Town of Castle Rock
Source Water Protection Plan – Public Version

Douglas County, Colorado
November 2017

Revised March 2022

Submitted by: Mallory Hiss
Colorado Rural Water Association
For the Community Water Provider:
Town of Castle Rock, PWSID# CO0118001

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Cover photo: Sellars Gulch as it flows under the Wilcox Street Bridge, photo by Nick Lucey.

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 Town of Castle Rock was developed using version 16.09.09 of the Colorado Rural Water Association's Source Water Protection Plan Template.

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COMMON ACRONYMS

AST	Aboveground Storage Tank
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railroad
CAP	Corrective Action Plan
CDLE	Colorado Division of Labor and Employment
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CRWA	Colorado Rural Water Association
CWA	Chatfield Watershed Authority
CWPP	Community Wildfire Protection Plan
DESC	Drainage Erosion and Sediment Control
FEMA	Federal Emergency Management Agency
FOG	Fats, Oils, and Greases
GESC	Grading, Erosion and Sediment Control
GIS	Geographic Information System
HAZMAT	Hazardous Material
HCR	Household Chemical Roundup
HHW	Household Hazardous Waste
LUST	Leaking Underground Storage Tank
MGD	Million Gallons per Day
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
OSHA	Occupational Safety and Health Administration
OWTS	Onsite Wastewater Treatment System
PCWRA	Plum Creek Water Reclamation Authority
POGS	Petroleum, Oil, Grease & Sand
PSOC	Potential Source of Contamination
RCRA	Resource Conservation and Recovery Act
SWAA	Source Water Assessment Area
SWAP	Source Water Assessment and Protection
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
TOT	Time of Travel
TCHD	Tri-County Health Department
UPRR	Union Pacific Railroad
USFS	United States Forest Service
UST	Underground Storage Tank
WUI	Wildland Urban Interface
WWTF	Wastewater Treatment Facility

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EXECUTIVE SUMMARY

Whether it be trash from a tipped dumpster, dropped fast-food wrappers or automotive fluids spilled from a crash, the potential for pollution to wash into the storm drains, making its way to our streams and creeks, creates the necessity to prevent potential contamination to our land and our water. While we might be part of the problem, each of us can also have a hand in the solution for cleaner, healthier water, and 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 and consistent updates of a source water protection plan provides an additional layer of protection at the local level beyond drinking water regulations.

The Town of Castle Rock 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 February through July 2017, at the Castle Rock Operations & Maintenance Building in Castle Rock, Colorado. Colorado Rural Water Association was instrumental in this effort by providing technical assistance in the development of this Source Water Protection Plan. This plan has been revised to incorporate the portion of East Plum Creek from the Meadows Parkway Bridge downstream to the confluence with West Plum Creek, as well as West Plum Creek in its entirety.

The majority of Castle Rock's water sources (approximately 69 percent) are from nonrenewable Denver Basin groundwater wells, while a smaller portion (approximately 31 percent) comes from renewable supplies along Plum Creek, which includes fourteen alluvial wells, one surface water diversion off the East Plum Creek and one surface diversion off the main stem of Plum Creek just north of Sedalia. The Source Water Protection Areas for the alluvial wells encompass the East Plum Creek Watershed. The Source Water Protection Areas for the deep wells are defined by calculating the distance from the wellhead through which a parcel of water travels over a five-year time period or 5-year time of travel (TOT). These Source Water Protection Areas are the areas that the Town 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 Areas.

The Steering Committee developed several 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.

In 2022, the potential contaminant sources, issues of concern and best practices were re-evaluated and adjusted. This plan incorporates those updates. The following list highlights the highest priority potential contaminant sources and/or issues of concern and their associated best management practices.

- **Public Outreach:**
  - Hold public meetings or appropriate outreach to educate citizens to the SWPP
  - Maintain Source Water Protection information on Town's website
  - Maintain CDPHE SWPA road signs at various locations within the SWPA.

- **Industrial Facilities, Fertilizer Runoff, Livestock Grazing/Agricultural Practices, Onsite Wastewater Treatment Facilities, Waste/Trash Management, Hospital/Medical Waste, Materials Storage Yards, LUST Sites, Household Hazardous Waste Improper Storage & Disposal:**
  - Develop public education campaigns for appropriate stakeholders within the Town's SWPAs to explain the importance of source water protection as they pertain to the above listed issues of concern.

- **Wastewater Treatment Facilities, Hazmat incidents/Spills, Train Derailment, Wildfire:**
  - Share electronic and hard copies of the SWPP and GIS shapefiles of the SWPA with appropriate stakeholders.

- **Hazmat incidents/Spills, Train Derailment, Wildfire:**
  - Share Emergency Notification Cards with appropriate stakeholders.

- **Wastewater Treatment Facilities:**
  - Expand outreach campaign to homeowners within the Town's SWPA that explains the importance of source water protection/outlines what not to dump down drains (partner w/ PCWRA).
  - Support PCRWA pretreatment program (regulates discharges).

- **Household Hazardous Waste Improper Storage & Disposal, Waste/Trash Management, Illegal Dumping:**
  - Continue working with the county health department to promote their Household Chemical Roundup Program.
  - Install signage around known or common illegal dump sites that includes information on where to properly dispose of materials.

- **Construction/Development:**
  - Continue to implement the MS4 program/Stormwater Master Plan.

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 its completion.

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 five years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified. With the acquisition of an existing diversion facility along Plum Creek north of Sedalia, the Town expanded its source water protection area from approximately 135 square miles to a total of 277 square miles. Therefore, this plan was revised in 2022 to reflect that.

1. 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. According to the Ocean Conservancy, street litter – along with fertilizers, pesticides, sediment, pet waste, and automotive fluids – "can pollute water hundreds of miles downstream from their source." (Martin, 2017)

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 and dispersed sources. A discrete source contaminant originates from a single point (point source), while a dispersed source contaminant originates from diffuse sources over a broader area (nonpoint source). According to the US Environmental Protection Agency, nonpoint source pollution is the leading cause of water quality degradation (Ground Water Protection Council, 2007).

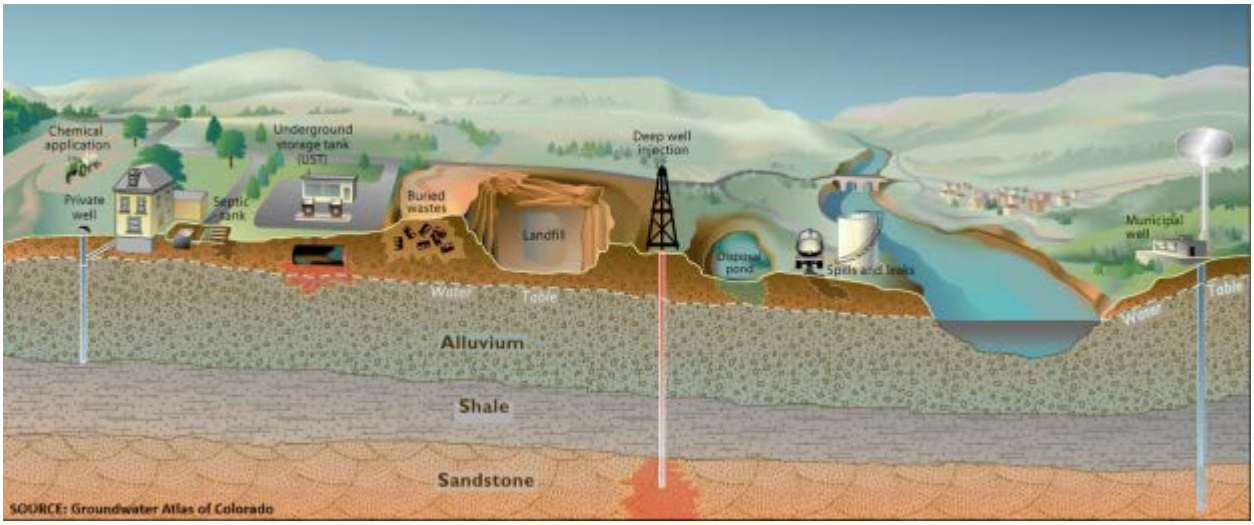

Figure 1: Schematic drawing of the potential source of contamination to surface and groundwater

The Town recognizes the potential for contamination of their drinking water sources, 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 Town's commitment to reducing risks to their drinking water supply.

This map has been removed from the public version of this document for security reasons. Please contact the water provider if you would like to see the full version of this Source Water Protection Plan.

Figure 2: Location of Town of Castle Rock's Water Sources in Douglas County, Colorado

1.1. Purpose of the Source Water Protection Plan

The Source Water Protection Plan (SWPP) is a tool for the Town 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.

1.2. Background of Colorado's SWAP Program

Source water assessment and protection (SWAP) 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 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.

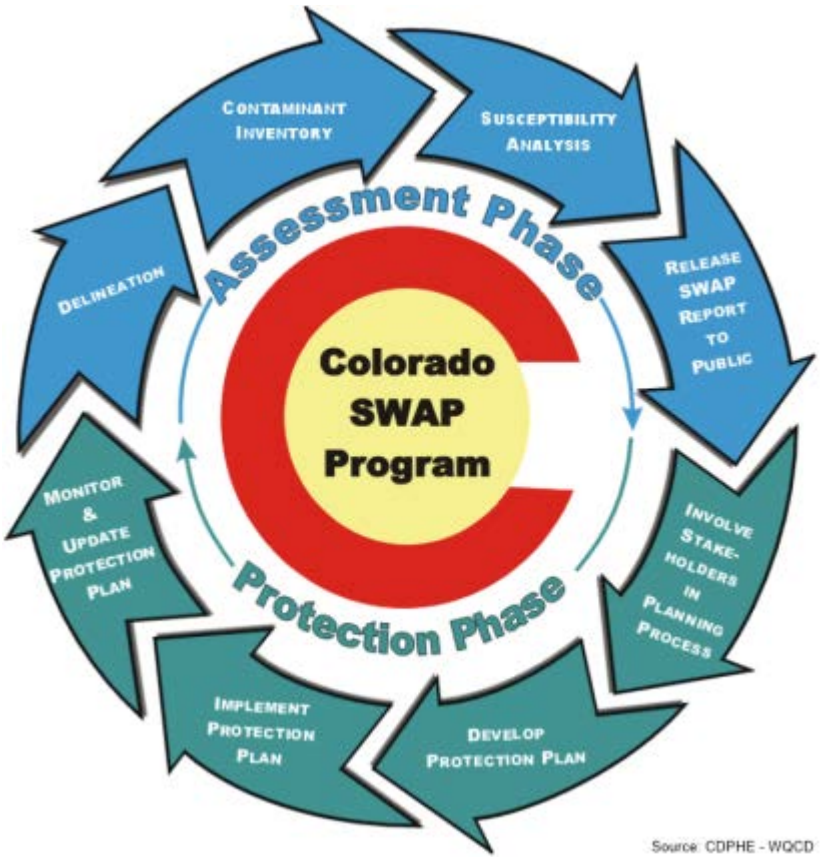

Figure 3: Source Water Assessment and Protection Phases

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 (Appendix A: Source Water Assessment Report and Appendix B: Source Water Assessment Report Appendices) was provided to each public water system in Colorado in 2004 that outlines the results of this Assessment Phase.

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.

2. SOURCE WATER SETTING

The Town of Castle Rock is a home rule municipality and is the county seat of Douglas County, Colorado. Castle Rock is located approximately 31 miles south of Denver, Colorado. Primary access to the Town is via Interstate-25. The Town has a population of approximately 80,000 residents and is expected to grow to over 100,000 by 2050.

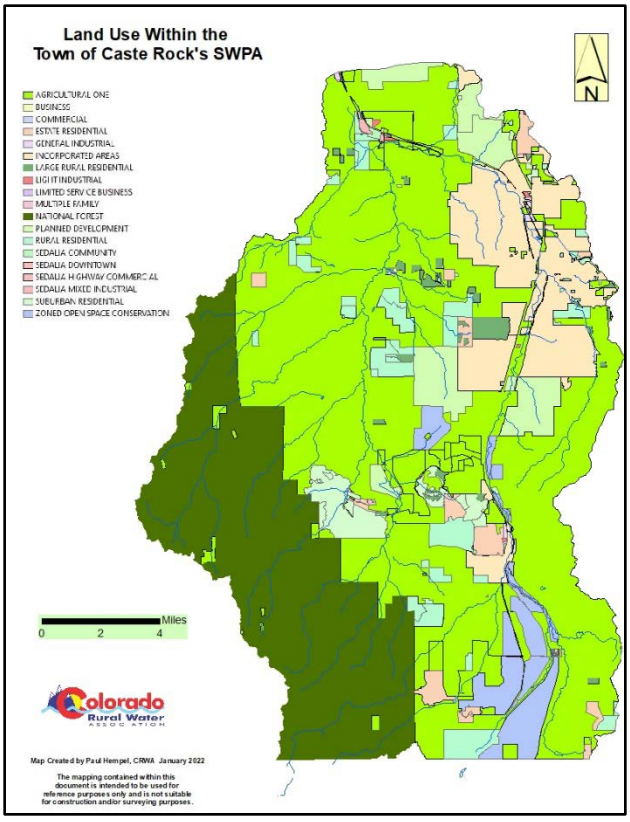

Figure 4: Land Use Within Town of Castle Rocks Source Water Protection Areas Source: CRWA

Castle Rock Water oversees the Town's water, wastewater and stormwater systems. The Town obtains its drinking water from a variety of sources. The majority of Castle Rock's water sources (approximately 69 percent) are from nonrenewable Denver Basin groundwater wells, while the remaining portion (approximately 31 percent) comes from renewable supplies along Plum Creek, which includes fourteen alluvial wells and two surface water diversions. The Town is striving for 75 percent renewable water supply by the year 2050 and has developed a long-term renewable water plan (Appendix C: Town of Castle Rock Water Resources Strategic Master Plan) to meet these goals (Town of Castle Rock, 2022). A part of the water plan includes developing an additional surface water intake on Plum Creek, with the hope to capture all of its native water rights as well as capitalize on reuse water. Since the original publication of this SWPP, this additional surface water intake has been acquired and the capturing of native and reuse water has been realized.

The Town's source waters lie within both public and private lands in the Plum Creek watershed. The private land is within Town boundaries as well as unincorporated areas of Douglas County, and the public lands include Pike and San Isabel National Forest Lands, managed by the Pikes Peak Ranger District, and Open Space Conservation areas managed by the Town or Douglas County. Land use on private land consists primarily of agricultural, rural, and urban residential development.

2.1. Denver Basin Aquifer System

Wells drilled into the Denver Basin are referred to as Castle Rock's deep wells. The wells range from 450-2,376 feet deep. As illustrated in Figures 5 and 6, the Denver Basin is comprised of layered geologic formations. Within this, four aquifers are statutory defined: Dawson, Denver, Arapahoe, and Laramie-Fox Hills. The Front Range constitutes the recharge area for the Denver Basin. Groundwater flow is predominantly from south to north.

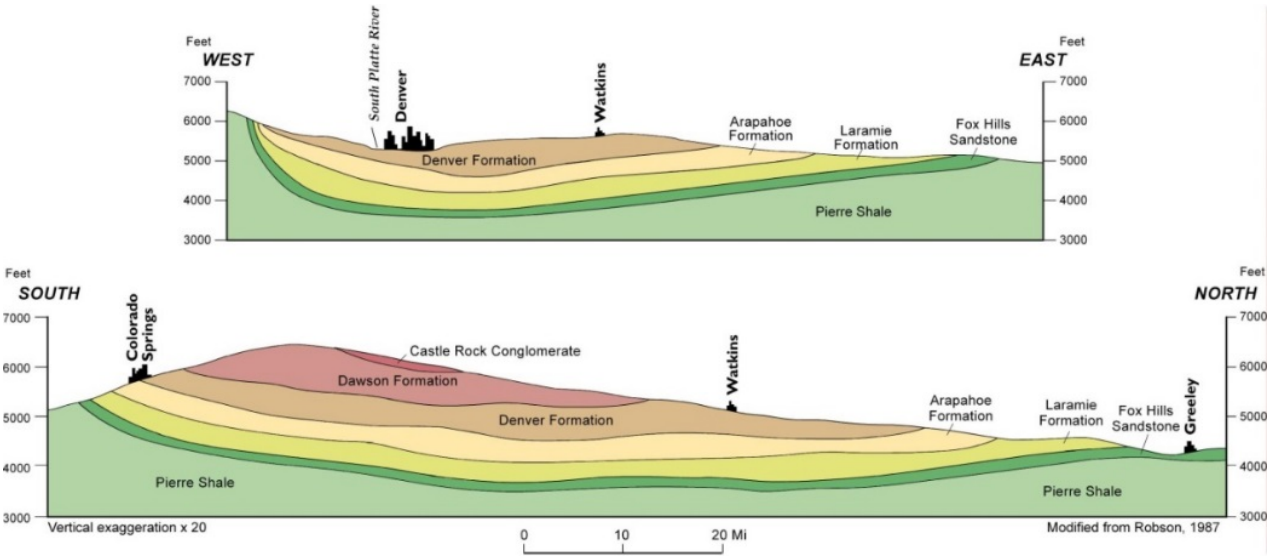

Figure 5: General geologic cross section through the Denver Basin

The Denver Formation consists of an 800-foot to 1000-foot thick sequence of shale, silty claystone, and interbedded sandstone along with beds of lignite and carbonaceous siltstone and shale common. It contains the Denver aquifer, which is generally a confined aquifer and the least permeable of the Denver Basin aquifers. The Arapahoe Formation consists of a 400-foot to 700-foot-thick sequence of interbedded conglomerate, sandstone, siltstone, and shale. It contains the Arapahoe aquifer, which extends over an area of about 4,300 square miles or about two-thirds the area of the Denver Basin aquifer system. It is a generally confined aquifer and the most permeable of the Denver Basin aquifers. The Laramie-Fox Hills aquifer is comprised of the Laramie Formation, which is comprised of impermeable shale along with fine sandstone and bituminous coal seams, and the Fox Hills Formation, which is comprised of sandstone and siltstone interbedded with shale. The Laramie-Fox Hills aquifer is generally confined and moderately permeable (USGS, 1995).

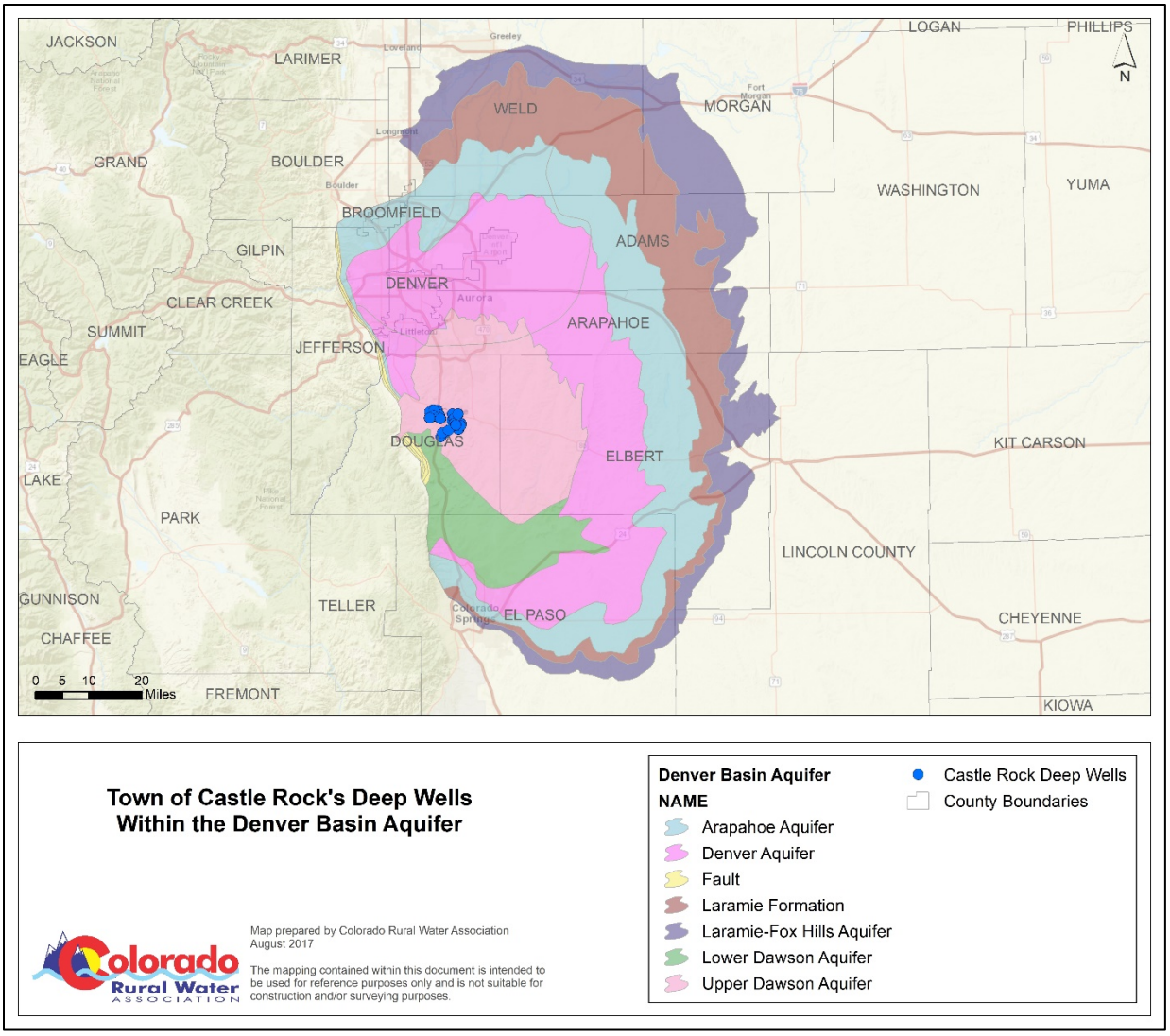

Figure 6: General location of the Town of Castle Rock's wells as they relate to the Denver Basin Aquifer System

2.2. Plum Creek Alluvial Aquifer

Castle Rock's 14 alluvial wells are drilled into the Plum Creek alluvial aquifer, which lies on either side of Plum Creek. Depth of the aquifer is approximately 50 feet or less, and consist primarily of silt, sand, and gravel, with significant clay zones that reduce the overall water production capabilities of the alluvial system. The saturated thickness of the Plum Creek alluvium ranges from 5 to 40 feet. The hydraulic conductivity of the alluvial material ranges from 6.3 to 52 feet/day, with an average of 24 feet/day. Available data indicate poor hydraulic connection between the alluvium and the underlying bedrock of the Denver Basin, and the hydraulic connection between the Plum Creek stream channel and the underlying alluvial aquifer is not strong (U.S. Army Corps of Engineers - Omaha District , 2017).

2.3. East Plum Creek and Plum Creek Diversions

The Town has two surface water diversions, one on East Plum Creek and one on Plum Creek shortly downstream of where East Plum Creek and West Plum Creek converge. Headwaters of Plum Creek originate in the Rampart Range approximately 21 miles south of Castle Rock, and the East branch joins with the West branch near Sedalia, Colorado to form the main stem of Plum Creek. Plum Creek and its branches generally flow from south to north into Chatfield Lake Reservoir which ultimately make their way to the South Platte River (Hydrologic Unit Code (HUC) 10190002). The South Platte River Basin is part of Colorado Water Division One with the office of the Division Engineer in Greeley.

The Chatfield Watershed Authority (CWA), in partnership with the Town, completed the Chatfield Watershed Plan in 2015 to address beneficial uses of water within the Chatfield Watershed, and measures to protect water quality and maintain those beneficial uses for the future (Appendix D: Chatfield Watershed Plan). In addition, the CWA maintains a monitoring program within the Plum Creek Watershed to characterize water quality and identify potential nonpoint sources in East Plum Creek, West Plum Creek, and Plum Creek. Monthly surface water samples are taken at 10 sampling sites located throughout the watershed (Figure 7 below, Chatfield Watershed Authority and Town of Castle Rock May 2015)).

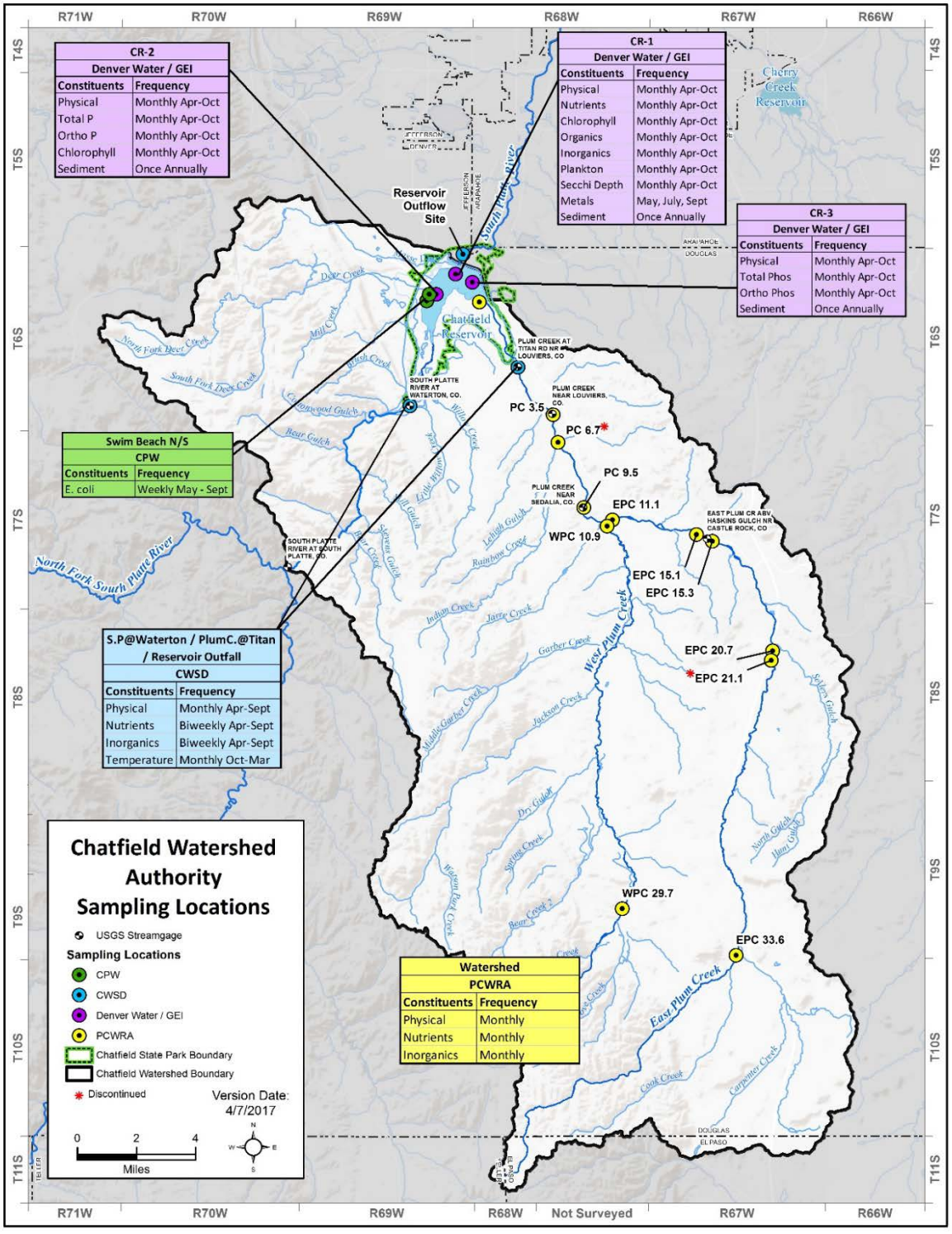

Figure 7: Chatfield Watershed Authority Sampling Locations (Chatfield Watershed Authority, 2017)

3. DRINKING WATER SUPPLY OPERATIONS

3.1. Water Supply and Infrastructure

The Town operates a community water supply system that supplies drinking water to approximately 80,000 residents located within Douglas County, Colorado. The Town obtains their drinking water from multiple sources including sixty-one Denver Basin wells, fourteen alluvial wells and two surface water intakes: one located on East Plum Creek and one located on the main stem of Plum Creek just north of Sedalia. Deep groundwater is treated to remove iron and manganese at one of four groundwater filtration plants while alluvial well water and surface water is treated at the Plum Creek Water Purification Facility located near the center of town using a robust treatment system that includes pre-ozonation, aeration, flocculation, sedimentation, biologically active carbon filtration, membrane filtration, advanced oxidation, and disinfection using ultraviolet (UV) light and chlorination/chloramination. Water is distributed through a network of transmission and distribution piping, and stored in fourteen water tanks located throughout town.

Figure 8: Deer drinking water at Town of Castle Rock's East Plum Creek diversion site

Figure 9: Town of Castle Rock's Plum Creek Diversion

3.2. Water Supply Demand Analysis

The Town serves an estimated 25,000 connections and approximately 80,000 residents and other users in the service area annually. The water system has the current capacity to produce approximately twenty-two (22) million gallons per day. Current data indicate that the average daily demand is approximately 8.8 million gallons per day, and that the average peak daily demand in summer is approximately 14.62 million gallons per day. Using these estimates, the water system has a surplus average daily demand capacity of 7.4 million gallons per day and a surplus average peak daily demand capacity of 3.75 million gallons per day.

Based on the estimates above, if 60% of the Town's water sources become disabled for an extended period of time due to contamination (or other reasons), the Town may not be able to meet the average daily demand of its customers. And in the event that 34% of its water sources become disabled for an extended period of time, the Town may not be able to meet the average peak daily demand of its customers during summer months.

The ability of the Town to meet either of these demands for an extended period of time is also affected by the amount of treated water the water system has in storage at the time a water source(s) becomes disabled.

The Town recognizes that potential contamination of its groundwater sources could result in having to treat the groundwater and/or abandon the water source if treatment proves to be ineffective or too costly. To understand the potential financial costs associated with such an accident, the Town estimates that it could cost approximately $2 million in today's dollars to replace one of its deep wells. To replace an alluvial well, that would cost approximately $500,000 to $700,000. 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 Castle Rock Water. As a result, Castle Rock Water

believes the development and implementation of a source water protection plan for the Town can help to reduce the risks posed by potential contamination of its water source(s). Additionally, the Town has developed an emergency response plan to coordinate rapid and effective response to any emergency incident that threatens or disrupts the community water supply.

4. SOURCE WATER PROTECTION PLAN DEVELOPMENT

The Colorado Rural Water Association's (CRWA) Source Water Protection Specialists, Kimberly Mihelich, helped facilitate the 2017 source water protection planning process and Paul Hempel assisted in this 2022 SWPP update. The goal of 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 2017 source water protection planning effort consisted of a series of public planning meetings and individual meetings. Information discussed at the meetings helped the Town 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. In 2022, three planning workshops were held to complete this SWPP update. A summary of those meetings is represented below in Table 1.

Table 1: 2022 SWP Update Meetings

Date	Purpose of Meeting
January 12, 2022	First Planning Meeting – Revisit 2017 SWPP, review first draft of 2022 update
February 17, 2022	Second Planning Meeting – Conduct updated risk assessment, review second draft of 2022 update
March 24, 2022	Third Planning Meeting – Conducted field visit in Sedalia to verify tributaries to the Plum Creek Diversion.

4.1. 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 Town's 2017 source water protection planning process attracted interest and participation from 46 stakeholders including local citizens and landowners, private businesses, water operators, local, state, and federal governments, and agency representatives. During the months of February through July 2017, five planning workshops were held at the Castle Rock Operations & Maintenance Building in Castle Rock, Colorado to encourage local stakeholder participation in the planning process. Stakeholders were notified of meetings by letters, emails, and phone calls.

A Steering Committee to help develop the 2017 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 Town 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. Stakeholder entities involved in the development of the 2017 SWPP included Town of Castle Rock, Black Hills Energy, Castle Rock Downtown Alliance, Colorado Department of Public Health and Environment (CDPHE), Colorado Oil and Gas Conservation Commission (COGCC), Colorado State University Extension, Douglas County, Douglas County Conservation District, Douglas County School District, Sedalia WSD, Plum Creek Water Reclamation Authority, Natural Resources Conservation Service, Town of Larkspur, Tri-County Health Department and United States Forest Service. Table 2 highlights 2022 stakeholders involved in the update of this plan.

Table 2: 2022 Stakeholders and Steering Committee Members

Stakeholder	Title	Affiliation	Planning Team Member
Tim Friday	Assistant Director	Town of Castle Rock	X
Sandi Aguilar	Customer Service Program Manager	Town of Castle Rock	X
Matt Benak	Water Resources Manager	Town of Castle Rock	X

4.2. Development and Implementation Grant

The Town was 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 Town was approved for this grant in January 2017, and it expired on January 11, 2019. The Town did not utilize the grant funds as it has adequate funding to implement the SWPP.

4.3. Source Water Assessment Report Review

The Town has reviewed the Source Water Assessment Report along with the Steering Committee. These Assessment results were used as a starting point to guide the development of appropriate management approaches to protect the source waters of the Town from potential contamination. A copy of the Source Water Assessment Report for the Town can be obtained by contacting the Town or by downloading a copy from the CDPHE's SWAP program website located at: https://www.colorado.gov/cdphe/source-water-assessment-and-protection-swap.

4.4. Defining the Source Water Protection Area

A source water protection area (SWPA) 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 areas that were delineated as part of the Town'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 their Source Water Assessment Report and the CDPHE's delineation of the Source Water Assessment Areas for each of the Town's sources, the Steering Committee chose to accept them as their Source Water Protection Areas for this Source Water Protection Plan.

The SWPAs are divided into three zones, which helped guide the potential contaminant source inventory and risk assessment determination during development of this Plan. The theory behind this is that the closer the potential contaminant is to a drinking water intake, the quicker it can reach the intake, thus causing impairments and disruptions to the water system. The zones will also help to guide the implementation of best management practices upon completion of this Plan. The Town's Source Water Protection Areas are defined as:

Surface Water SWPA (East Plum Creek, West Plum Creek and the Main Stem of Plum Creek up to Rio Grande Avenue in Sedalia):

1. **Zone 1** is defined as a 1,000-foot-wide band on either side of Plum Creek and its tributaries upstream of the surface water diversion.
2. **Zone 2** extends 1/4 mile beyond each side of the boundary of Zone 1 (2,320 feet from the stream) upstream of the surface water diversion.
3. **Zone 3** is made up by the remainder of the Plum Creek Watershed boundary upstream of the surface water diversions.

Alluvial Wells SWPA[1]:

1. **Zone 1A** is defined as a 500-foot radius around each alluvial well intake.
2. **Zone 1B** is defined as a 1,000-foot-wide band on either side of Plum Creek and its tributaries upstream of the furthest downstream alluvial wellhead.
3. **Zone 2** extends 1/4 mile beyond each side of the boundary of Zone 1 (2,320 feet from the stream) upstream of the furthest downstream alluvial wellhead.
4. **Zone 3** is made up by the remainder of the Plum Creek Watershed boundary upstream of the furthest downstream alluvial wellhead.

Deep Wells SWPA:

1. **Zone 1** is defined as a 500-foot radius around each Deep Well wellheads.
2. **Zone 2** is defined by calculating the distance from the wellheads through which a parcel of water travels over a two-year time period or 2-year time of travel (TOT).

[1] The Alluvial Wells SWPA Zones 1B, 2, and 3 are almost identical to the Surface Water SWPA Zones 1, 2, and 3 except that they extend an additional two miles south to include the wellheads downstream of the surface water diversion.

3. **Zone 3** is defined by calculating the distance from the wellhead through which a parcel of water travels over a five-year time period or 5-year time of travel (TOT).

The Source Water Protection Areas are illustrated in the following maps.

This map has been removed from the public version of this document for security reasons. Please contact the water provider if you would like to see the full version of this Source Water Protection Plan.

Figure 10: Town of Castle Rock's Source Water Protection Areas

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Figure 11: Town of Castle Rock Alluvial Wells Source Water Protection Areas

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Figure 12: Town of Castle Rock Deep Wells Source Water Protection Areas

4.5. 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 (CDPHE) 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).

The Town was asked, by CDPHE, to review the inventory information, field-verify selected information about existing and new contaminant sources and provide feedback on the accuracy of the inventory. Through this and the 2017 Source Water Protection Plan, the Town is reporting its updated findings to the CDPHE.

After much consideration, discussion, and input from local stakeholders, the Town and the Steering Committee developed a more accurate and current inventory of contaminant sources located within the Source Water Protection Area and other issues of concern that may impact the Town's drinking water sources.[2] In addition to the discrete and dispersed contaminant sources identified in the contaminant source inventory, the Steering Committee has also identified other issues of concern that may impact the Town's drinking water sources. Upon completion of this contaminant source inventory, the Town has decided to adopt it in place of the original contaminant source inventory provided by the CDPHE:

Town of Castle Rock's Inventory of Potential Contaminants Sources and Other Issues of Concern

- Wastewater Treatment Facilities
- Industrial Facilities
- HAZMAT Incidents/Spills/Illicit Discharge
- Chemical Storage
- Train Derailment
- Wildfire
- Fertilizer Runoff
- Livestock Grazing & Waste
- Onsite Wastewater Treatment Systems
- Construction/Development
- Transportation and Roads
- Household Hazardous Waste (Improper Storage & Disposal)
- Dog Parks/Pet Waste
- Waste/Trash Management
- Hospital/Medical Waste
- Dry Materials Storage Yards
- Active LUST Sites
- Illegal Dumping
- Known Contaminated Sites
- Flooding
- Public Outreach
- Degraded Riparian Areas

A more in-depth discussion on each PSOC/issue of concern can be found in Chapter 5 "DISCUSSION OF POTENTIAL CONTAMINANT SOURCES AND ISSUES OF CONCERN", pages 35-52.

[2] The information contained in this Plan is limited to that available from public records and the Town 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.

4.6. Risk Assessment & Level of Control 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 Town assessed the risk level and level of control of each item. The level of risk for each contaminant source is a measure of the water source's potential exposure to contamination. The Town utilized CRWA's *SWAP Risk Assessment Matrix* (Figure 12), which calculates the level of risk by estimating the following:

- **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

- **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. CDPHE developed information tables to assist with this evaluation (Appendices E-H). 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).
    - **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.

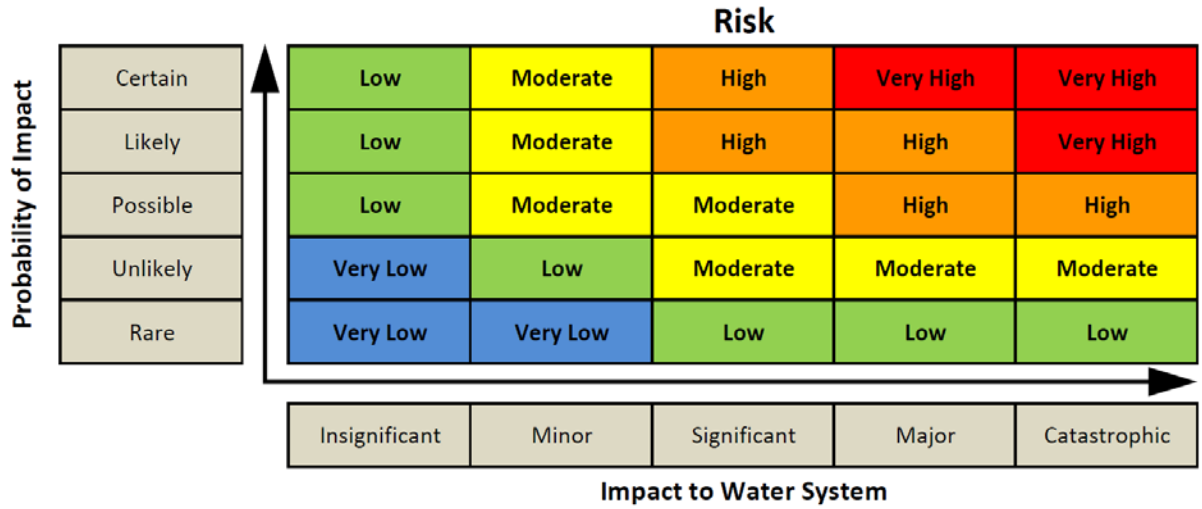

Figure 13: CRWA's SWAP Risk Assessment Matrix

The level of water system control describes the ability of the water system to take measures to prevent contamination or minimize impact. A potential contaminant source that falls within a water system's jurisdiction (i.e. direct control), may be of higher priority since they can take direct measures to prevent contamination or minimize the 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 Town and Steering Committee assessed the risk and level of control of the potential contaminant source inventory and issues of concern in the following manner:

Table 3: Risk of Assessment and Control Level of Potential Contaminant Sources & Issues of Concern

Potential Contaminant Source or Issue of Concern	Probability of Impact (Rare, Unlikely, Possible, Likely, Certain)	Impact to Water System (Insignificant, Minor, Significant, Major, Catastrophic)	Risk (Very Low, Low, Intermediate, High, Very High)	Control (Direct, Indirect, No)
Wastewater Treatment Facilities (Contaminants of Emerging Concern)	Possible	Unknown	Unknown at this time[3]	Direct
Wastewater Treatment Facilities (Regulated)	Rare	Significant	Low	Direct
Industrial Facilities	Rare	Significant	Low	Direct
HAZMAT Incidents/Spills	Rare	Minor	Very Low	No

[3] Contaminants of Emerging Concern are unregulated compounds that have yet to be evaluated.

Potential Contaminant Source or Issue of Concern	Probability of Impact (Rare, Unlikely, Possible, Likely, Certain)	Impact to Water System (Insignificant, Minor, Significant, Major, Catastrophic)	Risk (Very Low, Low, Intermediate, High, Very High)	Control (Direct, Indirect, No)
Chemical Storage	Rare	Significant	Low	Indirect
Train Derailment	Possible	Major	High	No
Wildfire	Unlikely	Minor	Low	Indirect
Fertilizer Runoff	Possible	Insignificant	Low	Indirect
Livestock Grazing & Waste	Unlikely	Minor	Low	Indirect
Degraded Riparian Areas	Rare	Insignificant	Very Low	Indirect
Onsite Wastewater Treatment Systems	Rare	Insignificant	Very Low	Indirect
Household Hazardous Waste	Unlikely	Minor	Low	Indirect
Construction/Development	Likely	Minor	Moderate	Direct
Dog Parks/Pet Waste	Possible	Minor	Low	Indirect
Waste/Trash Management	Unlikely	Minor	Low	Indirect
Hospital/Medical Waste	Rare	Insignificant	Very Low	Indirect
Materials Storage Yards	Rare	Minor	Very Low	Indirect
Active LUST Sites	Rare	Insignificant	Very Low	No
Illegal Dumping	Rare	Insignificant	Very Low	Indirect
Known Contaminated Sites	Rare	Insignificant	Very Low	No
Flooding	Rare	Minor	Very Low	Indirect
Public Outreach	n/a	n/a	n/a	Direct

4.7. Identifying Best Management Practices

Best Management Practices (BMPs) are the actions that can be taken within the Source Water Protection Area to help reduce the potential risks of contamination to the community's source waters. 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 Table 5: Source Water Protection Best Management Practices (pages 53-57) be considered for implementation.

4.8. Prioritization of Potential Contaminant Source Inventory and Best Management Practices

After identifying best management practices for each potential contaminant source and issue of concern, the Town prioritized each BMP to guide the implementation efforts upon completion of this Source Water Protection Plan. The prioritization ranking factored in the level of risk, the water system control, as well as the feasibility of implementing the BMPs that the Town developed. The Town assigned each BMP a priority ranking of “High”, “Moderate”, or “Low”. A complete list of Source Water Protection BMPs and the priority strategy can be found in Table 5: Source Water Protection Best Management Practices (pages 53-57).

5. 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.

5.1. Wastewater Treatment Facilities

The Plum Creek Water Reclamation Authority (PCWRA) is located north of the Town along Colorado State Highway 85 and is a regional wastewater treatment facility (WWTF) that provides wastewater treatment for five municipalities including the Town. PCWRA was established in 1990 and processes over five million gallons of wastewater per day for over 90,000 people. Impacts from the treatment facility are a concern as the Town began reusing effluent from PCWRA in 2021 as a water supply. Reuse water is an important component of the Town's overall water supply plan. All water that is treated at a wastewater treatment facility ultimately flows back into the environment, and thus the water quality that flows downstream from the plant must be good for aquatic life, recreation, and ultimately for human consumption (Plum Creek Water Reclamation Authority, 2017). PCWRA has been recognized as producing some of the highest quality effluent in Colorado.

Figure 14: Aerial View of the Plum Creek Water Reclamation Authority Facility (CRWA)

The CDPHE Water Quality Control Commission is authorized by section 25-8-205 C.R.S., under Regulation 85 (Nutrient Management Control Regulation), to promulgate control regulations to describe prohibitions, standards, concentrations, and effluent limitations on the extent of specifically identified pollutants that any person may discharge into any specific class of state waters (CDPHE Water Quality Control Commission, 2012). Reg. 85 contains nutrient effluent limits and nutrient monitoring requirements for WWTFs.

In the Chatfield Watershed, all operational WWTFs monitor their effluent discharges for compliance with their discharge permits and compliance with Regulation 73. Regulation 73 limits on phosphorus concentrations are incorporated as discharge permit limits. According to Section 73.2, no municipal, domestic, or industrial wastewater discharge in the Chatfield Watershed shall exceed 1.0 mg/L total phosphorus as a 30-day average concentration (Chatfield Watershed Authority & Town of Castle Rock, May 2015). The total annual wasteload of point source phosphorus in the Chatfield Watershed is limited to 7,533 pounds per year, and this wasteload allocation is sub-allocated amongst the WWTFs. The PCWRA has an allowed waste load point source phosphorous of 4,256 lbs./year (CDPHE Water Quality Control Commission, 2009).

5.2. Industrial Facilities

Within the Town's SWPA, there are industrial facilities such as chemical and metal manufacturing, mining and food processing that can contribute to nutrient and metal pollution in lakes, rivers, and streams, and can degrade water quality and threaten drinking water sources (see Figure 14 below). Wastewater discharges from industrial and commercial sources may contain pollutants at levels that could affect the quality of receiving waters or interfere with publicly owned treatment works that receive those discharges. The EPA's National Pollutant Discharge Elimination System (NPDES) permitting program establishes discharge limits and conditions for industrial and commercial sources with specific limitations based on the type of facility/activity generating the discharge. The EPA has identified 65 pollutants and classes of pollutants as "toxic pollutants", of which 126 specific substances have been designated "priority" toxic pollutants. All other pollutants are considered to be "nonconventional."

According to available data, there are approximately 106 facilities with NPDES permits within the Town's SWPA, and of those, 56 of those are active permits. These facilities discharge directly into Castle Rock's stormwater system or other waterbodies within the SWPA. The majority of the permits are coded as construction-type permits, and the remaining include permits for water supplies, businesses, restaurants, golf courses, and others. A detailed list of NPDES permits and other industry within the Town's SWPA is included in Appendix I, or for more information visit EPA's Envirofacts website at https://www3.epa.gov/enviro/.

Effluent Guidelines are national wastewater discharge standards that are developed by the EPA on an industry-by-industry basis. These are technology-based regulations and are intended to represent the greatest pollutant reductions that are economically achievable for an industry. The standards for direct dischargers are incorporated into NPDES permits issued by States and EPA regional offices, and permits or other control mechanisms for indirect dischargers (US Environmental Protection Agency, 2017). Furthermore, the Plum Creek Water Reclamation Authority implements their Industrial Pretreatment Program to help prevent pollutants from industrial dischargers from entering waterways (See WWTF Section, page 35).

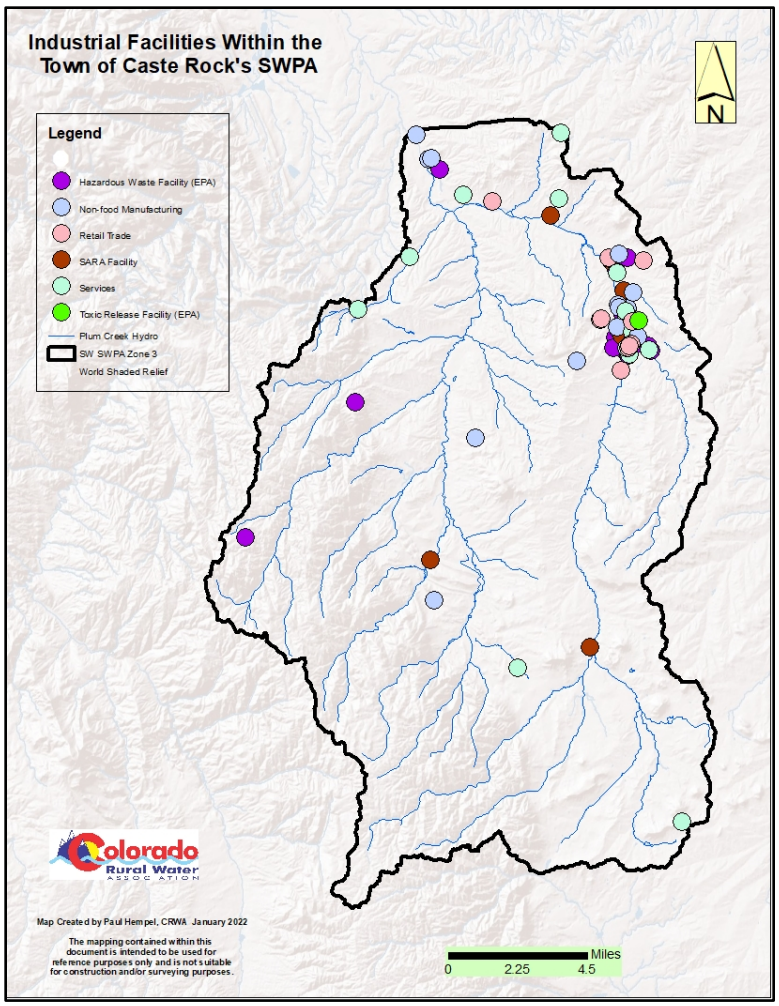

Figure 15: Industrial facilities within Castle Rock's SWPA

PCWRA Industrial Pretreatment Program

Although not an approved program, PCWRA implements their pretreatment program under the guidance of the EPA Clean Water Act's General Pretreatment Program Regulations, which were established in 1978. These regulations and amendments require states and local wastewater districts to enforce national pretreatment regulations, and are in place to protect wastewater treatment facilities, such as PCWRA, from indirect discharges that would cause treatment process interference or would pass through the wastewater plant and into receiving streams without sufficient treatment. Indirect discharge or sewerage is defined as wastewater drained to the sanitary sewer, treated by a wastewater treatment plant, then discharged to a river or open body of water, i.e. stream or lake (Plum Creek Water Reclamation Authority, 2017).

As part of the Industrial Pretreatment Program, PCWRA has a Fats, Oils & Grease (FOG) Program to provide education and increase awareness to the operators of local food service establishments and their employees and a Petroleum, Oil, Grease & Sand (POGS) Program to provide education and increase awareness to the operators of facilities such as auto shops, fleet services and carwashes. PCWRA has developed Policy Guidance Manuals for those businesses and industry in order to provide a greater understanding of the programs (Plum Creek Water Reclamation Authority, 2017).

5.3. Chemical Storage & Materials Storage Yards

There are many businesses in the Town's SWPAs including dry cleaners, beauty shops, vehicle repair shops, printers, laboratories, medical facilities, and many others who use chemicals and produce chemical waste to carry out their business functions. Improper storage and disposal of chemicals from these users can reach ground or surface water through a number of pathways. There are also several facilities within the SWPA that have dry material storage yards onsite. These storage facilities contain materials such as sand, rock, and gravel. If substances from these businesses are accidentally or intentionally discharged into sewers, contamination of ground and surface waters can occur (US Environmental Protection Agency, 2001).

The Resource Conservation and Recovery Act (RCRA), which was passed in 1976, was established to set up a framework for the proper management of hazardous waste. Hazardous waste is regulated under Subtitle C of RCRA. EPA has developed a comprehensive program to ensure that hazardous waste is managed safely from the moment it is generated to its final disposal (cradle-to-grave). Under Subtitle C, EPA may authorize states to implement key provisions of hazardous waste requirements in lieu of the federal government (US Environmental Protection Agency, 2017). In Colorado, the CDPHE is responsible for regulating and enforcing compliance with RCRA. Businesses that generate hazardous waste, as it is defined under RCRA, must comply with the Colorado Hazardous Waste Act for managing and disposing of hazardous wastes (CDPHE Hazardous Materials and Waste Management Division, 2008).

5.4. HAZMAT Incidents/Spills/Illicit Discharge

Hazardous materials, or HAZMAT, are substances in quantities or forms that may pose a reasonable risk to health, property, or the environment. This may include substances such as toxic chemicals, fuels, nuclear waste products, and biological, chemical, and radiological agents. HAZMATs may be released as liquids, solids, gases, or a combination or form of all three. HAZMAT spills can cause health problems, injuries, and even death in people and animals, and can damage buildings, homes, property, and the environment (National Oceanic and Atmospheric Administration, 2017).

In 1986, the Emergency Planning and Community Right-to-Know Act (EPCRA) was authorized by Title III of the Superfund Amendments and Reauthorization Act (SARA). Under the EPCRA, local governments are required to prepare chemical emergency response plans, and facilities handling or storing any hazardous chemicals must submit Material Safety Data Sheets (MSDSs) to state and local officials and local fire departments (US Environmental Protection Agency, 2016). The Castle Rock Fire and Rescue Department maintains an inventory of facilities meeting SARA Title III reporting requirements within their jurisdictions and is currently aware of 142 facilities that fall into this category. Of the 142 facilities, 28 are designated as "Special" or "Significant" Risks[4]. The Arapahoe Douglas HAZMAT Team maintains an online database that is used by Arapahoe and Douglas County businesses to report hazardous materials stored at their facilities. This database is also used by law enforcement and fire agencies to respond to incidents reported at these sites and is not available to the general public.

[4] High Risk: High Probability and High Impact/Consequence; Special Risk: Low Probability and Very High Impact/Consequence
Probability is defined as the likelihood an incident will occur, based on recent history
Impact/Consequence is defined as 1) The negative impact of an incident or event on the Fire Department's or Town's short or long-term ability to provide continuous service to the residents. 2) The negative impact of an incident or event on the cultural, historic or financial aspects of the Town

In addition to facilities that report HAZMAT onsite, there are three heli-ports/air strips, approximately 36 miles of state and interstate highway, and 18 miles of railroad that passes through the Town's SWPAs (Castle Rock Fire & Rescue Department, 2017). Motorists also travel along neighborhood roads where the wells are located and the new Plum Creek intake is less than 300 feet downstream of Rio Grande Avenue.

While unlikely, HAZMAT incidents from motor vehicle and helicopter accidents, train derailment, or reportable spills by facilities that store hazardous materials onsite are a concern to the Steering Committee. Fuels, waste, and other hazardous chemicals such as crankcase oil, transmission, hydraulic, and brake fluid, and antifreeze may be released from vehicle or helicopter accidents and into source waters. Chemicals from accidents or spills are often diluted with water, potentially washing the chemicals into the soil and infiltrating into the groundwater or draining directly to surface water sources.

Local response for HAZMAT incidents and spills is from the Castle Rock Fire and Rescue Department and the Douglas County Sheriff's Office of Emergency Management. Between 2012-2016, Castle Rock Fire and Rescue responded to 420 "Low Risk" HAZMAT incidents, 350 "Moderate Risk" HAZMAT incidents, and 19 "High Risk" HAZMAT incidents. Castle Rock Water has not seen any effects to their drinking water sources due to HAZMAT incidents.

Figure 16: Gasoline spill and HAZMAT response on March 24, 2017, at gas station in Castle Rock, CO

5.5. Train Derailment

There are two railroad corridors that run north and south through Castle Rock's Surface Water SWPA and parallel to Interstate 25. Currently, the main operators of the tracks are the Burlington Northern Santa Fe (BNSF) Railway and the Union Pacific Railroad (UP). In 2014, the most common commodities shipped and received by the BNSF Railway were consumer products (e.g. truck trailers or containers), industrial products (e.g. crude oil and asphalt), coal, and agricultural products (e.g. fertilizer) (BNSF Railway, 2014). In 2015, freight revenues for UPRR were from agricultural, industrial, and automotive products, intermodal, coal, and various chemicals such as crude oil, petroleum, and soda ash (Union Pacific Corporation, 2016).The Castle Rock Fire and Rescue Department is able to request information about the commodities shipped by rail, but it is historic information and the railroads do not publish what is being transported. All rail cars must comply with DOT placard and labeling requirements for hazardous materials and carry a manifest of rail car contents.

Rail corridors serving passenger or freight trains are potential sources of contamination due to chemicals released during normal use, track maintenance, and accidents. Accidents can release spills of train engine fluids and commercially transported chemicals that could potentially contaminate the surface water and, potentially, the groundwater. As with any other HAZMAT incident, local response from a train derailment is from the Castle Rock Fire and Rescue Department and potentially the Douglas County Sheriff's Office of Emergency Management.

5.6. Wildfire

The Town's Source Water Protection Areas includes forested lands and lands that contain pasture grass, crops, and areas of undisturbed natural grasslands. Wildfires including forest fires and small brush and grass fires are a concern for these areas. During 2007-2011, local fire departments across the country responded to an estimated average of 334,200 brush, grass, and forest fires per year. This translates to 915 such fires per day. Only 10% of those fires were coded as forest, woods, or wildland fires. The remainder were brush and grass fires (Ahrens, 2013). Castle Rock Fire Department responds to approximately 40 wildland type fires in their protection district annually.

The portion of the front range where Castle Rock is located has an active fire history. Fires larger than 1,000 acres occurring in this part of the state from 2000 to 2019 include, High Meadow (2000), Schoonover and Hayman (2002), Cherokee Ranch (2003), Burning Tree (2011), Lower North Fork, Springer and Waldo Canyon (2012), Black Forest (2013) and Marshall (2021). The Hayman fire was one of the largest fires in Colorado history with 146,899 acres burned. The Black Forest Fire was one of the most destructive with over 500 structures destroyed. The Marshall Fire exceed that with over 1000 homes destroyed.

In an effort to restore safe drinking water to homes in severely fire-impacted areas after the Marshall Fire, the City of Louisville tested the water in these areas for volatile organic compounds (VOCs), chlorine, and/or bacteria. Sample testing detected trace amounts of VOCs in the water mains in a small number of isolated locations which were sealed off from the rest of Louisville's water system since the night of the fire.

Douglas County, in their 2015 Local Hazard Mitigation Plan Update, determined that the risk and vulnerability to the Douglas County Planning Area from wildfire was of significant concern, with some areas of the Planning Area being at greater risk than others. Douglas County utilized the 2011 Douglas County Community Wildfire Protection Plan (CWPP) as part of their update.

High fuel loads in parts of the Planning Area, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. During fire season, the dry vegetation and hot and sometimes windy weather, combined with continued growth in the Wildland Urban Interface (WUI) areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the Planning Area, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

A 2022 investigation of the Colorado State Forest Service Forest Atlas Information Portal showed much of the Plum Creek watershed, where the Plum Creek intake has recently been installed, to be at high risk for wildfire.

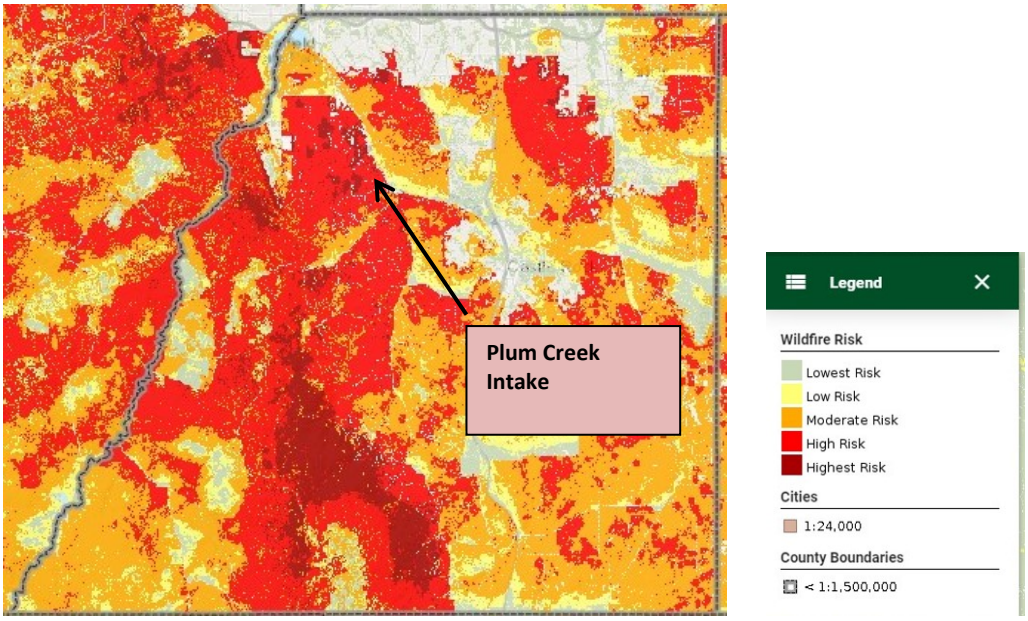

Figure 17: Wildfire risk of Plum Creek watershed

In 2021 the Town produced the Town of Castle Rock CWPP and adopted it in January 2022. The CWPP provides a comprehensive, scientifically based, analysis of wildfire-related hazards and risks in the Town of Castle Rock Wildland-Urban Interface (WUI) area. The goals of the plan are to:

1. Enhance life safety of residents, visitors, and responders;
2. Mitigate undesirable fire effects to property and infrastructure;
3. Mitigate undesirable fire effects to natural areas;
4. Maintain and enhance existing mitigation efforts; and
5. Promote collaborative efforts for outreach and education to the public.

Other desired outcomes include:

1. Promote community awareness;
2. Improve wildfire prevention through education;
3. Facilitate and prioritize appropriate hazardous fuel removal projects; and
4. Promote improved levels of response.

The CWPP was the result of an area-wide fire protection planning effort that included extensive field data, a compilation of existing documents and a scientific analysis of the fire behavior potential of the study area. Further, the CWPP provides an analysis of mitigation strategies and tactics designed to protect Values at Risk on which a significant wildfire would have an impact. These values include life safety, homes and other property, infrastructure, recreation, lifestyle, local economic and environmental resources.

The Town has numerous assets associated with water treatment and delivery, as well as wastewater collection. The total quantity of water system assets associated with source water extraction, treatment, storage, pressure regulation, and pumping exceed several hundred, and include over 50 structures. The wastewater collections system cannot operate on gravity alone due to the topography of the Town. The system requires numerous lift stations to collect and deliver municipal sewage to Plum Creek Water Reclamation Authority for treatment.

Most of these structures noted above are of at least partially ignition resistant construction, on concrete pads and have been cleared of nearby fuels. There are, however, some structures with fuels impinging them that could render them dangerous or impossible to access during fires (Figure 17). These assets are considered at risk due, not only, to the inherent value of water delivery and wastewater transport, but because of their reliance on electric power.

The fuels throughout the study area vary but are primarily in three groups, the Grass group, the Grass/Shrub group, and the Timber litter group. The Grass group is represented by short or mid grasses in parks, open space areas or HOA holdings. The Grass/Shrub group is represented by grass fields interspersed with Mountain Mahogany or Gamble oak (Figure 20). The shrubs grow in either small clumps or larger patches. This group has variability in fire behavior potential based on the season or drought conditions. When the shrubs are cured, dormant or have low moisture they burn very intensely, due in part to volatile oils in the leaves. Wind is the critical factor in determining how intense the fires will be. Spotting will also occur from dry leaves lofting ahead of the fire front and landing in the dried grass.

The Timber litter group, in which the Plum Creek intake is located, is represented by riparian areas that are mostly hardwood trees and pose a low threat and ponderosa pine stands that usually have Gamble oak in the understory. This group also has variability in fire behavior potential based on the season or drought conditions. The riparian areas are usually low intensity fires, burning in leaf litter and only during the driest time of the year or in drought conditions. Hardwood trees do not readily ignite so crown fires are not a concern. However, they can be difficult to extinguish because of the amount of dead and down material accumulated over the years.

Figure 18: Natural fuels surrounding a pump station

Figure 19: Grass fuels

Figure 20: Grass/Shrub fuels

Figure 21: Timber litter fuels

Nationally, wildfires are primarily naturally caused (i.e., lightning); however, grassfires can be started accidentally when using machinery such as chainsaws, lawnmowers, tractors, and welders during the summer. Grassfires can spread quickly, travelling up to 15 miles per hour. They tend to be less intense than a forest fire, however they can still generate enormous amounts of radiant heat. The taller and drier the grass, the more intensely a grassfire will burn. The shorter the grass, the lower the flame height, and the easier the fire will be to control. Short grass under 10 centimeters is a much lower risk (County Fire Authority, 2012).

Chemicals used in fire retardants may also have a negative impact on drinking water sources. On December 31, 2011, the US Forest Service signed a new direction to approve the use of aerially applied fire retardant and implement an adaptive management approach that protects resources and improves the documentation of retardant effects through reporting, monitoring and application coordination on US Forest Service lands. Aerial retardant drops are not allowed in mapped avoidance areas for certain threatened, endangered, proposed, candidate, or sensitive (TEPCS) species or waterways. All waterways were given at least a 300-foot buffer avoidance area. A waterway is defined as a body of water including lakes, rivers, streams and ponds whether or not they contain aquatic life (U.S. Department of Agriculture Forest Service, June 2015).

Castle Rock Water has not seen any effects to their drinking water sources due to wildfires, however if a major wildfire were to occur in Castle Rock's Source Water Protection Areas and surrounding lands, it could have an impact on Castle Rock's source waters by altering land cover and watershed hydrology. This can result in soil erosion and sediment and ash pollution in source water supplies, which present

challenges to water treatment operations. Large rain events can produce mudslides, and debris flows capable of destroying water infrastructure and impacting water quality.

5.7. Fertilizer Runoff

Within the Town's SWPAs, there are heavily landscaped areas including residential yards, commercial lawns, golf courses, ball fields, and parks. A variety of crops are also grown on small-acreage farms. Excess fertilizer use and poor application methods on these lands can cause fertilizer movement into surface and groundwater. If land is over-irrigated, this can lead to excess runoff of fertilizers as well. Fertilizers usually consist of nitrogen and phosphorus, the two compounds which are of greatest concern to drinking water supplies.

Nitrogen fertilizer, whether organic or inorganic, is biologically transformed to nitrate that is highly soluble in water. Use of nitrogen-containing fertilizers can contribute to nitrates in drinking water. Consumption of nitrates can cause methemoglobinemia (blue baby syndrome) in infants, which reduces the ability of the blood to carry oxygen. If left untreated, methemoglobinemia can be fatal for affected infants. Due to this health risk, EPA set a drinking water maximum contaminant level (MCL) of 10 milligrams per liter (mg/l) or 10 parts per million (ppm) for nitrate measured as nitrogen.

Phosphorus is the other element of concern in fertilizer. Under certain conditions phosphorus can be readily transported with the soil. In fact, 60 to 90 percent of phosphorus moves with the soil. Phosphorus is the major source of water quality impairments in lakes nationwide. Even though regulations that affect the taste and odor of water are not Federally enforceable under the Safe Drinking Water Act, municipalities often must treat their drinking water supplies for these aesthetic reasons (US Environmental Protection Agency, July 2001).

Pesticide application to crops, another potential source of contamination, can seep into surface and groundwater supplies if mismanaged. Synthetic organic chemicals in pesticides have been linked to serious health problems, including cancer, liver and kidney damage, reproductive difficulties, and nervous system effects.

Castle Rock Water routinely monitors for nitrate and nitrite in their finished water at each entry point into the distribution system (quarterly for PCWPF and yearly for groundwater treatment plants). Nitrate has been less than 0.2 mg/L at the Plum Creek Water Purification Facility and less than 0.1 mg/L at the groundwater plants. Nitrite has been below detection limit for all entry points.

5.8. Livestock Grazing & Waste

Agricultural land use has been a historical mainstay in Colorado for over a century. Even though land use changes have occurred over this time period with development of homes and businesses, agriculture will continue to be a presence in local communities and a key part of local heritage. "Right to Farm" laws and the preservation of private property rights are important to the landowners and will be respected when developing and implementing source water protection plans.

Livestock grazing occurs within the private lands in the Source Water Protection Areas. While many of the operations are relatively small, their cumulative impact can be a threat to water supplies. Livestock grazing can impact riparian health, stream-channel conditions, and water quality. The most common water quality impacts include pathogen contamination, sedimentation, and increased water temperatures from loss of vegetative stream coverage. Livestock grazing activities with the highest potential for direct and indirect impacts to water resources include long-term concentrated grazing in riparian areas, and trampling/trailing near water sources. Direct bank damage may add large amounts of sediment directly into streams, especially in wet meadow streams or erosive topography that is prone to gully formation.

In addition, animal waste contains many pollutants that can contaminate surface and ground waters used as drinking water sources. Pathogens found in animal waste can infect humans if ingested. Organisms like *Cryptosporidium*, *Giardia lamblia*, and *Salmonella* can induce symptoms ranging from skin sores to chest pain. *E. coli*, which causes diarrhea and abdominal gas, can cause serious illness and even death. *Cryptosporidium* is of particular concern, as it is highly resistant to disinfection with chlorine. This protozoan causes gastrointestinal illness that lasts 2 to 10 days in healthy individuals but can be fatal in people with weakened immune systems. (US Environmental Protection Agency, 2001).

Animal wastes can also contribute to nitrates in drinking water. Impacts from nitrates were discussed in Section 5.7 “Fertilizer Runoff”, page 41.

5.9. Household Hazardous Waste: Improper Storage & Disposal

The US Environmental Protection Agency (EPA) considers leftover household products that can contain corrosive, toxic, ignitable or reactive ingredients as household hazardous waste (HHW). These products can include paints, cleaners, oils, batteries, and pesticides and when stored or disposed of improperly can pose an environmental risk to surface, ground, and stormwater systems.

Improper disposal of HHW can include pouring them down the drain, on the ground, into storm sewers, or in some cases putting them out with the regular trash. Certain types of HHW have the potential to cause physical injury to sanitation workers, contaminate septic tanks or upset wastewater treatment systems if poured down drains or toilets. They can also present hazards to children and pets if left around the house (United States Environmental Protection Agency, 2017).

Decreasing and removing hazardous products from residential homes reduces the risk of fire hazards and the potential for accidental poisonings. The Tri-County Health Department operates Household Chemical Roundup (HCR) Programs in Adams and Douglas Counties as a means for the public to properly dispose of HHW that could otherwise contaminate the water supply, air, and landfills. The TCHD coordinates several HCR events annually and works with city and county officials, water and sanitation districts, metro districts and private corporations to plan and fund the events. The Town volunteers and participates in these events. In 2016, the TCHD collected over 300,000 pounds of hazardous material from the events held in Douglas County. Participation from Douglas County residents has averaged approximately 3,000 households per event season for the last ten years (Kennedy, 2017). In 2021, Douglas County formed its own health department and the Town will continue to support the HCR program administered through the Douglas County Health Department.

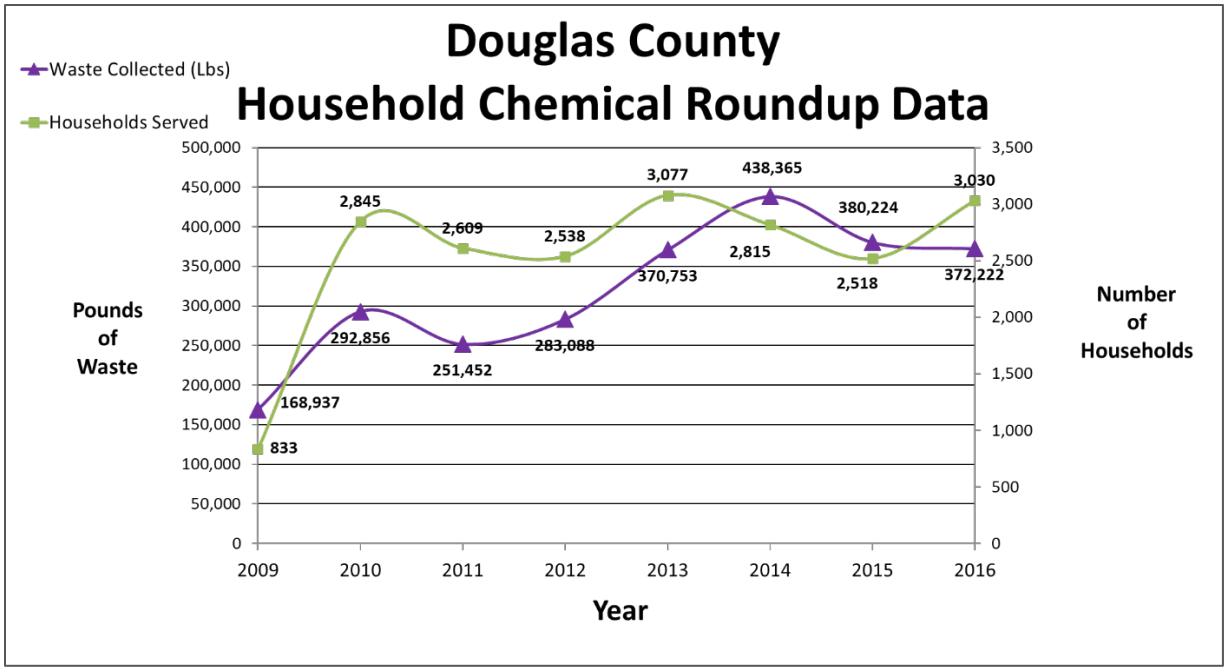

Figure 22: Douglas County Household Chemical Roundup Data (Kennedy, 2017)

5.10. Onsite Wastewater Treatment Systems

There are areas within the Town's SWPAs that include properties that rely on onsite wastewater treatment systems (OWTS) to dispose of their sewage. These include the Diamond Ridge and Bell Mountain subdivisions and unincorporated areas of Douglas County, including the Town of Sedalia immediately upstream of the Plum Creek Diversion. An OWTS, commonly known of as a septic system, consists of a septic tank that collects all the wastewater and a soil treatment area that disperses the liquid effluent onto a leach field for final treatment by the soil.

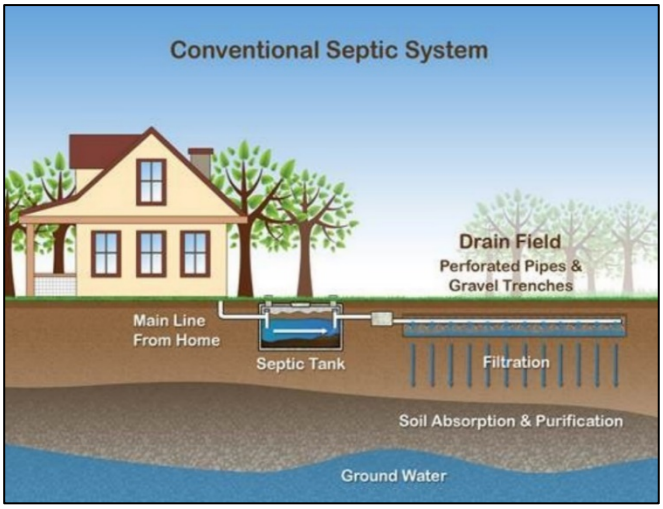

Figure 23: Conventional Septic System (Tri-County Health Department, 2016)

Unapproved, aging, and failing septic systems have a large impact on the quality and safety of the water supply. The failure of property owners to pump solids that accumulate in the septic tank may lead to premature failure of the soil treatment area. This in turn can cause untreated wastewater to back up into the home or to surface on the ground. If managed improperly, these residential septic systems can contribute excessive nutrients, bacteria, pathogenic organisms, and chemicals to the groundwater. While OWTSs are the second most frequently cited source of groundwater contamination in our country, Castle Rock Water has not seen any impacts to their drinking water due to improper maintenance or failure of OWTSs.

In Douglas County, individual sewage disposal systems are permitted by the Tri-County Health Department (TCHD), which services Adams, Arapahoe, and Douglas Counties. The TCHD administers and enforces the minimum standards, rules, and regulations under the authority of the On-Site Wastewater Treatment Act under Colorado State Statute 25-10-101. The TCHD has documented approximately 25,000 permitted OTWSs within their jurisdiction, however, it is unknown at this time the number of unapproved systems currently in use and the age of all septic systems in TCHD jurisdiction. The absence of effective monitoring and education increases the risk of excessive contaminants from OTWS entering the groundwater.

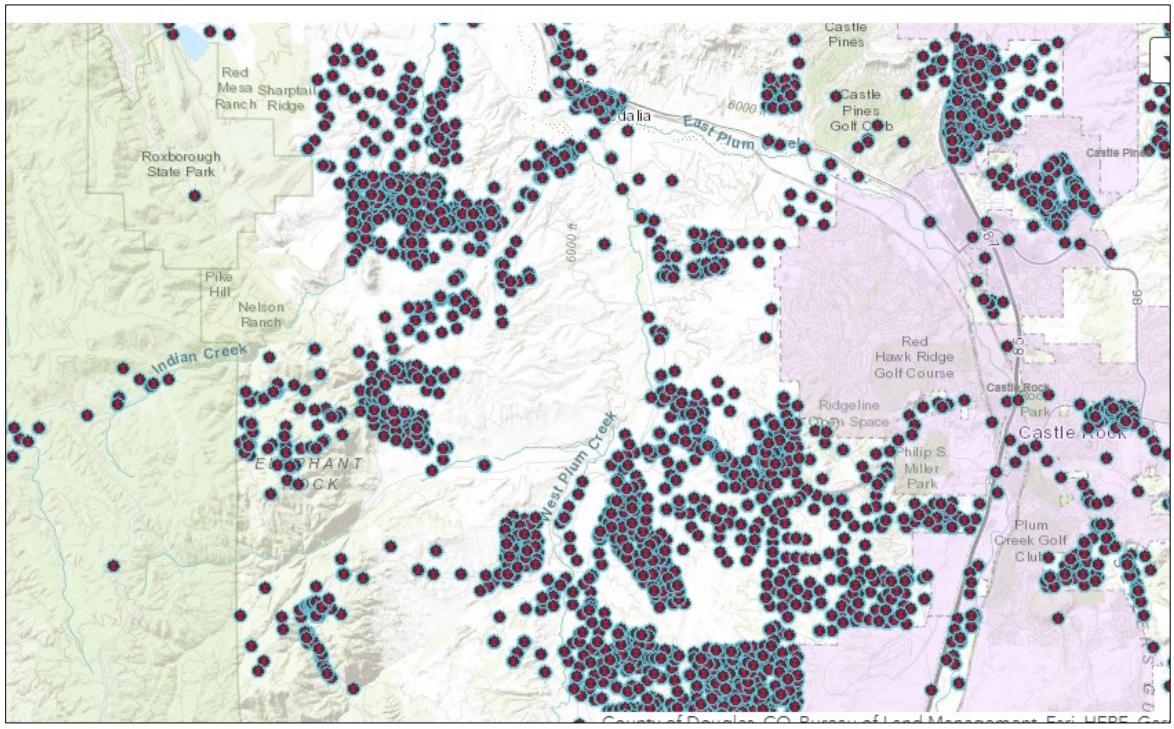

Figure 24: Documented OWTS in Tri-County Health Department Jurisdiction (Weakley, 2017)

5.11. Waste/Trash Management

Records indicate that there were several solid waste landfills within the Town's SWPA, all of which have since been closed. The landfills were used primarily for domestic trash, with some being used for demolition trash. The Naylor Landfill, which was operated by the Town from 1972 to 1975, was evaluated through a Preliminary Assessment (PA) in 1995 and a Site Inspection (SI) in 2000 by the EPA and the CDPHE. The SI report noted that the "results of the [target] organic analyses of the [Plum Creek] surface water samples indicated no significant detection." The SI report also concluded that "No elevated concentrations of any [target] organic analyte was reported in any of the ground water samples." Based on the analytical results documented in the SI report, EPA issued a No Further Remedial Action Planned (NFRAP) decision on February 16, 2000 (CDPHE Hazardous Materials & Waste Management Division, 2000).

While there are no active landfills within the SWPA, waste/trash management is still a concern as trash from households and businesses must be hauled away. There are three public trash providers that service the SWPA and certain neighborhoods with Homeowners Association (HOA) may provide trash

removal through their HOA. Trash that is improperly handled may contain contaminants that can enter waterways and pollute drinking water sources.

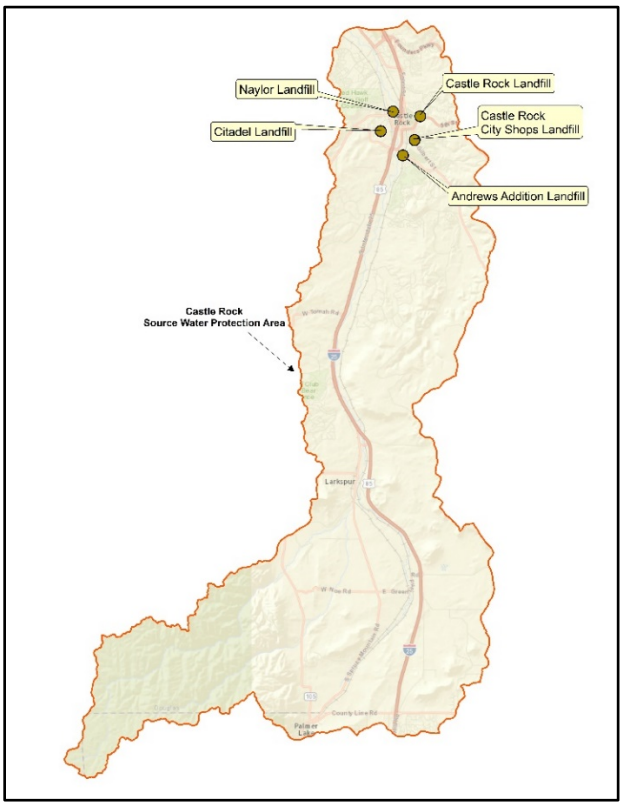

Figure 25: Historic Landfills within Castle Rock's SWPAs

5.12. Illegal Dumping

Illegal dumping can occur within the Town's SWPAs. Illegal dump sites can be found along roadways, at remote locations in the watershed, or on an abandoned property instead of a landfill. Illegal dumping is not only aesthetically unappealing—it can pose a threat to human health. Rats, mice, mosquitoes, and flies can all carry disease and are attracted to unkempt areas that contain food scraps. Water resources—such as ponds, streams, lakes, and even aquifers—can also become polluted from illegal dumping (Texas Commission on Environmental Quality, November 2010).

Douglas County's Land Use Code has enforceable regulations to help curb illegal dumping; however, the person or people responsible for the dumping are not always apparent. Since the Tri-County Health Department began their Household Chemical Roundup Program in 1984, the amount of illegal dumping has been minimized.

5.13. Dog Parks/Pet Waste

The Town's SWPAs include recreational sites such as local parks and dog parks, and open space areas that are popular sites for residents to bring their pets. While livestock are the greatest contributor of animal waste, perhaps the least suspected source of animal waste is man's very own best friend. Pets, particularly dogs, are significant contributors to source water contamination. Studies performed on

watersheds in the Seattle, Washington, area found that nearly 20 percent of the bacteria found in water samples were matched with dogs as the host animals (US Environmental Protection Agency, July 2001).

Animal waste can contain pathogens such as *Cryptosporidium*, *Giardia lamblia*, *Salmonella,* and *E. coli* which can infect humans if ingested. Dog and cat droppings can often contain roundworms and other parasitic nematodes. Infection by just a few roundworms usually causes no problems, but more severe infections may cause fevers, bronchitis, asthma, or vision problems. Cat feces may contain toxoplasmosis, a parasite that infects humans and other animals. Cats are the only animals known to excrete toxoplasmosis oocysts, which are resistant to most disinfectants. Toxoplasmosis is a serious health concern for pregnant women and immuno-compromised individuals (US Environmental Protection Agency, July 2001).

Figure 26: Pet waste station along East Plum Creek Trail in Castle Rock's SWPA1

Every spring, the Town holds an annual "Spring up the Creek" campaign to encourage local volunteers to clean up areas along East Plum Creek. The campaign was established in 2003 and has grown to include hundreds of volunteers and drainage ways throughout Castle Rock (Town of Castle Rock, 2017). The May 2017 event theme was "Scoop Up the Poop!" and volunteers helped clean up pet waste, as well as other trash, along designated creeks and trails. Various outreach campaigns to educate the public on the benefit of picking up pet waste is also incorporated into annual outreach programs.

The Town also has pet waste stations installed at various points along trails and in parks to encourage pet owners to pick up after their pets. HOAs typically provide these in common areas throughout town as well. Donors can sponsor pet waste stations and donations go towards installation and maintenance of new or existing stations. Sponsorship signs are mounted at each pet waste station owned and operated by the Town.

5.14. Construction Development

The Town is quickly growing. From the year 2000 to the year 2010, Castle Rock's population grew from 20,224 to 48,231, and by the year 2022, the population had grown again to over 80,000. Castle Rock adopted the Town's 2020 Vision and Comprehensive Master Plan in 2002 to provide direction to elected and appointed officials, the general citizenry, landowners and developers, and other area governmental entities for short-term and long-term growth and development of Castle Rock for the year 2030 and beyond (Town of Castle Rock, Colorado, 2017). The 2030 Comprehensive Master Plan plans for an estimated population of 90,000 by 2030 and an ultimate Town build-out population of approximately 130,000 to 150,000 residents (Town of Castle Rock, Colorado, 2017).

With a community that is quickly growing, comes an increase in construction and development. Construction may be a concern to drinking water due to stormwater runoff. Runoff from an unstabilized construction site can result in the loss of approximately 35–45 tons of sediment per acre each year. Even during a short period of time, construction sites can contribute more sediment to streams than would be deposited naturally over several decades (US Environmental Protection Agency, 2007). Erosion caused by construction and downstream sedimentation can damage property and degrade the quality of streams and lakes.

The Castle Rock Water's Stormwater Division provides construction site stormwater runoff control within Castle Rock's service areas. Castle Rock Water developed a Stormwater Master Plan in 2004, and updated it in 2017 (Appendix K). A guiding principle of the Stormwater Master Plan is to "protect water quality and mitigate impacts to receiving waters." The Town complies with the National Pollutant Discharge Elimination System (NPDES) Stormwater Phase II permit requirements through managing construction and post-construction runoff, preventing pollution from municipal operations, eliminating illicit connections and discharges, and educating the public (Castle Rock Water Engineering, March 2011). The NPDES permitting program was discussed in more detail in Section 5.2 "Industrial Facilities", and a detailed list of facilities that have active NPDES permits within the SWPA are included in Appendix I.

The Town has also developed a Temporary Erosion and Sediment Control (TESC) Manual (Appendix L) to help minimize impacts from construction and development. The TESC Manual describes the permitting programs that have been adopted to promote environmentally sound construction practices in Town. The goal of the program is to implement erosion and sediment control best management practices as a standard for all land-disturbance activities. The hope is to reduce increases in erosion and sedimentation over pre-development conditions (Town of Castle Rock, 2019).

Figure 27: Town of Castle Rock GESC/DESC Manual (Town of Castle Rock Utilities Department, June 2019)

5.15. Hospital/Medical Waste

There are approximately 20 health care facilities within Castle Rock's SWPAs, mostly within Castle Rock's town boundaries. These facilities may generate pharmaceutical waste such as expired drugs, IV bag and tubing, contaminated garments, absorbents and spill cleanup material, and containers that held drugs. If improperly handled or disposed of, pharmaceutical waste may pose a risk to drinking water sources. In addition to the pharmaceutical wastes, other hazardous wastes may be generated in other areas of medical facilities including the laboratory, radiology, housekeeping, and maintenance. In the laboratory, facilities may generate hazardous waste reagents, including analyzer reagent cuvettes that are not RCRA empty. In housekeeping, facilities may generate expired autoclave tape that may be toxic for lead. If improperly handled or disposed of, these medical wastes may pose a risk to drinking water sources.

Health care providers must evaluate waste that is generated to determine whether it is hazardous, then dispose of it properly. Pharmaceuticals can be regulated by both RCRA hazardous waste regulations and by other rules. For example:

- Pharmaceutical hazardous waste may also be regulated by the Occupational Safety and Health Administration (OSHA) as infectious waste, such as a wasted syringe containing a pharmaceutical with a mercury preservative;
- Pharmaceutical hazardous waste may also be regulated by the U.S. Drug Enforcement Agency (DEA) as a controlled substance, such as waste chloralhydrate (U034), Paral (U182), and Paraldehyde (U182).
- Pharmaceutical hazardous waste may also be regulated by the U.S. Nuclear Regulatory Commission (USNRC) as a radioactive waste, such as waste liquid scintillation cocktail.
- Pharmaceutical wastes may also be regulated by CDPHE as a solid waste that is a medical or infectious waste. (Colorado Department of Public Health and Environment, 2011)

Figure 28: Castle Rock Water Medication Disposal Site Flyer (Town of Castle Rock, Colorado, 2017)

The Town currently has an unused and expired prescription drug drop off site for residential use at the Castle Rock Police Department. More information about prescription drop off can be found at http://www.crgov.com/1732/Disposing-of-Medications.

5.16. Active LUST Sites

The Colorado Department of Labor and Employment (CDLE) Division of Oil & Public Safety regulates storage tanks in Colorado. Underground storage tanks (USTs) with a capacity greater than 110 gallons that contain petroleum products are regulated, and aboveground storage tanks (ASTs) with a capacity between 660 and 39,999 gallons that contain fuel or lubricants are regulated. Within the Town's SWPA, there are approximately 17 regulated ASTs and 57 USTs.

Storage tanks are a concern to water systems because they may be old and subject to leakage due to corrosion, failure of the piping systems, spills, and overfills, as well as equipment failure and human operational error. It only takes a small amount of petroleum to contaminate the ground or surface water. Even a small spill can have a serious impact. A single pint of oil released into the water can cover one acre of water surface area and can seriously damage an aquatic habitat. A spill of one gallon can contaminate a million gallons of water (US Environmental Protection Agency, 2001). Fuel tanks should be inspected visually on an annual basis and properly seated on a type of secondary containment structure to prevent spills from reaching the ground. The containment area should be able to hold 125% of the tank capacity.

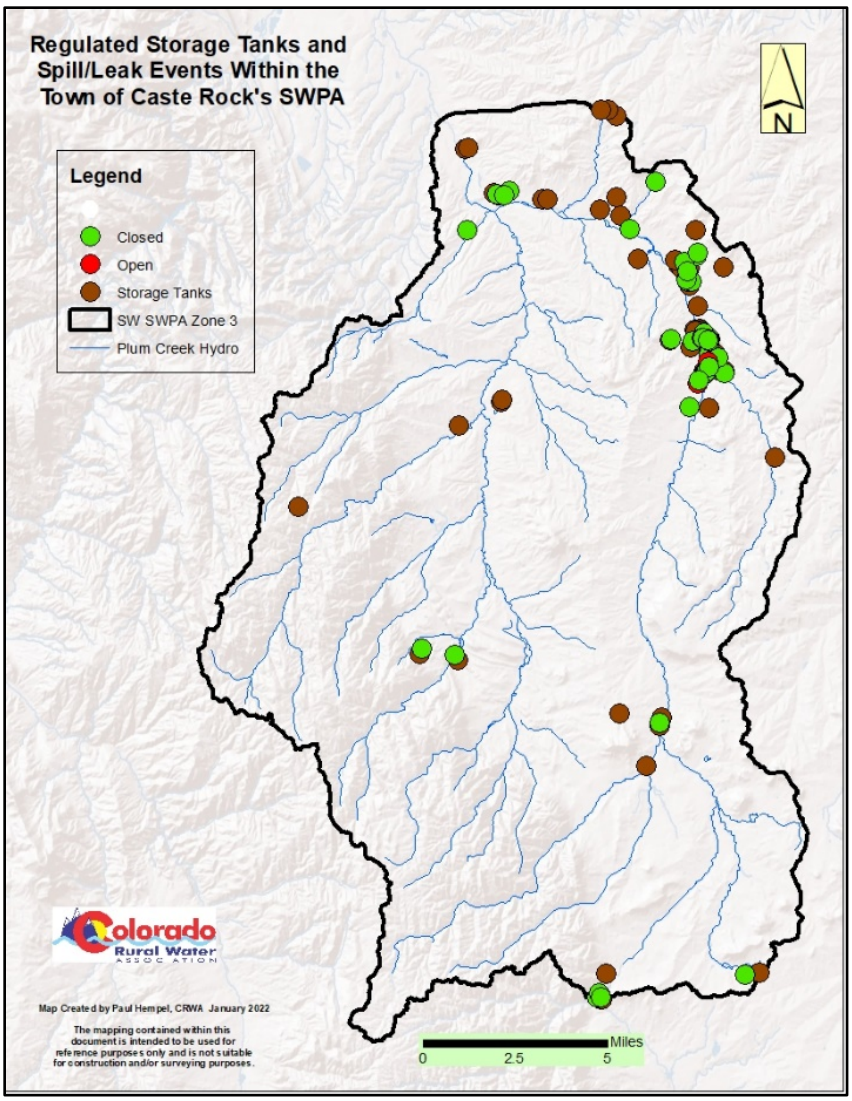

Figure 29: Regulated storage tanks and spill/leak events within the Town of Castle Rock's SWPA

According to the CDLE's Colorado Storage Tank Information System (COSTIS) website, there are three known open spill events that have a corrective action plan (CAP) in place (see Table 4 below). A CAP is required when the results of a site characterization report identify that remediation is necessary to abate the concerns associated with a release.

Table 4: Open Storage Tank Events in Castle Rock's SWPA (CDLE, 2000)

Event ID	Site Name	Site Location	Confirmed Release Reported	Source of Release	Cause of Release	CAP EFS Effective Date
12237	Sav-o-mat Inc.	865 S Wilcox St, Castle Rock, CO	3/19/2015	Tank Rupture	Physical/ Mechanical Damage	4/23/2015
11023	Western Gas & Convenience Store	800 S Wilcox St, Castle Rock, CO	12/12/2009	Unknown	Other	4/1/2010
6395	Castle Rock Townhall Center	100 N Wilcox St, Castle Rock, CO	3/2/1998	n/a	n/a	2/9/1999

The Castle Rock Town Hall site formerly housed a gas station, which was closed in the 1970s. According to the former property owner, one 1,000-gallon and two 6,000-gallon underground storage tanks (USTs) were removed from the site around 1980. A Phase II Environmental Assessment conducted in 1994 revealed soil and groundwater hydrocarbon contamination. Since that time, several investigations have been carried out to delineate the plume and soil vapor and groundwater monitoring wells have been monitored. Based on historical groundwater analytical data at the site, all impacted wells at the site have shown improvements in contaminant concentrations since remediation started in 2014. Quarterly monitoring is being conducted and reports are submitted twice per year to the Colorado Department of Labor and Employment, Division of Oil and Public Safety. Castle Rock Water has seen no impact on their sources from this event.

The two remaining sites are located on property not owned the Town, and they do not have detailed reports about those sites. However, the Town will track the events on the COSTIS website on an annual basis for any changes. For more information about storage tank releases visit https://opus.cdle.state.co.us/OIS2000/home.asp.

5.17. Flooding

Flooding is one of the most common hazards in the United States, causing more damage than any other severe weather-related event. Impacts to drinking water and wastewater utilities can include loss of power, damage to assets, and dangerous conditions for personnel. Often located in low lying areas, water and wastewater utilities are particularly vulnerable to flooding. Water and debris can inundate the facility, thereby damaging equipment and structures, and causing power outages. Such impacts can lead to various consequences including costly repairs, disruptions of services, and/or hazardous situations for personnel and public health advisories. (US Environmental Protection Agency, 2014).

Flooding depends on various factors including rainfall, topography, river-flow, drainage, and tidal-surge. The threat of flooding is based on the likelihood that such a flooding event will occur. The Federal Emergency Management Agency (FEMA) produces maps of a “100-year flood” (a flood event that has a one percent chance of occurring in a given year) and a more catastrophic “500-year flood” (a flood event that has a two tenths of a percent chance of occurring in a given year). The majority of the Town’s SWPAs lie outside of the 100- and 500-year floodplains with the exception of the land that directly encompasses East Plum Creek and its tributaries (Federal Emergency Management Agency, 2015).

Douglas County has developed a Local Hazard Mitigation Plan (Appendix M), in which they profiled and rated the significance of identified hazards including flooding. Flooding was determined to be of medium significance (or moderate potential impact) on a county-wide scale (Douglas County Colorado, June 2015). In addition, Castle Rock Water's Stormwater Division manages stormwater runoff to minimize

flooding hazards and protect water quality in their watersheds (Town of Castle Rock, 2017). There has been no impact to Castle Rock's drinking water sources during recent flood events.

This map has been removed from the public version of this document for security reasons. Please contact the water provider if you would like to see the full version of this Source Water Protection Plan.

Figure 30: Flood Zones within Town of Castle Rock's SWPAs

5.18. Known Contaminated Sites

Within Castle Rock's SWPAs may be other sites that contain contaminants not previously discussed in previous sections. Castle Rock Water monitors their drinking water for contaminants in accordance with Federal and State laws. An annual water quality report is completed once a year and distributed to its consumers. The water quality report includes all information and sample data a public water system has collected in the previous calendar year. The Town's 2017 Water Quality Report (CRgov.com/WaterQuality) indicated no violations, significant deficiencies, or formal enforcements actions necessary as Castle Rock Water did not exceed any maximum contaminant levels (MCL) or maximum residual levels (MRDL) set by the CDPHE (Castle Rock Water, 2017).

Castle Rock Water also routinely conducts inspections and maintenance activities of their drinking water intakes, treatment plants, storage facilities, and pipelines. If the maintenance work is not conducted properly, there can be short-term or long-term damage to the water supply system. Maintenance activities may include: visual inspections of intake structures, sampling to maintain water quality, repairing or replacing damaged sections of their collection system, distribution system and/or wastewater collection system. In addition, a sanitary survey was performed on September 8, 2017 by the Field Services Section of the Colorado Department of Public Health & Environment's Water Quality Control Division at Town of Castle Rock in accordance with the Colorado Primary Drinking Water Regulations, 5 CCR 1002-11 (Regulation 11), Sections 11.38(1)(b) and 11.38(2). No significant deficiencies or violations were identified.

5.19. Degraded Riparian Areas

A riparian zone or riparian area is the interface between land and a river or stream. Riparian zones are significant in ecology, environmental management, and civil engineering because of their role in soil conservation, their habitat biodiversity, and the influence they have on fauna and aquatic ecosystems, including grassland, woodland, wetland or sub-surface features such as water tables. In some regions the terms *riparian woodland*, *riparian forest*, *riparian buffer zone,* or *riparian strip* are used to characterize a riparian zone.

The need for riparian-zone restoration has come about because riparian zones have been degraded throughout much of the world by the activities of mankind affecting natural geologic forces. The unique biodiversity of riparian ecosystems and the importance of riparian zones in preventing erosion, protecting water quality, providing habitat and wildlife corridors, and maintaining the health of in-stream biota (aquatic organisms) has led to a surge of restoration activities aimed at riparian ecosystems in the last few decades. Restoration efforts are typically guided by an ecological understanding of riparian-zone processes and knowledge of the causes of degradation. They are often interdependent with stream restoration projects.

The riparian areas for both the East Plum Creek and Plum Creek Watersheds overall are in relatively good condition. Yet there are potential trouble spots within a five-mile reach for these tributaries. These include five areas on East Plum Creek and three areas on Plum Creek upstream of the intake respectively. In order to measure for any increases in sediment load due to streambank erosion, the Town is implementing stream stabilization projects within the Town boundaries according to the stormwater master plan.

5.20. Public Education

While public education is not a potential source of contamination, the Steering Committee believes that educating community members about source water protection efforts is essential to the prevention of surface and groundwater contamination. Public education can help community members understand the potential threats to their drinking water sources and motivate them to participate as responsible citizens to protect their valued resources.

Figure 31: Drinking Water Protection Area Sign

6. SOURCE WATER BEST MANAGEMENT PRACTICES

The following table lists the best management practices and their priority rating recommended by the Steering Committee to be considered for implementation.

Table 5: Source Water Protection Best Management Practices

Issues	Priority Ranking	Best Management Practices
Public Outreach (all issues)	High	• Hold public meeting/community outreach to educates citizens on the SWPP • Maintain Source Water Protection information on Town's website • Maintain CDPHE SWPA road signs at various locations within the SWPA.
Industrial Facilities, Fertilizer Runoff, Livestock Grazing/Agricultural Practices, Onsite Wastewater Treatment Systems, Waste/Trash Management, Hospital/Medical Waste, Materials Storage Yards, LUST Sites, Household Hazardous Waste Improper Storage & Disposal	High	• Develop public education campaigns for appropriate stakeholders* within the Town's SWPAs to explain the importance of source water protection as they pertain to specific issues of concern o Gather contact information and create mailing list for distribution; o Gather/develop outreach material as it pertains to specific issues of concern (work w/ CRWA and other agencies to find/create material) o Mail outreach material *Stakeholders Include: • Industrial Facilities - owners of industrial facilities • Fertilizer Runoff - farmers, ranchers, golf course owners, and other heavy fertilizer users • Livestock Grazing / Agricultural Practices - farmers and ranchers • Onsite Wastewater Treatment Systems - OWTS owners (distribute Westbank Ranch HOA OWTS maintenance video, Tri-County Health Dept. OWTS Homeowner Guidelines) • Waste/Trash Management - waste management companies • Hospital/Medical Waste - hospitals & medical facilities • Materials Storage Yards - materials storage yard owners • LUST Sites - storage tank owners
WWTP, Hazmat incidents/Spills,	High	• Share electronic and hard copies of the SWPP and GIS shapefiles of the SWPA with appropriate stakeholders*

Issues	Priority Ranking	Best Management Practices
Train Derailment, Wildfire		o Gather contact information and create mailing list for distribution; o Utilize CRWA's "SWPP Distribution Letter" template to develop a cover letter for SWPP distribution; o Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles; o Distribute SWPP Distribution Cover Letter along with copy of Town's SWPP and SWPA GIS shapefiles. *Stakeholders Include: • WWTP - Plum Creek Water Reclamation Authority and Chatfield Watershed Authority; • Hazmat incidents/Spills - Douglas County OEM, Castle Rock Fire & Rescue Department, Colorado State Patrol, CDOT, and other emergency responders • Train Derailment - BNSF, Union Pacific, Douglas County OEM, Castle Rock Fire & Rescue Department, Colorado State Patrol, CDOT, and other emergency responders • Wildfire - the USFS, Douglas County OEM, Castle Rock Fire & Rescue Department, and other emergency responders
Hazmat incidents/Spills, Train Derailment, Wildfire	High	• Share Emergency Notification Cards with appropriate stakeholders* o Gather contact information & create mailing list for distribution; o Develop Emergency Notification Cards that includes maps of the SWPAs and water system contact information; o Print hard copies/create electronic copies of Emergency Notification Cards o Mail/Distribute Emergency Notification Cards. *Stakeholders Include: • Hazmat incidents/Spills - Douglas County OEM, Castle Rock Fire & Rescue Department, and other emergency responders • Train Derailment - BNSF, Union Pacific, Douglas County OEM, Castle Rock Fire Protection District, Colorado State Patrol, CDOT, and other emergency responders • Wildfire - USFS, Douglas County OEM, Castle Rock Fire & Rescue Department, and other emergency responders.

Issues	Priority Ranking	Best Management Practices
WWTP	High	• Expand outreach campaign to homeowners within the Town's SWPA that explains the importance of source water protection/outlines what not to dump down drains (partner w/ PCWRA) • Support PCRWA pretreatment program (regulates discharges) • Create water quality monitoring alert system
Household Hazardous Waste Improper Storage & Disposal, Waste/Trash Management, Illegal Dumping	High	• Continue working w/ County Health Department to outreach their Household Chemical Roundup Program • Install signage around known or common illegal dump sites that includes information on where to properly dispose of materials.
Construction/Development	High	• Continue to implement the MS4 program/Stormwater Master Plan
Industrial Facilities	Moderate	• Further enhance communication pathway between Castle Rock Water and Castle Rock Fire Life Safety Division
Hospital/Medical Waste	Moderate	• Encourage hospitals and medical facilities to educate customers/patients about the local health department HCR program • Educate community members about pharmaceutical drop off locations within/near Town: http://www.dcsheriff.net/community/pharmaceutical-drop-off-locations/
Materials Storage Yards	Moderate	• Continue inspection of materials storage yards within Castle Rock's town boundaries and support Douglas County's regulation efforts of materials storage yards outside of town boundaries
Chemical Storage	Moderate	• Continue monitoring for contaminants • Refer to EPA's Enviromapper & ECHO databases to determine whether reportable quantities of chemicals have been released into water • Educate homeowners about proper chemical storage & disposal/educate them about Tri-County Health household chemical roundup program • Work w/ NRCS & CSU Extension to educate ag producers on proper chemical use and storage (NRCS Pest Management Practice)

Issues	Priority Ranking	Best Management Practices
Flooding	Moderate	• Further enhance communication pathway between Castle Rock Water and Castle Emergency Management • Switch water sources, if necessary, to continue providing drinking water to Town customers. • Support Douglas County Local Hazards Mitigation Plan and provide link to the plan on Castle Rock's website • Create water quality monitoring alert system
Onsite Wastewater Treatment Systems	Low	• Educate real estate agents and encourage them to inform buyers and sellers of the rules requiring a Use Permit or Renewal of a Use Permit upon the transfer, sale, or conveyance of any real property served by an OWTS. • Encourage regular maintenance of OWTS • Support Tri-County Health Department's OWTS public education campaign
Dog Parks/Pet Waste	Low	• Continue to implement "Spring up the Creek" events • Install/maintain additional dog waste stations throughout SWPA. Encourage donors to sponsor dog waste stations in town. • Continue to educate public on importance of picking up pet waste
Wildfire	Low	• If a wildfire were to occur, construct berms, diversion structures, or revegetation practices for flood mitigation, debris flow, and erosion control. • Support or collaborate with Castle Rock Fire, USFS, CSFS, etc. on their wildfire mitigation efforts and education. • Support the Community Wildfire Protection Plan (Castle Rock Water has representative on the team reviewing this Plan). • Continue to be involved in wildfire response planning including Vulnerability Assessments, Hazard Mitigation Plans, etc. to ensure that source watersheds are highlighted as an asset in each plan. • Create water quality monitoring alert system
Fertilizer Runoff, Livestock Grazing / Agricultural Practices	Low	• Work w/ NRCS, CSU Extension, and Douglas County Conservation District to educate ag producers on proper land management by incorporating source water protection into workshops or presentations

Issues	Priority Ranking	Best Management Practices
		• Include links to NRCS, CSU Extension, and Douglas County Conservation District on Castle Rock's website
LUST Sites	Low	• Monitor known databases (such as COSTIS) on the status of storage tank spills or events within the SWPA
Known Contaminated Sites	Low	• Continue monitoring for known contaminants
Degraded Riparian Areas	Very Low	• Continue to work with private landowners and livestock users to ensure that healthy riparian areas are maintained • Assess historic practices (e.g. irrigation diversions) to identify projects which will decrease bank erosion and restore proper stream and riparian area function • Conduct a study to assess the condition of riparian areas and potential restoration activities

7. EVALUATING EFFECTIVENESS OF SOURCE WATER PROTECTION PLAN

The Town 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 five 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 Town 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.

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9. APPENDICES[5]

A. Source Water Assessment Report

B. Source Water Assessment Report Appendices

C. Town of Castle Rock Water Resources Strategic Master Plan

D. Chatfield Watershed Plan

E. Table A-1 Discrete Contaminant Types

F. Table A-2 Discrete Contaminant Types (SIC Related)

G. Table B-1 Dispersed Contaminant Types

H. Table C-1 Contaminants Associated with Common PSOC's

I. NPDES Permits & Industrial Facilities

J. 2030 Comprehensive Master Plan

K. Castle Rock 2017 Stormwater Mater Plan Update

L. Castle Rock TESC Manual

M. Douglas County Local Hazard Mitigation Plan

[5] All appendices are located on the CD version of this SWPP.