway embankment. The expected differences in consolidation settlement are due to differences in the anticipated embankment fill thickness and the thickness of underlying compressible alluvial soils.

Design and construction of the outlet pipe should take into account the alignment change and elongation that will be caused by settlement, i.e., camber and belled joints. If it is desired to reduce settlement of the outlet pipe, the structure could be reduced by relocating the pipe further westward toward the west abutment where new fill thicknesses on the order of 5 feet or less are anticipated for construction of the dam embankment. Another option to reduce settlement of the outlet pipe could include complete or partial over-excavation of existing compressible from below the outlet pipe and replacement with new cohesive fill compacted to a minimum 95 percent of the materials Standard Proctor (ASTM D698) maximum dry density. Seepage along the outlet structure should be controlled with anti-seep collars or sand diaphragm.

Borrow Material Considerations

The cut and fill exhibit provided by Shive-Hattery (Figure No. 4) for the project indicates the primary borrow source for the dam/roadway embankment will come from the hill south of the proposed pond. The dam associated with the existing pond will be removed and would provide additional borrow source. It is our understanding that the owner has expressed interest in having a deeper pond, material may be removed from the bottom of the existing pond to achieve a design bottom elevation of 1155 feet for the new pond. As depicted in the following Figure No. 4, new cut depths on the order of 5 feet or less are anticipated from the hillside south of the pond. Cut depths on the order of 5 to 14 feet are anticipated to remove the existing dam and achieve the desired pond bottom near elevation 1155 feet. The existing pond area will be deepened approximately 5 feet.

In general, the lean clay loess soils encountered in the upper 7 feet of the south borrow area Boring No. 6 would be suitable for use in construction of the earthen dam. However, the very moist loess soils present below a depth of 5 feet may not provide adequate support for heavy construction equipment and it will likely be necessary to utilize low impact excavation equipment for cuts in the borrow area deeper than 3 to 4 feet. Boring No. 5, conducted south of the existing pond encountered approximately 1.5 feet of lean clay (CL) topsoil overlying limestone bedrock. The upper several feet of bedrock encountered in the boring was fractured and contained clay layers. The limestone bedrock was less fractured, dense and hard below a depth of 7 feet. Based on boring information, excavation to deepen the existing pond bottom to near elevation 1155 feet could encounter weathered bedrock, which could include harder limestone stringers or layers. It may be beneficial to conduct additional

exploration with test pits in the area of the existing pond to better determine the effort necessary to deepen the pond bottom. Soil materials, if present at the bottom of the existing pond, may be suitable for use as compacted cohesive fill; however, these materials will be very wet and will require extensive moisture conditioning to dry them prior to use as fill. Wet soil or hard bedrock materials from the pond could be wasted in non-critical areas of the site outside of the dam embankment.

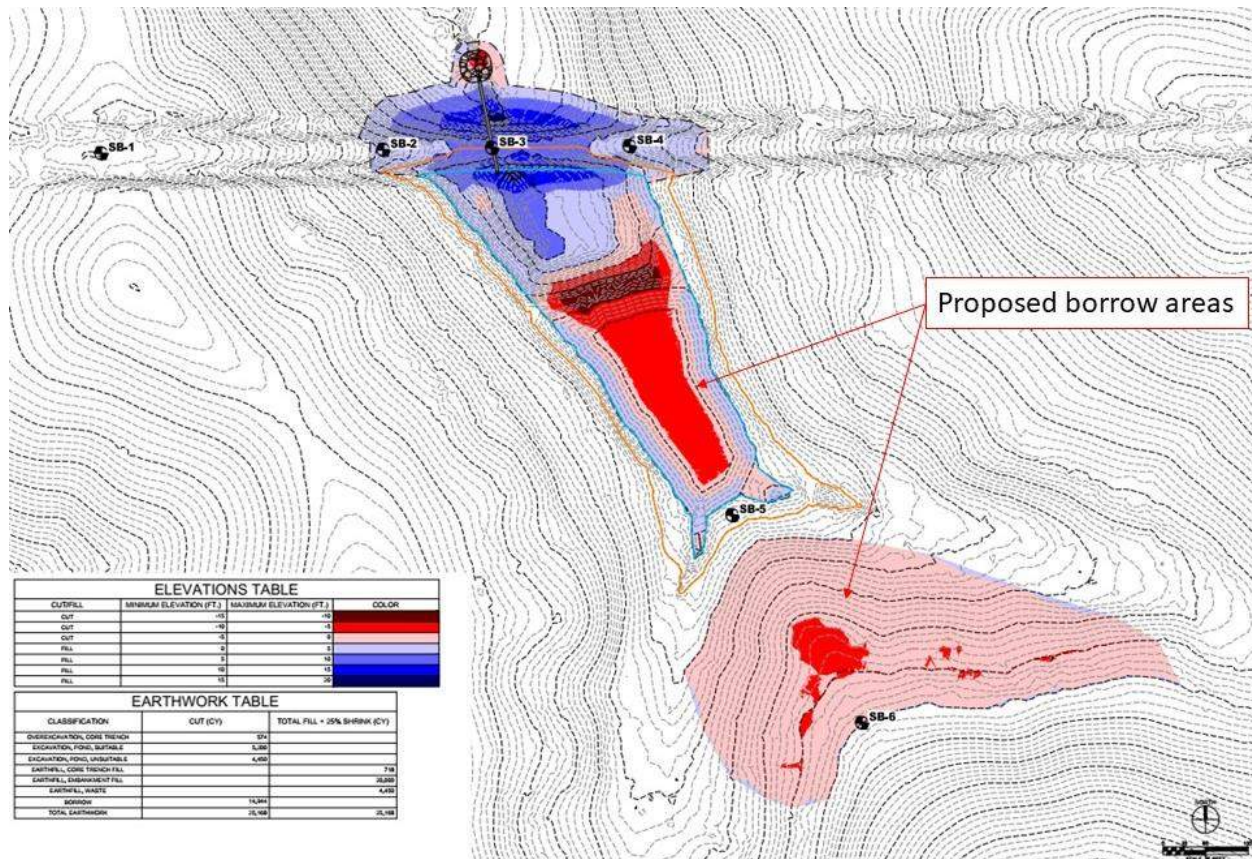


Figure No. 4 - Borrow Areas (Cut and Fill Exhibit by Shive-Hattery)

It is our understanding that NRCS Specification “IA-23 Earthfill” will be used to specify moisture conditioning and compaction of fill for the project. In our opinion, moisture conditioning and compacting cohesive fill to a minimum 95 percent of the materials maximum dry density determined by Standard Proctor (ASTM D698) would provide improved stability for the earthen embankment during and following construction. Soils compacted closer to optimum moisture content will exhibit greater stability under construction traffic loading. As previously discussed, fill compacted to 95 percent or more of the materials maximum dry density would also experience less consolidation settlement in deeper fill areas.

At the time of this geotechnical exploration, moisture contents of the lean clay (CL) loess borrow soils encountered in Boring No. 6 were generally above to well above the recommended

moisture content range for compaction. Therefore, adjustment of soil moisture content may be required in order to lower or raise the moisture to within the recommended moisture content range. Discing and aeration is generally the most economical method to lower soil moisture content, if climatic conditions allow.

Compaction of soils which are dry (below) of the recommended moisture range for compaction results in significant increases in soil permeability and potential leakage through the dam. Therefore, depending on the time of year, if the soils are too dry adding water with a water truck will be necessary to raise the soil moisture content before compacting. Also, once the soils are placed, they should not be allowed to dry out excessively (and form a 'crust') between lifts of fill. If this does occur, provisions should be made to strip or scarify/moisture condition/compact the surficial dry soils prior to the placement of new fill sections.

Cohesive soils can generally be suitably compacted with sheepsfoot or pneumatic type compactors, while granular soils (such as for the internal drainage layers) can generally be suitably compacted with vibratory compaction equipment. Care should be exercised in properly backfilling and compacting all trenches. In addition, hand compaction equipment will likely be required to ensure adequate compaction and continuous intimate contact of embankment soils with below grade structures, such as the outlet structure and pipe. If compaction and low permeability conditions cannot be achieved in these areas, it may be necessary to incorporate bentonite into the soils to provide an adequate seal.

We estimate that shrinkage for earthwork quantification for the cohesive lean clay (CL) loess and lean to fat clay (CL-CH) local alluvium soils will be on the order of 20 to 30 percent (1.2 to 1.3). Settlement of the embankment due to consolidation of new fill and underlying foundation soils will also appear as shrinkage and require additional volume.

Borrow Area Moisture Seepage and Cut Slope Stability

Based on our experience, cut slopes constructed at 3:1 (H:V) or flatter in similar subsurface conditions are generally stable if not subject to moisture seepage. Moisture seepage should be anticipated in areas where cut excavations extend below seasonal high groundwater levels. Flattening of slopes, installing interceptor drainlines, or on-going repair of unstable areas may be required to maintain the cut slopes. Ongoing, unmitigated moisture seepage on the slopes can lead to erosion, sloughing, and wet areas that can be difficult to mow and maintain.

Information from Boring No. 6 conducted on the uphill side of the south borrow area indicates relatively shallow groundwater conditions were observed near a depth of 5 feet. Cut areas

deeper than 3 to 4 feet could exhibit soft or unstable subgrade conditions and moisture seepage should be anticipated in the borrow area in cut areas deeper than 4 feet. Typically, subsurface interceptor drainlines are installed uphill of the potential seepage areas to intercept groundwater before exiting the slope. The following Figure No. 5 depicts a typical interceptor drainline cross-section. Based on subsurface conditions encountered in Boring No. 6, groundwater in the proposed borrow area is likely perched within the loess above the weathered shale and limestone bedrock. Interceptor drainlines would be most effective located upslope of the seepage zone extending through the loess down to the weathered bedrock. Final locations of subsurface drainage could be further reviewed and evaluated at the time of construction as areas of moisture seepage (or potential seepage) become evident.

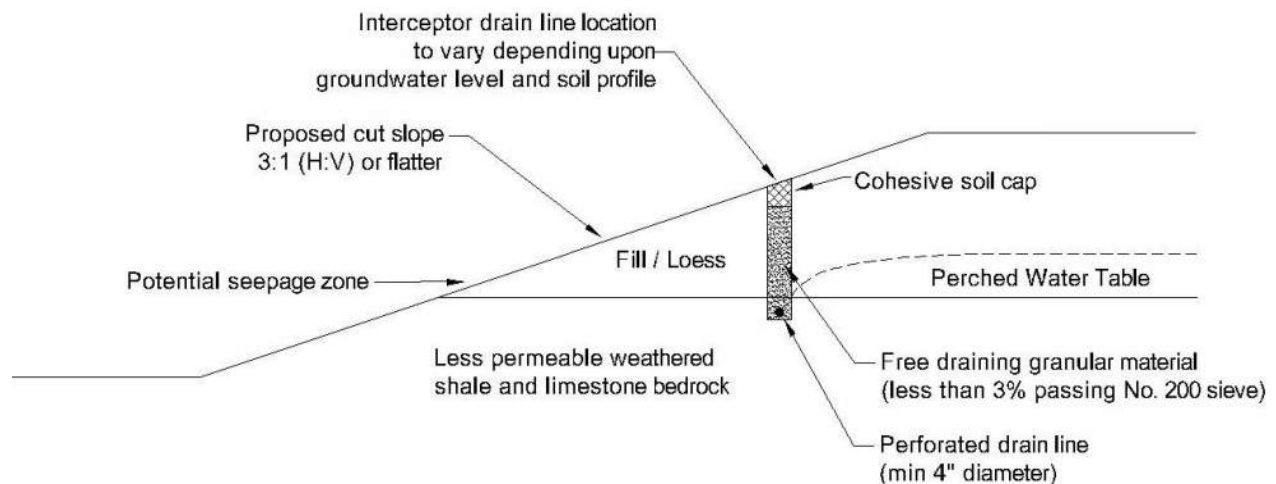


Figure No. 5: Typical Cut Slope Interceptor Drainline Cross-Section

Embankment Foundation (Slope) Stability

An earthfill dam should be designed and constructed to have an adequate factor of safety to withstand the shearing stresses induced in the embankment slopes and foundation soils. In our opinion, a long-term factor of safety of 1.5 or greater is generally considered adequate for low to moderate hazard dams, with respective temporary factors of safety of 1.3 and 1.2 or more being adequate during construction and under sudden draw down conditions. Stability evaluation requires consideration of the following three dam conditions: 1) during and immediately following construction, 2) steady state seepage (full reservoir), and 3) sudden draw down.

Our global stability analyses considered a dam with sideslopes on the order of 3:1 (H:V), top of dam/roadway width on the order of 25 feet, top of dam near elevation 1170 feet, upstream pond bottom near elevation 1155 feet, and downstream toe of the dam near elevation 1144 feet. Typical of most embankment stability analyses, our evaluation for proposed earthfill slopes indicated that the

critical period for shear failure of the embankment is during and at the end of construction. This critical period is a result of the potential reduction in shear strength in compressible foundation soils due to the development of excess pore water pressure caused by embankment fill loads. As consolidation proceeds within the compressible alluvial soils beneath the weight of the new earthfill dam, and excess pore water pressure dissipates gradually following construction, shear strength of the foundation soils gradually recovers.

Our stability analysis indicates that during construction, with pore water pressure development on the order of ½ the weight of new overburden soils (earthfill dam), the factor of safety against shear is approximately 1.4. With complete dissipation of pore water pressure under steady state seepage conditions, our analyses indicate the long-term factor of safety will improve to greater than 1.5. Following sudden draw down of water from a normal pool elevation (1165 feet) to the bottom of dam elevation (1155 feet), the factor of safety against shear is on the order of 1.4. The above factors of safety are considered adequate for the dam embankment under short and long-term conditions.

Erosion Control

We recommend the upstream embankment be protected from wave erosion. Common erosion control measures for dam embankments include construction of a berm near high water/crest elevation and/or installation of rip rap revetment. The layer of rip rap should be underlain by a geotextile fabric to prevent erosion of underlying embankment soils due to wave action. Other areas of intense water erosion, such as the outlet channel, should also be protected with properly designed erosion control. The downstream embankment slope and other areas subject to erosion from surface water should be protected with suitable erosion control measures, such as vegetation.

Excavation Stability and Dewatering

Boring information indicates excavations for construction of the dam embankment and outlet structure will encounter predominately cohesive soils. Excavations to deepen the existing pond bottom could encounter weathered and unweathered bedrock. The overburden soils can typically be excavated utilizing conventional excavation equipment. Excavations encountering hard limestone or sandstone bedrock, will likely require rippers, pneumatic tools, hydraulic breakers, or heavier excavation equipment.

If excavations encounter only cohesive soils with no wet sand seams or layers, it is expected that the water seepage can be controlled by permitting it to drain into temporary construction sumps and be pumped outside the perimeter of the excavations. More extensive dewatering such as sand

points and wells may be required for excavations which extend down into water bearing sand layers or excavations that extend below the water table. If water bearing sands are encountered, we recommend that water levels be maintained 2 feet or more below the bottom of excavations to prevent upward seepage forces which could reduce subgrade support.

The extent of bracing or sloping of open cut excavations will be dependent upon depth of cut, groundwater conditions, soils encountered, length of time the excavation will be open, area available for excavation and local governing regulations. Predominately cohesive soils may appear to stand nearly vertical in shallow excavations for short periods of time. However, soil creep, surcharge loads, precipitation, subsurface moisture seepage, construction activity vibrations and other factors may cause these soils to cave within an unpredictable period of time. Excavations encountering sand may tend to cave rapidly, especially if water is flowing through the sand. Unstable granular excavation walls may also cause surrounding cohesive soils to become unstable. Temporary shoring, flattening of the excavation slopes or use of trench boxes may be required to maintain a safe condition. Determining the appropriate OSHA classifications of the soil types encountered and implementing the required provisions for sloping, shoring, and bracing of excavations throughout the project during construction are the responsibility of the contractor per OSHA.

Construction Observation

We recommend that site grading operations such as stripping, key trench excavations, borrow material, and embankment construction be observed and monitored under direction of a geotechnical engineer or other qualified engineer.

GENERAL

The analyses and recommendations in this report are based in part upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

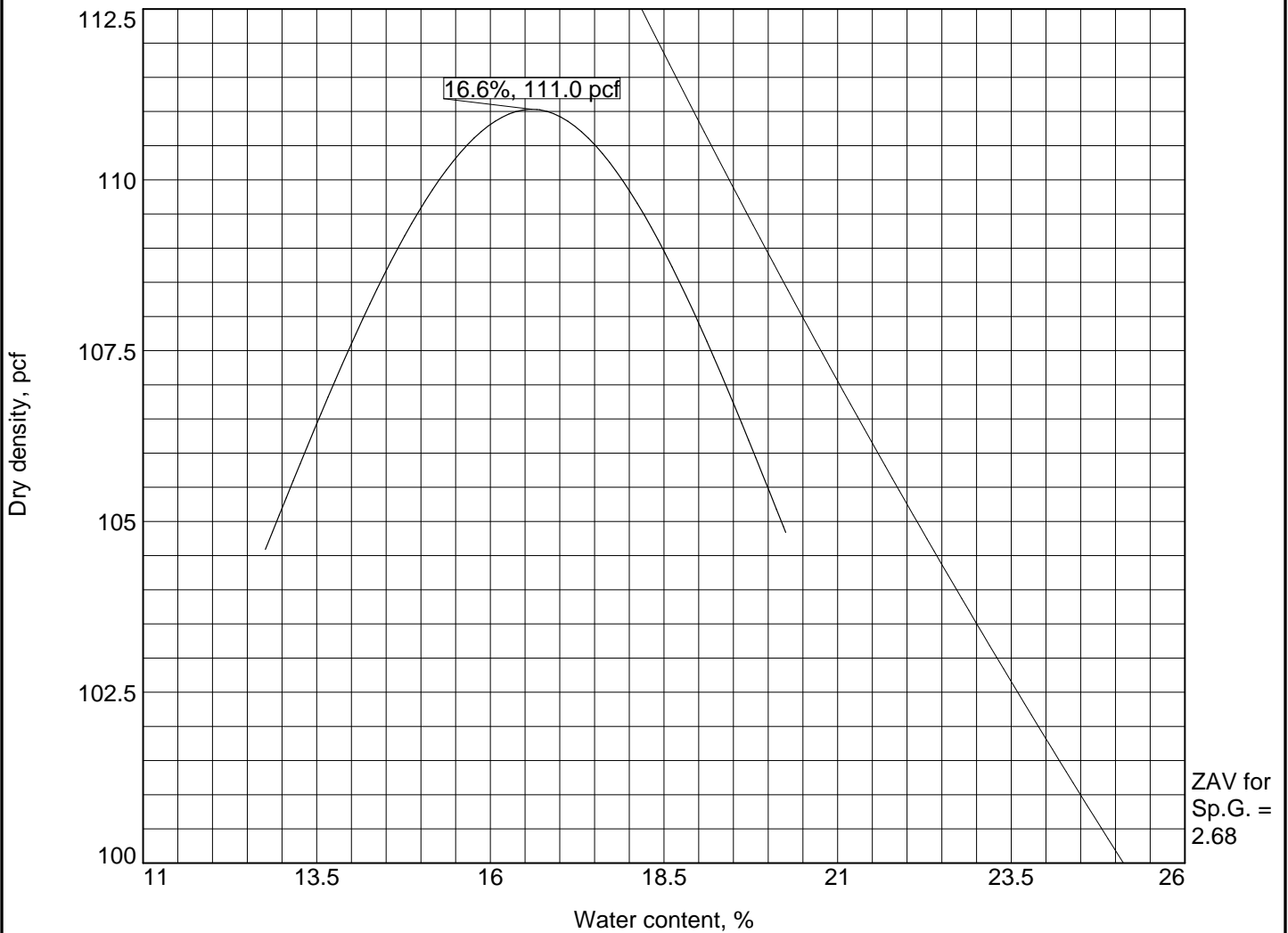
It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observation during earthwork and foundation construction phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, expressed or implied, is made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer.

The scope of our service was not intended to include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air on, below or adjacent to this site.

APPENDIX

PROCTOR TEST REPORT



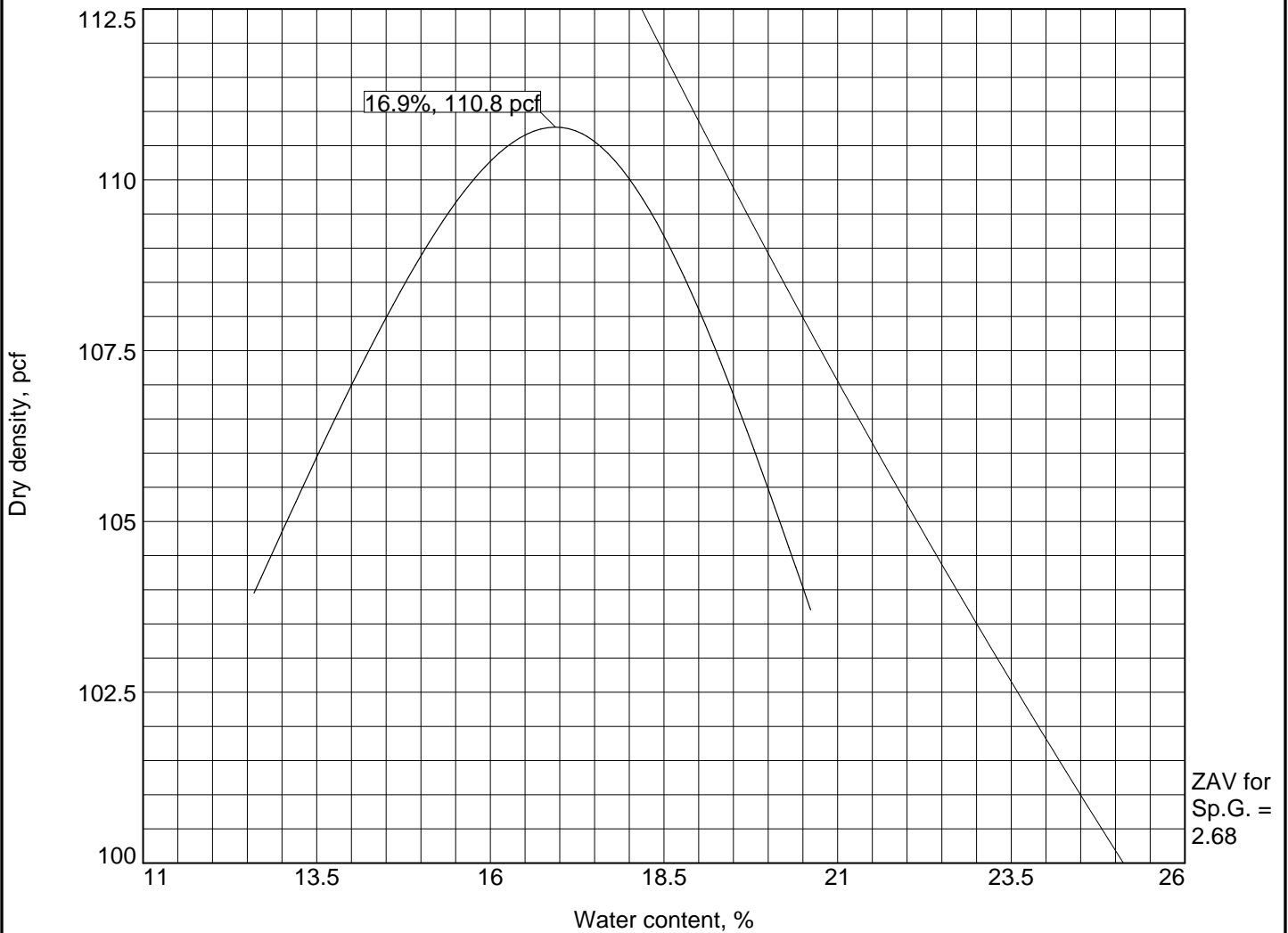
Test specification: ASTM D 698-12 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
				2.68	37	18		

TEST RESULTS		MATERIAL DESCRIPTION	
Maximum dry density = 111.0 pcf Optimum moisture = 16.6 %		Brown lean clay	
Project No. 191222A Client: Shive-Hattery, Inc. Project: Upper Iowa Watershed UI-022 Wessellmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa Location: Boring No. 1 (2.5' to 5')		Remarks: LOESS	
ALLENDER BUTZKE ENGINEERS, INC.			
		Figure PR-1	

Figure PR-1

PROCTOR TEST REPORT



Test specification: ASTM D 698-12 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
				2.68	34	16		

TEST RESULTS		MATERIAL DESCRIPTION	
Maximum dry density = 110.8 pcf		Gray-brown lean clay	
Optimum moisture = 16.9 %			
Project No. 191222A Client: Shive-Hattery, Inc. Project: Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa <input type="radio"/> Location: Boring No. 1 (5' to 9.5')		Remarks: LOESS	
ALLENDER BUTZKE ENGINEERS, INC.			

Figure

PR-2

BORING LOG DESCRIPTION/LEGEND

(page 1 of 3)

The material types encountered during the drilling operations were recorded on field logs. The profile represented on the Boring Log is based on final classification performed by a geotechnical engineer using the field logs, laboratory observation and testing. The material stratigraphy demarcation lines shown on the Boring Logs indicate changes in soil characteristics, however, actual soil changes or variations may occur as a gradual transition. Soil profile discussion, Log Boring information, water levels and recommendations presented in this report are based upon measured depths below ground levels existing at time of the field exploration, unless otherwise specified.

DRILLING AND SAMPLING

The borings were conducted with either a truck or all-terrain rotary drill rig using the drilling methods indicated on each Boring Log. Soil sampling and/or in-situ testing such as Shelby Tube (ST), split-spoon (SS), drive cone (DC), or core (C) was conducted at depth intervals which were selected in consideration of the characteristics of the proposed construction. Generally undisturbed soil samples are taken at 5 foot depth intervals or change in soil types. Disturbed soil samples from the auger, either jar size or bulk size samples, may be taken at intermediate intervals for the purpose of soil classification or laboratory testing. Borings conducted for soil classification only, will show no designation of sampling although disturbed sampling is performed. Soil samples obtained in the field were identified and sealed for transportation to the laboratory for performance of pertinent physical testing and engineering classification.

Drilling Methods

- CFA - Continuous Flight Auger: 4, 6, or 8-inch diameter (ASTM D1452).
- RD - Rotary Drilling: Using drilling fluid in cased or uncased boring (ASTM D2113).
- HSA - Hollow Stem Auger: 6 or 8-inch diameter, continuous flight auger remains in boring with soil removed from the hollow stem through which undisturbed sampling is conducted.
- HA - Hand Auger: 4-inch or less diameter.

Sample Types

- ST - Shelby Tube: Thin-walled tube samples of cohesive soils (ASTM D1587).
- SS - Split Spoon with 140 lb. manual hammer: Standard penetration test and split-barrel samples (ASTM D1586).
- SSA - Split Spoon with 140 lb. automatic hammer: Standard penetration test and split-barrel samples (ASTM D1586).
- DC - Drive Cone: Dynamic in-place testing of soil using a 2-inch diameter cone with a 60 degree point driven into the soil for continuous 1-foot intervals in the same manner as Split Spoon, no sample is obtained.
- C - Core: Sampling hard soil or bedrock with a diamond core barrel in a rotary drill boring (ASTM D2113).
- SPT - Standard Penetration Test: Number of blows required to drive sampler (split spoon or drive cone) into the soil with a 140-pound weight dropping a distance of 30-inches (ASTM D1586), number of blows recorded for each 6-inch interval in an 18-inch (or more) penetration depth, values shown are for each 6-inch interval (if series of number sets are shown) or a total of the last two 6-inch intervals (if only one number is shown) which is commonly referred to as "N" in blows per foot. High resistance is indicated by a high number of blows for a lesser penetration depth listed in inches.
- BS - Bulk Sample: Disturbed.
- CPT - Cone Penetration Test: Quasi-static in-place testing of soils using a 60 degree cone and friction sleeve which are steadily pushed into the soil and measure skin friction and end bearing (ASTM D3441).

STANDARD LABORATORY TESTING

Representative undisturbed soil samples obtained by the Shelby Tube sampler were tested for moisture content (ASTM D2216), density (dry) and unconfined compressive strength (ASTM D2166) in the laboratory. Results of these tests appear on the respective Boring Logs. Additional soil testing including particle size analysis (ASTM D422) and Atterberg Limits (ASTM D4318) may be conducted, if necessary, to define in more detail pertinent soil characteristics for classification in accordance with the Unified Soil Classification System. Specialized laboratory tests (if conducted) to determine pertinent soil characteristics are discussed in the "Laboratory Testing" section of the report.

WATER LEVEL MEASUREMENT

Water levels indicated on the Boring Logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with short term observations.

BORING LOG DESCRIPTION/LEGEND

(page 2 of 3)

DESCRIPTIVE SOIL CLASSIFICATION

Soil description is based on the Unified Classification System as outlined in ASTM Designations D-2487 and D-2488. This classification is primarily based upon visual and apparent physical soil characteristics, comparison with other soil samples, and our experience with the soil. Additional laboratory testing may be conducted, if necessary to define in more detail pertinent soil characteristics. The Unified Soil Classification group symbol shown on the boring logs corresponds with the group names listed below. The description includes soil constituents, moisture conditions, color and any other appropriate descriptive terms.

Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name
GW	Well-Graded Gravel	SW	Well-Graded Sand	CL	Lean Clay	CH	Fat Clay
GP	Poorly-Graded Gravel	SP	Poorly-Graded Sand	ML	Silt	MH	Elastic Silt
GM	Silty Gravel	SM	Silty Sand	OL	Organic Clay Organic Silt	OH	Organic Clay Organic Silt
GC	Clayey Gravel	SC	Clayey Sand			PT	Peat

RELATIVE PROPORTIONS			GRAIN SIZE TERMINOLOGY	
Descriptive Term(s) (Of components also present in sample)	Sand and Gravel % of Dry Weight	Fines % of Dry Weight	Major Component of Sample	Size Range
Trace	<15	<5	Cobbles	12 in. to 3 in. (300mm to 75mm)
With	15-30	5-12	Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Modifier	>30	>12	Sand	#4 to #200 sieve (4.75mm to 0.074mm)
			Silt or Clay	Passing #200 sieve (.074 mm)




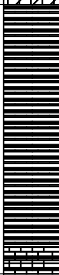
CONSISTENCY OF FINE-GRAINED SOILS			RELATIVE DENSITY OF COARSE-GRAINED SOILS	
Unconfined Compressive Strength, Qu, psf	Consistency	SPT, bpf	SPT, bpf	Relative Density
< 500	Very Soft	0-2	0-4	Very Loose
500-1,000	Soft	2-4	4-10	Loose
1,000-2,000	Medium Stiff	4-8	10-30	Medium Dense
2,000-4,000	Stiff	8-15	30-50	Dense
4,000-8,000	Very Stiff	15-30	50-80	Very Dense
8,000-16,000	Hard	30-100	80+	Extremely Dense
> 16,000	Very Hard	>100		







BORING LOG DESCRIPTION/LEGEND

(page 3 of 3)


















ABBREVIATIONS






COMMONLY USED ABBREVIATIONS	
ft. or ' - feet	elev. - Elevation
in. or " - inches	% - Percent
psf - pounds per square foot	No. - Number
plf - pound per lineal foot	TB - Test Boring
pcf - pounds per cubic feet	N - blow count (SPT, bpf)
kip - 1000 pounds	USCS - Unified Soil Classification System
ksf - 1000 pounds per square foot	LL - Liquid Limit
klf - 1000 pounds per lineal foot	PL - Plastic Limit
tsf - tons per square foot	PI - Plasticity Index
bpf - blows per foot (SPT, N)	




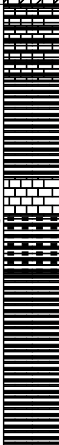

BORING LOG NO. 1								Project No.: 191222A						
Project: Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266						
Surface Elevation: 1200' ± Datum: Estimated from LiDAR								Date Drilled: 6/20/2019		Drilling Method: 4" CFA				
								Drilling Depth, ft.: 16.5		Page: 1 of 1				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *		Graphic Log	USCS	Water Level	Depth ----- Elevation ft.	
1200	0							CRUSHED ROCK WITH FINES (12"±)					1	
								Brown lean clay, moist Very moist after 2.5'			CL		1199	
1195	5							Gray-brown with increasing silt content after 5' LOESS						9.5
1190	10							Gray-brown sandy clay shale, moist						1190.5
								WEATHERED BEDROCK						
1185	15							Light brown weathered limestone, damp after 16'						16.5
								End of Boring						1183.5
1180	20													
1175	25													
1170	30													
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.														
Water Level Observation Time: at completion hrs. days Depth to water: Dry ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.						

BORING LOG NO. 2										Project No.: 191222A			
Project: Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266					
Surface Elevation: 1174' ± Datum: Estimated from LiDAR								Date Drilled: 6/20/2019 Drilling Depth, ft.: 14.1		Drilling Method: 4" CFA Page: 1 of 1			
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth Elevation ft.	
1170	0							CRUSHED ROCK WITH FINES (6"±) Brown-dark brown lean clay with sand, trace gravel, moist		CL		0.5	
		1	SSA	9	17.6			FILL With limestone gravel after 3.5'				5	
1165	5							Dark brown lean clay, moist		CL		1169	
								LOESS				8	
1160	10	2	SSA	15	8.8			Light brown and gray weathered limestone, damp				1166	
								WEATHERED BEDROCK				10.5	
1155	15	3	SSA	50/ 0.5"	7.3			Light brown limestone, damp				1163.5	
								BEDROCK				14.1	
1140								End of Boring				1159.9	
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.													
Water Level Observation Time: at completion hrs. days Depth to water: Dry ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.					

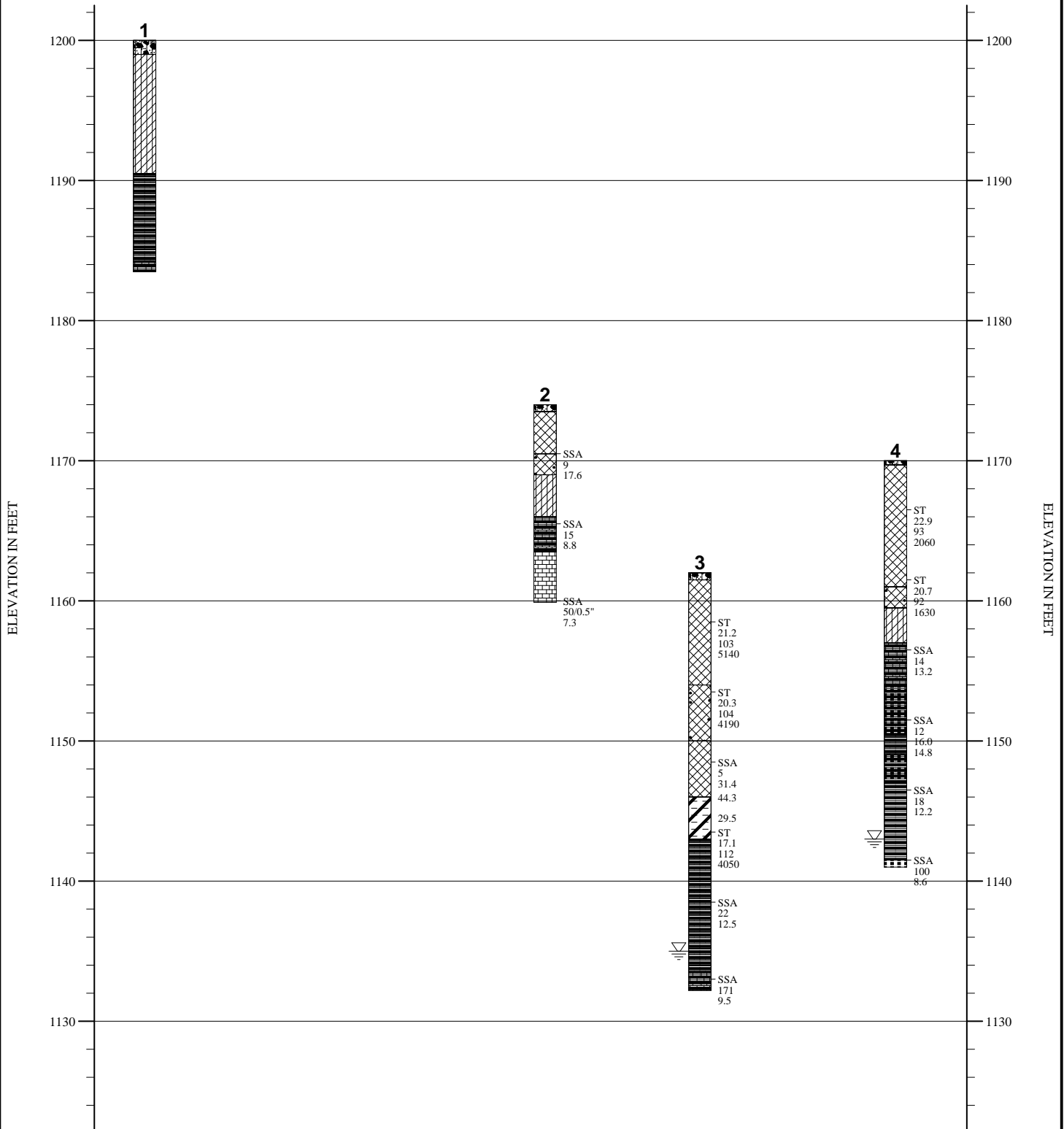
BORING LOG NO.						3	Project No.: 191222A					
Project: Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa						Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266						
Surface Elevation: 1162' ± Datum: Estimated from LiDAR						Date Drilled: 6/20/2019 Drilling Method: 4" CFA Drilling Depth, ft.: 29.8 Page: 1 of 1						
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1160	0							CRUSHED ROCK WITH FINES (6"±) Brown lean clay, trace sand and gravel, damp to moist	[Pattern]	CL		0.5 1161.5
1155	5	1	ST		21.2	103	5140	Brown and dark brown mixed after 6' FILL With gravel after 8'	[Pattern]			
1150	10	2	ST		20.3	104	4190	Moisture seepage near 12' Dark gray lean clay, very moist	[Pattern]	CL		12 1150
1145	15	3	SSA	5	31.4			POSSIBLE FILL Very dark gray after 14'	[Pattern]			16
					44.3			Very dark gray fat clay with organics, very moist	[Pattern]	CH		1146
					29.5			LOCAL ALLUVIUM	[Pattern]			19
1140	20	4	ST		17.1	112	4050	Gray-brown sandy clay shale, moist	[Pattern]			1143
1135	25	5	SSA	22	12.5			WEATHERED BEDROCK	[Pattern]			
								Light brown weathered limestone, damp after 28.5'	[Pattern]			29.8
1130	30	6	SSA	171	9.5			End of Boring	[Pattern]			1132.2
<small>*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.</small>												
Water Level Observation Time: at completion _____ hrs. _____ days Depth to water: 27 ft. _____ ft. _____ ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				

BORING LOG NO. <u>4</u>								Project No.: <u>191222A</u>				
Project: <u>Upper Iowa Watershed UI-022</u> <u>Wesselmann/Hageman Site</u> <u>Springfield Twp., Winneshiek Co., Iowa</u>						Client: <u>Shive-Hattery, Inc.</u> <u>4125 Westown Parkway, Suite 100</u> <u>West Des Moines, Iowa 50266</u>						
Surface Elevation: <u>1170' ±</u> Datum: <u>Estimated from LiDAR</u>						Date Drilled: <u>6/20/2019</u> Drilling Depth, ft.: <u>29</u>		Drilling Method: <u>4" CFA</u> Page: <u>1</u> of <u>1</u>				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1170	0							CRUSHED ROCK WITH FINES (3"±) Brown and dark brown mixed lean clay, moist		CL		0.3 1169.7
1165	5	1	ST		22.9	93	2060	FILL				
1160	10	2	ST		20.7	92	1630	With gravel after 9'				10.5
								Dark brown lean clay, moist LOESS Brown after 12'		CL		1159.5 13
1155	15	3	SSA	14	13.2			Light brown weathered limestone, damp to moist				1157
								Light brown uncemented sandstone after 16'				
								Moisture seepage near 18'				
1150	20	4	SSA	12	16.0 14.8			Gray clay shale, moist from 19.5' to 21'				
								WEATHERED BEDROCK Light brown uncemented sandstone after 21'				
								Gray clay shale from 23' to 28.5'				
1145	25	5	SSA	18	12.2							
												28.5
1140	30	6	SSA	100	8.6			Gray sandstone, damp BEDROCK				1141.5 29 1141
								End of Boring				
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.												
Water Level Observation Time: at completion hrs. days Depth to water: <u>27</u> ft.  ft.  ft. 								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				

BORING LOG NO. 5								Project No.: 191222A				
Project: Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa						Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266						
Surface Elevation: 1171' ± Datum: Estimated from LiDAR						Date Drilled: 6/20/2019 Drilling Depth, ft.: 9.3		Drilling Method: 4" CFA Page: 1 of 1				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1170	0							Dark brown lean clay, trace sand and organics, moist TOPSOIL		CL		1.5
		1	SSA	34	16.5			Light brown weathered limestone with clay layers, moist Moisture seepage near 4' WEATHERED BEDROCK				1169.5
1165	5							Light brown limestone, moist BEDROCK				7 1164
		2	SSA	200	14.4			End of Boring				9.3 1161.7
1160	10											
1155	15											
1150	20											
1145	25											
1140	30											
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.												
Water Level Observation Time: at completion hrs. days Depth to water: 5 ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				

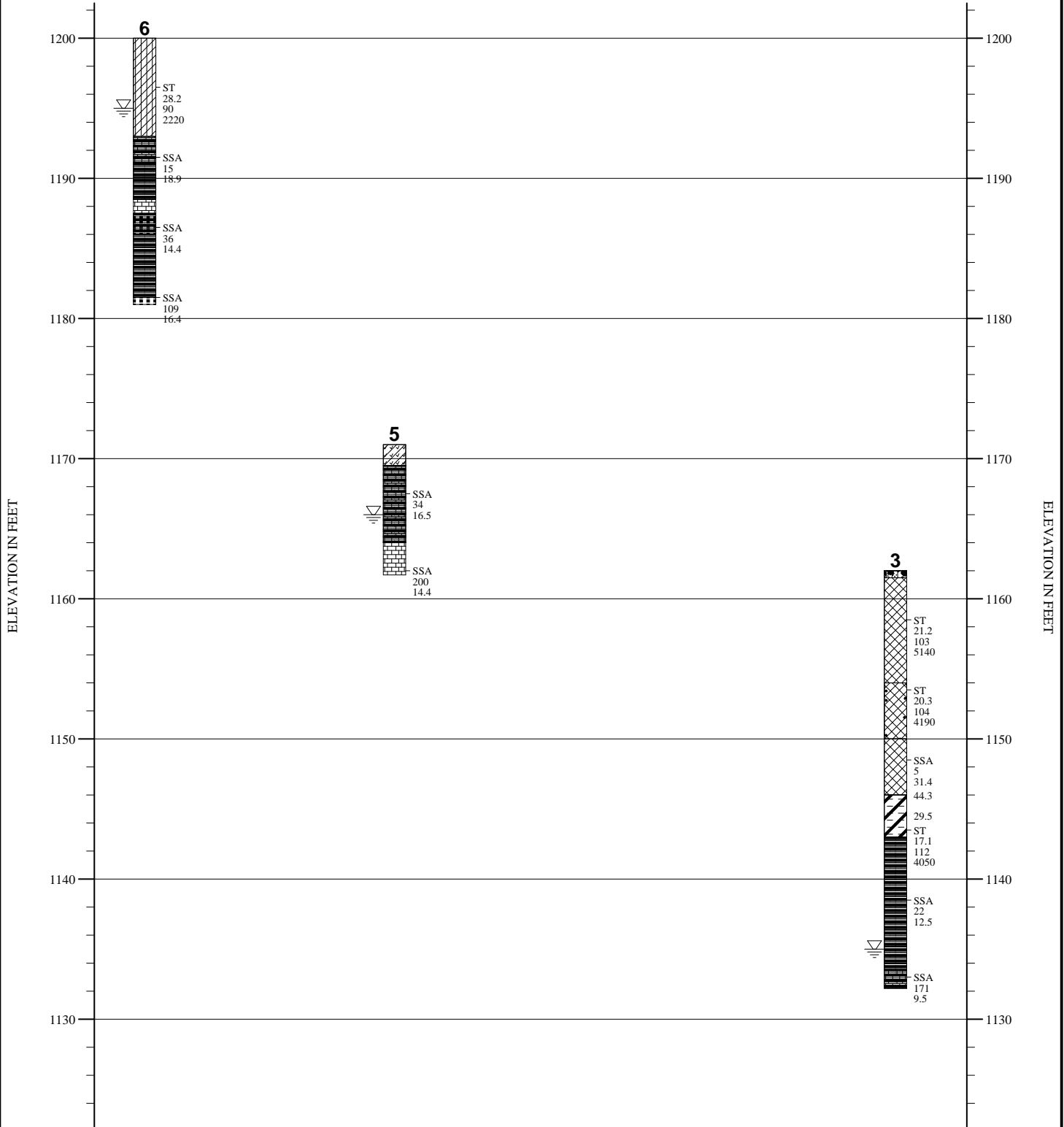
BORING LOG NO. 6								Project No.: 191222A					
Project: Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266					
Surface Elevation: 1200' ± Datum: Estimated from LiDAR								Date Drilled: 6/19/2019		Drilling Method: 4" CFA			
								Drilling Depth, ft.: 19		Page: 1 of 1			
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.	
1200	0							Dark brown to brown lean clay, moist		CL		7	
		1	ST		28.2	90	2220	LOESS					
1195	5							Gray and very moist after 5' Moisture seepage near 7'					
								Light brown weathered limestone, moist				1193	
		2	SSA	15	18.9			Gray clay shale, moist 9' to 11.5'					
1190	10							Hard limestone layer from 11.5' to 12.5' Light gray-brown uncemented sandstone 12.5' to 14'					
		3	SSA	36	14.4			WEATHERED BEDROCK					
								Gray clay shale, moist from 14' to 18.5'					
1185	15											18.5	
		4	SSA	109	16.4			Gray sandstone, damp					
								BEDROCK					
1180	20							End of Boring				1181.5 19 1181	
1175	25												
1170	30												
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.													
Water Level Observation Time: at completion hrs. days Depth to water: 5 ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.					

PROFILE OF BORINGS



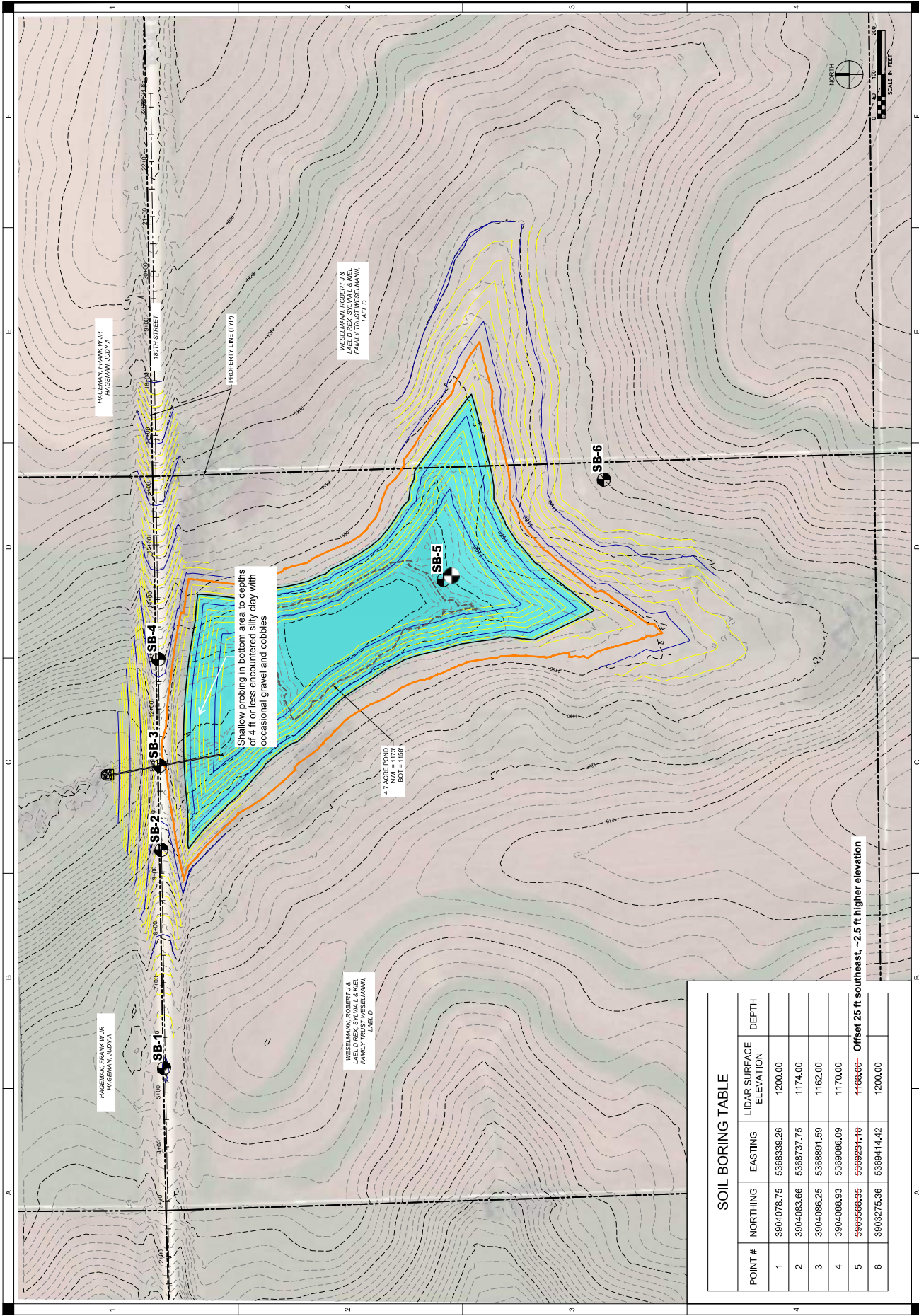
<div> Crushed Rock With Fines Lean Clay Fill Sandstone </div> <div> Silty Clay Lean Clay Fill With Gravel Water table at completion </div> <div> Weathered Clay Shale Limestone </div> <div> Weathered Limestone Fat Clay Alluvium Weathered Sandstone </div>	<div>PROJECT NO.: 191222A</div> <div>PROJECT: Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa</div> <div>PLATE: A-1</div>	<div>DATE: 2/14/2020</div> <div>SCALE: 10 feet/in.</div>
ALLENDER BUTZKE ENGINEERS, INC.		

PROFILE OF BORINGS



	Silty Clay		Weathered Sandstone		Lean Clay Fill With Gravel
	Weathered Limestone		Sandstone		Fat Clay Alluvium
	Weathered Clay Shale		Lean Clay Topsoil		Water table at completion
	Limestone		Crushed Rock With Fines		
			Lean Clay Fill		

PROJECT NO.:	191222A	DATE:	2/14/2020
PROJECT:	Upper Iowa Watershed UI-022 Wesselmann/Hageman Site Springfield Twp., Winneshiek Co., Iowa		
PLATE:	A-2	SCALE:	10 feet/in.
ALLENDER BUTZKE ENGINEERS, INC.			



SOIL BORING TABLE				
POINT #	NORTHING	EASTING	LIDAR SURFACE ELEVATION	DEPTH
1	3904078.75	5366339.26	1200.00	
2	3904083.66	5366737.75	1174.00	
3	3904086.25	5366891.59	1162.00	
4	3904086.93	5366908.09	1170.00	
5	3903566.35	5366923.18	1168.00	Offset 25 ft southeast
6	3903275.36	5366944.42	1200.00	

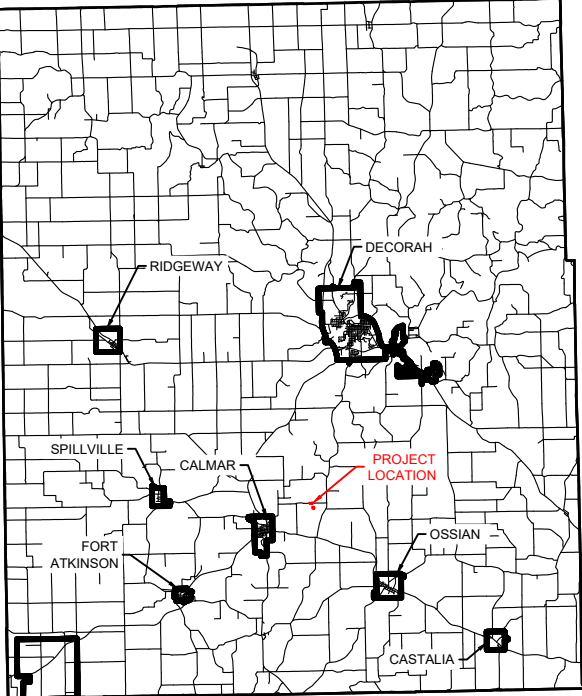
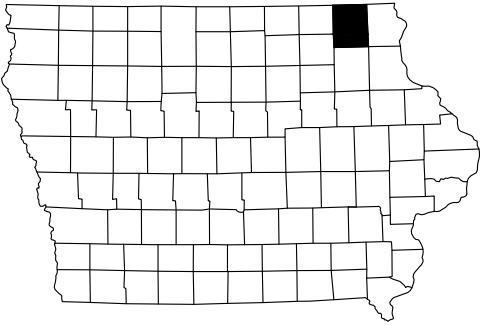
NOTES

UPPER IOWA WATERSHED IMPROVEMENTS
100% DESIGN COST OPINION - UI - 022 - WESELMANN-HAGEMAN

#	ITEM DESCRIPTION	QUANTITY	UNITS		UNIT COST		TOTAL COST
Construction Costs							
1	Site Clearing, Preparation, & Waste Disposal	1	LS	*	\$12,000.00	=	\$12,000.00
2	Structure Seeding	2	AC	*	\$2,500.00	=	\$4,000.00
3	Buffer Seeding	7	AC	*	\$1,000.00	=	\$6,900.00
4	Wetland Seeding	1	AC	*	\$2,000.00	=	\$1,400.00
5	Mobilization & Demobilization	1	LS	*	\$10,000.00	=	\$10,000.00
6	Traffic Control	1	LS	*	\$5,000.00		\$5,000.00
7	Earthfill, Embankment Fill	21,880	CY	*	\$3.50	=	\$76,580.00
8	Earthfill, Waste Fill	4,590	CY	*	\$3.00		\$13,770.00
9	Subgrade Preparation	1,472	SY	*	\$3.00	=	\$4,416.00
10	Topsoil, Strip, Salvage, And Respread	5,838	CY	*	\$3.00	=	\$17,514.00
11	CMP Pipe, 24"	6	LF	*	\$60.00	=	\$360.00
12	CMP Pipe, 36"	135	LF	*	\$80.00	=	\$10,800.00
13	48" CMP Riser With Trash Rack	1	LS	*	\$7,500.00	=	\$7,500.00
14	Rip Rap, Class 'E' With Geotextile Fabric	213	TON	*	\$25.00	=	\$5,325.00
15	Granular Surfacing, 8"	530	TON	*	\$28.00	=	\$14,840.00
16	Fencing, 5-Strands Of Barbed Wire	694	LF	*	\$2.50	=	\$1,735.00
17	Interceptor Drain	1,304	LF	*	\$15.00	=	\$19,560.00
18	Rolled Erosion Control Product	1,255	SY	*	\$1.75	=	\$2,196.25
Subtotal							\$213,900.00
Contingency (10%)							\$21,400.00
Project Total							\$235,300.00

**TOTAL PROJECT COSTS AND CONSTRUCTION COSTS PROVIDED HEREIN ARE MADE ON THE BASIS OF ENGINEER'S EXPERIENCE AND QUALIFICATIONS AND REPRESENT THE ENGINEER'S BEST JUDGMENT. HOWEVER, THE ENGINEER CANNOT AND DOES NOT GUARANTEE THAT BIDS OR ACTUAL TOTAL PROJECT OR CONSTRUCTION COSTS WILL NOT VARY FROM THE ESTIMATE OF PROBABLE CONSTRUCTION COST. THIS ESTIMATE IS INTENDED TO ASSIST IN BUDGETARY ASSESSMENT AND DOES NOT GUARANTEE THAT ACTUAL PROJECT COSTS WILL NOT EXCEED OR BE LOWER THAN THE AMOUNTS STATED IN THIS ESTIMATE.

UPPER IOWA WMA
UI-048-ROTHMEYER-NUMEDAHL
WINNESHIEK COUNTY, IA



WINNESHIEK COUNTY



CONTACT INFORMATION:

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FX: (515) 223-0622

LAND OWNER
SUE ROTHMEYER
7352 LAKE ST APT 3E
RIVER FOREST, IL 60305
PH: (708) 261-5104

WATERSHED COORDINATOR
MATT FRANA
2296 OIL WELL ROAD
DECORAH IOWA, 52101
PH: (563) 382-4352

TENANT
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 1727 222ND AVE
 CALMAR, IA 52132
 PH: (563) 380-0694

UPSTREAM LAND OWNER
LORAN HAGEMAN
2182 COUNTY ROAD
CALMAR, IA 52132
PH: (563) 380-4812

DOWNSTREAM LAND OWNER
RANDY NUMEDAH
 2218 180TH ST
 CALMAR, IA 52132
 PH: (563) 379-0654

Sheet List Table

Sheet Number	Sheet Title
C000	COVER SHEET
C001	PROJECT QUANTITIES & NOTES
C002	TRAFFIC CONTROL PLAN
CD01	EXISTING CONDITIONS AND REMOVALS PLAN
C201	OVERALL GRADING PLAN
C202	CUT-FILL PLAN
C203	ROAD EMBANKMENT PLAN AND PROFILE
C301	CULVERT PLAN AND PROFILE
C501	CONSTRUCTION DETAILS
C601	SEEDING PLAN

IOWA DOT PRECAST BOX CULVERT SHEETS

Sheet Number	Sheet Title
PRCB G1-13	INDEX & GENERAL NOTES
PRCB G2-13	TYPICAL CULVERT BARREL DETAILS
PRCB 6-13	CULVERT BARREL DETAILS, 6' SPANS
PES 1-13-T1	TYPE 1 END SECTION DETAILS, UP TO 7.5' SKEWS
PEP 1-13	EMBANKMENT PROTECTION DETAILS, 0° TO 45° SKEWS



CIVIL ENGINEER



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT DESCRIBED
BELOW WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL
SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER
UNDER THE LAWS OF THE STATE OF IOWA.

Signature: Sam Jensen Date: 1-12-2021

Printed or typed name: DANIEL JENSEN
License Number: 25063

My License Renewal Date is: DECEMBER 31, 2021

PAGES, SHEETS OR DIVISIONS COVERED BY THIS SEAL:
ALL, EXCLUDING IOWA DOT SHEETS

UPPER IOWA WMA

WINNESHIEK COUNTY, IA

COVER SHEET

C000

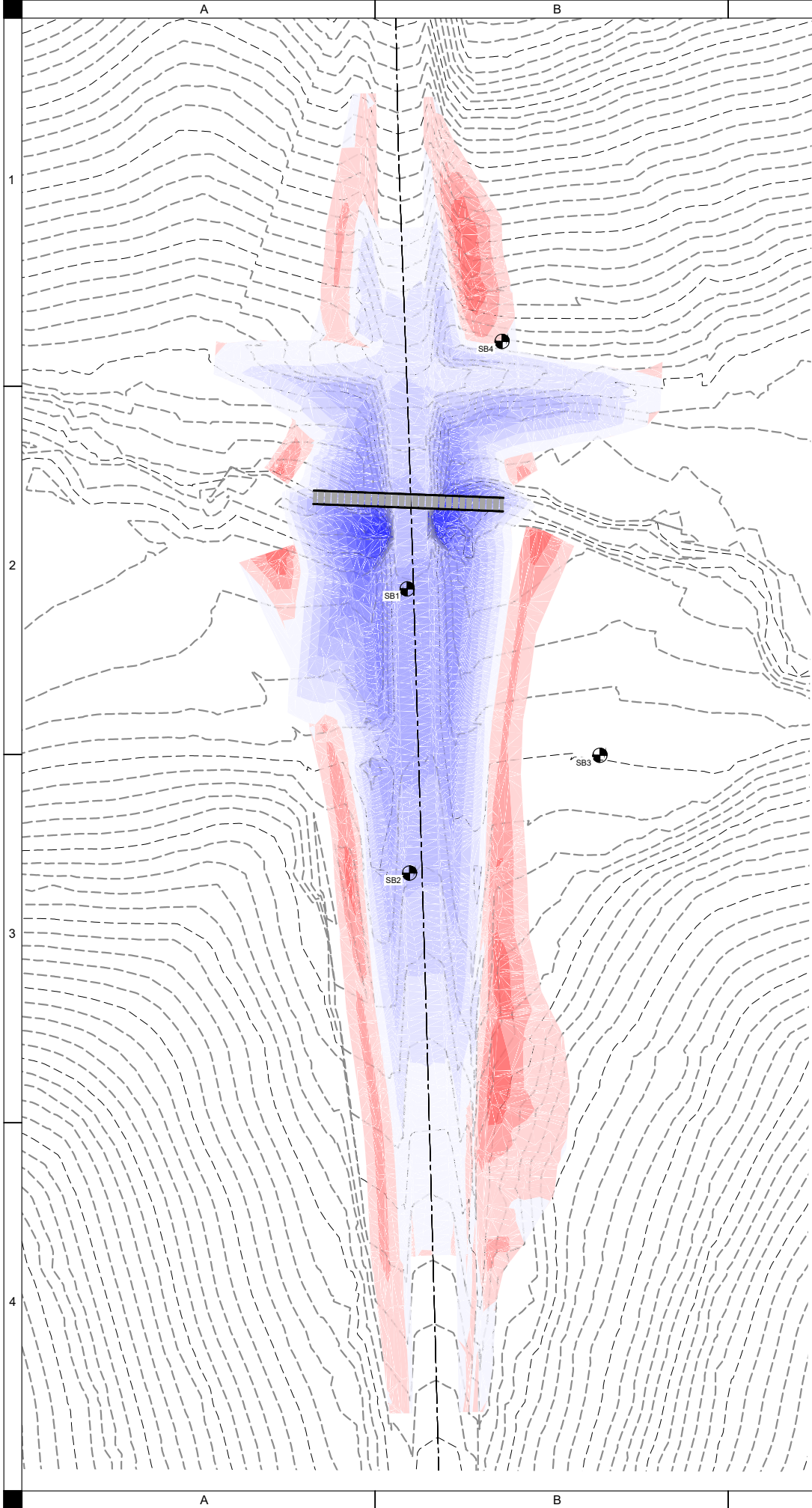
\\projects\DM14185190\Deliverables\Drawings\1_Civil\048_Rothmeyer\0000 COVER SHEET.dwg
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ITEM NO.	ITEM DESCRIPTION	SPEC. NO.	UNIT	BID QUANTITY	AS-BUILT QUANTITY
1	SITE CLEARING, PREPARATION, & WASTE DISPOSAL	IA-01	LS	1	
2	REMOVE AND DISPOSE 18' WIDE STEEL/WOOD BRIDGE, WING WALLS, AND FOUNDATION	IA-03	LS	1	
3	ROLLED EROSION CONTROL PRODUCT, TYPE 2D	IA-05	SY	1,368	
4	STRUCTURE SEEDING	IA-06	AC	2.4	
5	PASTURE SEEDING	IA-06	AC	2.9	
6	MOBILIZATION & DEMOBILIZATION	IA-08	LS	1	
7	CORE TRENCH OVEREXCAVATION	IA-21	CY	1,642	
8	EARTHFILL, EMBANKMENT AND CORE TRENCH FILL (P)	IA-23	CY	22,863	
9	SUBGRADE PREPARATION	IA-23 & SUDAS 2010	SY	2,176	
10	TOPSOIL, STRIP, SALVAGE AND RESPREAD	IA-26	LS	4,309	
11	24 INCH CMP CULVERT, 16GA ALUMINIZED STEEL	IA-51	LF	180	
12	30 INCH CMP CULVERT, 16GA ALUMINIZED STEEL	IA-51	LF	100	
13	RIP RAP, CLASS 'E' WITH GEOTEXTILE FABRIC	IA-61	CY	495	
14	EROSION STONE DITCH CHECKS	IA-61	EACH	16	
15	GRANULAR SURFACING, 8 INCH LAYER	IA-61 & IDOT 4120	TON	783	
16	CULVERT BEDDING, 24 INCH LAYER, IDOT GRAD. 4115	IA-61 & IDOT 4115	TON	180	
17	FENCE REMOVAL AND REPLACEMENT (5-STRANDS OF BARBED WIRE)	IA-92 & IA-03	LF	1,012	
18	IOWA DOT STANDARD PRE CAST REINFORCED CONCRETE BOX CULVERT, 6' X 8'	IDOT 2415, IA-620, IA-23, IA-21	LF	132	
19	REINFORCED BOX CULVERT STANDARD END SECTIONS	IDOT 2415	EACH	2	
20	TRAFFIC CONTROL	IDOT 2528	LS	1	

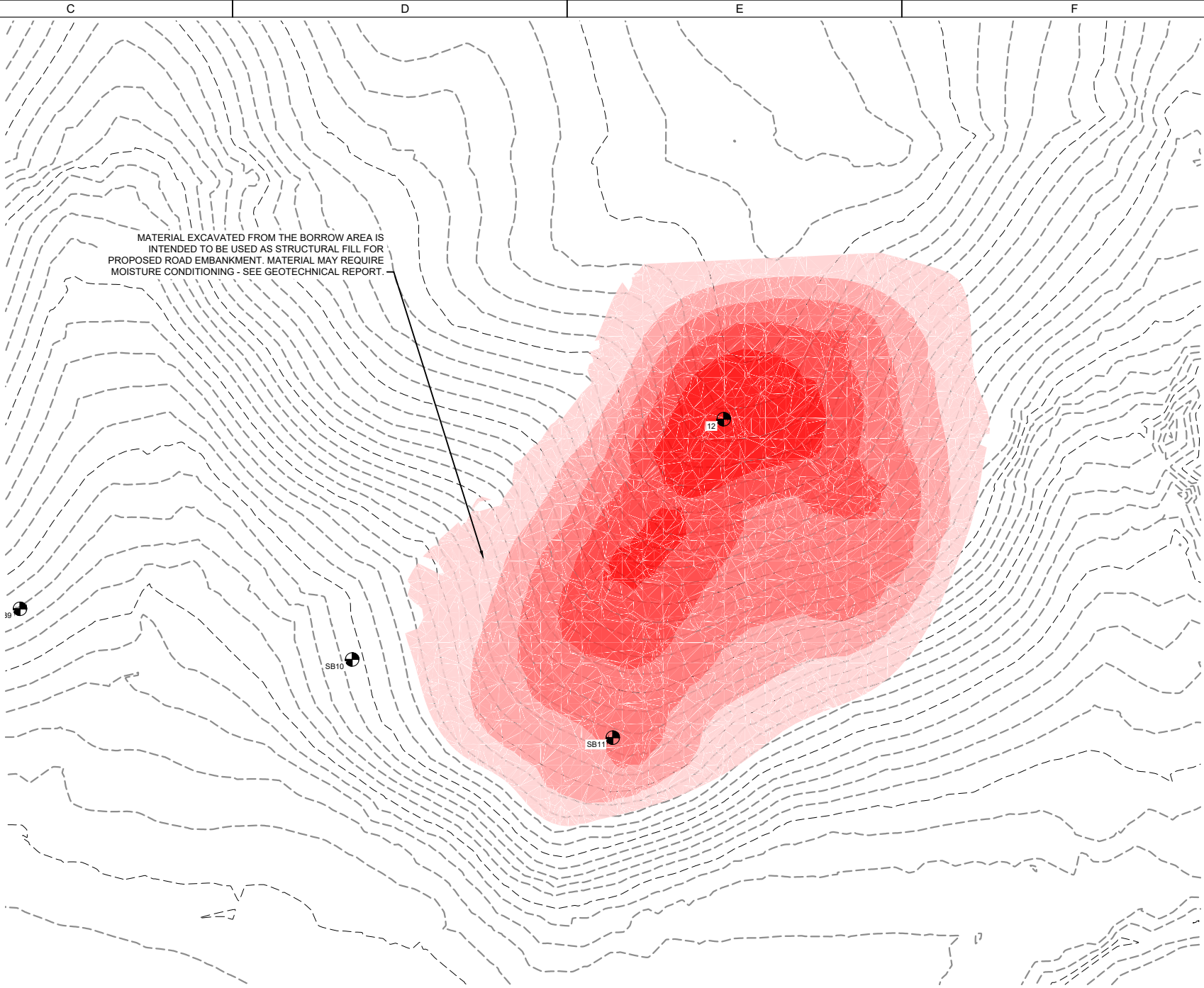
PARAMETER	QUANTITY	UNITS
TOTAL DRAINAGE AREA	952	ACRES
2-YR STORM HIGH WATER ELEVATION	1116.9	FEET
2-YEAR STORM TEMPORARY STORAGE VOLUME	6.5	ACRE-FEET
10-YR STORM HIGH WATER ELEVATION	1121.3	FEET
10-YEAR STORM TEMPORARY STORAGE VOLUME	26.3	ACRE-FEET
50-YR STORM HIGH WATER ELEVATION	1126.7	FEET
50-YEAR STORM TEMPORARY STORAGE VOLUME	76.1	ACRE-FEET
TOP OF ROAD EMBANKMENT	1130.5	FEET
STORAGE VOLUME AT TOP OF ROAD EMBANKMENT	131.3	ACRE-FEET
10-YEAR PRE DEVELOPED DISCHARGE (Q10-PRE)	1128.8	CFS
10-YEAR POST DEVELOPED DISCHARGE (Q10-POST)	792.8	CFS
10-YEAR DISCHARGE REDUCTION	29.80	%
50-YEAR PRE DEVELOPED DISCHARGE (Q50-PRE)	1946.1	CFS
50-YEAR POST DEVELOPED DISCHARGE (Q50-POST)	1010.0	CFS
50-YEAR DISCHARGE REDUCTION	48.1	%

<p>THE LOCATIONS OF UTILITY MAINS, STRUCTURES AND SERVICE CONNECTIONS PLOTTED ON THIS DRAWING ARE APPROXIMATE ONLY AND WERE OBTAINED FROM RECORDS MADE AVAILABLE TO SHIVE-HATTERY, INC. THERE MAY BE OTHER EXISTING UTILITY MAINS, STRUCTURES AND SERVICE CONNECTIONS NOT KNOWN TO SHIVE-HATTERY, INC. AND NOT SHOWN ON THIS DRAWING. THE VERIFICATION OF EXISTENCE OF, AND THE DETERMINATION OF THE EXACT LOCATION OF, UTILITY MAINS, STRUCTURES AND SERVICE CONNECTIONS SHALL BE THE RESPONSIBILITY OF THE CONSTRUCTION CONTRACTOR(S).</p>	<p>8. REPAIR OR REPLACE DAMAGE TO EXISTING FACILITIES (TILE, UTILITIES, FENCES, ETC.) DESIGNATED TO REMAIN, AT NO ADDITIONAL EXPENSE TO THE OWNER. ALL AREAS DISTURBED BY CONSTRUCTION, INCLUDING STAGING AREAS AND HAUL ROUTES, ARE TO BE REWORKED TO THEIR EXISTING CONDITIONS AND SEEDED AT NO ADDITIONAL COST TO THE DIVISION IF OUTSIDE OF PROJECT LIMITS AND NOT APPROVED BY ENGINEER.</p>	<p>14. SUBMIT MANUFACTURER'S CERTIFICATION AND MATERIAL DATA FOR ALL MATERIALS DELIVERED TO THE PROJECT SITE AS REQUESTED BY THE OWNERS REPRESENTATIVE.</p>	<p>21. CONTRACTOR SHALL MANAGE AND REPAIR EROSION AND SEDIMENT CONTROL THROUGHOUT THE PROJECT. THE CONTRACTOR SHALL HAVE MATERIALS EQUIPMENT AND LABOR AVAILABLE ON A DAILY BASIS TO INSTALL AND MAINTAIN EROSION CONTROL FEATURES IN ORDER TO COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATION. THIS SHALL BE INCIDENTAL TO THE PROJECT.</p>
<p>2. IOWA CODE 480, UNDERGROUND FACILITIES INFORMATION, REQUIRES VERBAL NOTICE TO IOWA ONE-CALL 1-800-292-8989, NOT LESS THAN 48 HOURS BEFORE EXCAVATING, EXCLUDING WEEKENDS AND HOLIDAYS.</p>	<p>9. WORK WHICH DOES NOT CONFORM TO THE REQUIREMENTS OF THE CONTRACT WILL BE CONSIDERED UNACCEPTABLE. UNACCEPTABLE WORK, WHETHER THE RESULT OF POOR WORKMANSHIP, USE OF DEFECTIVE MATERIALS, DAMAGE THROUGH CARELESSNESS OR ANY OTHER CAUSE, FOUND TO EXIST PRIOR TO THE FINAL ACCEPTANCE OF THE WORK, SHALL BE REMOVED AND REPLACED IN AN ACCEPTABLE MANNER, AS REQUIRED BY THE OWNER AT THE CONTRACTOR'S EXPENSE.</p>	<p>15. CONSTRUCTION SURVEY STAKING WILL BE PAID FOR BY THE OWNER AND PROVIDED BY THE ENGINEER. CONTROL POINTS WILL BE SET FOR USE WITH GPS CONTROLLED GRADING, IF DESIRED. CONTRACTOR SHALL PRESERVE STAKES TO THE EXTENT FEASIBLE. ANY RE-STAKING COSTS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.</p>	<p>22. PROJECT COORDINATES AND ELEVATIONS ARE NAD83, NAVD88, IOWA NORTH STATE PLANE COORDINATES (1401), US SURVEY FEET.</p>
<p>3. THE MEANS OF THE WORK AND THE SAFETY OF THE CONTRACTOR'S EMPLOYEES ARE SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.</p>	<p>10. WORK DONE CONTRARY TO THE INSTRUCTIONS OF THE OWNERS REPRESENTATIVE, WORK DONE BEYOND THE LINES SHOWN ON THE PLANS OR ANY EXTRA WORK DONE WITHOUT AUTHORITY WILL NOT BE PAID FOR.</p>	<p>16. ALL WORK SHALL BE PER PER NRCS SPECIFICATIONS UNLESS STATED OTHERWISE IN THE PROJECT SPECIFICATIONS.</p>	
<p>4. NO WORK SHALL BE PERFORMED BEYOND THE PROJECT LIMITS WITHOUT PRIOR AUTHORIZATION FROM THE OWNER'S REPRESENTATIVE.</p>	<p>11. A SHRINKAGE FACTOR OF 30% WAS ESTIMATED FOR THIS PROJECT BASED ON THE GEOTECHNICAL REPORT. THE CONTRACTOR SHALL MAKE CHANGES IN EARTHWORK AS NEEDED TO ADJUST FOR INACCURACIES INHERENT WITH ESTIMATING THE SHRINKAGE FACTOR. THESE CHANGES SHALL ONLY BE MADE AFTER CONSULTATION AND APPROVAL BY THE ENGINEER.</p>	<p>17. CONTRACTOR SHALL VISIT AND INSPECT THE PROJECT AREA AND THOROUGHLY FAMILIARIZE THEMSELVES WITH THE ACTUAL JOB CONDITIONS PRIOR TO THE START OF WORK. FAILURE TO VISIT THE SITE DOES NOT RELIEVE THE CONTRACTOR FROM PERFORMING THE WORK IN ACCORDANCE TO THE PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND CONTRACT.</p>	
<p>5. REPLACE ANY PROPERTY MONUMENTS REMOVED OR DESTROYED BY CONSTRUCTION. MONUMENTS SHALL BE SET BY A LAND SURVEYOR REGISTERED TO PRACTICE IN THE STATE OF IOWA.</p>	<p>12. CONTOURS AND SPOT ELEVATIONS SHOWN ARE TO FINISHED GRADE.</p>	<p>18. ALL WORK SHALL CONFORM TO AND BE CONDUCTED IN ACCORDANCE WITH ALL APPLICABLE CODES AND ORDINANCES.</p>	
<p>6. ALL DEBRIS AND TRASH ENCOUNTERED DURING CONSTRUCTION WITHIN THE PROJECT LIMITS, OR DIRECTED BY THE ENGINEER, SHALL BE PROPERLY DISPOSED OF.</p>	<p>13. ALL WORK WITHIN THE PUBLIC RIGHT OF WAY SHALL BE COORDINATED WITH THE GOVERNING AUTHORITY AND SHALL BE DONE IN ACCORDANCE WITH THEIR STANDARDS.</p>	<p>19. SITE ACCESS ROUTES AND STAGING AREAS SHALL BE COORDINATES AND APPROVED BY THE LANDOWNER AND WATERSHED COORDINATOR.</p>	
<p>7. CONTRACTOR IS RESPONSIBLE FOR ALL CONSTRUCTION DE-WATERING THAT IS REQUIRED AT NO ADDITIONAL COST TO THE OWNER. DEWATERING SHALL BE CONDUCTED IN ACCORDANCE WITH NRCS SPECIFICATION IA-11.</p>		<p>20. IF A CULTURAL RESOURCE IS IDENTIFIED DURING CONSTRUCTION, CONTRACTORS SHALL IMMEDIATELY HALT ALL WORK AND NOTIFY SHIVE-HATTERY. WORK MAY NOT RECOMMENCE UNTIL THE SITE IS CLEARED BY THE STATE HISTORIC PRESERVATION OFFICE.</p>	

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MATERIAL EXCAVATED FROM THE BORROW AREA IS
INTENDED TO BE USED AS STRUCTURAL FILL FOR
PROPOSED ROAD EMBANKMENT. MATERIAL MAY REQUIRE
MOISTURE CONDITIONING - SEE GEOTECHNICAL REPORT.



ELEVATIONS TABLE

CUT/FILL	MINIMUM ELEVATION (FT.)	MAXIMUM ELEVATION (FT.)	COLOR
CUT	-10	-8	
CUT	-8	-6	
CUT	-6	-4	
CUT	-4	-2	
CUT	-2	0	
FILL	0	2	
FILL	2	4	
FILL	4	6	
FILL	6	8	
FILL	8	10	
FILL	10	12	
FILL	12	14	
FILL	14	16	
FILL	16	18	
FILL	18	20	
FILL	20	22	
FILL	22	24	
FILL	24	26	

EARTHWORK TABLE

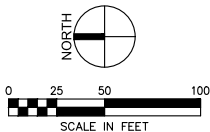
CLASSIFICATION	CUT (CY)	TOTAL FILL + 30% SHRINK (CY)
EXCAVATION, CORE TRENCH	1,642	0
EARTHFILL, EMBANKMENT AND CORE TRENCH	2,656	22,863
EXCAVATION, BORROW	18,565	0
TOTAL EARTHWORK	22,863	22,863

NOTES:

- A 30% SHRINKAGE FACTOR HAS BEEN USED FOR CALCULATION PURPOSES. SEE GEOTECHNICAL REPORT. EARTHWORK SHALL BE BALANCED ON SITE.
- EXCAVATION FOR STRUCTURE REMOVAL AND INSTALLATION, INCLUDING THE PROPOSED BOX CULVERT AND CMP CULVERTS IS NOT INCLUDED IN THE ABOVE EARTHWORK TABLE. EXCAVATION AND BACKFILL FOR THESE STRUCTURES SHALL BE INCIDENTAL TO THE ASSOCIATED BID ITEMS (I.E. CMP CULVERTS OR PRE-CAST BOX CULVERT). NO ADDITIONAL PAYMENT WILL BE MADE FOR EXCAVATION AND BACKFILL ASSOCIATED WITH INSTALLATION OF THESE STRUCTURES.

LEGEND

DESCRIPTION	SYMBOL / LINETYPE
SOIL BORING	



UPPER IOWA WMA

CUT-FILL PLAN

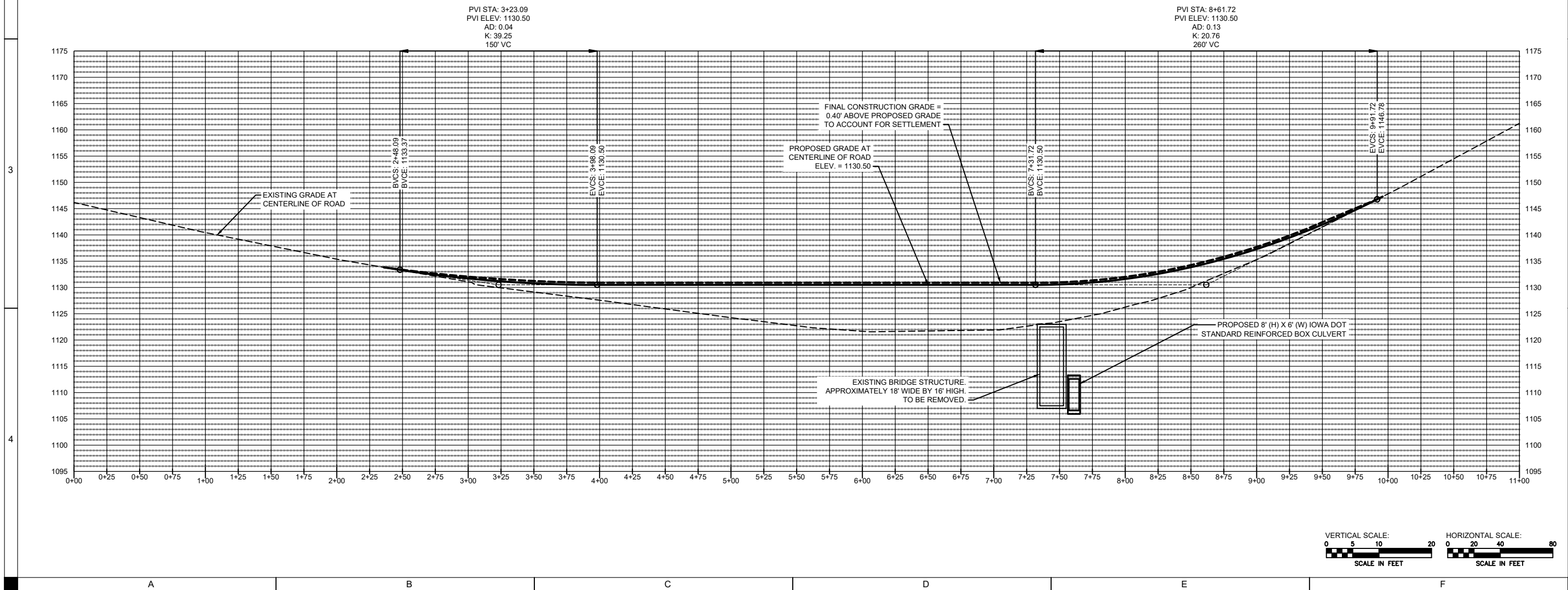
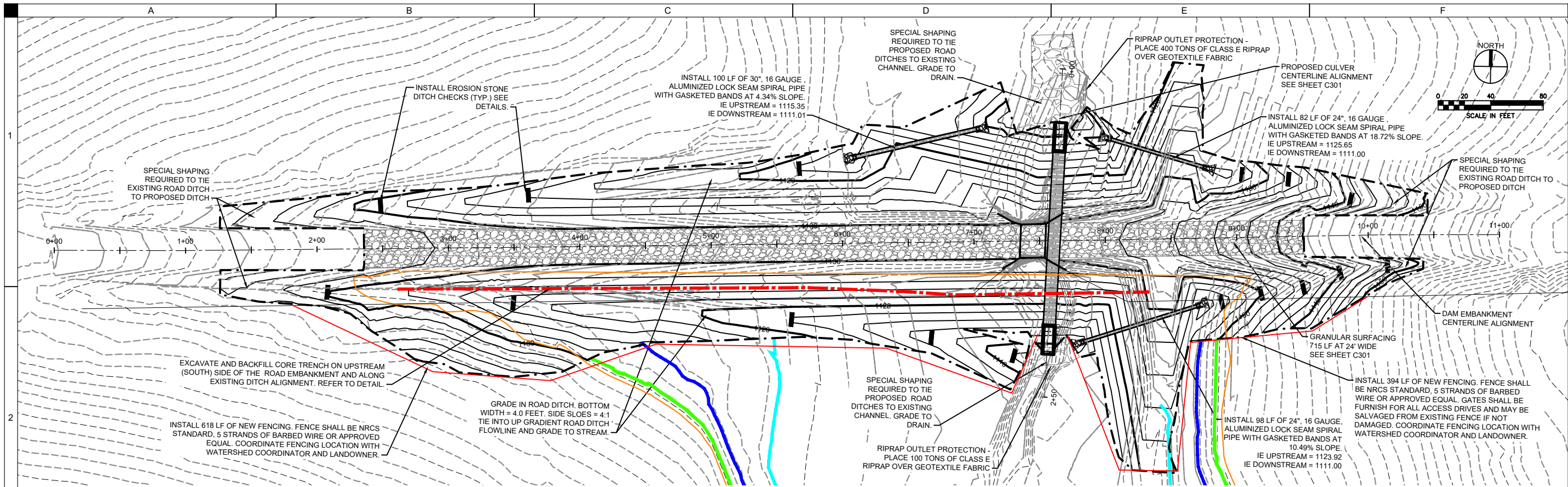
UI-048-ROTHMEYER-NUMEDAHL
WINNEBAGO COUNTY, IA

DRAWN: MJH
APPROVED: LTM
ISSUED FOR: BIDDING
DATE: 01-12-2021
PROJECT NO.: 185190
FIELD BOOK: -
CLIENT NO.: -

SHIVEHATTERY
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C202

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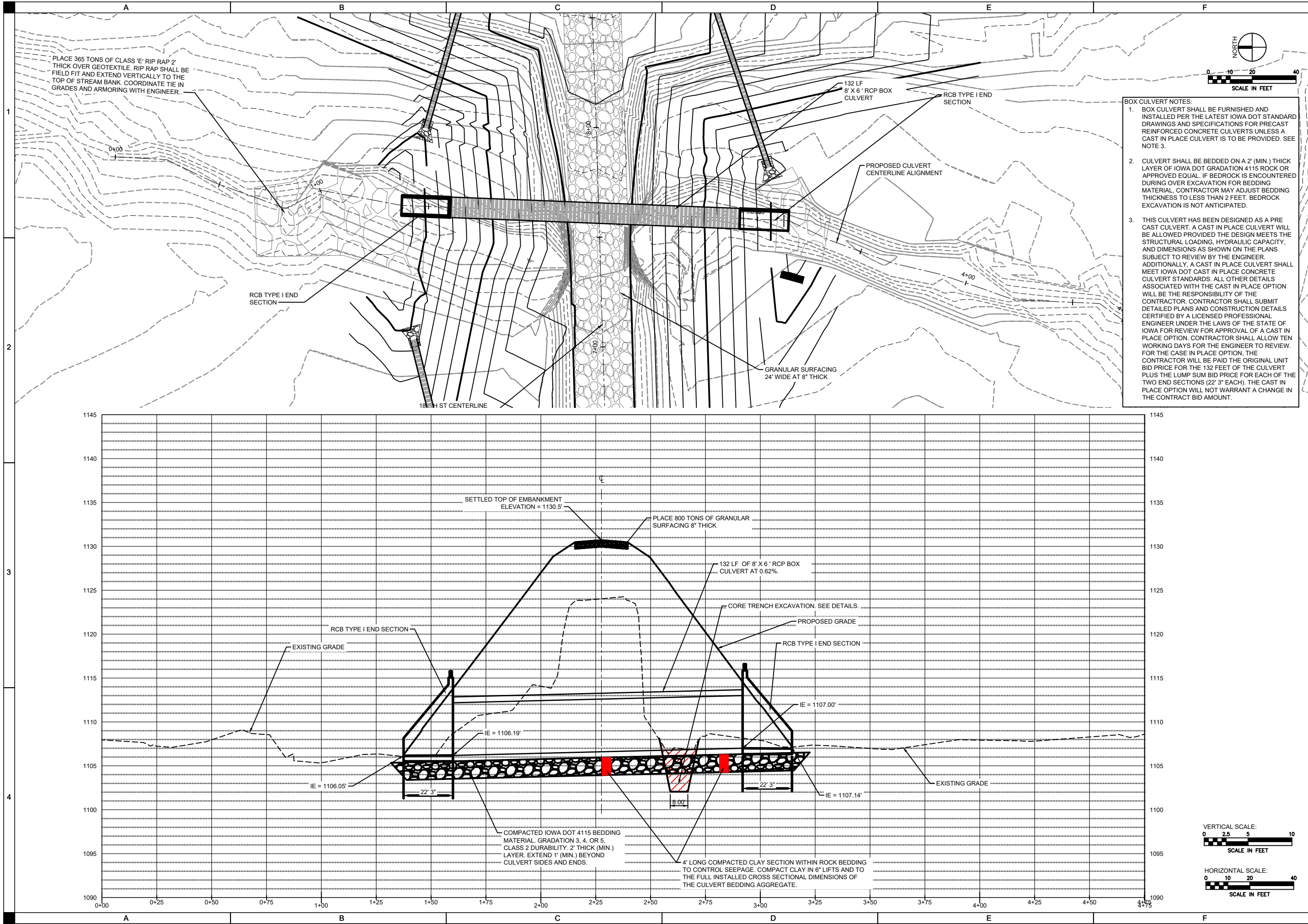
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UPPER IOWA WMA
UI-048-ROTHMEYER-NUMEDAH
WINNEBAGO COUNTY, IA

DRAWN:	MJH
APPROVED:	LTM
ISSUED FOR:	BIDDING
DATE:	01-12-2021
PROJECT NO.:	1185190
FIELD BOOK:	-
CLIENT NO.:	-

ROAD EMBANKMENT PLAN AND PROFILE
C203

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- BOX CULVERT NOTES:
1. BOX CULVERT SHALL BE FURNISHED AND INSTALLED PER THE LATEST IOWA DOT STANDARD DRAWINGS AND SPECIFICATIONS FOR PRECAST REINFORCED CONCRETE CULVERTS UNLESS A CAST IN PLACE CULVERT IS TO BE PROVIDED. SEE NOTE 3.
 2. CULVERT SHALL BE BEDDED ON A 2' (MIN.) THICK LAYER OF IOWA DOT GRADATION 4115 ROCK OR APPROVED EQUAL. IF BEDROCK IS ENCOUNTERED DURING OVER EXCAVATION FOR BEDDING MATERIAL, CONTRACTOR MAY ADJUST BEDDING THICKNESS TO LESS THAN 2 FEET. BEDROCK EXCAVATION IS NOT ANTICIPATED.
 3. THIS CULVERT HAS BEEN DESIGNED AS A PRE CAST CULVERT. A CAST IN PLACE CULVERT WILL BE ALLOWED PROVIDED THE DESIGN MEETS THE STRUCTURAL LOADING, HYDRAULIC CAPACITY, AND DIMENSIONS AS SHOWN ON THE PLANS SUBJECT TO REVIEW BY THE ENGINEER. ADDITIONALLY, A CAST IN PLACE CULVERT SHALL MEET IOWA DOT CAST IN PLACE CONCRETE CULVERT STANDARDS. ALL OTHER DETAILS ASSOCIATED WITH THE CAST IN PLACE OPTION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR SHALL SUBMIT DETAILED PLANS AND CONSTRUCTION DETAILS CERTIFIED BY A LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA FOR REVIEW FOR APPROVAL OF A CAST IN PLACE OPTION. CONTRACTOR SHALL ALLOW TEN WORKING DAYS FOR THE ENGINEER TO REVIEW. FOR THE CASE IN PLACE OPTION, THE CONTRACTOR WILL BE PAID THE ORIGINAL UNIT BID PRICE FOR THE 132 FEET OF THE CULVERT PLUS THE LUMP SUM BID PRICE FOR EACH OF THE TWO END SECTIONS (22' 3" EACH). THE CAST IN PLACE OPTION WILL NOT WARRANT A CHANGE IN THE CONTRACT BID AMOUNT.

UPPER IOWA WMA

DRAWN: MJH
APPROVED: LTM
ISSUED FOR: BIDDING
DATE: 01-12-2021
PROJECT NO: 1185190
FIELD BOOK: --
CLIENT NO: --

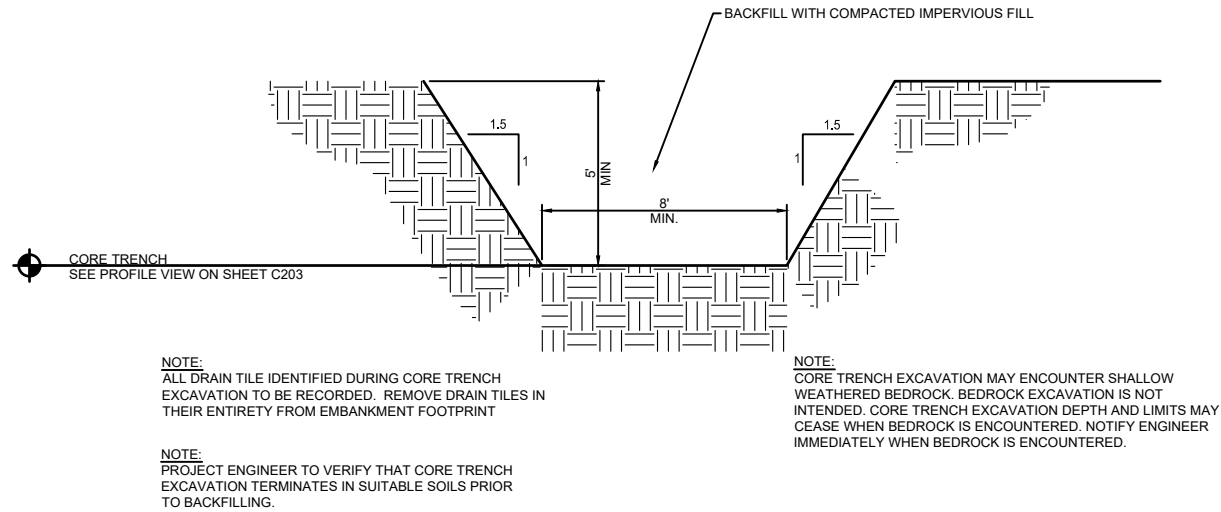
CULVERT PLAN AND
PROFILE

C301

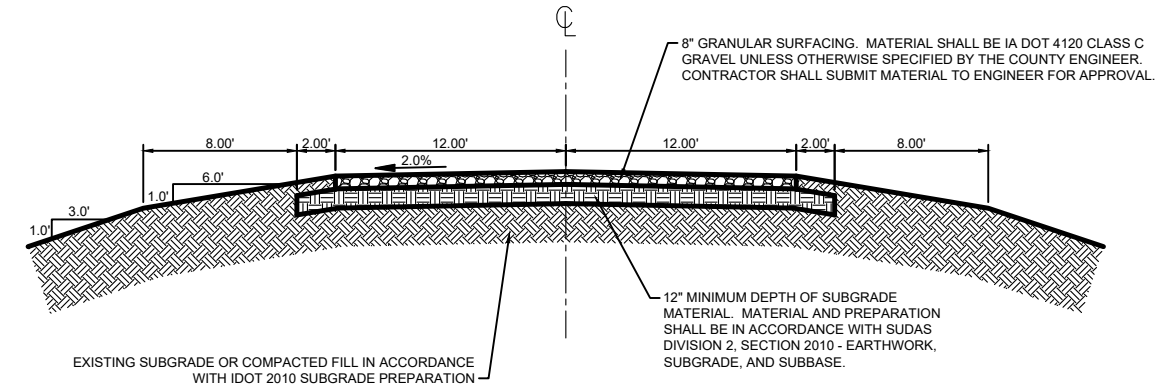
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UI-048-ROTHMEYER-NUMEDAH
WINNEBAGO COUNTY, IA

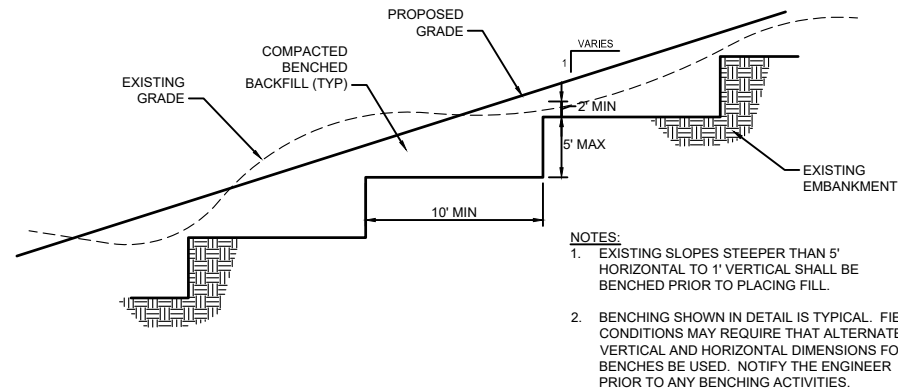
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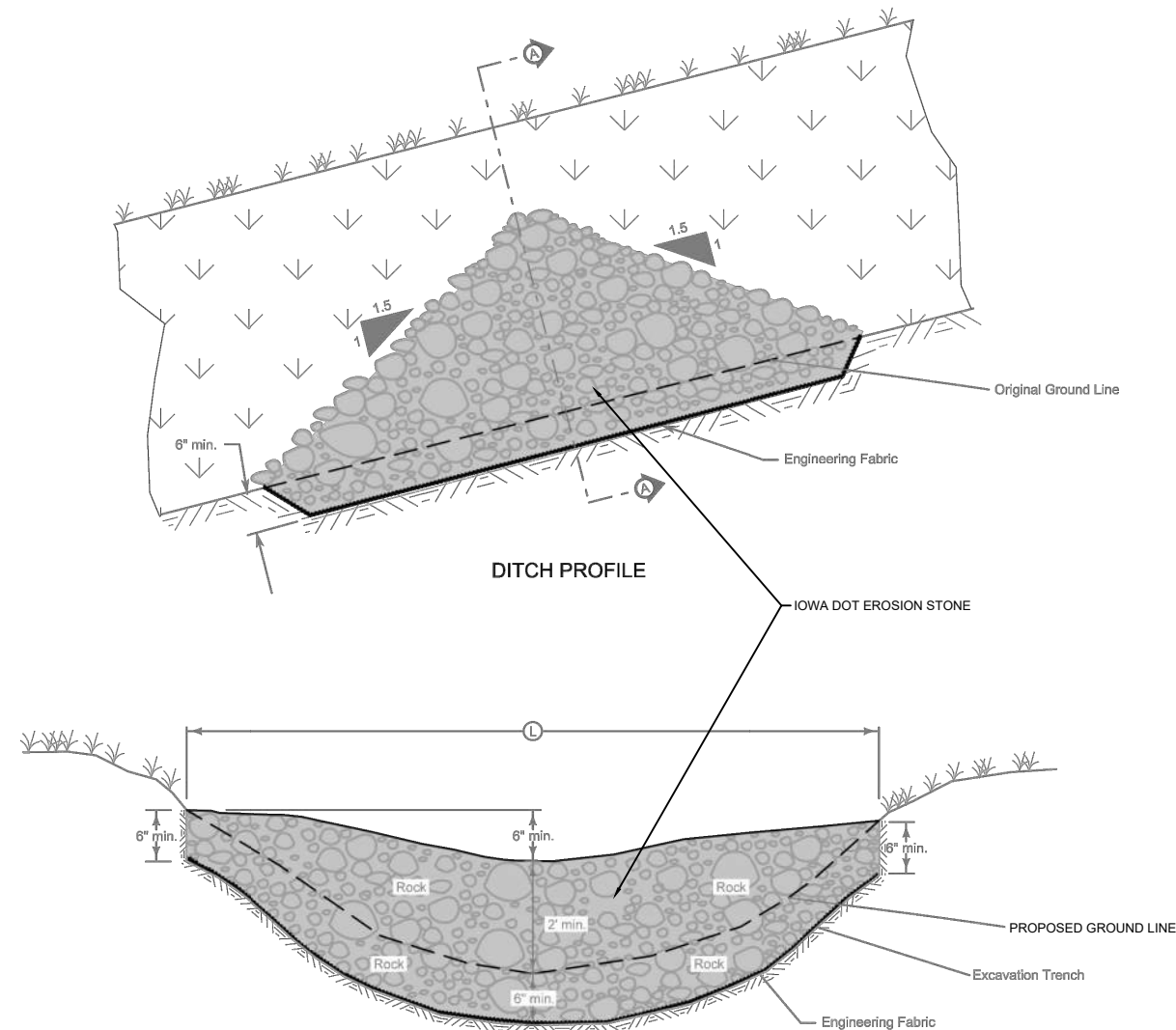
1 TYPICAL CORE TRENCH SECTION
NOT TO SCALE



2 TYPICAL ROAD SECTION
NOT TO SCALE

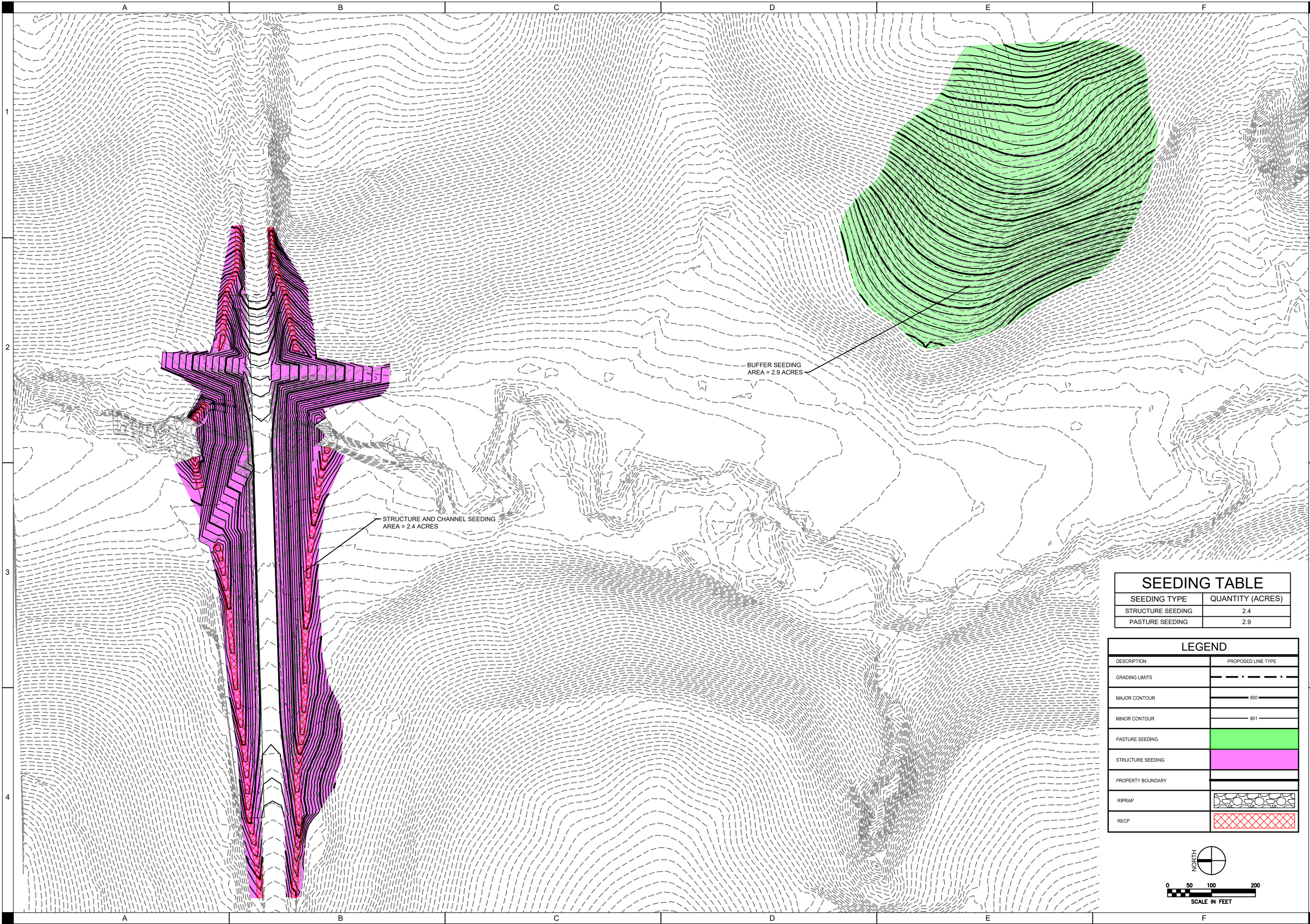


3 TYPICAL BENCHING DETAIL
NOT TO SCALE



4 TYPICAL DITCH CHECK
NOT TO SCALE

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BUFFER SEEDING
AREA = 2.9 ACRES

STRUCTURE AND CHANNEL SEEDING
AREA = 2.4 ACRES

SEEDING TABLE	
SEEDING TYPE	QUANTITY (ACRES)
STRUCTURE SEEDING	2.4
PASTURE SEEDING	2.9

LEGEND	
DESCRIPTION	PROPOSED LINE TYPE
GRADING LIMITS	- - - - -
MAJOR CONTOUR	800
MINOR CONTOUR	801
PASTURE SEEDING	
STRUCTURE SEEDING	
PROPERTY BOUNDARY	
RIPRAP	
RECP	



0 50 100 200
SCALE IN FEET

UPPER IOWA WMA

SEEDING PLAN

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UI-048-ROTHMEYER-NUMEDAHL
WINNEBAGO COUNTY, IA

DRAWN: MJH
APPROVED: LTM
ISSUED FOR: BIDDING
DATE: 01-12-2021
PROJECT NO: 4185190
FIELD BOOK: --
CLIENT NO: --

C601

REVISED 07-2016 - ADDED THE DESIGN VERTICAL AND HORIZONTAL EARTH PRESSURES AND RENUMBERED THE GENERAL NOTES.
ENGLISH(SIGNED)PRECASTCULVERTS.DGN - PRCB G1-13 - THIS SHEET ISSUED 01-13.



SINGLE PRECAST REINFORCED CONCRETE BOX CULVERT STANDARDS

GENERAL NOTES:

1. THE PRECAST RCB CULVERT SECTIONS ARE DESIGNED FOR HL-93 LIVE LOAD AND EARTH FILLS OF VARYING HEIGHTS.
2. VERTICAL EARTH PRESSURE, $E_v=0.120$ kcf.
HORIZONTAL EARTH PRESSURE, $E_{hmax} = 0.060$ kcf MAX, $E_{hmin} = 0.030$ kcf.
3. THE PRECAST RCB CULVERT SECTIONS ARE DESIGNED FOR CLASS 2 EXPOSURE CONDITIONS.
4. THE CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR EDGE OR END OF REINFORCING BAR TO BE $1\frac{1}{2}$ " MIN. AND 2" MAX. UNLESS OTHERWISE NOTED.
5. THE REINFORCEMENT SUPPLIED FOR THIS STRUCTURE SHALL BE PLAIN AND/OR DEFORMED WELDED WIRE REINFORCEMENT (WWR) $F_y = 65$ ksi, AND/OR GRADE 60 REINFORCING STEEL IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. THE REINFORCEMENT AREAS ARE BASED ON WELDED WIRE REINFORCEMENT. IF REINFORCING BARS ARE SUBSTITUTED FOR WELDED WIRE REINFORCEMENT, THE REINFORCEMENT AREAS SHALL BE INCREASED BY 8%. THE BARREL SECTIONS IN THESE STANDARDS WERE DESIGNED WITH PLAIN WWR, $F_y = 65$ ksi.
6. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS OTHERWISE NOTED OR SHOWN.
7. ANY OF THE FOLLOWING COMBINATIONS OF REINFORCEMENT MAY BE USED:
 - A. 1 OR 2 LAYERS OF WELDED WIRE REINFORCEMENT OR
 - B. 1 LAYER OF WELDED WIRE REINFORCEMENT AND 1 LAYER OF REINFORCEMENT BARS OR
 - C. 1 LAYER OF REINFORCEMENT BARS.THE REINFORCEMENT SHALL BE DEVELOPED IN ACCORDANCE WITH AASHTO LRFD SPECIFICATIONS.
8. THE MAXIMUM SIZE OF REINFORCEMENT BARS SHALL BE #6, EXCEPT FOR PARAPET REINFORCEMENT AS DETAILED.
9. THE MAXIMUM WELDED WIRE REINFORCEMENT SIZE SHALL BE A W23/D23 PER LAYER (MAXIMUM OF 2 LAYERS).
10. THE SPACING CENTER TO CENTER OF THE TRANSVERSE WIRES OR BARS SHALL NOT BE LESS THAN 2" NOR MORE THAN 4". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL WIRES OR BARS SHALL NOT BE MORE THAN 8".
11. WELDING WILL NOT BE ALLOWED ON REINFORCEMENT BARS OR WELDED WIRE REINFORCEMENT, EXCEPT THAT THE ORIGINAL WELDING REQUIRED TO MANUFACTURE THE WIRE REINFORCEMENT IS ACCEPTABLE.
12. WHEN REINFORCEMENT IS CUT, ADDITIONAL REINFORCEMENT SHALL BE ADDED ON BOTH SIDES OF THE CUT MEMBER TO REPLACE OR EXCEED THE CUT REINFORCEMENT.
13. BOXCAR SOFTWARE VERSION 3.1 WAS USED FOR THE DESIGN OF THE BARREL SECTIONS FOR THESE STANDARDS.
14. THESE CULVERT STANDARDS LABEL ALL REINFORCING STEEL WITH ENGLISH NOTATION (#3 IS $\frac{3}{8}$ INCH DIAMETER BAR). ENGLISH REINFORCING STEEL RECEIVED AT THE PRECAST PLANT MAY DISPLAY THE FOLLOWING "BAR DESIGNATION". THE "BAR DESIGNATION" IS THE STAMPED IMPRESSION ON THE REINFORCING BARS, AND IS EQUIVALENT TO THE BAR DIAMETER IN MILLIMETERS.

ENGLISH SIZE	3	4	5	6	7	8	9	10	11
BAR DESIGNATION	10	13	16	19	22	25	29	32	36

15. THE FIRST PRECAST BARREL SECTION ADJACENT TO THE OUTLET PRECAST END SECTION MAY BE A DOUBLE GROOVE BARREL TO FACILITATE PLACEMENT OF OUTLET END SECTIONS AND ALLOW INLET AND OUTLET END SECTIONS TO BE SIMILAR.

INDEX FOR PRECAST CULVERT STANDARDS:

PRCB G1-13	INDEX & GENERAL NOTES
PRCB G2-13	TYPICAL CULVERT BARREL DETAILS
PRCB 6-13	CULVERT BARREL DETAILS, 6' SPANS
PRCB 8-13	CULVERT BARREL DETAILS, 8' SPANS
PRCB 10-13	CULVERT BARREL DETAILS, 10' SPANS
PRCB 12-13	CULVERT BARREL DETAILS, 12' SPANS
PES 1-13-T1	TYPE 1 END SECTION DETAILS, UP TO 7.5° SKEWS
PES 1-13-T3	TYPE 3 END SECTION DETAILS, UP TO 7.5° SKEWS
PES 2-13-T3	TYPE 3 END SECTION DETAILS, 7.5° TO 45° SKEWS
PES 3-13-T3	TYPE 3 LINTEL BEAM DETAILS, 0° TO 45° SKEWS
PES 4-13	ALTERNATE CURTAIN WALL DETAILS
PEP 1-13	EMBANKMENT PROTECTION DETAILS, 0° TO 45° SKEWS

SPECIFICATIONS:

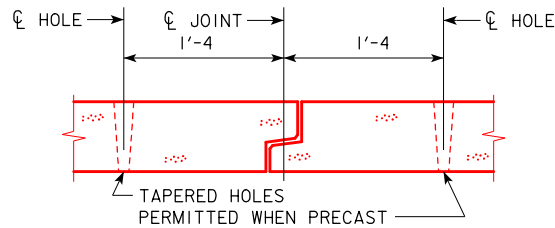
DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 5TH ED., SERIES OF 2010.

CONSTRUCTION:
IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, CURRENT SERIES, PLUS APPLICABLE GENERAL SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS.

DESIGN STRESSES:

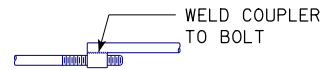
DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 5TH ED., SERIES OF 2010:
BAR REINFORCEMENT IN ACCORDANCE WITH AASHTO LRFD SECTION 5, GRADE 60.
WELDED WIRE REINFORCEMENT IN ACCORDANCE WITH AASHTO LRFD SECTION 5.
CONCRETE IN ACCORDANCE WITH AASHTO LRFD SECTION 5, f'_c FOR BARREL SECTIONS AS NOTED ON CULVERT BARREL DETAIL STANDARDS, FOR END SECTION DESIGN $f'_c = 5$ ksi.

07-2016 LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN SINGLE PRECAST REINFORCED CONCRETE BOX CULVERTS JANUARY, 2013	
		INDEX AND GENERAL NOTES	PRCB G1-13

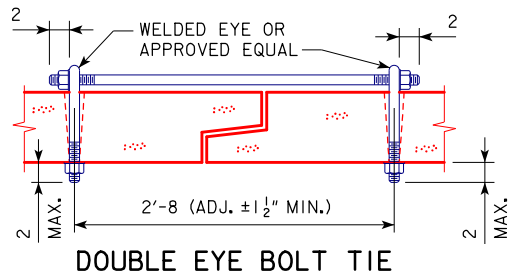
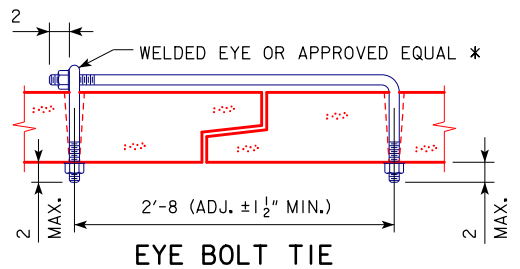
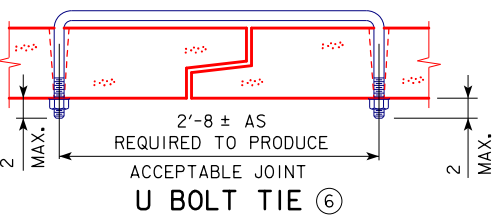
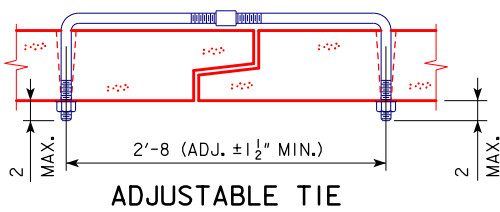


TYPICAL TIE LAYOUT

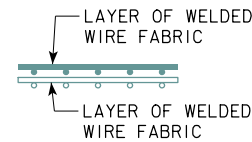
NOTE:
HOLES SHALL BE CAST OR DRILLED 1'-4" FROM CENTERLINE OF JOINTS AS SHOWN ABOVE, UNLESS FORMS ARE SET UP FOR 1'-4" SPACING FROM OUTSIDE OF JOINT.



TOP VIEW

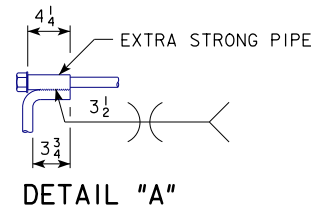


APPROVED CONCRETE BOX TIES

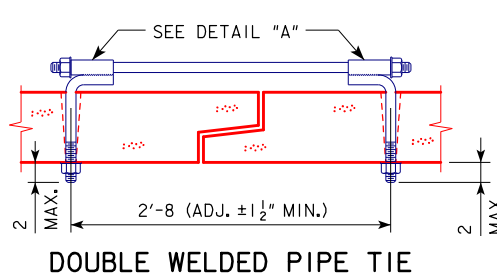
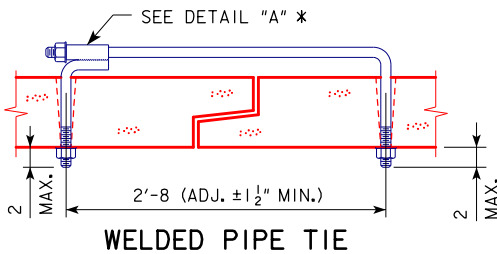


FABRIC LAYER DETAIL

NOTE:
WHEN MORE THAN ONE LAYER OF WELDED WIRE FABRIC IS USED TO OBTAIN THE REQUIRED REINFORCEMENT AREAS, THE WIRES OF THE WELDED WIRE FABRIC SHALL BE PLACED AS SHOWN.

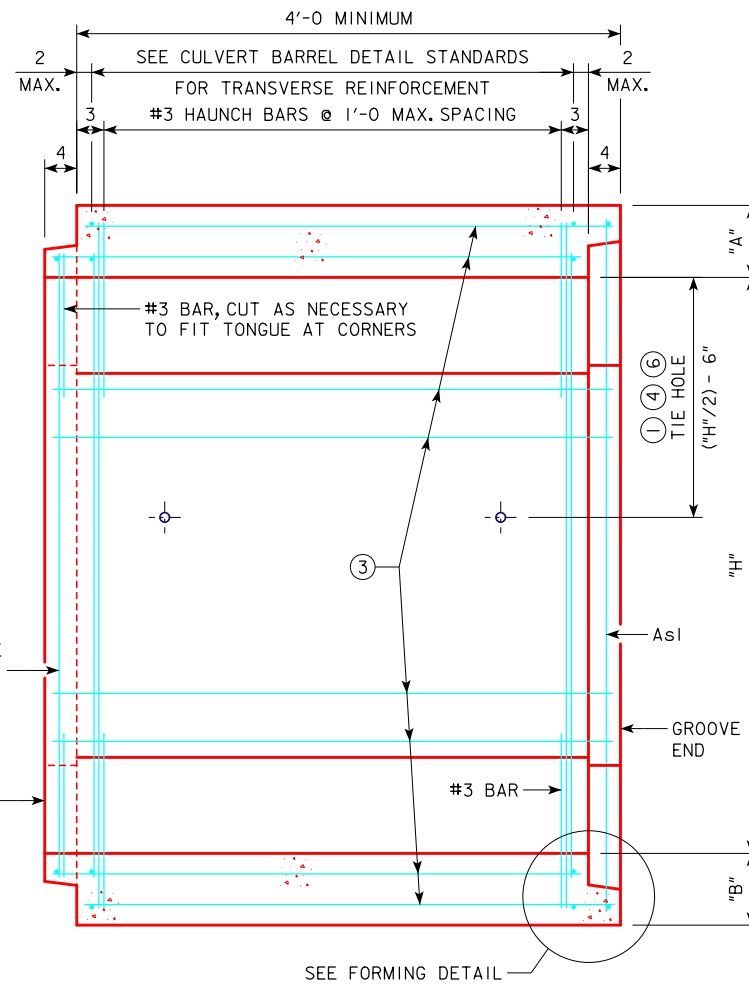
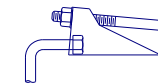


* THE CONNECTIONS SHALL BE PLACED AT THE DOWNSTREAM END WHEN THE CONNECTIONS ARE PLACED INSIDE OF STRUCTURE.

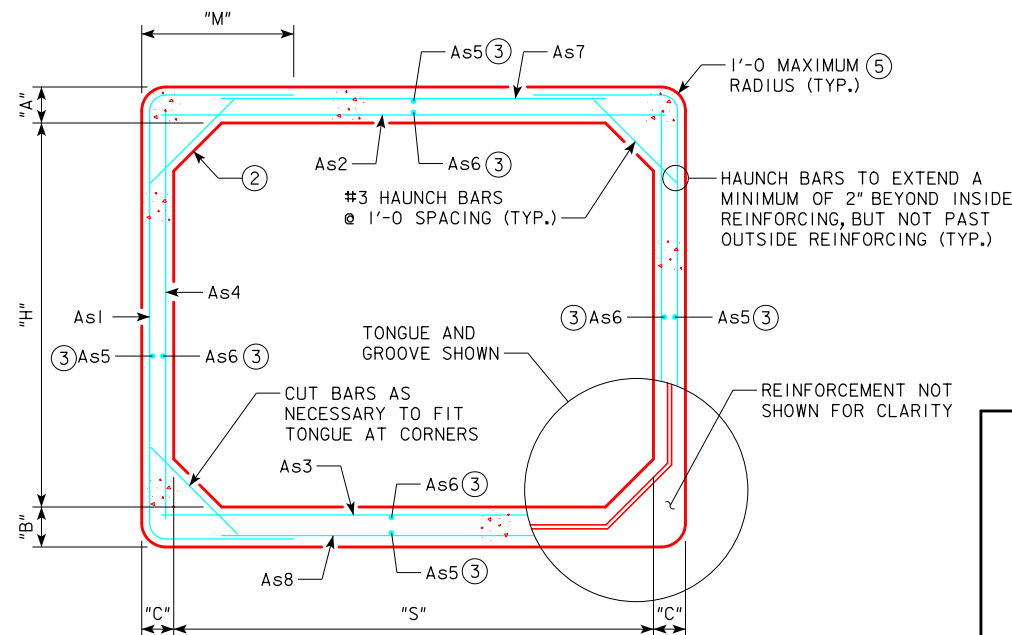


DOUBLE WELDED PIPE TIE

OPTIONAL CANOPY TIE



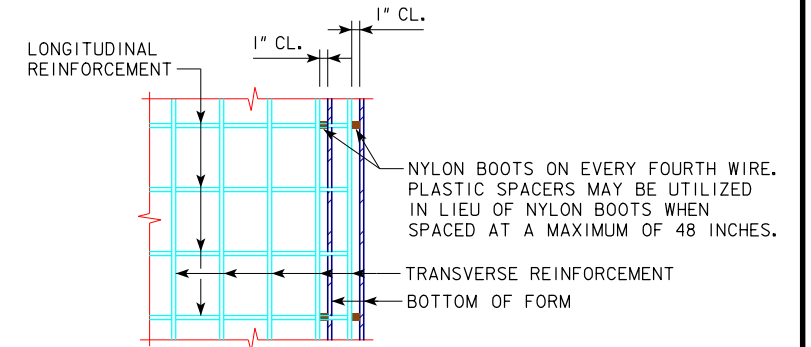
LONGITUDINAL BARREL SECTION



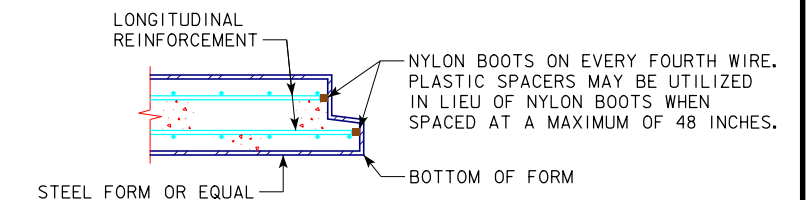
TRANSVERSE BARREL SECTION

NOTES:

- ① CULVERT TIES ARE TO BE 1" ϕ RODS. SEE THIS SHEET FOR CONNECTION DETAILS.
- ② HAUNCH SIZES ARE TO BE 12" VERTICAL, 12" HORIZONTAL ON ALL BOX SIZES.
- ③ LONGITUDINAL REINFORCEMENT DENOTED AS As5 & As6 MUST BE PLACED IN SLAB, FLOOR, AND WALLS AND MUST BE 0.06 IN²/FT. MIN.
- ④ REFER TO APPLICABLE END SECTION DETAIL SHEET FOR BARREL TO END SECTION CONNECTION TIE HOLE LOCATIONS.
- ⑤ OPTIONAL SQUARED CORNERS WITH 3/4" TO 2" CHAMFER.
- ⑥ U BOLT TIES ARE REQUIRED FOR BIKE, PEDESTRIAN AND CATTLE PATHS WITH NUTS ON FILL SIDE.

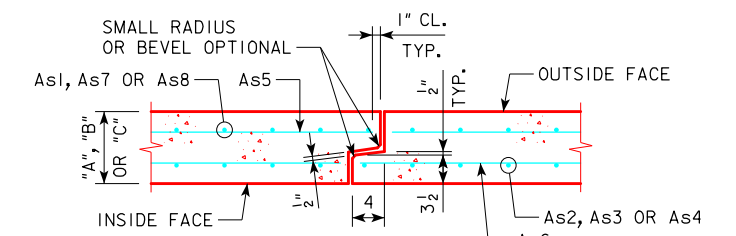


PLAN




SECTION

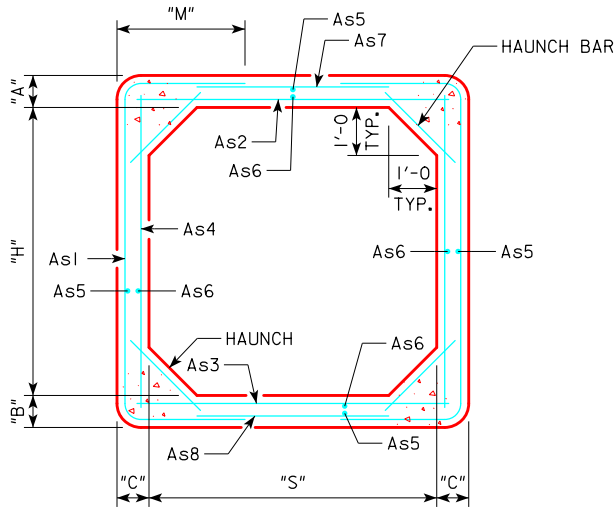
FORMING DETAIL



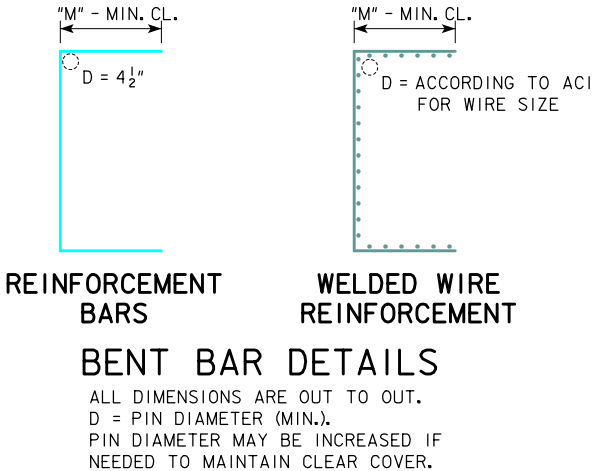
TONGUE AND GROOVE JOINT DETAIL

07-2016 LATEST REVISION DATE	APPROVED BY BRIDGE ENGINEER <i>Harmon L. McQuinn</i>	<div>  </div> <div> STANDARD DESIGN SINGLE PRECAST REINFORCED CONCRETE BOX CULVERTS JANUARY, 2013 </div> <div> <div>TYPICAL CULVERT BARREL DETAILS</div> <div>PRCB G2-13</div> </div>	
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Variable Dimensions and Quantities for 6' Span Barrel Sections																				
Dimensions									Reinforcement Requirements (in ² /ft)											Weight (lb/ft)
									As1			As2		As3		As4		As7/As8		
Size	Class	f'c (ksi)	Fill	S	H	A	B	C	Area	Length	M	Area	Length	Area	Length	Area	Length	Area	Length	
6x3	1	5.0	2-10	6	3	8	8	8	0.36	9'-2	2'-8	0.29	6'-6	0.27	6'-6	0.20	3'-6	0.20	3'-8	2370
	2	5.0	11-19	6	3	8	8	8	0.48	9'-2	2'-8	0.40	6'-6	0.40	6'-6	0.20	3'-6	0.20	3'-8	2370
	3	5.0	20-25	6	3	8	8	8	0.61	9'-2	2'-8	0.50	6'-6	0.50	6'-6	0.20	3'-6	0.20	3'-8	2370
6x4	1	5.0	2-11	6	4	8	8	8	0.31	10'-2	2'-8	0.35	6'-6	0.33	6'-6	0.20	4'-6	0.20	3'-8	2570
	2	5.0	12-19	6	4	8	8	8	0.41	10'-2	2'-8	0.47	6'-6	0.48	6'-6	0.20	4'-6	0.20	3'-8	2570
	3	5.0	20-25	6	4	8	8	8	0.52	10'-2	2'-8	0.59	6'-6	0.60	6'-6	0.20	4'-6	0.20	3'-8	2570
6x5	1	5.0	2-12	6	5	8	8	8	0.28	11'-2	2'-8	0.39	6'-6	0.38	6'-6	0.20	5'-6	0.20	3'-8	2770
	2	5.0	13-19	6	5	8	8	8	0.36	11'-2	2'-8	0.51	6'-6	0.53	6'-6	0.20	5'-6	0.20	3'-8	2770
	3	5.0	20-25	6	5	8	8	8	0.46	11'-2	2'-8	0.65	6'-6	0.66	6'-6	0.20	5'-6	0.20	3'-8	2770
6x6	1	5.0	2-12	6	6	8	8	8	0.26	12'-2	2'-8	0.43	6'-6	0.42	6'-6	0.20	6'-6	0.20	3'-8	2970
	2	5.0	13-19	6	6	8	8	8	0.33	12'-2	2'-8	0.54	6'-6	0.56	6'-6	0.20	6'-6	0.20	3'-8	2970
	3	5.0	20-25	6	6	8	8	8	0.41	12'-2	2'-8	0.68	6'-6	0.70	6'-6	0.20	6'-6	0.20	3'-8	2970
6x7	1	5.0	2-13	6	7	8	8	8	0.24	13'-2	2'-8	0.46	6'-6	0.46	6'-6	0.20	7'-6	0.20	3'-8	3170
	2	5.0	14-19	6	7	8	8	8	0.30	13'-2	2'-8	0.55	6'-6	0.58	6'-6	0.20	7'-6	0.20	3'-8	3170
	3	5.0	20-25	6	7	8	8	8	0.38	13'-2	2'-8	0.68	6'-6	0.71	6'-6	0.20	7'-6	0.20	3'-8	3170
6x8	1	5.0	2-13	6	8	8	8	8	0.23	14'-2	2'-8	0.49	6'-6	0.50	6'-6	0.20	8'-6	0.20	3'-8	3370
	2	5.0	14-19	6	8	8	8	8	0.29	14'-2	2'-8	0.55	6'-6	0.59	6'-6	0.21	8'-6	0.20	3'-8	3370
	3	5.0	20-25	6	8	8	8	8	0.36	14'-10	3'-0	0.68	6'-6	0.72	6'-6	0.25	8'-6	0.20	3'-0	3370





TYPICAL BARREL SECTION



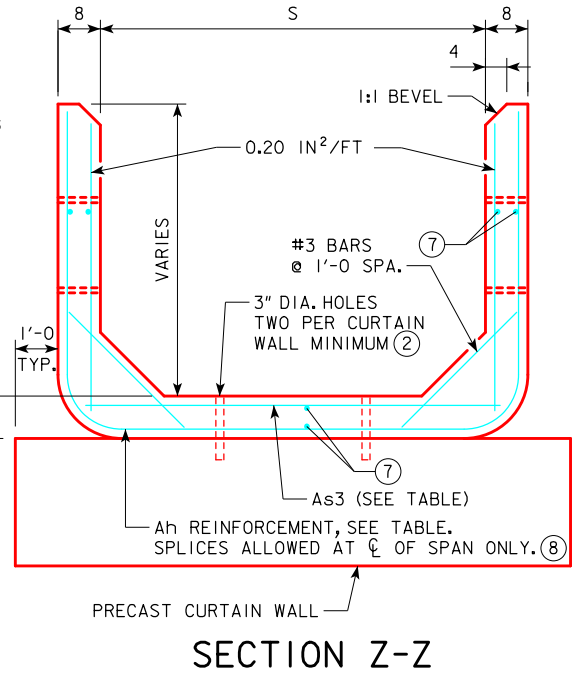
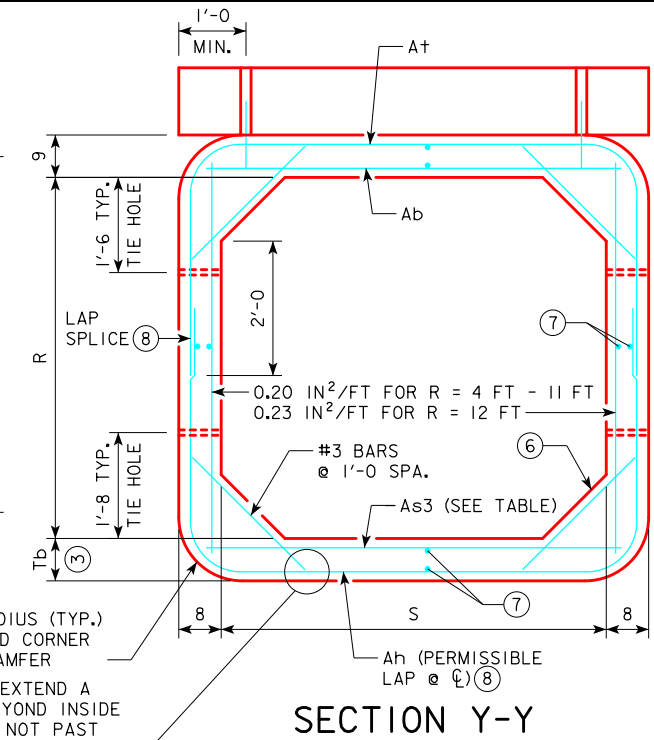
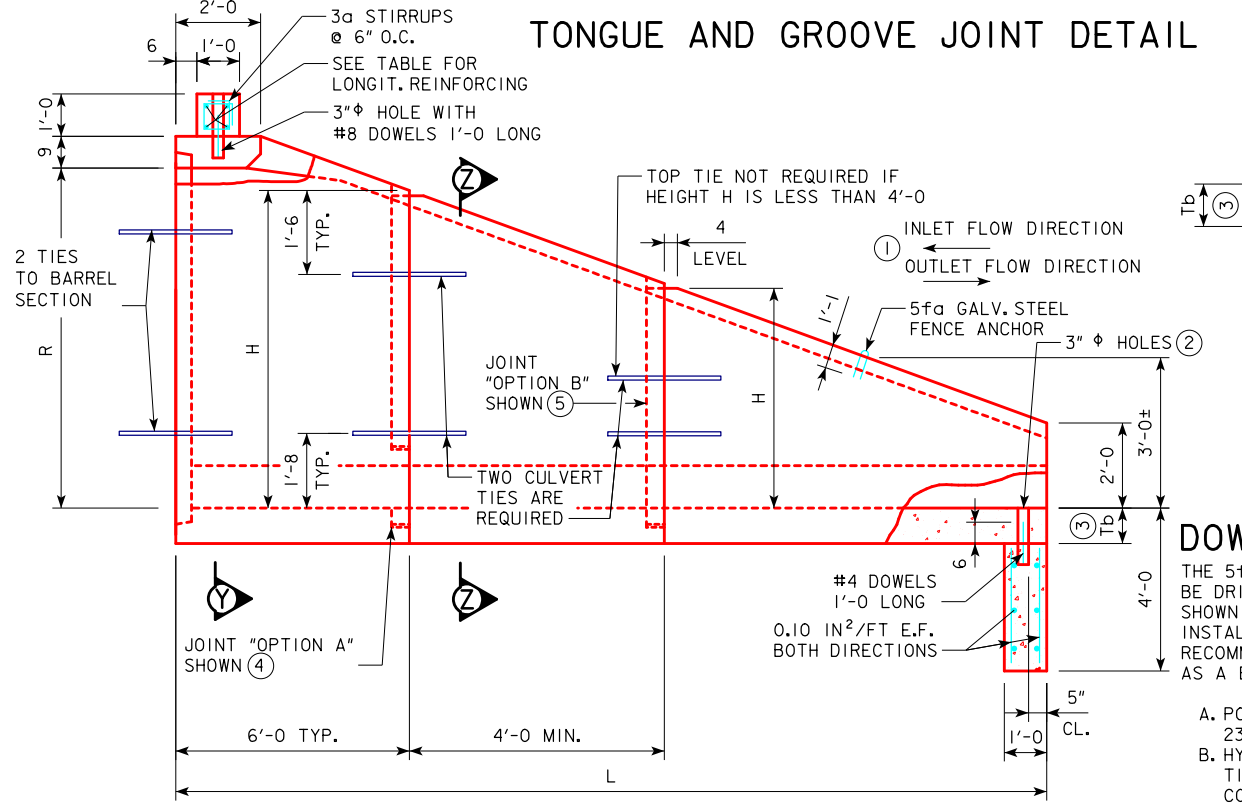
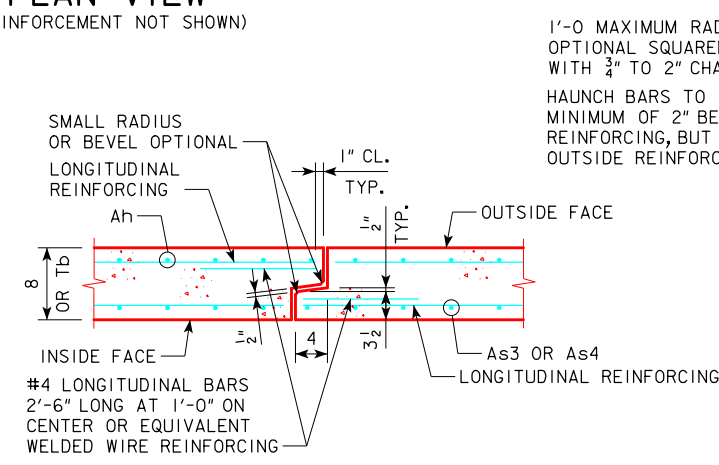
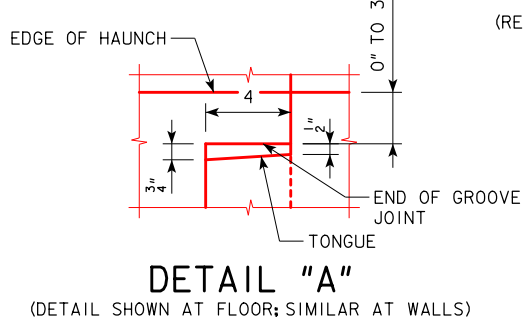
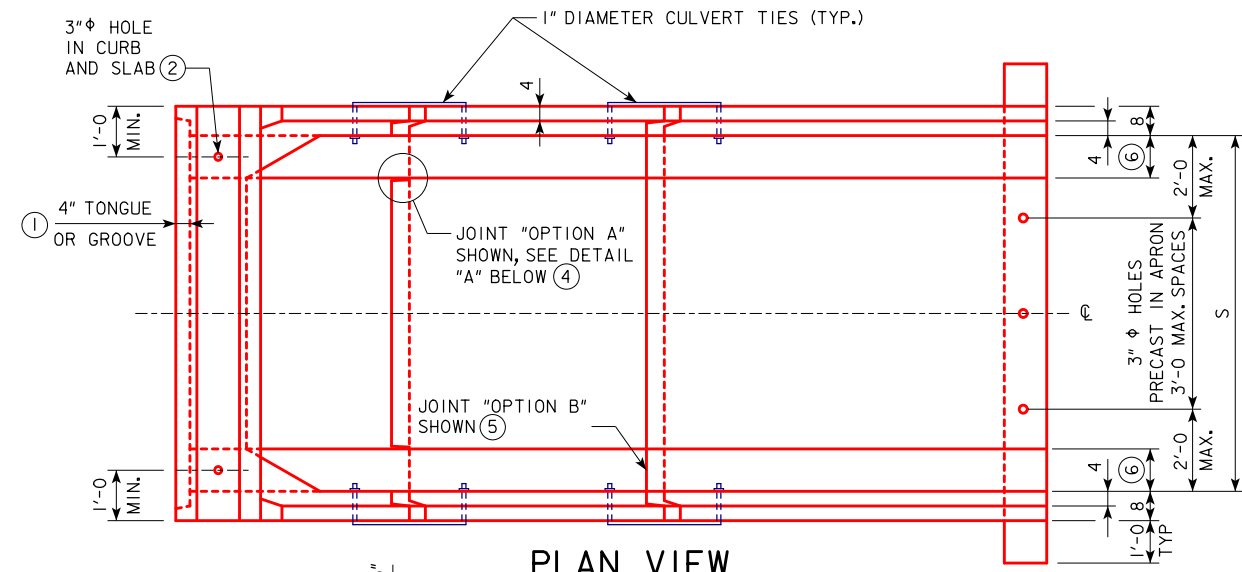
NOTES:

1. DIMENSIONS "A", "B" & "C" LISTED IN THE BAR LIST ARE IN INCHES.
2. LONGITUDINAL REINFORCEMENT DENOTED AS As5 AND As6 MUST BE PLACED IN SLAB, FLOOR, AND WALLS AND MUST BE 0.06 IN²/FT MINIMUM.
3. ALL REINFORCEMENT LENGTHS AND AREAS ARE MINIMUM REQUIREMENTS.
4. IF REINFORCING BARS ARE SUBSTITUTED FOR WELDED WIRE REINFORCING, DIMENSION "M" AND/OR LENGTH OF THE As7/As8 REINFORCEMENT SHALL BE ADJUSTED TO ENSURE ADEQUATE LAP LENGTH IS PROVIDED.
5. WEIGHT OF SECTIONS ASSUMES A DENSITY OF 150 PCF AND SQUARED CORNERS.
6. SEE PRCB G1-13 AND G2-13 FOR ADDITIONAL INFORMATION AND NOTES.

ENGLISHIGNEDPRECASTCULVERTS.DGN - PRCB 6-13 - THIS SHEET ISSUED 01-13.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN SINGLE PRECAST REINFORCED CONCRETE BOX CULVERTS JANUARY, 2013	
		CULVERT BARREL DETAILS 6' SPAN BARREL SECTIONS	PRCB 6-13

REVISED 05-13 - ADDED 3'-RISE TO THE APRON DIMENSIONS INFORMATION TABLE.
REVISED 07-2016 - CORRECTED TYPES.
ENGLISHIGNEDPRECASTCULVERTS.DGN - PES 1-13-T1 - THIS SHEET ISSUED 01-13.



CONSTRUCTION NOTES:

PRECAST BOX CULVERT END SECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH DETAILS AND NOTES, AS SHOWN BELOW:

REINFORCING FOR PRECAST END SECTIONS & CURTAIN WALLS SHALL BE WELDED WIRE REINFORCING (WWR) MEETING THE REQUIREMENTS OF AASHTO LRFD SECTION 5. THE CONCRETE COVER OVER THE REINFORCING STEEL SHALL NOT BE LESS THAN 1.5 INCHES OR GREATER THAN 2.0 INCHES.

REFER TO SHEET PRCB G1-13 FOR ADDITIONAL NOTES.

REFER TO FABRIC DETAIL ON SHEET PRCB G2-13 FOR MULTIPLE WWR LAYERS.

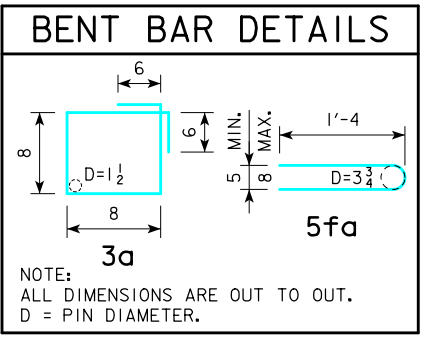
- USE TONGUE ON INLET END SECTION AND GROOVE ON OUTLET END SECTION.
- FILL HOLES WITH GROUT. GROUT SHALL CONSIST OF 1 PART CEMENT AND 2 PARTS SAND. USE AIR ENTRAINED PORTLAND CEMENT. GROUT MIX SHALL HAVE A MAXIMUM SLUMP OF 4 INCHES.
- THICKNESS OF FLOOR, $T_b = 8$ IN. FOR 6' SPAN, $T_b = 10$ IN. FOR ALL OTHER SPANS.
- JOINT "OPTION A": PROVIDE JOINT IN WALLS AND FLOOR. TERMINATE JOINT AT HAUNCH. SEE DETAIL "A" ON THIS SHEET.
- JOINT "OPTION B": PROVIDE JOINT IN WALLS, FLOOR AND HAUNCH.
- HAUNCH DIMENSION TO MATCH BARREL HAUNCH SIZE.
- MINIMUM LONGITUDINAL REINFORCEMENT SHALL BE 0.06 SQ. INCHES PER PERIPHERAL FOOT ON ALL FACES OF THE END SECTION, EXCEPT IN THE TONGUE AND GROOVE AREA.
- LAP SPLICES SHALL BE CLASS C AND SHALL BE DESIGNED ACCORDING TO THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

A+ & Ab REINF.		
SPAN S (FT)	A+ (IN ² /FT)	Ab (IN ² /FT)
6	0.22	0.33
8	0.24	0.46
10	0.31	0.59
12	0.38	0.74

PARAPET LONGIT. REINFORCING	
SPAN S (FT)	REQUIRED BAR SIZE
6'	#5
8'	#6
10'	#6
12'	#7

DIMENS.		Ah & As3 REINF.	
SPAN S (FT)	SECTION HT. H (FT)	Ah (IN ² /FT)	BOTTOM SLAB THICK. (IN) REQUIRED As3 (IN ² /FT)
6	3	0.20	0.20
	4	0.20	0.20
	5	0.20	0.20
	6	0.20	0.20
	7	0.31	0.23
	8	0.46	0.31
8	4	0.24	0.24
	5	0.24	0.24
	6	0.24	0.24
	7	0.24	0.24
	8	0.34	0.24
	9	0.49	0.29
	10	0.67	0.37
10	4	0.24	0.24
	5	0.24	0.24
	6	0.24	0.24
	7	0.24	0.24
	8	0.24	0.24
	9	0.34	0.26
	10	0.49	0.42
	11	0.67	0.53
	12	0.90	0.65

NOTE: H IS THE LARGEST VERTICAL DIMENSION OF THE SECTION.



APRON DIMENS.	
BOX RISE R (FT)	APRON LENGTH L (FT)
3	7'-3"
4	10'-3"
5	13'-3"
6	16'-3"
7	19'-3"
8	22'-3"
9	25'-3"
10	28'-3"
11	31'-3"
12	34'-3"

DOWEL SETTING NOTE :

THE 5fa BARS MAY BE SET AS DOWELS IN DRILLED HOLES. HOLES SHALL BE DRILLED TO THE DEPTH REQUIRED TO ACHIEVE BAR EMBEDMENT AS SHOWN IN THE "SIDE ELEVATION" DETAIL. THE DOWELS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. EITHER OF THE FOLLOWING SYSTEMS MAY BE USED AS A BONDING AGENT:

- POLYMER GROUT SYSTEM SHALL BE IN ACCORDANCE WITH ARTICLE 2301.03, E, OF THE STANDARD SPECIFICATIONS.
- HYDRAULIC CEMENT GROUT SYSTEMS. DRILLED HOLES ARE TO BE 2 $\frac{1}{2}$ TIMES THE DOWEL DIAMETER AND ARE TO BE BLOWN CLEAN WITH COMPRESSED AIR IMMEDIATELY PRIOR TO PLACING GROUT. THE HYDRAULIC CEMENT GROUT SHALL BE ONE OF THOSE APPROVED IN MATERIALS 1.M. 491.13.

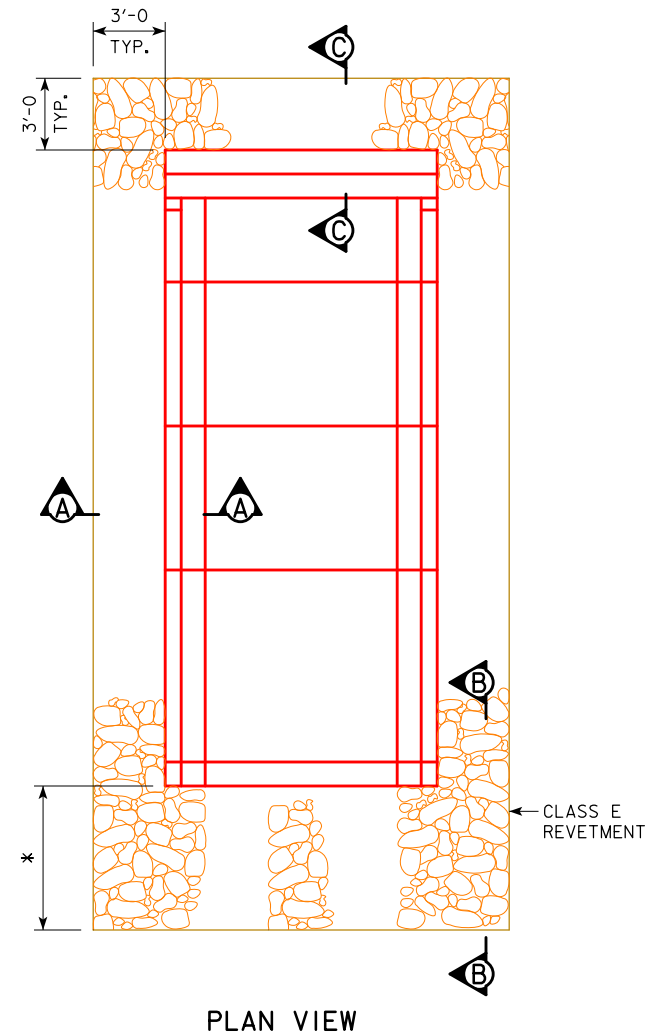


STANDARD DESIGN
SINGLE PRECAST REINFORCED
CONCRETE BOX CULVERTS
JANUARY, 2013

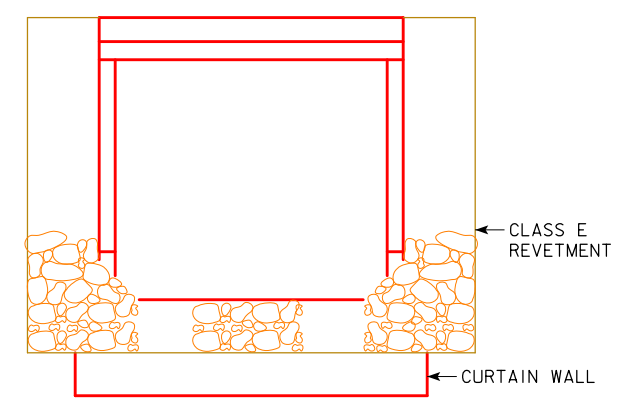
TYPE I END
SECTION DETAILS
FOR SKEWS UP TO 7.5°

PES 1-13-T1

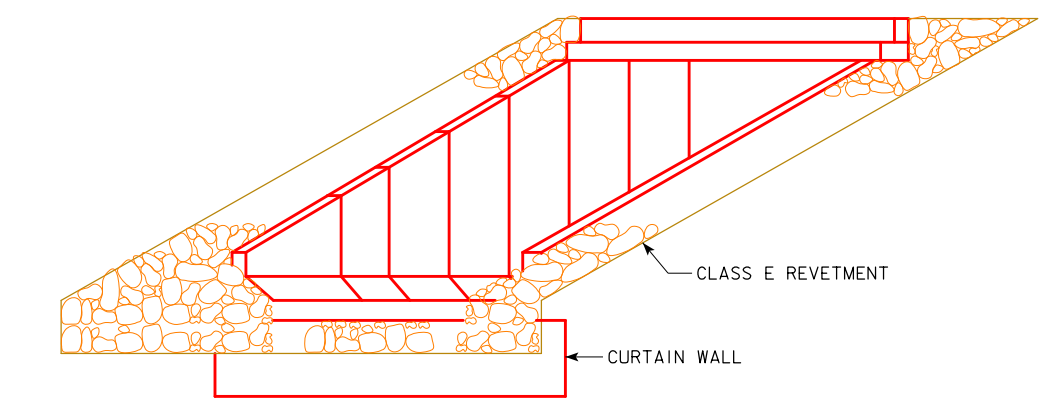
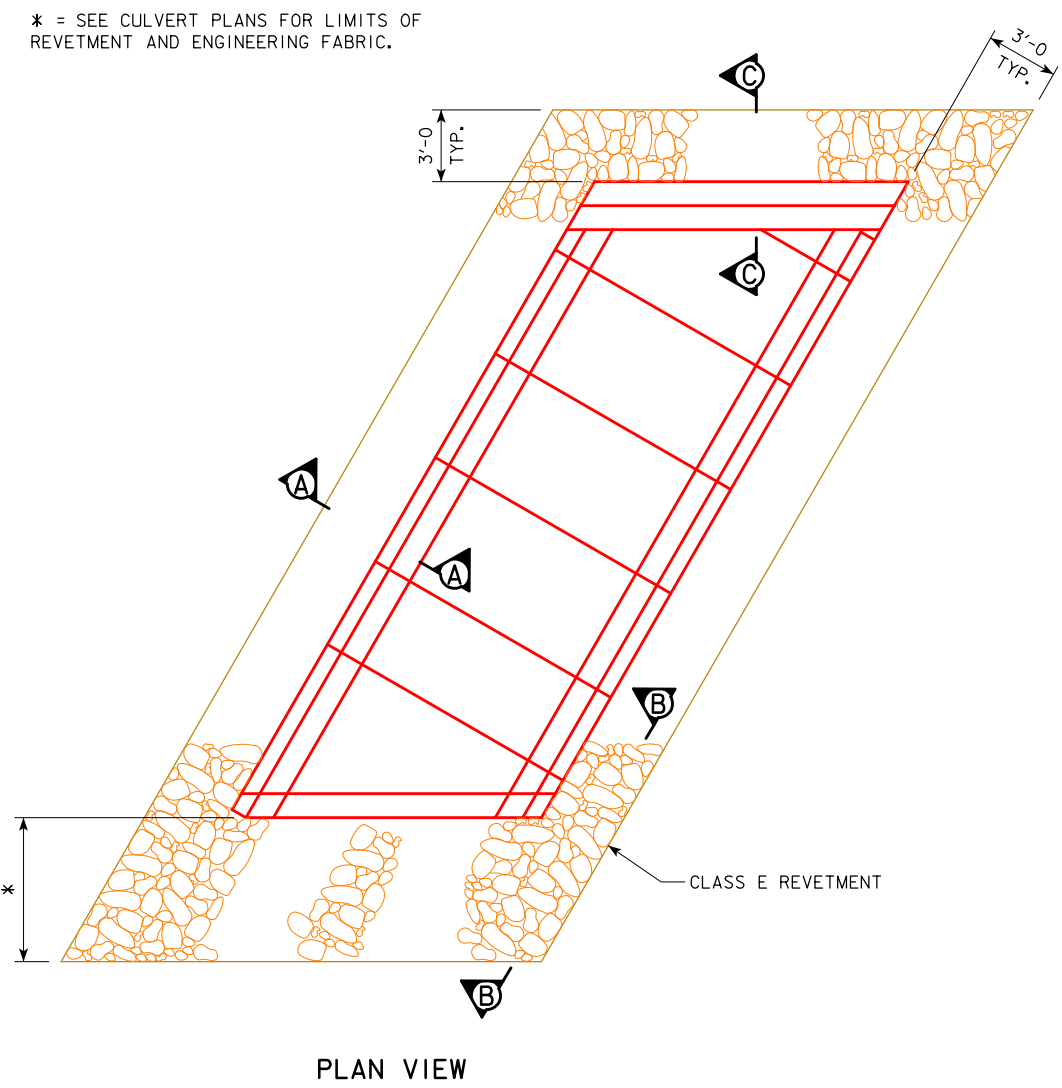
REVISED 10-14 - CHANGED THE AREA OF THE REVETMENT TO INCLUDE THE AREA IN FRONT OF THE APRON, CHANGED THE DEPTH OF REVETMENT TO 2'-0.
REVISED 12-15 - ADDED NOTE "SEE CULVERT PLANS FOR LIMITS OF REVETMENT AND ENGINEERING FABRIC."
ENGLISH\SIGNEDPRECASTCULVERTS.DGN - PEP 1-13 - THIS SHEET ISSUED 01-13.



* = SEE CULVERT PLANS FOR LIMITS OF REVETMENT AND ENGINEERING FABRIC.

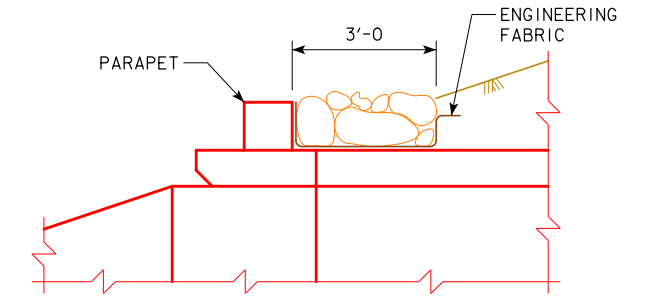


ELEVATION VIEW
NON-SKEW END SECTIONS



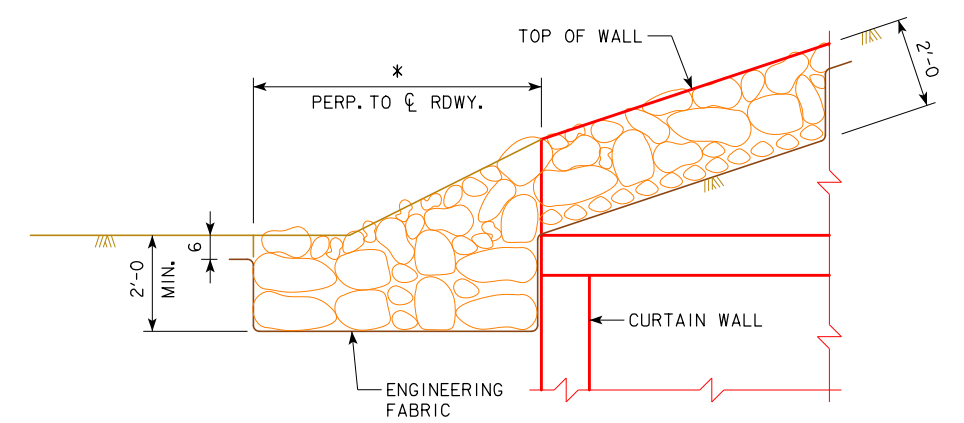
ELEVATION VIEW
SKEWED END SECTIONS

* = SEE CULVERT PLANS FOR LIMITS OF REVETMENT AND ENGINEERING FABRIC.

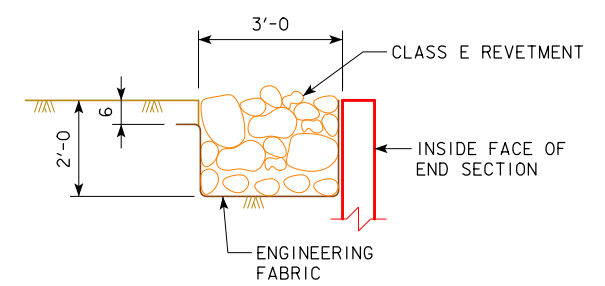


SECTION C-C

* = SEE CULVERT PLANS FOR LIMITS OF REVETMENT AND ENGINEERING FABRIC.



SECTION B-B

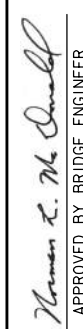



SECTION A-A
TYPICAL DETAILS

CONSTRUCTION NOTES:





CLASS E REVETMENT SHOULD BE USED AND PLACED ACCORDING TO ARTICLE 2507.03 OF THE STANDARD SPECIFICATIONS.

THE ENGINEERING FABRIC SHALL MEET THE MATERIAL REQUIREMENTS IN ACCORDANCE WITH ARTICLE 4196.01, B, 3 OF THE STANDARD SPECIFICATIONS.

12-15 LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN SINGLE PRECAST REINFORCED CONCRETE BOX CULVERTS JANUARY, 2013	
		EMBANKMENT PROTECTION DETAILS WITH 0° TO 45° SKEWED END SECTIONS	PEP 1-13

SECTION 02
CERTIFICATIONS PAGE
UI-BID-004
UI-048-ROTHMEYER-NUMEDAHL
UPPER IOWA RIVER WATERSHED MANAGEMENT AUTHORITY
WATERSHED IMPROVEMENTS (13-NDRI-009)
WINNESHIEK COUNTY, IOWA

STATE OF IOWA

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.											
	<table><tr><td></td><td>1-12-2021</td></tr><tr><td>Signature</td><td>Date</td></tr><tr><td colspan="2">Printed or typed name: Daniel J. Jensen, P.E.</td></tr><tr><td colspan="2">License Number: 25063</td></tr><tr><td colspan="2">My license renewal date is: 12-31-2021</td></tr><tr><td colspan="2">Pages, Sheets, or Divisions covered by this Seal: Project Manual</td></tr></table>		1-12-2021	Signature	Date	Printed or typed name: Daniel J. Jensen, P.E.		License Number: 25063		My license renewal date is: 12-31-2021		Pages, Sheets, or Divisions covered by this Seal: Project Manual
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SECTION E: EXISTING BRIDGE SUPPLEMENTAL INFORMATION

END OF SECTION

**SECTION A:
NRCS CONSTRUCTION SPECIFICATIONS
UPPER IOWA RIVER WMA
UI-048-ROTHMEYER-NUMEDAH**

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NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-1 SITE PREPARATION

1. SCOPE

Site preparation work shall consist of clearing, grubbing, stripping, refuse removal, bank sloping and structure removal on the site as necessary to rid the site of all undesirable materials on or near the surface and prepare the site for the structure. All woody growth within the construction area shall be cleared and all stumps and roots one inch in diameter or larger shall be grubbed from the site. In addition, all areas within 25 feet of the footprint of the structure shall be cleared and grubbed except as directed by NRCS. The work shall also consist of the removal and disposal of structures (including fences) that must be removed to perform other items of work.

For wetland restoration, enhancement, or creation projects, the wetland area shall be disturbed as little as possible and existing naturally vegetated spillway areas shall not be disturbed.

2. FOUNDATION PREPARATION

The construction areas shall be stripped a minimum of 6 inches to remove all unsuitable materials such as organic matter, grasses, weeds, sod, debris, and stones larger than 6 inches in diameter.

In an earth embankment foundation area, all channel banks and sharp breaks shall be sloped to no steeper than 1.5 horizontal to 1 vertical.

The foundation area shall be thoroughly scarified before placement of fill material. The surface shall have moisture added or shall be compacted if necessary so that the first layer of fill material can be compacted and bonded to the foundation.

3. STRIPPED MATERIAL DISPOSAL

Suitable soil material shall be stockpiled for use as topsoil. The other stripped materials shall be buried, removed from the site, or disposed of as directed by the owner or NRCS. Whenever possible, material shall not be disposed of in the pool area created by the structure.

Stockpiled materials around a construction site should be placed so as not to hinder subsequent construction operations.

4. DISPOSAL OF REFUSE MATERIALS

Waste materials from clearing and structure removal shall be burned or buried at locations approved by the owner. Buried materials shall be covered with a minimum of 2 feet of earthfill. Whenever possible, material shall not be disposed of in any pool area created by the structure.

All refuse shall be disposed of in a manner which complies with all local and state regulations.

5. SALVAGE

Items to be salvaged shall be as shown on the drawings. Structures and fencing materials that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas.

6. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-3 STRUCTURE REMOVAL

1. SCOPE

The work shall consist of the removal, salvage and/or disposal of structures (including fences) from the designated areas and as indicated on the drawings.

2. MARKING

Each structure or item to be removed will be marked by means of stakes, flags, painted markers or other suitable methods.

3. REMOVAL

All structures designated for removal shall be removed to the specified extent and depth.

4. SALVAGE

Structures that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly match marked with paint prior to disassembly. All pins, nuts, bolts, washers, plates and other loose parts shall be marked or tagged to indicate their proper location in the structure and shall be fastened to the appropriate structural member or packed in suitable containers. Materials from fences designated to be salvaged shall be placed outside the work area on the property from which they are removed. Wire shall be rolled into uniform rolls of convenient size. Posts and rails shall be neatly piled.

5. DISPOSAL OF REFUSE MATERIALS

Refuse materials resulting from structure removal shall be burned or buried at locations shown on the drawings. Buried materials shall be covered with a minimum of 2 feet of earthfill. Whenever possible, material shall not be disposed of in the pool area created by the structure.

All refuse shall be disposed of in a manner which complies with all local and state regulations.

6. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-5 POLLUTION CONTROL

1. SCOPE

The work shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air during construction operations.

2. MATERIALS

All materials furnished shall meet the requirements shown on the drawings or in the specifications.

3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

The measures and works shall include, but are not limited to, the following:

Staging of Earthwork Activities: The excavation and moving of soil materials shall be scheduled so that areas unprotected from erosion will be minimized. These areas will be unprotected for the shortest time feasible.

Seeding: Structures and disturbed areas shall be seeded as soon as possible after construction is completed.

Temporary seedings may be used as an alternative to other stabilization measures as approved by NRCS.

Mulching: Construction areas that have been disturbed but have no construction activity scheduled for 21 days or more shall have erosion protection measures applied by the 14th day. This erosion protection may be mulching or other approved temporary measures. Construction areas shall not be left open during a winter shutdown period and shall be protected by mulching.

All seeding and mulching shall be completed in accordance with the seeding plan and Iowa Construction Specification IA-6, Seeding and Mulching for Protective Cover.

The following works may be temporary. If they are installed as a temporary measure, they shall be removed and the area restored to its original state when they are no longer needed or when permanent measures are installed.

Diversions: Diversions may be required to divert clean runoff water away from work areas and to collect runoff from work areas for treatment and safe disposition.

Stream Crossings: Culverts or bridges may be required where construction equipment must cross streams.

Sediment Basins: Sediment basins may be required to settle and filter out sediment from eroding areas to protect properties and streams below the construction site.

Sediment Filters: Straw bale filters, geotextile sediment fences, or other equivalent methods may be used to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under them.

Waterways: Waterways may be required for the safe removal of runoff from fields, diversions, and other structures or measures.

4. CHEMICAL POLLUTION

The Contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to be used to dispose of chemical pollutants, such as drained lubricating or transmission oils, greases, soaps, concrete mixer wash water, asphalt, etc., produced as a by-product of the construction work. At the completion of the construction work, sumps shall be removed and the area restored without causing pollution.

Sanitary facilities such as chemical toilets or septic tanks shall not be placed adjacent to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water sources. At the completion of construction work, facilities shall be disposed of without causing pollution.

5. AIR POLLUTION

The burning of brush or trash or disposal of other materials shall adhere to local and state regulations.

Fire prevention measures shall be taken to prevent the start or the spreading of wild fires, which result from project work. Fire breaks or guards shall be constructed at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall insure safe operations at all times. If chemical dust suppressants are used, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the Engineer five working days before use.

6. MAINTENANCE, REMOVAL, AND RESTORATION

All pollution control measures and works shall be adequately maintained in a functional condition as long as needed during the construction operation. All temporary measures shall be removed and the site restored to as near original conditions as practical.

7. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-6 SEEDING AND MULCHING FOR PROTECTIVE COVER

1. SCOPE

The work shall consist of seeding, mulching, and fertilizing all disturbed areas and other areas as indicated on the drawings or otherwise designated.

2. SEEDBED PREPARATION AND APPLICATION

The entire area to be seeded shall be reasonably smooth and all washes and gullies shall be filled to conform to the desired cross-section before actual seedbed preparation is begun. At this stage of the operation, the required fertilizer and lime shall be applied uniformly and incorporated into the top 3 inches of the soil with suitable tillage equipment. The seedbed preparation operation shall be suspended when the soil is too wet or too dry. The seedbed shall be loosened to a depth of at least three inches.

On side slopes steeper than 2-1/2 horizontal to 1 vertical, the 3 inch minimum depth of seedbed preparation is not required, but the soil shall be worked enough to insure sufficient loose soil to provide adequate seed cover.

Unless otherwise specified, the seeding operation shall be performed immediately after preparation of the seedbed. The seed shall be drilled or broadcast by equipment that will insure uniform distribution of the seed.

3. MATERIALS

The seeding, fertilizing, and mulching requirements are as specified on Form IA-CPA-4.

Straw from cereal grains or hay will be used as mulching material. It shall be relatively free of weeds.

4. MULCH APPLICATION

The required mulching shall be performed as soon as possible after seeding unless otherwise specified. The mulch shall be applied uniformly over the area. The type and rate shall be as specified. When mulching is required, all areas seeded during any one day shall be mulched within 24 hours. The mulch may be spread by any means that results in a uniform cover.

The mulch shall be anchored. Anchoring of the mulch may be performed by a mulch anchoring tool or regular farm disk weighted and set nearly straight, by installation of mulch netting, or by other methods approved by NRCS.

5. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-8 MOBILIZATION AND DEMOBILIZATION

1. SCOPE

This work shall consist of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the contract.

The work shall not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract.

Mobilization will not be considered as work in fulfilling the contract requirement for commencement of work.

2. EQUIPMENT AND MATERIALS

Mobilization shall include all activities and costs for transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary facilities for the Contractor's operations at the site; premiums paid for performance and payment bonds, including coinsurance and reinsurance agreements as applicable; and other items specified in Section 4.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not included in the contract from the site; including the disassembly, removal and site cleanup of offices, buildings, and other facilities assembled for this contract.

The work includes mobilization and demobilization activities required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted or added items of work for which the contractor is entitled to an adjustment in contract price, compensation of such costs will be included in the price adjustment for the item or items of work changed or added.

3. SPECIAL SPECIFICATIONS

A. Measurement and Payment

- a. Payment will be made as the work proceeds, after presentation of invoices by the contractor showing specific mobilization and demobilization costs and evidence of the charges of suppliers, subcontractors, and others. If the total of such payments is less than the lump sum contract price, the unpaid balance will be included in the final contract payment. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for the completion of the work.
- b. Payment will not be made under this item for the purchase costs of materials having a residual value, the cost of materials to be incorporated in the project, or the purchase costs of operating supplies.

B. Items of Work and Construction Details

- a. Items of work to be performed in conformance with this specification and the construction details therefor are:
 - i. **Bid Item 4, Mobilization & Demobilization**
 1. This item shall consist of mobilizing and demobilizing personnel and equipment in preparation to perform the work within the scope of this contract.

2. Any work that is necessary to provide access to the site including, but not limited to, grading, temporary culverts, and clearing will be included in this item. When construction is completed access areas will be restored, as close as practical, to its original condition.
3. Any fence removed for access and /or to provide work area shall be replaced with same or like materials as approved by the engineer.
4. The Contractor shall exercise caution to minimize the amount of damage caused by the grading and clearing operations.
5. Portable toilets shall be provided at the construction site and used for the sanitary facilities.
6. This item shall not include transportation of personnel, equipment and operating supplies within the work limits areas of this contract.
7. Payment will constitute full compensation for related subsidiary items.

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

**IA-9 SUBSURFACE DRAIN INVESTIGATION,
REMOVAL, AND REPAIR**

1. SCOPE

The work shall consist of investigation, location, repair, and/or removal of subsurface drains (tile) near new or existing animal waste storage facilities or in wetland restoration, enhancement, or creation project areas, or other situations where subsurface drains may be present.

2. INVESTIGATION AND LOCATION

An inspection trench at least 10 inches wide shall be dug at the location shown on the drawings or as directed by the engineer or his representative. The trench shall be at least 6 feet deep measured from the original ground line, unless otherwise shown on the plans. The Engineer or his representative shall examine the trench and excavated material to identify tile lines.

Size, material, operating condition and direction of flow of each conduit shall be documented. Location and flow line elevation of each conduit shall be surveyed with horizontal and vertical control based on benchmarks shown on the plans.

The inspection trench shall be documented by surveying the natural ground and trench bottom location and elevations at the beginning, end, and every 50 feet for trenches longer than 50 feet.

Backfilling shall not be started without approval of the Engineer. See Section 5 for backfill specifications.

Trench shields, shoring and bracing, or other methods necessary to safeguard the workers and work, and to prevent damage to the existing improvements shall be furnished, placed, and subsequently removed by the contractor.

3. TILE REPAIR

Unless designated for removal, replace damaged conduit with new conduit having equal or greater capacity using material specified in Section 6 or 7. When replacing short sections of clay or concrete tile with single-wall corrugated polyethylene pipe, use the next larger nominal size.

Make connections with manufactured fittings and tight joints. Where joints have gaps that would allow soil to enter, cover the joint with a permanent type material such as coal tar pitch treated roofing paper, fiber glass sheet or mat, or plastic sheet.

If the investigation trench has been excavated below the existing drain grade, backfill the trench with gravel or well-pulverized soil in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to provide a firm foundation for the conduit at the existing grade. Do not backfill with any soil containing broken tile fragments.

Using selected soil free of hard clods, rocks, or frozen soil, hand tamp the backfill material around the haunch of the pipe in layers not over four (4) inches thick to provide support. Hold the conduit in place mechanically while placing excavated material around and over the conduit to ensure proper alignment and grade is maintained. Complete the backfill operation according to Section 5.

4. TILE REMOVAL

Remove conduits as shown on the plans or directed by the Engineer or his representative, including envelope filter material or other flow enhancing material when present.

Cap or plug the open ends of the disconnected conduit to prevent soil entry when the conduit will continue to function downstream, or otherwise shown on the plans. For a minimum distance of two feet around each sealed conduit end, backfill in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to a density equal to or greater than the surrounding undisturbed soil. Do not backfill with any soil containing broken tile fragments, large stones, frozen material, or large dry clods.

Where tile are located beneath an existing animal waste facility, remove the tile or fill the entire length of tile with concrete or Portland cement grout as shown on the plans. When tile removal is specified, the owner shall contact the Iowa Department of Natural Resources (IDNR) for permission to remove the drainage tile under the structure. The structure shall be emptied of waste or lowered to a point below the tile prior to its removal. The structure must be retested for percolation and the results submitted to IDNR and approval received prior to reusing the structure.

If shown on the plans or directed by the engineer, reroute upstream drain lines so the capacity of the upstream drainage system is maintained. Install conduit in accordance with Iowa Construction Specification IA-46, Tile Drains for Land Drainage.

5. BACKFILL

Compact soil around disturbed tile as specified in Section 3 (Tile Repair) and Section 4 (Tile Removal). Keep the backfill within 5 feet of the conduit free from large stones, frozen material, and large dry clods. Unless otherwise shown on the plans, backfill the remainder of the trench as follows:

For trenches located under or near structures, backfill in 12 inch layers and compact each layer to a density equal to or greater than the surrounding undisturbed soil.

For other locations, backfill the remainder of each trench with the excavated soil material which shall extend above the ground surface and be well rounded over the trench.

6. MATERIALS

Unless otherwise shown on the plans, conduit and fittings used for repair shall conform to the specifications listed in Table 1. Perforated pipe shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the pipe. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

Table 1. Acceptable pipe for subsurface drain repair

Kind of Pipe [#]	Specification
Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 6 inch	ASTM F 405
Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 24 inch	ASTM F 667
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 2 to 60 inch	ASTM F 2648 ^{\$}
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 12 to 60 inch	ASTM F 2306 ^{\$}
Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120	ASTM D 1785
PVC Pressure-Rated Pipe (SDR Series)	ASTM D 2241
Clay drain tile	ASTM C 4
Concrete drain tile	ASTM C 412

[#] Pipe sizes are nominal and the ranges are inclusive

^{\$} Pipe conforming to AASHTO M 252 (3 to 10 inch), or AASHTO M 294 (12 to 60 inch) is acceptable

7. SPECIAL SPECIFICATIONS

None

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-11 REMOVAL OF WATER

1. SCOPE

The work shall consist of the removal of surface water and ground water as needed to perform the required construction in accordance with the plans and specifications.

2. DIVERTING SURFACE WATER

The Contractor shall build, maintain and operate all cofferdams, channels, diversions, flumes, sumps, and other temporary protective works needed to divert surface water away from the construction site while construction is in progress.

3. DEWATERING THE CONSTRUCTION SITE

Foundations, cutoff trenches, borrow areas and other parts of the construction site shall be dewatered as needed for proper execution of the construction work. The Contractor shall furnish, install, operate and maintain all works and equipment needed to perform the dewatering.

4. EROSION AND POLLUTION CONTROL

Removal of water from the construction site, including the borrow areas shall be accomplished in such a manner that erosion and the transmission of sediment and other pollutants are minimized.

5. REMOVAL OF TEMPORARY WORKS

After temporary works have served their purposes and before the Contractor leaves the site, they shall be removed.

6. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-13 SHEET PILING

1. SCOPE

The work shall consist of furnishing and driving the specified sheet piling at the location shown on the drawings.

2. MATERIALS

Sheet piling shall conform to the requirements of ASTM A328 (Steel Sheet Piling), A572 (High-Strength Low-Alloy Columbium-Vanadium Structural Steel), or A690 (High-Strength Low-Alloy steel H-Piles and Sheet Piling for Use in Marine Environments). The sheet piling provided shall meet the required cross-section, section modulus, thickness, and steel grade shown on the drawings. Fabrication of sheet piles from shorter lengths of pile stock is not permitted.

3. DRIVING SHEET PILE

The piling shall be driven in a manner so as to insure perfect interlocking throughout the entire length of each pile. The piles shall be held in proper alignment during driving by means of suitable temporary guide structures which shall be removed when they have served their purpose.

Piling shall be driven to the full depth shown on the drawings unless otherwise approved by the engineer.

4. CUTTING OFF PILES

The contractor shall cut the piling off at the specified elevations. Piling length shall be sufficient to permit removal of all materials damaged by driving.

5. DEFECTIVE PILING

Any piling damaged in driving, driven out of its proper location, driven below the specified cut off elevation, or inaccurately cut off shall be pulled and replaced or re-driven. Any piling ruptured in the interlock or otherwise damaged during driving shall be pulled and replaced.

6. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-21 EXCAVATION

1. SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials. The cutoff trench and any other required excavations shall be dug to the lines and grades shown on the drawings or as staked in the field. Structure or trench excavations will conform to all safety requirements of OSHA.

2. USE OF EXCAVATED MATERIALS

Suitable materials from the specified excavations shall be used in the construction of required permanent earth fill. The suitability of materials for specific purposes shall be determined by the NRCS Inspector.

3. DISPOSAL OF WASTE MATERIAL

All surplus or waste material shall be disposed of in areas shown on the drawings or as approved by the NRCS Inspector. The waste material shall be smoothed and sloped to provide drainage.

4. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavations will conform to all safety requirements of OSHA.

5. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas as shown on the drawings or as approved by NRCS and the landowner. On wetland projects, borrow shall not be taken from the wetland area within 10 feet of the embankment or as shown on the drawings.

Borrow areas shall be excavated and grading completed in a manner to eliminate steep or unstable side slopes or hazardous or unsightly conditions.

6. OVER-EXCAVATION

Excavation beyond the specified lines and grades shall be corrected by filling the resulting voids with compacted earthfill, except that if the earth is to become the subgrade for riprap, sand or gravel bedding or drainfill, the voids shall be filled with material conforming to the specifications for the riprap, bedding or drainfill, as appropriate.

7. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-23 EARTHFILL

1. SCOPE

The work shall consist of the construction of earth fills required by the drawings and specifications. The completed work shall conform to the lines, grades, and elevations shown on the drawings or as staked in the field.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. Fill materials shall contain no sod, brush, roots or other bio-degradable materials. Rocks larger than 6 inches in diameter shall be removed prior to compaction of the fill.

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped a minimum of 6 inches to remove vegetation and other unsuitable materials. Foundation surfaces shall be scarified to a minimum depth of 2 inches prior to placing fill material.

Foundation and abutment surfaces shall not be sloped steeper than 1.5 horizontal to 1 vertical unless otherwise shown on the drawings.

4. PLACEMENT

Fill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by NRCS. Fill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Adjacent to structures or pipes, fill shall be placed in a manner which will prevent damage. The height of the fill adjacent to structures or pipes shall be increased at approximately the same rate on all sides.

The materials used throughout the earth fill shall be essentially uniform. Selective placement shall be as shown on the drawings or approved by NRCS.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified to a minimum depth of 2 inches before the next layer is placed.

The top surfaces of embankments shall be maintained approximately level during construction, except that a cross-slope of approximately 2% shall be maintained to ensure effective drainage.

When moving fill material from the borrow area(s) to the embankment by use of bulldozers only, the following steps shall be followed:

- Immediately after the borrow material is pushed to the embankment, it shall be spread in horizontal lifts placed parallel to the centerline of the embankment.
- Compactive effort will then be applied by operating equipment parallel to the centerline of the fill or embankment.
- Lift thicknesses shall be in strict compliance with Clause 6, below.

Sectional fills are not allowed unless they are shown on the construction drawings.

5. CONTROL OF MOISTURE CONTENT

The moisture content of the fill material shall be adequate for obtaining the required compaction. Material that is too wet shall be dried to meet this requirement, and material that is too dry shall have water added and mixed until the requirement is met.

The moisture content of the fill material shall be such that a ball formed with the hands does not crack or separate when struck sharply with a pencil and will easily ribbon out between the thumb and finger.

Earth foundations under and adjacent to concrete structures shall be prevented from drying and cracking before concrete and backfill are placed.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as possible.

6. COMPACTION

Earth fill shall be compacted by one of the following methods as specified on the plans or in Section 8, Special Specifications. If no method is specified, compaction will be in accordance with Method 1.

- Method 1 - Earthfill shall be placed so that the wheels or tracks of the loaded hauling equipment, traveling in a direction parallel to the centerline of fill, pass over the entire surface of each layer being placed. Low ground pressure vehicles shall not be used for this purpose.
- Method 2 - Two (2) complete passes of a tamping-type roller will be made over each layer. The roller shall be capable of exerting a minimum force of two hundred (200) pounds per square inch.
- Method 3 - Minimum density shall be 90% of the maximum density as determined by ASTM D 698 and as shown on the plans.

The maximum thickness of a lift of fill before compaction shall be 9 inches, unless otherwise indicated on the drawings.

Fill adjacent to structures, pipe conduits, and appurtenances shall be placed in layers not more than 4 inches thick and compacted to a density equivalent to that of the surrounding fill. Methods used to obtain compaction for fine or coarse grained materials are as follows:

- For fine grained materials, hand tamping or manually directed power tampers may be used. Hand compaction only shall be used to compact the earthfill under the bottom half of circular pipes. Manually directed power tampers shall not be used in tight spaces where applying full compactive effort will result in direct contact of the tamper plate with the pipe. Care should be taken so that compaction around the spillway pipe does not cause uplift of the pipe resulting in a void beneath the pipe.
- For coarse grained materials (sands and gravels), vibratory plate compactors shall be used for obtaining compaction. However, hand tamping shall be used to compact the material under the bottom half of circular pipes.

In all cases, follow manufacturer instructions for the specific compaction equipment being used. Heavy equipment shall not be operated within 2 feet of any structure or pipe.

Compacting of fill adjacent to concrete structures shall not be started until the concrete is 7 days old.

7. ISLANDS, MOUNDS, AND LOAFING AREAS ON WETLAND RESTORATION, ENHANCEMENT, OR CREATION PROJECTS

Islands shall be randomly located within the wetland area at locations shown on the drawings or as staked in the field. The orientation of island shorelines shall be random with attention given to prevailing winds to limit wave damage. In general, the side of the island with the longest dimension shall be parallel to the prevailing wind direction. Side slopes of islands shall be as shown on the drawings, but in no case shall be steeper than 6 horizontal to 1 vertical. Island shapes shall be irregular.

Loafing areas shall be constructed in the areas shown on the drawings or as staked in the field and shall be graded to drain runoff water. The elevation of at least one loafing area should be above the maximum water level whenever possible.

Excavated material not suitable for embankments, wetland dikes, or islands can be used to create mounds or blended into surrounding topography to create a natural appearance. Spoil material shall not be spread on existing wetland areas.

Organic soils shall not be used to construct islands, loafing areas, dikes, or embankments.

8. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-26 TOPSOILING

1. SCOPE

The work shall consist of salvaging topsoil from borrow areas or required excavations and spreading it on the exposed disturbed areas.

2. QUALITY OF TOPSOIL

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, stones, or other foreign materials.

3. EXCAVATION

After the site has been cleared and grubbed, the topsoil shall be removed from borrow areas and required excavation areas to the depth as shown on the drawings. Topsoil shall be stockpiled at locations approved by NRCS.

4. SPREADING

Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Surfaces designated to be covered shall be lightly scarified just prior to the spreading operation. Where compacted fills are designated to be covered by topsoil, the topsoil shall be placed concurrently with the fill and shall be bonded to the compacted fill with the equipment.

Topsoil shall be placed to the minimum depth shown on the drawings. After the spreading operation is completed, the surface shall be finished to a reasonably smooth surface.

5. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-31 CONCRETE

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing, and curing Portland cement concrete including steel reinforcement.

2. MATERIALS

Portland Cement shall conform to ASTM C 150 and shall be Type I or Type II.

Fine Aggregates shall conform to ASTM C 33 and shall be composed of clean, uncoated grains of material.

Coarse Aggregates shall be gravel or crushed stone conforming to ASTM C 33 and shall be clean, hard, durable and free from clay or coating of any character. The maximum size of coarse aggregate shall be 1 1/2 inches or as shown on the drawings.

Water shall be clean and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.

Air entraining agent shall conform to ASTM C 260.

Fly ash may be used as a partial substitution for Portland cement and shall be in strict compliance with ASTM C 618, Class F or C. The loss by ignition shall not exceed 4.0 percent.

Blast-furnace slag may be used as a partial substitution for Portland cement and shall be in conformance with ASTM C 989 for ground granulated blast-furnace slag (GGBF slag).

Water-reducing admixtures shall conform to ASTM C 494 and may be the following types:

1. Type A - Water-reducing admixture
2. Type D - Water-reducing and retarding admixture
3. Type F - Water-reducing, high range admixture (superplasticizer).
4. Type G - water-reducing, high range, and retarding admixture (superplasticizer).

Type D or G admixture may be used when the air temperature is over 80 degrees F. at the time of mixing and/or placement.

Calcium Chloride or other antifreeze compounds or accelerators will not be allowed.

Preformed expansion joint filler shall be a commercially available product made of bituminous, sponge rubber or closed cell foam materials with a minimum thickness of 1/2 inch.

Reinforcing steel shall be free from loose rust, oil, grease, paint, or other deleterious matter. Reinforcing steel shall conform to one or more of the following:

1. Reinforcing Bars - ASTM A 615 or A 996 , Grade 40 or greater, deformed.
2. Welded Wire Fabric - ASTM A 185 or A 497.

Waterstops shall be either metallic or nonmetallic. Metallic waterstops shall be fabricated from sheets of copper or galvanized steel. Nonmetallic waterstops shall be made of natural or synthetic rubber or vinyl chloride polymer or copolymer. Rubber, polymer and copolymer waterstops shall have ribbed or bulb-type anchor flanges and a hollow tubular center bulb, unless otherwise shown on the drawings. All waterstops shall be of the sizes shown on the drawings.

Curing compound shall be a liquid membrane-forming compound suitable for spraying on the concrete surface. The curing compound shall meet the requirements of ASTM C 309 Type 2 (white pigmented).

3. CONCRETE DESIGN MIX

The contractor will be responsible for the determining the design mix proportions in accordance with the requirements included in this paragraph and shall provide a copy of the mix to the NRCS Engineer at least 3 days prior to placing any concrete. The concrete mix shall be of such proportions as to provide a minimum strength of 3500 p.s.i. in 28 days, unless otherwise shown on the drawings. The air content shall be 4 to 8 percent of the volume of the concrete at the time of placement. The slump shall be 2 to 5 inches except when superplasticizer is used. The slump shall be 3 inches or less prior to the addition of superplasticizer admixture and shall not exceed 7 1/2 inches following addition and mixing. The fine aggregate shall be 30-50 percent of the total combined aggregate based on oven dry weights. The contractor shall provide tests to verify that the design mix meets the requirements. In lieu of this, one of the following mix proportions per cubic yard may be used:

<u>Mix Number</u>	<u>Minimum Cement, Pounds</u>	<u>Fly Ash, Pounds</u>	<u>GGBF Slag, Pounds</u>	<u>Maximum ** Water, Gallons</u>
1	564	0	0	33
2	470	45-90	0	31-34
3	517	129	0	31 *
4	366	114	91	31 *
5	259	103	155	31 *

** Total of available aggregate moisture, mixing water added at the plant and mixing water added at the job site (one gallon equals 8.33 pounds).

* Requires water reducing admixture.

4. MIXTURES AND MIXING

Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C 94. Concrete shall be uniform and thoroughly mixed when delivered to the forms. No mixing water in excess of the amount shown for the design mix or in an amount that would cause the maximum slump to be exceeded shall be added to the concrete during mixing, hauling or after arrival at the point of delivery. The concrete shall be batched and mixed so that the temperature of the concrete at the time of placing shall be between 50 and 90 degrees F.

5. BATCH TICKET

The contractor shall obtain from the supplier a delivery ticket for each batch of concrete before unloading at the site. The following information shall be included on the ticket: name of concrete supplier, job name or location, date, truck number, amount of concrete, time loaded or time of first mixing cement, aggregate, and mixing water added at the plant, type and amount of cement, type and amount of admixtures, oven dry weights of fine and coarse aggregate, and moisture content(%) or weight of water contained in the aggregates.

The following information shall be added to the batch ticket on site: mixing water added on site, time concrete arrived on site and time concrete was unloaded.

Upon completion of the concrete placement, copies of all batch tickets shall be provided to NRCS.

6. REINFORCING STEEL

Before reinforcement is placed, the surfaces of the bars or mesh shall be cleaned to remove any loose, flaky rust, mill scale, oil, grease, or other foreign substances. After placement, the reinforcement shall be maintained in a clean condition until it is completely embedded in the concrete.

Reinforcing bars shall be cut and bent according to ACI Standard 315.

Tack welding of bars shall not be permitted. Reinforcement shall be accurately placed as shown on the drawings and secured in position in a manner that will prevent its displacement during placement of concrete. Metal chairs, metal hangers, metal spacers or concrete chairs shall be used to support reinforcement. Precast concrete chairs shall be manufactured from concrete equal in quality to the concrete being placed. Precast concrete chairs shall be moist at the time concrete is placed

Splices of reinforcing bars shall be made only at the locations shown on the drawings, unless otherwise approved by the NRCS Engineer. All reinforcing splices and placement shall be in accordance with ACI 318 and shown on the drawings.

After placement of the reinforcement, concrete shall not be placed until the reinforcement has been inspected and approved by NRCS.

7. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete, the forms and subgrade shall be free of woodchips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. All surfaces shall be firm and damp prior to placing concrete. Placement of concrete on mud, dried earth, uncompacted fill, or frozen subgrade will not be permitted.

The forms and associated false-work shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and elevations. Forms will be mortar tight. Forms with torn surfaces, worn edges, dents or other defects will not be used. Forms shall be coated with a nonstaining form release agent before being set into place. Excess form coating material shall not stand in puddles in the forms or come in contact with the steel reinforcement or hardened concrete against which fresh concrete is to be placed.

Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be of a commercially manufactured type. Non fabricated wire shall not be used. Form ties shall be constructed so that the ends or end fasteners can be removed without causing spalling at the surface of the concrete.

Metal form ties used within the forms on structures with a total volume of concrete exceeding fifteen cubic yards shall be equipped with cones or other devices that permit their removal to a depth of at least one inch without damage to the concrete. The holes resulting from cones and other devices shall be patched in accordance with Section 9.

Form ties except those specifically covered by the preceding paragraph shall be broken off flush with the formed surface. Any surface areas which have been spalled or otherwise damaged shall be repaired in accordance with Section 9.

Steel tying and form construction adjacent to new concrete shall not be started until concrete has cured at least 12 hours.

Concrete joints shall be of the type and at the locations shown on the drawings.

Splices in metal waterstops shall be brazed, welded or overlapped and bolted. Splices in nonmetallic waterstops shall be cemented or joined as recommended by the manufacturer.

8. PLACING CONCRETE

Concrete shall not be placed until the subgrade, forms, and steel reinforcement have been inspected and approved by the NRCS Inspector. Any deficiencies are to be corrected before the concrete is delivered for placement.

Concrete shall be delivered to the site and discharged into the forms within 1 1/2 hours after the introduction of the cement to the aggregates. When a superplasticizer is used, the concrete shall be discharged within the manufacturer's recommended time limit for discharge after addition of the admixture. In hot weather or under conditions contributing to quick setup of the concrete, discharge of the concrete shall be accomplished in 45 minutes unless a set-retarding admixture is used, in which case the manufacturer's recommended time limit will apply.

Addition of water at the job site may be done at the beginning of placement of each load of concrete in order to obtain allowable slump, provided that the maximum water content and water/cement ratio in the design mix is not exceeded. Addition of water will not be permitted after placement of the load has started.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into corners and around reinforcement and other embedded items in a manner which prevents segregation. Formed concrete shall be deposited in layers 24 inches or less in depth and shall be continuously deposited so that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of "cold joints". Concrete containing superplasticizer shall be placed in lifts not exceeding 5 feet in depth. If the surface layer of concrete sets during placement to the degree that it will not flow and merge with the succeeding layer when tamped or vibrated, the contractor shall discontinue placing concrete and install a construction joint. Construction joints shall be completed as shown on the drawings or by one of the following methods:

1. The joint shall be constructed using a 6 inch wide by 1/4 inch steel plate. The surfaces of the construction joint shall be prepared by washing and scrubbing with a wire brush or wire broom to expose coarse aggregate. The steel plate shall be embedded 3" in the concrete.
2. The joint surface shall be cleaned to expose coarse aggregate by sandblasting or air-water cutting after the concrete has gained sufficient strength to prevent displacement of the coarse aggregate or cement fines. The surface of the concrete shall not be cut so deep as to undercut the coarse aggregate. The joint shall be washed to remove all loose material after cutting.

The surfaces of all construction joints shall be kept continuously moist for at least 1 hour prior to placement of the new concrete. The new concrete shall be placed directly on the cleaned and washed surface. New concrete shall not be placed until the hardened concrete has cured at least 12 hours.

Concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation. Concrete containing superplasticizer shall not be dropped more than 12 feet vertically.

Immediately after the concrete is placed in the forms, it shall be consolidated by vibration, spading or hand tamping as necessary to insure smooth surfaces and dense concrete. Care should be taken not to over-vibrate concrete containing superplasticizer. Vibration shall not be supplied directly to the reinforcing steel, the forms or concrete which has hardened to the degree that it does not insure a monolithic bond with the preceding layer. The use of vibrators to transport concrete in the forms or conveying equipment will not be permitted.

9. FORM REMOVAL AND FINISHING

Forms shall be left in place for at least 24 hours after placing concrete. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit concrete to take the stresses due to its own weight uniformly and gradually.

Immediately after removal of the forms, concrete which is honey combed, damaged or otherwise defective shall be repaired or replaced. All cavities or depressions resulting from form tie removal shall be patched with a non-shrink grout, mortar mix or epoxy-type sealer. Non-shrink grout consists of 1 part cement and 2-1/2 parts sand that will pass a No. 16 sieve. Only enough water shall be added to produce a filling which is at the point of becoming rubbery when the material is solidly packed.

All repaired and patched areas shall be cured as required in Section 10.

10. CURING

Concrete shall be cured for a period of not less than 7 consecutive days by one of the following approved methods:

- A. Membrane Curing: Concrete shall be cured with white pigmented curing compound. The compound shall be sprayed on moist concrete as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and finishing of that surface are completed. Curing compound shall not be applied to surfaces requiring bond to subsequently placed concrete, such as construction joints, shear plates, reinforcing steel, and other embedded items. Surfaces subjected to heavy rainfall or running water within 3 hours after curing compound has been applied or surfaces damaged by subsequent construction operations during the curing period, shall be reapplied in the same manner as the original application.
- B. Moist Curing: Concrete shall be cured by maintaining all surfaces continuously wet for the entire curing period.
- C. Cover: Adequately cover an exposed structure with burlap mats, or other material and continually soak with water.

11. BACKFILLING

Backfilling may begin when the curing period has ended. Backfill against the structure will be placed in no more than 4-inch layers and compacted by hand tamping or with manually directed power tampers or plate vibrators. Layers compacted in this manner shall extend not less than 2 feet from any part of the concrete structure.

12. HOT AND COLD WEATHER CONCRETING

When the atmospheric temperature may be expected to drop below 40⁰ F. at the time concrete is delivered to the work site, during placement, or at any time during curing period, concrete shall be mixed, placed and protected in accordance with ACI Standard 306, "Recommended Practice for Cold Weather Concreting."

When climatic or other conditions are such that the temperature of the concrete may reasonably be expected to exceed 90⁰ F. at the time of delivery to the work site, during placement or during the first 24 hours after placement, concrete shall be mixed, placed and protected in accordance with ACI Standard 305, "Recommended Practice for Hot Weather Concreting."

13. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-51 CORRUGATED METAL PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and placing circular, arched or elliptical corrugated metal pipe and the necessary fittings.

2. MATERIALS

Metallic-coated steel corrugated pipe and fittings shall be zinc-coated or aluminized, Type 2, and shall conform to the requirements of ASTM A 760 and A 929 for the specified type and size of pipe. Aluminum corrugated pipe shall conform to the requirements of ASTM B 745 for the specified type and size of pipe. All pipe is subject to the following additional requirements:

- A. When polymer coating is specified, pipe, coupling bands and anti-seep collars shall be coated in accordance with ASTM A 762. All riveted joints shall be caulked as described in paragraph B.
- B. Pipe with annular corrugations shall be furnished with caulked seams. Riveted pipe joints shall be caulked with a bituminous mastic material during fabrication to provide a watertight joint. All circumferential and longitudinal seams shall be caulked before riveting. This shall be accomplished by applying a uniform bead of the mastic compound to the inner lap surface before riveting such that when the rivets are in place, all voids are filled and a coating of mastic is between the lap surfaces. The inner surface of coupling bands shall be asphalt coated in the field prior to installation. A neoprene gasket having a minimum thickness of 3/8 inch and a minimum width of 7 inches may be used in lieu of mastic coated coupling bands.
- C. Welded or lock seams in helical corrugated pipe are considered to be watertight.
- D. When close riveted pipe is specified: (1) the pipe shall be fabricated so that the rivet spacing in the circumferential seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe, and (2) in those portions of the longitudinal seams that will be covered by the coupling bands, the rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating off the coupling bands.
- E. Double riveting or double spot welding of pipe less than 42 inches in diameter may be required. If specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

3. COUPLING BANDS

Coupling bands shall meet the requirements of the table below or have detailed drawings submitted for approval by the State Conservation Engineer. Coupling bands shall be of the same minimum thickness (gage) as the pipe being connected.

Description of Coupling Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
24-inch wide coupling band with four 1/2-inch Diam. galvanized rods with tank lugs for annular or helical corrugated metal pipe. Bands shall have a minimum lap of 3 inches.	All	All
Hugger band from Armco Steel Corp. for helical corrugated metal pipe with reformed ends; and for annular corrugated pipe. Bands include O-ring gaskets and two 1/2-inch Diam. galvanized rods and lugs. ^{1/}	35	48
Hugger band without rods and lugs but including O-ring gaskets. ^{1/}	20	24
Angles riveted or welded to a coupling band and drawn tight with bolts. Bands shall be a minimum of 7 corrugations wide and have a minimum lap of 2 inches.	35	15
Flanged couplings for helical corrugated pipe welded to the ends of the pipe and field assembled by a minimum of 3/8-inch Diam. bolts. A joint sealer shall be placed between the flanges to ensure water tightness.	25	12

^{1/} Use is limited to sites where soft foundation and conduit elongation is not anticipated.

4. FABRICATION

Fabrication of all appurtenances shall be done as shown on the drawings. All appurtenances shall be made of metallic-coated steel when corrugated steel pipe is used and aluminum when used with aluminum pipe. Dissimilar metals shall not be installed in contact with each other.

5. REPAIR OF DAMAGED COATINGS

The Contractor shall place the pipe without damaging the pipe or coatings. The pipe shall be transported and handled in a manner to prevent damage to the pipe or coating.

Breaks, scuffs, or other damage to the various coatings shall be repaired as follows:

- A. Metallic Coating - by thoroughly wire brushing the damaged area and cleaning with solvent, and then painting two coats of one of the following paints:
 - (1) Zinc Dust - Zinc Oxide Primer conforming to ASTM D 79 and D 520.
 - (2) Single package, moisture cured urethane prime in silver metallic color.
 - (3) Zinc-rich cold galvanized compound, brush, or aerosol applications.

- B. Polymer Coating - apply two coats of polymer material similar to and compatible with the durability, adhesion and appearance of the original polymer coating. The repair coating shall be a minimum thickness of 0.010 (10 mils) after drying and shall bond securely to the pipe.

6. LAYING AND BEDDING THE PIPE

The pipe shall be laid to the line and grade shown on the drawings and shall be firmly and uniformly bedded throughout its entire length. Details of the bedding are as shown on the drawings.

The pipe shall be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides at approximately the vertical mid-height of the pipe. Field welding of corrugated galvanized steel pipe will not be permitted. The pipe sections shall be joined with coupling bands.

7. BACKFILLING

Special care shall be taken during backfill operations not to disturb the grade and alignment.

The pipe shall be tied down or loaded sufficiently during backfilling around the sides to prevent its being lifted from the bedding.

Backfill material shall have sufficient moisture so that optimum compaction can be obtained. Backfill around the pipe shall be placed in layers not more than 4 inches thick before compaction.

Each layer of backfill shall be compacted with power tampers, hand tampers, or plate vibrators to the same density requirements as specified for the adjacent embankment. Backfill over and around the pipe shall be brought up uniformly on all sides. The passage of earth moving equipment will not be allowed over the pipe until backfill has been placed above the top of the pipe surface to a depth of two (2) feet.

8. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-61 LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments, structures and blankets, including filter layers or bedding where specified.

2. MATERIALS

Rock for loose rock riprap, filter layers or bedding shall come from sources approved by NRCS. The rock shall be excavated, selected and handled as necessary to meet the quality and grading requirements of this specification and the construction drawings.

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to sub rounded in shape. The least dimension of an individual rock fragment shall not be less than 1/3 the greatest dimension of the fragment unless otherwise specified on the construction drawings.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap or bedding is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall be compacted to a density equal to the adjacent existing soil material.

Rock materials shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by NRCS.

4. EQUIPMENT-PLACED ROCK RIPRAP

Rock shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be constructed to the full thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact, one to another, with the smaller rocks and spalls filling the voids between the larger rocks. Placement of rock shall begin at the bottom of the slope or downstream end of the structure.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to adjacent structures.

5. HAND-PLACED RIPRAP

Rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact, one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge unless otherwise specified. Placement of rock shall begin at the bottom of the slope or downstream end of the structure.

6. FILTER LAYERS OR BEDDING

When the drawings specify filter layers or bedding beneath riprap, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

7. SPECIAL SPECIFICATIONS

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

IA-81 METAL FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of furnishing, fabricating, and installing metalwork including metal parts of composite structures.

2. MATERIALS

Steel shall be of structural quality. Finished surfaces shall be smooth and true to assure proper fit.

Bolts, nuts, washers, rods, rivets, etc., shall be of a material equal to the steel being fastened.

3. PROTECTIVE COATINGS

Protective coatings will consist of either galvanizing or painting and shall be applied by the fabricator.

Galvanizing shall consist of a zinc coating by the hot dip process, except that bolts, nuts, and washers may have a electrodeposited zinc coating.

Paint System for this specification shall consist of the application of one coat of Epoxy Polyamide Primer (lead and chromate free) and one or more coats of Epoxy Polyamide (intermediate or finish), lead free. When finished, it will have a minimum dry film thickness of 8.0 mils.

4. FABRICATION

Materials shall be carefully fabricated as shown on the drawings. The fabrication shall be smooth and true to assure proper fit. Galvanized items shall not be cut, welded, or drilled after the zinc coating is applied.

5. ERECTION

The metal shall be erected true and plumb, closely conforming to the drawings.

6. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-92. FENCES

1. SCOPE

The work shall consist of furnishing and installing fences, including gates and fittings.

2. STANDARD FENCE

Barbed wire fences shall have a minimum of 4 wires for farm borders. A minimum of three wires shall be used for interior fencing, cross fencing, or excluding livestock from special areas such as wildlife area, forested tracts or other special use areas. Wires shall be spaced approximately an equal distance apart. The top wire shall be at least 42 inches high and 2 inches below the top on wood posts and 1 inch below the top on steel posts. The bottom wire shall be 18 inches or less above the ground level. Wire shall be spaced no more than 12 inches apart.

Each barbed wire shall consist of 2 twisted strands of either 12 ½ gauge wire or 15 ½ gauge high tensile strength wire. The barbs shall be either 2-point barbs on approximately 4 inch centers or 4-point barbs on approximately 5 inch centers. Wire shall be stretched and attached after the posts are properly set and backfilled. Attach wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

Top and bottom strands of woven wire shall be a minimum of 12 ½ gauge. Wire for intermediate strands shall be 14 1/3 gauge or heavier. Fences with woven wire 32 inches or less in height shall have at least 2 barbed wires above the woven wire spaced 8 to 12 inches apart. Fences constructed with woven wire higher than 32 inches shall have at least 1 barbed wire 8 to 12 inches above the woven wire. The base of the woven wire shall be placed near the ground surface. The top wire shall be at least 42 inches above the ground level and 2 inches below the top of wood posts and 1 inch below the top of steel posts. All wire shall be galvanized. Wire shall be stretched and attached after the posts are properly set and backfilled. Attach wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

Staples shall be 9 gauge steel or heavier with a minimum length of 1 ½ inches for soft woods and a minimum length of 1 inch for close grained hardwoods. Drive staples diagonal to the grain of the wood and at a slight downward angle. Space should be left between the staple and the post to permit free movement of the wire. Wires may be attached to steel posts by use of manufacturer's clips or by 14 gauge galvanized wire twisted at least two turns.

All wooden posts (except red cedar, Osage orange, or black locust) shall be treated with pentachlorophenol, creosote, or chromated copper arsenate (CCA) by a method that ensures complete penetration of the sapwood. At least half of the diameter of red cedar shall be heartwood. Quality of treated wood shall provide sufficient strength and quality to last for the expected life of the fence.

All corner posts, gate posts, end posts, pull posts and brace posts normally shall be wood with sufficient length for the construction of at least a 42 inch high fence and permit setting the post at least 36 inches deep. Earth backfill shall be thoroughly tamped. On areas where soil depth is restricted to less than 36 inches, additional anchors or deadman applied against the direction of pull may be needed. Wood posts shall have a minimum top diameter of 5 inches. A 2-½ inch steel pipe with appropriate bracing or set in concrete of sufficient depth also may be used. Reinforced concrete or metal posts of equivalent strength may be substituted if they have suitable means of attaching wires and braces.

The maximum spacing of line posts shall be one rod (16.5 feet). Wood line posts shall have a 3 inch top (2 ½ inch for Osage orange). Wood line posts shall have a minimum length of 6 ½ feet and shall be set or driven to a minimum depth of 24 inches where conditions permit. When posts are set, earth backfill shall be thoroughly tamped. Steel line posts shall weigh not less than 1.33 pounds per foot and shall have a steel anchor plate securely fastened to the plate. The posts shall be “T”, “U”, or “Y” shaped and have corrugations, knobs, studs, or grooves suitable for fastening fencing to the posts. Steel posts shall be rolled from high carbon steel and shall have a protective coating; either galvanized by the hot dip process, painted with one or more coats of high grade weather resistant paint for steel, or enameled and baked. Steel line posts shall be at least 6 feet in length and shall be set in the ground a minimum of 20 inches. Steel posts shall be used as line posts at least once every 6 rods (99 feet) to act as a ground for lightning protection.

End bracing will be installed at locations where the fence ends and on both sides of gate openings. Corner bracing should be installed where fence alignment changes 15 degrees or more. Bracing is required at all corner, gate, pull and end assemblies in a fence. The brace member shall be the equivalent of a wood post with at least a 3 ½ inch diameter at the top or standard weight 2 inch diameter galvanized steel pipe. The brace shall be at least 3 feet above the ground and at least 8 inches below the top of the post. The brace member shall be 6 to 8 feet in length. A brace wire consisting of 2 complete loops of 9 gauge smooth wire, 2 loops of barbed wire or a single loop of 12 ½ gauge high tensile strength wire shall be installed. “H” braces or angle braces as shown in figure 3 will be used in standard fences.

Pull post assemblies consisting of three posts with braces shall be installed in straight reaches of fence at intervals 660 feet (40 rods), at any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 percent and at the beginning and end of each curve.

For a narrow ditch or draw crossing with slopes steeper than 8 feet horizontal to 1 foot vertical, the fence shall be anchored with a concrete anchor weighing at least 150 pounds and buried with at least 18 inches of cover or a commercial screw-in type metal anchor 5 inches in diameter and not less than 48” long to position the fence to the contour of the ditch or draw.

Wire gates shall be made of the same materials as used for the fence. Panel or tube type gates shall be equivalent in quality to the fencing material and shall be fitted with at least two hinges and a latch or galvanized chain for fastening.

3. CHAIN LINK FENCE

Chain link fence, fabric, posts, top rails, braces, gates and accessories shall conform to the requirements of ASTM Specifications types, classes and materials listed below. The fence shall be constructed in a workmanlike manner.

Fabric shall be ASTM A392, 2-inch mesh, 9 gauge galvanized steel wire. Zinc coating shall be Class 2. Fabric shall be 60 inches in height. Fabric shall not be stretched until at least 4 days after the posts are set in concrete backfill or grouted in concrete walls. A stretcher bar of the same length as the fabric width shall secure each end of each run of fabric. The bar and fabric shall be stretched taut and secured to the end post by tension bands equally spaced not more than 15 inches apart. The fabric shall be attached to all braces; the top rail, all line posts and the tension wire by wire ties or clips at intervals not exceeding two feet.

Posts and fence framework shall conform to the requirements of ASTM F1043 Group 1A, for Heavy Industrial Fence. Coatings shall be type A galvanized coating both internal and external surfaces. Steel pipe for posts shall conform to the requirements of ASTM F1043 and F1083. The minimum diameter of end, corner, and pull posts shall be 2 3/8 inches. Line posts shall be at least 1.9 inches in diameter. Gate posts shall have a minimum diameter of 2 7/8 inches. The maximum spacing of line posts shall be ten feet. Post holes shall be at least 6 inches in diameter and 18 inches deep for line posts and 24 inches for corner, end, pull and gate posts. All posts shall be set in concrete backfill. Concrete shall completely fill the annular space around the posts and shall be neatly finished to slope

up to the post approximately 1 ½ inches above the ground surface. Pull posts shall be located in long straight runs of fence at intervals of 500 feet or less. Posts set in concrete walls shall be grouted into preformed holes at least 12 inches in depth. Where posts are installed in highly corrosive soils such as disturbed mine spoil, the posts shall be vinyl coated in addition to the above requirements and set in concrete poured inside a 6 inch clay tile or plastic tubing at least 24 inches long.

When used, **braces and top rails** shall be installed horizontally at the height shown on the drawings or recommended by the manufacturer. See previous paragraph for specifications. Braces and top rails shall be attached to the posts by suitable fittings, as recommended by the manufacturer. When the brace has been placed, a 6 gauge double truss galvanized steel wire with adjustable tightener and fittings shall be attached to the corner post just below the brace and to the brace post approximately 4 inches above ground level. A similar truss wire shall be attached to brace post just below the brace and to the corner post approximately 4 inches above ground level. A 7 gauge galvanized steel tension wire, tightened by mechanical means, shall be placed approximately 4 inches from the ground level. A similar tension wire shall be placed at the top of the fence if a top rail is not used.

Gates, gateposts and gate accessories shall conform to the requirements of ASTM F900. Coating shall be the same as the adjoining fence and framework.

4. HIGH TENSILE WIRE (HTW) FENCE

HTW fence shall have a minimum of eight smooth strands of galvanized 12 ½ gauge **wire** with not less than 0.8 ounce of zinc per square foot of wire surface and a tensile strength of 200,000 pounds per square inch. Each strand of wire shall be strung to a tension of not less than 250 pounds. The top wire shall be 48 to 54 inches above the ground surface. The bottom wire shall not be more than 6 inches above the ground surface. The wire shall be fastened on a direct line splice with enough nicopress sleeves that the accumulated strength of the sleeves exceeds the tensile strength of the wire. End wrap splices shall be fastened with two nicopress sleeves. Splices may also be made with other products used as directed by the manufacturer.

Posts shall be the same size and material as posts for standard fences. Line posts shall be spaced not more than 30 feet apart with spacer made of wood or fiberglass spaced at not more than 15 feet from either post. Corners, pull assemblies, ends and gates shall have a double assembly consisting of three driven posts with horizontal braces. Each assembly shall be further braced with a double wrap of high tensile wire (see attachment A).

5. PERMANENT HTW ELECTRIC FENCE

Permanent HTW electric fences are constructed with the intent of being in place for years. It is the equivalent of any non-electric permanent fence. Electric fences provide psychological deterrent rather than a physical barrier to livestock and wildlife. To be effective, a shock of at least 1,000 volts must be delivered to cattle, 2,000 volts to sheep and 2,500-3,000 volts to deer, dogs, and coyotes.

Wire shall be a single strand of 12 ½ gauge or larger with a minimum tensile strength of 110,000 pounds per square inch. The wire shall galvanized (Type III) or aluminum or copper clad. Barbed wire should not be used on electric fences because of safety hazard. Wire will be attached to the posts by a method that allows them to slip. Wires will be attached to stays in a manner that prevents stay slippage along the fence. The tension of each wire shall be sufficient to maintain the wires at the appropriate height. Suggested wire heights and spacing are shown by intended use in the following table:

Fence Description	Number of Wires	Wire Height (In.)
<u>Internal/Cross Fence</u>		
Cow /calf & stocker	1 wire	30 to 34
Hogs	1 wire	12
Cow /calf & stocker	2 wire	22;32
Sheep and cattle	3 wire	10; 20; 32
Sheep and cattle	4 wire	10; 20;32;46
<u>Perimeter Fence</u>		
Cattle, horses, sheep (Non-predator)	5 wire	10; 20; 30; 40; 50
Sheep, goats (Predator)	8 wire	4; 8; 12; 18; 24; 30; 40; 52

Electronic energizers of power fence controllers shall be installed according to manufacturer's recommendations. The energizers shall be high power, low impedance with 5,000 volt peak output and a pulse that is less than 300 mAmps in intensity, finished within 0.0003 of a second and at a rate of 35-65 pulses per minute. Energizers shall be provided with high impact, weather resistant cases. Circuitry shall be solid state. Service modules shall be snap-in for fast field repair. A safety fuse to prevent over pulsing shall be provided. The system shall be 110 volt, 220 volt or 12-volt battery powered. The battery-powered system shall be capable of working for at least 3 weeks without replacing the battery. If the length of the fence requires more than 4 joules (watts times seconds equals joules), a solar charger will be needed for 12 volt systems. The energizer shall be capable of producing one joule for each mile of planned fence when average energy loss is expected.

All electric fences must be properly grounded. The energizer ground wire should be connected to a galvanized pipe or rod ½ inch or larger in diameter. Bury 3 feet of ground rod for each joule of energy output. Ground rods should be buried where soil remains moist for best results. Ground rods should be driven into the ground at least 10 feet apart when multiple rods are necessary to provide the required length of ground rod. Normally individual ground rods will be driven no more than 6 to 8 feet into the ground. Connect a continuous ground wire from the energizer to each ground rod with aluminum or galvanized steel clamp. If energizer terminals are not stainless steel or copper, do not use copper ground rods due to corrosion at the connection and subsequent loss of electrical continuity. Copper rods with copper wire may be used if energizer terminals are stainless steel or copper. Use copper clamps with copper wire and copper rods.

The ground wire(s) of the fence may be connected to the same ground as the energizer or to a separate ground with the same size and depth requirements. More ground rods may be needed for the system to function properly. Do not use the grounding system for other existing applications, such as power poles, breaker boxes and milk barns,. At least 25 feet should separate the fence grounding system from any other grounding system.

Lightening can cause damage to the energizer. Most energizers are poorly protected from damage caused by lightning. External **lightning arrestors** and an induction loop (lightning choke) should be installed for added protection. Lightning arrestor grounding rods should be placed at least 65 feet from those of the energizer (See attachment B).

Install an additional set of ground rods and attach to a lightning arrestor. The lightning arrestor ground must be better than the energizer ground for it to function properly, because lightning will seek the path of least resistance to ground. Use at least 1 more ground rod on the arrestor than was used on the energizer. Attach the lightning arrestor to the wires of the fence. Install a lightning choke in the fence line immediately between the lightning arrestor and the energizer.

For protection of energizers, it is recommended that for 120 or 240-volt energizers that a voltage **spike protector** be used. Also, a ground rod should be installed at electric company's transformer pole (primary ground) and another ground rod installed at the electrical circuit breaker box (secondary ground), if they do not exist. Additionally, a surge protector should be installed between the energizer and power supply.

Insulation used for positive charged wire(s) must be high-density polyethylene with ultra-violet stabilizer or high-density polypropylene with ultra-violet stabilizer.

Braces and end assemblies are required at all corners, gates and angles in the fence line (See attachment A for criteria on corners, angles, and brace assemblies.)

For 1 and 2 wire fences, corner, gate, end and brace assemblies use one of the following:

- Steel "T" post that are a minimum of 1.25 pounds per foot of length, with appropriate knee, deadman, angle or H-brace.
- Wood posts with a minimum top diameter of 3.5 inches set two feet in the ground with appropriate knee, deadman, angle, or H-brace.
- Wood, steel pipe or fiberglass post with a minimum top diameter of 5 inches, set to a depth equal to, or greater than, the height of the post above the ground without bracing.
- Steel pipe or fiberglass posts with a minimum diameter of 2 inches, set 2 feet in the ground with appropriate knee, angle, or H-brace, deadman or anchor plate.
- Steel pipe or fiberglass posts with a minimum diameter of 2 inches and set in concrete to a depth of 2 feet.
- Steel pipe or fiberglass posts with a minimum diameter of 1 inch with appropriate angle bracing and sufficient ground anchoring to maintain wire tension while remaining erect and firmly anchored.

For 3 or more wire power fences; corner, gate, end and brace assemblies will be either a floating angle brace or H-brace assembly. Posts will be 4-inch nominal wood, 2-inch nominal steel pipe (capped), 2-inch fiberglass or steel "T" posts with appropriate appurtenances for corner and end bracing. Posts must be set a minimum of 2 feet in the ground.

All wood posts shall be at least 2 inches higher than the top wire of the fence. Posts of any other material shall be at least 1 inch higher than the top wire of the fence.

Line post and stays will be either:

- Australian ironwood (eucalyptus) at least 2 inches in diameter; fiberglass, rigid plastic and PVC solid round sucker rod of at least 5/8 inch diameter, or fiberglass "T" post and stays of at least 1 inch in cross-section. Attach wire to the post with loose wire clips or run the wire through holes in the post. Attach the wire to stays with tight clips.
- Wood posts at least 3 inches in diameter of black locust, red cedar, Osage orange, redwood, pressure treated pine or any other wood of equal life and strength may be used. At least one half of the diameter of the red cedar and redwood post shall be heartwood. Pressure treated posts shall be treated with pentachlorophenol, creosote, or chromated copper arsenate (CCA) by a method which ensures the complete penetration of the sapwood. Insulators shall attach wire.
- Steel "U" or "T" posts that are a minimum of 1.25 pounds per foot of length. Wire shall be attached with insulators.

Posts for one or two wire fences shall be long enough to be set at least 18 inches in the ground, except that in soils which are sandy loam or coarser in texture, the posts shall be set at least 24 inches into the ground. Posts for 3 or more wire fences shall be set at least 24 inches into the ground. Posts in dips shall be constructed so that they do not pull out of the soil. Posts 2 inch or smaller shall be anchored. Wood posts shall be set to a depth sufficient to resist pull out.

Wood posts shall be at least 2 inches higher than the top wire on the fence. All other posts shall be at least 1 inch higher than the top wire of the fence.

Spacing of the line posts and stays depends on the terrain and the number of wires. Maximum spacing is as follows

- One or two wire fences may have line posts spaced up to 100 feet apart with no stays. Line posts may be spaced 150 feet apart with stays every 50 feet between the posts
- For three and four wire fences, the line posts may be spaced every 50 feet with no stays or every 150 feet with stays at spacing of not more than every 50 feet.
- Fences with more than 4 wires shall have posts and stays spaced every 30 feet, with posts not further apart than every 90 feet.
- In undulating terrain, space posts and stays as needed to maintain the fence height.

Insulators for conductive material posts, end, corner and angle braces shall be high-density polyethylene with ultra-violet stabilizer, high density polypropylene with ultra-violet stabilizer, or porcelain. All insulators shall be capable of withstanding 10,000 volts or more of current leakage. Red insulators attract hummingbirds and should not be used.

Electrified **gates** may be constructed of a single straight wire, galvanized cable, or polytape with a insulated spring loaded handle or an expandable, coiled, high tensile, 12 ½ gauge wire attached to an insulated handle. The number of wires shall be determined by the objective of the fence. The gate shall be constructed so that it is non-electrified when the gate is open. Overhead or underground transmission lines will be used to carry electricity past the gate to the remainder of the fence.

Use insulated galvanized wire for crossing gates and areas where an electrical shock to livestock and humans is undesirable. All underground wires must be insulated for a minimum of 15,000 volts. Insulated underground wire should be specifically designed for high voltage electric fence. The insulation shall be high-density polyethylene with ultra-violet stabilizer or high-density polypropylene with ultra-violet stabilizer. Placing buried wire inside plastic pipe helps to decrease the likelihood of short-circuiting. Overhead transmission lines shall be at a height where the lines do not impeded movement of livestock or equipment.

An electrified **floodgate** may be used in lieu of a non-electrified gate if desired. The electrified floodgate should be constructed by stretching an electrified wire across the drainage above the high water level. Attach droppers of 12 ½ gauge high tensile fence wire, galvanized cable or galvanized chains to the electrified wire at a spacing of 6 inches for sheep and 12 inches for cattle. The droppers shall be extended to approximately 6 inches above normal water level. Connect gate to electric fence with a double insulated cable through a cutoff switch and flood control gate controller. If flooding is expected to last for an extended period of time, switch the floodgate off. (See attachment C).

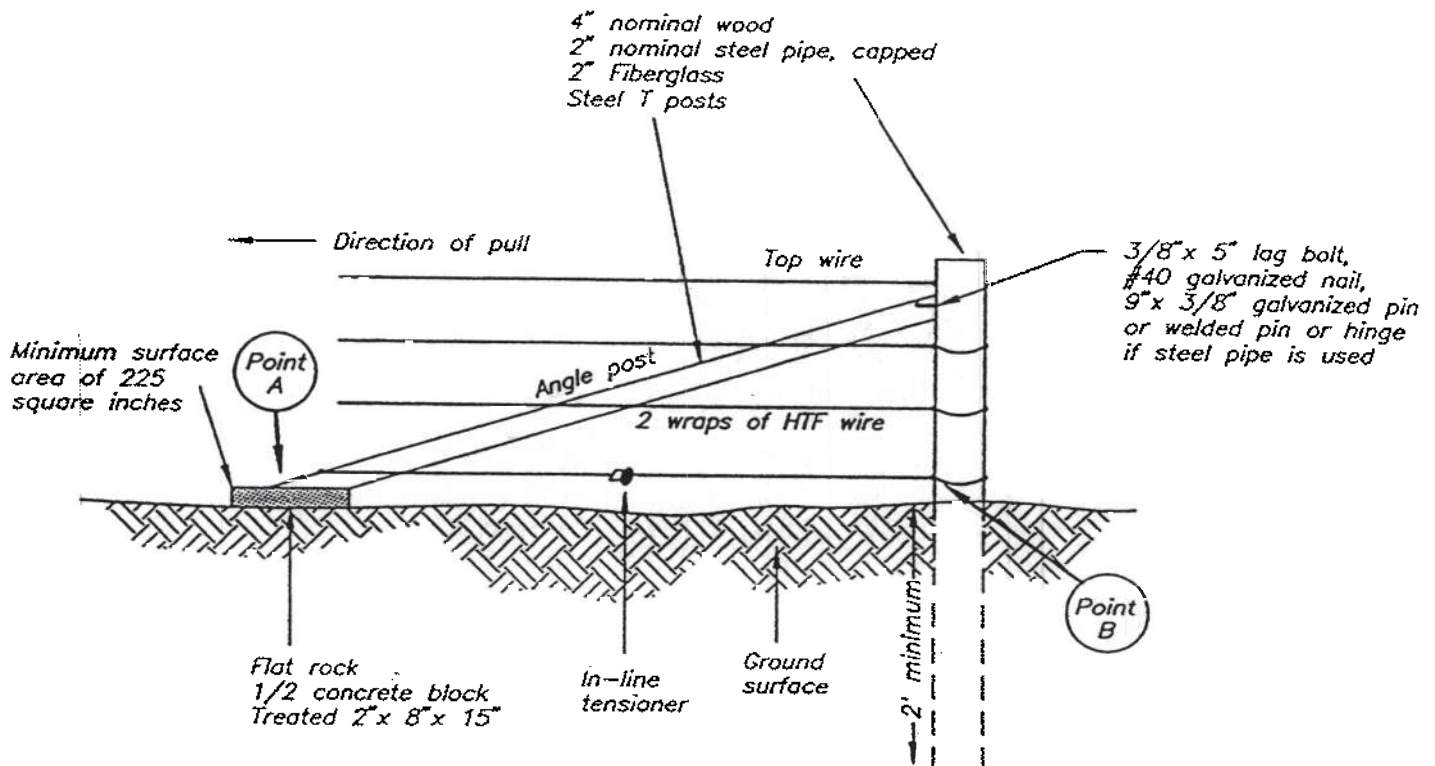
Other materials of equivalent strength, durability and design may be used.

6. TEMPORARY ELECTRIC FENCE

Temporary electric fencing is constructed with the intent of being left in place for only a short period of time. The fence is not intended as a substitute or equivalent of permanent fence. The temporary fence requires materials, design and construction that will accomplish the intended purpose and last for the planned time period with no more maintenance than is desired.

Many companies market portable fence systems that use materials such as polyethylene wire and tape with steel or aluminum wire woven into them, aluminum wire, plastic and fiberglass posts, reels to roll up wire, and battery operated energizers that are high voltage and low impedance (see previous section on energizers). A minimum of six strands of steel or aluminum wire should be woven into the polywire or polytape. Temporary fences may be attached to permanent fences to subdivide pasture. Follow manufacturer's directions for construction, use and operation of temporary electric fences

7. SPECIAL SPECIFICATIONS

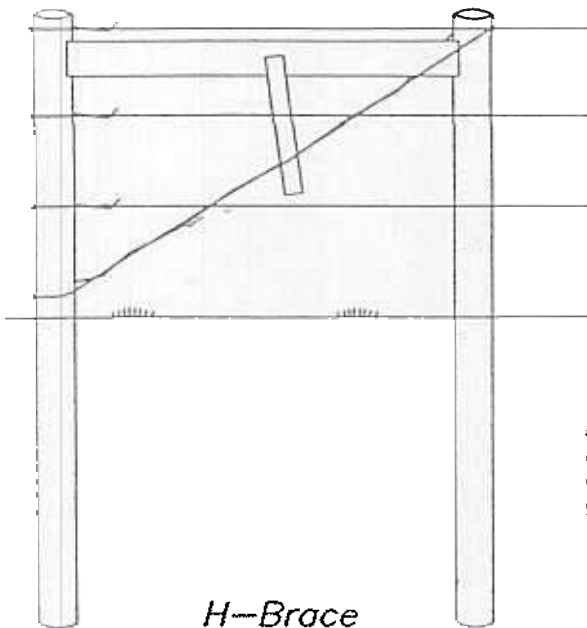


Note:
Distance from point A to B shall be a minimum twice the height between the top wire and the ground surface.

Single Post End Brace (Floating Angle Brace) Assembly

Figure 1

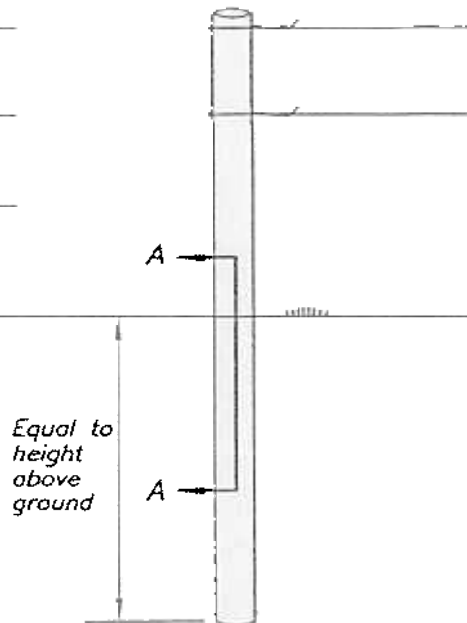
Attachment A



H-Brace

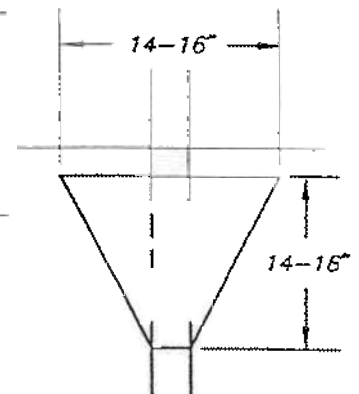
Note:
Same sizes
with bracing
(See Figure 1)

Use H or Diagonal Braces with fences
having over 2 wires or where pull
distances is > 660 feet.



Single Post Assembly

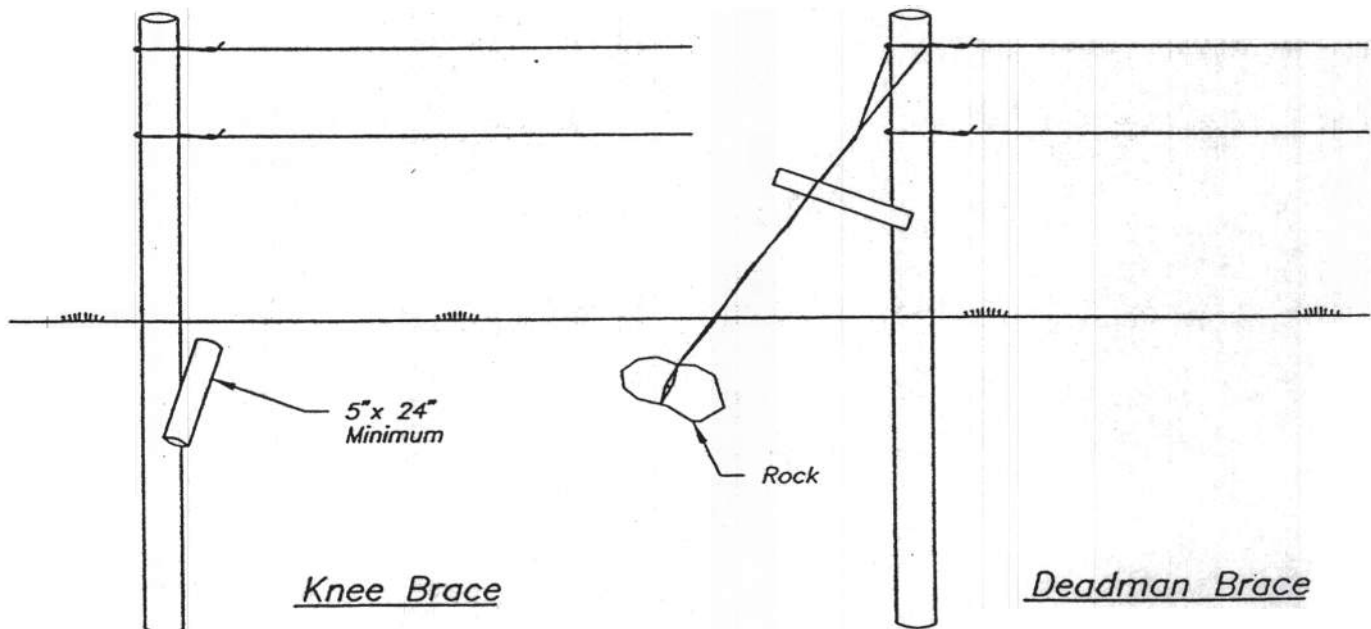
Single Post--No brace with
wood, fiberglass, or steel pipe
with a minimum top diameter
of 5" set to depth greater
than or equal to the height
of the post above ground.



SECTION A-A

Alternate Single
Post Assembly

Single steel post with a
minimum nominal diameter
of 2" set in ground 1/2
the length of the post with
anchor plate, knee brace or
deadman.



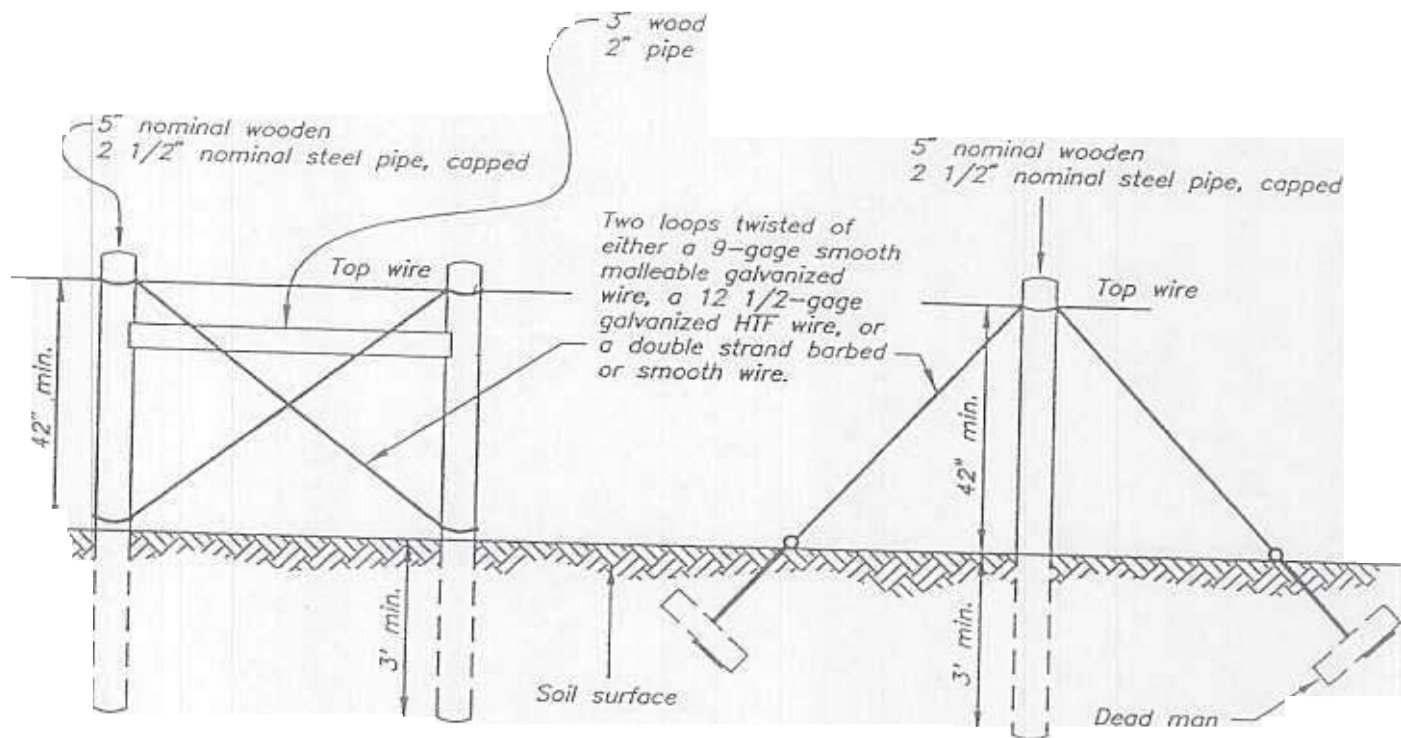
Knee Brace

Deadman Brace

Knee or Deadman Braces may be used on fences with
2 wires or where pull distances is < 660 feet.

Electric Fencing Bracing Alternatives

Figure 2



H-Brace
Pull Assembly

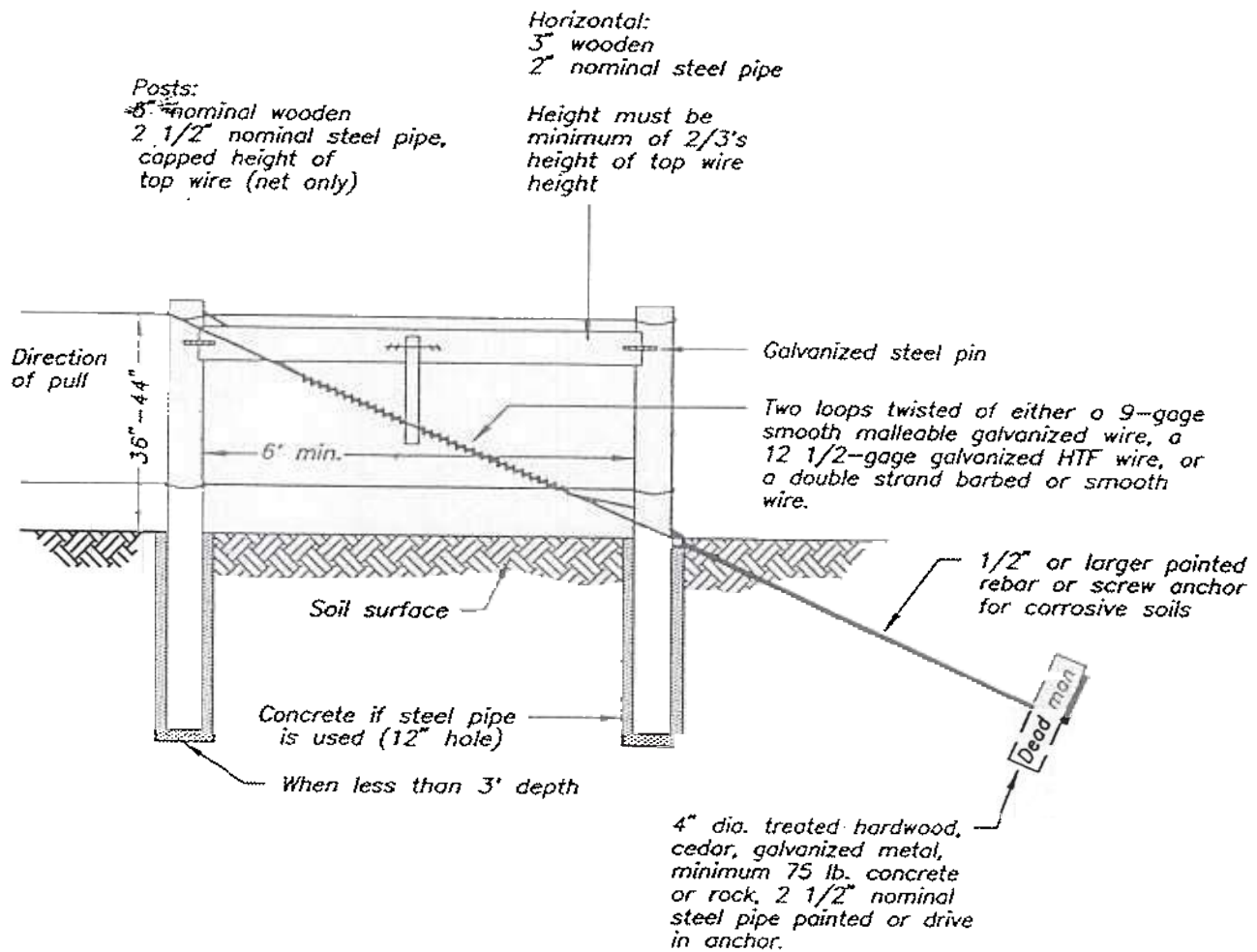
(a)

Single Post
Pull Assembly

(b)

*Standard Suspension Fence,
Corner and Pull Assembly*

Figure 3



Materials: Post must be new eastern red juniper, blueberry juniper, bois-d'arc, treated pine, treated hardwood, or steel pipe (cemented). Used steel pipe is acceptable and must be painted.

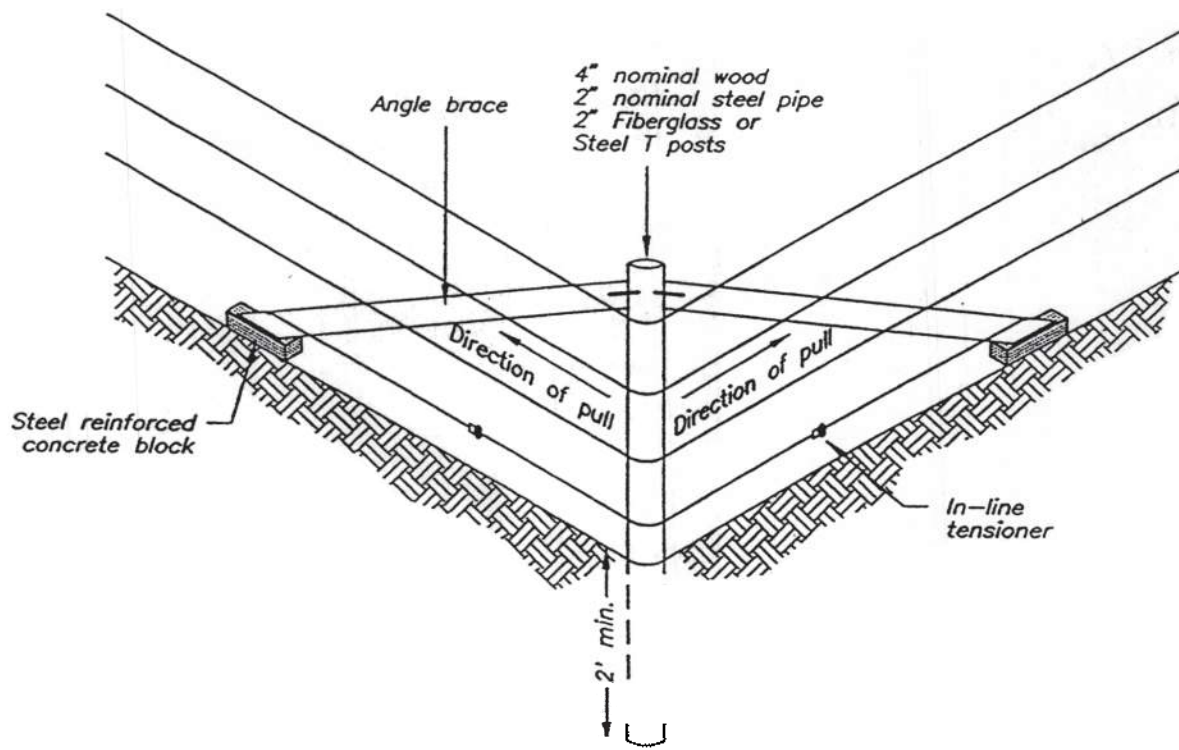
Splices: Use "western-union splices, figure "8" knots or crimping sleeves for malleable wire. Use crimping sleeves or figure "8" knot for high tensile strength wire.

2 Post Brace With Deadman

(c)

Standard Suspension Fence,
Corner and Pull Assembly

Figure 3

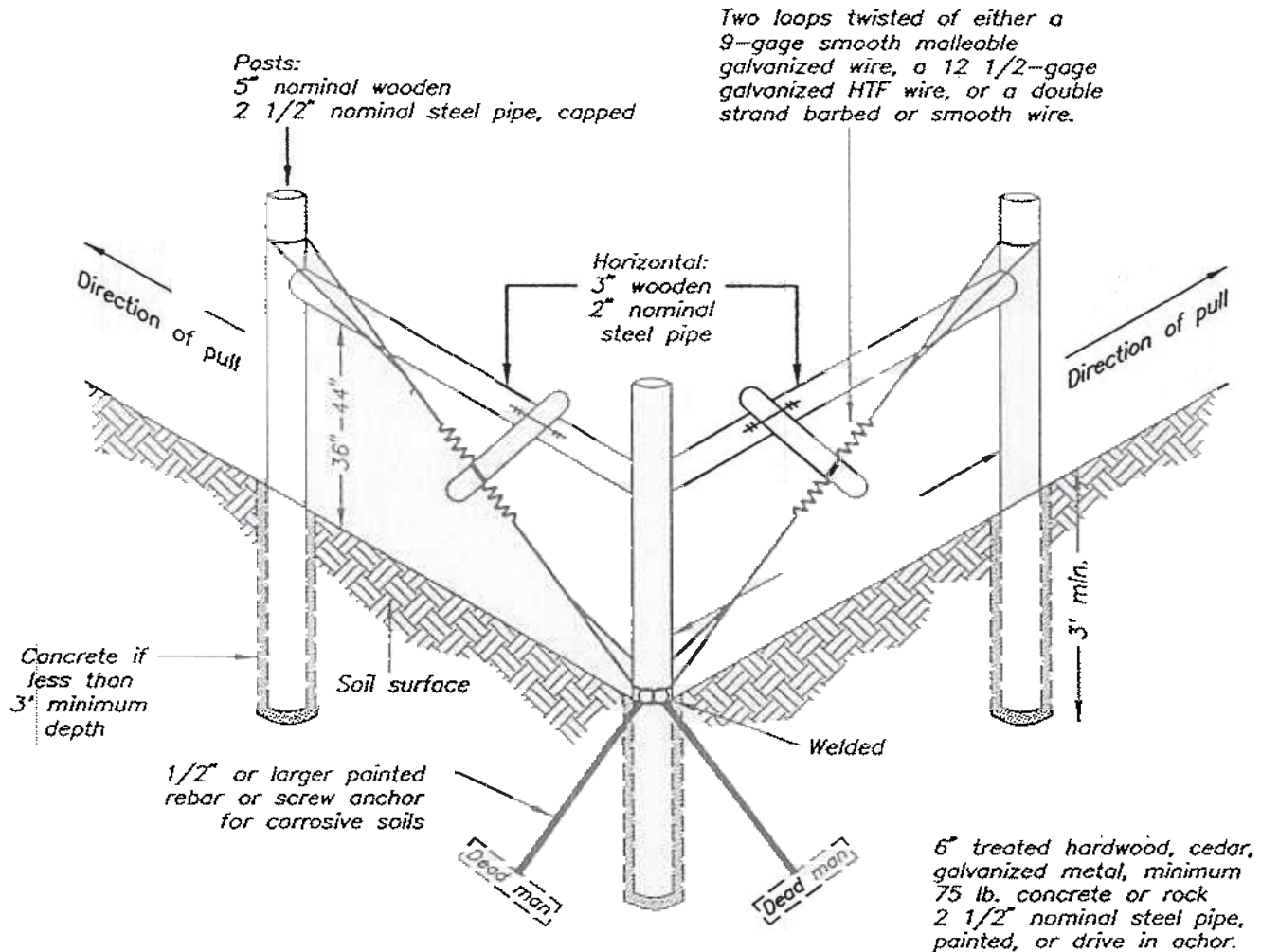


Single Post Corner or Angle Brace Assembly

(d)

Standard Suspension Fence,
Corner and Pull Assembly

Figure 3



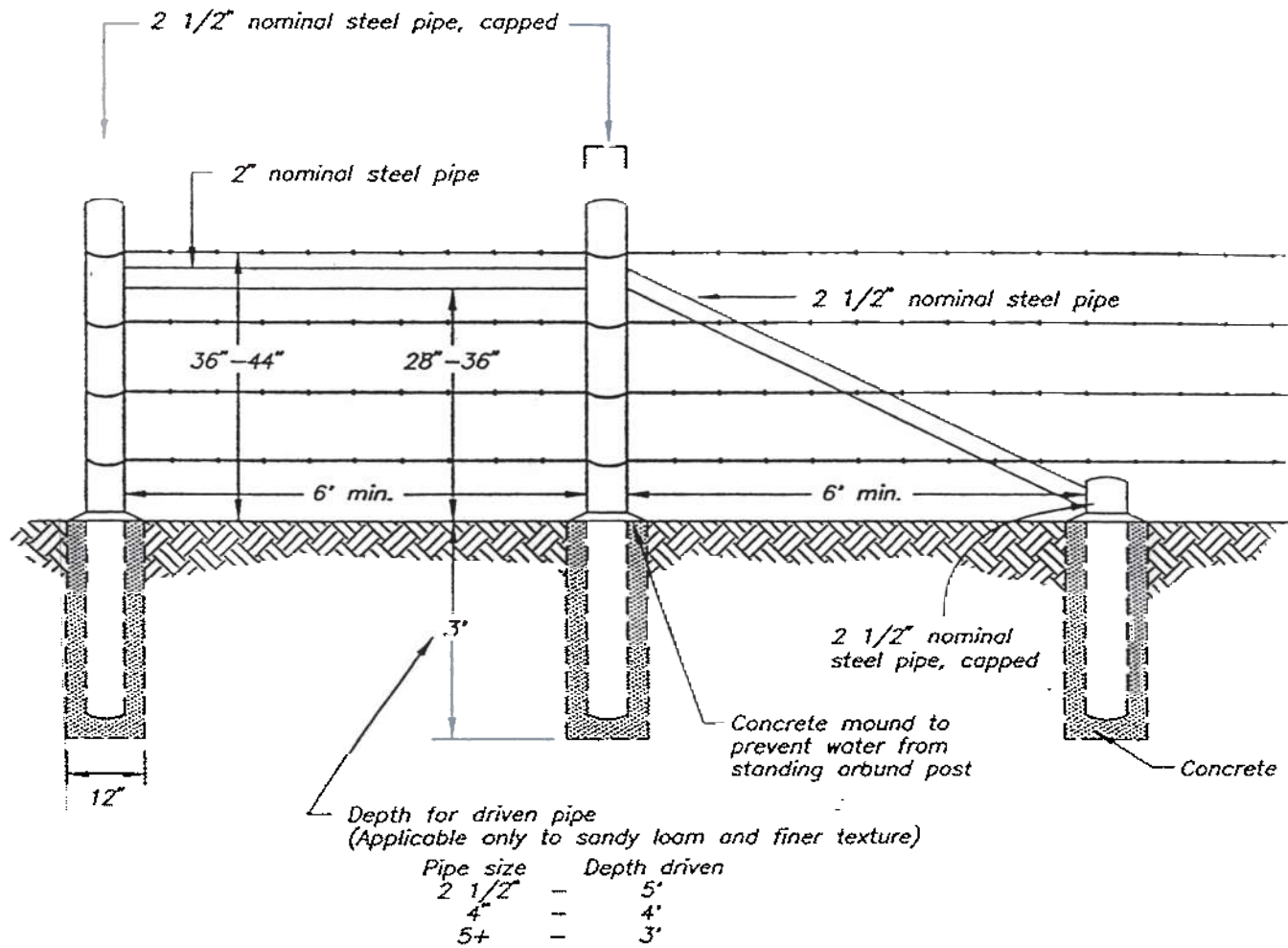
Materials: Post must be new eastern red juniper, blueberry juniper, bois-d'arc, treated pine, treated hardwood, or steel pipe. Used steel pipe is acceptable and must be painted.

Splices: Use "western-union splices, figure "8" knots or crimping sleeves for malleable wire.

Use crimping sleeves or figure "8" knot for high tensile strength wire.

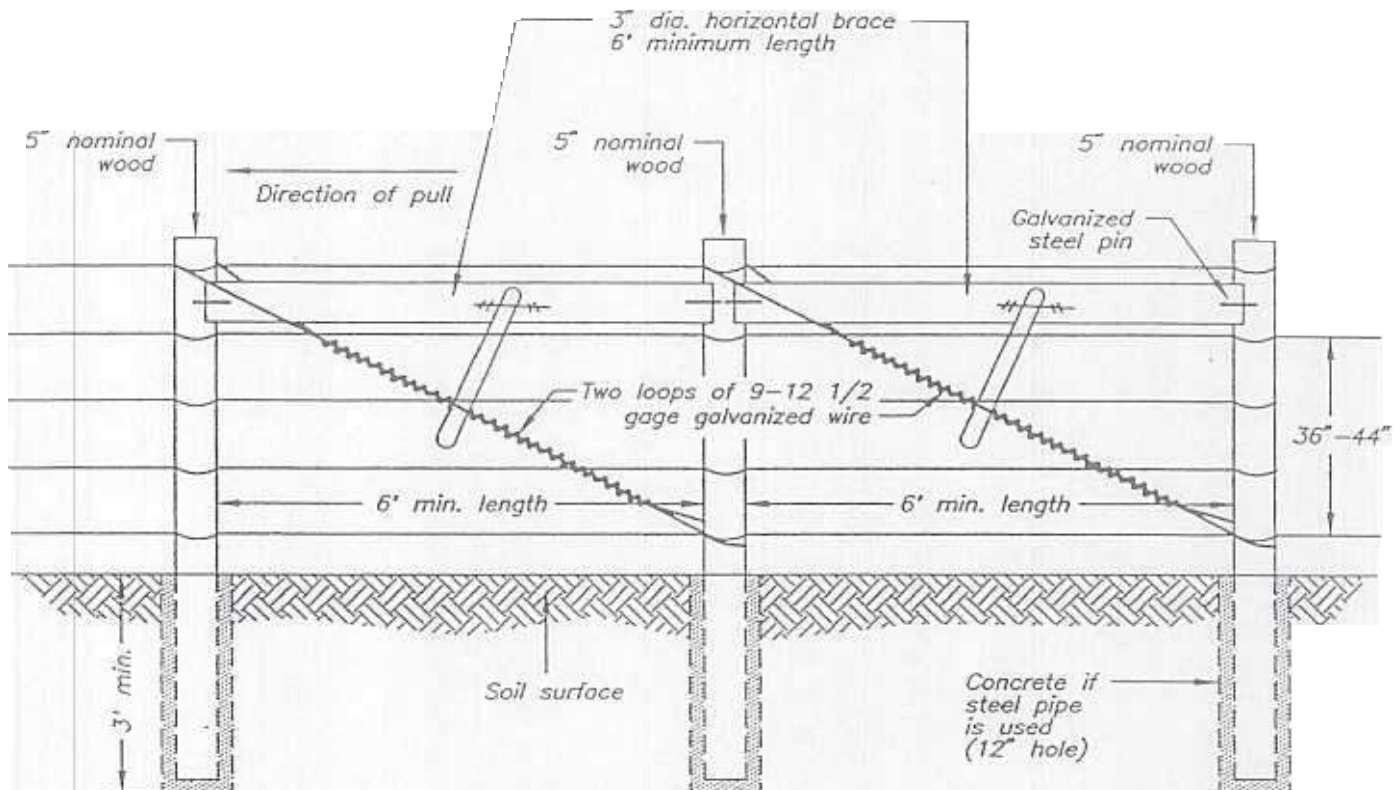
Deadmaned 3-Post Corner

Figure 4



Welded Steel 3-Post Diagonal
End Brace Assembly

Figure 5

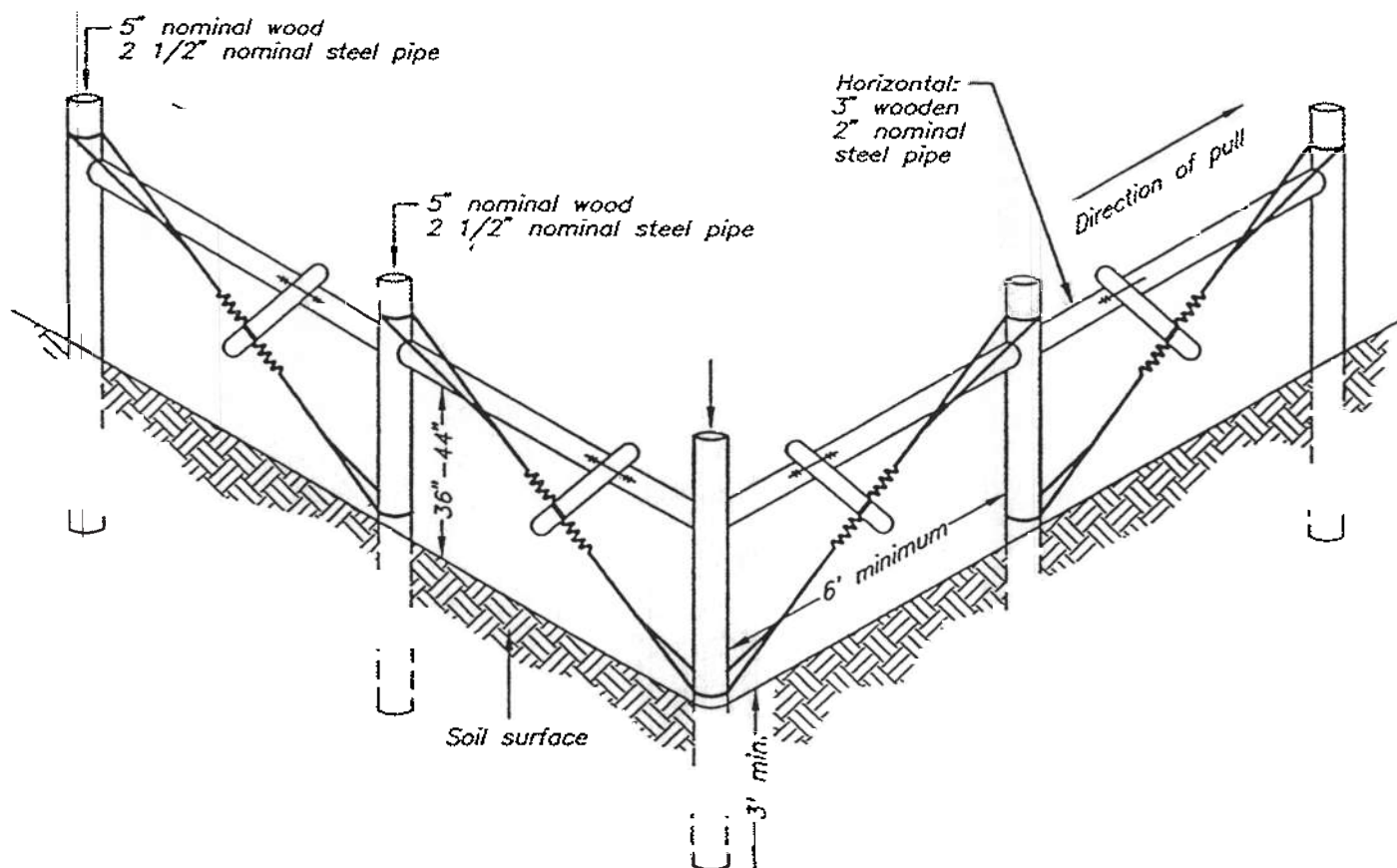


Note:

Materials shown above may be substituted using 2 1/2" nominal steel pipe, capped, set in concrete (12 in. diameter hole). Pipe must be painted.

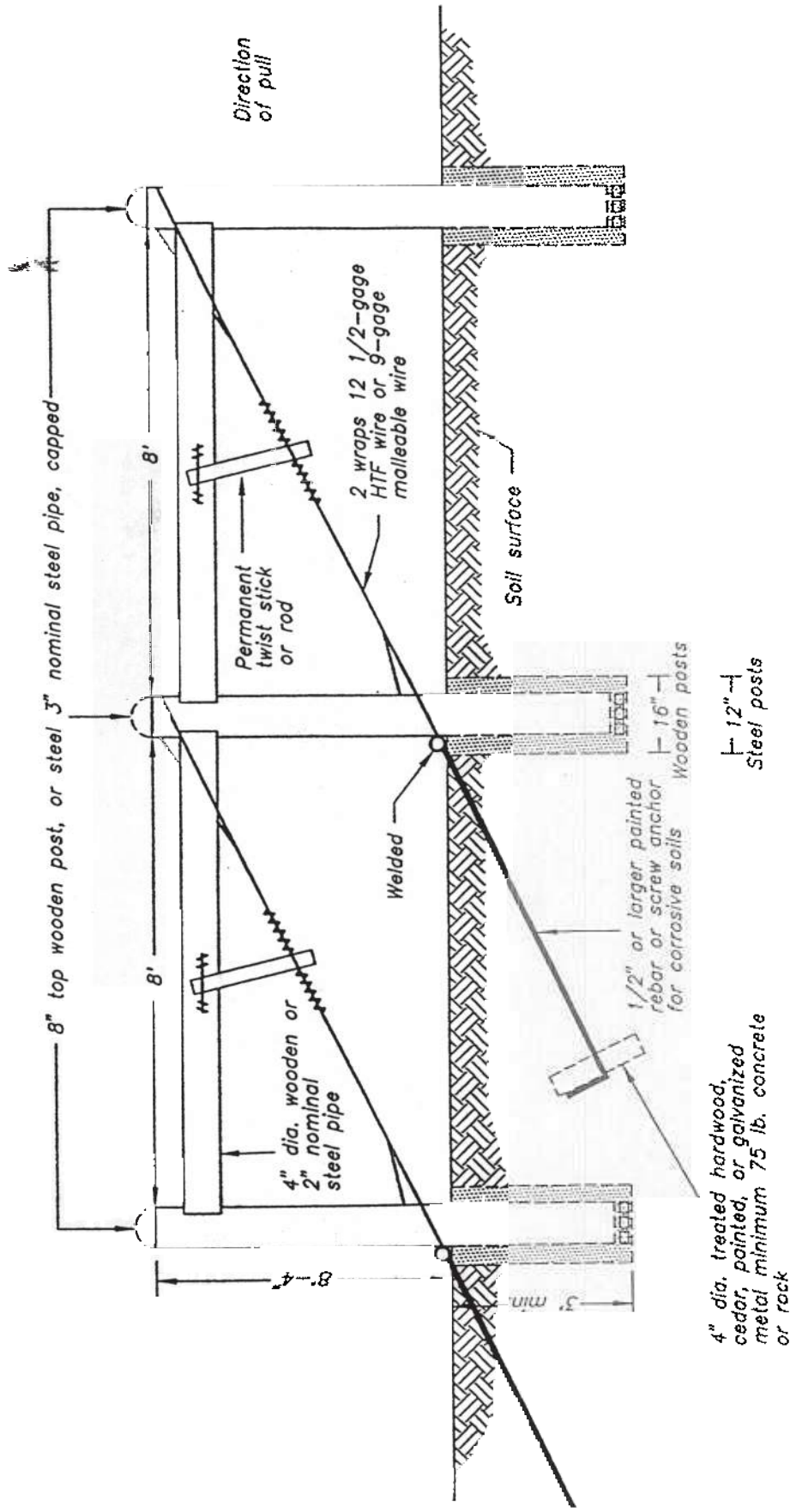
Wooden 3 Post Double "H" Brace
End Assembly Without Deadman

Figure 6

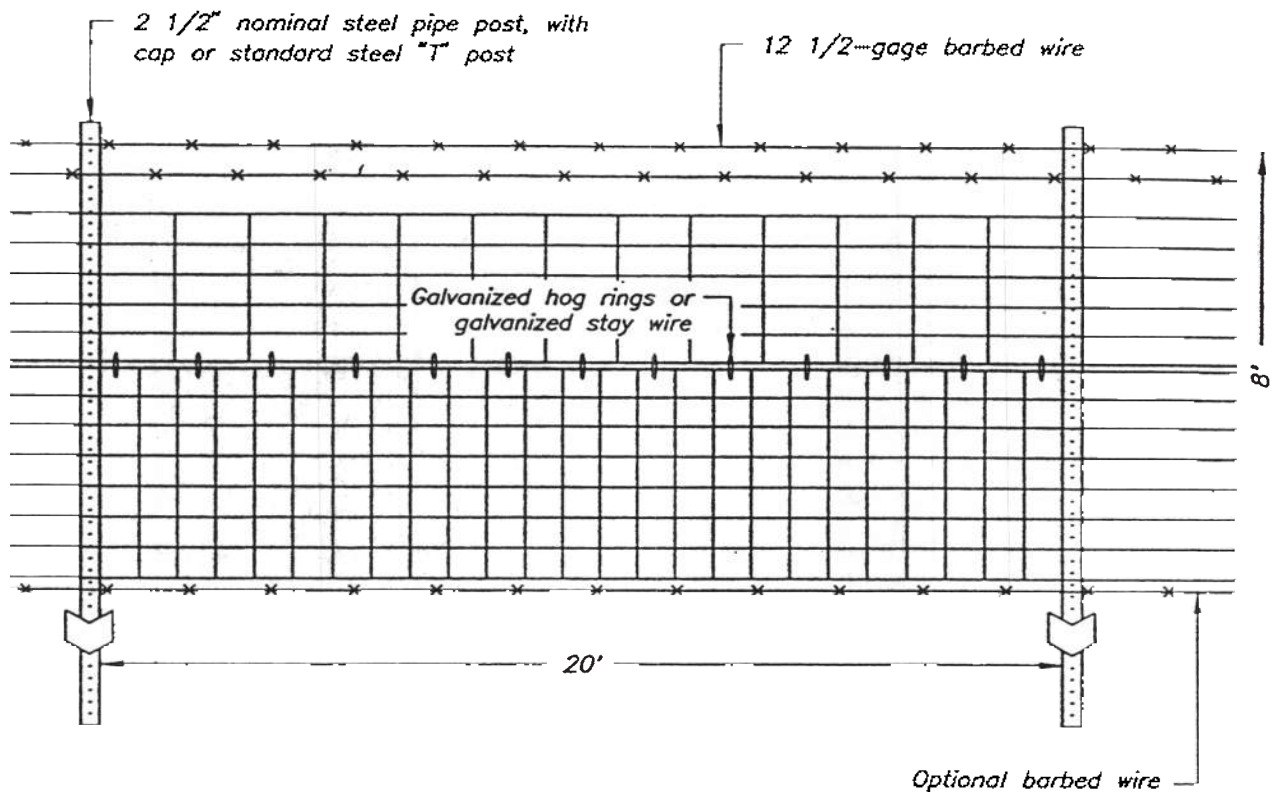


Without Deadman

Figure 7



End Brace Assembly Deer Management Fence

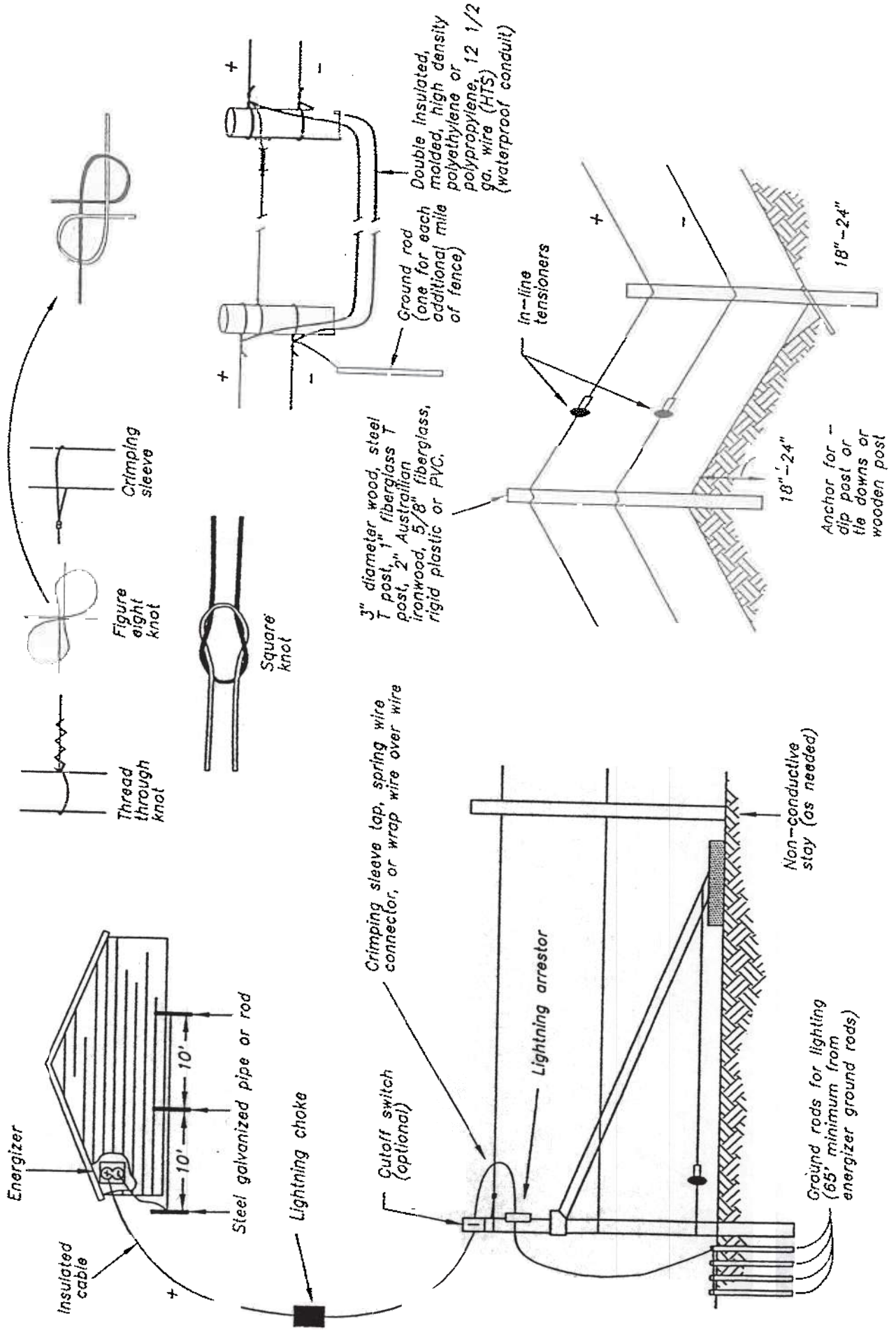


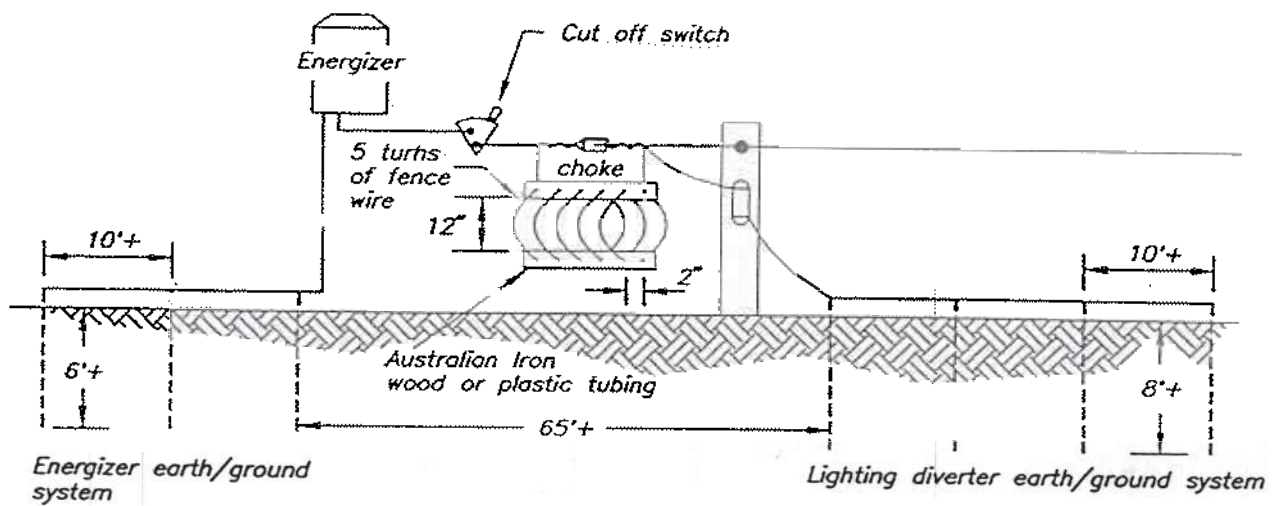
Note: If standard steel "T" posts are used, install 2 1/2" nominal steel pipe post, with cap or 6" top wooden post every 150' (Wooden stays may be placed between line post as needed.)

General Installation Specification For Deer Management Fence

Figure 9

Methods of tying HTS Wire



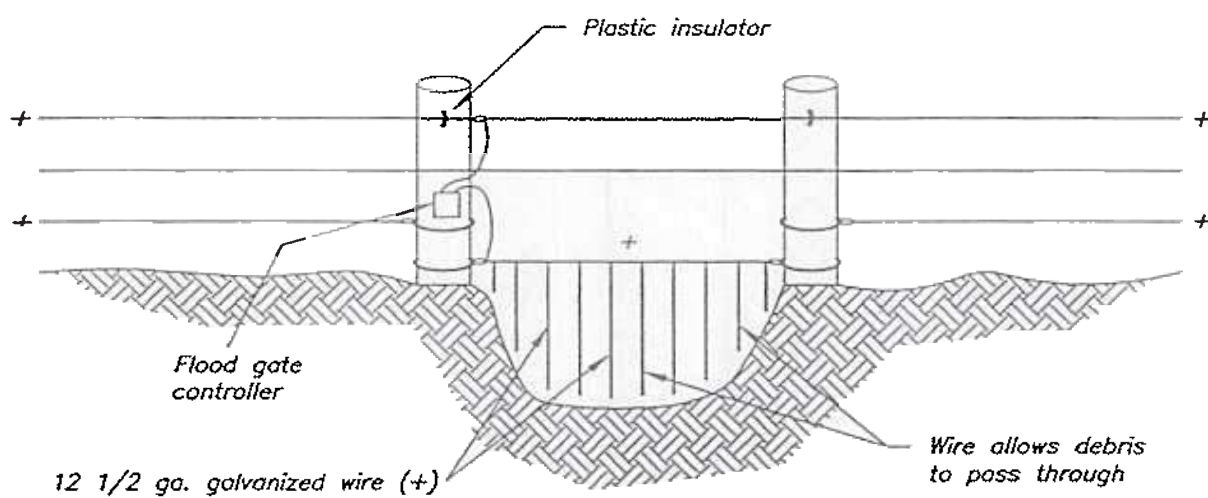


An induction loop may be as an alternative to a choke.

An induction loop is made by coiling 8 to 10 loops of heavily insulated 12 gage wire in 10-12" diameter circles and taping the loops together.

Electric Fence

Figure 2



Electric Flood Gate

Figure 1

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

IA-95 GEOTEXTILE

1. SCOPE

This work shall consist of furnishing all materials, equipment, and labor necessary for the installation of geotextile.

2. MATERIAL QUALITY

Geotextile shall be manufactured from synthetic long chain or continuous polymeric filaments or yarns, having a composition of at least 95 percent, by weight, of polypropylene, polyester or polyvinylidene-chloride. The geotextile shall be formed into a stable network of filaments or yarns that retain their relative position to each other, are inert to commonly encountered chemicals and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents and insects. Unless otherwise specified, the class and type of geotextile shall be as shown on the drawings and shall meet the requirements for materials that follow:

- a. Woven Geotextile shall conform to the physical properties listed in Table 1. The woven geotextile shall be manufactured from monofilament yarns that are woven into a uniform pattern with distinct and measurable openings. The geotextile shall be manufactured so that the yarns will retain their relative position with regard to each other. The yarns shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure. The edges of the material shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.
- b. Nonwoven Geotextile shall conform to the physical properties listed in Table 2. Nonwoven geotextile shall be manufactured from randomly oriented fibers that have been mechanically bonded together by the needle-punched process. In addition, one side may be slightly heat bonded. Thermally bonded, nonwoven geotextile, in addition to mechanically bonded, nonwoven geotextile, may be used for Road Stabilization. The filaments shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure.
- c. The geotextile shall be shipped in rolls wrapped with a protective covering to keep out mud, dirt, dust, debris and direct sunlight. Each roll of geotextile shall be clearly marked to identify the brand, type and production run.

3. STORAGE

Prior to use, the geotextile shall be stored in a clean dry place, out of direct sunlight, not subject to extremes of either hot or cold, and with the manufacturer's protective cover in place. Receiving, storage, and handling at the job site shall be in accordance with the requirements in ASTM D 4873.

4. SURFACE PREPARATION

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. The surface shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions and standing or flowing water (unless otherwise shown on the drawings).

5. PLACEMENT

Prior to placement of the geotextile, the soil surface will be inspected for quality assurance of design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings. The geotextile shall be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when material is placed on or against it. The geotextile may be folded and overlapped to permit proper placement in the designated area.

The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified), and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a "U", "L", or "T" shape or contain "ears" to prevent total penetration. Steel washers shall be provided on all but the "U" shaped pins. The upstream or up-slope geotextile shall overlap the abutting down-slope geotextile. At vertical laps, securing pins shall be inserted through both layers along a line through approximately the midpoint of the overlap. At horizontal laps and across slope laps, securing pins shall be inserted through the bottom layer only. Securing pins shall be placed along a line approximately 2 inches in from edge of the of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate, to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to be left in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used, overlaying the existing geotextile. The patch shall extend a minimum of 2 feet from the edge of any damaged area.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. Geotextile shall be placed in accordance with the following applicable specification according to the use indicated in drawings:

Slope protection – Class I or II as indicated in Tables 1 and 2.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. Rock shall not be pushed or rolled over the geotextile.

Class I, unprotected – limit height for dropping stone onto bare geotextile to 3 feet.

Class II, protected – require the use of 6 inches a clean pit-run gravel over the geotextile to cushion the stone and limit the height of drop to 3 feet.

On slopes with strong seepage flow, the geotextile must be in intimate contact with the soil to prevent erosion of the soil surface. Use 6 inches of a clean pit-run gravel over the geotextile to hold it in place and minimize voids under the riprap. Embedment of the geotextile in a trench to form a cutoff at regular intervals down the slope will prevent erosion under the fabric. Place cutoffs more closely together in highly erodible soils and wider apart in more stable soils.

Subsurface drains – Class III as indicated in Tables 1 and 2.

The geotextile shall not be placed until drainfill or other material can be used to provide cover within the same working day. Drainfill material shall be placed in a manner that prevents damage to the geotextile. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet.

Road stabilization – Class IV as indicated in Tables 1 and 2.

The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting conformation to the surface irregularities when the roadway fill material is placed on its surface. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet. Unless otherwise specified, the minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended or provided by the manufacturer, but they shall be removed before the permanent covering material is placed.

6. SPECIAL SPECIFICATIONS

TABLE 1. REQUIREMENTS FOR WOVEN GEOTEXTILES ^{1/}

Property	Test Method	Class I	Class II	Class III	Class IV
Grab tensile strength (pounds)	ASTM D4632	247 minimum	180 minimum	180 minimum	315 minimum
Elongation at failure (%)	ASTM D4632	< 50	< 50	< 50	< 50
Trapezoidal tear strength (pounds)	ASTM D4533	90 minimum	67 minimum	67 minimum	112 minimum
Puncture strength (pounds)	ASTM D6241	495 minimum	371 minimum	371 minimum	618 minimum
Ultraviolet light (% retained strength)	ASTM D4355	50 minimum	50 minimum	50 minimum	70 minimum
Permittivity (sec ⁻¹)	ASTM D4491			as specified	
Apparent opening size (AOS) ^{2/}	ASTM D4751			as specified	
Percent open area (POA) (%)	USACE ^{3/} CWO-02215-86			as specified	

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Maximum average roll value.

3/ Note: CWO is a USACE reference.

TABLE 2. REQUIREMENTS FOR NONWOVEN GEOTEXTILES ^{1/}

Property	Test Method	Class I ^{2/}	Class II ^{2/}	Class III ^{2/}	Class IV ^{2/}
Grab tensile strength (pounds)	ASTM D4632 grab test	202 minimum	157 minimum	112 minimum	202 minimum
Elongation at failure (%)	ASTM D4632	50 minimum	50 minimum	50 minimum	50 minimum
Trapezoidal tear strength (pounds)	ASTM D4533	79 minimum	56 minimum	40 minimum	79 minimum
Puncture strength (pounds)	ASTM D6241	433 minimum	309 minimum	223 minimum	433 minimum
Ultraviolet light (retained strength) (%)	ASTM D4355	50 minimum	50 minimum	50 minimum	50 minimum
Permittivity (sec ⁻¹)	ASTM D4491		0.70 minimum or as specified		
Apparent opening size (AOS) (mm) ^{3/}	ASTM D4751		0.22 maximum or as specified		

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Needle punched geotextiles may be used for all classes. Heat-bonded or resin-bonded geotextiles may be used for class IV only.

3/ Maximum average roll value.

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS**

IA-620 UNDERGROUND OUTLET

1. SCOPE

This work shall consist of installation of underground outlets and any appurtenant water control structures in accordance with an approved plan and design.

2. MATERIALS

Materials for underground outlets shall meet the requirements as shown in the plans and specifications. They shall be field inspected for any deficiencies such as thin spots or cracking prior to installation.

Conduit

The following reference specifications pertain to products currently acceptable for use as underground outlets:

Plastic

Corrugated Polyethylene (PE) Pipe and Fittings (3-6 inch)	ASTM F 405
3 through 24 inch Corrugated Polyethylene (PE) Pipe and Fittings.....	ASTM F 667
Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings (4-36 inch)	ASTM F 949
Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.....	ASTM D 2729
Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.....	ASTM D 3034
Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)	ASTM D 2241
Polyethylene Plastics Pipe and Fittings Materials	ASTM D 335

Clay

Clay Drain Tile.....	ASTM C 4
Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.....	ASTM C 700
Vitrified Clay Pipe, test methods.....	ASTM C 301

Concrete

Concrete Drain Tile (4-36 inch).....	ASTM C 412
Concrete Pipe for Irrigation or Drainage.....	ASTM C 118
Concrete Pipe, Manhole Sections, or Tile (test methods).....	ASTM C 497
Concrete Sewer, Storm Drain and Culvert Pipe	ASTM C 14
Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.....	ASTM C 76
Perforated Concrete Pipe	ASTM C 444
Portland Cement	ASTM C 150

Other

Styrene-Rubber (SR) Plastic Drain Pipe and Fittings.....	ASTM D 2852
Corrugated Aluminum Pipe for Sewers and Drains	ASTM B 745
Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains.....	ASTM A 760

Inlet

The inlet shall be fabricated and installed as shown on the plans. Inlets must be of durable material, structurally sound, and resistant to damage by rodents or other animals. Inlets shall be of rigid material, which does not require supplemental support to remain in a vertical position. Materials, which meet these requirements, include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum,
2. Smooth steel pipe, with 3/16 inch minimum wall thickness,
3. Smooth plastic pipe, polyvinyl chloride (PVC), with an SDR of 43 or less,
4. High-density polyethylene pipe (PE). Round pipe shall have an SDR of 43 or less. Square intakes shall have minimum wall thickness as shown in the following table:

<u>Nominal Size</u>	<u>Minimum Thickness</u>
6 inch	0.16 inch
8 inch	0.21 inch
10 inch	0.26 inch
12 inch	0.31 inch

All plastic and polyethylene inlets shall include ultra-violet stabilizer to protect from solar degradation.

Perforations in the inlet shall be smooth and free of burrs. Unless otherwise specified, the above ground portion of the inlet shall have holes evenly spaced around the perimeter of the inlet in accordance with the following table:

<u>Inlet Size</u>	<u>Minimum Number of 1" Diameter Holes per Foot of Inlet</u>
4 inch	20
5 inch	24
6 inch	30
8 inch	40
10 inch	50
12 inch	60

If slots or round holes other than 1 inch in diameter are provided, the total cross sectional area of the openings per foot shall be equivalent to that provided by 1 inch diameter round holes meeting the above criteria.

The below ground portion of the inlet may be perforated with holes 5/16 of an inch in diameter or less to provide drainage around the inlet.

Appurtenances (i.e. tees and elbows) for polyvinyl chloride (PVC) inlets shall be schedule 40 or heavier.

Additional subsurface drainage tubing or tile may be used in conjunction with the surface inlet to improve access and farmability around the inlet. These underground extensions (when used) shall have a minimum length of 10 feet.

The inlet shall be offset from the main conduit except as noted below. A minimum of 8 feet of non-perforated conduit shall be installed between the inlet and the main conduit. The minimum diameter of the offset line shall be 3 inches. When conduit capacity is based on orifice flow from the inlet, such inlets shall be fabricated so that an orifice can easily be installed.

Only the top inlet in a terrace system may be placed directly on the main conduit. If the top most inlet in a terrace system is placed directly on the main conduit, the conduit shall be non-perforated from the inlet to the toe of the terrace back slope.

Outlet

A continuous section of non-perforated conduit at least 20 feet long shall be used at the outlet. Two-thirds of the outlet pipe shall be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or the side slope shall be protected from erosion. Acceptable materials for use at the outlet include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum;
2. Smooth steel pipe, with 3/16 inch minimum wall thickness;
3. Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 26 or less or schedule 40 or heavier; or
4. Corrugated profile wall (dual wall) polyethylene (PE) pipe meeting or exceeding the requirements of ASTM F 2648 (2" to 60"), ASTM F 2306 (12" to 60"). Pipe conforming to AASHTO M 252 (3" to 10"), or AASHTO M 294 (12" to 60") is acceptable.

All plastic and polyethylene pipe outlets shall include ultra-violet stabilizer. PVC and PE pipe outlets shall not be used where burning vegetation on the outlet ditch bank is likely to create a fire hazard.

Connections with the outlet pipe shall be made watertight.

The outlet shall be equipped with a flap-gate type rodent guard.

3. TRENCH EXCAVATION

Trench excavation shall be sufficient to provide required cover after other construction is completed.

The trench bottom shall be smooth and free of exposed rock. If rock is encountered in the trench bottom, over-excavate the trench and place at least 6 inches of compacted earth or sand bedding in the trench to bring it up to the conduit grade. In stable soils, the bottom of the trench shall be shaped to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. The groove shall be shaped to fit the size of conduit. The 90-degree "V" groove shall not be used on conduits greater than 6 inches in diameter.

Unless otherwise shown on the drawings, trench width at the top of the conduit should be the minimum required to permit installation and provide bedding conditions suitable to support the load on the conduit, but with not less than 3 inches of clearance on each side. Maximum trench width shall be the conduit diameter plus 12 inches measured at the top of the conduit, unless approved bedding is installed.

Plow installation is allowed except under the base width of the terrace or embankment. Trench width shall be at least two (2) inches wider than the conduit on each side to allow sufficient bedding to support the pipe.

4. INSTALLATION

The underground outlet system shall be installed to the line and grade shown in the plans or as staked in the field. Conduit lines shall be installed and properly blinded or bedded prior to placement of any other earthfill over the lines.

Conduit lines shall be joined with standard factory couplers, if applicable, to produce a continuous system. Internal couplers may be used if they do not cause excessive flow restrictions. Conduit ends shall be protected during installation.

All appurtenant structures, including trash and rodent guards, shall be installed promptly and provisions shall be made for protecting them during installation. All conduit ends except the outlet and inlets with screens shall be capped with standard factory end caps or concrete. When corrugated plastic tubing is used, no more than 5% stretch will be allowed.

Orifice plates, when specified, shall have smooth edges and fit tightly.

5. TRENCH BACKFILL

Conduits shall be bedded and backfilled throughout the base width of the basin embankment or terrace ridge. Friable soil material shall be placed in 4 inch layers and hand tamped to a depth of 2 feet above the conduit. The sides of the remaining trench shall be sloped no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

Water packing may be used as an alternative to mechanical compaction. If the conduit is non-perforated, it shall be filled with water during the water packing procedure. The initial backfill, before wetting, shall be of sufficient depth to ensure complete coverage of the pipe after consolidation has taken place. Water packing is accomplished by adding water in such quantity as to thoroughly saturate the initial backfill without inundation. The wetted fill shall be allowed to dry until firm before final backfill is begun. Final backfill shall be accomplished by placing friable soil material in 4 inch layers and hand tamping to a depth of 2 feet above the conduit. The sides of the remaining trench shall be sloped no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

Conduit which is not under the embankment or terrace ridge shall be backfilled with select bedding material containing no hard objects larger than 1½ inches in diameter to a minimum depth of 6 inches over the conduit. The conduit shall be held in place mechanically while select backfill material is placed around and over the conduit. This is to ensure that the proper conduit grade is maintained. All backfill material shall be placed so that deflection or displacement of the conduit will not occur. The remainder of the trench above the conduit shall be backfilled as rapidly as consistent with the soil conditions. Backfill shall extend above the ground surface and be well rounded over the trench. Large stones, frozen material, and large clods are not allowed in the backfill material.

6. FINISH

Work areas shall be smoothed and left in a workmanlike manner. Vegetation or other protective cover shall be established as specified.

7. SPECIAL SPECIFICATIONS

**SECTION B:
SUPPLEMENTAL SPECIFICATIONS
UPPER IOWA RIVER WMA
UI-048-ROTHMEYER-NUMEDAH**

EXPLANATION

- A. The purpose of this Section of the Specifications is to provide supplemental information which is required to complete the Standard Construction Specifications and to set forth supplementary requirements, modifications and/or deletions which are required to make the whole of the Construction Specifications project specific.
- C. Where there is any variance between the Standard Construction Specifications and these Supplemental Specifications, the Supplemental Specifications shall take precedence.
- D. Where any section of the Standard Construction Specifications is modified, or any Paragraph, Sub-paragraph or Clause thereof is changed or deleted by these Supplemental Specifications, the unaltered provisions of that Section, Paragraph, Sub-paragraph or Clause in the Standard Construction Specifications shall remain in effect. Unless these Supplemental Specifications make specific reference to the modification or deletion of a Paragraph, Sub-paragraph or Clause in the Standard Construction Specifications, no changes are intended, and paragraphs contained in these Supplemental Specifications are intended only to supplement, amplify, or clarify said Standard Construction Specifications.

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SUPPLEMENTAL NRCS SPECIFICATIONS

IA-1	SITE PREPARATION
IA-3	STRUCTURE REMOVAL
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IA-6	SEEDING AND MULCHING FOR PROTECTIVE COVER
IA-8	MOBILIZATION AND DEMOBILIZATION
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2419	PRECAST CONCRETE UNITS
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IA-1 SITE PREPARATION

A. Measurement and Payment

1. Compensation for Site Clearing, Preparation, & Waste Disposal (Bid Item 1) shall be made on a lump sum basis. Any work item described in the contract documents but not explicitly listed in the bid schedule will be included in the lump sum payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in the Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Bid Item 1-Site Clearing, Preparation, & Waste Disposal
 - (1) This item will consist of the removal and proper off-site disposal of all woody growth within the construction area. Trees may also be burned and buried onsite in an owner and engineer approved location and manner.
 - (2) This item includes the removal and proper off-site disposal of existing pipes/outlets through the road embankment and existing access drives. This includes the removal of any granular materials or other unsuitable backfill materials encountered during removal. Removal of all pipes/outlets shall be completed in accordance with IA-1 and IA-3.
 - (3) This item includes the removal of field tile located during excavation or general grading activities. Any field tile encountered within the project grading limits shall be removed by the contractor in accordance to IA-1, IA-3, and IA-9.
 - a. Tiles encountered within the project area are not anticipated. Notify the engineer and watershed coordinator if tile is encountered.
 - (4) This item includes stripping, salvaging, and replacing the existing gravel surfacing on the roadbed inside the grading limits. This includes the length of roadway extending from the embankment fill zone to the borrow area, as shown on the plans. Additional removal beyond the limits shown on the plans is not included in this item.
 - (5) This item includes the removal and proper off-site disposal of all refuse and debris encountered on grade in areas being graded or seeded.
 - (6) This item includes the removal and proper off-site disposal of any fence within the project grading limits. Any fence removed for access and /or to provide work area shall be salvaged if practical or replaced with same or like materials as approved by the engineer and in accordance with specification IA-92. Removal or salvage shall be completed in accordance with IA-1 and IA-3. Payment for the removal or salvage of fence shall be incidental to Bid Item 1.
 - (7) All removals shall be completed in accordance with IA-5 Pollution Control.

IA-3 STRUCTURE REMOVAL

A. Measurement and Payment

1. Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Remove and Dispose 18' Wooden Bridge (Bid Item 2)
 - (1) This bid item will consist of excavation, removal, and proper off site disposal of the existing bridge structure as shown on the plans. Removal of the existing structure shall be in its entirety, including wing walls, wood, steel, concrete, reinforcing, and footings as applicable.
 - (2) The quantity of work will not be measured for payment. Payment for this item will be made at the contract lump sum price when satisfactory removal and disposal of the structure has been completed.
 - (3) Removal shall be in accordance with IA-5.
 - b. Subsidiary Item, Pollution Control
 - (1) Structure removal shall be completed in accordance with IA-5.
 - (2) No separate payment will be made for hauling and proper off-site disposal of the bridge.

IA-5 POLLUTION CONTROL

A. Measurement and Payment

1. Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with the specification and the construction details therefore are:
 - a. Subsidiary Item, Sediment Filters
 - (1) This item consists of all work to install, maintain and remove sediment filters for the project. Sediment filters to be removed once vegetation is established.
 - (2) No separate payment will be made for sediment filters. Compensation for this item will be incidental to other items of work.
 - (3) Contractor shall perform all construction activities in a manner that will minimize water pollution, air pollution, and soil erosion. Sediment filters shall be placed as needed where off-site erosion could occur.
 - b. Subsidiary Item, Pollution Control
 - (1) This item will consist of applying and performing all construction activities in a manner that will minimize water pollution, air pollution and soil erosion and shall be completed in compliances with all state, local and federal regulations.
 - (2) No separate payment will be made for Pollution Control. Compensation for this item will be incidental to other items of work.
 - c. Rolled Erosion Control Product (Bid Item 3)
 - (1) Payment for this item shall include the cost to obtain, install, and maintain rolled erosion control products in the locations indicated in the plans.
 - (2) Rolled erosion control product shall be long term temporary double net rolled erosion control blanket consisting of processed degradable natural and/or polymer fibers, mechanically bound together between two degradable synthetic or natural fiber nettings. Product shall meet or exceed ECTC Standard Specifications for Type 2.D classification.
 - (3) Measurement and payment of this bid item will be based on the quantity (in square yards) listed on the plans unless the WMA or Engineer directs the contractor to install a different amount in the field. In that case, payment shall be made based on the actual quantity (measured in square yards) installed, at the bid unit price.

IA-6 SEEDING AND MULCHING FOR PROTECTIVE COVER

A. Measurement and Payment

1. For items of work for which specific prices are established in the contract each area treated is measured and the area calculated to the nearest 0.1 acre.
2. Payment for seeding is made at the contract unit price per acre for the designated treatment, which will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Seeding, Structure and Channel Mix (Bid Item 4)
 - (1) This item will consist of seeding the embankment, terrace flowlines, ditches, all concentrated flow paths, and any area steeper than 4:1 (H:V).
 - (2) All seed must be cleaned and weed free. Seeding rates are expressed in bulk pounds per acre. Seed quality shall not drop below 70% Pure Life Seed (PLS) where $PLS = (\% \text{ germination} + \% \text{ dormant seed}) \text{ times } \%$ purity.
 - (3) Seed mix shall be as specified in the road structure seed mix table on the following page.

Seeding Plan

Name ROAD STRUCTURE SEEDING PLAN
Prepared by Matt Frana

Date 12/21/2020
Tract No. _____
Field No. _____
Contract No. _____

Program: Upper Iowa Watershed Project

Acres: 1.00

Seeding Mix Summary

Grasses	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
1	<i>Elymus canadensis</i>	Canada Wildrye	10.000	5.236	5.24
2	<i>Andropogon gerardii</i>	Big Bluestem	5.000	1.361	1.36
3	<i>Elymus trachycaulus</i>	Slender Wheatgrass	6.000	2.367	2.37
4	<i>Sorghastrum nutans</i>	Indiangrass	5.000	1.134	1.13
5	<i>Panicum virgatum</i>	Switchgrass	10.000	1.945	1.94
6	<i>Elymus virginicus</i>	Virginia Wildrye	10.000	6.482	6.48
SUBTOTAL GRASSES			46.000	18.525	18.525
Forbs/Legumes	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
1	<i>Rudbeckia hirta</i>	Black-eyed Susan	1.500	0.044	0.044
2	<i>Astragalus canadensis</i>	Canadian Milkvetch	1.500	0.240	0.24
3	<i>Oenothera biennis</i>	Common Evening Primrose	1.500	0.045	0.045
4	<i>Ratibida pinnata</i>	Gray-headed Coneflower	1.500	0.136	0.14
5	<i>Asclepias syriaca</i>	Common Milkweed	1.500	0.953	0.95
6	<i>Pycnanthemum virginianum</i>	Common Mountain Mint	1.500	0.019	0.019
7	<i>Chamaecrista fasciculata</i>	Partridge Pea	1.500	1.513	1.51
8	<i>Oligoneuron rigidum</i>	Stiff Goldenrod	1.500	0.100	0.100
SUBTOTAL FORBS			13.500	3.108	3.108
Woody	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
SUBTOTAL VINES/WOODY			0.000	0.000	0.000
TOTAL			59.500	21.633	21.633

Estimated Cost/Acre

Estimated Total Cost

	Soil Test Information	Total Needed lbs
Lime (ECCE) (Actual Lime)		
Nitrogen		
Phosphate (P205)		
Potash (K20)		

Seeding Dates: Spring (April 1 - July 1)

Additional Seeding Criteria: TO BE USED ON STRUCTURE SIDE SLOPES.

REVIEW IOWA JOBSHEET (327) FOR ADDITIONAL SEEDING RECOMMENDATIONS

Seeding was completed by according to the above requirements.
(Date)

(Contractor's Signature)

(Date)

- (4) Prepare a firm seedbed for all planting methods:
 - (a) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, till all areas to be seeded by disking or other approved methods; thoroughly loosen and pulverize the soil to a depth of three (3) inches. This may require multiple passes of the disk or other approved equipment. If the land was used for pasture and has a smooth surface, the preparation in non-disturbed areas to be seeded shall include mowing any vegetation taller than 12 inches and applying a burn down herbicide, such as glyphosate, at the labeled rates to emergent growth 2 to 4 weeks after mowing. After the vegetation has died, the area shall be disked as needed to thoroughly loosen and pulverize the soil to a depth of three (3) inches. If emergent growth occurs again prior to seeding, the area shall receive a second application of herbicide. Seeding shall not occur until the existing vegetation has died. If the pasture has a rough surface that would negatively impact the seeding, the area shall be thoroughly disked and the cultipacked prior to seeding.
 - (b) After the disking operation, and prior to seed application, firm the seedbed with a cultipacker or similar piece of equipment.
- (5) Fertilizer shall be applied on the entire seeding area at the following rate:
 - (a) Nitrogen: 30 lbs./acre
 - (b) Phosphorus (P2O5): 30 lbs./acre
 - (c) Potassium (K2O): 40 lbs./acre
- (6) Hydraulic seeding and mulching:
 - (a) Complete hydraulic seeding in concurrence with hydro mulching. At the contractors preference and at no additional cost to the owner, conventional seeding may be performed separately to the hydro mulching operation.
- (7) Hydraulic mulch shall be wood cellulose or Bonded Fiber Matrix (BFM). Products and installation for hydro mulch shall be according to SUDAS Section 9010.
- (8) Seeding will be completed during the follow seeding periods
 - Spring: March 1 to May 15
 - Summer: August 1 to September 15
 - Fall: November 15 to freeze up
- (9) Sow seeds with the contour using a grassland or rangeland drill set for the specified seeding rates. The drill shall be equipped with double coulter furrow openers. The drill shall be subject to acceptance by Engineer. Overlap each successive seeding pass to ensure complete coverage.
- (10) For seeding occurring in the spring, contractor shall ensure the seedbed remains moist until plant establishment. Moisture may be maintained during dry conditions through regular watering. Consult the engineer for recommended moisture control methods. Seeding should occur when rain is in the forecast when possible. Failure to make a good faith effort to maintain moisture may result in re-seeding by the Contractor at no additional expense to the Owner.
- (11) If seeding is completed during the spring seeding period, a companion crop of oats shall be seeded at ½ bushel per acre.
- (12) Plant seed using a drill between ¼ and ½ inch deep

- (13) Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall also be allowed in areas not accessible to drills or other equipment. Once broadcast, the seed must be covered with soil to a depth no greater than one half (1/2) inch by means of hand rakes or other approved methods.
- (14) Upon completion of the seeding operation, cultipack the seedbed to provide a positive seed-soil contact. If the drill seeder is equipped with an approved cultipacker or press wheels, separate operations shall not be necessary. The type of cultipacker / seeder to be used shall be subject to acceptance by Engineer.
- (15) Measurement and payment will be based on the area successfully seeded.

b. Seeding, Pasture Seed Mix (Bid Item 5)

- (1) This item will consist of seeding buffer areas as shown in the drawings.
- (2) All seed must be cleaned and weed free. Seeding rates are expressed in bulk pounds per acre. Seed quality shall not drop below 70% Pure Life Seed (PLS) where $PLS = (\% \text{ germination} + \% \text{ dormant seed}) \times \% \text{ purity}$.
- (3) Seed mix shall be as specified in the buffer seed mix table on the following page.

Pasture Seeding Plan

Name Pasture Seeding

Date _____

Tract No. _____

Field No.

Contract No

Type of Seeding: Pasture

Prepared by Matt Frana

$$\text{Seeding Percent Pure Live Seed} = \frac{(\% \text{ Germination} + \text{Hard Seed}) * \% \text{ Purity}}{100}$$

Critical area ▼

Enter Acres:

Total Needed

		Acres	% of full rate	Pounds Per Acre of Pure Live Seed (PLS)*		Total Needed		
Species								
Timothy	▼	1	20	10.0	Pounds	2.00	Pounds	
Red clover	▼	1	25	16.0	Pounds	4.00	Pounds	
Kentucky bluegrass	▼	1	40	25.0	Pounds	10.00	Pounds	
Orchardgrass	▼	1	20	10.0	Pounds	2.00	Pounds	
	▼				Pounds		Pounds	
Oats OR Cereal Rye		1	100	1.5	Bushels		1.5	Bushels
Fertilizer & Lime								
Lime (ECCE)		0	Lbs/Ac			0	Pounds	
Nitrogen		30	Lbs/Ac			30	Pounds	
Phosphate (P205)		30	Lbs/Ac			30	Pounds	
Potash (K20)		40	Lbs/Ac			40	Pounds	

Seeding will be completed: Other: 3

August 1st-September 15th OR November 15th - freeze

Additional Seeding Criteria:

Refer to Critical Area Planting jobsheet (342) for additional seeding and establishment recommendations.

Seeding was completed according to the above requirements on _____ (Date)

By: _____
(Signature)

(Date)

Certified by: _____

Date: _____

- (4) Prepare a firm seedbed for all planting methods:
 - (a) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, till all areas to be seeded by disking or other approved methods; thoroughly loosen and pulverize the soil to a depth of three (3) inches. This may require multiple passes of the disk or other approved equipment. If the land was used for pasture and has a smooth surface, the preparation in non-disturbed areas to be seeded shall include mowing any vegetation taller than 12 inches and applying a burn down herbicide, such as glyphosate, at the labeled rates to emergent growth 2 to 4 weeks after mowing. After the vegetation has died, the area shall be disked as needed to thoroughly loosen and pulverize the soil to a depth of three (3) inches. If emergent growth occurs again prior to seeding, the area shall receive a second application of herbicide. Seeding shall not occur until the existing vegetation has died. If the pasture has a rough surface that would negatively impact the seeding, the area shall be thoroughly disked and the cultipacked prior to seeding.
 - (b) After the disking operation, and prior to seed application, firm the seedbed with a cultipacker or similar piece of equipment.
- (5) Fertilizer shall be applied on the entire seeding area at the following rate:
 - (a) Nitrogen: 30 lbs./acre
 - (b) Phosphorus (P2O5): 30 lbs./acre
 - (c) Potassium (K2O): 40 lbs./acre
- (6) No mulch shall be applied.
- (7) Seeding will be completed during the follow seeding periods:
 - Spring: March 1 to May 15
 - Fall: November 15 to freeze up
- (8) For seeding occurring in the Spring seeding period, scarification of the seed must be completed by the seed provider.
- (9) Sow seeds using a broadcast seeder at the specified rates.
- (10) If seeding is completed during the spring seeding period, a companion crop of oats shall be seeded at ½ bushel per acre.
- (11) Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall also be allowed in areas no accessible to other equipment.
- (12) Upon completion of the seeding operation, lightly cultipack the seedbed to provide a positive seed-soil contact. The type of cultipacker / seeder to be used shall be subject to acceptance by Engineer.
- (13) Measurement and payment will be based on the area successfully seeded.

c. Subsidiary Item, Temporary Seeding

- (1) This item will consist of temporary seeding with 100 lb/acre of oats for erosion control when construction activities are not anticipated for a period of 21 days and the project is not yet substantially complete or as requested by the engineer.
- (2) Contractor shall perform temporary seeding in accordance with the specifications for structure and channel seed mix including fertilizing, mulching, seedbed preparation, planting, and watering.
- (3) No separate payment will be made for Temporary Seeding. Compensation for this item will be incidental to other items of work.

IA-8 MOBILIZATION AND DEMOBILIZATION

A. Measurement and Payment

1. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.
2. Initial payment of 50% of the contract price will be made in the first pay application after mobilization of the contractor's equipment to the project site and commencement of the project work has started. Final payment of the remaining 50% of the contract price will be made in the pay application following when the project is considered substantially complete by the Engineer.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Mobilization & Demobilization (Bid Item 6)
 - (1) This item shall consist of mobilizing and demobilizing personnel and equipment to and from the project location in preparation to perform the work within the scope of this contract.
 - (2) Any work that is necessary to provide access to the site including, but not limited to, grading, access road construction, temporary culverts, and clearing shall be included in this item. When construction is completed access areas will be restored, as close as practical, to its original condition unless approval is obtained from the Engineer and the landowner.
 - (3) The Contractor shall exercise caution to minimize the amount of damage caused by the grading and clearing operations.
 - (4) Portable toilets shall be provided at the construction site and used for the sanitary facilities. Toilets must be removed upon completion of the work.
 - (5) This item shall not include transportation of personnel, equipment and operating supplies within the work limits areas of this contract.
 - (6) Payment will constitute full compensation for related subsidiary items.
 - b. Traffic Control (Bid Item 20)
 - (1) This item includes all materials, equipment, and procedures for traffic control during construction.
 - (2) The costs to furnish, erect, operate, maintain, move, and remove all traffic control devices as required shall be included in this item.
 - (3) Execution of this item shall be according the Iowa Department of Transportation Standard Plans and Specifications.

IA-9 SUBSURFACE DRAIN INVESTIGATION, REMOVAL, AND REPAIR

A. MEASUREMENT AND PAYMENT

1. Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. ITEMS OF WORK AND CONSTRUCTION DETAILS

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Subsidiary Item, Drainage Tile Investigation and Removal
 - (1) Any drainage tiles encountered within the project area shall be traced to the upstream inlet or practice boundary, whichever is encountered first in accordance with this specification.
 - (2) This item shall consist of the excavation necessary to locate and remove all tile under the embankment, to remove tile at the other tile locations shown on the plans and locate the field tile lines in the practice. This item shall also consist of backfilling tile trenches if required.
 - (3) This item does not include the additional tile removal that occurs as part of the proposed project earthwork. Tile removal occurring in these areas is made subsidiary to specification IA-1, Site Preparation.
 - (4) The extent of tile investigation and removal shall be as required to locate and extend tiles as shown on the plans.
 - (5) The investigation should reveal where the tile crosses the embankment footprint or where it is located if it does not cross the embankment footprint.
 - (6) Removal shall be completed in accordance with IA-1, IA-3, IA-5, and IA-9.

IA-11 REMOVAL OF WATER

A. MEASUREMENT AND PAYMENT

1. Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified Items of Work and Construction Details section of this specification.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Subsidiary Item, Dewatering
 - (1) This item shall include all costs to divert, pump, dam or other means to control water run-on, run-off, and accumulation within the construction site.
 - (2) No separate or additional payment will be made for control or removal of water from the project location. Compensation for this item shall be subsidiary to other work items.

IA-21 EXCAVATION

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section. Items of Work and Construction Details.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Excavation, Core Trench and Over-excavation (Bid Item 7)
 - (1) This item will consist of over-excavating the core trench and existing channels upstream of the existing roadway parallel to the road ditch, as shown in the plans and construction details.
 - (2) Measurement and payment of this bid item will be based on the quantity (in cubic yards) listed on the plans unless the WMA or Engineer directs the contractor to excavate a different amount in the field. In that case payment shall be made based on the actual quantity excavated (measured in cubic yards), at the bid unit price. Depth and width of over-excavation may vary depending on the soils or bedrock encountered. Over-excavation must terminate in suitable soils as determined by the Engineer.
 - (3) Fill for the core trench and streambank over-excavation shall be paid for under Earthfill, Embankment Fill (Bid Item 8).
 - b. Subsidiary Item, Excavation for Earthfill
 - (1) This item will consist of the excavation of material in locations shown on the plans for use as Earthfill or excavation necessary for structure installation. All excavation required for the project will be balanced onsite, unless otherwise noted, in areas designated as Earthfill.
 - (2) No separate payment will be made for excavation.
 - (3) Compensation for this item will be included in the payment for Earthfill, Embankment Fill (Bid Item 8) or the structure bid item for which it is made subsidiary.

IA-23 EARTHFILL

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Earthfill, Embankment and Core Trench Fill (Bid Item 8)
 - (1) This item shall consist of excavating, placing, and compacting the earthfill necessary to construct the embankment and adjacent fill areas as shown on the plans.
 - (2) Earthfill approved soil material shall be taken from excavation and designated borrow areas unless other areas are approved by the engineer.
 - (3) Compaction shall be Method 2 unless otherwise noted on the plans.
 - (4) Rocks larger than 6" shall be removed prior to compaction.
 - (5) Measurement and payment for Earthfill, Embankment Fill shall be on a plan "P" cubic yard basis. Plan basis means that the plan quantity listed in the proposal will be used to measure and pay for the bid item regardless of the actual quantity.
 - (6) A 30% shrinkage factor was used to determine the plan quantity.
 - b. Subsidiary Item, Backfill Required Excavation
 - (1) This item shall consist of backfilling the areas excavated to remove or install other components related to the project such as the existing bridge, box culvert, end sections, piping or structures.
 - (2) Compaction adjacent to the structures shall be as indicated in IA-23 for fill adjacent to structures. All other compaction shall be Method 2 or equivalent.
 - (3) No separate payment will be made for Backfill of Structure Excavation. Compensation for this item will be included in payment for Reinforced Concrete Box Culvert, Corrugated Metal Pipe, or Tile Investigation and Removal if applicable.

a. Subgrade Preparation (Bid Item 9)

- (1) This item includes, but is not limited to, excavating, manipulating, replacing, compacting, and trimming to the proper grade.
- (2) Execution of this item shall be according to the following specifications:
 - (a) Uniform Composition: Provide uniform composition of at least 12 inches below top of subgrade under new paving or subbase, plus 2 feet on each side. Use select subgrade materials unless granular stabilization materials or subgrade treatment is specified.
 - 1) Construct in two 6 inch lifts.
 - 2) Remove stones over 3 inches from subgrade.
 - 3) Construct to elevation and cross-section such that, after rolling, surface will be above required subgrade elevation.
 - (b) Subgrade Stability:
 - 1) Perform proof rolling with a truck loaded to the maximum single legal axle gross weight of 20,000 pounds or the maximum tandem axle gross weight of 34,000 pounds. Operate trucks at less than 10 mph. Make multiple passes for every lane. The subgrade will be considered to be unstable if, under the operation of the loaded truck, the surface shows yielding (soil wave in front of the loaded tires) or rutting of more than 2 inches, measured from the top to the bottom of the rut at the outside edges.
 - 2) If soft or yielding areas are located, remove unstable materials and replace with suitable foundation materials as approved by the Engineer, meeting SUDAS Section 2010, 2.04. Compact subgrade materials in cut sections as required by the Engineer. If stabilization material is used, place and compact as required for subbase.
 - (c) Final Subgrade: Complete final subgrade by excavation to grade by use of steel-shod template supported on side forms, support rollers, or by use of an automatically-controlled subgrade excavating machine.
 - (d) Subgrade Check: Check subgrade elevation and grade by method approved by Engineer prior to paving.
 - (e) Ruts: If ruts or other objectionable irregularities form in subgrade during construction, reshape and re-roll subgrade before placing pavement. Fill ruts or other depressions with material similar to other subgrade material, and compact.
- (3) All soils required for subgrade materials must be approved by the Engineer. Approval of materials and their use will be based on SUDAS section 2010, subpart 2.03
 - (a) Density of 95 pcf or greater according to ASTM D 698 or AASHTO T 99 (Standard Proctor Density).
 - (b) AASHTO M 145 group index of less than 30.
 - (c) Liquid limit (LL) less than 50.
 - (d) Soils not meeting these requirements are considered unsuitable soils, regardless of classification.
- (4) The Engineer may authorize a change in subgrade materials subject to materials available locally at time of construction.

IA-26 TOPSOILING

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Topsoil, Strip, Salvage and Re-spread (Bid Item 10)
 - (1) This item will consist of stripping, salvaging, stockpiling and re-spreading topsoil within the roadway embankment and borrow areas shown on the drawings. Topsoiling of the aggregate roadbed is not required.
 - (2) All other areas being excavated or receiving fill should be stripped of the top six (6) inches of topsoil and stockpiled.
 - (3) Areas in the valleys upstream and downstream of the embankment where fill is being placed may need to be stripped to depths greater than 6" in order to remove deeper deposits of organic materials, which were indicated in the geotechnical soil borings.
 - (a) Additional stripping should be coordinated with the Engineer prior to execution.
 - (4) A minimum six (6) inch layer of topsoil shall be applied to all disturbed areas that will be seeded prior to project seeding.
 - (5) Measurement and payment for top soiling shall be on a plan "P" cubic yard basis. Plan basis means that the plan quantity listed in the proposal will be used to measure and pay for the bid item regardless of the actual quantity.
 - (a) If additional stripping is required, as defined in paragraph (3) of this specification, the additional volume shall be estimated and paid at the contracted bid item price.
 - (b) No additional payment will be granted for work not approved by the Engineer.

IA-31 Concrete

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
 - a. Subsidiary Item – Concrete
 - (1) This item shall consist of furnishing and placing poured concrete and reinforced concrete as shown on the drawings.
 - (2) No separate payment will be made for Concrete. Compensation for this item will be included in the payment for the pond outlet drop intake and pond outlet pipe.

IA-51 CORRUGATED METAL PIPE CONDUITS

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Corrugated Metal Pipe, 24" (Bid Item 11):
 - (1) This item will consist of furnishing and installing the corrugated metal pipe outlet, including rodent guard.
 - (2) The corrugated metal pipe shall be 16-gauge aluminum coated with annular or helical corrugations as noted on the drawings. The minimum corrugation size shall be 2 3/4" x 1".
 - (3) Pipe materials with recycled content that meet ASTM A 760 and A 929 for the specified size of pipe are preferred and should be used where feasible. Post-consumer Steel Content of 15 to 70% and total recoverable steel material of 25-100% is recommended if available. Engineer may request information regarding recycled content of pipe materials for review.
 - (4) Coupling bands, repair of damaged coatings, and other appurtenances are subsidiary to this item and shall not warrant separate payment.
 - (5) Linear foot measurement and payment will constitute full compensation for this bid item and related subsidiary items.
 - b. Corrugated Metal Pipe, 30" (Bid Item 12):
 - (1) This item will consist of furnishing and installing the corrugated metal pipe outlet including anti-seepage collars and rodent guard.
 - (2) The corrugated metal pipe shall be 16-gauge aluminum coated with annular or helical corrugations as noted on the drawings. The minimum corrugation size shall be 2 3/4" x 1".
 - (3) Pipe materials with recycled content that meet ASTM A 760 and A 929 for the specified size of pipe are preferred and should be used where feasible. Post-consumer Steel Content of 15 to 70% and total recoverable steel material of 25-100% is recommended if available. Engineer may request information regarding recycled content of pipe materials for review.
 - (4) Coupling bands, anti-seep collars, repair of damaged coatings, and other appurtenances are subsidiary to this item and shall not warrant separate payment.
 - (5) Linear foot measurement and payment will constitute full compensation for this bid item as related subsidiary items.

IA-61 LOOSE ROCK RIPRAP

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Class E Revetment stone (Bid Item 13):
 - (1) This item shall consist of procurement and placement of rip-rap or revetment stone as shown on the drawings
 - (2) Rip-Rap Materials shall meet Iowa ` Section 4130 Class E Revetment.
 - (3) Alternative materials, including natural field stone, may be substituted in place of rip-rap if the size, shape, and quantity is approved by the Engineer. Field stone may be sourced locally by the contractor or from the project landowner. Substitution requests shall be submitted to the Engineer and include photos showing the relative size and quantity of stone to be used.
 - (4) Measurement and payment shall be on an actual per ton basis of stone installed. Weigh tickets shall be provided to the Engineer.
 - (5) Subsidiary Item - Geotextile Fabric, IA-95
 - (a) Geotextile shall be installed under all rip rap as shown on the drawings.
 - (b) Geotextile shall be non-woven, Class I.
 - (c) No separate payment will be made for geotextile.
 - b. Erosion Stone Ditch Checks (Bid Item 14)
 - (1) This item shall consist of procurement and placement of Iowa DOT Erosion Stone Ditch Checks as shown on the plans.
 - (2) Measurement and payment shall be on an lump sum price for each ditch check installed and accepted.
 - (3) Subsidiary Item – Geotextile Fabric
 - (a) Erosion Stone Ditch Checks shall be underlain with IA-95 Class 1 Non-Woven Geotextile as shown on the plans.
 - (b) No additional payment shall be made for geotextile
 - c. Granular Surfacing (Bid Item 15):
 - (1) This item shall consist of procurement and placement of Iowa DOT 4120.04, Class A roadstone (Gradation 11) to a depth of 8”, as shown on the drawings.
 - (2) No additional payment shall be made for granular surfacing material required to restore gravel roads outside of the project limits shown on the plans. Any additional material shall be provided at the Contractor’s expense.
 - (3) Any costs associated with the respreading of existing granular material stripped as part of Site Preparation (Bid Item 1) shall be considered incidental to this bid item. No additional compensation shall be given.

- (4) Alternative materials may be substituted in place of 1.5" road stone if the size, shape, and quantity is approved by the Engineer. Substitution requests shall be submitted to the Engineer.
- (5) Measurement and payment shall be on an actual per ton basis of stone installed. Weigh tickets shall be provided to the Engineer.

d. Culvert Bedding (Bid Item 16):

- (1) This item shall consist of procurement and placement of Iowa DOT 4115, Class 2, Gradation 3 aggregate bedding to a depth of 24", as shown on the drawings.
- (2) Alternative materials may be substituted in place of the bedding material if the size, shape, and quantity is approved by the Engineer. Substitution requests shall be submitted to the Engineer.
- (3) Measurement and payment shall be on an actual per ton basis of stone installed. Weigh tickets shall be provided to the Engineer.
- (4) Subsidiary Item – Compacted Clay Seepage Cutoffs
 - (a) Two Compacted Clay Seepage Control sections shall be installed within the culvert bedding as shown on the plans
 - (b) No additional payment will be made for Compacted Clay Seepage Control sections.

IA-81 Metal Fabrication and Installation

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Subsidiary Item- Metal and Metal Fabrication
 - (1) This item will consist of furnishing and installing all steel and aluminum shown on the drawings.
 - (2) No separate payment will be made for Steel, aluminum or metal fabrication. Payment for this item will be considered subsidiary to the following Bid Items:
 - (a) Corrugated Metal Pipe, 24" (Bid Item 11)
 - (b) Corrugated Metal Pipe, 30" (Bid Item 12)

IA-92 FENCE

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Fencing, 5-Strands of Barbed Wire (Bid Item 17)
 - (1) This item will consist of furnishing and installation of fencing as shown on the project drawings.
 - (2) Fencing shall be 5 strands of barbed wire and in accordance with IA-92 (2) Standard Fence.
 - (3) Measurement and payment shall be on a per linear foot of fence installed and accepted.
 - b. Subsidiary Items – Fence repair or replacement
 - (1) This item is subsidiary to Site Clearing, Preparation, & Waste Disposal (Bid Item 1).
 - (2) Any fence damaged or removed by the contractor that was not specified in the project drawings shall be replaced per IA-92. The fence type shall be determined by the type of existing fence that was damaged. Sufficient length of fencing shall be replaced to provide a seamless transition between the existing and replacement fence.

IA-95 GEOTEXTILE

A. Measurement and Payment

1. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specification Section.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in accordance with this specification and the construction details therefore are:
 - a. Subsidiary Item - Geotextile Fabric
 - (1) This item shall consist of furnishing and placing geotextile on all earth surfaces that contact the rock riprap, erosion stone, or roadstone as shown on the drawings.
 - (2) Geotextile shall be Class I, nonwoven. See Specification Table 2.
 - (3) The geotextile shall be placed with the long dimension parallel to the channel.
 - (4) Geotextile shall not be measured and shall be considered subsidiary to Rock Riprap and Erosion Stone Ditch Check bid items.
 - (5) No additional payment will be made for geotextile.

TABLE 2. REQUIREMENTS FOR NONWOVEN GEOTEXTILES

Property	Test Method	Class I	Class II	Class III	Class IV ^{3/}
Tensile strength (pounds) ^{1/}	ASTM D 4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure (%) ^{1/}	ASTM D 4632	≥ 50	≥ 50	≥ 50	> 50
Puncture (pounds)	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent opening size – AOS	ASTM D 4751	As specified max. # 40 ^{2/}	As specified max. # 40 ^{2/}	As specified max. # 40 ^{2/}	As specified max. # 40 ^{2/}
Permittivity sec ⁻¹	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

1/ Minimum average roll value (weakest principal

direction). 2/ U.S. standard sieve size

3/ Heat-bonded or resin bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle punched geotextiles are required for all other classes.

IA-620 UNDERGROUND OUTLET

A. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the length of pipe will be computed to the nearest foot along the centerline of pipe and shall include the length of the aprons. Payment will be made to constitute full payment for all labor, materials, equipment, and all other items necessary and incidental to the completion of the work.
2. For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum prices and will constitute full compensation for completion of the work

B. Items of Work and Construction Details

1. Precast Reinforced concrete box culvert, 6' x 8' (Bid Item 18)
 - a. This item will consist of furnishing and installing the Precast Reinforced concrete box culvert as shown on the plans.
 - b. This item shall be completed in accordance with IA-620 and Iowa DOT 2419.
 - c. Measurement and payment for the following items shall be per linear foot of box culvert installed and accepted and does not include the linear feet of culvert end sections, which are to be paid per Bid Item 19.
 - d. A cast in place culvert will also be allowed provided that the design meets the design loading, headwater elevations, and dimensions similar to the proposed pre-cast structure. Additionally, a cast in place culvert shall meet Iowa DOT culvert standards. Details associated with the cast in place culvert will be the responsibility of the contractor, including but not limited to placement of fence, headwalls, reinforcing, and concrete mix design. The cast in place culvert details shall be certified by a Professional Engineer licensed in the State of Iowa. Submit drawings to Engineer for approval and allow 10 working days for the Engineer's review. Providing a cast in place culvert shall not require an adjustment in the unit price, plan quantities, or total culvert bid amount (Sum of Bid Items 18 & 19) provided in the original bid.
2. Bedding Material, Iowa DOT 4115 (Bid Item 16)
 - a. This will consist of furnishing and placing the 24" thick layer of culvert bedding material as shown on the plans.
 - b. Measurement and payment for this bid item shall be on an actual tonnage basis as determined by weigh tickets provided to the engineer.
3. Reinforced Concrete Box Culvert Standard End Sections, Bid Item 19
 - a. Standard Iowa DOT Precast Reinforced Concrete Culvert Type I End Sections shall be furnished and installed on both the upstream and downstream ends of the culvert as shown on the project drawings.
 - b. Culvert end sections shall be the standard size for a 6' span, 8' Rise precast box culvert as shown on the drawings.
 - c. The quantity of work will not be measured for payment. Payment for this item will be made at the contract unit price when satisfactory completion of the culvert wing walls is achieved.
4. Subsidiary Item, Excavation and backfill for culvert installation
 - a. No additional payment will be made for excavation and backfill required for culvert installation.
 - b. Backfill shall be in accordance with IA-23.

Section 2419. Precast Concrete Units

2419.01 DESCRIPTION.

- A. Provide precast concrete units produced in a plant for which equipment, procedures, and quality of concrete have been approved by the Contracting Authority.
- B. Provide, or have fabricator provide, technical personnel experienced and skilled in application of precast system being used. Ensure technical personnel cooperate with Engineer in technical aspects of the work.
- C. Apply provisions of this section to production and construction of precast concrete as defined in [Section 1101](#).
- D. Unless modified elsewhere in the contract documents, perform fabrication in precast fabrication plants that are approved prior to letting.
- E. Requirements for specific precast units are found in the [Materials I.M. 445 series](#), [Materials I.M. 571](#), and in the following specification sections:
 - [Section 4145](#): Concrete Culvert Pipe
 - [Section 2415](#): Concrete Box, Arch, and Circular Culverts
 - [Section 2416](#): Rigid Pipe Culverts
 - [Section 2430](#): Modular Block Retaining Wall
 - [Section 2431](#): Segmental Retaining Wall
 - [Section 2432](#): Mechanically Stabilized Earth (MSE) Retaining Wall
 - [Section 2513](#): Concrete Barrier (Precast)
 - [Section 2435](#): Sanitary and Storm Sewer Structures
 - [Section 2503](#): Storm Sewers
 - [Section 2504](#): Sanitary Sewers
 - [Section 4149](#): Sanitary and Storm Sewer Pipe and Structures Materials
 - [Section 2436](#): Precast Noise Wall
 - [Section 2523](#): Highway Lighting

2419.02 MATERIALS.

Use materials meeting requirements of [Division 41](#) for respective material, and the following:

- A. **Aggregates.**
 - 1. Apply [Sections 4110](#), [4111](#), [4115](#), and [4117](#), except gradation requirements of [Articles 4110.02](#) and [4115.03](#) and cement requirements of [Article 4117.05](#).
 - 2. Submit aggregate gradations and proportions with mix design to District Materials Engineer for approval.
 - 3. Use aggregates similar to Class V only when 30% or more of total weight of aggregate is limestone.

B. Admixtures.

When authorized by Engineer, approved admixtures complying with [Section 4103](#) may be used and shall be from an approved source identified in [Materials I.M. 403](#).

C. Reinforcing Steel and Wire Fabric.

Comply with requirements of [Section 4151](#) and ensure materials are from an approved source identified in [Materials I.M. 451](#). Precast fabricator shall accept reinforcing steel with certified mill test reports for each heat delivered.

D. Cement.

Apply [Section 4101](#), unless otherwise specified. If the use of Type III Portland cement has been authorized, use it in same proportions as specified for Type I Portland cement. Cement with total equivalent sodium oxide between 0.61% and 0.75% may be used, provided it is non-reactive with proposed aggregate when tested according to ASTM C 1260, C 1567, or C 1293.

E. Supplementary Cementitious Materials.

1. Apply [Section 4108](#).
2. Fly ash may be substituted for Portland cement. Use a substitution rate of no more than 25% by weight for wet cast concrete only. Fly ash shall be from an approved source identified in [Materials I.M. 491.17](#).
3. GGBFS may be substituted for Portland cement. Use a substitution rate of no more than 35% by weight for GGBFS as a mineral admixture. GGBFS shall be from an approved source identified in [Materials I.M. 491.14](#).
4. The maximum total supplementary cementitious materials substitution shall not exceed 50%.

2419.03 CONSTRUCTION.**A. Equipment.**

Use equipment meeting requirements of [Section 2001](#) and the following:

1. **Forms:** Use forms for precast concrete true to dimensions shown in contract documents, true to line, mortar tight, and of sufficient rigidity to not sag or bulge out of shape under placement and vibration of concrete. Ensure inside surfaces are smooth and free of projections, indentations, or offsets that might restrict differential movements of forms and concrete.
2. **Weighing and Proportioning Equipment.**
Apply [Article 2001.20](#), except that a vibrator will not be required on cement batch hopper.
3. **Mixing Equipment.**
[Article 2001.21](#).

4. Bins.
[Article 2001.06](#)

B. Concrete.

1. For precast construction, do not exceed maximum water-cementitious ratio, including free moisture in aggregate, of 0.450 pound per pound.
2. Intended air entrainment of finished wet cast concrete is 6%. To allow for loss during placement, use a target value of 6.5% for air content of fresh unvibrated concrete, with a maximum variation of plus 1.5% and minus 1.0%.

C. Proportioning, Mixing, and Placing Concrete.

1. Proportion and mix concrete according to applicable requirements of [Article 2403.02, D, 3.](#)
2. Do not place concrete when ambient temperature is below 35°F unless Engineer has approved plant for cold weather concrete placement. When necessary, heat aggregate or water, or both, so temperature of concrete when deposited in forms is 40°F to 90°F. Do not use frozen material in concrete.
3. When a series of units is cast in a line, cast entire series in one continuous operation, or as directed by Engineer. Place successive batches before preceding batch has perceptibly hardened or dried. Do not allow more than 45 minutes to pass between placement of successive batches of concrete in a unit. Do not retemper concrete or add water to interface of the concrete between batches.
4. Carefully work and consolidate concrete around reinforcement without displacing it. Ensure formation of honeycomb, stone pockets, or similar defects have not occurred. Consolidate concrete using small diameter vibrators or by other means approved by Engineer. Overfill forms during consolidation. Screed off excess concrete and finish surface to desired texture.

D. Curing.

1. Use a method of curing that prevents loss of moisture and maintains an internal concrete temperature at least 40°F during curing period. Obtain Engineer's approval for this method.
2. In all cases, cover concrete and leave covered until curing is completed. Side forms and pans forming underside of channel shapes may be removed during this period if cover is immediately replaced. Do not, under any circumstances, remove units from casting bed until strength requirements are met.
3. When accelerated heat is used to obtain temperatures above 100°F:

- a. Record temperature of interior of concrete using a system capable of automatically producing a temperature record at intervals of no more than 15 minutes during entire curing period.
- b. Space systems at a minimum of one location per 100 feet of length per unit or fraction thereof, with a maximum of three locations along each line of units being cured.
- c. Ensure all units, when calibrated individually, are accurate within $\pm 5^{\circ}\text{F}$.
- d. Do not artificially raise temperature of concrete above 100°F for a minimum of 2 hours after units have been cast. After 2 hour period, temperature of concrete may be raised to a maximum temperature of 160°F at a rate not to exceed 25°F per hour.
- e. Hold maximum temperature for a period sufficient to develop strength required for release of prestress or for post tensioning, as the case may be.
- f. Lower temperature of concrete at a rate not to exceed 40°F per hour by reducing amount of heat applied until interior of concrete has reached the temperature of surrounding air.

E. Placing Reinforcement.

Place reinforcement carefully, accurately, and secure in proper position according to contract documents. Apply [Article 2404.03](#).

F. Removal of Forms.

If forms are removed before concrete has attained strength which will permit units to be moved or stressed, remove protection only from immediate section from which forms are being removed. Immediately replace protection and resume curing following form removal. Do not remove protection any time before units attain specified compressive strength when surrounding air temperature is below 20°F .

G. Tolerances.

Limit variation from dimensions shown in contract documents to no more than 1/8 inch. For overruns, greater deviation may be accepted if, in Engineer's opinion, it does not impair suitability of member for its intended use.

H. Handling and Storage.

During fabrication, storage, handling, and hauling take care to prevent cracking, twisting, unnecessary roughness, or other damage. In particular, do not allow tiedowns to come in direct contact with concrete surfaces. Do not subject units to excessive impact. Replace, at no additional cost to Contracting Authority, units that are, in Engineer's opinion, damaged in a way to impair their strength or suitability for their intended use.

I. Finish.

Finish surfaces which will be exposed in finished structure as provided in [Article 2403.03, P. 2, b.](#)

2419.04 METHOD OF MEASUREMENT.

For precast units, Engineer will determine quantity of each of the various respective sizes, lengths, and types per the sections listed in [Article 2419.01, E.](#)

2419.05 BASIS OF PAYMENT.

Payment will be per the sections listed in [Article 2419.01, E.](#)

Section 2528. Traffic Control

2528.01 DESCRIPTION.

A. General.

1. This section describes various materials, equipment, and procedures involved in traffic control during construction. The Contractor and the Contracting Authority have certain responsibilities, whether public traffic is allowed or is prohibited during construction. Apply [Article 1107.09](#).
2. The contract may include an item for traffic control. In this case furnish, erect, operate, maintain, move, and remove all traffic control devices required by the contract documents.
3. The contract may indicate that traffic control is incidental. In this case the Contracting Authority will furnish all signs and traffic control devices, except pilot car and flaggers' signs, and all Type III barricades, and associated mounting devices. Furnish all other traffic control devices required. Erect, operate, maintain, move, and remove all traffic control devices. Signs and barricades to be furnished by the Contracting Authority will be made available at a nearby maintenance site. Return the signs and barricades when no longer needed. Contracting Authority signs and barricades damaged during construction activities by Contractor's activities shall be replaced at no charge to the Contracting Authority.
4. The contract documents may specify orange mesh safety fence be used in conjunction with other traffic control devices as part of the project traffic control requirements. Use orange mesh safety fence meeting the requirements of [Article 4188.03](#). Securely support the fence so it is in a vertical position without any sagging. Locate and place the safety fence supports so they are not a safety hazard.
5. Ensure all traffic control complies with the current edition of the MUTCD, Part 6 as adopted by the Department, unless modified by the contract documents.
6. On Interstate and Primary Road projects, use crashworthy Category I and Category II traffic control signs and devices that meet NCHRP Report 350; or MASH 2016 (Manual for Assessing Safety Hardware).
7. Upon request provide the following to the Engineer for the purpose of documenting the crashworthiness of Category I and Category II signs and traffic control devices:
 - a. The vendor's self-certification for Category I traffic control devices.
 - b. FHWA NCHRP Report 350 or MASH approval memos for Category II signs and traffic control devices.
8. A list of approved Category II traffic control devices is found on the World Wide Web at the following URL:
https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/.
9. ~~Gender specific signs, such as FLAGMAN and MEN WORKING, will not be allowed. Use neutral gender signs, for example FLAGGER, or equivalent symbol signs.~~

409. Provide 10 calendar days advance notification of a pedestrian path closure to the following:

- National Federation of the Blind of Iowa: Affiliate President,
<https://nfb.org/resources-iowa>.
- Engineer

B. Monitoring with Incident Response.

1. Provide 24 hour per day continuous monitoring of traffic control devices and incident response for emergency situations on projects during complex traffic situations as defined in the contract documents. ~~The contract documents will identify projects requiring monitoring with incident response.~~ Ensure a vehicle and operator traverses the project throughout the entire traffic control zone at all times, except for refueling and short rest breaks no greater than 15 minutes in duration.
2. Furnish this work according to the contract documents any time that signs, barriers, barricades, or other traffic control devices are in place during complex traffic situations.
3. Provide a vehicle and operator for this work as follows:
 - a. **Equipment.**
 - 1) Meet the following requirements:
 - a) 3/4 ton pickup truck or another similar vehicle.
 - b) Contractor's insignia on the doors of the vehicle.
 - c) Adequate weight and power and suitably equipped to move stalled automobiles, sport utility vehicles, or pickup trucks.
 - d) Equipped with an amber ~~revolving light or amber strobe~~ or yellow high intensity rotating, flashing, or oscillating warning light visible in all directions and a cellular telephone or similar type of mobile phone.
 - e) Capable of carrying traffic signs, tools, traffic control devices, and other necessary equipment.
 - 2) When used on projects where more than one lane in one direction is maintained at all times, ensure this vehicle is also be equipped with a Type C arrow panel as described in ~~Article 2528.03, G~~ [Article 2528.03, E](#), mounted to be visible to traffic approaching from behind.
 - b. **Operation.**
 - 1) Furnish an operator for the vehicle. Ensure the operator re-erects, repairs, or replaces defective devices immediately upon discovery.
 - 2) Have the operator:
 - a) Be available to assist persons with vehicle problems and move automobiles, sport utility vehicles, pickup trucks and other obstructions ~~so as~~ to keep all travel lanes and shoulders available for public traffic.
 - b) Continue assistance to motorists and involvement with obstructions until they are no longer an impediment to traffic and further assistance can be provided safely by others.
 - c) Assist motorists or remove obstructions promptly and safely when a vehicle or anything else is obstructing a travel lane or shoulder intended to be clear.
 - d) Summon further assistance if needed.
 - e) Keep a report of any events that restrict the normal traffic flow during complex operations, including responses to emergency situations, on forms provided by the Engineer. Provide the Engineer with a copy of this report daily.

- 3) During anticipated peak traffic times, the Engineer may direct the Contractor to provide additional monitoring personnel. Payment will be made as extra work according to [Article 1109.03, B.](#)

C. Traffic Quality Control.

1. Maintain a Traffic Control Technician on staff, even though the traffic control portion of the contract may be subcontracted. The Traffic Control Technician is required to have attended and passed the exam in an ATSSA Traffic Control Technician, IMSA Work Zone Traffic Control, Iowa AGC Traffic Control Technician class, Minnesota DOT Traffic Control Supervisor training class, or Texas Engineering Extension Service Work Zone Traffic Control training class. This Traffic Control Technician is responsible for overall management of the Contractor's quality control program for traffic control. Starting April 2018, the Traffic Control Technician shall retake and pass the exam in one of the approved classes every 5 years.
2. On a daily basis as the project is constructed, perform the following quality control work associated with monitoring and documenting traffic control conditions:
 - a. Review all traffic control operations for compliance with contract documents and maintain a project traffic control daily diary in a format provided by the Contracting Authority. Submit this diary to the Engineer. It will become a part of the Contracting Authority's permanent project records. The Engineer may require submission of completed portions of the daily diary at routine intervals during construction of the project. In the diary include:
 - Listing and station location of traffic control used each day referenced to the appropriate Standard Road Plan, project plan sheet, etc.,
 - All reviews of traffic control devices and operations, whether satisfactory or unsatisfactory, and corrections made,
 - Approved changes to the contract document's traffic control,
 - Incidentals affecting the efficiency and safety of traffic, and
 - A daily list of trained flaggers used, including hours worked.
 - b. Monitor traffic operations and submit proposed Traffic Control Plan changes to the Engineer for approval.
 - c. Coordinate all changes to the Traffic Control Plan.
 - d. Coordinate all traffic control operations, including those of subcontractors and suppliers.
3. Employees who install and remove temporary traffic control signs and devices shall be supervised by a trained Traffic Control Technician per [Article 2528.01, C, 1](#). When traffic control is installed or removed, the Traffic Control Technician who supervised the installation or removal of temporary traffic control devices and signs shall document in the daily traffic control diary what was installed or removed.

2528.02 MATERIALS.

Use materials meeting the requirements of Part 6 of the MUTCD and [Division 41](#) for the respective traffic control signs and devices.

2528.03 ~~SIGNS AND DEVICES~~ CONSTRUCTION.

A. Signs.

1. Furnish signs that are of the size and type shown in the contract documents and use retroreflective sheeting meeting the requirements of [Article 4186.03](#).
2. For Interstate and Primary projects, furnish diamond shaped warning signs that are 48 inches by 48 inches unless specified otherwise in the contract documents.
3. For traffic control zones in duration for 4 calendar days or more, mount signs on fixed posts.
4. Signs for traffic control zones in duration for less than 4 calendar days may be mounted on moveable skids or fixed posts.
5. Meet the following requirements for fixed post mounted signs:
 - a. Sign sheeting applied to rigid wood or metal.
 - b. Mounted at a height of at least 7 feet, measured from the bottom of the sign to the near edge of the pavement. A secondary sign on the same post may be mounted 1 foot lower than specified above.
 - c. A clear distance 2 feet behind a curb or beyond the edge of the shoulder.
6. Meet the following requirements for moveable skid mounted signs:
 - a. Flexible roll-up sheeting or other skid mounted sign systems that meet NCHRP 350 or MASH requirements.
 - b. Mounted at a height of at least 1 foot above the roadway.
7. Ensure mounting devices are not so substantial as to be a hazard to vehicles. Meet the following requirements for posts mounted in existing soil:
 - a. Wood sign supports meeting the materials requirements of [Article 4164.04](#).
 - b. 3.0 pounds per foot U-shaped rail steel posts.
 - c. 2 1/4 or 2 1/2 inch square 12 gage perforated steel tubing.
8. Dual-post and triple-post configurations using these sign supports are acceptable provided that no more than two posts occupy any 8 foot wide path. Bracing of these posts will not be permitted. Posts exceeding these requirements shall have breakaway features approved by the Engineer.
9. Ensure signs are in a condition so they are effective for the intended purposes when viewed from a vehicle. For nighttime installations, ensure the reflectance is adequate so that the message is clearly readable. Ensure signs are maintained in a near vertical position.
10. When indicated in the contract documents, use supplemental sign flags in conjunction with work zone signing. Use sign flags 16 inches square and sheeted with red Type ~~IV~~ XI retroreflective sheeting meeting requirements of [Article 4186.03](#).
11. On projects where two new lanes are being constructed adjacent to an existing two lane highway, place TWO WAY TRAFFIC (W6-3) signs. Place them off the right shoulder of mainline: 1) after each public side road for each direction of travel for traffic that may enter from all intersecting side roads; or 2) at 1/2 mile intervals, whichever is less. Install these signs when grading activities start and leave in place until the entire four lane divided highway is opened to traffic. If the pavement is constructed under a separate contract, leave these signs in place after the grading contract is completed. They become the property of the Contracting Authority. The paving contractor then takes over these signs and removes them when the four lane divided highway is opened to traffic. Payment will be according to [Article 2528.05, A](#).

12. When directed by the Engineer, cover or remove permanent signing that conveys a message contrary to the message of the temporary signing and not applicable to the working conditions. When the work is completed uncover or replace permanent signing. Permanent signs damaged by the Contractor's activities shall be replaced at no charge to the Contracting Authority.
13. The END ROAD WORK (G20-2) sign may be eliminated for mobile or short duration (less than 1 hour) temporary traffic control zones.
14. When milled or scarified surfaces exist, sign approaches to scarified areas using ROUGH ROAD (W8-8) signs. Place signs at least 250 feet in advance of milled or scarified areas. Repeat signs for traffic that may enter within the scarified area from intersecting public roads. At locations where milled or scarified areas end at project limits, bridges, or end of day's work; place BUMP (W8-1) signs within 50 feet in advance of each location. Erect, move, and maintain these signs until milled or scarified areas have been covered with new HMA or PCC pavement.

B. Portable Dynamic Message Signs

Furnish, place, operate (when specified), and maintain Portable Dynamic Message Sign (PDMS) meeting requirements of [Article 4188.07](#) at locations shown on the plans. The Contractor maintains possession of PDMS upon completion of the project.

1. Testing and Configuration.

- a. Physical and electronic access to PDMS shall be granted to the Engineer.
- b. On Interstate and Primary projects:
 - 1) At least 1 week before PDMS is deployed to a project, a testing and configuration meeting with the Engineer shall be held.
 - 2) The Contractor, shall perform necessary configuration adjustments to the PDMS and cellular modem to allow remote control by the Contracting Authority's NTCIP software.

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2. Remote Operation.

- a. On Interstate and Primary projects, the Department will remotely operate signs through use of a modem and NTCIP software.
- b. Contracting Authority will use their own NTCIP compliant software to activate messages, check sign's status, and perform diagnostic tests.
- c. Anytime during the project, the Engineer may remotely activate a message on the PDMS. Any message placed on the PDMS shall not be removed or replaced by the Contractor unless requested by the Engineer.

3. Direct Operation.

- a. On Secondary road projects, PDMS will be operated directly by either the Contractor or the Engineer.
- b. The Engineer may request the Contractor to operate PDMS for advance traffic notification and warning. Authority to operate PDMS will be under the direction of the Engineer. The Contractor may only operate the PDMS to display messages authorized by the Engineer.
- c. Promptly program and/or reprogram the computer to provide the messages as directed by the Engineer.

4. Maintenance.

- a. Provide preventive maintenance necessary to achieve uninterrupted service. Provide monitoring of health of each PDMS to accomplish proactive preventive maintenance and provide uninterrupted service. This includes, but is not limited to, performing remote diagnostic tests of

equipment's operational status, monitoring status of system performance such as communication, battery status, etc.

- b. Engineer may perform remote diagnostic tests of sign's operational status and notify Contractor when a problem is detected.
- c. Respond to service phone calls immediately and to the service request emails within 2 hours. Conduct remote or on-site troubleshooting and respond back to the Engineer with notification of action (i.e. device repaired remotely, sending field technician, etc.) within 2 hours of responding.
- d. Provide unscheduled maintenance or total replacement of sign when sign is unable to display a message adequately within 24 hours of notification. Action shall be taken to resolve the following problems if they have been visually observed or confirmed by self diagnostics by the PDMS for three continuous days or seven intermittent days over a 2 week period.
 - 1) An entire pixel board is showing failure.
 - 2) Five or more pixel failures over entire message panel anytime while sign is deployed for use (blank or displaying a message).
 - 3) Two or more pixel failures in any character when displaying a message.
- e. Repairs shall be completed within 12 hours of initial notification or the Engineer may cause such work to be performed as may be necessary to provide this service. The cost for this restoration shall be borne by the Contractor.

C. Channelizing Devices.

1. Use Channelizing Devices that are of the type shown in the contract documents. Ensure all channelizing devices meet the current requirements of the MUTCD and [Section 4188](#). Use reflective sheeting meeting the requirements of [Article 4186.03](#).
 - a. **Barricades.**
 - ~~1) A 2 foot minimum length barricade may be used when Type I or Type II Barricades are furnished as one of the options for channelizing devices in lieu of vertical panels, 42 inch channelizers, cones, or drums.~~
 - 2 1) Ensure Type III barricades have a minimum length of rail of 6 feet. When traffic is permitted in each direction around a Type III Barricade, ensure the Type III Barricade used has fully reflectorized faces on both sides of the rails.
 - 3 2) Erect barricades in essentially a ~~horizontal~~ vertical position perpendicular to the direction of approaching traffic. Ballast them so as not to cover any striped rail.
 - b. **Cones, ~~Vertical Panels~~, 42 Inch Channelizers, Drums, and Tubular Markers.**
 - 1) Ensure cones, ~~vertical panels~~, 42 inch channelizers, drums, and tubular markers, and other traffic control devices meet the current requirements of the MUTCD, and [Section 4188](#).
 - ~~2) When used to separate two-way traffic, separate temporary no-passing lines approximately 16 inches, with the marker to be installed between these lines.~~
 - 3 2) Ensure tubular markers meet the following:
 - a) A nominal 36 inch height.
 - b) Diameter facing traffic at least 2 inches in width.
 - c) Completely faced with reflectorized white and orange sheeting that is in two bands 4 inches wide with 6 inches between bands, with the top band no more than 2 inches from the top of the tubular marker.

4 3) Cones may be used as channelizing devices in tapers and along lane lines during daylight hours only.

5 4) 42 inch channelizers may be used in place of drums in work areas remaining in place for up to three days. Spacing of channelizers shall be half the spacing required for drums or double the number of drums required.

c. Temporary Lane Separator System.

1) Installation.

Install according to the manufacturer's recommendations.

2) Maintenance.

Repair or replace all damaged curb units or posts no later than 24 hours after the damage is reported to the Contractor.

3) Removal.

a) Upon completion of the project, the temporary lane separator system will remain the property of the Contractor for systems used in temporary traffic control zones. When placed as part of a permanent installation, the system will become the property of the Contracting Authority.

b) Repair all holes left in the pavement or bridge deck when the temporary lane separator system is removed. Holes shall be filled with a non shrink grout meeting the requirements of [Materials I.M. 491.13](#).

2. Channelizing devices may be placed up to 2 feet beyond centerline or lane line at specific locations where actual work activity is taking place. Return channelizing devices to the original position when the work activity has passed.
3. Individual channelizing devices may be omitted during working hours in areas where placement interferes with the work. Channelizing devices on tapers are required at all times.
4. Do not intermix channelizing devices of different types.
5. For pedestrian path closures, use Type III Barricades to block the full width of the pedestrian path. Mount a SIDEWALK CLOSED (R9-9) sign to at least one of the Type III barricades at each closure.

~~D. Pilot Cars.~~

- ~~1. Pickup trucks or automobiles displaying the Contractor's company insignia, equipped with G20 4 signs reading: PILOT CAR - FOLLOW ME. Ensure two signs are mounted on the vehicle so as to be clearly visible from both directions of traffic. Mount the signs so the bottoms are at least 1 foot above the top of the vehicle's roof.~~
- ~~2. Operate pilot cars such that they maintain a uniform speed through the work area, no greater than 40 miles per hour.~~

E D. Temporary Barrier Rail.

Use temporary barrier rail as shown in the contract documents. Unless shown otherwise, use precast concrete units. Tie the units together as specified or as approved by the Engineer.

F E. Modular Glare Screens.

1. When specified in the contract documents furnish, install, and maintain a modular glare screen system on the top of concrete barrier rail according to the contract documents and the modular glare screen system manufacturer's instructions. Furnish a system consisting of modular base rails attached to the top of concrete barrier rail with blades evenly spaced and securely mounted to the base rails. Ensure the following:
 - Modular base rails and glare screen blades are compatible so the base unit and blades can be securely attached to each other.
 - Base rails and blades supplied are manufactured by the same manufacturer.
 - The length of individual modular base rails is no longer than the nominal length of individual temporary concrete barrier rail sections.
 - The width of the modular base rails is no wider than the top width of the concrete barrier rail.
 - Glare screen blades are FHWA highway green in color and made of impact resistant non-metallic high density plastic material.
 - Blade height is from 24 inches to 30 inches and width is from 6 inches to 9 inches.
 - The same uniform sized blades are used throughout the work.
 - The modular glare screen system is manufactured by a company on the approved manufacturer's list in [Materials I.M. 486.06, Appendix A](#).
2. Install the modular glare screen system according to the manufacturer's instructions and the approval of the Engineer. Install the system so that:
 - It is centered along the longitudinal axis length of the top of the concrete barrier rail.
 - The overhang of the base rails, blades, and associated assembly over the edges of the top of the concrete barrier rail is kept to a minimum.
 - The modular base rails are flush with the top of the concrete barrier rail and they do not extend over the joints between concrete barrier rail sections. A maximum gap between base rails across barrier rail gaps shall be 12 inches.
3. Install glare screen blades so the combination of blade width and spacing provide for a minimum 22 degree sight cut-off angle.
4. Glare screen blades shall be free from reflective sheeting or other modifications and shall be consistent in appearance.
5. Maintain the modular glare screen throughout the work. Replace or repair damaged parts of the modular glare screen system, as soon as practical, at no additional cost to the Contracting Authority.
6. When moving temporary barrier rail with a modular glare screen system, the Contractor may temporarily remove base rails and glare screen blades, if necessary, to assist in the moving. Reinstall the removed base units and glare screen blades as soon as the temporary concrete barrier rail has been moved to its new location.
7. Perform final removal of the modular glare screens from the concrete barrier rail when directed by the Engineer. Upon removal, ensure there are no protrusions on the top of the concrete barrier rail.
- ~~8. Upon completion of the work, the Contractor retains ownership of the modular glare screen system.~~

G F. Lighting Devices Arrow Boards.

4. ~~Furnish lighting devices as required by the contract documents. Type A barricade warning lights will normally be required for nighttime installations. Type B warning lights will normally be required for 24 hour operation.~~
-
2. ~~Use barricade warning lights that comply with the ITE Standard for Flashing and Steady Burn Barricade Warning Lights and are identified as such. In addition, use Type A barricade warning lights that:~~
 - ~~Operate on a 12 volt battery system, unless the ITE identification specifically indicates that the rating is based on a different system, and~~
 - ~~Are visible to both directions of traffic.~~
-
3. ~~When arrow displays are used, furnish Type C arrow displays described in the current edition of the MUTCD, Part 6, and operate them in a sequential chevron mode when indicating a lane change.~~
1. **Operation.**
 - a. When indicating a right or left lane closure, operate in a sequential chevron mode.
 - b. When indicating a traffic split, operate in a flashing double arrow mode.
 - c. When indicating caution, operate in an alternating diamond mode.
-
2. **Remote Communications.**
When using an Arrow Board for stationary work zones on the Interstate System, remote communication capabilities meeting requirements of [Article 4188.10, F](#) are required.
-
3. **Type and Size.**
Type C Arrow Boards as defined in Part 6 of the MUTCD are required for all applications.
4. **Testing and Configuration.**
On Interstate projects, at least 1 week before Arrow Board is deployed to a project, a testing and configuration process shall be performed with the Engineer.

H G. Temporary Traffic Signals.

1. **General.**
 - a. Set up and operate temporary traffic signals as shown in the contract documents. Ensure the temporary traffic signal system meets the physical display and operational requirements of conventional traffic signals as specified in Part 4 of the MUTCD. Unless stated otherwise in the contract documents, either a span wire or trailer mounted temporary traffic signal system may be provided.
 - b. In the event any part of the temporary traffic signal system malfunctions or a continuous red flash mode is encountered, furnish flaggers on a 24 hour/7 day a week basis until repairs are made and the signals are fully functional. For temporary traffic signals at intersections, install stop signs on all approaches until the signals are fully operational, at no additional cost to the Contracting Authority.
 - c. Notify the Engineer at least 48 hours prior to the use of the signals for timing approval and verification.
2. **Equipment.**
 - a. **Trailer, or Span Wire, or Flagger Station Mounted Systems.**

- 1) Furnish actuated signal controllers complying with NEMA and ITE standards. Ensure the temporary traffic signal system complies with the following:
 - a) Includes a solid state digital traffic signal controller capable of operating the signals according to MUTCD requirements and NEMA Standard TS-5. A copy of the manufacturer's certificate of compliance is to be posted in the control cabinet (in a weatherproof folder) and made available to the Engineer upon request.
 - b) Has conflict monitoring complying with NEMA Standard TS1 and the following:
 - Detects the presence of conflicting signal indications, absence of proper voltages, and proper operation of the controller.
 - Upon detection of a conflict or loss of communication, all signals enter into flashing red mode.
- 2) Apply [Article 2525.03, E, 4](#), with the following exceptions for one lane two way traffic control:
 - a) **Green Revert.**
If during an All Red clearance interval a call occurs on the phase losing the right-of-way prior to a call on any other traffic phase, the right-of-way reverts to the previous traffic phase, initiating the initial green interval. The transfer is to be immediate without completing the All Red clearance interval.
 - b) **Rest in Absence of Actuation.**
In the absence of detector actuation of assertion or recall switch(es), the right-of-way indication dwells in All Red.
- 3) Comply with the following:
 - a) Clearance for overhead wiring is a minimum of 18 feet.
 - b) A detection area is located near the stop line with the downstream edge positioned 6 feet from the stop line. A second detection area is located 100 to 150 feet in advance of the stop line. The size of detection areas is 6 feet by 10 feet. A single above-ground detector may be used to provide detection for both areas.
 - c) Signal heads have 12 inch lenses and comply with ITE Specification "Vehicle Traffic Control Signal Heads". All signal heads are equipped with visors and back plates. The backplate provides a minimum of 5 inches black field around the signal assembly and has a dull black finish.
 - d) A minimum of two traffic signal heads per approach. All signal heads mounted over the road surface are mounted a minimum of 15 feet from the bottom of the signal head to the top of the road surface. One signal head mounted over the center of the travel lane. All far right signal heads mounted a minimum of 8 feet from the bottom of the signal head to the top of the ground surface. Required signal heads for through traffic on any one approach located no less than 8 feet apart measured horizontally perpendicular to the approach between the centers of the signal faces.
- b. **Trailer Mounted Systems.**
Provide a system consisting of two or more self-contained trailer mounted units each containing two signal heads.
- c. **Span-Wire Mounted Systems.**
Ensure posts meet the requirements of [Article 2528.03, A](#).
- d. **Flagger Station Systems.**

Provide a traffic signal system, for one-lane/two-way operation in conjunction with a flagger and/or pilot car operation in order to provide greater advance visibility to the flagging operations.

- Two or more self-contained trailer mounted units each consisting of one or two signal heads.
- Single-signal head systems shall have a signal head mounted on each side of the roadway
- Two-signal head systems shall have one signal head mounted on a mast arm capable of extending over the center of the travel lane and the other signal head mounted on the same trailer.

3. Operational Requirements.

- a. Locate signals, stop bars, and signs exactly as identified in the contract documents. Secure and level temporary traffic signal installations in a manner approved by the Engineer.
- b. Program all temporary traffic signals for red flash upon startup, conflict, or power failure. Program the temporary traffic signal system to dwell in All Red.
- c. For one lane two way traffic control operations, when an additional phase is used for a side road movement, only one long all red interval is to be used between active phases on each side of the work area.
- d. Set signal timing as identified in the contract documents.

4. Equipment Crossings.

- a. For equipment crossings, use a signal operator to control the signal system. Position this operator with good sight distance for both the mainline and haul road.
- b. Program the signal system with fixed yellow and all red time periods so the operator can only activate the beginning of the yellow interval for mainline traffic.
- c. When the equipment crossing is not in use, set the signal to yellow flash mode. If hauling operations are suspended for more than one week, cover the signal heads, or if portable trailer units are used, remove the trailers.

† H. Temporary Floodlighting.

1. General.

- a. Set up and operate either pole mounted or portable, ~~mobile~~ self contained LED temporary floodlights at locations shown in contract documents.
- b. Ensure floodlighting is installed and in service before commencing work requiring nighttime traffic control according to the traffic control plan.
- c. Exercise reasonable care to avoid interruptions during hours of darkness, promptly repair damage to system, and replace burned out lamps promptly.

2. Equipment.

a. Pole Mounted Floodlights.

- 1) Pole-mounted luminaire.
- 2) Mounting height of luminaires is no less than 35 feet above the roadway and as shown in the contract documents. Pole length determined by field measurement to obtain specified mounting height.

- 3) Place poles outside normal shoulder line at approximate locations shown on the contract documents.
- 4) Meet the following requirements for floodlighting luminaires:
 - Standard roadway types with totally enclosed refractors.
 - IES glare control rating of "cut off".
 - Lamps with initial output rating at least 19,000 lumens.
 - Photoelectric controlled for dusk to dawn operation.
 - Approval of the Engineer.
- 5) Ensure clearance for overhead wiring at least 18 feet. Auxiliary poles used to furnish power to floodlighting offset 30 feet from traveled way unless there are right-of-way restrictions.
- 6) Above ground lighting circuits are aluminum or A.C.S.R. triplex.
- 7) Underground lighting circuits are type U.S.E. or U.F.
- b. **Portable, Mobile Self Contained LED Floodlights.**
 - 1) Mounted on portable trailers containing solar cell array and storage battery system to power LED luminaire. Ensure system meets NCHRP 350 or MASH Category IV crash testing.
 - 2) Ensure mounting height of LED luminaires is no less than 17 feet above roadway, or as shown in the contract documents.
 - 3) Locate portable trailers so LED luminaire is centered over outside edge of pavement and trailer is on shoulder offset as far as possible from traveled way
 - 4) Meet materials requirements of [Article 4188.05](#) for LED Floodlighting Luminaires.

J I. Temporary Crash Cushions.

Apply [Section 2551](#).

K J. Flaggers.

1. Prior to flagging operations, ensure the flaggers are trained in safe flagging operations that comply with [Iowa DOT Flagger's Handbook](#), Part 6 of the MUTCD, and the Standard Specifications. Ensure training of flaggers includes the following:
 - a. Issuing and reviewing the current [Iowa DOT Flagger's Handbook](#),
 - b. Presentation of the current Iowa Professional Flagging Video,
 - c. Issuing flagger training cards including the information below. ~~Ensure the flaggers carry their flagger training card at all times and show it upon request.~~
 - 1) Employee name,
 - 2) Date of training,
 - 3) Name of Instructor, and
 - 4) Expiration date of December 31 of the year following the training date.
2. Maintain a list of the flaggers trained and the date of the training.
3. Training is not required for short time, emergency, or relief assignment of employees to flagging operations. Payment will not be made in accordance with [Article 2528.05.I](#).
4. Ensure flagger operations, equipment, and apparel comply with the current [Iowa DOT Flagger's Handbook](#).
5. When nighttime flagging is required, provide auxiliary lighting to illuminate the flagging stations according to the MUTCD, Part 6 and current [Iowa DOT Flagger's Handbook](#). Set up this lighting in such a manner to minimize glare to motorists.

The cost of furnishing nighttime flagging stations lighting is included in the lump sum price bid for Traffic Control.

6. Ensure flaggers always carry their flagger training card and show it upon request.

K. Pilot Cars.

1. Pickup trucks or automobiles displaying Contractor's company insignia on doors of the vehicle, equipped with G20-4 signs reading: PILOT CAR - FOLLOW ME. Ensure two signs are mounted on vehicle to be clearly visible from both directions of traffic. Mount signs so bottoms are at least 1 foot above top of vehicle's roof.
2. Operate pilot cars so they maintain a uniform speed through work area, no greater than 40 miles per hour.

L. Temporary Portable Rumble Strips

Use temporary portable rumble strips of the type shown in the contract documents and meeting requirements of [Article 4188.08](#).

1. Placement.

- a. A temporary portable rumble strip panel consists of three individual temporary portable rumble strips placed on roadway surface.
- b. Place centerline end of temporary portable rumble strip 6 inches from centerline of roadway perpendicularly extending its full length transversely across pavement surface.
- c. Place each individual temporary portable rumble strip 15 to 20 feet apart within the temporary portable rumble strip panel.

2. Maintenance.

Ensure temporary portable rumble strips maintain alignment within 6 inches perpendicular to centerline of roadway when measured from one end to the other end of the individual temporary portable rumble strip.

3. Removal.

When temporary traffic control requiring temporary portable rumble strips is no longer in operation, remove temporary portable rumble strips from roadway.

M. Speed Feedback Signs.

Furnish, place, operate, and maintain speed feedback signs at locations shown on the contract documents. Ensure all speed feedback signs meet the current requirements of the MUTCD and [Section 4188](#).

1. Definitions.

a. Speed Feedback Trailer.

Speed feedback trailers are mobile devices using speed feedback signs to capture vehicle speed for oncoming traffic.

b. Display.

The display is a device connecting to the speed feedback trailer capable of broadcasting the speed of oncoming traffic captured by the speed feedback sign. This device allows for vehicle speed feedback to the vehicle operator, allowing for speed adjustment throughout the remainder of the work zone.

2. Testing and Configuration.

- a. At least 1 week before speed feedback trailer is deployed to a project, a testing and configuration meeting with the Engineer shall be held.

- b. The Contractor, in conjunction with the Engineer, will perform necessary configuration adjustments to the speed feedback trailer.

3. Maintenance.

- a. Provide preventive maintenance necessary to achieve uninterrupted service.
- b. Verify operational status each day as part of the daily diary and notify Engineer when a problem is detected.
- c. Provide unscheduled maintenance or total replacement of sign when sign is unable to display a message adequately within 24 hours of notification. Action shall be taken to resolve the following problems if they have been visually observed or confirmed by self diagnostics by the speed feedback trailer for 3 continuous days or 7 intermittent days over a 2 week period.
 - 1) An entire pixel board is showing failure.
 - 2) Five or more pixel failures over entire message panel anytime while sign is deployed for use (blank or displaying a message).
 - 3) Two or more pixel failures in any character when displaying the speed.
- d. If service is not restored within 24 hours, Engineer will cause such work to be performed as may be necessary to provide this service. The cost for this restoration shall be borne by the Contractor.

~~4. Remove speed feedback trailers when no longer needed.~~

N. Safety Closure.

Two types of safety closures will be specified: road closures and hazard closures.

1. Road Closures.

- a. Place fence meeting requirements of [Article 2528.02](#) across roadway from outside edge of shoulder to outside edge of shoulder. Securely support fence so it is in a vertical position without sagging.
- b. Place Type III barricade, described in Part 6 of the MUTCD, immediately in front of fence at the approximate roadway centerline. Mount ROAD CLOSED (R11-2) sign on the Type III barricade.
- c. In lieu of [Articles 2528.03, N, 1, a](#) and [b](#) above, place a series of Type 3 barricades across roadway from outside edge of shoulder to outside edge of shoulder. Ensure gaps between Type 3 barricades are no greater than 6 inches. Mount ROAD CLOSED (R11-2) sign over the top two rails of on the Type 3 barricade located closest to the approximate roadway centerline.
- d. Erect road closures as specified in the contract documents. Erect them on the mainline of roadway where public traffic is diverted onto an on-site detour and where public traffic is prohibited from entering work area.
- e. Erect road closures beginning with the start of the contract period as specified in the contract documents, or when work commences.

2. Hazard Closure.

- a. Place fence meeting requirements of [Article 2528.02](#) across roadway from outside edge of shoulder to outside edge of shoulder. Securely support fence so it is in a vertical position without sagging.
- b. Place Type III barricade, described in Part 6 of the MUTCD, immediately in front of fence at the approximate roadway centerline.
- c. In lieu of [Articles 2518.03, N, 2, a](#) and [b](#) above, place a series of Type 3 barricades across roadway from outside edge of shoulder to outside edge of shoulder. Ensure gaps between Type 3 barricades are no greater than 6 inches.
- d. Erect hazard closures as specified in the contract documents. Erect them at locations within work area when construction involves major hazards on existing or relocated roadways. Such hazards may be located at streams,

gullies, railroads, bridge approaches, and driveway locations. Through public traffic should not normally encounter a hazard closure.

- e. Erect hazard closures beginning with the start of the contract period as specified in the contract documents, or when work commences.

3. Responsibility.

- a. Maintain location and condition of safety closures. Any Contractor who temporarily moves the safety closure for equipment or delivery of materials, shall replace it in its original position and is responsible for the restriction of public traffic into the closed area.
- b. If a safety closure placed by the Contractor is required for an area after the Engineer's approval of completed work for that specific area, maintenance of that safety closure will become the responsibility of the Contracting Authority. The Engineer will document in writing the transfer of authority.
- c. The Engineer will notify Contractor of the date of removal of safety closures. Safety closure remains property of the installing Contractor. If safety closure is not removed by the date specified in the notification, it will become property of the Contracting Authority and the Contractor will be charged for removal costs.

N O.Limitations.

1. Use sandbags or other crashworthy methods to anchor all traffic control devices subject to movement by wind.
- ~~2. When a two-way road is open to public traffic during contract work, do not control one-way traffic through the work area by means of a carry through flag or other token, except during equipment failure or emergency. Use other means when voice or signal communication between flaggers at control points is difficult or not effective because of distance, sight, or noise. Other means may be two-way radio, pilot cars, or traffic signals.~~
- ~~3. Use pilot cars when the normal work area exceeds 1/4 mile on Primary projects. Where necessary for short durations, the distance may be extended to 1/2 mile for better sight distance or to clear intersections or other safety considerations with approval of the Engineer, provided a two-way radio is used for communication between flaggers.~~
- 4.2. During non-working hours, remove, cover, or turn down traffic control devices intended for working hours only, unless a drop-off or physical obstruction remains within 15 feet of a lane open to traffic. Signs or barricades are not required for work beyond 15 feet of a lane open to traffic. When traffic control devices are no longer needed, remove them.
- 5.3. Personnel in the highway right-of-way shall wear only orange or strong yellow green ANSI 107 Type R Class 2 apparel when exposed to traffic or construction equipment. Orange or strong yellow green colored or a combination of these colors, ANSI 107 Class E pants or shin reflectors/gaiters are also required to be worn at night. Shin reflectors/gaiters shall have a minimum of two 2 inch bands of retroreflective material spaced at least 6 inches apart. Background material shall extend at least 2 inches above and below retroreflective bands and continue through the length of shin reflector/gaiter. Shin reflector/gaiter shall completely encircle the leg and be worn on lower leg between knee and ankle.
- 6.4. The Engineer may require signs and traffic control devices to be recleaned by washing. Use a brush and water, and detergent or solvent as necessary. Include

the entire target area or sign face, supplemental or auxiliary signs, if any, all reflectors, and faces of warning lights which are part of that device.

- 7 5.** Ensure entry to and exit from work areas is in the direction of public traffic and does not cross open traffic lanes at other than designated locations.
- 8 6.** During hours of darkness, operate equipment in the traffic control zone facing in the direction of traffic flow unless specified otherwise in the Traffic Control Plan. Darkness will include the period from sunset to sunrise and other times when conditions such as fog, snow, sleet or rain provide insufficient lighting to clearly identify persons and vehicles on the highway at a distance of 500 feet ahead.
- 9 7.** Unless stated otherwise in the ~~traffic control plan~~ Traffic Control Plan, provide for a minimum of 2 miles between traffic control zones on rural roadways. The Engineer will determine minimum distances between traffic control zones on urban roadways.
- 40 8.** Submit Traffic Control Plan modifications to the Engineer for review and approval prior to any changes being made. The Engineer may modify sign spacing to meet existing field conditions or to prevent obstruction of the motorist's view of permanent signing.
- 44 9.** Ensure vehicles (except ready mix trucks) hauling soil, aggregate, ~~and~~ paving material, and other construction material to or from work area display a minimum 16 inch by 48 inch sign with the legend "DO NOT FOLLOW - INTO WORK AREA", as shown in the contract documents. Comply with the following requirements for the sign:
 - Orange with black lettering using Type VII (Iowa) sheeting.
 - Keep clean to maintain its visibility.
- 42 10.** For lanes closed to traffic, place two drums meeting the requirements of [Article 2528.03, C](#), every 1000 feet. For full depth excavations in a closed lane, place two drums in front of each location. Additional drums need not be placed for full depth excavations spaced closer than 150 feet.
- 43.** ~~When milled or scarified surfaces exist, sign approaches to scarified areas using ROUGH ROAD (W8-8) signs. Place signs at least 250 feet in advance of milled or scarified areas. Repeat signs for traffic that may enter within the scarified area from intersecting public roads. At locations where milled or scarified areas end at project limits, bridges, or end of day's work, place BUMP (W8-1) signs within 50 feet in advance of each location. Erect, move, and maintain these signs until milled or scarified areas have been covered with new HMA or PCC pavement.~~
- 44 11.** Active eContractor vehicles and self-propelled equipment (except hand operated equipment) operating or parked within 15 feet of an open traffic lane (unless shielded by temporary or permanent barrier) and contractor, delivery, ~~and~~ service and private vehicles entering or exiting work area shall display cab roof mounted amber or yellow high intensity rotating, flashing, or oscillating warning lights. Repair or replace vehicle warning lights not functional or missing within 24 hours.
- 12.** Parking of private vehicles on Interstate right-of-way will be allowed if private vehicles are parked at least 15 feet away from an open traffic lane when Contractor is working. Parking of private vehicles on Interstate right-of-way is not permitted during non-working hours. Request approval from Engineer of location for parking of private vehicles.

13. Conduct operations within the same lane from the start of work area to end of work area and do not shift traffic from one lane to another lane unless allowed in the contract documents. If the contract includes work in adjacent lanes, space individual lane closures for each lane per requirements in [Article 2528.03, Q.9.](#)

2528.04 METHOD OF MEASUREMENT.

Measurement will be as follows:

A. Traffic Control.

Lump sum.

B. Portable Dynamic Message Signs.

The Engineer will count the number of days each Portable Dynamic Message Sign is required to be in place along a road and capable of displaying messages to the traveling public. Days when PDMS is blank and is in good working condition, will be measured. Days when PDMS is unable to display a message due to cellular (~~when specified~~) or mechanical problems will not be measured. Days when PDMS is on the roadway and not approved by the Engineer will not be measured.

C. Temporary Barrier Rail.

The Engineer will ~~calculate~~ measure the length of temporary barrier rail used ~~based on count and the nominal length of each unit~~ in linear feet. The length of temporary barrier rail measured will be the length required per setup. Measurement will also be made for temporary barrier rail moved within, or added to, an existing setup when required by the contract documents. Measurement of temporary barrier rail, after its initial placement, will not be made unless it is required by the contract documents to be moved.

D. Temporary Lane Separator System.

The Engineer will measure the length of the Temporary Lane Separator System installed in linear feet.

E. Modular Glare Screen.

Measurement for Modular Glare Screen System will be in linear feet.

F. Temporary Crash Cushions.

[Article 2551.04](#) applies.

G. Temporary Traffic Signals.

By count for each group installation of temporary traffic signals operated by a common control unit. A group installation is normally four signal heads at the same traffic conflict area.

H. Temporary Floodlighting Luminaire.

By count.

I. Pilot Cars.

1. By count for the number of pilot cars used during each work shift. A shift is a scheduled period of work for the Contractor's operations.
2. For a pilot car to be counted:
 - a. Use of the pilot car is necessary and it is used as part of preplanned work that is started that shift and is intended to proceed for a major part of the

shift. If used less than 4 hours during a shift, one half pilot car will be counted.

- b. Use of other pilot cars is necessary and they are used for at least 1 hour during the shift, perhaps intermittently, and this shall be the primary duty of the employee. If used less than 4 hours in a shift, one-half pilot car will be counted. If used at least 4 hours, but less than 12 hours, a total of one pilot car will be counted. If used 12 hours or more, an additional one-half pilot car will be counted for a total of 1.5 pilot cars for the shift.

J. Flaggers.

1. By count for the number of flaggers used during each work shift. A shift is a scheduled period of work for the Contractor's operations.
2. For flaggers to be counted:
 - a. Use of the flaggers is necessary and they are used as part of preplanned work that is started that shift and is intended to proceed for a major part of the shift. If used less than 4 hours during a shift, one-half flagger will be counted. If used at least 4 hours, but less than 12 hours, a total of one flagger will be counted. If used 12 hours or more, an additional one-half flagger will be counted for a total of 1.5 flaggers for the shift.
 - b. Use of other flaggers is necessary and they are used for at least 1 hour during the shift, perhaps intermittently, and this shall be the primary duty of the employee. If used less than 4 hours in a shift, one-half flagger will be counted.

K. Monitoring with Incident Response.

Calendar days based on the contract quantity. Additional personnel required by the Engineer to provide additional traffic monitoring of ~~CMS~~ PDMS operation will be measured in calendar days per person needed.

L. Safety Closures.

By count for number of Safety Closures placed.

2528.05 BASIS OF PAYMENT.

Payment will be at the contract unit price as described below. When the Engineer requires recleaning of reflectorized surfaces of signs and traffic control devices, payment will be made as extra work according to [Article 1109.03, B](#). All signs and traffic control devices furnished by the Contractor remain the Contractor's property at the completion of the work and are to be removed from the site when no longer needed.

A. Traffic Control.

1. Lump sum when there is a contract item for Traffic Control.
2. Payment is full compensation for:
 - Erecting, maintaining, moving, and removing all traffic control devices required by the contract documents, including warning lights,
 - Furnishing all materials, labor, and equipment, and
 - Traffic quality control.

B. Portable Dynamic Message Signs.

1. Payment will be at the contract unit price per calendar day for each Portable Dynamic Message Sign measured as provided in [Article 2528.04, B](#).

2. Payment is full compensation for furnishing, placing, operation (when specified), and maintenance of PDMS. Payment includes the cost of preventative and unscheduled maintenance, cellular communication (~~when specified~~), on-board software, hardware, and power supply.

C. Temporary Barrier Rail.

1. Linear feet of Temporary Barrier Rail measured.
2. Maintenance of temporary barrier rail is incidental to Temporary Barrier Rail.
3. Payment for repair or replacement of temporary barrier rail damaged by public traffic will be paid according to [Article 1109.03, B.](#)

D. Temporary Lane Separator System.

1. Linear feet of Temporary Lane Separator System measured
2. Payment includes installation, maintenance, repair, removal of the temporary lane separator system (if installed in a temporary traffic control zone), and all required pavement or bridge deck repair.

E. Modular Glare Screen.

1. ~~Per foot~~ Linear feet of Modular Glare Screen System measured.
2. Payment is full compensation for:
 - Material, equipment, and labor to furnish and install the system on the top of the temporary concrete barrier rail,
 - ~~Furnishing and applying retroreflective strips,~~
 - Maintenance of the system,
 - Repairing or replacing damaged parts of the system,
 - Removing and reinstalling the system if necessary when moving the concrete barrier rail, and
 - Final removal of the system from the top of the concrete barrier rail.

F. Temporary Crash Cushions.

[Article 2551.05, A.](#), applies.

G. Temporary Traffic Signals.

1. Each, for individual group installations operated by a common control unit, normally four signal heads at the same traffic control area.
2. Payment is full compensation for furnishing, installing, maintaining and servicing the controller, signal heads, traffic detection system, signal operator, costs for electrical energy, and the cost of removing temporary traffic signal materials from the construction site. The Contractor shall supply their own breaker box and power meter and shall not connect to existing Contracting Authority owned circuits to supply power for temporary traffic signals.

H. Temporary Floodlighting Luminaire.

1. Each.

2. Payment is full compensation for: furnishing, installing, maintaining and servicing temporary floodlighting units, costs for electrical energy, cost of removing lighting materials from construction site, and Contractor shall supply their own breaker box and power meter and shall not connect to existing Contracting Authority owned circuits to supply power for temporary floodlighting.

- ~~• Furnishing, installing, maintaining and servicing the temporary floodlighting units;~~
- ~~• All costs for electrical energy;~~
- ~~• The cost of removing all lighting materials from the construction site, and~~
- ~~• The Contractor shall supply their own breaker box and power meter and shall not connect to existing Contracting Authority owned circuits to supply power for temporary floodlighting.~~

I. Pilot Cars.

Predetermined contract unit price per each for the number of shifts each pilot car was operated.

J. Flaggers.

1. Predetermined contract unit price per each for the number of shifts each flagger was used.
2. Payment is full compensation for providing trained flaggers according to ~~Article 2528.03, K~~ [Article 2528.03, J](#).

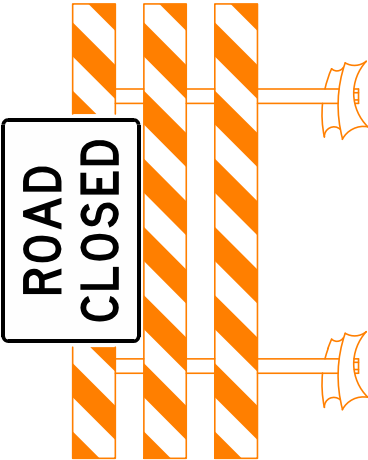
K. Monitoring with Incident Response.

1. Per calendar day for the number of calendar days used.
2. This payment is full compensation for:
 - Furnishing the necessary vehicle (including operation, maintenance, and supplies),
 - Furnishing the operator,
 - Documentation of any events that restrict the normal flow of traffic including responses to an emergency situation,
 - Re-erecting, repairing, or replacing traffic control devices,
 - Providing assistance to persons with vehicle problems,
 - Moving stalled vehicles, and
 - Summoning further assistance when needed.
3. Payment for the number of calendar days that additional personnel, such as for ~~EMS~~ PDMS operation required by the Engineer, will be the contract unit price per calendar day. Payment is full compensation for furnishing the required personnel and necessary support vehicles.

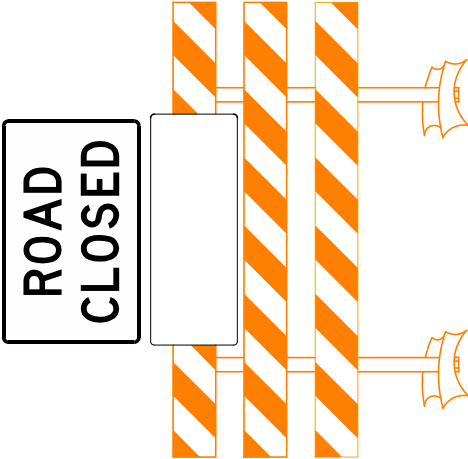
L. Safety Closures.

Payment is full compensation for furnishing material, labor, and equipment necessary to erect, maintain, and remove Safety Closure, unless indicated otherwise in the contract documents.

SIGN PLACEMENT ON
TYPE III BARRICADES




Typical Sign Placement



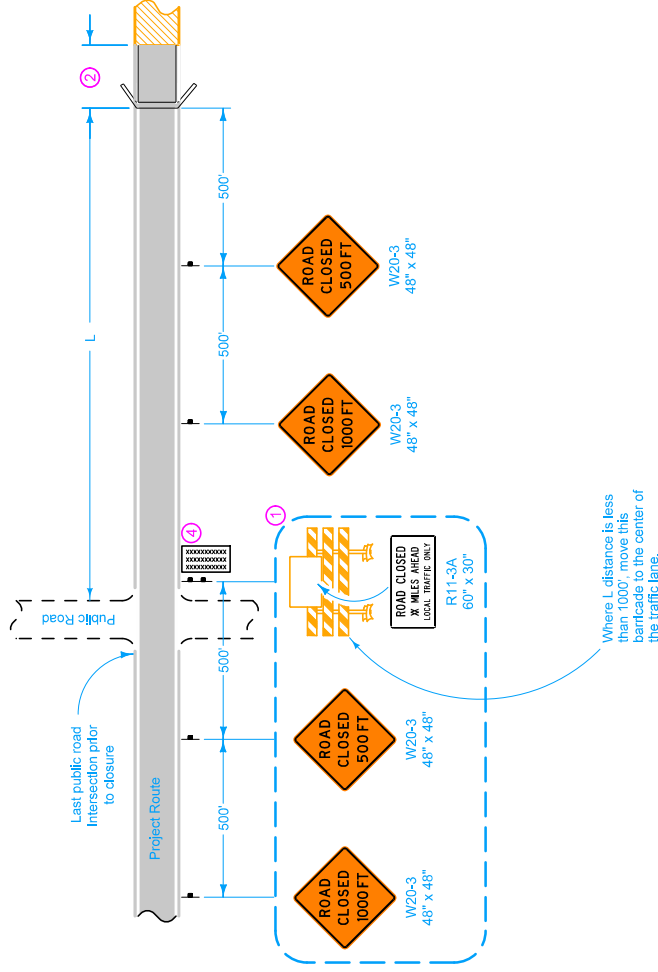
Sign Placement with
Supplemental Sign

Possible Contract Items:
Traffic Control
Safety Closures
Portable Dynamic Message Sign

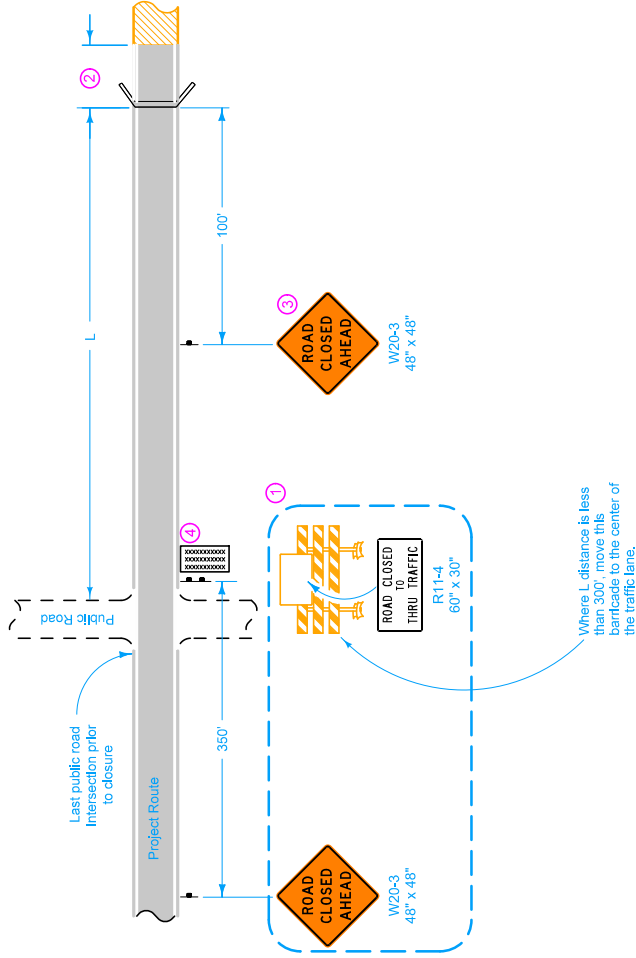
Possible Tabulation:
108-13A

 STANDARD ROAD PLAN	REVISION 6 04-21-20
	TC-252
	SHEET 1 of 3
REVISIONS: Added Portable Dynamic Message Sign and new note 4 on Sheet 2.	
<i>Handwritten signature</i> APPROVED BY DESIGN METHODS ENGINEER	
ROUTES CLOSED TO TRAFFIC	

SITUATION 1 (RURAL)
Project Route Closure





SITUATION 1 (URBAN)
Project Route Closure



LEGEND

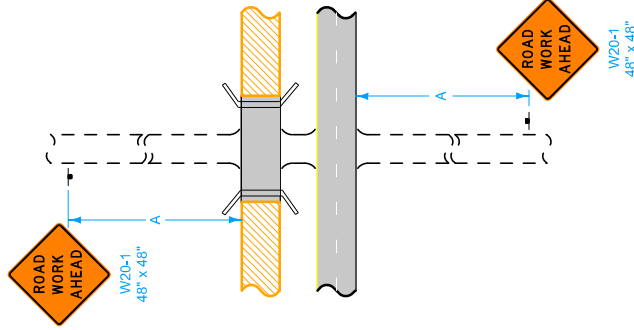
- Traffic Sign
- Type III Barricade
- Portable Dynamic Message Sign
- Work Area
- Road Closure

- ① In situation 1, if the intersection is the point of detour these signs and barricade will become the responsibility of the contracting authority and may be modified by the contracting authority to fit detour signing.
- ② When possible, a 100' buffer is desirable.
- ③ When L is less than 300 feet, omit the ROAD CLOSED AHEAD sign.
- ④ Place for 7 calendar days prior to closure. The Engineer will determine the message to display. Remove when road is closed. Use of Portable Dynamic Message Sign is optional on non-primary roadways.

	REVISION	6	04-21-20
	TC-252		
	STANDARD ROAD PLAN		
	SHEET 2 of 3		
REVISIONS: Added Portable Dynamic Message Sign and new note 4 on Sheet 2.			
			
APPROVED BY DESIGN METHODS ENGINEER			
ROUTES CLOSED TO TRAFFIC			

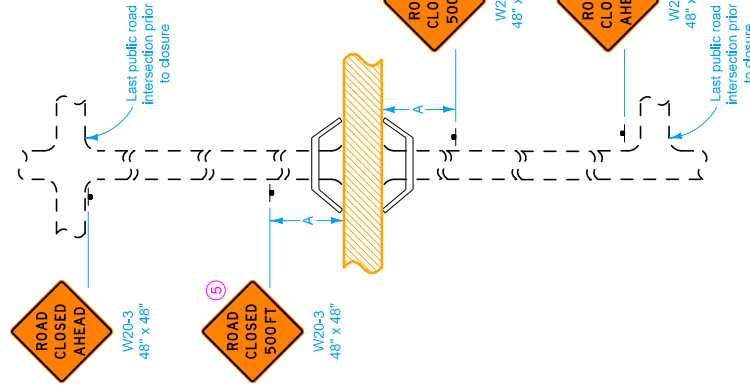
SITUATION 2

Public cross-traffic maintained.
No access to project.



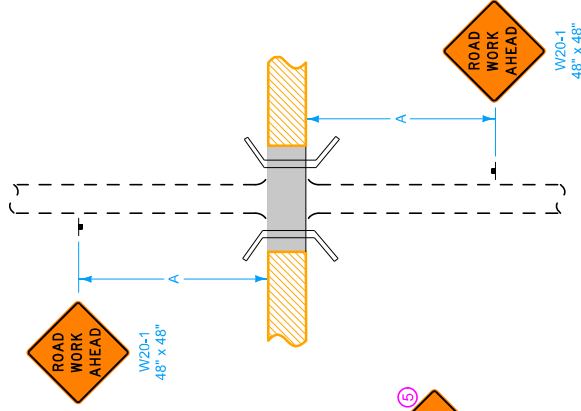
SITUATION 3

No access to project
(Applicable to T-Intersections)



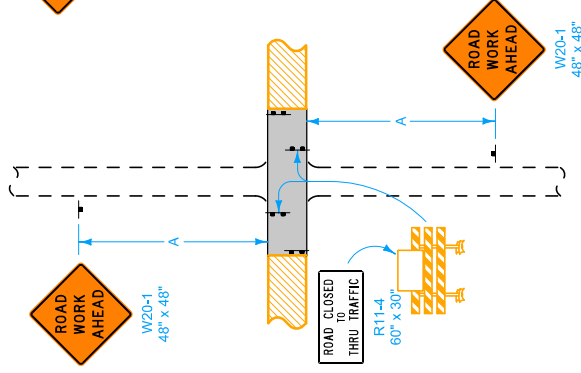
SITUATION 4

Public cross-traffic maintained.
No access to project.



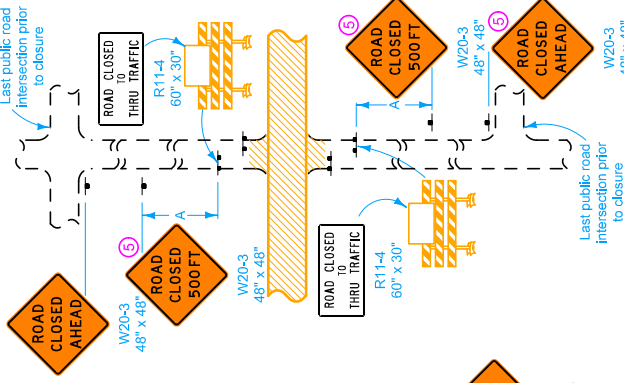
SITUATION 5

Public cross-traffic maintained.
Contractor and resident access.



SITUATION 6

No public access. Contractor and resident access only. (Applicable to T-Intersections)



During suspension of work, (such as over winter):

- Use Situation 2 on two-lane to four-lane projects.
- Situation 5 is preferred where cross-traffic is maintained.

⑤ When the distance between the last public road intersection and the ROAD CLOSED or ROAD CLOSED TO THRU TRAFFIC barricade is less than 1,000 feet, omit the ROAD CLOSED 500 FT sign.

LEGEND	
	Traffic Sign
	Type III Barricade
	Work Area
	Road Closure

Location	A
Urban	200'
Rural	500'

REVISION
6 04-21-20

TC-252
STANDARD ROAD PLAN
SHEET 3 of 3
REVISIONS: Added Portable Dynamic Message Sign and new note 4 on Sheet 2.

APPROVED BY DESIGN METHODS ENGINEER

ROUTES CLOSED TO TRAFFIC

Section 4115. Coarse Aggregate for Portland Cement Concrete

4115.01 DESCRIPTION.

Gravel or crushed stone particles meeting one of the aggregate durability classes listed below. Acquire aggregates from an approved source meeting the requirements of [Materials I.M. 409](#). Unless stated otherwise on the source approval, coarse aggregate for Portland Cement Concrete shall be washed with sufficient agitation to cause material coatings to be separated and removed.

A. Class 2 Durability.

No deterioration of pavements of non-Interstate segments of the road system after 15 years and only minimal deterioration in pavements after 20 years of age.

B. Class 3 Durability.

No deterioration of pavements of non-Interstate segments of the road system after 20 years of age and less than 5% deterioration of the joints after 25 years.

C. Class 3i Durability.

No deterioration of pavements of the Interstate Road System after 30 years of service and less than 5% deterioration of the joints after 35 years.

4115.02 QUALITY.

Meet the requirements of Tables 4115.02-1 and 4115.02-2 and [Section 4109](#):

Table 4115.02-1: Aggregate Quality

Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion (Cr. Stone)	50	AASHTO T 96
Abrasion (Gravel)	35 (may be increased by 0.1% for each 1% of particles with at least one fractured face)	AASHTO T 96
Alumina ^(a)	0.5	Iowa DOT Materials Laboratory Test Method No. 222
A Freeze	6	Iowa DOT Materials Laboratory Test Method No. 211, Method A
Clay Lumps and Friable Particles	0.5	Materials I.M. 368
(a) If the Alumina value fails, determine the A Freeze value for specification compliance. Iowa DOT Materials Laboratory Test Method No. 222 does not apply to gravel.		

Table 4115.02-2: Maximum Permissible Amounts of Objectionable Materials

Objectionable Materials.	Maximum Percent	Test Method
--------------------------	-----------------	-------------

	Allowed	
Coal and carbonaceous shale	0.5	Materials I.M. 372
Total of all shale, similar objectionable materials, and coal combined	1.0	Materials I.M. 372
Organic Materials, except coal	0.01	Iowa DOT Materials Laboratory Test Method No. 215
Unsound chert particles retained on 3/8 inch sieve (Nonstructural concrete)	3.0	Materials I.M. 372
Unsound chert particles retained on 3/8 inch sieve (Structural concrete)	2.0	Materials I.M. 372
<p>Note: Chert particle which break into three or more pieces when subjected to the freezing and thawing test will be considered unsound.</p> <p>Chert in aggregate produced from limestone sources is defined as unsound when any of the fractions of the crushed or uncrushed chert do not meet the soundness requirements.</p>		

4115.03 GRADATION.

Meet the requirements of [Article 4109.02](#) and Table 4115.03-1:

Table 4115.03-1: Aggregate Gradations

Mix Class (Materials I.M. 529)	Mix Number (Materials I.M. 529)	Gradation Numbers (Article 4109.02)
D	57, 57-6	3 or 5
A, B, C	2 to 8, V47B	3, 4, or 5
M	4	3, 4, or 5
A, B, C, M	V	7

4115.04 AGGREGATE USE DURABILITY REQUIREMENTS.

A. Meet the requirements of Table 4115.04-1:

Table 4115.04-1: Aggregate Use Durability Requirements

Specification Section Number	Minimum Durability Class Required			Use
	3i	3	2	
2122 , 2201 , 2212 , 2213 , 2301 , 2302 , 2310 , 2529 , 2530 Interstate Primary	X*			PCC Paved Shoulders, Base, Base Repair, Base Widening PCC Pavement, Widening, PCC Overlay, Finish Patches, and Bridge Approaches
		X*		

Other			X	
2403			X	Structural Concrete
2406 (See 2403)			X	Concrete Structures
2407			X	Precast Units
2407 , 2501		X		Prestressed Units, Concrete Piles
2412 (See 2403) Interstate & Primary Other		X		Concrete Bridge Decks
			X	
2413 (See 2413.02, D, 1)		X		Bridge Deck Surfacing, Repair, & Overlay
2414 (See 2403)			X	Concrete Railings
2415 (See 2403)			X	Concrete Box, Arch, & Circular Culverts
2416 (See 4145)			X	Rigid Pipe Culverts
2424			X	Shotcrete
2503 (See 2403)			X	Storm Sewers (Catch Basins, Intakes, & Utility Access)
2505 (See 2403)			X	Guardrails (Concrete End Anchorage)
2511 , 2515 (See 2403)			X	PCC Sidewalks, Paved Driveways
2512 (See 2403)			X	PCC Curb & Gutter
2513 (See 2403)			X	Concrete Barrier
2516 (See 2403)			X	Concrete Walls and Steps
2517 Primary Other		X		Railroad Approach Sections
			X	
2522 (See 2403)			X	Tower Lighting (Concrete Footings & Foundations)
2523 (See 2403)			X	Highway Lighting (Concrete Footings & Foundations)
2524 (See 2403)			X	Highway Signing (Concrete Footings & Foundations)
2525 (See 2403)			X	Traffic Signals (Concrete Footings & Foundations)
* For patches and PCC base repair, Class 2 durability or better aggregate will be required if the existing pavement was constructed of Class 2 or lower durability aggregate. If the existing pavement was constructed of Class 3 or Class 3i durability aggregate, use Class 3 aggregate or better and Class 3i aggregate, respectively, in the repair.				

B. Use crushed stone coarse aggregate for:

- Aesthetic concrete cast with form liners or rustication. This includes Mechanically Stabilized Earth (MSE) walls and noise walls.

- Concrete receiving color sealer or texture treatments.
- Concrete for precast box culverts that are to receive color sealer.

4115.05 COARSE AGGREGATE FOR BRIDGE DECK SURFACING, REPAIR, AND OVERLAY.

Acquire from a Class 3 durability or better source meeting the following requirements:

A. Quality.

Meet the requirements of Tables 4115.05-1 and 4115.05-2:

Table 4115.05-1: Aggregate Quality

Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion	40	AASHTO T 96
Alumina ^(a)	0.5	Iowa DOT Materials Laboratory Test Method No. 222
A Freeze	6	Iowa DOT Materials Laboratory Test Method No. 211, Method A
Absorption	2.5	Iowa DOT Materials Laboratory Test Method No. 201
(a) If the Alumina value fails, determined the A Freeze value for specification compliance. Iowa DOT Materials Laboratory Test Method No. 222 does not apply to gravels.		

Table 4115.05-2: Maximum Permissible Amounts of Objectionable Material

Objectionable Materials	Maximum Percent Allowed	Test Method
Unsound chert particles retained on No. 4 sieve	0.5	Materials I.M. 372
Total of all unsound chert, shale, coal, and iron combined	1.0	Materials I.M. 372
Organic Materials, except coal	0.01	Iowa DOT Materials Laboratory Test Method No. 215
Note: Unsound chert particles are defined in Article 4115.02 .		

B. Gradation.

Meet the gradation requirements for Gradation No. 6 of the [Aggregate Gradation Table, Article 4109.02](#).

Section 4120. Granular Surfacing and Granular Shoulder Aggregate

4120.01 DESCRIPTION.

Uniform mixture of fine and coarse particles of crushed stone, gravel, or a combination of these materials with sand. Crushed recycled materials are to total no more than:

- 30% of the shoulder aggregate for new construction.
- 50% of the total for existing granular shoulders.

4120.02 GRANULAR MATERIAL.

A. Granular Surfacing.

Furnish material meeting the requirements of [Article 4120.04](#), or when specified in the contract documents, meet the requirements of [Article 4120.03](#), [4120.05](#), or [4120.06](#).

B. Granular Shoulders.

1. Furnish material meeting the requirements of [Article 4120.04](#) or recycled materials. When specified in the contract documents, meet the requirements of [Article 4120.05](#) or [4120.06](#). For recycled materials, meet the following requirements:
 - Recycle PCC, RAP, or composite pavements to meet the requirements of [Materials I.M. 210](#).
 - Crush PCC or composite pavement to meet the requirements for Gradation No. 11 of the Aggregate Gradation Table, [Article 4109.02](#).
 - Process RAP to pass the 1.5 inch sieve.
2. The contract documents may allow a Class C gravel and crushed aggregate mixture for granular shoulders meeting the following:
 - 30% to 50% crushed stone meeting soundness and abrasion requirements of [Article 4120.05](#). Meet the requirements for Gradation No. 10 of the Aggregate Gradation Table, [Article 4109.02](#) with the exception of 8% to 16% passing the No. 200 sieve.
 - 30% to 50% recycled crushed PCC or composite materials meeting the above requirements for Granular Shoulders. Meet the requirements for Gradation No. 10 of the Aggregate Gradation Table, [Article 4109.02](#) with the exception of 8% to 16% passing the No. 200 sieve.
 - 30% to 50% RAP processed to pass the 1.5 inch sieve.

4120.03 CLASS C GRAVEL.

Meet the requirements for gradation No. 10 of the Aggregate Gradation Table, [Article 4109.02](#) and Table 4120.03-1:

Table 4120.03-1: Coarse Aggregate Quality (Class C Gravel)

Coarse Aggregate Quality	Maximum Percent Allowed	Test Method
C Freeze	15	Office of Materials Test Method No. Iowa 211, Method C

Shale (+ No. 4 sieve)	10	Materials I.M. 372
Total of Clay Lumps and Friable Particles, plus % passing No. 200 sieve	15	Materials I.M.s 368 and 306
Total of Shale, Clay lumps and friable particles, plus % passing. No. 200 sieve	20	Materials I.M.s 372 , 368 , and 306

4120.04 CLASS A CRUSHED STONE.

Meet the requirements for Gradation No. 11 of the Aggregate Gradation Table, [Article 4109.02](#) and Table 4120.04-1:

Table 4120.04-1: Coarse Aggregate Quality (Class A Crushed Stone)

Coarse Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion	45	AASHTO T 96
C Freeze	15	Office of Materials Test Method No. Iowa 211, Method C
Clay Lumps and Friable Particles	4	Materials I.M. 368
Note: For shoulders only, abrasion limits may be raised to 55 if Alumina does not exceed 0.7 or A Freeze does not exceed 10.		

4120.05 CLASS B CRUSHED STONE.

Meet the requirements for Gradation No. 11 of the Aggregate Gradation Table, [Article 4109.02](#) and Table 4120.05-1:

Table 4120.05-1: Coarse Aggregate Quality (Class B Crushed Stone)

Coarse Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion	55	AASHTO T 96
C Freeze	20	Office of Materials Test Method No. Iowa 211, Method C
Total of Abrasion & C Freeze	65	
Clay Lumps and Friable Particles	4	Materials I.M. 368

4120.06 CLASS D CRUSHED STONE.

Refer to the contract documents for gradation and quality requirements.

4120.07 AGGREGATE FOR PAVED SHOULDER FILLETS.

Crushed stone or recycled materials meeting the requirements for Gradation No. 11 of the Aggregate Gradation Table, [Article 4109.02](#), and meeting the quality requirement of [Article 4120.04](#). For recycled materials, meet the requirements of [Article 4120.02, B](#).

Section 4130. Revetment Stone, Erosion Stone, and Gabion Stone

4130.01 REVETMENT DESCRIPTION.

- A.** Broken limestone, dolomite, quartzite, or granite from an approved source as described in [Materials I.M. 409](#) and meeting the following requirements.
- A minimum of 50% of the stone is to be composed of beds or slabs more than 5 inches thick.
 - A minimum of 10% of the beds or slabs are to be thick enough to produce the required weight of either the stone or concrete, with the greatest dimension not more than two times the smallest dimension.
- B.** When the source test plot or service history is not available, meet the requirements of Table 4130.01-1 for virgin stone crushed to 3/4 inch to 1 1/2 inch nominal sizes. Abrasion loss for all revetment stone is not to exceed 50% when tested according to AASHTO T 96.

Table 4130.01-1: Virgin Stone Requirements

Revetment Type	Revetment Quality	Test Limits (max)	Test Method
Class A, B, C, & E revetment	Alumina	0.7	Iowa 222
	A Freeze	10	Iowa 211, Method A
	Secondary Pore Index	25	Iowa 219
Class D revetment	C Freeze	10	Iowa 211, Method C
Note: Revetment may pass either Alumina or A Freeze for compliance.			

- C.** Recycled PCC pavement or broken concrete meeting the requirements of [Materials I.M. 210](#) may be used with the approval of the Engineer.
- All reinforcement material is to be cut flush with the flat surface of the concrete.
 - A minimum of 50% of the broken concrete revetment is to be composed of slabs more than 5 inches thick.
 - A minimum of 10% of the slabs are to be thick enough to produce the required weight of the concrete with the greatest dimension not more than 2 times the smallest dimension.
 - No petroleum based or HMA material is to be included in revetment.

4130.02 REVETMENT GRADATION.

- A.** Engineer will determine gradation compliance by visual inspection. After visual inspection and prior to loading, the Engineer may designate material as too fine or too coarse.
- 1. Class A Revetment.**
- Nominal top size of 400 pounds.
 - At least 75% of the stones are to weigh more than 75 pounds.
 - None less than 50 pounds.

- Stones are to have at least one flat face with one dimension at least 15 inches.

2. Class B Revetment.

- Nominal top size of 650 pounds.
- At least 20% of the stones are to weigh more than 500 pounds.
- At least 50% of the stones are to weigh more than 275 pounds.
- At least 90% of the stones are to weigh more than 25 pounds.

3. Class C Revetment.

- Nominal top size of 450 pounds.
- At least 50% of the stones weighing more than 275 pounds.
- At least 90% of the stones weighing more than 75 pounds.

4. Class D and Class E Revetment.

- Nominal top size of 250 pounds.
- At least 50% of the stones are to weigh more than 90 pounds.
- At least 90% of the stones are to weigh more than 5 pounds.
- The Engineer may approve using revetment containing material larger than 250 pounds.

- B.** Mechanically process Class D and Class E material to remove material 3 inches and less.

4130.03 EROSION STONE DESCRIPTION.

Broken limestone, dolomite, quartzite, granite, or broken concrete with steel removed.

4130.04 EROSION STONE GRADATION.

Engineer will determine gradation compliance by visual inspection. After visual inspection and prior to loading, the Engineer may designate material as too fine or too coarse.

- Nominal 6 inch size.
- 100% passing the 9 inch screen.
- 100% retained on the 3 inch screen.

4130.05 EROSION STONE QUALITY.

Except for recycled concrete, meet the requirements of Table 4130.05-1. There are no quality requirements for recycled concrete.

Table 4130.05-1: Aggregate Quality (Erosion Stone)

Aggregate Quality	Maximum Percent Allowed	Test Method
C Freeze	15	Office of Materials Test Method No. Iowa 211, Method C
Abrasion	50	AASHTO T 96
Clay Lumps and Friable Particles	5	Materials I.M. 368
Note: Perform tests on product crushed to 3/4 inch or 1 inch maximum size.		

4130.06 GABION STONE DESCRIPTION.

Broken stone or gravel boulders meeting the requirements below. Use stone and boulders from sources similar in geological origin.

4130.07 GABION STONE AND MATTRESS GRADATION.

Process stone or boulders for gabions and mattresses to sizes ranging from 4 inches to 8 inches in nominal dimensions. Three inches to 5 inches is recommended for mattresses.

4130.08 GABION STONE QUALITY.

Meet requirements of Table 4130.08-1. Sources with Revetment A, B, or E approvals need not meet these requirements.

TABLE 4130.08-1

Aggregate Quality	Maximum Allowed Percent	Test Method
Alumina	0.7	Office of Materials Test Method No. Iowa 211, Method A
A Freeze	10	
Abrasion	50	AASHTO T 96
Note: Pass either Alumina or A Freeze for compliance (alumina does not apply to gravel). Perform tests on product crushed to 3/4 inch or 1 inch maximum size.		

END OF UI-048-ROTHMEYER-NUMEDAHL SUPPLEMENTAL SPECIFICATIONS

SECTION C:
NRCS CONSERVATION PRACTICE 382: FENCING
UPPER IOWA RIVER WMA
UI-048-ROTHMEYER-NUMEDAHL

Fence: Barbed & Woven Wire

Iowa Job Sheet

Natural Resources Conservation Service (NRCS)
Des Moines, Iowa

Iowa Conservation Practice 382
September 2018

Definition

A constructed barrier to animals or people.

Purpose

Facilitate the application of conservation practices by providing a means to control movement of animals and people.

Conditions Where Practice Applies

This practice may be applied on any area where management of animal or people movement is needed. Fences are not needed where natural barriers will serve the purpose.

General Criteria and Specifications

A. Barbed Wire

Barbed wire fences shall have a minimum of 4 wires for farm borders. A minimum of three wires shall be used for interior fencing, cross fencing, or excluding livestock from special areas such as wildlife areas, forested tracts, or other special use areas. Wires shall be placed approximately an equal distance apart. The top wire shall be at least 42 inches high and 2 inches below the top on wood posts and 1 inch below the top on steel posts. Wire shall be spaced no more than 12 inches apart.

Each barbed wire shall consist of 2 twisted strands of either 12 1/2 gauge wire or 15 1/2 gauge high tensile strength wire. The barbs shall be either 2-point barb or 4-point barb. Wire shall be stretched taut and attached after the posts are properly set and backfilled. Attached wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

Barb wire fences shall not be electrified.

B. Woven Wire

Top and bottom strands of woven wire shall be a minimum of 12 1/2 gauge. Wire for intermediate strands shall be 14 1/3 gauge or heavier. Woven wire fences 32 inches or less in height shall have at least 2 barbed wires above the woven wire, spaced 8 to 12 inches apart. Fences constructed with woven wire 33-47 inches shall have at least 1 barbed wire above the woven wire. Woven wire fence 48 inches are not required to have barbed wire above except if it is needed to contain livestock or deter predators. The base of the woven



wire shall be placed near the ground surface. Optional barbed wire may be ran near the ground. The top wire shall be at least 42 inches above the ground level and 2 inches below the top of wood posts and 1 inch below top of steel posts. All wire shall be galvanized (Class 3). Wire shall be stretched and attached after the posts are properly set and backfilled. Attach wire to the side of the post closest to the livestock, except on corners and curves where the wire should be placed on the outside of the corner or curve.

C. Staples

Staples shall be 9 gauge steel or heavier with a minimum length of 1 1/2 inches for soft woods and a minimum length of 1 inch for close grained hardwoods. Space should be left between the staple and the post to permit free movement of the wire. Wires may be attached to steel posts by use of manufacturer's clips or by 14 gauge galvanized wire twisted at least two turns.

D. Posts

All wooden posts (except red cedar, osage orange, or black locust) shall be treated with creosote, pentachlorophenol, or chromate copper arsenate (CCA) by a method that ensures complete penetration of the sapwood. Quality of treated wood shall provide sufficient strength and quality to last for the expected life of the fence. At least half of the diameter of red cedar shall be heartwood.

E. Corner, Gate, Brace, and End Posts

Corner posts, gate posts, end posts, pull posts and brace posts shall be wood with sufficient length for the construction of at least a 42 inch high fence and permit setting the post at least 36 inches deep. Earth backfill shall be thoroughly tamped. Where soil depth is restricted to less than 36 inches, additional anchors or deadman applied against the direction of pull may be needed. Wood posts shall have a minimum top diameter of 5 inches. A 2 1/2-inch steel pipe with appropriate bracing or set in concrete of sufficient depth also may be used. Reinforced concrete or metal posts of equivalent strength may be substituted if they have suitable means of attaching wires and braces.

F. Line Posts

The maximum spacing of line posts shall be one rod (16 1/2 feet). Wood line posts shall have a minimum 3 inch top diameter. Wood line posts shall have a minimum length of 6 1/2 feet and shall be set or driven to a minimum depth of 24 inches where conditions permit. When posts are set, earth backfill shall be thoroughly tamped. Steel line posts shall not weigh less than 1 1/3 pounds per foot and shall have a steel anchor plate securely fastened to the plate. The posts shall be "T", "U", or "Y" shaped and have corrugations, knobs, studs, or grooves suitable for fastening fencing to the posts. Steel posts shall be rolled from high carbon steel and shall have a protective coating; either galvanized by the hot dip process, or painted with one or more coats of high grade weather resistant paint for steel, or enameled and baked. Steel line posts shall be at least 6 feet in length and shall be set in the ground a minimum of 20 inches. Steel posts shall be used as line posts at least once every 6 rods (99 feet) to act as a ground for lightning protection.

G. Bracing

End bracing will be installed at locations where the fence ends and on both sides of gate openings. Corner bracing should be installed where fence alignment changes 15 degrees or more. Bracing is required at all corner, gate, pull and end assemblies in a fence. The brace member shall be the equivalent of a wood post with a 3 1/2 inch diameter at

the top or a standard weight 2-inch diameter galvanized steel pipe. The brace shall be at least 3 feet above the ground and at least 8 inches below the top of the post. The brace member shall be 6 to 8 feet in length. A brace wire consisting of 2 complete loops of 9 gauge smooth wire, 2 loops of barbed wire or a single loop of 12 1/2 gauge high tensile strength wire shall be installed. "H" braces or angle braces will be used in standard fences.

Pull post assemblies consisting of three posts with braces shall be installed in straight reaches of fence at intervals of 660 feet (40 rods), at any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 percent and at the beginning and end of each curve.

H. Crossings

For a narrow ditch or draw crossing with slopes steeper than 8 feet horizontal to 1 foot vertical, the fence shall be anchored with a concrete anchor weighing at least 150 pounds and buried with at least 18 inches of cover or a commercial screw-in type metal anchor 5 inches in diameter and not less than 48" long to position the fence to the contour of the ditch or draw.

I. Gates

Gates weighing less than 100 lbs. may be hung from single end posts properly installed. Heavy metal or wood gates more than 6 ft. wide shall best be attached to the pull post of an H-brace or diagonal floating brace.

All gates must be substantial enough to withstand expected pressures from livestock, predators, and/or wildlife.

Wire gates shall be made of the same materials as used for the fence. Panel or tube type gates shall be equivalent in quality to the fencing material and fitted with at least two hinges and a latch or chain for fastening.

Electrified perimeter fence gates may consist of a pair of 12 1/2 gauge straight or coiled wires installed to be non-electrified when opened. A 12 1/2 gauge overhead or insulated underground transmission line will be used to carry electricity across all gate openings (including electrified gates to charge the remainder of the fence).

Operation and Maintenance

Regular inspection of fences should be part of an on-going management program. Inspection of fences at regular intervals and after storm events is needed to facilitate the function of the intended use of the fence. Maintenance and repairs will be performed as needed to facilitate the operation of the fence.

Specifications

Site-specific requirements are listed on the specifications sheet. Additional provisions are entered on the job sketch. Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See Conservation Practice Standard – Fence (382).

Client:		Farm #:	
Field(s):		Tract #:	
Planned By:		Location:	
Date:		Length of Fence (ft):	
Landowner Objectives:			
Purpose: (check all that apply)			
<input type="checkbox"/> Reduce erosion and improve water quality by controlling livestock access to streams, springs, wetlands, and ponds.		<input type="checkbox"/> Protect sensitive environmental areas and flora from vehicular, pedestrian, or animal traffic use.	
<input type="checkbox"/> Protect newly planted areas from disturbances until established.		<input type="checkbox"/> Protect the safety of people, livestock, and wildlife by limiting or denying access to hazardous areas.	
<input type="checkbox"/> Facilitate handling, movement, and feeding of livestock in the pasture environment.		<input type="checkbox"/> Improve distribution and timing of livestock grazing	
<input type="checkbox"/> Other (specify)			
Type of Fence – Barbed (check all that apply)			
<input type="checkbox"/> 3-strand barbed wire	<input type="checkbox"/> 4-strand barbed wire	<input type="checkbox"/> 5-strand barbed wire	
<input type="checkbox"/> 6-strand barbed wire	<input type="checkbox"/> 8-strand barbed wire	<input type="checkbox"/> Other: _____	
Wire Gauge and Barbs			
<input type="checkbox"/> 12 ½ gauge wire		<input type="checkbox"/> 2-point barbs on 4" or 5" centers	
<input type="checkbox"/> 15 ½ gauge wire		<input type="checkbox"/> 4-point barbs on 5" centers	
Type of Fence – Woven Wire			
Woven Wire Ht (ft): _____	# of Wire(s): _____	Top/Bottom Wire Gauge: _____	Wire Spacing (in): _____
		Intermediate Wire Gauge: _____	
Woven Wire Type: _____		Top Deterrent Type: _____	
Attachment to Posts			
Staple Gauge: _____	Staple length (in): _____	<input type="checkbox"/> Manufacturer clips	<input type="checkbox"/> 14 gauge wire
Line Posts (check all that apply)			
Type: <input type="checkbox"/> Red Cedar or Osage Orange or Black Locust or pressure treated or other preservative wood or <input type="checkbox"/> Standard steel line posts (1 1/3 lb/ft posts)		Size: <input type="checkbox"/> Line posts are wood 6 1/2 feet or longer 3" minimum top diameter or <input type="checkbox"/> 6' Standard steel line post with anchor plate	
Spacing: <input type="checkbox"/> Wood line posts spaced a maximum of 16 1/2 feet apart set 2 ft deep minimum with a steel post every 99 ft for lightning protection or <input type="checkbox"/> Steel line posts spaced a maximum of 16 1/2 ft apart set to top of anchor plate or 20"			
Braces, Corners, Ends, & Gates (check all that apply)			
Corners, Ends, & Gates: (6 - 8 ft minimum length) <input type="checkbox"/> 5" top diameter wood post or <input type="checkbox"/> 2 1/2" galvanized steel pipe.		Brace Wire <input type="checkbox"/> 2 complete loops of 9 gauge smooth wire or <input type="checkbox"/> 2 loops of barbed wire or <input type="checkbox"/> Single loop of 12 1/2 gauge high tensile, galvanized steel	
Braces <input type="checkbox"/> 3 1/2 top diameter wood post or <input type="checkbox"/> 2" galvanized steel pipe and <input type="checkbox"/> Horizontal brace rails between 3' above ground and 8" below top of posts			

Iowa One Call

The contractor is required to follow Iowa One Call law.

IowaOneCall.com or Call 811

Ticket # _____

Layout Sketch and Drawing

(Provide sketch, drawings, maps, and/or aerial photos)

Scale 1" = _____ ft. (NA indicates sketch not to scale: grid size = $\frac{1}{2}$ " by $\frac{1}{2}$ ")

[illegible]

Attach IA-92 Fence Specifications and relevant fence drawings as needed.

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Helping People Help the Land
www.ia.nrcs.usda.gov

SECTION D:
GEOTECHNICAL REPORT
UPPER IOWA RIVER WMA
UI-048-ROTHMEYER-NUMEDAHL



OCTOBER 15, 2020

PN 201247

GEOTECHNICAL EXPLORATION

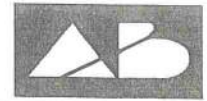
**UPPER IOWA WATERSHED UI-048
ROTHMEYER SITE
180TH STREET AND 222ND AVENUE
SECTION 30, SPRINGFIELD TOWNSHIP
WINNESHIEK COUNTY, IOWA**

PERFORMED FOR

**SHIVE-HATTERY, INC.
4125 WESTOWN PARKWAY, SUITE 100
WEST DES MOINES, IA 50266**

ALLENDER BUTZKE ENGINEERS INC.

GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.



October 15, 2020

Shive-Hattery, Inc.
4125 Westown Parkway, Suite 100
West Des Moines, IA 50266
Attn: Mr. Luke Monat, P.E.


RE: Geotechnical Exploration
Upper Iowa Watershed UI-048
Rothmeyer Site
180th Street and 222nd Avenue
Section 30, Springfield Township
Winneshiek County, Iowa
PN 201247


Dear Mr. Monat:



As authorized, Allender Butzke Engineers Inc. (ABE) has completed the geotechnical exploration for the above referenced project. The geotechnical exploration was conducted to evaluate physical characteristics of subsurface conditions with respect to design and construction of this project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the borings and laboratory tests, discusses the observed subsurface conditions, and provides geotechnical engineering recommendations for this project.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience. We are also staffed and equipped to provide construction testing and inspection services on this project as well as environmental site assessments.

Respectfully submitted,
ALLENDER BUTZKE ENGINEERS INC.


Seth Hansen, E.I.
Staff Engineer


Matt Drummond, P.E.
Project Engineer

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.	
	 Matthew J. Drummond, P.E. My license renewal date is December 31, 2020. Pages covered by this seal: <u>All Pages</u>	<u>10/15/2020</u> Date

1 PC and 1 Email
1 Email Shive-Hattery; Attn: Anthony Harbaugh, E.I.
1 Email Shive-Hattery; Attn: Daniel Jensen, P.E.

GEOTECHNICAL EXPLORATION

UPPER IOWA WATERSHED UI-048 ROTHMEYER SITE 180TH STREET AND 222ND AVENUE SECTION 30, SPRINGFIELD TOWNSHIP WINNESHIEK COUNTY, IOWA

PN 201247

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GEOTECHNICAL EXPLORATION

UPPER IOWA WATERSHED UI-048 ROTHMEYER SITE 180TH STREET AND 222ND AVENUE SECTION 30, SPRINGFIELD TOWNSHIP WINNESHIEK COUNTY, IOWA

PN 201247

October 15, 2020

PROJECT INFORMATION

The Upper Iowa River Water Management Authority (WMA) with design assistance from Shive-Hattery is planning water quality improvements at several sites in Winneshiek County, Iowa. The project at this site includes raising the profile of 180th Street approximately 10 feet and flattening the embankment slopes to 3:1 (horizontal: vertical) or flatter for construction of a low hazard class earthen dam. The site is located approximately 0.6 mile east of the 222nd Avenue and 180th Street intersection northeast of Calmar, Iowa as shown in the following Figure Nos. 1 and 2.

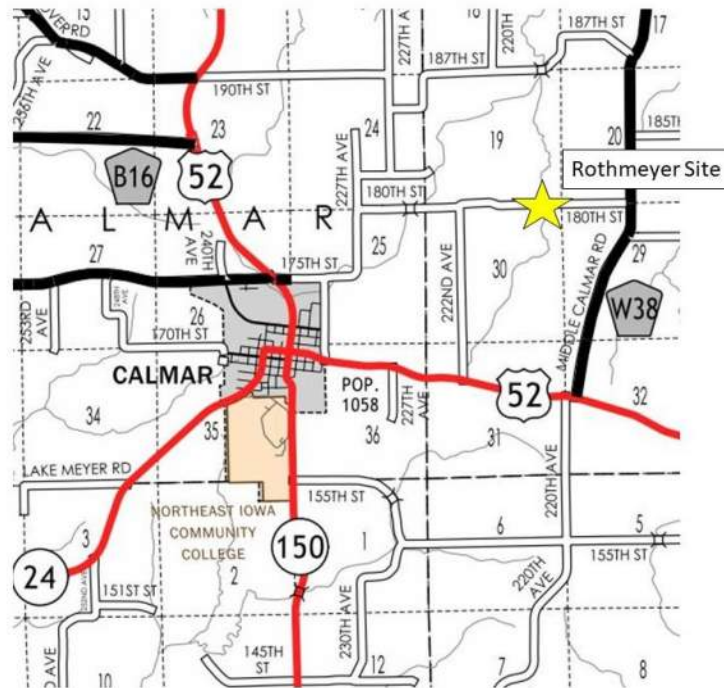


Figure No. 1 - Approximate Site Location

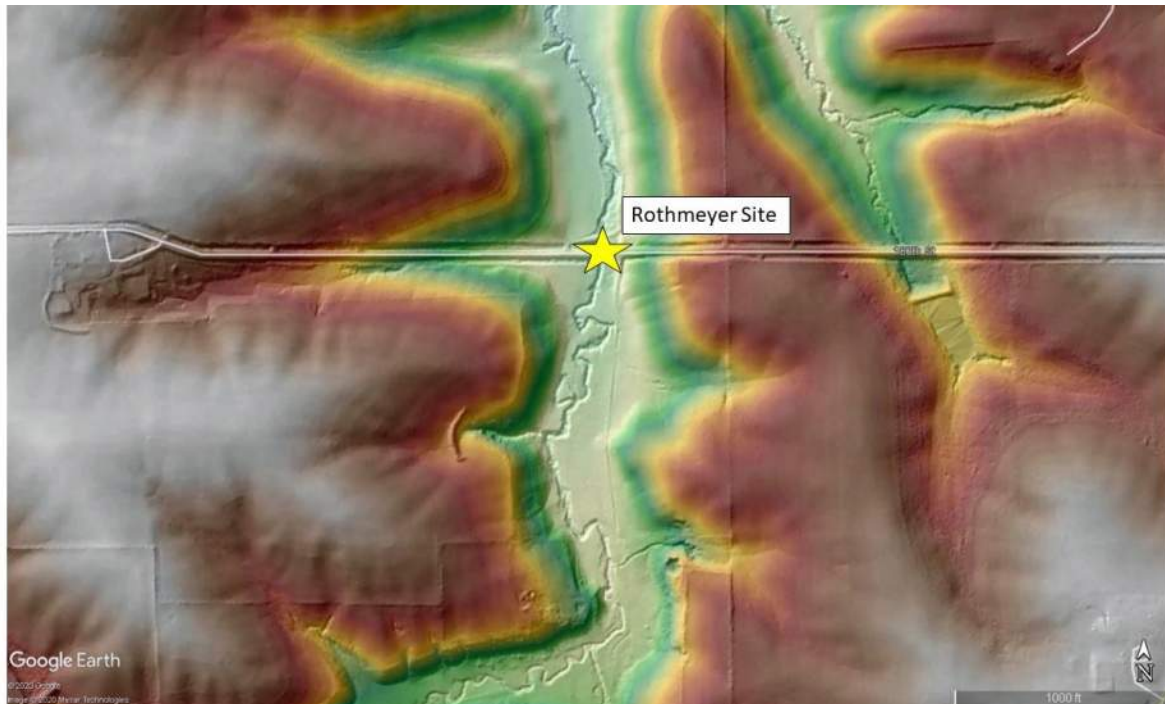


Figure No. 2 - Approximate Site Location (Hillshade Model)

Luke Monat, P.E. and Anthony Harbaugh, E.I. with Shive-Hattery have indicated that the existing roadway structure will be raised approximately 10 feet to accommodate the design storm events for the proposed temporary detention structure. The top of the embankment will be established near elevation 1,132 feet with an overall embankment height on the order of 20 to 25 feet. The embankment side slopes will be flattened to 3:1 (H:V) which will require up to 15 feet of new fill on the upstream and downstream side slopes. The existing culvert will be removed and replaced by a 6 x 8 feet reinforced concrete box culvert. The 10-year and 100-year high-water elevation on the upstream side of the dam is planned at 1,122.47 and 1,127.55 feet, respectively. Under normal dam operations no permanent pool is planned.

The existing roadway embankment stands approximately 10 to 15 feet above the culvert/stream level. Existing embankment side slopes between the roadway and drainageway are steep. Topographic contours on the site survey suggest the overall slope configuration is between 1.5 and 2:1 (horizontal (H): vertical(V)).

FIELD EXPLORATION

Twelve borings were conducted at this site on May 12 and 13, 2020. Approximate locations of the roadway borings are shown on the enclosed Site Plan and were located and staked at the site by Erdman Engineering prior to the field exploration. The locations of the borrow borings were selected by Matt Frana with the Natural Resources Conservation Service. Final boring locations and ground surface elevations were determined by ABE using GPS survey equipment. The boring surface elevations, indicated on the enclosed Boring Logs, are Iowa Real-Time Network (RTN) derived. Methods of drilling, sampling, standard laboratory testing, and classifying of subsurface materials are discussed in the Boring Log Description/Legend pages of the Appendix.

SUBSURFACE CONDITIONS

Site Geology

Winneshiek County is located within a geomorphic region of Iowa referred to as the Paleozoic Plateau. The landscape in the Paleozoic Plateau region is dominated by bedrock outcroppings and deep narrow valleys that have formed as result of erosion into Paleozoic age rock strata. Overburden soil materials at the site have been deposited by different geomorphic processes including water, wind, gravity, and ice. As a result, soil stratigraphy at the site varies by geographic position.

Soil stratigraphy in upland areas generally consists of discontinuous loess cover underlain by bedrock. The loess is an eolian (wind-blown) deposit derived from flood plain sediments and tends to have relatively uniform silt and clay particle sizes.

Loess has been deposited in valleys and is comprised of fine-grained silt and clay materials. Colluvium is typically located on or near the base of steep to very steep side slopes along valleys and is typically comprised of silt and clay materials with various sized rock fragments eroded or moved from the upland areas and deposited in lower positions on the slopes.

The overburden soils are underlain by weathered shale, sandstone, and limestone bedrock formations of the Devonian and Ordovician bedrock systems.

Soil Profile

Detailed descriptions of soils encountered by this exploration are provided on the Boring Logs enclosed in the Appendix. The Profile of Borings (Plates A-1 and A-2) presented in the Appendix depicts the relative deposit elevations in borings located between the roadway and upstream toe (Plate A-1) and the borings conducted in the potential borrow area in the adjacent field east of the drainageway (Plate A-2). The following is a discussion of the subsurface materials encountered in the borings. Unless otherwise indicated, the depths of soil stratum and groundwater levels are referenced from below existing grade at the individual boring locations at the time of drilling.

Boring Nos. 1 and 2 were conducted on 180th Street and encountered between 4 and 8 inches of crushed rock with fines over stiff to very stiff dark brown and brown lean clay (CL) embankment fill. Dark brown and very dark gray lean clay (CL) cohesive alluvium underlaid the embankment fill and extended to depths of 15.5 and 19 feet. Boring No. 3 was conducted on the valley floor and encountered dark brown lean clay (CL) topsoil over dark brown to very dark gray (CL) lean clay cohesive alluvium. In Boring Nos. 1 and 3 a layer of saturated fine to medium sand with silt (SP-SM) was present between the cohesive alluvium and the underlying limestone bedrock. Weathered limestone bedrock was encountered underlying the cohesive alluvium in Boring Nos. 1 through 3 between depths of 16 and 19 feet (between elevations 1,104.4 and 1,105.0 feet).

Topsoil consisting of dark brown lean clay (CL) with organics was present at the ground surface in Boring Nos. 4 through 12 which were conducted in the upland borrow areas east of the creek. The damp to moist topsoil extended to depths between 1 and 2 feet. Brown lean clay (CL) loess underlaid the topsoil and extended to depths between 3 and 14 feet in Boring Nos. 6 through 12. Loess was not encountered in Boring Nos. 4 and 5 located on the side slope in the northeast portion of the site. Boring Nos. 4 through 12 terminated in weathered limestone bedrock between depths of 3.5 and 20 feet.

Groundwater Level Observations

The borings were monitored during and shortly after drilling operations to detect moisture seepage and groundwater accumulation. The results of our water level observations are noted on the Boring Logs enclosed in the Appendix.

During drilling operations, groundwater accumulation was observed shortly after drilling operations in Boring Nos. 1 and 2 conducted on the road near depths of 16 feet. In Boring No. 3, conducted on the west side slope groundwater accumulation was observed near a depth of 12 feet which appears to be near creek level. No groundwater accumulation was observed in Boring Nos. 4 through 12 conducted in the upland borrow areas east of the creek. These short-term water levels are not necessarily a true indication of the groundwater table. Long-term observations would be necessary to accurately define the groundwater variations at this site. Fluctuation of groundwater levels can occur due to seasonal variations in the amount of rainfall, surface drainage, subsurface drainage, site topography, irrigation practices, and ground cover (pavement or vegetation).

ANALYSES AND RECOMMENDATIONS

Summary

Analyses and recommendations for design of the proposed roadway embankment and earthfill dam at this site are based upon test boring data, laboratory test results, our experience with similar soil types, and our understanding of the project. In our opinion, the proposed dam can be constructed at this site; however, appropriate design and construction measures should be implemented for construction of the dam considering on-site subsurface conditions. Soft to medium stiff compressible alluvium soils were encountered below the embankment fill soils in Boring Nos. 1 and 2 and in the upstream Boring No. 3. We anticipate compressible alluvium soils will likely be present below the culvert and the portions of the embankment that extend downstream and upstream of the existing embankment. The following sections discuss design and construction considerations for the proposed dam and pond at this site.

Site Preparation

Stripping – Prior to site grading, organic and loose materials in addition to all vegetation must be stripped. We expect that a minimum stripping depth of 6 inches will be required on the side slopes. Stripping depths may vary due to localized variations in vegetation cover and subgrade stability and deeper stripping of one foot or more may be necessary to remove thicker organics or soft sediments that may be encountered low-lying areas within the valley. Stripped soil could be used for landscaping purposes in non-critical areas. Root balls and large roots from mature trees, if any, should be completely removed prior to filling. Existing slopes to receive fill, such as the existing roadway embankments and abutment areas should be adequately benched and deeply scarified to integrate the new fill sections with the existing terrain. The subgrade should then be

proof-rolled to delineate zones of soft soils present near the surface which may require additional removal or compaction.

Key Trench – We recommend that a key trench be installed below the flattened embankment, near or slightly upstream of the existing roadway ditch in order to integrate the embankment into the underlying soils and provide discontinuity for any shallow flow of water below the embankment. The key trench should have a bottom width on the order of 6 to 8 feet with side slopes no steeper than 1:1 (horizontal to vertical), extend approximately 3 to 5 feet below existing grades, and extend up the abutments to elevation 1,129 feet. This trench is not intended to extend through the shallow weathered/fractured bedrock present below the dam or on the valley sidewalls. The key trench should be backfilled with cohesive (clay) soils such as the on-site lean clay (CL) loess or other clay borrow materials. Cohesive materials excavated from the key trench could be reused for compacted fill within the key trench; however, the existing materials in the lower lying upstream valley and ditch will likely require moisture conditioning prior to use as fill.

Filling the Existing Channel – We recommend that the existing creek channel be completely filled with compacted cohesive fill preferably 2 feet or more beneath the flattened embankment slope. This may require over-excavating areas where the channel is less than 2 feet deep unless bedrock is encountered shallower than 2 feet. Channel side slopes should be adequately benched and deeply scarified prior to filling in order to integrate the new fill sections with the existing terrain.

Borrow Material Considerations

The proposed borrow area is planned from the southeast hill in the area of Boring Nos. 10, 11, 12 where thicker loess deposits were encountered. Based on discussions with Shive-Hattery, preliminary maximum cuts on the order of 8 feet are planned. The thicker loess deposits were generally located in upland areas and decreasing in thicknesses on and near the side slopes. In general, the lean clay loess soils encountered in Boring Nos. 10, 11, and 12 would be suitable for use in construction of the earthen dam. However, very moist loess soils may not provide adequate support for heavy construction equipment and it will likely be necessary to utilize low impact excavation equipment for cuts in the borrow area deeper than 3 to 4 feet.

Based on our experience, cut slopes constructed at 3:1 (H:V) or flatter in similar subsurface conditions are generally stable if not subject to moisture seepage. Moisture seepage should be anticipated in areas where cut excavations extend below seasonal high groundwater levels.

Flattening of slopes, installing interceptor drain lines, or on-going repair of unstable areas may be required to maintain the cut slopes. Ongoing, unmitigated moisture seepage on the slopes can lead to erosion, sloughing, and wet areas that can be difficult to mow and maintain.

It is our understanding that NRCS Specification “IA-23 Earthfill” will be used to specify moisture conditioning and compaction of fill for the project. Compaction of soils which are dry (below) of the recommended moisture range for compaction results in significant increases in soil permeability and potential leakage through the embankment. Therefore, depending on the time of year, if the soils are too dry adding water with a water truck will be necessary to raise the soil moisture content before compacting. Also, once the soils are placed, they should not be allowed to dry out excessively (and form a ‘crust’) between lifts of fill. If this does occur, provisions should be made to strip or scarify/moisture condition/compact the surficial dry soils prior to the placement of new fill sections.

Cohesive soils can generally be suitably compacted with sheepsfoot or pneumatic type compactors, while granular soils (such as for the internal drainage layers) can generally be suitably compacted with vibratory compaction equipment. Care should be exercised in properly backfilling and compacting all trenches. In addition, hand compaction equipment will likely be required to ensure adequate compaction and continuous intimate contact of embankment soils with below grade structures, such as the outlet structure and pipe. If compaction and low permeability conditions cannot be achieved in these areas, it may be necessary to incorporate bentonite into the soils to provide an adequate seal.

We estimate that shrinkage for earthwork quantification for cohesive lean clay (CL) loess and cohesive alluvium soils will be on the order of 20 to 30 percent (1.2 to 1.3). Settlement of the embankment due to consolidation of new fill and underlying foundation soils will also appear as shrinkage and require additional volume.

Erosion Control

Areas of intense water erosion, such as the outlet channel, should also be protected with properly designed erosion control. The downstream embankment slope and other areas subject to erosion from surface water should be protected with suitable erosion control measures, such as vegetation.

Embankment Slope Stability

An earthfill dam should be designed and constructed to have an adequate factor of safety to withstand the shearing stresses induced in the embankment slopes and foundation soils. Stability evaluation typically requires consideration of the following three conditions: 1) during and immediately following construction, 2) steady state seepage (full reservoir), and 3) sudden draw down.

New fill associated with flattening slopes may generate excess pore water pressure during construction. Our stability analysis indicates that during construction, with pore water pressure development in the compressible alluvium soils on the order of $\frac{1}{2}$ to $\frac{3}{4}$ the weight of new overburden soils (earthfill dam), the factor of safety against shear is on the order of 1.4 which is adequate. After complete dissipation of excess pore water pressure, our analyses indicate the long-term factor of safety will improve to greater than 1.5.

During a conference call on October 14, 2020 Shive-Hattery indicated that during a 100-year storm event water may be temporarily stored for less than 24 hours. Considering the dam is designed for the temporary storage of water during storm events, it is our opinion that steady state seepage and rapid draw-down conditions will not occur.

Embankment Settlement

Plans for the project indicate new fill thicknesses on the order of 10 to 15 feet will be required to achieve desired final grades. The weight of the new fill will cause the underlying soft to medium stiff cohesive alluvium to consolidated resulting in settlement at the ground surface. We estimate total embankment settlement on the order of 2 to 4 inches within the softer clay alluvium soils may occur where new fill thicknesses are between 10 and 15 feet. Settlements would decrease towards the upstream and downstream edges/toes of the embankment fill and over the existing roadway embankment.

Culvert Support and Foundation Design

During a conference call on October 14, 2020 Shive-Hattery indicated the culvert may be constructed east of the existing culvert. Information for Boring Nos. 1 through 3 indicate the weathered bedrock surface within the floodplain area is relatively uniform near elevation 1105 feet, the bedrock elevation in Boring No. 4 conducted east of the driveway was approximately 20 feet higher near elevation 1125 feet. While we assume the bedrock elevation in the creek valley

may be consistent with borings conducted west of the creek, it would be appropriate to conduct additional exploration with test pits near the proposed culvert location to confirm the depth/elevation of bedrock and determine whether bedrock excavation would be required.

The preliminary Grading Plan provided by Shive-Hattery indicates that the culvert flow line will vary between 1,107 and 1,109 feet. Boring information from Boring Nos. 1, 2, and 3 indicates the culvert will bear on 2 to 5 feet of soft to medium stiff cohesive alluvium soils over weathered limestone bedrock. We recommend that a granular blanket of clean coarse crushed rock (similar to or coarser than Iowa DOT 4115) 2-feet thick or more be utilized below the culvert bottom to provide a uniform bearing surface and a stable working platform. If bedrock is encountered within 2 feet of the culvert bottom then the granular blanket could extend to the bedrock surface, i.e. excavation of the weathered limestone would not be necessary. The coarse crushed rock layer, would be capable of supporting maximum net allowable bearing pressures on the order of 2,000 pounds per square foot psf. We recommend visual observations and test probing be conducted by an ABE representative at the time of construction to confirm suitable bearing conditions. Culvert alignment and joint design should include consideration for estimated total and differential settlements on the order of 1 or less when the overlying embankment is reconstructed.

Coefficient of sliding friction values of 0.8 may be used for Portland cement concrete on a granular (crushed aggregate) subgrade. Active earth pressure design assumes that the wall can rotate and deflect at the top. If the wall is rigidly fixed, higher lateral earth pressures will develop against the wall and at-rest pressure parameters should be used for design. Increased earth pressures can also develop from restricted soil drainage, surcharge loads adjacent to the wall, and compaction of the adjacent backfill. Expansive materials (CH), either natural or backfill, should not be within 3 feet of below grade walls.

Culvert walls should be designed to accommodate unbalanced lateral earth pressures. Estimated lateral earth pressures for cohesive and cohesionless (granular) backfill are presented in the following Table A.

TABLE A
LATERAL EARTH PRESSURE PARAMETERS

Condition	Cohesive Soil (non-expansive clay)	Cohesionless Soil (granular-sand)
Assumed Backfill Characteristics		
Approximate Total Density	130 pcf	120 pcf
Approximate Friction Angle	15° - 20°	30° - 35°
Active Pressure Coefficient, K_a	0.5	0.3
At-Rest Pressure Coefficient, K_o	0.7	0.5
Passive Pressure Coefficient, K_p	2	3.3
Estimated Lateral Earth Pressure ¹ (Equivalent Fluid Pressures)		
Active - Drained	65 pcf	35 pcf
Active - Undrained ²	95 pcf	80 pcf
At-Rest - Drained	90 pcf	60 pcf
At-Rest - Undrained ²	110 pcf	90 pcf
Passive - Drained	260 pcf	400 pcf
Passive - Undrained ³	135 pcf	190 pcf

- 1) Assumes no safety factor, negligible wall friction, vertical wall, level backfill, zero surcharge loads and ignores cohesion shear strength.
- 2) Combined buoyant backfill unit weight and hydrostatic (water @ 62.4 pcf) loading.
- 3) Excludes hydrostatic loading.

Excavation Stability and Dewatering

Boring information indicates excavations for construction of the key trench will encounter predominately cohesive soils with saturated sand layers above the weathered bedrock. Weathered bedrock was encountered near elevation 1,105 feet in Boring Nos. 1, 2, and 3. Therefore, excavations deeper than 2 to 4 feet near the existing streambed may encounter weathered limestone bedrock. As the key trench extends east and west of the proposed culvert, we anticipate the key trench will encounter predominately cohesive alluvium soils. The overburden soils can typically be excavated utilizing conventional excavation equipment. Excavations encountering harder limestone bedrock, will likely require rippers, pneumatic tools, hydraulic breakers, or heavier excavation equipment.

If excavations encounter only cohesive soils with no wet sand seams or layers, it is expected that the water seepage can be controlled by permitting it to drain into temporary construction sumps and be pumped outside the perimeter of the excavations. More extensive dewatering such as sand points and wells may be required for excavations which extend down into water bearing sand layers or excavations that extend below the water table. If water bearing sands are

encountered, we recommend that water levels be maintained 2 feet or more below the bottom of excavations to prevent upward seepage forces which could reduce subgrade support.

The extent of bracing or sloping of open cut excavations will be dependent upon depth of cut, groundwater conditions, soils encountered, length of time the excavation will be open, area available for excavation and local governing regulations. Predominately cohesive soils may appear to stand nearly vertical in shallow excavations for short periods of time. However, soil creep, surcharge loads, precipitation, subsurface moisture seepage, construction activity vibrations and other factors may cause these soils to cave within an unpredictable period of time. Excavations encountering sand may tend to cave rapidly, especially if water is flowing through the sand. Unstable granular excavation walls may also cause surrounding cohesive soils to become unstable. Temporary shoring, flattening of the excavation slopes or use of trench boxes may be required to maintain a safe condition. Determining the appropriate OSHA classifications of the soil types encountered and implementing the required provisions for sloping, shoring, and bracing of excavations throughout the project during construction are the responsibility of the contractor per OSHA.

Construction Observation

We recommend that site grading operations such as stripping, key trench excavations, borrow material, and embankment construction be observed and monitored under direction of a geotechnical engineer or other qualified engineer.

GENERAL

The analyses and recommendations in this report are based in part upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further

recommended that the geotechnical engineer be retained for testing and observation during earthwork and foundation construction phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, expressed or implied, is made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer.

The scope of our service was not intended to include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air on, below or adjacent to this site.

APPENDIX

BORING LOG DESCRIPTION/LEGEND

(page 1 of 3)

The material types encountered during the drilling operations were recorded on field logs. The profile represented on the Boring Log is based on final classification performed by a geotechnical engineer using the field logs, laboratory observation and testing. The material stratigraphy demarcation lines shown on the Boring Logs indicate changes in soil characteristics, however, actual soil changes or variations may occur as a gradual transition. Soil profile discussion, Log Boring information, water levels and recommendations presented in this report are based upon measured depths below ground levels existing at time of the field exploration, unless otherwise specified.

DRILLING AND SAMPLING

The borings were conducted with either a truck or all-terrain rotary drill rig using the drilling methods indicated on each Boring Log. Soil sampling and/or in-situ testing such as Shelby Tube (ST), split-spoon (SS), drive cone (DC), or core (C) was conducted at depth intervals which were selected in consideration of the characteristics of the proposed construction. Generally undisturbed soil samples are taken at 5 foot depth intervals or change in soil types. Disturbed soil samples from the auger, either jar size or bulk size samples, may be taken at intermediate intervals for the purpose of soil classification or laboratory testing. Borings conducted for soil classification only, will show no designation of sampling although disturbed sampling is performed. Soil samples obtained in the field were identified and sealed for transportation to the laboratory for performance of pertinent physical testing and engineering classification.

Drilling Methods

- CFA - Continuous Flight Auger: 4, 6, or 8-inch diameter (ASTM D1452).
- RD - Rotary Drilling: Using drilling fluid in cased or uncased boring (ASTM D2113).
- HSA - Hollow Stem Auger: 6 or 8-inch diameter, continuous flight auger remains in boring with soil removed from the hollow stem through which undisturbed sampling is conducted.
- HA - Hand Auger: 4-inch or less diameter.

Sample Types

- ST - Shelby Tube: Thin-walled tube samples of cohesive soils (ASTM D1587).
- SS - Split Spoon with 140 lb. manual hammer: Standard penetration test and split-barrel samples (ASTM D1586).
- SSA - Split Spoon with 140 lb. automatic hammer: Standard penetration test and split-barrel samples (ASTM D1586).
- DC - Drive Cone: Dynamic in-place testing of soil using a 2-inch diameter cone with a 60 degree point driven into the soil for continuous 1-foot intervals in the same manner as Split Spoon, no sample is obtained.
- C - Core: Sampling hard soil or bedrock with a diamond core barrel in a rotary drill boring (ASTM D2113).
- SPT - Standard Penetration Test: Number of blows required to drive sampler (split spoon or drive cone) into the soil with a 140-pound weight dropping a distance of 30-inches (ASTM D1586), number of blows recorded for each 6-inch interval in an 18-inch (or more) penetration depth, values shown are for each 6-inch interval (if series of number sets are shown) or a total of the last two 6-inch intervals (if only one number is shown) which is commonly referred to as "N" in blows per foot. High resistance is indicated by a high number of blows for a lesser penetration depth listed in inches.
- BS - Bulk Sample: Disturbed.
- CPT - Cone Penetration Test: Quasi-static in-place testing of soils using a 60 degree cone and friction sleeve which are steadily pushed into the soil and measure skin friction and end bearing (ASTM D3441).

STANDARD LABORATORY TESTING

Representative undisturbed soil samples obtained by the Shelby Tube sampler were tested for moisture content (ASTM D2216), density (dry) and unconfined compressive strength (ASTM D2166) in the laboratory. Results of these tests appear on the respective Boring Logs. Additional soil testing including particle size analysis (ASTM D422) and Atterberg Limits (ASTM D4318) may be conducted, if necessary, to define in more detail pertinent soil characteristics for classification in accordance with the Unified Soil Classification System. Specialized laboratory tests (if conducted) to determine pertinent soil characteristics are discussed in the "Laboratory Testing" section of the report.

WATER LEVEL MEASUREMENT

Water levels indicated on the Boring Logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with short term observations.

BORING LOG DESCRIPTION/LEGEND

(page 2 of 3)

DESCRIPTIVE SOIL CLASSIFICATION

Soil description is based on the Unified Classification System as outlined in ASTM Designations D-2487 and D-2488. This classification is primarily based upon visual and apparent physical soil characteristics, comparison with other soil samples, and our experience with the soil. Additional laboratory testing may be conducted, if necessary to define in more detail pertinent soil characteristics. The Unified Soil Classification group symbol shown on the boring logs corresponds with the group names listed below. The description includes soil constituents, moisture conditions, color and any other appropriate descriptive terms.

Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name
GW	Well-Graded Gravel	SW	Well-Graded Sand	CL	Lean Clay	CH	Fat Clay
GP	Poorly-Graded Gravel	SP	Poorly-Graded Sand	ML	Silt	MH	Elastic Silt
GM	Silty Gravel	SM	Silty Sand	OL	Organic Clay Organic Silt	OH	Organic Clay Organic Silt
GC	Clayey Gravel	SC	Clayey Sand			PT	Peat

RELATIVE PROPORTIONS			GRAIN SIZE TERMINOLOGY	
Descriptive Term(s) (Of components also present in sample)	Sand and Gravel % of Dry Weight	Fines % of Dry Weight	Major Component of Sample	Size Range
Trace	<15	<5	Cobbles	12 in. to 3 in. (300mm to 75mm)
With	15-30	5-12	Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Modifier	>30	>12	Sand	#4 to #200 sieve (4.75mm to 0.074mm)
			Silt or Clay	Passing #200 sieve (.074 mm)

CONSISTENCY OF FINE-GRAINED SOILS			RELATIVE DENSITY OF COARSE-GRAINED SOILS	
Unconfined Compressive Strength, Qu, psf	Consistency	SPT, bpf	SPT, bpf	Relative Density
< 500	Very Soft	0-2	0-4	Very Loose
500-1,000	Soft	2-4	4-10	Loose
1,000-2,000	Medium Stiff	4-8	10-30	Medium Dense
2,000-4,000	Stiff	8-15	30-50	Dense
4,000-8,000	Very Stiff	15-30	50-80	Very Dense
8,000-16,000	Hard	30-100	80+	Extremely Dense
> 16,000	Very Hard	>100		

BORING LOG DESCRIPTION/LEGEND

(page 3 of 3)

ABBREVIATIONS

COMMONLY USED ABBREVIATIONS	
ft. or ' - feet	elev. - Elevation
in. or " - inches	% - Percent
psf - pounds per square foot	No. - Number
plf - pound per lineal foot	TB - Test Boring
pcf - pounds per cubic feet	N - blow count (SPT, bpf)
kip - 1000 pounds	USCS - Unified Soil Classification System
ksf - 1000 pounds per square foot	LL - Liquid Limit
klf - 1000 pounds per lineal foot	PL - Plastic Limit
tsf - tons per square foot	PI - Plasticity Index
bpf - blows per foot (SPT, N)	

BORING LOG DESCRIPTION/LEGEND BEDROCK

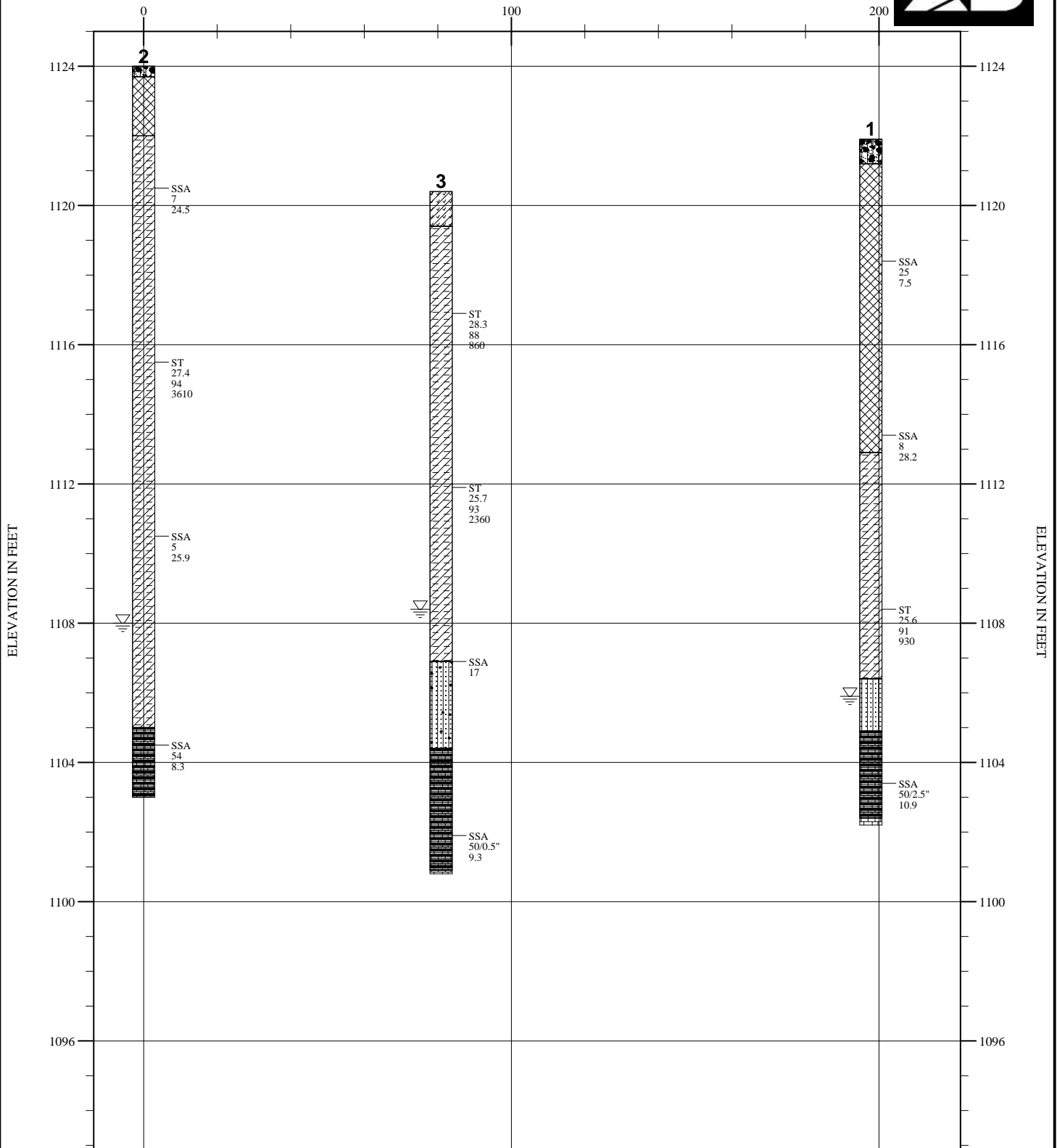
CLASSIFICATION	
LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of CaCO_3 , reacts with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of MgCO_3 , slightly harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, smooth, very fine-grained texture, composed of micro-crystalline quartz (SiO_2), brittle, breaks into angular fragments, will scratch glass.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand-sized grains of quartz, feldspar, etc.
SHALE	Light to dark colored, very fine-grained texture, composed of consolidated mud, silt, or clay, usually bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone, or mudstone.
COAL	Usually black graphite-like material composed of carbonaceous matter (decomposed organics) and clay, brittle.

Rock Quality Designation, RQD is based on a modified core recovery procedure which, in turn, is based indirectly on the number of fractures and amount of softening or alteration in the rock mass as observed in the rock cores from a drill hole. Instead of counting the fractures, an indirect measure is obtained by summing up the total length of core recovered but counting only those pieces of core which are 4 inches in length or longer, and which are hard and sound.

ROCK QUALITY DESIGNATION (RQD)

RQD	Description of Rock Quality
0 – 25	Very Poor
25 – 50	Poor
50 – 75	Fair
75 – 90	Good
90 – 100	Excellent

PROFILE OF BORINGS



Strata symbols

- Crushed Rock With Fines
- Lean Clay Fill
- Lean Clay Alluvium
- Weathered Limestone

- Lean Clay Topsoil
- Poorly Graded Sand With Silt and Gravel
- Limestone
- Poorly Graded Sand With Silt

PROJECT NO.:

201247

DATE:

6/23/2020

PROJECT:

Upper Iowa Watershed UI-048
Rothmeyer Site, Springfield Township
Winnebago County, Iowa

PLATE:

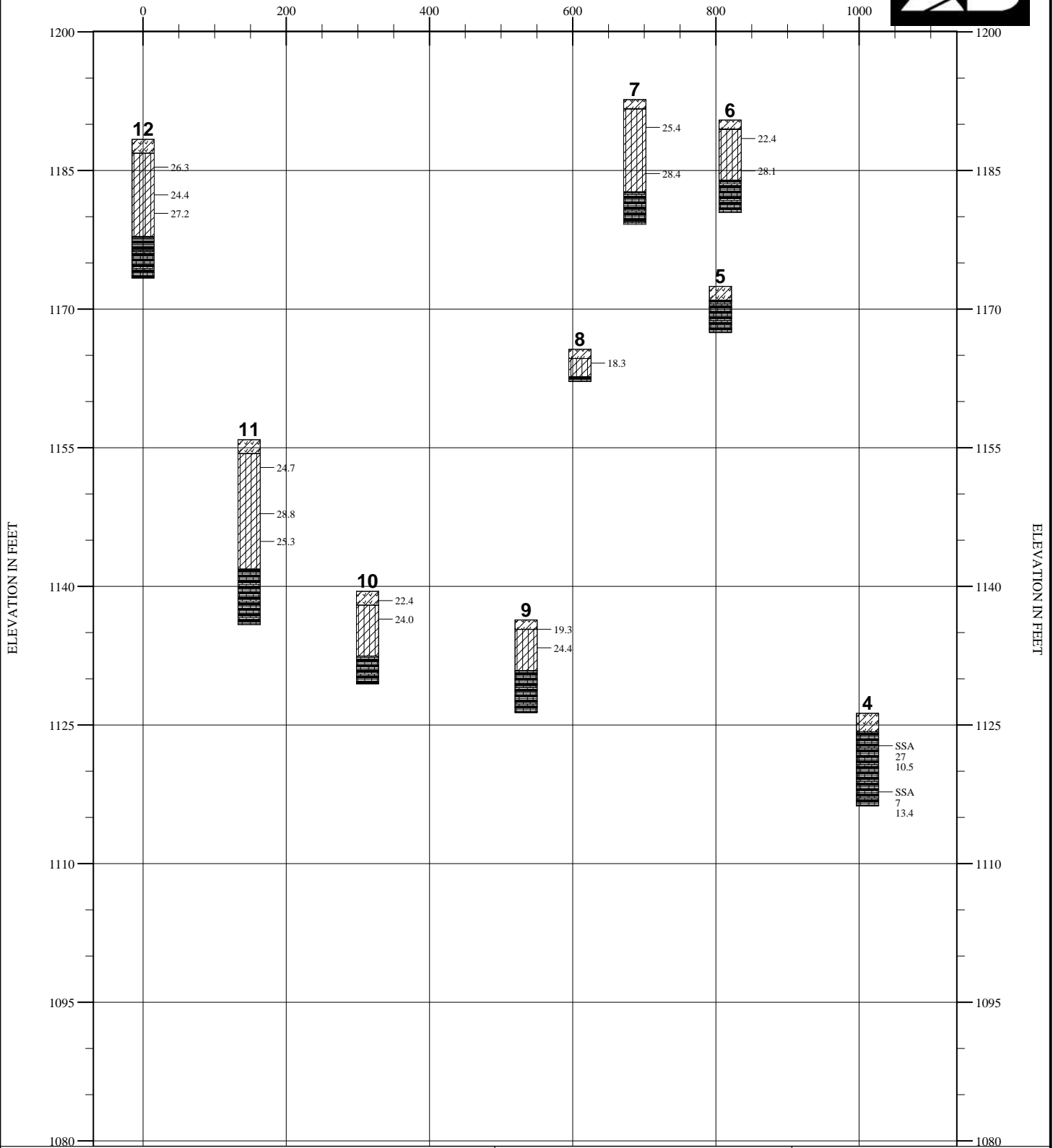
A-1

SCALE:

4 feet/in.

ALLENDER BUTZKE ENGINEERS, INC.

PROFILE OF BORINGS



Strata symbols



Limestone



Lean Clay Topsoil



Silty Clay



Weathered Clay Shale



Weathered Limestone

PROJECT NO.:

201247

DATE:

6/23/2020

PROJECT:

Upper Iowa Watershed UI-048
Rothmeyer Site, Springfield Township
Winneshiek County, Iowa












































PLATE:

A-2









SCALE:






15 feet/in.


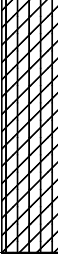

ALLENDER BUTZKE ENGINEERS, INC.

BORING LOG NO. 1				NORTHING 3904060.296				EASTING 5367437.768				Project No.: 201247																																																																																																																																																																																	
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winneshiek County, Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266																																																																																																																																																																																					
Surface Elevation: 1121.9'								Date Drilled: 5/13/2020				Drilling Method: 4" CFA																																																																																																																																																																																	
Datum: Site Survey								Drilling Depth, ft.: 19.7				Page: 1 of 1																																																																																																																																																																																	
<table><tr><th>Elevation ft.</th><th>Depth ft.</th><th>Sample No.</th><th>Type</th><th>SPT bpf</th><th>Moisture Content, %</th><th>Dry Density pcf</th><th>Unconfined Compressive Strength psf</th></tr><tr><td>1120</td><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1116</td><td>4</td><td>1</td><td>SSA</td><td>25</td><td>7.5</td><td></td><td></td></tr><tr><td>1112</td><td>8</td><td>2</td><td>SSA</td><td>8</td><td>28.2</td><td></td><td></td></tr><tr><td>1108</td><td>12</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1104</td><td>16</td><td>3</td><td>ST</td><td></td><td>25.6</td><td>91</td><td>930</td></tr><tr><td>1100</td><td>20</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1096</td><td>24</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>28</td><td>4</td><td>SSA</td><td>50/2.5"</td><td>10.9</td><td></td><td></td></tr></table>												Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	1120	0							1116	4	1	SSA	25	7.5			1112	8	2	SSA	8	28.2			1108	12							1104	16	3	ST		25.6	91	930	1100	20							1096	24								28	4	SSA	50/2.5"	10.9			<table><tr><th>Material Description*</th><th>Graphic Log</th><th>USCS</th><th>Water Level</th><th>Depth ft.</th><th>Elevation ft.</th></tr><tr><td>CRUSHED ROCK WITH FINES (8"±)</td><td></td><td></td><td></td><td>0.7</td><td></td></tr><tr><td>Brown lean clay with sand and limestone gravel, moist</td><td></td><td>CL</td><td></td><td>1121.2</td><td></td></tr><tr><td>FILL</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Dark brown after 6.5'</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Very dark gray lean clay, moist to very moist</td><td></td><td>CL</td><td></td><td>9</td><td>1112.9</td></tr><tr><td>COHESIVE ALLUVIUM</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Brown-gray after 13'</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Brown medium to coarse sand with silt and gravel, very moist</td><td></td><td>SP-SM</td><td></td><td>15.5</td><td></td></tr><tr><td>Moisture seepage near and saturated after 16'</td><td></td><td></td><td></td><td>17</td><td>1106.4</td></tr><tr><td>GRANULAR ALLUVIUM</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Light brown weathered limestone, moist</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>WEATHERED BEDROCK</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Light brown limestone, damp</td><td></td><td></td><td></td><td>19.5</td><td></td></tr><tr><td>BEDROCK</td><td></td><td></td><td></td><td>1102.4</td><td></td></tr><tr><td>End of Boring</td><td></td><td></td><td></td><td>19.7</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>1102.2</td></tr></table>				Material Description*	Graphic Log	USCS	Water Level	Depth ft.	Elevation ft.	CRUSHED ROCK WITH FINES (8"±)				0.7		Brown lean clay with sand and limestone gravel, moist		CL		1121.2		FILL						Dark brown after 6.5'						Very dark gray lean clay, moist to very moist		CL		9	1112.9	COHESIVE ALLUVIUM						Brown-gray after 13'						Brown medium to coarse sand with silt and gravel, very moist		SP-SM		15.5		Moisture seepage near and saturated after 16'				17	1106.4	GRANULAR ALLUVIUM						Light brown weathered limestone, moist						WEATHERED BEDROCK						Light brown limestone, damp				19.5		BEDROCK				1102.4		End of Boring				19.7							1102.2
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Depth to water: 16 ft. ft. ft.																																																																																																																																																																																													




BORING LOG NO. 2 NORTHING 3904058.675 EASTING 5367240.009								Project No.: 201247				
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winnebago County, Iowa						Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266						
Surface Elevation: 1124.0' Datum: Site Survey						Date Drilled: 5/12/2020 Drilling Depth, ft.: 21		Drilling Method: 4" CFA Page: 1 of 1				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1124	0							CRUSHED ROCK WITH FINES (4"±) Brown and dark brown mixed sandy lean clay, with limestone gravel, moist		CL		0.3 1123.7
								FILL Dark brown lean clay, moist		CL		2 1122
1120	4	1	SSA	7	24.5			Brown-gray and moist to very moist after 4'				
1116	8	2	ST		27.4	94	3610					
1112	12							COHESIVE ALLUVIUM Trace limestone fragments after 12'				
1108	16	3	SSA	5	25.9			With limestone fragments after 16'				
1104	20	4	SSA	54	8.3			Gray-brown weathered limestone, damp to moist WEATHERED BEDROCK				19 1105
								End of Boring				21 1103
1100	24											
1096	28											
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.												
Water Level Observation Time: at completion hrs. days Depth to water: 16 ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				

BORING LOG NO. 3		NORTHING 3903926.195		EASTING 5367321.985		Project No.: 201247							
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winneshie County, Iowa				Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266									
Surface Elevation: 1120.4'				Date Drilled: 5/12/2020		Drilling Method: 4" CFA							
Datum: Site Survey				Drilling Depth, ft.: 19.6		Page: 1 of 1							
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ft.	Elevation ft.
1120	0							Dark brown lean clay, trace organics, damp to moist TOPSOIL		CL		1	
								Dark brown lean clay, moist to very moist		CL		1119.4	
1116	4	1	ST	28.3	88	860							
								Very dark gray to dark brown after 5.5'					
								COHESIVE ALLUVIUM					
1112	8	2	ST	25.7	93	2360							
								Very moist with limestone fragments after 12'					
1108	12	3	SSA	17				Brown fine to medium sand with silt, gravel, saturated GRANULAR ALLUVIUM		SP-SM		13.5	
								Light brown weathered limestone, moist to very moist WEATHERED BEDROCK				16	
1104	16	4	SSA	50/0.5"	9.3			Light brown limestone, damp BEDROCK				1104.4	
								End of Boring				19.5	
1100	20											1100.9	
												19.6	
												1100.8	
1096	24												
1092	28												
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.													
Water Level Observation													
Time: at completion hrs. days													
Depth to water: 12 ft. ft. ft.													
ALLENDER BUTZKE ENGINEERS, INC.													
Geotechnical Environmental Construction Q.C.													

BORING LOG NO. <u>5</u> NORTHING <u>3903859.072</u> EASTING <u>5367864.725</u>								Project No.: <u>201247</u>				
Project: <u>Upper Iowa Watershed UI-048</u> <u>Rothmeyer Site, Springfield Township</u> <u>Winneshiek County, Iowa</u>								Client: <u>Shive-Hattery, Inc.</u> <u>4125 Westown Parkway, Suite 100</u> <u>West Des Moines, Iowa 50266</u>				
Surface Elevation: <u>1172.4'</u> Datum: <u>Site Survey</u>								Date Drilled: <u>5/12/2020</u> Drilling Depth, ft.: <u>5</u>				
								Drilling Method: <u>4" CFA</u> Page: <u>1</u> of <u>1</u>				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1172	0							Dark brown lean clay, trace organics, damp TOPSOIL		CL		1.5
								Light brown weathered limestone, damp WEATHERED BEDROCK				1170.9
1168	4											5
								End of Boring				1167.4
1164	8											
1160	12											
1156	16											
1152	20											
1148	24											
1144	28											
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.												
Water Level Observation Time: at completion hrs. days Depth to water: <u>Dry</u> ft.  ft.  ft. 								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				

BORING LOG NO. 6 NORTHING 3903928.081 EASTING 5368038.589								Project No.: 201247					
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winneshie County, Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266					
Surface Elevation: 1190.4' Datum: Site Survey								Date Drilled: 5/12/2020 Drilling Depth, ft.: 10					
								Drilling Method: 4" CFA Page: 1 of 1					
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.	
	0							Dark brown to brown lean clay, trace organics, moist		CL		1	
					22.4			TOPSOIL		CL		1189.4	
1188								Brown lean clay, moist					
	4							Very moist after 3'					
					28.1			LOESS					6.5
1184								Light brown weathered limestone, damp				1183.9	
	8							WEATHERED BEDROCK					
1180								End of Boring				10	
	12											1180.4	
1176													
	16												
1172													
	20												
1168													
	24												
1164													
	28												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation Time: at completion hrs. days Depth to water: Dry ft.  ft.  ft. 	ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.
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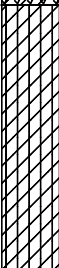
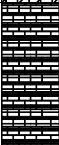
BORING LOG NO. <u>7</u> NORTHING <u>3903784.932</u> EASTING <u>5368027.424</u>								Project No.: <u>201247</u>				
Project: <u>Upper Iowa Watershed UI-048</u> <u>Rothmeyer Site, Springfield Township</u> <u>Winnebago County, Iowa</u>								Client: <u>Shive-Hattery, Inc.</u> <u>4125 Westown Parkway, Suite 100</u> <u>West Des Moines, Iowa 50266</u>				
Surface Elevation: <u>1192.6'</u> Datum: <u>Site Survey</u>								Date Drilled: <u>5/12/2020</u> Drilling Depth, ft.: <u>13.5</u>				
								Drilling Method: <u>4" CFA</u> Page: <u>1</u> of <u>1</u>				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1192	0							Dark brown lean clay, trace organics, damp TOPSOIL		CL		1
					25.4			Brown lean clay, moist Very moist after 3'		CL		1191.6
1188	4							LOESS				
1184	8				28.4			Brown-gray after 8.5'				10
								Light brown weathered limestone, damp to moist WEATHERED BEDROCK				1182.6
1180	12							Light brown limestone, damp BEDROCK				13.2
								End of Boring				1179.4 13.5
												1179.1
1176	16											
1172	20											
1168	24											
1164	28											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.




<p style="text-align: center;">Water Level Observation</p> <p>Time: at completion hrs. days</p> <p>Depth to water: Dry ft. ft. ft. </p>	<p style="font-size: 1.2em; font-weight: bold;">ALLENDER BUTZKE ENGINEERS, INC.</p> <p>Geotechnical Environmental Construction Q.C.</p>
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BORING LOG NO. 8 NORTHING 3903664.525 EASTING 5367900.256								Project No.: 201247				
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winnebago County, Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266				
Surface Elevation: 1165.6' Datum: Site Survey								Date Drilled: 5/12/2020 Drilling Depth, ft.: 3.5				
Drilling Method: 4" CFA Page: 1 of 1												
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1164	0				18.3			Dark brown lean clay, trace organics, damp TOPSOIL		CL		1
								Brown lean clay, moist LOESS		CL		1164.6
								Light brown weathered limestone, damp to moist WEATHERED BEDROCK				3
								End of Boring				1162.6 3.5 1162.1
1160	4											
1156	8											
1152	12											
1148	16											
1144	20											
1140	24											
1136	28											
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.												
Water Level Observation Time: at completion hrs. days Depth to water: Dry ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				

BORING LOG NO. 9 NORTHING 3903546.190 EASTING 5367774.640								Project No.: 201247				
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winnebago County, Iowa						Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266						
Surface Elevation: 1136.3' Datum: Site Survey						Date Drilled: 5/12/2020 Drilling Depth, ft.: 10		Drilling Method: 4" CFA Page: 1 of 1				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1136	0				19.3			Dark brown lean clay, trace organics, damp TOPSOIL		CL		1
					24.4			Brown lean clay, moist LOESS		CL		1135.3
1132	4											5.5
								Light brown weathered limestone, moist with interbedded clay seams WEATHERED BEDROCK				1130.8
1128	8											10
								End of Boring				1126.3
1124	12											
1120	16											
1116	20											
1112	24											
1108	28											
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.												
Water Level Observation Time: at completion hrs. days Depth to water: Dry ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				

BORING LOG NO. 10 NORTHING 3903302.229 EASTING 5367737.398								Project No.: 201247				
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winneshie County, Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266				
Surface Elevation: 1139.4' Datum: Site Survey								Date Drilled: 5/12/2020 Drilling Method: 4" CFA Drilling Depth, ft.: 10 Page: 1 of 1				
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
	0				22.4			Dark brown lean clay, trace organics, damp TOPSOIL		CL		1.5
					24.0			Brown lean clay, moist Brown-gray after 3' LOESS		CL		1137.9
1136	4											7
								Brown weathered limestone, moist WEATHERED BEDROCK				1132.4
1132	8											10
								End of Boring				1129.4
1128	12											
1124	16											
1120	20											
1116	24											
1112	28											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

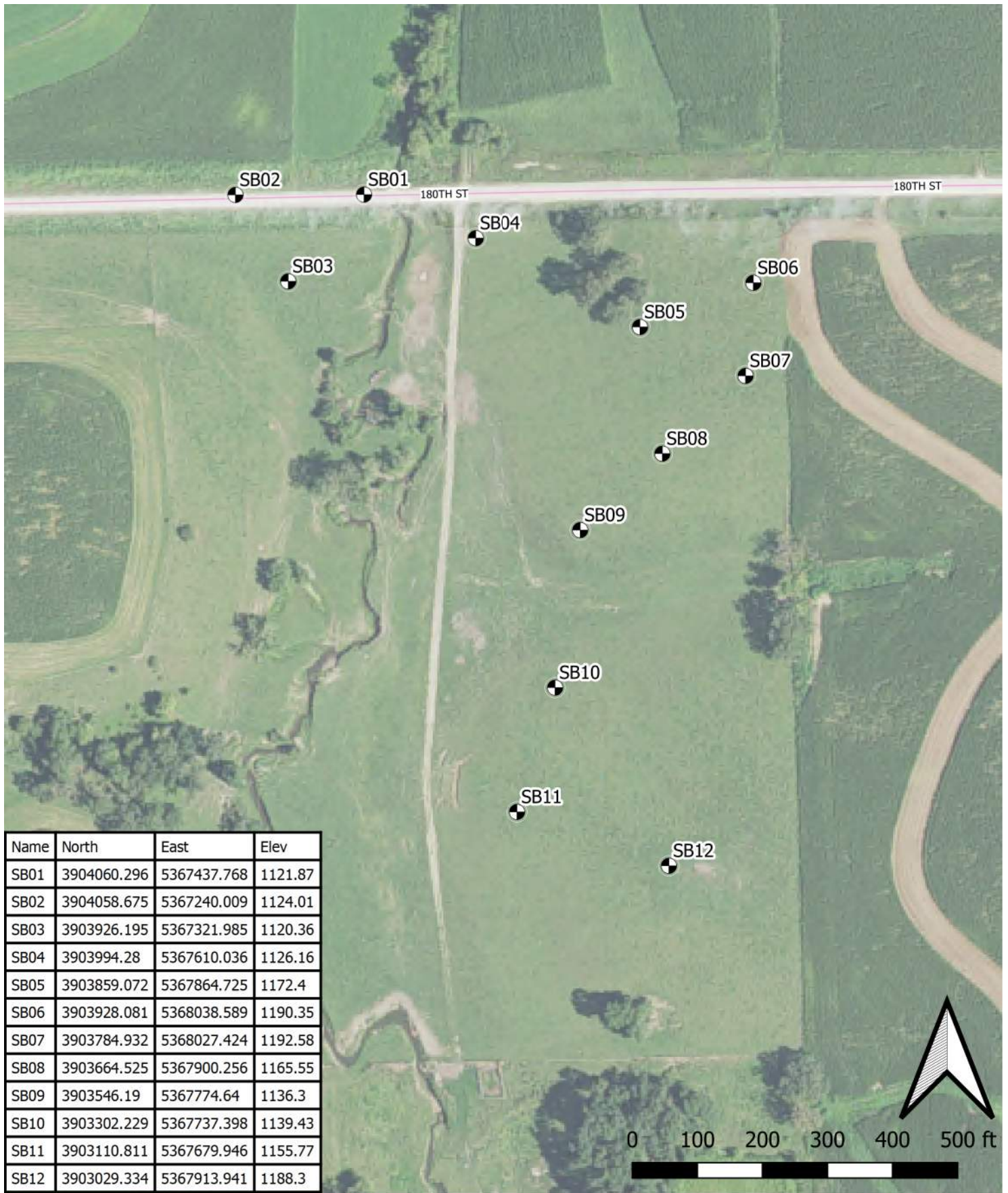
Water Level Observation Time: at completion hrs. days Depth to water: Dry ft.  ft.  ft. 	ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.
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BORING LOG NO. 11 NORTHING 3903110.811 EASTING 5367679.946								Project No.: 201247				
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winnebago County, Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266				
Surface Elevation: 1155.8' Datum: Site Survey								Date Drilled: 5/12/2020 Drilling Depth, ft.: 20				
Drilling Method: 4" CFA Page: 1 of 1												
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
	0							Dark brown lean clay, trace organics, damp TOPSOIL		CL		1.5
					24.7			Brown lean clay, moist		CL		1154.3
1152	4											
					28.8			Very moist after 7' LOESS				
1148	8							Gray-brown after 9'				
					25.3			With limestone fragments after 12'				
1144	12											14
								Light brown weathered limestone, moist				1141.8
1140	16							WEATHERED BEDROCK				
												20
1136	20							End of Boring				1135.8
1132	24											
1128	28											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation Time: at completion hrs. days Depth to water: Dry ft. ft. ft.	ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.
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BORING LOG NO. 12 NORTHING 3903029.334 EASTING 5367913.941								Project No.: 201247				
Project: Upper Iowa Watershed UI-048 Rothmeyer Site, Springfield Township Winneshie County, Iowa								Client: Shive-Hattery, Inc. 4125 Westown Parkway, Suite 100 West Des Moines, Iowa 50266				
Surface Elevation: 1188.3' Datum: Site Survey								Date Drilled: 5/12/2020 Drilling Depth, ft.: 15				
Drilling Method: 4" CFA Page: 1 of 1												
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description *	Graphic Log	USCS	Water Level	Depth ----- Elevation ft.
1188	0							Dark brown lean clay, trace organics, damp TOPSOIL		CL		1.5
					26.3			Brown lean clay, moist		CL		1186.8
1184	4				24.4			Brown-gray, very moist after 4'				
					27.2			LOESS Very moist after 7'				10.5
1180	8							Brown-gray weathered shale, moist				1177.8
1176	12							Light brown weathered limestone, moist after 12' WEATHERED BEDROCK				15
1172	16							End of Boring				1173.3
1168	20											
1164	24											
1160	28											
*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.												
Water Level Observation Time: at completion hrs. days Depth to water: Dry ft. ft. ft.								ALLENDER BUTZKE ENGINEERS, INC. Geotechnical Environmental Construction Q.C.				



ALLENDER BUTZKE ENGINEERS INC.

3660 109th Street
Urbandale, IA 50322



UI-048 Rothmeyer Roadway Structure
180th Street, Calmar Twp
Winneshiek Co, Iowa

PN 201247

Site Plan

**UPPER IOWA WATERSHED IMPROVEMENTS
FINAL DESIGN COST OPINION - UI - 048 - ROTHMEYER-NUMEDAH**

#	ITEM DESCRIPTION	QUANTITY	UNITS		UNIT COST		TOTAL COST
1	SITE CLEARING, PREPARATION, & WASTE DISPOSAL	1	LS	*	\$6,000.00	=	\$6,000.00
2	REMOVE AND DISPOSE 18' WIDE STEEL/WOOD BRIDGE, WING WALLS, AND FOUNDATION	1	LS	*	\$15,000.00	=	\$15,000.00
3	ROLLED EROSION CONTROL PRODUCT, TYPE 2D	1,368	SY	*	\$1.75	=	\$2,394.00
4	STRUCTURE SEEDING	2.4	AC	*	\$2,500.00	=	\$6,000.00
5	PASTURE SEEDING	2.9	AC	*	\$1,000.00	=	\$2,900.00
6	MOBILIZATION & DEMOBILIZATION	1.0	LS	*	\$30,000.00	=	\$30,000.00
7	CORE TRENCH OVEREXCAVATION	1,642	CY	*	\$3.00	=	\$4,926.00
8	EARTHFILL, EMBANKMENT AND CORE TRENCH FILL (P)	22,863	CY	*	\$3.50	=	\$80,020.50
9	SUBGRADE PREPARATION	2,176	SY	*	\$3.00	=	\$6,528.00
10	TOPSOIL, STRIP, SALVAGE AND RESPREAD	4,309	LS	*	\$3.00	=	\$12,927.00
11	24 INCH CMP CULVERT, 16GA ALUMINIZED STEEL	180	LF	*	\$35.00	=	\$6,300.00
12	30 INCH CMP CULVERT, 16GA ALUMINIZED STEEL	100	LF	*	\$45.00	=	\$4,500.00
13	RIP RAP, CLASS 'E' WITH GEOTEXTILE FABRIC	495	TON	*	\$25.00	=	\$12,375.00
14	EROSION STONE DITCH CHECKS	16	EACH	*	\$400.00	=	\$6,400.00
15	GRANULAR SURFACING, 8 INCH LAYER	783	TON	*	\$40.00	=	\$31,320.00
16	CULVERT BEDDING, 24 INCH LAYER, IDOT GRAD. 4115	180	TON	*	\$35.00	=	\$6,300.00
17	FENCE REMOVAL AND REPLACEMENT (5-STRANDS OF BARBED WIRE)	1,012	LF	*	\$4.00	=	\$4,048.00
18	IOWA DOT STANDARD PRE CAST REINFORCED CONCRETE BOX CULVERT, 6' X 8'	132	LF	*	\$600.00	=	\$79,200.00
19	REINFORCED BOX CULVERT STANDARD END SECTIONS	2	EACH	*	\$20,000.00	=	\$40,000.00
20	TRAFFIC CONTROL	1	LS	*	\$5,000.00	=	\$5,000.00
Subtotal							\$362,200.00
Contingency (15%)							\$54,400.00
Project Total							\$416,600.00

***TOTAL PROJECT COSTS AND CONSTRUCTION COSTS PROVIDED HEREIN ARE MADE ON THE BASIS OF ENGINEER'S EXPERIENCE AND QUALIFICATIONS AND REPRESENT THE ENGINEER'S BEST JUDGMENT. HOWEVER, THE ENGINEER CANNOT AND DOES NOT GUARANTEE THAT BIDS OR ACTUAL TOTAL PROJECT OR CONSTRUCTION COSTS WILL NOT VARY FROM THE ESTIMATE OF PROBABLE CONSTRUCTION COST. THIS ESTIMATE IS INTENDED TO ASSIST IN BUDGETARY ASSESSMENT AND DOES NOT GUARANTEE THAT ACTUAL PROJECT COSTS WILL NOT EXCEED OR BE LOWER THAN THE AMOUNTS STATED IN THIS ESTIMATE.