# **STORM WATER FACILITY PLAN**

DOUGLAS COUNTY, SOUTH DAKOTA

PROJECT NUMBER: 201030F

DATE: September 2021





REPORT PREPARED BY: Brosz Engineering, Inc. 3030 Airport Rd., Suite A, Box 23 Pierre, SD 57501 (605) 224-1123 www.broszeng.com

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### I. INTRODUCTION

### A. Purpose

The Purpose of this report is to provide an investigation into the existing storm water collector system, existing ditches, and intermittent streams to develop a Storm Water Facility Plan (Project) for three drainage basins in Douglas County (Applicant).

The County of Douglas wishes to perform an extensive evaluation of its facilities in order to determine the current status of the three drainageways and any upgrades or improvements that are needed for each stormwater system to function effectively.

The County of Douglas has authorized Brosz Engineering, Inc. (BEI), to prepare a report, which will provide inventory and condition of the current stormwater drainage system. Based on these assessments, alternatives and recommendations will be provided for improving the current system.

### B. Scope

This Storm Water Facility Plan encompasses three separate drainage areas located in Douglas County, South Dakota. These areas are outlined below:

#### Andes Creek

The Andes Creek watershed encompasses the Iowa Township, 24 sections in Holland Township, 24 sections in Walnut Grove Township, and 18 sections in Grand View Township for a total of approximately 40,358 acres in Douglas County.

#### Garden Valley Ditch

The Garden Valley Ditch watershed encompasses portions or all of 16 sections of Walnut Grove Township, 34 Sections of Holland Township, and portions of two sections in Aurora County.

#### Tributary to Platte Creek

The Tributary to Platte Creek watershed encompasses portions of 12 sections in Iowa Township and 7 sections in Clark Township.

The principal elements of this report include the following:

- Analyze and inventory current stormwater structures and area drainageways.
- Deficiencies, as well as satisfactory elements within the system, will be annotated within the report.

- Investigate possible alternatives for stormwater drainage improvements.
- Issue formal recommendations based on alternative analysis.

### C. Demographic Data

All statistical information in this section is based in the 2010 US Census. Douglas County, South Dakota, has a population of 3,002. With a land area of 431.8 square miles, the county has a population per square mile of approximately 7.0. The age divisions are as follows: 0-17 years (26.1%), 18-64 years (49.9%), and 65 years (24.0%). Approximately 93.7% of the county's population is of Caucasian decent, 2.6% is Native American, and 2.0% is Hispanic or Latino.

### II. SYNOPSIS OF STUDY

### A. Criteria for Recommendations

Various policies, standards, and criteria were used as guidelines to formulate the Storm Water Facility Plan. Recommendations are based on the level of service of the existing structure based on the roadway's associated flood event. The design criteria for road crossings are different for South Dakota State Highways, Federal Highway System (FHS) routes, and non-FHS routes. The flood event associated with level of service for each type of roadway are as follows:

### 1. South Dakota State Highways

For road crossings through South Dakota State Highways, the criteria for recommendation must comply with South Dakota Department of Transportation (SDDOT) standards. The Storm Water Facility Plan uses a 100-year event to define the level of service for storm water facilities for State Highway crossings.

### 2. FHS Routes

Typically, county roads with a traffic volume greater than 100 vehicles per day (vpd) are defined as FHS routes. Since these roadways are federally funded, they have different criteria for storm water facilities. The Storm Water Facility Plan uses a 25-year event to define the level of service of facilities for FHS road crossings.

#### 3. Non-FHS Routes

Non-FHS routes are typically county roads that have a traffic volume of fewer than 100 vpd. Non-FHS routes do not receive federal funding, making the county financially responsible to maintain the roadway. The Storm Water Facility Plan uses a 10-year event to define level of service for Non-FHS road crossings.

#### 4. Geographic

There are considerations relative to any hydraulic recommendation that are relative to the geographic location. These largely include stream slopes, vegetation, and soil types. Application of these factors were used when developing the model. Variability of vegetation is critical to understanding the performance of waterways in Douglas County. Given the lack of vertical relief, areas that have high vegetative density will cause slow propagation of storm water.

Consideration was given to each of these variables while developing the working model for these watersheds.

### **III. HYDROLOGIC AND HYDRAULIC ANALYSIS**

### A. Hydrologic and Hydraulic Criteria

The basis for Brosz Engineering's analysis and modeling for small watersheds is based on United States Department of Agriculture (USDA) "Urban Hydrology for Small Watersheds; TR-55" (June 1986), as determined by HydroCAD.

For larger watersheds, the Storm Water Facility Plan is based on the regression equations found in the report entitled, "Techniques for Estimating Peak-Flow Magnitude and Frequency Relations for South Dakota Streams," prepared by Steven K. Sando as part of the "Water-Resources Investigations Report; 98-4055" (1998).

Brosz Engineering's analyses are consistent with the hydraulic criteria required by the SDDOT. Specifically, the document titled "South Dakota Department of Transportation; Local Roads Plan" (2011).

### **B.** Supporting Documentation

Brosz Engineering will complete a review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). Any Special Flood Hazard Areas (SFHAs) will be reviewed and noted for 100-year flood models.

### C. Models Completed

Brosz Engineering has developed models for the three drainage areas for three conditions: Existing, Proposed, and Flood.

### 1. Existing Conditions

The models created for the existing conditions include a detailed inventory of existing facilities including culverts, bridges, and ditches. The models also include details about land use throughout each of the drainage areas. More information about existing conditions can be found in Section V.

#### 2. <u>Proposed Conditions</u>

Brosz Engineering's models created for proposed conditions include a hydraulic analysis of the three drainage basins based on the recommended improvements made to storm water facilities. Proposed conditions may include improvements to existing culvert(s) and ditches, as well as recommended changes to land use in some areas. Proposed conditions are based on whether the road crossing is defined as a State Highway, FHS route, or non-FHS route as per Section II.

### 3. Flood Conditions

Models created for flood conditions are based on a 100-year flood event. These models are created to find critical areas for extreme flood events so improvements may be recommended. Criteria requires recommendations for 100-year flood events to not change expected water levels at any point by more than one foot for that event.

### **IV. APPROACH**

### A. General

This section explains the approach taken to evaluate existing drainage facilities and formulate required facilities to provide adequate draining and flood protection for the area. The facilities defined in the Storm Water Facility Plan and the hydrologic and hydraulic models provide the basis for the work performed by Brosz Engineering.

### B. Hydrology

The Storm Water Facility Plan has split the Douglas County project area into three separate basins to isolate each to its own drainage exit. For each drainage basin, USGS Stream Stats is used to apply the 1998 regression equations (Sando) to determine the flow data (cfs) for 2, 5, 10, 25, 50, and 100-year events.

### C. Hydraulics

The hydraulic modeling completed by Brosz Engineering for the drainage in each of the three basins within Douglas County utilizes the modeling data from the HY-8 and Hydro-CAD programs to simulate rainfall events. Brosz Engineering used these models to simulate runoff with the existing conditions of the land and drainage facilities.

By comparing the data from the USGS Stream Stats to the data from the HY-8 and Hydro-CAD models, it can be determined if the existing facilities are satisfactory or need improvement. The HY-8 and Hydro-CAD models are used to make recommendations for improvement for crossings determined as unsatisfactory according to its respective rainfall event.

#### D. Water Quality Treatment

For the Storm Water Facility Plan, no consideration was made for water quality. Any work performed regarding water quality treatment must meet the requirements of the South Dakota Department of Agriculture and Natural Resources (SDDANR) General Permit for Stormwater Discharge Associated with Construction

### V. EXISTING CONDITIONS

Brosz Engineering has completed field surveys to identify existing conditions of the three drainage basins as well as take inventory of existing facilities. Current FEMA FIRMs were reviewed and investigated for existing Special Flood Hazard Areas (SFHAs). These SFHAs can be critical areas for analysis when creating a new drainage plan.

Following the initial field survey and hydrologic and hydraulic analysis, follow up site visits were completed to identify areas of concern found in the models. In addition to areas of concern, verification of initial data in those areas that will have recommendations for improvement. Arial photography has also been used to identify land use areas such as fields, sloughs, etc.

#### VI. EXISTING STRUCTURE ANALYSIS

Flow data returned by the Hydro-CAD modeling were input into the HY-8 program to determine the capacity of the existing drainage structures. Each existing drainage structure is analyzed based on the level of service criteria stated in Section II. Reasons an improvement to an existing facility may be recommended include the following:

### A. Overtopping

Overtopping occurs when the headwater level rises to the elevation of the roadway. Field surveys performed on the study area have provided overtopping elevations for each of the road crossings being analyzed for the study. The overtopping elevations are compared to the headwater elevation data given by Culvert Master to determine if overtopping will occur. If it is determined that the existing structure will allow overtopping for its specified flood event, the structure may be recommended for improvement.

### B. Quality of Existing Structures

Observations collected through field surveys may also be used to recommend improvements to the existing structures. The quality of the facility can impact the substantially affect the functionality of the structure.

The quality of Corrugated Metal Pipe (CMP) culverts is examined for anything that could affect the normal function of the culvert. Some examples of problems with CMP culverts include bent/broken pipe ends, pipe rusting, and being plugged with dirt and debris. Bridges and box culverts are also inspected for their quality. They are inspected for dirt and debris as well as the overall sufficiency of the structure.

### **VII. CRITICAL NEEDS ANLYSIS**

Through review of the models, locations where the existing structures do not meet their associated level of service are identified. These critical needs are assessed for their severity based on lack of capacity, condition of structure, and owner identified concerns. The most critical issues for each of the three drainage basins are identified below:

### A. Andes Creek Basin

- B. Garden Valley Ditch Basin
- C. Tributary to Platte Creek Basin

### **VIII. SENSITIVITY ANALYSIS**

Each basin is modeled in HydroCAD using the hydrologic and hydraulic tools within the software. In addition, HY8 is utilized as the main hydraulic modeling tool for bridges within the watersheds.

These modeling techniques are industry accepted for purposes of studies such as this. There is some concern however that the SDDOT uses the convention of the "USGS regression equations" (Techniques for Estimating Peak-Flow Magnitude and Frequency Relations for South Dakota Streams, Sando 1998). As such hydrologic results from HydroCAD were compared to returns from the USGS Regression Equations and the HydroCAD model was either verified to be within a 10% tolerance or the model was adjusted to match the USGS Regression Equations results at main crossings within the watersheds.

This activity ensures us as modelers that we have the model operating in a manner that not only behaves with the historical data and the projections developed from them but also allows us to develop a more precise model.

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### **IX. OPINION OF PROBABLE COSTS**

Andes Creek Basin

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### **IX. OPINION OF PROBABLE COSTS**

Garden Valley Ditch Basin

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### **IX. OPINION OF PROBABLE COSTS**

**Tributary to Platte Creek Basin** 

# FINDINGS

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**X. FINDINGS** 

**Andes Creek Basin** 

# FINDINGS

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### **X. FINDINGS**

A. Garden Valley Ditch Basin

# FINDINGS

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### **X. FINDINGS**

B. Tributary to Platte Creek Basin

Hydrology Location: Crossing Number: Project Number: 20-10 Local System: Federal Aid Eligibility:	ANDES CREEK 1 030 County Highway Non Federal Aid	DOT Structure Route: Location: ADT	e Number: 22-143-110 279th St 1.5N,3.7W OF ARMOUR Unknown
USGS Stream Stats D Stream Gradient Structure Invert Elevation Overtopping Elevation	rainage Area 40' Single s	63.06 0.0079 span Prestressed Co 1508.1 1515.77	Square Miles ft/ft oncrete Channel Deck Bridge ft ft
USGS Stream Stats -	Flow Data		
Q2	105 cfs	Q25	1630 cfs
Q5	413 cfs	Q50	2480 cfs
Q10	815 cfs	Q100	3580 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1513.59	ft
Q10 Velocity		7.53	ft/sec
Q25 Headwater Elevation Q25 Velocity		1516.16	ft
		12.08	ft/sec
Q100 Head	water Elevation	1519.23	ft
Q100 Veloc	ity	14.97	ft/sec
Hvdro-CAD Modeling I	Data		
Q10 Structu	Ire Flow	737.3	cfs
Q10 Headw	ater Elevation	1511.78	ft
Q10 Velocit	V	6.5	ft/sec
Q25 Structu	re Flow	955.8	cfs
Q25 Headw	ater Elevation	1512.49	ft
Q25 Velocit	v	7.1	ft/sec
Q100 Struct	ture Flow	1398.7	cfs
Q100 Head	water Elevation	1513.77	ft
Q100 Veloc	ity	8.1	ft/sec

# COMMENTS:

No overtopping occurs during Q100 event.

RECOMMENDATIONS: None at this time.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 2 030	DOT Structure Number 22-144-100 Route: 278th St Location: 2.0N & 3.6W OF ARMOU ADT Unknown		
Local System: Federal Aid Eligibility:	County Highway Non Federal Aid			
USGS Stream Stats D Stream Gradient Structure	rainage Area	61.26 Square Miles 0.0046 ft/ft 25' Single Span Precast Concrete Bridge		
Invert Elevation		1515.12 ft		
Overtopping Elevation		1519.29	ft	
USGS Stream Stats -	Flow Data			
Q2	103 cfs	Q25	1600 cfs	
Q5	407 cfs	Q50	2440 cfs	
Q10	802 cfs	Q100	3520 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1520.41	ft	
Q10 Velocit	у	7.71	ft/sec	
Q25 Headwater Elevation Q25 Velocity		1522.65 ft		
		11.39 ft/sec		
Q100 Head	water Elevation	1525.54 ft		
	ity	14.42	II/Sec	
Hydro-CAD Modeling	Data			
Q10 Structu	ire Flow	737.5	cfs	
Q10 Headw	ater Elevation	1519.29	ft	
Q10 Velocit	У	7	ft/sec	
Q25 Structu	Ire Flow	943.7	cfs	
Q25 Headw	ater Elevation	1520.04	ft	
Q25 Velocit	у Бала <b>Б</b> ала	1.6	ft/sec	
	ure Flow	1393.3	CIS #	
	ity	11021.74	n ft/soc	
	ity	11.2	10360	

COMMENTS:

Overtopping occurs during Q100 Event.

RECOMMENDATIONS: None at this time.

Hydrology LocationANDES CREEKCrossing Number3Project Number: 20-1030Local System:TownshipFederal Aid Eligibility:Non Federal Aid	DOT Structure Number 22-144-090 Route: 277th St Location: 3.0N & 3.8 W OF ARM ADT Unknown		
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation	53.12 Square Miles 0.0002 ft/ft 20' Single Span Concrete Bridge 1518.7 ft 1524.97 ft		
USGS Stream Stats - Flow Data			
Q2 97.3 cfs	Q25 1470 cfs		
Q5 378 cfs	Q50 2240 cfs		
Q10 742 cfs	Q100 3220 cfs		
HY-8 Modeling Data			
Q10 Headwater Elevation	1524.78 ft		
Q10 Velocity	6.55 ft/sec		
Q25 Headwater Elevation	1526.63 ft		
Q25 Velocity	8.63 ft/sec		
Q100 Headwater Elevation	1529.72 ft		
Q100 Velocity	11.9 ft/sec		
Hydro-CAD Modeling Data			
Q10 Structure Flow	716.1 cfs		
Q10 Headwater Elevation	1523.81 ft		
Q10 Velocity	9.4 ft/sec		
Q25 Structure Flow	918.1 cfs		
Q25 Headwater Elevation	1524.86 ft		
Q25 Velocity	9.9 ft/sec		
Q100 Structure Flow	1195.3 cfs		
Q100 Headwater Elevation	1526.19 ft		
Q100 Velocity	10.6 ft/sec		

ation: 3.0N & 3.8 W OF ARMOUR ADT Unknown 53.12 Square Miles 0002 ft/ft ingle Span Concrete Bridge 18.7 ft 24.97 ft 1470 cfs 2240 cfs 3220 cfs 24.78 ft 6.55 ft/sec 26.63 ft 8.63 ft/sec 29.72 ft 11.9 ft/sec 16.1 cfs 23.81 ft 9.4 ft/sec 18.1 cfs 4.86 ft 9.9 ft/sec 95.3 cfs 26.19 ft

COMMENTS:

No overtoping occures during Q25 event.

**RECOMMENDATIONS:** None at this time.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK	DOT Structure Number 22-145-0 Route: HWY 44 Location: 0.5 W JCT US 281 ADT Unknown		
Local System: Federal Aid Eligibility:	State Highway STP			
USGS Stream Stats D Stream Gradient Structure	rainage Area	51.43 Square Miles 0.0001 ft/ft 80' Bridge		
Invert Elevation		1521.31 ft		
Overtopping Elevation		1529.34 f	t	
USGS Stream Stats -	Flow Data			
Q2	94.5 cfs	Q25	1430 cfs	
Q5	369 cfs	Q50	2180 cfs	
Q10	723 cfs	Q100	3130 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1528.39 f	t	
Q10 Velocit	у	1.3 f	t/sec	
Q25 Headwater Elevation		1529.41 f	t	
Q25 Velocit	у	2.23 f	t/sec	
Q100 Head	water Elevation	1531.17 f	t	
Q100 Velocity		4.39 f	t/sec	
Hydro-CAD Modeling I	Data			
Q10 Structu	ire Flow	780.1 c	ofs	
Q10 Headw	ater Elevation	1523.85 f	t	
Q10 Velocit	у	5.1 ft/sec		
Q25 Structu	ire Flow	1131.3 cfs		
Q25 Headw	ater Elevation	1524.55 f	t	
Q25 Velocit	у	5.8 f	t/sec	
Q100 Struct	ture Flow	1717.6 cfs		
Q100 Head	water Elevation	1525.58 f	t	
Q100 Veloc	ity	6.7 f	t/sec	

# COMMENTS:

No overtopping occurs during the Q100 event.

RECOMMENDATIONS: None at this time

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 5 30	DOT Structur Route: Location:	DOT Structure Number 22-145-060 Route: 274th St Location: 1.0 S & 0.5 W of Corsid		
Local System: Federal Aid Eligibility:	County Highway Non Federal Aid	ADT	Unknown		
USGS Stream Stats D Stream Gradient	rainage Area	27.93 Square Miles 0.0050 ft/ft			
Structure Invert Elevation Overtopping Elevation	25' Single Span Concrete Bridge on Timber A 1519.97 า 1525.6		outments W/ Timber wir ft ft	ıgs	
USGS Stream Stats -	Flow Data				
Q2	73.2 cfs	Q25	997 cfs		
Q5	271 cfs	Q50	1500 cfs		
Q10	518 cfs	Q100	2140 cfs		
HY-8 Modeling Data					
Q10 Headw	ater Elevation	1524.68	ft		
Q10 Velocity		6.11	ft/sec		
Q25 Headwater Elevation		1526.68	ft		
Q25 Velocity Q100 Headwater Elevation		10.01	ft/sec		
		1529.31	ft		
Q100 Veloc	ity	11.97	ft/sec		
Hydro-CAD Modeling I	Data				
Q10 Structu	ire Flow	608.4	cfs		
Q10 Headw	ater Elevation	1525.75	ft		
Q10 Velocit	у	6.8	ft/sec		
Q25 Structu	ire Flow	729.2	cfs		
Q25 Headw	ater Elevation	1526.26	ft		
Q25 Velocit	у	7.3	ft/sec		
Q100 Struct	ture Flow	912.2	cfs		
Q100 Head	water Elevation	1526.98	ft		
Q100 Veloc	ity	7.8	ft/sec		

### COMMENTS:

A small amount of overtopping occurs durning Q10 event. Large amount of vegetation located upstream and downstream of structure. Bridge in good condition with no posting requirements.

# **RECOMMENDATIONS:**

Option 1: Complete channel cleanout downstream of structure to remove old vegetation and sediment from channel to improve carrying capacity of stream.

Option 2: When structure is replaced in the future, Increase size of structure to accommodate Q10 event.

Hydrology Location Crossing Number Project Number: 20-10 Local System: Federal Aid Eligibility:	ANDES CREEK 6A 030 County Highway STP	DOT Structur Route: Location: ADT	re Number 22-142-050 273th St 0.8 W CORSICA 520	
USGS Stream Stats D Stream Gradient Structure Invert Elevation Overtopping Elevation	sre rainage Area 53.0'L x 25.6	23.28 0.0051 5'W Three Span Contir 1522.99 1529.62	Square Miles ft/ft nuous Concrete Bridge H Girder ft ft	
USGS Stream Stats -	Flow Data			
Q2	67.8 cfs	Q25	903 cfs	
Q5	247 cfs	Q50	1350 cfs	
Q10	469 cfs	Q100	1910 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1525.66	ft	
Q10 Velocity		3.22 ft/sec		
Q25 Headwater Elevation		1526.32	ft	
Q25 Velocity		5.73	ft/sec	
Q100 Head	water Elevation	1528.16	ft	
Q100 Veloc	ity	12.07	ft/sec	
Hvdro-CAD Modeling	Data			
Q10 Structu	Ire Flow	476.4	cfs	
Q10 Headw	ater Elevation	1525.12	ft	
Q10 Velocit	V	5.5	ft/sec	
Q25 Structu	ire Flow	716.9	cfs	
Q25 Headw	ater Elevation	1525.84	ft	
Q25 Velocit	V	6.1	ft/sec	
Q100 Struc	ture Flow	1085.6	cfs	
Q100 Head	water Elevation	1526.8	ft	
Q100 Veloc	ity	6.9	ft/sec	

# COMMENTS:

No overtopping occures during the Q100 event.

RECOMMENDATIONS: None at this time.

Hydrology LocationANDES CREEKCrossing Number6BProject Number: 20-1030		DOT Structure Number N/A Route: 388th Ave Location: 1.0W&0.1N OF CORSICA		
Local System: Federal Aid Eligibility:	Township Non Federal Aid	ADT U	Inknown	
USGS Stream Stats D Stream Gradient Structure Invert Elevation Overtopping Elevation	orainage Area	23.18 Square Miles 0.0009 ft/ft 54"x30' CMP 1523 ft 1526.78 ft		
USGS Stream Stats -	Flow Data			
Q2	68 cfs	Q25	901 cfs	
Q5	246 cfs	Q50	1340 cfs	
Q10	468 cfs	Q100	1900 cfs	
HY-8 Modeling Data				
Q10 Headw	vater Elevation	1528.58 ft		
Q10 Velocit	ty	7.7 ft	/sec	
Q25 Headw	vater Elevation	1529.72 ft		
Q25 Velocit	ty	8.76 ft/sec		
Q100 Head	water Elevation	1531.87 ft		
Q100 Veloc	bity	10.6 ft	/sec	
Hydro-CAD Modeling	Data			
Q10 Structu	ure Flow	68.5 c	fs	
Q10 Headw	vater Elevation	1527.13 ft		
Q10 Velocit	ty	5.9 ft/sec		
Q25 Structu	ure Flow	71.7 c	fs	
Q25 Headw	vater Elevation	1527.25 ft		
Q25 Velocit	ty	6.0 ft	/sec	
Q100 Struc	ture Flow	76.1 c	fs	
Q100 Head	water Elevation	1527.42 ft		
Q100 Veloc	city	6.1 ft	/sec	

# COMMENTS:

Existing pipe is undersized and overtops during Q1 event. Existing pipe is in good condition.

### **RECOMMENDATIONS:**

Install Double barrel 3'x12' reinforced concrete box culvert to allow roadway to not overtop during Q10 event. A decrease in elevation will occur at crossing and no increase Is shown at downstream crossing 6A during the Q100 event.

Hydrology Location Crossing Number Project Number: 20-1 Local System:	ANDES CREEK 7 030 Township	DOT Structure Number N/A Route: 387th Ave Location: 1.0N&2.0W OF CORSICA		
Federal Aid Eligibility	Non Federal Aid			
USGS Stream Stats I Stream Gradient Structure Invert Elevation Overtopping Elevation	Drainage Area n	20.89 Square Miles 0.0023 ft/ft Two 30"x37' CMP 1538.27 ft 1541.38 ft		
USGS Stream Stats -	Flow Data			
Q2	64.7 cfs	Q25	848 cfs	
Q5	234 cfs	Q50	1260 cfs	
Q10	442 cfs	Q100	1780 cfs	
HY-8 Modeling Data				
Q10 Head	water Elevation	1543.23 ft		
Q10 Veloc	ity	8.81 1	ft/sec	
Q25 Head	water Elevation	1544.32 1	ft	
Q25 Veloc	ity	9.48 1	ft/sec	
Q100 Head	dwater Elevation	1546.38 ft		
Q100 Velo	city	10.91 1	ft/sec	
Hydro-CAD Modeling	Data			
Q10 Struct	ure Flow	52.3 (	cfs	
Q10 Head	water Elevation	1541.69 ft		
Q10 Veloc	ity	5.3 ft/sec		
Q25 Struct	ure Flow	54.6 0	cfs	
Q25 Head	water Elevation	1541.82	ft	
Q25 Veloc	ity	5.6 1	ft/sec	
Q100 Strue	cture Flow	57.3 (	cfs	
Q100 Head	dwater Elevation	1541.97 1	ft	
Q100 Velo	city	5.8 1	ft/sec	

### COMMENTS:

Existing pipes are undersized and overtop during Q1 event. Existing pipe are in good to fair condition.

# **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly. Option 2: Complete grade raise to increase overtopping elevation to 1542 elevation and install double barrel 3'x10' reinforced concrete box culvert to allow reoadeay to not overtop during Q10 event. An increase of 0.5' will occure at crossing and no increase is shown at downstream crossing 6B during the Q100 event.

Crossing Number   6   Rotte: 273d St     Project Number: 20-1030   Local System:   County Highway     Local System:   County Highway   ADT   520     Federal Aid Eligibility:   Non Federal Aid   ADT   520     USGS Stream Stats Drainage Area   9.93 Square Miles     Stream Gradient   0.0065 ft/ft     Structure   Two 4'x7' RCBC     Invert Elevation   1562.61 ft     Overtopping Elevation   1569.6 ft     USGS Stream Stats - Flow Data   Q2     Q2   47.2 cfs   Q25     Q5   160 cfs   Q50     Q10   295 cfs   Q100     HY-8 Modeling Data   1566.34 ft     Q10 Headwater Elevation   1566.34 ft
Project Number: 20-1030   Location: 0.2N&2.8W OF CORSICA     Local System:   County Highway     Federal Aid Eligibility:   Non Federal Aid     USGS Stream Stats Drainage Area   9.93 Square Miles     Stream Gradient   0.0065 ft/ft     Structure   Two 4'x7' RCBC     Invert Elevation   1562.61 ft     Overtopping Elevation   1569.6 ft     USGS Stream Stats - Flow Data   Q2     Q2   47.2 cfs   Q25     Q5   160 cfs   Q50     Q10   295 cfs   Q100     HY-8 Modeling Data   Q10 Headwater Elevation   1566.34 ft     Q10 Valentity   1184 ft/acc
Local System.   County Highway   AD1   520     Federal Aid Eligibility:   Non Federal Aid   9.93 Square Miles     USGS Stream Stats Drainage Area   9.93 Square Miles     Stream Gradient   0.0065 ft/ft     Structure   Two 4'x7' RCBC     Invert Elevation   1562.61 ft     Overtopping Elevation   1569.6 ft     USGS Stream Stats - Flow Data   Q2     Q2   47.2 cfs   Q25     Q5   160 cfs   Q50     Q10   295 cfs   Q100     HY-8 Modeling Data   1566.34 ft     Q10 Headwater Elevation   1566.34 ft     Q10 Velacibity   11.94 ft/page
VSGS Stream Stats Drainage Area   9.93 Square Miles     Stream Gradient   0.0065 ft/ft     Structure   Two 4'x7' RCBC     Invert Elevation   1562.61 ft     Overtopping Elevation   1569.6 ft     USGS Stream Stats - Flow Data   Q2     Q2   47.2 cfs   Q25   549 cfs     Q5   160 cfs   Q50   804 cfs     Q10   295 cfs   Q100   1120 cfs
USGS Stream Stats Drainage Area 9.93 Square Miles Stream Gradient 0.0065 ft/ft Structure Two 4'x7' RCBC Invert Elevation 1562.61 ft Overtopping Elevation 1569.6 ft USGS Stream Stats - Flow Data Q2 47.2 cfs Q25 549 cfs Q5 160 cfs Q50 804 cfs Q10 295 cfs Q100 1120 cfs HY-8 Modeling Data Q10 Headwater Elevation 1566.34 ft Q10 Vicination 1566.34 ft
Stream Gradient0.0065 ft/ftStructureTwo 4'x7' RCBCInvert Elevation1562.61 ftOvertopping Elevation1569.6 ftUSGS Stream Stats - Flow DataQ2Q247.2 cfsQ5160 cfsQ5160 cfsQ10295 cfsQ10295 cfsQ10 Headwater Elevation1566.34 ftQ10 Velosity11.94 ft/page
StructureTwo 4'x7' RCBCInvert Elevation1562.61 ftOvertopping Elevation1569.6 ftUSGS Stream Stats - Flow Data2Q247.2 cfsQ25Q5160 cfsQ50Q10295 cfsQ1001120 cfs1120 cfsHY-8 Modeling Data1566.34 ftQ10 Headwater Elevation1566.34 ft
Invert Elevation 1562.61 ft Overtopping Elevation 1569.6 ft USGS Stream Stats - Flow Data Q2 47.2 cfs Q25 549 cfs Q5 160 cfs Q50 804 cfs Q10 295 cfs Q100 1120 cfs HY-8 Modeling Data Q10 Headwater Elevation 1566.34 ft Q10 Valaging Valage
Overtopping Elevation1569.6 ftUSGS Stream Stats - Flow DataQ247.2 cfsQ5160 cfsQ5160 cfsQ10295 cfsQ10295 cfsHY-8 Modeling DataQ10 Headwater Elevation1566.34 ftQ10 Valacity11.84 ft/acc
USGS Stream Stats - Flow Data Q2 47.2 cfs Q25 549 cfs Q5 160 cfs Q50 804 cfs Q10 295 cfs Q100 1120 cfs HY-8 Modeling Data Q10 Headwater Elevation 1566.34 ft Q10 Valasity 11.84 ft/ass
Q2 47.2 cfs Q25 549 cfs   Q5 160 cfs Q50 804 cfs   Q10 295 cfs Q100 1120 cfs
Q5 160 cfs Q50 804 cfs Q10 295 cfs Q100 1120 cfs HY-8 Modeling Data Q10 Headwater Elevation 1566.34 ft Q10 Velevity 11.84 ft/sec
Q10 295 cfs Q100 1120 cfs HY-8 Modeling Data Q10 Headwater Elevation 1566.34 ft Q10 Velevity 11.84 ft/sec
HY-8 Modeling Data Q10 Headwater Elevation 1566.34 ft Q10 Velocity 11.84 ft/acc
Q10 Headwater Elevation 1566.34 ft
Q25 Headwater Elevation 1568.83 ft
Q25 Velocity 13.79 ft/sec
Q100 Headwater Elevation 1571.47 ft
Q100 Velocity 15.2 ft/sec
Hvdro-CAD Modeling Data
Q10 Structure Flow 250.7 cfs
Q10 Headwater Elevation 1569.49 ft
Q10 Velocity 11.9 ft/sec
Q25 Structure Flow 272 cfs
Q25 Headwater Elevation 1570.73 ft
Q25 Velocity 13 ft/sec
Q100 Structure Flow 290.2 cfs
Q100 Headwater Elevation 1571.3 ft
Q100 Velocity 13.8 ft/sec

# COMMENTS:

Overtopping occurs during the Q25 event.

### **RECOMMENDATIONS:**

Place Riprap upstream and Downstream of RCBC to reduce erosion and protect roadway.

Hydrology Location Crossing Number Project Number: 20-10 Local System: Federal Aid Eligibility:	ANDES CREEK 9 30 Township Non Federal Aid	DOT Structur Route: Location: ADT	e Number N/A 247th St 3.2W OF CORSICA Unknown
USGS Stream Stats Dr Stream Gradient Structure Invert Elevation Overtopping Elevation	rainage Area	9.65 0.0021 Two 36"x4 1575.47 1579.53	Square Miles ft/ft ł8' CMP ft ft
USGS Stream Stats - F	-low Data		
Q2	46.6 cfs	Q25	540 cfs
Q5	158 cfs	Q50	790 cfs
Q10	290 cfs	Q100	1100 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1580.63	ft
Q10 Velocity		8.91	ft/sec
Q25 Headw	ater Elevation	1581.44	ft
Q25 Velocity	/	9.99	ft/sec
Q100 Head	vater Elevation	1582.89	ft
Q100 Veloci	ty	11.66	ft/sec
Hydro-CAD Modeling	Data		
Q10 Structu	re Flow	82.5	cfs
Q10 Headw	ater Elevation	1579.83	ft
Q10 Velocity	/	5.9	ft/sec
Q25 Structu	re Flow	85.3	cfs
Q25 Headw	ater Elevation	95	ft
Q25 Velocity	/	6	ft/sec
Q100 Struct	ure Flow	89.3	cfs
Q100 Head	vater Elevation	1580.11	ft
Q100 Veloci	ty	6.3	ft/sec

# COMMENTS:

Existing pipes are undersized and overtopping during Q1 event. Existing Pipe are in good condition.

# **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly. Option 2: Install 3 additional 36' CMP (5 Total) to allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 8 during the Q100 event. Option 3: Install 3'x10' RCBC to allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 8 during Q100 event

Hydrology Location: Crossing Number: Project Number: 20-10 Local System: Federal Aid Eligibility:	ANDES CREEK 10 30 Township Non Federal Aid	DOT Structure N Route: 38 Location: 0. ADT U	Number: N/A 85th Ave .5N&4.2w OF CORISCA nknown		
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		7.47 Square Miles 0.0002 ft/ft Two 24"x40' CMP 1586.26 ft 1588.6 ft			
USGS Stream Stats - I	Flow Data				
Q2	41.8 cfs	Q25	465 cfs		
Q5	139 cfs	Q50	676 cfs		
Q10	252 cfs	Q100	938 cfs		
HY-8 Modeling Data					
Q10 Headw	ater Elevation	1589.76 ft			
Q10 Velocit	V	5.44 ft/sec			
Q25 Headwater Elevation		1590.41 ft			
Q25 Velocity		7.07 ft/sec			
Q100 Headwater Elevation		1591.65 ft			
Q100 Velocity		9.21 ft/sec			
Hydro-CAD Modeling I	Data				
010 Structure Flow		28.7 cf	is is		
Q10 Headw	ater Elevation	1589 29 ft	0		
Q10 Velocity		4 6 ft/	/sec		
Q25 Structure Flow		31.1 cf	fs.		
Q25 Headwater Elevation		1598.5 ft	-		
Q25 Velocity		5 ft/	/sec		
Q100 Structure Flow		34.1 cf	fs		
Q100 Headwater Elevation		1589.78 ft			
Q100 Veloc	ity	5.4 ft/	/sec		

### COMMENTS:

Existing pipes are undersized and overtop during Q1 events. Existing pipe are in good condition.

### **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly.

Option 2: Complete grade raise to increase overtopping elevation to 1589.5 elevation to allow roadway to not overtop during Q1 event and sign accordingly. An increase of 0.8' will occur at crossing and no increase is shown at downstream crossing 9 during the Q100 event. Option 3: Complete grade raise to increase overtopping elevation to 1589.50 and Install 6-30" CMP or 3'x10' RCBC to allow roadway to not overtop during Q10 event. And increase of 0.4' will occure at crossing and no increase is shown at downstream crossing 9 during Q10 event.

Hydrology Crossing I	Location	ANDES CREEK 11	DC	DOT Structure Number N/A Route: 274th St				
Project Number: 20-1030			Location:	1.2N	& 4.7	W OF CO	RISCA	
Local Syst	tem:	Township		ADT Unknown				
Federal A	id Eligibility:	Non Federal Aid						
USGS Stream Stats Drainage Area			6.61	Squar	re Mil	es		
Stream G	radient			0.0015 ft/ft				
Structure				No Pipe - Low water crossing				
Invert Elevation			N/A	ft				
Overtoppi	ng Elevation			N/A	ft			
USGS Str	eam Stats - F	-low Data						
	Q2	39.7 cfs		Q25		433 (	cfs	
	Q5	130 cfs		Q50		628	cfs	
	Q10	236 cfs		Q100		869	cfs	
HY-8 Mod	eling Data							
	Q10 Headwa	ater Elevation		N/A	ft			
Q10 Velocity			N/A	ft/sec				
Q25 Headwater Elevation			N/A	ft				
Q25 Velocity			N/A	ft/sec				
Q100 Headwater Elevation			N/A	ft				
Q100 Velocity			N/A	ft/sec				
Hydro-CA	D Modeling [	Data						
	Q10 Structu	re Flow		N/A	cfs			
Q10 Headwater Elevation			1591.30	ft				
Q10 Velocity			N/A	ft/sec				
Q25 Structure Flow			N/A	cfs				
Q25 Headwater Elevation			1591.37	ft				
Q25 Velocity			N/A	ft/sec				
	Q100 Struct	, ure Flow		N/A	cfs			
Q100 Headwater Elevation			1591.48	ft				
	Q100 Veloci	ity		N/A	ft/sec			

### COMMENTS:

Existing Low water crossing and two - track trail. Section line trail runs through National Waterfowl Production Area.

RECOMMENDATIONS: None at this time.

Hydrology LocationANDES CREEKCrossing Number12Project Number: 20-1030		ANDES CREEK 12 30	DOT Structure Number N/A Route: 384th Ave Location: 1.8N & 5.2W OF CORISCA		
Local System Federal Aid E	: ligibility:	Township Non Federal Aid	ADT Un	known	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		ainage Area	3.44 Square Miles 0.0040 ft/ft 24"x40' CMP 1597.07 ft 1600.90 ft		
USGS Stream	n Stats - F	low Data			
Q2		30.1 cfs	Q25	296 cfs	
Q5		93.4 cfs	Q50	423 cfs	
Q1	0	165 cfs	Q100	577 cfs	
HY-8 Modelin	g Data				
Q1	0 Headwa	ter Elevation	1601.93 ft		
Q10 Velocity			5.76 ft/sec		
Q25 Headwater Elevation		ter Elevation	1602.4 ft		
Q2	5 Velocity		6.46 ft/sec		
Q100 Headwater Elevation		ater Elevation	1603.28 ft		
Q100 Velocity		У	7.57 ft/sec		
Hydro-CAD N	lodeling D	ata			
Q1	0 Structur	e Flow	20.3 cfs		
Q10 Headwater Elevation		ter Elevation	1600.99 ft		
Q10 Velocity			6.50 ft/sec		
Q25 Structure Flow		e Flow	20.4 cfs		
Q25 Headwater Elevation		ter Elevation	1601.01 ft		
Q25 Velocity			6.50 ft/s	ec	
Q1	00 Structu	Ire Flow	20.5 cfs		
Q100 Headwater Elevation		ater Elevation	1601.05 ft		
Q100 Velocity		6.50 ft/s	ec		

### COMMENTS:

When large closed basin area located 2,500' south of crossing is completely inundated, existing pipe is undersized and overtops during Q1 event. Existing pipe is in good condition.

### **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly.

Option 2: Install 4 additional 24 CMP (5 total) to allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 11 during the Q100 event.

# **RECOMMENDATIONS:**

Option 3: Closed basin along roadway has overflow elevation of 1599.5 Complete grade raise to increase overtopping elevation to 1601.5 to provide 2' of freeboard betweeen road and water. Install 2-36" CMP to allow roadway to not overtop during Q10 event. An increase of 0.6' will occur at crossing and no increase is shown at downstream crossing 11 during Q100 event.

Hydrology Location Crossing Number	ANDES CREEK 13	DOT Structure Number N/A Route: HWY 44		
Local System: Federal Aid Eligibility:	State Highway STP	ADT Un	known	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		2.56 Square Miles 0.0017 ft/ft 36"x75' RCP 1615.06 ft 1624.32 ft		
USGS Stream Stats -	Flow Data			
Q2	26.5 cfs	Q25	249 cfs	
Q5	80.4 cfs	Q50	353 cfs	
Q10	141 cfs	Q100	480 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1624.91 ft		
Q10 Velocity		11.15 ft/sec		
Q25 Headwater Elevation		1625.4 ft		
Q25 Velocity		11.9 ft/sec		
Q100 Headwater Elevation		1626.22 ft		
Q100 Velocity		13.06 ft/sec		
Hydro-CAD Modeling	Data			
Q10 Structure Flow		84.3 cfs	5	
Q10 Headw	ater Elevation	1620.53 ft		
Q10 Velocity		11.9 ft/sec		
Q25 Structure Flow		105 cfs		
Q25 Headwater Elevation		1622.69 ft		
Q25 Velocit	у	14.9 ft/s	sec	
Q100 Struct	ture Flow	122.2 cfs	5	
Q100 Headwater Elevation		1624.85 ft		
Q100 Velocity		17.3 ft/s	Sec	

# COMMENTS:

Overtopping occurs during Q50 event.

RECOMMENDATIONS: Replace pipe as in poor condition.

Hydrology Loca Crossing Numb Project Number Local System: Federal Aid Elig	tion ANDES CRE er 14 : 20-1030 Township jibility: Non Federal	EEK DOT Structu Route: Location: ADT Aid	re Number N/A 277th St 3.8S & 1.4W OF CORISCA Unknown		
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		3.89 0.0060 48"x32' C 1548.31 1551.97	3.89 Square Miles 0.0060 ft/ft 48"x32' CMP & 36"x29' CMP 1548.31 ft 1551.97 ft		
USGS Stream	Stats - Flow Data				
Q2	31.7 cf	s Q25	318 cfs		
Q5	99.4 cf	s Q50	455 cfs		
Q10	177 cf	s Q100	624 cfs		
HY-8 Modeling	Data				
Q10	Headwater Elevatior	n 1552.6	i ft		
Q10	Velocity	8.05	8.05 ft/sec		
Q25 Headwater Elevation		າ 1552.84	1552.84 ft		
Q25 Velocity		8.37	8.37 ft/sec		
Q100 Headwater Elevation		on 1553.16	1553.16 ft		
Q100 Velocity		8.79	8.79 ft/sec		
Hydro-CAD Mo	deling Data				
Q10 Structure Flow		121.5	cfs		
Q10 Headwater Elevation		n 1552.85	i ft		
Q10 Velocity		6.6	ft/sec		
Q25 Structure Flow		130.9	cfs		
Q25 Headwater Elevation		າ 1553.22	? ft		
Q25 Velocity		7.0	ft/sec		
Q100 Structure Flow		142.7	′ cfs		
Q100 Headwater Elevation		on 1553.8	\$ ft		
Q100 Velocity		7.6	i ft/sec		

# COMMENTS:

Existing Pipe are undersized and overtop during Q2 event.

### **RECOMMENDATIONS:**

Option 1: Allow crossing to remain as low water crossing and sign accordingly.

Option 2: Install 2 additional 48" CMP (3 total & 1-36" CMP) to allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 2 during Q100 event.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 15 030	DOT Structure Number N/A Route: 387th Ave		
Local System:	Townshin			
Eederal Aid Eligibility:	Non Federal Aid			
	Non rederar Ald			
USGS Stream Stats Drainage Area Stream Gradient		2.44 Square Miles 0.0036 ft/ft		
Structure		66"X51" CMPA		
Invert Elevation		1579.57 ft		
Overtopping Elevation		1581.21 ft		
USGS Stream Stats -	Flow Data			
0000 01/04/1 01013	26 cfs	025	242 cfs	
Q5	79 cfs	Q50	343 cfs	
Q10	137 cfs	Q100	466 cfs	
QIU	107 015	QTOO	400 013	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1583.88 ft		
Q10 Velocity		8.64 ft/sec		
Q25 Headwater Elevation		1584.35 ft		
Q25 Velocity		9.21 ft/sec		
Q100 Headwater Elevation		1585.15 ft		
Q100 Velocity		9.88 ft/sec		
Livera CAD Madalian	Data			
Hydro-CAD Modeling		20.4 efe		
Q10 Structure Flow		39.1 CTS		
Q10 Headwater Elevation		1582.11 π		
Q10 Velocity		4.8 ft/se	ec	
Q25 Structure Flow		45.7 cts		
Q25 Headwater Elevation		1582.35 ft		
Q25 Velocity		5.0 ft/se	ec	
Q100 Struc	ture Flow	56.7 cfs		
Q100 Headwater Elevation		1582.73 ft		
Q100 Velocity		5.4 ft/se	ec	

### COMMENTS:

Existing pipe is undersized and overtops during Q1 event. Existing pipe is in good condition.

# **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly. Option 2: Complete grade raise to increase overtopping elevation to 1582.50 and install 2 additional 66"x51" CMPA (3 total) to allow roadway to not overtop during Q10 event. An increase of 0.5' will occur at crossing and no increase is shown at downstream crossing 14 during the Q100 event.
Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 16 030	DOT Structure Number N/A Route: 388th Ave	
Local System:	Townshin		hnown
Federal Aid Eligibility:	Non Federal Aid		
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		1.93 Square Miles 0.0051 ft/ft 72"x60' CMP 1550.6 ft 1565 ft	
USGS Stream Stats - I	Flow Data		
Q2	23.5 cfs	Q25	211 cfs
Q5	69.9 cfs	Q50	298 cfs
Q10	120 cfs	Q100	402 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1555.14 ft	
Q10 Velocit	у	11.53 ft/sec	
Q25 Headw	ater Elevation	1557.27 ft	
Q25 Velocit	у	13.16 ft/sec	
Q100 Head	water Elevation	1559.66 ft	
Q100 Veloc	ity	14.26 ft/sec	
Hydro-CAD Modeling I	Data		
Q10 Structu	ire Flow	202.5 cf	S
Q10 Headw	ater Elevation	1556.4 ft	
Q10 Velocit	у	7.2 ft/sec	
Q25 Structu	ire Flow	265.5 cfs	
Q25 Headw	ater Elevation	1558.49 ft	
Q25 Velocit	У	9.4 ft/	sec
Q100 Struct	ure Flow	297.6 cf	S
Q100 Head	water Elevation	1559.74 ft	
Q100 Veloc	ity	10.5 ft/	sec

COMMENTS: No overtopping during Q25 event.

Hydrology Location Crossing Number	ANDES CREEK	DOT Structure Number N/A Route: 386th Ave	
Local System:			ns a 3.200 OF CORISCA
Federal Aid Eligibility:	Non Federal Aid		IKHOWH
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		0.64 Square Miles 0.0016 ft/ft 30"x30' CMP 1581.4 ft 1585.38 ft	
USGS Stream Stats - I	-low Data		
Q2	14.7 cfs	Q25	111 cfs
Q5	40 cfs	Q50	153 cfs
Q10	66 cfs	Q100	202 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1585.76 ft	
Q10 Velocity	y	8.08 ft/sec	
Q25 Headw	ater Elevation	1586.02 ft	
Q25 Velocity	y	8.32 ft/sec	
Q100 Head	water Elevation	1586.48 ft	
Q100 Veloc	ity	8.7 ft/sec	
Hydro-CAD Modeling [	Data		
Q10 Structu	re Flow	26.9 cfs	S
Q10 Headw	ater Elevation	1585.62 ft	
Q10 Velocity	y	5.5 ft/sec	
Q25 Structu	re Flow	27.7 cfs	
Q25 Headw	ater Elevation	1585.75 ft	
Q25 Velocity	V	5.6 ft/s	sec
Q100 Struct	ure Flow	28.9 cfs	S
Q100 Head	water Elevation	1585.94 ft	
Q100 Velocity		5.9 ft/s	sec

#### COMMENTS:

Existing pipe is undersized and overtop during Q5 event. Existing pipe is in poor condition.

#### **RECOMMENDATIONS:**

Replace existing pipe with 2-30" CMP to allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 16 during Q100 event.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 18 030	DOT Structure N Route: 388 Location: 1.5	umber N/A ith Ave s & 1.2W OF CORISCA
Local System: Federal Aid Eligibility:	Township Non Federal Aid	ADT Unł	known
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		1.97 Square Miles 0.0046 ft/ft Three 24" CMP 1540.18 ft 1543.35 ft	
USGS Stream Stats -	Flow Data		
Q2	23.7 cfs	Q25	213 cfs
Q5	70.4 cfs	Q50	302 cfs
Q10	122 cfs	Q100	408 cfs
HY-8 Modeling Data			
Q10 Headv	vater Elevation	1544.04 ft	
Q10 Veloci	ty	7.8 ft/sec	
Q25 Headv	vater Elevation	1544.44 ft	
Q25 Veloci	ty	8.17 ft/sec	
Q100 Head	water Elevation	1545.15 ft	
Q100 Veloc	city	8.8 ft/se	ec
Hydro-CAD Modeling	Data		
Q10 Struct	ure Flow	41.6 cfs	
Q10 Headv	vater Elevation	1544.23 ft	
Q10 Veloci	ty	6.60 ft/se	ec
Q25 Struct	ure Flow	43.50 cfs	
Q25 Headv	vater Elevation	1544.51 ft	
Q25 Veloci	ty	6.90 ft/se	ec
Q100 Struc	ture Flow	46.00 cfs	
Q100 Head	water Elevation	1544.91 ft	
Q100 Veloo	city	7.30 ft/se	ec

### COMMENTS:

Existing pipe are undersized and overtop during Q1 event. Existing pipe are in good condition.

## **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly.

Option 2: Install 3'x7' RCBC to allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 4 during Q100 event

Hydrology Location Crossing Number Project Number: 20-10 Local System:	ANDES CREEK 19 30 Township	DOT Structure Number N/A Route: 275th St Location: 1.8s & 4.1W OF CORISC ADT Unknown	
Federal Aid Eligibility:	Non Federal Aid		
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		2.09 Square Miles 0.0016 ft/ft 18" CMP NEW & 15" CMP FAIR 1612.37 ft 1614.87 ft	
USGS Stream Stats -	Flow Data		
Q2	24 cfs	Q25	221 cfs
Q5	73 cfs	Q50	313 cfs
Q10	126 cfs	Q100	423 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1615.71 ft	
Q10 Velocit	у	6.81 ft/sec	
Q25 Headw	ater Elevation	1616.1 ft	
Q25 Velocit	у	7.12 ft/sec	
Q100 Head	water Elevation	1616.81 ft	
Q100 Veloc	ity	7.68 ft/s	ec
Hydro-CAD Modeling	Data		
Q10 Structu	ire Flow	14.7 cfs	
Q10 Headw	ater Elevation	1614.95 ft	
Q10 Velocit	у	4.9 ft/sec	
Q25 Structu	ire Flow	14.8 cfs	
Q25 Headw	ater Elevation	1614.97 ft	
Q25 Velocit	у	4.9 ft/s	ec
Q100 Struct	ture Flow	14.9 cfs	
Q100 Head	water Elevation	1615 ft	
Q100 Veloc	ity	5.0 ft/s	ec

#### COMMENTS:

Existing Pipe are undersized and overtop during Q1 event.

#### **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly.

Option 2: Install 1 additional 18" CMP (2 total) to allow roadway to not overtop during Q1 event and sign as low water crossing. No increase is shown at downstream crossing 11 during Q100 event.

Option 3: Install 4-24" CMP to complete grade raise to increase overtopping elevation to 1615.5 to allow roadway to not overtop during q10 event. An increase of 0.6 will occur at crossing ad no increase is shown at downstream crossing 11 during Q100 event

Hydrology Location: Crossing Number: Project Number: 20.10	ANDES CREEK	DOT Structure Number: N/A Route: HWY 44 Location: 2.8s & 4.5W OF CORISC ADT Unknown	
Local System: Federal Aid Eligibility:	State Highway STP		
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		1.32 Square Miles 0.0001 ft/ft 30"x60' RCP 1630.15 ft 1636.26 ft	
USGS Stream Stats -	Flow Data		
Q2	20 cfs	Q25	169 cfs
Q5	57 cfs	Q50	237 cfs
Q10	98 cfs	Q100	319.002 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1636.73 ft	
Q10 Velocit	у	12.58 ft/sec	
Q25 Headw	ater Elevation	1637.1	ft
Q25 Velocit	у	12.75 ft/sec	
Q100 Head	water Elevation	1637.73 ft	
Q100 Veloc	ity	13 ft/sec	
Hydro-CAD Modeling I	Data		
Q10 Structu	ire Flow	22	cfs
Q10 Headw	ater Elevation	1632.83 ft	
Q10 Velocit	у	4.5 ft/sec	
Q25 Structu	ire Flow	26.8	cfs
Q25 Headw	ater Elevation	1633.51	ft
Q25 Velocit	у	5.5	ft/sec
Q100 Struct	ture Flow	33.2	cfs
Q100 Head	water Elevation	1634.62	: ft
Q100 Veloc	ity	6.8	ft/sec

COMMENTS: No overtopping during Q100 event.

Hydrology Location	ANDES CREEK	DOT Structure Number N/A	
Project Number: 20-1	030	Location	1: 3 6S & 5 0W OF CORISCA
Local System:	Township	AD <sup>-</sup>	T Unknown
Federal Aid Eligibility	: Non Federal Aid		
USGS Stream Stats	Drainage Area	0.1	6 Square Miles
Stream Gradient	-	0.001	6 ft/ft
Structure		No Pipe	- Low water crossing
Invert Elevation		N/A	ft
Overtopping Elevatio	n	N/A	ft
USGS Stream Stats	- Flow Data		
Q2	8 cfs	Q25	49 cfs
Q5	20 cfs	Q50	66 cfs
Q10	31 cfs	Q100	85 cfs
HY-8 Modeling Data			
Q10 Head	water Elevation	N/A	ft
Q10 Veloc	itv	N/A	ft/sec
Q25 Head	water Elevation	N/A	ft
Q25 Veloc	itv	N/A	ft/sec
Q100 Hea	dwater Elevation	N/A	ft
Q100 Velo	city	N/A	ft/sec
Hvdro-CAD Modeling	Data		
Q10 Struct	ure Flow	N/A	cfs
Q10 Head	water Elevation	1632 6	9 ft
Q10 Veloc	itv	N/A	ft/sec
Q25 Struct	ure Flow	N/A	cfs
Q25 Head	water Elevation	1633.1	1 ft
Q25 Veloc	itv	N/A	ft/sec
Q100 Stru	cture Flow	N/A	cfs
Q100 Hea	dwater Elevation	1633.74	4 ft
Q100 Velo	city	N/A	ft/sec

## COMMENTS:

Existing low water crossing. No pipe was located within the crossing. Road has a substantial storage area located upstream.

#### **RECOMMENDATIONS:**

Install 18" equalization pipe to relieve roadway during rain events. No increase is shown at downstream crossing 20 during Q100 event.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 22 30	DOT Structure Number N/A Route: 389th Ave Location: 3.6S OF COR		
Local System: Federal Aid Eligibility:	County Highway STP	ADT	336	
USGS Stream Stats D	rainage Area	0.4 Square Miles		
Structure		Single 3'x	R'x50' RCBC	
Invert Elevation		1542.12	ft	
Overtopping Elevation		1549.63	ft	
USGS Stream Stats - I	Flow Data			
Q2	12.2 cfs	Q25	84.8 cfs	
Q5	31 cfs	Q50	116 cfs	
Q10	51.4 cfs	Q100	152 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1543.75	ft	
Q10 Velocit	y	7.97	ft/sec	
Q25 Headw	ater Elevation	1544.38	ft	
Q25 Velocit	У	9.14 ft/sec		
Q100 Head	water Elevation	1545.74 ft		
Q100 Veloc	ity	10.88	ft/sec	
Hydro-CAD Modeling I	Data			
Q10 Structu	re Flow	53	cfs	
Q10 Headw	ater Elevation	1543.81	ft	
Q10 Velocit	У 	5.10	ft/sec	
Q25 Structu	re Flow	72.70	cts	
Q25 Headw	ater Elevation	1544.24	ft G/	
Q25 Velocit	У	5.70	π/sec	
Q100 Struct		107.40	CIS #	
		1544.92	Π #/	
	пу	6.30	TL/SEC	

COMMENTS: No overtopping during Q100 event.

Hydrology LocationANDES CREEKCrossing Number23Project Number: 20-1030		DOT Structure Number N/A Route: Highway 281 Location: 2.0S OF CORISCA	
Local System: Federal Aid Eligibility:	State Highway NHS	ADT	Unknown
USGS Stream Stats D	rainage Area	6.1	Square Miles
Stream Gradient		0.0060	ft/ft
Structure		Single 8'x7	/'x80' RCBC
Invert Elevation		1525.64	ft c
Overtopping Elevation		1532	π
USGS Stream Stats - I	Flow Data		
Q2	38.4 cfs	Q25	413 cfs
Q5	125 cfs	Q50	598 cfs
Q10	226 cfs	Q100	826 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1530.04	ft
Q10 Velocit	y	13.59 ft/sec	
Q25 Headw	ater Elevation	1532.36	ft
Q25 Velocit	y	15.68	ft/sec
Q100 Head	water Elevation	1535.22 ft	
Q100 Veloc	ity	17.44 ft/sec	
Hydro-CAD Modeling [	Data		
Q10 Structu	re Flow	123.1	cfs
Q10 Headw	ater Elevation	1528.4	ft
Q10 Velocit	y	7.3	ft/sec
Q25 Structu	re Flow	167.8	cfs
Q25 Headw	ater Elevation	1529.12	ft
Q25 Velocit	y	7.9	ft/sec
Q100 Struct	ure Flow	242.9	cfs
Q100 Head	water Elevation	1530.24	ft
Q100 Veloc	ity	8.7	ft/sec

COMMENTS: No overtopping during Q100 Event.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 24 30	DOT Structure Number N/A Route: 390th Ave	
Local System	Township	ADT Un	known
Federal Aid Eligibility:	Non Federal Aid	712 1 011	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		5.65 Square Miles 0.0023 ft/ft Two 18" x 32' CMP 1560 ft 1562.14 ft	
USGS Stream Stats - I	Flow Data		
Q2	37 cfs	Q25	398 cfs
Q5	121 cfs	Q50	575 cfs
Q10	218 cfs	Q100	794 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1563.14 ft	
Q10 Velocit	y	6.86 ft/s	ec
Q25 Headw	ater Elevation	1563.45 ft	
Q25 Velocit	y	7.17 ft/s	ec
Q100 Head	water Elevation	1563.95 ft	
Q100 Veloc	ity	7.67 ft/sec	
Hydro-CAD Modeling I	Data		
Q10 Structu	re Flow	12.6 cfs	
Q10 Headw	ater Elevation	1562.27 ft	
Q10 Velocit	у	3.6 ft/s	ec
Q25 Structu	re Flow	13 cfs	
Q25 Headw	ater Elevation	1562.32 ft	
Q25 Velocit	y	3.7 ft/s	ec
Q100 Struct	ure Flow	14.6 cfs	
Q100 Head	water Elevation	1562.54 ft	
Q100 Veloc	ity	4.1 ft/s	ec

#### COMMENTS:

Existing pipe in good condition. Pipe are undersized and overtop during Q5 event.

#### **RECOMMENDATIONS:**

Option 1: Install 3 additional 18" CMP (5 Total) to allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 23 during Q100 Event.

Option : Install 3 new 24" CMP (3 Total) replacing existing 18" CMPto allow roadway to not overtop during Q10 event. No increase is shown at downstream crossing 23 during Q100

Hydrology Location Crossing Number	ANDES CREEK	DOT Structure Number N/A Route: Highway 44	
Local System: State Highway		Location: 2 ADT L	Jnknown
Federal Aid Eligibility:	NHS		
USGS Stream Stats D	rainage Area	3.33 Square Miles	
Stream Gradient			t/ft
Structure		30 X/U RU 1566 97 f	F t
		1573 00 f	ι †
		1010.991	L
USGS Stream Stats -	Flow Data		
Q2	30 cfs	Q25	292 cfs
Q5	93 cfs	Q50	418 cfs
Q10	164 cfs	Q100	570 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1574.7 f	t
Q10 Velocit	у	11.75 f	t/sec
Q25 Headw	ater Elevation	1575.24 f	t
Q25 Velocit	у	12.47 f	t/sec
Q100 Head	water Elevation	1576.16 ft	
Q100 Veloc	ity	13.52 ft/sec	
Hydro-CAD Modeling	Data		
Q10 Structu	ire Flow	44.4 c	ofs
Q10 Headw	ater Elevation	1570.2 ft	
Q10 Velocit	у	6.3 ft/sec	
Q25 Structu	ire Flow	53.2 cfs	
Q25 Headw	ater Elevation	1570.95 ft	
Q25 Velocit	у	7.5 f	t/sec
Q100 Struct	ture Flow	64.4 c	zfs
Q100 Head	water Elevation	1572.08 f	t
Q100 Velocity		9.1 ft/sec	

COMMENTS: No overtopping during Q100 event.

Hydrology Location Crossing Number Project Number: 20-1	ANDES CREEK 26 030	DOT Structure Route: 3 Location: 3	Number N/A 90th Ave .2S & 0.8E OF CORISCA
Local System: Federal Aid Eligibility:	Non Federal Aid	ADIL	Inknown
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		1.5 Square Miles 0.0004 ft/ft 15"x30' CMP 1577.71 ft 1579.5 ft	
USGS Stream Stats -	Flow Data		
Q2	21.4 cfs	Q25	183 cfs
Q5	62 cfs	Q50	258 cfs
Q10	106 cfs	Q100	346 cfs
HY-8 Modeling Data			
Q10 Head	water Elevation	1580.3 ft	
Q10 Veloc	ity	5.42 ft/sec	
Q25 Head	water Elevation	1580.63 ft	
Q25 Veloc	ity	5.84 ft/sec	
Q100 Head	dwater Elevation	1581.24 ft	
Q100 Velo	city	6.56 ft/sec	
Hydro-CAD Modeling	Data		
Q10 Struct	ure Flow	6.8 c	fs
Q10 Head	water Elevation	1580.49 ft	
Q10 Veloc	ity	5.5 ft/sec	
Q25 Struct	ure Flow	7.2 c	fs
Q25 Head	water Elevation	1580.76 ft	:
Q25 Veloc	ity	5.9 ft	/sec
Q100 Strue	cture Flow	7.8 c	fs
Q100 Head	dwater Elevation	1581.14 ft	
Q100 Velo	city	6.4 ft	/sec

### COMMENTS:

Existing pipe in fair condition. Pipe is undersized and overtops during Q1 event with limited road section to allow for pipe size increase. Grade raise of overtopping section will cause Q100 elevation to increase.

### **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly.

## **RECOMMENDATIONS:**

Option 2: Complete grade raise to increase overtopping elevation to 1580.5 and install 4-30" CMP to allow roadway to not overtop during Q10 event. An increase of 0.6' will occur at crossing and minimal increase of 0.1 is shown at downstream crossing 25 during Q100 event.

Option 3: Complete grade raise to increase overtopping elevation to 1580.0 and install 2-24" cmp to allow roadway to not overtop during Q2 event. An increase of 0.3' will occur at crossing and no increase is shown at downstream crossing 25 during Q100 event.

Hydrology Location Crossing Number Project Number: 20-10	logy LocationANDES CREEKDOT Structure Numbering Number27Route: Highwayct Number: 20-1030Location: 1.3S & (		Number N/A Highway 281 1.3S & 0.2W OF CORISCA
Local System: Federal Aid Eligibility:	State Highway NHS	ADTU	Jnknown
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation		10.8 Square Miles 0.0026 ft/ft 12'x6' RCBC 1521.9 ft	
Overtopping Elevation		1532.9 f	t
USGS Stream Stats -	Flow Data		
Q2	49 cfs	Q25	576 cfs
Q5	167 cfs	Q50	845 cfs
Q10	308 cfs	Q100	1180 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1526.93 ft	
Q10 Velocit	у	5.95 ft/sec	
Q25 Headw	ater Elevation	1529.01 f	ť
Q25 Velocit	у	10.19 f	t/sec
Q100 Head	water Elevation	1534.13 ft	
Q100 Veloc	ity	13.83 ft/sec	
Hydro-CAD Modeling	Data		
Q10 Structu	Ire Flow	296.70 c	ofs
Q10 Headw	ater Elevation	1526.34 ft	
Q10 Velocit	у	7.40 ft/sec	
Q25 Structu	Ire Flow	381.76 cfs	
Q25 Headw	ater Elevation	1527.17 f	ť
Q25 Velocit	у	8.00 f	t/sec
Q100 Struc	ture Flow	507.62 0	cfs
Q100 Head	water Elevation	1528.30 f	ť
Q100 Veloc	ity	8.80 f	t/sec

COMMENTS: No overtopping during Q100 event.

Hydrology Location Crossing Number Project Number: 20-1	ANDES CREEK 28 030	DOT Structure Number N/A Route: 274th St Location: 0.8S & 0.7E OF CORISC/	
Local System: Federal Aid Eligibility:	Township Non Federal Aid	ADT Unknown	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		9.4 Square Miles 0.0025 ft/ft DBL 6'x3'x26' RCBC 1525.25 ft 1527.34 ft	
USGS Stream Stats -	Flow Data		
Q2	47 cfs	Q25	536 cfs
Q5	157 cfs	Q50	783 cfs
Q10	288 cfs	Q100	1090 cfs
HY-8 Modeling Data			
Q10 Heady	vater Elevation	1528.24 ft	
Q10 Veloci	ty	7.67 ft/sec	
Q25 Headv	vater Elevation	1528.96 ft	
Q25 Veloci	ty	8.49 ft/	/sec
Q100 Head	water Elevation	1530.3 ft	
Q100 Velo	city	9.51 ft/	/sec
Hydro-CAD Modeling	Data		
Q10 Struct	ure Flow	157.1 cf	fs
Q10 Headv	vater Elevation	1528.28 ft	
Q10 Veloci	ty	5.8 ft/	/sec
Q25 Struct	ure Flow	180.72 cf	fs
Q25 Headv	vater Elevation	1528.58 ft	
Q25 Veloci	ty	6 ft/	/sec
Q100 Struc	ture Flow	218.70 cf	ſs
Q100 Head	water Elevation	1529.02 ft	
Q100 Velo	city	6.40 ft/	/sec

#### COMMENTS:

Roadway overtops during Q1 event. Existing RCBC is in good condition but undersized with low road elevation and high amount of storage.

#### **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly. Option 2: Complete grade raise to 1529 elevation along 1,700 feet of roadway with 100' overtopping section at 1528.5' elecation. Install one additional double 6'x3' RCBC. No increase in Q100 is shown at downstream crossing 27.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK 29 30 Township	DOT Structure Number N/A Route: 274th St Location: 0.8S & 1.0E OF CORISC	
Federal Aid Eligibility:	Non Federal Aid	ADT Unknown	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		0.2 Square Miles 0.0075 ft/ft 30"x40' CMP 1533.31 ft 1537 ft	
USGS Stream Stats -	Flow Data		
Q2	9 cfs	Q25	53 cfs
Q5	21 cfs	Q50	71 cfs
Q10	33 cfs	Q100	92 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1536.95 ft	
Q10 Velocit	y	7.45 ft/sec	
Q25 Headw	ater Elevation	1537.13 ft	
Q25 Velocit	y	7.61 ft/sec	
Q100 Head	water Elevation	1537.42 ft	
Q100 Veloc	ity	7.86 ft/sec	
Hydro-CAD Modeling I	Data		
Q10 Structu	ire Flow	21.8 cfs	
Q10 Headw	ater Elevation	1536.66 ft	
Q10 Velocit	V	4.4 ft/sec	
Q25 Structu	re Flow	26.05 cfs	
Q25 Headw	ater Elevation	1537.09 ft	
Q25 Velocit	v	5.3 ft/se	C
Q100 Struct	ure Flow	29.69 cfs	
Q100 Head	water Elevation	1537.51 ft	
Q100 Velocity		6.1 ft/se	C

# COMMENTS:

High Storage but good equalization and no overtopping at the Q10 event. Existing CMP is in good condition.

Hydrology Crossing N Project Nu	Location: Number: ımber: 20-10	ANDES CREEK 30 30	DOT Structure Number: N/A Route: 273th St		
Local Syst Federal Ai	em: d Eligibility:	County Highway STP	ADT	115	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		ainage Area	1.93 Square Miles 0.0095 ft/ft Four 36"x52' CMP w/ Safety Ends 1538 ft 1545.12 ft		
USGS Str	eam Stats - F	-low Data			
	Q2	24 cfs	Q25	211 cfs	
	Q5	70 cfs	Q50	298 cfs	
	Q10	120 cfs	Q100	402 cfs	
HY-8 Mod	eling Data				
	Q10 Headwa	ater Elevation	1540.69 ft		
	Q10 Velocity	/	8.63 ft/s	ec	
	Q25 Headwa	ater Elevation	1542.08 ft		
	Q25 Velocity	/	9.98 ft/s	ec	
	Q100 Heady	vater Elevation	1545.71 ft		
	Q100 Veloci	ty	12.33 ft/s	12.33 ft/sec	
Hydro-CA	D Modeling [	Data			
	Q10 Structu	re Flow	151 cfs		
	Q10 Headwa	ater Elevation	1541.38 ft		
	Q10 Velocity	/	5.9 ft/sec		
	Q25 Structu	re Flow	204 cfs		
	Q25 Headwa	ater Elevation	1542.71 ft		
	Q25 Velocity	/	7.2 ft/s	ec	
	Q100 Struct	ure Flow	285 cfs		
	Q100 Headw	vater Elevation	1544.82 ft		
	Q100 Veloci	ty	10.1 ft/s	ec	

# COMMENTS:

CMP can handle Q100 event. Existing CMP are in good condition.

Hydrology Location Crossing Number Project Number: 20-10	ANDES CREEK	DOT Structure Number N/A Route: 273th St	
Local System: Federal Aid Eligibility:	County Highway STP	ADT	115
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		0.29 Square Miles 0.0150 ft/ft 30" x 42' RCP w/ FES 1555.27 ft 1559 ft	
USGS Stream Stats - I	-low Data		
Q2	11 cfs	Q25	70 cfs
Q5	27 cfs	Q50	95 cfs
Q10	43 cfs	Q100	124 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1559.58 ft	
Q10 Velocity	/	11.46 ft/sec	
Q25 Headw	ater Elevation	1559.83 ft	
Q25 Velocity	/	11.62 ft	/sec
Q100 Head	water Elevation	1560.19 ft	
Q100 Veloc	ity	11.84 ft/sec	
Hydro-CAD Modeling [	Data		
Q10 Structu	re Flow	34.2 c	fs
Q10 Headw	ater Elevation	1559.07 ft	
Q10 Velocity	/	7.000 ft/sec	
Q25 Structu	re Flow	34.4 c	fs
Q25 Headw	ater Elevation	1559.09 ft	
Q25 Velocity	/	7 ft	/sec
Q100 Struct	ure Flow	34.71 c	fs
Q100 Head	water Elevation	1559.13 ft	
Q100 Velocity		7.10 ft	/sec

#### COMMENTS:

Roadway overtops during Q5 event. Existing RCP is in fair condition.

#### **RECOMMENDATIONS:**

Install one additional 30" RCP with existing RCP which may result in 0.2' increase in Q100 headwater elevation at downstream crossing 41. Crossing will then meet Q10 event but will not meet recommended Q25. Due to increasing Q100 downstream additionl pipe are not recommended

Hydrology Location Crossing Number	ANDES CREEK 32	DOT Structure Number N/A Route: 273th St	
Project Number: 20-10 Local System: Federal Aid Eligibility:	30 County Highway STP	Location: 0.2 ADT	2n & 2.7E OF CORSICA 115
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		2.4 Square Miles 0.0030 ft/ft 12" x 72' RCP 1568.7 ft 1575.5 ft	
USGS Stream Stats - I	Flow Data		
Q2	26.1 cfs	Q25	241 cfs
Q5	79 cfs	Q50	342 cfs
Q10	137 cfs	Q100	465 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1576.43 ft	
Q10 Velocit	y	8.9 ft/s	sec
Q25 Headw	ater Elevation	1576.55 ft	
Q25 Velocit	у	8.98 ft/s	sec
Q100 Head	water Elevation	1576.72 ft	
Q100 Veloc	ity	4.52 ft/sec	
Hydro-CAD Modeling I	Data		
Q10 Structu	ire Flow	6.7 cfs	;
Q10 Headw	ater Elevation	1573.17 ft	
Q10 Velocit	у	8.5 ft/sec	
Q25 Structu	ire Flow	7.62 cfs	
Q25 Headw	ater Elevation	1574.2 ft	
Q25 Velocit	у	9.7 ft/s	sec
Q100 Struct	ure Flow	8.72 cfs	;
Q100 Head	water Elevation	1575.61 ft	
Q100 Veloc	ity	11.1 ft/s	sec

## COMMENTS:

Closed basin with good equalization during Q10 & Q25 events. Existing RCP is in fair condition. Closed basin overflow elevation is 1574.5

Hydrology Location Crossing Number Project Number: 20-10 Local System: Federal Aid Eligibility:	ANDES CREEK 33 030 Township Non Federal Aid	DOT Structure Number N/A Route: 272nd St Location: 1.2n & 2.2E OF CORSICA ADT Unknown	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		0.89 Square Miles 0.0019 ft/ft 18"x32' CMP 1582.52 ft 1585.31 ft	
USGS Stream Stats -	Flow Data		
Q2	17 cfs	Q25	133 cfs
Q5	47 cfs	Q50	185 cfs
Q10	79 cfs	Q100	246 cfs
HY-8 Modeling Data			
Q10 Headv	vater Elevation	1585.93 ft	
Q10 Veloci	ty	7.15 ft/sec	
Q25 Headv	vater Elevation	1586.2 ft	
Q25 Veloci	ty	7.43 ft/sec	
Q100 Head	water Elevation	1586.68 ft	
Q100 Veloc	city	7.91 ft/sec	
Hydro-CAD Modeling	Data		
Q10 Structu	ure Flow	9.2 cf	S
Q10 Headv	vater Elevation	1585.67 ft	
Q10 Veloci	ty	5.2 ft/sec	
Q25 Structu	ure Flow	9.48 cf	S
Q25 Headv	vater Elevation	1585.76 ft	
Q25 Veloci	ty	5.4 ft/	sec
Q100 Struc	ture Flow	9.86 cf	S
Q100 Head	water Elevation	1585.9 ft	
Q100 Veloc	bity	5.6 ft/	sec

#### COMMENTS:

Undersized pipe with limited road section to allow for pipe size increase. 8-18" CMP would be required to eliminate overtopping during Q10 event at existing grade and no increase in Q100 is shown at downstream crossing 32. Existing CMP is in fair condition.

#### **RECOMMENDATIONS:**

Option 1: Allow roadway to remain as low water crossing and sign accordingly.

Option 2: Install 8 new 18" CMP.

Option 3: Raise grade and install 42 CMP to replace existing culvert.

Hydrology Location Crossing Number	ANDES CREEK 34	DOT Structure Number N/A Route: 386th Ave		
Project Number: 20-10	30	Location: 1	.2n & 3.2W OF COR	SICA
Local System:	County Road	ADT U	Inknown	
Federal Aid Eligibility:	Non Federal Aid			
USGS Stream Stats D	rainage Area	8.56 S	quare Miles	
Stream Gradient		0.0040 ft	/ft	
Structure		60"x32' CM	P w/concrete headal	1
Invert Elevation		1565.15 ft		
Overtopping Elevation		1572.72 ft		
USGS Stream Stats - F	Flow Data			
Q2	44.3 cfs	Q25	503 cfs	
Q5	148 cfs	Q50	735 cfs	
Q10	272 cfs	Q100	1020 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1573.42 ft		
Q10 Velocity	/	11.47 ft/sec		
Q25 Headw	ater Elevation	1574.3 ft		
Q25 Velocity	/	12.01 ft	/sec	
Q100 Head	vater Elevation	1575.73 ft		
Q100 Veloci	ty	12.86 ft	/sec	
Hydro-CAD Modeling [	Data			
Q10 Structu	re Flow	140.3 c	fs	
Q10 Headw	ater Elevation	1570.54 ft		
Q10 Velocity	/	8.3 ft/sec		
Q25 Structu	re Flow	194.3 c	fs	
Q25 Headw	ater Elevation	1572.44 ft		
Q25 Velocity	/	9.9 ft	/sec	
Q100 Struct	ure Flow	231 c	fs	
Q100 Head	vater Elevation	1573.57 ft		
Q100 Velocity		11.8 ft	/sec	

# COMMENTS:

Existing pipe in good general condition and capacity exceeds the Q25 event.

Hydrology Location Crossing Number Project Number: 20-10 Local System: Federal Aid Eligibility:	ANDES CREEK 35 )30 Township Non Federal Aid	DOT Structure Number N/A Route: 272nd St Location: 1.2n & 3.4W OF CORSIC ADT Unknown		A
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		8.37 Square Miles 0.0023 ft/ft 36"x36' CMP 1571.68 ft 1576.63 ft		
USGS Stream Stats -	Flow Data			
Q2	44 cfs	Q25	497 cfs	
Q5	147 cfs	Q50	725 cfs	
Q10	268 cfs	Q100	1010 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1577.9 f	ť	
Q10 Velocit	v	8.95 ft/sec		
Q25 Headw	ater Elevation	1578.63 f	t	
Q25 Velocit	v	9.67 f	t/sec	
Q100 Head	water Elevation	1579.99 ft		
Q100 Veloc	ity	10.86 f	t/sec	
Hydro-CAD Modeling	Data			
Q10 Structu	Ire Flow	54.8 0	cfs	
Q10 Headw	ater Elevation	1577.36 ft		
Q10 Velocit	V	7.8 ft/sec		
Q25 Structu	ire Flow	57.3 cfs		
Q25 Headw	ater Elevation	1577.74 f	t	
Q25 Velocit	v	8.1 f	t/sec	
Q100 Struc	ture Flow	59.9 0	cfs	
Q100 Head	water Elevation	1578.17 f	ť	
Q100 Veloc	ity	8.5 f	it/sec	

## COMMENTS:

Existing pipe in good condition. Pipe is undersized and crossing overtops during Q1 event.

#### **RECOMMENDATIONS:**

Install 2 additional 36" CMP (total 3) to allow roadway to not overtop during the Q10 event. No increase in Q100 is shown at downstream crossing 34

Hydrology Location Crossing Number Project Number: 20-7 Local System:	ANDES CREEK 36 1030 Township	DOT Structure Number N/A Route: 385th Ave Location: 0.5N & 4.2W OF CORSIC ADT Unknown	
Federal Aid Eligibility	: Non Federal Aid		
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		6.7 Square Miles 0.0006 ft/ft 24"x32' CMP 1577.15 ft 1579.74 ft	
USGS Stream Stats	- Flow Data		
Q2	40 cfs	Q25	436 cfs
Q5	131 cfs	Q50	633 cfs
Q10	238 cfs	Q100	876 cfs
HY-8 Modeling Data			
Q10 Head	water Elevation	1581.41 ft	
Q10 Veloc	city	8.13 ft/sec	
Q25 Head	water Elevation	1582.05 ft	
Q25 Veloc	city	8.7 ft/	/sec
Q100 Hea	dwater Elevation	1583.25 ft	
Q100 Velo	ocity	9.38 ft/	/sec
Hydro-CAD Modeling	Data		
Q10 Struc	, ture Flow	15.2 cf	fs
Q10 Head	water Elevation	1579.81 ft	
Q10 Veloc	city	4.8 ft/sec	
Q25 Struc	ture Flow	15.2 cf	fs
Q25 Head	water Elevation	1579.83 ft	
Q25 Veloc	city	4.9 ft/	/sec
Q100 Stru	cture Flow	15.3 cf	fs
Q100 Hea	dwater Elevation	1579.86 ft	
Q100 Velo	ocity	4.9 ft/	/sec

#### COMMENTS:

Downstream croplan inundated. Crossing overtops during Q1 event. Undersized pipe with limited road section to allow for pipe size increase. Grade raise of overtopping section will cause Q100 Elevation to increase.

### **RECOMMENDATIONS:**

Option 1: Release a portion of stored water between crossing 35 and 36 by completing 450 linear feet of channel cleanout located approximatly 1,100 feet upstream (SW) of crossing 35

**RECOMMENDATIONS:** 

Option 2: Allow roadway to remain as low water crossing and sign accordingly.

Option 3: Install 5 additional 24" culverts (total of 6) to allow roadway to not overtop during Q10 event. A minimal increase of 0.1' is shown at downstream crossing 35 during Q100.

Hydrology Location Crossing Number Project Number: 20-10 Local System: Federal Aid Eligibility:	ANDES CREEK 37 30 Township Non Federal Aid	DOT Structure Number N/A Route: 384th Ave Location: 0.4N & 5.2W OF CORSIC ADT Unknown	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		5.09 Square Miles 0.0004 ft/ft Two 24" CMP & 18" CMP 1586.96 ft 1589.71 ft	
USGS Stream Stats -	Flow Data		
Q2	35 cfs	Q25	369 cfs
Q5	113 cfs	Q50	532 cfs
Q10	203 cfs	Q100	732 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1590.56 ft	
Q10 Velocit	V	7.32 ft/sec	
Q25 Headw	ater Elevation	1591.14 ft	
Q25 Velocit	V	7.85 ft/sec	
Q100 Head	, water Elevation	1592.2 ft	
Q100 Veloc	ity	8.81 ft/sec	
Hydro-CAD Modeling I	Data		
Q10 Structu	re Flow	24.1 cfs	
Q10 Headw	ater Elevation	1588.88 ft	
Q10 Velocit	V	3.8 ft/sec	
Q25 Structu	re Flow	31.2 cfs	
Q25 Headw	ater Elevation	1589.38 ft	
Q25 Velocit	v	4.2 ft/s	ec
Q100 Struct	ure Flow	39 cfs	
Q100 Head	water Elevation	1589.94 ft	
Q100 Veloc	ity	5.2 ft/s	ec

# COMMENTS:

Crossing Does not overtop during Q25 event. Pipe in good to fair condition.

Hydrology Location	ANDES CREEK	DOT Structure N	lumber N/A
Crossing Number	38	Route: 2/3rd St	
Project Number: 20-1030		Location: 0.1	S & 0.2E OF HARRISON
Federal Aid Eligibility:	STP	ADT	520
LISCS Stream State D	rainade Area	4 7 Sa	uare Miles
Stream Gradient	allage Alea	4.7 Oq 0.0004 ft/ft	
Structure		6'X3' 30' long	RC Box Culvert
Invert Elevation		1501 11 ft	NO DOX COIVER
		1505 5 ft	
		1090.0 11	
USGS Stream Stats - F	Flow Data		
Q2	34 cfs	Q25	352 cfs
Q5	109 cfs	Q50	507 cfs
Q10	194 cfs	Q100	696 cfs
HY-8 Modeling Data			
Q10 Headwa	ater Elevation	1595.86 ft	
Q10 Velocity	/	9.36 ft/sec	
Q25 Headwa	ater Elevation	1596.54 ft	
Q25 Velocity	/	9.77 ft/sec	
Q100 Head	vater Elevation	1597.62 ft	
Q100 Veloci	ty	11.27 ft/sec	
Hydro-CAD Modeling	Data		
Q10 Structu	re Flow	20.3 cfs	
Q10 Headwa	ater Elevation	1592.34 ft	
Q10 Velocity	/	3.4 ft/sec	
Q25 Structu	re Flow	29.8 cfs	
Q25 Headwa	ater Elevation	1592.7 ft	
Q25 Velocity	/	3.9 ft/s	ec
Q100 Struct	ure Flow	47.7 cfs	i
Q100 Heady	vater Elevation	1593.28 ft	
Q100 Veloci	ty	4.7 ft/s	ec

# COMMENTS:

Crossing does not overtop during Q100 event but has high amount of storage.

**RECOMMENDATIONS:** 

Do not change roadway overtopping elevation.

Hydrology Location Crossing Number Project Number: 20-10 Local System:	ANDES CREEK 39 30 Township	DOT Structure Number N/A Route: 274th St Location: 1.1S & 0.7E OF HARRISC ADT No information		
Federal Ald Eligibility:	Non Federal Ald			
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		2.03 Square Miles 0.0016 ft/ft 18" x 34' Plastic Pipe 1592.95 ft 1593.76 ft		
USGS Stream Stats - I	Flow Data			
Q2	24 cfs	Q25	217 cfs	
Q5	71 cfs	Q50	307 cfs	
Q10	124 cfs	Q100	415 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1594.31 ft		
Q10 Velocit	y	4.81 ft/sec		
Q25 Headw	ater Elevation	1594.42 ft		
Q25 Velocit	y	5.04 ft/sec		
Q100 Head	water Elevation	1594.62 ft		
Q100 Veloc	ity	5.44 ft/s	5.44 ft/sec	
Hydro-CAD Modeling I	Data			
Q10 Structu	re Flow	2.9 cfs	8	
Q10 Headw	ater Elevation	1594.02 ft		
Q10 Velocit	V	3.2 ft/sec		
Q25 Structu	, re Flow	3.2 cfs	8	
Q25 Headw	ater Elevation	1594.08 ft		
Q25 Velocit	V	3.3 ft/s	sec	
Q100 Struct	ure Flow	3.6 cfs	8	
Q100 Head	water Elevation	1594.17 ft		
Q100 Veloc	ity	3.4 ft/s	sec	

### COMMENTS:

Pipe with limited road section to allow for pipe size increase. Grade raise of overtopping will cause Q100 elevation to increase at crossing but does not show an increase at downstream crossing 38.

#### **RECOMMENDATIONS:**

Allow roadway to remain as low water crossing and sing accordingly. If improvements are made, allow overtopping section to remain at current grade.

Hydrology Location Crossing Number Project Number: 20-10	ogy LocationANDES CREEKDOT Structure Numng Number40Route: 383tht Number: 20-1030Location: 1.65 (		Number N/A 33th Ave 6S OF HARRISON
Local System: Federal Aid Eligibility:	County Highway STP	ADT	65
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		0.37 Square Miles 0.0014 ft/ft 24" x 34' CMP 1591.87 ft 1595.55 ft	
USGS Stream Stats - I	-low Data		
Q2	12 cfs	Q25	80 cfs
Q5	30 cfs	Q50	109 cfs
Q10	49 cfs	Q100	142 cfs
HY-8 Modeling Data			
Q10 Headwater Elevation		1595.78 ft	
Q10 Velocity		3.12 ft/	sec
Q25 Headw	ater Elevation	1595.82 ft	
Q25 Velocity		3.2 ft/	sec
Q100 Head	water Elevation	1595.87 ft	
Q100 Velocity		3.32 ft/	sec
Hydro-CAD Modeling I	Data		
Q10 Structu	re Flow	12.5 cfs	S
Q10 Headw	ater Elevation	1594.91 ft	
Q10 Velocity		4 ft/	sec
Q25 Structure Flow		16.5 cfs	S
Q25 Headwater Elevation		1595.65 ft	
Q25 Velocit	y	5.2 ft/	sec
Q100 Struct	ure Flow	19.4 cfs	S
Q100 Head	water Elevation	1596.35 ft	
Q100 Velocity		6.2 ft/	sec

## COMMENTS:

Existing pipe in fair condition. Minor roadway overtopping during Q25 event.

RECOMMENDATIONS:

Install one additional 24" CMP. No increase in Q100 is shown at downstream crossing 39.

Hydrology Location Crossing Number Project Number: 20-1 Local System: Federal Aid Eligibility:	ANDES CREEK 41 030 Township Non Federal Aid	DOT Structure Number N/A Route: 391St Ave Location: 0.2n & 1.7E OF CORSIC ADT No information	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		3.22 Square Miles 0.0040 ft/ft No Pipe - Low water crossing N/A ft 1557 ft	
USGS Stream Stats -	Flow Data		
Q2	29.6 cfs	Q25	287 cfs
Q5	91.1 cfs	Q50	406 cfs
Q10	161 cfs	Q100	558 cfs
HY-8 Modeling Data			
Q10 Heady	vater Elevation	N/A f	t
Q10 Veloci	tv	N/A ft/sec	
Q25 Heady	vater Elevation	N/A ft	
Q25 Veloci	tv	N/A ft/sec	
Q100 Head	water Elevation	N/A ft	
Q100 Velocity		N/A ft/sec	
Hvdro-CAD Modelina	Data		
Q10 Struct	ure Flow	N/A c	ofs
Q10 Headwater Elevation		1558 1 ft	
Q10 Velocity		N/A ft/sec	
Q25 Struct	ure Flow	N/A cfs	
Q25 Heady	vater Elevation	1558 28 ft	
Q25 Veloci	tv	N/A ft/sec	
Q100 Struc	ture Flow	N/A c	fs
Q100 Head	water Elevation	1558.54 ft	
Q100 Velo	city	N/A f	t/sec

### COMMENTS:

Existing low water crossing. Installation of additional pipe at existing upstream crossing 31 may result in 0.2' increase in Q100 Headwater Elevation.

#### **RECOMMENDATIONS:**

Install one 18" CMP equalization culvert which will not increase Q100 headwater elevation at downstream crossing 28.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 1 30	DOT Structure Number: N/A Route: 391st Ave Location: 2.6N & 1.8E of Corsic	
Federal Aid Eligibility:	Non Federal Aid	ADT	Unknown
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		26.12 Square Miles 0.0037 ft/ft DBL 48"X60" RCP 1533.19 ft 1536.43 ft	
USGS Stream Stats - I	Flow Data		
Q2	71.2 cfs	Q25	966 cfs
Q5	262 cfs	Q50	1440 cfs
Q10	500 cfs	Q100	2050 cfs
HY-8 Modeling Data			
Q10 Headwater Elevation		1537.12	ft
Q10 Velocity		8.08	ft/sec
Q25 Headwater Elevation		1537.44	ft
Q25 Velocity		8.48	ft/sec
Q100 Head	water Elevation	1537.9 ft	
Q100 Velocity		9.04	ft/sec
Hydro-CAD Modeling I	Data		
Q10 Structure Flow		94.6 cfs	
Q10 Headwater Elevation		1535.9 ft	
Q10 Velocity		5.5 ft/sec	
Q25 Structure Flow		100.6	cfs
Q25 Headwater Elevation		1536 1	ft
Q25 Velocit	у	5.6	ft/sec
Q100 Struct	ure Flow	109.3	cfs
Q100 Headwater Elevation		1536.15	ft
Q100 Velocity		5.7	ft/sec

### COMMENTS:

Overtops during Q10 existing pipe are in good condition.

#### **RECOMMENDATIONS:**

Install an additional 48"x60' RCP (total of 3) to allow roadway to not overtop during Q10 event. Q100 shall be verified to not be impacted downstream prior to installation.

Hydrology Location: Crossing Number: Project Number <sup>,</sup> 20-1	Garden Valley Ditch 2 030	DOT Structure Number: N/A Route: HWY 281 Location: 3.0N & 0.2W of Cors ADT Unknown		
Local System: Federal Aid Eligibility:	State NHS			
USGS Stream Stats [	Drainage Area	22.63	Square Miles	
Stream Gradient		0.0019	ft/ft	
Structure		Box Culve	rt 14'x8'	
Invert Elevation		1551.01	ft	
Overtopping Elevatior	١	1564.8	ft	
USGS Stream Stats -	Flow Data			
Q2	67 cfs	Q25	888 cfs	
Q5	243 cfs	Q50	1320 cfs	
Q10	462 cfs	Q100	1870 cfs	
HY-8 Modeling Data				
Q10 Headwater Elevation		1558.58	ft	
Q10 Velocity		4.61	ft/sec	
Q25 Heady	vater Elevation	1561.58	ft	
Q25 Veloci	ty	7.93 ft/sec		
Q100 Head	water Elevation	1565.47 ft		
Q100 Velo	city	12.35	ft/sec	
Hydro-CAD Modeling	Data			
Q10 Struct	ure Flow	32.7	cfs	
Q10 Headv	vater Elevation	1552.75 ft		
Q10 Veloci	ty	1.9 ft/sec		
Q25 Struct	ure Flow	42.9 cfs		
Q25 Heady	vater Elevation	1553.03 ft		
Q25 Veloci	ty	2.1 ft/sec		
Q100 Struc	ture Flow	86.5	cfs	
Q100 Head	water Elevation	1553.94	ft	
Q100 Velocity		2.9	ft/sec	

#### COMMENTS:

No overtopping occurs during Q100 Event.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 3 030	DOT Structure Route: Location:	e Number: N/A 388th Ave 3.1N & 1.1w of Corsica
Local System: Federal Aid Eligibility:	Township Non Federal Aid	ADT	Unknown
USGS Stream Stats Drainage Area Stream Gradient Structure		20.52 Square Miles 0.0001 ft/ft 42" CMP	
Invert Elevation		1548.35	ft
Overtopping Elevation		1552.09	ft
USGS Stream Stats -	Flow Data		
Q2	64 cfs	Q25	839 cfs
Q5	231 cfs	Q50	1250 cfs
Q10	438 cfs	Q100	1760 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1554.37	ft
Q10 Velocit	у	7.07	ft/sec
Q25 Headw	ater Elevation	1554.98	ft
Q25 Velocit	У	7.07	ft/sec
Q100 Head	water Elevation	1555.87 ft	
Q100 Velocity		7.28	ft/sec
Hydro-CAD Modeling	Data		
Q10 Structu	ire Flow	11.1	cfs
Q10 Headwater Elevation		1551.99	ft
Q10 Velocity		1.4	ft/sec
Q25 Structure Flow		11.6	cfs
Q25 Headw	ater Elevation	1552.8	ft
Q25 Velocit	у	1.4	ft/sec
Q100 Struct	ture Flow	11.9	cfs
Q100 Head	water Elevation	1553.78	ft
Q100 Veloc	ity	1.2	ft/sec

# COMMENTS:

Existing pipe is in good condition. Crossing overtops on Q25 Event Closed Basin (National Waterfowl Production Area) located upstream

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 4 30	DOT Structure Number: N/A Route: 386th Ave Location: 3.2N & 3.1W of Corsic	
Local System:	County	ADT	Unknown
Federal Aid Eligibility:	Non Federal Aid		
USGS Stream Stats Drainage Area Stream Gradient Structure		15.3 0.0027 60" CMP	Square Miles ft/ft
Invert Elevation		1549.64	ft
Overtopping Elevation		1554.2	ft
USGS Stream Stats - I	Flow Data		
Q2	57 cfs	Q25	706 cfs
Q5	199 cfs	Q50	1040 cfs
Q10	373 cfs	Q100	1470 cfs
HY-8 Modeling Data			
Q10 Headwater Elevation		1554.74	ft
Q10 Velocity		9.18	ft/sec
Q25 Headwater Elevation		1554.96	ft
Q25 Velocit	y	9.57	ft/sec
Q100 Head	water Elevation	1555.28 ft	
Q100 Velocity		8.48 ft/sec	
Hydro-CAD Modeling [	Data		
Q10 Structu	re Flow	117.8	cfs
Q10 Headw	ater Elevation	1556.22 ft	
Q10 Velocity		6 ft/sec	
Q25 Structu	re Flow	119.1	cfs
Q25 Headw	ater Elevation	1556.86	ft
Q25 Velocit	y	6.1	ft/sec
Q100 Struct	ure Flow	120.5	cfs
Q100 Head	water Elevation	1557.21	ft
Q100 Velocity		6.1	ft/sec

### COMMENTS:

Existing Pipe is in good condition. Crossing overtops during Q1 eent. Closed Basin(National waerfoul production area) has on existing overflow elevation of 1556.5, which is above roadway overtopping section.

#### **RECOMMENDATIONS:**

Install 4'x8' Reinforced concrete box culvert and complete grade raise to increase road overtopping elevation above downstream closed basin overflow. No increase in Q100 is shown at downstream crossing 3.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 5 30	DOT Structure Route: 3 Location: 3	Number: N/A 385th Ave 3.2N & 4.1W of Corsica	
Federal Aid Eligibility:	Non Federal Aid	ADT	JNKNOWN	
USGS Stream Stats Drainage Area Stream Gradient Structure		11.22 Square Miles 0.0020 ft/ft 66" CMP		
Overtopping Elevation		1570.68 f	t	
USGS Stream Stats - I	Flow Data			
Q2	49 cfs	Q25	585 cfs	
Q5	169 cfs	Q50	859 cfs	
Q10	312 cfs	Q100	1200 cfs	
HY-8 Modeling Data				
Q10 Headwater Elevation		1571.09 f	ť	
Q10 Velocit	y	7.79 f	t/sec	
Q25 Headw	ater Elevation	1571.68 f	t	
Q25 Velocit	y	8.57 ft/sec		
Q100 Head	water Elevation	15/3.// π		
Q100 Velocity 10.61 ft/sec		t/sec		
Hydro-CAD Modeling I	Data			
Q10 Structu	re Flow	165.3 c	cfs	
Q10 Headwater Elevation		1570.83 ft		
Q10 Velocit	У 	7.1 ft/sec		
Q25 Structure Flow		168.9 0	cts	
Q25 Headw	ater Elevation	15/1.06 t	t	
Q25 Velocity	У	7.1 t	t/sec	
Q100 Struct		169.6 (	CTS	
Q100 Headwater Elevation		15/1.3/ 1	τ	
Q100 Velocity		7.1 t	t/sec	

## COMMENTS:

Existing pipe is in good condtition. Crossing has minor overtopping during Q10 event.

#### **RECOMMENDATIONS:**

Replace existing pipe with 72" arch pipe equivalent (81" x 59") to allow crossing to meet the Q10 event. No increase in Q100 is shown at downstream crossing 4.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 6 30	DOT Structure Number: N/A Route: 270th St Location: 3.2N & 4.6W of Corsic	
Local System: Federal Aid Eligibility:	Township Non Federal Aid	ADT U	Jnknown
USGS Stream Stats Drainage Area Stream Gradient		10.4 Square Miles 0.0001 ft/ft	
			-4
		1507.551	1 74
		1577.511	L
USGS Stream Stats - I	-low Data		
Q2	48 cfs	Q25	560 cfs
Q5	163 cfs	Q50	821 cfs
Q10	300 cfs	Q100	1140 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1578.48 f	ť
Q10 Velocit	V	7.23 f	t/sec
Q25 Headw	ater Elevation	1581 f	ť
Q25 Velocit	y	9.71 f	t/sec
Q100 Headwater Elevation		1584.27 ft	
Q100 Velocity		12.44 ft/sec	
Hydro-CAD Modeling I	Data		
Q10 Structu	re Flow	61 0	cfs
Q10 Headwater Elevation		1572.79 ft	
Q10 Velocity		5 ft/sec	
Q25 Structure Flow		73.3 0	cfs
Q25 Headw	ater Elevation	1573.23 f	īt
Q25 Velocity		5.3 f	īt/sec
Q100 Struct	ure Flow	61 0	cfs
Q100 Head	water Elevation	1573.82 f	īt
Q100 Velocity		5 f	īt/sec

## COMMENTS:

Existing Pipe is in food condition. Crossing does not overtop during the Q100 event.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 7 30	DOT Structure N Route: 38 Location: 2.6	lumber: N/A 4th Ave 6N & 5.1W of Corsica
Local System: Federal Aid Eligibility:	Township Non Federal Aid	ADT Ur	hknown
USGS Stream Stats Drainage Area Stream Gradient		7 Sc 0.0021 ft/f 60" CMP	juare Miles t
Invert Elevation		1566 02 ft	
Overtopping Elevation		1570.03 ft	
		1070.00 1	
USGS Stream Stats - I	Flow Data		
Q2	40 cfs	Q25	445 cfs
Q5	133 cfs	Q50	646 cfs
Q10	242 cfs	Q100	895 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1570 71 ft	
Q10 Velocit	V	3.39 ft/s	sec
Q25 Headw	, ater Elevation	1571 ft	
Q25 Velocit	V	3.94 ft/s	sec
Q100 Head	, water Elevation	1571.39 ft	
Q100 Velocity		4.53 ft/s	sec
	Data		
010 Structu	re Flow	45.8 cfs	2
Q10 Olluciu Q10 Headw	ater Elevation	1572 79 ft	2
		4 8 ft/s	sec
Q10 Velocity Q25 Structure Flow		45 3 cfs	3
Q25 Headw	ater Elevation	1573.82 ft	
Q25 Velocit	V	4.7 ft/s	sec
Q100 Struct	ure Flow	45.8 cfs	3
Q100 Head	water Elevation	1573.82 ft	
Q100 Velocity		4.8 ft/s	sec

### COMMENTS:

Existing pipe is in fair condition. Pipe is undersized and downstream crossing 6 roadway elevation exceeds crossing 7 by 7' and backwater from crossing 6 controls elevation within crossing 7.

**RECOMMENDATIONS:** 

Option 1: Allow roadway to remain as low water crossing and sign accordingly.

Option 2: Complete grade raise to increase roadway above downstream crossing 6 Q10 headwater elevation.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 8 30	DOT Structure N Route: 38 Location: 2.0	lumber: N/A 3th Ave 6N & 5.6W of Corsica
Local System: Federal Aid Eligibility:	County Non Federal Aid	ADT	115
USGS Stream Stats Drainage Area Stream Gradient Structure		5 Square Miles 0.0009 ft/ft 72" CMP	
Invert Elevation Overtopping Elevation		1569.78 ft 1577.23 ft	
USGS Stream Stats - I	Flow Data		
Q2	35 cfs	Q25	362 cfs
Q5	111 cfs	Q50	522 cfs
Q10	199 cfs	Q100	718 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1576.62 ft	
Q10 Velocit	y	7.93 ft/s	sec
Q25 Headw	ater Elevation	1577.57 ft	
Q25 Velocit	y	8.57 ft/sec	
Q100 Head	water Elevation	1577.85 ft	
Q100 Velocity		8.8 ft/s	Sec
Hydro-CAD Modeling [	Data		
Q10 Structu	re Flow	64.5 cfs	3
Q10 Headwater Elevation		1573.17 ft	
Q10 Velocity		5.7 ft/sec	
Q25 Structure Flow		79.5 cfs	3
Q25 Headw	ater Elevation	1573.6 ft	
Q25 Velocit	y	6 ft/s	sec
Q100 Struct	ure Flow	102.4 cfs	5
Q100 Head	water Elevation	1574.21 ft	
Q100 Velocity		6.4 ft/s	sec

# COMMENTS:

Existing Pipe is in good condition. Crossing does not overtop during Q100 event.
Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 9 30	DOT Structure Number: N/A Route: 270th St Location: 3 2N & 6 8W of Cors		
Local System: Federal Aid Eligibility:	County Non Federal Aid	ADT	80	
USGS Stream Stats D	rainage Area	0.5 Se	quare Miles	
Stream Gradient		0.0009 ft/	ft	
Structure		18" cmp		
Invert Elevation		15/1.4 ft		
Overtopping Elevation		1574.56 π		
USGS Stream Stats -	Flow Data			
Q2	13 cfs	Q25	94 cfs	
Q5	34 cfs	Q50	129 cfs	
Q10	57 cfs	Q100	170 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1575.01 ft		
Q10 Velocit	y	6.68 ft/sec		
Q25 Headw	ater Elevation	1575.1 ft		
Q25 Velocit	у	6.73 ft/sec		
Q100 Head	water Elevation	1575.18 ft		
Q100 Veloc	ity	6.79 ft/	sec	
Hydro-CAD Modeling I	Data			
Q10 Structu	re Flow	9.2 cf	S	
Q10 Headw	ater Elevation	1574.68 ft		
Q10 Velocit	у	5.2 ft/	sec	
Q25 Structu	re Flow	9.4 cf	s	
Q25 Headw	ater Elevation	1574.79 ft		
Q25 Velocit	у	5.3 ft/	sec	
Q100 Struct	ure Flow	9.5 cf	S	
Q100 Head	water Elevation	1574.93 ft		
Q100 Velocity		5.4 ft/	sec	

### COMMENTS:

Existing Pipe is in good condition. Pipe is undersized and crossing overtops during Q5 event.

## **RECOMMENDATIONS:**

Option 1: Install 2 additional 18" CMP (Total of 3) to allow roadway to not overtop during the Q10 event. No increase in Q100 is shown at downstream crossing 8.

Option 2: Install 2-24" CMP to allow roadway to not overtop during the Q10 event. No increase in Q100 is shown at downstream crossing 8.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 10 30	DOT Structure I Route: 3 Location: 2	Number: N/A 82nd Ave .2N & 6.0W of Corsica
Local System: Federal Aid Eligibility:	County Non Federal Aid	ADT U	nknown
USGS Stream Stats D Stream Gradient Structure	rainage Area	2.52 Square Miles 0.0099 ft/ft 42" CMP	
Invert Elevation		1576.28 ft	
Overtopping Elevation		1581.4 ft	
USGS Stream Stats - I	-low Data		
Q2	26 cfs	Q25	245 cfs
Q5	79 cfs	Q50	347 cfs
Q10	138 cfs	Q100	472 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1579.19 ft	
Q10 Velocit	y	4.14 ft/	/sec
Q25 Headw	ater Elevation	1579.3 ft	
Q25 Velocit	y	4.01 ft/	/sec
Q100 Head	water Elevation	1579.48 ft	
Q100 Velocity		4.03 ft	/sec
Hydro-CAD Modeling [	Data		
Q10 Structu	re Flow	45.26 ct	fs
Q10 Headw	ater Elevation	1579.06 ft	
Q10 Velocit	y	4.7 ft/	/sec
Q25 Structu	re Flow	61.55 ct	ÍS
Q25 Headw	ater Elevation	1579.1 ft	
Q25 Velocit	y	4.73 ft/	/sec
Q100 Struct	ure Flow	90.39 ct	s
Q100 Head	water Elevation	1579.15 ft	
Q100 Velocity		4.74 ft/	/sec

# COMMENTS:

Overtops at Q10; undersized or may be ok as low water crossing

**RECOMMENDATIONS:** 

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 10 30	DOT Structure Number: N/A Route: 382nd Ave Location: 2.2N & 6.0W of Cors		
Local System: Federal Aid Eligibility:	County Non Federal Aid	ADT Ur	nknown	
USGS Stream Stats Drainage Area Stream Gradient Structure		2.52 Square Miles 0.0099 ft/ft 42" CMP		
Invert Elevation		1576.28 ft		
Overtopping Elevation		1581.4 ft		
USGS Stream Stats - I	Flow Data			
Q2	26 cfs	Q25	245 cfs	
Q5	79 cfs	Q50	347 cfs	
Q10	138 cfs	Q100	472 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1579.19 ft		
Q10 Velocit	y	4.14 ft/sec		
Q25 Headw	ater Elevation	1579.3 ft		
Q25 Velocit	y	4.01 ft/s	sec	
Q100 Head	water Elevation	1579.48 ft		
Q100 Velocity		4.03 ft/s	sec	
Hydro-CAD Modeling I	Data			
Q10 Structu	re Flow	15.5 cfs	5	
Q10 Headw	ater Elevation	1581.94 ft		
Q10 Velocit	y	3.7 ft/s	sec	
Q25 Structu	re Flow	19 cfs	5	
Q25 Headw	ater Elevation	1582.48 ft		
Q25 Velocit	y	3.9 ft/s	sec	
Q100 Struct	ure Flow	39.5 cfs	S	
Q100 Head	water Elevation	1585.56 ft		
Q100 Velocity		8 ft/s	sec	

# COMMENTS:

Existing Pipe is in good condition. Pipe overtops during Q100 event.

Hydrology Location: Crossing Number: Project Number: 20-10	Garden Valley Ditch 12 30	DOT Structure N Route: 27 Location: 2.	Number: N/A 71st St 2N & 7.5W of Corsica	
Local System: Federal Aid Eligibility:	Township Non Federal Aid	ADT U	nknown	
USGS Stream Stats D Stream Gradient Structure	rainage Area	0.32 Square Miles 0.0017 ft/ft 30" CMP		
Invert Elevation		1579.79 ft		
Overtopping Elevation		1582.76 ft		
USGS Stream Stats - I	Flow Data			
Q2	10.8 cfs	Q25	73.3 cfs	
Q5	27.7 cfs	Q50	99.5 cfs	
Q10	44.8 cfs	Q100	130 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1583.03 ft		
Q10 Velocit	y	5.7 ft/sec		
Q25 Headw	ater Elevation	1583.14 ft		
Q25 Velocit	y	5.42 ft/	/sec	
Q100 Head	water Elevation	1583.28 ft		
Q100 Veloc	ity	5.76 ft/	sec	
Hydro-CAD Modeling I	Data			
Q10 Structu	re Flow	15.5 cf	s	
Q10 Headw	ater Elevation	1582.32 ft		
Q10 Velocit	y	4.3 ft/	/sec	
Q25 Structu	re Flow	19 cf	S	
Q25 Headw	ater Elevation	1582.66 ft		
Q25 Velocit	y	4.5 ft/	/sec	
Q100 Struct	ure Flow	23.3 cf	s	
Q100 Head	water Elevation	1583.35 ft		
Q100 Velocity		4.8 ft/	/sec	

# COMMENTS:

Existing pipe is in fair condition. Pipe overtops during Q50 event.

Hydrology Location: Crossing Number: Project Number: 20-10	Tributary to Platte Creek	DOT Structure Number: 22-049-06 Route: 273rd St		
Local System:	County		265	
Ederal Aid Eligibility:	STP-HPMS	AUT	200	
USGS Stream Stats D	rainage Area	13.72 \$	Square Miles	
Stream Gradient		0.0006 f	ft/ft	
Structure		31' two spa	an Bridge	
Invert Elevation		1583.96 f	ft	
Overtopping Elevation		1589 f	ft	
USGS Stream Stats -	Flow Data			
Q2	53.5 cfs	Q25	658 cfs	
Q5	187 cfs	Q50	970 cfs	
Q10	349 cfs	Q100	1360 cfs	
HY-8 Modeling Data				
Q10 Headw	ater Elevation	1588.81 ft		
Q10 Velocit	v	2.32 ft/sec		
Q25 Headw	ater Elevation	1589.28 f	ft	
Q25 Velocit	v	3.92 ft/sec		
Q100 Head	water Elevation	1590.29 ft		
Q100 Veloc	ity	5.19 ft/sec		
Hydro-CAD Modeling I	Data			
Q10 Structu	re Flow	134.5 (	cfs	
Q10 Headw	ater Elevation	1585.2 f	ft	
Q10 Velocit	v	3.6 f	ft/sec	
Q25 Structu	re Flow	184.2 (	cfs	
Q25 Headw	ater Elevation	1585.53 f	ft	
Q25 Velocit	v	4.1 f	ft/sec	
Q100 Struct	, ure Flow	290.3 0	cfs	
Q100 Head	water Elevation	1586.16 f	ft	
Q100 Veloc	ity	4.9 f	ft/sec	

## COMMENTS:

No overtopping occurs during Q100 event.

Hydrology Location: Crossing Number: Project Number: 20-10	Tributary to Platte Creek 2 )30	k DOT Structure Number: N/A Route: 274Th St	
Local System:	Township	ADT I	Inknown
Federal Aid Eligibility	Non Federal Aid		
USGS Stream Stats D	rainage Area	455	Square Miles
Stream Gradient		0 0030 f	
Structure		30" CMP	
Invert Elevation		1591 23 f	7
Overtopping Elevation		1596 16 f	- T
		1000.101	
USGS Stream Stats -	Flow Data		
Q2	33 cfs	Q25	344 cfs
Q5	106 cfs	Q50	494 cfs
Q10	190 cfs	Q100	679 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1596.83 f	ťt
Q10 Velocit	У	9.17 f	t/sec
Q25 Headw	vater Elevation	1597.03 f	īt
Q25 Velocit	y	9.32 f	t/sec
Q100 Head	water Elevation	1597.27 ft	
Q100 Veloc	ity	9.5 ft/sec	
	-		
Hydro-CAD Modeling	Data		
Q10 Structu	Ire Flow	57.9 d	cfs
Q10 Headw	ater Elevation	1596.28 f	īt
Q10 Velocit	Q10 Velocity		īt/sec
Q25 Structu	ire Flow	58.3 0	ofs
Q25 Headw	ater Elevation	1596.31 f	ft
Q25 Velocit	y	6.1 f	t/sec
Q100 Struct	ture Flow	58.7 0	cfs
Q100 Head	water Elevation	1596.35 f	īt
Q100 Veloc	ity	6.1 f	t/sec

### COMMENTS:

Overtoping occurs during Q2 event. Existing pipe is in good condition but is silted in.

### **RECOMMENDATIONS:**

Option 1: Install one additional 30" CMP (2 total) and roadway will still have minor overtopping occurance during Q10 event. Remove sediment from existing pipe. No increase is shown downstream at crossing 1 during Q100 event.

Option 2: Replace existing pipe with 2-36" CMP to allow roadway to not overtop during Q10 event. No increase is shown downstream at crossing 1 during Q100 event.

Hydrology Location: Crossing Number: Project Number: 20-10	Tributary to Platte Creek 3 )30	DOT Structure Number: N/A Route: 276th St	
Local System:	Township	ADT I	N/A
Federal Aid Fligibility	Non Federal Aid		
r odorar / lid Englorinty.			
USGS Stream Stats D	rainage Area	3.5 \$	Square Miles
Stream Gradient		0.0019 f	īt/ft
Structure		30" x 40' R	СР
Invert Elevation		1603.35 f	ft
Overtopping Elevation		1609 f	īt
USGS Stream Stats -	Flow Data		
Q2	29.9 cfs	Q25	296 cfs
Q5	93 cfs	Q50	424 cfs
Q10	165 cfs	Q100	579 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	1609.89 f	Ĩt
Q10 Velocit	У	11.87 f	īt/sec
Q25 Headw	ater Elevation	1610.18 f	Ĩt .
Q25 Velocit	У	12.09 f	t/sec
Q100 Head	water Elevation	1610.59 ft	
Q100 Veloc	ity	12.4 ft/sec	
Hydro-CAD Modeling	Data		
Q10 Structu	ire Flow	37.5 0	cfs
Q10 Headw	ater Elevation	1608.24 f	Ĩt
Q10 Velocit	У	6.1 f	t/sec
Q25 Structu	ire Flow	48.3 0	ofs
Q25 Headw	ater Elevation	1609.05 f	īt
Q25 Velocit	у	6.8 f	t/sec
Q100 Struc	ture Flow	51.7 c	cfs
Q100 Head	water Elevation	1609.2 f	īt
Q100 Veloc	ity	7.3 f	t/sec

# COMMENTS:

No overtopping during Q10 event. Existing pipe is in good condition.

Hydrology Location: Crossing Number:	Tributary to Platte Creek	C DOT Structure Number: N/A Route: HWY 44			
Project Number: 20-1	030	Location: 3.0	S &2.6E of New Holland		
Local System:	State	ADT N/A	A		
Federal Aid Eligibility:	STP-HPMS				
USGS Stream Stats I	Drainage Area	1.9 Sq	uare Miles		
Stream Gradient		0.0053 ft/ft			
Structure		48" RCP			
Invert Elevation		1628.84 ft			
Overtopping Elevation	1	1634.4 ft			
USGS Stream Stats -	Flow Data				
Q2	23 cfs	Q25	207 cfs		
Q5	68 cfs	Q50	292 cfs		
Q10	118 cfs	Q100	394 cfs		
HY-8 Modeling Data					
Q10 Head	water Elevation	1634.63 ft			
Q10 Veloci	ity	11.11 ft/s	11.11 ft/sec		
Q25 Head	water Elevation	1635.05 ft			
Q25 Veloc	ity	11.34 ft/s	ec		
Q100 Head	dwater Elevation	1635.38 ft			
Q100 Velo	city	11.52 ft/s	ес		
Hvdro-CAD Modeling	Data				
Q10 Struct	ure Flow	20.3 cfs			
Q10 Head	water Elevation	1630.86 ft			
Q10 Veloc	ity	4.7 ft/s	ec		
Q25 Struct	ure Flow	27.7 cfs			
Q25 Head	water Elevation	1631.23 ft			
Q25 Veloc	itv	5.1 ft/s	ec		
Q100 Struc	cture Flow	43 cfs			
Q100 Head	dwater Elevation	1631.92 ft			
Q100 Velo	city	5.7 ft/s	ec		
		•			

COMMENTS: No overtopping during Q100 event.

Hydrology Location: Crossing Number: Project Number: 20-10 Local System: Federal Aid Eligibility:	Tributary to Platte Creek 5 30 County Non Federal Aid	DOT Structure Number: N/A Route: 381st Ave Location: 3.5S & 2.4E of New Ho ADT N/A	
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		1.52 0.0049 2-36" CM 1642.64 1647.3	2 Square Miles 9 ft/ft P 9 ft 9 ft
USGS Stream Stats -	Flow Data		
Q2	21 cfs	Q25	182 cfs
Q5	61 cfs	Q50	256 cfs
Q10	105 cfs	Q100	344 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	N/A	ft
Q10 Velocit	у	N/A	ft/sec
Q25 Headw	vater Elevation	N/A	ft
Q25 Velocit	у	N/A	ft/sec
Q100 Head	water Elevation	N/A	ft
Q100 Veloc	ity	N/A	ft/sec
Hvdro-CAD Modeling	Data		
Q10 Structu	Ire Flow	N/A	cfs
Q10 Headw	ater Elevation	1646.11	ft
Q10 Velocit	V	N/A	ft/sec
Q25 Structu	ire Flow	N/A	cfs
Q25 Headw	ater Elevation	1646.47	ft
Q25 Velocit	V	N/A	ft/sec
Q100 Struct	ture Flow	N/A	cfs
Q100 Head	water Elevation	1646.62	ft
Q100 Veloc	ity	N/A	ft/sec

## COMMENTS:

Basin overflow elevation is 1646 to the northeast of crossing. Existing road elevation is 1647.3 Existing pipes are both 36" CMP in fair condition. Pipes currently function as equalization.

### **RECOMMENDATIONS:**

Complete 450 feet of Channel cleanout north east of northern 36" CMP to a minimum elevation of 1644.

Hydrology Location: Crossing Number:	Tributary to Platte Creek 6	DOT Structure Number: N/A Route: 381st ave		
Project Number: 20-1	030	Location:	1.0S &2.1E of New Holland	
Local System:	Township	ADT	N/A	
Federal Aid Eligibility:	Non Federal Aid			
USGS Stream Stats [	Drainage Area	0.24	Square Miles	
Stream Gradient		0.0014	ft/ft	
Structure		None		
Invert Elevation		N/A	ft	
Overtopping Elevation	ו	1589	ft	
USGS Stream Stats -	Flow Data			
Q2	9.6 cfs	Q25	62 cfs	
Q5	23.9 cfs	Q50	84 cfs	
Q10	38 cfs	Q100	109 cfs	
HY-8 Modeling Data				
Q10 Heady	water Elevation	N/A	ft	
Q10 Veloci	tv	N/A	ft/sec	
Q25 Heady	water Elevation	N/A	ft	
Q25 Veloci	itv	N/A	ft/sec	
Q100 Head	dwater Elevation	N/A	ft	
Q100 Velo	city	N/A	ft/sec	
Hydro-CAD Modeling	Data			
010 Struct	ure Flow	N/A	cfs	
Q10 Under Q10 Heady	water Elevation	1585 51	ft	
Q10 Veloci	tv	N/A	ft/sec	
Q25 Struct	ure Flow	N/A	cfs	
Q25 Head	water Elevation	1585 99	ft	
Q25 Veloci	tv	N/A	ft/sec	
0100 Strue	sture Flow	N/A	cfs	
Q100 Hear	dwater Elevation	1586 77	ft	
Q100 Velo	citv	N/A	ft/sec	
2.00 1010	,			

### COMMENTS:

Closed Basin, No outlet. Basin overflow elevation is 1593 to the northeast of crossing. Existing road elevation is 1589.

## **RECOMMENDATIONS:**

Option 1: Complete Grade Raise to Elevation 1595 on 274th St for 1800 Linear feet and on 381st Ave for 1550 linear feet. Install 18" CMP equalization culverts on both 274th St and 381st Ave.

Option 2: Complete grade raise to 3' above current water elevation and install equalization culverts.

Hydrology Location: Crossing Number:	Tributary 7	to Platte Creek	DOT Structure Number: N/A Route: 380th Ave		: N/A e
Project Number: 20-10	)30		Location: (	0.9S &1.0	DE of New Holland
Local System:	Township	)	ADT I	N/A	
Federal Aid Eligibility:	Non Fede	eral Aid			
USGS Stream Stats D	rainage Ar	ea	6.1 \$	Square N	liles
Stream Gradient			0.0009 f	ft/ft	
Structure			24" CMP		
Invert Elevation			1587.47 f	ft	
Overtopping Elevation			1589.84 f	ft	
USGS Stream Stats -	Flow Data				
Q2	#N/A	cfs	Q25	#N/A	cfs
Q5	#N/A	cfs	Q50	#N/A	cfs
Q10	#N/A	cfs	Q100	#N/A	cfs
HY-8 Modeling Data					
Q10 Headw	ater Eleva	tion	1591.15 f	ft	
Q10 Velocit	у		8.67 ft/sec		
Q25 Headw	ater Eleva	tion	1591.27 f	ft	
Q25 Velocit	у		8.8 f	ft/sec	
Q100 Head	water Elev	ation	1591.46 ft		
Q100 Veloc	ity		9.03 ft/sec		
Hydro-CAD Modeling	Data				
Q10 Structu	ire Flow		6.9 0	cfs	
Q10 Headw	ater Eleva	tion	1589.22 f	ft	
Q10 Velocit	у		3 f	ft/sec	
Q25 Structu	ire Flow		8.9 (	cfs	
Q25 Headw	ater Eleva	tion	1589.55 f	ft	
Q25 Velocit	у		3.3 f	ft/sec	
Q100 Struc	ture Flow		10.6 0	cfs	
Q100 Head	water Elev	ation	1589.87 f	ft	
Q100 Veloc	ity		3.5 f	ft/sec	

COMMENTS: No overtopping during Q25 event.

# **RECOMMENDATIONS:**

Replace 12" CMP in poor condition located south of intersection on 380th ave. with a 18" CMP.

Hydrology Location: Crossing Number: Project Number: 20-10 Local System: Federal Aid Eligibility:	Tributary to Platte Creek 8 30 Township Non Federal Aid	DOT Structu Route Location ADT	re Number: N/A : 275th St : 2.0S &1.6E OF NEW HOLLANI N/A
USGS Stream Stats Drainage Area Stream Gradient Structure Invert Elevation Overtopping Elevation		2.87 0.0009 No Pipe o N/A 1605	7 Square Miles 9 ft/ft overflows away from road ft 5 ft
USGS Stream Stats -   Q2 Q5	Flow Data 27.5 cfs 84.5 cfs	Q25 Q50	264 cfs 376 cfs
Q10	148 cfs	Q100	512 cfs
HY-8 Modeling Data			
Q10 Headw	ater Elevation	N/A	ft
Q10 Velocit	y	N/A	ft/sec
Q25 Headw	ater Elevation	N/A	ft
Q25 Velocit	y	N/A	ft/sec
Q100 Head	water Elevation	N/A	ft
Q100 Veloc	ity	N/A	ft/sec
Hydro-CAD Modeling I	Data		
Q10 Structu	re Flow	N/A	cfs
Q10 Headw	ater Elevation	1602.77	7 ft
Q10 Velocit	y	N/A	ft/sec
Q25 Structu	re Flow	N/A	cfs
Q25 Headw	ater Elevation	1603.22	2 ft
Q25 Velocit	y	N/A	ft/sec
Q100 Struct	ure Flow	N/A	cfs
Q100 Head	water Elevation	1603.94	4 ft
Q100 Veloc	ity	N/A	ft/sec

## COMMENTS:

No pipe exists within roadway. Roadway acts as overtopping section for crossing 9 closed basin. Closed basin true overtopping location is approximately 450' north of crossing 8 and has an overtopping elevation of 1604.5

## **RECOMMENDATIONS:**

Option 1: Install 18" CMP equalization pipe to allow water from north side of crossing to drain back into closed basin during low water events and equalization during high events. Option 2: Install 18 CMP equalization pipe and complete channel cleanout from roadway to approximately 2000 feet north(downstream) to lower overtopping elevation of closed basin to 1602.5 which will prevent roadway from being inundated. No increase in elevation at downstream crossing 7 is shown during Q100 event.

Hydrology Location: Crossing Number: Project Number: 20-10 Local System: Federal Aid Eligibility:	Tributary to Platte Creek 9 )30 Township Non Federal Aid	DOT Structur Route: Location: ADT	e Number: 380th Ave 2.5S & 1.0 N/A	N/A )E of New Holland
USGS Stream Stats D Stream Gradient Structure Invert Elevation Overtopping Elevation	rainage Area	0.96 0.0001 No pipe N/A 1605	Square Mi ft/ft ft ft	les
USGS Stream Stats -	Flow Data			
Q2	17.3 cfs	Q25	139	cfs
Q5	48.4 cfs	Q50	194	cfs
Q10	81.6 cfs	Q100	258	cfs
HY-8 Modeling Data				
Q10 Headw	ater Elevation	N/A	ft	
Q10 Velocit	V	N/A	ft/sec	
Q25 Headw	vater Elevation	N/A	ft	
Q25 Velocit	V	N/A	ft/sec	
Q100 Head	water Elevation	N/A	ft	
Q100 Veloc	ity	N/A	ft/sec	
Hvdro-CAD Modelina	Data			
Q10 Structu	Ire Flow	N/A	cfs	
Q10 Headw	ater Elevation	1602.77	ft	
Q10 Velocit	V	N/A	ft/sec	
Q25 Structu	ire Flow	N/A	cfs	
Q25 Headw	ater Elevation	1603.22	ft	
Q25 Velocit	V	N/A	ft/sec	
Q100 Struct	ture Flow	N/A	cfs	
Q100 Head	water Elevation	1603.94	ft	
Q100 Veloc	ity	N/A	ft/sec	

## COMMENTS:

Closed basin and a national waterfowl production area. No flow leaves basin during all rain events. No pipe located within section line trail. Closed basin overtopping elevation 1605 located at crossing 8 roadtop.



Douglas County Crossing Number: 1 Location: 1.5 Mi. N. & 3.7 Mi. W. of Armour, SD 40' Concrete Bridge

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$56,958.05	\$56,958.05
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	2000	CY	\$12.00	\$24,000.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$8,000.00	\$8,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
8	Erosion Control	1	LS	\$20,000.00	\$20,000.00
9	Remove/Salvage Existing Structure	1	LS	\$15,000.00	\$15,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$16,970.50	\$16,970.50
12	Structure Excavation, Bridge	150	CY	\$200.00	\$30,000.00
13	Bridge End Embankment	300	CY	\$40.00	\$12,000.00
14	Granular Bridge End Backfill	30	CY	\$150.00	\$4,500.00
15	Class A45 Concrete, Bridge Deck	75	CY	\$1,250.00	\$93,750.00
16	Class A45 Concrete, Bridge	69	CY	\$1,200.00	\$82,800.00
17	Type T101 Bridge Railing	97	Ft	\$200.00	\$19,400.00
18	Reinforcing Steel	10000	Lb	\$1.50	\$15,000.00
19	Epoxy Coated Reinforcing Steel	22600	Lb	\$1.60	\$36,160.00
20	Preboring Pile	40	Ft	\$40.00	\$1,600.00
21	HP 10x42 Steel Test Pile, Furnish & Drive	200	Ft	\$100.00	\$20,000.00
22	HP 10x42 Steel Bearing Pile, Furnish & Drive	1280	Ft	\$50.00	\$64,000.00
23	4" Underdrain Pipe	140	Ft	\$25.00	\$3,500.00
24	Porous Backfill	32	Ton	\$100.00	\$3,200.00
25	Class B Riprap	1000	Ton	\$70.00	\$70,000.00
26	Type B Drainage Fabric	800	SY	\$4.00	\$3,200.00
				Total	\$626.538.55

#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal \$62,653.86 \$37,592.31 Subtotal \$100,246.17



Douglas County Crossing Number: 2 Location: 2.0 Mi. N. & 3.6 Mi. W. of Armour, SD 25' Concrete Bridge

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$47,304.88	\$47,304.88
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	2000	CY	\$12.00	\$24,000.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$8,000.00	\$8,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
8	Erosion Control	1	LS	\$20,000.00	\$20,000.00
9	Remove/Salvage Existing Structure	1	LS	\$15,000.00	\$15,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$12,373.75	\$12,373.75
12	Structure Excavation, Bridge	150	CY	\$200.00	\$30,000.00
13	Bridge End Embankment	300	CY	\$40.00	\$12,000.00
14	Granular Bridge End Backfill	30	CY	\$150.00	\$4,500.00
15	Class A45 Concrete, Bridge Deck	48	CY	\$1,250.00	\$60,000.00
16	Class A45 Concrete, Bridge	43	CY	\$1,200.00	\$51,600.00
17	Type T101 Bridge Railing	61	Ft	\$200.00	\$12,200.00
18	Reinforcing Steel	6250	Lb	\$1.50	\$9,375.00
19	Epoxy Coated Reinforcing Steel	14125	Lb	\$1.60	\$22,600.00
20	Preboring Pile	25	Ft	\$40.00	\$1,000.00
21	HP 10x42 Steel Test Pile, Furnish & Drive	200	Ft	\$100.00	\$20,000.00
22	HP 10x42 Steel Bearing Pile, Furnish & Drive	1280	Ft	\$50.00	\$64,000.00
23	4" Underdrain Pipe	140	Ft	\$25.00	\$3,500.00
24	Porous Backfill	32	Ton	\$100.00	\$3,200.00
25	Class B Riprap	1000	Ton	\$70.00	\$70,000.00
26	Type B Drainage Fabric	800	SY	\$4.00	\$3,200.00
				Total	\$520.353.63

#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal \$52,035.36 \$31,221.22 Subtotal \$83,256.58



Douglas County Crossing Number: 3 Location: 3.0 Mi. N. & 3.8 Mi. W. of Armour, SD 20' Concrete Bridge

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$43,892.90	\$43,892.90
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	2000	CY	\$12.00	\$24,000.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$8,000.00	\$8,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
8	Erosion Control	1	LS	\$20,000.00	\$20,000.00
9	Remove/Salvage Existing Structure	1	LS	\$15,000.00	\$15,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$10,749.00	\$10,749.00
12	Structure Excavation, Bridge	150	CY	\$200.00	\$30,000.00
13	Bridge End Embankment	300	CY	\$40.00	\$12,000.00
14	Granular Bridge End Backfill	30	CY	\$150.00	\$4,500.00
15	Class A45 Concrete, Bridge Deck	38	CY	\$1,250.00	\$47,500.00
16	Class A45 Concrete, Bridge	34	CY	\$1,200.00	\$40,800.00
17	Type T101 Bridge Railing	48	Ft	\$200.00	\$9,600.00
18	Reinforcing Steel	5000	Lb	\$1.50	\$7,500.00
19	Epoxy Coated Reinforcing Steel	11300	Lb	\$1.60	\$18,080.00
20	Preboring Pile	20	Ft	\$40.00	\$800.00
21	HP 10x42 Steel Test Pile, Furnish & Drive	200	Ft	\$100.00	\$20,000.00
22	HP 10x42 Steel Bearing Pile, Furnish & Drive	1280	Ft	\$50.00	\$64,000.00
23	4" Underdrain Pipe	140	Ft	\$25.00	\$3,500.00
24	Porous Backfill	32	Ton	\$100.00	\$3,200.00
25	Class B Riprap	1000	Ton	\$70.00	\$70,000.00
26	Type B Drainage Fabric	800	SY	\$4.00	\$3,200.00
				Total	\$482.821.90

#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal \$48,282.19 \$28,969.31 Subtotal \$77,251.50

	2309 W. 50th Street Sioux Fails, SD 57105 Ph: 605.336.1676
ARCHITECTURE	NGINEERING, INC. ENGINEERING SURVEYING

#### Douglas County Crossing Number: 4 Location: 0.5 Mi. W. of JCT US 281 N 80' Concrete Bridge

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$83,844.35	\$83,844.35
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	2000	CY	\$12.00	\$24,000.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$8,000.00	\$8,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
8	Erosion Control	1	LS	\$20,000.00	\$20,000.00
9	Remove/Salvage Existing Structure	1	LS	\$15,000.00	\$15,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$29,773.50	\$29,773.50
12	Structure Excavation, Bridge	150	CY	\$200.00	\$30,000.00
13	Bridge End Embankment	300	CY	\$40.00	\$12,000.00
14	Granular Bridge End Backfill	30	CY	\$150.00	\$4,500.00
15	Class A45 Concrete, Bridge Deck	153	CY	\$1,250.00	\$191,250.00
16	Class A45 Concrete, Bridge	137	CY	\$1,200.00	\$164,400.00
17	Type T101 Bridge Railing	218	Ft	\$200.00	\$43,600.00
18	Reinforcing Steel	20000	Lb	\$1.50	\$30,000.00
19	Epoxy Coated Reinforcing Steel	45200	Lb	\$1.60	\$72,320.00
20	Preboring Pile	80	Ft	\$40.00	\$3,200.00
21	HP 10x42 Steel Test Pile, Furnish & Drive	200	Ft	\$100.00	\$20,000.00
22	HP 10x42 Steel Bearing Pile, Furnish & Drive	1280	Ft	\$50.00	\$64,000.00
23	4" Underdrain Pipe	140	Ft	\$25.00	\$3,500.00
24	Porous Backfill	32	Ton	\$100.00	\$3,200.00
25	Class B Riprap	1000	Ton	\$70.00	\$70,000.00
26	Type B Drainage Fabric	800	SY	\$4.00	\$3,200.00
				Total	\$922.287.85

#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal \$92,228.79 \$55,337.27 Subtotal \$147,566.06



Douglas County Crossing Number: 5 Location: 1.0 Mi. S. & 0.5 Mi. W. of Corsica, SD 24' Concrete Bridge

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$46,588.88	\$46,588.88
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	2000	CY	\$12.00	\$24,000.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$8,000.00	\$8,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
8	Erosion Control	1	LS	\$20,000.00	\$20,000.00
9	Remove/Salvage Existing Structure	1	LS	\$15,000.00	\$15,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$12,032.80	\$12,032.80
12	Structure Excavation, Bridge	150	CY	\$200.00	\$30,000.00
13	Bridge End Embankment	300	CY	\$40.00	\$12,000.00
14	Granular Bridge End Backfill	30	CY	\$150.00	\$4,500.00
15	Class A45 Concrete, Bridge Deck	46	CY	\$1,250.00	\$57,500.00
16	Class A45 Concrete, Bridge	41	CY	\$1,200.00	\$49,200.00
17	Type T101 Bridge Railing	58	Ft	\$200.00	\$11,600.00
18	Reinforcing Steel	6000	Lb	\$1.50	\$9,000.00
19	Epoxy Coated Reinforcing Steel	13560	Lb	\$1.60	\$21,696.00
20	Preboring Pile	24	Ft	\$40.00	\$960.00
21	HP 10x42 Steel Test Pile, Furnish & Drive	200	Ft	\$100.00	\$20,000.00
22	HP 10x42 Steel Bearing Pile, Furnish & Drive	1280	Ft	\$50.00	\$64,000.00
23	4" Underdrain Pipe	140	Ft	\$25.00	\$3,500.00
24	Porous Backfill	32	Ton	\$100.00	\$3,200.00
25	Class B Riprap	1000	Ton	\$70.00	\$70,000.00
26	Type B Drainage Fabric	800	SY	\$4.00	\$3,200.00
				Total	\$512.477.68

#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal \$51,247.77 \$30,748.66 Subtotal \$81,996.43

A 2309 W. 50th Street Sour Fails, SD 57105 Ph: 095-338.1676 Ph: 095-338.1676 Ph: 095-338.1676 Ph: 095-338.1676 Ph: 095-338.1676

#### Douglas County Crossing Number: 6A Location: 1.0 Mi. W. of Corsica, SD 55' Concrete Bridge

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$67,004.98	\$67,004.98
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	2000	CY	\$12.00	\$24,000.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$8,000.00	\$8,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
8	Erosion Control	1	LS	\$20,000.00	\$20,000.00
9	Remove/Salvage Existing Structure	1	LS	\$15,000.00	\$15,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$21,754.75	\$21,754.75
12	Structure Excavation, Bridge	150	CY	\$200.00	\$30,000.00
13	Bridge End Embankment	300	CY	\$40.00	\$12,000.00
14	Granular Bridge End Backfill	30	CY	\$150.00	\$4,500.00
15	Class A45 Concrete, Bridge Deck	105	CY	\$1,250.00	\$131,250.00
16	Class A45 Concrete, Bridge	95	CY	\$1,200.00	\$114,000.00
17	Type T101 Bridge Railing	133	Ft	\$200.00	\$26,600.00
18	Reinforcing Steel	13750	Lb	\$1.50	\$20,625.00
19	Epoxy Coated Reinforcing Steel	31075	Lb	\$1.60	\$49,720.00
20	Preboring Pile	55	Ft	\$40.00	\$2,200.00
21	HP 10x42 Steel Test Pile, Furnish & Drive	200	Ft	\$100.00	\$20,000.00
22	HP 10x42 Steel Bearing Pile, Furnish & Drive	1280	Ft	\$50.00	\$64,000.00
23	4" Underdrain Pipe	140	Ft	\$25.00	\$3,500.00
24	Porous Backfill	32	Ton	\$100.00	\$3,200.00
25	Class B Riprap	1000	Ton	\$70.00	\$70,000.00
26	Type B Drainage Fabric	800	SY	\$4.00	\$3,200.00
				Total	\$737,054.73

#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal \$73,705.47 \$44,223.28 Subtotal \$117,928.76



### Douglas County Crossing Number: 6B Location: 0.1 Mi. N. & 1.0 Mi. W. of Corsica, SD 54" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,188.40	\$2,188.40
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	10	Ton	\$40.00	\$400.00
4	54" CMP, Furnish	30	Ft	\$278.50	\$8,355.00
5	54" CMP, Install	30	Ft	\$120.00	\$3,600.00
6	54" CMP Flared End, Furnish	2	Each	\$1,784.00	\$3,568.00
7	54" CMP Flared End, Install	2	Each	\$663.00	\$1,326.00
8	Unclassified Excavation	170	CuYd	\$8.00	\$1,360.00
9	8" Gravel Surfacing	27	Ton	\$25.00	\$675.00
10	Existing Culvert Removal and Disposal	30	Ft	\$20.00	\$600.00
				Total	\$24,072.40

Estimated Total Site Cost	\$32,738.46
Subtota	l \$4,814.48
Construction Engineering	\$2,407.24
Design Engineering	\$2,407.24
Design and Construction Management Services	
Subtota	l \$3,851.58
6% Admin / Legal	\$1,444.34
10% Contingency	\$2,407.24
Contingency / Admin & Legal Fees	



## Douglas County Crossing Number: 7 Location: 1.0 Mi. N. & 2.0 Mi. W. of Corsica, SD 2 - 30" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,653.55	\$1,653.55
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	14.5	Ton	\$40.00	\$580.00
4	30" CMP, Furnish	80	Ft	\$49.20	\$3,936.00
5	30" CMP, Install	80	Ft	\$35.27	\$2,821.60
6	30" CMP Flared End, Furnish	4	Each	\$540.67	\$2,162.68
7	30" CMP Flared End, Install	4	Each	\$318.92	\$1,275.68
8	Unclassified Excavation	134	CuYd	\$8.00	\$1,072.00
9	8" Gravel Surfacing	43.5	Ton	\$25.00	\$1,087.50
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$18,189.01

Estimated Total Project Cost		\$24,737.05
	Subtotal	\$3,637.80
Construction Engineering		\$1,818.90
Design Engineering		\$1 <i>,</i> 818.90
Design and Construction Management Services		
	Subtotal	\$2,910.24
6% Admin / Legal		\$1,091.34
10% Contingency		\$1,818.90
Contingency / Admin & Legal Fees		



## Douglas County Crossing Number: 8 Location: 0.2 Mi. N. & 2.8 Mi. W. of Corsica, SD 2 - 7' x 4' Reinforced Concrete Box Culverts

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$18,217.80	\$18,217.80
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	467	CY	\$12.00	\$5,604.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$4,000.00	\$4,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	4" Asphalt Concrete Surfacing	42	TON	\$175.00	\$7,350.00
8	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
9	Erosion Control	1	LS	\$5,000.00	\$5,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$4,100.00	\$4,100.00
12	Structure Excavation, Box Culvert	320	CY	\$45.00	\$14,400.00
13	Box Culvert Undercut	56	CY	\$120.00	\$6,720.00
14	7'x4' Precast Concrete Box Culvert, Furnish	80	FT	\$500.00	\$40,000.00
15	7'x4' Precast Concrete Box Culvert, Install	80	FT	\$150.00	\$12,000.00
16	7'x4' Precast Concrete Box Culvert End Section, Furnish	4	EACH	\$6,000.00	\$24,000.00
17	7'x4' Precast Concrete Box Culvert End Section, Install	4	EACH	\$1,500.00	\$6,000.00
18	Class B Riprap	135	TON	\$70.00	\$9,450.00
19	Type B Drainage Fabric	12	SY	\$4.50	\$54.00
20	Diversion Channel	1	LS	\$12,000.00	\$12,000.00
21	Remove/Salvage Existing Structure	1	LS	\$5,000.00	\$5,000.00
				Total	\$200,395.80

Contingency / Admin & Legal Fees		
10% Contingency		\$20,039.58
6% Admin / Legal		\$12,023.75
	Subtotal	\$32,063.33
Design and Construction Management Services		
Design Engineering		\$20,039.58
Construction Engineering		\$20,039.58
	Subtotal	\$40,079.16
Estimated Total Project Cost		\$272,538.29

2009 W. 50th Street Souck Fails, SD 57105 PR: 605.33.6767 Crossing Number: 9 Location: 3.2 Mi. W. of Corsica, SD 2 - 36" CMP Culvert						
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	
1	Mobilization	1	LS	\$1,928.66	\$1,928.66	
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00	
3	Pipe Bedding	17.4	Ton	\$40.00	\$696.00	
4	36" CMP, Furnish	80	Ft	\$55.00	\$4,400.00	
5	36" CMP, Install	80	Ft	\$25.15	\$2,012.00	
6	36" CMP Flared End, Furnish	4	Each	\$891.90	\$3,567.60	
7	36" CMP Flared End, Install	4	Each	\$588.00	\$2,352.00	
8	Unclassified Excavation	173	CuYd	\$8.00	\$1,384.00	
9	8" Gravel Surfacing	51	Ton	\$25.00	\$1,275.00	
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00	
				Total	\$21,215.26	
	Contingency / Adm	in & Legal Fees				
	10	0% Contingency			\$2,121.53	
6% Admin / Legal				\$1,272.92		
				Subtotal	\$3,394.44	
	Design and Construction Management Services					
	Des	ign Engineering			\$2,121.53	
	Construct	ion Engineering			\$2,121.53	
				Subtotal	\$4,243.05	

Estimated Total Project Cost

\$28,852.75



## Douglas County Crossing Number: 10 Location: 0.5 Mi. N. & 4.2 Mi. W. of Corsica, SD 2 - 24" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,339.63	\$1,339.63
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	11.6	Ton	\$40.00	\$464.00
4	24" CMP, Furnish	80	Ft	\$42.20	\$3,376.00
5	24" CMP, Install	80	Ft	\$24.10	\$1,928.00
6	24" CMP Flared End, Furnish	4	Each	\$264.24	\$1,056.96
7	24" CMP Flared End, Install	4	Each	\$248.97	\$995.88
8	Unclassified Excavation	111	CuYd	\$8.00	\$888.00
9	8" Gravel Surfacing	43.5	Ton	\$25.00	\$1,087.50
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$14,735.97

Estimated Total Project Cost		\$20,040.92
	Subtotal	\$2,947.19
Construction Engineering		\$1,473.60
Design Engineering		\$1,473.60
Design and Construction Management Services		
	Subtotal	\$2,357.76
6% Admin / Legal		\$884.16
10% Contingency		\$1,473.60
Contingency / Admin & Legal Fees		



## Douglas County Crossing Number: 11 Location: 1.2 Mi. N. & 4.7 Mi. W. of Corsica, SD

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1					
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20					

Contingency / Admin & Legal Fees		
10% Contingency		\$0.00
6% Admin / Legal		\$0.00
	Subtotal	\$0.00
Design and Construction Management Services		
Design Engineering		\$0.00
Construction Engineering		\$0.00
	Subtotal	\$0.00
Estimated Total Project Cost		\$0.00



## Douglas County Crossing Number: 12 Location: 1.8 Mi. S. & 5.2 Mi. W. of Corsica, SD 24" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$719.29	\$719.29
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	5.8	Ton	\$40.00	\$232.00
4	24" CMP, Furnish	40	Ft	\$42.20	\$1,688.00
5	24" CMP, Install	40	Ft	\$24.10	\$964.00
6	24" CMP Flared End, Furnish	2	Each	\$264.24	\$528.48
7	24" CMP Flared End, Install	2	Each	\$248.97	\$497.94
8	Unclassified Excavation	15	CuYd	\$8.00	\$120.00
9	8" Gravel Surfacing	14.5	Ton	\$25.00	\$362.50
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$7,912.21

Contingency / Admin & Legal Fees		
10% Contingency		\$791.22
6% Admin / Legal		\$474.73
S	ubtotal	\$1,265.95
Design and Construction Management Services		
Design Engineering		\$791.22
Construction Engineering		\$791.22
S	ubtotal	\$1,582.44
Estimated Total Project Cost		\$10,760.61

2309 W. 50th Street Sidux Fails, SD 57105 Ph: 605,336,1676 PMOSZ ENGINEERING, INC.
ENGINEERING, INC. ENGINEERING SURVEYING

## Douglas County Crossing Number: 13 Location: 2.7 Mi. S. & 5.2 Mi. W. of Corsica, SD 36" RCP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,767.38	\$1,767.38
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	8.7	Ton	\$40.00	\$348.00
4	36" RCP Class 2, Furnish	40	Ft	\$44.65	\$1,786.00
5	36" RCP, Install	40	Ft	\$48.12	\$1,924.80
6	36" RCP Sloped End, Furnish	2	Each	\$600.00	\$1,200.00
7	36" RCP Sloped End, Install	2	Each	\$500.00	\$1,000.00
8	Unclassified Excavation	200	CuYd	\$8.00	\$1,600.00
9	12" Gravel Surfacing	98.6	Ton	\$25.00	\$2,465.00
10	4" Asphalt Concrete Surfacing	26	Ton	\$175.00	\$4,550.00
11	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$19,441.18

Contingency / Admin & Legal Fees		
10% Contingency		\$1,944.12
6% Admin / Legal		\$1,166.47
	Subtotal	\$3,110.59
Design and Construction Management Services		
Design Engineering		\$1,944.12
Construction Engineering		\$1,944.12
	Subtotal	\$3,888.24
Estimated Total Project Cost		\$26,440.00

2309 W. 50th Street Sioux Fails, SD 57105 Ph: 605,336.1676
NGINEERING, INC. Engineering surveying

## Douglas County Crossing Number: 14 Location: 3.8 Mi. S. & 1.4 Mi. W. of Corsica, SD 48" & 36" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,578.43	\$2,578.43
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	20.3	Ton	\$40.00	\$812.00
4	36" CMP, Furnish	40	Ft	\$55.00	\$2,200.00
5	36" CMP, Install	40	Ft	\$25.15	\$1,006.00
6	48" CMP, Furnish	40	Ft	\$150.00	\$6,000.00
7	48" CMP, Install	40	Ft	\$95.00	\$3,800.00
8	36" CMP Flared End, Furnish	2	Each	\$891.90	\$1,783.80
9	36" CMP Flared End, Install	2	Each	\$588.00	\$1,176.00
10	48" CMP Flared End, Furnish	2	Each	\$2,086.00	\$4,172.00
11	48" CMP Flared End, Install	2	Each	\$304.00	\$608.00
12	Unclassified Excavation	33	CuYd	\$8.00	\$264.00
13	8" Gravel Surfacing	14.5	Ton	\$25.00	\$362.50
14	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$28,362.73

#### Contingency / Admin & Legal Fees

10% Contingency	\$2,836.27
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Estimated Total Project Cost		\$38.573.31
	Subtotal	\$5,672.55
Construction Engineering		\$2,836.27
Design Engineering		\$2,836.27
Design and Construction Management Services		
	Subtotal	\$4,538.04
6% Admin / Legal		\$1,701.76



## Douglas County Crossing Number: 15 Location: 3.8 Mi. S. & 2.2 Mi. W. of Corsica, SD 64" x 54" Oval CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,559.36	\$2,559.36
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	14.5	Ton	\$40.00	\$580.00
4	60" CMP, Furnish	40	Ft	\$210.00	\$8,400.00
5	60" CMP, Install	40	Ft	\$145.00	\$5,800.00
6	60" CMP Flared End, Furnish	2	Each	\$2,725.80	\$5,451.60
7	60" CMP Flared End, Install	2	Each	\$684.00	\$1,368.00
8	Unclassified Excavation	113	CuYd	\$8.00	\$904.00
9	8" Gravel Surfacing	11.6	Ton	\$25.00	\$290.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$28,152.96

Estimated Total Project Cost		\$38,288.03
	Subtotal	\$5,630.59
Construction Engineering		\$2,815.30
Design Engineering		\$2,815.30
Design and Construction Management Services		
	Subtotal	\$4,504.47
6% Admin / Legal		\$1,689.18
10% Contingency		\$2,815.30
Contingency / Admin & Legal Fees		



## Douglas County Crossing Number: 16 Location: 2.4 Mi. S. & 1.2 Mi. W. of Corsica, SD 72" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$4,964.80	\$4,964.80
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	28.3	Ton	\$40.00	\$1,132.00
4	72" CMP, Furnish	65	Ft	\$300.00	\$19,500.00
5	72" CMP, Install	65	Ft	\$200.00	\$13,000.00
6	72" CMP Flared End, Furnish	2	Each	\$3,740.00	\$7,480.00
7	72" CMP Flared End, Install	2	Each	\$850.00	\$1,700.00
8	Unclassified Excavation	297	CuYd	\$8.00	\$2,376.00
9	8" Gravel Surfacing	46.4	Ton	\$25.00	\$1,160.00
10	Existing Culvert Removal and Disposal	65	Ft	\$20.00	\$1,300.00
				Total	\$54,612.80

Contingency / Admin & Legal Fees		
10% Contingency		\$5,461.28
6% Admin / Legal		\$3,276.77
	Subtotal	\$8,738.05
Design and Construction Management Services		
Design Engineering		\$5,461.28
Construction Engineering		\$5,461.28
	Subtotal	\$10,922.56
Estimated Total Project Cost		\$74,273.41



### Douglas County Crossing Number: 17 Location: 2.7 Mi. S. & 3.2 Mi. W. of Corsica, SD 32" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,122.83	\$1,122.83
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	7.8	Ton	\$40.00	\$312.00
4	36" CMP, Furnish	40	Ft	\$55.00	\$2,200.00
5	36" CMP, Install	40	Ft	\$25.15	\$1,006.00
6	36" CMP Flared End, Furnish	2	Each	\$891.90	\$1,783.80
7	36" CMP Flared End, Install	2	Each	\$588.00	\$1,176.00
8	Unclassified Excavation	111	CuYd	\$8.00	\$888.00
9	8" Gravel Surfacing	42.5	Ton	\$25.00	\$1,062.50
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$12,351.13

Contingency / Admin & Legal Fees			
10% Contingency		\$1,235.11	
6% Admin / Legal		\$741.07	
	Subtotal	\$1,976.18	
Design and Construction Management Services			
Design Engineering		\$1,235.11	
Construction Engineering		\$1,235.11	
	Subtotal	\$2,470.23	



## Douglas County Crossing Number: 18 Location: 1.5 Mi. S. & 1.2 Mi. W. of Corsica, SD 2 - 24" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,403.08	\$1,403.08
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	11.6	Ton	\$40.00	\$464.00
4	24" CMP, Furnish	80	Ft	\$42.20	\$3,376.00
5	24" CMP, Install	80	Ft	\$24.10	\$1,928.00
6	24" CMP Flared End, Furnish	4	Each	\$264.24	\$1,056.96
7	24" CMP Flared End, Install	4	Each	\$248.97	\$995.88
8	Unclassified Excavation	160	CuYd	\$8.00	\$1,280.00
9	8" Gravel Surfacing	53.2	Ton	\$25.00	\$1,330.00
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$15,433.92

Contingency / Admin & Legal Fees		
10% Contingency		\$1,543.39
6% Admin / Legal		\$926.04
	Subtotal	\$2,469.43
Design and Construction Management Services		
Design Engineering		\$1,543.39
Construction Engineering		\$1,543.39
	Subtotal	\$3,086.78
Estimated Total Project Cost		\$20,990.14

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 Douglas County Crossing Number: 19 Location: 1.8 Mi. S. & 4.1 Mi. W. of Corsica, SD 18" & 15" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,116.21	\$1,116.21
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	8	Ton	\$40.00	\$320.00
4	15" CMP, Furnish	40	Ft	\$20.86	\$834.40
5	15" CMP, Install	40	Ft	\$23.15	\$926.00
6	18" CMP, Furnish	40	Ft	\$26.33	\$1,053.20
7	18" CMP, Install	40	Ft	\$22.21	\$888.40
8	15" CMP Flared End, Furnish	2	Each	\$140.00	\$280.00
9	15" CMP Flared End, Install	2	Each	\$225.00	\$450.00
10	18" CMP Flared End, Furnish	2	Each	\$170.00	\$340.00
11	18" CMP Flared End, Install	2	Each	\$247.05	\$494.10
12	Unclassified Excavation	97	CuYd	\$8.00	\$776.00
13	8" Gravel Surfacing	48	Ton	\$25.00	\$1,200.00
14	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$12,278.31

#### Contingency / Admin & Legal Fees

Estimated Total Project Cost		\$16,698.50
	Subtotal	\$2 <i>,</i> 455.66
Construction Engineering		\$1,227.83
Design Engineering		\$1,227.83
Design and Construction Management Services		
	Subtotal	\$1,964.53
6% Admin / Legal		\$736.70
10% Contingency		\$1,227.83

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## Douglas County Crossing Number: 20 Location: 2.8 Mi. S. & 4.5 Mi. W. of Corsica, SD 30" RCP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,695.82	\$1,695.82
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	7.3	Ton	\$40.00	\$292.00
4	30" RCP Class 2, Furnish	40	Ft	\$35.78	\$1,431.20
5	30" RCP, Install	40	Ft	\$45.17	\$1,806.80
6	30" RCP Sloped End, Furnish	2	Each	\$642.68	\$1,285.36
7	30" RCP Sloped End, Install	2	Each	\$467.93	\$935.86
8	Unclassified Excavation	174	CuYd	\$8.00	\$1,392.00
9	12" Gravel Surfacing	98.6	Ton	\$25.00	\$2,465.00
10	4" Asphalt Concrete Surfacing	26	Ton	\$175.00	\$4,550.00
11	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$18,654.04

Contingency / Admin & Legal Fees		
10% Contingency		\$1,865.40
6% Admin / Legal		\$1,119.24
	Subtotal	\$2,984.65
Design and Construction Management Services		
Design Engineering		\$1,865.40
Construction Engineering		\$1,865.40
	Subtotal	\$3,730.81
Estimated Total Project Cost		\$25,369.50



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## Douglas County Crossing Number: 21 Location: 3.6 Mi. S. & 5.0 Mi. W. of Corsica, SD

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
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Contingency / Admin & Legal Fees		
10% Contingency		\$0.00
6% Admin / Legal		\$0.00
	Subtotal	\$0.00
Design and Construction Management Services		
Design Engineering		\$0.00
Construction Engineering		\$0.00
	Subtotal	\$0.00
Estimated Total Project Cost		\$0.00

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## Douglas County Crossing Number: 22 Location: 3.6 Mi. S. of Corsica, SD 8' x 3' Reinforced Concrete Box Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$12,668.32	\$12,668.32
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	361	CY	\$12.00	\$4,332.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$4,000.00	\$4,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	4" Asphalt Concrete Surfacing	30	TON	\$175.00	\$5,250.00
8	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
9	Erosion Control	1	LS	\$5,000.00	\$5,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$2,375.00	\$2,375.00
12	Structure Excavation, Box Culvert	93	CY	\$45.00	\$4,185.00
13	Box Culvert Undercut	39	CY	\$120.00	\$4,680.00
14	8'x3' Precast Concrete Box Culvert, Furnish	50	FT	\$500.00	\$25,000.00
15	8'x3' Precast Concrete Box Culvert, Install	50	FT	\$150.00	\$7,500.00
16	8'x3' Precast Concrete Box Culvert End Section, Furnish	2	EACH	\$6,000.00	\$12,000.00
17	8'x3' Precast Concrete Box Culvert End Section, Install	2	EACH	\$1,500.00	\$3,000.00
18	Class B Riprap	83.3	TON	\$70.00	\$5,831.00
19	Type B Drainage Fabric	6.7	SY	\$4.50	\$30.15
20	Diversion Channel	1	LS	\$12,000.00	\$12,000.00
21	Remove/Salvage Existing Structure	1	LS	\$5,000.00	\$5,000.00
				Total	\$139,351.47

Contingency / Admin & Legal Fees		
10% Contingency		\$13,935.15
6% Admin / Legal		\$8,361.09
	Subtotal	\$22,296.23
Design and Construction Management Services		
Design Engineering		\$13,935.15
Construction Engineering		\$13,935.15
	Subtotal	\$27,870.29
Estimated Total Project Cost		\$189,517.99
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## Douglas County Crossing Number: 23 Location: 2.0 Mi. S. of Corsica, SD 8' x 7' Reinforced Concrete Box Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$17,787.12	\$17,787.12
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	750	CY	\$12.00	\$9,000.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$4,000.00	\$4,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	4" Asphalt Concrete Surfacing	35	TON	\$175.00	\$6,125.00
8	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
9	Erosion Control	1	LS	\$5,000.00	\$5,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$4,050.00	\$4,050.00
12	Structure Excavation, Box Culvert	267	CY	\$45.00	\$12,015.00
13	Box Culvert Undercut	61	CY	\$120.00	\$7,320.00
14	8'x7' Precast Concrete Box Culvert, Furnish	80	FT	\$600.00	\$48,000.00
15	8'x7' Precast Concrete Box Culvert, Install	80	FT	\$150.00	\$12,000.00
16	8'x7' Precast Concrete Box Culvert End Section, Furnish	2	EACH	\$8,000.00	\$16,000.00
17	8'x7' Precast Concrete Box Culvert End Section, Install	2	EACH	\$2,500.00	\$5,000.00
18	Class B Riprap	83.3	TON	\$70.00	\$5,831.00
19	Type B Drainage Fabric	6.7	SY	\$4.50	\$30.15
20	Diversion Channel	1	LS	\$12,000.00	\$12,000.00
21	Remove/Salvage Existing Structure	1	LS	\$5,000.00	\$5,000.00
				Total	\$195,658.27

Contingency / Admin & Legal Fees		
10% Contingency		\$19,565.83
6% Admin / Legal		\$11,739.50
	Subtotal	\$31,305.32
Design and Construction Management Services		
Design Engineering		\$19,565.83
Construction Engineering		\$19,565.83
	Subtotal	\$39,131.65
Estimated Total Project Cost		\$266,095.24



## Douglas County Crossing Number: 24 Location: 2.3 Mi. S. & 1.0 Mi. E. of Corsica, SD 2 - 18" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,008.18	\$1,008.18
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	8.7	Ton	\$40.00	\$348.00
4	18" CMP, Furnish	80	Ft	\$26.33	\$2,106.40
5	18" CMP, Install	80	Ft	\$22.21	\$1,776.80
6	18" CMP Flared End, Furnish	4	Each	\$116.24	\$464.96
7	18" CMP Flared End, Install	4	Each	\$203.42	\$813.68
8	Unclassified Excavation	49	CuYd	\$8.00	\$392.00
9	8" Gravel Surfacing	23.2	Ton	\$25.00	\$580.00
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$11,090.02

Contingency / Admin & Legal Fees		
10% Contingency		\$1,109.00
6% Admin / Legal		\$665.40
	Subtotal	\$1,774.40
Design and Construction Management Services		
Design Engineering		\$1,109.00
Construction Engineering		\$1,109.00
	Subtotal	\$2,218.00
Estimated Total Project Cost		\$15.082.42

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## Douglas County Crossing Number: 25 Location: 2.8 Mi. S. & 1.1 Mi. E. of Corsica, SD 36" RCP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,767.38	\$1,767.38
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	8.7	Ton	\$40.00	\$348.00
4	36" RCP Class 2, Furnish	40	Ft	\$44.65	\$1,786.00
5	36" RCP, Install	40	Ft	\$48.12	\$1,924.80
6	36" RCP Sloped End, Furnish	2	Each	\$600.00	\$1,200.00
7	36" RCP Sloped End, Install	2	Each	\$500.00	\$1,000.00
8	Unclassified Excavation	200	CuYd	\$8.00	\$1,600.00
9	12" Gravel Surfacing	98.6	Ton	\$25.00	\$2,465.00
10	4" Asphalt Concrete Surfacing	26	Ton	\$175.00	\$4,550.00
11	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$19,441.18

Contingency / Admin & Legal Fees		
10% Contingency		\$1,944.12
6% Admin / Legal		\$1 <i>,</i> 166.47
	Subtotal	\$3,110.59
Design and Construction Management Services		
Design Engineering		\$1,944.12
Construction Engineering		\$1,944.12
	Subtotal	\$3,888.24
Estimated Total Project Cost		\$26,440.00



#### Douglas County Crossing Number: 26 Location: 3.2 Mi. S. & 0.8 Mi. E. of Corsica, SD 15" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$681.74	\$681.74
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	3.6	Ton	\$40.00	\$144.00
4	15" CMP, Furnish	40	Ft	\$20.86	\$834.40
5	15" CMP, Install	40	Ft	\$23.15	\$926.00
6	15" CMP Flared End, Furnish	2	Each	\$140.00	\$280.00
7	15" CMP Flared End, Install	2	Each	\$225.00	\$450.00
8	Unclassified Excavation	46	CuYd	\$8.00	\$368.00
9	8" Gravel Surfacing	40.6	Ton	\$25.00	\$1,015.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$7,499.14

Estimated Total Project Cost		\$10,198.83
	Subtotal	\$1,499.83
Construction Engineering		\$749.91
Design Engineering		\$749.91
Design and Construction Management Services		
	Subtotal	\$1,199.86
6% Admin / Legal		\$449.95
10% Contingency		\$749.91
Contingency / Admin & Legal Fees		



## Douglas County Crossing Number: 27 Location: 1.3 Mi. S. & 0.2 Mi. W. of Corsica, SD 12' x 6' Reinforced Concrete Box Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$23,095.79	\$23,095.79
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	725	CY	\$12.00	\$8,700.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$4,000.00	\$4,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	4" Asphalt Concrete Surfacing	37.8	TON	\$175.00	\$6,615.00
8	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
9	Erosion Control	1	LS	\$5,000.00	\$5,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$6,025.24	\$6,025.24
12	Structure Excavation, Box Culvert	332	CY	\$45.00	\$14,940.00
13	Box Culvert Undercut	85	CY	\$120.00	\$10,200.00
14	12'x6' Precast Concrete Box Culvert, Furnish	80	FT	\$621.36	\$49,708.80
15	12'x6' Precast Concrete Box Culvert, Install	80	FT	\$434.95	\$34,796.00
16	12'x6' Precast Concrete Box Culvert End Section, Furnish	2	EACH	\$12,000.00	\$24,000.00
17	12'x6' Precast Concrete Box Culvert End Section, Install	2	EACH	\$6,000.00	\$12,000.00
18	Class B Riprap	163.3	TON	\$70.00	\$11,431.00
19	Type B Drainage Fabric	9.3	SY	\$4.50	\$41.85
20	Diversion Channel	1	LS	\$12,000.00	\$12,000.00
21	Remove/Salvage Existing Structure	1	LS	\$5,000.00	\$5,000.00
				Total	\$254,053.68

Contingency / Admin & Legal Fees		
10% Contingency		\$25,405.37
6% Admin / Legal		\$15,243.22
	Subtotal	\$40,648.59
Design and Construction Management Services		
Design Engineering		\$25 <i>,</i> 405.37
Construction Engineering		\$25,405.37
	Subtotal	\$50,810.74
Estimated Total Project Cost		\$345,513.00



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#### Douglas County Crossing Number: 28 Location: 0.8 Mi. S. & 0.7 Mi. E. of Corsica, SD Double 6' x 3' Reinforced Concrete Box Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$11,667.90	\$11,667.90
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	227	CY	\$12.00	\$2,724.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$4,000.00	\$4,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	4" Asphalt Concrete Surfacing	0	TON	\$175.00	\$0.00
8	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
9	Erosion Control	1	LS	\$5,000.00	\$5,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$1,990.00	\$1,990.00
12	Structure Excavation, Box Culvert	67	CY	\$45.00	\$3,015.00
13	Box Culvert Undercut	29	CY	\$120.00	\$3,480.00
14	2-6'x3' Precast Concrete Box Culvert, Furnish	24	FT	\$800.00	\$19,200.00
15	2-6'x3' Precast Concrete Box Culvert, Install	24	FT	\$150.00	\$3,600.00
16	2-6'x3' Precast Concrete Box Culvert End Section, Furnish	2	EACH	\$6,000.00	\$12,000.00
17	2-6'x3' Precast Concrete Box Culvert End Section, Install	2	EACH	\$2,500.00	\$5,000.00
18	Class B Riprap	187.5	TON	\$70.00	\$13,125.00
19	Type B Drainage Fabric	10	SY	\$4.50	\$45.00
20	Diversion Channel	1	LS	\$12,000.00	\$12,000.00
21	Remove/Salvage Existing Structure	1	LS	\$5,000.00	\$5,000.00
				Total	\$128,346.90

Contingency / Admin & Legal Fees		
10% Contingency		\$12,834.69
6% Admin / Legal		\$7,700.81
	Subtotal	\$20,535.50
Design and Construction Management Services		
Design Engineering		\$12,834.69
Construction Engineering		\$12,834.69
	Subtotal	\$25,669.38
Estimated Total Project Cost		\$174,551.78



### Douglas County Crossing Number: 29 Location: 0.8 Mi. S. & 1.0 Mi. E. of Corsica, SD 30' CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,087.70	\$1,087.70
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	7.5	Ton	\$40.00	\$300.00
4	30" CMP, Furnish	40	Ft	\$49.20	\$1,968.00
5	30" CMP, Install	40	Ft	\$35.27	\$1,410.80
6	30" CMP Flared End, Furnish	2	Each	\$540.67	\$1,081.34
7	30" CMP Flared End, Install	2	Each	\$318.92	\$637.84
8	Unclassified Excavation	108	CuYd	\$8.00	\$864.00
9	8" Gravel Surfacing	40.6	Ton	\$25.00	\$1,015.00
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$11,964.68

10% Contingency		\$1,196.47
6% Admin / Legal		\$717.88
	Subtotal	\$1,914.35
Design and Construction Management Services		
Design Engineering		\$1,196.47
Design Engineering Construction Engineering		\$1,196.47 \$1,196.47
Design Engineering Construction Engineering	Subtotal	\$1,196.47 \$1,196.47 <b>\$2,392.94</b>

	2309 W. 50th Street Sioux Falls, SD 57105 Ptr. 605.336.1676 COSSZ GINEBRING, INC. NGINEBRING, SURVEYING
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### Douglas County Crossing Number: 30 Location: 0.2 Mi. N. & 0.8 Mi. E. of Corsica, SD 4 - 36" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$4,453.82	\$4,453.82
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	34.8	Ton	\$40.00	\$1,392.00
4	36" CMP, Furnish	160	Ft	\$55.00	\$8,800.00
5	36" CMP, Install	160	Ft	\$25.15	\$4,024.00
6	36" CMP Flared End, Furnish	8	Each	\$891.90	\$7,135.20
7	36" CMP Flared End, Install	8	Each	\$588.00	\$4,704.00
8	Unclassified Excavation	361	CuYd	\$8.00	\$2,888.00
9	12" Gravel Surfacing	121.8	Ton	\$25.00	\$3,045.00
10	4" Asphalt Concrete Surfacing	42	Ton	\$175.00	\$7,350.00
11	Existing Culvert Removal and Disposal	160	Ft	\$20.00	\$3,200.00
				Total	\$48,992.02

Contingency / Admin & Legal Fees		
10% Contingency		\$4,899.20
6% Admin / Legal		\$2 <i>,</i> 939.52
	Subtotal	\$7,838.72
Design and Construction Management Services		
Design Engineering		\$4,899.20
Construction Engineering		\$4,899.20
	Subtotal	\$9,798.40
Estimated Total Project Cost		\$66,629.15

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(D)	2309 W. 50th Street Sioux Fails, SD 57105 Ph: 605.336.1676
	ENGINEERING, INC.
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### Douglas County Crossing Number: 31 Location: 0.2 Mi. N. & 1.7 Mi. E. of Corsica, SD 30" RCP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,637.62	\$1,637.62
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	7.3	Ton	\$40.00	\$292.00
4	30" RCP Class 2, Furnish	40	Ft	\$35.78	\$1,431.20
5	30" RCP, Install	40	Ft	\$45.17	\$1,806.80
6	30" RCP Sloped End, Furnish	2	Each	\$642.68	\$1,285.36
7	30" RCP Sloped End, Install	2	Each	\$467.93	\$935.86
8	Unclassified Excavation	145	CuYd	\$8.00	\$1,160.00
9	12" Gravel Surfacing	98.6	Ton	\$25.00	\$2,465.00
10	4" Asphalt Concrete Surfacing	24	Ton	\$175.00	\$4,200.00
11	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$18,013.84

Contingency / Admin & Legal Fees		
10% Contingency		\$1 <i>,</i> 801.38
6% Admin / Legal		\$1 <i>,</i> 080.83
	Subtotal	\$2,882.21
Design and Construction Management Services		
Design Engineering		\$1 <i>,</i> 801.38
Construction Engineering		\$1 <i>,</i> 801.38
	Subtotal	\$3,602.77
Estimated Total Project Cost		\$24,498.83



# Douglas County Crossing Number: 32 Location: 0.2 Mi. N. & 2.7 Mi. E. of Corsica, SD

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1					
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Estimated Total Project Cost		\$0.00
	Subtotal	\$0.00
Construction Engineering		\$0.00
Design Engineering		\$0.00
Design and Construction Management Services		
	Subtotal	\$0.00
6% Admin / Legal		\$0.00
10% Contingency		\$0.00
Contingency / Admin & Legal Fees		



### Douglas County Crossing Number: 33 Location: 1.2 Mi. N. & 2.2 Mi. E. of Corsica, SD 18" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$693.09	\$693.09
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	4.4	Ton	\$40.00	\$176.00
4	18" CMP, Furnish	40	Ft	\$26.33	\$1,053.20
5	18" CMP, Install	40	Ft	\$22.21	\$888.40
6	18" CMP Flared End, Furnish	2	Each	\$116.24	\$232.48
7	18" CMP Flared End, Install	2	Each	\$203.42	\$406.84
8	Unclassified Excavation	63	CuYd	\$8.00	\$504.00
9	8" Gravel Surfacing	34.8	Ton	\$25.00	\$870.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$7,624.01

Contingency / Admin & Legal Fees		
10% Contingency		\$762.40
6% Admin / Legal		\$457.44
	Subtotal	\$1,219.84
Design and Construction Management Services		
Design Engineering		\$762.40
Construction Engineering		\$762.40
	Subtotal	\$1,524.80
Estimated Total Project Cost		\$10,368.66



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#### Douglas County Crossing Number: 34 Location: 1.2 Mi. N. & 3.2 Mi. W. of Corsica, SD 60" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,726.96	\$2,726.96
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	14.5	Ton	\$40.00	\$580.00
4	60" CMP, Furnish	40	Ft	\$210.00	\$8,400.00
5	60" CMP, Install	40	Ft	\$145.00	\$5,800.00
6	60" CMP Flared End, Furnish	2	Each	\$2,725.80	\$5,451.60
7	60" CMP Flared End, Install	2	Each	\$684.00	\$1,368.00
8	Unclassified Excavation	250	CuYd	\$8.00	\$2,000.00
9	8" Gravel Surfacing	34.8	Ton	\$25.00	\$870.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$29,996.56

Contingency / Admin & Legal Fees		
10% Contingency		\$2 <i>,</i> 999.66
6% Admin / Legal		\$1,799.79
	Subtotal	\$4,799.45
Design and Construction Management Services		
Design Engineering		\$2 <i>,</i> 999.66
Construction Engineering		\$2 <i>,</i> 999.66
	Subtotal	\$5,999.31
Estimated Total Project Cost		\$40,795.32



### Douglas County Crossing Number: 35 Location: 1.2 Mi. N. & 3.4 Mi. W. of Corsica, SD 36" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,115.18	\$1,115.18
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	8.7	Ton	\$40.00	\$348.00
4	36" CMP, Furnish	40	Ft	\$55.00	\$2,200.00
5	36" CMP, Install	40	Ft	\$25.15	\$1,006.00
6	36" CMP Flared End, Furnish	2	Each	\$891.90	\$1,783.80
7	36" CMP Flared End, Install	2	Each	\$588.00	\$1,176.00
8	Unclassified Excavation	121	CuYd	\$8.00	\$968.00
9	8" Gravel Surfacing	34.8	Ton	\$25.00	\$870.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$12.266.98

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10% Contingency		\$1,226.70
6% Admin / Legal		\$736.02
	Subtotal	\$1,962.72
Design and Construction Management Services		
Design Engineering		\$1,226.70
Design Engineering Construction Engineering		\$1,226.70 \$1,226.70
Design Engineering Construction Engineering	Subtotal	\$1,226.70 \$1,226.70 <b>\$2,453.40</b>



### Douglas County Crossing Number: 36 Location: 0.5 Mi. N. & 4.2 Mi. W. of Corsica, SD 24" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$837.39	\$837.39
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	5.8	Ton	\$40.00	\$232.00
4	24" CMP, Furnish	40	Ft	\$42.20	\$1,688.00
5	24" CMP, Install	40	Ft	\$24.10	\$964.00
6	24" CMP Flared End, Furnish	2	Each	\$264.24	\$528.48
7	24" CMP Flared End, Install	2	Each	\$248.97	\$497.94
8	Unclassified Excavation	87	CuYd	\$8.00	\$696.00
9	8" Gravel Surfacing	38.7	Ton	\$25.00	\$967.50
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$9,211.31

Estimated Total Project Cost		\$12,527.38
	Subtotal	\$1,842.26
Construction Engineering		\$921.13
Design Engineering		\$921.13
Design and Construction Management Services		
	Subtotal	\$1,473.81
6% Admin / Legal		\$552.68
10% Contingency		\$921.13
Contingency / Admin & Legal Fees		



### Douglas County Crossing Number: 37 Location: 0.4 Mi. N. & 5.2 Mi. W. of Corsica, SD 24" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$823.64	\$823.64
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	5.8	Ton	\$40.00	\$232.00
4	24" CMP, Furnish	40	Ft	\$42.20	\$1,688.00
5	24" CMP, Install	40	Ft	\$24.10	\$964.00
6	24" CMP Flared End, Furnish	2	Each	\$264.24	\$528.48
7	24" CMP Flared End, Install	2	Each	\$248.97	\$497.94
8	Unclassified Excavation	82	CuYd	\$8.00	\$656.00
9	8" Gravel Surfacing	34.8	Ton	\$25.00	\$870.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$9,060.06

Contingency / Admin & Legal Fees		
10% Contingency		\$906.01
6% Admin / Legal		\$543.60
	Subtotal	\$1,449.61
Design and Construction Management Services		
Design Engineering		\$906.01
Construction Engineering		\$906.01
	Subtotal	\$1,812.01
Estimated Total Project Cost		\$12,321.68



### Douglas County Crossing Number: 38 Location: 0.1 Mi. S. & 0.2 Mi. E. of Harrison, SD 6' x3' Reinforced Concrete Box Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$10,774.25	\$10,774.25
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00
3	Unclassified Excavation	202	CY	\$12.00	\$2,424.00
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00
5	Traffic Control	1	LS	\$4,000.00	\$4,000.00
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00
7	4" Asphalt Concrete Surfacing	28.8	TON	\$175.00	\$5,040.00
8	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00
9	Erosion Control	1	LS	\$5,000.00	\$5,000.00
10	Fencing	1	LS	\$2,500.00	\$2,500.00
11	Incidental Work, Structure	1	LS	\$1,825.00	\$1,825.00
12	Structure Excavation, Box Culvert	60	CY	\$45.00	\$2,700.00
13	Box Culvert Undercut	25	CY	\$120.00	\$3,000.00
14	6'x3' Precast Concrete Box Culvert, Furnish	40	FT	\$450.00	\$18,000.00
15	6'x3' Precast Concrete Box Culvert, Install	40	FT	\$125.00	\$5,000.00
16	6'x3' Precast Concrete Box Culvert End Section, Furnish	2	EACH	\$5,500.00	\$11,000.00
17	6'x3' Precast Concrete Box Culvert End Section, Install	2	EACH	\$1,250.00	\$2,500.00
18	Class B Riprap	53.3	TON	\$70.00	\$3,731.00
19	Type B Drainage Fabric	5	SY	\$4.50	\$22.50
20	Diversion Channel	1	LS	\$12,000.00	\$12,000.00
21	Remove/Salvage Existing Structure	1	LS	\$5,000.00	\$5,000.00
				Total	\$118,516.75

Contingency / Admin & Legal Fees		
10% Contingency		\$11,851.68
6% Admin / Legal		\$7,111.01
	Subtotal	\$18,962.68
Design and Construction Management Services		
Design Engineering		\$11,851.68
Construction Engineering		\$11,851.68
	Subtotal	\$23,703.35
Estimated Total Project Cost		\$161,182.78



## Douglas County Crossing Number: 39 Location: 1.1 Mi. S. & 0.7 Mi. E. of Harrison, SD 18" Polyethylene Plastic Pipe Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$602.89	\$602.89
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	4.4	Ton	\$40.00	\$176.00
4	18" CMP, Furnish (plastic Existing)	40	Ft	\$26.33	\$1,053.20
5	18" CMP, Install	40	Ft	\$22.21	\$888.40
6	18" CMP Flared End, Furnish	2	Each	\$116.24	\$232.48
7	18" CMP Flared End, Install	2	Each	\$203.42	\$406.84
8	Unclassified Excavation	59	CuYd	\$8.00	\$472.00
9	8" Gravel Surfacing	0	Ton	\$25.00	\$0.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$6,631.81

Contingency / Admin & Legal Fees		
10% Contingency		\$663.18
6% Admin / Legal		\$397.91
	Subtotal	\$1,061.09
Design and Construction Management Services		
Design Engineering		\$663.18
Construction Engineering		\$663.18
	Subtotal	\$1,326.36
Estimated Total Project Cost		\$9,019.26

Ā	A Situr Fails SD 57105 PH: 605.332.1076 PH: 605.332.1076
ITEM	ITEM DESCRIPTION
1	Mobilization
2	Clearing and Grubbing
2	D' D 11

### Douglas County Crossing Number: 40 Location: 1.6 Mi. S. of Harrison, SD 24" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$888.74	\$888.74
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	5.8	Ton	\$40.00	\$232.00
4	24" CMP, Furnish	40	Ft	\$42.20	\$1,688.00
5	24" CMP, Install	40	Ft	\$24.10	\$964.00
6	24" CMP Flared End, Furnish	2	Each	\$264.24	\$528.48
7	24" CMP Flared End, Install	2	Each	\$248.97	\$497.94
8	Unclassified Excavation	139	CuYd	\$8.00	\$1,112.00
9	8" Gravel Surfacing	42.6	Ton	\$25.00	\$1,065.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$9,776.16

Contingency / Admin & Legal Fees		
10% Contingency		\$977.62
6% Admin / Legal		\$586.57
	Subtotal	\$1,564.19
Design and Construction Management Services		
Design Engineering		\$977.62
Construction Engineering		\$977.62
	Subtotal	\$1,955.23
Estimated Total Project Cost		\$13,295.58



# Douglas County Crossing Number: 41 Location: 0.2 Mi. N. & 1.7 Mi. E. of Corsica, SD

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
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Estimated Total Project Cost		\$0.00
	Subtotal	\$0.00
Construction Engineering		\$0.00
Design Engineering		\$0.00
Design and Construction Management Services		
	Subtotal	\$0.00
6% Admin / Legal		\$0.00
10% Contingency		\$0.00
Contingency / Admin & Legal Fees		

A     Douglas County Storm Water Facility Plan       Garden Valley Ditch Basin     Garden Valley Ditch Basin       Crossing Number: 1     Location: 2.6 Mi. N. & 1.8 Mi. E. of Corsica, SD       2 - 48" RCP Culvert					
ГЕМ	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$3,719.49	\$3,719.49
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	34.8	Ton	\$40.00	\$1,392.00
4	48" RCP Class 2, Furnish	120	Ft	\$88.29	\$10,594.80
5	48" RCP, Install	120	Ft	\$81.79	\$9,814.80
6	48" RCP Flared End, Furnish	4	Each	\$1,152.37	\$4,609.48
7	48" RCP Flared End, Install	4	Each	\$702.58	\$2,810.32
8	Unclassified Excavation	267	CuYd	\$8.00	\$2,136.00
9	8" Gravel Surfacing	57.5	Ton	\$25.00	\$1,437.50
10	Existing Culvert Removal and Disposal	120	Ft	\$20.00	\$2,400.00
				Total	\$40,914.39
	Contin	gency / Admin & Legal Fees 10% Contingency 6% Admin / Legal		Subtotal	\$4,091.44 \$2,454.86 <b>\$6,546.30</b>
	Design and Constru	ction Management Services			
		Design Engineering			\$4,091.44
		Construction Engineering			\$4,091.44
				Subtotal	\$8,182.88
	E	stimated Total Project Cost			\$55,643.57

V	A Story W. Soln Street Sour Folks. SD 57105 Ph: 605.336.1676 Crossing Number: 2 Location: 3.0 Mi. N. & 0.2 Mi. W. of Corsica, SD 14' x 8' Reinforced Concrete Box Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	
1	Mobilization	1	LS	\$23,095.79	\$23,095.79	
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00	
3	Unclassified Excavation	725	CY	\$12.00	\$8,700.00	
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00	
5	Traffic Control	1	LS	\$4,000.00	\$4,000.00	
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00	
7	4" Asphalt Concrete Surfacing	37.8	TON	\$175.00	\$6,615.00	
8	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00	
9	Erosion Control	1	LS	\$5,000.00	\$5,000.00	
10	Fencing	1	LS	\$2,500.00	\$2,500.00	
11	Incidental Work, Structure	1	LS	\$6,025.24	\$6,025.24	
12	Structure Excavation, Box Culvert	332	CY	\$45.00	\$14,940.00	
13	Box Culvert Undercut	85	CY	\$120.00	\$10,200.00	
14	12'x6' Precast Concrete Box Culvert, Furnish	80	FT	\$621.36	\$49,708.80	
15	12'x6' Precast Concrete Box Culvert, Install	80	FT	\$434.95	\$34,796.00	
16	12'x6' Precast Concrete Box Culvert End Section, Furnish	2	EACH	\$12,000.00	\$24,000.00	
17	12'x6' Precast Concrete Box Culvert End Section, Install	2	EACH	\$6,000.00	\$12,000.00	
18	Class B Riprap	163.3	TON	\$70.00	\$11,431.00	
19	Type B Drainage Fabric	9.3	SY	\$4.50	\$41.85	
20	Diversion Channel	1	LS	\$12,000.00	\$12,000.00	
21	Remove/Salvage Existing Structure	1	LS	\$5,000.00	\$5,000.00	
				Total	\$254,053.68	

Contingency / Admin & Legal Fees		
10% Contingency		\$25,405.37
6% Admin / Legal		\$15,243.22
	Subtotal	\$40,648.59
Design and Construction Management Services		
Design Engineering		\$25 <i>,</i> 405.37
Construction Engineering		\$25,405.37
	Subtotal	\$50,810.74
Estimated Total Project Cost		\$345,513.00

V	A     Douglas County Storm Water Facility Plan       Garden Valley Ditch Basin     Garden Valley Ditch Basin       Crossing Number: 3     Location: 3.1 Mi. N. & 1.1 Mi. W. of Corsica, SD       42" CMP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	
1	Mobilization	1	LS	\$1,411.74	\$1,411.74	
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00	
3	Pipe Bedding	10.2	Ton	\$40.00	\$408.00	
4	42" CMP, Furnish	40	Ft	\$71.00	\$2,840.00	
5	42" CMP, Install	40	Ft	\$69.00	\$2,760.00	
6	42" CMP Flared End, Furnish	2	Each	\$1,276.11	\$2,552.22	
7	42" CMP Flared End, Install	2	Each	\$521.78	\$1,043.56	
8	Unclassified Excavation	91.7	CuYd	\$8.00	\$733.60	
9	8" Gravel Surfacing	39.2	Ton	\$25.00	\$980.00	
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00	
				Total	\$15,529.12	

Contingency / Admin & Legal Fees

	Subtotal	\$2,484.66
6% Admin / Legal		\$931.75
10% Contingency		\$1,552.91

Design and Construction Management Services

A     Douglas County Storm Water Facility Plan       Sinux Falls, SD 57105     Tributary to Platte Creek Basin       Crossing Number: 4     Location: 3.2 Mi. N. & 3.1 Mi. W. of Corsica, SD       60" CMP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,759.71	\$2,759.71
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	14.5	Ton	\$40.00	\$580.00
4	60" CMP, Furnish	40	Ft	\$210.00	\$8,400.00
5	60" CMP, Install	40	Ft	\$145.00	\$5,800.00
6	60" CMP Flared End, Furnish	2	Each	\$2,725.80	\$5,451.60
7	60" CMP Flared End, Install	2	Each	\$684.00	\$1,368.00
8	Unclassified Excavation	250	CuYd	\$8.00	\$2,000.00
9	8" Gravel Surfacing	47.9	Ton	\$25.00	\$1,197.50
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$30,356.81
Contingency / Admin & Legal Fees 10% Contingency \$3,035.68					\$3,035.68
	69	6 Admin / Legal			\$1,821.41
				Subtotal	\$4,857.09
	Design and Construction Manage	ement Services			
	Desi	ign Engineering			\$3,035.68
	Constructi	on Engineering			\$3,035.68
				Subtotal	\$6,071.36
	Estimated To	tal Project Cost			\$41,285.26

A     Douglas County Storm Water Facility Plan       Garden Valley Ditch Basin     Garden Valley Ditch Basin       Crossing Number: 5     Location: 3.2 Mi. N. & 4.1 Mi. W. of Corsica, SD       66" CMP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$3,247.50	\$3,247.50
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	16	Ton	\$40.00	\$640.00
4	66" CMP, Furnish	40	Ft	\$280.00	\$11,200.00
5	66" CMP, Install	40	Ft	\$170.00	\$6,800.00
6	66" CMP Flared End, Furnish	2	Each	\$3,200.00	\$6,400.00
7	66" CMP Flared End, Install	2	Each	\$588.00	\$1,176.00
8	Unclassified Excavation	173	CuYd	\$8.00	\$1,384.00
9	8" Gravel Surfacing	51	Ton	\$25.00	\$1,275.00
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$35,722.50
	Contingency / Adm	in & Legal Fees			
	10	0% Contingency			\$3,572.25
	69	% Admin / Legal			\$2,143.35
				Subtotal	\$5,715.60
Design and Construction Management Services					
	Desi	ign Engineering			\$3,572.25
	Constructi	ion Engineering			\$3,572.25
				Subtotal	\$7,144.50
	Estimated To	tal Project Cost			\$48,582.60

A     Douglas County Storm Water Facility Plan       Side Falls, SD 57/05     Garden Valley Ditch Basin       Crossing Number: 6     Location: 3.2 Mi. N. & 4.6 Mi. W. of Corsica, SD       60" CMP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,759.71	\$2,759.71
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	14.5	Ton	\$40.00	\$580.00
4	60" CMP, Furnish	40	Ft	\$210.00	\$8,400.00
5	60" CMP, Install	40	Ft	\$145.00	\$5,800.00
6	60" CMP Flared End, Furnish	2	Each	\$2,725.80	\$5,451.60
7	60" CMP Flared End, Install	2	Each	\$684.00	\$1,368.00
8	Unclassified Excavation	250	CuYd	\$8.00	\$2,000.00
9	8" Gravel Surfacing	47.9	Ton	\$25.00	\$1,197.50
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$30,356.81
Contingency / Admin & Legal Fees 10% Contingency 6% Admin / Legal				Subtotal	\$3,035.68 \$1,821.41 <b>\$4.857.09</b>
	<b>Design and Construction Manage</b> Desi Constructio	ement Services gn Engineering on Engineering			\$3,035.68 \$3,035.68
				Subtotal	\$6,071.36
	Estimated Tot	al Project Cost			\$41,285.26

A     Douglas County Storm Water Facility Plan       Sour Falls, SD 57105     Garden Valley Ditch Basin       Crossing Number: 7     Location: 2.6 Mi. N. & 5.6 Mi. W. of Corsica, SD       60" CMP Culvert					
TEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,547.96	\$2,547.96
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	14.5	Ton	\$40.00	\$580.00
4	60" CMP, Furnish	40	Ft	\$210.00	\$8,400.00
5	60" CMP, Install	40	Ft	\$145.00	\$5,800.00
6	60" CMP Flared End, Furnish	2	Each	\$2,725.80	\$5,451.60
7	60" CMP Flared End, Install	2	Each	\$684.00	\$1,368.00
8	Unclassified Excavation	135	CuYd	\$8.00	\$1,080.00
9	8" Gravel Surfacing	0	Ton	\$25.00	\$0.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$28,027.56
	Contingonoul	Admin 8 Logal Faar			
	Contingency / /	10% Contingency			\$2 802 76
		6% Admin / Legal			\$1.681.65
		ovo nanimy regu		Subtotal	\$4,484.41
	Design and Construction Ma	nagement Services			
	-	Design Engineering			\$2,802.76
	Const	ruction Engineering			\$2,802.76
				Subtotal	\$5,605.51
:	Estimated	d Total Project Cost			\$38,117.48

A     Douglas County Storm Water Facility Plan       Garden Valley Ditch Basin     Garden Valley Ditch Basin       Crossing Number: 8     Location: 2.6 Mi. N. & 5.6 Mi. W. of Corsica, SD       Y     72" CMP Culvert						
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	
1	Mobilization	1	LS	\$3,661.85	\$3,661.85	
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00	
3	Pipe Bedding	17.4	Ton	\$40.00	\$696.00	
4	72" CMP, Furnish	40	Ft	\$300.00	\$12,000.00	
5	72" CMP, Install	40	Ft	\$200.00	\$8,000.00	
6	72" CMP Flared End, Furnish	2	Each	\$3,740.00	\$7,480.00	
7	72" CMP Flared End, Install	2	Each	\$850.00	\$1,700.00	
8	Unclassified Excavation	340	CuYd	\$8.00	\$2,720.00	
9	8" Gravel Surfacing	48.9	Ton	\$25.00	\$1,222.50	
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00	
				Total	\$40,280.35	
	Contingency / Adm 10 69		\$4,028.04 \$2,416.82			
			Subtotal	\$6,444.86		
	Design and Construction Manag	ement Services				
	Des	ign Engineering			\$4,028.04	
	Construct	ion Engineering			\$4,028.04	
		5 0		Subtotal	\$8,056.07	
	Estimated Total Project Cost					

Douglas County Storm Water Facility Plan Garden Valley Ditch Basin Crossing Number: 9 Location: 3.2 Mi. N. & 6.8 Mi. W. of Corsica, SD 18" CMP Culvert							
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST		
1	Mobilization	1	LS	\$725.14	\$725.14		
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00		
3	Pipe Bedding	4.4	Ton	\$40.00	\$176.00		
4	18" CMP, Furnish	40	Ft	\$26.33	\$1,053.20		
5	18" CMP, Install	40	Ft	\$22.21	\$888.40		
6	18" CMP Flared End, Furnish	2	Each	\$116.24	\$232.48		
7	18" CMP Flared End, Install	2	Each	\$203.42	\$406.84		
8	Unclassified Excavation	74	CuYd	\$8.00	\$592.00		
9	8" Gravel Surfacing	44.1	Ton	\$25.00	\$1,102.50		
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00		
				Total	\$7,976.56		
	Contingency / Admin & Legal Fees						
	10	0% Contingency			\$797.66		
	69	% Admin / Legal			\$478.59		
				Subtotal	\$1,276.25		
	Design and Construction Manag	ement Services					
	Des	ign Engineering			\$797.66		
	Construct	ion Engineering			\$797.66		
	Subtotal \$1,595.31						

Estimated Total Project Cost

\$10,848.12

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	2309 W. 50th Street Sioux Falls, SD 57105 Ph: 605,336,1676 PMOSSZ ENGINEERING, INC. ENGINEERING SURVEYING

# Douglas County Storm Water Facility Plan Garden Valley Ditch Basin Crossing Number: 10 Location: 2.2 Mi. N. & 7.5 Mi. W. of Corsica, SD 30" CMP Culvert

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$991.50	\$991.50
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	7.3	Ton	\$40.00	\$292.00
4	30" CMP, Furnish	40	Ft	\$49.20	\$1,968.00
5	30" CMP, Install	40	Ft	\$35.27	\$1,410.80
6	30" CMP Flared End, Furnish	2	Each	\$540.67	\$1,081.34
7	30" CMP Flared End, Install	2	Each	\$318.92	\$637.84
8	Unclassified Excavation	100	CuYd	\$8.00	\$800.00
9	8" Gravel Surfacing	37	Ton	\$25.00	\$925.00
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	<b>\$10,9</b> 06.48

Contingency / Admin & Legal Fees		
10% Contingency		\$1,090.65
6% Admin / Legal		\$654.39
	Subtotal	\$1,745.04
Design and Construction Management Services		
Design Engineering		\$1,090.65
Construction Engineering		\$1,090.65
	Subtotal	\$2,181.30
Estimated Total Project Cost		\$14,832.81

V	Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 1 Location: 1.1 Mi. E. of New Holland, SD 31' Two-Span Concrete Bridge					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	
1	Mobilization	1	LS	\$56,958.05	\$56,958.05	
2	Clearing and Grubbing	1	LS	\$5,000.00	\$5,000.00	
3	Unclassified Excavation	2000	CY	\$12.00	\$24,000.00	
4	Placing Topsoil	1	LS	\$5,000.00	\$5,000.00	
5	Traffic Control	1	LS	\$8,000.00	\$8,000.00	
6	Gravel Surfacing	300	TON	\$25.00	\$7,500.00	
7	Seeding, Fertilizing, and Mulching	1	LS	\$6,500.00	\$6,500.00	
8	Erosion Control	1	LS	\$20,000.00	\$20,000.00	
9	Remove/Salvage Existing Structure	1	LS	\$15,000.00	\$15,000.00	
10	Fencing	1	LS	\$2,500.00	\$2,500.00	
11	Incidental Work, Structure	1	LS	\$16,970.50	\$16,970.50	
12	Structure Excavation, Bridge	150	CY	\$200.00	\$30,000.00	
13	Bridge End Embankment	300	CY	\$40.00	\$12,000.00	
14	Granular Bridge End Backfill	30	CY	\$150.00	\$4,500.00	
15	Class A45 Concrete, Bridge Deck	75	CY	\$1,250.00	\$93,750.00	
16	Class A45 Concrete, Bridge	69	CY	\$1,200.00	\$82,800.00	
17	Type T101 Bridge Railing	97	Ft	\$200.00	\$19,400.00	
18	Reinforcing Steel	10000	Lb	\$1.50	\$15,000.00	
19	Epoxy Coated Reinforcing Steel	22600	Lb	\$1.60	\$36,160.00	
20	Preboring Pile	40	Ft	\$40.00	\$1,600.00	
21	HP 10x42 Steel Test Pile, Furnish & Drive	200	Ft	\$100.00	\$20,000.00	
22	HP 10x42 Steel Bearing Pile, Furnish & Drive	1280	Ft	\$50.00	\$64,000.00	
23	4" Underdrain Pipe	140	Ft	\$25.00	\$3,500.00	
24	Porous Backfill	32	Ton	\$100.00	\$3,200.00	
25	Class B Riprap	1000	Ton	\$70.00	\$70,000.00	
26	Type B Drainage Fabric	800	SY	\$4.00	\$3,200.00	
				Total	\$626.538.55	

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#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal

\$62,653.86 \$37,592.31 Subtotal \$100,246.17

Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 2 Location: 1.0 Mi. S. & 2.8 Mi. E. of New Holland, SD 30" CMP Culvert						
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	
1	Mobilization	1	LS	\$1,057.10	\$1,057.10	
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00	
3	Pipe Bedding	7.3	Ton	\$40.00	\$292.00	
4	30" CMP, Furnish	40	Ft	\$49.20	\$1,968.00	
5	30" CMP, Install	40	Ft	\$35.27	\$1,410.80	
6	30" CMP Flared End, Furnish	2	Each	\$540.67	\$1,081.34	
7	30" CMP Flared End, Install	2	Each	\$318.92	\$637.84	
8	Unclassified Excavation	157	CuYd	\$8.00	\$1,256.00	
9	8" Gravel Surfacing	45	Ton	\$25.00	\$1,125.00	
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00	
				Total	\$11,628.08	
	Contingency / Admin & Legal Fees					
	10	% Contingency			\$1,162.81	
	6%	6 Admin / Legal			\$697.68	
				Subtotal	\$1,860.49	
	Design and Construction Manage	ement Services				
	Desi	gn Engineering			\$1,162.81	
	Construction	on Engineering			\$1,162.81	

Estimated Total Project Cost

\$15,814.19

Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 3 Location: 3.0 Mi. S. & 2.6 Mi. E. of New Holland, SD 30" RCP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$1,695.82	\$1,695.82
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	7.3	Ton	\$40.00	\$292.00
4	30" RCP Class 2, Furnish	40	Ft	\$35.78	\$1,431.20
5	30" RCP, Install	40	Ft	\$45.17	\$1,806.80
6	30" RCP Sloped End, Furnish	2	Each	\$642.68	\$1,285.36
7	30" RCP Sloped End, Install	2	Each	\$467.93	\$935.86
8	Unclassified Excavation	174	CuYd	\$8.00	\$1,392.00
9	12" Gravel Surfacing	98.6	Ton	\$25.00	\$2,465.00
10	4" Asphalt Concrete Surfacing	26	Ton	\$175.00	\$4,550.00
11	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$18,654.04

Contingency / Admin & Legal Fees

	Subtotal	\$2,984.65
6% Admin / Legal		\$1,119.24
10% Contingency		\$1,865.40

Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 4 Location: 3.0 Mi. S. & 2.6 Mi. E. of New Holland, SD 48" RCP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$2,245.61	\$2,245.61
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	11.6	Ton	\$40.00	\$464.00
4	48" RCP Class 2, Furnish	40	Ft	\$88.29	\$3,531.60
5	48" RCP, Install	40	Ft	\$81.79	\$3,271.60
6	48" RCP Flared End, Furnish	2	Each	\$1,152.37	\$2,304.74
7	48" RCP Flared End, Install	2	Each	\$702.58	\$1,405.16
8	Unclassified Excavation	208	CuYd	\$8.00	\$1,664.00
9	12" Gravel Surfacing	98.6	Ton	\$25.00	\$2,465.00
10	4" Asphalt Concrete Surfacing	26	Ton	\$175.00	\$4,550.00
11	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
				Total	\$24,701.71
Contingency / Admin & Legal Fees 10% Contingency 6% Admin / Legal Si			Subtotal	\$2,470.17 \$1,482.10 <b>\$3,952.27</b>	
	Design and Construction Manag	ement Services			
Design Engineering \$2,470.1			\$2,470.17		
	Construction Engineering			\$2,470.17	

Estimated Total Project Cost

\$4,940.34

\$33,594.33

Subtotal

Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 5 Location: 3.5 Mi. S. & 2.4 Mi. E. of New Holland, SD					
v 2 - 36" CMP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	PRICE	COST
1	Mobilization	1	LS	\$1,928.66	\$1,928.66
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	17.4	Ton	\$40.00	\$696.00
4	36" CMP, Furnish	80	Ft	\$55.00	\$4,400.00
5	36" CMP, Install	80	Ft	\$25.15	\$2,012.00
6	36" CMP Flared End, Furnish	4	Each	\$891.90	\$3,567.60
7	36" CMP Flared End, Install	4	Each	\$588.00	\$2,352.00
8	Unclassified Excavation	173	CuYd	\$8.00	\$1,384.00
9	8" Gravel Surfacing	51	Ton	\$25.00	\$1,275.00
10	Existing Culvert Removal and Disposal	80	Ft	\$20.00	\$1,600.00
				Total	\$21,215.26
	Contingency / Adm 10	in & Legal Fees			\$2,121.53
	6% Admin / Legal				\$1,272.92
				Subtotal	Ş3,394.4 <b>4</b>
Design and Construction Management Services					
	Des	ign Engineering			\$2,121.53
	Constructi	ion Engineering			\$2,121.53
Subtotal				\$4,243.05	
	Estimated To	tal Project Cost			\$28,852.75

2309 W. 50th Street Sioux Fails, SD 57105 Ph: 605.336.1676
NGINEERING, INC. ENGINEERING SURVEYING

### Douglas County Storm Water Facility Plan Tributarty to Platte Creek Basin Crossing Number: 6 Location: 1.0 Mi. S. & 2.1 Mi. E of New Holland, SD No Structure

ITEM	ITEM DESCRIPTION Q	UANTITY	UNIT	UNIT	TOTAL
1	Mobilization		LS	<b>PRICE</b> \$0.00	\$0.00
2	Clearing and Grubbing		LS	\$5,000,00	\$0.00
3	Unclassified Excavation		CY	\$12.00	\$0.00
4	Placing Topsoil		LS	\$5,000,00	\$0.00
5	Traffic Control		LS	\$8,000,00	\$0.00
6	Gravel Surfacing		TON	\$25.00	\$0.00
7	Seeding Fertilizing and Mulching		LS	\$6,500.00	\$0.00
8	Frosion Control		LS	\$20,000.00	\$0.00
9	Remove/Salvage Existing Structure		LS	\$15,000.00	\$0.00
10	Fencing		LS	\$2,500.00	\$0.00
11	Incidental Work. Structure		LS	\$0.00	\$0.00
12	Structure Excavation. Bridge		CY	\$200.00	\$0.00
13	Bridge End Embankment		CY	\$40.00	\$0.00
14	Granular Bridge End Backfill		CY	\$150.00	\$0.00
15	Class A45 Concrete, Bridge Deck		CY	\$1,250.00	\$0.00
16	Class A45 Concrete, Bridge		CY	\$1,200.00	\$0.00
17	Type T101 Bridge Railing		Ft	\$200.00	\$0.00
18	Reinforcing Steel		Lb	\$1.50	\$0.00
19	Epoxy Coated Reinforcing Steel		Lb	\$1.60	\$0.00
20	Preboring Pile		Ft	\$40.00	\$0.00
21	HP 10x42 Steel Test Pile, Furnish & Drive		Ft	\$100.00	\$0.00
22	HP 10x42 Steel Bearing Pile, Furnish & Drive		Ft	\$50.00	\$0.00
23	4" Underdrain Pipe		Ft	\$25.00	\$0.00
24	Porous Backfill		Ton	\$100.00	\$0.00
25	Class B Riprap		Ton	\$70.00	\$0.00
26	Type B Drainage Fabric		SY	\$4.00	\$0.00
				Total	\$0.00

#### Contingency / Admin & Legal Fees

10% Contingency 6% Admin / Legal \$0.00 \$0.00 Subtotal \$0.00

Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 7 Location: 0.9 Mi. S. & 1.0 Mi. E. of New Holland, SD 24" CMP Culvert					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	\$856.39	\$856.39
2	Clearing and Grubbing	1	LS	\$2,000.00	\$2,000.00
3	Pipe Bedding	5.8	Ton	\$40.00	\$232.00
4	24" CMP, Furnish	40	Ft	\$42.20	\$1,688.00
5	24" CMP, Install	40	Ft	\$24.10	\$964.00
6	24" CMP Flared End, Furnish	2	Each	\$264.24	\$528.48
7	24" CMP Flared End, Install	2	Each	\$248.97	\$497.94
8	Unclassified Excavation	92	CuYd	\$8.00	\$736.00
9	8" Gravel Surfacing	44.7	Ton	\$25.00	\$1,117.50
10	Existing Culvert Removal and Disposal	40	Ft	\$20.00	\$800.00
Total \$9,420.31					\$9,420.31
	Contingency / Adm 1 6	<b>nin &amp; Legal Fees</b> 0% Contingency % Admin / Legal		Subtotal	\$942.03 \$565.22 <b>\$1,507.25</b>
	Design and Construction Manag	ement Services			
Design Engineering \$942.03				\$942.03	
Construction Engineering			\$942.03		

	Subtotal	\$1,884.06	
Estimated Total Project Cost		\$12,811.62	
Estimated Total Project Cost		\$22,231.94	
Δ			
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23	09 W. 50th Street x Fails SD 57105		
	Ph: 605.336.1676		
	DSZ		
	EERING, INC.		
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## Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 8 Location: 2.0 Mi. S. & 1.6 Mi. E. of New Holland, SD No Structure

ITEM	ITEM DESCRIPTION Q	UANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization		LS	\$0.00	\$0.00
2	Clearing and Grubbing		LS	\$5,000.00	\$0.00
3	Unclassified Excavation		CY	\$12.00	\$0.00
4	Placing Topsoil		LS	\$5,000.00	\$0.00
5	Traffic Control		LS	\$4,000.00	\$0.00
6	Gravel Surfacing		TON	\$25.00	\$0.00
7	4" Asphalt Concrete Surfacing		TON	\$175.00	\$0.00
8	Seeding, Fertilizing, and Mulching		LS	\$6,500.00	\$0.00
9	Erosion Control		LS	\$5,000.00	\$0.00
10	Fencing		LS	\$2,500.00	\$0.00
11	Incidental Work, Structure		LS	\$0.00	\$0.00
12	Structure Excavation, Box Culvert		CY	\$45.00	\$0.00
13	Box Culvert Undercut		CY	\$120.00	\$0.00
14	7'x4' Precast Concrete Box Culvert, Furnish		FT	\$500.00	\$0.00
15	7'x4' Precast Concrete Box Culvert, Install		FT	\$150.00	\$0.00
16	7'x4' Precast Concrete Box Culvert End Section, Furnish		EACH	\$6,000.00	\$0.00
17	7'x4' Precast Concrete Box Culvert End Section, Install		EACH	\$1,500.00	\$0.00
18	Class B Riprap		TON	\$70.00	\$0.00
19	Type B Drainage Fabric		SY	\$4.50	\$0.00
20	Diversion Channel		LS	\$12,000.00	\$0.00
21	Remove/Salvage Existing Structure		LS	\$5,000.00	\$0.00
				Total	\$0.00

Contingency / Admin & Legal Fees		
10% Contingency		\$0.00
6% Admin / Legal		\$0.00
	Subtotal	\$0.00
Design and Construction Management Services		
Design Engineering		\$0.00
Construction Engineering		\$0.00
	Subtotal	\$0.00
Estimated Total Project Cost		\$0.00

Douglas County Storm Water Facility Plan Tributary to Platte Creek Basin Crossing Number: 9 Location: 2.5 Mi. S. & 1.0 Mi. E. of New Holland, SD No Structure					
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization		LS	\$0.00	\$0.00
2	Clearing and Grubbing		LS	\$2,000.00	\$0.00
3	Pipe Bedding		Ton	\$40.00	\$0.00
4	36" CMP, Furnish		Ft	\$55.00	\$0.00
5	36" CMP, Install		Ft	\$25.15	\$0.00
6	36" CMP Flared End, Furnish		Each	\$891.90	\$0.00
7	36" CMP Flared End, Install		Each	\$588.00	\$0.00
8	Unclassified Excavation		CuYd	\$8.00	\$0.00
9	8" Gravel Surfacing		Ton	\$25.00	\$0.00
10	Existing Culvert Removal and Disposal		Ft	\$20.00	\$0.00
				Total	\$0.00
	Contingency / Admi		-		

Estimated Total Project Cost		\$0.00
	Subtotal	\$0.00
Construction Engineering		\$0.00
Design Engineering		\$0.00
Design and Construction Management Services		
	Subtotal	\$0.00
6% Admin / Legal		\$0.00
10% Contingency		\$0.00
contingency / Admin & Legal Fees		