

Tabernash Meadows Water and Sanitation District Source Water Protection Plan

Grand County, Colorado

November 22, 2015

Revised May 30, 2018



Written by: Canyon Water Resources, LLC
For the Community Water Provider:
TMWSD, CO0125720

Primary Contact Information for Tabernash Meadows Water and Sanitation District

PWS Name	Tabernash Meadows Water and Sanitation District
PWSID #	CO0125720
Name	Mr. Thom Yoder
Title	District Manager
Address	729 County Road 5141, Tabernash, CO 80478
Phone	970-726-2839
Website	www.tmwsd.com

Cover photo courtesy of TMWSD, overlooking Crooked Creek in winter.

This Source Water Protection Plan is a planning document and there is no legal requirement to implement the recommendations herein. Actions on public lands will be subject to federal, state, and county policies and procedures. Action on private land may require compliance with county land use codes, building codes, local covenants, and permission from the landowner. This SWPP for the Tabernash Meadows Water and Sanitation District was developed using version 15.04.27 of the Colorado Rural Water Association’s Source Water Protection Plan Template.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 5

INTRODUCTION..... 8

 Purpose of the Source Water Protection Plan 9

 Background of Colorado’s SWAP Program 9

 Source Water Assessment Phase 10

 Source Water Protection Phase 11

SOURCE WATER SETTING..... 12

 Location and Description..... 12

 Hydrologic Setting 14

DRINKING WATER SUPPLY OPERATIONS 19

 Water Supply and Infrastructure..... 19

 Water Supply Demand Analysis 20

SOURCE WATER PROTECTION PLAN DEVELOPMENT 22

 Stakeholder Participation in the Planning Process..... 22

 Development and Implementation Grant..... 24

 Source Water Assessment Report Review 24

 Defining the Source Water Protection Area..... 24

 Inventory of Potential Contaminant Sources and Other Issues of Concern 26

 Priority Strategy of Potential Contaminant Sources and Other Issues of Concern..... 26

 Susceptibility Analysis of Water Sources..... 29

DISCUSSION OF POTENTIAL CONTAMINANT SOURCES AND ISSUES OF CONCERN 30

 Transportation Spills and Roads 30

 Industrial Activities 31

 Golf Course Operations 32

 Contamination of Pole Creek and Roberts Pond..... 32

 Security and Vandalism 33

SOURCE WATER Best Management Practices 34

Evaluating Effectiveness of Source Water Protection Plan 38

REFERENCES..... 40

APPENDICES 41

COMMON ACRONYMS

AF	Acre-feet
BMP	Best Management Practice
CDPHE	Colorado Department of Public Health and Environment
CRWA	Colorado Rural Water Association
GIS	Geographic Information System
MGD	Million Gallons per Day
PSOC	Potential Source of Contamination
SWAA	Source Water Assessment Area
SWAP	Source Water Assessment and Protection
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
TMWSD	Tabernash Meadows Water and Sanitation District
TOT	Time of Travel

EXECUTIVE SUMMARY

There is a growing effort in Colorado to protect community drinking water sources from potential contamination. Many communities are taking a proactive approach to preventing the pollution of their drinking water sources by developing a source water protection plan. A source water protection plan identifies a source water protection area, lists potential contaminant sources and outlines best management practices to reduce risks to the water source. Implementation of a source water protection plan provides an additional layer of protection at the local level beyond drinking water regulations.

The Tabernash Meadows Water and Sanitation District values a clean, high quality drinking water supply and decided to work collaboratively with area stakeholders to develop a Source Water Protection Plan. The source water protection planning effort consisted of public planning meetings with stakeholders including local citizens and landowners, private businesses, water operators, local and state governments, and agency representatives during the months of March 2015 to November 2015, at the District's offices. Colorado Rural Water Association was instrumental in this effort by providing technical assistance in the development of this Source Water Protection Plan.

The Tabernash Meadows Water and Sanitation District obtains its drinking water from 3 groundwater wells in the Pole Creek alluvium (2 wells) and the Troublesome Formation bedrock aquifer (1 well). The Source Water Protection Area for these water source(s) includes the Pole Creek and Crooked Creek watersheds. The Primary Protection Area is adjacent to the wells and mostly within the boundaries of the District. The Source Water Protection Area is the area that the Tabernash Meadows Water and Sanitation District has chosen to focus its source water protection measures to reduce source water susceptibility to contamination. The Steering Committee conducted an inventory of potential contaminant sources and identified other issues of concern within the Source Water Protection Area.

The Steering Committee developed best management practices to reduce the risks from the potential contaminant sources and other issues of concern. The best management practices are centered on the themes of building partnerships with community members, businesses, and local decision makers; raising awareness of the value of protecting community drinking water supplies; and empowering local communities to become stewards of their drinking water supplies by taking actions to protect their water sources.

The following list highlights the highest priority potential contaminant sources and/or issues of concern and their associated best management practices.

Transportation Spills and Roads

Transportation Corridor Recommendations:

1. Improve drainage and vegetation around the wells. Grade soils so that surface water run-off flows beyond the wells and there is no water ponding in the vicinity of the wells. Near Well No. 2, grade soils so that snow-melt run-off does not pond on the access road or near the well house. Near Well No. 1, delineate community snow storage area so that run-off from the melting snow piles will not flow past or in the vicinity of the well and well house.
2. Work with the owners of Lots 16, 17, 18, 19, 20 and 21 to implement agreed upon source water protection measures.

3. Install “Source Water Protection Area” signs at strategic locations throughout source water protection area.
4. Develop an Emergency Notification Card and distribute.
5. Share shapefiles of the source water protection areas with Emergency Responders and CDOT to be overlaid on their spill response maps.
6. Maintain (update annually) contact information with Emergency Responders and CDOT to improve notification of spill response activities.

Collaboration

Collaboration Recommendations:

1. Continue to be an active member of the FRSWPP, participating in outreach and collaborating on new initiatives
2. Verify contacts of the FRSWPP response phone tree and perform a test call at least once a year

Industrial Activities

Industrial Area Recommendations:

1. Meet with various industrial and commercial entities within SWPA to raise awareness about source water protection and to distribute Emergency Notification Cards.
2. Work with the local industrial and commercial entities as well as the Local Emergency Planning Committee to inventory potential contaminants stored onsite.
3. Purchase and distribute spill response kits to industries and activities that are not under regulation.
4. Ensure all TMWSD work trucks are equipped with spill response kits so staff are able to respond to spills immediately.

Pole Creek Golf Course Operations

Pole Creek Golf Courses Best Management Practices Recommendations:

1. Meet with golf course administrative staff to raise awareness about source water protection and distribute Emergency Notification Cards.
2. Encourage and support the golf course’s current Best Management Practices.
 - a. The Fraser Valley Municipal Recreation District follows all rules and regulations pertaining to the Colorado Pesticide Applicators’ Act (C.R.S. Article 10 of Title 35).
 - b. The FVMRD employs certified public pesticide applicators on staff,
 - c. All chemicals are stored in a chemical shed with a spill proof floor,
 - d. Products used on site are EPA registered, safe to humans and wildlife, and break down immediately.
 - e. The golf course design includes vegetative buffers adjacent to surface waters on the golf course and slow down and filter run-off.
 - f. Operations include bulk fertilization of fairways, rough, and tee boxes twice a year. This activity is contracted out.
3. The golf course sanitary septic system is inspected annually and meets Grand County regulations.

Contamination of Pole Creek and Roberts Pond

1. Install “Source Water Protection Area” signs at strategic locations near Pole Creek, Crooked Creek and Roberts Pond.
2. Remain vigilant to recognize if/when a contamination occurs on Pole Creek and follow up by closing the Pearl Ditch Headgate.
3. Maintain pet waste stations that have been installed at Roberts Pond to reduce the amount of fecal bacteria that gets carried into the pond via surface runoff.
4. Increase outreach to local residents on the importance of cleaning up pet waste to decrease water contamination.

Security and Vandalism

Vandalism Best Management Practices Recommendations:



1. Perform regular checks to ensure the padlocks that have been installed on wellheads (see picture left) are secure.
2. Continue to rely on existing measures (locked well heads and fencing) around wells to prevent vandalism/tampering.
3. Remain vigilant to recognize if/when vandalism/tampering occurs.
4. Install Drinking Water Protection Area signs at strategic locations throughout source water protection area.
5. Share Source Water Protection Plan with the County Sheriff and enlist their support for regular patrol of area.

Image 1: Security padlock installed on Well 2 wellhead

The Steering Committee recognizes that the usefulness of this Source Water Protection Plan lies in its implementation and will begin to execute these best management practices upon completion of this Plan.

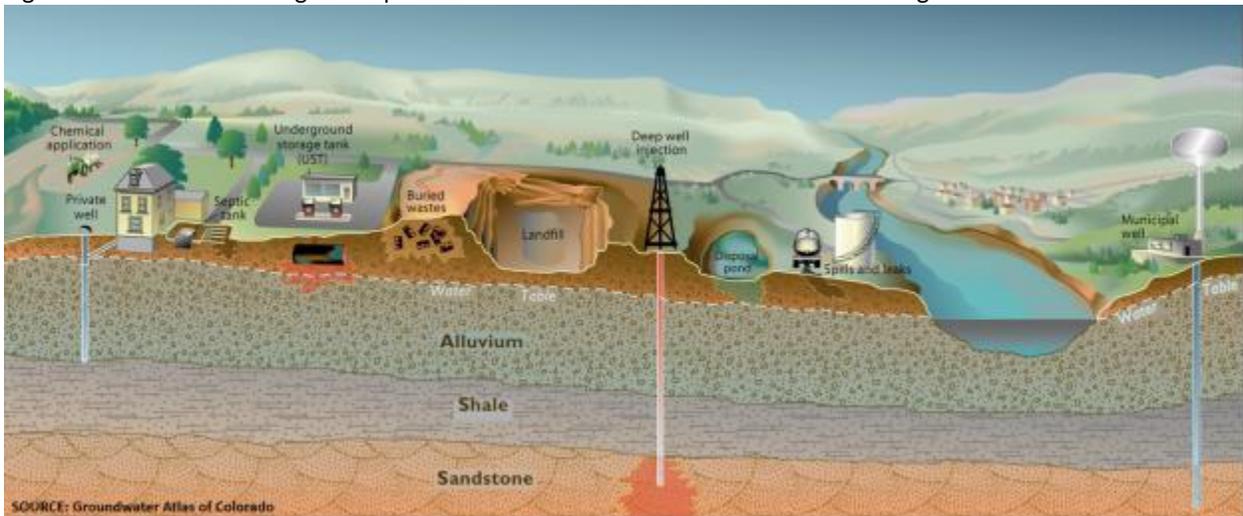
This Plan is a living document that is meant to be updated to address any changes that will inevitably come. The Steering Committee will review this Plan at a frequency of once every 3-10 years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified. This plan was originally written in November of 2015 and has been revised as of April 2018. This SWPP will be approved by the TMWSD Board of Directors as well as the Board of County Commissioners and then posted on both organizations’ websites to raise awareness.

INTRODUCTION

Source water protection is a proactive approach to preventing the pollution of lakes, rivers, streams, and groundwater that serve as sources of drinking water. For generations water quality was taken for granted, and still today many people assume that their water is naturally protected. However, as water moves through and over the ground, contaminants may be picked up and carried to a drinking water supply.

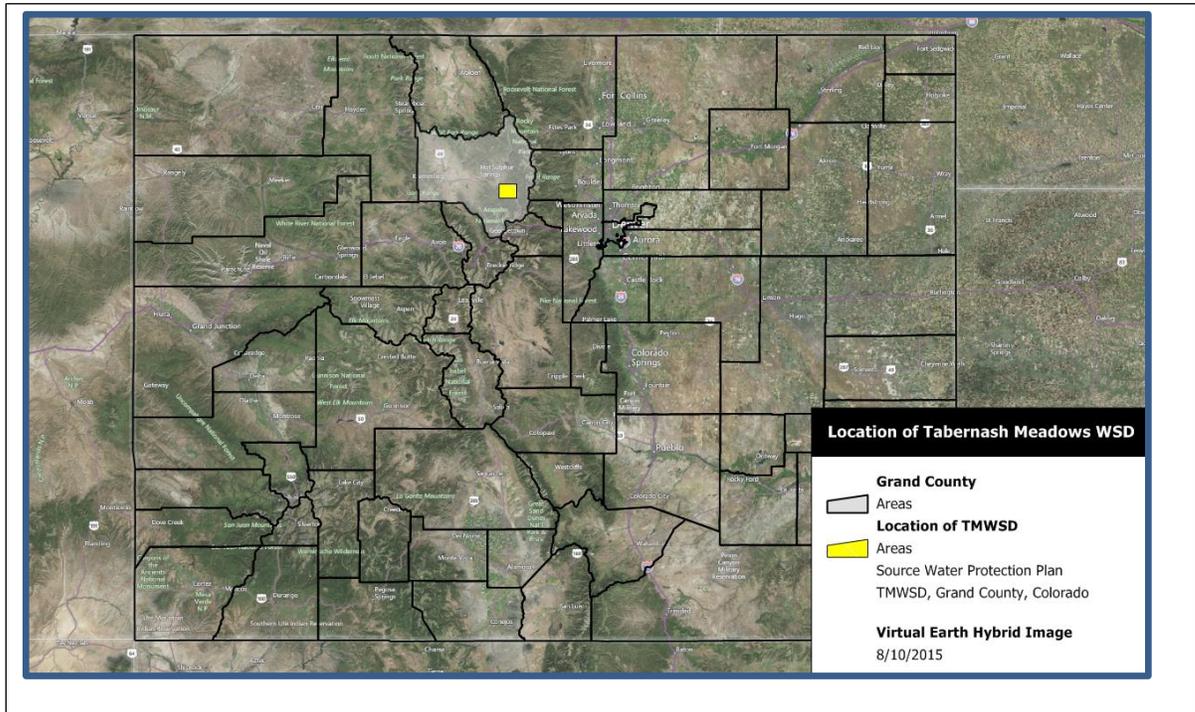
While a single catastrophic event may wipe out a drinking water source, the cumulative impact of minor contaminant releases over time can also result in the degradation of a drinking water source. Contamination can occur via discrete (point source) and dispersed (nonpoint source) sources. A discrete source contaminant originates from a single point, while a dispersed source contaminant originates from diffuse sources over a broader area. According to the US Environmental Protection Agency, nonpoint source pollution is the leading cause of water quality degradation (GWPC, 2008).

Figure 1: Schematic drawing of the potential source of contamination to surface and groundwater



The Tabernash Meadows Water and Sanitation District recognizes the potential for contamination of their drinking water source, and realizes that the development of this Source Water Protection Plan is the first step in protecting this valuable resource. Proactive planning is essential to protect the long-term integrity of the drinking water supply and to limit costs and liabilities. This SWPP demonstrates the Tabernash Meadows Water and Sanitation District’s commitment to reducing risks to their drinking water supply.

Figure 2: Map of Colorado Indicating Grand County and the Location of TMWSD



Purpose of the Source Water Protection Plan

The Source Water Protection Plan (SWPP) is a tool for the Tabernash Meadows Water and Sanitation District to ensure clean and high quality drinking water sources for current and future generations. This Source Water Protection Plan is designed to:

- Create an awareness of the community’s drinking water sources and the potential risks to surface water and/or groundwater quality within the watershed;
- Encourage education and voluntary solutions to alleviate pollution risks;
- Promote management practices to protect and enhance the drinking water supply;
- Provide for a comprehensive action plan in case of an emergency that threatens or disrupts the community water supply.

Developing and implementing source water protection measures at the local level (i.e. county and municipal) will complement existing regulatory protection measures implemented at the state and federal governmental levels by filling protection gaps that can only be addressed at the local level.

Background of Colorado’s SWAP Program

Source water assessment and protection came into existence in 1996 as a result of Congressional reauthorization and amendment of the Safe Drinking Water Act. These amendments required each state to develop a source water assessment and protection (SWAP) program. The Water Quality Control Division, an agency of the Colorado Department of Public Health and Environment (CDPHE),

assumed the responsibility of developing Colorado’s SWAP program and integrated it with the Colorado Wellhead Protection Program.

Colorado’s SWAP program is an iterative, two-phased process designed to assist public water systems in preventing potential contamination of their untreated drinking water supplies. The two phases include the Assessment Phase and the Protection Phase as depicted in the upper and lower portions of Figure 3, respectively.



Source: CDPHE - WQCD

Figure 3: Source Water Assessment and Protection Phases

Source Water Assessment Phase

The Assessment Phase for all public water systems was completed in 2004 and consisted of four primary elements:

1. Delineating the source water assessment area for each of the drinking water sources;
2. Conducting a contaminant source inventory to identify potential sources of contamination within each of the source water assessment areas;
3. Conducting a susceptibility analysis to determine the potential susceptibility of each public drinking water source to the different sources of contamination;
4. Reporting the results of the source water assessment to the public water systems and the general public.

A Source Water Assessment Report was provided to each public water system in Colorado in 2004 that outlines the results of this Assessment Phase. The Tabernash Meadows Water and Sanitation District did not receive a Source Water Assessment by the CDPHE Water Quality Control Division.

Source Water Protection Phase

The Protection Phase is a non-regulatory, ongoing process in which all public water systems have been encouraged to voluntarily employ preventative measures to protect their water supply from the potential sources of contamination to which it may be most susceptible. The Protection Phase can be used to take action to avoid unnecessary treatment or replacement costs associated with potential contamination of the untreated water supply. Source water protection begins when local decision makers use the source water assessment results and other pertinent information as a starting point to develop a protection plan. As depicted in the lower portion of Figure 3, the source water protection phase for all public water systems consists of four primary elements:

1. Involving local stakeholders in the planning process;
2. Developing a comprehensive protection plan for all of their drinking water sources;
3. Implementing the protection plan on a continuous basis to reduce the risk of potential contamination of the drinking water sources; and
4. Monitoring the effectiveness of the protection plan and updating it accordingly as future assessment results indicate.

The water system and the community recognize that the Safe Drinking Water Act grants no statutory authority to the Colorado Department of Public Health and Environment or to any other state or federal agency to force the adoption or implementation of source water protection measures. This authority rests solely with local communities and local governments.

The source water protection phase is an ongoing process as indicated in Figure 3. The evolution of the SWAP program is to incorporate any new assessment information provided by the public water supply systems and update the protection plan accordingly.

SOURCE WATER SETTING

Location and Description

The Tabernash Meadows Water and Sanitation District is in Grand County, Colorado (Figure 2). The geographical area is classified as the Southern Rocky Mountains – High Mountains and Valleys (NRCS, 2009). The area is characterized by steep, high mountain ranges and associated mountain valleys. Vegetation is sagebrush-grass at low elevations, and with increasing elevation ranges from coniferous forest to alpine tundra. Elevations range from 6,500 to 14,400 feet. Recreation, mining, and wildlife habitat are important land uses throughout this area. Small valleys are irrigated and used for growing hay and pasture for livestock.

The area surrounding the TMWSD includes both private and publically owned lands. The Town of Tabernash, the YMCA of the Rockies, numerous subdivisions, and other privately owned lands comprise the private lands. The public land is primarily United States Forest Service Arapahoe-Roosevelt National Forest managed by the Sulphur Ranger District.

The average annual precipitation in this area ranges from 15 – 30 inches in the valleys and 30 – 63 inches in the mountains (NRCS, 2009). Rainfall occurs as high intensity, convective thunderstorms during the growing season but most of the precipitation falls in winter as snow. The average annual Temperature is 26 to 54 degrees F (-3 to 12 degrees C). The frost-free period averages 135 days and ranges from 45 to 230 days.

The geology of the area near the Town of Tabernash is characterized by alluvial and colluvium¹ surficial deposits overlying the Troublesome Formation bedrock deposits. To the west of Tabernash, thrust faults expose the older sedimentary bedrock units including the Middle Park Formation and sedimentary rocks. Further to the west and south of Tabernash faulting exposes the crystalline bedrock units comprised of metamorphic rocks and small plutons (Shroba et al, 2010).

The alluvium is mostly poorly sorted coarse sand and pebbly to cobbly gravel. The materials occur in stream channels and flood plains along the Fraser River and tributary streams. In glaciated tributary drainages, the alluvium is described as gravelly stream-terrace alluvium. The valley alluvium unit consists mostly of poorly sorted sand and gravel along non-glaciated tributary streams. Locally, in areas underlain by the Troublesome Formation, the unit contains a significant amount of silt. Also, in marshes and other wet areas, the alluvial deposits may include organic-rich sediments (Shroba et al, 2010).

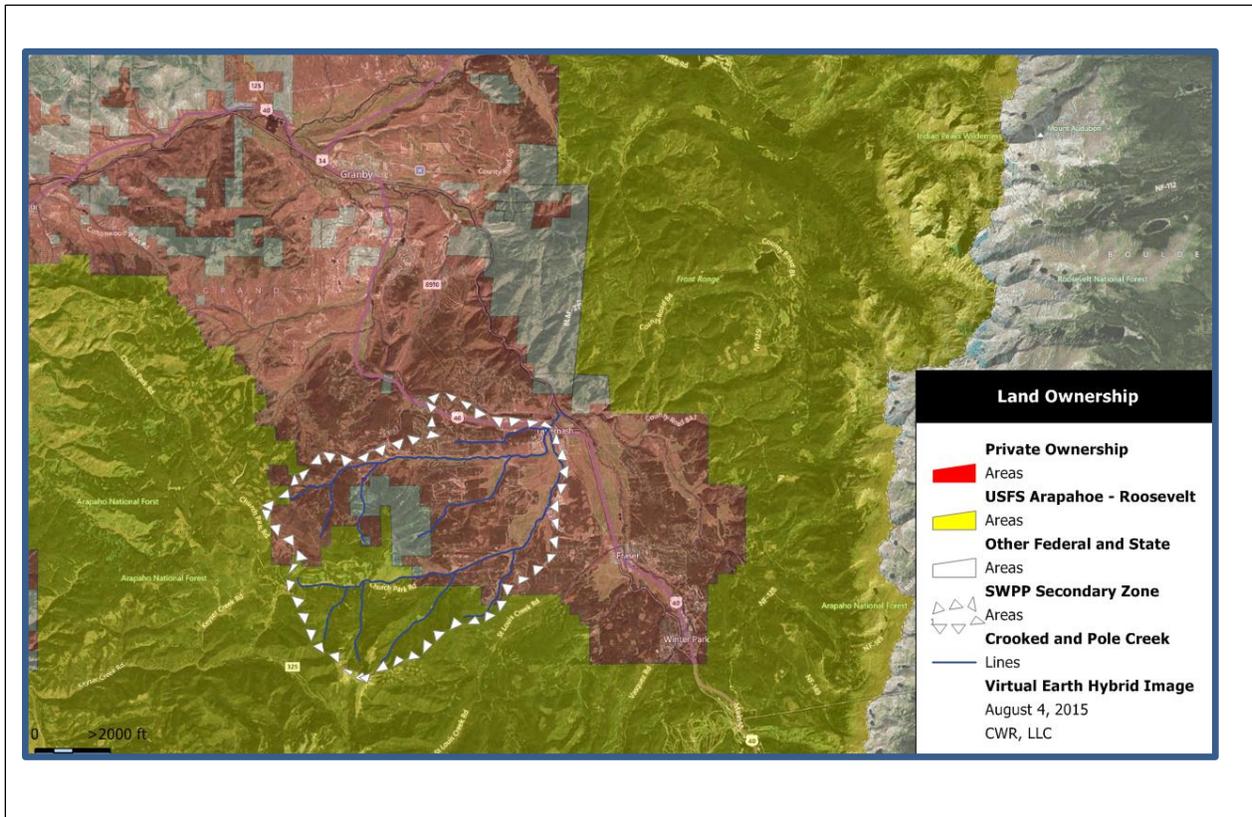
The lithography of poorly exposed outcrops and small man-made exposures of the Troublesome Formation in the Fraser basin indicate weakly consolidated siltstone, minor interbedded sandstone and conglomerate, and locally unconsolidated sand and gravel. Lithologic data in driller's logs for water wells near Fraser and Tabernash suggest that the unit in the subsurface consists chiefly of siltstone. Much of the Formation exposed in the Troublesome basin (Hot Sulphur Springs quadrangle), northwest of the Fraser basin is also composed of siltstone. Limited lithologic data in driller's logs suggest that sandstone and conglomerate locally form discontinuous channel-fill

¹ The terms "alluvium" and "alluvial" refer to sediment transported by running water confined to channels (stream alluvium) as well as by running water not confined to channels (sheet flow or unconfined overland flow). The term "colluvium" refers to all rock and sediment transported downslope chiefly by gravity (Hilgard, 1892; Merrill, 1897).

deposits of variable thickness (about 0.3–17 m) within more uniform intervals of fine-grained sediment (probably mostly siltstone) (Shroba et al, 2010).

The Troublesome Formation in the Fraser quadrangle has measured dips of 5–16°, is slightly tilted and is locally faulted. The siltstone layers, in areas with steep slopes, are prone to displacement by creep, sliding, and other mass-movement processes. Estimates of thickness based on outcrop and drill-hole data indicate the deposit is at least 150 m thick near Fraser and about 255 m near Tabernash (Shroba et al, 2010).

Figure 4: Land Ownership in the Vicinity of the SWPP



Hydrologic Setting

The Tabernash Meadows Water and Sanitation District’s water supply is groundwater pumped from the Crooked Creek and Pole Creek watershed. Pole Creek is tributary to Crooked Creek and Crooked Creek joins the Fraser River approximately ½ mile north of Tabernash. The creeks drain roughly equal areas of the watershed upstream of TMWSD, totaling approximately 35 square miles.

Pole Creek and Crooked Creek flow from west to east with headwaters near Sheep Mountain, Bottle Pass, and Moose Mountain. Bottle Pass is at an elevation of approximately 10,000 feet. At its confluence with the Fraser River, Crooked Creek drops in elevation to approximately 8,500 feet. Crooked Creek is approximately 9 miles long and Pole Creek is approximately 8 miles long.

Neither Pole Creek nor Crooked Creek include any stream segments that are designated by the Colorado Department of Public Health and Environment. The surface water uses include agricultural irrigation and the Colorado Water Conservation Board owns instream flow water rights on portions of Crooked Creek. There are no long-term stream gauges in the watershed.

The United States Geological Survey has published water quality data for Crooked Creek and Pole Creek. Figures 5 and 6 show the locations of the USGS surface water and groundwater quality stations, respectively. Tables 1 and 2 summarize the locations and period for the water quality analyses for the surface water and groundwater, respectively. The most frequently analyzed water quality parameters include ammonia, chloride, dissolved oxygen, nitrate/nitrite, orthophosphate, phosphorous, specific conductance, temperature, and instantaneous discharge.

Figure 5: Locations of USGS Surface Water Quality Monitoring in the Vicinity of TMWSD

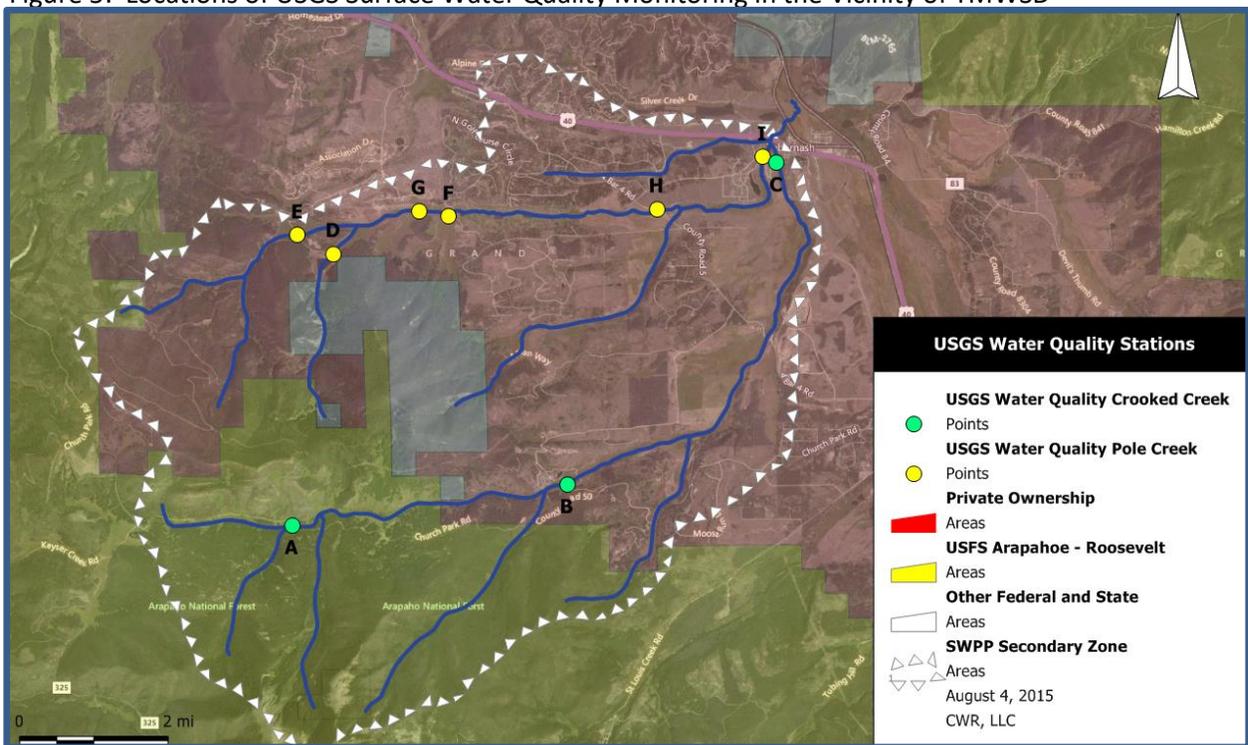


Table 1: Summary of Surface Water Quality Monitoring in the Vicinity of TMWSD

Map Key	Site ID	Site Name	Begin Date	End Date	Count
A	395612105563700	CROOKED CR BLW PTARMIGAN CR NR TABERNASH, CO	7/18/2000	9/11/2001	9
B	395634105532401	CROOKED CREEK BL TIPPERARY CREEK NR TABERNASH, CO	6/18/1997	9/21/2009	130
C	395927105505700	CROOKED CR ABV POLE CREEK AT TABERNASH	10/21/1999	7/20/2015	132
D	395838105560800	POLE CREEK TRIB BLW YMCA RESERV R NR TABERNASH, CO	8/14/2001	8/14/2001	1
E	395848105563300	POLE CREEK ABOVE YMCA CAMP NEAR TABERNASH, CO	8/14/2001	8/14/2001	1
F	395858105544700	POLE CREEK ABOVE GOLF COURSE NR TABERNASH, CO	8/14/2001	8/14/2001	1
G	395901105550800	POLE CREEK AT UPPER STATION NR TABERNASH, CO	2/26/1997	9/22/2009	111
H	395902105522100	POLE CREEK ABV SKUNK CREEK NEAR TABERNASH, CO	8/14/2001	8/14/2001	1
I	395930105510700	POLE CREEK AT MOUTH NR TABERNASH, CO	2/26/1997	11/8/2011	125

Figure 6: Locations of USGS Groundwater Quality Monitoring in the Vicinity of TMWSD

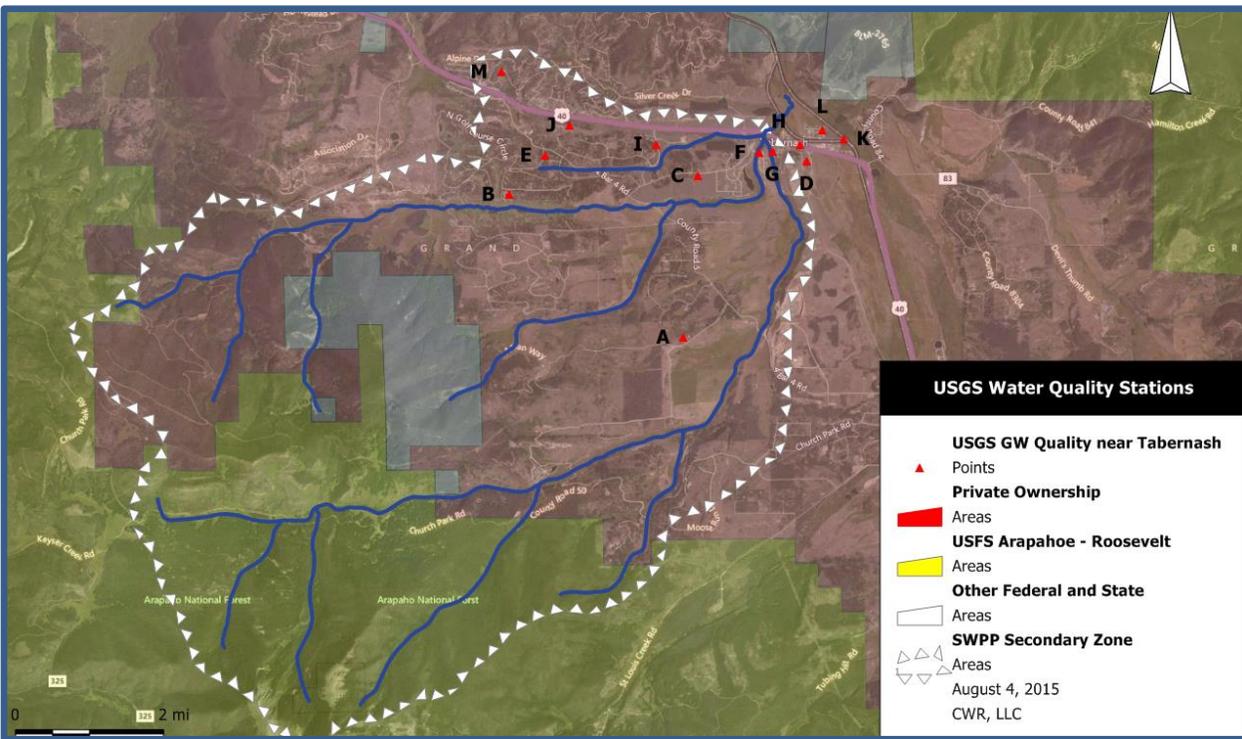


Table 2: Summary of Groundwater Quality Monitoring in the Vicinity of TMWSD

Map Key	Site Number	Site Name	WQ date Begin	WQ date End
A	395750105515800	SC00107614BDA	8/20/1998	9/13/2001
B	395907105540100	SC00107604CDD	8/18/1998	9/11/2001
C	395917105514800	WILLET	--	--
D	395925105503100	SC00107601DAB	8/24/1998	8/24/1998
E	395928105533500	SC00107604ABC	8/20/1998	9/13/2001
F	395929105510300	SC00107602DAC	5/21/1997	5/14/2012
G	395930105505500	SC00107601CDC	8/17/1998	8/17/1998
H	395934105503600	SC00107601DDD	8/19/1998	8/19/1998
I	395934105521700	SC00107603ADD	8/18/1998	8/18/1998
J	395935105535800	SC00107604BA00	9/13/1997	9/13/1997
K	395937105500500	SC00107601CDB	8/24/1998	9/13/2001
L	395942105502000	SC00107501CBC	8/18/1998	9/12/2001
M	400013105540600	SC00107633ACC	8/20/1998	8/20/1998

The District pumps its water supply from three wells (Figure 7). Two of the water supply wells are completed in the alluvium of Crooked Creek (Wells No. 1 and 3). One well is completed in the bedrock Troublesome Formation (Well No. 2). The alluvial wells are perforated from approximately 50 to 60 feet below the ground surface and the Troublesome well has perforation at intervals from 170 to 300 feet below the ground surface. Perforation allows ground water to recharge the wells.

Water quality testing done by the TMWSD indicates that the alluvial water supplies are not under the direct influence of surface water, but it is likely that the alluvial aquifer is recharged by the groundwater flow in Crooked Creek and Pole Creek. The Troublesome well indicates water chemistry typical of the deep wells in the area (naturally occurring Fluoride and dissolved minerals measured as total dissolved solids). The recharge area for the Troublesome well is not known. The groundwater in the Troublesome Formation occurs in lenses and beds of silty sandstones, siltstones, and fractures.

Crooked Creek and Pole Creek do not have any State stream segment classifications or 303d listed stream segments, meaning they are not considered impaired by the EPA. There are Colorado Water Conservation Board instream flow water rights on Crooked Creek.

The water system has not petitioned the Water Quality Control Commission for the establishment of a classified groundwater area and associated site-specific ground water quality standards for its ground water intakes under Regulation No. 42.

Figure 7: Location Map of the TMWSD Wells



Table 3: Summary of the USGS Water Quality Data for Crooked Creek

Count	Parameter Code
104	Agency analyzing sample, code
123	Ammonia, water, filtered, milligrams per liter as NH4
123	Ammonia, water, filtered, milligrams per liter as nitrogen
122	Barometric pressure, millimeters of mercury
1	Carbonaceous biochemical oxygen demand, water, unfiltered, 5 days at 20 degrees Celsius, milligrams per liter
121	Chloride, water, filtered, milligrams per liter
12	Dead fish, severity, code
122	Discharge, instantaneous, cubic feet per second
122	Discharge, instantaneous, cubic meters per second
122	Dissolved oxygen, water, unfiltered, milligrams per liter
122	Dissolved oxygen, water, unfiltered, percent of saturation
42	Escherichia coli, m-TEC MF method, water, colonies per 100 milliliters
2	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters
50	Fecal coliforms, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters
12	Floating algae mats, severity, code
12	Floating debris, severity, code
12	Floating garbage, severity, code
110	Gage height, above datum, meters
110	Gage height, feet
120	Hydrogen ion, water, unfiltered, calculated, milligrams per liter
123	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen
123	Nitrate, water, filtered, milligrams per liter as nitrate
121	Nitrate, water, filtered, milligrams per liter as nitrogen
123	Nitrite, water, filtered, milligrams per liter as nitrite
123	Nitrite, water, filtered, milligrams per liter as nitrogen
64	Number of sampling points, count
12	Odor, atmospheric, severity, code
12	Oil and grease, severity, code
1	Organic nitrogen, water, filtered, milligrams per liter as nitrogen
123	Orthophosphate, water, filtered, milligrams per liter as phosphorus
123	Orthophosphate, water, filtered, milligrams per liter as PO4
120	pH, water, unfiltered, field, standard units
123	Phosphorus, water, filtered, milligrams per liter as phosphorus
105	Phosphorus, water, unfiltered, milligrams per liter as phosphorus
69	Sample location, distance downstream, feet
38	Sample purpose, code
28	Sample splitter type, field, code
85	Sampler type, code
86	Sampling method, code
38	Site visit purpose, code
17	Specific conductance, water, unfiltered, laboratory, microsiemens per centimeter at 25 degrees Celsius
121	Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius
63	Stream width, feet
12	Suds or foam, severity, code
120	Suspended solids, water, unfiltered, milligrams per liter
102	Temperature, air, degrees Celsius
123	Temperature, water, degrees Celsius
7	Total nitrogen [nitrate + nitrite + ammonia + organic-N], water, filtered, analytically determined, milligrams per liter
12	Turbidity, severity, code
71	Type of quality assurance data associated with sample, code
1	Velocity at point in stream, feet per second
1	Weather, World Meteorological Organization code

DRINKING WATER SUPPLY OPERATIONS

Water Supply and Infrastructure

The Tabernash Meadows Water and Sanitation District operates a community water supply system that supplies drinking water to approximately 400 residents located within Grand County, Colorado. The District obtains its drinking water supply from 3 groundwater wells. Two of the wells are in the alluvium of Crooked Creek and one well is in the bedrock Troublesome Formation.

The alluvial wells are designated as Well #1 and Well #3. Well #1 corresponds to well permit number 55036-F and was installed by the developer of the subdivision in 2001. The well is 60 feet deep and perforated with slotted steel casing from 37 to 44 feet; plain steel casing and cement seal from 37 to the surface. As this time, Well #1 serves as a back-up to Well #3.

The District pumps the majority of its water supply from Well #3. The well corresponds to permit number 74508-F. Well #3 was installed in 2011 by the District to replace the function of Well #1. The well is 64 feet deep and perforated from 49 to 59 feet with stainless steel wire wrapped screen. Blank casing extends from 49 feet to ground surface.

Well #2 is the Troublesome well, permit number 61836-F. Well #2 was installed in 2005 by the District and re-completed by grouting the lower portion of the well perforation in 2014. The well total depth is 518 feet and well perforations are located across sand and siltstone intervals from depths of 174 – 184 and 278 – to 300. Blank well casing extends from 174 to the surface. A steel surface casing extends from the ground surface to 50 feet.

Water quality data collected by the District and anecdotal information indicate that fluoride is commonly detected in the deeper Troublesome wells in the vicinity of Tabernash. Water quality testing of Well #2 indicated that the fluoride concentrations varied between 2 and 16 ppm depending on how long the well pumped and the pumping flow rate. The District's water supply operations have always blended the Troublesome well water with the alluvial water from Wells #1 and #3. Fluoride concentrations in the alluvial water are below 0.3 ppm. The result is that the water supplied to the distribution system is 1.0 ppm fluoride which is less than the 4 ppm MCL (maximum contaminant level) fluoride concentration.

In 2014, the District sealed the bottom interval of Well #2 from 462 to 305 feet. The purpose of the seal is to mitigate fluoride concentrations in the Troublesome well water supply. It is believed that the higher fluoride concentrations are present in the lower lenses and layers of sandstone and siltstone aquifer. Fluoride concentration from Well #2 are now consistently below the 4 ppm MCL (maximum contaminant level) fluoride concentration.

The wells pump groundwater to the District's treatment system and storage tank after water filtration and chlorination at the well head. Figure 7 shows the location of the wells and storage tank. The groundwater treatment system consists of chlorination and bag filtration to 1 micron. The volume of the storage tank is 325,000 gallons. The storage tank is located near the high point of the District at an elevation of approximately 8,577 feet. The distribution system is gravity pressurized and serves approximately 170 taps.

Table 4: Groundwater Supply Information

Water System Facility Name	Formation	Well Permit Number	Water System Facility Number	Total Depth of Well (ft.)	Depth of Plain Casing (ft.)	Depth of Perforation (ft.)	Yield (gpm)	Year Drilled
Well #1	Alluvial	55036-F		60	0-37	37-44	200	2001
Well #2	Troublesome	61836-F	original construction	581	0 - 174	Discrete Intervals from 174 – 300	40	2005
			recompletion 2014	300	0-174	174 – 184, 278 - 318	40	Lower portion well sealed in 2014
Well #3	Alluvial	74508-F		64	0-59	49-59	200	2010

Water Supply Demand Analysis

The Tabernash Meadows Water and Sanitation District serves an estimated 170 connections and approximately 400 residents and other users in the service area. The water system has the current capacity to produce and treat a maximum of 84,400 gallons per day. Current estimates indicate that the average daily demand is approximately 12,000 gallons per day, and that the average peak daily demand is approximately 37,000 gallons per day. Using these estimates, the water system has a surplus average daily demand capacity of 43,000 gallons per day and a surplus average peak daily demand capacity of 47,400 gallons per day. In addition, the water system includes a storage tank with a volume of 325,000 gallons.

If the primary alluvial well (Well #3) became disabled for an extended period of time due to contamination, then the District may not be able to meet the water demands of its customers. For example, if the well was not operable and the storage tank was just one-half full, then the supply on hand would last for approximately 2 weeks (assuming average daily flow rate of 12,000 gpd). It is important to note that emergency supplies could be extended by conserving water use and judicious operation of the Troublesome well.

Tabernash Meadows Water and Sanitation District recognizes that potential contamination of its groundwater source(s) could result in having to treat the groundwater or replace the water source if treatment proves to be ineffective or too costly. To understand the potential financial costs associated with such an accident, the Tabernash Meadows Water and Sanitation District estimates that it could cost up to \$1,500,000 in today’s dollars to replace its groundwater water source. Treatment costs, which can vary depending on the type of contaminant(s) that need(s) to be treated, were not included in this estimate.

The potential financial and water supply risks related to the long-term disablement of one or more of the community’s water sources are a concern to the Steering Committee. As a result, the Steering Committee believes the development and implementation of a source water protection plan for Tabernash Meadows Water and Sanitation District can help to reduce the risks posed by

potential contamination of its water source(s). Additionally, the Tabernash Meadows Water and Sanitation District has developed an Emergency Response Plan (Appendix A) to coordinate rapid and effective response to any emergency incident that threatens or disrupts the community water supply.

SOURCE WATER PROTECTION PLAN DEVELOPMENT

The Colorado Rural Water Association’s (CRWA) Source Water Protection Specialist, Mr. Dylan Eiler, helped guide and facilitate the source water protection planning process. The goal of the CRWA’s Source Water Protection Program is to assist public water systems in minimizing or eliminating potential risks to drinking water supplies through the development and implementation of Source Water Protection Plans.

The source water protection planning effort consisted of a series of public planning meetings and individual meetings. Information discussed at the meetings helped the Tabernash Meadows Water and Sanitation District develop an understanding of the issues affecting source water protection for the community. The Steering Committee then made recommendations for best management practices to be incorporated into the Source Water Protection Plan. In addition to the planning meetings, data and other information pertaining to Source Water Protection Area was gathered via public documents, internet research, phone calls, emails, and field trips to the protection area. A summary of the meetings is represented below.

Table 5: Planning Meetings

Date	Purpose of Meeting
March 27, 2015	Kick-Off Meeting – brief overview of source water protection. Roles in the planning process. Estimated timelines and tasks. Tracking forms; meeting dates and locations; and identify stakeholders. Review CDPHS’s SWAP assessment. Review SWPP template.
June 4, 2015	First Planning Meeting - Overview of the Tabernash Meadows Water and Sanitation District’s water system. Overview of source water protection planning process and objectives. Delineate the Source Water Protection Areas. Begin an inventory of potential sources of contamination and issues of concern. Field trip of facilities.
July 14, 2015	Second Planning Meeting - Finalize the delineation of the source water protection areas. Inventory and prioritize potential sources of contamination and issues of concern. .
August 13, 2015	Third Planning Meeting - Finalize the prioritization of the potential contaminant inventory. Develop best management practices. Review and update CDPHE’s susceptibility ranking.
October 13, 2015	Fourth Planning Meeting – Review and comment on draft source water protection plan. Develop Action Plan for BMP implementation.

Stakeholder Participation in the Planning Process

Local stakeholder participation is vitally important to the overall success of Colorado’s Source Water Assessment and Protection (SWAP) program. Source water protection was founded on the concept that informed citizens, equipped with fundamental knowledge about their drinking water source and the threats to it, will be the most effective advocates for protecting this valuable resource. Local support and acceptance of the Source Water Protection Plan is more likely when local stakeholders have actively participated in its development.

The Tabernash Meadows Water and Sanitation District’s source water protection planning process attracted interest and participation from 10 stakeholders including local citizens and landowners, private businesses, water operators, local and state governments, and agency representatives.

During the months of June 2015 through December 2015, 4 planning meetings were held at the Tabernash Meadows Water and Sanitation District’s office to encourage local stakeholder participation in the planning process. The stakeholders were invited by website notification, emails, letters, and phone calls.

A Steering Committee to help develop the source water protection plan was formed from the stakeholder group. The Steering Committee’s role in the source water protection planning process was to advise the Tabernash Meadows Water and Sanitation District in the identification and prioritization of potential contaminant sources as well as management approaches that can be voluntarily implemented to reduce the risks of potential contamination of the untreated source water. All Steering Committee members attended at least one meeting and contributed to planning efforts from their areas of experience and expertise. Their representation provided diversity and led to a thorough Source Water Protection Plan. The Tabernash Meadows Water and Sanitation District and the Colorado Rural Water Association are very appreciative of the participation and expert input from the following participants.

Table 6: Stakeholders and Steering Committee Members (*Names, Titles, and Affiliations were as of 2015)

Stakeholder	Title	Affiliation	Steering Committee Member
Laura Lee Kourse	Manager	Tabernash Meadows WSD	X
Buff Borrás	Operator	GCWSD No. 1	
Buck Holland	Operator	Tabernash Meadows WSD	
Scott Ledin	Director of Parks and Recreation	Fraser Valley Metropolitan District	
Ryan Lokteff	Director	Grand County Water Information Network	
Ed Moyer	Assistant County Manager	Grand County	
Jim Pearce	Hydrologist	Consultant for TMWSD	X
Chris Sandoval	Utility Manager	YMCA Snow Mountain Ranch	
Dennis Soles	Asst. Fire Chief	East Grand Fire Protection District #4	
Sammy Stovall	Intern	Tabernash Meadows WSD	
Sid Logemann	Board Member	Tabernash Meadows WSD	X
Sherri Jones	Engineer	Consultant for TMWSD	
Irene Cook	Board Member	TMWSD	X
Donna Ferber	Board Member	Pole Creek Valley Owners Association	
Dick Sprague	DRC	Pole Creek Valley Owners Association	X
Todd Holzworth	Fire Chief	East Grand Fire Protection District	
Rudy Michalek	Citizen	Homeowner	
Joanna Goodman	Operator	Tabernash Meadows WSD	
Stephen Eddy	Citizen	Homeowner	
Nathan Macchione	Sergeant	Grand County Sheriff’s Office	
Dylan Eiler	Source Water Specialist	Colorado Rural Water Association	X

Development and Implementation Grant

The Tabernash Meadows Water and Sanitation District has been awarded a \$5,000 Development and Implementation Grant from the Colorado Department of Public Health and Environment (CDPHE). This funding is available to public water systems and representative stakeholders committed to developing and implementing a source water protection plan. A one to one financial match (cash or in-kind) is required. The Tabernash Meadows Water and Sanitation District was approved for this grant in February 2015, and it expires on March 15, 2017. The Tabernash Meadows Water and Sanitation District intends to utilize the funds for development and writing of the SWPP and to implement source water protection measures that are identified in this Plan.

Source Water Assessment Report Review

The Tabernash Meadows Water and Sanitation District has reviewed the State's list of Source Water Assessment Reports and determined that there is not a SWAP report for the system. Therefore, this Plan serves as the assessment for the system.

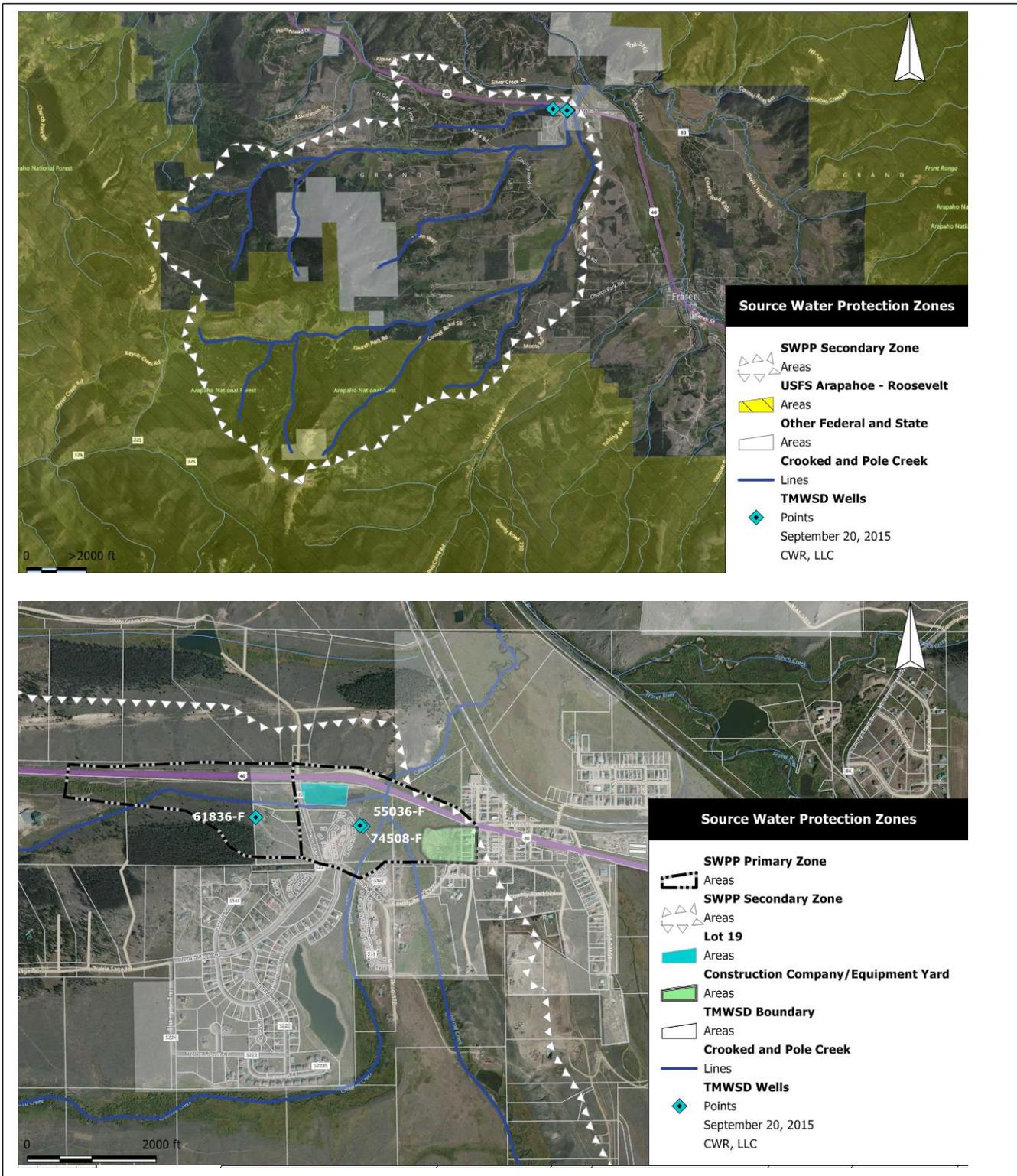
Defining the Source Water Protection Area

A source water protection area is the surface and subsurface areas within which contaminants are reasonably likely to reach a water source. The purpose of delineating a source water protection area is to determine the recharge area that supplies water to a public water source. Delineation is the process used to identify and map the area around a pumping well that supplies water to the well or spring, or to identify and map the drainage basin that supplies water to a surface water intake. The size and shape of the area depends on the characteristics of the aquifer and the well, or the watershed. The source water assessment area that was delineated as part of the Tabernash Meadows Water and Sanitation District's Source Water Assessment Report provides the basis for understanding where the community's source water and potential contaminant threats originate, and where the community has chosen to implement its source water protection measures in an attempt to manage the susceptibility of their source water to potential contamination.

After carefully reviewing the location of the District's wells, the area's geography, topography, water sources, cultural features, and other factors the Tabernash Meadows Water and Sanitation District and the Steering Committee selected primary and secondary source water protection areas. The Tabernash Meadows Water and Sanitation District's Source Water Protection Area is defined as:

1. **Primary Zone:** encompasses an area of approximately 100 acres. This area is of critical concern because of its proximity to the wells. Most of the Primary Zone is within the boundaries of the TMWSD. The western most 10 acres of the Primary Zone are not within the boundaries of the District. The Primary Zone includes undeveloped lots for housing, open space/conservation easements, approximately 1.25 miles of Highway 40 easement and frontage, an equipment yard and offices for a construction company, and approximately 0.5 miles of County Roads and frontage.
2. **Secondary Zone:** encompasses the whole area of the Pole Creek and Crooked Creek watersheds upstream of the District's groundwater wells. The Secondary Zone is an area of about 35 square miles. This area contains numerous private land subdivisions, the Pole Creek Golf Course, YMCA Snow Mountain Ranch, agricultural areas producing grass hay and pasture, and Federal lands (BLM and USFS).

The Source Water Protection Area is illustrated in the following map(s).



Inventory of Potential Contaminant Sources and Other Issues of Concern

In 2001 – 2002, as part of the Source Water Assessment Report, a contaminant source inventory was conducted by the Colorado Department of Public Health and Environment to identify selected potential sources of contamination that might be present within the source water assessment areas. Discrete and dispersed contaminant sources were inventoried using selected state and federal regulatory databases, land use / land cover and transportation maps of Colorado. The contaminant inventory was completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS).

Since CDPHE did not complete a Source Water Assessment Report for the Tabernash Meadows Water and Sanitation District, the TMWSD, through much consideration, discussion, and input from local stakeholders, has developed an accurate and current inventory of contaminant sources located within the Source Water Protection Area and other issues of concern that may impact their drinking water source(s).² The Potential Sources of Contamination and Issues of Concern Prioritization are listed on Table 7. Through this Source Water Protection Plan, the Tabernash Meadows Water and Sanitation District is reporting its findings to the CDPHE.

Priority Strategy of Potential Contaminant Sources and Other Issues of Concern

After developing a contaminant source inventory and list of issues of concern that is more accurate, complete, and current, the Steering Committee utilized CRWA’s *SWAP Risk Assessment Matrix* (Appendix B) to assist with the prioritization of this inventory for the implementation of the Best Management Practices outlined in this Source Water Protection Plan (see Table 8: Source Water Protection Best Management Practices). The *SWAP Risk Assessment Matrix* calculates the level of risk by measuring the impact of the potential contaminant source to the public water system against the probability of impact.

The Tabernash Meadows Water and Sanitation District and Steering Committee considered the following criteria when estimating the risk of contaminant sources and issues of concern.

1. **Risk** – The risk value of each contaminant source is a measure of the water source’s potential exposure to contamination. Risk is determined by estimating the following:
 - **Impact to the Public Water System** – The risk to the source waters increases as the impact to the water system increases. The impact is determined by evaluating the human health concerns and potential volume of the contaminant source. The following descriptions provide a framework to estimate the impact to the public water system.
 - **Catastrophic** - irreversible damage to the water source(s). This could include the need for new treatment technologies and/or the replacement of existing water source(s).

² The information contained in this Plan is limited to readily available from public records and the Tabernash Water and Sanitation District at the time that the Plan was written. Other potential contaminant sites or threats to the water supply may exist in the Source Water Protection Area that are not identified in this Plan. Furthermore, identification of a site as a “potential contaminant site” should not be interpreted as one that will necessarily cause contamination of the water supply.

- **Major** - substantial damage to the water source(s). This could include a loss of use for an extended period of time and/or the need for new treatment technologies.
 - **Significant** - moderate damage to the water source(s). This could include a loss of use for an extended period of time and/or the need for increased monitoring and/or maintenance activities.
 - **Minor** - minor damage resulting in minimal, recoverable, or localized efforts. This could include temporarily shutting off an intake or well and/or the issuance of a boil order.
 - **Insignificant** - damage that may be too small or unimportant to be worth consideration, but may need to be observed for worsening conditions. This could include the development of administrative procedures to maintain awareness of changing conditions.
- **Probability of Impact** – The risk to the source waters increases as the relative probability of damage or loss increases. The probability of impact is determined by evaluating the number of contaminant sources, the migration potential or proximity to the water source, and the historical data. The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within one to ten years.
 - **Certain:** >95% probability of impact
 - **Likely:** >70% to <95% probability of impact
 - **Possible:** >30% to <70% probability of impact
 - **Unlikely:** >5% to <30% probability of impact
 - **Rare:** <5% probability of impact
2. **Controllability** – The level of control, in conjunction with the evaluation of risk to the source water(s), helped determine the prioritization of the contaminant source inventory and of issues of concern in a way that best fits the needs and resources of the community. In other words, a community may assign higher priority to a potential contaminant source if they can take direct measures to prevent contamination or minimize impact.
- **Direct Control** – The water system can take direct measures to prevent.
 - **Indirect Control** – The water system cannot directly control the issue, but can work with another person or entity to take measures to prevent.
 - **No Control** – The PSOC or issue of concern is outside the control of the public water system and other entities.

The Tabernash Meadows Water and Sanitation District and Steering Committee ranked the potential contaminant source inventory and issues of concern in the following way:

Table 7: Potential Sources of Contamination and Issues of Concern Prioritization Table

Potential Source of Contamination or Issue of Concern	Controllable (Direct, Indirect, No)	Impact to Water System (Insignificant, Minor, Significant, Major, Catastrophic)	Probability of Impact (Rare, Unlikely, Possible, Likely, Certain)	Risk (Very Low, Low, Intermediate, High, Very High)	Priority Ranking
Transportation Spills / Roads	Indirect	Catastrophic	Likely	Very High	Very High
Industrial Activity (including fuel storage tanks)	Indirect	Major	Unlikely	Moderate	High
Golf Course Operations	Indirect	Significant	Unlikely	Moderate	High
Contamination of Pole Creek and Roberts Pond	Direct	Significant	Unlikely	Moderate	High
Security/Vandalism	Indirect	Catastrophic	Unlikely	Moderate	High
Commercial Development	Indirect	Minor	Unlikely	Low	Medium
Residential Septic Systems	Indirect	Minor	Unlikely	Low	Low
Pesticide Application (County and Private Weed Management)	Indirect	Minor	Unlikely	Low	Low
Road Maintenance	Indirect	Insignificant	Unlikely	Very Low	Low
Residential Practices	Indirect	Insignificant	Unlikely	Very Low	Low
Electrical Distribution System and Mettler Substation (oil filled transformers)	Indirect	Minor	Rare	Very Low	Very Low
Agriculture	Indirect	Minor	Rare	Very Low	Very Low
Sewerage Systems	Indirect	Minor	Rare	Very Low	Very Low
Wildfire	No	Insignificant	Unlikely	Very Low	Very Low

Susceptibility Analysis of Water Sources

Source Water Assessment Reports contain a susceptibility analysis³ to identify how susceptible an untreated water source could be to contamination from potential sources of contamination inventoried within its source water assessment area. The analysis looked at the susceptibility posed by individual potential contaminant sources and the collective or total susceptibility posed by all of the potential contaminant sources in the source water assessment area. The CDPHE developed a susceptibility analysis model for surface water sources and ground water sources under the influence of surface water, and another model for groundwater sources. Both models provided an objective analysis based on the best available information at the time of the analysis. The two main components of the CDPHE’s susceptibility analysis are:

1. **Physical Setting Vulnerability Rating** – This rating is based on the ability of the surface water and/or groundwater flow to provide a sufficient buffering capacity to mitigate potential contaminant concentrations in the water source.
2. **Total Susceptibility Rating** – This rating is based on two components: the physical setting vulnerability of the water source and the contaminant threat.

Since there is not an existing susceptibility analysis, the Steering Committee determined that the Total Susceptibility Rating would be used to accurately reflect the current situation. The Steering Committee evaluated susceptibility through discussion, on-site observation, and review of historical data involving stakeholders and experts.

Table 8: Updated Susceptibility Analysis

Source ID #	Source Name	Source Type	CDPHE Physical Setting Vulnerability Rating	CDPHE Total Susceptibility Rating	Updated Total Susceptibility Rating
125720-001	Well #1	Groundwater	NA	NA	Moderately High
125720-003	Well #2	Groundwater	NA	NA	Low
125720-002	Well #3	Groundwater	NA	NA	Moderately High

³ The susceptibility analysis provides a screening level evaluation of the likelihood that a potential contamination problem could occur rather than an indication that a potential contamination problem has or will occur. The analysis is NOT a reflection of the current quality of the untreated source water, nor is it a reflection of the quality of the treated drinking water that is supplied to the public.

DISCUSSION OF POTENTIAL CONTAMINANT SOURCES AND ISSUES OF CONCERN

The following section provides a brief description of potential contaminant sources and issues of concern that have been identified in this plan, describes the way in which they threaten the water source(s) and outlines best management practices. The highest priority potential contaminant sources and issues of concern are:

- Transportation Spills and Roads,
- Industrial Activity,
- Golf Course Operations,
- Contamination of Pole Creek and Roberts Pond, and
- Security/ vandalism

Transportation Spills and Roads

The source water protection areas developed for this Plan includes a paved highway and paved and unpaved county, forest service, and private roads. Approximately 1.25 miles of Highway 40 traverses the northern most edge of the Primary Zone. The Primary Zone includes 0.5 miles of County Roads. The roads within the Primary Zone are maintained by the Colorado Department of Transportation (CDOT) and Grand County.

Groundwater Contaminant Pathways

Motor vehicles, roads and parking facilities are a source of water pollution to both surface and groundwater. An estimated 46% of US vehicles leak hazardous fluids, including crankcase oil, transmission, hydraulic, and brake fluid, and antifreeze. Runoff from roads and parking lots has a high concentration of toxic metals, suspended solids, and hydrocarbons, which originate largely from automobiles (Gowler and Sage, 2006). Storm water runoff over these roads can deliver contaminants from the road surface into the nearby groundwater.

Vehicular spills may occur along the transportation route within the source water protection areas from trucks that transport fuels, waste, and other chemicals that have a potential for contaminating the groundwater. Chemicals from accidental spills are often mitigated by diluting with water, potentially washing the chemicals into the soil and infiltrating into the groundwater. Roadways are also frequently used for illegal dumping of hazardous or other potentially harmful wastes.

The greatest potential for catastrophic spills resulting in surface and ground water contamination is along the US Highway 40 corridor. The risk of spills is greatest along the highway because of the amount of traffic and nature of the transportation. Images from Google Earth indicate an accident on Highway 40 near the intersection of Prairie Sage Road sometime since 2010. Anecdotal information describes a semi-truck rollover accident destroying the spruce tree formerly near the intersection.

In 2015, the TMWSD purchased “Lot 19”, at the intersection of Highway 40 and Prairie Sage Road near Wells 1 and 3. The current Grand County zoning for Lot 19 includes commercial uses. TMWSD will be selling Lot 19, with the intention of working with developers to ensure responsible management and the protection of source water.

Transportation Corridor Recommendations:

1. Improve drainage and vegetation around the wells. Grade soils so that surface water run-off flows beyond the wells and there is no water ponding in the vicinity of the wells. Near Well No. 2, grade soils so that snow-melt run-off does not pond on the access road or near the well house. Near Well No. 1, delineate community snow storage area so that run-off from the melting snow piles will not flow past or in the vicinity of the well and well house.
2. Work with the owners of Lots 16, 17,18, 19, 20 and 21 to implement agreed upon source water protection measures.
3. Install “Source Water Protection Area” signs at strategic locations throughout source water protection area.
4. Develop an Emergency Notification Card and distribute.
5. Share shapefiles of the source water protection areas with Emergency Responders and CDOT to be overlaid on their spill response maps.
6. Maintain (update annually) contact information with Emergency Responders and CDOT to improve notification of spill response activities.

Collaboration

TMWSD is a member of the Fraser River Source Water Protection Partnership (FRSWPP), also known as the East Grand County Water District. FRSWPP is made up of water and sanitation districts all along the Fraser River including: Moraine Park, Granby North Service Area, Granby South Service Area, the

Town of Fraser, Winter Park Ranch Water and Sanitation, Grand County Water and Sanitation District

#1, Winter Park Water and Sanitation District, and Denver Water. TMWSD is part of the FRSWPP response phone tree, ensuring consistent and timely communication and coordination up and down stream, especially in the event of contamination. If one member of FRSWPP calls in a spill to the state, the phone tree will automatically be activated.

As a member of FRSWPP, TMWSD contributes and collaborates on outreach projects such as a source water protection flyer that was distributed to all TMWSD customers and informational booths at local events.

Collaboration Recommendations:

1. Continue to be an active member of the FRSWPP, participating in outreach, collaborating on new initiatives, and being listed on the response phone tree
2. Verify contacts of the FRSWPP response phone tree and perform a test call at least once a year

Industrial Activities

The Primary Zone source water protection area developed for this Plan includes approximately 1 acre of land used as equipment yard and offices for an excavation and construction company. Equipment is stored on the lot, there are fuel storage tanks on the property, and there is a maintenance shop for equipment. Similar to the transportation corridors, this area is potentially a source for contaminants leaking onto the ground and into the groundwater.

Industrial Area Recommendations:

1. Meet with various industrial and commercial entities within SWPA to raise awareness about source water protection and to distribute Emergency Notification Cards.
2. Work with the local industrial and commercial entities as well as the Local Emergency Planning Committee to inventory potential contaminants stored onsite.
3. Purchase and distribute spill response kits to industries and activities that are not under regulation.
4. Ensure all TMWSD work trucks are equipped with spill response kits so staff are able to respond to spills immediately.

Golf Course Operations

The Pole Creek Golf course, YMCA Snow Mountain Ranch, and US Forest Service public lands are the major recreational facilities within the Secondary Zone source water protection area. Surface and groundwater quality can be affected by different practices used within recreational areas. The Steering Committee identified the golf course operated by the Fraser Valley Municipal Recreation District (FVMRD) as an issue of concern because of the use of fertilizers and pesticides and commercial septic system associated with golf course operations.

This plan recognizes that the golf course operations conduct careful and safe practices associated with the use and handling of all chemicals. This Plan recommends that the Pole Creek Golf Course continue the Best Management Practices established for the golf industry and implemented at the course:

Pole Creek Golf Courses Best Management Practices Recommendations:

1. Meet with golf course administrative staff to raise awareness about source water protection and distribute Emergency Notification Cards.
2. Encourage and support the golf course's current Best Management Practices.
 - a. The Fraser Valley Municipal Recreation District follows all rules and regulations pertaining to the Colorado Pesticide Applicators' Act (C.R.S. Article 10 of Title 35).
 - b. The FVMRD employs certified public pesticide applicators on staff,
 - c. All chemicals are stored in a chemical shed with a spill proof floor,
 - d. Products used on site are EPA registered, safe to humans and wildlife, and break down immediately.
 - e. The golf course design includes vegetative buffers adjacent to surface waters on the golf course and slow down and filter run-off.
 - f. Operations include bulk fertilization of fairways, rough, and tee boxes twice a year. This activity is contracted out.
3. The golf course sanitary septic system is inspected annually and meets Grand County regulations.

Contamination of Pole Creek and Roberts Pond

Contamination of Pole Creek is a high priority concern in this Plan because the District's Wells #1 and #3 pump alluvial ground water from Pole Creek (Figure 7). Contamination of Roberts Pond is a concern because the pond is tributary to Pole Creek and upstream of the alluvial wells. The recharge area for the wells is not known. Nonetheless, it is likely that areas in Pole Creek Valley alluvium upstream of the wells are contributing to the groundwater flow near the wells.

The areas of the pond and creek serve as a catchment and detention for storm water run-off from the surrounding subdivisions and county roads. Storm water run-off may contain contaminants derived from spills, illegal dumping, traffic accidents, fires, pet waste, or other mechanisms. Pedestrian pathways provide vehicular access to the perimeter of the pond. The paths have been utilized for pond maintenance and weed spraying. Accidents may result in contamination of the pond and/or Pole Creek.

Contamination of Pole Creek and Roberts Pond Best Management Practices Recommendations:

1. Install “Source Water Protection Area” signs at strategic locations near Pole Creek and Roberts Pond.
2. Remain vigilant to recognize if/when a contamination occurs on Pole Creek and follow up by closing the Pearl Ditch Headgate.
3. Maintain pet waste stations installed at Roberts Pond to reduce the amount of fecal bacteria that gets carried into the pond via surface runoff.
4. Increase outreach to local residents on the importance of cleaning up pet waste to decrease water contamination.

Security and Vandalism

Indiscriminate vandalism could endanger the water supply even though measures have been taken to protect the area. Although no recent incidents have occurred, this is a concern of the steering committee. It recommends conducting public education and outreach for neighborhood residents to encourage practices that will protect their drinking water source.

Topics may include: Ways to secure the SWPA and Neighborhood Watch and Reporting. A reference for the program is a brochure “Neighborhood Watch Program: The Basics.” BMPs associated with the Neighborhood Watch Program include:

- Observation is paying attention to what is happening around you. Keep an eye out for your neighbors and their property as well as your own. Residents are the best experts on what is normal and acceptable for their neighborhood.
- Communication is simply passing on your observations or information you receive. If you witness suspicious behavior or discover a crime, report it to the Sheriff’s Office immediately. **For emergencies, dial 911. Otherwise call the non-emergency Dispatch line at 390-5555.**
- Security involves each person taking a critical look at their home, their habits and the entire neighborhood to ensure that the area is not inviting to potential criminals. This includes assessing and possibly upgrading physical security measures, lighting, and other features to create the safest environment possible.

In addition, several physical security measures are offered, including placing signs and padlocking the outside well heads. Padlocks have been installed to secure well heads.

Vandalism Best Management Practices Recommendations:

1. Perform regular checks to ensure the installed padlocks (image 1) on wellheads are secure.
2. Continue to rely on existing measures (locked well heads and fencing) around wells to prevent vandalism/tampering.
3. Remain vigilant to recognize if/when vandalism/tampering occurs.
4. Install Drinking Water Protection Area signs at strategic locations throughout source water protection area.

5. Share Source Water Protection Plan with the County Sheriff and enlist their support for regular patrol of area.

SOURCE WATER BEST MANAGEMENT PRACTICES

The Steering Committee reviewed and discussed several possible best management practices that could be implemented within the Source Water Protection Area to help reduce the potential risks of contamination to the community’s source water. The Steering Committee established a “common sense” approach in identifying and selecting the most feasible source water management activities to implement locally. The best management practices were obtained from multiple sources including: Environmental Protection Agency, Colorado Department of Public Health and Environment, Natural Resources Conservation Service, and other source water protection plans. The Steering Committee recommends the best management practices listed in the following table be considered for implementation.

Table 9: Source Water Protection Best Management Practices

PSOC’s and/or Issues of Concern	Best Management Practices	Partners
Transportation Spills / Roads	<ol style="list-style-type: none"> 1. Improve drainage and vegetation around the wells. Grade soils so that surface water run-off flows beyond the wells and there is no water ponding in the vicinity of the wells. Near Well No. 2, grade soils so that snow-melt run-off does not pond on the access road or near the well house. Near Well No. 1, delineate community snow storage area so that run-off from the melting snow piles will not flow past or in the vicinity of the well and well house. 2. Work with the owner of Lots 16, 17, 18, 19, 20 and 21 to implement agreed upon source water protection measures. 3. Install “Source Water Protection Area” signs at strategic locations throughout source water protection area. 4. Develop an Emergency Notification Card and distribute. 5. Share shapefiles of the source water protection areas with Emergency Responders and CDOT to be overlaid on their spill response maps. 6. Maintain (update annually) contact information with Emergency Responders and CDOT to improve notification of spill response activities. 	<ol style="list-style-type: none"> 1. TMWSD 2. TMWSD 3. TMWSD 4. TMWSD 5. TMWSD 6. TMWSD

Collaboration	<ol style="list-style-type: none"> 1. Continue to be an active member of the FRSWPP, participating in outreach and collaborating on new initiatives 2. Verify contacts of the FRSWPP response phone tree and perform a test call at least once a year 	<ol style="list-style-type: none"> 1. FRSWPP 2. FRSWPP
Industrial Activity	<ol style="list-style-type: none"> 1. Meet with various industrial and commercial entities within SWPA to raise awareness about source water protection and to distribute Emergency Notification Cards. 2. Work with the local industrial and commercial entities as well as the Local Emergency Planning Committee to inventory potential contaminants stored onsite. 3. Purchase and distribute spill response kits to industries and activities that are not under regulation. 4. Ensure all TMWSD work trucks are equipped with spill response kits so staff are able to respond to spills immediately. 	<ol style="list-style-type: none"> 1. TMWSD 2. TMWSD 3. TMWSD 4. TMWSD
Golf Course Operations	<ol style="list-style-type: none"> 1. Meet with golf course administrative staff to raise awareness about source water protection and distribute Emergency Notification Cards. 2. Encourage and support the golf course's current Best Management Practices. Work with the <ol style="list-style-type: none"> a. The Fraser Valley Municipal Recreation District follows all rules and regulations pertaining to the Colorado Pesticide Applicators' Act (C.R.S. Article 10 of Title 35). b. The FVMRD employs certified public pesticide applicators on staff, c. All chemicals are stored in a chemical shed with a spill proof floor, d. Products used on site are EPA registered, safe to humans and wildlife, and break down immediately. e. The golf course design includes vegetative buffers adjacent to surface waters on the golf course and slow down and filter run-off. f. Operations include bulk fertilization of fairways, rough, and tee boxes twice a year. This activity is contracted out. 3. The golf course sanitary septic system is inspected annually and meets Grand County regulations. 	<ol style="list-style-type: none"> 1. TMWSD 2. TMWSD 3. FVMRD
Contamination of	<ol style="list-style-type: none"> 1. Install "Source Water Protection Area" signs 	<ol style="list-style-type: none"> 1. TMWSD

<p>Pole Creek and Roberts Pond</p>	<p>at strategic locations near Pole Creek and Roberts Pond.</p> <ol style="list-style-type: none"> 2. Remain vigilant to recognize if/when a contamination occurs and follow up as needed. 3. Maintain pet waste stations that have been installed at Roberts Pond to reduce the amount of fecal bacteria that gets carried into the pond via surface runoff. 4. Increase outreach to local residents on the importance of cleaning up pet waste to decrease water contamination. 	<ol style="list-style-type: none"> 2. TMWSD 3. TMWSD 4. TMWSD
<p>Security/Vandalism</p>	<ol style="list-style-type: none"> 1. Perform regular checks to ensure the padlocks that have been installed on wellheads are secure. 2. Install fencing around wells and other critical areas, and/or vaults over wellheads. 3. Consider installing security cameras at wellhouses. 4. Continue to rely on existing measures (locked well heads and fencing) around wells to prevent vandalism/tampering. 5. Remain vigilant to recognize if/when vandalism/tampering occurs. 6. Install Drinking Water Protection Area signs at strategic locations throughout source water protection area. 7. Share Source Water Protection Plan with the County Sheriff and enlist their support for regular patrol of area. 	<ol style="list-style-type: none"> 1. TMWSD 2. TMWSD 3. TMWSD 4. TMWSD 5. TMWSD 6. TMWSD 7. TMWSD, GCPD
<p>Residential Septic Systems</p>	<ol style="list-style-type: none"> 1. Provide property owners with septic systems within the source water protection area BMP educational material. Information provided will include: the proper use and maintenance of their septic systems, how to proceed in the event of a septic system failures, and how the source of their drinking water can be affected by an inadequate functioning septic system. 	<ol style="list-style-type: none"> 1. TMWSD
<p>Pesticide Application (County and Private Weed Management)</p>	<ol style="list-style-type: none"> 1. Share maps and shapefiles of well/intake locations and source water protection areas to allow the Grand County Department of Natural Resources to effectively protect them. 2. Maintain a current contact list between TMWSD and the Grand County Department of Natural Resources and the Pole Creek Valley Owners Association licensed 	<ol style="list-style-type: none"> 1. TMWSD, GCDNR 2. TMWSD

	<p>applicators.</p> <p>3. Coordinate with the Grand County Weed Management Program on education and outreach opportunities within the community.</p>	<p>3. TMWSD</p>
Commercial Development	<p>1. Share a copy of the final Source Water Protection Plan and shapefiles with the County Planning Department and with homeowners associations within the Pole Creek Valley subdivision encourage them to consider source water protection in their review process.</p>	<p>1. TMWSD</p>
Road Maintenance	<p>1. Meet with CDOT and the County Transportation Department to provide them with an Emergency Notification Card along with GIS shapefiles. Encourage them to continue the use of their road Best Management Practices to prevent road materials from entering the source waters. Recommendations for application of road deicing and dust abatement materials include:</p> <ul style="list-style-type: none"> • applying minimum amounts necessary; • apply only when removal of snow and ice cannot be accomplished by blading, plowing or sanding; • minimize use of chemicals in and adjacent to streams, aquifers, and flood prone areas; and • avoid dumping or storing snow where it can melt and infiltrate groundwater or flow into surface waters. <p>2. Install “Source Water Protection Area” signage at strategic locations throughout SWPA.</p>	<p>1. TMWSD</p> <p>2. TMWSD</p>
Residential Practices	<p>1. Conduct public education and outreach programs for landowners/homeowners in the source water protection area to report issues and to encourage practices that will protect their drinking water source from potential contamination. This could include the installation of signs at strategic locations throughout the source water protection area, water bill inserts, public presentations, etc.</p>	<p>1. TMWSD</p>
Electrical Distribution System and Mettler	<p>1. Meet with Mountain Parks Electric to raise awareness about source water protection</p>	<p>1. TMWSD</p>

Substation (oil filled transformers)	and to distribute Emergency Notification Cards.	
Agriculture	<ol style="list-style-type: none"> 1. Identify and develop relationships with agricultural landowners within the source water protection area and encourage them to practice stewardship of their lands, using only the recommended amounts of pesticides and fertilizers. 2. Work with the local NRCS Field Office, local conservation districts, and the local Colorado State University Extension office on public education campaigns on subjects such as grazing management, manure management, irrigation practices, chemical application, animal rendering, and chemical use and. Request their services in conducting site visits to landowners (upon request by the landowner) within the SWPA to evaluate practices and provide recommendations. Provide these agencies with a copy of the plan and GIS shapefiles of the SWPA. 	<ol style="list-style-type: none"> 1. TMWSD 2. TMWSD, NRCS, CSUE
Sewerage Systems	<ol style="list-style-type: none"> 1. Work with the local Sewerage Systems to ensure that lines of communication are open and that contact info is updated regularly. 2. Share maps and shapefiles of the source water protection area with all local sewerage systems. 	<ol style="list-style-type: none"> 1. TMWSD 2. TMWSD
Wildfire	<ol style="list-style-type: none"> 1. Share maps, GIS shapefiles, and Emergency Notification Cards with the USFS and the East Grand Fire Protection District and coordinate with them on fuels reduction opportunities and integration with the Community Wildfire Protection Plan. 2. Share TMWSD system information with the East Grand Fire Protection District and USFS to inform fire suppression efforts. 	<ol style="list-style-type: none"> 1. TMWSD, EGFPD, USFS 2. TMWSD, EGFPD, USFS
Annual Review	<ol style="list-style-type: none"> 1. Complete annual review of the Source Water Protection Plan (or sooner if needed) and an update of emergency contacts, water system maps and contacts on file with the Emergency Dispatch, and emergency response plans. 	<ol style="list-style-type: none"> 1. TMWSD

EVALUATING EFFECTIVENESS OF SOURCE WATER PROTECTION PLAN

The Tabernash Meadows Water and Sanitation District is committed to evaluating the effectiveness of the various source water best management practices that have been implemented. The purpose of evaluating the effectiveness is to determine if the various source water best management practices are being achieved, and if not, what adjustments to the Source Water Protection Plan will be taken in order to achieve the intended outcomes. It is further recommended that this Plan be reviewed at a frequency of once every 3-10 years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified.

The Tabernash Meadows Water and Sanitation District is committed to a mutually beneficial partnership with the Colorado Department of Public Health and Environment in making future refinements to their source water assessment and to revise the Source Water Protection Plan accordingly based on any major refinements.

REFERENCES

Ground Water Protection Council. (2008). *Ground Water Report to the Nation: A Call to Action*. Oklahoma City, Oklahoma: Ground Water Protection Council.

Hempel, P., (January 2013). *Source Water Protection Plan for Academy Water and Sanitation District for the Colorado River Partnership Source Water Protection Plan*. Paul Hempel, CRWA. Pueblo, Colorado.

Shroba, R.R., Bryant, Bruce, Kellogg, K.S., Theobald, P.K., and Brandt, T.R., 2010, Geologic map of the Fraser 7.5-minute quadrangle, Grand County, Colorado: U.S. Geological Survey Scientific Investigations Map 3130, scale 1:24,000, 1 sheet, 26 p. pamphlet. [Available at URL <http://pubs.usgs.gov/sim/3130>].

APPENDICES⁴

- A. Emergency Response Plan
- B. CRWA's SWAP Risk Assessment Matrix
- C. MOU Between CDPHE and U.S. Forest Service Rocky Mountain Region

⁴ Notice: This public document does not include appendices that may be sensitive to the safety and operation of the individual public water system. Appendices marked with an "*" are only included in the public water system's report or kept on file at their office. All other documents are included on the CD located in the back pocket of this report. All documents can be reprinted.

APPENDIX A.

Emergency Response Plan Pole Creek Valley Water System

Chemical Spills

- Evacuate the vicinity until the chemical can be identified.
- If someone is unconscious or appears to be affected by the chemical, call 911 and/or Contact the Poison Control Center at 1-800-222-1222.
- Identify the type and quantity of chemical spilled.
- Contact the operator in responsible charge (ORC) of the water district and follow any direct orders.
- If the chemical is suspected of being able to discharge into any state waters (surface or groundwater), the spill should be reported immediately to the Environmental Release and Incident Reporting Line at 1-877-518-5608. Additional numbers regarding spills are listed in the contacts sheet.
- Refer to the Materials Safety and Data Sheet (MSDS) for information and procedures for clean-up and safety.

Flooding

- Identify whether the flood is a moving flood or standing water flood and seek immediate shelter uphill if the flood is moving.
- Identify the source of the flood and whether the flood is likely to get worse and how quickly.
- Identify areas in the district that may be threatened by the flood. Contact the ORC and follow any direct orders.
- Contact the Grand County Sheriff's Office at (970)725-3343 if the flood appears to be increasing and may threaten the public.
- Identify any water system structures that may be threatened by the flood. Currently, the most likely structure that would be threatened would be Well #1. If the threatened structures can be safely accessed, the structures should be shut-off and any valuable portables should be transported to a safe location.
- If a well is located in a flooded area, the well should be immediately shut-off in order to minimize any contaminated water from entering into the water system.

Distribution System Failure

Main Line Break

- Identify the exact location of the reported leak.
- Identify whether the source is actually from the distribution system or is natural seepage from the ground. Commonly, in the spring, large runoffs can result in what appears to be a pipe break. To test whether the leak is from the distribution system, test the water for any residual chlorine.
- Contact the ORC and follow any direct orders.
- Referencing the water distribution system maps and main line valve book, identify the main lines and their respective valves that would isolate the main line break.
- Using a valve key, close all the surrounding water valves so the break is isolated from the rest of the distribution system.
- Contact the on call excavator for the district.
- Provide support for the excavation team and help identify locations of distribution and collection system piping.
- Contact and explain to any nearby residents of the situation.
- May have to distribute a bottled water order to the consumers if pressure was lost in the system.

House Flood

- Respond to the location of the report.
- Identify the source of the leak; whether it is before or after the water meter and whether it is a house pipe or a pipe in the distribution system.
- Contact the ORC and follow any direct orders. Turn off the curbstop with the curbstop key.
- Place a lock on the curbstop so that it remains off until repairs have been made and any required re-inspections have been completed.

Air Lock in Pipe System

- Identify the location of the air lock in the distribution system. This may be a trial and error by opening fire hydrants along the system.
- Contact the ORC and follow any direct orders.
- Open hydrants and any residential dwelling fixtures with the permission of the resident so that the air can escape.

Incidental Contamination

- Upon reporting of incidental contamination of the system, locate the exact location of the contamination.
- Contact the ORC and follow any direct orders.
- Contact the state regulatory authority at the Environmental Release and Incident Reporting Line at 1-877-518-5608.
- Referencing the distribution system map and the main line valve book, locate valves that would isolate the contamination.
- Close the valves so that the contamination is likely isolated.
- Inform the water system consumers to the contamination and request that water not be used until further notice.

Treatment Process Failure

- Identify the general source of the failure. Contact the ORC and follow any direct orders.
- Calculate the available storage and the current daily use of water. Calculate the time till more water will be needed for the distribution system.
- Identify the specific source of the failure and whether the solution can be solved onsite with available tools.
- If the solution requires more specialized tools or outside help, contact the CDPHE District Engineer at (970) 879-7479.
- If a solution may not be found or completed in time, inform the water consumers to conserve water until further notice.

Water Source Failure

- Contact the ORC and follow any direct orders.
- Identify the water source failure, whether it affects one well or both wells. Calculate the current storage and water usage of the system. Calculate the time until more water will be needed.
- If possible, operate the other well until the well affected is operational. Identify whether the source of failure is mechanical or is a result of the actual aquifer.
- Contact the CDPHE District Engineer at (970) 879-7479.

Vandalism/Sabotage

- Identify whether you or any others are in any immediate danger. Contact the Grand County Sheriff's Office at (970)725-3343. Contact the ORC and follow any direct orders.
- Identify the extent of damage and whether any damage could result in compromising the safety of the public.
- Try to isolate the damage by shutting-down any systems that may be affected by the event or could damage/affect other systems.
- Identify key components of the water system that may have been damaged. Contact the CDPHE District Engineer at (970) 879-7479.
- Identify whether the water system is operational and adequately safe to provide water.
- If not, inform and guide the water system users as to what they should do.

Earthquake

- Identify whether you or any others are in any immediate danger. Contact the ORC and follow any direct orders.
- Identify the main line valve at the storage tank.
- Shut-off the valve so that no more water flows to the distribution system. Contact the Grand County Sheriff's Office at (970)725-3343.
- Provide any support needed for emergency personnel.
- Identify any obvious water main breaks in the distribution system.
- Inform the water system consumers that the water has been shut-off until the condition of the distribution system has been identified.

Blizzard

- Consult the National weather forecast for predicted conditions. Their website is www.nws.noaa.gov.
- Contact the ORC and follow any direct orders.
- Contact the plow company for the district and notify them about the situation. Check the water treatment plant and any other structures and prepare in case the facilities become inaccessible for at least a day.

Forest Fire

- Immediately evacuate the area if the fire appears to be an immediate threat to your position.
- Call 911 if the fire appears to be an immediate threat to the system structures or the public.
- Otherwise call the fire department to obtain information regarding the fire.
- Contact the ORC and follow any direct orders
- Turn on the treatment plant and fill the water storage tank to its' maximum capacity.
- Remain "on call" and provide support to emergency personnel at their request.

Power Failure

- Visually identify which structures are without power.
- Check the breaker boxes and identify whether the power outage is from onsite or is a result of a lack of supply.
- Contact the ORC and follow any direct orders.
- Contact Mountain Parks Electric at (970)887-3378 and report the outage as well as inquire about a time frame until power is restored.
- Check the outside temperature and place propane/kerosene heaters in structures to prevent pipes from freezing.
- Once power is restored, check all system components to see that they are in their proper settings and are operating.