PURPOSE AND NEED DEVELOPMENT MEMORANDUM

ENVIRONMENTAL IMPACT STATEMENT FOR THE SOUTH ROCHFORD ROAD, PENNINGTON COUNTY, SD

June 2012

1.0 INTRODUCTION

In January 2012, Pennington County, South Dakota Department of Transportation (SDDOT), and Federal Highway Administration (FHWA) (the Joint Lead Agencies) published in the Federal Register the Notice of Intent (NOI) to initiate the South Rochford Road Environmental Impact Statement (EIS).

The purpose of this memo is:

- **Describe the issues with South Rochford Road identified during scoping process with the agencies, tribes, and public that could be potential needs for the Project.** Under SAFETEA-LU, the Joint Lead Agencies are responsible for the development of the project's purpose and need statement. This memo's purpose is to initiate the development of the purpose and need by identifying and discussing all issues with South Rochford Road to finalize the need for the Project.
- **Identify the future steps to complete the Purpose and Need for the Project.**

1.1 PROJECT BACKGROUND

In May 2004, the County Federal Aid Surface Transportation Program approved the resolution to construct a new road along South Rochford Road.

The request for the resolution was spurred by the need to improve South Rochford Road due to increasing maintenance costs and reoccurring roadway deficiencies, i.e. frost heaves, and potential safety issues, i.e. clear zones (the Project). In 2006, SDDOT determined that the level of environmental analysis needed was an Environmental Assessment (EA) and a consultant was hired to design the Project; preliminary plans were completed in 2008. In 2008, a Level III intensive cultural resources survey was performed. By 2010, FHWA communicated to SDDOT and Pennington County that an EIS would be required instead of an EA due to the concerns of the tribal governments.

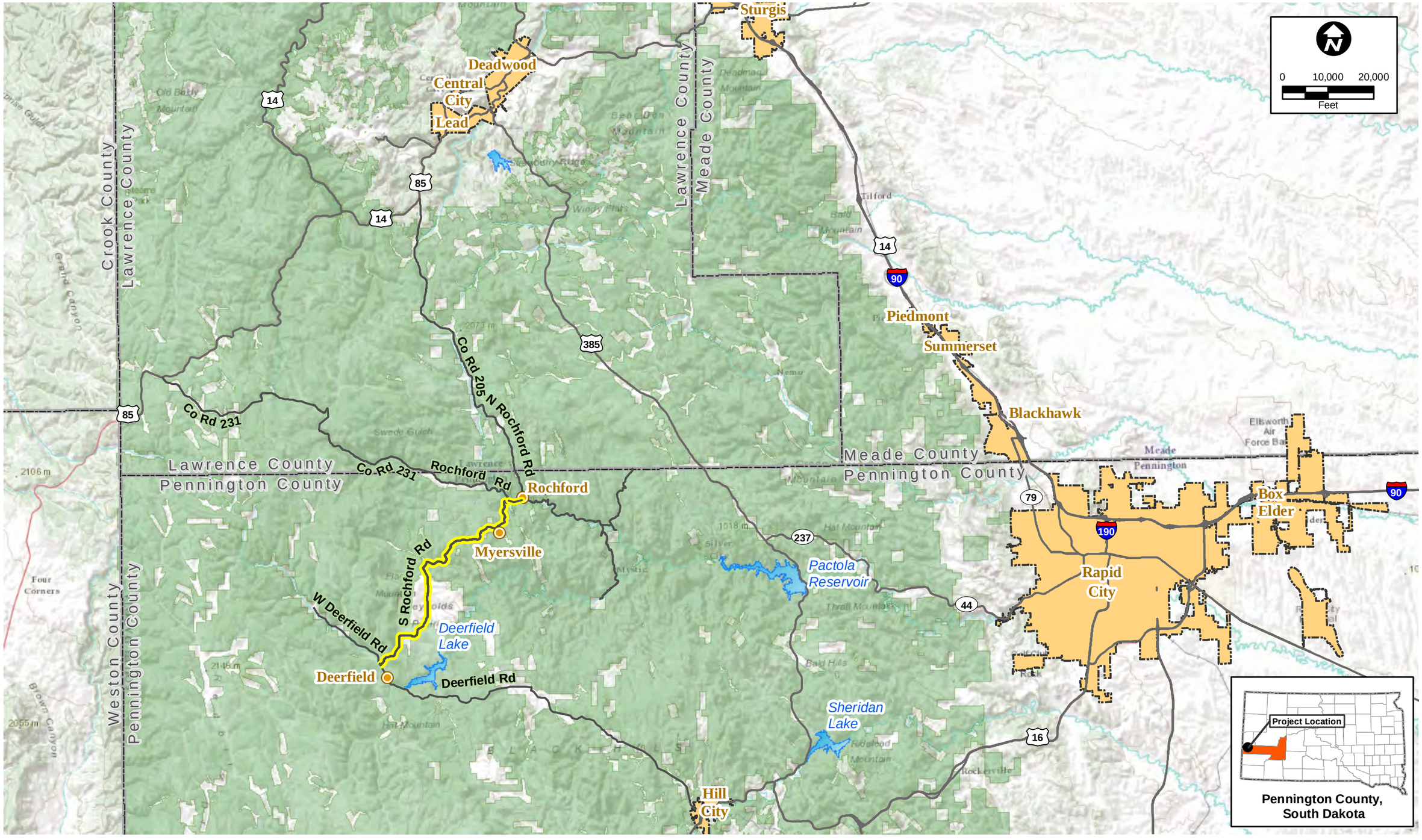
1.2 PROJECT AREA DESCRIPTION

The Project is located in western South Dakota, south of the Town of Rochford in Pennington County. The existing South Rochford Road extends northeast to southwest from the Town of Rochford to the Deerfield Lake area. The roadway is approximately 10 miles in length starting at Rochford Road and ending at its intersection with West Deerfield Road (see Figure 1).

South Rochford Road is part of the Pennington County transportation network. For the transportation network within Pennington County, there are limited corridors that run north to south in this area for north-south bound traffic. The existing roadway system is displayed on Figure 1 and includes:

- **North Rochford Road**, County Road 205, which extends from US Highway 14A southeast to the Town of Rochford.

- **Rochford Road**, County Road 231, which extends from US 85 through the Town of Rochford west to US Highway 385.
- **South Rochford Road** extends from the Town of Rochford southwest to West Deerfield Road.
- **Deerfield Road** extends from US 85 to Hill City. The roadway is a paved section from the intersection of West Deerfield Road and South Rochford Road to Hill City.
- **US Highway 385 (US 385)** extends from Deadwood-Lead Area southeast to US 16.
- **US Highways 14A and 85 (US 14A and US 85)** extends from Deadwood-Lead Area to the southwest to US 16.



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Overview Map
South Rochford Road

Environmental Impact Statement
Pennington County, South Dakota

Cities
City Limits
Water Body
USFS Land

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FIGURE
1

2.0 IDENTIFYING DATA THAT INDICATES THERE IS A NEED FOR THE PROJECT

In discussions with Pennington County, SDDOT, FHWA, federal, state, and local agencies, tribes, and the public, a number of issues have been identified in regard to the existing roadway. In order to develop a defensible purpose and need, initially each of the issues has been further analyzed to determine if each can be an element of the purpose and need for the Project. Although there may be many needs for the Project, each need must be a specific reason alone to build the Project. The potential needs for the project were grouped by the need categories in the FHWA Technical Advisory T 6640.8A: roadway deficiencies, safety, and connectivity. Some of the issues could also fall into categories other than need, such as: potential benefits, constraints, and potential opportunities. The purpose of the following sections is to provide further discussion of each issue and allow the Joint Lead Agencies to determine the project needs to carry forward for formulation of the purpose and need for the Project.

2.1 ROADWAY DEFICIENCIES

The condition of South Rochford Road has been affected by drainage issues consisting of inadequate roadbed drainage and overtopping from adjacent road ditches and/or natural drainageways and streams. In addition, frost heaves have created an inconsistent roadway surface. These condition issues have led to expensive maintenance costs per mile in comparison to similar county roads.

- **Drainage and Overtopping**: South Rochford Road experiences overtopping and drainage issues in the Icebox Canyon area, at South Fork Rapid Creek (southwest of Rochford) and at the small intermittent tributary to South Fork Rapid Creek. The overtopping causes severe roadbed and sub-grade erosion.
- **Frost heaves**: Ice lenses forming beneath the soil below the roadbed causes road lifting along parts of South Rochford Road. This creates the need for additional roadway maintenance. Figures 2a thru 2d display the areas that frost heaves have been documented.

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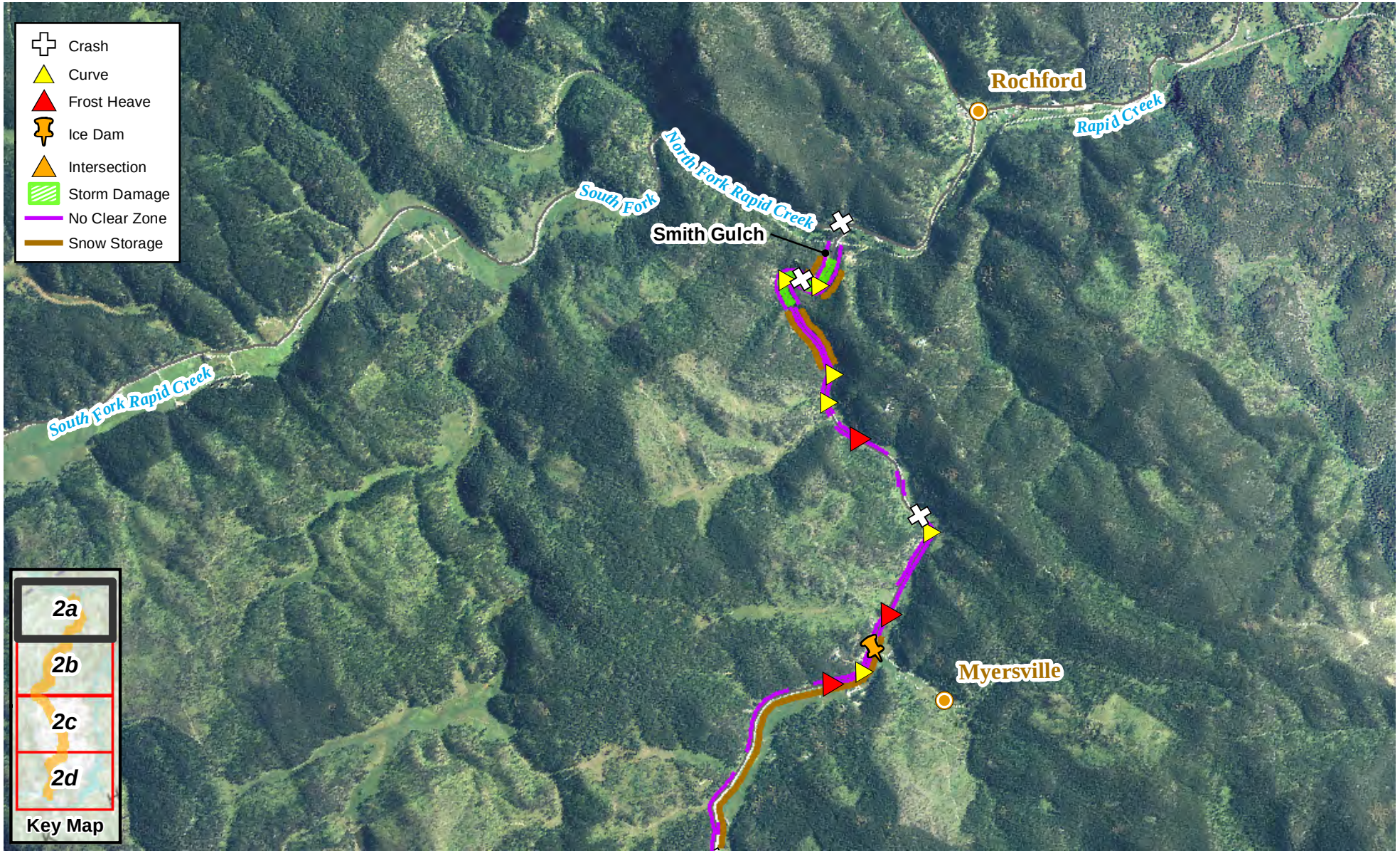

Pennington County, South Dakota

South Dakota DOT Department of Transportation

U.S. Department of Transportation Federal Highway Administration

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Feet

Project Needs

Environmental Impact Statement
Pennington County, South Dakota

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FIGURE

2a

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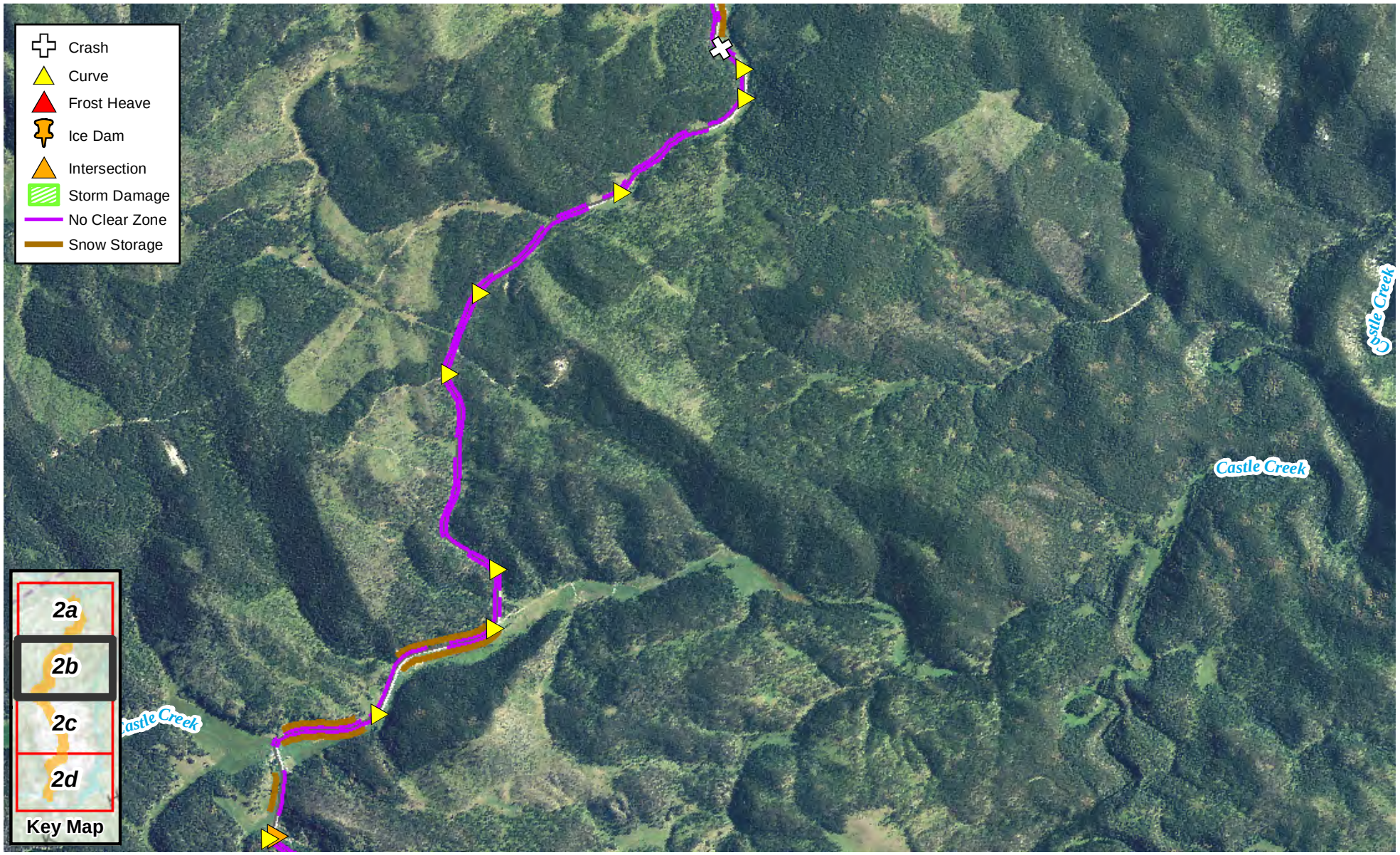

Pennington County, South Dakota

South Dakota DOT Department of Transportation

U.S. Department of Transportation Federal Highway Administration

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Project Needs

Environmental Impact Statement
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FIGURE

2b

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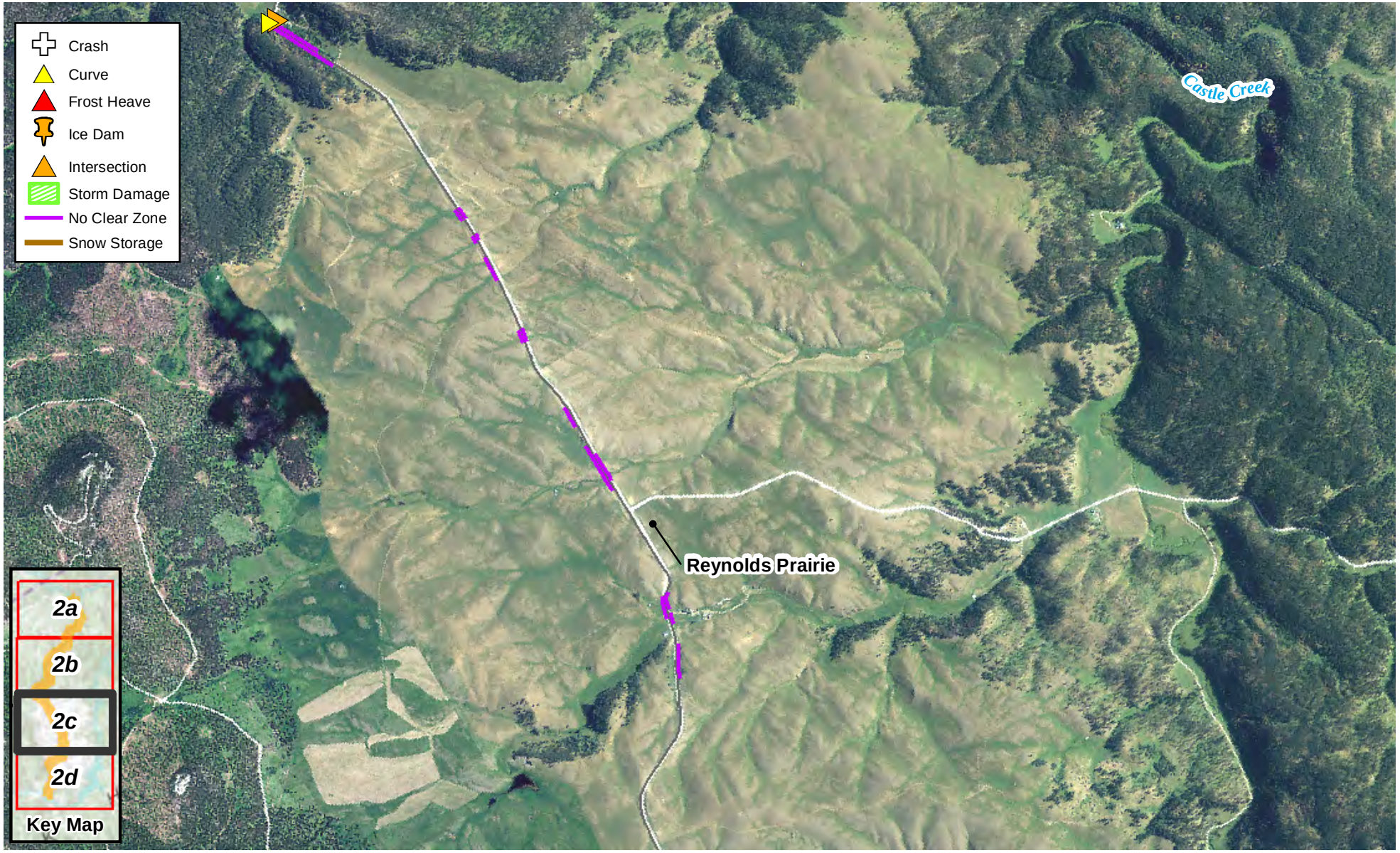

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Project Needs

Environmental Impact Statement
Pennington County, South Dakota

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FIGURE
2c

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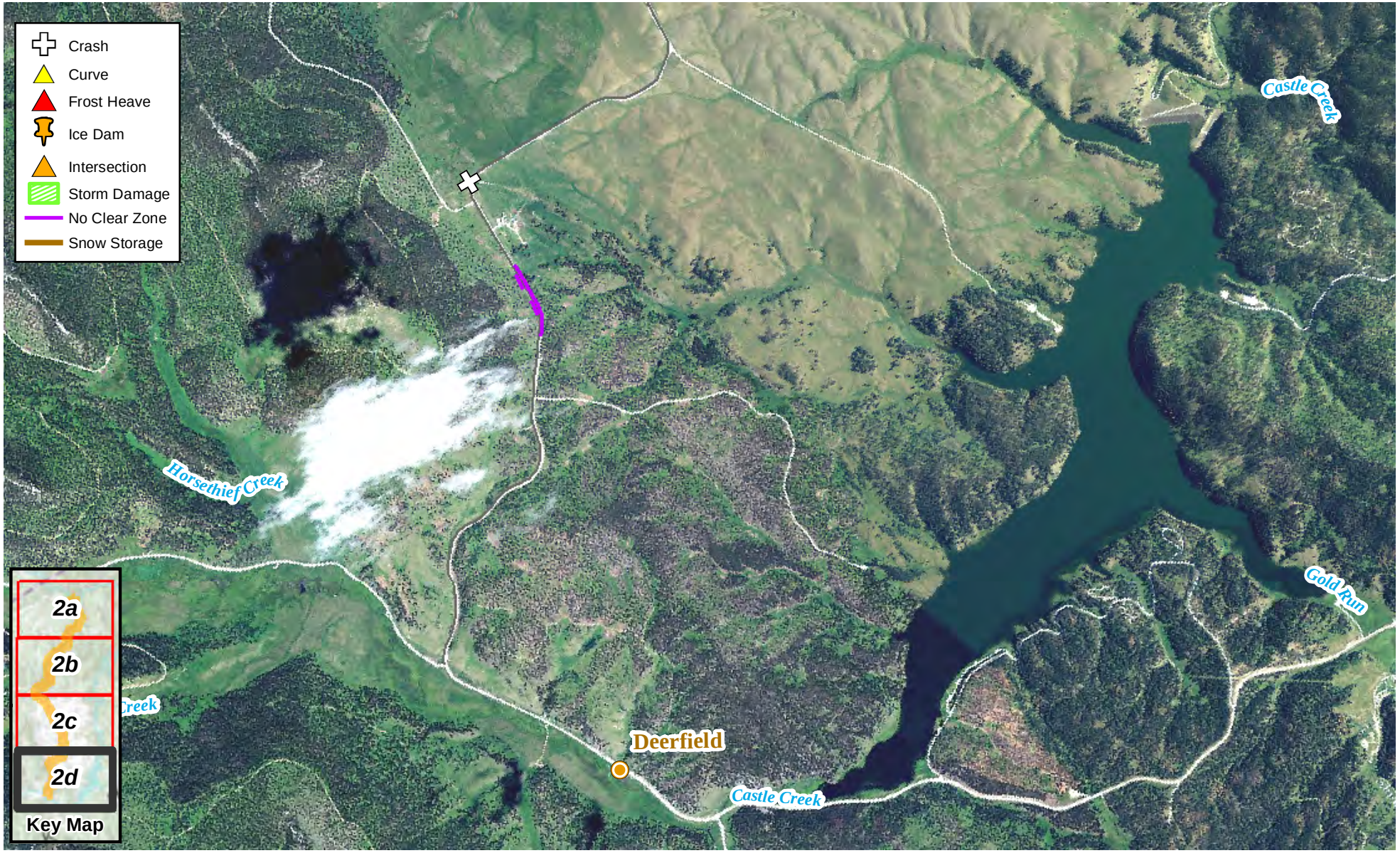

Pennington County, South Dakota

South Dakota DOT Department of Transportation

U.S. Department of Transportation Federal Highway Administration

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Feet

Project Needs

Environmental Impact Statement
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FIGURE

2d

- **Frequent roadway maintenance**: The aforementioned problems require frequent roadway maintenance and high maintenance costs. From 2001 to 2011, it cost the County an average of $8,061 per mile to maintain South Rochford Road, compared to an average maintenance cost of $3,942 per mile for similar two-lane gravel roads in Pennington County (see Table 1). The County documented 12 times from 1990 to 2009 where South Rochford Road required repair. Table 2 provides the date, work type and project cost per mile for each repair. For the 12 times that the County has data on project cost, the average project cost per repair was $60,412. For the seven repairs where a length was documented, the average project cost per mile was $24,336.

  In order to determine the expected maintenance costs associated with South Rochford Road following the proposed improvements, the maintenance costs of a paved roadway adjacent to South Rochford Road was identified, Deerfield Road. Maintenance cost records from three segments of Deerfield Road stretching from South Rochford Road to Tigerville Road indicate $5,026.59 was spent annually per road mile from 2002-2012 (see Figure 3). An estimated decrease in annual maintenance costs would therefore be $3,035 per mile.

  The Minnesota Department of Transportation (MNDOT) published a report "*Economics of Upgrading an Aggregate Road*" and used a 30-year economic evaluation of gravel vs. bituminous surface for seven road categories ranging in average annual daily traffic (AADT) from 0-49 AADT to 300+ AADT [1]. The relationship between traffic level and maintenance cost indicated maintenance cost of gravel and bituminous surfaces become identical once traffic volumes reach 150-199 vehicles per day. This research recommends serious consideration to upgrading roads with traffic volumes above 200 vehicles per day. Other indirect monetary factors associated with paved surfaced roads mentioned in the study include improved driver and vehicle efficiency and redistributing traffic.

[1] Jahren, C.T., D. Smith, J. Thorius, M. Rukashaza-Mukome, D. White, and G. Johnson. 2005. Economics of upgrading an aggregate road. Iowa State University. Ames, IA. 50011. p. 72.

Table 1
Maintenance Costs of South Rochford Road Compared to Similar County Roads

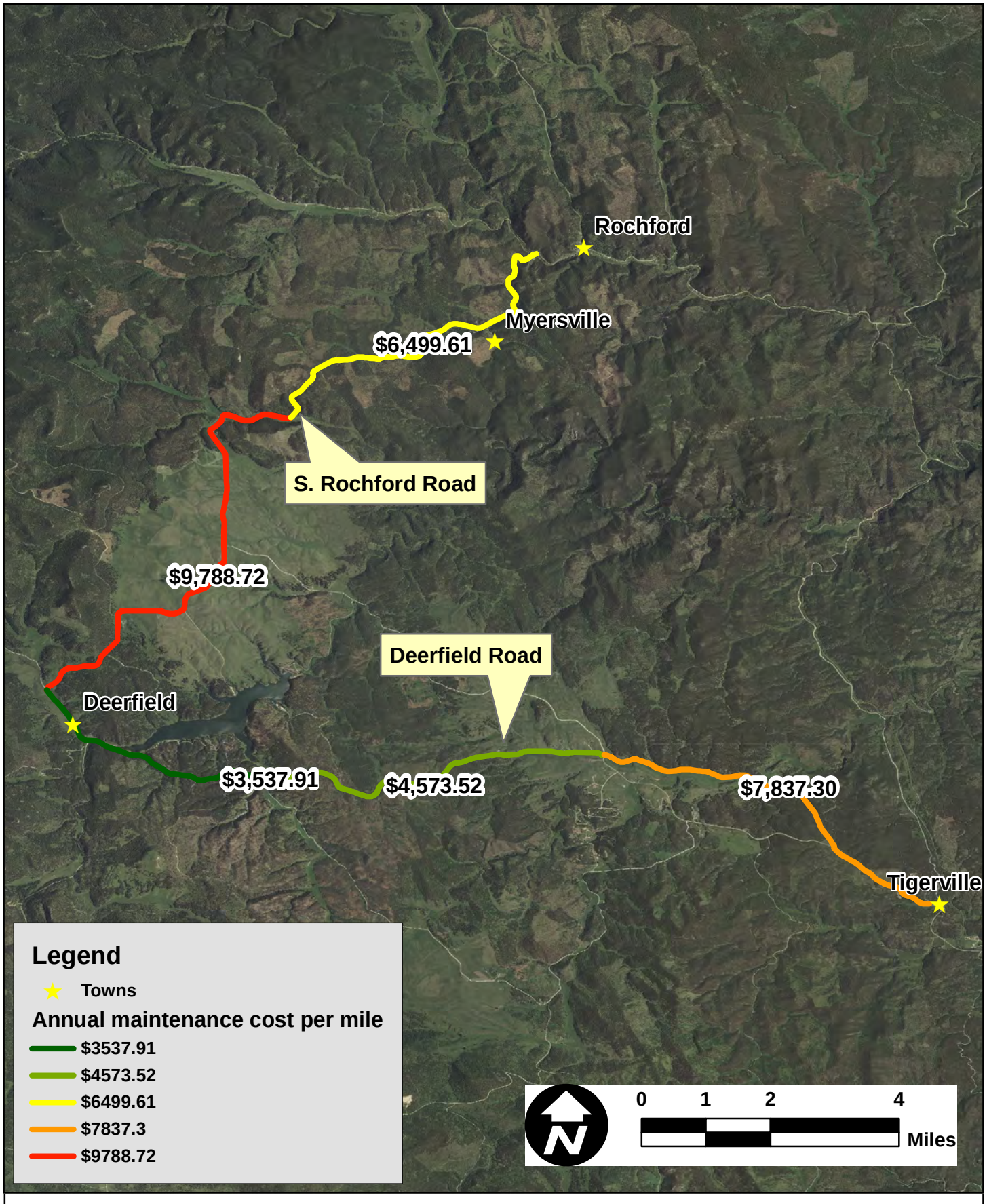
Year	Cost[1]	Cost per Mile	Pennington County Cost per Mile[2]
2001	$37,025	$3,574	$3,103
2002	$66,868	$6,454	$3,458
2003	$17,893	$1,727	$3,335
2004	$352,303	$34,006	$3,166
2005	$36,335	$3,507	$3,528
2006	$19,452	$4,773	$4,378
2007	$33,626	$3,246	$4,078
2008	$172,026	$16,605	$4,643
2009	$94,579	$9,129	$4,090
2010	$35,022	$3,381	$4,526
2011	$21,551	$2,466	$5,060
Average=	**$80,607 per year**	**$8,061 per mile**	**$3,942 per mile**

Note:
1 Data includes two segments of South Rochford Road, end of asphalt to Seven Hills Road (5.36 miles) and Seven Hills Road to Rochford Road (5.00 miles). These segments are slightly longer than the Project length of 10 miles. Source: Pennington County, 2012
2 Data includes all gravel roads within Pennington County, excluding South Rochford Road. Source: Pennington County, 2012

Table 2
Work History of South Rochford Road

Date	Work Type	Project Length (miles)[1]	Project Cost	Project Cost per Mile
July 1990	Gravel	10.36	Unknown	--
July 1992	Gravel	5.00	$91,398	$18,280
July 1993	Gravel	10.36	Unknown	--
October 2001	Gravel and Spot Gravel	Unknown	$14,650	--
August 2002	Gravel	3.00	$42,796	$14,265
October 2004	Gravel	1.00	$40,117	$40,117
October 2004	Chip Seal	1.02	$4,425	$4,338
November 2004	Gravel	2.50	$143,127	$57,251
December 2004	Reconstruct	3.50	$113,778	$32,508
September 2008	Spot Gravel	Unknown	$86,559	--
September 2009	Spot Gravel	5.36	$19,266	$3,594
October 2009	Spot Gravel	Unknown	$47,471	--
		Average=	**$60,412**	**$24,336**

Note:
[1] Data includes two segments of South Rochford Road, end of asphalt to Seven Hills Road (5.36 miles) and Seven Hills Road to Rochford Road (5.00 miles). These segments are slightly longer than the Project length of 10 miles. Source: Pennington County, 2012



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Pennington County, South Dakota

South Dakota DOT Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Road Maintenance Cost

South Rochford Road EIS
Pennington County, South Dakota

DATE
June 2012

FIGURE
3

2.2 SAFETY

Typically safety issues include nighttime visibility, impaired driving, speeding, animal crossings, fixed objects next to the roadway, sharp curves, and lack of a "clear zone" where drivers can safely stop if needed. The following are potential issues contributing to unsafe driving conditions. Each would be evaluated to determine if they contribute to a potential for unsafe travel:

- **Traffic Volumes:** Overall, traffic volumes on South Rochford Road have decreased from 2000 to 2011. There could be a number of factors that contribute to the decline, including less vehicle miles traveled during a recessed economy, less vacation travel, higher gasoline prices, reduced hunting licenses, and condition of the road.

Table 1-3
Average Daily Traffic on South Rochford Road by Segment

Date	Average Daily Traffic	Average Annual Growth Rate
Rochford Road to Seven Hills Road (non-rally week)		
7/6/2005	177	-2.29%
7/6/2006	193	
7/20/2007	168	
9/10/2008	126	
7/27/2010	173	
7/20/2011	184	
7/26/2011	154	
Rochford Road to Seven Hills Road (rally week)		
8/4/2005	294	-6.30%
8/1/2008	186	
7/30/2009	155	
8/7/2010	265	
8/7/2011	199	
Seven Hill Road to Slate Prairie		
7/12/2000	148	-1.10%
7/16/2003	172	
7/6/2005	133	
10/8/2008	47	
9/1/2011	131	
Slate Prairie to Flag Mountain		
7/12/2000	119	-1.13%
7/16/2003	134	
7/6/2005	97	
9/10/2008	51	
9/1/2011	105	

Source: Pennington County, 2012

During the Sturgis Motorcycle Rally, motorcycle use increases along South Rochford Road. In 2010, traffic increased by 34.7 percent from the non-rally week traffic volumes and in 2011, it increased by 22.6 percent.

A travel demand forecasting model is being developed as part of a new Pennington County transportation plan. Traffic forecasts from that model would be used to estimate future travel demand on South Rochford Road.

- **Crash Data:** Five reported accidents have occurred on South Rochford Road in four years. Of the 5 accidents, three were due to winter conditions, one was due to improper backing, and one animal hit. See Figures 2a thru 2d for the location of the crashes.

  Techniques developed as part of the Highway Safety Manual (HSM) provide the capability to forecast crashes based on roadway conditions. The crash prediction capabilities of the Interactive Highway Safety Design Model (IHSDM) wouldbe used to estimate crashes for the future no-build conditions and for future design alternatives. Differences between these crash predictions can lead to justification for roadway improvements.

- **Clear Zones:** The American Association of State Highway and Transportation Officials (AASHTO) Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT $\leq$ 400) indicates in both safety and risk assessment literature indicates that run-off-road crashes on roads with very low traffic volumes occur so infrequently as to make any minimum clear zone width not as cost-effective. In many cases along this corridor, the provision of additional clear zone width will increase construction costs and requires additional right-of-way (ROW) acquisition which potentially has both cost and environmental concerns.

  Further discussion in the AASHTO guidelines indicates that unless there is an area with a crash history, clear zones are not required for this classification of road.

  In summary, the designer is encouraged to tailor the roadside design to site-specific conditions, considering costs and safety tradeoffs. Although guardrail is considered a roadside obstacle and is not considered cost-effective for very low-volume local roads, AASHTO does allow engineering judgment concerning the placement of guardrail at locations where the departure of a vehicle from the roadway would result in extremely severe consequences. Clear zone issues including lack of proper safety ends on the culverts, drop-offs, trees, and fences encroaching into the clear zones will need to be addressed on a case-by-case basis (see Figures 2a thru 2d).

- **Horizontal Curves:** AASHTO guidelines define sight distance as the straight line chord of a horizontal curve from one point on the inside lane to another point on the inside lane. The minimum required sight distance is based on the required stopping distance for a given speed and includes reaction and braking time. On the existing roadway the following are curves that do not meet the minimum required sight distance or are less than 35 mph design speed:

  - The “hair-pin” curve area has a recommended speed of 20 mph with a required sight distance of 95 feet (see Figure 2). The estimated current minimum sight distance is 90 feet, slightly less than recommended.

- There are at least 15 curves on the current alignment that are very close to or will not meet the recommended sight distance of 165 feet for a 30 mph road. All but 2 curves would need to have the alignment straightened to improve sight distance. Two (2) curves would gain sight distance by the removal of trees.

- **Intersections:** There also appears to be at least one intersection (driveway approach) that does not meet the minimum AASHTO recommendations for sight distance. The recommended minimum sight distance for intersections on a 30 mph road is 120 feet (see Figure 2).

- **Snow Storage:** Snow storage is the ability to plow and store snow from the roadway, generally in the ditch sections. Much of the South Rochford Road, particularly north of Reynolds Prairie, does not have adequate snow storage capacity. The ditch sections on the uphill side of these areas are generally shallow and narrow and will not allow for significant snow storage. Areas on the downhill side of the road will accept significant snow storage, but in areas where the road crosses or abuts private property, the private property is often fenced. Snow placed on or against a fence would damage the fence. During winters that have significant snowfall, it is not uncommon to run out of snow storage space. In these cases, the width available for travel narrows and becomes a safety hazard. The areas that snow storage is an issue are noted on Figures 2a thru 2d.

- **Dust:** Several public comments received at the Community Meeting, Public Scoping meeting and on the Project's website indicated issues with dust. Many of the residences along the roadway have applied chemicals that suppress excessive dust from the roadway.

  A Pennington County dust emissions dataset including 227 paved roads and 19 gravel roads indicates that the amount of dust per vehicle ton mile (lb T^{-1} mi^{-1}) is 0.28 lb T^{-1} mi^{-1} for gravel roads and 2.87 *10^{-3} lb T^{-1} mi^{-1} for paved roads. Therefore, dust emissions would decrease nearly 100 fold assuming traffic counts stay the same (Pennington County, 2012[2])

- **Driver Expectancy**: Design consistency refers to a highway's geometry's conformance with driver expectancy. One definition of expectancy with regard to transportation has been given:

  > "Driver expectancy relates to the observable, measureable features of the driving environment which: (1) increase a driver's readiness to perform a driving task in a particular manner, and (2) cause the driver to continue in the task until it is completed or interrupted."

  Drivers expect things to operate in certain ways. When a driver's expectancy is incorrect, either the driver takes longer to respond properly or he/she may respond poorly or wrongly. What the driver expects on a road is greatly influenced by the

[2] Pennington County, May 29, 2012. Information provided by Pennington County via email to HDR.

"roadway environment" i.e. what was experienced on the previous section of the road. Studies have shown that what a driver experiences on a road section- presence or absence of traffic control devices, road surface type, condition and width, narrow bridges, or culverts, is what the driver expects to continue for the next half to one mile.

Consistency relates to the "sameness" of the nature of the road from one section to another. Inconsistencies are sudden changes in the nature of the road, for example a sharp curve after a long, straight section. Inconsistencies violate a driver's expectancy; thus either the road should be made consistent, which the practicability of this must be determined (Russell, 1998[3]).

For South Rochford Road, the issues noted above can be considered inconsistencies. Some of the inconsistencies are permanent, for example tight curves that if impractical to reconstruct can be managed with proper signage. Some inconsistencies are temporary, for example frost heaves, which can be noted on temporary signage but are not always consistent for the driver. Therefore, some of these inconsistencies can be potential issues for driver expectancy, and in some cases the safety of the roadway.

2.3 CONNECTIVITY

One of the potential needs for a transportation project is system linkage, the linkage of the proposed project with the existing roadways. Although, Pennington County is currently working on their transportation plan, the County has noted that South Rochford Road is a vital north-south bound roadway within the transportation network. The following are discussion items for connectivity for the Project:

- **System Linkage:** The maintenance of a transportation system is an integral part of a community and region. Therefore, the consideration of the Project on a level of regional transportation is required to ensure the transportation needs are met for an area, including the travel of emergency vehicles and public schools.

  The current roadway system is described in the Introduction and shown on Figure 1. The only paved roadway system from Deadwood-Lead area to Hill City is US 385. At a regional look the adjacent alternative route to US 385 would be the combination of North Rochford Road, South Rochford Road, and West Deerfield Road. Unlike US 385, a portion of the roadway is unpaved consisting of the extents of this Project. In the event that US 385 would require a roadway closure, the connection from Deadwood-Lead area to Hill City would be the roadway combination mentioned above. Without an alternative route, emergency vehicles could be delayed when traveling in this region.

[3] Russell, R. Eugene, 1998. 1998 Transportation Conference Proceedings. Using Concepts of Driver Expectancy, Positive Guidance and Consistency for Improved Operation and Safety http://www.ctre.iastate.edu/pubs/crossroads/155using.pdf

By completing this Project and paving South Rochford Road, an alternative improved route is provided connecting the Deadwood-Lead area to Hill City in the event that US 385 was closed. .

- **Vehicle Access:** Vehicle access of an area is an evaluation of local traffic that uses a roadway system. A closer look is required for the South Rochford Road and the current uses of that roadway. The following is a description of the local uses for South Rochford Road:
    - The roadway currently provides access for approximately 22 residences. The residences are noted on Figure 2a thru 2d.
    - The roadway provides access for general public use of USFS resources and Deerfield Lake. The following are the roadways utilized for general public use from the south to north that are only accessible from South Rochford Road:
        - NF 461- extends to a look out of Deerfield Lake.
        - NF 417- extends to a recreational area of Deerfield Lake, including a boat ramp.
        - Bell Park Road- a loop roadway from South Rochford Road
        - NF 121- roadway off of Bell Park Road
    - The roadway provides access to school buses and emergency vehicles.

3.0 FUTURE STEPS TO DEVELOP PURPOSE AND NEED

The following are the proposed steps to complete the purpose and need for the Project:

- Meeting held with Joint Lead Agencies to discuss the problems associated with South Rochford Road that are defensible and that are justified for development as a Project need.
- A memo will be prepared that details the purpose and need of the Project and will be provided to the Joint Lead Agencies.
- The Purpose and Need memo will be provided to agencies with the Alternatives Corridor memo for discussion at the next scheduled agency coordination meeting.