Spring Creek
Watershed Management and Project Implementation Plan
Segment 3

319 Watershed Project
October 2014

Sponsored By:

Pennington County
315 St. Joseph Street
Suite 118
Rapid City, South Dakota 57701

Submitted to:

South Dakota Department of
Environment and Natural Resources
Pierre, South Dakota 57501

CONTENTS

1.0 PROJECT SUMMARY SHEET

1.1 PROJECT TITLE

Spring Creek Watershed Management and Project Implementation Plan-Segment 3

1.2 NAME AND ADDRESS OF LEAD PROJECT SPONSOR

Pennington County
315 Saint Joseph Street
Suite 118
Rapid City, SD 57701

1.3 STATE CONTACT PERSON

Barry McLaury
Natural Resources Engineer
Barry.McLaury@state.sd.us
PHONE: 605.773.4254
FAX: 605.773.4068

1.4 PROJECT LOCATION

STATE: South Dakota
WATERSHED: Cheyenne River
HYDROLOGIC UNIT CODE: 10120109
Latitude: 43.9751974 *Longitude:*–103.4705745

1.5 PROJECT TYPES:

[ ] BASE [X] WATERSHED [ ] GROUNDWATER [ ] I&E
HIGH PRIORITY WATERSHED (**yes**/no)

1.6 WATERBODY TYPES

[ ] GROUNDWATER
[X] LAKES/RESERVOIRS
[ ] RIVERS
[X] STREAMS
[ ] WETLANDS
[ ] OTHER

1.7 NON-POINT SOURCE CATEGORY

[X] AGRICULTURE
[X] URBAN RUNOFF
[X] SILVICULTURE
[X] CONSTRUCTION
[ ] RESOURCE EXTRACTION
[ ] HYDRAULIC MODIFICATION
[ ] OTHER

1.8 SUMMARIZATION OF GOALS

The project goal is to bring Spring Creek into compliance with state water quality standards for fecal coliform bacteria, E. *coli* and Total Suspended Solids (TSS) by implementing the recommended Best Management Practices (BMPs) by 2021. The goal of this project, as set forth in the Spring Creek/Sheridan Lake Total Maximum Daily Load (TMDL), is to continue:

- Implementation of riparian, manure management, and on-site wastewater treatment system (OWTS) BMPs in the watershed to reduce fecal coliform bacteria, E. coli, and TSS from the headwaters of Spring Creek to Sheridan Lake.
- Demonstration of BMP projects for stormwater, forestry, and lake rehabilitation that will help encourage BMP implementation and expand public outreach efforts.
- Conduct significant public education and outreach to stakeholders within the Spring Creek Watershed.
- Perform water-quality monitoring to aid in tracking watershed conditions that will ensure that the BMPs are effective and the proper BMPs are being implemented.

1.9 PROJECT DESCRIPTION

Pennington County is the project sponsor for this two-year 319 project. This is the third of six planned segments. This project would continue implementation of the BMPs identified in the TMDL reports for the Spring Creek Watershed, the Stormwater Management Plan and On-site Wastewater Management Plan. Completion of the activities planned for this segment would advance the BMP implementation for fecal coliform bacteria, E. *coli*, and Total Suspended Solids. These BMPs include management of riparian zones, stormwater, forestry, grazing, lake improvement, and on-site wastewater treatment systems.

FISCAL YEARS	**2015-2017**
319 FUNDS:	**$215,000**
TOTAL PROJECT COST	**$397,000**
LOCAL MATCH:	**$182,000**
319 FUNDED FULL-TIME PERSONNEL:	**0.5**

2.0 BACKGROUND

2.1 LOCATION

Spring Creek is a perennial mountain stream located in Pennington and Custer Counties in the Black Hills of South Dakota. Spring Creek is a tributary of the Cheyenne River, which flows into the Missouri River. The drainage area of Spring Creek is approximately 425 square miles at the confluence with the Cheyenne River.

The surface area of the watershed that impacts the impaired reach of Spring Creek above Sheridan Lake encompasses approximately 93,124 acres and includes Hydrologic Units 101201090901, 101201090902, 101201090903, 101201090904. The city of Hill City (population ~950) is the only municipality located in the watershed.

The BMPs that will be installed during this project segment are consistent with the schedules contained in the Spring Creek Watershed On-site Wastewater Management Plan, the Spring Creek Watershed Stormwater Management Plan, and the Spring Creek Watershed Strategic Implementation Plan. Fecal coliform bacteria reductions will be presented in the Ten-Year Watershed Strategic Implementation Plan.

2.2 PROJECT AREA

The project area is the Spring Creek Watershed which covers about 93,124 acres or 145 square miles and is defined as the drainage upstream of Sheridan Lake Dam and shown in Figure 2-1. The watershed or project area terms are used interchangeably throughout this plan. The watershed is about 18 miles long and 11 miles wide.

2.3 LAND USE IN THE WATERSHED

Land use in the watershed is primarily silviculture, recreation, residential, and grazing. Metamorphic slates and schists, along with granite rock, underlie a large portion of the basin and form the Central Crystalline Area of the Black Hills that covers the majority of the watershed area.

2.4 SOIL TYPES IN THE WATERSHED

The watershed's major soil types are Pactola, Buska, Mocmont, and Stovho. The Pactola series of soils, which cover most of the watershed, were formed by the weathering of materials in steeply tilted metamorphic rock. The Buska series descends from micaceous schist while the Mocmont formed from material weathered from granite. Those two series generally occur in the upper reaches of the watershed in the Harney Peak area. The Stovho series formed from the weathering of limestone and calcareous sandstone and is found in the upper reaches of the watershed in the area underlain by the Madison Limestone Formation.

2.5 SLOPE

Digital Elevation Models (DEMs) of the area show the average slope to be approximately 20 percent. Much of the land is located within the Black Hills National Forest and is predominantly forested with ponderosa pine. Other cover includes grasslands and hardwoods.

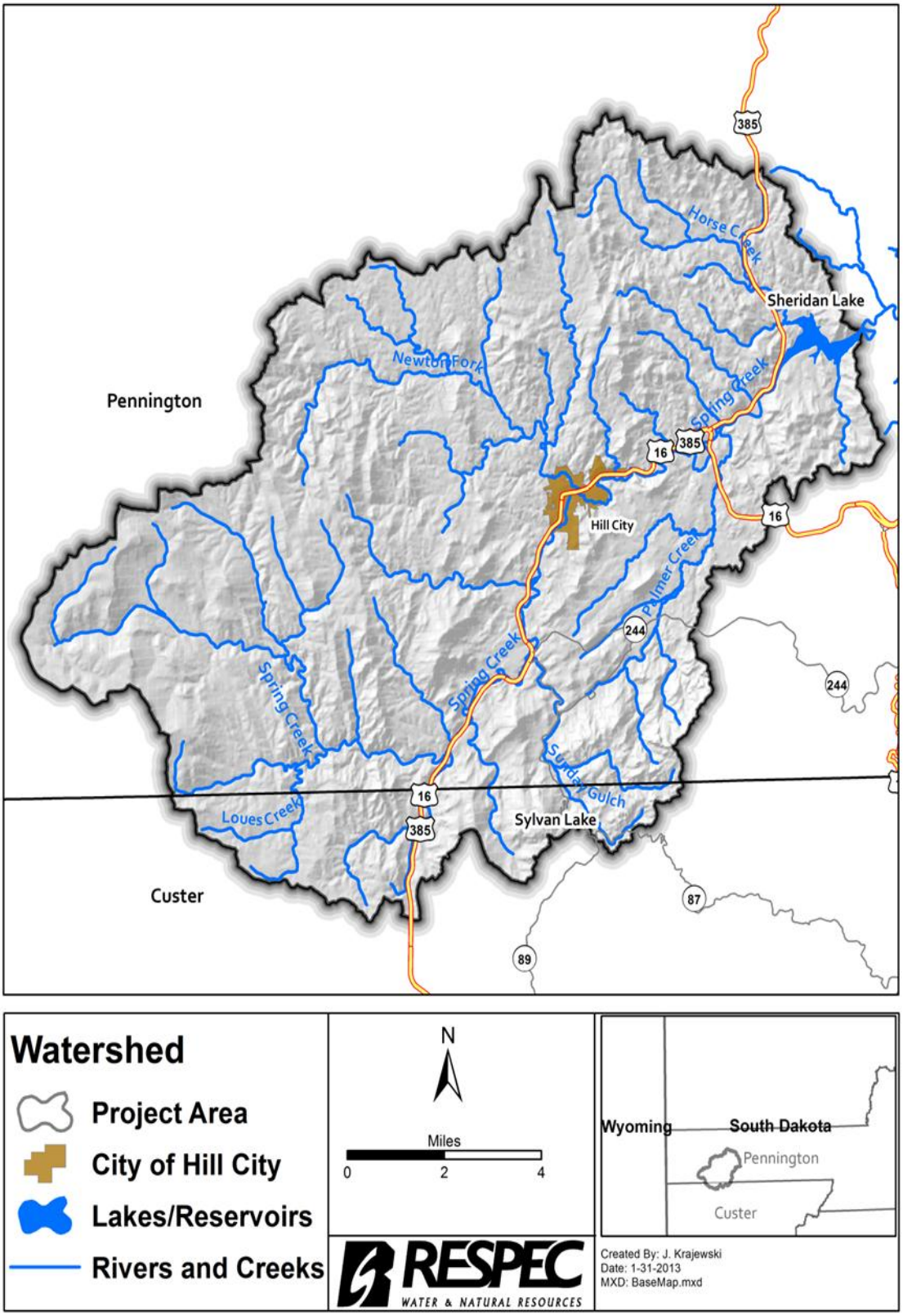
Pennington
Custer
Hill City
Sylvan Lake
Sheridan Lake
Horse Creek
Newton Fork
Spring Creek
Palmer Creek
Sunday Gulch
Loues Creek
385
16
244
87
89
Watershed
Project Area
City of Hill City
Lakes/Reservoirs
Rivers and Creeks
N
Miles
0
2
4
Wyoming
South Dakota
Pennington
Custer
RESPEC
WATER & NATURAL RESOURCES
Created By: J. Krajewski
Date: 1-31-2013
MXD: BaseMap.mxd

FIGURE 2-1

2.6 PRECIPITAITON

The average annual precipitation in the watershed is 20.8 inches; 80 percent usually falls in April through September. Tornadoes and severe thunderstorms strike occasionally. These storms are local and of short duration and occasionally produce heavy rainfall events. The average seasonal snow pack is 27.3 inches per year.

2.7 MODELING RESULTS

Modeling results of the initial TMDL assessment estimated that more than half (63.5 percent) of the bacteria load originates from livestock and other agricultural land uses. The remaining load originates from urban runoff (13.7 percent) and other human sources (14.8 percent), including failing septic and leaking sanitary sewer systems. (Figure 2-2) During Segment 1, questions were raised and concerns expressed by the Spring Creek Watershed Advisory Group (SCWAG) members regarding the accuracy of the modeling results so additional data including water-quality monitoring, land use, septic locations and failure rates, livestock and wildlife populations, and installed BMPs within the watershed have been collected to improve the watershed model and its results for future implementation segments.

These modeling results are incorporated and discussed in detail in the Spring Creek Watershed Stormwater Management Plan and the Spring Creek Watershed Strategic Implementation Plan. Critical conditions occur within the watershed during the summer. Typically, greatest numbers of livestock and tourist activities (i.e., trail rides, camping) occur in the watershed during summer months. Combined with the peak in bacteria sources, high-intensity storm events also occur during the spring, summer, and fall and produce a significant amount of fecal coliform load because of bacterial wash-off in the watershed.

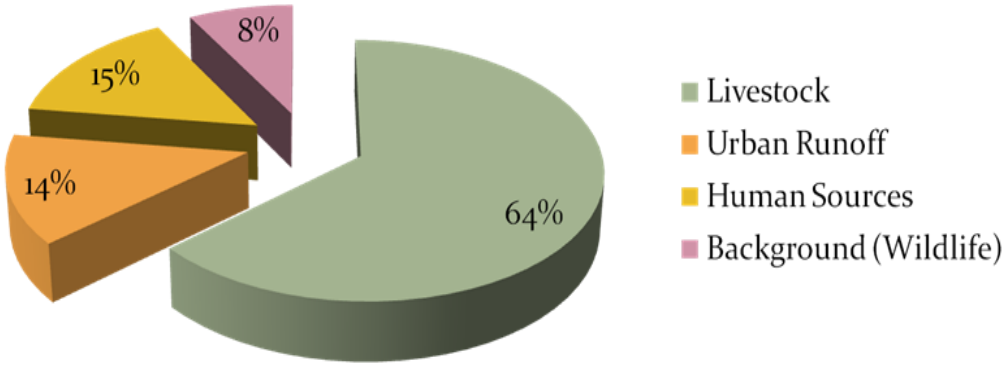

FIGURE 2-2

3.0 STATEMENT OF NEED

3.1 TOTAL MAXIMUM DAILY LOAD

The South Dakota School of Mines & Technology (SDSM&T), along with the South Dakota Department of Environment and Natural Resources (SD DENR), developed and implemented an assessment project to determine the fecal coliform Total Maximum Daily Load (TMDL) for Spring Creek and the Sheridan Lake TMDL for Trophic State Index (TSI). The project started during 2002. The purpose of the assessment was to address rural and urban nutrient, sediment, and fecal coliform problems in the watershed. The overall goal was to produce a TMDL for fecal coliform in Spring Creek and a TSI TMDL in Sheridan Lake to improve water quality by reducing fecal coliform, nutrient, and sediment loading in Spring Creek. The Sheridan Lake TSI TMDL and the Spring Creek fecal coliform bacteria TMDL were approved by the Environmental Protection Agency (EPA) in 2006 and 2008, respectively.

3.2 BENEFICIAL USES

Spring Creek was assigned the following beneficial uses: cold-water permanent fish life propagation (above Sheridan Lake), cold-water marginal fish life propagation (below Sheridan Lake), immersion recreation, limited contact recreation, fish and wildlife propagation, recreation and stock watering, and irrigation. Sheridan Lake was assigned the following beneficial uses: cold-water permanent fish life propagation, immersion recreation, limited contact recreation, fish and wildlife propagation, and recreation and stock watering. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

In addition to the EPA approved TMDLs on Spring Creek and Sheridan Lake, the SD DENR's 2010 Integrated Report and 303d list states that Spring Creek's coldwater permanent fish life beneficial use is impaired because of temperature, Sheridan Lake's coldwater permanent fish life beneficial use is impaired because of dissolved oxygen and temperature, and Sylvan Lake's coldwater permanent fish life beneficial use is impaired because of temperature. Spring Creek, Sheridan Lake, and Sylvan Lake are scheduled for additional TMDL development to address these impairments in 2018, 2020, and 2020, respectively.

3.3 USE ATTAINABILITY ANALYSIS (2013)

A Use Attainability Analysis (UAA) was performed by DENR on Spring Creek in June 2013. The impaired reach of Spring Creek was analyzed (See Figure 3-1) utilizing data collected as part of this Project. In addition, DENR visited several Spring Creek monitoring sites, interviewed landowners, took photos, collected water quality samples, measured channel dimensions, recorded flows and calculated stream discharge. Three recommendations were made by DENR from the UAA:

1. Lake Alexander is added under SDAR 74:51:02:54 with the beneficial uses of Permanent Coldwater Fish Life Propagation, Immersion Recreation, and Limited Contact Recreation.
2. The stricter beneficial use of Immersion Recreation be removed from the upper portion of Spring Creek (headwaters to Spring Creek Road West).
3. The beneficial uses of Immersion Recreation and Limited Contact Recreation will remain for the segment of Spring Creek from Spring Creek Road West to Sheridan Lake.

3.4 ADDITIONAL IMPAIRMENTS

Individual parameters determine the support of these beneficial uses. South Dakota has narrative standards that may be applied to the undesired eutrophication of lakes and streams. Administrative Rules of South Dakota (ARSD) Article 74:51 contains language that prohibits the presence of materials causing pollutants to form, visible pollutants, taste- and odor-producing materials, and nuisance aquatic life. Reduction of nutrients in Spring Creek, specifically phosphorus, was addressed in the TSI TMDL developed for Sheridan Lake and is included in the scope of this watershed implementation project.

3.5 WATER QUALITY CRITERIA

The numeric TMDL target established for the beneficial uses for Spring Creek is based on the current daily maximum criteria for fecal coliform bacteria. Water-quality criteria for the immersion recreation beneficial use requires that (1) no sample exceeds 400 colony-forming units (cfu)/100 milliliters (mL) and (2) during a 30-day period, the geometric mean of a minimum of five samples collected during separate 24-hour periods must not exceed 200 cfu/100 mL. This criterion is applicable from May 1 to September 30.

Of all the assessed parameters for which surface water-quality criteria are established, fecal coliform and water temperature exceed criteria for the cold-water permanent fish life propagation beneficial use on Spring Creek. During the TMDL study, ten samples collected from several sites within the assessed stream segment exceeded the total suspended solids (TSS) criterion. However, TSS was not included as a cause of impairment for this reach in the 2008 Impaired Waterbodies List because less than 10 percent of the TSS samples collected during the period of record considered for the 2008 report (October 1, 2002, to September 30, 2007) exceeded the numeric criterion (see Section 3.5 for updated listing).

3.6 2014 INTEGRATED REPORT

The SD DENR 2014 Integrated Report was approved by the EPA in May 2014. Additional parameters were added to the 303(d) list as part of this Integrated Report for Spring Creek. These included E. *coli* and TSS. The BMPs currently being implemented for fecal coliform can reduce E. *coli* and TSS loads. These additional listings should not change the scope and goals of the implementation project.

Water-quality criteria for the immersion recreation beneficial use for E. *coli* requires that (1) no sample exceeds 235 most probable number (mpn)/100 milliliters (mL) and (2) during a 30-day period, the geometric mean of a minimum of five samples collected during separate 24-hour periods must not exceed 126 mpn/100 mL. This criterion is applicable from May 1 to September 30.

Water-quality criteria for the coldwater permanent fishlife propagation for TSS require that (1) no sample exceeds 53 milligrams (mg)/ liter (L) and (2) during a 30-day period, the average of the samples collected must not exceed 30 mg/L. This criterion is applicable year-round.

3.7 LOCATION OF IMPAIRMENTS

The impaired (303(d) listed) segment (Figure 3-1), for fecal coliform, E. *coli*, Temperature and TSS, of Spring Creek has a length of 31 miles and flows through Mitchell Lake, which has a surface area of about 7 acres. This segment ends where

Spring Creek empties into Sheridan Lake, approximately 4 miles downstream of Mitchell Lake. The impaired (303(d) listed) segment, because of temperature, also begins at the headwaters and ends where Spring Creek crosses Highway 79, south of Rapid City. The drainage area of the 303(d) listed segment is approximately 425 square miles.

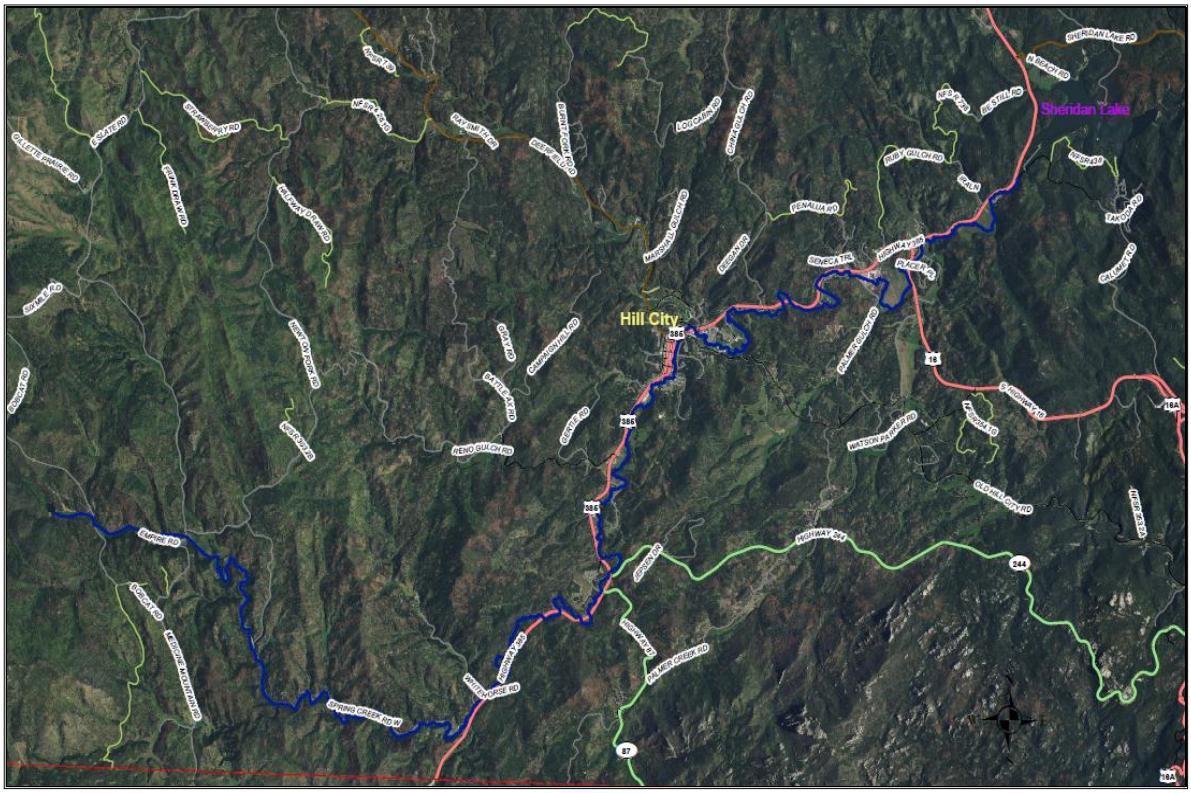

FIGURE 3-1

4.0 PROJECT IMPLEMENTATION

Project implementation of the Best Management Practices (BMPs) recommended in the Spring Creek fecal coliform bacteria TMDL began in 2010. The first year of implementation included funding from local residential property owners, commercial property owners, and agricultural property owners, Pennington County, City of Hill City, South Dakota Game, Fish, and Parks (SDGFP), SDSM&T, City of Rapid City, Black Hills FlyFishers, Pennington Conservation District, Black Hills RC&D Association, U.S. Forest Service – Black Hills National Forest, Custer County, National Resource Conservation Service (NRCS), and the U.S. Geological Survey.

Five products of the Segment 1 project were the 2010 Spring Creek Water-Quality Monitoring Plan, 2011 Spring Creek Water-Quality Monitoring Plan, Spring Creek Watershed On-site Wastewater Management Plan, the Spring Creek Watershed Stormwater Management Plan, and the Spring Creek Watershed Strategic Implementation Plan. These plans outline the work that has been completed and will be accomplished during the next several years to meet the TMDL.

4.1 SEGMENT 1

During Segment 1, Pennington County and their partners conducted baseline multiparty monitoring in 2010 for fecal coliform bacteria, *E. coli*, total suspended solids (TSS), total phosphorus (TP), and nitrate+nitrite (NO3+NO2) on 17 monitoring sites and again in 2011, Pennington County along with SDSM&T students, local civic groups, and project participants collected ambient and storm event water-quality samples on 16 monitoring sites. These monitoring efforts are described in more detail in Section 4.3.

From June 2010 to June 2012, Pennington County held 3 cost-share application signups and received 87 cost-share applications from Spring Creek Watershed property owners requesting approximately $520,000 for riparian, manure management, and on-site wastewater treatment systems (OWTS) improvements. The Spring Creek Watershed Advisory Group (SCWAG) reviewed the cost-share applications and application ranking worksheets; then made recommendations to the Pennington County Board of Commissioners. During Segment 1, Pennington County approved 12 riparian and manure management project applications and agreements totaling $98,808 and 14 OWTS applications and agreements totaling $87,600. There were 6 completed riparian and 8 completed OWTS BMP projects in the watershed. Table 4-17 lists the BMPs that were installed during Segment 1.

Also during Segment 1, some unique outreach activities were completed with the Spring Creek 319 Watershed Project website launched and can be accessed at **www.pennco.org/springcreek**. This website received more than 1,300 unique visitors. Three direct mailings to over 1,000 watershed residents were conducted to inform them about the implementation project, water-quality monitoring, and BMP cost-share signups.

Along with these efforts, Pennington County, NRCS, SDSM&T, SD DENR and watershed consultant staff met with over 200 watershed residents and property owners. Three public meetings and two field tours were held in the watershed. Presentations were made to the Pennington County Board of Commissioners, National Forest Advisory Board, South Dakota Lakes and Streams Association, WDWDD, Black Hills Mayors' Conference, Western South Dakota Hydrology Conference, and the SDACD's NACD Northern Plains Region Leaders Meeting.

Also during this segment, over 14 SCWAG meetings were held to review progress and make recommendations to the Pennington County Board of Commissioners.

4.2 SEGMENT 2

During Segment 2, Pennington County conducted monitoring in 2012 and 2013 for fecal coliform bacteria, *E. coli*, total phosphorus (TP), nitrate+nitrite (NO3+NO2) and total suspended solids (TSS) on 17 monitoring sites. These monitoring results are described in more detail in Section 4.3. In 2014, Pennington County conducted monitoring for fecal coliform bacteria, E. *coli*, and TSS on 8 monitoring sites.

In Segment 2, Pennington County opened up application submittal times and continually accepted cost-share applications from Spring Creek Watershed property owners. To date, there have been 49 applications submitted requesting approximately $242,000 for riparian, stormwater, and on-site wastewater treatment systems (OWTS) improvements. The Spring Creek Watershed Advisory Group (SCWAG) reviews the cost-share applications and application ranking worksheets; then made recommendations to the Pennington County Board of Commissioners. As of August of 2014, the Advisory Group will now make recommendations to the Pennington County Planning Director.

To date, in Segment 2, Pennington County has approved 9 riparian and stormwater project applications and agreements totaling $135,235 and 8 OWTS applications and agreements totaling $32,500. To date, there is 1 completed riparian and 3 completed OWTS BMP projects in the watershed. Table 4-17 lists the BMPs that were approved during Segment 2.

4.3 WATER QUALITY RESULTS

Spring Creek

2010

During the first segment, Pennington County and their partners conducted baseline multiparty monitoring in 2010 for fecal coliform bacteria, *E. coli*, total suspended solids (TSS), total phosphorus (TP), and nitrate+nitrite (NO3+NO2). From April through October, approximately, 145 grab samples were collected at 17 sites and ISCO automatic samplers at 4 mainstem sites collected 24 storm event samples. During 2010, 845 analyses were completed for fecal coliform, *E. coli*, TSS, TP, and NO3+NO2 by Energy Labs in Rapid City. Additionally, 170 analyses were completed for fecal coliform, *E. coli*, TSS, TP, and NO3+NO2 for quality assurance and quality control (QA/QC).

Table 4-1. *Number of Samples Collected and the Percent of Samples Exceeding the Single- Sample Water-Quality Criterion, 2010*

Sample Type	Fecal Coliform		*E. coli*		Suspended Solids	
	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)
Ambient (Grab)	90	7	90	13	90	19

Table 4-2. *Ambient Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2010*

Pollutant	Minimum	Maximum	Average
Fecal Coliform (cfu/100mL)	<2	8,900	249
E. *coli* (mpn/100mL)	<1	7,950	221
Suspended Solids (mg/L)	<5	620	49

Table 4-3. *Number of Samples Collected and the Percent of Samples Exceeding the Single- Sample Water-Quality Criterion, 2010*

Sample Type	Fecal Coliform		*E. coli*		Suspended Solids	
	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)
Storm (Composite)	23	57	23	52	23	35

Table 4-4. *Storm Event (Composite) Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2010*

Pollutant	Minimum	Maximum	Average
Fecal Coliform (cfu/100mL)	12	6,400	1,276
E. *coli* (mpn/100mL)	17	7,950	1,335
Suspended Solids (mg/L)	<5	610	103

2011

In 2011, Pennington County expanded their monitoring efforts in the watershed to include local volunteers and project participants in sampling water quality and help assess the project's effectiveness and ensure future implementation funding is appropriately prioritized. Pennington County staff and SDSM&T students worked with local civic groups to collect water samples from June through September and submitted them for analysis of total phosphorus, nitrate, total suspended sediment, *E. coli* and *Enterococcus* bacteria.

From June to September 2011, Pennington County and its partners conducted 4 ambient monthly sampling events on 16 monitoring sites and submitted over 70 ambient water-quality samples for lab analysis. Additionally, over 60 storm event mean concentration (EMC) and discrete water-quality samples were collected during 4 storm events from June through September by SDSM&T students at 5 locations in the watershed. Also in 2011, two project participants with BMP projects collected water-quality samples above and below their properties in coordination

with Pennington County staff and SDSM&T students during monthly ambient monitoring.

Table 4-5. *Number of Samples Collected and the Percent of Samples Exceeding the Single- Sample Water-Quality Criterion, 2011*

Sample Type	*E. coli*		Suspended Solids	
	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)
Ambient (Grab)	44	0	44	0

Table 4-6. *Ambient Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2011*

Pollutant	Minimum	Maximum	Average
E. *coli* (mpn/100mL)	<1	218	58
Suspended Solids (mg/L)	<5	42	11

Table 4-7. *Number of Samples Collected and the Percent of Samples Exceeding the Single- Sample Water-Quality Criterion, 2011*

Sample Type	*E. coli*		Suspended Solids	
	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)
Storm (Composite)	10	60	10	50

Table 4-8. *Storm Event (Composite) Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2011*

Pollutant	Minimum	Maximum	Average
E. *coli* (mpn/100mL)	49	2,420	842
Suspended Solids (mg/L)	5	520	149

2012

In 2012, Pennington County and its partners conducted 7 ambient monthly sampling events from April to October on 19 monitoring sites and submitted over 160 ambient water-quality samples for lab analysis. Additionally, over 90 storm event mean concentration (EMC) and discrete water quality samples were collected during 5 storm events from April through July by SDSM&T students at 7 locations in the watershed. These samples were analyzed for total phosphorus, nitrate, total suspended sediment, fecal coliform, and *E. coli* and *Enterococcus* bacteria.

Table 4-9. *Number of Samples Collected and the Percent of Samples Exceeding the Single- Sample Water-Quality Criterion, 2012*

Sample Type	Fecal Coliform		*E. coli*		Suspended Solids	
	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)
Ambient (Grab)	91	7	91	11	91	0

Table 4-10. *Ambient Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2012*

Pollutant	Minimum	Maximum	Average
Fecal Coliform (cfu/100mL)	<2	9,000	271
E. *coli* (mpn/100mL)	<1	>2,419.6	151
Suspended Solids (mg/L)	<5	11	0

Table 4-11. *Number of Samples Collected and the Percent of Samples Exceeding the Single- Sample Water-Quality Criterion, 2012*

Sample Type	Fecal Coliform		*E. coli*		Suspended Solids	
	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)
Storm (Composite)	8	88	8	88	8	63

Table 4-12. *Storm Event (Composite) Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2012*

Pollutant	Minimum	Maximum	Average
Fecal Coliform (cfu/100mL)	46	14,000	3,835
E. *coli* (mpn/100mL)	147	9,678	2,674
Suspended Solids (mg/L)	7	410	137

2013

In 2013, no stormwater runoff events were targeted, and instead samples were taken at 16 sites 1-2 times per week from May through September to allow for comparison to geometric mean standards. This resulted in analysis of over 280 water quality samples for total phosphorus, nitrate, total suspended sediment, fecal coliform, and *E. coli* bacteria. The 2013 monitoring indicated high levels of E. coli bacteria throughout Spring Creek and resulted in issuance of advisories from Rapid City-Pennington County Emergency Management.

Table 4-13. *Number of Samples Collected and the Percent of Samples Exceeding the Single- Sample Water-Quality Criterion, 2013*

Sample Type	Fecal Coliform		*E. coli*		Suspended Solids	
	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)	No. of Samples	Exceeding Criterion (%)
Ambient (Grab)	284	7	284	19	284	0

Table 4-14. *Ambient Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2013*

Pollutant	Minimum	Maximum	Average
Fecal Coliform (cfu/100mL)	<2	4,200	164
E. *coli* (mpn/100mL)	<1	4,840	218
Suspended Solids (mg/L)	<5	49	7

2014

In 2014, samples were taken at 8 sites 1 time per week from May through September to allow for comparison to geometric mean standards. To date, 128 water quality samples for total suspended sediment, fecal coliform, and *E. coli* bacteria have been collected. The 2014 monitoring preliminary data indicates high levels of E. *coli* bacteria from the Junction of 385 and Highway 16 to Sheridan Lake. This has resulted in issuance of an advisory from Rapid City-Pennington County Emergency Management.

Palmer Gulch Creek

2010-2014

Palmer Gulch Creek is a tributary that discharges into Spring Creek above Sheridan Lake. Various locations on Palmer Gulch Creek have been monitored for water quality and flow from 2010 to 2014. Although the creek is meeting the water quality criteria for its beneficial use (Limited Contact Recreation), the water quality data suggests that it has a reasonable contribution to the fecal coliform bacteria, E. coli, and TSS loads to Spring Creek during storm events. At this time, it is the only tributary in the watershed with a high priority for implementation projects. Below is a

compilation of the ambient (grab) and Storm (Composite) data collected on Palmer Gulch Creek from 2010 to 2013.

Table 4-15. *Ambient Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2010-2013*

Pollutant	Minimum	Maximum	Average
Fecal Coliform (cfu/100mL)	<2	2,000	217
E. *coli* (mpn/100mL)	<1	>2,419.6	285
Suspended Solids (mg/L)	<5	41	8

Table 4-16. *Storm Event (Composite) Minimum, Maximum, and Average Values of Water Quality Samples by Pollutant, 2010-2013*

Pollutant	Minimum	Maximum	Average
Fecal Coliform (cfu/100mL)	14	38,000	7,528
E. *coli* (mpn/100mL)	3	9,678	2,253
Suspended Solids (mg/L)	8	720	135

4.4 STORMWATER MANAGEMENT PLAN

The Stormwater Management Plan was finalized in May 2014. This Plan identified priority areas for managing stormwater by catchments. The catchments were ranked utilizing the following criteria:

- Number of acres treated
- Initial costs and life-cycle costs of alternatives
- Fecal coliform bacteria removed per season
- Life-cycle cost per fecal coliform bacteria removed

Figure 4-1 maps the locations of the priority catchments for Stormwater Management in and surrounding Hill City, South Dakota.

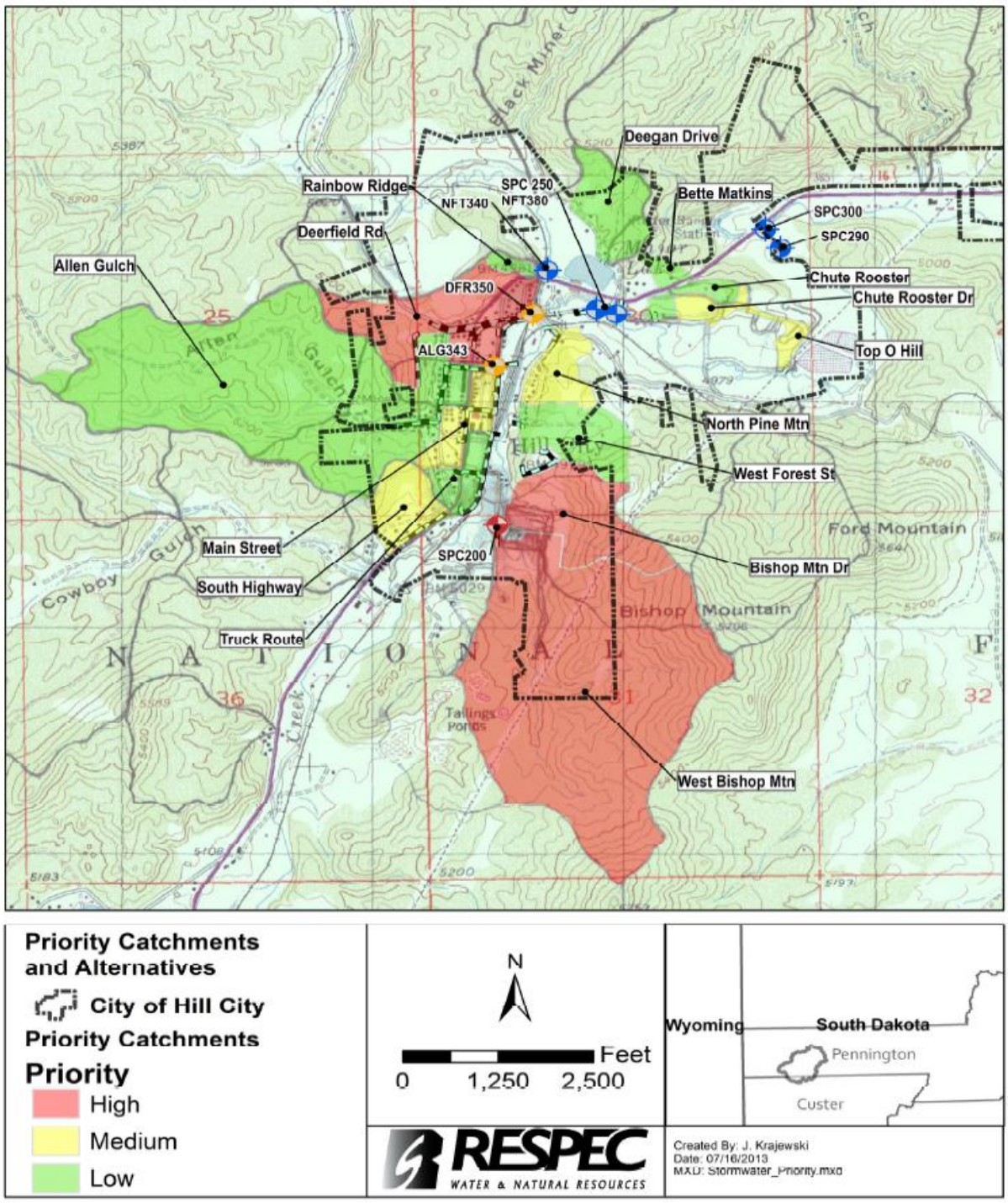
Deegan Drive
Rainbow Ridge
SPC 250
NFT340
NFT380
Bette Matkins
SPC300
SPC290
Deerfield Rd
Allen Gulch
DFR350
Chute Rooster
Chute Rooster Dr
ALG343
Top O Hill
North Pine Mtn
West Forest St
Main Street
SPC200
Bishop Mtn Dr
South Highway
Truck Route
West Bishop Mtn
Priority Catchments and Alternatives
City of Hill City
Priority Catchments
Priority
High
Medium
Low
N
Feet
0
1,250
2,500
Wyoming
South Dakota
Pennington
Custer
RESPEC
WATER & NATURAL RESOURCES
Created By: J. Krajewski
Date: 07/16/2013
MXD: Stormwater_Priority.mxd

FIGURE 4-1

4.5 ON-SITE WASTEWATER MANAGEMENT PLAN

The On-site Wastewater Management Plan was finalized in May 2014. This Plan identified priority areas for managing on-site wastewater treatment systems (OWTS). The ranking criteria for each sub-watershed included the following:

- Number and percent total of OWTS
- Number of people served by OWTS
- Number of OWTS by year installed
- Percent of fecal coliform bacteria production estimated during recreation season
- Number of monitoring sites with fecal coliform water-quality criteria exceedences
- Number of monitoring sites with E. coli water-quality exceedences

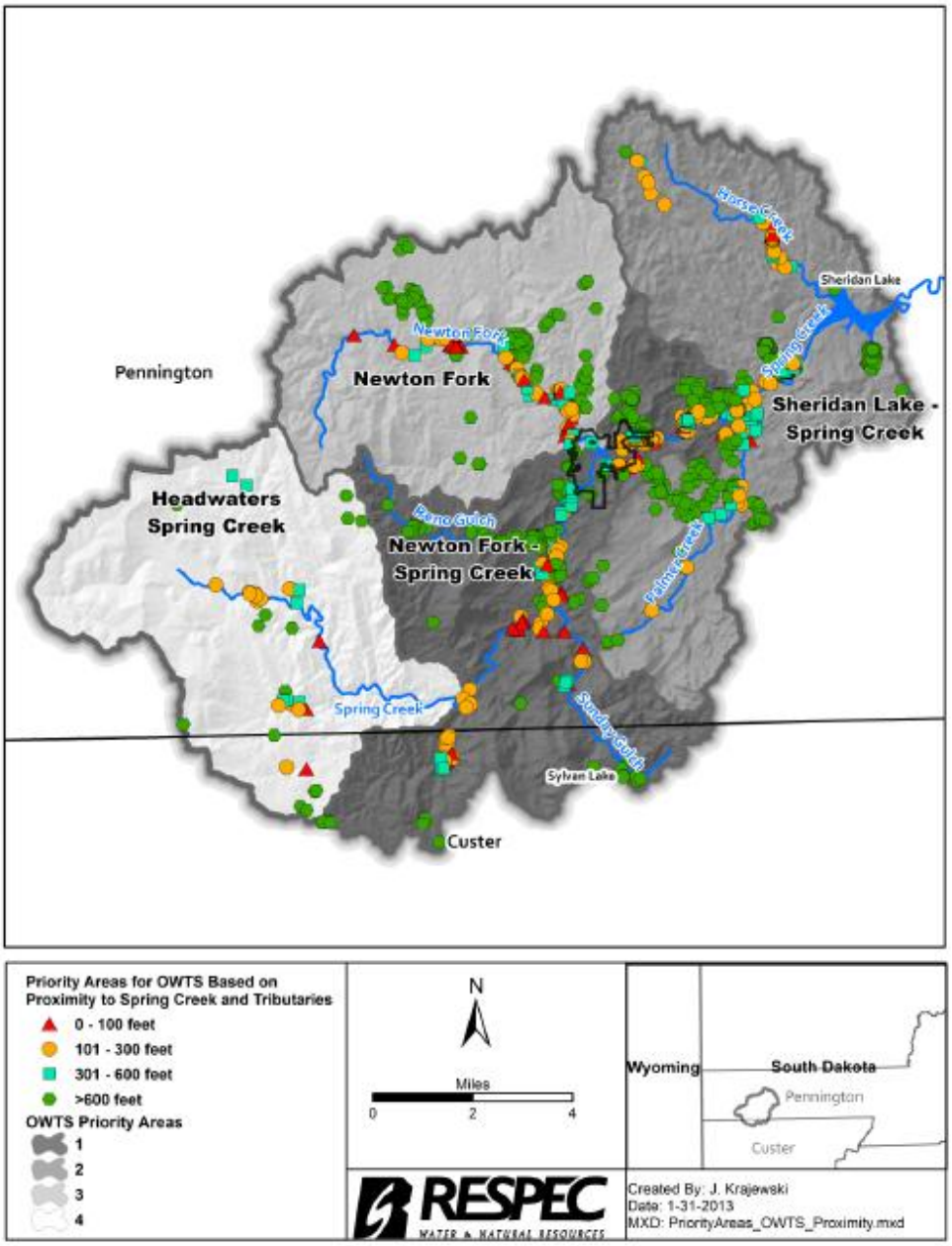

FIGURE 4-2

Table 4-17. Fecal Coliform Bacteria BMPs Scheduled to Be Installed in Segment 3

Best Management Practices	BMP Units	Completed in Segment 1	Approved (as of 8/2014) in Segment 2	Planned in Segment 3
OWTS – Single Family Residence	Each	7	8	7
OWTS – Residential/Seasonal Cluster	Each			
OWTS – Small Commercial/Industrial	Each			1
OWTS – Aerobic Treatment Unit (ATU)	Each			
OWTS – Mounds	Each			
OWTS – Cluster, Advanced, or Comm. Mgt Plan	Each			
Access Control	Acre	27	0.5	10
Bioretention Area	Sq. Ft.		4,750	2,000
Channel Vegetation	Feet	900	75	100
Conservation Cover	Acre			
Critical Area Planting	Acre			
Dam, Diversion	Each			
Detention Pond	Each		1	1
Diversion	Feet	200		100
Fence, 4-Wire	Feet	1,000		
Fence, 2-Wire Electric	Feet	500		
Fence, Corral Panel	Each	6		
Filter Strip	Acre	1	2.21	2
Forest Stand Improvement	Acre			
Irrigation System	Acre	1		
Grade Stabilization Structure	Each		3	1
Nutrient Management	Acre	5		
Pasture and Hayland Management	Acre			
Pest Management	Acre	25		
Pipeline, PVC, HDPE, PE Pipe 1.25”- 8”	Feet	3,500		
Pond	Each	1	2	1
Prescribed Grazing	Acre	178		
Pumping Plant for Water Control	Each	1		
Rain Barrels (commercial)	Each		2	5
Rain Barrels (residential)	Each			10
Range Planting	Acre			
Riparian Forest Buffer	Acre	2	2	3
Riparian Herbaceous Cover	Acre			
Spring Development	Each	1		
Stream Crossing	Feet	100		
Stream Bank and Shoreline Protection	Feet	300	1,215	1,500
Structure for Water Control	Each	1		
Vegetated Swale	Sq. Ft.		7,080	3,000
Vegetated Treatment Area	Acre			1
Waste Storage Facility	Each	1		
Water and Sediment Control Basin	Each			1
Watering Facility	Each	6		
Weed Control	Acre		4	5
Wetland Enhancement	Acre	1		

5.0 PROJECT DESCRIPTION

The subsections below describe the overall project goals, objectives, and tasks for Segment 3 of the Spring Creek Watershed Management and Project Implementation Plan.

5.1 OBJECTIVES AND TASKS

The strategy of the Spring Creek Watershed Implementation Team is to progressively and efficiently implement BMPs within watershed to bring the creek back into compliance with its assigned beneficial uses. This project segment focuses heavily on BMP implementation. The project strategy would be reviewed annually to measure overall success, to determine adjustments, and to obtain funding for the future project segments. Federal, state, and private funding would be used to fund BMPs. A final report would be produced for each 319 project segment completed. Additional projects and funding proposals would be submitted during the next several years to continue installing BMPs that reduce fecal coliform bacteria to meet the TMDL.

OBJECTIVE 1: Implement BMPs Recommended in the Spring Creek Watershed TMDL

The strategy outlined in the Spring Creek 10-Year Strategic Implementation Plan to address reductions identified in the Spring Creek TMDL recommends BMPs focused on improving riparian management, reducing stormwater, forest, and rangeland runoff, repairing defective OWTS systems, increasing stream habitat, improving grazing and forest land health, and removing sediment in Mitchell and Major Lakes.

The TMDL identifies a load reduction of 90 percent needs to be achieved in the high flow zone (48–525 cfs), 16 percent reduction in the moist flow zone (14–47 cfs), and 38 percent reduction in the low flow zone (0–2.1 cfs) for the stream to meet its assigned beneficial uses. BMPs implemented in this segment would be focused on critical areas in the watershed and would be prioritized based on pollutant reduction potential.

Task 1 - Riparian, Stormwater, Livestock, and Grazing Improvements

Types of BMPs suggested in the strategic implementation plan include livestock and manure management, riparian buffers, streambank stabilization, stormwater runoff and detention, grazing and forest management, and stream and lake habitat improvement. The focus of this project segment would be to continue to implement and assess the effectiveness of riparian, stormwater, livestock, grazing, and forestry improvement projects.

During this Task 1, 13 BMP projects would be completed which include: 5 riparian vegetation/streambank protection; 5 stormwater; 2 manure/grazing management, and a rain barrel cost share program. These projects would be selected for their impact on water-quality and monitored for BMP effectiveness to aid in assessing those impacts.

Land managers in the watershed are comprised of federal and state agencies, and private individuals. Livestock producers in the watershed often have federal grazing leases and maintain their herds on both public and private lands. In the case of

livestock grazing, it is paramount that these groups cooperate to maintain healthy riparian systems.

Stormwater management BMP projects would also be implemented during this segment to reduce the negative effects of stormwater discharge on fecal bacteria levels in Spring Creek. Stormwater BMPs would be demonstrated on impervious areas, such as: an existing, developed commercial site; a developed, municipal drainage area; a residential home site; or a road district or highway project identified in the Spring Creek Watershed Stormwater Management Plan.

Also, this Segment would propose a rain barrel program to provide local business owners and residents in the Hill City area with low cost rain barrels to reduce stormwater impacts in urban areas of the watershed.

Products:

1. Riparian, Stormwater, Livestock, Grazing Improvements.
   1a. Five Riparian Vegetation/Streambank Protection Projects
   1b. Five Stormwater Projects (an existing, developed commercial site; a developed, municipal drainage area; a residential home site; or a road district or highway project)
   1c. Two Manure/Grazing Management Projects
   1d. One Stormwater Rain Barrel Program

   Product Cost: $ 203,500 319 Cost: $ 125,000
   Match: $ 78,500

   - Lead: Local Citizens, Spring Creek Watershed Advisory Group, Watershed Coordinator Consultants
   - Other Groups: Natural Resources Conservation Service (NRCS), U.S. Forest Service (USFS-Black Hills National Forest), Game, Fish & Parks (GF&P), U.S. Fish and Wildlife Service (USFWS), Pennington County, City of Hill City
   - Milestone: June 2017, five complete riparian vegetation/ streambank stabilization projects, five stormwater projects, two manure management and grazing management projects, one stormwater rain barrel program
   - (see timeline, Figure 5-1)

2. Engineering – Includes preliminary and final designs of Riparian, Stormwater, and Livestock and Grazing BMPs.

   Product Cost: $ 30,000 319 Cost: $ 30,000

Task 2 - On-site Wastewater Treatment System (OWTS) Improvements

Human sources, including failing septic systems and leaking sanitary sewer systems, contribute to the existing bacteria load according to the HSPF model used in the initial TMDL assessment project. The area contains over 750 septic systems that are mostly located near Spring Creek and its tributaries on limited soil conditions. Information has been collected about the age and condition of these systems. The goal of this task would be to implement the priority strategies in critical areas outlined in the Spring Creek Watershed On-site Wastewater Management

Plan and continue to identify OWTS systems that are in need of repair and require upgrades. In addition, it will include one recreational vehicle dump station.

Products:

3. On-site Wastewater Treatment System (OWTS) Improvements

Product Cost: $71,500 319 Cost: $35,000
Match: $ 36,500

- Lead: Local Citizens, Spring Creek Watershed Advisory Group
- Other Groups: Pennington County
- Milestone: June 2017, Eight Completed OWTS Improvement Projects (see timeline, Figure 5-1)

OBJECTIVE 2: Public Outreach and Project Management

Public outreach is an essential part of this project. Public meetings and tours keep the community informed and encourage involvement in the project. Local citizen implementation project planning and record keeping is important for efficient report writing. Grant writing for future projects involving water-quality issues in the watershed would further assist in the Spring Creek Watershed improvement efforts.

Task 3 - Public Outreach, Implementation Record Keeping, and Reports

One public meeting, one tour, and eight advisory group meetings would be held during this project segment. The function of the meetings will be to update the status of the project for the landowners, citizens, and stakeholders and educate and encourage them to become involved with implementing BMPs. These meetings would provide an avenue for input from the residents in the area. Notifications of meetings would be made to local agencies, businesses, and organizations through direct mailings to 1,100 watershed residents; and advertisements in local/regional newspapers.

In addition, the project's public web page (**www.pennco.org/springcreek**), which is averaging over 100 visitors per month, is updated periodically by Pennington County to provide the latest available data as well as an overview of the project and status of work activities.

Implementation projects require working with the property owners, residents, and agriculture producers in completing applications, project planning, and organizing and filing applications and bills.

Grant Reporting and Track System (GRTS) Reports will be completed as required by the EPA. A final report would be submitted to the EPA at the conclusion of the project. This report will cover all work completed during this segment and the effects BMPs have on the water quality.

Products:

5. Public Outreach, Implementation Record Keeping, Report and Future Grant Writing.

3a. Informational Public Outreach - One Public Meeting, one Project Tour, and Eight Advisory Group Meetings.

3b. Project Management (20 Participant Conservation Plans and Agreements on Five Riparian Vegetation-Streambank Protection, Five Stormwater, Two Manure/Grazing, and Eight OWTS Projects

3c. Administration (2 Audits, 22 Payment applications, 8 Quarterly Reimbursements, 8 Quarterly Progress Reports, 2 GRTS Reports, 1 Final Report)

3d. Travel (Mileage, 2 Coordinator Meetings, Lodging, Expenses)

Product Cost: $ 92,000 319 Cost: $ 25,000
Match: $ 67,000

- Lead: Pennington County, Spring Creek Watershed Advisory Group, Watershed Coordinator Consultants
- Other Groups: Pennington Conservation District, City of Hill City, Black Hills RC&D, US Forest Service, SD GF&P
- Milestone: June 2017, GRTS reports, One final report, One Public Meeting, One Tour, and Eight Advisory Group Meetings
- (see timeline, Figure 5-1)

5.2 SCHEDULE

The project milestone schedule is shown in Figure 5-1. The milestone schedule is based on work approval by June 2015 and completion by June 2017.

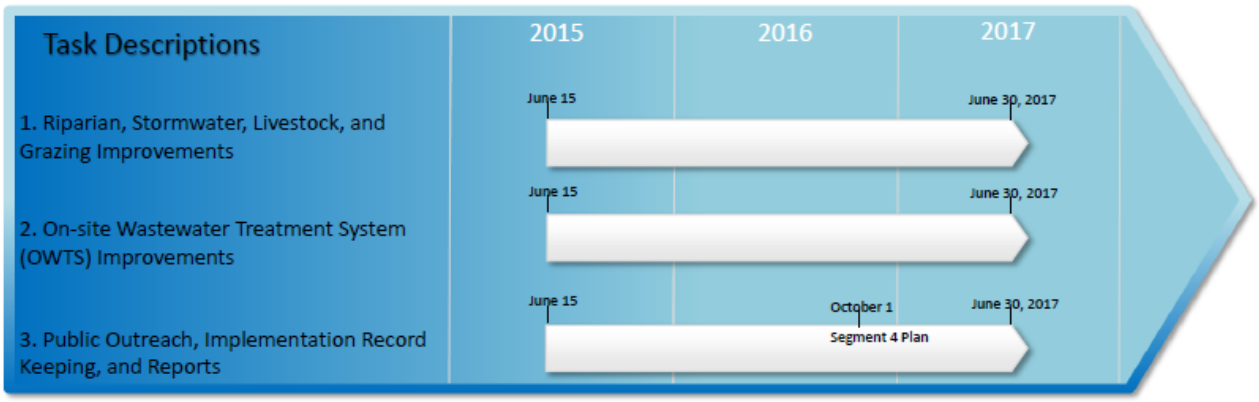

FIGURE 5-1

5.3 PERMITS

Before any new construction, required permits will be obtained. Permits that may be needed to be obtained for any stream, OWTS, and stormwater construction work include, but are not limited to, floodplain development, OWTS, 401 and 404 stream, and construction permits from local, state, and federal agencies.

5.4 LEAD PROJECT SPONSOR

Pennington County, a government entity, is the lead local sponsor for this implementation project and is experienced in administering 319 implementation

projects; they are actively involved in several watershed, water-quality improvement, and resource conservation management projects.

5.5 OPERATION AND MAINTENANCE QUALITY ASSURANCE

Responsibilities for operation and maintenance of 319 and CWSRF funded BMPs will be provided for through Pennington County's participant agreements, cooperative agreements and contracts. Reimbursable agreements developed for cost-sharing, not-to-exceed amounts, operations and maintenance, payments, procedures for BMP failure or abandonment, termination, ownership, and the life span BMP maintenance. The government-funding sponsor, if applicable, along with watershed coordinator consultants, would be responsible for completing operation and maintenance scheduling, on-site evaluations, and follow-up with project participants when actions need to be taken to ensure BMP operation for its designated life span.

Construction and compliance for BMPs implemented with 319 and CWSRF funds will be in accordance with the applicable rules and regulations set forth in the South Dakota NRCS Conservation Practice Standards and NRCS' Environmental Quality Incentives Program (EQIP) Manual, Pennington County's On-Site Wastewater Treatment System Ordinance, and provisions of Chapter 74:53:01 (and any amendments thereto) of the Administrative Rules of South Dakota. Participants who do not maintain practices funded by this project for the length of the agreed contract term will be required to repay all cost-share funds and any liquidated damages incurred. Pennington County will be responsible for participant contacts, developing a participant list, keeping records, submitting vouchers and reports, and recording match amounts as required in the SD DENR subgrant agreement.

6.0 COORDINATION PLAN

6.1 PARTICIPATING GROUPS AND AGENCIES

There has been strong local support for this project. The following groups/agencies have been participating and would continue to participate in the Spring Creek Watershed implementation project:

Spring Creek Watershed Advisory Group

Black Hills Resource Conservation and Development (RC&D)

City of Hill City

City of Rapid City

Pennington Conservation District

Pennington County

Custer County

South Dakota Game, Fish, and Parks (SD GF&P)

South Dakota School of Mines and Technology (SDSM&T)

USDA Natural Resource Conservation Service (NRCS)

USDA Forest Service (USFS), Black Hills National Forest

Black Hills FlyFishers

6.2 LETTERS OF SUPPORT

Letters of support would be supplied by cooperating organizations to the SD DENR for the Spring Creek Watershed Management and Implementation Project – Segment 3 upon request.

6.3 COORDINATION WITH OTHER PROGRAMS

Pennington County and their Spring Creek Watershed Advisory Group (SCWAG) would continue to coordinate activities with local, state, and federal agencies through frequent communication and quarterly meetings. SD GF&P, USFS, NRCS, SD DENR, local organizations, and local government agencies would provide input and involvement in this project. Additional coordination with local City of Hill City, NRCS, USFS, and SD GF&P personnel will be necessary for riparian, streambank, stormwater, livestock, grazing, forestry, and lake management improvement projects, weed/pest management, and streambank stabilization projects.

6.4 SIMILAR ACTIVITIES IN THE WATERSHED

Most of the expected activities in the Spring Creek Watershed are included in the funding table. Additional partners and projects may be identified during this Segment.

7.0 EVALUATION

7.1 MODELS

BASINS model, along with HSPF, were used to determine the contribution of fecal coliform bacteria from identified sources and to evaluate the implementation of BMPs to control these sources. The Spring Creek Watershed was represented using four subwatersheds in the model to represent the upper and lower Spring Creek and key tributaries (Palmer and Newton Fork Creeks). The nonpoint sources in the study area are modeled in HSPF by estimating per-acre fecal coliform accumulation rates and maximum fecal coliform storage rates for each source. The buildup and wash-off of fecal coliform is simulated based on these rates and precipitation. The values for the accumulation and storage rates were calculated using the Bacterial Indicator Tool (BIT) and the Bacteria Source Load Calculator (BSLC) may be used in future modeling efforts. Human sources (failing septic systems, leaking sanitary sewer lines, and leaking lagoons) and livestock in streams are nonpoint sources that are modeled as point sources because the coliform they produce cannot be adequately represented by buildup and accumulation rates. The BIT and BSLC calculate flow rates and fecal coliform counts per hour that are used in the simulation model to represent livestock and wildlife in streams and human sources.

Pennington County, SDSM&T, and watershed consultants have been gathering additional data including water-quality monitoring, land use, septic location and failure rates, livestock and wildlife populations, and installed BMPs within the watershed to improve the Spring Creek Watershed model for the current and future implementation segments. These modeling results would be incorporated and discussed in detail in the Spring Creek Watershed Stormwater Management Plan and the Spring Creek Watershed Strategic Implementation Plan.

7.2 LONG-TERM OPERATION AND MAINTENANCE (O&M) FUNDING

The long-term O&M funding for BMPs installed would be funded and maintained by the project participants.

8.0 BUDGET

Table 8-1 identifies the funding sources and cash flow during the project. Tables 8-2 and 8-3 present the budget for the 319 funds as well as the matching funds for the project. EPA 319 funds represent approximately 54 percent of the total project budget.

Table 8-1. Cash Flow

Budget	June 2015–May 2016 ($)	June 2016—May 2017 ($)	Total ($)
319 Funds	**107,500**	**107,500**	**215,000**
Participant	47,500	47,500	95,000
Hill City	5,000	5,000	10,000
Hill City School District	2,500	2,500	5,000
Pennington County	36,000	36,000	72,000
Subtotal	**91,000**	**91,000**	**182,000**
Total Budget	**198,500**	**198,500**	**397,000**

Table 8-2 Budget of 319 and CWSRF Funds

Project Objective and Task Description	319 Funds		
	Participants	Consultants	Total
Objective 1. Implement BMPs Recommended in the Spring Creek Watershed TMDL			
Task 1. Riparian, Stormwater, Livestock, and Grazing Improvements			
Products 1a-1c BMPs, Engineering			
Engineering		30,000	30,000
1a. Five Riparian/Vegetation/Streambank Protection Projects	60,000		60,000
1b. Five Stormwater Projects	60,000		60,000
1c. Two Manure/Grazing Projects	5,000		5,000
Task 1 Totals	**125,000**	**30,000**	**155,000**
Task 2. *On-site Wastewater Treatment System (OWTS) Improvements*			
Product 2. OWTS BMPs			
Eight OWTS BMPs	35,000		35,000
Task 2 Totals	**35,000**		**35,000**
Objective 2. Public Outreach and Project Management			
Task 3. Public Outreach, Implementation Record Keeping, and Reports			
Products 3a-3d. Project Management/Public Outreach			
3a. Public Education and Outreach		7,000	7,000
3b. Project Management		15,000	15,000
3c. Administration		2,500	2,500
3d. Travel		500	500
Task 3 Totals		**25,000**	**25,000**
TOTALS	**160,000**	**55,000**	**215,000**

Table 8-3 EPA 319, CWSRF, and Matching Funds Budget by Task

Project Objectives and Task Descriptions	Year 1	Year 2	Total	319 Funds	Match	Participant	Hill City	Hill City School District	Pennington County
Objective 1. Implement BMPs in the Spring Creek Watershed									
Task 1. Riparian, Stormwater, Livestock, Grazing, Forest, and Lake Improvements									
Engineering	**15,000**	**15,000**	**30,000**	**30,000**					
Products 1a-1e. Riparian, Stormwater, Grazing, Forest, and Lake BMP Projects									
1a. Five Riparian Streambank Protection Projects	45,750	45,750	91,500	60,000	31,500	30,000			1,500
1b. Five Stormwater Projects	50,750	50,750	101,500	60,000	41,500	25,000	10,000	5,000	1,500
1c. Two Manure/Grazing Projects	5,250	5,250	10,500	5,000	5,500	5,000			500
Task 1 Totals	**116,750**	**116,750**	**233,500**	**155,000**	**78,500**	**60,000**	**10,000**	**5,000**	**3,500**
Task 2. On-site Wastewater Treatment System Improvements									
Product 2. Eight OWTS Projects	35,750	35,750	71,500	35,000	36,500	35,000			1,500
Task 2 Totals	**35,750**	**35,750**	**71,500**	**35,000**	**36,500**	**35,000**			**1,500**
Objective 2. Public Outreach and Project Management									
Task 3. Public Outreach, Record Keeping, Report Writing									
Products 3a-3d. Public Outreach/Project Management									
3a. Informational Public Outreach - One Public Meeting, one Project Tour, and Eight Advisory Group Meetings	9,500	9,500	19,000	7,000	12,000				12,000
3b. Project Management (Participant Conservation Plans, Agreements, and Cultural Resources)	25,750	25,750	51,500	15,000	36,500				36,500
3c. Administration	9,750	9,750	19,500	2,500	17,000				17,000
3d. Travel	1,000	1,000	2,000	500	1,500				1,500
Task 3 Totals	**46,000**	**46,000**	**92,000**	**25,000**	**67,000**				**67,000**
Project Totals	**198,500**	**198,500**	**397,000**	**215,000**	**182,000**	**95,000**	**10,000**	**5,000**	**72,000**

9.0 PUBLIC INVOLVEMENT

Communication with the major stakeholders in this project is critical to success. Public involvement in the project would be continued through coordination with the Spring Creek Watershed Advisory Group, public meetings with stakeholders, newsletters, word of mouth, and by the website **http://www.pennco.org/springcreek** that is in operation for this project.