

2016

Bridge Improvement Grant (BIG) Procedure



South Dakota

Department of Transportation

Office of Local Government Assistance

10/29/2015

Local Bridge Improvement Grant (BIG) Procedure

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I. Objective:

In 2015, the South Dakota Legislature created the Bridge Improvement Grant (BIG) fund that will provide \$7 million for local government bridges derived from an increase in license plate fees. In addition, the DOT will add \$2 million state funds, for a total of \$9 million annually available in the bridge grant program until 2019 when DOT will add another \$6 million annually. The objective of these procedures is to define how these bridge projects will be prioritized and selected and these funds obligated to Local Public Agencies (LPAs) for highway bridge preservation, replacement, or rehabilitation projects on both federal aid On-System and Off-System routes. Funding for this program is not intended to be used for expansion of infrastructure with creation of new routes on new alignments.

II. Definitions

ADT - Value of average daily traffic contained in the National Bridge Inventory (NBI Item 29) or obtained from a traffic count within the last 2 years.

Bridge - As defined in the National Bridge Inspection Standards (NBIS): A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening. Refer to Figure II-1.

Bridge Improvement Grant (BIG) – Grant available to LPA's for structure replacement or major rehabilitation.

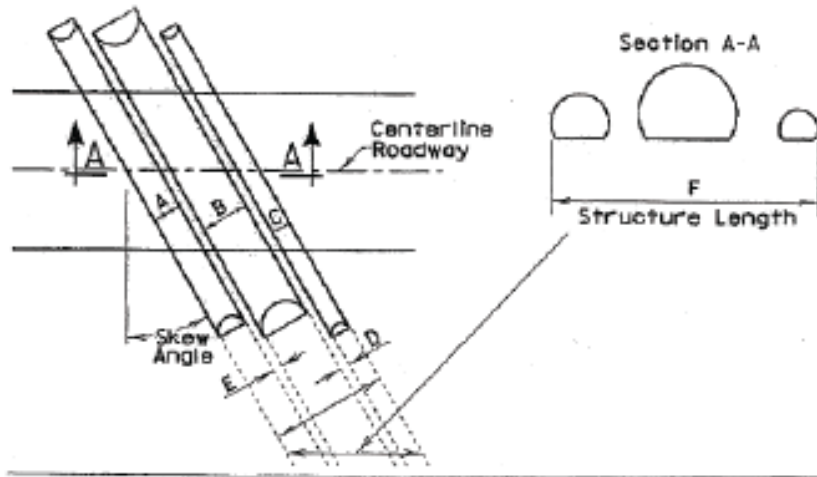
Bridge Preservation – Actions or strategies that prevent, delay or reduce deterioration of bridges or bridge elements, restore the function of existing bridges, keep bridges in good condition and extend their life. Preservation actions may be preventive or condition-driven.

Culvert Condition – Condition rating of culvert – Based on the data in NBI item 62.

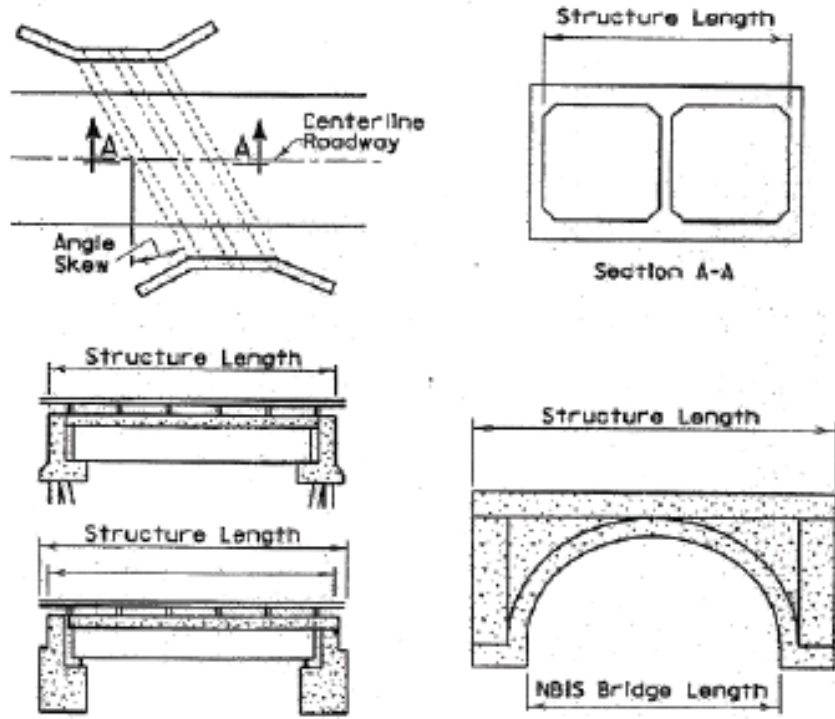
Deck Condition – Condition rating of the part of the structure that carries traffic – Based on the data in the NBI item 58.

Figure II-1

Diagram from "SD Bridge System Code Manual, 1998 Edition"



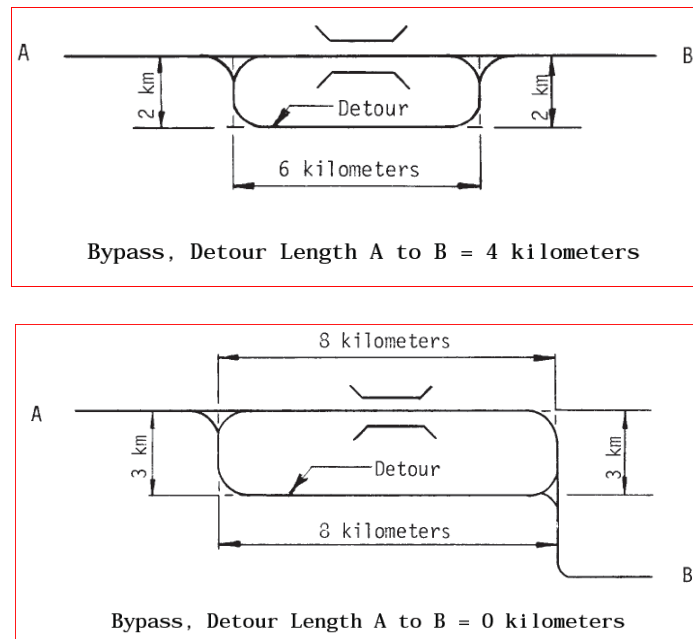
Multiple pipes may be considered a bridge if the distance between the pipes is less than half the smallest opening and the structure length is greater than 6.1 meters (20 feet). In the above illustration, distance D and E must be less than half the distance C and distance F must be greater than 6.1 meters (20 feet) for these pipes to be a bridge.



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Detour Length - Minimum additional length of travel required if the bridge in question was closed. Detour route shall not include bridges posted at less than legal loads or not allow non-permitted height or width loads to pass. User impact will be based on actual length as provided by the LPA on the grant application and not that reported in the NBI. Refer to Figure II-2 for examples.

Figure II-2



Engineers Cost – A cost estimate of all eligible items to be included with the BIG application. This amount as reviewed and approved by SDDOT will establish the maximum limiting amount of the grant that will be awarded.

Federal-aid System – A public highway eligible for assistance from the Federal Highway Administration other than a highway functionally classified as a local road or rural minor collector.

Full Maintenance Road – A road on the South Dakota Non State Public Road Inventory that has not been designated as a Minimum Maintenance Road or a No Maintenance Road.

Fracture Critical – Failure of any one main structural member may cause a significant portion or the entire bridge to collapse. As reported in the NBI.

Minimum Maintenance Road – A road that has been designated by a board of county commissioners or a township board as a minimum maintenance road if the board

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determines that the road or segment of the road is used only occasionally or intermittently for passenger and commercial travel.

National Bridge Inventory (NBI) – A database, compiled by the Federal Highway Administration, with information on all bridges and tunnels in the United States that have roads passing above or below.

No Maintenance Road – A road that has been designated by a township board as a no maintenance section line if the segment has been unimproved and is not maintained for vehicle travel. A No Maintenance Road is also a road or any segment of road that has designated by a township board as a no maintenance road if the board determines that the road or segment of the road is unsafe for vehicle travel.

Off-System - Public Roads, other than those on a Federal-aid System.

On-System - Public Roads, on a Federal-aid System. NBI Item 26.

PE-BIG– Subgrant available for LPA to perform preliminary engineering work, i.e., surveys bridge hydrologic/hydraulic (H/H) study including the type, location and size recommendation, etc.

Posted – Bridge is signed for less than legal loads. NBI item 70.

Preservation BIG– Grant for minor repair/rehabilitation and preservation work valued at less than financial limits as set in Section III of this procedure. Examples are scour projects, fatigue retrofits, waterproofing joints, painting, safety upgrade rail/barrier, or deck treatments (Low Slump Dense Concrete Overlays , Asphalt & Membrane overlays, and Epoxy Chip Seals). The primary function of these treatments is to preserve the structure elements and extend the service life of the structure.

Rehabilitation Projects – Major repair/rehabilitation work or combination of minor preservation work valued greater than financial limits to be classified as preservation only work as set in Section III of this procedure.

Replacement Projects – Total replacement of the structure.

Scour Critical – Foundation may be or has the potential to become unstable due to hydraulic undermining. NBI appraisal item 113 (Scour) having a value of 3 or less or having unknown foundations.

Shovel Ready – All design, review, certifications, and permits are completed and project is ready for bid letting within six months of award of BIG funding.

Structurally Deficient – Condition of one or more major component includes a significant

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defect. As reported in the NBI.

Substructure Condition – Condition rating of the part of the structure that supports the superstructure (piers, bents, abutments) – Based on the data in the NBI item 60.

Sufficiency Rating - A method of evaluating bridge data to obtain a numeric value which is indicative of a bridge's sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent a perfect bridge and zero percent would represent a completely failed bridge. The value shall be as derived from the equations found in FHWA's "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges".

Superstructure Condition – Condition rating of the part of the structure that supports traffic (deck, slab, girders) – Based on the data in the NBI item 59.

Wheel Tax – Imposition of a tax by County ordinance as authorized in South Dakota Codified Law 32-5A. County rate evaluated will be based on the tax imposed to vehicles over 6000 lbs GVWT.

III. Funding Responsibilities

Federal Funding - Federal funds will be made available to perform all LPA bridge inspections at 80 percent of eligible costs. The local match for bridge NBIS inspections will come from the LPA. No state cash funds are to be used for bridge inspections.

State Bridge Improvement Grant (BIG) Funds - Funding will be made available for eligible On and Off-System LPA bridges for preservation, rehabilitation, or replacement as detailed within this Procedure; the program size (i.e. available funds) will be determined by the Director of Planning & Engineering prior to each selection process. Authorized work will be funded at 80 percent of eligible costs through the BIG fund.

Local Funding Responsibilities – The LPA will be responsible for 20 percent of eligible costs and for 100 percent of non-eligible costs. Right of Way Costs, utility relocations, roadway surfacing, fencing, aesthetics, permanent signing, and off-site environmental mitigation costs will be considered non-eligible. These items have historically been non-participating, as agreed by the LPA's, to stretch the available funding as far as possible by having the local government perform these activities. Final determination of eligible costs will be determined prior to any work being performed. All parties must agree to responsibilities in writing.

Limiting Amounts - Minimum grant costs, including engineering, of \$30,000 for preservation projects and \$100,000 for rehabilitation or replacement projects are established as eligibility criteria for access to BIG Funds. Funding dedicated to LPA bridges through this program will also have a capped maximum total award amount of \$4,000,000 in grants to any one LPA in a three year period. Any costs outside of these limits will be classified as non-eligible and shall be the responsibility of the LPA to fund. The limiting amounts may be adjusted by the Director of Planning & Engineering prior to each selection process. Refer to Table III-1.

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Table III-1

| | Grant Amount | Local Match | Total | Limits |
|------------------|------------------------------|------------------------------|-------------------------------|--|
| PE-BIG | 80% Approved Design Hours | 20% Approved Design Hours | 100% Approved Design Hours | <326 hours – small drainage areas (unnamed tributaries/creeks) <501 hours – medium drainage areas (named creeks/rivers) <801 hours – large drainage areas (navigable rivers) |
| Preservation BIG | \$30,000 | \$7,500 | \$37,500 | Minimum |
| BIG Rehab/Repl. | \$100,000 | \$25,000 | \$125,000 | Minimum |
| | \$4,000,000 | Maximum in a 3yr. Period | | |

IV. Qualification Criteria

SDDOT will provide a preliminary screening of all bridges to ensure they meet the minimum qualifications. Note that this is only a screening tool and does not guarantee selection. SDDOT will verify accuracy of the data within the NBI for the qualified bridges.

In order to be eligible for a BIG grant, County owned structures must be listed as a “need” in that County’s Highway and Bridge Improvement Plan as approved by SDDOT. The following Qualification Criteria will establish the requirements for identifying eligibility for bridges to be considered for each selection process:

A. All Projects:

1. **Bridge Function** – Bridge must serve multiple residences, farms, ranches or a multi-lot development. Roadway cannot be located on a “No Maintenance” or a “Minimum Maintenance Road”, terminate into a field entrance, a driveway, single residence, farm, or ranch.
2. **NBIS (National Bridge Inspection Standards)** - LPA must be in full compliance with Federal and State inspection requirements including but not limited to posting of load restrictions.
3. **General Maintenance** – Starting with the 2017 grant application process, the LPA must show proof of general maintenance on the structure (provide history

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of all work performed, charge of materials, no reoccurring items on maintenance report on inspection forms, etc.). Record keeping for maintenance of each structure shall be provided with the application, with data beginning in calendar year 2016 and carry through the current application period.

4. **County Highway and Bridge Improvement Plan** – County (Cities excluded) must have a SDDOT approved transportation plan and bridge must be in the County's 5-year plan.
5. **Wheel Tax** - County (Cities excluded) in which the bridge is located has an active wheel tax imposed on the residents of the county for vehicles > 6000 pounds Gross Vehicle Weight.

B. Preservation BIG Grant and PE-BIG Grant

1. **Cost of Project** – Total costs, including engineering, as established in Section III of this procedure.
2. **Extends Service Life** – Project is projected to extend the service life by at least 10 years.
3. **For Bridge Deck Overlays** – Qualifying criteria to use as a guide is as follows:

Qualifying Criteria

| | | |
|--|-----------------------|----------------------------------|
| #New Epoxy Chip Seals | Structure Age | No restriction |
| | Deck Condition | Element Condition State 1 or 2** |
| New Low Slump Deck Concrete (LSDC) | Structure Age | Built in or after 1964* |
| | Deck Condition | Element Condition State 1 or 2** |
| | Structure Type | No simple spans* |
| | Deck Thickness | ≥ 6.75" |
| Existing LSDC or Latex Modified Concrete (LMC) Overlays (Replacement 2 nd or 3 rd LSDC Overlays) | *Overlay Age | 20 or more years |
| | Overlay Condition | Element Condition State 3 to 5** |
| | Substrate (Deck/Slab) | Element Condition State 1 or 2 |

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Structures submitted for new Rigid Concrete Overlays must also be checked for impact on Load Capacity prior to being added to the program

* These are general guidelines. Structures outside of these parameters can be considered if they are in good condition and/or joints can be eliminated (eliminate simple spans). **Overlay Age is a general guide only as Overlay and Substrate Condition are the critical factors.**

** American Association of State Highway Transportation Officials (AASHTO) Element Condition States

This system has also been used to seal badly cracked concrete overlays and new slabs/decks with epoxy coated resteel that have a significant cracking problem, too extensive for individual crack repair.

C. Major Rehabilitation and Replacement Projects (BIG)

1. **Cost of project** – Total costs, including Engineering, as established in Section III of this procedure.
2. **Replacement** – Replacement eligible structures must meet all of the following criteria:

| Measure | Criteria |
|------------------------|--|
| Sufficiency Rating | 60 or less |
| Structurally Deficient | NBI Condition Rating of 4 or less for Deck, Superstructure, Substructure, or Culvert |

All structures must be evaluated for potential rehabilitation prior to any consideration for replacement. The condition, age, structure type, scour criticality, and potential preservation or rehabilitation alternatives shall be reviewed for each structure. The feasibility of those alternatives and the economics of replacement versus rehabilitation shall be considered. When the rehabilitation costs are in the range of 60% or more of the replacement costs, replacement becomes a viable option.

V. Selection Process

The SDDOT will conduct the BIG selection process annually. It will be initiated in December, and be completed by April of the following year to allow inclusion of successful projects in the corresponding annual State Transportation Improvement Plan (STIP). Preservation BIG and PE-BIG may be awarded on a more frequent basis with final award of all projects to be determined by the South Dakota Transportation Commission. These awards are contingent on the amount of grant application received by DOT and funds available. Successful candidates will be required to enter into an individual project agreement between all applicable parties.

1. Preservation BIG Grant

- a) Structure's preservation needs as determined by LPA's Bridge Inspection Engineer may be submitted by application from the LPA for the Preservation category.
- b) LPA will complete and submit application to SDDOT for eligible bridges.
- c) Recommendation of preservation projects will be based on available funding, and SDDOT review of structure condition and anticipated treatment effectiveness.

2. Preliminary Engineering Bridge Improvement Grant (PE-BIG)

- a) Any structure that meets Section IV criteria of this procedure will be eligible for a PE-BIG grant.
- b) LPA will complete and submit application to SDDOT for eligible bridges.
- c) Recommendation of PE-BIG grant will be based on available funding and SDDOT review of structure condition.

3. Bridge Improvement Grant (BIG)

- a) SDDOT will post notice of a pending selection process on SDDOT's website along with the list of qualifying bridges based on Section VI Ranking Criteria from the previous year's inspection data as submitted to the Federal Highway Administration.
- b) If the LPA has a bridge(s) not included on the qualified list, the LPA may request an independent review by SDDOT to add the structure to the list.

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- c) LPA will complete and submit application to SDDOT to compete for grants for eligible bridges.
- d) LPA will include the Type, Size, and Location (TS&L) report (See Appendixes), and a detailed engineer's cost estimate with the application.
- e) DOT will use current inventory condition reports at the time of award for the ranking process in Section VI.
- f) Recommendation of BIG grant will be based on ranking process in Section VI, available funding, and SDDOT review and recommendation.

VI. Ranking Criteria (100 points total maximum)

The following Ranking Criteria will be used to rank the competing qualified bridges and ultimately recommend bridges to program for BIG funding:

- **Bridge Condition (60 points maximum)**
 - a) **Posting (29 points maximum)** - As defined by the NBI Item 70. (See Table VI-1)

Table VI-1

| Bridge Inventory Code | Relationship of Operating Rating to Maximum Legal Load | Ranking Points |
|-----------------------|--|----------------|
| 5 | NO POSTING REQUIRED | 0 |
| 4 | 0.1 TO 9.9% BELOW | 6 |
| 3 | 10.0 TO 19.9% BELOW | 12 |
| 2 | 20.0 TO 29.9% BELOW | 18 |
| 1 | 30.0 TO 39.9% BELOW | 24 |
| 0 | > 39.9% BELOW | 29 |

- b) **Substructure Condition (6 points maximum)** – As defined by the NBI Item 60. (See Table VI-2)
- c) **Superstructure Condition (6 points maximum)** – As defined by the NBI Item 59. (See Table VI-2)

Table VI-2

| Bridge Inventory Code | Ranking Points |
|-----------------------|----------------|
| >5 | 0 |
| 5 | 1 |
| 4 | 2 |
| 3 | 3 |
| 2 | 4 |
| 1 | 5 |
| 0 | 6 |

- d) **Culvert Condition (12 points maximum)** – As defined by the NBI Item 62. Points awarded at two times the value as shown in Table VI-2.
- e) **Fracture Critical (6 points or zero points)** - Points awarded if structure is determined to be Fracture Critical.

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- f) **Scour Critical** (6 points or zero points) - Points awarded if structure is determined to be Scour Critical.
- g) **Emergency** (6 points or zero points) – Points awarded if structure has been closed due to a catastrophic failure not eligible to receive Federal Emergency Management Agency or Federal Highway Emergency Relief funds.
- h) **Sufficiency Rating** (1 point maximum) – $(100-SR)/100$.
- **User Impact** (20 points maximum) - User Impact will be a variable that measures the impact on the users and will be calculated by multiplying the ADT by the Detour Length from the SDDOT verified NBI data. The points will be assigned based on the following formulas with the maximum value for user impact capped at 20 points:
 - $\text{User Impact (On-System)} = \text{ADT} \times \text{Detour Length (miles)} / 350$
 - $\text{User Impact (Off-System)} = \text{ADT} \times \text{Detour Length (miles)} / 100$
- **Local Planning** (20 points maximum)
 - a) **Wheel Tax** (10 points maximum) (See Table VI-3)

Table VI-3

| Assessment / Wheel | Points |
|--------------------|----------------------|
| \$5 | 10 |
| \$4-\$4.99 | Actual \$ Amount x 2 |
| \$3-\$3.99 | Actual \$ Amount x 2 |
| \$2-2.99 | Actual \$ Amount x 2 |
| \$1-1.99 | Actual \$ Amount x 2 |
| \$0-\$0.99 | 0 |

- b) **Shovel Ready (10 points or zero points)** – Project ready to let to bid within 6 months of grant award.
- **LPA Financial Commitment (bonus points)** – Three points for every 5% of increased local match beyond the required 20%.

VIII. Project Development Requirements

The following descriptions of duties are general guidelines and can be modified through individual project agreements. As an example, a LPA may have a large, complicated, off-system bridge that they would like the SDDOT to perform duties as described for an on-system bridge. SDDOT will consider any such request on a case-by-case basis.

All Local Let Projects

- The LPA will:
 - a) Select and hire a professional engineer (PE) from the current SDDOT Consultant Retainer List from the applicable category (See Appendixes) and provide a copy of the contract to SDDOT,
 - a) Acquire any necessary right of way according to the Uniform Act
 - b) Coordinate utility notification and relocation (if applicable), environmental clearance with Corps of Engineers (COE),
 - c) Obtain all necessary permits (COE 404, DOT, Federal Lands, BIA, Tribal, Municipal, etc.)
- The DOT will:
 - a) Conduct an initial environmental assessment and provide guidance to the LPA.

All DOT Let Projects

- The LPA will:
 - a) Acquire any necessary right of way according to the Uniform Act
 - b) Coordinate utility notification and relocation (if applicable)
- The DOT will:
 - a) Conduct environmental clearance with all coordinating agencies,
 - b) Obtain all necessary permits (COE 404, DOT, Federal Lands, BIA, Tribal, Municipal, etc.)

All Bridge Preservation Treatments

- The LPA will:
 - a) Comply with terms as established in the SDDOT Scope of Services

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- requirements (See Appendixes), including but not limited to requiring the consultant to submit plans, design & check design calculations, and load ratings to SDDOT for review,
- b) Obtain and submit copy to SDDOT the bid documents, plans, and specifications sealed and signed by a professional engineer licensed in the State of South Dakota,
 - c) If applicable, design & check design calculations, scour analyses, develop a Quality Control/Quality Assurance (QC/QA) plan, load rating and analyses for the bridge inspection file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load),
 - d) Address all SDDOT review comments in writing,
 - e) Advertise the project for bids and conduct bid letting,
 - f) Obtain SDDOT concurrence in bid prior to award,
 - g) Enter into a construction contract with contractor and require a performance bond,
 - h) Issue the contractor a Notice to Proceed,
 - i) Select a construction engineer (CE) from SDDOT Consultant Retainer List for Construction Administration/Inspection/Testing (See Appendixes), enter into an agreement for CE services and provide copy of the agreement to SDDOT,
 - j) Have design engineer review Shop plans of prefabricated products (if applicable),
 - k) Submit monthly requests for reimbursement, monthly progress reports, and summary of QC/QA test results to SDDOT
 - l) Notify SDDOT of completion of project with final request for reimbursement.
- The SDDOT will:
 - a) Conduct a plan review of final plans, applicable design calculations, and scour analyses; load rating and analyses for the bridge inspection file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load), and specifications sealed and signed by a professional engineer licensed in the State of South Dakota, costs estimates, and bid documents as applicable to

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the project.

- b) Review and approve negotiated (not signed by the engineer or executed by the LPA) construction engineering agreement,
- c) Review and approve quality assurance and testing plan for construction testing and inspection, and
- d) Conduct a final inspection.

Off-System Bridge Preliminary Engineering Studies

- The LPA will:
 - a) Select and hire a professional engineer (PE) from the current SDDOT Consultant Retainer List for Bridge Design (See Appendixes),
 - b) Comply with terms as established in the SDDOT Scope of Services requirements (See Appendixes),
 - c) Invite SDDOT to all planning, scoping, and inspection meetings,
 - d) Submit draft TS&L to SDDOT for review, comment, and approval, and
 - e) Address all SDDOT review comments in writing,
 - f) Submit final TS&L report to SDDOT (See Appendixes).
- The SDDOT will:
 - a) Participate in all planning, scoping, and inspection meetings, and
 - b) Review TS&L Report.

On-System Bridge Preliminary Engineering Studies

- The LPA will:
 - a) Select a professional engineer (PE) from the current SDDOT Consultant Retainer List for Bridge Design (See Appendixes),
 - b) Participate in all planning, scoping, and inspection meetings, and
 - c) Review and comment on TS&L Report
- The SDDOT will:
 - a) Hire the LPA selected consulting firm for preliminary engineering,
 - b) Invite LPA to all planning, scoping, and inspection meetings, and
 - c) Submit draft TS&L to LPA for review and comment, and

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- d) Review TS&L Report.

Off-System Bridge Rehabilitation/Replacements

- The LPA will:
 - a) Comply with terms as established in the SDDOT Scope of Service requirements (See Appendixes), including but not limited to requiring the consultant to submit foundation investigation and recommendations, plans, design calculations, and load ratings to SDDOT for review,
 - b) Address all SDDOT review comments in writing,
 - c) Obtain bid documents, plans, design & check design calculations, scour analyses, develop a QC/QA plan, load rating and analyses for the bridge inspection file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load), and specifications sealed and signed by a professional engineer licensed in the State of South Dakota,
 - d) Advertise the project for bids, and conduct bid letting,
 - e) Obtain SDDOT concurrence in the bid prior to bid award,
 - f) Enter into a construction contract with contractor and require a performance bond,
 - g) Issue the contractor a Notice to Proceed,
 - h) Select a construction engineer (CE) from SDDOT Consultant Retainer List for Construction Administration/Inspection/Testing (See Appendixes), enter into an agreement for CE services and provide copy of the agreement to SDDOT,
 - i) Submit monthly requests for reimbursement, monthly progress reports, and summary of QC/QA test results to SDDOT
 - j) Have design engineer review Shop plans of prefabricated products (if applicable).
 - k) Notify SDDOT of completion of project.
- The SDDOT will:
 - a) Conduct plan review for geotechnical, structural, and scour review, design calculations, scour analyses, load rating and analyses for the bridge inspection

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file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load), and specifications sealed and signed by a professional engineer licensed in the State of South Dakota,

- b) Conduct review of final plans, costs estimates, and bid documents as applicable to the project,
- c) Review and approve negotiated (not signed by the engineer or executed by the LPA) construction engineering agreement,
- d) Review and approve quality assurance and testing plan for construction testing and inspection, and
- e) Conduct a final inspection.

On-System Bridge Rehabilitation/Replacements

- The LPA will:
 - a) Select a professional engineer (PE) from the current SDDOT Consultant Retainer List for Bridge Design (See Appendixes),
 - b) The LPA shall review final plans.

- The SDDOT will:
 - a) Hire the LPA selected consulting firm for design engineering,
 - b) Conduct the foundation investigation,
 - c) Advertise the project for bids, and conduct bid letting,
 - d) Enter into a construction contract,
 - e) Issue the contractor a Notice to Proceed,
 - f) Perform construction engineering (CE) services,
 - g) Notify LPA of completion of work.

VII. Reimbursement Process

For BIG funding for On-System bridges, SDDOT will bill the LPA for their 20% cost share monthly or quarterly depending on volume of work being performed.

For all other types of work, the LPA shall provide a copy of engineering firm and contractor contracts, pay estimates, and weekly progress reports on SDDOT supplied forms. Submittals must be received on a quarterly basis but may be submitted more frequently. The SDDOT will reimburse the LPA for 80% of the pay estimates for eligible items, up to a capped amount, if applicable. All Construction Change Orders will need to be submitted to SDDOT for review and approval.

IX. Dispute Resolution

The SDDOT Local Government Engineer is responsible for managing the program and making decisions not specifically addressed in this procedure.

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Appendix A – Survey and Hydraulic Work Order Requirements and Type, Size, and Location (TS&L) Report

Example Packet – Preliminary Survey, Hydraulic Data, and Historic Records Search

Bridge Improvement Grant Work Order Requirements for Survey and Hydraulics

SCOPE OF SERVICES – Survey & Hydraulics

1. **Field survey for completion of the Drainage Data Sheet and Contour Map.** The information required for placement on these sheets is listed below. An example is attached containing the required information.
- Stationing from south to north or west to east.
 - Beginning and ending stations of the current structure.
 - Proposed and in-place gradelines.
 - Stream profile. (Including a table of stations and elevations for each shot taken.)
 - Sea level datum is required. Stations, elevations, and offsets from and descriptions of permanent objects will be required for project benchmarks. (The High Accuracy Reference Network (HARN) map and the County Bench Mark map for the State of South Dakota can be found at the following web site – www.state.sd.us/dot/pe/roaddesign/survey.htm)
 - Include an electronic file containing the plan/profile of the in-place gradeline at the structure.
 - Landowners with their addresses, phone numbers, and location of property.
 - Utilities with their addresses, phone numbers, and locations along the project.

2. **Field survey as necessary for preparation of construction plans.** Required information is listed below.
- Establishment of transit points, land ties and benchmarks as well as cross sections and topography. (Stations, elevations, and offsets from permanent objects will be required for project benchmarks.)
 - Project limits as established by consultation with the County Highway Superintendent.
 - Additional legal survey as required for preparation of right-of-way plats.
 - The geometrics of horizontal and vertical alignment in accordance with the Local Roads Plan design standards.
 - Survey notes are to be retained on file with the Consultant for subsequent use in the preparation of construction plans and are to be available to the County upon request.

It is anticipated that this item will permit the issuance of a separate work order (after the Type, Size and Location (TS&L) Inspection) for the development of construction plans with no further survey needed.

3. **Photo Documentation and Record Search of the Structure as defined in Attachment #2.**
4. **Preliminary Hydraulic Data Sheet, Plan/Profile Sketches (Preliminary Hydraulic Layouts) and gradelines, Electronic Copy of HEC-RAS File, Final Drainage Memo/Letter in accordance with the newest version of the South Dakota Drainage Manual, and cost estimates for existing and all proposed structure alternatives. (More than one feasible alternative is required. This includes options on different alignments if applicable.)** The newest version of the South Dakota Drainage Manual is available at the following location: <http://www.sddot.com/business/design/forms/drainage/>. Guidance and an example Final Drainage Memo/Letter can be found in Chapter 6 of the manual. The current preliminary hydraulic data sheet to be used can be found at the following internet location: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc. Directions for filling out the form can be found at the same location. All items will be submitted to the Local Government Assistance Office for distribution to SDDOT personnel for review for compliance with minimum required State and Federal standards. Necessary revisions shall be provided in writing by the SDDOT and shall be forwarded to the Consultant by the Local Government Assistance Office. The Consultant is wholly responsible for the accuracy of the design calculations and the independent check design calculations.

Note for Box Culverts/Pipe Options and Plans: The Corps now requires all culverts/pipe where aquatic organism transport is present to have a flow line sunk 1'. If a box/pipe is included in the options, it should be clearly noted that the flowline has been sunk to the required 1'. If the selected structure is a box culvert or pipe, project plans and the final hydraulic data sheet should show that the box or pipe has been sunk to the required 1'.

5. **Conduct TS&L inspection, assistance in the selection of the type, size and location of the replacement structure, and preparation of TS&L summary letter (See Examples #1 & #2 following the attachments).** The county or city (owner) shall be in attendance and if time allows, a member of the Local Government Assistance office.

6. **Draft Hydraulic Design Report, and Final Hydraulic Data Sheet (use the current data sheet found at the following internet location: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc.)** These items will be considered draft if subsurface investigation will be conducted during the design phase.

Please refer to the checklist in **Attachment #1** for the TS&L Packet of items that shall be submitted to the Local Government Assistance Office.

Attachment #3 contains applicable excerpts from the Current SDDOT Consultant Retainer, DOT-900 AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES.

Attachment #1
Bridge Improvement Grant
Checklist for Survey and Hydraulics Work Order TS&L Packet

[These items must be submitted to DOT/Local Government Assistance.](#)
[If any of these items are missing, the full packet will be returned for completion and resubmission to this office.](#)

Project Number _____ County _____ PCN _____

Survey Sheets and Contour Map including the following information:

Stationing from south to north or west to east

Beginning and ending stations of the existing structure

Beginning and ending stations of proposed structures

Proposed and existing gradelines

Stream profile and cross sections (Downstream to upstream direction including a table showing stations and elevations for each shot taken)

Elevation and location of buildings and other structures

Survey information using sea level datum and showing station, elevation, offset, and physical description of each project benchmark

Landowner names, addresses, phone numbers, and legal descriptions of their property

Utility names, addresses, phone numbers, and locations along the project

Photo Documentation and Historical Record Search of the Structure (including list of files or repositories searched) as defined in Attachment #2. (In the event that nothing is found, a letter indicating lack of findings, along with files or repositories searched, shall be submitted to the SDDOT/Local Government Assistance Office.)

Preliminary Hydraulic Data Sheet (use current data sheet found at: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc) including the following information:

Calculated flows

Inplace conditions (Ordinary High Water Elevation, HW₁₀₀, Vmax, OTfr)

Proposed conditions for each option (HW₂, HW₂₃, HW₁₀₀, Vmax Qot, OTfr, ELOvertop)

Ordinary High Water Elevation Shown on Cross-Sections (vegetation elevation on stream banks – approx. 2-year flow)

Observed High Water Elevation (identifiable high water mark)

Electronic copy of HEC-RAS model of existing and proposed conditions

Final Drainage Memo/Letter (example and directions can be found in Chapter 6 of the SD Drainage Manual located at: <http://www.sddot.com/business/design/forms/drainage/>)

- Plan and profile sketches (preliminary hydraulic layout sheets) for the existing structure and proposed gradelines for each option (**More than one feasible alternative is required. This includes options on different alignments if applicable.**)
- Cost Estimates (including design and construction engineering and construction costs for each option.)
- TS&L Summary Letter
- Draft Final Hydraulic Data Sheet with Draft Scour Recommendations (if subsurface investigation to be conducted during design phase.)
 - Use current data sheet found at: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc
- Draft Final Hydraulic Design Report (if subsurface investigation to be conducted during design phase.)

Attachment #2
Local Government Assistance
Photo Documentation and Record Search of the Structure

The information defined below will satisfy one of the requirements of the State Historic Preservation Society in clearing the structure for removal.

Photo Documentation of the Structure

- Site map and photo log of all photos**
- Photos will be taken of: (*at minimum*)**
 - Full views of the structure's primary elevations
 - Close-ups of any decorative, character-defining or structural features
 - General views of the bridge and its environment
- Photos will be labeled as follows:**
 - Photo Number - from photo log and site map
 - Name and Address of property – if property does not have legal address then please note either the Universal Transverse Mercator (UTM) or the legal location down to the quarter section.
 - Month and Year of photograph
 - Description of view, including camera direction (cardinal direction – N, S, E, W)
- Photos will be submitted in one of the following formats:**
 - Digital Photographs
 - At least 2000 X 3000 pixels at 300 dpi
 - Saved as TIFFs submitted on CDs
 - 35mm Black and White Photographs
 - 35mm black/white film printed on black/white photographic paper
 - Both prints and negatives submitted

Historical Record Search of the Structure

- Any or all of the following are needed:**
 - Reports – maintenance or otherwise indicating modifications to the original structure – what was done and why
 - Any Photographs of the original structure (not inspection photos; not photos referenced in this work order)
 - Original Drawings
 - Original Plans
 - Any other documentation

- Names of Files or Repositories (courthouse, county historical society, etc.) Searched**

If possible, provide the original copy of this information. If not, submit the information in the following format. High quality clear Xerox copies of any reports, drawings, or plans; and photographs scanned at 600 dpi, saved as TIFFs, and submitted on a CD.

If these documents are not otherwise restricted through state or federal law; submit them to the SDDOT/Local Government Office for submission to the South Dakota State Historical Society for public use and reproduction. In the event that nothing is found, a letter indicating lack of findings, along with files or repositories searched, shall be submitted to the SDDOT/Local Government Assistance Office.

Attachment #3
Bridge Improvement Grant
Excerpts from Current DOT-900 (09/2014)
AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES
(SDDOT Consultant Retainer)

FURNISHING OF DOCUMENTS (DOT-900, 09/2014, Section 3.)

Except where otherwise specifically provided, the CONSULTANT will furnish to the DEPARTMENT all documents, exhibits, electronic files, and other presentations for all phases of the work performed under the terms of this Agreement.

The CONSULTANT will furnish to the DEPARTMENT all design and check design computations. All documents furnished, including all original drawings, software generated electronic files, design computations, and check design computations, will become and remain the property of the DEPARTMENT and may be used by the DEPARTMENT without restriction for any public purpose.

The CONSULTANT will provide survey documents for bench levels and for the checking of bench levels on standard loose-leaf transit field book sheets. The CONSULTANT will provide all other data collected in an electronic format and will include the following files: FWD file, DGN file, DTM file, ALG file, and the RAW data file. The FWD file, DGN file, DTM file, and ALG file, will be compatible with the DEPARTMENT'S current version of InRoads. The RAW data file will be in ASCII format and will include the following information: point number, northing, easting, description, and any pertinent notes corresponding to a particular point.

The CONSULTANT, as requested by the DEPARTMENT, will submit construction documents, either electronic or paper format, and said documents will become and remain the DEPARTMENT'S property.

The CONSULTANT will return all data furnished to the CONSULTANT by the DEPARTMENT to the DEPARTMENT.

Compliance with all of the foregoing will be considered to be within the purview of this Agreement and will not constitute a basis for additional or extra compensation.

GENERAL REQUIREMENTS (DOT-900, 09/2014, Section 19.C.)

2. Survey for roadway and hydraulic design will be in accordance with the edition of the Department of Transportation Survey Manual currently in place at the time of execution of the Work Order.
3. Wetland delineation will be in conformance with the US Army Corps of Engineers Wetland Delineation Manual and Regional Supplements. Wetland mitigation plans will include construction plans, performance criteria, and a five (5) year monitoring plan.
4. Hydrologic/Hydraulic design will be in accordance with the edition of the South Dakota Drainage Manual (and its revisions) currently in place at the time of execution of the Work Order.

ROADWAY DESIGN (DOT-900, 09/2014, Section 19.D.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. Roadway design will be in accordance with the edition of the Department of Transportation Roadway Design Manual (and its revisions) currently in place at the time of execution of the Work Order and the American Association of State Highway and Transportation Officials (AASHTO) Specifications, "A Policy on Geometric Design of Highways and Streets" (2011 or the version in place at the time of execution of the Work Order), and Interims, or the Local Roads Plan.
2. The CONSULTANT will complete and furnish to the DEPARTMENT, at the time the plans are delivered to the DEPARTMENT, a DEPARTMENT provided checklist. This checklist will provide certification that a separate check has been performed, all review revisions have been made, and the plans are correct and complete.

3. The CONSULTANT will furnish basic design criteria in the Scope Summary Report and in the Scope of Services.
4. The CONSULTANT may obtain standard drawings of roadway appurtenances from the DEPARTMENT'S Office of Roadway Design.
5. The CONSULTANT will contact the DEPARTMENT'S Office of Bridge Design, if a DEPARTMENT structure's drainage area is greater than 1,000 acres. For these structures, the DEPARTMENT'S Office of Bridge Design will make a hydraulics recommendation, or will concur on the hydraulics requirement if hydraulics is part of the work order scope.
6. The DEPARTMENT will furnish basic surfacing design criteria, such as type, thickness, and width of pavement.
7. The DEPARTMENT will furnish material recommendations.

STRUCTURE DESIGN (DOT-900, 09/2014, Section 19.E.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. Prior to initiating design, the CONSULTANT will be required to submit the QC/QA plan/procedure to be followed for structure design to the DEPARTMENT for approval. The CONSULTANT may not begin structure design work until the QC/QA plan/procedure is approved and documented. If the CONSULTANT has a prior approved structure design QC/QA plan/procedure document on file with the OBD, and no changes to that document are anticipated for the current contract, the CONSULTANT will not need to resubmit a structure design QC/QA plan/procedure document.
2. The CONSULTANT will design bridges, box culverts, and miscellaneous highway structures in accordance with the edition of the "AASHTO LRFD Bridge Design Specifications," currently in place at the time of execution of the Work Order except as modified by the DEPARTMENT'S design practices. Prior to beginning design work, the DEPARTMENT will supply the CONSULTANT with a copy of design practices along with examples of standard detailing procedures and typical plans.
3. The CONSULTANT will design highway structures for a vehicular live loading of HL-93. Additional design criteria may be included in the Scope of Work.
4. The CONSULTANT will load rate each structure, including culverts that are bridge length, in accordance with the edition of the AASHTO "Manual for Bridge Evaluation" with latest Interim Revisions using the LRFR method currently in place at the time of execution of the Work Order. The CONSULTANT will perform an HL-93 Design Load Rating for each structure. The CONSULTANT will analyze the AASHTO HS20 vehicle for Inventory and Operating Ratings. The CONSULTANT will also perform a Legal Load Rating for South Dakota legal trucks, the notional rating load, and the four specialized hauling vehicles. The CONSULTANT will submit a copy of the rating analyses to the DEPARTMENT along with the Final Plans for bid letting purposes. The Bridge Management Engineer from the DEPARTMENT'S Office of Bridge Design will review load ratings. Load ratings must be above the Legal Loads. The CONSULTANT will provide a separate summary table of all load ratings to be included in the Bridge Inspection file.
5. The CONSULTANT will provide the DEPARTMENT a hard copy of design computations, independent check design computations, and load ratings, including computer output if applicable, with the final review set of drawings.
6. The CONSULTANT will review shop plans for fabricated items, and will forward marked-up shop plans to the DEPARTMENT. The DEPARTMENT must authorize any fabrication.

PLANS, SPECIFICATIONS, AND ESTIMATES, GENERAL (DOT-900, 09/2014, Section 19.H.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. When complete plans, supplemental specifications, or special provisions are prepared, these will become the property of the DEPARTMENT, County, or City.
2. The CONSULTANT will furnish and deliver to the DEPARTMENT original drawings of all sheets comprising the set of plans, together with all reports, drawings, computer files, studies, memoranda, and other data pertaining thereto.
3. The CONSULTANT will furnish to the DEPARTMENT an electronic MS Word file of all special specifications.
4. The CONSULTANT will prepare plans in conformance with the DEPARTMENT'S customary practices. The CONSULTANT will use standard format for notes, tables, and rates of materials.
5. The CONSULTANT will prepare plans on sheets 11" x 17" or 8 ½" x 11" in size, under the guidance of the Road Design Manual's Chapter 18 – Plans Assembly: www.sddot.com/business/design/forms/roaddesign/Default.aspx or as directed by the DEPARTMENT. The CONSULTANT will follow the specific section of the Road Design Manual's Chapter 18 as it relates to plans produced by consultants in order to provide accurate electronic plans and bid items for the DEPARTMENT'S electronic bidding system. The CONSULTANT will utilize the DEPARTMENT'S web site: <http://www.sddot.com/business/design/Default.aspx> for Plan Preparation (i.e. Road Design Manual, CADD Procedure Manual, and User Guide for Electronic Plan Review), Downloadable Files (i.e. Form Letters, Microstation and InRoad files, and Plan Notes) and other information as necessary to design and prepare plans. The CONSULTANT will follow the properties and procedures set up for the DEPARTMENT'S electronic plans as set forth in document located at the following web site address: <http://www.sddot.com/business/design/docs/cadd/ElectronicPlans.pdf>. Electronic plans will be used for bidding purposes and must contain a watermark on each sheet stating "For Bidding Purposes Only." Refer to Paragraph 12 below for details on the set of plans to be used for construction.
6. The CONSULTANT will prepare plans with sufficient precision to permit the convenient layout in the field for construction and for other purposes. The plans will also provide for the production of an accurate estimate of quantities for the work to be performed in the construction of the project.
7. The CONSULTANT will furnish such other pertinent information and data with respect to the plans and designs as the DEPARTMENT may request.
8. The DEPARTMENT will require all persons designing, detailing, and checking structure plans to legibly place their names or initials on each plan sheet in the spaces provided for this purpose.
9. The DEPARTMENT will designate the basic premises and criteria for the design. The CONSULTANT will develop plans in accordance with the DEPARTMENT'S standard specifications for roadway and bridge construction.
10. As part of the work embraced in the preparation of plans, the CONSULTANT will prepare and furnish to the DEPARTMENT special provisions in standard DEPARTMENT format, for items of work included in the plans which are not covered by the standard specifications, plan notes, or DEPARTMENT-approved special provisions.
11. The CONSULTANT will ensure scales, lettering, and the general delineation of the plans mirror the DEPARTMENT format and provide readily legible reproductions.
12. The CONSULTANT will ensure each plan sheet bears the South Dakota registered professional seal and endorsement of the CONSULTANT as per the requirements of the South Dakota Board of Technical Professions.
13. The CONSULTANT will use software acceptable to the DEPARTMENT as agreed to in the Work Order.

Note: The DEPARTMENT'S standard software programs are the Bentley Civil Products (InRoads Suite), MicroStation, AASHTOWare products, Adobe Acrobat, and the Microsoft Office Suite. The DEPARTMENT may require other software on Work Orders.

CONSTRUCTION ENGINEERING TECHNICAL REQUIREMENTS (DOT-900, 09/2014, Section 20.)

- A. CONSULTANT'S RESPONSIBILITIES.** The CONSULTANT will be responsible to the DEPARTMENT, and will complete all work to the DEPARTMENT'S satisfaction.

Subject to availability, the CONSULTANT will provide personnel for the areas of expertise necessary to satisfactorily complete the work specified in the Work Order and this Agreement. The DEPARTMENT will notify the CONSULTANT as to the proper medium that will be used for recording purposes of field data. The CONSULTANT will submit reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order. The responsibilities for these areas are described in **Exhibit 4**, CONSTRUCTION ENGINEERING CONSULTANT RESPONSIBILITIES.

EXHIBIT 4 (DOT-900, 09/2014)

CONSULTANT RESPONSIBILITIES

GENERAL

The CONSULTANT will:

1. Be knowledgeable of the requirements of the project plans and specifications, the DEPARTMENT'S Survey Manual, Road Design Manual, South Dakota Drainage Manual, and CADD Procedures Manual.
2. Assure project personnel are knowledgeable of their duties and responsibilities.
3. Assure project personnel are knowledgeable of the DEPARTMENT'S Materials Manual.
4. Oversee day to day activities to ensure the project is constructed in accordance with plans and specifications.
5. Ensure all documentation and reports are accurate and kept current.
6. Prepare and electronically submit Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Pay Estimate, and Final Construction Change Order, all on the current version of the DEPARTMENT'S Construction Management System. The CONSULTANT will submit these reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order.
7. Require all individuals providing acceptance testing and independent assurance testing of construction materials or acceptance inspection to record all data/results electronically on the current version of the DEPARTMENT'S Construction Management System, or as instructed by the DEPARTMENT.
8. Require all individuals providing acceptance testing and independent assurance testing of materials or acceptance inspection to meet the requirements of the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual.
9. Ensure testing equipment identified in the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual be calibrated and documented according to the designated frequencies and procedures designated in the Manual.
10. Perform other duties assigned by the DEPARTMENT as defined in this Agreement.

The CONSULTANT'S PROJECT ENGINEER will:

1. Assist with conducting the pre-construction meeting.

2. Prepare Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Estimate, and Final Construction Change Order electronically on the current version of the DEPARTMENT'S Construction Management System.
3. Handle EEO and Labor Compliance activities.
4. Ensure that subcontractors working on the project are approved by the DEPARTMENT.

The CONSULTANT'S INSPECTOR will:

1. Assure the asphalt or concrete plant is properly calibrated.
2. Perform scale accuracy checks.
3. Ensure construction activities remain inside the acquired right-of-way or easement as specified on the plans unless approved by the DEPARTMENT.

The CONSULTANT'S SURVEY PARTY CHIEF will:

1. Record field notes for slope stakes, blue tops, paving grades, pipe, structure layout, and other items of the same sort in electronic format, FWD files, DGN files, DTM files, ALG files, and RAW files compatible to the current version of InRoads being used by the DEPARTMENT.
2. Set centerline, offset lines, bluetops, slope stakes, pipe stakes, structure stakes, and other items of the same sort by electronic or manual means.
3. Run bench levels within acceptable tolerances of the DEPARTMENT'S Survey Manual and maintain field notes on standard loose-leaf transit field book sheets.
4. Obtain necessary topographic data within acceptable tolerances of the DEPARTMENT'S Survey Manual.
5. Supervise and assure the survey crew is knowledgeable as to its duties and responsibilities.

The CONSULTANT'S TEST PERSON AND EQUIPMENT will:

1. Be knowledgeable of the requirements of the project plans and specifications.
2. Sample and test materials for acceptance as specified by the DEPARTMENT'S Materials Manual. Perform material tests for QC/QA projects in accordance with QC/QA manual and have the proper QC/QA certification.
3. Recognize and have the ability to take corrective action for calibration of testing equipment.



ABC ENGINEERING

Street Address
City, State, ZIP
PHONE / FAX

EXAMPLE 1 Bridge TS&L Letter Template

Items to be customized for the specific project and conditions are in **blue font**. Guidance notes are **highlighted**.

DATE

ADDRESS BLOCK

RE: BR_ ###(00), COUNTY OR CITY, PCN
STRUCTURE NUMBER, LOCATION

Dear NAME:

A Type, Size, and Location inspection was held on DATE, for the above referenced project. The following personnel were in attendance:

ATTENDEE NAMES, TITLES

The following items were discussed and agreed upon by the inspection participants:

The most feasible structure for this site is a 63' 1 span precast channel bridge with a 24' deck (22' clear width) and a 30° LHF skew. The substructure shall consist of steel pile abutments. (Also note bent type if known – such as 2-column bents, etc.) The bridge location will be shown on the Final Hydraulic Data Sheet and will be centered at approximately station 10+00. T101 rail will be shown in the plans. Approach rail will OR will not be needed. Fence anchor eyes will OR will not be provided.

The Contractor will remove and dispose of the existing structure. The Contractor shall also salvage the beams, wood planks, and railing for the County OR City, which shall be noted in the plans for bidding purposes. Remaining materials shall be disposed of by the Contractor. The abutments and bents shall be removed to 1' below flowline.

The road will be closed during construction with no detour necessary. OR An onsite detour on the DIRECTION side of the structure will be shown in the plan.

Project limits will run from approximately 100' north to 100' south of the structure. The current grade shall be maintained. The typical section will include a crown slope of 0.03 ft/ft, 4:1 inslopes, 5:1 backslopes, and a standard 10' ditch at 20:1. The approach subgrade shall taper from the structure to match the new subgrade and will provide for a WIDTH finished roadway top. The surfacing will consist of gravel OR asphalt, which will be furnished and installed by the County OR City. All design data for the project will meet or exceed SPEED MPH.

No channel change and no channel cleanout will be necessary at this site. OR No channel change will be necessary at this site. Some channel cleanout of trees and/or brush will be necessary to the northeast and southeast.

The Consultant will provide erosion protection recommendations with the Final Hydraulic Data Sheet. The southwest bank will need to be built up and protected with riprap. (Note location of any out-of-the-ordinary need for riprap and reason why.)

Specific project notes for this project are attached. (ADD ANY PROJECT SPECIFIC NOTES AS ATTACHMENT TO THIS MEMO.)

The Contractor will be responsible for traffic control, topsoiling, and seeding.

The County OR City will be responsible for the following items without Grant Participation:

- 1) Right of way and temporary and permanent easements
- 2) Coordination of any utility adjustments
- 3) Furnish and install final surfacing
- 4) Furnish and install temporary and/or permanent fencing
- 5) Furnish and install new permanent signing
- 6) Remove silt fence in permanently seeded areas

The SDDOT Geotechnical Engineering Activity is requested to provide foundation and backfill recommendations by DATE (12-18 months from letter date).

The Consultant will provide the name, address, and phone number of adjacent landowners. Utility Company contact information is also needed in the plans for any utilities that exist within the project area. The DOT Local Government Office (DOT LET) OR the County OR City (LOCALLY LET) will initiate the 404 permit and other related environmental clearances, and will provide the Consultant with materials recommendations if needed.

The Consultant will outline the two archeological sites on the roadway plan sheet. These sites are located within ¼ mile of the structure and cannot be disturbed. Notes stating this shall be placed in the plans and are located with the other project specific notes. THIS ONLY APPLIES IF SHPO STATES THAT SITES HAVE BEEN FOUND AND MUST BE AVOIDED. TAILOR AS NECESSARY OR DELETE IF NOT NEEDED.

The estimated letting date will be in the fall/spring of YEAR, with an overall completion date of -----.
OR with the Area Engineer to specify an overall completion date at the time that plans are submitted to Bid Letting by this office. It shall be noted in the proposal, as submitted by this office, that a 45, 60 or 90 working OR calendar day maximum amount of time for construction of the project will be allowed. It has been determined by Game, Fish & Parks that an April 1 – June 30 seasonal limitation applies to in-stream work. THIS ONLY APPLIES IF THE GF&P LETTER SPECIFIES IT AND THE SITE IS NOT A TOPEKA SHINER SITE. OR This site is a Topeka Shiner site.

If there are any questions or comments please contact me at NUMBER.

Sincerely,

NAME
TITLE

CC: COUNTY/CITY – CONTACT NAME
LGA – CONTACT NAME



ABC ENGINEERING
 Street Address
 City, State, ZIP
 PHONE / FAX

EXAMPLE 2
Box Culvert/Pipe TS&L Letter
Template

Items to be customized for the specific project and conditions are in **blue font**. Guidance notes are **highlighted**.

DATE

ADDRESS BLOCK

RE: BR_###(00), COUNTY, PCN
 STRUCTURE NUMBER, LOCATION

Dear NAME:

A Type, Size, and Location meeting was held on DATE, for the above referenced project. The following personnel were in attendance:

ATTENDEE NAMES, TITLES

The following items were discussed and agreed upon by the inspection participants:

The most feasible structure for this site is a 5 barrel 12' X 5' cast-in-place OR precast RCBC with a 0° RHF OR LHF skew, and 0° flared wingwalls at the inlet & 0° flared wingwalls at the outlet. Cutoff wall is to be extended 6" below the recommended outlet protection. The new structure will be centered at approximately sta. 10+07. Fence anchor eyes will OR will not be required at this site. The box opening will be outside of the 10' clear zone. (The thickness of the bottom slab shall be the same or greater than the thickness of the top slab.)

REMOVE IF NOT NEEDED – The Corps now requires all culverts/pipe where aquatic organism transport is present to have a flow line sunk 1'. Project plans and the final hydraulic data sheet should show that the box or pipe has been sunk to the required 1'. As aquatic organism transport is present at this location, the flowline of the box culvert OR pipe and riprap must be submerged a minimum of 1'. This needs to be documented both on the final hydraulic data sheet and on the structure, general drawing plan sheet.

The Contractor shall remove and dispose of the in-place structure. EXTRA ITEMS AS NEEDED - The Contractor shall also salvage the beams, wood planks, and railing for the County, which shall be noted in the plans for bidding purposes. The Contractor will dispose of items not salvaged. The bent and abutments shall be removed to the bottom of the undercut.

The project limits shall be from approximately 150' south to 150' north of the structure. The road will be closed with no detour necessary. Only local traffic will be allowed access. OR An onsite detour on the DIRECTION side of the structure will be shown in the plan.

The typical section will include a crown slope of 0.03 ft/ft, 4:1 inslopes, 5:1 backslopes, and a standard 10' ditch at 20:1. The approach subgrade will taper into the existing and provide for a WIDTH finished roadway top (2- WIDTH' lanes and 2- WIDTH' shoulders.) The surfacing will consist of gravel OR asphalt, which will be furnished and installed by the County OR City. All design data for the project will meet or exceed SPEED MPH.

The Consultant will provide inlet and outlet recommendations on the Final Hydraulic Data Sheet. The inlet & outlet protection shall be riprap. (Any extra riprap needed? If so, where and why?)

No channel change and no channel cleanout will be necessary at this site. **OR** No channel change will be necessary at this site. Some channel cleanout of trees and/or brush will be necessary. A temporary diversion channel will be installed south of the structure.

The Contractor will be responsible for traffic control, topsoil stripping, and seeding.

The **County OR City** will be responsible for the following items without Grant Participation:

- 1) Right of way and temporary and permanent easements
- 2) Coordination of any utility adjustments
- 3) Furnish and install final surfacing
- 4) Furnish and install temporary and/or permanent fencing
- 5) Furnish and install new permanent signing
- 6) Remove silt fence in permanently seeded areas

The SDDOT Geotechnical Engineering Activity Office is requested to provide undercut recommendations by **DATE (6 months from letter)**.

The Consultant will provide names, addresses, and phone numbers of the adjacent landowners. Utility Company contact information is also needed in the plans for any utilities that exist within the project area. **The DOT Local Government Office (DOT LET) OR the County OR City (LOCALLY LET)** will initiate the 404 permit and other related environmental clearances, and will provide the consultant with materials recommendations.

The Consultant will outline the two archeological sites on the roadway plan sheet. These sites are located within ¼ mile of the structure and cannot be disturbed. Notes stating this shall be placed in the plans and are located with the other project specific notes. **THIS ONLY APPLIES IF SHPO STATES THAT SITES HAVE BEEN FOUND AND MUST BE AVOIDED. TAILOR AS NECESSARY OR DELETE IF NOT NEEDED.**

The estimated letting date will be in the **fall/spring** of **YEAR**, with an overall completion date of **-----**. **OR** with the Area Engineer to specify an overall completion date at the time that plans are submitted to Bid Letting by this office. It shall be noted in the proposal, as submitted by this office, that a **30, 45, 60 working OR calendar** day maximum amount of time for construction of the project will be allowed. It has been determined by Game, Fish & Parks that an April 1 – June 30 seasonal limitation applies to in-stream work. **THIS ONLY APPLIES IF THE GF&P LETTER SPECIFIES IT AND THE SITE IS NOT A TOPEKA SHINER SITE.**

If there are any questions or comments please contact me at **NUMBER**.

Sincerely,

NAME
TITLE

cc: **COUNTY/CITY – CONTACT NAME**
LGA – CONTACT NAME



ABC ENGINEERING
Street Address
City, State, ZIP
PHONE / FAX

**EXAMPLE PACKET
PRELIMINARY SURVEY,
HYDRAULIC DATA, AND
HISTORIC RECORDS SEARCH**

DATE

NAME
TITLE/COMPANY
ADDRESS
CITY, South Dakota, 57

RE: PROJECT NUMBER, COUNTY, PCN

Dear NAME:

In accordance with the requirements of the Department of Transportation, we have considered three appropriate and feasible structure types for the referenced project. Alternatives include an 82'-0" single span berm type bridge (45M prestressed girders assumed), a 4-10'x10'x80' reinforced concrete box culvert with 30° flared wings at the inlet and 0° at the outlet and a 4-11'x10'x80' precast concrete box culvert with precast sloped end sections (0° flared wings). The 4 barrel precast box was assumed to be comprised of 2-double cell structures. All structures are proposed to be built at a normal skew to roadway. The box culverts flowline was assumed to be lowered 12" below stream flowline as called for in the US Army Corps of Engineers 2012 Regional Conditions for aquatic organisms.

We propose 700 ft. of grading on this project to provide for a 55 mph design speed sag-type vertical curve. We assumed a 30 ft. clear roadway bridge and a 26 ft. top of surfacing width in determining culvert lengths and hydraulics.

The 45M section girder and 82'-0" bridge would provide for approximately 1.2 ft. of freeboard for the 100-year runoff event, match the 25-year headwater of the existing bridge and reduce the 100-year headwater from existing conditions by 2.1 ft. Both culvert options raised the 25-year headwater by 0.1 ft. when compared to existing and raised the 100-year headwater by 0.3 ft. over existing. The proposed bridge centerline is being shifted south from existing to better align the south bridge berm with the existing channel bank. The centerlines of both boxes were shifted slightly to better align with the creek.

Enclosed are the Preliminary Hydraulic Data Sheet and Layout, plan and profile sheets for the three options, Drainage Data Sheet, contour map with cross sections, a CD with photos, Historical Records Search and Drainage Memo.

Please let us know if there are any questions or if further information is required.

Sincerely,
ABC ENGINEERING

NAME
TITLE

Enclosures
cc: File

HYDRAULIC DATA SHEET

County Project No. PCN Sec. Township Range
 Station 23+41.8 Over North Branch of CREEK Drainage Area 52.3 Sq. Mi. Direction of Flow East
 Preliminary X Final Q-Design Yr. Frequency 25-year Observed H.W. Elev 1283.1
 STRUCTURE NO. ##-###-### LOCATION LOCATION

| Cross Section | Qd. cfs | W.W. Area sq.ft. | V fps | So. ft./ft. | Bottom | | H.W. ft. | dn ft. | C.L. FL Elev. | D.H.W. Elev. | | Ch Ch | Degree Skew |
|----------------------|---------|------------------|-------|-------------|-----------|---------|----------|--------|---------------|--------------|--------|-------|-------------|
| | | | | | Structure | Ch. | | | | Culv. Inlet | Bridge | | |
| Trapezoid 2:1 S:S | 1979 | 335 | 5.9 | .0018 | | Natural | | 8.1 | 1273.18* | | 1281.8 | No** | 0° |
| Rectangle II | 1979 | 330 | 6.0 | .0018 | 4B=40' | | | 8.7 | 1273.18* | 1281.9 | | No** | 0° |
| Rectangle III | 1979 | 360 | 5.5 | .0018 | 4B=44' | | | 8.7 | 1273.18* | 1281.9 | | No** | 0° |

Type: I. Berm Type Bridge II. RCBC w/30° Flared Wing walls at Inlet and 0° Flared at Outlet III. Precast CBC with 0° Flared Wing walls at Inlet and Outlet

Size: I. 82.0 ft. (single span with 45 M Section) II. 4-10'x10' (effective opening 4-10'x9') III. 4-11'x10' (effective opening 4-11'x9')

Proposed Location I. Center at Sta. 23+26, berm toes located at Sta. 23+12± (elev. 1274.0) & Sta. 23+40 ± (Elev. 1274.0) II. Center at Sta. 23+37 III. Center at Sta. 23+37

Notes or Remarks: Discharges were obtained from Methods Outlined in Water Resources Report 98-4055 for ungaged sites near a gaging station on the same stream. Stream gage # 06478260 for years of record from 1956-1978. Q₂ = 91 cfs; Q₂₅ = 1979 cfs; Q₁₀₀ = 4997 cfs; Q₅₀₀ = 11,811 cfs. Structure width and flowline elevation for the box culvert options meet the criteria called for in the US Army Corp. of Engineers 2012 Regional Conditions for aquatic organisms.

INPLACE CONDITIONS: Q₂ Elev. = 1275.0, HW₂₅ = 1281.8, HW₁₀₀ = 1286.9 *** Overtop Freq. = Q₈₅ = 4500 cfs, V_{max} = V₈₅ = 9.1 fps

PROPOSED CONDITIONS: I. Q₂ Elev. = 1274.9, V₂ = 2.8 fps, HW₁₀₀ = 1284.8, ***Overtop Freq. = Q₂₇₄ = 8000 cfs, V_{max} = V₁₀₀ = 11.7 fps II. Q₂ Elev. = 1274.4, (Q₂ Depth = 1.1 ft. and V₂ = 2.1 fps at culvert outlet), HW₁₀₀ = 1287.2, ***Overtop Freq. = Q₁₈₅ = 6450 cfs, V_{max} = V₁₀₀ = 13.9 fps III. Q₂ Elev. = 1274.4, (Q₂ Depth = 1.1 ft. and V₂ = 1.9 fps at culvert outlet), HW₁₀₀ = 1287.2, ***Overtop Freq. = Q₁₈₀ = 6400 cfs, V_{max} = V₁₀₀ = 12.6 fps

Additional Remarks:
*Elevation of the Stream flowline at the centerline of the proposed roadway. The box culvert flowline has been lowered 12" below stream flowline and this embedded depth is assumed to not convey any water.
**Minor channel shaping will be required at channel inlet and outlet.
***The existing roadway overtops at Elev. 1286.23 near Sta. 23+75 and the proposed gradeline overtops at Elev. 1290.8 at Sta. 23+50.

Δ Hutchinson County is participating in NFIP.
◆ The area is not mapped and is considered NSFHA (No Special Flood Hazard Area)
PRELIMINARY X FINAL SCOUR RECOMMENDATIONS: I. Riprap will be required on both bridge berms. Foundation Report has not been received. Contraction Scour for proposed bridge is estimated at 6.0 ft. for the 100 year event. Scour estimate is based on assumed D₅₀ = .2mm. II & III. Provide 33 in. thick Class B riprap on newly graded 2:1 bank slopes from elev. 1280.0 down to culvert Flowline and across channel at outlet. Extend riprap 18.0 ft. downstream of wings. Provide Type B drainage fabric beneath all riprap. Natural Stream bed material will not need to be placed over riprap and culvert invert.

Vertical Datum Used: NAVD 88: X NGVD 29: Unknown:
 Topeka Shiner Stream: Yes X No
 Community Participating in NFIP Program: Yes X Δ No
 Site in Identified NFIP Floodplain: Yes No X ◆

Prepared by: Signature
 Date: DATE

Checked by: Signature
 Date: DATE

PRELIMINARY HYDRAULIC DATA LAYOUT

To Define the Minimum Channel Configuration at Bridge

Project BR - #### (00)

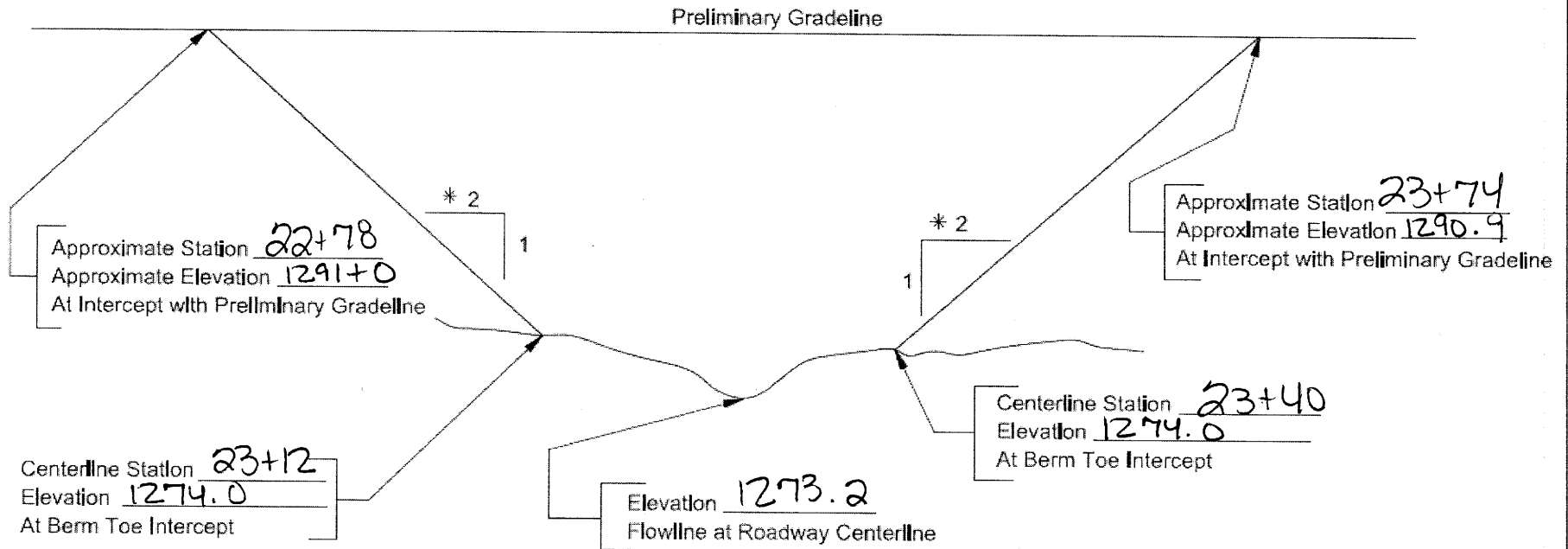
Station 23+26

County _____

Skew 0°

PCN _____

Date Prepared DATE



* Berm slope perpendicular to channel centerline. If bridge is skewed, berm slope must be adjusted to meet skew.

This idealized drawing is not to scale.
See project roadway profile for more details.

FINAL DRAINAGE MEMO

To: Local Government Assistance
NAME, TITLE

FROM: ABC Engineering
Street Address
City, State, ZIP
NAME

RE: Project #, County, PCN
Location, Structure Number

Date: **DATE**

The drainage inspection for the above-references project was held on **DATE**. Those attending were **NAMES**.

This site is located near Gaging Station 02785846 and we used the methods outlined in the Techniques for Estimating Peak-Flow Magnitude and Frequency Relations for South Dakota Streams to estimate the discharges at this drainage crossing. This project is located in Sub-region Z. The precipitation intensity index for the project is 1.03 inches. The contributing drainage areas (DA) given are for used in the equations provided in the above publication.

COUNTY is participating in the FEMA program however the area is not mapped and is considered NSFHA (No Special Flood Hazard Area).

The following is a summary of the drainage basin size (DA), slope (if applicable), flow direction (direction of outlet) and comments by station:

Sta. 23+41.8 **North Branch of CREEK** DA = 52.3 square miles, slope = 9.5 ft/mile, flows right. The immediate downstream channel is not a mapped FEMA floodplain.
ABC Engineering will recommend a structure at this location.



SCALE:
1"=100'

SE1/4, SECTION 29-T99N-R59W

OWNER:

Name
Address
Phone #

OPTION I

± STA. 22+85.00 TO ± STA. 23+67.00
82'-0" SINGLE SPAN BERM TYPE BRIDGE
45M PRESTRESSED GIRDER ASSUMED
0° SKEW AND 30'-0" ROADWAY

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|--------------|--------------|-----------|--------------|
| SOUTH DAKOTA | BRF 6197(02) | 1 | 6 |

NE1/4, SECTION 29-T99N-R59W

OWNER:

Name
Address
Phone #

BEGIN PROJECT BRF 6197(02)

418TH AVENUE, HUTCHINSON COUNTY
STA. 20+00 = 1998.34' NORTH AND 81.40' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 84765.28, E. 32249.71

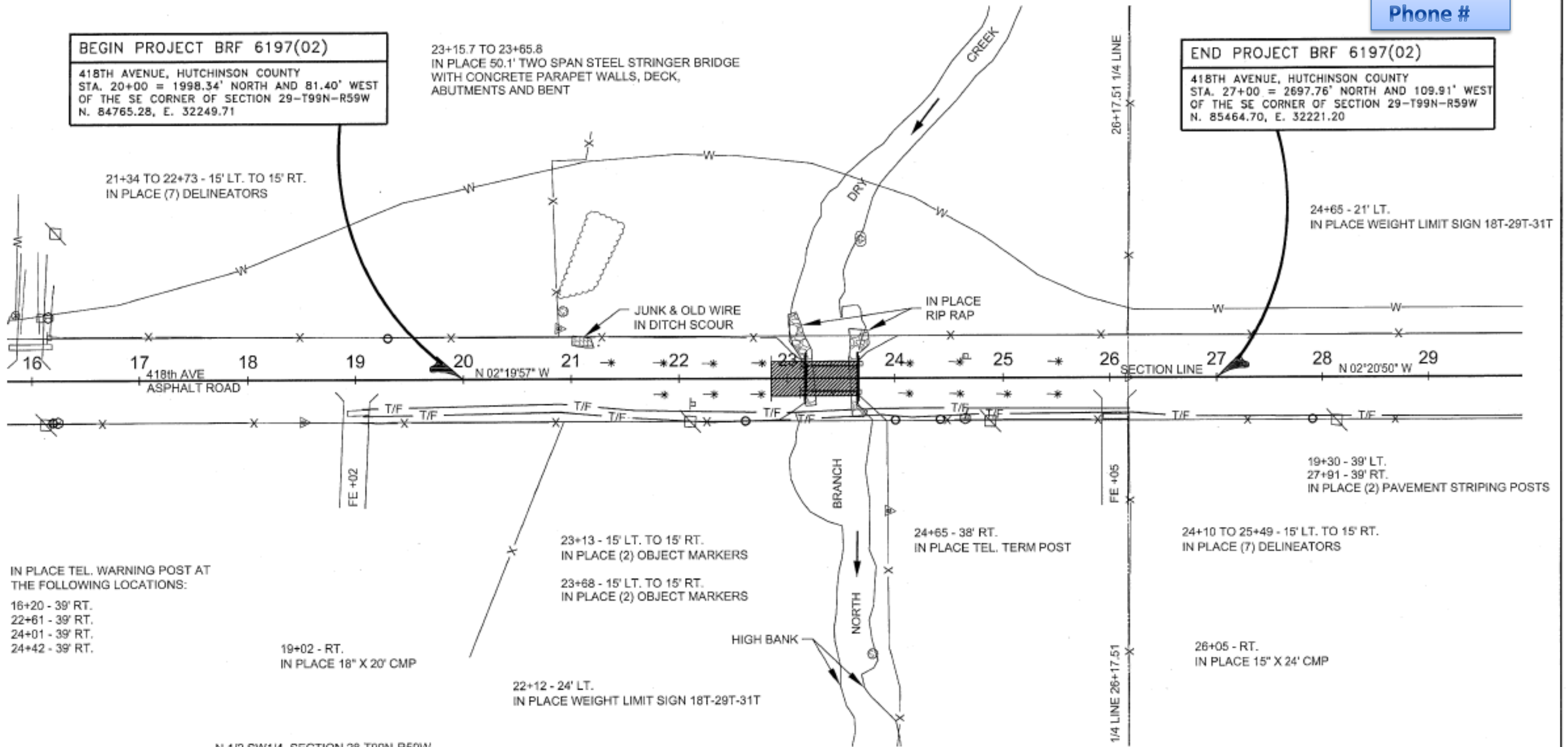
23+15.7 TO 23+65.8
IN PLACE 50.1' TWO SPAN STEEL STRINGER BRIDGE
WITH CONCRETE PARAPET WALLS, DECK,
ABUTMENTS AND BENT

END PROJECT BRF 6197(02)

418TH AVENUE, HUTCHINSON COUNTY
STA. 27+00 = 2697.76' NORTH AND 109.91' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 85464.70, E. 32221.20

21+34 TO 22+73 - 15' LT. TO 15' RT.
IN PLACE (7) DELINEATORS

24+65 - 21' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T



IN PLACE TEL. WARNING POST AT
THE FOLLOWING LOCATIONS:

- 16+20 - 39' RT.
- 22+61 - 39' RT.
- 24+01 - 39' RT.
- 24+42 - 39' RT.

19+02 - RT.
IN PLACE 18" X 20" CMP

22+12 - 24' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T

23+13 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS

23+68 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS

24+65 - 38' RT.
IN PLACE TEL. TERM POST

24+10 TO 25+49 - 15' LT. TO 15' RT.
IN PLACE (7) DELINEATORS

26+05 - RT.
IN PLACE 15" X 24" CMP

N 1/2 SW1/4, SECTION 28-T99N-R59W

OWNER:

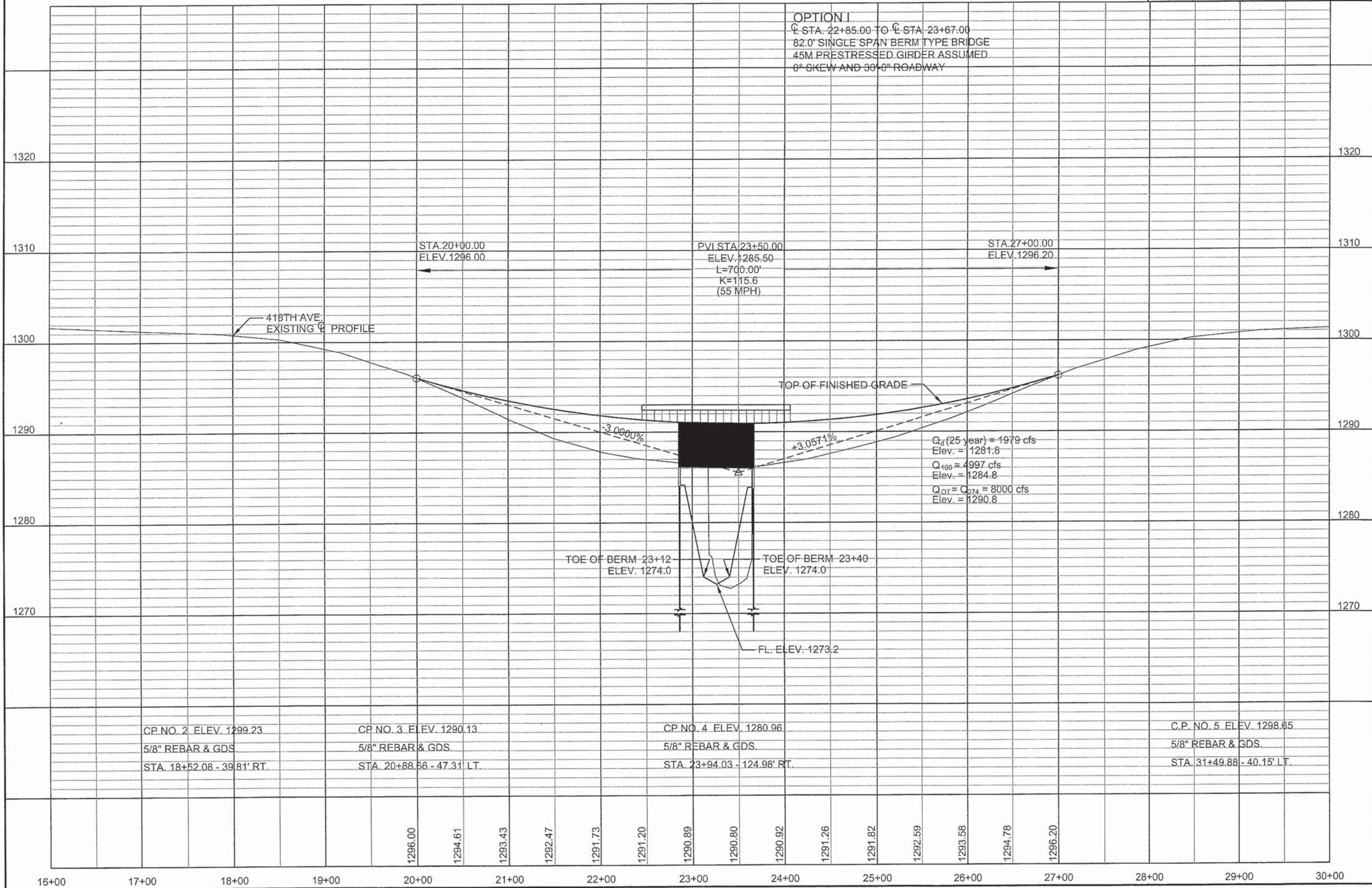
Name
Address
Phone #

S 1/2 NW1/4, SECTION 28-T99N-R59W

OWNER:

Name
Address
Phone #

OPTION I
 CL STA. 22+85.00 TO CL STA. 23+67.00
 82.0' SINGLE SPAN BERM TYPE BRIDGE
 45M PRESTRESSED GIRDER ASSUMED
 0° SKEW AND 30'-0" ROADWAY





SCALE:
1"=100'

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|--------------|--------------|-----------|--------------|
| SOUTH DAKOTA | BRF 6197(02) | 3 | 6 |

OPTION II
 @ STA. 23+15.33 TO @ STA. 23+58.67
 4 - 10' X 10' X 80'-0" CAST IN PLACE RCBC
 W/ 30" F.W.W. AT INLET AND 0" F.W.W. AT OUTLET
 0° SKEW

SE1/4, SECTION 29-T99N-R59W
 OWNER:

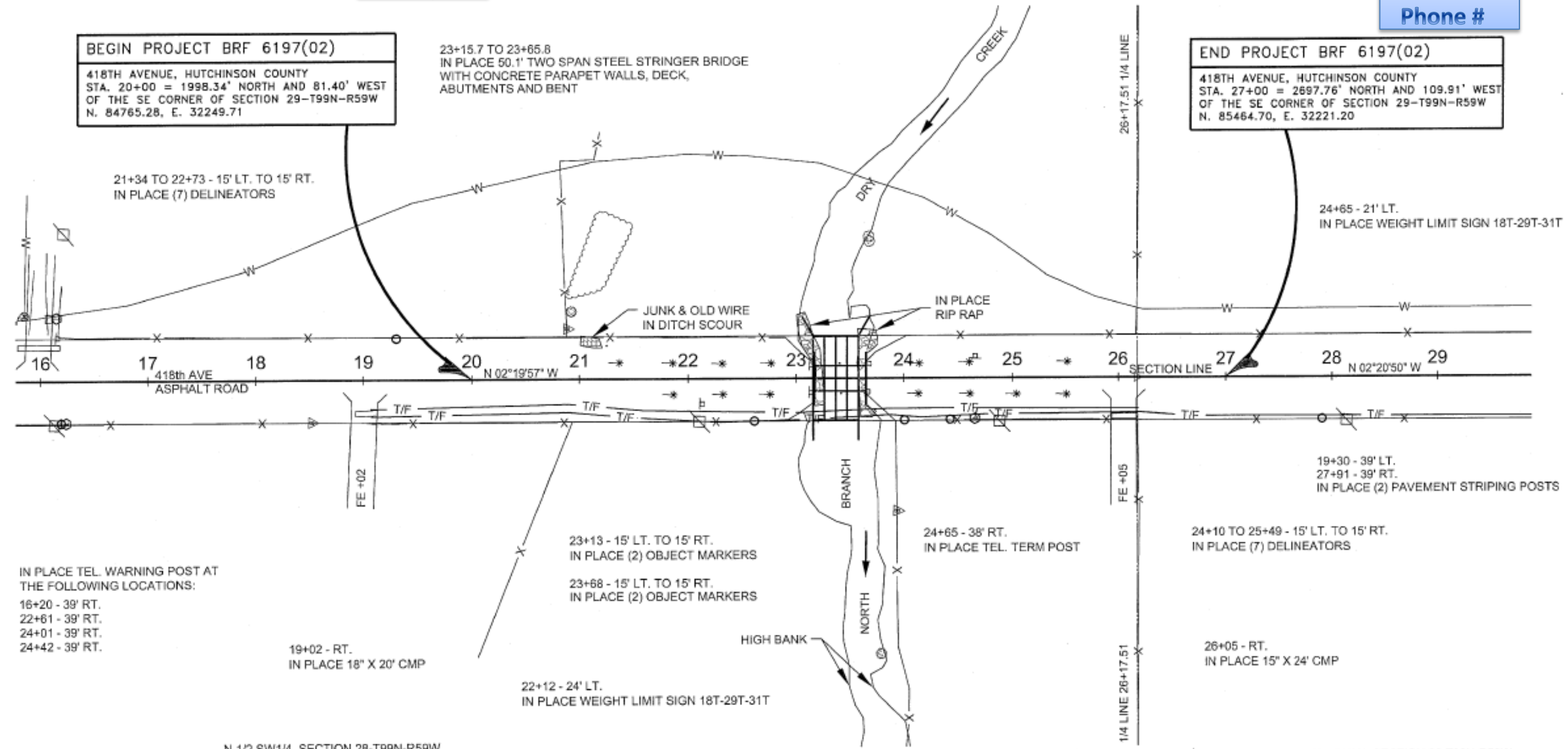
Name
Address
Phone #

NE1/4, SECTION 29-T99N-R59W
 OWNER:

Name
Address
Phone #

BEGIN PROJECT BRF 6197(02)
 418TH AVENUE, HUTCHINSON COUNTY
 STA. 20+00 = 1998.34' NORTH AND 81.40' WEST
 OF THE SE CORNER OF SECTION 29-T99N-R59W
 N. 84765.28, E. 32249.71

END PROJECT BRF 6197(02)
 418TH AVENUE, HUTCHINSON COUNTY
 STA. 27+00 = 2697.76' NORTH AND 109.91' WEST
 OF THE SE CORNER OF SECTION 29-T99N-R59W
 N. 85464.70, E. 32221.20



IN PLACE TEL. WARNING POST AT THE FOLLOWING LOCATIONS:
 16+20 - 39' RT.
 22+61 - 39' RT.
 24+01 - 39' RT.
 24+42 - 39' RT.

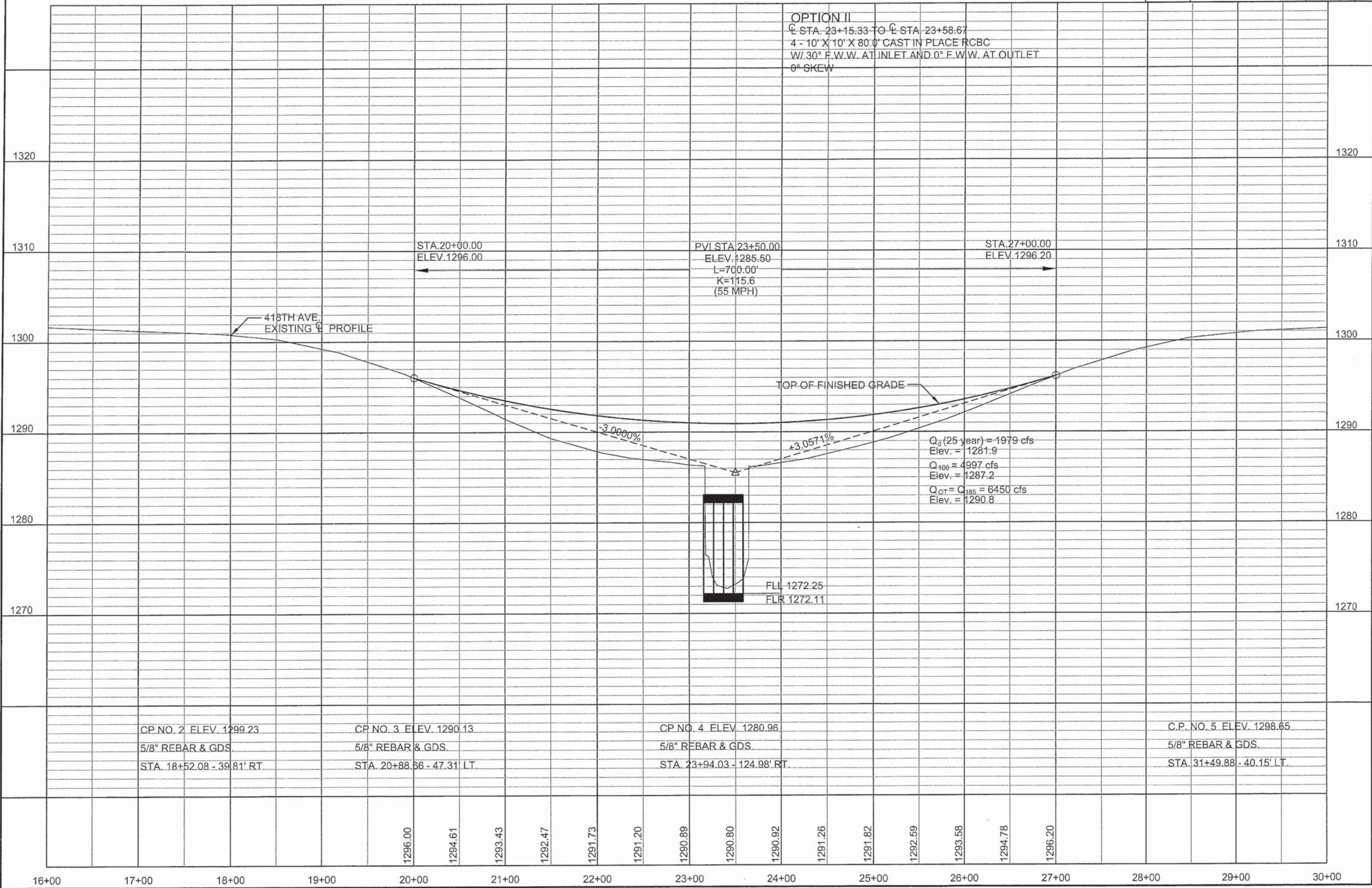
N 1/2 SW1/4, SECTION 28-T99N-R59W
 OWNER:

Name
Address
Phone #

S 1/2 NW1/4, SECTION 28-T99N-R59W
 OWNER:

Name
Address
Phone #

OPTION II
 C STA. 23+15.33 TO C STA. 23+58.67
 4 - 10' X 10' X 80.0' CAST IN PLACE RCBC
 W/ 30° F.W.W. AT INLET AND 0° F.W.W. AT OUTLET
 0° SKEW



CP NO. 2 ELEV. 1299.23
 5/8" REBAR & GDS.
 STA. 18+52.08 - 39.81' RT.

CP NO. 3 ELEV. 1290.13
 5/8" REBAR & GDS.
 STA. 20+88.66 - 47.31' LT.

CP NO. 4 ELEV. 1280.96
 5/8" REBAR & GDS.
 STA. 23+94.03 - 124.98' RT.

C.P. NO. 5 ELEV. 1298.65
 5/8" REBAR & GDS.
 STA. 31+49.88 - 40.15' LT.

1296.00 1294.61 1293.43 1292.47 1291.73 1291.20 1290.89 1290.80 1290.92 1291.26 1291.82 1292.59 1293.58 1294.78 1296.20

16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00



SCALE:
1"=100'

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|--------------|--------------|-----------|--------------|
| SOUTH DAKOTA | BRF 6197(02) | 5 | 6 |

OPTION III
 @ STA. 23+12.63 TO @ STA. 23+61.38
 4 - 11' X 10' X 80'-0" PRECAST CBC
 W/ 0° FLARED SLOPED ENDS AT INLET AND OUTLET
 0° SKEW

SE1/4, SECTION 29-T99N-R59W

OWNER:

Name
Address
Phone #

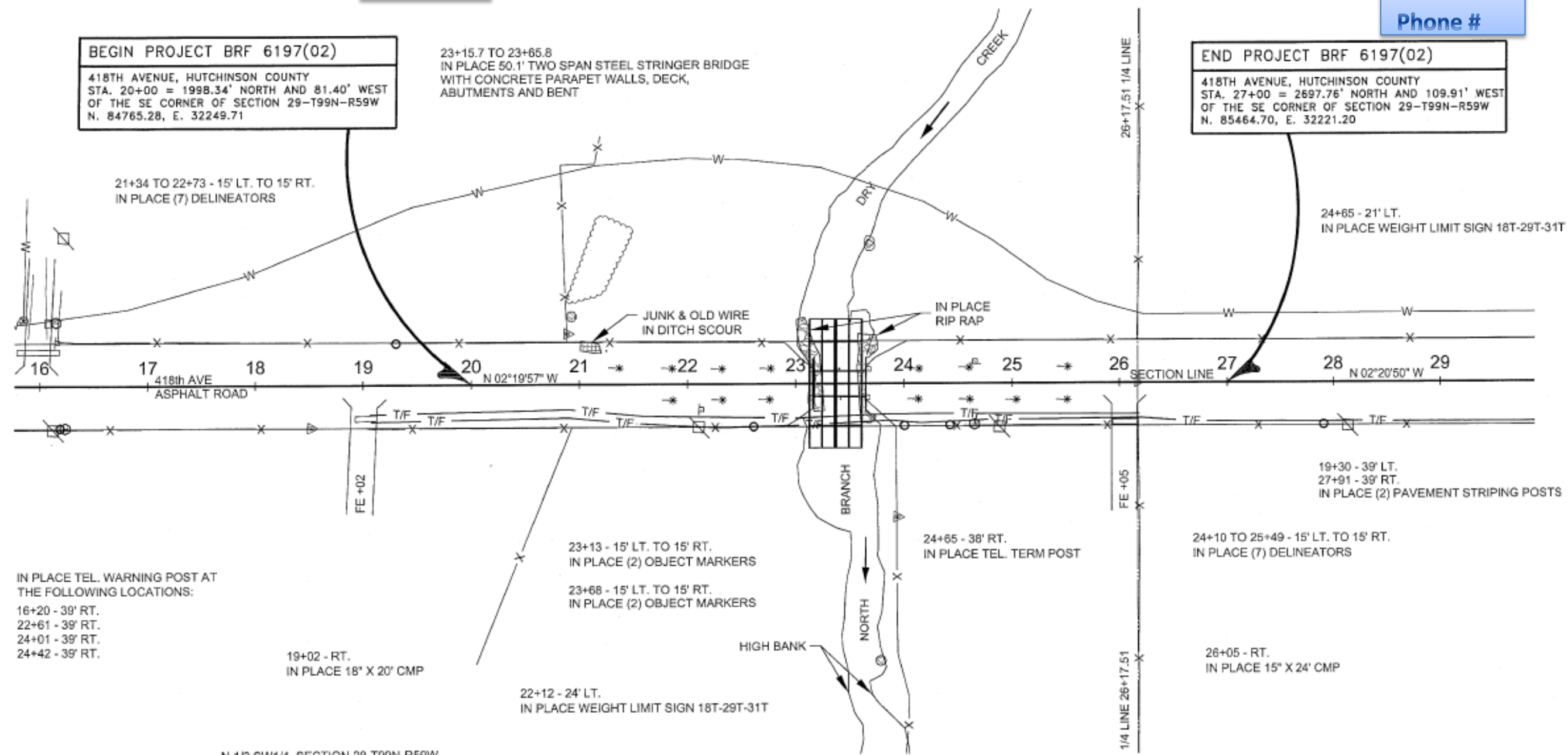
NE1/4, SECTION 29-T99N-R59W

OWNER:

Name
Address
Phone #

BEGIN PROJECT BRF 6197(02)
 418TH AVENUE, HUTCHINSON COUNTY
 STA. 20+00 = 1998.34' NORTH AND 81.40' WEST
 OF THE SE CORNER OF SECTION 29-T99N-R59W
 N. 84765.28, E. 32249.71

END PROJECT BRF 6197(02)
 418TH AVENUE, HUTCHINSON COUNTY
 STA. 27+00 = 2697.76' NORTH AND 109.91' WEST
 OF THE SE CORNER OF SECTION 29-T99N-R59W
 N. 85464.70, E. 32221.20



IN PLACE TEL. WARNING POST AT THE FOLLOWING LOCATIONS:
 16+20 - 39' RT.
 22+61 - 39' RT.
 24+01 - 39' RT.
 24+42 - 39' RT.

19+02 - RT.
 IN PLACE 18' X 20' CMP

22+12 - 24' LT.
 IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T

23+13 - 15' LT. TO 15' RT.
 IN PLACE (2) OBJECT MARKERS

23+68 - 15' LT. TO 15' RT.
 IN PLACE (2) OBJECT MARKERS

24+65 - 38' RT.
 IN PLACE TEL. TERM POST

24+10 TO 25+49 - 15' LT. TO 15' RT.
 IN PLACE (7) DELINEATORS

26+05 - RT.
 IN PLACE 15' X 24' CMP

24+65 - 21' LT.
 IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T

19+30 - 39' LT.
 27+91 - 39' RT.
 IN PLACE (2) PAVEMENT STRIPING POSTS

N 1/2 SW1/4, SECTION 28-T99N-R59W

OWNER:

Name
Address
Phone #

S 1/2 NW1/4, SECTION 28-T99N-R59W

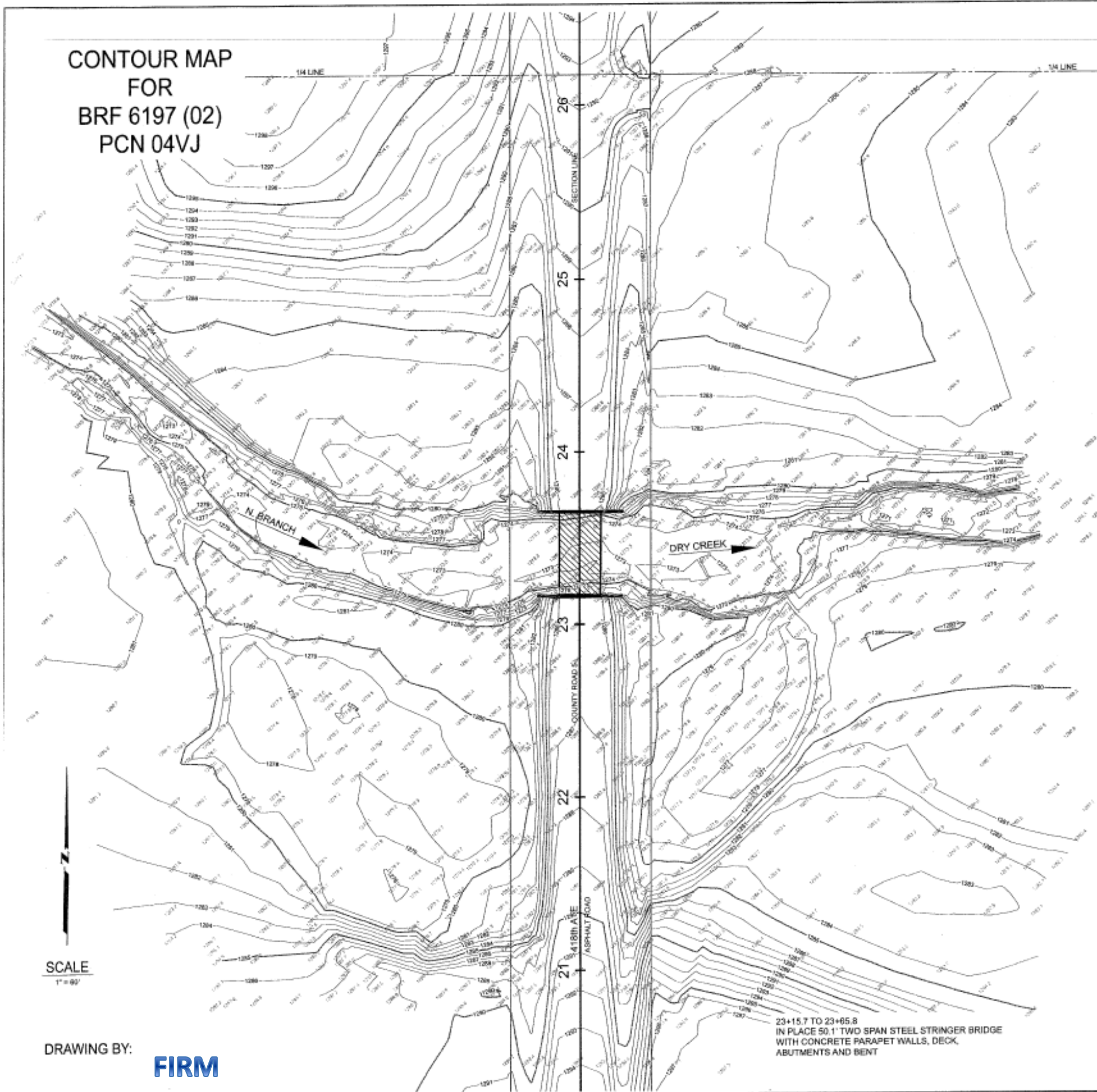
OWNER:

Name
Address
Phone #

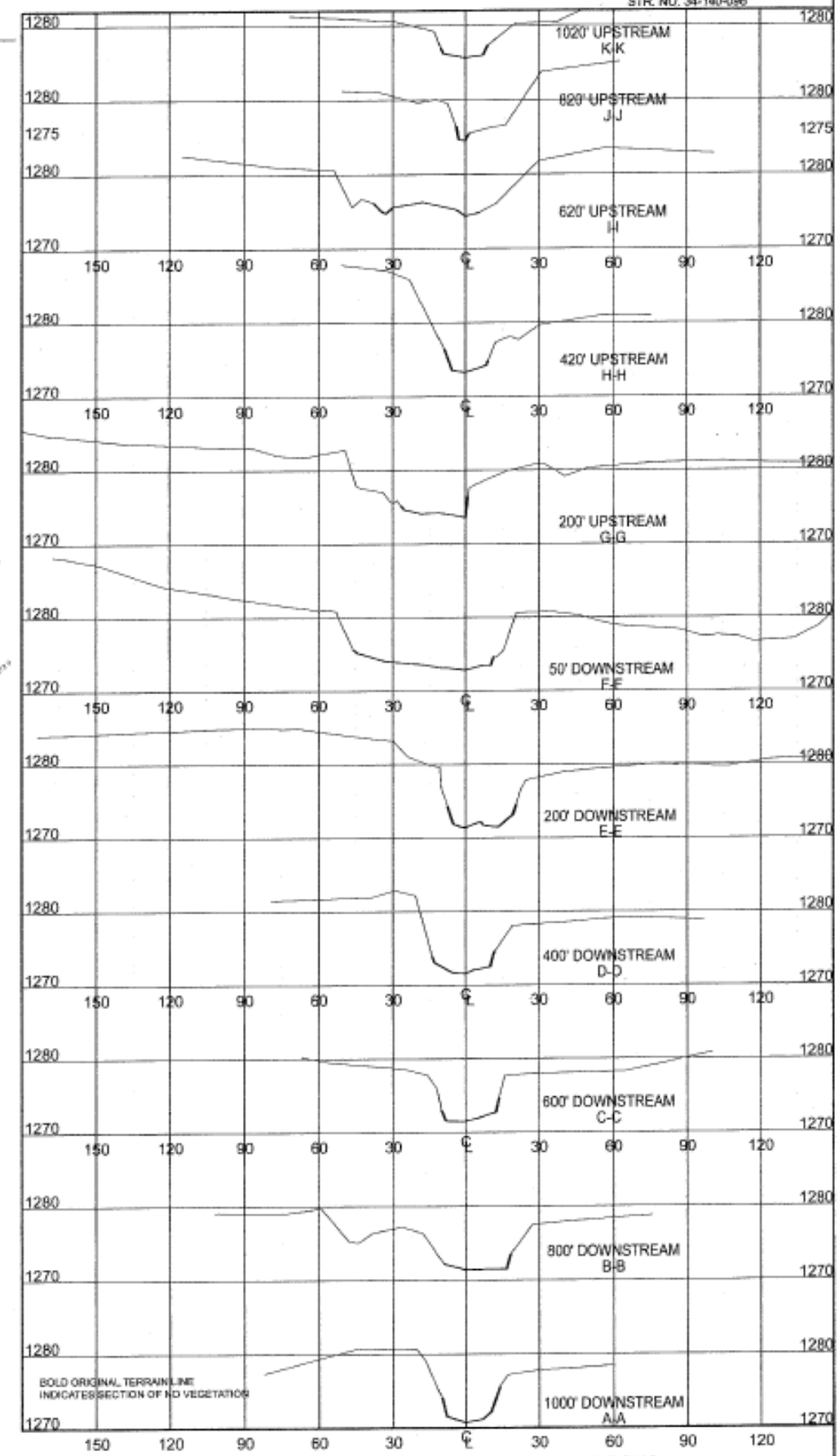
| | | | |
|-----------------------|----------------------|-------------|----------------|
| STATE OF SOUTH DAKOTA | PROJECT BRF 6197(02) | SHEET NO. 2 | TOTAL SHEETS 2 |
|-----------------------|----------------------|-------------|----------------|

STR. NO. 34-140-096

CONTOUR MAP FOR BRF 6197 (02) PCN 04VJ



23+15.7 TO 23+65.8
IN PLACE 50.1' TWO SPAN STEEL STRINGER BRIDGE WITH CONCRETE PARAPET WALLS, DECK, ABUTMENTS AND BENT



N. BRANCH DRY CREEK CROSS-SECTIONS

SCALE 1" = 60'

DRAWING BY: **FIRM**

Photo Documentation and Record Search for Hutchinson County Structure No. 34-140-096

The offices and individuals contacted include:

| | | |
|--|----------------|--------------------------------------|
| Hutchinson County Assessor | Tony Dewald | No Information |
| Hutchinson County Auditor | Diane Murtha | No Information |
| Hutchinson County Highway Superintendent | Joel Baumiller | Inspections Reports (We already had) |
| Hutchinson County Register of Deeds | Unknown | No Information |
| Hutchinson County Treasurer | Tamara Miller | No Information |
| Heritage Hall Museum (in Freeman) | Kelsey Ortman | No Information |
| Heritage Hall Archives (in Freeman) | Kelsey Ortman | No Information |

The Hutchinson County Assessor, Tony Dewald, was contacted on May 25th, 2015 by Diane Murtha. Murtha reported that Dewald had not found any information regarding the structure.

The Hutchinson County Auditor, Diane Murtha, was contacted on May 6th, 2015 by email. Murtha noted that she had not found any information regarding the structure. She also noted that she had talked to the Department of Equalization and the Register of Deeds, neither of which could provide information about the structure.

The Hutchinson County Highway Superintendent, Joel Baumiller, was contacted on May 6th, 2015 by email. Baumiller then responded by phone that same day and was not able to provide information other than the inspection reports that we (**FIRM**) already had. The reports provided the approximated date of completion of the structure (1935) as well as information specific to the construction and condition of the structure. The inspection report is attached.

The Hutchinson County Register of Deeds, Unknown, was contacted on May 25th, 2015 by Diane Murtha. Murtha reported that the Register of Deeds had not found any information regarding the structure.

The Hutchinson County Treasurer, Tamara Miller, was contacted on May 6th, 2015 by email. Miller has not yet responded.

The Heritage Hall Museum and Heritage Hall Archives, run by Kelsey Ortman, were contacted on May 25th, 2015 by email. Ortman reported that she had not found any information regarding the structure.

The State Historic Preservation Office's CRGRID was also used to find any historic survey's conducted on the structure. It revealed the structure was Surveyed in 2004. The survey summary and report are attached.

SOUTH DAKOTA STATE HISTORIC PRESERVATION OFFICE

RECORD SEARCH SUMMARY - BRIDGE

04-16-2015



| <u>SHPO ID</u> | <u>Bridge Name</u> | <u>UTM Zone</u> | <u>UTM Easting</u> | <u>UTM Northing</u> | <u>Date Built</u> |
|----------------|--------------------|-----------------|--------------------|---------------------|-------------------|
| HT00001571 | 34-140-096 | 14 | 594245.0000 | 4801719.0000 | 1935 |

| <u>Survey Date</u> | <u>Street</u> | <u>City</u> | <u>County</u> | <u>Location Description</u> | <u>TWP</u> |
|--------------------------|---------------|-------------|---------------|-----------------------------|------------|
| 6/25/2004 12:00:00 AM | 418 AVE | Parkston | HT | 8E 2.6S PARKSTON | 99N |

| <u>Rng</u> | <u>Sec</u> | <u>Quarter1</u> | <u>Quarter2</u> | <u>DOE</u> | <u>Nomination Status</u> |
|------------|------------|-----------------|-----------------|-------------|--------------------------|
| 59W | 28 | NW | SW | NR Eligible | |



SHPOID **SiteID** **BridgeID**
HT00001571 48635 2211

SITE INFORMATION

***Survey Date:** 6/25/2004 12:00:00 AM ***Quarter1:** NW
***Surveyor:** Jennie Goff / Renewable Technologies, Inc. ***Quarter2:** SW
***Property Address:** 418 AVE ***Township:** 99N
***County:** HT ***Range:** 59W
***City:** Parkston ***Section:** 28
Acres:
Quadname: Parkston SE (1968)

Legal Description: North Branch of Dry Creek

Location Description: 8E 2.6S PARKSTON

Owner Code1: **Owner Name:**
Owner Code2: **Owner Address:**
Owner Code3: **Owner City:**
Owner State:
Owner Zip:

HISTORIC SIGNIFICANCE

***DOE:** NR Eligible **Register Name:** 34-140-096
***DOE Date:** 6/25/2004 12:00:00 AM **Multiple Property Name**
Nomination Status: **SignificanceLevel1:**
Listed Date: **SignificanceLevel2:**
Ref Num: **NR Criteria 1:**
Period: **NR Criteria 2:**
Category: **NR Criteria 3:** C
Historic District Rating: **NR Criteria 4:**

Significance Notes : This bridge retains historic integrity, although it has minor condition problems due to collision damage. It is a good example of pre-World War II steel stringer bridge construction in South Dakota, reflecting both the history and technology of such projects. Bridge 34-140-096 is eligible for listing in the National Register of Historic Places under criterion C, as an example of the steel stringer type for the Depression period.

BRIDGE DETAILS

*Bridge Name: 34-140-096

Other Name:

*Date Built: 1935

Significant Person:

Structural System:

Type: Stringer

Length: 50

Style: No Style

Number Of Spans: 2

Materials: Steel

ApproachSpanType: N/A

Occupied:

*UTM Zone: 14

Accessible:

*UTM Easting: 594245.0000

*UTM Northing: 4801719.0000

Restricted: N

Altered/Moved Notes:

Physical Notes: This structure is a two span steel stringer bridge that carries 418th Avenue (paved) over the North Branch of Dry Creek. It is located in rural Hutchinson County about 8.5 miles southeast of Parkston in a region of cultivated fields and rolling grassland. The superstructure consists of 12 steel I-beam stringers supporting a concrete deck. Precast concrete balustrade rails with elliptical openings flank the bridge. A short portion of the south end of the west rail has been damaged by a vehicle collision. Abutments, backwalls, and wingwalls are solid concrete. The intermediate pier is open concrete, consisting of two rectangular (in cross section) vertical posts with a solid, cantilevered cap. Recessed panels bearing the date "1935" are found on the insides of the curbs. Other than the moderate rail damage, the structure remains essentially as-built.

Link to National Register Nomination:

No National Register Nomination Available

Local Bridge Improvement Grant (BIG) Procedure

Appendix B – Structure Design and Foundation Investigation Work Order Requirements

Example Packet – Final Hydraulic Data Sheet and Hydraulic Report

Bridge Improvement Grant
Work Order Requirements for Structure Design and
Foundation Investigation (Bridges) or Undercut Recommendation (Boxes/Pipe)

SCOPE OF SERVICES – Design

1. **Preparation of sketches and HEC RAS model of the structure as selected during the TS&L.**
Within four (4) weeks of the notice to proceed date, the Consultant shall submit an electronic copy of the HEC RAS model with existing and proposed conditions, general drawing sheets, and plan/profile of the selected option to the Local Government Assistance Office for review.
2. **Report of Foundation Investigation.** Conduct field investigation and provide design recommendations according to AASHTO LRFD Bridge Design Specifications Section 10. Report shall include boring information, lab results, and design recommendations. See **Examples #1 and #2, following the attachments**, for reports that are typically developed by SDDOT Geotechnical Engineering Activity.
3. **Final Hydraulic Design Report, Final Hydraulic Data Sheet, and if the structure selected is a bridge, Scour Memo summarizing hydraulic scour calculations, Scour Calculations, and Berm Slope Protection Recommendations (if applicable.)**
4. **Survey and plans for the above referenced project as described in the TS&L letter and Final Hydraulics Data Sheet, design calculations, independent design check, and load ratings.**
Review plans (100% complete) are to be submitted in PDF format. Specifications shall follow the most current edition of the Standard Specification for Roads and Bridges. South Dakota Department of Transportation Bid Items, Standard plates and plan notes, from the SDDOT website, must be used in development of the **11" x 17" Non Section Method** plan set.

The consultant shall provide design calculations, independent check, and load ratings for the structure as set forth in the Master Retainer Contract. In addition, load ratings for the Special Hauling Vehicles specified in **Attachment #2** shall also be submitted. The Consultant is wholly responsible for the accuracy and safe keeping of the design calculations and the independent design check.
5. **Incorporation into the plans of any changes that may be requested in the SDDOT plan review comments or provide written explanation for items not changes.**
6. **Review of shop fabrication drawings as may be required and submittal of the approved shop drawings to the Consultant.** This item is to be completed within two (2) weeks of receipt of shop or fabrication drawings from the contractor and shall be noted accordingly in the plans.
7. **Provide Quality Assurance / Quality Control Testing Plan based on SDDOT Materials Manual.**
This document must be reviewed by the SDDOT prior to the notice to proceed being issued to the contractor. See **Attachment #3** for requirements.

Please refer to the checklist in **Attachment #1** for the items required to be submitted to the Local Government Assistance Office.

Attachment #4 contains applicable excerpts from the Current SDDOT Consultant Retainer, DOT-900 AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES.

**Attachment #1
Local Government Assistance
Checklist for Structure Design Work Order**

These items must be submitted to DOT/Local Government Assistance.
If any of these items are missing, the full packet will be returned for completion and resubmission
to this office.

Project Number _____ County _____ PCN _____

- Plan/profile, general drawing sketches, and HEC RAS model of the structure as selected during the TS&L
- Report of Investigation (Bridges) or Undercut Recommendation (Boxes/Pipe)
- Final Hydraulic Data Sheet and Scour Recommendations
(Use current data sheet found at: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc)
- Scour memo, scour calculations, and berm slope protection recommendations (Bridges Only)
- Review Plans (100% complete & ready for review) in PDF Format
- Design calculations, independent design check, and load ratings

To be submitted after plan review is complete

- Memo Addressing Plan Review Comments
- Final Plans – Electronic PDF file of the engineered, stamped set of plans
- Quality Assurance / Quality Control Testing Plan

Attachment #2
Bridge Improvement Grant
Load Rating Requirements for the Special Hauling Vehicles



U.S. Department
of Transportation
Federal Highway
Administration

Memorandum

Subject: **ACTION:** Load Rating of Specialized Hauling
Vehicles

Date: November 15, 2013

/s/ *Original Signed by*

From: Joseph S. Krolak
Acting Director, Office of Bridge Technology

In Reply Refer To:
HIBT-10

To: Federal Lands Highway Division Engineers
Division Administrators

The purpose of this memorandum is to clarify FHWA's position on the analysis of *Specialized Hauling Vehicles* (SHVs) as defined in the AASHTO Manual for Bridge Evaluation (MBE) during bridge load rating and posting to comply with the requirements of the *National Bridge Inspection Standards* (NBIS). The intent of the load rating and posting provisions of the NBIS is to insure that all bridges are appropriately evaluated to determine their safe live load carrying capacity considering all unrestricted legal loads, including State routine permits, and that bridges are appropriately posted if required, in accordance with the MBE.

The SHVs are closely-spaced multi-axle single unit trucks introduced by the trucking industry in the last decade. Examples include dump trucks, construction vehicles, solid waste trucks and other hauling trucks. SHVs generally comply with Bridge Formula B and are for this reason considered legal in all States, if a States' laws do not explicitly exclude the use of such vehicles.

NCHRP Project 12-63 (Report 575, 2007) studied the developments in truck configurations and State legal loads and found that AASHTO Type 3, 3-S2 and 3-3 legal vehicles are not representative of all legal loads, specifically SHVs. As a result, legal load models for SHVs were developed and adopted by AASHTO in 2005, recognizing that there is an immediate need to incorporate SHVs into a State's load rating process, if SHVs operate within a State. The SHV load models in the MBE include SU4, SU5, SU6 and SU7 representing four- to seven-axle SHVs respectively, and a Notional Rating Load (NRL) model that envelopes the four single unit load models and serves as a screening load. If the load rating factor for the NRL model is 1.0 or greater, then there is no need to rate for the single-unit SU4, SU5, SU6 and SU7 loads. However, if the load rating factor for the NRL is less than 1.0, then the single-unit SU4, SU5, SU6 and SU7 loads need to be considered during load rating and posting.

The SHVs create higher force effects, and thus result in lower load ratings for certain bridges, especially those with a shorter span or shorter loading length such as transverse floor beams, when compared to AASHTO Type 3, 3-S2 and 3-3 legal loads and HS20 design load. Therefore, SHVs, i.e., SU4, SU5, SU6 and SU7 or NRL, are to be included in rating and posting analyses in accordance with Article 6A.2.3 and Article 6B.9.2 of the 1st Edition of the MBE (Article 6B.7.2 of the 2nd Edition of the MBE), unless one of the following two conditions is met:

Condition A: The State verifies that State laws preclude SHV use; or

Condition B: The State has its own rating vehicle models for legal loads and verifies that the State legal load models envelope the *applicable* AASHTO SHV loading models specified in Appendix D6A and Figure 6B.9.2-2 of the 1st Edition of the MBE (Figure 6B.7.2-2 of the 2nd Edition of the MBE), and the State legal load models have been included in rating/posting analyses of all bridges. The SHV types, e.g. six- or seven-axle SHVs, precluded by State laws need not be considered.

The SHV load models apply to Allowable Stress Rating, Load Factor Rating, and Load and Resistance Factor Rating in accordance with Section 6A and 6B of the MBE.

The FHWA recognizes that there are bridges in the inventory that have not been rated for SHVs and that it is not feasible to include SHVs in the ratings for the entire inventory at once. FHWA is establishing the following timelines for rating bridges for SHVs, if neither Condition A or B is met:

Group 1: Bridges with the shortest span not greater than 200 feet should be re-rated after their next NBIS inspection, but no later than December 31, 2017, that were last rated by:

- a) either Allowable Stress Rating (ASR) or Load Factor Rating (LFR) method and have an operating rating for the AASHTO Routine Commercial Vehicle either Type 3, Type 3S2, or Type 3-3 less than 33 tons (English), 47 tons (English), or 52 tons (English) respectively; or
- b) Load and Resistance Factor Rating (LRFR) method and have a legal load rating factor for the AASHTO Routine Commercial Vehicle, either Type 3, Type 3S2 or Type 3-3, less than 1.3.

Group 2: Rate those bridges not in Group 1 no later than December 31, 2022.

For either group, if a re-rating is warranted due to changes of structural condition, loadings, or configuration, or other requirements, the re-rating should include SHVs.

The selection of load rating method should comply with FHWA's Policy Memorandum *Bridge Load Ratings for the National Bridge Inventory*, dated October 30, 2006.

A State may utilize an alternative approach in lieu of the above to address the load rating for SHVs for bridges in their inventory; however, the approach must be reviewed and formally accepted by FHWA.

The timeline presented above will be incorporated into the review of Metric 13 under the National Bridge Inspection Program (NBIP); specifically, it is expected that all bridges meeting Group 1 criteria be load rated for SHVs by the end of 2017. Please work with your State to assist them in developing appropriate actions to meet those timelines. If your State is currently developing or implementing a Plan of Corrective Actions (PCA) for load rating bridges, the PCA should be reviewed and modified as necessary to take into account the rating of SHVs for those bridges and these timelines.

We request that you share this memorandum with your State or Federal agency partner. All questions that cannot be resolved at the Division Office level should be directed to Lubin Gao at lubin.gao@dot.gov or at 202-366-4604.

Attachment #3
Bridge Improvement Grant
Example Quality Assurance / Quality Control Testing Plan

**Coming Soon
Under
Development**

Attachment #4
Bridge Improvement Grant
Excerpts from Current DOT-900 (09/2014)
AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES
(SDDOT Consultant Retainer)

FURNISHING OF DOCUMENTS (DOT-900, 09/2014, Section 3.)

Except where otherwise specifically provided, the CONSULTANT will furnish to the DEPARTMENT all documents, exhibits, electronic files, and other presentations for all phases of the work performed under the terms of this Agreement.

The CONSULTANT will furnish to the DEPARTMENT all design and check design computations. All documents furnished, including all original drawings, software generated electronic files, design computations, and check design computations, will become and remain the property of the DEPARTMENT and may be used by the DEPARTMENT without restriction for any public purpose.

The CONSULTANT will provide survey documents for bench levels and for the checking of bench levels on standard loose-leaf transit field book sheets. The CONSULTANT will provide all other data collected in an electronic format and will include the following files: FWD file, DGN file, DTM file, ALG file, and the RAW data file. The FWD file, DGN file, DTM file, and ALG file, will be compatible with the DEPARTMENT'S current version of InRoads. The RAW data file will be in ASCII format and will include the following information: point number, northing, easting, description, and any pertinent notes corresponding to a particular point.

The CONSULTANT, as requested by the DEPARTMENT, will submit construction documents, either electronic or paper format, and said documents will become and remain the DEPARTMENT'S property.

The CONSULTANT will return all data furnished to the CONSULTANT by the DEPARTMENT to the DEPARTMENT.

Compliance with all of the foregoing will be considered to be within the purview of this Agreement and will not constitute a basis for additional or extra compensation.

GENERAL REQUIREMENTS (DOT-900, 09/2014, Section 19.C.)

2. Survey for roadway and hydraulic design will be in accordance with the edition of the Department of Transportation Survey Manual currently in place at the time of execution of the Work Order.
3. Wetland delineation will be in conformance with the US Army Corps of Engineers Wetland Delineation Manual and Regional Supplements. Wetland mitigation plans will include construction plans, performance criteria, and a five (5) year monitoring plan.
4. Hydrologic/Hydraulic design will be in accordance with the edition of the South Dakota Drainage Manual (and its revisions) currently in place at the time of execution of the Work Order.

ROADWAY DESIGN (DOT-900, 09/2014, Section 19.D.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. Roadway design will be in accordance with the edition of the Department of Transportation Roadway Design Manual (and its revisions) currently in place at the time of execution of the Work Order and the American Association of State Highway and Transportation Officials (AASHTO) Specifications, "A Policy on Geometric Design of Highways and Streets" (2011 or the version in place at the time of execution of the Work Order), and Interims, or the Local Roads Plan.
2. The CONSULTANT will complete and furnish to the DEPARTMENT, at the time the plans are delivered to the DEPARTMENT, a DEPARTMENT provided checklist. This checklist will provide certification that a separate check has been performed, all review revisions have been made, and the plans are correct and complete.
3. The CONSULTANT will furnish basic design criteria in the Scope Summary Report and in the Scope of Services.
4. The CONSULTANT may obtain standard drawings of roadway appurtenances from the DEPARTMENT'S Office of Roadway Design.
5. The CONSULTANT will contact the DEPARTMENT'S Office of Bridge Design, if a DEPARTMENT structure's drainage area is greater than 1,000 acres. For these structures, the DEPARTMENT'S Office of Bridge Design will make a hydraulics recommendation, or will concur on the hydraulics requirement if hydraulics is part of the work order scope.
6. The DEPARTMENT will furnish basic surfacing design criteria, such as type, thickness, and width of pavement.
7. The DEPARTMENT will furnish material recommendations.

STRUCTURE DESIGN (DOT-900, 09/2014, Section 19.E.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. Prior to initiating design, the CONSULTANT will be required to submit the QC/QA plan/procedure to be followed for structure design to the DEPARTMENT for approval. The CONSULTANT may not begin structure design work until the QC/QA plan/procedure is approved and documented. If the CONSULTANT has a prior approved structure design QC/QA plan/procedure document on file with the OBD, and no changes to that document are anticipated for the current contract, the CONSULTANT will not need to resubmit a structure design QC/QA plan/procedure document.
2. The CONSULTANT will design bridges, box culverts, and miscellaneous highway structures in accordance with the edition of the "AASHTO LRFD Bridge Design Specifications," currently in place at the time of execution of the Work Order except as modified by the DEPARTMENT'S design practices. Prior to beginning design work, the DEPARTMENT will supply the CONSULTANT with a copy of design practices along with examples of standard detailing procedures and typical plans.
3. The CONSULTANT will design highway structures for a vehicular live loading of HL-93. Additional design criteria may be included in the Scope of Work.
4. The CONSULTANT will load rate each structure, including culverts that are bridge length, in accordance with the edition of the AASHTO "Manual for Bridge Evaluation" with latest Interim Revisions using the LRFR method currently in place at the time of execution of the Work Order. The CONSULTANT will perform an HL-93 Design Load Rating for each structure. The CONSULTANT will analyze the AASHTO HS20 vehicle for Inventory and Operating

Ratings. The CONSULTANT will also perform a Legal Load Rating for South Dakota legal trucks, the notional rating load, and the four specialized hauling vehicles. The CONSULTANT will submit a copy of the rating analyses to the DEPARTMENT along with the Final Plans for bid letting purposes. The Bridge Management Engineer from the DEPARTMENT'S Office of Bridge Design will review load ratings. Load ratings must be above the Legal Loads. The CONSULTANT will provide a separate summary table of all load ratings to be included in the Bridge Inspection file.

5. The CONSULTANT will provide the DEPARTMENT a hard copy of design computations, independent check design computations, and load ratings, including computer output if applicable, with the final review set of drawings.
6. The CONSULTANT will review shop plans for fabricated items, and will forward marked-up shop plans to the DEPARTMENT. The DEPARTMENT must authorize any fabrication.

PLANS, SPECIFICATIONS, AND ESTIMATES, GENERAL (DOT-900, 09/2014, Section 19.H.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. When complete plans, supplemental specifications, or special provisions are prepared, these will become the property of the DEPARTMENT, County, or City.
2. The CONSULTANT will furnish and deliver to the DEPARTMENT original drawings of all sheets comprising the set of plans, together with all reports, drawings, computer files, studies, memoranda, and other data pertaining thereto.
3. The CONSULTANT will furnish to the DEPARTMENT an electronic MS Word file of all special specifications.
4. The CONSULTANT will prepare plans in conformance with the DEPARTMENT'S customary practices. The CONSULTANT will use standard format for notes, tables, and rates of materials.
5. The CONSULTANT will prepare plans on sheets 11" x 17" or 8 ½" x 11" in size, under the guidance of the Road Design Manual's Chapter 18 – Plans Assembly: www.sddot.com/business/design/forms/roaddesign/Default.aspx or as directed by the DEPARTMENT. The CONSULTANT will follow the specific section of the Road Design Manual's Chapter 18 as it relates to plans produced by consultants in order to provide accurate electronic plans and bid items for the DEPARTMENT'S electronic bidding system. The CONSULTANT will utilize the DEPARTMENT'S web site: <http://www.sddot.com/business/design/Default.aspx> for Plan Preparation (i.e. Road Design Manual, CADD Procedure Manual, and User Guide for Electronic Plan Review), Downloadable Files (i.e. Form Letters, Microstation and InRoad files, and Plan Notes) and other information as necessary to design and prepare plans. The CONSULTANT will follow the properties and procedures set up for the DEPARTMENT'S electronic plans as set forth in document located at the following web site address: <http://www.sddot.com/business/design/docs/cadd/ElectronicPlans.pdf>. Electronic plans will be used for bidding purposes and must contain a watermark on each sheet stating "For Bidding Purposes Only." Refer to Paragraph 12 below for details on the set of plans to be used for construction.
6. The CONSULTANT will prepare plans with sufficient precision to permit the convenient layout in the field for construction and for other purposes. The plans will also provide for the

production of an accurate estimate of quantities for the work to be performed in the construction of the project.

7. The CONSULTANT will furnish such other pertinent information and data with respect to the plans and designs as the DEPARTMENT may request.
8. The DEPARTMENT will require all persons designing, detailing, and checking structure plans to legibly place their names or initials on each plan sheet in the spaces provided for this purpose.
9. The DEPARTMENT will designate the basic premises and criteria for the design. The CONSULTANT will develop plans in accordance with the DEPARTMENT'S standard specifications for roadway and bridge construction.
10. As part of the work embraced in the preparation of plans, the CONSULTANT will prepare and furnish to the DEPARTMENT special provisions in standard DEPARTMENT format, for items of work included in the plans which are not covered by the standard specifications, plan notes, or DEPARTMENT-approved special provisions.
11. The CONSULTANT will ensure scales, lettering, and the general delineation of the plans mirror the DEPARTMENT format and provide readily legible reproductions.
12. The CONSULTANT will ensure each plan sheet bears the South Dakota registered professional seal and endorsement of the CONSULTANT as per the requirements of the South Dakota Board of Technical Professions.
13. The CONSULTANT will use software acceptable to the DEPARTMENT as agreed to in the Work Order.

Note: The DEPARTMENT'S standard software programs are the Bentley Civil Products (InRoads Suite), MicroStation, AASHTOWare products, Adobe Acrobat, and the Microsoft Office Suite. The DEPARTMENT may require other software on Work Orders.

CONSTRUCTION ENGINEERING TECHNICAL REQUIREMENTS (DOT-900, 09/2014, Section 20.)

- A. CONSULTANT'S RESPONSIBILITIES.** The CONSULTANT will be responsible to the DEPARTMENT, and will complete all work to the DEPARTMENT'S satisfaction.

Subject to availability, the CONSULTANT will provide personnel for the areas of expertise necessary to satisfactorily complete the work specified in the Work Order and this Agreement. The DEPARTMENT will notify the CONSULTANT as to the proper medium that will be used for recording purposes of field data. The CONSULTANT will submit reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order. The responsibilities for these areas are described in **Exhibit 4, CONSTRUCTION ENGINEERING CONSULTANT RESPONSIBILITIES.**

EXHIBIT 4 (DOT-900, 09/2014)

CONSULTANT RESPONSIBILITIES

GENERAL

The CONSULTANT will:

1. Be knowledgeable of the requirements of the project plans and specifications, the DEPARTMENT'S Survey Manual, Road Design Manual, South Dakota Drainage Manual, and CADD Procedures Manual.

2. Assure project personnel are knowledgeable of their duties and responsibilities.
3. Assure project personnel are knowledgeable of the DEPARTMENT'S Materials Manual.
4. Oversee day to day activities to ensure the project is constructed in accordance with plans and specifications.
5. Ensure all documentation and reports are accurate and kept current.
6. Prepare and electronically submit Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Pay Estimate, and Final Construction Change Order, all on the current version of the DEPARTMENT'S Construction Management System. The CONSULTANT will submit these reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order.
7. Require all individuals providing acceptance testing and independent assurance testing of construction materials or acceptance inspection to record all data/results electronically on the current version of the DEPARTMENT'S Construction Management System, or as instructed by the DEPARTMENT.
8. Require all individuals providing acceptance testing and independent assurance testing of materials or acceptance inspection to meet the requirements of the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual.
9. Ensure testing equipment identified in the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual be calibrated and documented according to the designated frequencies and procedures designated in the Manual.
10. Perform other duties assigned by the DEPARTMENT as defined in this Agreement.

The CONSULTANT'S PROJECT ENGINEER will:

1. Assist with conducting the pre-construction meeting.
2. Prepare Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Estimate, and Final Construction Change Order electronically on the current version of the DEPARTMENT'S Construction Management System.
3. Handle EEO and Labor Compliance activities.
4. Ensure that subcontractors working on the project are approved by the DEPARTMENT.

The CONSULTANT'S INSPECTOR will:

1. Assure the asphalt or concrete plant is properly calibrated.
2. Perform scale accuracy checks.
3. Ensure construction activities remain inside the acquired right-of-way or easement as specified on the plans unless approved by the DEPARTMENT.

The CONSULTANT'S SURVEY PARTY CHIEF will:

1. Record field notes for slope stakes, blue tops, paving grades, pipe, structure layout, and other items of the same sort in electronic format, FWD files, DGN files, DTM files, ALG files, and RAW files compatible to the current version of InRoads being used by the DEPARTMENT.
2. Set centerline, offset lines, bluetops, slope stakes, pipe stakes, structure stakes, and other items of the same sort by electronic or manual means.
3. Run bench levels within acceptable tolerances of the DEPARTMENT'S Survey Manual and maintain field notes on standard loose-leaf transit field book sheets.
4. Obtain necessary topographic data within acceptable tolerances of the DEPARTMENT'S Survey Manual.
5. Supervise and assure the survey crew is knowledgeable as to its duties and responsibilities.

The CONSULTANT'S TEST PERSON AND EQUIPMENT will:

1. Be knowledgeable of the requirements of the project plans and specifications.
2. Sample and test materials for acceptance as specified by the DEPARTMENT'S Materials Manual. Perform material tests for QC/QA projects in accordance with QC/QA manual and have the proper QC/QA certification.
3. Recognize and have the ability to take corrective action for calibration of testing equipment.

EXAMPLE #1
REPORT OF FOUNDATION INVESTIGATION

PROJECT: BRO 8048(03) Mellette County PCN 02DY

LOCATION: Structure No. 48-102-010, 18.9 miles North & 0.8 miles West of Cedar Butte over the White River.

METHOD OF INVESTIGATION:

All soundings are made according to the Standard South Dakota Subsurface Investigation Techniques and AASHTO Specifications. Auger holes are drilled with a 4-1/2 inch continuous flight auger. Penetration and Push Test holes are drilled with a 6-5/8 inch continuous hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples. Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil. Corings with the SDDOT drive rig are performed by using a California retractable plug sampler, which is driven with a 490 pound hammer. The drill stem is P.K. rod, which is 2-7/8 inch O.D., and 2 inch nominal diameter cores are obtained. All laboratory tests are performed in accordance with standard AASHTO or SDDOT laboratory procedures.

RECOMMENDATIONS:

Abutments:

I. Steel HP10 X 42 Piling

A. A LRFD maximum factored pile bearing resistance of 77 tons can be used for design.

B. The anticipated tip elevations are:

| <u>Station</u> | <u>Elevation</u> |
|----------------|------------------|
| 22+06 | 1910 |
| 25+27 | 1892 |

C. The nominal pile bearing resistance shall be 192 tons verified by the SDDOT's Modified ENR formula.

Bents:

I. Drilled Shafts

A. A LRFD maximum factored resistance value of 2,800 psf can be used for design below elevation 1912 ft. or maximum scour whichever is lower.

B. Permanent casings will be required to elevation 1915 ft.

C. The point of fixity within the bedrock can be assumed to be the elevation 1912 ft.

DISCUSSION:

The proposed structure location is underlain by brown sand-silt (alluvium) overlying brown silt-sand with gravel (alluvium). The alluvial sediments rest upon gray silt-clay (Pierre Shale). The D50 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 0.06 mm, 1.0 mm, and 0.004 mm. The D95 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 1.0 mm, 6.0 mm, and 0.06 mm.

Steel HP10X42 piling along with the anticipated tip elevations, are listed in the recommendations for use in the abutments. Drilled Shafts are listed in the recommendations for use at the bents.

The piling were evaluated for drivability and group effects at the LRFD Strength Limit State. Settlement of the substructure units and horizontal movement of the abutment piling were evaluated at the LRFD Service Limit State.

Drivability –

A drivability analysis was performed for the steel HP10X42 piling using the wave equation analysis program (GRLWEAP). A group of pile hammers that were evaluated and found to produce acceptable driving stresses is listed later in this report for inclusion in the plans.

Pile Group Effects:

Axial Loading – Abutments

For a single row of piling, AASHTO requires the center-to-center pile spacing to be at least 30" or 2.5 times the width of the pile, whichever is greater. Therefore, for the steel HP10x42 piling at the abutment the center-to-center spacing shall be at least 30".

Settlement –

The steel pile tips will be founded in the Pierre Shale. Unconfined compression test results of the Pierre Shale exceed the proposed bridge loadings. Past experience for piling driven into hard shale soil bedrocks has shown little, if any, settlement has occurred. Therefore, 1/4 inch or less of total settlement can be used to design the substructure units.

Horizontal Movement –

AASHTO states that if the center-to-center spacing of the piling in the substructure unit is greater than 5 times the width of the pile then group effects can be ignored. Therefore, if the designed spacing is greater than 5 times the pile width a group efficiency factor of 1.0 can be used with no reduction in pile loading required. If this minimum pile spacing is not met a reduction factor will need to be calculated according to the AASHTO code.

Horizontal movement at the substructure units can be calculated using the following soil parameters:

Sand-silt (alluvium); phi angle = 24 degrees, cohesion = 50 psf, wet unit weight = 118 pcf
Silt-sand with gravel (alluvium); phi angle = 32 degrees, cohesion = 0 psf, wet unit weight = 130 pcf
Silt-clay (Pierre Shale); phi angle = 18 degrees, cohesion = 1,000 psf, wet unit weight = 130 pcf

For the drilled shafts, a LRFD maximum factored resistance value (skin friction) of 2,800 psf is recommended below elevation 1912 for the bents or maximum scour whichever is lower. The point of fixity within the bedrock can be assumed to be 1912 for the bents.

Each drilled shaft shall have a minimum of 3 access tubes for a shaft diameter of 3.0' and less. The number of access tubes needed shall be increased by 1 for each foot increase in shaft diameter above the 3.0'. The access tubes shall be furnished and installed according to the South Dakota Department of Transportation's 2004 Standard Specifications for Roads and Bridges. These access tubes shall be equally spaced in the shaft reinforcement prior to placing the reinforcement cage.

A representative of the [CONSULTING FIRM \(NAME AND NUMBER\)](#) shall be present during drilling operations to confirm the elevations provided in this report and to observe the placement of the drilled shafts. In addition to the notes below, contact the [CONSULTANT REPRESENTATIVE](#) for the most current drilled shaft construction notes to be included in the plans.

The following notes shall be placed in the plans:

A drivability analysis was performed using the wave equation analysis program (GRLWEAP). The pile hammers listed below were evaluated and found to produce acceptable driving stresses. Pile hammers not listed will require evaluation and approval prior to use from the [CONSULTANT REPRESENTATIVE NAME AND PHONE NUMBER](#).

Hammers need to be sized according to site specific soil parameters and structure design requirements. The following list of hammers is owned and readily available by contractors that do work in SD. Select and specify in the report which hammers are acceptable for use on individual projects.

ICE 180
Delmag D19-42
Delmag D25-32

Delmag D12-42
MVE M-19
Delmag D30-32

FEC 1500
ICE 42S
SPI D30

Delmag D16-32
MKT DE 42/35
Delmag D46-32

Delmag D19-32
APE D19-42

| | | | |
|----------|---------|-----------|--------------|
| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
| S.D. | | | |

Plotting Date: 03/26/2013

The Geotechnical Engineering Activity has on file all of the boring logs for this project. These logs and additional results of laboratory test, if any, are available for review at the Central Office in Pierre.

LEGEND

- ⊕ Auger Test
- ⊖ Drive Test
- ▽ Water
- Penetration Test
- ⊖ Caved
- Sample Zone

Drive test are conducted by dropping a 490 pound hammer 30 inches to drive a 2 7/8 inch drill stem with attached retractable plug sampler for taking samples and to measure the resistance to penetration of the soil.

Auger holes are drilled with a 4 1/2 inch diameter continuous flight auger. Penetration and Push Test holes are drilled with a 6 5/8 inch diameter hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples.

GROUND WATER ELEVATIONS

as of December 2012

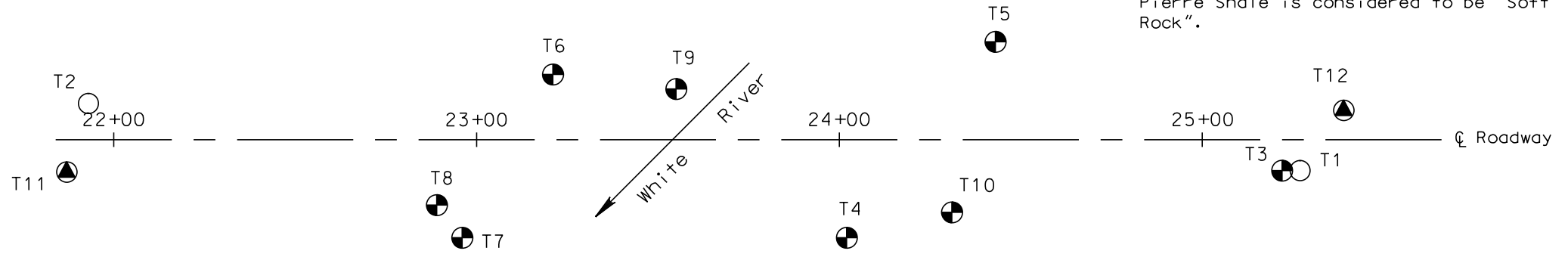
| | | |
|-----|---------|--------|
| T1 | (Caved) | 1931.3 |
| T2 | (Caved) | 1910.9 |
| T3 | | Dry |
| T4 | | 1929.7 |
| T5 | | 1926.9 |
| T6 | | 1928.9 |
| T7 | | 1930.2 |
| T8 | | 1929.1 |
| T9 | | 1930.0 |
| T10 | | 1929.3 |
| T11 | | Dry |
| T12 | | 1929.8 |

MEASURED SKIN FRICTION

| | Elev | psf |
|-----|--------|-------|
| T11 | 1924.0 | 2,193 |
| T12 | 1907.3 | 1,214 |

Pierre Shale is a marine shale with a textural classification that varies from silt-clay to clay-silt. Color varies from buff gray to black. The formation may contain concretion zones that are normally thin but occasionally are massive. These zones may be considered hard and dense. Thin zones may be present that are cemented resulting in claystone or siltstone seams. Bentonite zones may be encountered but are normally less than one half inch thick. Nonweathered Pierre Shale is considered to be "Soft Rock".

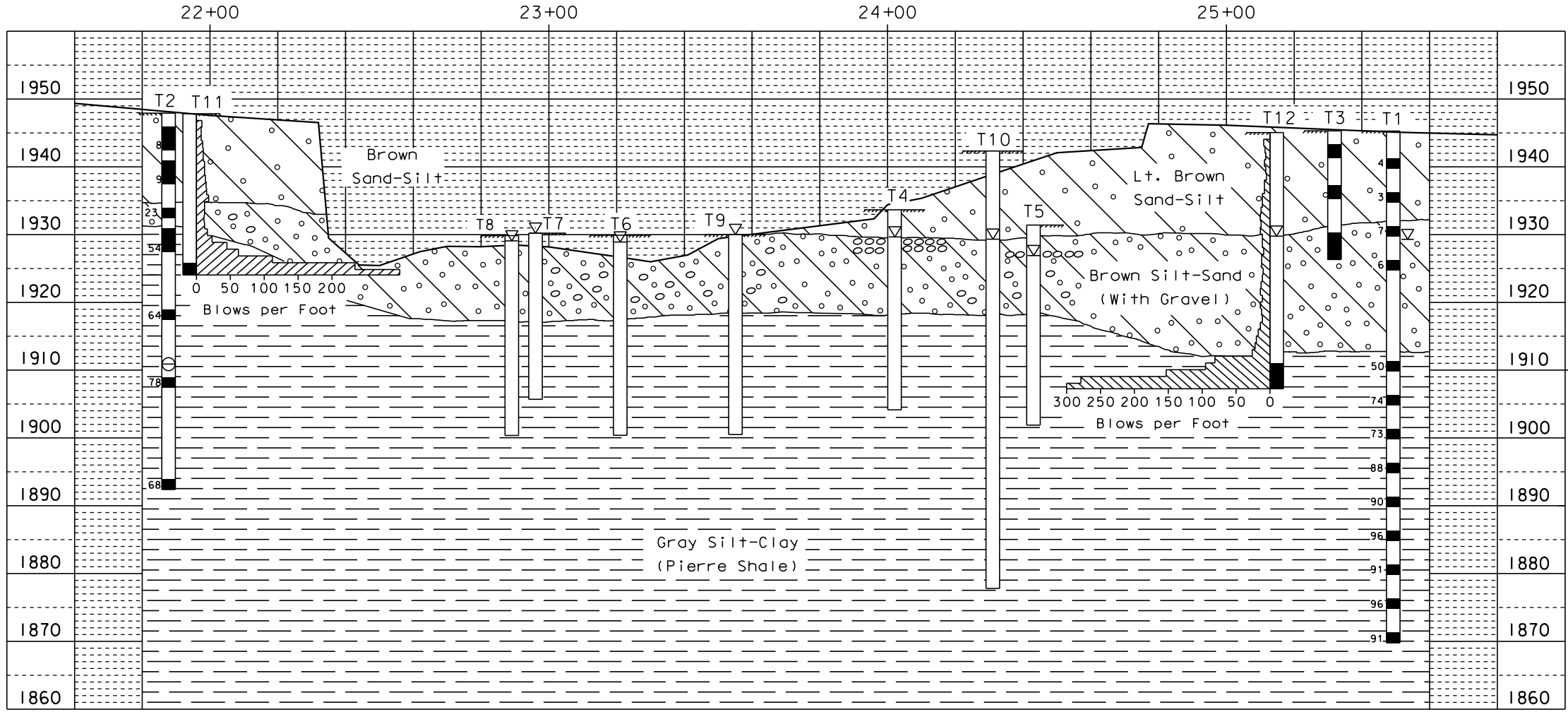
| Hole Number | T2 | T3 | T3 | T11 | T12 |
|----------------------------|-----------|-----------|-----------|------------|------------|
| Station | 21+93 | 25+22 | 25+22 | 21+87 | 25+29 |
| Depth | 9.0 ft | 9.7 ft | 17.0 ft | 23.8 ft | 37.8 ft |
| Soil Color | Brown | Brown | Brown | Gray | Gray |
| Classification | Sand-Clay | Silt | Sand | Clay | Clay |
| Strength (Q _u) | 655.3 psf | ----- psf | ----- psf | 33,490 psf | 40,240 psf |
| Dry Density | 83.6 pcf | 81.7 pcf | 97.8 pcf | 116.9 pcf | 112.5 pcf |
| Wet Density | 95.6 pcf | 91.8 pcf | 107.0 pcf | 136.6 pcf | 133.3 pcf |
| Moisture | 14.8 % | 12.3 % | 9.4 % | 16.9 % | 18.5 % |
| Pass No. 10 | 84.4 % | 99.9 % | 96.2 % | 99.8 % | 99.8 % |
| Pass No. 40 | 76.2 % | 97.1 % | 74.9 % | 99.7 % | 99.8 % |
| Pass No. 200 | 61.9 % | 55.1 % | 9.9 % | 96.9 % | 99.5 % |
| Sand Content | 22.6 % | 44.8 % | 86.3 % | 2.8 % | 0.3 % |
| Silt Content | 23.0 % | 45.1 % | 9.9 % | 41.1 % | 39.6 % |
| Clay Content | 38.8 % | 10.0 % | 0.0 % | 55.9 % | 59.9 % |



* Values represent uncorrected "N" values from Penetration Test.

Sample Zone ■ 48 Blows Per Foot

Bore holes on profile are moved slightly for clarity



BRO 8048(03) MELLETTE COUNTY PCN 02DY
 18.9 MILES N. AND 0.8 MILES W. OF CEDAR BUTTE
 SECTION 28 TOWNSHIP 45 W. RANGE 31 W.
 OVER WHITE RIVER
 STR. NO. 48-102-010

SITE PLAN & SUBSURFACE PROFILE

| | | | |
|-------------|----------|------------|-----------------|
| DESIGNED BY | DRAWN BY | CHECKED BY | APPROVED |
| | NN | JW | |
| | | | BRIDGE ENGINEER |

PLOT SCALE - 1:20

PLOTTED FROM - TRPR18174

FILE ... \SUBSURFACE PROFILE\02DY.DGN

**EXAMPLE #2
RECOMMENDATIONS**

Re: BRO 8027(29), Gregory County, PCN 00QR
Str. No. 27-030-081, located 2.0 West & 0.1 South of the Jct of SD44/SD47
RCBC Undercut Recommendation

Soils maps of the area indicate the soils at the location of the proposed structure have the following characteristics.

Station 16+86 (Str. No. 27-030-081)

CLASSIFICATION: A-7
Clay & Silty Clay
AVERAGE LIQUID LIMIT: 66
SHRINK-SWELL POTENTIAL: High to Very High
FROST ACTION POTENTIAL: Low
CORROSIVITY: High for steel, Low to Moderate for concrete

RECOMMENDATIONS:

Provide 24 inches of undercut and backfill.

DISCUSSION:

The project consists of replacing an existing single span 22' steel stringer bridge with a 2 barrel 13' x 6' cast-in-place RCBC. The proposed box culvert will be in the same location as the existing bridge location. The existing surfacing on the road is gravel and will be resurfaced with gravel upon completion. Minimal grading at the proposed box culvert location is anticipated, therefore, the material shall be compacted using the Ordinary Compaction Method.

A subsurface investigation was conducted for the proposed RCBC. The subsurface investigation consisted of placing a boring near both the proposed inlet and outlet ends of the structure and logging the material to 3 feet below the flow line. Samples were collected from below the flow line for soils classification. A dynamic cone penetrometer was used at both the inlet and outlet ends to identify the change in relative density of the subsurface material below flow line.

Subsurface soils at the proposed site consist of brown silt-clay to 3' below the existing flow line.

The 2' undercut depth is recommended to remove the low strength soils with high shrink-swell potential from below the box culvert.

The following paragraphs shall be placed in the plans:

Compaction of earth embankment and box culvert backfill material shall be governed by the Ordinary Compaction Method.

Any questions about the recommendations or the subsurface conditions can be directed to the [CONSULTANT CONTACT NAME AND PHONE NUMBER](#).



ABC ENGINEERING
Street Address
City, State, ZIP
PHONE / FAX

**EXAMPLE PACKET
FINAL HYDRAULIC DATA
SHEET AND HYDRAULIC
REPORT**

DATE

NAME
TITLE/COMPANY
ADDRESS
CITY, South Dakota, 57

RE: PROJECT NUMBER, COUNTY, PCN

Dear NAME:

Enclosed are the Final Hydraulic Data Sheet and Hydraulic Design Report for the referenced project. Please let us know if there are any questions or if further information is required.

Sincerely,
ABC ENGINEERING

NAME
TITLE

Enclosures
cc: File

**SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION
HYDRAULIC DATA SHEET**

County Clay Project No. BRO 8014(25) PCN 6868 Sec. 3/4 Township 95 Range 51
 Existing Station 25+59.4 Over Ash Creek Drainage Area 12.9 sq. mi. Direction of Flow (N S E W)
 Preliminary Final X Q-Design Yr. Frequency 10 yr. Observed H.W. Elev. 1281.4±
 BRIDGE NO. 14-150-006 LOCATION 0.6 miles south & 15.0 miles east of Irene, SD

| Cross Section | Q ₂ cfs | W.W. Area sq ft | V fps | S ₀ ft/ft | Bottom | | H.W. ft | d _n ft | C.L. FL Elev. | D.H.W. Elev. | | Ch. Ch. | Degree Skew |
|---------------|--------------------|-----------------|-------|----------------------|-----------|-----|---------|-------------------|---------------|--------------|--------|---------|-------------|
| | | | | | Structure | Ch. | | | | Culv. Inlet | Bridge | | |
| Rectangle | 1280 | 160 | 8.0 | 0.0009 | 2B=28' | | 7.0 | 5.7 | 1272.67* | 1279.7 | | No** | 0° |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

Type: RCBC with 20° Flared Wingwalls at Inlet and 0° Flared Wingwalls at Outlet.
 Size: 2 - 14' x 10' (effective opening 2 - 14'x9')
 Proposed Location: Center at Sta. 25+50
 Notes or Remarks: Discharges computed using Water Resources Investigations Report 98-4055.
Q₂ = 351 cfs; Q₁₀₀ = 3090 cfs; Structure width and flow line elevation meet the criteria called for in "Fish Passage Guidelines for Culvert Projects Impacting the Topeka Shiner or Other Fishery Resources".

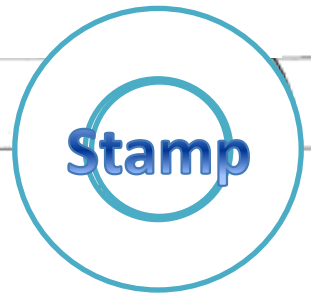
IN PLACE CONDITIONS: Q₂ Elev.=1277.4 HW₁₀=1279.8 HW₁₀₀=1283.3 *****Overtop Freq.= Q_{20.7}=1750 cfs V_{max}=V_{20.7}=11.3 fps

PROPOSED CONDITIONS: HW₁₀₀ = 1282.4 Overtop Freq. = Q_{20.5} = 1740 cfs V_{max} = V₁₀₀ = 12.4 fps
Q₂ Elev. = 1277.0 at culvert inlet Q₂ Depth = 4.3 ft. at outlet assuming flow line Elev. 1272.7 V₂ = 2.9 fps at culvert outlet

*The box culvert flow line has been lowered 12" below estimated stream flow line due to the presence of Topeka Shiner. Bottom 1.0' of box culvert assumed to not convey any water. Centerline RCBC and Precast CBC Elev. = 1271.67.
** Minor channel shaping will be required at the channel inlet and outlet.
***Clay County is a participating community in NFIP.
****The area is mapped and the site is shown as being Zone A which means No Base Flood Elevations are determined. Firm Map No. 46027C0100C.
***** Existing and proposed roadway overtop at Elev. 1280.83 near Sta. 24+01.
Provide 24" thick Class B riprap at outlet across the channel and extend up the 2:1 banks to an elevation of 1277.0± for a distance of 12'± downstream of outlet. Also provide riprap in NE ditch from end of wing wall 70' North to culvert invert. Provide Type B Drainage Fabric beneath all riprap.
 Vertical Datum Used: NAVD 88: X NGVD 29: Unknown:
 Topeka Shiner Stream: Yes X No 404 Permit: Yes X No
 Community Participating in NFIP: Yes X*** No
 Site in Identified NFIP Floodplain: Yes No X***
 In-Place Structure: 44.0' Three Span Timber Stringer Bridge
 100-Yr. DHW Elev. (existing): 1283.3 OHW Elev. = 1277.4

Prepared By: Signature
 Hydraulic Engineer

Date:



HYDRAULIC SUMMARY FOR PLAN SHEET

| | | |
|-----------|------|-------|
| Q_d | 1280 | cfs |
| A_d | 160 | sq ft |
| V_d | 8.0 | fps |
| Q_F | 1280 | cfs |
| Q_{100} | 3090 | cfs |
| Q_{OT} | 1740 | cfs |
| V_{max} | 12.4 | fps |

Q_d = design discharge for the proposed bridge based on 10 year frequency. El. 1279.7.

Q_{OT} = overtopping discharge and frequency 20.5 year recurrence interval. El. 1280.8.
Location: Sta. 24+01.

Q_F = designated peak discharge for the basin approaching proposed project based on 10 year frequency.

Q_{100} = computed discharge for the basin approaching proposed project based on 100 year frequency. El. 1282.4.

V_{max} = maximum computed outlet velocity for the proposed structure, based on a 100 year frequency.

The hydraulic data contained in these plans is valid only if the overflow section is maintained. Alteration of the overflow section will require re-analysis of the hydraulics at this site to determine its effect on public safety.

Hydraulic Data to be Included on Roadway Profile Sheet

| Flow | | | | Elevation | |
|--------------|------|---|------|-----------|--------|
| $Q_d =$ | 1280 | | cfs | | 1279.7 |
| $Q_{100} =$ | 3090 | | cfs | | 1282.4 |
| $Q_{OT} = Q$ | 20.5 | = | 1740 | cfs | 1280.8 |

HYDRAULIC DESIGN REPORT

**Ash Creek
Structure No. 14-150-006
BRO 8014(25)
PCN 6868
Clay County, South Dakota**

Prepared for:
**South Dakota Department of Transportation
Division of Planning/Engineering
700 E Broadway Ave
Pierre, SD 57501-2586**

July 2015

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1.0 PROJECT DESCRIPTION

FIRM was retained by the South Dakota Department of Transportation (SDDOT) to design the replacement of a 44.0' three span timber stringer bridge which carries 467th Ave. over Ash Creek in Clay County, South Dakota. The Hydrology and Hydraulics were reviewed for proposed conditions to determine type, size and location of replacement structure for the site. All items in this report are under the project number BRO 8014(25).

2.0 SITE LOCATION

An existing 44.0' three span timber stringer bridge with timber deck, rails, abutment, bents, wingwalls, pile cap and piles conveys flow for Ash Creek under 467th Ave. in Clay County, approximately 0.6 miles south and 15.0 miles east of Irene, SD.

Legal description: Section 3/4 – T95N – R51W

Structure Number: 14-150-006

See Appendix B for location map

3.0 CHARACTERISTICS OF SITE

The existing 44.0' three span timber stringer bridge conveys flow from the natural channel west underneath 467th Ave. in Clay County. The existing bridge was constructed in 1960. The creek is wide and intermittent located in a low relief valley. It has non-alluvial channel boundaries and its banks are comprised of less than 50% tree cover. Most of the creek runs through existing farm land, primarily a rural site and is meandering upstream and downstream. The surrounding areas drain to the creek via culverts and overland low points in the terrain. The floodplain is wide with little to no natural levees. After passing underneath 467th Ave. the creek continues to the west. The vertical datum used is NAVD 88. An upstream and downstream view from the roadway is shown in Figures 1 and 2.



Figure 1: Upstream view from roadway



Figure 2: Downstream view from roadway

4.0 DESIGN ELEMENTS

The following sections categorize and summarize elements that will affect the design of a new structure at this location.

4.1 ENVIRONMENTAL CONSIDERATIONS

The US Army Corps of Engineers (USACE) Omaha District provided Nationwide Permit (NWP) regional conditions to be used in the State of South Dakota. The intent is to ensure all projects result in less than minimal adverse impacts to the aquatic environment and to address local resources concerns. See link "Nationwide Permit Regional conditions for South Dakota" under <http://www.nwo.usace.army.mil/Missions/RegulatoryProgra/SouthDakota.aspx>. A policy for countersinking culverts is included for crossings that carry a "Waterway of the United States." Currently, any roadway crossing marked with a blue stream line running through it as shown on the quadrangle map (7.5 minute series scaled at 1:24,000) is considered to be a "Waterway of the U.S." according to the USACE. Jurisdictional waters are identified at this location. If a culvert structure is used it will be required to countersink it 1.0 feet to allow for aquatic organism passage. A section 404 permit will be required for any work performed in the channel. Ash Creek is a Topeka Shiner stream.

4.2 ROADWAY ELEMENTS

4.2.1 Functional Classification. 467th Ave. is classified as a rural local road.

4.2.2 Horizontal Alignment. 467th Ave. runs straight north and south. The proposed structure will need a 0° skew to maintain the natural channel flow path.

4.2.3 Vertical Alignment. The proposed culvert is situated approximately 150' north of the sag point on a sag vertical curve. The proposed entrance grade from the sag vertical curve from the north is -5.000% and the exit grade to the south is -2.100%.

4.2.4 Typical Sections. The 467th typical section for this site will include a crown slope of 0.03 ft/ft, 4:1 inslopes, 5:1 backslopes, and a standard 10' ditch at 20:1. The approach subgrade will taper into the existing and provide for a 20' finished roadway top. The clear zone is 10'. See Appendix D for the Typical Section of the proposed roadway in the vicinity of the structure.

4.2.5 Design Speed. The design speed for the proposed 467th Ave. is 35 mph.

4.3 RIGHT-OF-WAY CONSIDERATIONS

The existing right of way on the east side of 467th Ave. extends 33' east of the centerline of the roadway. The existing right of way on the west side of 467th Ave. extends 33' west of the centerline of the roadway. There will be a need to purchase additional right of way on the east and west sides to accommodate RCBC wings and riprap for erosion control. The site will continue to utilize open drainage. There is an underground telephone line on the west side of 467th Ave. approximately 15' to 20' from centerline of roadway that will likely be relocated for this project. Also, an underground water line on the west side of 467th Ave. approximately 30' to 40' from centerline of roadway that will likely be relocated for this project. There is also a water line on the east side of 467th Ave. that will remain in place.

4.4 GEOTECHNICAL CONSIDERATIONS

To protect against erosion the downstream channel will be armored with riprap.

4.5 FEMA CONSIDERATIONS

Clay County is participating in the National Flood Insurance Program (NFIP). The FEMA Flood Insurance Rate Map Number 46027C0100C, effective August 5, 2010 (FEMA FIRM) was used for this report and the design of the proposed structures. Ash Creek is within an mapped floodplain in the FEMA FIRM. The structure is located in Zone A, which means no base flood elevations are determined, of FIRM #46027 0100 C.

5.0 HYDROLOGY

The Ash Creek is an un-gaged stream located in a rural watershed. The drainage area was delineated using USGS StreamStats. The drainage area was found to be 12.9 Square miles with a main channel slope of 4.8 ft/mile. Peak flow rates were calculated using the USGS Water-Resources Investigations Report 98-4055 "Techniques for Estimating Peak-Flow Magnitude and Frequency Relations for South Dakota Streams". Using this report the watershed was determined to be located in Subregion A with a PII value 1.2 inches found in the South Dakota Drainage Manual Figure 7.9-A and Figure 7.9-B. The regression equations in Figure 7.9-C of the South Dakota Drainage Manual were used to determine the peak flows. The design frequency of 10 years and review frequency of 100 years were determined using Figure 7.6-A in the South Dakota Drainage Manual. The calculated peak flow rates used are shown in Table 1. See Appendix E for flow calculations.

Table 1: Peak flow values

| USGS Report 98-4055 | |
|-----------------------------|---------|
| Sub-Region A | |
| Recurrence Interval (years) | Q (cfs) |
| 2 | 351 |
| 10 | 1280 |
| 25 | 1940 |
| 100 | 3090 |

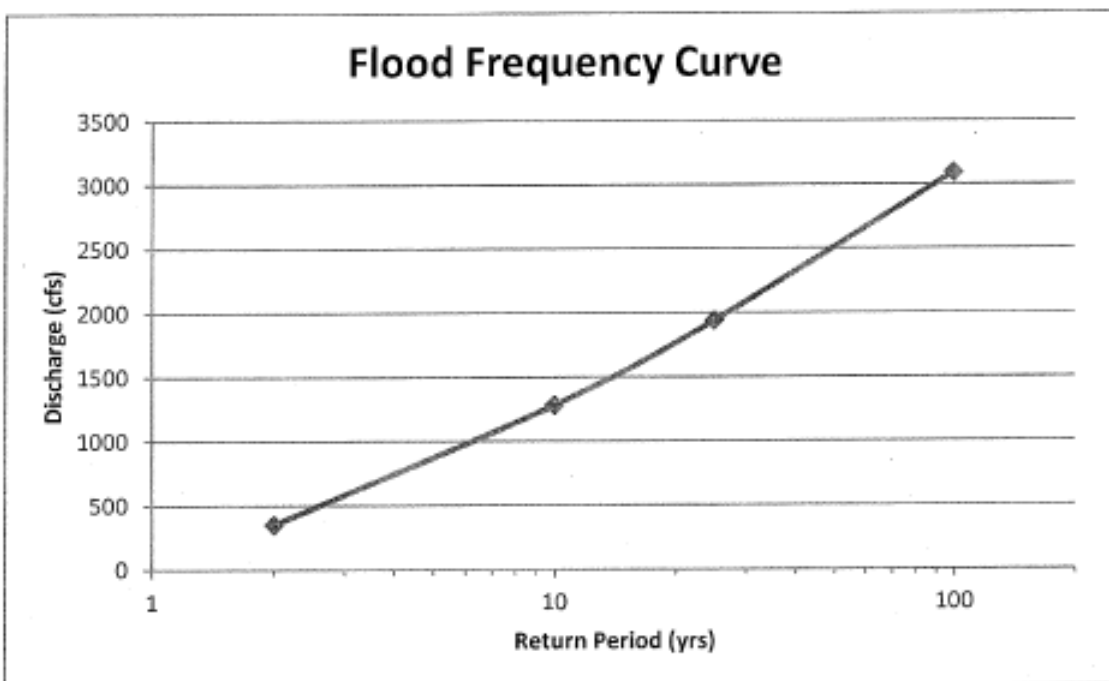


Figure 3: Flood Frequency of Ash Creek

6.0 HYDRAULICS

6.1 General

The scope of the project is to evaluate flow characteristics of the existing bridge and design a new structure to meet these characteristics. One dimensional flow analysis was performed on the channel and each structure. This analysis was performed using HEC-RAS (Hydrologic Engineering Center River Analysis System) developed by the US Army Corps of Engineers. The HEC-RAS output is provided in Appendix H.

A meeting was held on April 23, 2015 to discuss options for bridge replacement. Members of the SDDOT, Clay County and **FIRM** discussed the layout, existing structure, proposed structure. The issue of traffic control was also discussed and it was decided that the road would be closed. No traffic diversion or detour will be needed. It was decided that a 2 barrel 14' X 10' cast-in-place RCBC with a 0° skew, and 20° flared wingwalls at the inlet & 0° flared wingwalls at the outlet would be the most feasible structure.

6.2 Existing Bridge

Discharge data for the HEC-RAS model was calculated using the techniques discussed in the previous hydrology section. The roadway, stream profile, and tailwater were created using survey data, and Carlson Civil Suite then inputting the values into HEC-RAS. Approximate locations of the cross sections can be found in Appendix G. Manning’s n-values for the channel cross-section were estimated to be 0.03 for the stream channel, 0.04 for the left overbank and 0.05 for the right overbank. Expansion and contraction coefficients were 0.1 and 0.3 for all cross sections.

6.2.1 Results

The existing bridge was modeled in HEC-RAS. For our analysis, a comparison was made in headwater difference between the existing bridge/existing road profile and the proposed culvert/proposed road profile. This analysis yielded results that indicated the proposed culvert would meet the parameters set forth in the SDDOT Drainage Manual for bridge replacement.

Figures 4, 5, and 6 show the profile plots of the 2, 10, and 100 year floods respectively. The overtopping frequency is the 20.7 year flood with a discharge of 1750 cfs. The overtopping of the existing roadway takes place at Sta. 24+01.

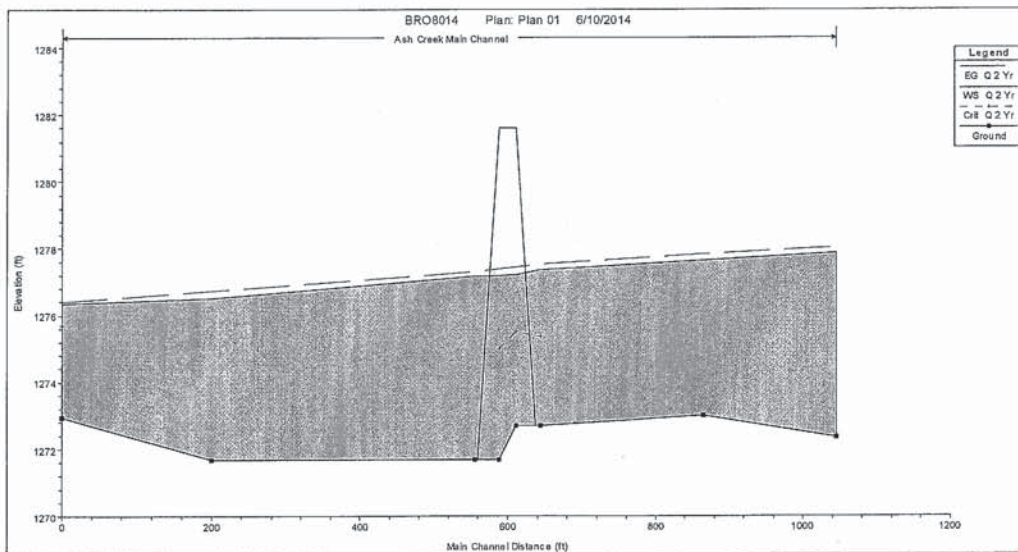


Figure 4: Existing 2-year profile plot

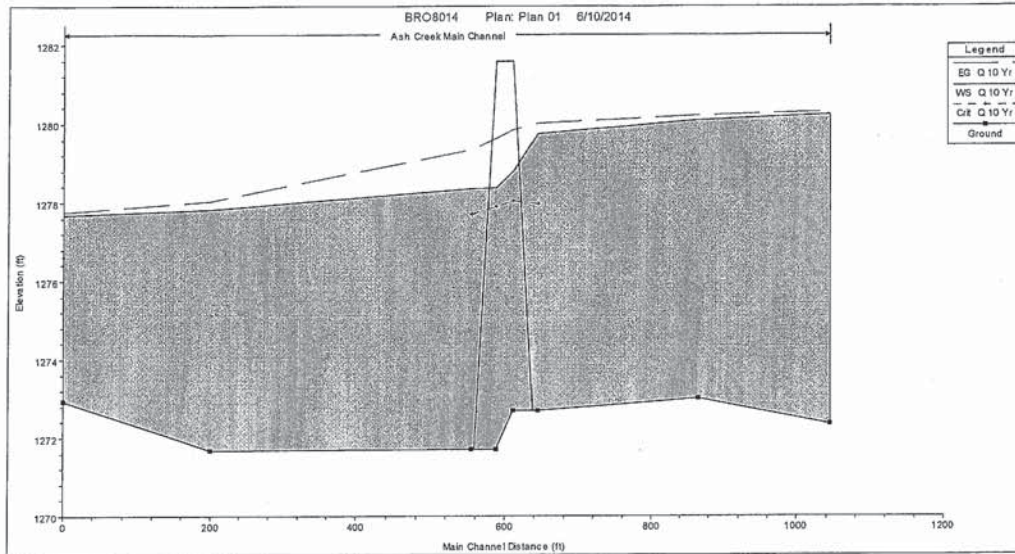


Figure 5: Existing 10-year profile plot

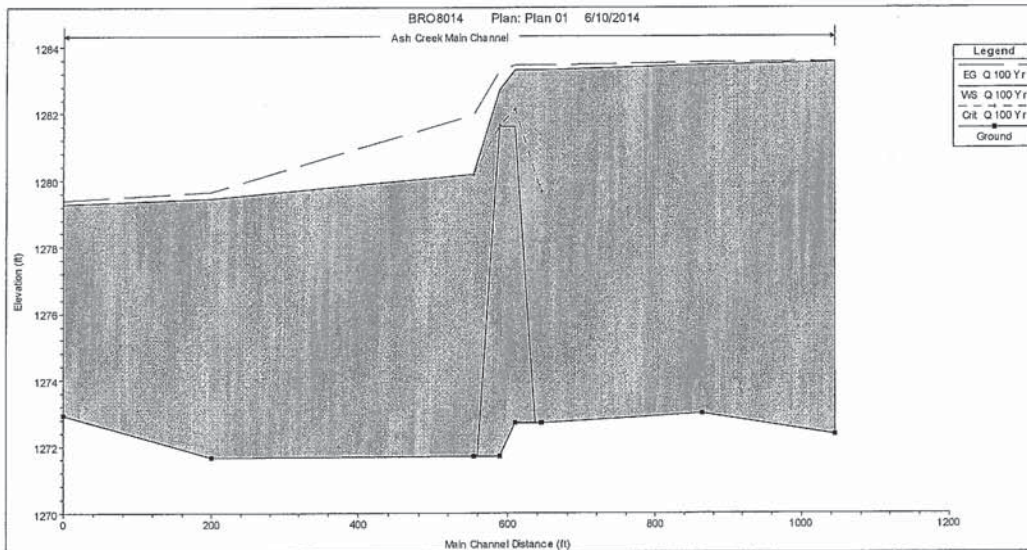


Figure 6: Existing 100-year profile plot

6.3 Proposed 2-14' X 10' RCBC

The proposed culvert is a 2-14' X 10' X 77.3' RCBC with 20° flared wing walls at inlet and 0° flared wing walls at outlet. The culvert is 28' wide and meets the structure width criteria outlined in "Fish Passage Guidelines for Culvert Projects Impacting Topeka Shiner or Other Fishery Resource". The culvert flow line will be lowered 12" below the estimated stream flow line to meet the USACOE 2012 regional conditions for aquatic organisms. For the hydraulic calculations it was assumed that the area below the natural flowline fills in and does not convey flow. The centerline flow elevation will be 1272.67. The culvert slope is 0.0009 ft/ft.

The 2-14' X 10' RCBC was analyzed using HEC-RAS. The Manning's n values are the same as for the existing structure. Cross sections were taken both upstream and downstream of the structure. See Appendix G for approximate cross section locations. The peak discharges are the same as described in the hydrology section of this report. Expansion and contraction coefficients were 0.1 and 0.3 for all cross sections except at the culvert entrance and exit sections. Figure 7 shows the proposed stage discharge curve for Ash Creek at the entrance of the 2-14' X 10' RCBC.

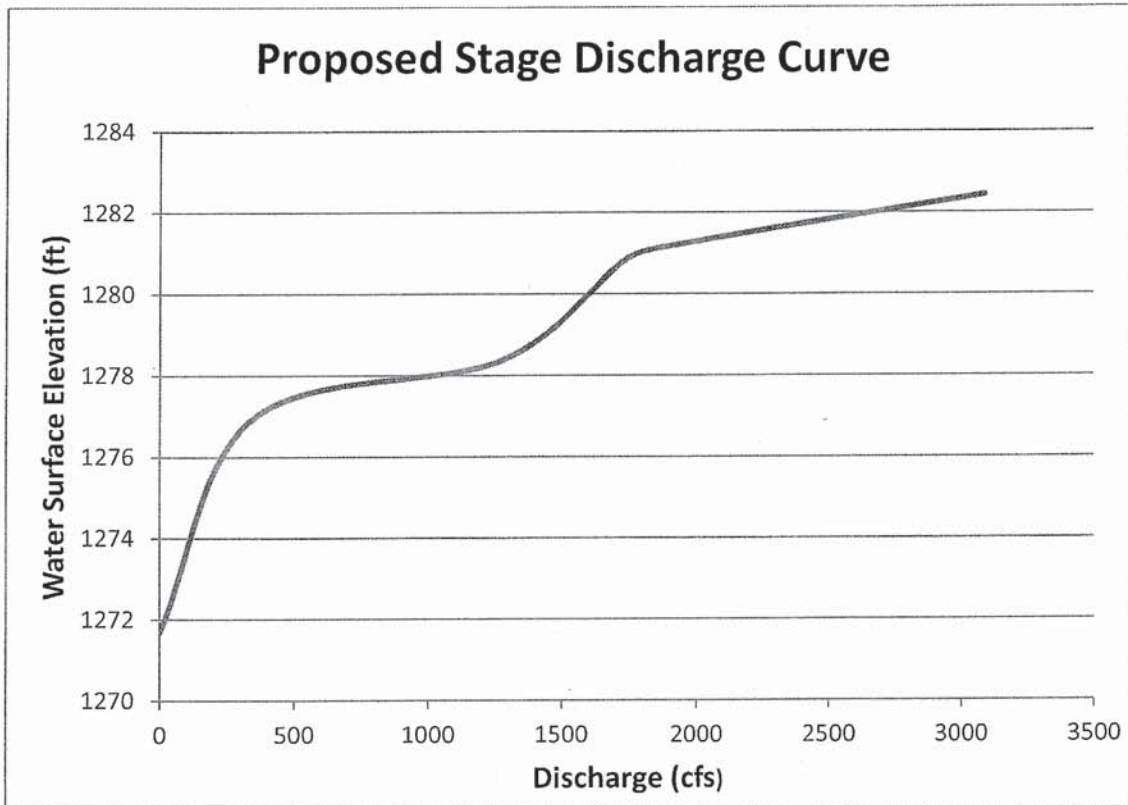


Figure 7: Proposed Stage Discharge Curve for 2-14' X 10' RCBC Entrance

6.3.1 Results

Figures 8, 9, and 10 show the proposed profiles for the 2-14' X 10' RCBC. With the proposed 2-14' X 10' RCBC, overtopping occurs with a 20.5 year flood at a discharge of 1740 cfs with a max outlet velocity of 12.4 ft/s. The overtopping occurs at an elevation of 1280.83 at Sta. 24+01. The performance curve for the culvert is shown in Figure 11. Also provide 24" thick Class B riprap at outlet across the channel and extend up the 2:1 banks to an elevation of 1277.0± for a distance of 12'± downstream of outlet. Provide Type B Drainage Fabric beneath all riprap.

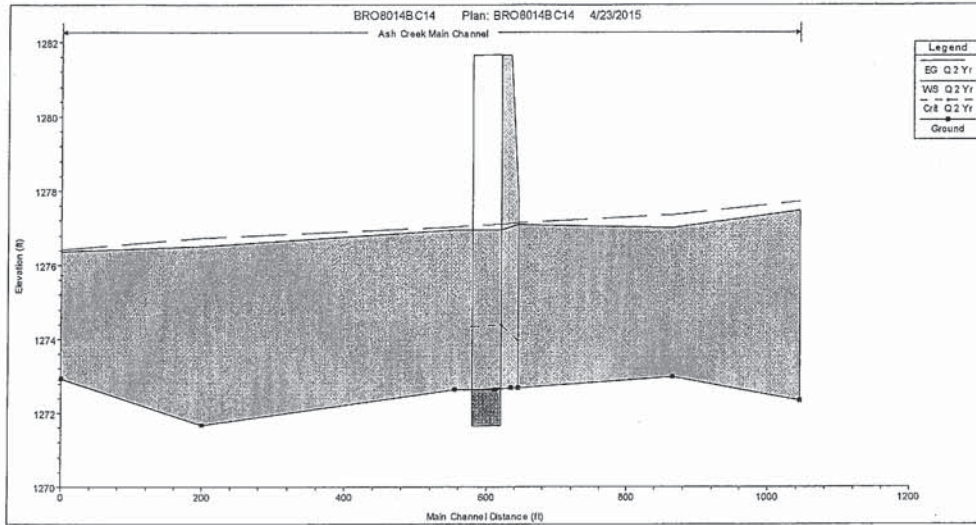


Figure 8: Proposed 2 year profile plot 2-14'X10' RCBC

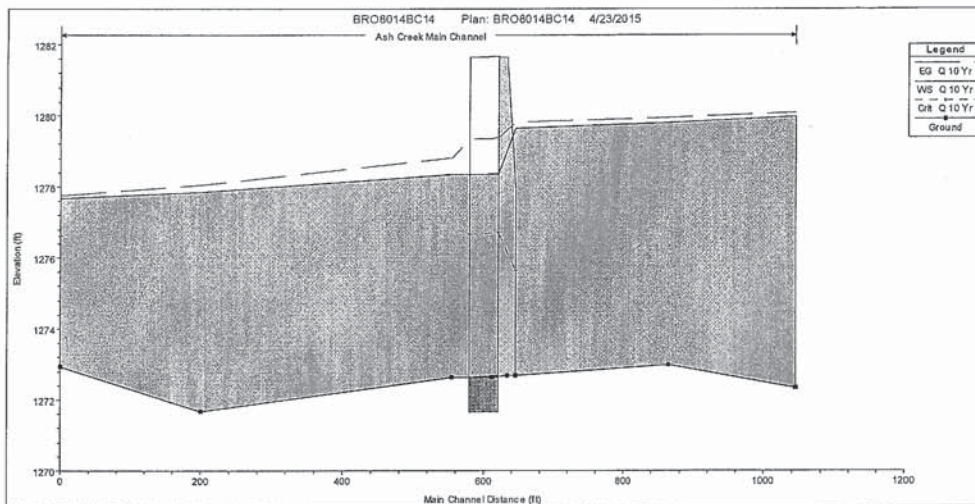


Figure 9: Proposed 10 year profile plot 2-14'X10' RCBC

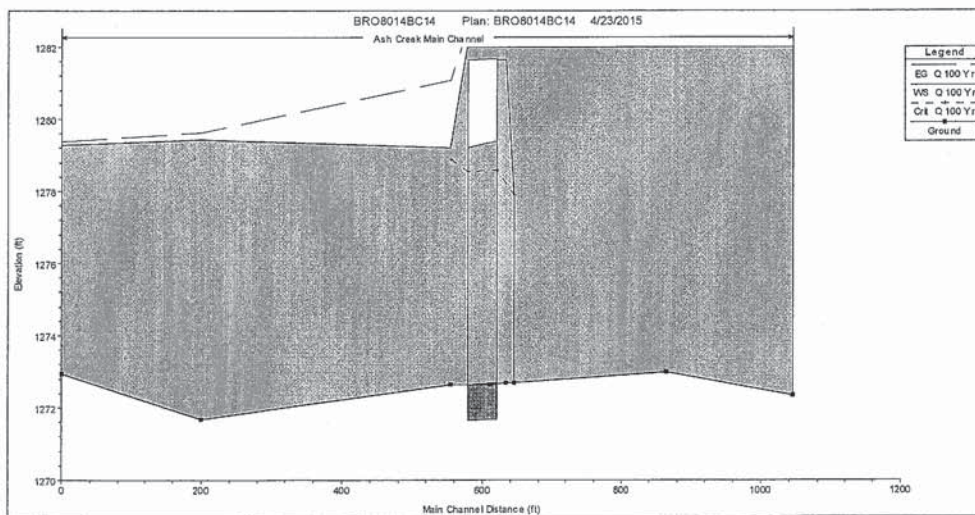


Figure 10: Proposed 100 year profile plot 2-14'X10' RCBC

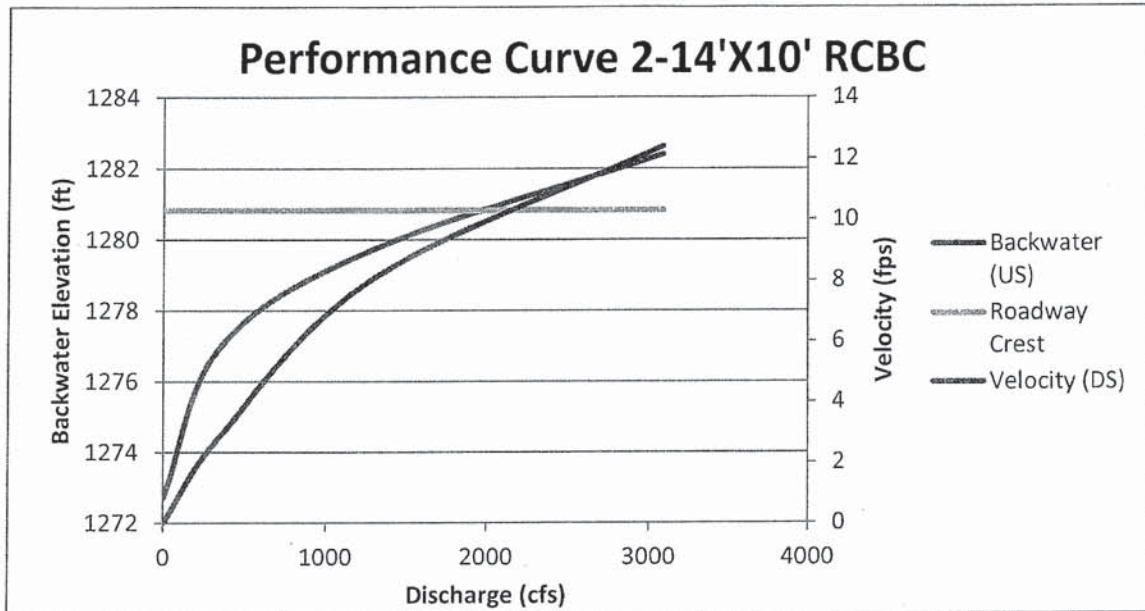


Figure 11: Performance Curve for 2-14'X10' RCBC

6.4 Recommendation

It is the goal of this design to meet the design minimum as set forth in the SDDOT Drainage Manual. The hydraulic calculations indicate that the overtopping elevation and frequency will not change as a result of replacing the existing 44.0' Three Span Timber Stringer Bridge with the 2-14'X10' RCBC.

7.0 APPENDIX A: HYDRAULIC DATA SHEET

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION
HYDRAULIC DATA SHEET

County Clay Project No. BRO 8014(25) PCN 6868 Sec. 3/4 Township 95 Range 51
 Existing Station 25+59.4 Over Ash Creek Drainage Area 12.9 sq. mi. Direction of Flow (N S E W)
 Preliminary Final X Q-Design Yr. Frequency 10 yr. Observed H.W. Elev. 1281.4±
 BRIDGE NO. 14-150-006 LOCATION 0.6 miles south & 15.0 miles east of Irene, SD

| Cross Section | Q _d cfs | W.W. Area sq ft | V fps | S _b ft/ft | Bottom | | H.W. ft | d _s ft | C.L. FL Elev. | D.H.W. Elev. | | Ch. Ch. | Degree Skew |
|---------------|--------------------|-----------------|-------|----------------------|-----------|-----|---------|-------------------|---------------|--------------|--------|---------|-------------|
| | | | | | Structure | Ch. | | | | Culv. Inlet | Bridge | | |
| Rectangle | 1280 | 160 | 8.0 | 0.0009 | 28"=28' | | 7.0 | 5.7 | 1272.67* | 1279.7 | | No** | 0° |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

Type: RCBC with 20° Flared Wingwalls at Inlet and 0° Flared Wingwalls at Outlet.
 Size: 2 - 14' x 10' (effective opening 2 - 14'x9')
 Proposed Location: Center at Sta. 25+50
 Notes or Remarks: Discharges computed using Water Resources Investigations Report 98-4055.
Q₂ = 351 cfs; Q₁₀₀ = 3090 cfs; Structure width and flow line elevation meet the criteria called for in "Fish Passage Guidelines for Culvert Projects Impacting the Topeka Shiner or Other Fishery Resources".

IN PLACE CONDITIONS: Q₂ Elev. = 1277.4 HW₁₀ = 1279.8 HW₁₀₀ = 1283.3 *****Overtop Freq. = Q_{20.5} = 1750 cfs V_{max} = V_{20.5} = 11.3 fps

PROPOSED CONDITIONS: HW₁₀₀ = 1282.4 Overtop Freq. = Q_{20.5} = 1740 cfs V_{max} = V₁₀₀ = 12.4 fps
 Q₂ Elev. = 1277.0 at culvert inlet Q₂ Depth = 4.3 ft. at outlet assuming flow line Elev. 1272.7 V₂ = 2.9 fps at culvert outlet

*The box culvert flow line has been lowered 12" below estimated stream flow line due to the presence of Topeka Shiner. Bottom 1.0' of box culvert assumed to not convey any water. Centerline RCBC and Precast CBC Elev. = 1271.67.
 ** Minor channel shaping will be required at the channel inlet and outlet.
 ***Clay County is a participating community in NFIP.
 ****The area is mapped and the site is shown as being Zone A which means No Base Flood Elevations are determined. Firm Map No. 46027C0100C.
 ***** Existing and proposed roadway overtop at Elev. 1280.83 near Sta. 24+01.
 Provide 24" thick Class B riprap at outlet across the channel and extend up the 2:1 banks to an elevation of 1277.0± for a distance of 12'± downstream of outlet. Also provide riprap in NE ditch from end of wing wall 70' North to culvert invert. Provide Type B Drainage Fabric beneath all riprap.
 Vertical Datum Used: NAVD 88: X NGVD 29: Unknown:
 Topeka Shiner Stream: Yes X No 404 Permit: Yes X No
 Community Participating in NFIP: Yes X*** No
 Site in Identified NFIP Floodplain: Yes No X***
 In-Place Structure: 44.0' Three Span Timber Stringer Bridge
 100-Yr. DHW Elev. (existing): 1283.3 OHW Elev. = 1277.4

Prepared By: Signature
 Hydraulic Engineer
 Date:



HYDRAULIC SUMMARY FOR PLAN SHEET

| | | |
|-----------|------|-------|
| Q_d | 1280 | cfs |
| A_d | 160 | sq ft |
| V_d | 8.0 | fps |
| Q_F | 1280 | cfs |
| Q_{100} | 3090 | cfs |
| Q_{OT} | 1740 | cfs |
| V_{max} | 12.4 | fps |

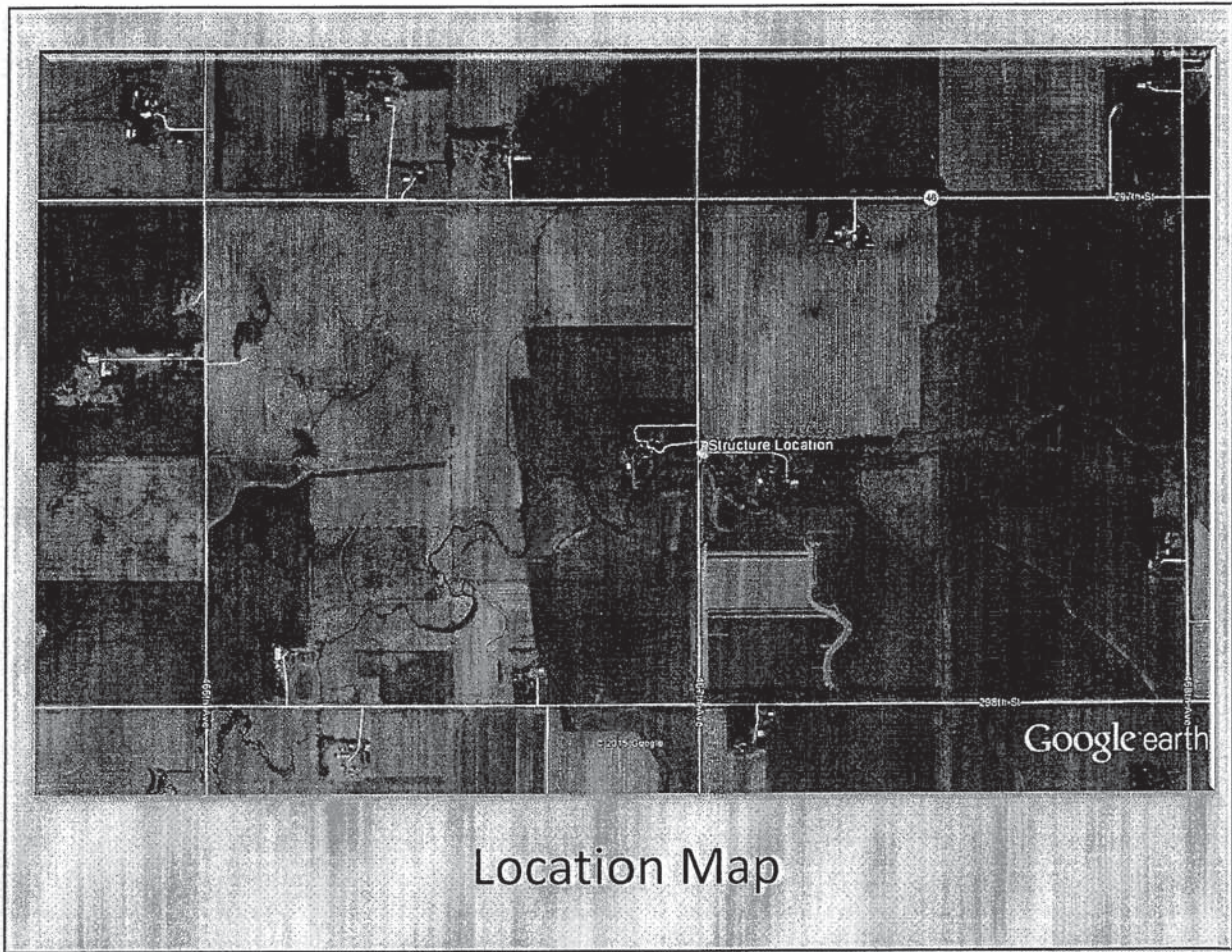
- Q_d = design discharge for the proposed bridge based on 10 year frequency. El. 1279.7.
- Q_{OT} = overtopping discharge and frequency 20.5 year recurrence interval. El. 1280.8.
Location: Sta. 24+01.
- Q_F = designated peak discharge for the basin approaching proposed project based on 10 year frequency.
- Q_{100} = computed discharge for the basin approaching proposed project based on 100 year frequency. El. 1282.4.
- V_{max} = maximum computed outlet velocity for the proposed structure, based on a 100 year frequency.

The hydraulic data contained in these plans is valid only if the overflow section is maintained. Alteration of the overflow section will require re-analysis of the hydraulics at this site to determine its effect on public safety.

Hydraulic Data to be Included on Roadway Profile Sheet

| Flow | | | Elevation |
|--------------|-------------|-----|-----------|
| $Q_d =$ | 1280 | cfs | 1279.7 |
| $Q_{100} =$ | 3090 | cfs | 1282.4 |
| $Q_{OT} = Q$ | 20.5 = 1740 | cfs | 1280.8 |

8.0 APPENDIX B: DRAINAGE AREA LOCATION MAP



Location Map

Section 3/4-T95N-R51W

9.0 APPENDIX C: DRAINAGE AREA

5/14/2014

Basin Characteristics Report

smw 2/

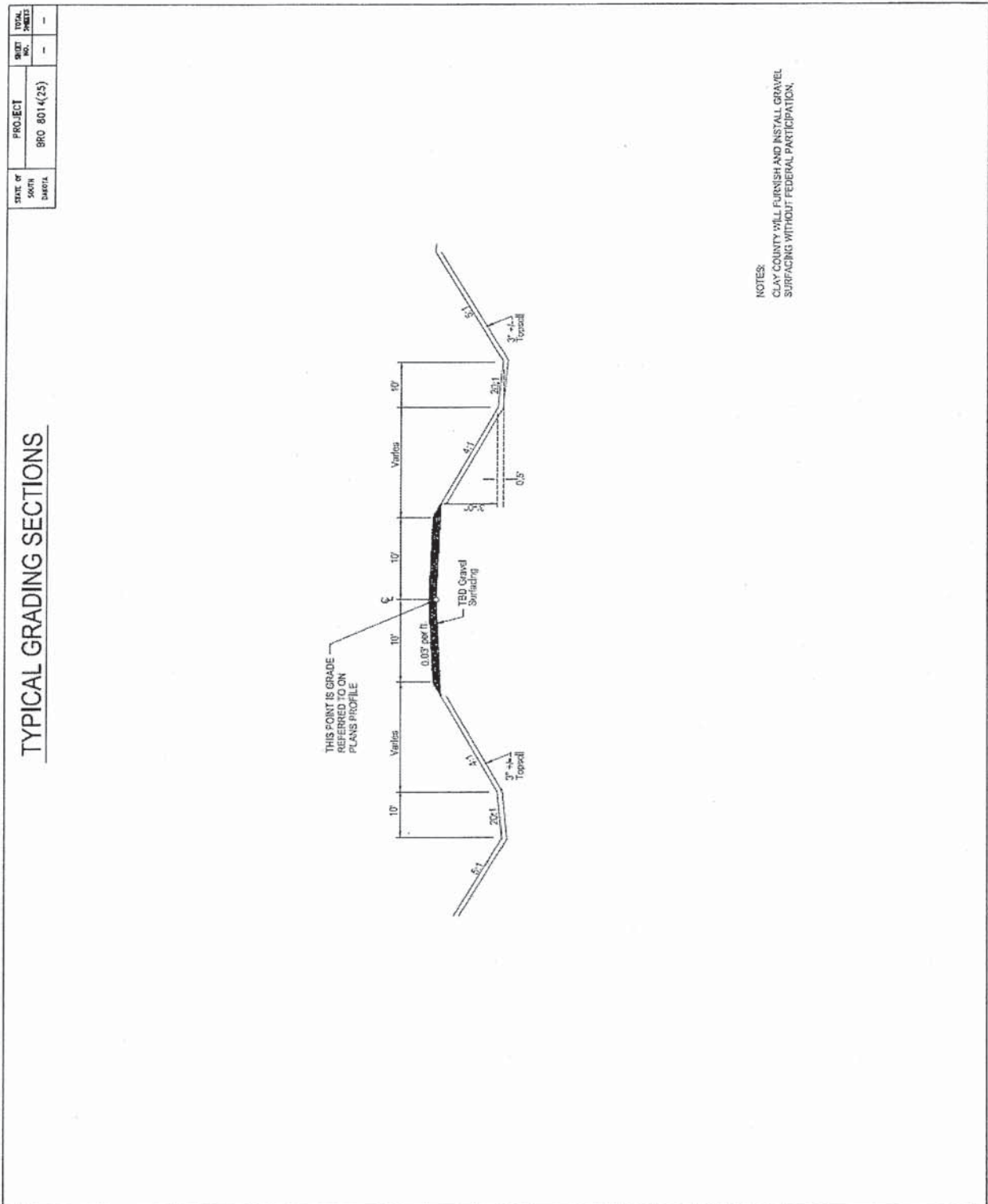


Basin Characteristics Report

Date: Wed May 14 2014 08:54:47 Mountain Daylight Time
 NAD27 Latitude: 43.0761 (43 04 34)
 NAD27 Longitude: -96.8645 (-96 51 52)
 NAD83 Latitude: 43.0760 (43 04 34)
 NAD83 Longitude: -96.8648 (-96 51 53)

| Parameter | Value |
|--|-------|
| Percent Limestone Headwaters from Sando and others (2008) | 0.000 |
| Percent lakes and ponds as determined from the National Wetlands Inventory (2001) | 0.237 |
| 24 Hour 2 year Precipitation | 1.2 |
| Perimeter in miles | 21.7 |
| Length of associated Longest Flow Path in miles | 8.38 |
| Percent wetlands as determined from the National Wetlands Inventory (2001) | 2.020 |
| Percent total limestone from Sando and others (2008) | 0.000 |
| Maximum elevation in feet | 1540 |
| Percent Artesian Spring from Sando and others (2008) | 0.000 |
| Percent Limestone Loss Zone from Sando and others (2008) | 0.000 |
| Slope ratio = channel slope / basin slope | 13.78 |
| Min elevation in feet | 1270 |
| Elevation at outlet, in feet | 1274 |
| Percent Black Hills Exterior from Sando and others (2008) | 0.000 |
| Mean basin elevation, in feet | 1410 |
| Compactness ratio, dimensionless | 1.71 |
| Percent storage (lakes, ponds, or wetlands), derived from the National Wetlands Inventory (2001) | 2.257 |
| Maximum - minimum elevation, in feet | 269 |
| Area covered by non-contrib DA | 0.00 |
| Relative relief in feet per mile - RELIEF/PERIM | 12.4 |
| Total Drainage Area | 12.86 |
| Contributing DA = DA - non contrib DA | 12.86 |
| Percent Loss Zone/Artesian Spring from Sando and others (2008) | 0.000 |
| Percent Sand Hills setting from Sando and others (2008) | 0.000 |
| 10-85 Channel slope in feet per mile | 32.6 |
| Percent Crystalline Core from Sando and others (2008) | 0.000 |
| Mean basin slope in percent, computed from 10-meter DEM | 2.4 |

10.0 APPENDIX D: TYPICAL ROADWAY SECTION



NOTES:
CLAY COUNTY WILL FURNISH AND INSTALL GRAVEL SURFACING WITHOUT FEDERAL PARTICIPATION.

11.0 APPENDIX E: PEAK FLOW CALCULATIONS

Clay County BRO 8014(25)
 Str. # 14-150-006
 JEC # 214008
 16-Apr-14

USGS - Water Investigations Report 98-4055

SUBREGION A

| Recurrence Intervall (years) | Contributing Drainage Area "CA" (sq mi) | Precipitation Intensity Index "PII" | Q (cfs) |
|------------------------------------|---|--|------------|
| | 12.86 | 1.2 | |
| 2 | | | 351 |
| 5 | | | 847 |
| 10 | | | 1282 |
| 25 | | | 1939 |
| 50 | | | 2496 |
| 100 | | | 3094 |
| 500 | | | 4633 |

13.0 APPENDIX G: HEC-RAS CROSS SECTION LOCATIONS



14.0 APPENDIX H: HEC-RAS OUTPUT

14.1 EXISTING CROSS SECTIONS

| Reach | River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|--------------|-----------|----------|------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|--------------------|----------------------|-------------------|--------------|
| Main Channel | 1400 | Q 2 Yr | 351 | 1272.35 | 1277.89 | | 1278.05 | 0.00103 | 3.43 | 136.26 | 128.03 | 0.31 |
| Main Channel | 1400 | Q 10 Yr | 1280 | 1272.35 | 1280.24 | | 1280.32 | 0.000506 | 3.33 | 786.36 | 355.51 | 0.24 |
| Main Channel | 1400 | Q 25 Yr | 1940 | 1272.35 | 1281.61 | | 1281.66 | 0.000309 | 2.98 | 1326.46 | 433.24 | 0.19 |
| Main Channel | 1400 | Q 100 Yr | 3090 | 1272.35 | 1283.54 | | 1283.58 | 0.000189 | 2.71 | 2269.14 | 532.67 | 0.16 |
| Main Channel | 1400 | OT | 1750 | 1272.35 | 1281.27 | | 1281.33 | 0.000337 | 3.02 | 1184.78 | 414.26 | 0.2 |
| Main Channel | 1220 | Q 2 Yr | 351 | 1273 | 1277.65 | | 1277.84 | 0.00127 | 3.63 | 117.53 | 93.04 | 0.36 |
| Main Channel | 1220 | Q 10 Yr | 1280 | 1273 | 1280.1 | | 1280.22 | 0.000619 | 3.69 | 711.38 | 280.96 | 0.28 |
| Main Channel | 1220 | Q 25 Yr | 1940 | 1273 | 1281.5 | | 1281.6 | 0.000417 | 3.52 | 1126.07 | 313.54 | 0.23 |
| Main Channel | 1220 | Q 100 Yr | 3090 | 1273 | 1283.45 | | 1283.53 | 0.000291 | 3.46 | 1758.84 | 332 | 0.2 |
| Main Channel | 1220 | OT | 1750 | 1273 | 1281.16 | | 1281.26 | 0.000439 | 3.49 | 1021.98 | 304.36 | 0.24 |
| Main Channel | 1045 | Q 2 Yr | 351 | 1272.7 | 1277.38 | 1275.36 | 1277.52 | 0.001537 | 3.04 | 116.87 | 64.66 | 0.38 |
| Main Channel | 1045 | Q 10 Yr | 1280 | 1272.7 | 1279.75 | 1277.97 | 1280.02 | 0.001158 | 4.36 | 342.68 | 318.07 | 0.37 |
| Main Channel | 1045 | Q 25 Yr | 1940 | 1272.7 | 1281.09 | 1278.67 | 1281.43 | 0.001056 | 4.99 | 539.86 | 340.36 | 0.37 |
| Main Channel | 1045 | Q 100 Yr | 3090 | 1272.7 | 1283.3 | 1279.65 | 1283.45 | 0.000413 | 3.89 | 1370.26 | 405.58 | 0.24 |
| Main Channel | 1045 | OT | 1750 | 1272.7 | 1280.82 | 1278.5 | 1281.1 | 0.000956 | 4.59 | 450.37 | 336.93 | 0.35 |
| Main Channel | 1000 | | Bridge | | | | | | | | | |
| Main Channel | 955 | Q 2 Yr | 351 | 1271.7 | 1277.16 | | 1277.32 | 0.001154 | 3.25 | 108.41 | 42.13 | 0.34 |
| Main Channel | 955 | Q 10 Yr | 1280 | 1271.7 | 1278.37 | 1277.7 | 1279.34 | 0.004422 | 8.04 | 179.24 | 227.29 | 0.7 |
| Main Channel | 955 | Q 25 Yr | 1940 | 1271.7 | 1278.97 | 1278.97 | 1280.44 | 0.005783 | 10.1 | 231.96 | 291 | 0.82 |
| Main Channel | 955 | Q 100 Yr | 3090 | 1271.7 | 1280.16 | 1280.16 | 1281.95 | 0.005641 | 11.6 | 339.42 | 332.25 | 0.85 |
| Main Channel | 955 | OT | 1750 | 1271.7 | 1278.73 | 1278.73 | 1280.14 | 0.005875 | 9.82 | 210.49 | 265.55 | 0.82 |
| Main Channel | 600 | Q 2 Yr | 351 | 1271.68 | 1276.52 | | 1276.74 | 0.002448 | 4.1 | 128.73 | 180.62 | 0.46 |
| Main Channel | 600 | Q 10 Yr | 1280 | 1271.68 | 1277.84 | | 1278.05 | 0.002137 | 5.06 | 459.84 | 299.42 | 0.47 |
| Main Channel | 600 | Q 25 Yr | 1940 | 1271.68 | 1278.49 | | 1278.71 | 0.001904 | 5.33 | 671.33 | 352.6 | 0.45 |
| Main Channel | 600 | Q 100 Yr | 3090 | 1271.68 | 1279.44 | | 1279.64 | 0.001563 | 5.51 | 1041.05 | 426.7 | 0.42 |
| Main Channel | 600 | OT | 1750 | 1271.68 | 1278.31 | | 1278.53 | 0.001975 | 5.27 | 609.17 | 336.95 | 0.46 |
| Main Channel | 400 | Q 2 Yr | 351 | 1272.95 | 1276.36 | 1275.72 | 1276.42 | 0.00086 | 2.62 | 262.67 | 287.41 | 0.29 |
| Main Channel | 400 | Q 10 Yr | 1280 | 1272.95 | 1277.68 | 1276.63 | 1277.75 | 0.000861 | 3.03 | 676.83 | 333.72 | 0.3 |
| Main Channel | 400 | Q 25 Yr | 1940 | 1272.95 | 1278.33 | 1276.88 | 1278.42 | 0.00086 | 3.43 | 900.58 | 359 | 0.31 |
| Main Channel | 400 | Q 100 Yr | 3090 | 1272.95 | 1279.27 | 1277.2 | 1279.39 | 0.000861 | 3.97 | 1261.35 | 416.06 | 0.32 |
| Main Channel | 400 | OT | 1750 | 1272.95 | 1278.15 | 1276.8 | 1278.24 | 0.00086 | 3.32 | 836.84 | 349.97 | 0.31 |

14.2 EXISTING BRIDGE

| Reach | River Sta | Profile | E.G. US. (ft) | Min El Prs (ft) | BR Open Area (sq ft) | Prs O WS (ft) | Q Total (cfs) | Min El Weir Flow (ft) | Q Weir (cfs) | Delta EG (ft) |
|--------------|-----------|----------|------------------|--------------------|-------------------------|------------------|------------------|--------------------------|-----------------|------------------|
| Main Channel | 1000 | Q 2 Yr | 1277.52 | 1281.6 | 294.54 | | 351 | 1280.84 | | 0.2 |
| Main Channel | 1000 | Q 10 Yr | 1280.02 | 1281.6 | 294.54 | | 1280 | 1280.84 | | 0.68 |
| Main Channel | 1000 | Q 25 Yr | 1281.43 | 1281.6 | 294.54 | | 1940 | 1280.84 | 78.26 | 0.99 |
| Main Channel | 1000 | Q 100 Yr | 1283.45 | 1281.6 | 294.54 | 1286.25 | 3090 | 1280.84 | 1736.98 | 1.5 |
| Main Channel | 1000 | OT | 1281.1 | 1281.6 | 294.54 | | 1750 | 1280.84 | 14.44 | 0.96 |

14.3 PROPOSED CROSS SECTIONS

| Reach | River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|--------------|-----------|----------|------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|--------------------|----------------------|-------------------|--------------|
| Main Channel | 1400 | Q 2 Yr | 351 | 1272.35 | 1277.48 | | 1277.74 | 0.001649 | 4.12 | 95.39 | 73.64 | 0.39 |
| Main Channel | 1400 | Q 10 Yr | 1280 | 1272.35 | 1279.99 | | 1280.1 | 0.000674 | 3.74 | 699.5 | 341.36 | 0.27 |
| Main Channel | 1400 | Q 25 Yr | 1940 | 1272.35 | 1281.58 | | 1281.64 | 0.000317 | 3.01 | 1314.31 | 431.64 | 0.19 |
| Main Channel | 1400 | Q 100 Yr | 3090 | 1272.35 | 1282.84 | | 1282.9 | 0.000308 | 3.3 | 1905.15 | 506.3 | 0.2 |
| Main Channel | 1400 | OT | 1740 | 1272.35 | 1281.21 | | 1281.27 | 0.000352 | 3.07 | 1159.35 | 410.76 | 0.2 |
| Main Channel | 1220 | Q 2 Yr | 351 | 1273 | 1277.01 | | 1277.35 | 0.002744 | 4.69 | 75.02 | 41.05 | 0.51 |
| Main Channel | 1220 | Q 10 Yr | 1280 | 1273 | 1279.8 | | 1279.96 | 0.00086 | 4.19 | 627.64 | 275.95 | 0.32 |
| Main Channel | 1220 | Q 25 Yr | 1940 | 1273 | 1281.47 | | 1281.57 | 0.000428 | 3.55 | 1116.58 | 313.13 | 0.24 |
| Main Channel | 1220 | Q 100 Yr | 3090 | 1273 | 1282.71 | | 1282.83 | 0.000453 | 4.08 | 1513.99 | 328.58 | 0.25 |
| Main Channel | 1220 | OT | 1740 | 1273 | 1281.1 | | 1281.2 | 0.000457 | 3.54 | 1002.25 | 302.21 | 0.24 |
| Main Channel | 1045 | Q 2 Yr | 351 | 1272.7 | 1277.12 | 1273.98 | 1277.16 | 0.000185 | 1.6 | 220.09 | 61.39 | 0.14 |
| Main Channel | 1045 | Q 10 Yr | 1280 | 1272.7 | 1279.66 | 1275.65 | 1279.83 | 0.000415 | 3.35 | 407.15 | 311.94 | 0.24 |
| Main Channel | 1045 | Q 25 Yr | 1940 | 1272.7 | 1281.22 | 1276.54 | 1281.46 | 0.000439 | 3.99 | 627.87 | 344.37 | 0.25 |
| Main Channel | 1045 | Q 100 Yr | 3090 | 1272.7 | 1282.43 | 1277.89 | 1282.71 | 0.000495 | 4.67 | 1068.72 | 384.1 | 0.27 |
| Main Channel | 1045 | OT | 1740 | 1272.7 | 1280.86 | 1276.29 | 1281.09 | 0.000442 | 3.88 | 503.73 | 337.08 | 0.25 |
| Main Channel | 1000 | | Culvert | | | | | | | | | |
| Main Channel | 955 | Q 2 Yr | 351 | 1272.65 | 1276.96 | | 1277.04 | 0.000387 | 2.18 | 160.69 | 45.86 | 0.21 |
| Main Channel | 955 | Q 10 Yr | 1280 | 1272.65 | 1278.33 | | 1278.82 | 0.001741 | 5.62 | 239.39 | 222.68 | 0.46 |
| Main Channel | 955 | Q 25 Yr | 1940 | 1272.65 | 1278.84 | | 1279.71 | 0.002773 | 7.59 | 276.56 | 276.62 | 0.59 |
| Main Channel | 955 | Q 100 Yr | 3090 | 1272.65 | 1279.22 | 1278.89 | 1281.08 | 0.005429 | 11.13 | 305.11 | 301 | 0.83 |
| Main Channel | 955 | OT | 1740 | 1272.65 | 1278.71 | | 1279.46 | 0.002446 | 7.01 | 266.86 | 262.64 | 0.55 |
| Main Channel | 600 | Q 2 Yr | 351 | 1271.68 | 1276.52 | | 1276.74 | 0.002448 | 4.1 | 128.73 | 180.62 | 0.46 |
| Main Channel | 600 | Q 10 Yr | 1280 | 1271.68 | 1277.84 | | 1278.05 | 0.002137 | 5.06 | 459.84 | 299.42 | 0.47 |
| Main Channel | 600 | Q 25 Yr | 1940 | 1271.68 | 1278.49 | | 1278.71 | 0.001904 | 5.33 | 671.25 | 352.58 | 0.45 |
| Main Channel | 600 | Q 100 Yr | 3090 | 1271.68 | 1279.44 | | 1279.64 | 0.001563 | 5.51 | 1041.05 | 426.7 | 0.42 |
| Main Channel | 600 | OT | 1740 | 1271.68 | 1278.3 | | 1278.52 | 0.001979 | 5.27 | 605.84 | 336.09 | 0.46 |
| Main Channel | 400 | Q 2 Yr | 351 | 1272.95 | 1276.36 | 1275.72 | 1276.42 | 0.00086 | 2.62 | 262.67 | 287.41 | 0.29 |
| Main Channel | 400 | Q 10 Yr | 1280 | 1272.95 | 1277.68 | 1276.61 | 1277.75 | 0.000861 | 3.03 | 676.79 | 333.72 | 0.3 |
| Main Channel | 400 | Q 25 Yr | 1940 | 1272.95 | 1278.33 | 1276.88 | 1278.42 | 0.00086 | 3.43 | 900.58 | 359 | 0.31 |
| Main Channel | 400 | Q 100 Yr | 3090 | 1272.95 | 1279.27 | 1277.2 | 1279.39 | 0.000861 | 3.97 | 1261.35 | 416.06 | 0.32 |
| Main Channel | 400 | OT | 1740 | 1272.95 | 1278.14 | 1276.79 | 1278.23 | 0.00086 | 3.32 | 833.47 | 349.49 | 0.31 |

14.4 PROPOSED CULVERT

| Reach | River Sta | Profile | E.G. US (ft) | W.S. US (ft) | E.G. IC (ft) | E.G. OC (ft) | Min El Weir Flow (ft) | Q Culv Group (cfs) | Q Weir (cfs) | Delta WS (ft) | Culv Vel US (ft/s) | Culv Vel DS (ft/s) |
|--------------|-----------------|----------|-----------------|-----------------|-----------------|-----------------|--------------------------|-----------------------|-----------------|------------------|-----------------------|-----------------------|
| Main Channel | 1000 Culvert #1 | Q 2 Yr | 1277.16 | 1277.12 | 1275.31 | 1277.16 | 1280.84 | 351 | | 0.16 | 2.93 | 2.91 |
| Main Channel | 1000 Culvert #1 | Q 10 Yr | 1279.83 | 1279.66 | 1278.91 | 1279.83 | 1280.84 | 1280 | | 1.32 | 8.04 | 8.04 |
| Main Channel | 1000 Culvert #1 | Q 25 Yr | 1281.46 | 1281.22 | 1280.89 | 1281.46 | 1280.84 | 1853.23 | 86.77 | 2.38 | 10.6 | 10.7 |
| Main Channel | 1000 Culvert #1 | Q 100 Yr | 1282.71 | 1282.43 | 1282.44 | 1282.71 | 1280.84 | 2278.37 | 811.63 | 3.22 | 12.13 | 12.39 |
| Main Channel | 1000 Culvert #1 | OT | 1281.09 | 1280.86 | 1280.32 | 1281.09 | 1280.84 | 1726.9 | 13.1 | 2.15 | 10.11 | 10.18 |

Appendix C – Structure Rehabilitation Work Order Requirements

Bridge Improvement Grant Work Order Requirements for Structure Rehabilitation

Note: Not all rehabilitation work will require hydraulic analysis or foundation investigation. For this reason, several of the related items below have been marked “**if needed.**” If the Subject project does not require hydraulic analysis and/or foundation investigation, simply do not include these items in the breakdown of estimated costs.

SCOPE OF SERVICES – Structure Rehabilitation

1. **Field survey for completion of the Drainage Data Sheet and Contour Map.** The information required for placement on these sheets is listed below. An example is attached containing the required information.
 - Stationing from south to north or west to east.
 - Beginning and ending stations of the current structure.
 - Proposed and in-place gradelines.
 - Stream profile. (Including a table of stations and elevations for each shot taken.)
 - Sea level datum is required. Stations, elevations, and offsets from and descriptions of permanent objects will be required for project benchmarks. (The High Accuracy Reference Network (HARN) map and the County Bench Mark map for the State of South Dakota can be found at the following web site – www.state.sd.us/dot/pe/roaddesign/survey.htm)
 - Include an electronic file containing the plan/profile of the in-place gradeline at the structure.
 - Landowners with their addresses, phone numbers, and location of property.
 - Utilities with their addresses, phone numbers, and locations along the project.

2. **Field survey as necessary for preparation of construction plans.** Required information is listed below.
 - Establishment of transit points, land ties and benchmarks as well as cross sections and topography. (Stations, elevations, and offsets from permanent objects will be required for project benchmarks.)
 - Project limits as established by consultation with the County Highway Superintendent.
 - Additional legal survey as required for preparation of right-of-way plats.
 - The geometrics of horizontal and vertical alignment in accordance with the Local Roads Plan design standards.
 - Survey notes are to be retained on file with the Consultant for subsequent use in the preparation of construction plans and are to be available to the County upon request.

3. **(If needed.) Preliminary Hydraulic Data Sheet, Plan/Profile Sketches (Preliminary Hydraulic Layouts) and gradelines, Electronic Copy of HEC-RAS File, Final Drainage Memo/Letter in accordance with the newest version of the South Dakota Drainage Manual, and cost estimates for existing and all proposed structure alternatives. (More than one feasible alternative is required. This includes options on different alignments if applicable.)** The newest version of the South Dakota Drainage Manual is available at the following location: <http://www.sddot.com/business/design/forms/drainage/>. Guidance and an example Final Drainage Memo/Letter can be found in Chapter 6 of the manual. The current preliminary hydraulic data sheet to be used can be found at the following internet location: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc. Directions for filling out the form can be found at the same location. All items will be submitted to the Local Government Assistance Office for distribution to SDDOT personnel for review for compliance with minimum required State and Federal standards. Necessary revisions shall be provided in writing by the SDDOT and shall be forwarded to the Consultant by the Local Government Assistance Office. The Consultant is wholly responsible for the accuracy of the design calculations and the independent check design calculations.

4. **Conduct TS&L inspection, assistance in the selection of the type of rehabilitation, and preparation of TS&L summary letter.** The county or city (owner) shall be in attendance and if time allows, a member of the Local Government Assistance office.

5. **(If needed.) Report of Foundation Investigation.** Conduct field investigation and provide design recommendations according to AASHTO LRFD Bridge Design Specifications Section 10. Report shall include

boring information, lab results, and design recommendations. See **Examples #1 and #2, following the attachments**, for reports that are typically developed by SDDOT Geotechnical Engineering Activity.

6. **(If needed.) Final Hydraulic Design Report and Final Hydraulic Data Sheet (use the current data sheet found at the following internet location: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc.)** These items will be considered draft if subsurface investigation will be conducted during the design phase.

7. **Survey and plans for the above referenced project as described in the TS&L letter and Final Hydraulics Data Sheet, design calculations, independent design check, and load ratings.** Review plans (100% complete) are to be submitted in PDF format. Specifications shall follow the most current edition of the Standard Specification for Roads and Bridges. South Dakota Department of Transportation Bid Items, Standard plates and plan notes, from the SDDOT website, must be used in development of the 11” x 17” **Non Section Method** plan set.

If applicable to the type of rehabilitation, the consultant shall provide design calculations, independent check, and load ratings for the structure as set forth in the Master Retainer Contract. In addition, load ratings for the Special Hauling Vehicles specified in **Attachment #3** shall also be submitted. The Consultant is wholly responsible for the accuracy and safe keeping of the design calculations and the independent design check.

8. **Incorporation into the plans of any changes that may be requested in the SDDOT plan review comments or provide written explanation for items not changes.**

9. **Review of shop fabrication drawings as may be required and submittal of the approved shop drawings to the Consultant.** This item is to be completed within two (2) weeks of receipt of shop or fabrication drawings from the contractor and shall be noted accordingly in the plans.

10. **Provide Quality Assurance / Quality Control Testing Plan based on SDDOT Materials Manual.** This document must be reviewed by the SDDOT prior to the notice to proceed being issued to the contractor. See **Attachment #4** for requirements.

Please refer to the checklist in **Attachment #1** for the TS&L Packet of items that shall be submitted to the Local Government Assistance Office.

Attachment #2 contains applicable excerpts from the Current SDDOT Consultant Retainer, DOT-900 AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES.

Attachment #1
Bridge Improvement Grant
Checklist for Structure Rehabilitation Work Order

These items must be submitted to DOT/Local Government Assistance.
If any of these items are missing, the full packet will be returned for completion and resubmission to this office.

Project Number _____ County _____ PCN _____
CROSS OFF ANY NON-APPLICABLE ITEMS

- Survey Sheets and Contour Map including the following information:**
 - Stationing from south to north or west to east
 - Beginning and ending stations of the existing structure
 - Beginning and ending stations of proposed structures
 - Proposed and existing gradelines
 - Stream profile and cross sections (Downstream to upstream direction including a table showing stations and elevations for each shot taken)
 - Elevation and location of buildings and other structures
 - Survey information using sea level datum and showing station, elevation, offset, and physical description of each project benchmark
 - Landowner names, addresses, phone numbers, and legal descriptions of their property
 - Utility names, addresses, phone numbers, and locations along the project

- Preliminary Hydraulic Data Sheet (use current data sheet found at: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc) including the following information:**
 - Calculated flows
 - Inplace conditions (Ordinary High Water Elevation, HW₁₀₀, Vmax, OTfr)
 - Proposed conditions for each option (HW₂, HW₂₃, HW₁₀₀, Vmax Qot, OTfr, ELovertop)
 - Ordinary High Water Elevation Shown on Cross-Sections (vegetation elevation on stream banks – approx. 2–year flow)
 - Observed High Water Elevation (identifiable high water mark)

- Electronic copy of HEC-RAS model of existing and proposed conditions**

- Final Drainage Memo/Letter (example and directions can be found in Chapter 6 of the SD Drainage Manual located at: <http://www.sddot.com/business/design/forms/drainage/>)**

- Plan and profile sketches (preliminary hydraulic layout sheets) for the existing structure and proposed gradelines for each option (More than one feasible alternative is required. This includes options on different alignments if applicable.)**

- Cost Estimates (including design and construction engineering and construction costs for each option.)**

TS&L Summary Letter

Final Hydraulic Data Sheet with Scour Recommendations

- Use current data sheet found at: <ftp://ftp.state.sd.us> Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc
- Scour memo, scour calculations, and berm slope protection recommendations (Bridges Only)

Final Hydraulic Design Report

Report of Investigation (Bridges) or Undercut Recommendation (Boxes/Pipe)

Review Plans (100% complete & ready for review) in PDF Format

Design calculations, independent design check, and load ratings

To be submitted after plan review is complete

Memo Addressing Plan Review Comments

Final Plans – Electronic PDF file of the engineered, stamped set of plans

Quality Assurance / Quality Control Testing Plan

Attachment #2
Bridge Improvement Grant
Excerpts from Current DOT-900 (09/2014)
AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES
(SDDOT Consultant Retainer)

FURNISHING OF DOCUMENTS (DOT-900, 09/2014, Section 3.)

Except where otherwise specifically provided, the CONSULTANT will furnish to the DEPARTMENT all documents, exhibits, electronic files, and other presentations for all phases of the work performed under the terms of this Agreement.

The CONSULTANT will furnish to the DEPARTMENT all design and check design computations. All documents furnished, including all original drawings, software generated electronic files, design computations, and check design computations, will become and remain the property of the DEPARTMENT and may be used by the DEPARTMENT without restriction for any public purpose.

The CONSULTANT will provide survey documents for bench levels and for the checking of bench levels on standard loose-leaf transit field book sheets. The CONSULTANT will provide all other data collected in an electronic format and will include the following files: FWD file, DGN file, DTM file, ALG file, and the RAW data file. The FWD file, DGN file, DTM file, and ALG file, will be compatible with the DEPARTMENT'S current version of InRoads. The RAW data file will be in ASCII format and will include the following information: point number, northing, easting, description, and any pertinent notes corresponding to a particular point.

The CONSULTANT, as requested by the DEPARTMENT, will submit construction documents, either electronic or paper format, and said documents will become and remain the DEPARTMENT'S property.

The CONSULTANT will return all data furnished to the CONSULTANT by the DEPARTMENT to the DEPARTMENT.

Compliance with all of the foregoing will be considered to be within the purview of this Agreement and will not constitute a basis for additional or extra compensation.

GENERAL REQUIREMENTS (DOT-900, 09/2014, Section 19.C.)

2. Survey for roadway and hydraulic design will be in accordance with the edition of the Department of Transportation Survey Manual currently in place at the time of execution of the Work Order.
3. Wetland delineation will be in conformance with the US Army Corps of Engineers Wetland Delineation Manual and Regional Supplements. Wetland mitigation plans will include construction plans, performance criteria, and a five (5) year monitoring plan.
4. Hydrologic/Hydraulic design will be in accordance with the edition of the South Dakota Drainage Manual (and its revisions) currently in place at the time of execution of the Work Order.

ROADWAY DESIGN (DOT-900, 09/2014, Section 19.D.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. Roadway design will be in accordance with the edition of the Department of Transportation Roadway Design Manual (and its revisions) currently in place at the time of execution of the Work Order and the American Association of State Highway and Transportation Officials (AASHTO) Specifications, "A Policy on Geometric Design of Highways and Streets" (2011 or the version in place at the time of execution of the Work Order), and Interims, or the Local Roads Plan.
2. The CONSULTANT will complete and furnish to the DEPARTMENT, at the time the plans are delivered to the DEPARTMENT, a DEPARTMENT provided checklist. This checklist will provide certification that a separate check has been performed, all review revisions have been made, and the plans are correct and complete.

3. The CONSULTANT will furnish basic design criteria in the Scope Summary Report and in the Scope of Services.
4. The CONSULTANT may obtain standard drawings of roadway appurtenances from the DEPARTMENT'S Office of Roadway Design.
5. The CONSULTANT will contact the DEPARTMENT'S Office of Bridge Design, if a DEPARTMENT structure's drainage area is greater than 1,000 acres. For these structures, the DEPARTMENT'S Office of Bridge Design will make a hydraulics recommendation, or will concur on the hydraulics requirement if hydraulics is part of the work order scope.
6. The DEPARTMENT will furnish basic surfacing design criteria, such as type, thickness, and width of pavement.
7. The DEPARTMENT will furnish material recommendations.

STRUCTURE DESIGN (DOT-900, 09/2014, Section 19.E.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. Prior to initiating design, the CONSULTANT will be required to submit the QC/QA plan/procedure to be followed for structure design to the DEPARTMENT for approval. The CONSULTANT may not begin structure design work until the QC/QA plan/procedure is approved and documented. If the CONSULTANT has a prior approved structure design QC/QA plan/procedure document on file with the OBD, and no changes to that document are anticipated for the current contract, the CONSULTANT will not need to resubmit a structure design QC/QA plan/procedure document.
2. The CONSULTANT will design bridges, box culverts, and miscellaneous highway structures in accordance with the edition of the "AASHTO LRFD Bridge Design Specifications," currently in place at the time of execution of the Work Order except as modified by the DEPARTMENT'S design practices. Prior to beginning design work, the DEPARTMENT will supply the CONSULTANT with a copy of design practices along with examples of standard detailing procedures and typical plans.
3. The CONSULTANT will design highway structures for a vehicular live loading of HL-93. Additional design criteria may be included in the Scope of Work.
4. The CONSULTANT will load rate each structure, including culverts that are bridge length, in accordance with the edition of the AASHTO "Manual for Bridge Evaluation" with latest Interim Revisions using the LRFR method currently in place at the time of execution of the Work Order. The CONSULTANT will perform an HL-93 Design Load Rating for each structure. The CONSULTANT will analyze the AASHTO HS20 vehicle for Inventory and Operating Ratings. The CONSULTANT will also perform a Legal Load Rating for South Dakota legal trucks, the notional rating load, and the four specialized hauling vehicles. The CONSULTANT will submit a copy of the rating analyses to the DEPARTMENT along with the Final Plans for bid letting purposes. The Bridge Management Engineer from the DEPARTMENT'S Office of Bridge Design will review load ratings. Load ratings must be above the Legal Loads. The CONSULTANT will provide a separate summary table of all load ratings to be included in the Bridge Inspection file.
5. The CONSULTANT will provide the DEPARTMENT a hard copy of design computations, independent check design computations, and load ratings, including computer output if applicable, with the final review set of drawings.
6. The CONSULTANT will review shop plans for fabricated items, and will forward marked-up shop plans to the DEPARTMENT. The DEPARTMENT must authorize any fabrication.

PLANS, SPECIFICATIONS, AND ESTIMATES, GENERAL (DOT-900, 09/2014, Section 19.H.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

1. When complete plans, supplemental specifications, or special provisions are prepared, these will become the property of the DEPARTMENT, County, or City.
2. The CONSULTANT will furnish and deliver to the DEPARTMENT original drawings of all sheets comprising the set of plans, together with all reports, drawings, computer files, studies, memoranda, and other data pertaining thereto.
3. The CONSULTANT will furnish to the DEPARTMENT an electronic MS Word file of all special specifications.
4. The CONSULTANT will prepare plans in conformance with the DEPARTMENT'S customary practices. The CONSULTANT will use standard format for notes, tables, and rates of materials.
5. The CONSULTANT will prepare plans on sheets 11" x 17" or 8 ½" x 11" in size, under the guidance of the Road Design Manual's Chapter 18 – Plans Assembly: www.sddot.com/business/design/forms/roaddesign/Default.aspx or as directed by the DEPARTMENT. The CONSULTANT will follow the specific section of the Road Design Manual's Chapter 18 as it relates to plans produced by consultants in order to provide accurate electronic plans and bid items for the DEPARTMENT'S electronic bidding system. The CONSULTANT will utilize the DEPARTMENT'S web site: <http://www.sddot.com/business/design/Default.aspx> for Plan Preparation (i.e. Road Design Manual, CADD Procedure Manual, and User Guide for Electronic Plan Review), Downloadable Files (i.e. Form Letters, Microstation and InRoad files, and Plan Notes) and other information as necessary to design and prepare plans. The CONSULTANT will follow the properties and procedures set up for the DEPARTMENT'S electronic plans as set forth in document located at the following web site address: <http://www.sddot.com/business/design/docs/cadd/ElectronicPlans.pdf>. Electronic plans will be used for bidding purposes and must contain a watermark on each sheet stating "For Bidding Purposes Only." Refer to Paragraph 12 below for details on the set of plans to be used for construction.
6. The CONSULTANT will prepare plans with sufficient precision to permit the convenient layout in the field for construction and for other purposes. The plans will also provide for the production of an accurate estimate of quantities for the work to be performed in the construction of the project.
7. The CONSULTANT will furnish such other pertinent information and data with respect to the plans and designs as the DEPARTMENT may request.
8. The DEPARTMENT will require all persons designing, detailing, and checking structure plans to legibly place their names or initials on each plan sheet in the spaces provided for this purpose.
9. The DEPARTMENT will designate the basic premises and criteria for the design. The CONSULTANT will develop plans in accordance with the DEPARTMENT'S standard specifications for roadway and bridge construction.
10. As part of the work embraced in the preparation of plans, the CONSULTANT will prepare and furnish to the DEPARTMENT special provisions in standard DEPARTMENT format, for items of work included in the plans which are not covered by the standard specifications, plan notes, or DEPARTMENT-approved special provisions.
11. The CONSULTANT will ensure scales, lettering, and the general delineation of the plans mirror the DEPARTMENT format and provide readily legible reproductions.
12. The CONSULTANT will ensure each plan sheet bears the South Dakota registered professional seal and endorsement of the CONSULTANT as per the requirements of the South Dakota Board of Technical Professions.
13. The CONSULTANT will use software acceptable to the DEPARTMENT as agreed to in the Work Order.

Note: The DEPARTMENT'S standard software programs are the Bentley Civil Products (InRoads Suite), MicroStation, AASHTOWare products, Adobe Acrobat, and the Microsoft Office Suite. The DEPARTMENT may require other software on Work Orders.

CONSTRUCTION ENGINEERING TECHNICAL REQUIREMENTS (DOT-900, 09/2014, Section 20.)

- A. CONSULTANT'S RESPONSIBILITIES.** The CONSULTANT will be responsible to the DEPARTMENT, and will complete all work to the DEPARTMENT'S satisfaction.

Subject to availability, the CONSULTANT will provide personnel for the areas of expertise necessary to satisfactorily complete the work specified in the Work Order and this Agreement. The DEPARTMENT will notify the CONSULTANT as to the proper medium that will be used for recording purposes of field data. The CONSULTANT will submit reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order. The responsibilities for these areas are described in **Exhibit 4**, CONSTRUCTION ENGINEERING CONSULTANT RESPONSIBILITIES.

EXHIBIT 4 (DOT-900, 09/2014)

CONSULTANT RESPONSIBILITIES

GENERAL

The CONSULTANT will:

1. Be knowledgeable of the requirements of the project plans and specifications, the DEPARTMENT'S Survey Manual, Road Design Manual, South Dakota Drainage Manual, and CADD Procedures Manual.
2. Assure project personnel are knowledgeable of their duties and responsibilities.
3. Assure project personnel are knowledgeable of the DEPARTMENT'S Materials Manual.
4. Oversee day to day activities to ensure the project is constructed in accordance with plans and specifications.
5. Ensure all documentation and reports are accurate and kept current.
6. Prepare and electronically submit Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Pay Estimate, and Final Construction Change Order, all on the current version of the DEPARTMENT'S Construction Management System. The CONSULTANT will submit these reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order.
7. Require all individuals providing acceptance testing and independent assurance testing of construction materials or acceptance inspection to record all data/results electronically on the current version of the DEPARTMENT'S Construction Management System, or as instructed by the DEPARTMENT.
8. Require all individuals providing acceptance testing and independent assurance testing of materials or acceptance inspection to meet the requirements of the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual.
9. Ensure testing equipment identified in the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual be calibrated and documented according to the designated frequencies and procedures designated in the Manual.
10. Perform other duties assigned by the DEPARTMENT as defined in this Agreement.

The CONSULTANT'S PROJECT ENGINEER will:

1. Assist with conducting the pre-construction meeting.

2. Prepare Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Estimate, and Final Construction Change Order electronically on the current version of the DEPARTMENT'S Construction Management System.
3. Handle EEO and Labor Compliance activities.
4. Ensure that subcontractors working on the project are approved by the DEPARTMENT.

The CONSULTANT'S INSPECTOR will:

1. Assure the asphalt or concrete plant is properly calibrated.
2. Perform scale accuracy checks.
3. Ensure construction activities remain inside the acquired right-of-way or easement as specified on the plans unless approved by the DEPARTMENT.

The CONSULTANT'S SURVEY PARTY CHIEF will:

1. Record field notes for slope stakes, blue tops, paving grades, pipe, structure layout, and other items of the same sort in electronic format, FWD files, DGN files, DTM files, ALG files, and RAW files compatible to the current version of InRoads being used by the DEPARTMENT.
2. Set centerline, offset lines, bluetops, slope stakes, pipe stakes, structure stakes, and other items of the same sort by electronic or manual means.
3. Run bench levels within acceptable tolerances of the DEPARTMENT'S Survey Manual and maintain field notes on standard loose-leaf transit field book sheets.
4. Obtain necessary topographic data within acceptable tolerances of the DEPARTMENT'S Survey Manual.
5. Supervise and assure the survey crew is knowledgeable as to its duties and responsibilities.

The CONSULTANT'S TEST PERSON AND EQUIPMENT will:

1. Be knowledgeable of the requirements of the project plans and specifications.
2. Sample and test materials for acceptance as specified by the DEPARTMENT'S Materials Manual. Perform material tests for QC/QA projects in accordance with QC/QA manual and have the proper QC/QA certification.
3. Recognize and have the ability to take corrective action for calibration of testing equipment.

Attachment #3
Bridge Improvement Grant
Load Rating Requirements for the Special Hauling Vehicles



Memorandum

Subject: **ACTION:** Load Rating of Specialized Hauling Vehicles
/s/ Original Signed by

Date: November 15, 2013

From: Joseph S. Krolak
Acting Director, Office of Bridge Technology

In Reply Refer To:
HIBT-10

To: Federal Lands Highway Division Engineers
Division Administrators

The purpose of this memorandum is to clarify FHWA's position on the analysis of *Specialized Hauling Vehicles (SHVs)* as defined in the AASHTO Manual for Bridge Evaluation (MBE) during bridge load rating and posting to comply with the requirements of the *National Bridge Inspection Standards (NBIS)*. The intent of the load rating and posting provisions of the NBIS is to insure that all bridges are appropriately evaluated to determine their safe live load carrying capacity considering all unrestricted legal loads, including State routine permits, and that bridges are appropriately posted if required, in accordance with the MBE.

The SHVs are closely-spaced multi-axle single unit trucks introduced by the trucking industry in the last decade. Examples include dump trucks, construction vehicles, solid waste trucks and other hauling trucks. SHVs generally comply with Bridge Formula B and are for this reason considered legal in all States, if a States' laws do not explicitly exclude the use of such vehicles.

NCHRP Project 12-63 (Report 575, 2007) studied the developments in truck configurations and State legal loads and found that AASHTO Type 3, 3-S2 and 3-3 legal vehicles are not representative of all legal loads, specifically SHVs. As a result, legal load models for SHVs were developed and adopted by AASHTO in 2005, recognizing that there is an immediate need to incorporate SHVs into a State's load rating process, if SHVs operate within a State. The SHV load models in the MBE include SU4, SU5, SU6 and SU7 representing four- to seven-axle SHVs respectively, and a Notional Rating Load (NRL) model that envelopes the four single unit load models and serves as a screening load. If the load rating factor for the NRL model is 1.0 or greater, then there is no need to rate for the single-unit SU4, SU5, SU6 and SU7 loads. However, if the load rating factor for the NRL is less than 1.0, then the single-unit SU4, SU5, SU6 and SU7 loads need to be considered during load rating and posting.

The SHVs create higher force effects, and thus result in lower load ratings for certain bridges, especially those with a shorter span or shorter loading length such as transverse floor beams, when compared to AASHTO Type 3, 3-S2 and 3-3 legal loads and HS20 design load. Therefore, SHVs, i.e., SU4, SU5, SU6 and SU7 or NRL, are to be included in rating and posting analyses in accordance with Article 6A.2.3 and Article 6B.9.2 of the 1st Edition of the MBE (Article 6B.7.2 of the 2nd Edition of the MBE), unless one of the following two conditions is met:

Condition A: The State verifies that State laws preclude SHV use; or

Condition B: The State has its own rating vehicle models for legal loads and verifies that the State legal load models envelope the *applicable* AASHTO SHV loading models specified in Appendix D6A and Figure 6B.9.2-2 of the 1st Edition of the MBE (Figure 6B.7.2-2 of the 2nd Edition of the MBE), and the State legal load models have been included in rating/posting analyses of all bridges. The SHV types, e.g. six- or seven-axle SHVs, precluded by State laws need not be considered.

The SHV load models apply to Allowable Stress Rating, Load Factor Rating, and Load and Resistance Factor Rating in accordance with Section 6A and 6B of the MBE.

The FHWA recognizes that there are bridges in the inventory that have not been rated for SHVs and that it is not feasible to include SHVs in the ratings for the entire inventory at once. FHWA is establishing the following timelines for rating bridges for SHVs, if neither Condition A or B is met:

Group 1: Bridges with the shortest span not greater than 200 feet should be re-rated after their next NBIS inspection, but no later than December 31, 2017, that were last rated by:

- a) either Allowable Stress Rating (ASR) or Load Factor Rating (LFR) method and have an operating rating for the AASHTO Routine Commercial Vehicle either Type 3, Type 3S2, or Type 3-3 less than 33 tons (English), 47 tons (English), or 52 tons (English) respectively; or
- b) Load and Resistance Factor Rating (LRFR) method and have a legal load rating factor for the AASHTO Routine Commercial Vehicle, either Type 3, Type 3S2 or Type 3-3, less than 1.3.

Group 2: Rate those bridges not in Group 1 no later than December 31, 2022.

For either group, if a re-rating is warranted due to changes of structural condition, loadings, or configuration, or other requirements, the re-rating should include SHVs.

The selection of load rating method should comply with FHWA's Policy Memorandum *Bridge Load Ratings for the National Bridge Inventory*, dated October 30, 2006.

A State may utilize an alternative approach in lieu of the above to address the load rating for SHVs for bridges in their inventory; however, the approach must be reviewed and formally accepted by FHWA.

The timeline presented above will be incorporated into the review of Metric 13 under the National Bridge Inspection Program (NBIP); specifically, it is expected that all bridges meeting Group 1 criteria be load rated for SHVs by the end of 2017. Please work with your State to assist them in developing appropriate actions to meet those timelines. If your State is currently developing or implementing a Plan of Corrective Actions (PCA) for load rating bridges, the PCA should be reviewed and modified as necessary to take into account the rating of SHVs for those bridges and these timelines.

We request that you share this memorandum with your State or Federal agency partner. All questions that cannot be resolved at the Division Office level should be directed to Lubin Gao at lubin.gao@dot.gov or at 202-366-4604.

Attachment #4
Bridge Improvement Grant
Example Quality Assurance / Quality Control Testing Plan

**Coming Soon
Under
Development**

EXAMPLE #1
REPORT OF FOUNDATION INVESTIGATION

PROJECT: BRO 8048(03) Mellette County PCN 02DY

LOCATION: Structure No. 48-102-010, 18.9 miles North & 0.8 miles West of Cedar Butte over the White River.

METHOD OF INVESTIGATION:

All soundings are made according to the Standard South Dakota Subsurface Investigation Techniques and AASHTO Specifications. Auger holes are drilled with a 4-1/2 inch continuous flight auger. Penetration and Push Test holes are drilled with a 6-5/8 inch continuous hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples. Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil. Corings with the SDDOT drive rig are performed by using a California retractable plug sampler, which is driven with a 490 pound hammer. The drill stem is P.K. rod, which is 2-7/8 inch O.D., and 2 inch nominal diameter cores are obtained. All laboratory tests are performed in accordance with standard AASHTO or SDDOT laboratory procedures.

RECOMMENDATIONS:

Abutments:

I. Steel HP10 X 42 Piling

A. A LRFD maximum factored pile bearing resistance of 77 tons can be used for design.

B. The anticipated tip elevations are:

| <u>Station</u> | <u>Elevation</u> |
|----------------|------------------|
| 22+06 | 1910 |
| 25+27 | 1892 |

C. The nominal pile bearing resistance shall be 192 tons verified by the SDDOT's Modified ENR formula.

Bents:

I. Drilled Shafts

A. A LRFD maximum factored resistance value of 2,800 psf can be used for design below elevation 1912 ft. or maximum scour whichever is lower.

B. Permanent casings will be required to elevation 1915 ft.

C. The point of fixity within the bedrock can be assumed to be the elevation 1912 ft.

DISCUSSION:

The proposed structure location is underlain by brown sand-silt (alluvium) overlying brown silt-sand with gravel (alluvium). The alluvial sediments rest upon gray silt-clay (Pierre Shale). The D50 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 0.06 mm, 1.0 mm, and 0.004 mm. The D95 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 1.0 mm, 6.0 mm, and 0.06 mm.

Steel HP10X42 piling along with the anticipated tip elevations, are listed in the recommendations for use in the abutments. Drilled Shafts are listed in the recommendations for use at the bents.

The piling were evaluated for drivability and group effects at the LRFD Strength Limit State. Settlement of the substructure units and horizontal movement of the abutment piling were evaluated at the LRFD Service Limit State.

Drivability –

A drivability analysis was performed for the steel HP10X42 piling using the wave equation analysis program (GRLWEAP). A group of pile hammers that were evaluated and found to produce acceptable driving stresses is listed later in this report for inclusion in the plans.

Pile Group Effects:

Axial Loading – Abutments

For a single row of piling, AASHTO requires the center-to-center pile spacing to be at least 30" or 2.5 times the width of the pile, whichever is greater. Therefore, for the steel HP10x42 piling at the abutment the center-to-center spacing shall be at least 30".

Settlement –

The steel pile tips will be founded in the Pierre Shale. Unconfined compression test results of the Pierre Shale exceed the proposed bridge loadings. Past experience for piling driven into hard shale soil bedrocks has shown little, if any, settlement has occurred. Therefore, 1/4 inch or less of total settlement can be used to design the substructure units.

Horizontal Movement –

AASHTO states that if the center-to-center spacing of the piling in the substructure unit is greater than 5 times the width of the pile then group effects can be ignored. Therefore, if the designed spacing is greater than 5 times the pile width a group efficiency factor of 1.0 can be used with no reduction in pile loading required. If this minimum pile spacing is not met a reduction factor will need to be calculated according to the AASHTO code.

Horizontal movement at the substructure units can be calculated using the following soil parameters:

Sand-silt (alluvium); phi angle = 24 degrees, cohesion = 50 psf, wet unit weight = 118 pcf
Silt-sand with gravel (alluvium); phi angle = 32 degrees, cohesion = 0 psf, wet unit weight = 130 pcf
Silt-clay (Pierre Shale); phi angle = 18 degrees, cohesion = 1,000 psf, wet unit weight = 130 pcf

For the drilled shafts, a LRFD maximum factored resistance value (skin friction) of 2,800 psf is recommended below elevation 1912 for the bents or maximum scour whichever is lower. The point of fixity within the bedrock can be assumed to be 1912 for the bents.

Each drilled shaft shall have a minimum of 3 access tubes for a shaft diameter of 3.0' and less. The number of access tubes needed shall be increased by 1 for each foot increase in shaft diameter above the 3.0'. The access tubes shall be furnished and installed according to the South Dakota Department of Transportation's 2004 Standard Specifications for Roads and Bridges. These access tubes shall be equally spaced in the shaft reinforcement prior to placing the reinforcement cage.

A representative of the [CONSULTING FIRM \(NAME AND NUMBER\)](#) shall be present during drilling operations to confirm the elevations provided in this report and to observe the placement of the drilled shafts. In addition to the notes below, contact the [CONSULTANT REPRESENTATIVE](#) for the most current drilled shaft construction notes to be included in the plans.

The following notes shall be placed in the plans:

A drivability analysis was performed using the wave equation analysis program (GRLWEAP). The pile hammers listed below were evaluated and found to produce acceptable driving stresses. Pile hammers not listed will require evaluation and approval prior to use from the [CONSULTANT REPRESENTATIVE NAME AND PHONE NUMBER](#).

Hammers need to be sized according to site specific soil parameters and structure design requirements. The following list of hammers is owned and readily available by contractors that do work in SD. Select and specify in the report which hammers are acceptable for use on individual projects.

ICE 180
Delmag D19-42
Delmag D25-32

Delmag D12-42
MVE M-19
Delmag D30-32

FEC 1500
ICE 42S
SPI D30

Delmag D16-32
MKT DE 42/35
Delmag D46-32

Delmag D19-32
APE D19-42

| | | | |
|----------|---------|-----------|--------------|
| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
| S.D. | | | |

Plotting Date: 03/26/2013

The Geotechnical Engineering Activity has on file all of the boring logs for this project. These logs and additional results of laboratory test, if any, are available for review at the Central Office in Pierre.

LEGEND

- ⊕ Auger Test
- ⊖ Drive Test
- ▽ Water
- Penetration Test
- ⊖ Caved
- Sample Zone

Drive test are conducted by dropping a 490 pound hammer 30 inches to drive a 2 7/8 inch drill stem with attached retractable plug sampler for taking samples and to measure the resistance to penetration of the soil.

Auger holes are drilled with a 4 1/2 inch diameter continuous flight auger. Penetration and Push Test holes are drilled with a 6 5/8 inch diameter hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples.

GROUND WATER ELEVATIONS

as of December 2012

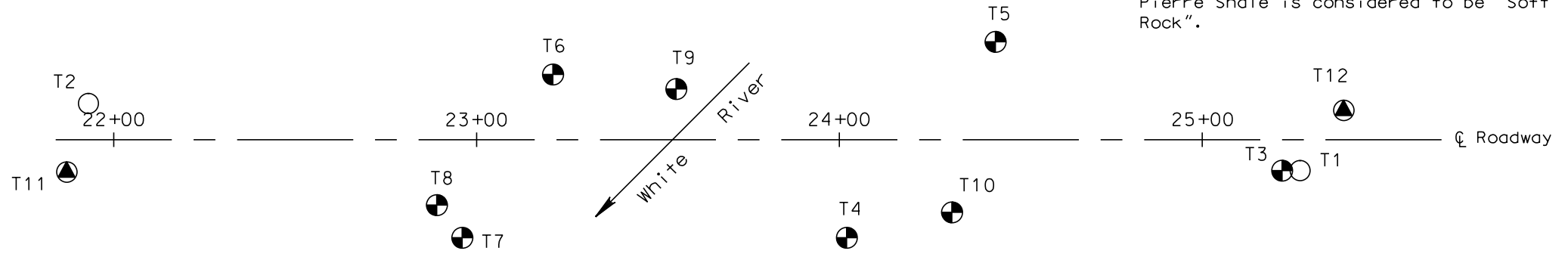
| | | |
|-----|---------|--------|
| T1 | (Caved) | 1931.3 |
| T2 | (Caved) | 1910.9 |
| T3 | | Dry |
| T4 | | 1929.7 |
| T5 | | 1926.9 |
| T6 | | 1928.9 |
| T7 | | 1930.2 |
| T8 | | 1929.1 |
| T9 | | 1930.0 |
| T10 | | 1929.3 |
| T11 | | Dry |
| T12 | | 1929.8 |

MEASURED SKIN FRICTION

| | Elev | psf |
|-----|--------|-------|
| T11 | 1924.0 | 2,193 |
| T12 | 1907.3 | 1,214 |

Pierre Shale is a marine shale with a textural classification that varies from silt-clay to clay-silt. Color varies from buff gray to black. The formation may contain concretion zones that are normally thin but occasionally are massive. These zones may be considered hard and dense. Thin zones may be present that are cemented resulting in claystone or siltstone seams. Bentonite zones may be encountered but are normally less than one half inch thick. Nonweathered Pierre Shale is considered to be "Soft Rock".

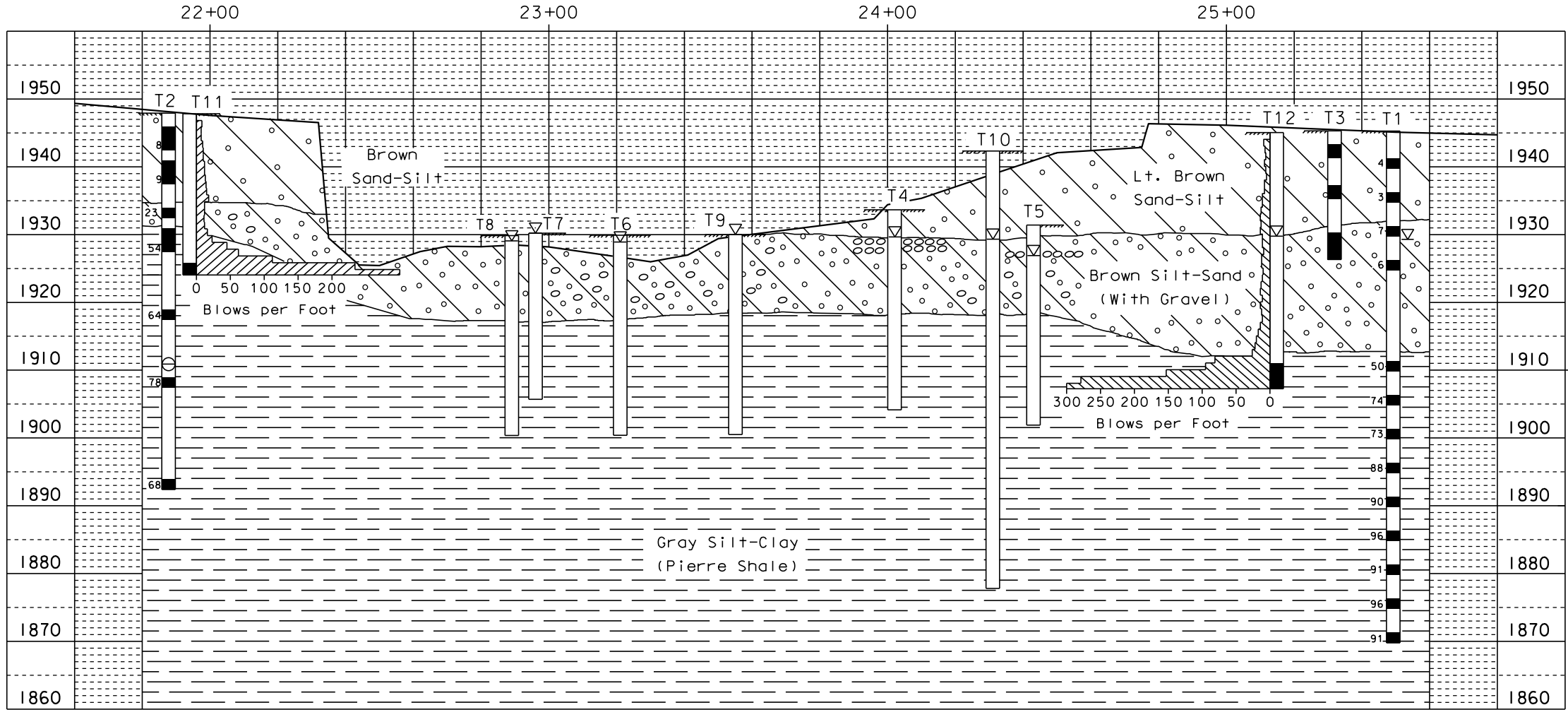
| Hole Number | T2 | T3 | T3 | T11 | T12 |
|----------------------------|-----------|-----------|-----------|------------|------------|
| Station | 21+93 | 25+22 | 25+22 | 21+87 | 25+29 |
| Depth | 9.0 ft | 9.7 ft | 17.0 ft | 23.8 ft | 37.8 ft |
| Soil Color | Brown | Brown | Brown | Gray | Gray |
| Classification | Sand-Clay | Silt | Sand | Clay | Clay |
| Strength (Q _u) | 655.3 psf | ----- psf | ----- psf | 33,490 psf | 40,240 psf |
| Dry Density | 83.6 pcf | 81.7 pcf | 97.8 pcf | 116.9 pcf | 112.5 pcf |
| Wet Density | 95.6 pcf | 91.8 pcf | 107.0 pcf | 136.6 pcf | 133.3 pcf |
| Moisture | 14.8 % | 12.3 % | 9.4 % | 16.9 % | 18.5 % |
| Pass No. 10 | 84.4 % | 99.9 % | 96.2 % | 99.8 % | 99.8 % |
| Pass No. 40 | 76.2 % | 97.1 % | 74.9 % | 99.7 % | 99.8 % |
| Pass No. 200 | 61.9 % | 55.1 % | 9.9 % | 96.9 % | 99.5 % |
| Sand Content | 22.6 % | 44.8 % | 86.3 % | 2.8 % | 0.3 % |
| Silt Content | 23.0 % | 45.1 % | 9.9 % | 41.1 % | 39.6 % |
| Clay Content | 38.8 % | 10.0 % | 0.0 % | 55.9 % | 59.9 % |



* Values represent uncorrected "N" values from Penetration Test.

Sample Zone ■ 48 Blows Per Foot

Bore holes on profile are moved slightly for clarity



BRO 8048(03) MELLETTE COUNTY PCN 02DY
 18.9 MILES N. AND 0.8 MILES W. OF CEDAR BUTTE
 SECTION 28 TOWNSHIP 45 W. RANGE 31 W.
 OVER WHITE RIVER
 STR. NO. 48-102-010

SITE PLAN & SUBSURFACE PROFILE

| | | | |
|-------------|----------|------------|-----------------|
| DESIGNED BY | DRAWN BY | CHECKED BY | APPROVED |
| | NN | JW | |
| | | | BRIDGE ENGINEER |

PLOT SCALE - 1:20

PLOTTED FROM - TRPR18174

FILE ... \SUBSURFACE PROFILE\02DY.DGN

**EXAMPLE #2
RECOMMENDATIONS**

Re: BRO 8027(29), Gregory County, PCN 00QR
Str. No. 27-030-081, located 2.0 West & 0.1 South of the Jct of SD44/SD47
RCBC Undercut Recommendation

Soils maps of the area indicate the soils at the location of the proposed structure have the following characteristics.

Station 16+86 (Str. No. 27-030-081)

CLASSIFICATION: A-7
Clay & Silty Clay
AVERAGE LIQUID LIMIT: 66
SHRINK-SWELL POTENTIAL: High to Very High
FROST ACTION POTENTIAL: Low
CORROSIVITY: High for steel, Low to Moderate for concrete

RECOMMENDATIONS:

Provide 24 inches of undercut and backfill.

DISCUSSION:

The project consists of replacing an existing single span 22' steel stringer bridge with a 2 barrel 13' x 6' cast-in-place RCBC. The proposed box culvert will be in the same location as the existing bridge location. The existing surfacing on the road is gravel and will be resurfaced with gravel upon completion. Minimal grading at the proposed box culvert location is anticipated, therefore, the material shall be compacted using the Ordinary Compaction Method.

A subsurface investigation was conducted for the proposed RCBC. The subsurface investigation consisted of placing a boring near both the proposed inlet and outlet ends of the structure and logging the material to 3 feet below the flow line. Samples were collected from below the flow line for soils classification. A dynamic cone penetrometer was used at both the inlet and outlet ends to identify the change in relative density of the subsurface material below flow line.

Subsurface soils at the proposed site consist of brown silt-clay to 3' below the existing flow line.

The 2' undercut depth is recommended to remove the low strength soils with high shrink-swell potential from below the box culvert.

The following paragraphs shall be placed in the plans:

Compaction of earth embankment and box culvert backfill material shall be governed by the Ordinary Compaction Method.

Any questions about the recommendations or the subsurface conditions can be directed to the [CONSULTANT CONTACT NAME AND PHONE NUMBER](#).

Appendix D - 2015-2016 Consultant Retainer Firms

Bridge Design

Aaron Swan & Associates, Inc.
Aason Engineering Company Inc.
AECOM Technical Services Inc.
Alfred Benesch and Co.
Banner Associates Inc.
Brosz Engineering Inc.
Civil Design Inc.
Clark Engineering Corporation
Felsburg Holt & Ullevig Inc.
HDR Inc.
Hofland Engineering
Howard R. Green Company
Interstate Engineering Inc.
Johnson Engineering Co.
Kadmas Lee & Jackson Inc.
Kirkham Michael & Associates Inc.
Pierce & Harris Engineering Company
Short-Elliott-Hendrickson Incorporated
Stanley Consultants Inc.
Stantec Consulting Services Inc.
Ulteig Engineers Inc.
URS Corporation

Geotechnical Services

American Engineering Testing Inc.
FMG Inc.
GeoTek Engineering & Testing Services Inc.
McLaury Engineering Inc.
Short-Elliott-Hendrickson Incorporated

Construction Administration/Inspection/Testing

Aaron Swan & Associates, Inc.
Aason Engineering Company Inc.
Advanced Engineering and Environmental Services Inc.
AECOM Technical Services Inc.
Banner Associates Inc.
Brosz Engineering Inc.
Civil Design Inc.
Clark Engineering Corporation
DeWild Grant Reckert and Associates Company
Dream Design

Local Bridge Improvement Grant (BIG) Procedure

Eisenbraun & Associates Inc.
Ferber Engineering Company
FMG Inc.
GeoTek Engineering & Testing Services Inc.
Goldsmith Heck Engineers Inc.
HDR Inc.
Helms & Associates
Hofland Engineering
Howard R. Green Company
Infrastructure Design Group Inc.
Interstate Engineering Inc.
Johnson Engineering Co.
JSA Consulting Engineers/Land Surveyors Inc.
Kadmas Lee & Jackson Inc.
McLaury Engineering Inc.
Pierce & Harris Engineering Company
Project Solutions Inc.
Sayre Associates Inc.
Schmucker Paul Nohr & Associates Inc.
Short-Elliott-Hendrickson Incorporated
Stanley Consultants Inc.
Stantec Consulting Services Inc.
Stockwell Engineers Inc.
TSP Inc.
Ulteig Engineers Inc.

Wetland Delineation/Mitigation

Banner Associates Inc.
Clark Engineering Corporation
Dakota Land Surveying & Engineering
Felsburg Holt & Ullevig Inc.
FMG Inc.
HDR Inc.
Howard R. Green Company
Kadmas Lee & Jackson Inc.
Louis Berger Group Inc.
Pierce & Harris Engineering Company
Renner & Associates LLC
RESPEC Consulting & Services
Short-Elliott-Hendrickson Incorporated
SRF Consulting Group Inc.
Wenck Associates Inc.