RISK ASSESSMENT
2016

CASTLE ROCK FIRE RESCUE COLORADO

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Castle Rock Fire and Rescue Department

Fire Chief Arturo Morales

Deputy Chief Norris Croom III

Assistant Chief Craig Rollins

Captain Tad Anderson

Lieutenant Jay Allen

Lieutenant Oren Bersagel-Briese

Lieutenant Brett Johnson

Lieutenant Patrick Richardson

Engineer Steve Patik

Fire Prevention Officer Rick Young

Fire Fighter / Paramedic Eric Bockhacker

Fire Fighter / Paramedic Stephen Coffin

Fire Fighter / Paramedic Todd Lewis

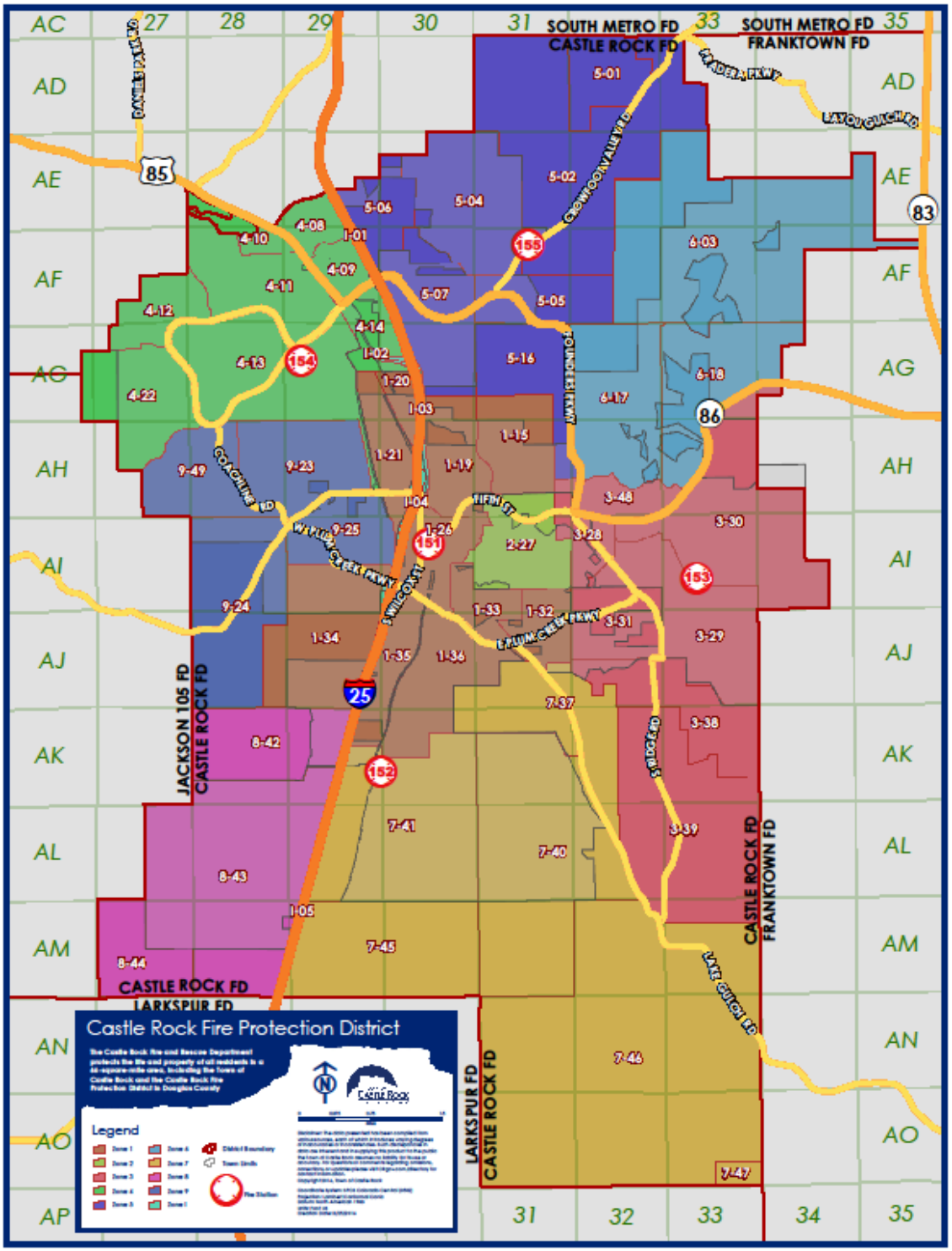
Fire Fighter / EMT Caleb McNeil

Fire Fighter / EMT Geoff Polidoro

Fire Fighter / EMT Casey Venafro

Fire Fighter / EMT Chad Wachs

Castle Rock Fire and Rescue Planning Zone Map



Executive Summary

The Castle Rock Fire and Rescue Department completed this Community Risk Assessment as part of the Commission on Fire Accreditation International's (CFAI) Standards of Cover (SOC) process, and in response to a 2012 CFAI Peer Team recommendation to develop an enhanced risk assessment. This document is a comprehensive analysis of each emergency response service (fire suppression, hazardous materials, emergency medical services, technical rescue, and wildland fire suppression) and the inherent risk(s) of each within the Castle Rock Fire and Rescue's jurisdiction. Castle Rock Fire and Rescue Department provides service to two authorities and 66 square miles, the Town of Castle Rock (34 square miles) and the Castle Rock Fire Protection District (32 square miles). The Department maintains four fire stations, nine station planning zones (possible future station areas) and 56 fire management zones (FMZ). This risk assessment evaluates the risks within each of the nine station planning zones to determine the maximum risk for each emergency service provided.

To evaluate the risks, the team reviewed multiple aspects of each commercial occupancy, historical response data, geographic information systems (GIS) data, and local topography/fuel models. Upon identifying each service risk, they were ranked to determine the maximum risk within a given station planning zone. To define risk, the Department use the following model;

Risk will be defines as:		
Low	Low Probability	Low Impact
Moderate	High Probability	Low Impact
High	High Probability	High Impact
Special	Low Probability	Very High Impact

The maximum risk may be either a "High" or "Special" risk depending on the station planning area and various contributing factors. "Special" risks may not fall within the strict assessment criteria and are defined as a risk with extenuating circumstances (previous significant incidents, community or cultural significance, impact on the Department/Town's ability to provide services, etc.). Below are summaries of the maximum risk for each station planning zone.

	Station Planning Zone 1
Fire	One-Stop Tire & Auto
EMS	24-Hour Care Facilities (multiple)
HAZMAT	Comm Net
Tech Rescue	Rock Park *(rope rescue)*
Wildland	Occluded Risks, weather dependent

Station Planning Zone 2
Valley House Assisted Living
Valley House Assisted Living
Town of Castle Rock Maintenance
Memmen Ridge *(rope rescue)*
Occluded Risks, weather dependent

	Station Planning Zone 3
Fire	King Sooper's Fuel Center
EMS	Private Residences and motor vehicle accidents
HAZMAT	King Sooper's Fuel Center
Tech Rescue	State Highway 86 *(extrication)*
Wildland	Classic Risks, weather dependent

Station Planning Zone 4
Bonaventure Senior Living
24-Hour Care Facilities (multiple)
Castle Rock Adventist Hospital
Ridgeline Open Space *(rope rescue)*
Classic Risks, weather dependent

	Station Planning Zone 5
Fire	Castle Rock Care Center
EMS	24-Hour Care Facilities (multiple)
HAZMAT	Home Depot
Tech Rescue	Interstate 25 *(extrication)*
Wildland	Occluded Risks, weather dependent

Station Planning Zone 6
Sage Canyon Elementary School
Private Residences and motor vehicle accidents
State Highway 86
Rocky View Rd & Valley View Rd *(extrication)*
Mixed Risks, weather dependent

	Station Planning Zone 7
Fire	Assured Assisted Living
EMS	24-Hour Care Facilities (multiple)
HAZMAT	Direct TV & Pan Sat
Tech Rescue	I-25 Frontage Road *(extrication)*
Wildland	Mixed Risks, weather dependent

Station Planning Zone 8
Remote residential structures
Private Residences and motor vehicle accidents
Interstate I-25
I-25 Frontage Road *(extrication)*
Mixed Risks, weather dependent

	Station Planning Zone 9
Fire	Acme Brick Company
EMS	24-Hour Care Facilities (multiple)
HAZMAT	Pure Water Solutions
Tech Rescue	Miller Activity Complex *(rope rescue)*
Wildland	Mixed Risks, weather dependent

In addition to identifying the maximum risk by service and station planning zone, the team made five recommendations. Four of the recommendation will ensure the risk assessment remains current and consistent with the growth in the area. The fifth recommendation, looks to address a hazardous material risk to victims, rescuers, and the environmental should a fire occur within two businesses.

- Actively participate with other Town departments in development and planning phases for future growth to ensure and plan for fire and emergency responses.
- Consider an expanded hazardous materials commodity flow study that provides a more comprehensive overview of the materials being transported through the jurisdiction.
- Develop a sustainable methodology to ensure all new and updated commercial occupancies are evaluated using the current assessment model, and significant changes or special risks are communicated and accounted for in the response planning.
- Consider adopting the International Wildland Urban Interface (IWUI) code.
- Consider adding a Hazardous Materials Response for all reported fires at the following facilities due their volume and types of materials stored on-site:
    - Amerigas, 511 S. Gilbert St
    - Comm Net, 1555 & 1562 Park St
    - Plum Creek Water Purification Facility, 1929 Liggett Rd
    - Pure Water Solutions, 520 Topeka Way
    - Ray Waterman Regional Water Treatment Center, 1282 Castle Oaks Dr

Implementing these recommendations in conjunction with the Department's Standards of Cover will ensure that Castle Rock Fire and Rescue Department is aware and strives to mitigate the risks identifies.

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1. Introduction

Legal Basis

The Town of Castle Rock (TCR), 28 miles south of Denver, founded in 1874, is the county seat of Douglas County, Colorado, and named for the prominent castle tower-shaped butte near the center of town. The Castle Rock Fire and Rescue Department (CRFD) is the fire, rescue, and emergency medical services provider for the Town of Castle Rock, Colorado. The CRFD is a municipal department operating under the TCR, with seven council members elected to four-year terms, and one of which serves as mayor.

The TCR operates as a "home rule" municipality under the Constitution of the State of Colorado, and under the Council-Manager form of government.

As outlined in the Castle Rock Municipal Code, Section 3-4, Other Offices, (3), "the Fire Chief, who shall be responsible for planning and directing the work of the fire department, and shall perform such other duties required by this Charter, or as required by the Council or the Town Manager and not inconsistent with this Charter."

Additionally, Section 8.02.010 Emergency Response Authority of the Castle Rock Municipal Code states the following:

> "The Castle Rock Fire Department, the Fire Chief, and his or her duly authorized representatives are hereby assigned as the designated emergency response authority for hazardous materials incidents within the Town of Castle Rock. The Fire Chief shall provide an emergency response to hazardous materials incidents by taking necessary initial action to minimize the effects of such an incident and provide continued supervision and authority over all further efforts to eliminate the threat of immediate and irreparable harm to the environment or public health and safety."

Purpose

The purpose of the Community Risk Assessment is to define, identify and, if possible, quantify the risks to the community, the Department, and the Town. This document will identify, in detail, risks related to each of the department's five service categories: Fire Suppression, Emergency Medical Services, Hazardous Materials, Technical Rescue, and Wildland-Urban Interface. Responses to each risk type and magnitude are discussed the Department's Standards of Cover document. Discussion of the Town's disaster potential is found in the Town of Castle Rock Emergency Operations Plan.

Jurisdiction

The Castle Rock Fire and Rescue Department is a full-service, career organization protecting the life and property of the TCR (34 square miles with approximately 59,000 residents) and the Castle Rock Fire Protection District (CRFPD) (32 square miles with approximately 2,000 residents). The jurisdiction is divided into nine station planning zones (PZ) for the purpose of planning, analysis, and reporting. Each PZ covers a theoretical station area assuming the Town and Fire Protection District have reached

full build-out. These PZs are covered by four staffed fire stations, with a fifth scheduled to open in the fall of 2018.

PZ1 covers 6.95 square miles with an estimated population of 13,513 (population density 1,944/mile^2), and is 85% residential, 15% commercial, with 24% of its area dedicated as open space. PZ1 has 125 centerline road miles (measuring both directions of travel). PZ1 includes the historic Downtown area, Craig & Gould, Young American, Plum Creek, and The Woodlands neighborhoods and a section of railroad that runs parallel to Perry St. as well as a portion of Interstate 25 with two access points (exits 181, 182). Buildings in this PZ vary dramatically in their age (from late 1800's to current), construction and protection systems and residences have a median home value of $298,700. PZ1 covers two high schools, three elementary schools, one multi-story senior facility, two assisted living facilities, one skilled nursing center, four multi-family condos/apartment complexes and 18 churches.

PZ2 is the smallest of the PZs at 0.88 square miles with an estimated population of 1,827 (population density 2,076/mile^2), and is 98% residential, 2% commercial with 15% of its area dedicated as open space. PZ2 has 16 centerline road miles (measuring both directions of travel). PZ2 covers Homestead Village, Aspen Grove Condos and the Winrock Apartments. The houses are of earlier construction (late 70's to the early 2000's) with median home value of $258,400. PZ2 also includes one elementary school, one multi-story senior facility, four churches and two condo/apartment complexes.

PZ3 covers 9.05 square miles with an estimated population of 10288 (population density 1,137/mile^2), and is 99% residential, 1% commercial with 11% of its area dedicated as open space. PZ3 has 123 centerline road miles (measuring both directions of travel). PZ3 includes Founders Village and Castlewood Ranch neighborhoods as well as a section of State Highway 86. The construction in PZ3 is typical construction from the mid 1970's to current lightweight methods with a median home value of $251,400. PZ3 has one middle school, two elementary schools, and four churches.

PZ4 covers 6.0 square miles and is the Department's most populous PZ with an estimated of 13,720 (population density 2,287/mile^2) and is 94% residential, 6% commercial with 18% of its area dedicated as open space. PZ4 has 145 centerline road miles (measuring both directions of travel). PZ4 includes The Meadows, and The Pines as Castlegate neighborhoods. Additionally, this zone contains the site of one of the nation's largest mixed use construction sites, The Promenade. This site is being development in multiple phases and will eventually encompass roughly 1,000,000 square feet of commercial and residential over commercial space. In conjunction with The Promenade and to ease traffic congestion on Meadows Parkway, the Town of Castle Rock partnered with the Colorado Department of Transportation to build the North Meadows Extension. The project will connect North Meadows Parkway with Interstate 25, and includes two bridges and a new exit for I-25. The residential construction in PZ4 is primarily lightweight with the vast majority of the homes built within the last 15 years with a median home value of $279,700. PZ4 has three elementary schools, one middle school, one high school, Castle Rock Adventist Health Campus, The Outlets at Castle Rock, the Douglas County Justice Center, one large multi-story senior facility, several single story senior facilities, four churches, portions of Interstate 25, State Highway 85 and a section of railroad on it eastern boundary.

PZ5 covers 9.0 square miles with and estimated population of 6,975 (population density 775/mile^2) and 92% residential, 8% commercial, and 9% of its area dedicated as open space. PZ5 has 93 centerline road miles (measuring both directions of travel). PZ5 includes Diamond Ridge, Sapphire Point, Metzler Ranch, Maher Ranch, Brookwood, Silver Heights, and Echo Ridge neighborhoods. Residential

construction varies from the 1970's to current lightweight methods with a median home value of $400,500. PZ5 has one elementary school, two multi-story senior care facilities, several "big box" retail stores, portions of Interstate 25, State Highway 86.

PZ6 covers 6.9 square miles with and estimated population of 3,764 (population density 544/mile^2) and 99.9% residential, .1% commercial, and 40% of its area dedicated as open space. PZ6 has 79 centerline road miles (measuring both directions of travel). PZ6 includes Castle Oaks, Terrain, Liberty Village and Cobblestone Ranch neighborhoods. The construction in PZ6 is primarily lightweight with the vast majority of the homes built within the last 15 years with a median home value of $406,800. PZ6 has one elementary school and is bordered to the south and west by State Highway 86 and to the east by State Highway 83.

PZ7 covers 16.8 square miles with an estimated population of 3,587 (population density 214/mile^2) and is 99% residential, 1% commercial and 6% of its area dedicated as open space. PZ7 has 96 centerline road miles (measuring both directions of travel). PZ7 includes, Crystal Valley Ranch, Heckendorf Ranch, The Lanterns, Ditmars Ranch, Bell Mountain Ranch, and Lost Canyon Ranch neighborhoods. The residential construction varies greatly from typical 1970's construction to current lightweight methods with a median home value of $358,400. PZ7 is largely residential with one notable exception, a large satellite communication facility in the far southwest corner of the PZ. PZ7 is bordered to the west by a section of railroad running parallel to the east frontage road of Interstate 25. The Department has been monitoring growth in this PZ, and tracking performance. The Department has recognized that it cannot meet its established baselines in the most populated areas of PZ7. As calls for service increase, in PZ7 and district wide, the likelihood that a 2nd due company will be responding increase as well. To address these concerns, the Department has begun planning and design for a new fire station, estimated to open in 2018.

PZ8 covers 5.3 square miles with an estimated population of 252 (population density 48/mile^2) and is 100% residential. PZ8 has 26 centerline road miles (measuring both directions of travel). PZ8 is largely undeveloped covering Yucca Hills, and portions of Keene Ranch, both within unincorporated Douglas County. Yucca Hills has older homes and various lots sizes. Keene Ranch, has larger higher priced homes on minimum of 5 acre lots. Keene Ranch is a shared response area with Jackson 105, a mostly volunteer agency to the west. Additionally, to access Keene Ranch, CRFD units must leave the jurisdiction, on Tomah Rd, before they can make entry into the neighborhood. PZ8 also contains a section of railroad that runs parallel to the west frontage road for Interstate 25. The median home value in PZ8 is $615,600.

PZ9 covers 4.6 square miles with an estimated population of 7,111 (population density 1,546/mile^2) and is 97% residential, 3% commercial with 30% of its area dedicated as open space. PZ3 has 64 centerline road miles (measuring both directions of travel). PZ9 includes the Red Hawk, Castle Highlands, Castle Meadows, and the Reserve at Castle Highlands neighborhoods. The construction in PZ9 is primarily lightweight with the vast majority of the homes built within the last 15 years with a median home value of $397,400. PZ9 includes one elementary school, one large senior facility, a large multi-use indoor/outdoor recreation center and miles of soft-surface recreational trails. For several years, this PZ has met the minimum call volume requirements to consider a new fire station. However, given that the response times for the first arriving unit and effective response force are within the annually established baselines, the Department has elected to not build a fire station in this area yet. The Department will

monitor call volume and performance quarterly and annually to identify trends that could negatively affect the residents in this area.

Station 151 is located in the historic downtown area of Castle Rock with two access points to Interstate I-25 (exits 181, 182). Station 151's district is the 2nd largest within the jurisdiction at 22.4 square miles (34%), having approximately 286 road miles (35%), and an overall population of roughly 18,894 (31%) residents. Station 151 maintains primary response coverage for PZ1, PZ2, PZ8, and the majority of PZ7.

Station 153 is located within a residential neighborhood on the eastern side of the jurisdiction. Station 153 's district is the largest of CRFD's station districts at 23.5 square miles (36%) having approximately 211 road miles (26%) and an overall population of roughly 14,337 (23%) residents. Station 153 maintains primary response coverage for PZ3, part of PZ6, and a portion of PZ7.

Station 154 is located in the northwestern portion of the jurisdiction, just to the east of the Department's highest population center, and west of the main retail center with a single point of access to I-25 (exit 184). Of the four station districts, Station 154 ranks third with respect to area and road miles, 10.6 sq. miles (16%) and 219 miles (27%) respectively. Station 154 is the most populous district, in excess of 20,831 (34%) residents. Station 154 maintains primary response coverage for PZ4 and PZ9.

Station 155 is located in the northeastern portion of the jurisdiction centered between several residential neighborhoods and east of Castle Rock's main retail centers. Station 155 has the smallest district with respect to area, road miles, and overall population at 9.0 sq. miles (14%), 98 (12%), and 6975 (11%) respectively. Station 155 maintains primary response coverage for PZ5 and part of PZ6.

Deployment Capabilities

Castle Rock Fire and Rescue Department maintains a minimum daily staffing of 19 fire fighters and officers across four fire stations. All CRFD apparatus (suppression and medic units) are ALS capable with at least one paramedic and a full complement of ALS medications and equipment. Minimum staffing on each of the four suppression apparatus is three members; one officer, one engineer (driver/operator), and one fire fighter. Minimum staffing on each of the three medic units is two members with at least one paramedic. Daily staffing also includes one battalion chief. Additionally, each station houses at least one cross-staffed apparatus. A cross-staff apparatus requires the crews to respond in equipment other than their primary vehicle, leaving the primary vehicle out of service.

Table 1.1

	Daily Staffing (minimum)				
	Suppression Apparatus	Medic	Battalion Chief	Cross-Staffed Units	Daily Staffing
Station 151	Engine 151 4 (3)	Medic 151 2 (2)	BA151 1 (1)	Brush 151	7 (6)
Station 153	Engine 154 4 (3)	Medic 153 2 (2)	N/A	Brush 153 Tracked Rescue Vehicle HazMat 153	6 (5)
Station 154	Engine 154 3 (3)	Medic 154 2 (2)	N/A	Brush 154 Squad 154	5 (5)
Station 155	Quint 155 4 (3)	N/A	N/A	Brush 155	4 (3)
	15 (12)	6 (6)	1 (1)	0	22 (19)

In 2011 the Department completed a critical task analysis (CTA) that evaluated each incident type that the department may respond to and identified the critical tasks needed to mitigate the incident and the number of people require to complete those tasks. The Department verified these CTAs in early 2016 to ensure that with changes in tactic and best practices, the required response meets the risks identified.

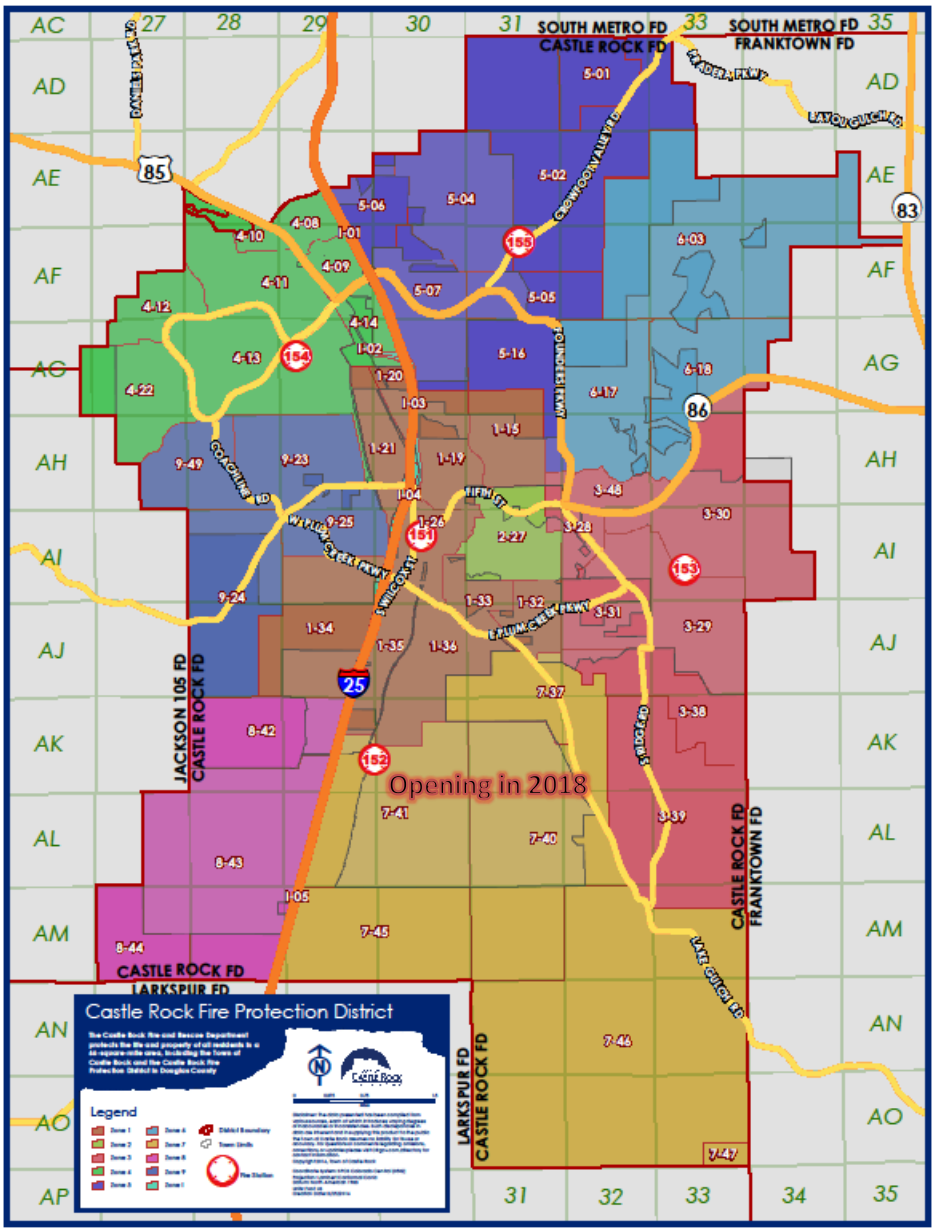
Based on the 2016 CTAs, if all units are available, Castle Rock Fire and Rescue Department is capable of responding to and mitigating;

- Three simultaneous medical incidents
- One single motor vehicle accident with extrication and one non-CPR medical incident
- One single alarm residential structure fire and one non-CPR medical incident
- One single alarm commercial structure fire
- One single alarm wildland urban interface fire (non-red flag day) and one non-CPR medical incident

Even with all units available, Castle Rock Fire and Rescue Department requires mutual aid for either personnel or equipment to respond to and mitigate:

- Any complex technical rescue incident
- Any complex hazardous materials incident
- Any wildland fire on a red-flag day (automatically adds a second alarm)

Map 1.1 Deployment



Automatic and Mutual Aid Agreements

Castle Rock Fire and Rescue Department maintains several mutual and automatic aid agreements. These agreements are reviewed annually by CRFD Executive staff to ensure each agreement is current and valid.

- Larkspur Fire Protection District – Automatic Aid
- Jackson 105 Fire Protection District – Automatic Aid
- Franktown Fire Protection District – Automatic Aid
- South Metro Fire and Rescue Authority – Automatic Aid
- Front Range Mutual Aid Agreement
- Douglas County Mutual Aid Agreement

Total Population and Population Density

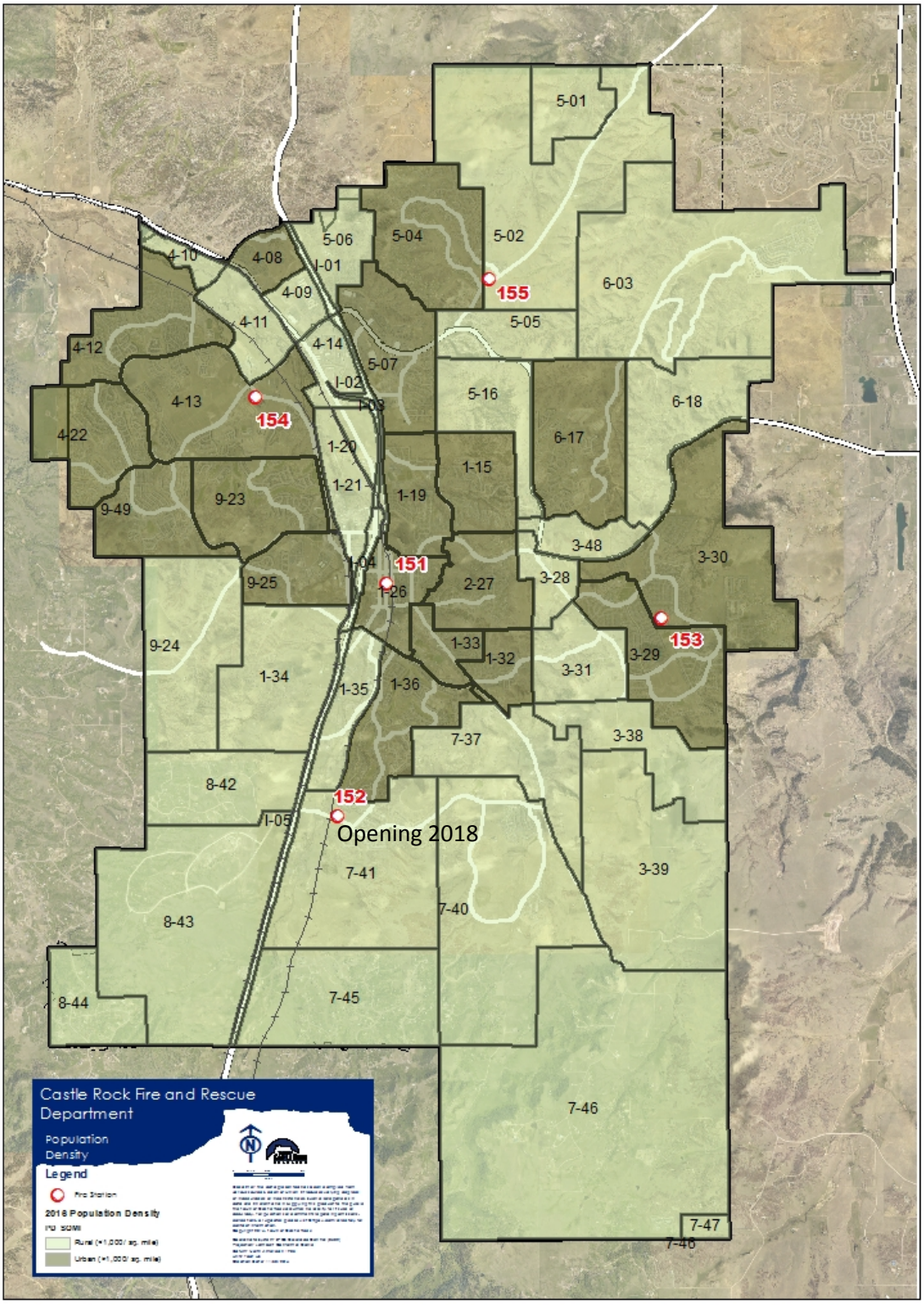
CRFD provides fire and emergency services to 61,000 residents within a 66 square mile jurisdiction, with an overall population density of 924 residents/mile2. CRFD defines population densities as follows:

Rural: Less than 1,000 residents/mile2

Urban: Greater than 1,000 residents/mile2

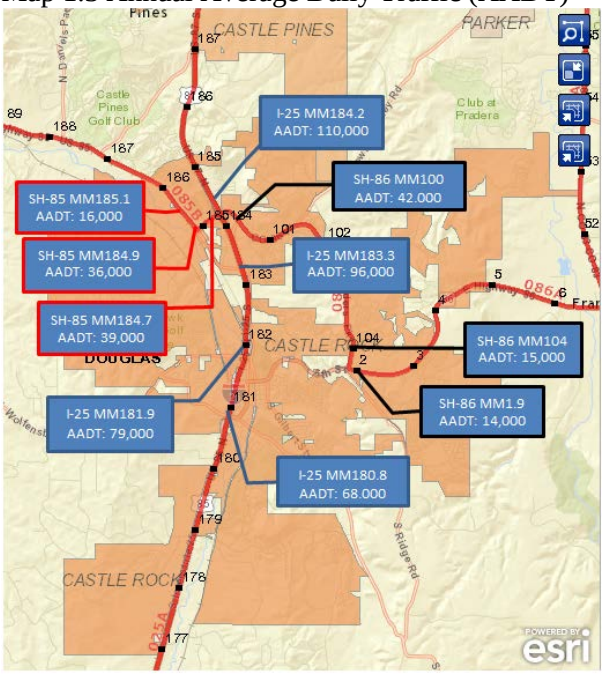
Overall, CRFD's jurisdiction is considered low with less than 1,000 residents/mile^2. However, CRFD's jurisdiction is divided between two entities, the Town of Castle Rock (TCR), and the Castle Rock Fire Protection District (CRFPD). The Town of Castle Rock's Development Services maintains an annual estimate of the resident population for the 34 square miles of the Town of Castle Rock. As of September 2015, the population within town limits is 59,000. The population density for the Town is 1,735/mile^2, and is considered an urban population density. The Castle Rock Fire Protection District represents the remaining 32 square miles of CRFD's jurisdiction and has an estimated population of 2,000 residents CRFPD's population density is 63 residents/mile^2, and is considered a rural population density. Furthermore, the population is concentrated in neighborhoods throughout the jurisdiction resulting in pockets of higher population densities. Therefore, CRFD has determined the population density within each of the 56 fire management zones (FMZ) and assigned a density value of rural or urban as appropriate. The Department has established performance guidelines for the low and high population densities. These performance guidelines are monitored monthly and revised annually as needed.

Map 1.2 Population Density Map



Daily Population Fluctuation and Highways

Map 1.3 Annual Average Daily Traffic (AADT)



In September 2015, the Department completed a Daytime Population Study (Town of Castle Rock, 2015) that examined several influences leading to an increased daily population. The population of Castle Rock is estimated to increase on a daily basis to roughly 80,000. The Town of Castle Rock follows the Douglas County model with roughly 60% of the residents leaving the county for work. The increase in daytime population comes from the influx of employees for local businesses and shoppers. This increased population is focused in the Founders retail area (FMZ 15507) and the area of the Outlets at Castle Rock (15409). Additionally, CRFD has one interstate (I-25) and two state highways (SH-85, SH-86) within its jurisdiction. While the vehicles traveling on these roads may or may not be residents of the Castle Rock, CRFD must respond to all types of emergencies on these thoroughfares. Based on the Department's 2015 Daytime Population Study (Town of Castle Rock, 2015), the average daily transportation population on the road system in the Castle Rock area is approximately 118,070 vehicles per day or about 4,920/hour. Compared to data collected in 2011, there has been a total increase in traffic of 13.5%. Peak travel hours for Interstate 25, State Highway 85, and State Highway 86 are 05:00 through 22:00 (5AM – 10PM).

Demographics

Overall, Castle Rock is a young, affluent community with Forbes ranking Douglas County the 8th richest county in the Unites States (Forbes, 2015). As seen in table 1.2, the median age in Castle Rock is 33.8, which is younger than the Douglas County, State of Colorado, and National median ages of 36.6, 36.1, and 37.2 respectively with 49.6% male and 50.4% female. Further analysis shows that the senior population, 65 years and older, of Castle Rock is 6.2%. This is lower than the Douglas County, State of Colorado, and National averages of 7.1%, 10.9%, and 13% respectively. The youth populations, under 5 years and under 18 years, are higher than the County, State, and National averages (U.S. Census n.d.).

Table 1.2	Castle Rock	Douglas County	Colorado	United States
Median Age (years)	33.8	36.6	36.1	37.2
Under 5	9.2%	7.7%	6.8%	6.5%
Under 18	32.4%	30.5%	24.4%	24%
18 – 64 years	52.2%	54.7%	57.9%	56.5%
65 Years and Older	6.2%	7.1%	10.9%	13.0%
Male	49.6%	49.5%	50.1%	49.2%
Female	50.4%	50.5%	49.9%	50.8%

When compared to State and National statistics, Castle Rock (Table 1.3) is a relatively homogenous demographic, with 84.7% percent of the population identifying as White, 10.0% as Hispanic or Latino, 2.8% Two or More Races, 1.7% Asian, 1.1% as Black/African American, 0.6% American Indian/Native Alaskan, and .01% as Native Hawaiian/Pacific Islander (U.S. Census n.d.).

Table 1.3	Castle Rock	Douglas County	Colorado	Unites States
White	84.7%	85.2%	70.0%	63.7%
Hispanic or Latino	10.0%	7.5%	20.7%	16.3%
Two or More Races	2.8%	2.6%	3.4%	2.9%
Asian alone	1.7%	3.8%	2.8%	4.8%
Black or African American	1.1%	1.2%	4.0%	12.6%
American Indian and Alaskan Native	0.6%	0.4%	1.1%	0.9%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%	0.1%	0.2%

The Town of Castle Rock exceeds the state and national averages (table 1.4) with respect to education for residents that are 25 years or older (U.S. Census, n.d.).

Table 1.4	Castle Rock	Douglas County	Colorado	United States
Less than High School	4.52%	2.45%	10.08%	14.28%
High School Graduate	16.76%	13.69%	22.36%	28.24%
Some College or Associate Degree	33.62%	29.04%	30.89%	28.99%
Bachelor Degree	31.33%	37.09%	23.45%	17.88%
Master, Doctorate, or Professional Degree	14.71%	17.73%	14.08%	13.47%

Castle Rock's median income from 2010-2014 was $86,563, significantly higher than both the Colorado and National medians of $59,448 and $53,482 respectively, but lower that the Douglas County median of $102,626 (U.S. Census, n.d.). The median home value in Castle Rock from 2010-2014 was $283,700 which was higher than the Colorado and National medians of $239,400 and $175,700 respectively, but lower than the Douglas County median value of $340,300 (U.S. Census, n.d.).

Growth and Development

In the past five years, the Town of Castle Rock has seen an increase in nearly all of its growth indicators (Table 1.5). In addition the growth factors in table 1.5, the Town of Castle Rock experienced a 39% increase in utility accounts, and a 20% increase in full time employees. Fire and emergency services incidents have increased by 38% percent. In 2012, the Castle Rock Police Department updated how it classified calls for service to more closely follow national trends.

Table 1.5	2010	2015		2020 (projected)	
Town Population	46,261	59,000	27.5%	68,800	17%
Total Business Licenses	130	647	40.0%	850	32%
Total Lane Miles	531	613	15.4%	669	9%
Developed Park Acres	293	331	13.0%	359	9%
Police Calls	52,376	73,045	39.5%	88,870	22%
Fire/EMS Calls	3,758	5,199	38.3%	6,300	21%

In the next five years, the Town of Castle Rock's Development Services Department estimates the population within the Town of Castle Rock will reach roughly 68,8000 residents, representing a 17% increase. Road miles are anticipated to increase by 9% due to residential and commercial growth. Developed park acres are expected to increase by 9% to stay consistent with the Town's Master Plan. Both the Castle Rock Police Department and Castle Rock Fire and Rescue Department conservatively estimates a 4% annual increase in call volume based on long-term trending.

The Town is the site of a nearly 1,000,000 square foot mixed use (retail, light commercial and residential) project, The Promenade. There are several other new commercial projects around the Town that equate to roughly 250,000 square feet of space, with several more in the planning stages.

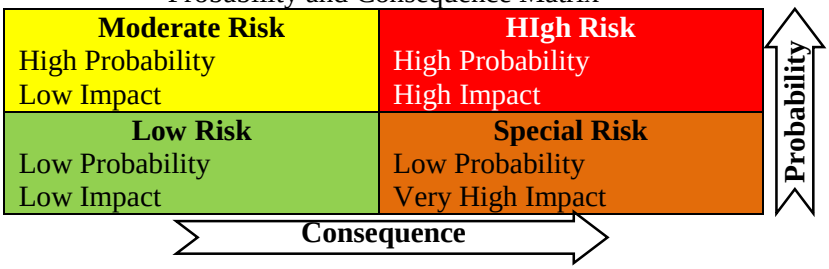
2. Risk Assessment Methodology

In determining the risk for each service category, data from January 1, 2011 through December 31, 2015 was evaluated. The data studied and complied for this report was obtained through several sources, to include, but not limited to High Plains©, Emergency Reporting™, and internal documentation or reports. Data analysis is completed using several systems; exports into MS Excel, StatsFD, Emergency Reporting™, and ArcGIS.

Using information provided by the Center for Public Safety Excellence, as well as personal experiences, education, and information on risk management from industry experts, the Department has adopted table 2.1 to define risk:

Table 2.1

Probability and Consequence Matrix



For the application of table 2.1, the terms consequence and probability shall be defined as follows;

Consequence: 1) The negative impact of an incident or event on the Department's or Town's short term or long term, ability to provide continuous service to the residents. 2) The negative effect of an incident or event on the cultural, historic or financial aspects of the Town.

Probability: Based on recent history, the likelihood an incident will occur.

Generally speaking, as the level of risk increases, so should the level of response, i.e. A High/Special Rick incident will require more resources (apparatus, equipment, and personnel) than a low risk incident. This frequency / risk table follows each service type's risk assessment.

Fire Risk Methodology

All existing commercial occupancies were evaluated using the Occupancy Vulnerability Assessment Profile (OVAP), the OVAP evaluation was completed in June 2014. The Department recognizes that with the expected growth within the jurisdiction that updating the OVAP spreadsheet needs to be an on-going effort. There are four OVAP risk levels. As shown in table 2.2, CRFD includes a fifth risk level, Special Risk. A special risk is not defined by a numerical score, but rather represents a historical, cultural, or otherwise irreplaceable aspect within the community, or poses a significant operational challenge (i.e. fire flow requirement greater than 4250 GPM, type of construction, or a high life safety risk). Additionally, a special risk could also be based on previous experience/incidents, or aspects that the OVAP does not consider.

Table 2.2 Fire Risk Levels

Risk Level	OVAP Range	Number of Occupancies
Low	<20	6
Moderate	20 – 39	1304
Significant	40 -59	21
Maximum	>60	0
Special	N/A	50
	Total	1381

For commercial occupancies, the needed fire flow is calculated using the International Code Council's 2012, table B105.1 MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS (Appendix A).

EMS Risk Methodology

Emergency Medical Services (EMS) incidents represent the majority of CRFD's calls for service at 58% of all calls. Historical call volume, population density, and occupancy type, specifically senior housing and nursing facilities, have shown to be a good indication of the probability of future EMS call volume. It is important to note that motor vehicle accidents (MVA) are included in the EMS category.

HAZMAT Risk Methodology

As part of the HAZMAT risk assessment the Department completed a Hazardous Materials Commodity Study (Town of Castle Rock, 2016) in early 2016. This study evaluated all commercial facilities, state, and interstate highways, the local rail system and any heli-port or air strips within CRFD's jurisdiction. The study identified all Tier II facilities per SARA Title III and established a risk (Low, Ordinary, High, Special) for each facility. The Department has 142 businesses ranging from retail to light industrial that maintain a reportable quantity of materials per SARA Title III, 36 miles of state or interstate highway, 18 miles of railroad, two heliports, and one airstrip. All SARA Title III businesses are inspected annually and rated as Low, Ordinary, High or Special risks (based on material stored, process hazard, structural concerns, quantity, and/or potential impact to the community or environment).

Table 2.3

Risk Level	Number of Occupancies
Low	44
Ordinary	70
Significant	14
Special	14

Technical Rescue Risk Methodology

Technical rescue, defined as building collapse, confined space, heavy extrication (commercial carriers, dump trucks, buses, etc), high/low angle rope rescue, and ice/water rescue, proves to be a difficult risk to quantify. Calls for service are extremely low for this category, and represent a significant risk to the patient/victim as well as responders due to the inherent hazards involved. The technical rescue risks are evaluated based on historical call volume by PZ, population density, and topographical features (canyons, rock cliffs, etc.).

The primary risk for building collapse is due to vehicles accidents (vehicle into a building), ignition of a gas leak, or collapse during renovation. There are four fault lines within Douglas County with a maximum projected magnitude of 5.5. There have been no major earthquakes within the Town of Castle Rock or Douglas County.

Confined space risks are found throughout the jurisdiction in water, sewer, and utility areas. For the purpose of this document, the team identified locations within each PZ that require a confined space permit before entering.

Heavy extrication is possible throughout the jurisdiction. However, the probability increased on the major routes, state, interstate highways, and railroad crossings.

Rope rescue has two distinct levels of risk, high angle and low angle. High angle rope rescue present a much greater risk to all persons involved. Whereas, low angle rope rescue presents a lower risk to patient/victims and rescuers. The primary distinction between low and high angle rescue is the rope system represents a safety system not a method of extrication.

Trench rescue is a dynamic risk that changes frequently based on commercial and residential development, in addition to the needed utility and infrastructure work to support a growing community. As such, it is not practical to identify the maximum risk within each PZ.

Water/Ice Rescue risks are seasonally dependent, the team looked at two main areas: still water and moving water. In looking at the still water risk, the team identified all year-round ponds of water and detention ponds by PZ. Year-round ponds represent a higher risk than detention ponds and also pose the highest ice rescue risk. Detention ponds are typically dry, designed to control stormwater runoff during heavy rain events. All detention ponds are designed to hold a maximum depth of 10 feet in depth during a 100-year storm/event. Risk for all ponds is based on ease of access or position near the Town's existing trail system. High risk ponds are within 100 feet of the Town's trail system. With respect to moving water the team evaluated three aspects: 100-year flood plan, potential velocity, and stream cross-section. First the team looked at the 100-year flood plain, the expected width of a stream during a 100-year storm. Second the team looked at potential velocity. The Town of Castle Rock Utilities department identifies a stream velocity greater than 11 feet per second as an area for stream improvements as defined within the 2010 Stormwater Master Plan (Castle Rock, 2010). Third, the team looked at stream cross section (depth/width). The Town of Castle Rock Utilities department identifies a stream cross section greater than .22 as an area for stream improvements as defined within the 2010 Stormwater Master Plan (Castle Rock, 2010). Each of these factors were mapped to identify high risk

areas, where one of the factors are within 100 feet of a trail or recreation area. Special risk for moving water are areas where two or more of these factors are within the 100 feet of the Town's trail system.

Wildland-Urban Interface (WUI) Risk Methodology

Wildland-urban interface risks are prevalent throughout CRFD's jurisdiction. There are three widely accepted risk categories; classic, mixed, and occluded. Classic wildland risk is defined by having a clear demarcation between wildland fuels and structures/improvements (e.g. neighborhood boundaries). Mixed wildland risk is defined by structures/improvements that are scattered and intermingled with wildland fuels. Occluded wildland risk is defined by areas within a city/town where structures abut islands of wildland fuels (open spaces, drainage areas, etc.). Generally speaking, Castle Rock has all three types of wildland risk. Classic is the most predominant. It is important to note, that all risk types have potential to cause a significant fire with homes, structures, and lives lost.

To help quantify the wildland-urban interface risks the Department elected to look at wildland risk based on structures at risk. For the purpose of this study CRFD further refined the three WUI risks as;

- Classic: platted lots directly abutting wildland fuels that are less than one acre in size
- Mixed: platted lots intermixed with wildland fuels that are greater than one acre is size
- Occluded: areas of unmaintained wildland fuels within 100 feet of homes of businesses

For each PZ, the department has established the number of structures within each risk type (classic, mixed, and occluded). This does not imply that if a wildland fire were to occur, that many structures would be threatened or lost, only that there are many structures within each risk type. The actual threat to structure and lives depends entirely on circumstances of that fire (fuels, topography, weather, and fire behavior).

From 1999 to 2008, the Castle Rock Fire and Rescued Department averaged 16 wildland fires a year with most fires less than five acres and all controlled in the first operational period (the first 12 hours of an incident). With fire occurrence in the lowest category measured by the number of fires per year per 1000 acres, this is expected to increase. Most fires in Colorado are human-caused. As the population grows, the number of ignitions will likely increase. The Town of Castle Rock is an attractive place to live and play in part because of its topography and landscape. These features raise cause for concern as it pertains to potential rate of spread (the speed at which fire moves in a horizontal direction across the landscape). Of the 125,801 acres evaluated, 110,371 acres rate from high to extreme. A second category worth considering is the flame length characteristic. Flame length, is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame. Most of the area served rates as moderate with a flame length of 4-8 ft. The last category that merits consideration is the fire intensity scale (FIS). Similar to the Richter scale for earthquakes, FIS provides a standard scale of 1 – 5 to measure potential wildland fire intensity. Three environmental factors are considered (fuels, weather, and topography) in developing this category. The vast majority of Castle Rock is considered to be in Class 4 or High. Class 4 is characterized by large flames up to 30 feet in length, short-range spotting common with medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective whereas indirect attack may be effective. Significant potential for harm or damage to life and property exists.

3. Fire Risks

The Town of Castle Rock has a very diverse inventory of buildings and construction types that pose various fire risks. There are a number of buildings that were built in the late 1800's and early 1900's, modern homes with light weight construction, several multi-story senior living facilities, several multi-story condo or apartment complexes, large retail complexes, and mixed light industrial facilities. There are residential occupancies in each of the nine PZs. The majority of the industrial occupancies are located in PZs 1 and 9, and the vast majority of retail occupancies are located in PZs 1, 4 and 5.

At jurisdictional level, Castle Rock Fire and Rescue's commercial fire risk is overwhelmingly Moderate with 94% of all commercial occupancies scoring between 20 and 39 per the OVAP worksheet and only 22 occupancies score as significant and 48 deemed as special risks. Map 3.1 (Appendix B) shows the distribution of all commercial occupancies and their associated risks throughout the jurisdiction and within each of the nine PZs.

Table 3.1 CRFD OVAP Risk Levels

Risk Level	OVAP Range	Station Planning Zone									
		CRFD	1	2	3	4	5	6	7	8	9
Low	<20	6	2	1	0	2	1	0	0	0	0
Moderate	20 – 39	1304	681	9	25	328	202	4	5	0	50
Significant	40 -59	21	15	1	1	1	3	0	0	0	0
Maximum	>60	0	0	0	0	0	0	0	0	0	0
Special	N/A	50	18	2	3	8	7	1	3	0	8
Total Occupancies		1381	716	13	29	339	213	5	8	0	58

Table 3.2 places each of the 171 fire incidents, from 2011 through 2015, into their relevant risk categories. It is important to note that 10 passenger car fires and six commercial carrier fires were located on Interstate 25, and there were two residential structure fires that did not have a PZ assigned. The highest frequency events are residential structure fires, passenger car fires, and commercial structure fires. In the five-year evaluation period there were two fires within significant or special risk occupancies for a combined loss of 17,000 dollars.

Fire Risk Table 3.2 CRFD Fire Risk

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (45)	Residential Structure Fire (66)	Commercial Structure Fire (34)
	Low	Commercial Carrier Fire (10) Unattached Building Fire (6) Dumpster Fire (9) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (1)

Since 2011 Castle Rock had experienced only one fire related death. This incident occurred in a multi-family occupancy in which the resident apparently disabled the smoke detectors in the unit. The Department responded to a call for service for a water leak. Upon entering the apartment crews recognized that at some point there was a fire. Crews exited the structure and donned the appropriate PPE, and reentered locating the deceased. No suppression activities were required.

Station Planning Zone 1: Fire

Planning Zone 1 (PZ1) is primarily residential (85%) with a urban population density (1,944/mile^2). However, PZ1 contains 52% of the jurisdiction's commercial occupancies. Map 3.2 (Appendix B) displays all the commercial occupancies in PZ1. As evident by the map, the bulk of the occupancies are in the Downtown and Park St / Caprice Dr areas. PZ1 contains 18 Special Risk occupancies and 15 Significant Risk occupancies (table 3.3). PZ1 contains eight schools, three bowstring roofed buildings, each with multiple occupancies, and two 24-hour care facilities. In addition to the special risks, PZ1 has 15 significant risk occupancies, see Table 3.4 for their OVAP score and needed fire flow. There were only two fire incidents at either a Special or Significant. Both incidents (13-0848, 15-0302) occurred at a Significant Risk structure within the Rolling Hills Apartments* and resulted in zero injuries or fatalities causing an estimated combined dollar loss of $17,000. The residential fire risk in this area varies from late 1800's construction to current lightweight construction.

The single greatest fire risk in PZ1 is One-Stop Tire and Auto at 414 Wilcox St. The building is classified as a Special Risk and poses numerous complications due to the type of construction, and business type. The building is a Type IV construction with a bowstring roof that houses an auto repair facility. Of special note[1], there are three Special Risk HAZMAT facilities (Comnet Wireless, Amerigas, and Plum Creek Water Purification Facility) in PZ1 the team recommends the addition of a Hazardous Materials response as part of the 1st alarm commercial structure fire assignment.

Table 3.3 Special Risk PZ1

Special Risk		
Address	OVAP	Reason for "Special" rating
1297 S Perry St.	43	24-Hour Care Facility
201 Fourth St.	41	Bowstring Roof
414 N Wilcox St.	41	Bowstring Roof
107 N Wilcox St.	40	Bowstring Roof
807 N Wilcox St.	36	Bowstring Roof
1057 N Park St.	34	School
15 S Gilbert St.	34	School
205 Fourth St.	33	Bowstring Roof
105 N Wilcox St.	32	Bowstring Roof
209 Fourth St.	32	Bowstring Roof
2693 N Front St.	31	School
2842 N Front St.	29	School
221 N Cantril St.	27	24-Hour Care Facility
203 Fourth St.	27	Bowstring Roof
1103 Canyon Dr.	26	School
961 Plum Creek BLVD	26	School
780 S Interstate Highway 25	26	School
312 N Cantril St.	22	School
511 S. Gilbert ST	30	HAZMAT Risk[1]
1562 Park St	29	HAZMAT Risk[1]
1929 Liggett Rd	25	HAZMAT Risk[1]

Table 3.4 Significant Risk

Significant Risk (40-59)		
Address	OVAP	Fire Flow
515 Jerry St.	52	1500 (2 hours)
1101 Auburn Dr.	44	2000 (2 hours)
300 N Wilcox St.	43	1500 (2 hours)
1135-1291 S Gilbert St.	43	3500 (3 hours)
221 Fourth St.	42	3500 (3 hours)
400 Third St.	42	2750 (2 hours)
111-133 N Wilcox St.	42	3250 (3 hours)
100 S Wilcox St.	42	1500 (2 hours)
125 S Wilcox St.	41	2750 (2 hours)
1129 S Eaton Cr.*	41	2000 (2 hours)
415 N Perry St.	41	1500 (2 hours)
111 N Wilcox St.	41	3250 (3 hours)
107 N Wilcox St.	40	1500 (2 hours)
880 S Perry St.	40	1500 (2 hours)
884 Park St.	40	1500 (2 hours)

PZ1 is the most active PZ with respect to fires with a total of 52 fire incidents, 30% of all fires, from 2011 through 2015 as shown in table 3.5.

Table 3.5 Fire Risk PZ1

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (12) Dumpster Fire (6)	Residential Structure Fire (15)	Commercial Structure Fire (16)
	Low	Commercial Carrier Fire (1) Unattached Building Fire (1) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (1)

Station Planning Zone 2: Fire

Planning Zone 2 (PZ2) is the smallest of the PZs and is 98% residential with a urban population density (1,827/mile^2). However, PZ2 contains 13 (1%) commercial occupancies; of those occupancies, two are considered Special Risk, see table 3.6 and map 3.3 (Appendix B) for details. The remaining occupancies are either Moderate (9) or Low (1) risk. There are two apartment complexes in PZ2, Aspen Grove Condos and Winrock Apartments. The residential fire risk in PZ2 varies from typical construction of the 1970's to early 2000's. PZ2 has a small area that is not serviced by hydrants, however, there are no commercial occupancies in that area. Additionally, for all structure fires in the un-hydranted area, three water tenders are automatically added to the initial response.

The single greatest fire risk in PZ2 is The Valley House a two story 24-hour senior care facility. While the building is protected with sprinklers, there is a high life hazard, and many occupants requiring assistance to evacuate.

Table 3.6 Special / Significant Risk PZ2

Special Risk		
Address	OVAP	Reason for "Special" rating
255 S Valley Drive	39	24-Hour Care Facility
1100 South Street	29	School

Table 3.7 Significant Risk

Significant Risk (40-59)		
Address	OVAP	Fire Flow
202-294 Oman Road	41	2500 (2 hours)

PZ2 experienced relatively low fire incidents form 2011 through 2015 (Table 3.8), with eight fire incidents (5%), seven residential, and one commercial (Winrock Apartments). During that same time frame, there were no fire incidents in a Special or Significant risk occupancies in PZ2.

Table 3.8 Fire Risk PZ2

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (0)	Residential Structure Fire (7)	Commercial Structure Fire (1)
	Low	Commercial Carrier Fire (0) Unattached Building Fire (0) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (0)

Station Planning Zone 3: Fire

Planning Zone 3 (PZ3) is nearly all residential (99%) with a urban population density (1,137/mile^2). PZ3 contains a total of 29 (2%) commercial occupancies (Map 3.4, Appendix B). Of those 29 occupancies, there are three Special Risk occupancies, all schools (table 3.9). There is also one Significant Risk occupancy, a fueling station (Table 3.10). The residential construction is typical construction from the mid 1970's to current lightweight methods.

The single greatest fire hazard in PZ3 is the King Sooper's fueling station at 750 N Ridge Road, due to the amount of combustible liquid. Of special note[1], there is one Special Risk HAZMAT facilities (Ray Waterman Regional Water treatment Facility) in PZ3 the team recommends the addition of a Hazardous Materials response as part of the 1st alarm commercial structure fire assignment.

Table 3.9 Special / Significant Risk PZ2		
Special Risk		
Address	OVAP	Reason for "Special" rating
104 Lovington St.	30	School
400 N Heritage Ave	29	School
365 Mitchell St.	26	School
1282 Castle Oaks Dr	23	HAZMAT Risk[1]

Table 3.10 Significant Risk		
Significant Risk (40-59)		
Address	OVAP	Fire Flow
750 N Ridge Rd.	40	1500 (2 hours)

PZ3 was the 3rd busiest PZ for fires from 2011 through 2015 with 21 (12%) fire incidents (Table 3.11). During that same time-frame, there were no fire incidents within a commercial occupancy.

Fire Risk Table 3.11

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (7)	Residential Structure Fire (11)	Commercial Structure Fire (0)
	Low	Commercial Carrier Fire (0) Unattached Building Fire (1) Dumpster Fire (2) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (0)

Station Planning Zone 4: Fire

Planning Zone 4 (PZ4) is 94% residential and is the most populous area within the jurisdiction with a urban population density (2,287/mile^2). PZ4 contains 345 (25%) commercial occupancies to include The Outlets at Castle Rock and Castle Rock Adventist Health Campus. Additionally, PZ4 contains The Promenade, one of the nation's largest mixed use (commercial/retail/residential) construction sites. When completed, The Promenade will encompass roughly 1,000,000 square feet of mixed use space. In conjunction with The Promenade and to ease traffic congestion on Meadows Parkway, the Town of Castle Rock partnered with the Colorado Department of Transportation (CDOT) to build the North Meadows Extension. The project will connect North Meadows Parkway with Interstate 25, and includes two bridges and a new exit for I-25. PZ4 contains eight Special Risk (table 3.12), and one Significant Risk (table 3.13) occupancies (Map 3.5, Appendix B). Since 2011 there has been one fire in a Special or Significant risk occupancy. The fire at 5254 N Meadows (12-1434) was a dumpster fire and did not extend to the building. The residential construction in PZ4 is primarily lightweight with the vast majority of the homes built within the last 15 years.

The single greatest fire risk in PZ4 is Bonaventure Senior Living at 1855 Low Meadow BLVD, a four story tiered senior facility. While the building is protected with sprinklers, there is a high life hazard, and many occupants requiring assistance to evacuate.

Table 3.12 Special Risk PZ4		
Special Risk		
Address	OVAP	Reason for "Special" rating
1855 Low Meadow BLVD	41	24-Hour Care Facility
2350 Meadows BLVD	38	Hospital
2131 Low Meadow BLVD	34	School
4665 Tanglevine Dr.	31	School
5254 N Meadows Dr.	31	School
2473 Woodhouse Ln.	30	24-Hour Care Facility
2575 Meadows BLVD	29	School
3700 Butterfield Crossing Dr.	27	School

Table 3.13 Significant Risk		
Significant Risk (40-59)		
Address	OVAP	Fire Flow
610 Genoa Way	49	1,500 (2 hours)

PZ4 is the 2nd most active PZ with respect to fire incidents with 28 (16%) reported incidents (Table 3.14). Residential structure fires represent 42% of the fire calls at 12 calls, commercial structure fires are 29% of the fire incidents at 8 calls, and all other fires tighter are 29% at 8 incidents.

Fire Risk Table 3.14

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (4)	Residential Structure Fire (12)	Commercial Structure Fire (8)
	Low	Commercial Carrier Fire (2) Unattached Building Fire (1) Dumpster Fire (1) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (0)

Station Planning Zone 5: Fire

Planning Zone 5 (PZ5) is 92% residential with a rural population density (775/mile^2). PZ5 contains 222 commercial occupancies (15%), mostly retail and food service (Map 3.6, Appendix B). PZ5 has seven Special Risk, (two schools and five 24-hours care facilities), and three Significant Risk occupancies (strip malls), tables 3.15 and 3.16. Since 2011 there have been no fires in a Special or Significant risk occupancy. The residential construction in PZ5 is primarily lightweight with the vast majority of the homes built within the last 15 years with the exception of the Silver Heights area. Silver Heights is an older community with homes built in the mid-1960's. The maximum fire risk in PZ5 is Castle Rock Care Center at 4001 Home St, due to the extensive life safety risk.

Table 3.15 Special Risk PZ5		
Special Risk		
Address	OVAP	Reason for "Special" rating
4001 Home St.	34	24-Hour care facility
797 Tarpan Pl.	29	24-Hour care facility
815 Tarpan Pl.	29	24-Hour care facility
1746 Wild Star Way	27	24-Hour care facility
3960 Trail Boss Ln.	26	School
3950 Trail Boss Ln.	26	School
864 Barranca Dr.	24	24-Hour care facility

Table 3.16 Significant Risk		
Significant Risk (40-59)		
Address	OVAP	Fire Flow
4714 Milestone Ln.	42	1500 (2 hours)
5650 Allen Way	41	1500 (2 hours)
4800 Milestone Ln.	41	1750 (2 hours)

Fire Risk Table 3.17

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (7)	Residential Structure Fire (5)	Commercial Structure Fire (7)
	Low	Commercial Carrier Fire (0) Unattached Building Fire (0) Dumpster Fire (0) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (0)

PZ5 is the 4th most active PZ with respect to fire incidents with 19 (11%) reported incidents (table 3.17). The fire incidents are almost evenly split between commercial structure fires (seven), passenger car fires (seven), and residential structure fires (seven).

Station Planning Zone 6: Fire

Planning Zone 6 (PZ6) is 99.9% residential with only five commercial occupancies, an elementary school, in-school daycare, two community pools & clubhouses, and a water treatment facility (Map 3.7, Appendix B). The residential population density is rural (544/mile^2). This PZ is unique in that fire management zone (FMZ) 15603 receives a CRFD response and a mutual aid response due to the proximity and response time of Franktown Fire Protection District station 184. Additionally, there are certain areas that are not serviced by fire hydrants, and receive three mutual aid tenders on the initial response. There are no commercial occupancies in the non-hydranted areas. The maximum fire risk in PZ6 is Sage Canyon Elementary School, 2420 Autumn Sage St.

Table 3.18 Special Risk PZ6		
Special Risk		
Address	OVAP	Reason for "Special" rating
2420 Autumn Sage St.	31	School

Table 3.19 Significant Risk		
Significant Risk (40-59)		
Address	OVAP	Fire Flow
N/A	N/A	N/A

PZ6 had the second lowest number of fire incidents with five (3%) reported incidents (table 3.20). There were four residential structure fires and one unattached building fire.

Fire Risk Table 3.20

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (0)	Residential Structure Fire (4)	Commercial Structure Fire (0)
	Low	Commercial Carrier Fire (0) Unattached Building Fire (1) Dumpster Fire (0) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (0)

Station Planning Zone 7: Fire

Planning Zone 7 (PZ7) (Map 3.8, Appendix B) is the largest of the nine PZs at 16.8 mile^2, and is 99% residential with a rural population (214/mile^2). However, this PZ is expected to experience significant growth in the near future, some of which is already occurring. There are few commercial occupancies in PZ7, however, this PZ contains two of the Department's most unique Special Risk occupancies, 5454 & 5281 Garton Road. These facilities are secure satellite facilities with specialized suppression systems at the far southeastern portion of CRFD's jurisdiction. Aside from the Garton Rd addresses, there is three

Special Risks and zero Significant Risk occupancies in PZ7 (Tables 3.21, and 3.22). Since 2011 there have been zero fires in either a Special or Significant risk occupancy. On the southwestern portion of PZ7 is Bell Mountain Ranch. This neighborhood is split between Larkspur Fire Protection District and CRFD, homes on the south side of Bell Mountain Pkwy are serviced by Larkspur Fire Protection District and CRFD on the north side. The residential construction in this area is predominantly current, lightweight construction. There are some areas that are not serviced by fire hydrants and receive three mutual aid tenders on the initial response. The Department has been monitoring growth in this PZ and tracking performance. The Department has recognized that it cannot meet its established baselines in the most populated areas of PZ7. As calls for service increase toward warrants established in the 2014-2019 Fire Master Plan, within PZ7 and district wide, the likelihood that a 2nd due company will be responding increase as well. To address these concerns, the Department has begun planning and design for a new fire station, estimated to open in 2018. The maximum fire risk in PZ7 is the 24-hour care facility on Evening Song Dr. (Assured Assisted living). However, the satellite facilities on Garton Rd cannot be neglected due to their inherent value to regional communications.

Table 3.21 Special Risk PZ7		
Special Risk		
Address	OVAP	Reason for "Special" rating
572 Evening Song Dr.	35	24-Hour Care Facility
5454 Garton Rd.	30	Satellite Facility
5281 Garton Rd.	25	Satellite Facility

Table 3.22 Significant Risk		
Significant Risk (40-59)		
Address	OVAP	Fire Flow
N/A	N/A	N/A

PZ7 (table 3.23) has experienced relatively low fire incidents since 2011 with three residential structure fires, two unattached building fire, and passenger car fires.

Fire Risk Table 3.23

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (2)	Residential Structure Fire (3)	Commercial Structure Fire (0)
	Low	Commercial Carrier Fire (0) Unattached Building Fire (2) Dumpster Fire (0) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (0)

Station Planning Zone 8: Fire

Planning Zone 8 (PZ8) (Map 3.9, Appendix B) is the least populated and contains no commercial occupancies. The vast majority of PZ8 is pasture and an abandon residential project from the late 1980's. The population density for PZ8 is rural (48/mile^2). There are two district population centers in this area; Yucca Hills, with older homes and Keene Ranch, with larger higher priced homes in the southern portion of the area. Keene Ranch is a shared response area with Jackson 105 and Larkspur Fire Protection District. Additionally, to access Keene Ranch, CRFD units must leave the jurisdiction, on Tomah Rd, before they can make entry into the neighborhood.

Since 2010, there have been no fire incidents in PZ8. Furthermore, there have been only 38 total incidents in PZ8 between 2011 and 2015.

The maximum fire risk in PZ8 is remote residential structures in non-hydranted areas. These response plans include three automatic aid tenders on any reported fire.

Station Planning Zone 9: Fire

Planning Zone 9 (PZ9) (Map 3.10, Appendix B) is 97% residential with a urban population density (1,546/mile^2) and a total of 65 commercial occupancies. Of the 65 occupancies, there are 8 Special Risk occupancies (Table 3.24), five of these are 24-hour care facilities, three are schools, and there is one facility that has a fire flow greater than 4,250 GPM. Acme Brick requires 6,250GPM for four hours based on fire flow calculations (Appendix A). The Life Safety Division determined the water system in the immediate area is able to provide the needed fire flow (Town of Castle Rock, 2016). Additionally, the CRFD response plan for commercial structure fires includes three engines and one aerial with a combined minimum pumping capacity of 7,000GPM. Given the type of structure (Type II, Non-Combustible) and the non-combustible contents (clay and bricks) the risk of a fire in the facility are relatively low. If the building were to become fully involved, requiring the 6,250GPM, this would be a defensive operation using master streams (ground and elevated) limiting the number of fire fighters needed for attack lines.

For several years this PZ has met the minimum call volume requirements to consider a new fire station. However, given that the response times for the first arriving unit and effective response force are within the annually established baselines, the Department has elected to not build a fire station in this area yet. The Department will monitor call volume and performance quarterly and annually to identify trends that could negatively affect the residents in this area. Of special note[1], there is one Special Risk HAZMAT facilities (Pure Water Solutions) in PZ9 the team recommends the addition of a Hazardous Materials response as part of the 1st alarm commercial structure fire assignment.

Table 3.24 Special Risk PZ9

Special Risk		
Address	OVAP	Reason for "Special" rating
401 Prairie Hawk Dr.	42	Fire Flow (6250GPM 4 Hours)
1640 Wild Rye Ct.	30	24-Hour Care Facility
1470 Clear Sky Way	30	School
1861 Sapling Ct.	27	24-Hour Care Facility
1671 Thatch Cr.	27	24-Hour Care Facility
1687 Paonia Ct.	26	24-Hour Care Facility
1768 Rose Petal Ln.	26	24-Hour Care Facility
1551 Prairie Hawk Dr.	25	School
520 Topeka Way	29	HAZMAT Risk[1]

Table 3.25 Significant Risk

Significant Risk (40-59)		
Address	OVAP	Fire Flow
N/A	N/A	N/A

PZ9 has experienced 13 fire related incidents since 2011, table 3.26.

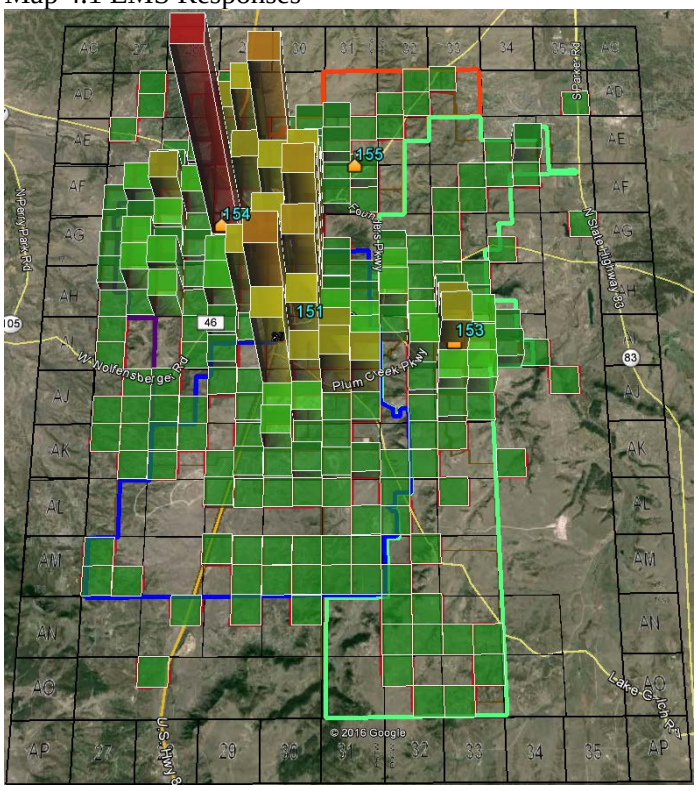
Fire Risk Table 3.26

		Risk		
		Low	Moderate	High / Special
Frequency	High	Passenger Car Fire (3)	Residential Structure Fire (7)	Commercial Structure Fire (2)
	Low	Commercial Carrier Fire (1) Unattached Building Fire (0) Dumpster Fire (0) Explosion No Fire (0)	Explosion with Fire (0)	Train Fire (0)

4. Emergency Medical Services (EMS) Risks

Castle Rock Fire and Rescue Department responded to 13,100 EMS incidents between 2011 and 2015, and continues to be the highest service demand at 58% of all calls for service. In general, EMS is a high probability / low consequence event that does not unduly burden the system. The department understands that as the population ages, the calls for EMS will increase. One aspect of this that the department has quantified is the senior population living within either a 24-hour care facility, or independent senior living facilities. In a 2013 study of responses to these facilities, the department estimated that there will be one call for service per resident per year.

Map 4.1 EMS Responses



Map 4.1 (right) depicts all EMS calls from 2011 – 2015. The color and height of each column indicates the number of calls for service. The tallest (red) column contains the largest 24-hour care facility within the jurisdiction. Given historical response data and the 2013, study the greatest EMS risks are the senior housing and 24-hour care centers. In PZs that do not have a these facilities, incidents within homes or businesses along with motor vehicle accidents (MVA) are the greatest EMS risk.

Station Planning Zone 1: EMS

Planning Zone 1 contains three 24-hour care facilities and two senior independent living complexes:

- 24-hour Care Facilities:
  - Brookside Inn: 1297 South Perry Street
  - Cantril House: 221 Cantril Street
  - Safe at Home Residences: 1605 Whitetail Drive
- Independent Senior Living:
  - Reyn Rock Apartments
  - Oakwood Apartments

Station Planning Zone 2: EMS

Planning Zone 2 has one 24-hour care facility, Valley House: 255 South Valley Drive

Station Planning Zone 3: EMS

Planning Zone 3 has no 24-hour care centers or senior specific housing.

Station Planning Zone 4: EMS

Planning Zone 4 has two 24-hour care facilities:

- 24-hour Care Facilities:
  - Bonaventure Senior Living: 1855 Low Meadow Boulevard
  - Castle Rock Assisted Living: 2473 Woodhouse Lane

Station Planning Zone 5: EMS

Planning Zone 5 has five 24-hour care facilities:

- 24-hour Care Facilities:
  - Castle Rock Care Center: 4001 Home Street
  - Metzler Memory Care: 864 Barranca Drive
  - Assured Assisted Living: 797 Tarpan Place
  - Assured Assisted Living: 815 Tarpan Place
  - Assisted Living of Woodlands: 1746 Wild Star Way

Station Planning Zone 6: EMS

Planning Zone 6 has no 24-hour care centers or senior specific housing.

Station Planning Zone 7: EMS

Planning Zone 7 has two 24-hour care facilities:

- 24-hour Care Facilities:
  - Assured Assisted Living: 572 Evening Song Drive
  - Safe at Home Residences: 1361 Chalk Hill Place

Station Planning Zone 8: EMS

Planning Zone 8 has no 24-hour care centers or senior specific housing.

Station Planning Zone 9: EMS

Planning Zone 9 has five 24-hour care facilities and one independent senior complex:

- 24-hour Care Facilities:
  - Castle Rock Assisted Living: 1640 Wild Rye Court
  - Assured Assisted Living: 1687 Paonia Ct
  - Assured Assisted Living: 1671 Thatch Circle
  - Castle Rock Assisted Living: 1768 Rose Pedal Lane
  - Assured Assisted Living: 1861 Sapling Court
- Independent Senior Living:
  - Auburn Ridge Apartments

5. Hazardous (HAZMAT) Materials Risks

In March of 2016, the Castle Rock Fire and Rescue completed a Hazardous Materials Commodity Study (Town of Castle Rock, 2016) that evaluated the hazardous materials traveling through and contained with CRFD's jurisdiction. At the time of the study, there were 142 commercial occupancies that met the minimum hazardous material reporting requirements per the 2012 International Fire Code (IFC) adopted by Town of Castle Rock Town Council in January 2013. These occupancies were assigned a risk category (Low, Ordinary, High, or Special) based on the material(s) stored, quantity, process concerns, protection systems, structural concerns, and the potential impact to the community and environment (Map 5.1, Appendix C). The department has two heli-ports, one at the local hospital and the other on private property operated by a contractor. Additionally, there is one soft surface private airstrip that is used by a small single engine propeller plane (table 5.1). None of these facilities meet the requirements for the department to staff or maintain Aircraft Rescue and Fire Fighting (ARFF) apparatus or certifications.

Table 5.1 CRFD HAZMAT Risk Levels

Risk Level	Station Planning Zone									
	CRFD	1	2	3	4	5	6	7	8	9
Low	44	20	0	2	10	6	1	2	0	3
Ordinary	70	30	1	3	15	11	0	2	0	8
High	14	5	0	0	3	3	0	1	0	2
Special	14	6	0	2	2	1	0	0	0	3
Sub-Total	142	61	1	7	30	21	1	5	0	16
Heli-port	2	0	0	0	1	0	0	1	0	0
Airstrip	1	0	0	1	0	0	0	0	0	0
Total	145	61	1	8	31	21	1	6	0	16

For the period of 2011 through 2015, there have been a total of 20 High Risk hazardous materials incidents. Of those, only two received an effective response force (13-4119, 15-3470). Incident 13-4119 required a "Level A" entry to mitigate a hydrochloric acid (HCL) leak, from a pipe within water treatment facility. Incident 15-3470 was to investigate three plastic containers along the roadside. The investigation determined that the containers were discarded motor oil, no specialized PPE was needed or used. For the same time period, the Department has responded to 425 Moderate Risk and 779 Low Risk hazardous material incidents (table 5.2).

Table 5.2 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (368) Natural/LP Gas Leak, Outside (184) Odor Investigation (155)	Natural/LP Gas, Inside (251)	
	Low	Fuel Containment < 25 Gallons (72)	Gas Line Rupture (77) CO Alarm Symptomatic (73) HAZAMAT Investigation (18) Fuel Containment > 25 Gallons (6) BIO-Chem (0)	HAZMAT (20)

Overall, the greatest risk to the community and the environment is the hazardous material that travels through the Town and fire protection district via the state and interstate highways because of the variety of materials, frequency of transport, and potential for release.

Station Planning Zone 1: HAZMAT

Planning Zone 1 (PZ1), map 5.2, contains the most hazardous materials facilities, table 5.3, with 61 facilities. Among those are seven "Special" risk facilities and five "High" risk facilities. Additionally, PZ1 has several miles of interstate highway and railroad within the district that pose the greatest overall hazardous materials risk because of the variety of materials, frequency of transport, and potential for release. With respect to fixed facilities, the greatest hazardous materials risk is Comm Net, 1562 N. Park Street. This is a telephone switch center with a variety of hazardous materials risks and considerable volume. Because if the products stored at Comm Net, it is the recommendation of the HAZMAT Team to add a Hazardous Materials apparatus to the initial response for any reported fire within that occupancy.

Table 5.3 HAZMAT Risk PZ1	
Low	20
Ordinary	30
High	5
Special	6

Table 5.4 Special HAZMAT Risk PZ1		
Business Name	Address	Reason for Special rating
Amerigas [1]	511 S Gilbert Street	Quantity of material, Compressed gases
Comnet Wireless [1]	1555 & 1562 N Park Street	Critical infrastructure, Quantity of material, Corrosives
Plum Creek Water Purification Facility [1]	1929 Liggett Road	Critical infrastructure, Quantity of material, Process Hazard, Corrosives
1 Stop Tire & Auto	414 N Wilcox Street	Quantity of material, Process hazard, Structural concern
Black Hills Energy	1769 Park Street	Critical infrastructure, Quantity of material
Sherwin-Williams Paint	175 Plum Creek Parkway	Quantity on material, Rack storage

Note 1: The CRFD Hazmat Team recommends adding a Hazardous Materials Unit to the initial response for any commercial structure fire due to the contents, processes and/or relative importance of the facility.

Table 5.5 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (74) Natural/LP Gas Leak, Outside (62) Odor Investigation (50)	Natural/LP Gas, Inside (58)	
	Low	Fuel Containment < 25 Gallons (27)	Gas Line Rupture (16) CO Alarm Symptomatic (13) HAZAMAT Investigation (7) Fuel Containment > 25 Gallons (1) BIO-Chem (0)	HAZMAT (9)

Station Planning Zone 2: HAZMAT

Planning Zone 2 (PZ2), map 5.3, is smallest of all PZs, with only one hazardous materials facility, table 5.4. The greatest hazardous materials risk is also the only hazardous material facility, a Town owned maintenance and storage building.

Table 5.6 HAZMAT Risk PZ2	
Low	0
Ordinary	1
High	0
Special	0

Table 5.7 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (6) Natural/LP Gas Leak, Outside (2) Odor Investigation (3)	Natural/LP Gas, Inside (2)	
	Low	Fuel Containment < 25 Gallons (0)	Gas Line Rupture (4) CO Alarm Symptomatic (1) HAZAMAT Investigation (1) Fuel Containment > 25 Gallons (0) BIO-Chem (0)	HAZMAT (0)

Station Planning Zone 3: HAZMAT

Planning Zone 3 (PZ3), map 5.4, has a total of seven hazardous materials facilities, two of which are Special Risks and several miles of state highway. The two Special Risk facilities are the Mitchell Creek Lift Station, an automated water lift/pump station, and the Ray Waterman Regional Water Treatment Center. These two facilities have protection/alarm systems, and are considered critical infrastructure. However they have sufficient quantity of product to warrant concern. The Hazardous Materials Commodity Study showed that the type and quantity of hazardous materials being transported on State Highway 86 is relatively low (Town of Castle Rock, 2016). The greatest hazardous materials risk in PZ3 is the Fueling Center at King Sooper's, due to the quality of product, frequency of delivery (two-three tankers per week) and the general exposure to the environment if there was a release or spill.

Table 5.8 HAZMAT Risk PZ3	
Low	2
Ordinary	3
High	0
Special	2

Table 5.9 Special HAZMAT Risk PZ3		
Business Name	Address	Reason for Special rating
Mitchell Creek Lift Station	5708 Wagonwheel Trail	Critical Infrastructure, Quantity of material
Ray Waterman Regional Water Treatment Center [1]	1282 Castle Oaks Drive	Critical Infrastructure, Quantity of material, Process hazard, Compressed gasses, Corrosives

Note 1: The CRFD Hazmat Team recommends adding a Hazardous Materials Unit to the initial response for any commercial structure fire due to the contents, processes and/or relative importance of the facility.

Table 5.10 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (57) Natural/LP Gas Leak, Outside (15) Odor Investigation (20)	Natural/LP Gas, Inside (27)	
	Low	Fuel Containment < 25 Gallons (4)	Gas Line Rupture (3) CO Alarm Symptomatic (10) HAZAMAT Investigation (1) Fuel Containment > 25 Gallons (1) BIO-Chem (0)	HAZMAT (1)

Station Planning Zone 4: HAZMAT

Planning Zone 4 (PZ4), map 5.5, has a total of 30 hazardous materials facilities. Additionally, PZ4 has several miles of railroad and interstate highway within the district that pose the greatest overall hazardous materials risk because of the variety of materials, frequency of transport, and potential for release. With respect to fixed facilities, the greatest hazardous materials risk is the Castle Rock Adventist Hospital Campus due to the volume of products, critical infrastructure, proximity to residential areas, and the life safety risks within the facility.

Table 5.11 HAZMAT Risk PZ4	
Low	10
Ordinary	15
High	3
Special	2

Table 5.12 Special HAZMAT Risk PZ4		
Business Name	Address	Reason for Special rating
Town of CR Service Center	4175 Castleton Ct	Critical Infrastructure, Quantity of material, Process hazard
Castle Rock Adventist Health Campus	2350 Meadows Boulevard	Critical Infrastructure, Quantity of material

Table 5.13 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (111) Natural/LP Gas Leak, Outside (39) Odor Investigation (33)	Natural/LP Gas, Inside (81)	
	Low	Fuel Containment < 25 Gallons (14)	Gas Line Rupture (19) CO Alarm Symptomatic (22) HAZAMAT Investigation (3) Fuel Containment > 25 Gallons (1) BIO-Chem (0)	HAZMAT (4)

Station Planning Zone 5: HAZMAT

Planning Zone 5 (PZ5), map 5.6, has a total of 21 hazardous materials facilities, table 5.7. Additionally, PZ5 has several miles of interstate highway on its southwestern border. The highway represents the greatest overall hazardous materials risk because of the variety of materials, frequency of transport, and potential for release. With respect to fixed facilities, the greatest risk is Home Depot, due to the volume of product(s) and the proximity to residential areas.

Table 5.14 HAZMAT Risk PZ5	
Low	6
Ordinary	11
High	3
Special	1

Table 5.15 Special HAZMAT Risk PZ5		
Business Name	Address	Reason for Special rating
Silver Heights Water & Sanitation	1027 Harvey St	Critical Infrastructure, Quantity of material, No Fire System

Table 5.16 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (53) Natural/LP Gas Leak, Outside (32) Odor Investigation (23)	Natural/LP Gas, Inside (44)	
	Low	Fuel Containment < 25 Gallons (15)	Gas Line Rupture (13) CO Alarm Symptomatic (6) HAZAMAT Investigation (3) Fuel Containment > 25 Gallons (1) BIO-Chem (0)	HAZMAT (4)

Station Planning Zone 6: HAZMAT

Planning Zone 6 (PZ6), map 5.7, has one hazardous materials facility, and borders several miles of state highway 86. The Hazardous Materials Commodity Study showed that the type and quantity of hazardous materials being transported on State Highway 86 is relatively low (Town of Castle Rock, 2016). However, given the other risks within P6, the highway is still the greatest hazardous materials risk.

Table 5.17 HAZMAT Risk PZ6	
Low	1
Ordinary	0
High	0
Special	0

Table 5.18 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (16) Natural/LP Gas Leak, Outside (2) Odor Investigation (4)	Natural/LP Gas, Inside (10)	
	Low	Fuel Containment < 25 Gallons (2)	Gas Line Rupture (5) CO Alarm Symptomatic (7) HAZAMAT Investigation (5) Fuel Containment > 25 Gallons (0) BIO-Chem (0)	HAZMAT (1)

Station Planning Zone 7: HAZMAT

Planning Zone 7 (PZ7), map 5.8, has a total of four hazardous materials facilities, table 5.9. Additionally, PZ7 has several miles of interstate highway on the western border. The highway represents the greatest overall hazardous materials risk because of the variety of materials, frequency of transport, and potential for release. With respect to fixed facilities, the greatest risk is the Direct TV facility, due to the volume of product and being considered critical infrastructure.

Table 5.19 HAZMAT Risk PZ7	
Low	0
Ordinary	2
High	2
Special	0

Table 5.20 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (13) Natural/LP Gas Leak, Outside (5) Odor Investigation (5)	Natural/LP Gas, Inside (6)	
	Low	Fuel Containment < 25 Gallons (1)	Gas Line Rupture (6) CO Alarm Symptomatic (1) HAZAMAT Investigation (0) Fuel Containment > 25 Gallons (0) BIO-Chem (0)	HAZMAT (1)

Station Planning Zone 8: HAZMAT

Planning Zone 8 (PZ8), map 5.9, is the least populated of all the PZ with a total population of 329 residents. PZ8 has no hazardous material occupancies. However, PZ8 is adjacent to Interstate 25 and has a couple miles of railroad on its eastern border.

Table 5.21 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (0) Natural/LP Gas Leak, Outside (0) Odor Investigation (0)	Natural/LP Gas, Inside (1)	
	Low	Fuel Containment < 25 Gallons (0)	Gas Line Rupture (1) CO Alarm Symptomatic (0) HAZAMAT Investigation (0) Fuel Containment > 25 Gallons (0) BIO-Chem (0)	HAZMAT (0)

Station Planning Zone 9: HAZMAT

Planning Zone 9 (PZ9), map 5.10, has a total of 16 hazardous materials facilities, table 5.10. While PZ9 only borders the highway at the southern eastern corner, the proximity to the highway still poses a potential risk. With respect to fixed facilities, the greatest risk is 520 Topeka Way, Pure Water Solutions, due to the volume of and type of product used and stored. Because if the products stored at the Pure Water Facility, it is the recommendation of the HAZMAT Team to add a Hazardous Materials apparatus to the initial response for any reported fire within that occupancy.

Table 5.22 HAZMAT Risk PZ9	
Low	3
Ordinary	8
High	2
Special	3

Table 5.23 Special HAZMAT Risk PZ9		
Business Name	Address	Reason for Special rating
Douglas County School District RE1	701 Prairie Hawk Drive	Critical infrastructure, Quantity of material, Process hazard
Kolbe Striping	550 Topeka Way	Quantity of material, Process hazard, structural concerns
Pure Water Solutions[1]	520 Topeka Way	Quantity of material, Process hazard, Compressed gases

Note 1: The CRFD Hazmat Team recommends adding a Hazardous Materials Unit to the initial response for any commercial structure fire due to the contents, processes and/or relative importance of the facility.

Table 5.24 CRFD HAZMAT Risk

		HAZMAT Risk 2011 - 2015		
		Low	Moderate	High / Special
Frequency	High	Asymptomatic CO Alarm (38) Natural/LP Gas Leak, Outside (13) Odor Investigation (14)	Natural/LP Gas, Inside (17)	
	Low	Fuel Containment < 25 Gallons (3)	Gas Line Rupture (9) CO Alarm Symptomatic (9) HAZAMAT Investigation (0) Fuel Containment > 25 Gallons (0) BIO-Chem (0)	HAZMAT (0)

6. Technical Rescue Risks

Generally speaking, Technical Rescue incidents are low frequency / high risk events that may require specialized equipment and training to safety mitigate the incident. For the purpose of this and other related documents, Technical Rescue shall consist of the following disciplines:

- Building / Structural Collapse
- Confined Space
- Heavy Extrication (commercial carriers, dump truck buses, etc.)
- High/Low Angle Rope Rescue
- Trench Rescue
- Water/Ice Rescue

Note: Extrication of passenger vehicles is not included in this category, but is included as a high risk emergency medical services.

While the jurisdiction has buildings dating back to the early 1900's, there is little threat of seismic activity and the primary risk of building collapse stems from vehicles accidents, ignition of a gas leak, or collapse during renovation. As such, it is not practical to identify the maximum risk within each PZ.

There are 63 areas that require a confined space permit before entering. These are highlighted and mapped by PZ (Confined Space Rescue Map 6.1). These facilities are typically below grade pressure relief valves (PRV) contained within a concrete vault accessible only via manholes. The facilities are identified by address and/or their Utilities facilityID.

Heavy extrication is possible throughout the jurisdiction. However, the probability increases on the major routes, state and interstate highways. Specific areas are briefly discussed by PZ.

Rope rescue are found throughout the jurisdiction, and specific areas are briefly discussed by PZ.

Trench rescue is a dynamic risk that changes frequently based on commercial and residential development, in addition to the needed utility and infrastructure work to support a growing community. As such, it is not practical to identify the maximum risk within each PZ.

Using the risk model detailed in Section 2, there are a 12 permanent ponds (containing water year-round), 201 detention ponds and 35.2 miles of trails. Of those, eight permanent ponds, 66 detention ponds, and 22.2 miles of stream are within 100 feet of the Town's trail system, and there are 3.6 miles of swift Water Special Risk areas along East Plum Creek (Water/Ice Rescue Map 6.10).

Station Planning Zone 1: Technical Rescue

Confined space: the team identified 19 locations within PZ1 that require a confined space permit before entering (Confined Space Rescue Map 6.2).

Table 6.1 Confined Space Risk PZ1

Location	FacilityID
Mt Royal Drive	PRV17
2275 Sandhurst	PRV40
2266 Beecham	PRV42
Ridge Trail @ Quail Lane	PRV30
Holmby Ct.	PRV51
Oakcrest Cir @ Miller Blvd	PRV50
450 S. Perry St.	PRV16
Gilbert & South St.	PRV27
Gilbert & 5th St	PRV26
841 Scott Blvd.	PRV21

Location	FacilityID
1909 Baldwin Park Rd	PRV41
Saddleback	PRV36
Emerald Drive	PRV48
Douglas County High School	PRV61
Oakwood Dr. @ Mt. View	PRV23
Canyon Dr @ Oakwood Dr	PRV22
799 Canyon Dr.	PRV24
Ash Ave @ Dead End	PRV49
Celtic Dr	PRV64

The maximum heavy extrication risk in PZ1 is the interstate highway (I-25) with two access points (north and south) at mile markers 181 and 182. Additionally, the eastern train tracks cross over I-25 between mile marker 182 and 183 at the north and south bound lanes and there are three at grade railroad crossings at 2nd St., 3rd St., and 5th St.

The maximum rope rescue risk in PZ1 is Rock Park. This area has numerous vertical, high, and low angle rescue opportunities. This is a popular hiking and climbing area. Access is limited as are potential rope anchor sites.

Water/Ice Rescue: PZ1 contains a total of three permanent ponds, 91 detention ponds, and roughly 6.7 miles of streams. PZ1 High Risk areas are: three permanent ponds, 25 detention ponds, and 5.25 miles of stream. Additionally, PZ1 contains 2.25 miles of Special Risk areas along East Plum Creek (Water/Ice Rescue Map 6.11).

Station Planning Zone 2: Technical Rescue

Confined space: the team identified four locations within PZ2 that require a confined space permit before entering (Confined Space Rescue Map 6.3).

Table 6.2 Confined Space Risk PZ2

Location	FacilityID
2276 Hwy 86	PRV32
534 Valley Dr.	PRV31
250 Burgess Drive	PRV33
1061 South Street	PRV34

The maximum heavy extrication risk in PZ2 is on 5th Street in the area between Woodlands Boulevard and N Ridge Road. This is a main artery for the downtown area and has a relatively steep grade.

The maximum rope rescue risk in PZ2 is the Memmen Ridge area, there are numerous high and low angle rope rescue potentials.

Water/Ice Rescue: PZ2 contains a total of zero permanent ponds, one detention pond and roughly 1.0 mile of stream. PZ2 contains 0.7 miles of stream are within 100 feet of a recreation area or trail. There are no Swift Water Special Risk areas in PZ2 (Water/Ice Rescue Map 6.12).

Station Planning Zone 3: Technical Rescue

Confined space: the team identified seven locations within PZ3 that require a confined space permit before entering (Confined Space Rescue Map 6.4).

Table 6.3 Confined Space Risk PZ3

Location	FacilityID
Enderud (Irrigation)	PRV59
555 Ridge Rd (Oaks Line)	PRV44
Mikelson	PRV52
Enderud @ PSCO (Potable)	PRV58
500 N Heritage Road	PRV46
Hwy 86 @ Founders Pkwy	PRV43
1321 N Founders (Res 9)	PRV37

The maximum heavy extrication risk in PZ3 is on state highway 86. This is an alternate route for I-25 and also has a relatively steep grade heading east with steep slopes on both sides, and little shoulder area. High voltage power lines cross this highway between Enderud Boulevard and North Ridge Road presenting a unique risk for this roadway and possibly a challenge in the event of a heavy extrication involving this equipment.

The maximum rope rescue risk in PZ3 is Mitchell Gulch trail system. Mitchell Gulch has several vertical and high angle areas, and a series of heavily traveled pathways that backs up to a middle school with a number of foot paths from children traversing the cliff lines.

Water/Ice Rescue: PZ3 contains two permanent ponds, 25 detention ponds, and roughly 2.0 miles of streams. PZ2 High Risk areas are: two permanent ponds, five detention ponds, and 1.5 miles of stream. There are no Swift Water Special Risk areas in PZ3 (Water/Ice Rescue Map 6.13).

Station Planning Zone 4: Technical Rescue

Confined space: the team identified nine locations within PZ4 that require a confined space permit before entering (Confined Space Rescue Map 6.5).

Table 6.4 Confined Space Risk PZ4

Location	FacilityID
1760 Meadows Blvd	PRV6
3244 Soaring Eagle & Starling	PRV1
Foothills 100' N of Soaring Eagle	PRV4
Meadows Blvd at Springbriar Dr.	PRV3
4990 Buttercup Drive	PRV2
3398 Bluegrass Cir	PRV5
Red Hawk Dr. & Melting Snow	PRV53
Skyward Way	PRV54
N Meadows @ Butterfield	PRV7

The maximum heavy extrication risks in PZ4 are interstate 25 (I-25) with one access point (south) at mile marker 184 and State Highway 85 with one access point to a two lane highway.

The maximum rope rescue risk in PZ4 is low angle rope rescue from miles of walking and biking trails with limited access points and few landmarks to identify victim location.

Water/Ice Rescue: PZ4 contains one permanent pond, 68 detention ponds, and roughly 6.25 miles of streams. PZ4 High Risk areas are: one permanent pond, 15 detention ponds, and 4.75 miles of stream. Additionally, PZ4 contains 1.35 miles of Swift Water Special Risk areas along East Plum Creek (Water/Ice Rescue Map 6.14).

Station Planning Zone 5: Technical Rescue

Confined space: the team identified nine locations within PZ5 that require a confined space permit before entering (Confined Space Rescue Map 6.6).

Table 6.5 Confined Space Risk PZ5

Location	FacilityID
Behind Home Depot	PRV12
North End of Lazy K	PRV47
621 Black Feather Trail	PRV20
133 Sam Walton Lane (Wal-Mart)	PRV15
Trail Boss @ Founders	PRV14
Allen St & Allen Way	PRV11
Front St & Founders	PRV13
Allen St. @ Founders	PRV19
Black Pine	PRV39

The maximum heavy extrication risk in PZ5 with one access point (north) at mile marker 184.

The maximum rope rescue risk in PZ5 vertical and high angle aspects in the cliffs west of Diamond Ridge and above Springer Park. Additionally, there are a number of homes built adjacent to the cliff lines.

Water/Ice Rescue: PZ5 contains one permanent pond, 35 detention ponds, and roughly 2.25 miles of streams. PZ5 High Risk area is one detention pond. There are no Swift Water Special Risk areas in PZ5 (Water/Ice Rescue Map 6.15).

Station Planning Zone 6: Technical Rescue

Confined space: the team identified two locations within PZ6 that require a confined space permit before entering (Confined Space Rescue Map 6.7).

Table 6.6 Confined Space Risk PZ6

Location	FacilityID
Castle Oaks @ W Pleasant View	PRV55
Castle Oaks @ Autumn Sage	PRV56

The maximum heavy extrication risk in PZ6 is traffic along portions of State Highway 86 / Founders Parkway.

The maximum rope rescue risk in PZ6 is low angle MVA evacuations along Rocky View Rd and Valley View Rd, which are unlit, winding dirt roads.

Water/Ice Rescue: PZ6 contains one permanent pond, 18 detention ponds, and roughly 5.0 miles of streams. PZ6 High Risk areas are: one permanent pond, eight detention ponds, and 4.5 miles of stream. There are no Swift Water Special Risk areas in PZ6 (Water/Ice Rescue Map 6.16).

Station Planning Zone 7: Technical Rescue

Confined space: the team identified seven locations within PZ7 that require a confined space permit before entering (Confined Space Rescue Map 6.8).

Table 6.7 Confined Space Risk PZ7

Location	FacilityID
Crosshaven @ Plum Creek	PRV18
1137 Halfmoon Dr.	PRV28
888 Eaglestone Dr.	PRV29
West Loop	PRV35
East Loop	PRV45
Burnham Trail-Heckendorf Ranch	PRV62
Spring Ridge @ Clear Brooke Ct	PRV60

While PZ7 does border I-25 on the western edge, there is no access to the highway. The maximum heavy extrication risk in PZ7 is the east frontage road from mile marker 176 to mile marker 181.

The maximum rope rescue risk in PZ6 is the vertical and high angle rescue potential in Lost Canyon with difficult access to bottom of canyon and long evacuations.

Water/Ice Rescue PZ7 contains two permanent ponds, 21 detention ponds, and roughly 9.0 miles of streams. PZ7 High Risk areas are: two detention ponds and 3.0 miles of stream. There are no Swift Water Special Risk areas PZ6 (Water/Ice Rescue Map 6.17).

Station Planning Zone 8: Technical Rescue

Confined space: the team identified zero locations within PZ8 that require a confined space permit before entering.

While PZ8 does border I-25 on the eastern edge, there is no access to the highway. The maximum heavy extrication risk in PZ8 is the west frontage road for I-25. Additionally, PZ8 has several miles of rail that parallels the frontage road the entire length of the frontage road in PZ8.

The maximum rope rescue risk in PZ8 is low angle MVA evacuations.

Water/Ice Rescue: PZ8 contains no water/ice rescue hazards.

Station Planning Zone 9: Technical Rescue

Confined space: the team identified six locations within PZ9 that require a confined space permit before entering (Confined Space Rescue Map 6.9).

Table 6.9 Confined Space Risk PZ9

Location	FacilityID
Miller Activity Center	PRV63
Red Zone PS	PRV57
651 Topeka	PRV10
Redhawk & Wolfsenberger	PRV9
Switchgrass & Prarie Hawk	PRV8
Knobbie Cir at Melting Snow Way	PRV65

The maximum heavy extrication risk in PZ9 is West Plum Creek Parkway, due to the amount of construction traffic and ongoing events at the Miller Activity Complex. PZ9 also contains several industrial facilities. These facilities pose the greatest mechanical entrapment risk throughout the jurisdiction.

High/Low Angle Rope Rescue: The Miller Activity Center (MAC) has zip lines, including supporting towers and platforms, and a vertical rock wall run by a private contractor. Additionally, the MAC has a set of incline stairs and a number of miles of trails open to the public. CRFD would provide a supporting role for zip line & rock wall incidents during the day and would be entirely responsible for incidents involving any of the recreation features during off hours. This would include vertical, high angle and low angle rescues and evacuations. Potential for victims to become stuck on zip lines during off hours requiring technician level rescues.

Water/Ice Rescue: PZ9 contains two permanent ponds, 42 detention ponds, and roughly 3.0 miles of streams. PZ9 High Risk areas are: one permanent pond, 10 detention ponds, and 2.5 miles of stream. There are no Swift Water Special Risk areas in PZ9 (Water/Ice Rescue Map 6.18).

7. Wildland Urban Interface (WUI) Risks

Castle Rock Fire and Rescue Department responds to two types of wildland fires, Brush Fire Non-Threatening and Brush Fire Threatening. In simplest terms, a brush fire non-threatening is any brush or wildland fire that does not pose an immediate threat to any buildings or structures. While a brush fire threatening is any brush or wildland fire in which any buildings or structures are on fire or threatened by fire. Given the local topography, native flora and fauna, development, climate, and weather patterns, Castle Rock has the potential for brush / wildland fire throughout the jurisdiction year round.

The wildland risk is also directly impacted by weather conditions, specifically; temperature, relative humidity, wind, and fuel moisture content. Under certain conditions (high temperatures, low humidity, high winds, and dry fuels) these factors result Red Flag Warnings. A Red Flag Warning indicates conditions are ideal for a wildland fire starts, will support rapid fire spread, or contribute to extreme fire behavior. When the National Weather Service issues a red flag warning for the area, the Douglas County Regional Communication Center (DRCC) automatically adds a second alarm to the initial dispatch as detailed in the Castle Rock Response Plans issued January 6th 2016 (Town of Castle Rock, 2016).

Each PZ has been evaluated by looking at each of the three risk categories, classic, mixed, and occluded. It is important to note that one risk type is not greater than the others. However, one risk may be more prevalent than the others, or place a greater number of homes at risk. As a jurisdiction, there are 3,340 homes (10,134 residents) within the classic risk, 1,308 homes (3,974 residents) within the mixed risk encompassing 17,537 acres, and 1,651 homes (4,793 residents) within an occluded risk area encompassing 3,291 acres (Map 7.1, Appendix E).

Table 7.1 places each of the 415 wildland responses from 2011 through 2015 into their relevant risk categories.

Wildland Risk Table 7.1 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (217)		
	Low	Illegal / Controlled Burn (81)	Field/Open Area Fire/Brush: Non-Threatening (89)	Wildland Interface Fire/Brush: Threatening (28)

Station Planning Zone 1: Wildland

Planning Zone 1 (PZ1) is the most active PZ for wildland fire with 111 incidents from 2011 through 2015. PZ1 has 169 homes (504 residents) within the classic risk, 35 homes (106 residents) within the mixed risk encompassing 1,001 acres, and 730 homes (2,043 residents) within an occluded risk area encompassing 821 acres (Map 7.2, Appendix E).

Wildland Risk Table 7.2 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (59)		
	Low	Illegal / Controlled Burn (25)	Field/Open Area Fire/Brush: Non-Threatening (16)	Wildland Interface Fire/Brush: Threatening (11)

Station Planning Zone 2: Wildland

Planning Zone 2 (PZ2) is the fifth most active PZ for wildland fire with 36 incidents from 2011 through 2015. PZ2 has no homes within the classic risk, no homes within the mixed risk, and 402 homes (1,172 residents) within an occluded risk area encompassing 491 acres (Map 7.3, Appendix E).

Wildland Risk Table 7.3 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (11)		
	Low	Illegal / Controlled Burn (15)	Field/Open Area Fire/Brush: Non-Threatening (8)	Wildland Interface Fire/Brush: Threatening (2)

Station Planning Zone 3: Wildland

Planning Zone 3 (PZ3) is the third most active PZ for wildland fire with 45 incidents from 2011 through 2015. PZ3 has 364 homes (1,107 residents) within the classic risk, 154 homes (468 residents) within the mixed risk encompassing 2,316 acres, and 472 homes (1,435 residents) within an occluded risk area encompassing 1,209 acres (Map 7.4, Appendix E).

Wildland Risk Table 7.4 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (22)		
	Low	Illegal / Controlled Burn (16)	Field/Open Area Fire/Brush: Non-Threatening (4)	Wildland Interface Fire/Brush: Threatening (3)

Station Planning Zone 4: Wildland

Planning Zone 4 (PZ4) is the second most active PZ for wildland fire with 80 incidents from 2011 through 2015. PZ4 has 881 homes (2,678 residents) within the classic risk, no homes within the mixed risk, and no homes within an occluded risk area. (Map 7.5, Appendix E).

Wildland Risk Table 7.5 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (42)		
	Low	Illegal / Controlled Burn (13)	Field/Open Area Fire/Brush: Non-Threatening (19)	Wildland Interface Fire/Brush: Threatening (6)

Station Planning Zone 5: Wildland

Planning Zone 5 (PZ5) is the sixth most active PZ for wildland fire with 34 incidents from 2011 through 2015. PZ5 has 330 homes (993 residents) within the classic risk, 257 homes (781 residents) within the mixed risk encompassing 1,297 acres, and no homes within an occluded risk area (Map 7.6, Appendix E).

Wildland Risk Table 7.6 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (20)		
	Low	Illegal / Controlled Burn (11)	Field/Open Area Fire/Brush: Non-Threatening (2)	Wildland Interface Fire/Brush: Threatening (1)

Station Planning Zone 6: Wildland

Planning Zone 6 (PZ6) is the eighth most active PZ for wildland fire with 18 incidents from 2011 through 2015. PZ6 has 859 homes (2,611 residents) within the classic risk, 174 homes (529 residents) within the mixed risk encompassing 1,728 acres, and 47 homes (143 residents) within an occluded risk area encompassing 26 acres (Map 7.7, Appendix E).

Wildland Risk Table 7.7 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (8)		
	Low	Illegal / Controlled Burn (1)	Field/Open Area Fire/Brush: Non-Threatening (7)	Wildland Interface Fire/Brush: Threatening (2)

Station Planning Zone 7: Wildland

Planning Zone 7 (PZ7) is the seventh most active PZ for wildland fire with 29 incidents from 2011 through 2015. 445 homes (1,353 residents) within the classic risk, 543 homes (1,648 residents) within the mixed risk encompassing 8,812 acres, and no homes within an occluded risk area (Map 7.8, Appendix E).

Wildland Risk Table 7.8 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (15)		
	Low	Illegal / Controlled Burn (6)	Field/Open Area Fire/Brush: Non-Threatening (6)	Wildland Interface Fire/Brush: Threatening (1)

Station Planning Zone 8: Wildland

Planning Zone 8 (PZ8) is the least active PZ for wildland fire with 5 incidents from 2011 through 2015. PZ8 has no homes within the classic risk, 111 homes (337 residents) within the mixed risk encompassing 1,318 acres, and no homes within an occluded risk area (Map 7.9, Appendix E).

Wildland Risk Table 7.9 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (5)		
	Low	Illegal / Controlled Burn (0)	Field/Open Area Fire/Brush: Non-Threatening (0)	Wildland Interface Fire/Brush: Threatening (0)

Station Planning Zone 9: Wildland

Planning Zone 9 (PZ9) is the fourth most active PZ for wildland fire with 39 incidents from 2011 through 2015. PZ9 has 292 homes (888 residents) within the classic risk, 34 homes (103 residents) within the mixed risk encompassing 1,032 acres, and no homes within an occluded risk area (Map 7.10, Appendix E).

Wildland Risk Table 7.10 CRFD

		Risk		
		Low	Moderate	High / Special
Frequency	High	Smoke Investigation, Outside (20)		
	Low	Illegal / Controlled Burn (5)	Field/Open Area Fire/Brush: Non-Threatening (7)	Wildland Interface Fire/Brush: Threatening (2)

8. Conclusions and Recommendations

In conclusion, the Department's current deployment model meets the mission of "*High Customer Satisfaction* – through quality preparation and excellent service". However, embracing by embracing continuous improvement, the team identified five recommendations that will further the Department on its vision of "*To Be the Best* – at providing emergency and prevention services". Additionally, a challenge for the Department will be to ensure the proper resources (staffing, equipment, and fixed facilities) are available as the community continues to grows.

Based on the findings within this risk assessment, it is the recommendation of the Department to:

- Actively participate with other Town department's in the development and planning phases to ensure and plan for fire and emergency responses
- Consider an expanded hazardous materials commodity flow study that provides a more comprehensive overview of the materials being transported through the jurisdiction.
- Develop a sustainable methodology to ensure all new and updated commercial occupancies are evaluated using the current assessment model, and significant changes or special risks are communicated and accounted for in the response planning.
- Consider adopting the International Wildland Urban Interface (IWUI) code.
- Consider adding a Hazardous Materials Response for all reported fires at:
    - Amerigas 511 S. Gilbert St
    - Comm Net 1555 & 1562 Park St
    - Plum Creek Water Purification Facility 1929 Ligget Rd
    - Pure Water Solutions 520 Topeka Way
    - Ray Waterman Regional Water Treatment Center 1282 Castle Oaks Dr

Appendix A International Code Council (2012) Table B105.1

APPENDIX B

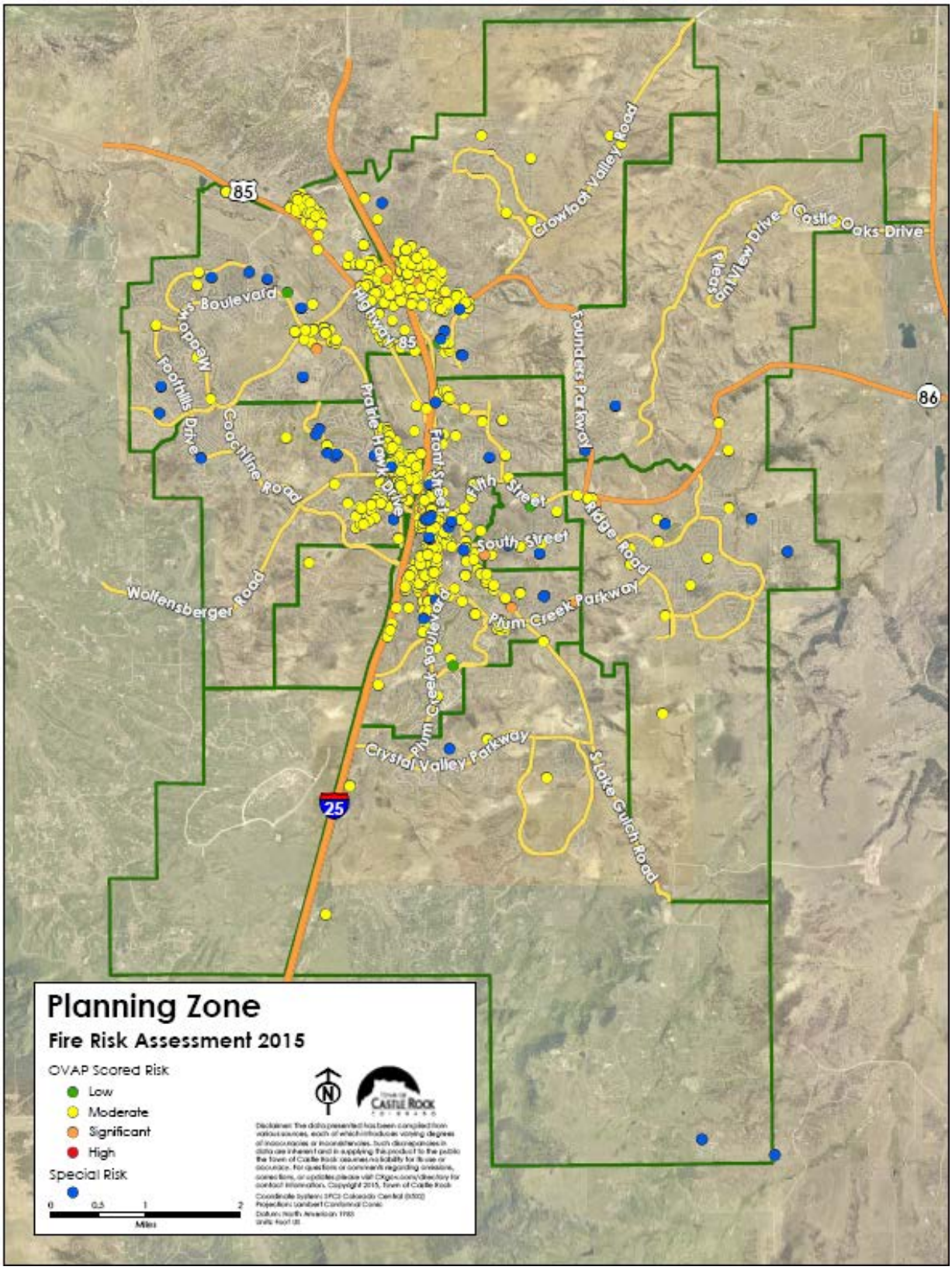
TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

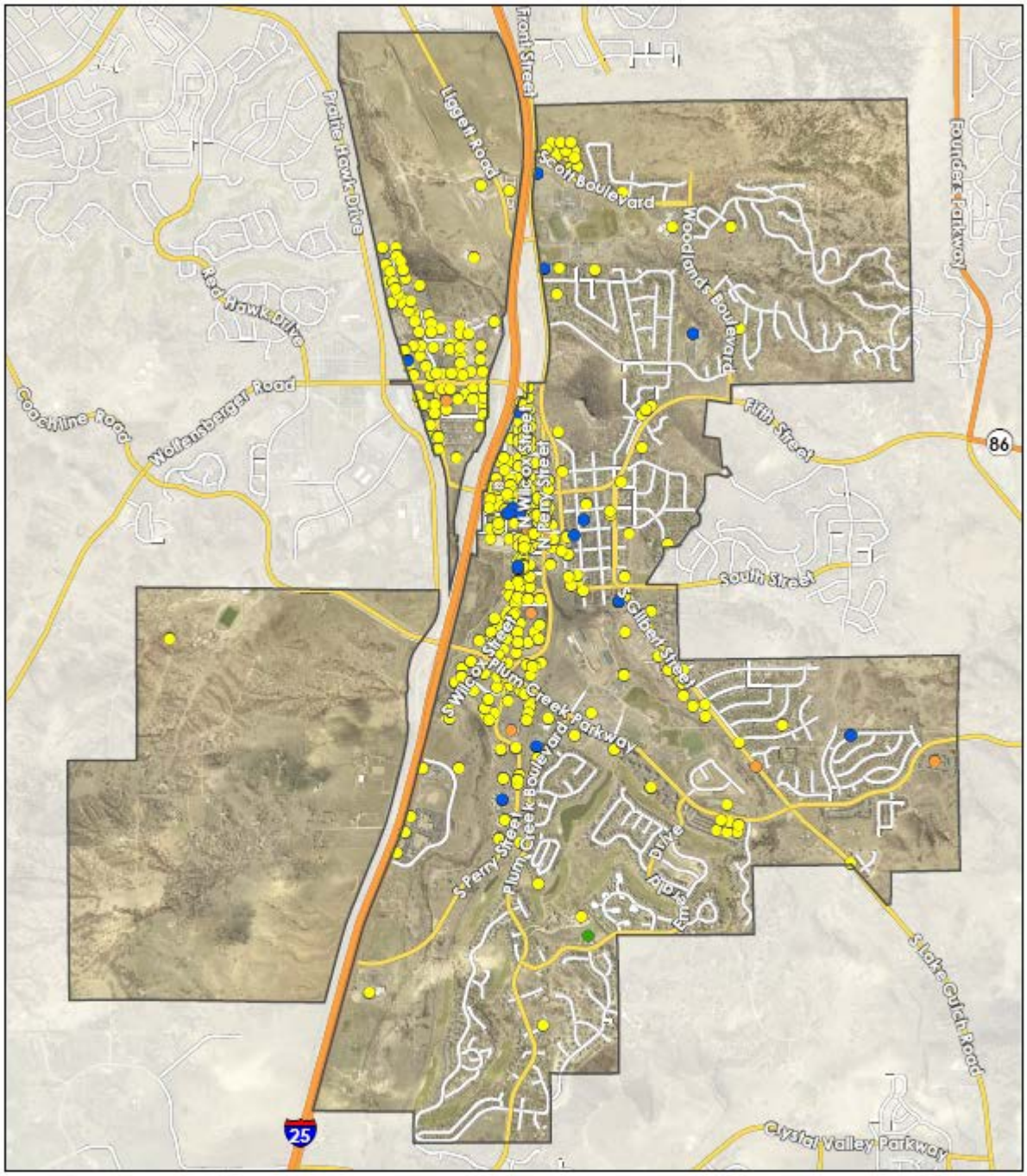
For SI: 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.
a. Types of construction are based on the *International Building Code*.
b. Measured at 20 psi residual pressure.

Appendix B Fire Risk Assessment Maps

Map 3.1 CRFD Fire Risks (return to Fire Risks)



Map 3.2 Fire Risk PZ1 (return to Fire Risks)



Planning Zone 1

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

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Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.25 0.5 1
Miles

N

Town of Castle Rock Colorado

Map 3.3 Fire Risk PZ2 (return to Fire Risks)

Planning Zone 2

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

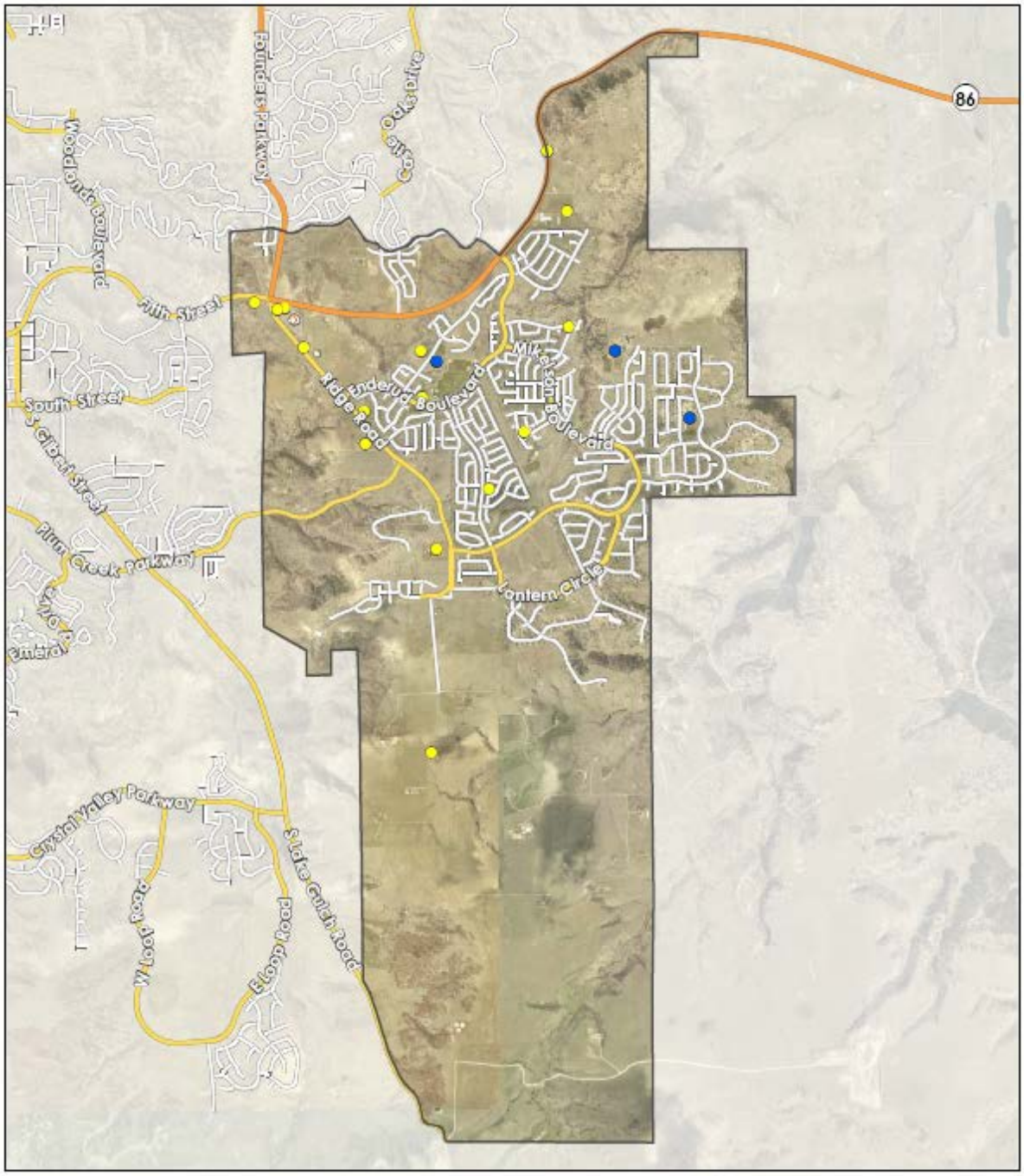
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.075 0.15 0.3
Miles

N

Town of Castle Rock Colorado

Map 3.4 Fire Risk PZ3 (return to Fire Risks)



Planning Zone 3

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

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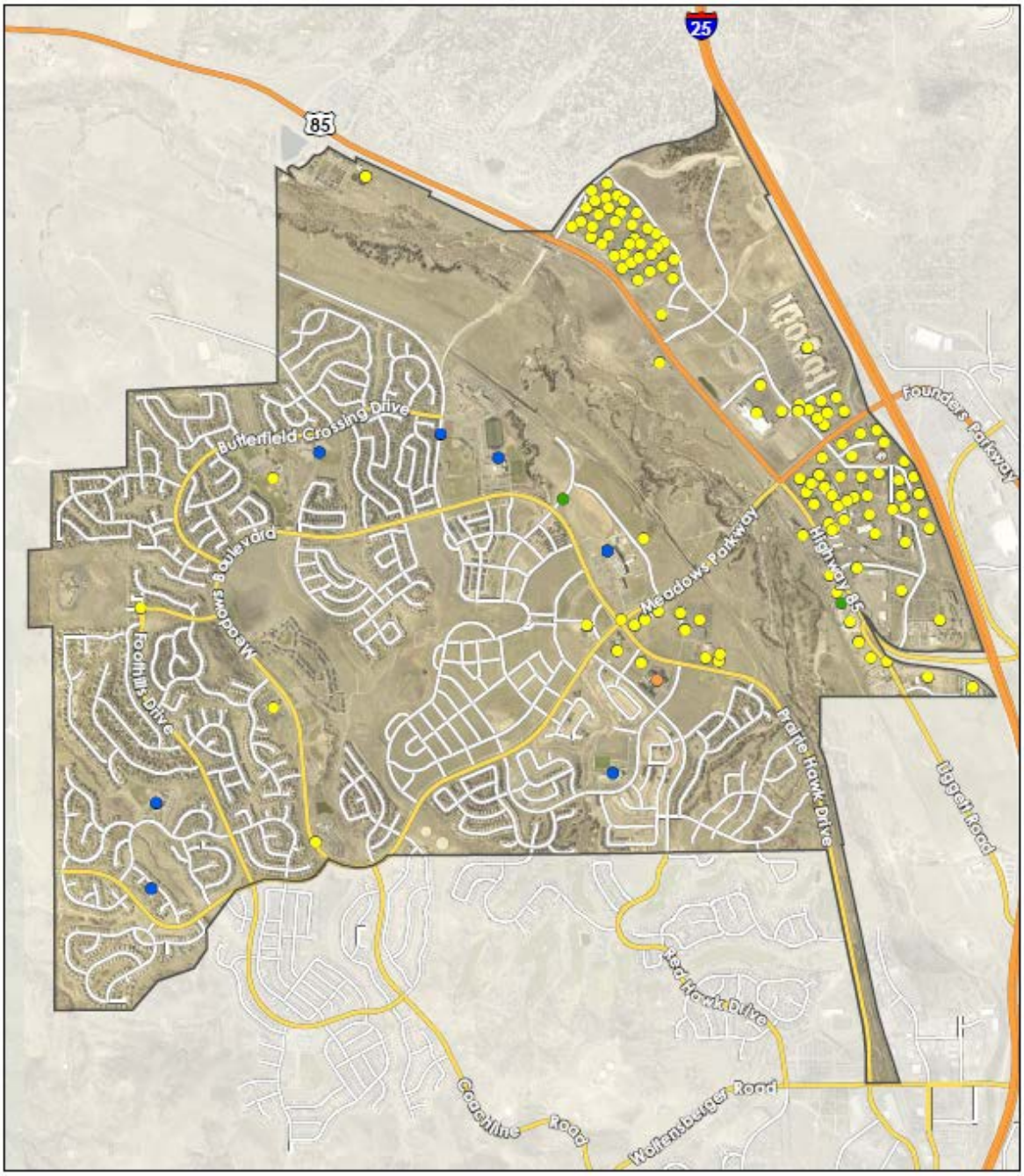
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.35 0.7 1.4
Miles

N

Town of Castle Rock Colorado

Map 3.5 Fire Risk PZ4 (return to Fire Risks)



Planning Zone 4

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

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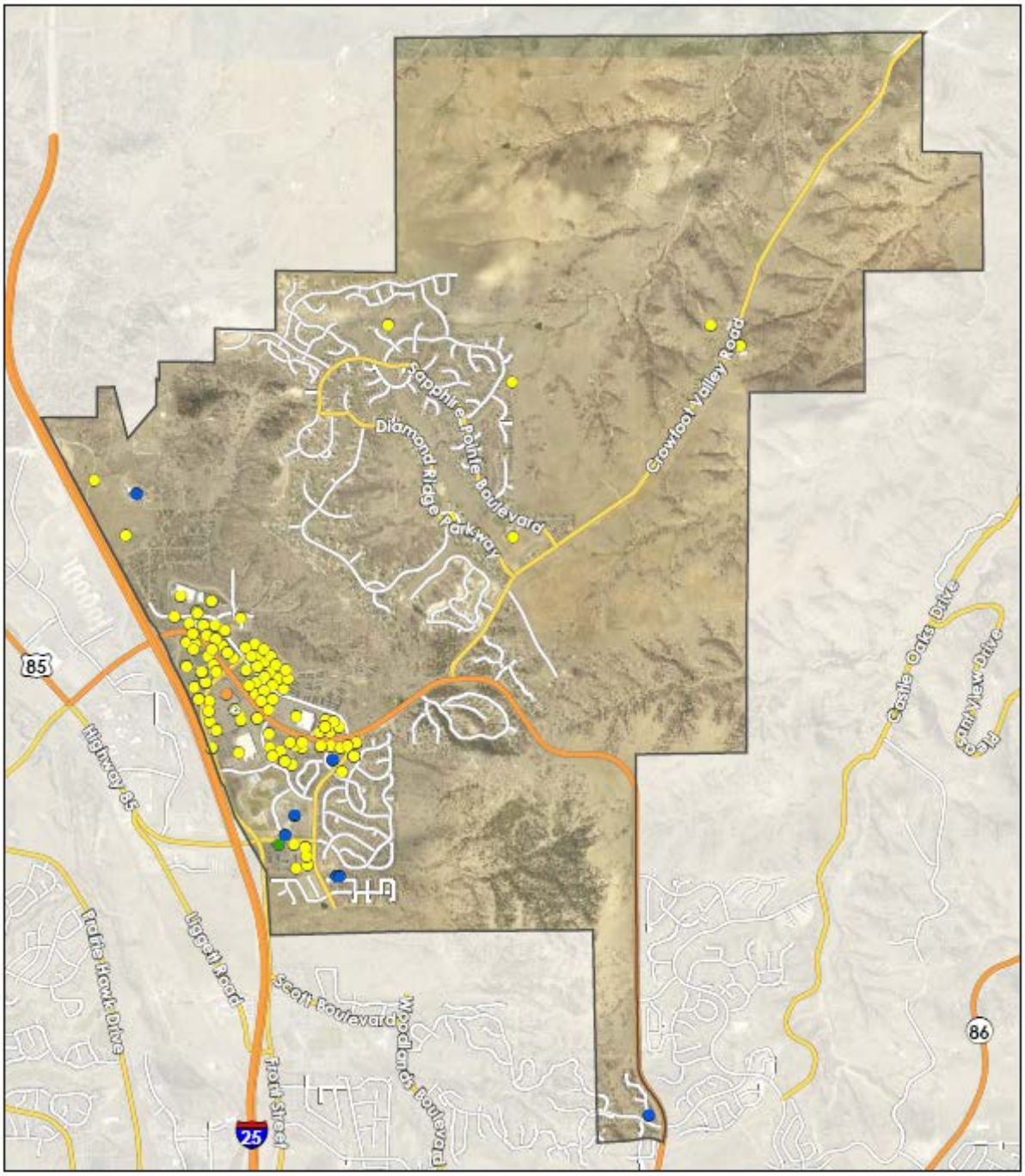
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.225 0.45 0.9
Miles

N

Town of Castle Rock Colorado

Map 3.5 Fire Risk PZ5 (return to Fire Risks)



Planning Zone 5

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

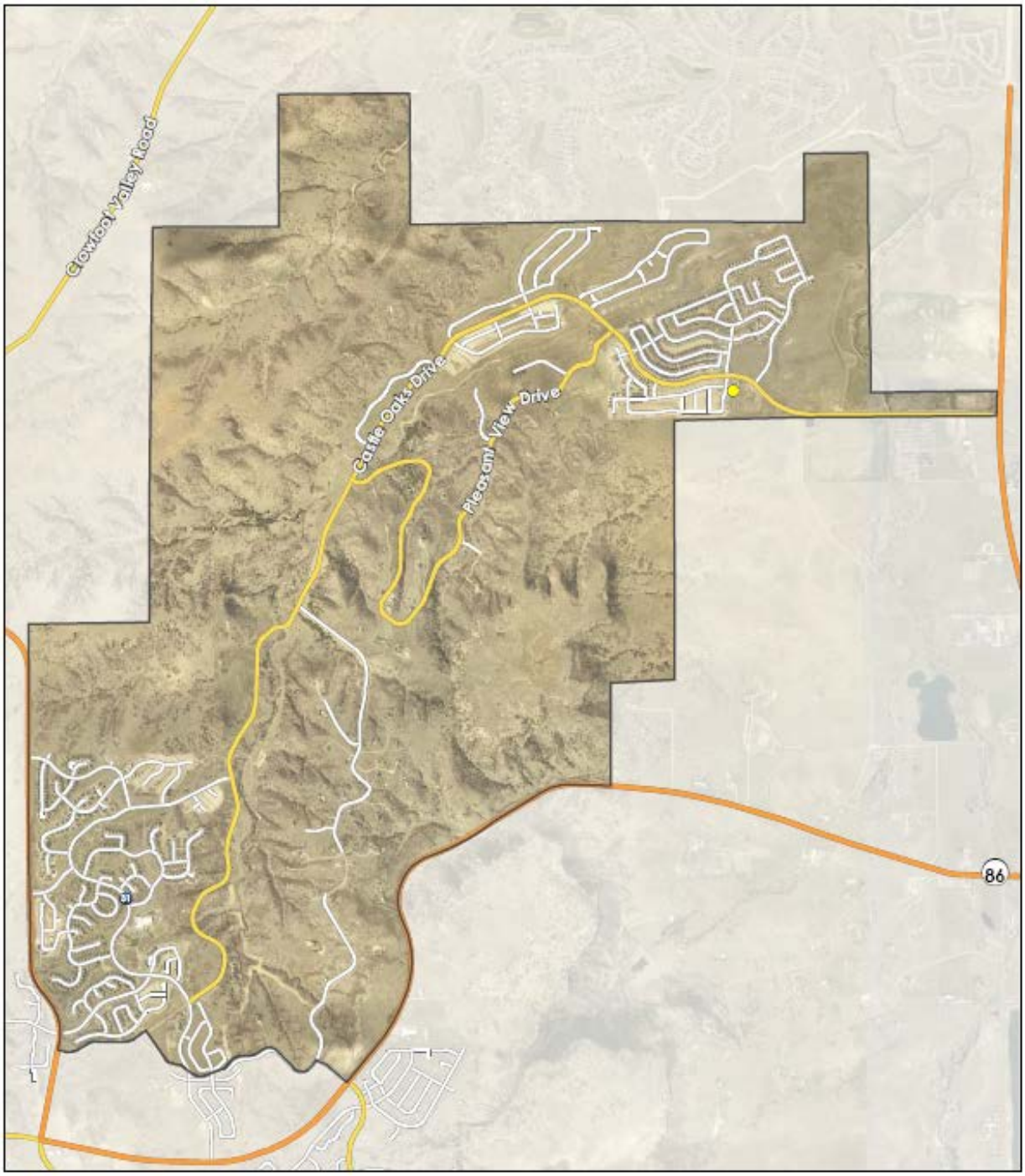
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.275 0.55 1.1
Miles

N

Town of Castle Rock Colorado

Map 3.7 Fire Risk PZ6 (return to Fire Risks)



Planning Zone 6

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

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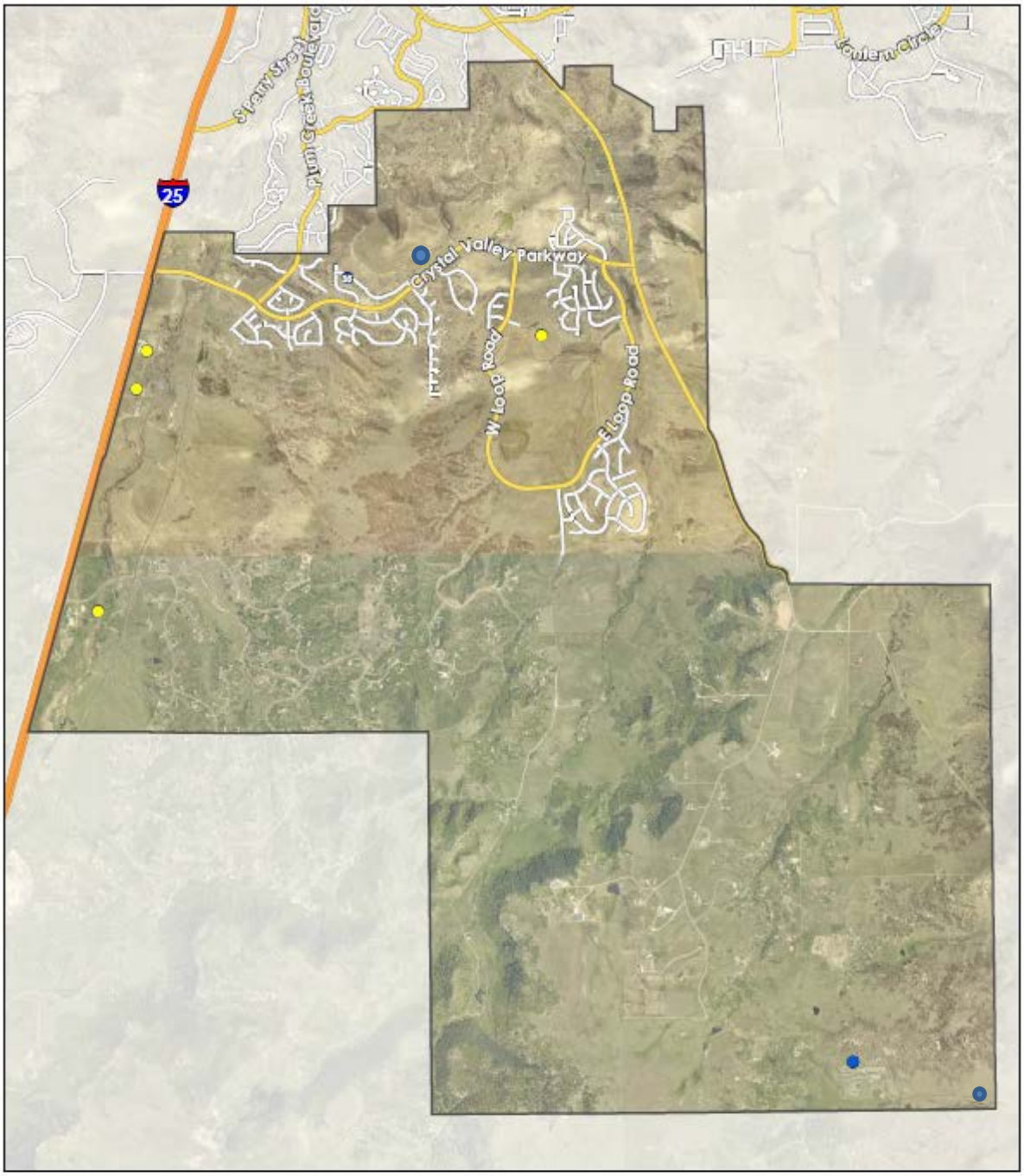
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.25 0.5 1
Miles

N

Town of Castle Rock Colorado

Map 3.8 Fire Risk PZ7 (return to Fire Risks)



Planning Zone 7

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

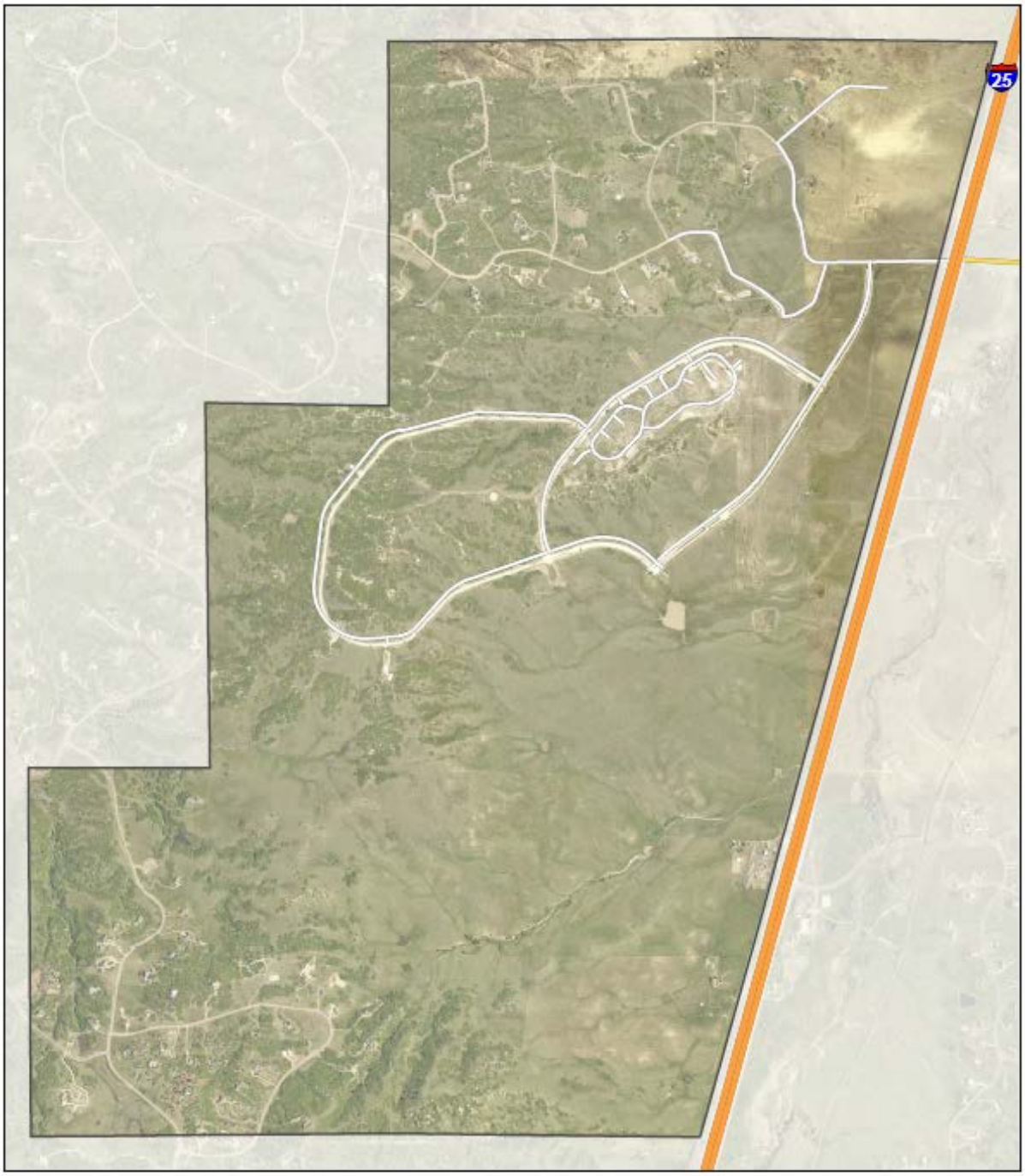
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.35 0.7 1.4
Miles

N

TOWN OF CASTLE ROCK COLORADO

Map 3.9 Fire Risk PZ8 (return to Fire Risks)



Planning Zone 8

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

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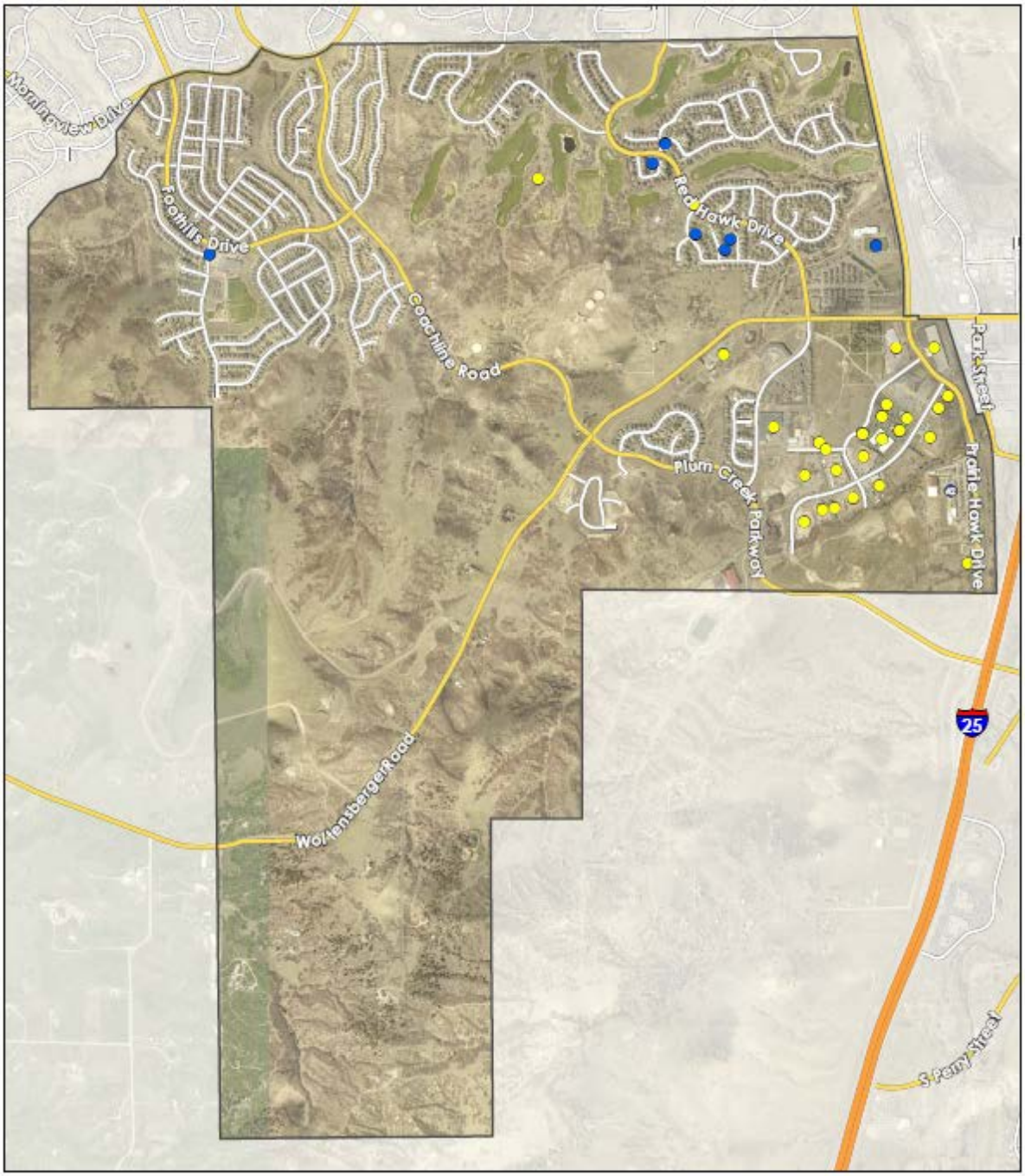
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.175 0.35 0.7
Miles

N

Town of Castle Rock Colorado

Map 3.10 Fire Risk PZ9 (return to Fire Risks)



Planning Zone 9

Fire Risk Assessment 2015

OVAP Scored Risk
- Low
- Moderate
- Significant
- High

Special Risk

Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

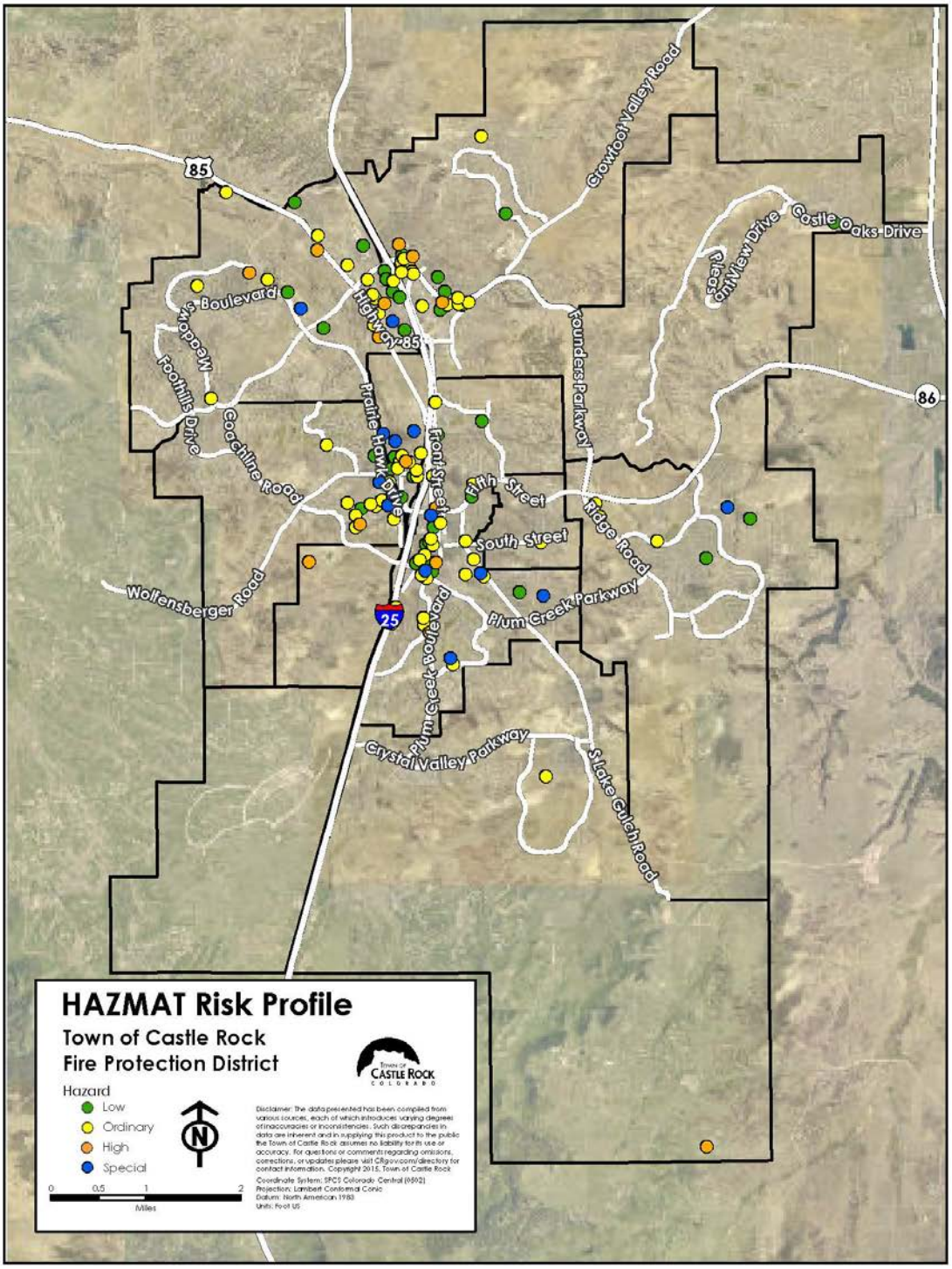
0 0.175 0.35 0.7
Miles

N

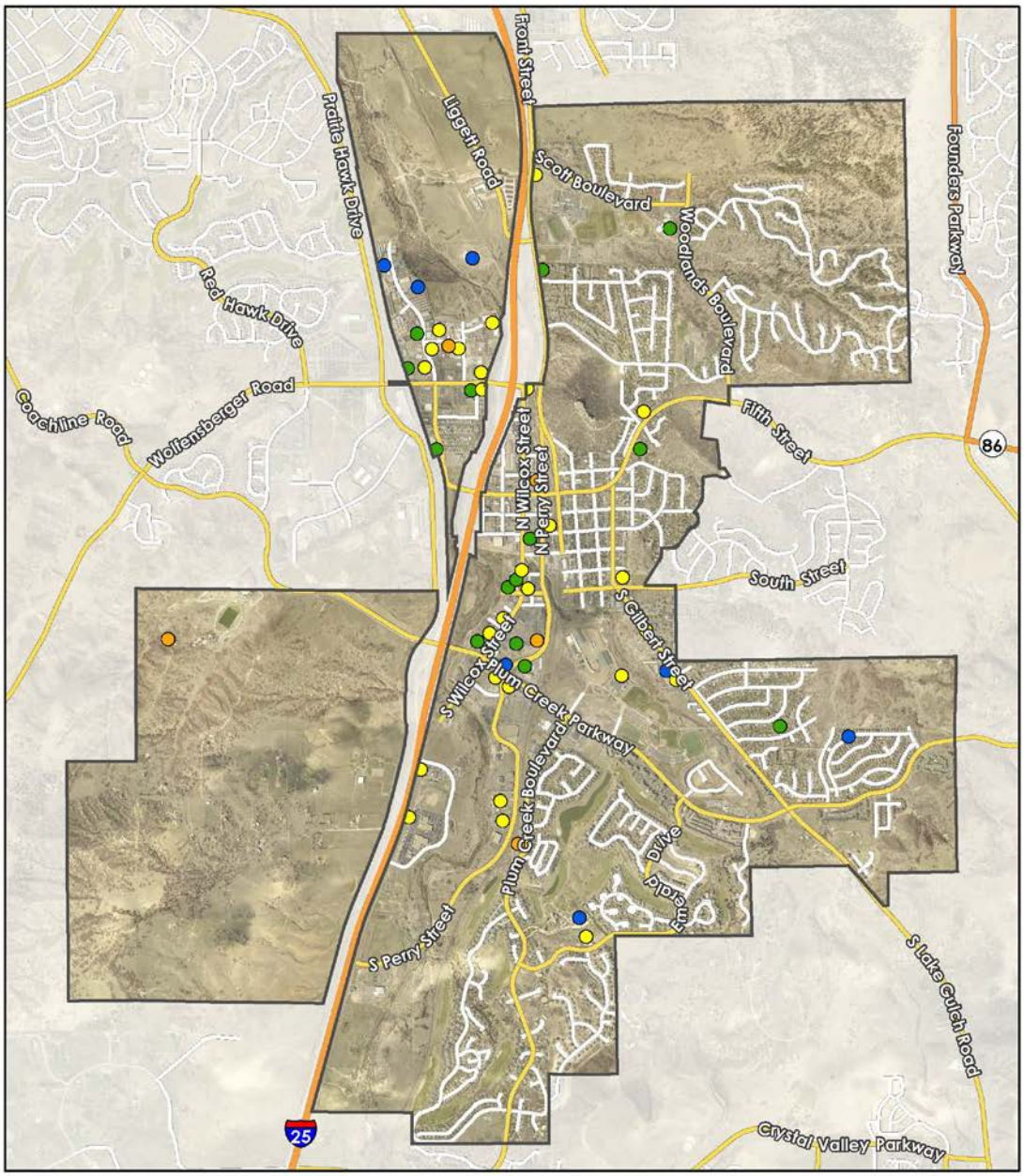
TOWN OF CASTLE ROCK COLORADO

Appendix C HAZMAT Risk Assessment Maps

Map 5.1 HAZMAT Risk (return to HAZMAT Risk)



Map 5.2 HAZMAT Risk PZ1 (return to HAZMAT Risk)



Planning Zone 1

HAZMAT Risk Profile

Hazard

- Low
- Ordinary
- High
- Special

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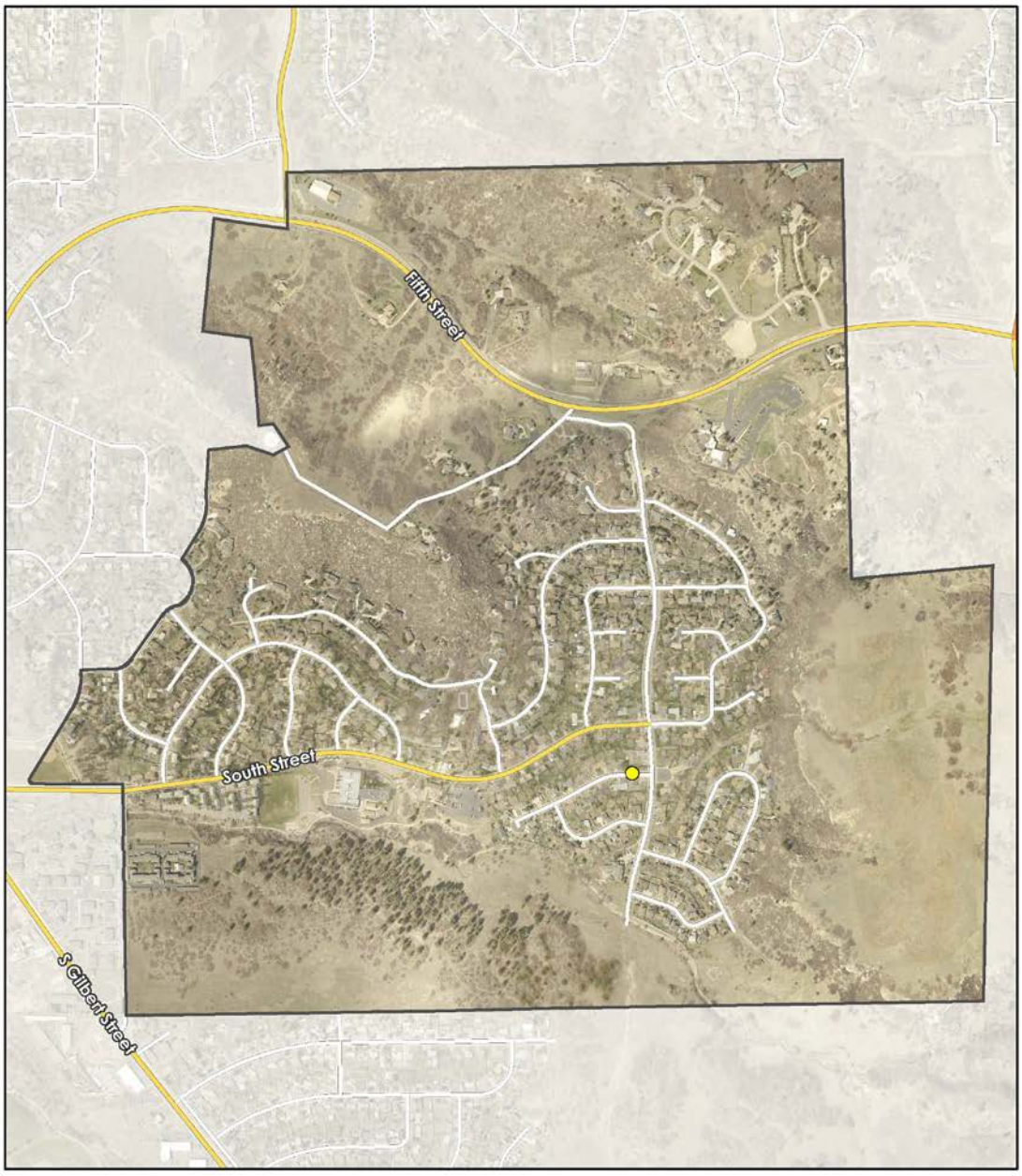
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.25 0.5 1
Miles

N

Town of Castle Rock Colorado

Map 5.3 HAZMAT Risk PZ2 (return to HAZMAT Risk)



Planning Zone 2

HAZMAT Risk Profile

Hazard

- Low
- Ordinary
- High
- Special

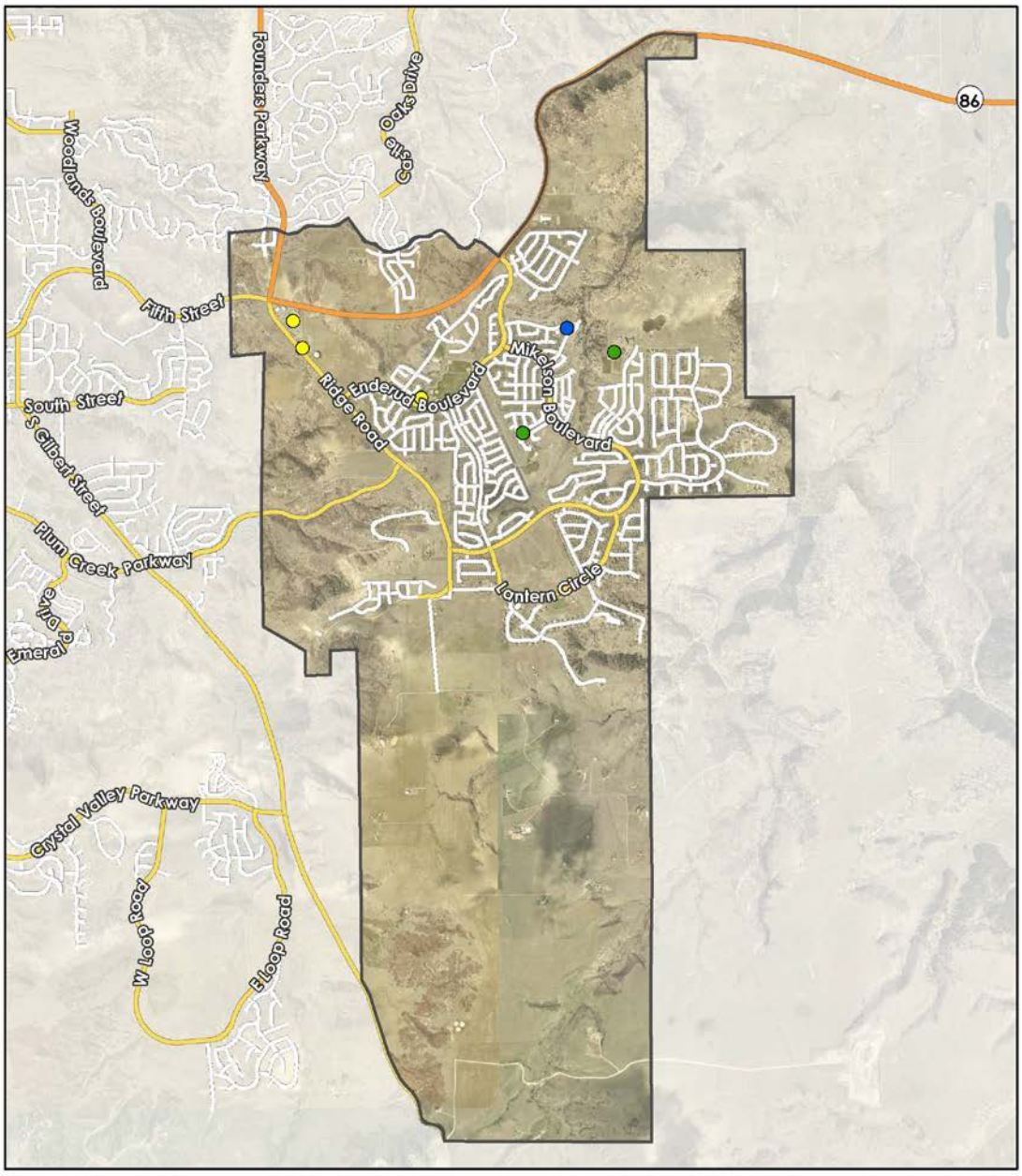
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.075 0.15 0.3
Miles

N

Town of Castle Rock Colorado

Map 5.4 HAZMAT Risk PZ3 (return to HAZMAT Risk)



Planning Zone 3

HAZMAT Risk Profile

Hazard

- Low
- Ordinary
- High
- Special

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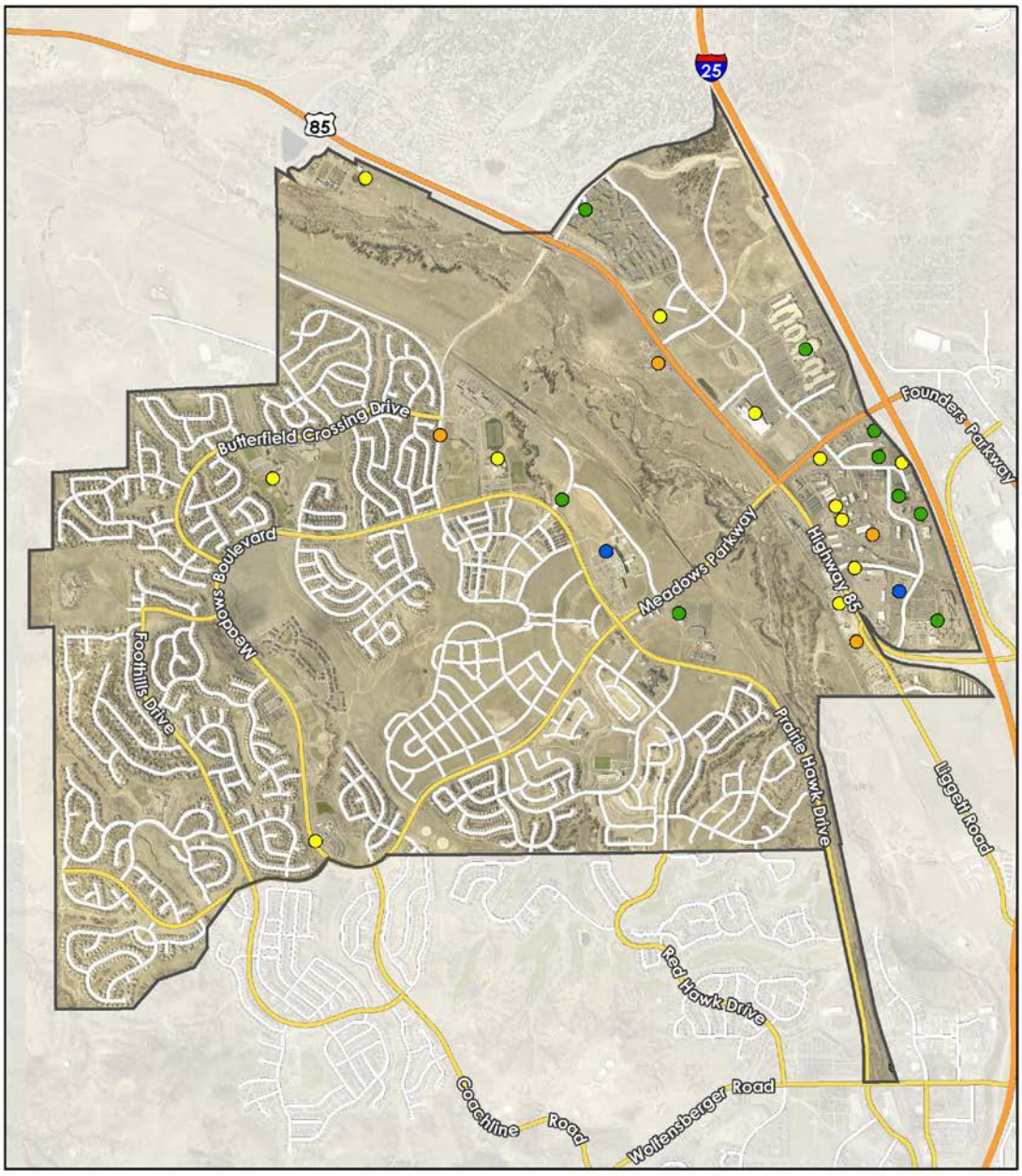
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.35 0.7 1.4
Miles

N

Town of Castle Rock Colorado

Map 5.5 HAZMAT Risk PZ4 (return to HAZMAT Risk)



Planning Zone 4

HAZMAT Risk Profile

Hazard

- Low
- Ordinary
- High
- Special

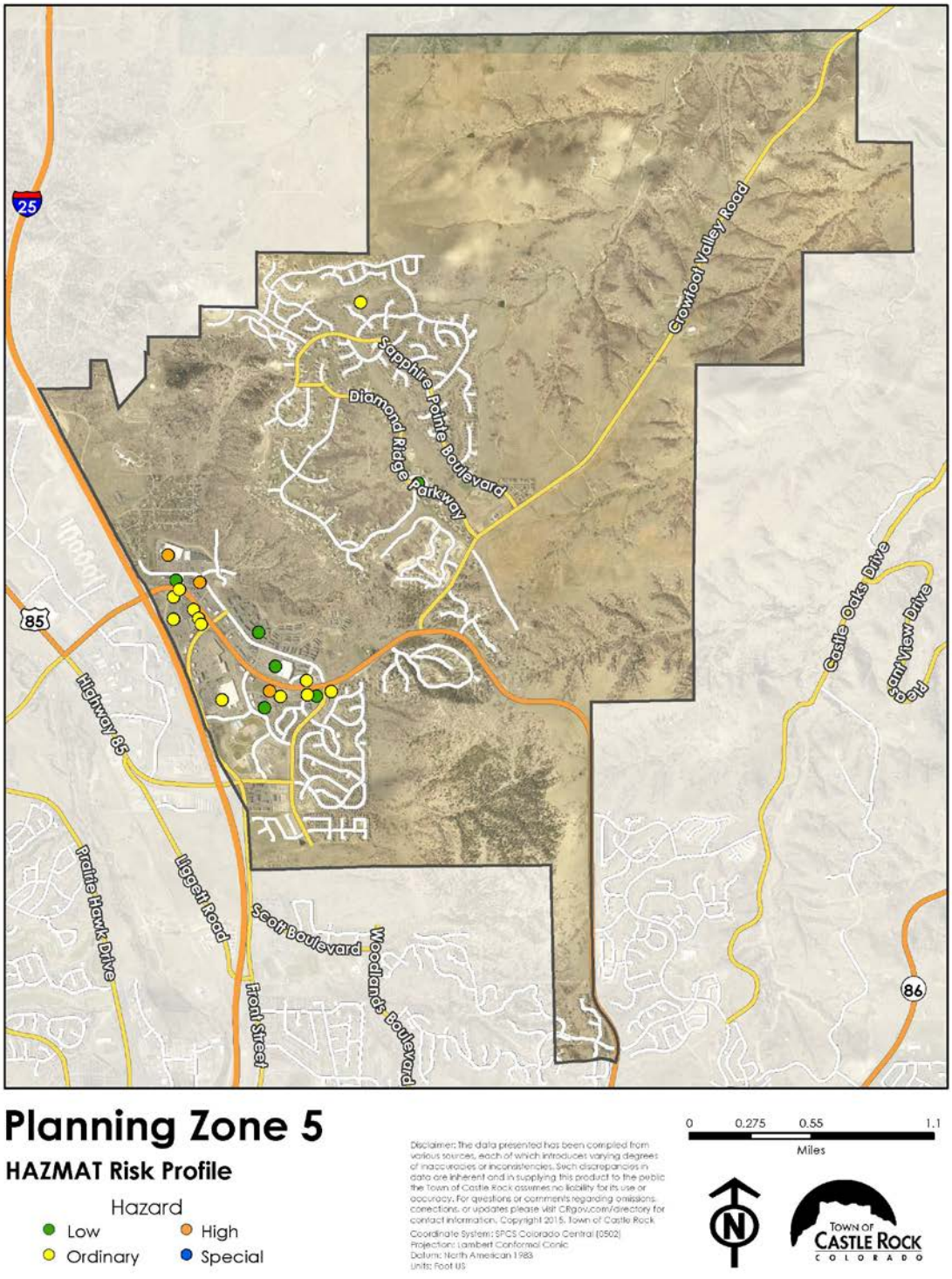
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.225 0.45 0.9
Miles

N

Town of Castle Rock Colorado

Map 5.6 HAZMAT Risk PZ5 (return to HAZMAT Risk)



Planning Zone 5

HAZMAT Risk Profile

Hazard

- Low
- Ordinary
- High
- Special

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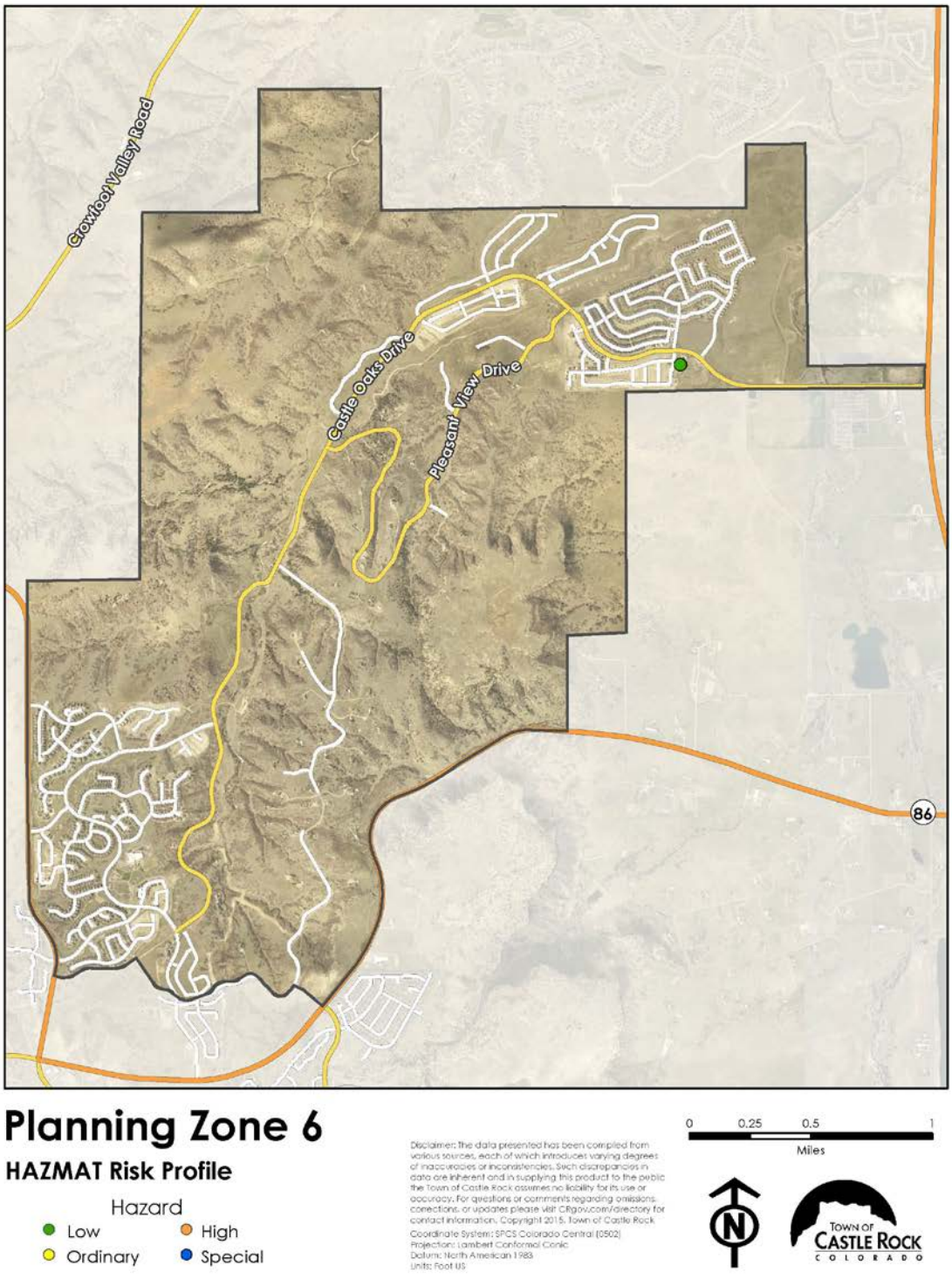
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.275 0.55 1.1
Miles

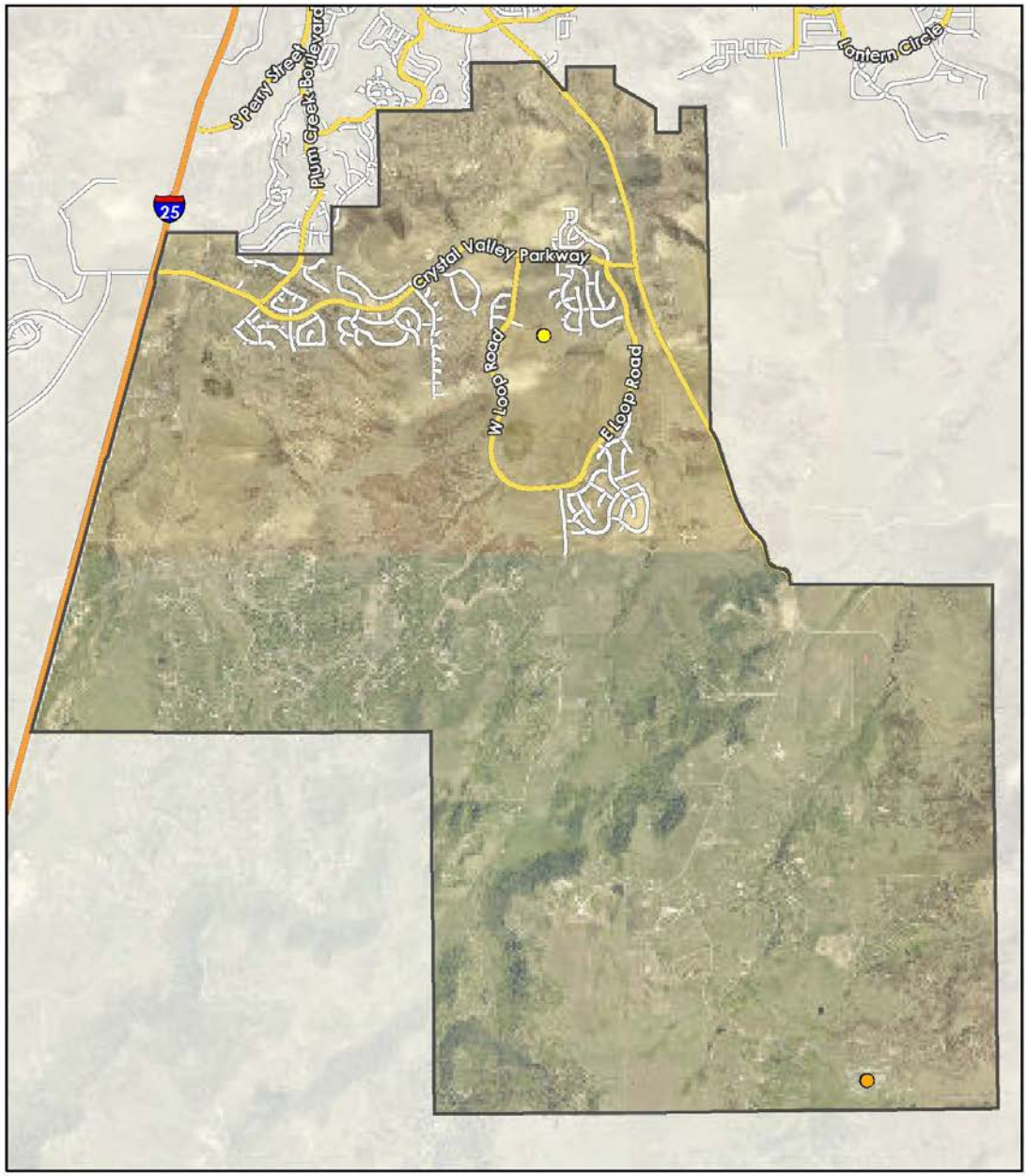
N

Town of Castle Rock Colorado

Map 5.7 HAZMAT Risk PZ6 (return to HAZMAT Risk)



Map 5.8 HAZMAT Risk PZ7 (return to HAZMAT Risk)



Planning Zone 7

HAZMAT Risk Profile

Hazard

- Low
- High
- Ordinary
- Special

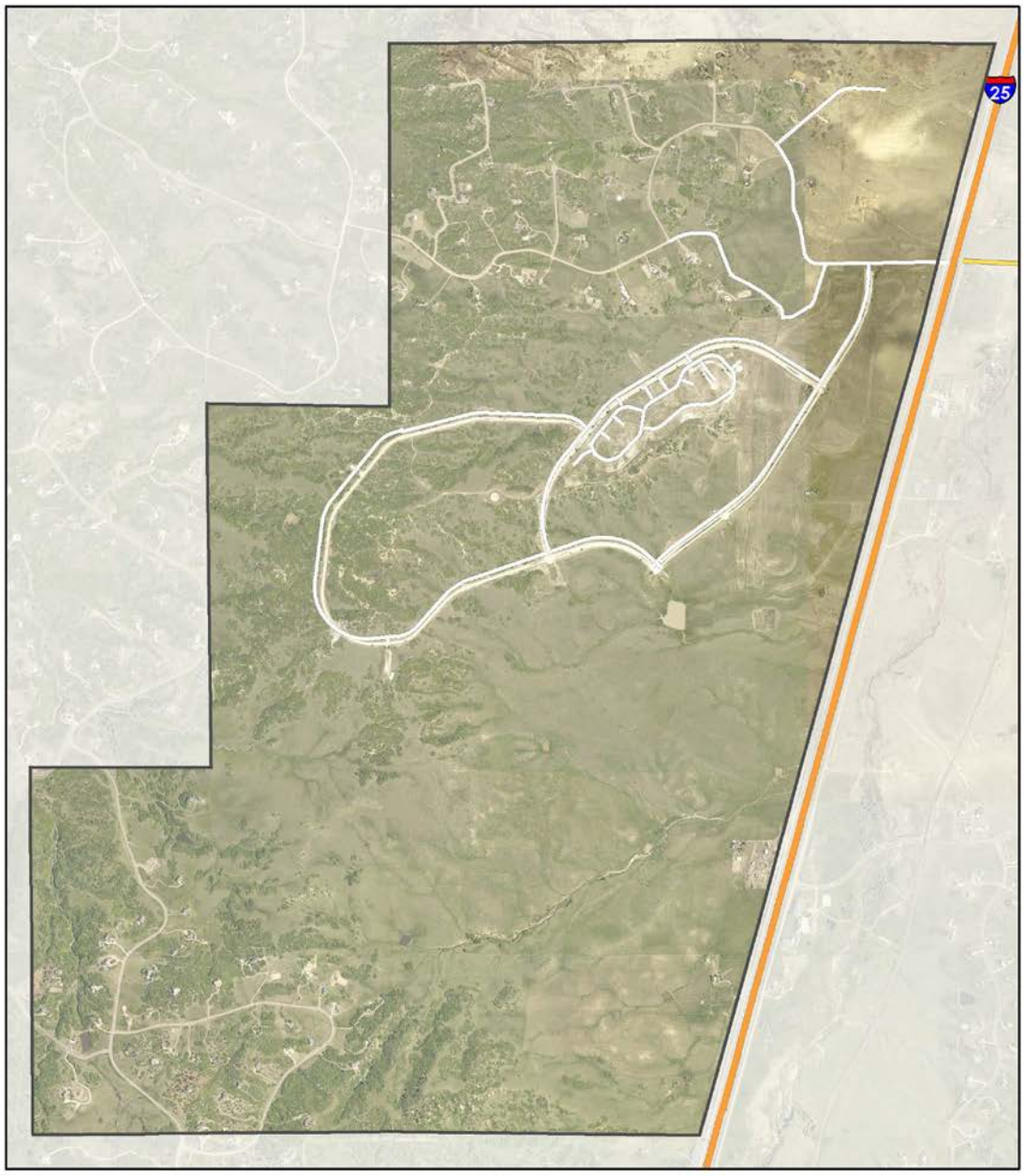
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.35 0.7 1.4
Miles

N

TOWN OF CASTLE ROCK COLORADO

Map 5.9 HAZMAT Risk PZ8 (return to HAZMAT Risk)



Planning Zone 8

HAZMAT Risk Profile

Hazard

- Low
- Ordinary
- High
- Special

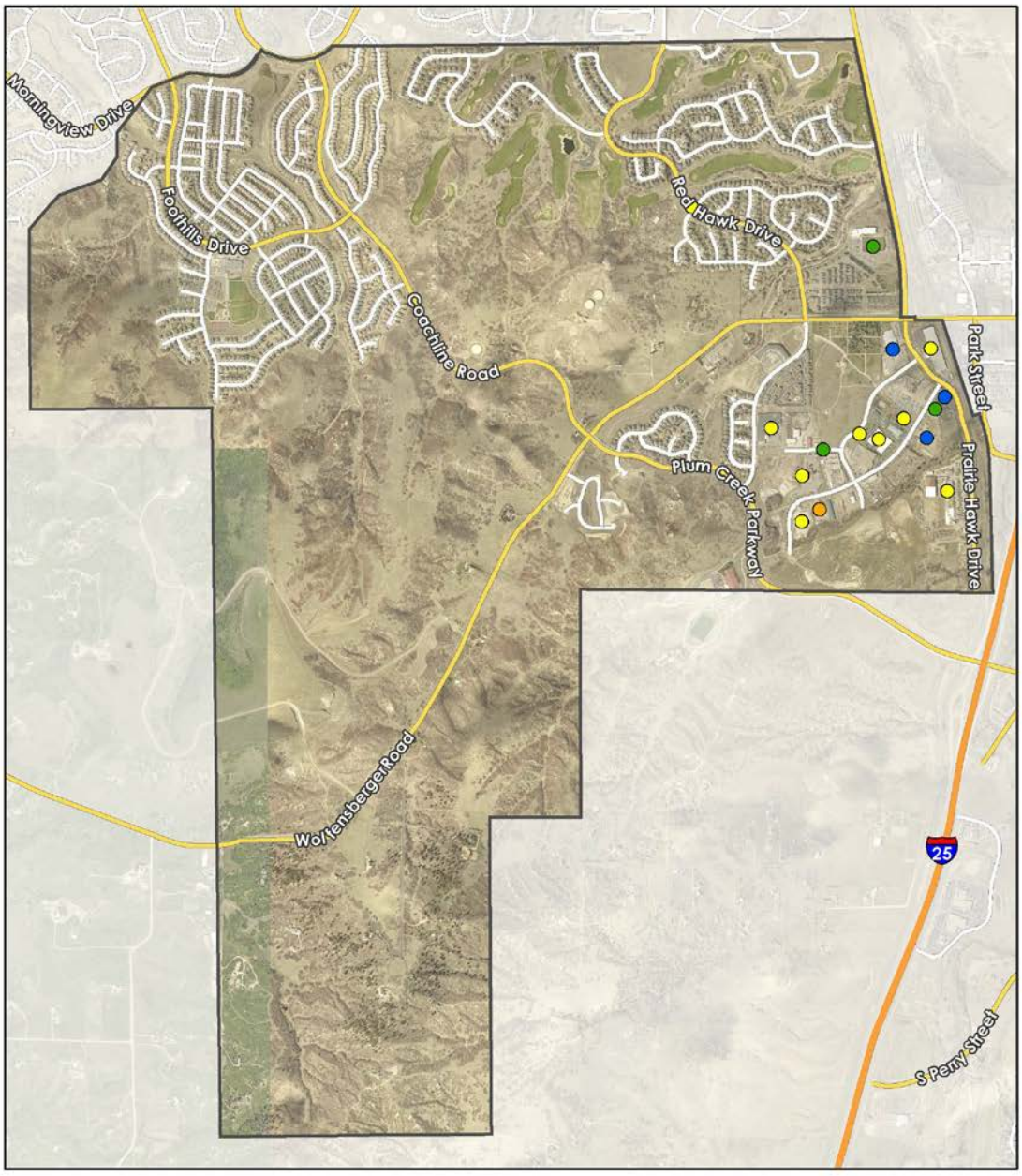
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.175 0.35 0.7
Miles

N

Town of Castle Rock Colorado

Map 5.10 HAZMAT Risk PZ9 (return to HAZMAT Risk)



Planning Zone 9

HAZMAT Risk Profile

Hazard

- Low
- Ordinary
- High
- Special

Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

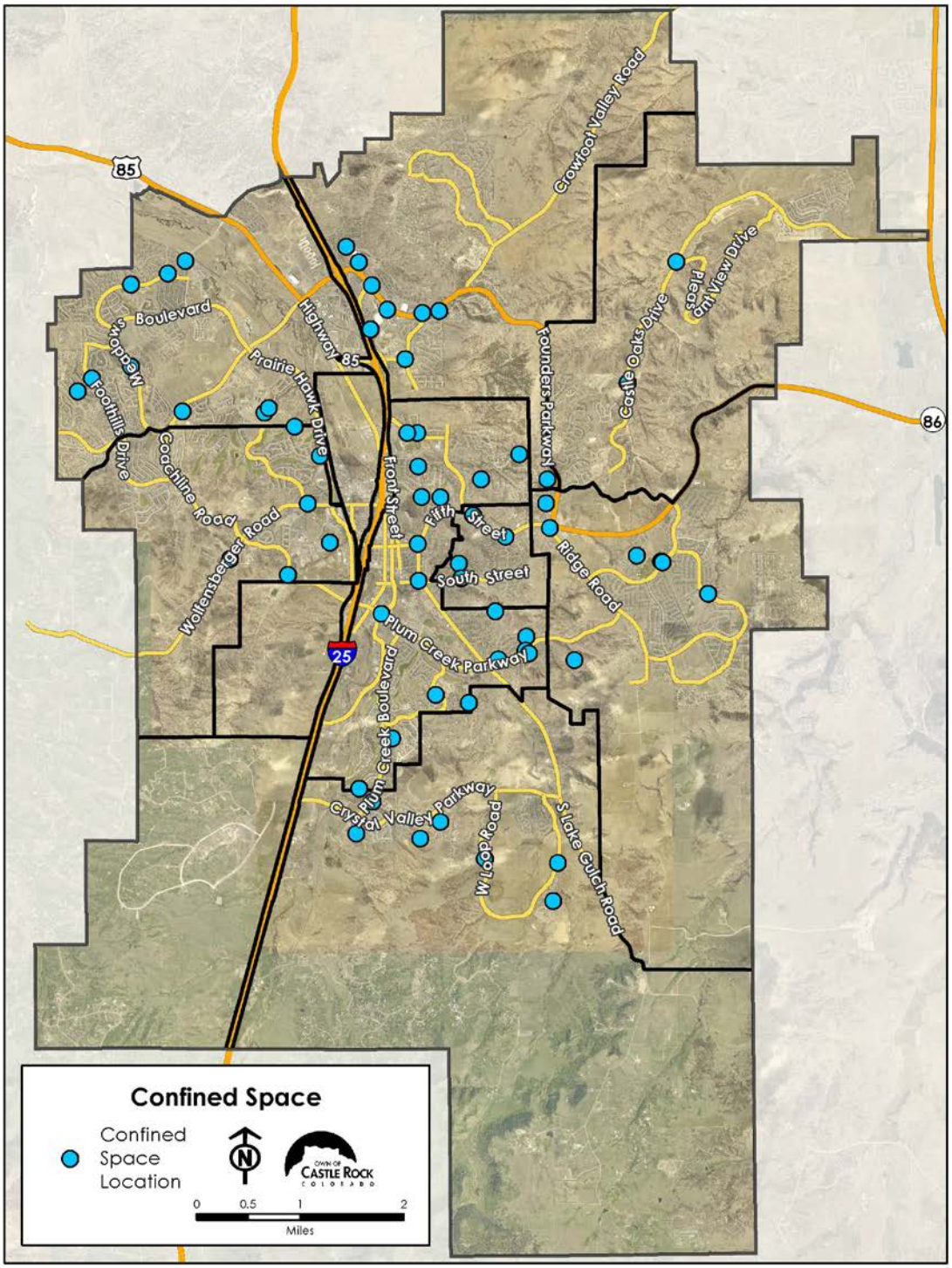
0 0.175 0.35 0.7
Miles

N

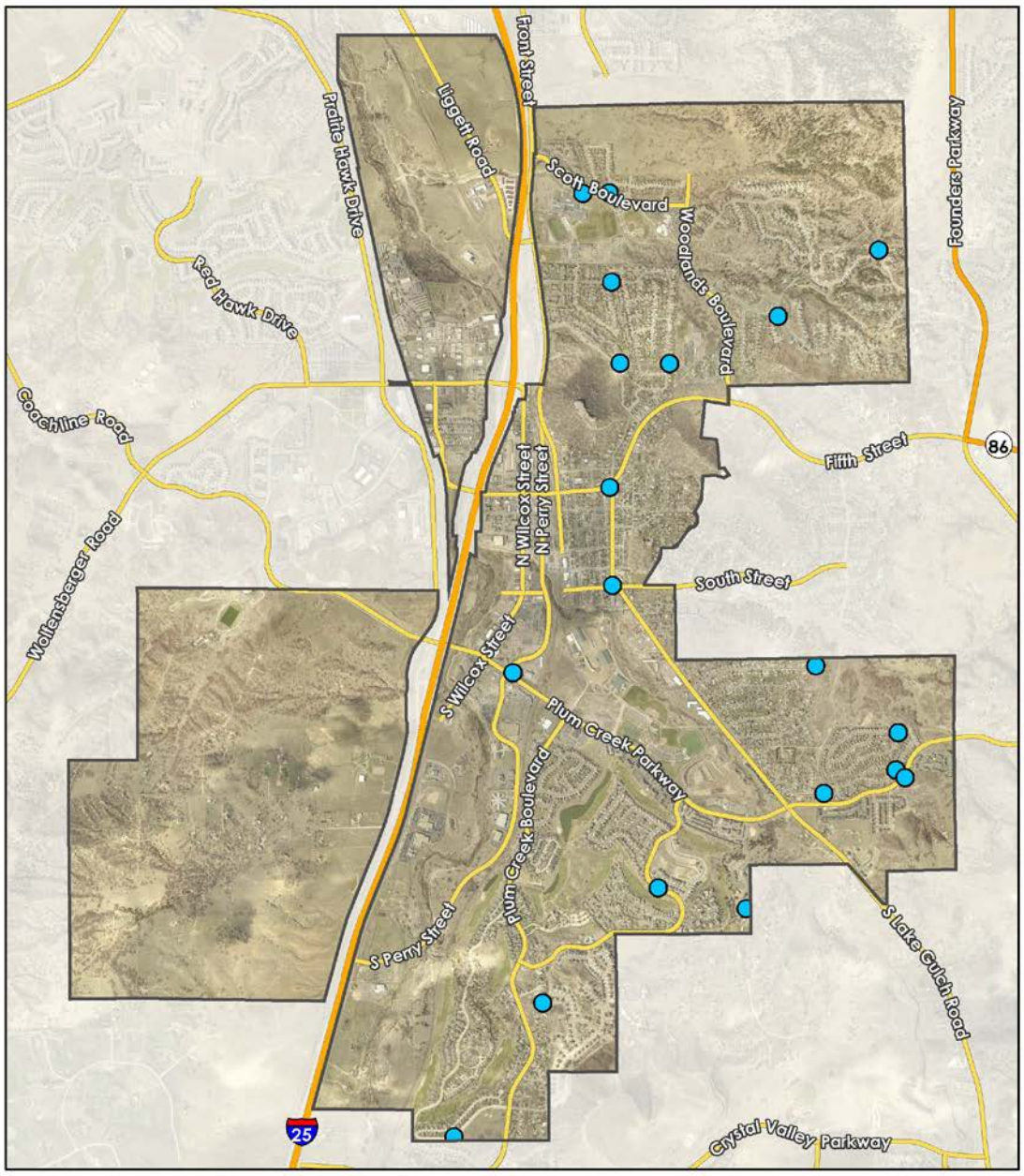
Town of Castle Rock Colorado

Appendix D Technical Rescue Risk Assessment Maps

Map 6.1 Confined Space Rescue Risk CRFD (return to Tech Rescue Risks)



Map 6.2 Confined Space Rescue Risk PZ1 (return to Tech Rescue Risks)



Planning Zone 1
Confined Space

Confined Space Location

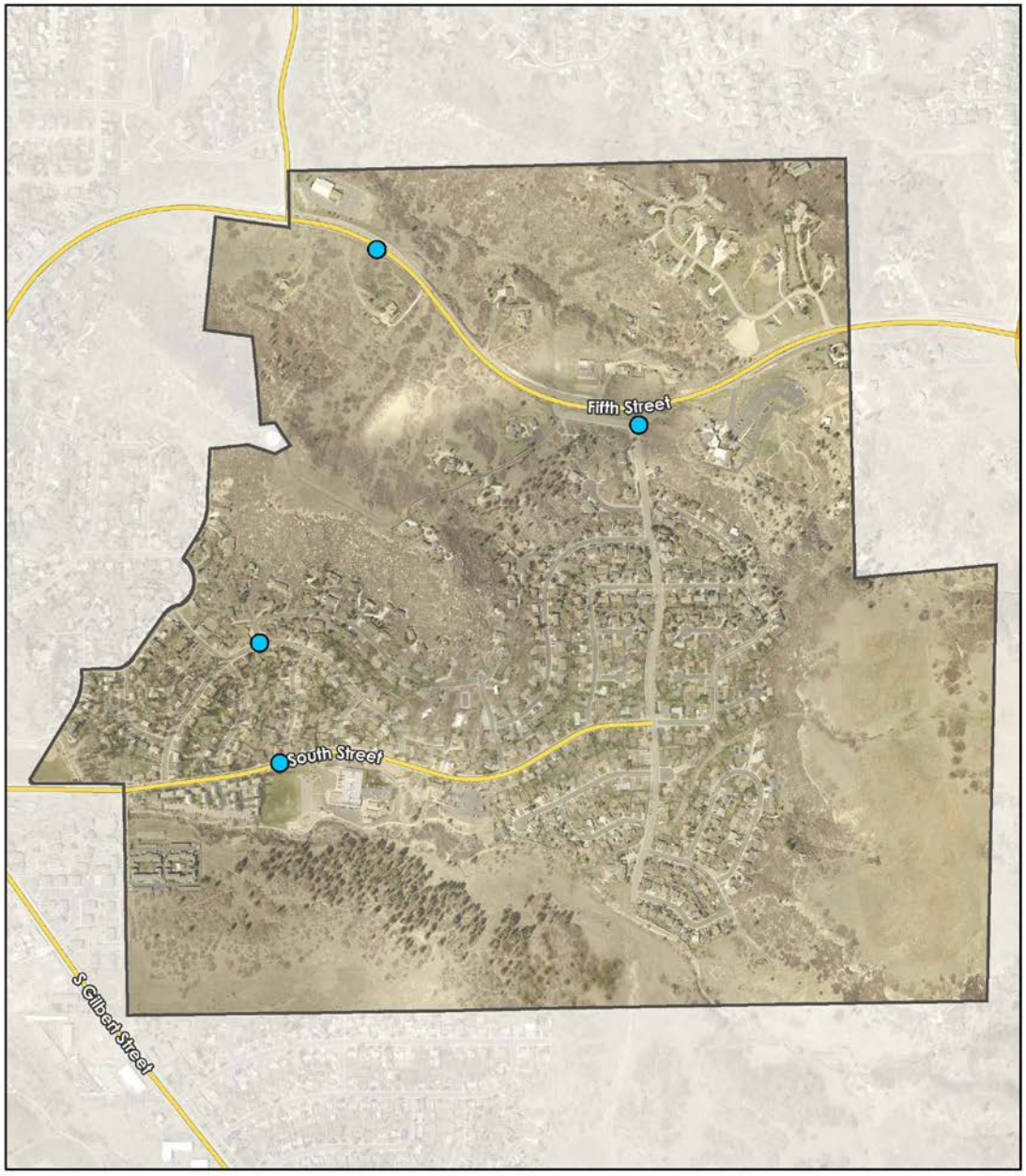
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.25 0.5 1
Miles

N

Town of Castle Rock Colorado

Map 6.3 Confined Space Rescue Risk PZ2 (return to Tech Rescue Risks)



Planning Zone 2
Confined Space

Confined Space Location

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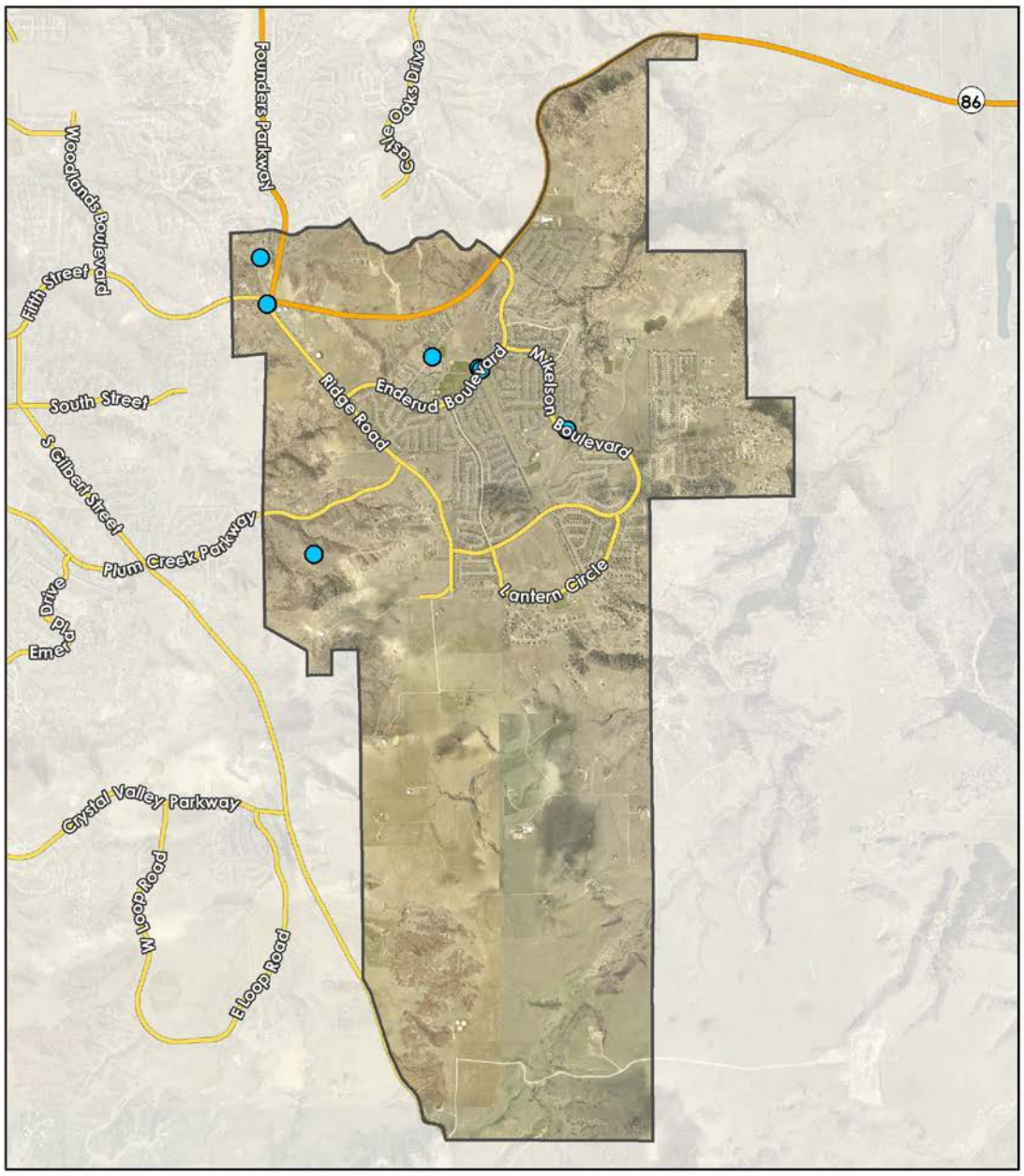
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.075 0.15 0.3
Miles

N

Town of Castle Rock Colorado

Map 6.4 Confined Space Rescue Risk PZ3 (return to Tech Rescue Risks)



Planning Zone 3
Confined Space

Confined Space Location

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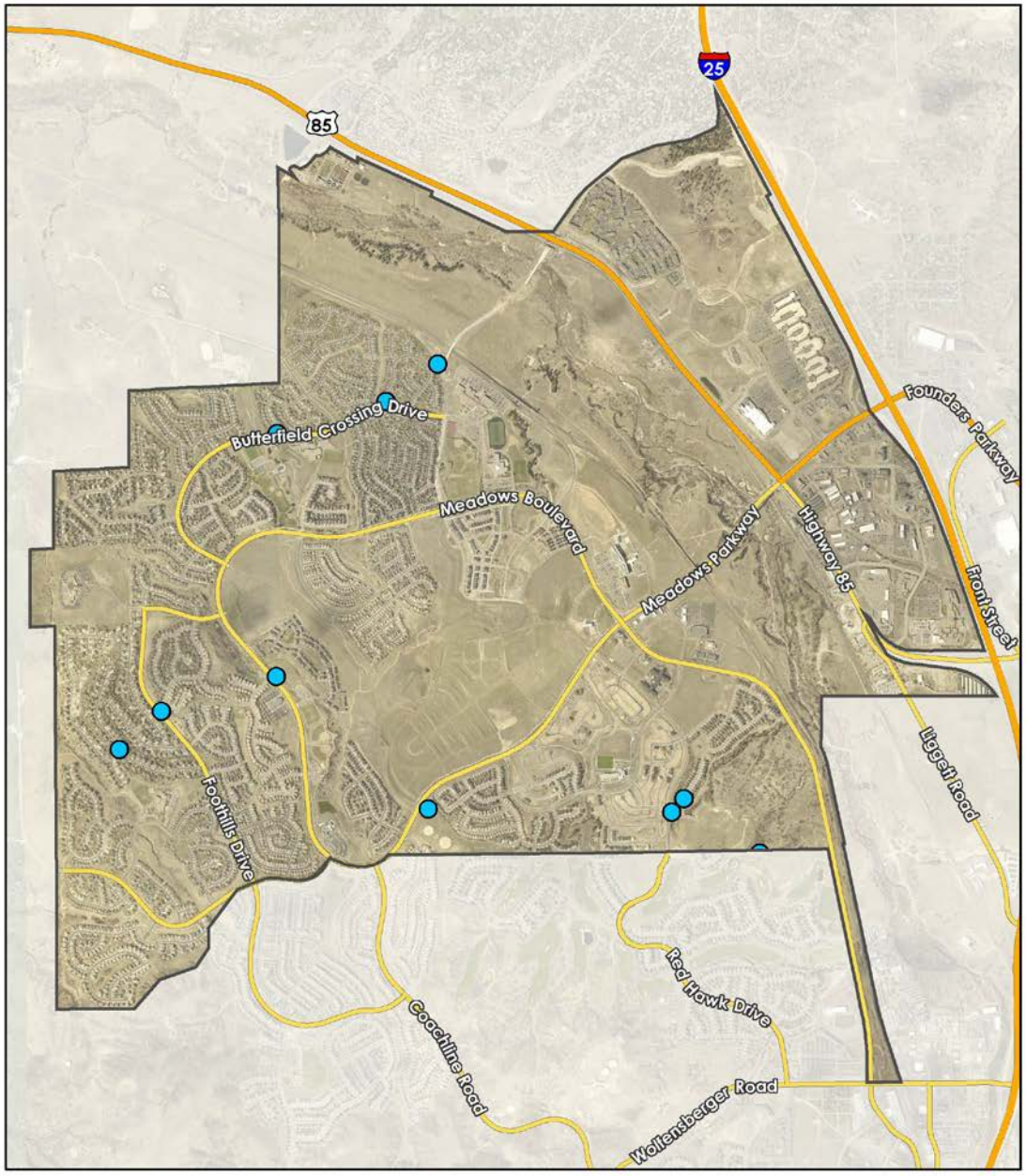
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

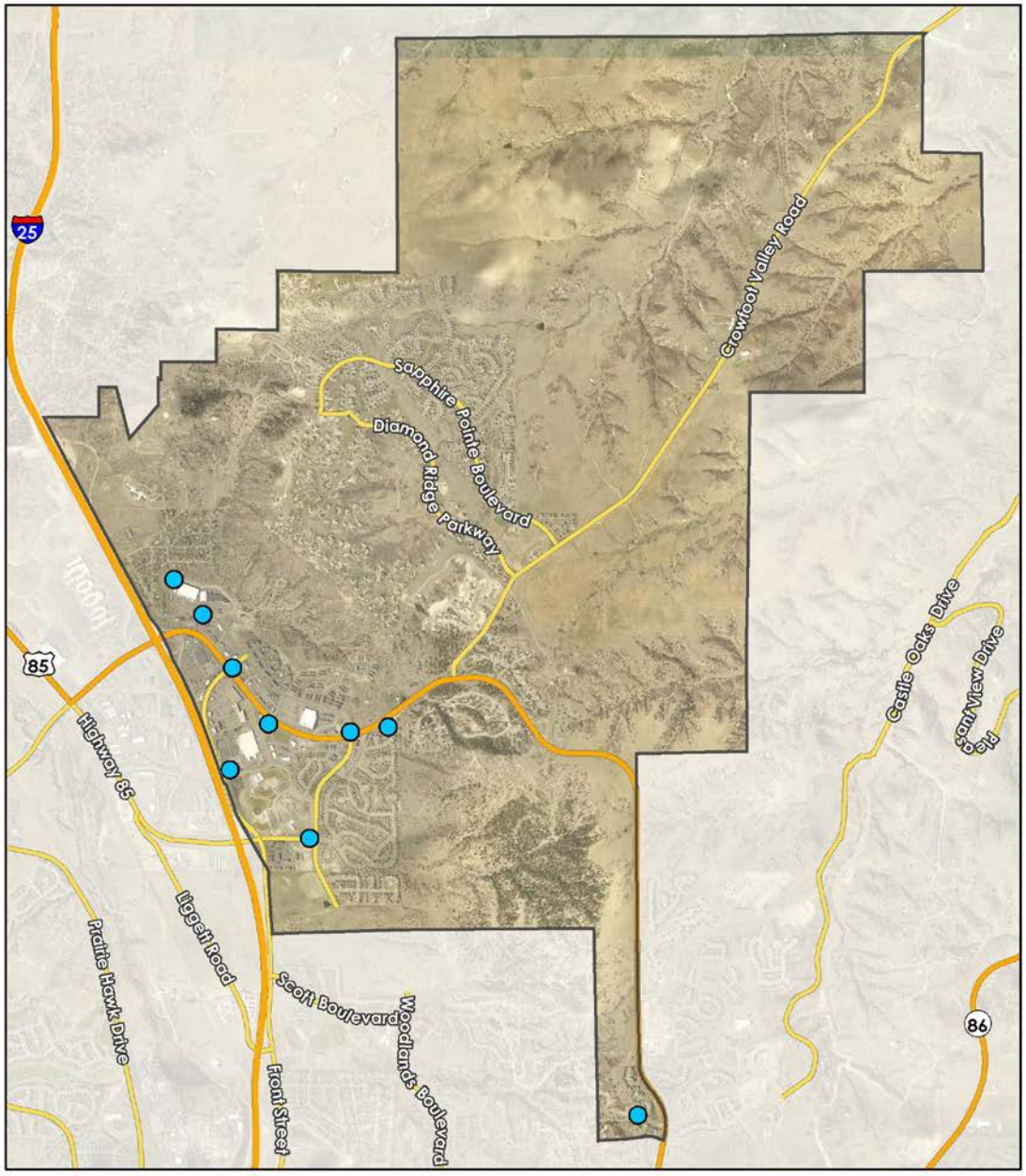
0 0.35 0.7 1.4
Miles

TOWN OF CASTLE ROCK COLORADO

Map 6.5 Confined Space Rescue Risk PZ4 (return to Tech Rescue Risks)



Map 6.6 Confined Space Rescue Risk PZ5 (return to Tech Rescue Risks)



Planning Zone 5
Confined Space

Confined Space Location

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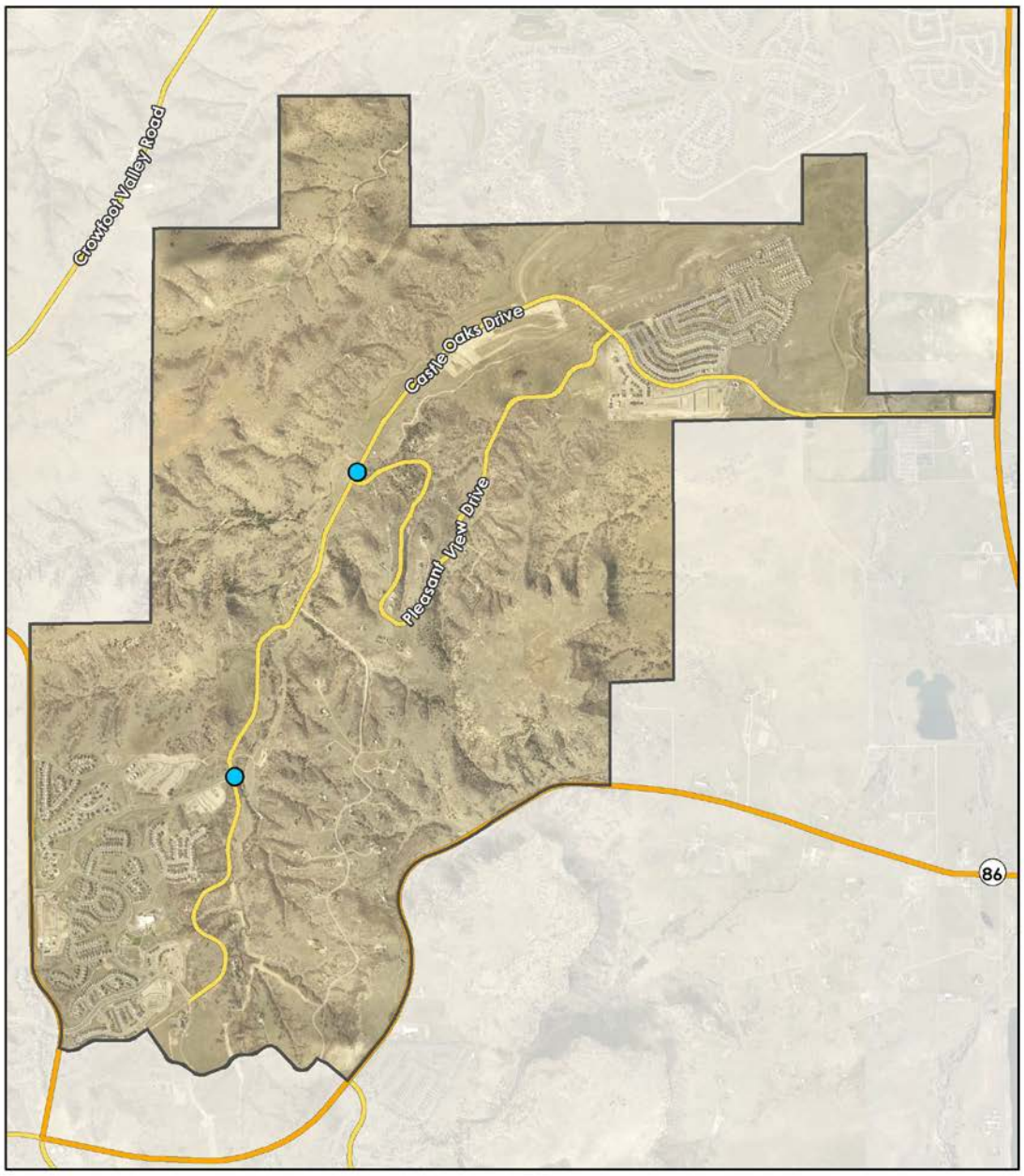
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.275 0.55 1.1
Miles

N

Town of Castle Rock Colorado

Map 6.7 Confined Space Rescue Risk PZ6 (return to Tech Rescue Risks)



Planning Zone 6
Confined Space

Confined Space Location

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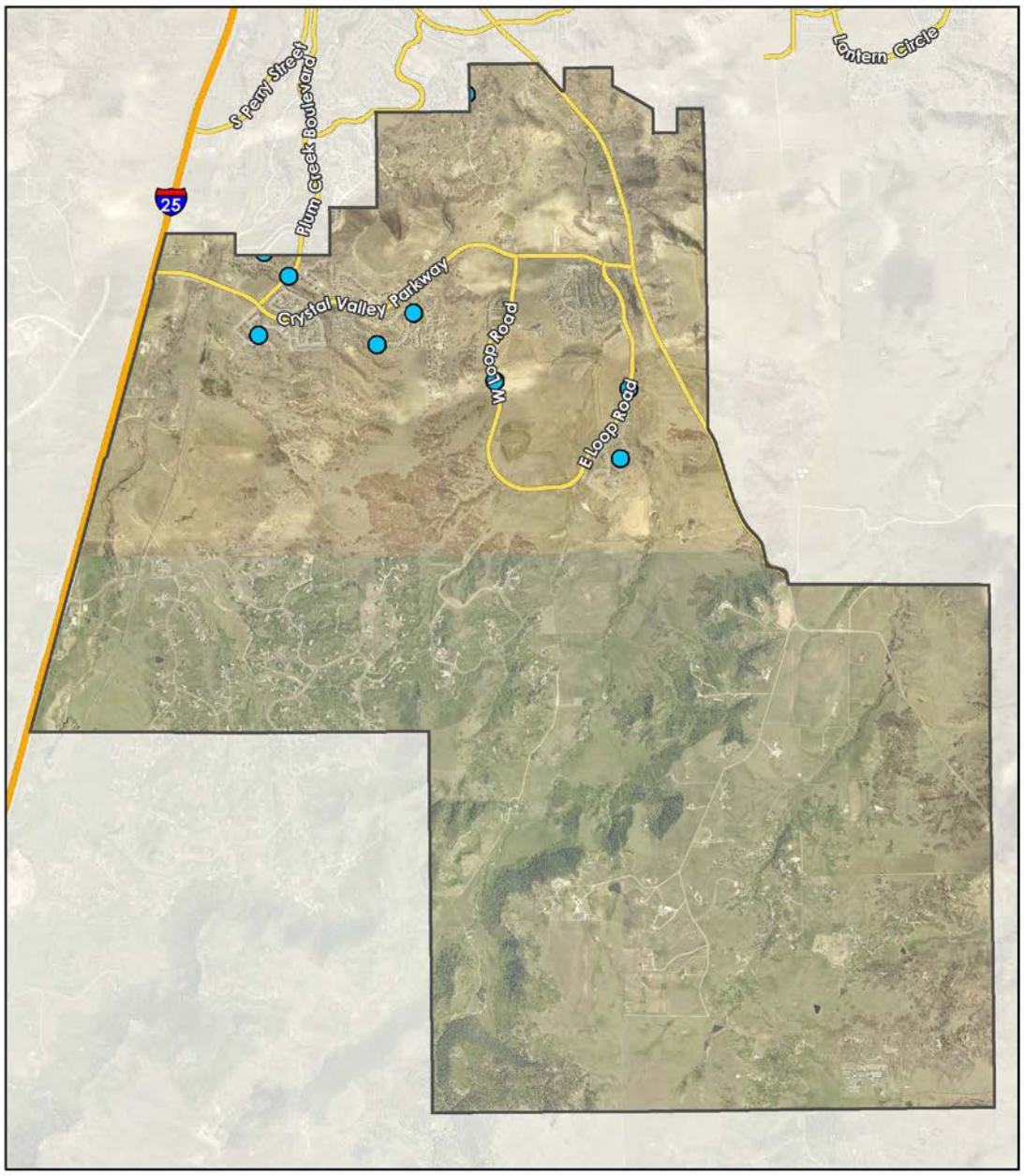
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.25 0.5 1
Miles

N

Town of Castle Rock Colorado

Map 6.8 Confined Space Rescue Risk PZ7 (return to Tech Rescue Risks)



Planning Zone 7
Confined Space

Confined Space Location

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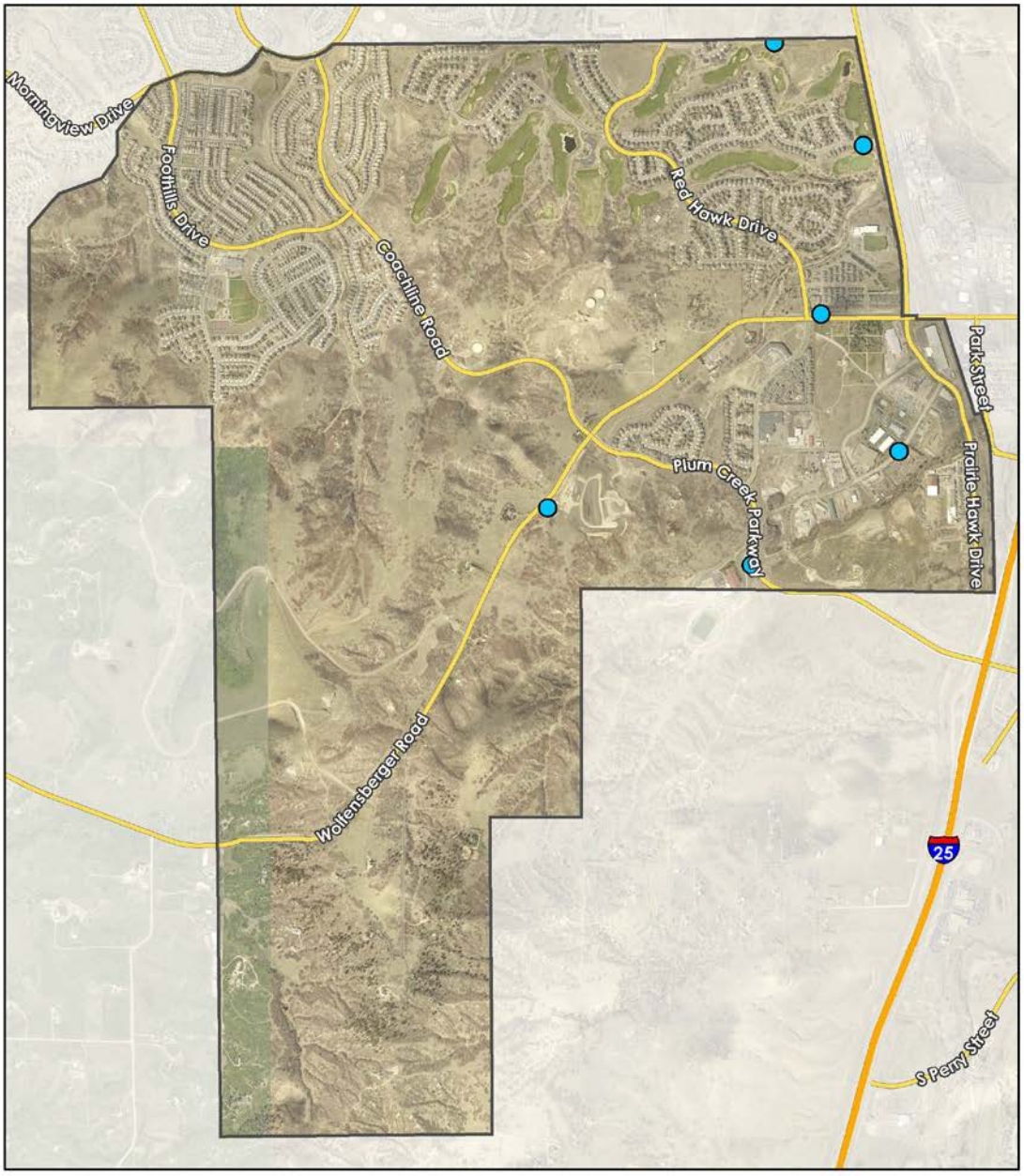
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.35 0.7 1.4
Miles

N

Town of Castle Rock Colorado

Map 6.9 Confined Space Rescue Risk PZ9 (return to Tech Rescue Risks)



Planning Zone 9
Confined Space

Confined Space Location

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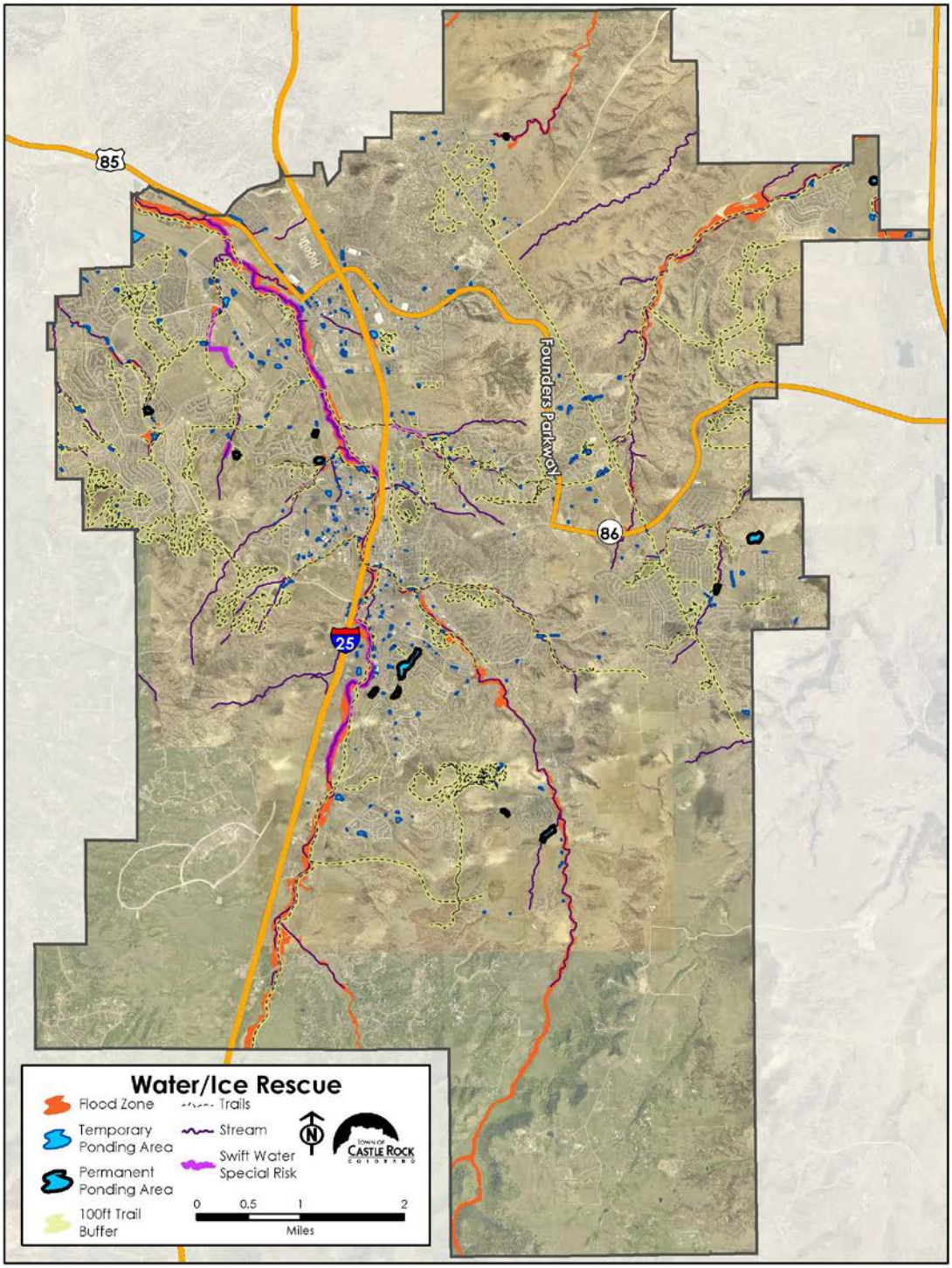
Coordinate System: NAD 83 Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.175 0.35 0.7
Miles

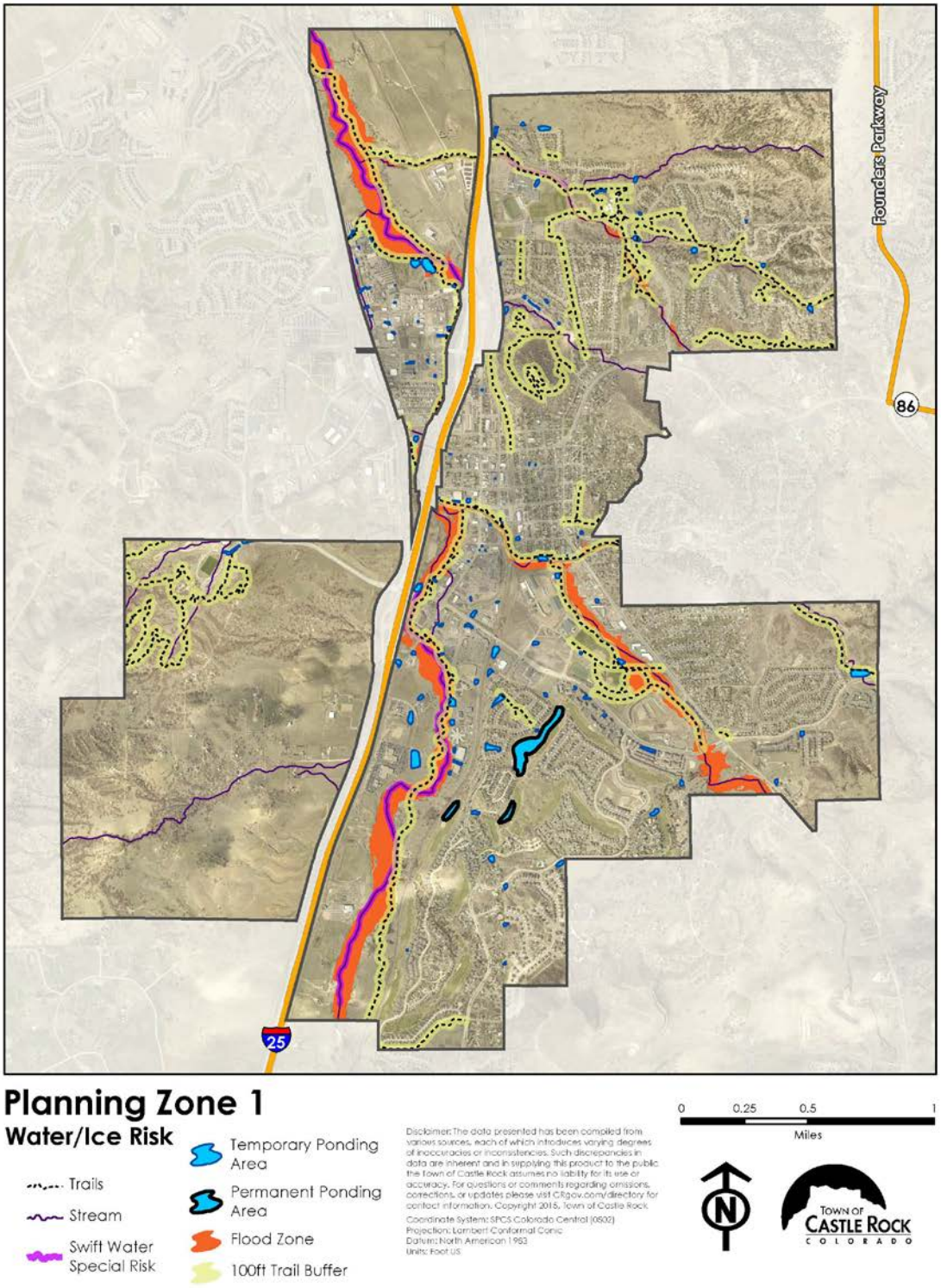
N

Town of Castle Rock Colorado

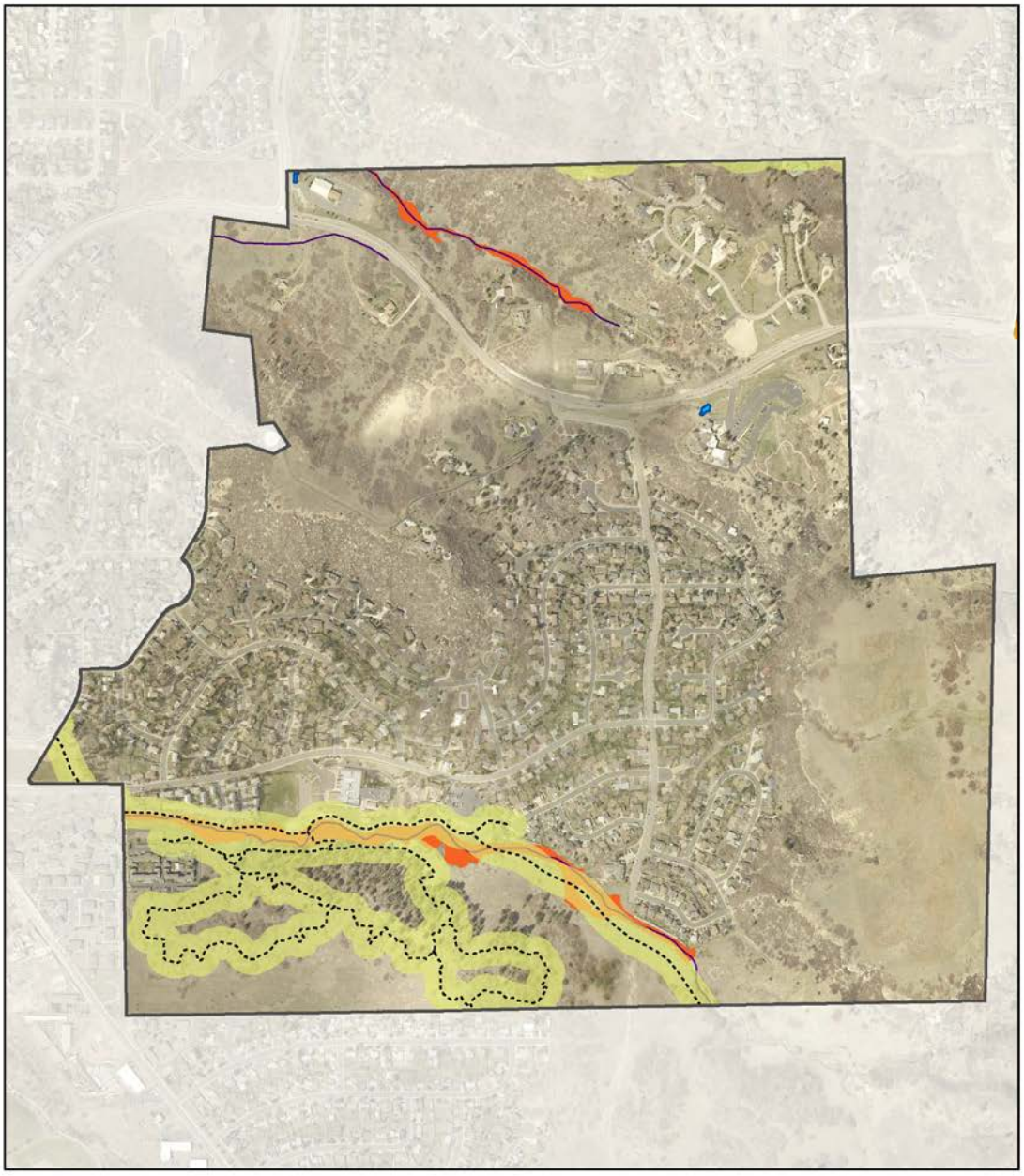
Map 6.1 Water/Ice Rescue Risk CRFD (return to Tech Rescue Risks)



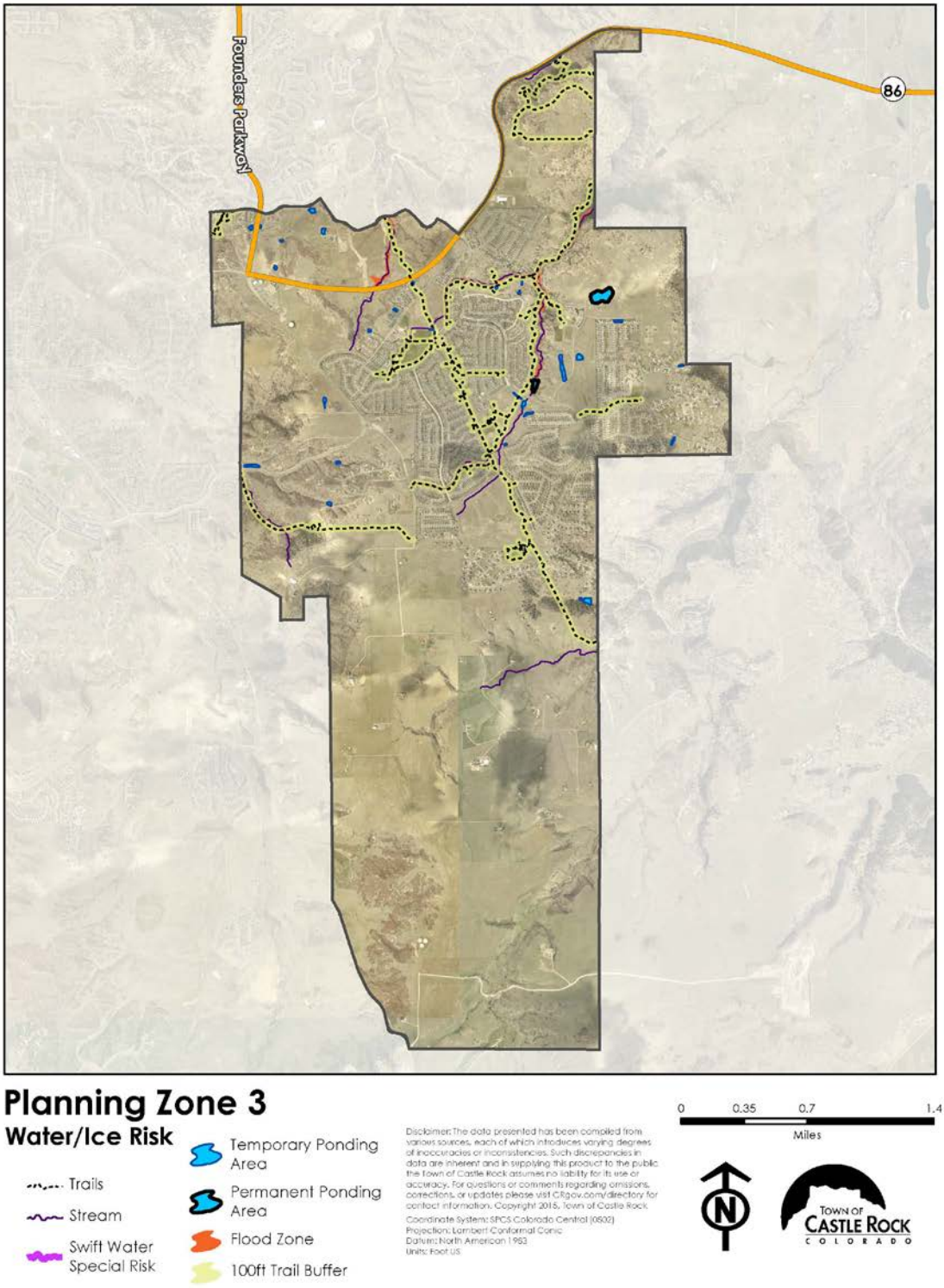
Map 6.11 Water/Ice Rescue Risk PZ1 (return to Tech Rescue Risks)



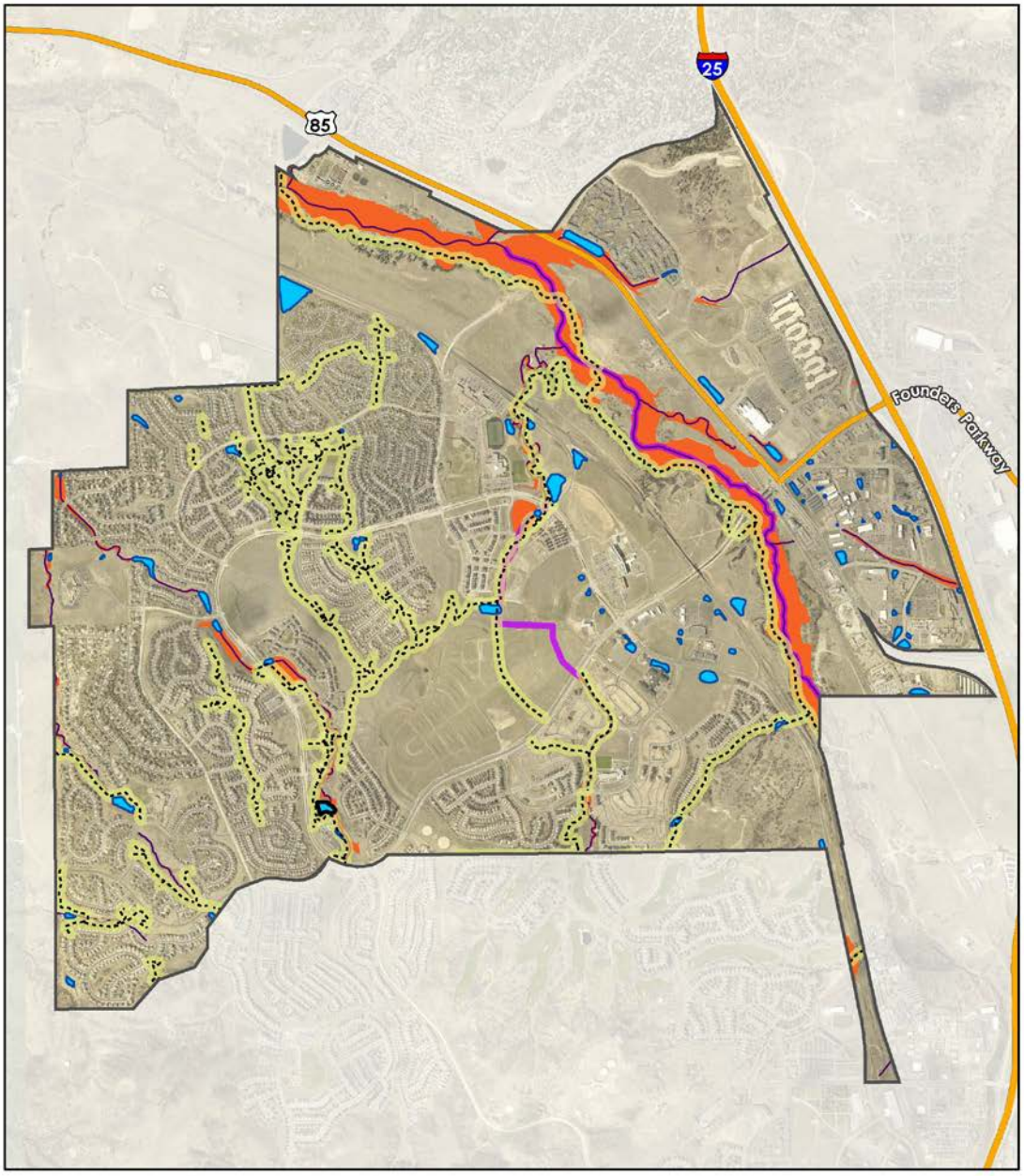
Map 6.12 Water/Ice Rescue Risk PZ2 (return to Tech Rescue Risks)



Map 6.13 Water/Ice Rescue Risk PZ3 (return to Tech Rescue Risks)



Map 6.14 Water/Ice Rescue Risk PZ4 (return to Tech Rescue Risks)



Planning Zone 4

Water/Ice Risk

- Trails
- Stream
- Swift Water Special Risk
- Temporary Ponding Area
- Permanent Ponding Area
- Flood Zone
- 100ft Trail Buffer

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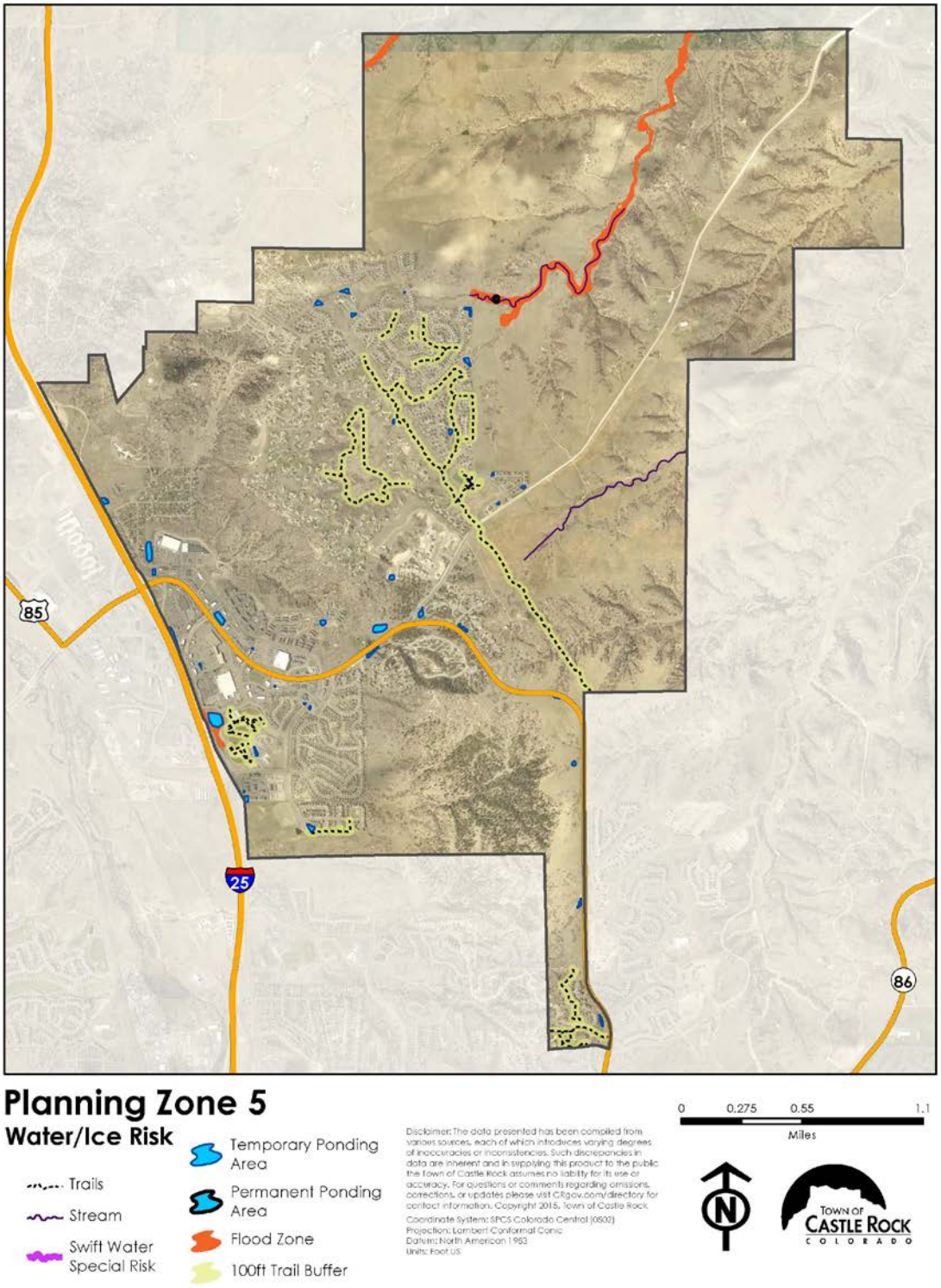
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.225 0.45 0.9
Miles

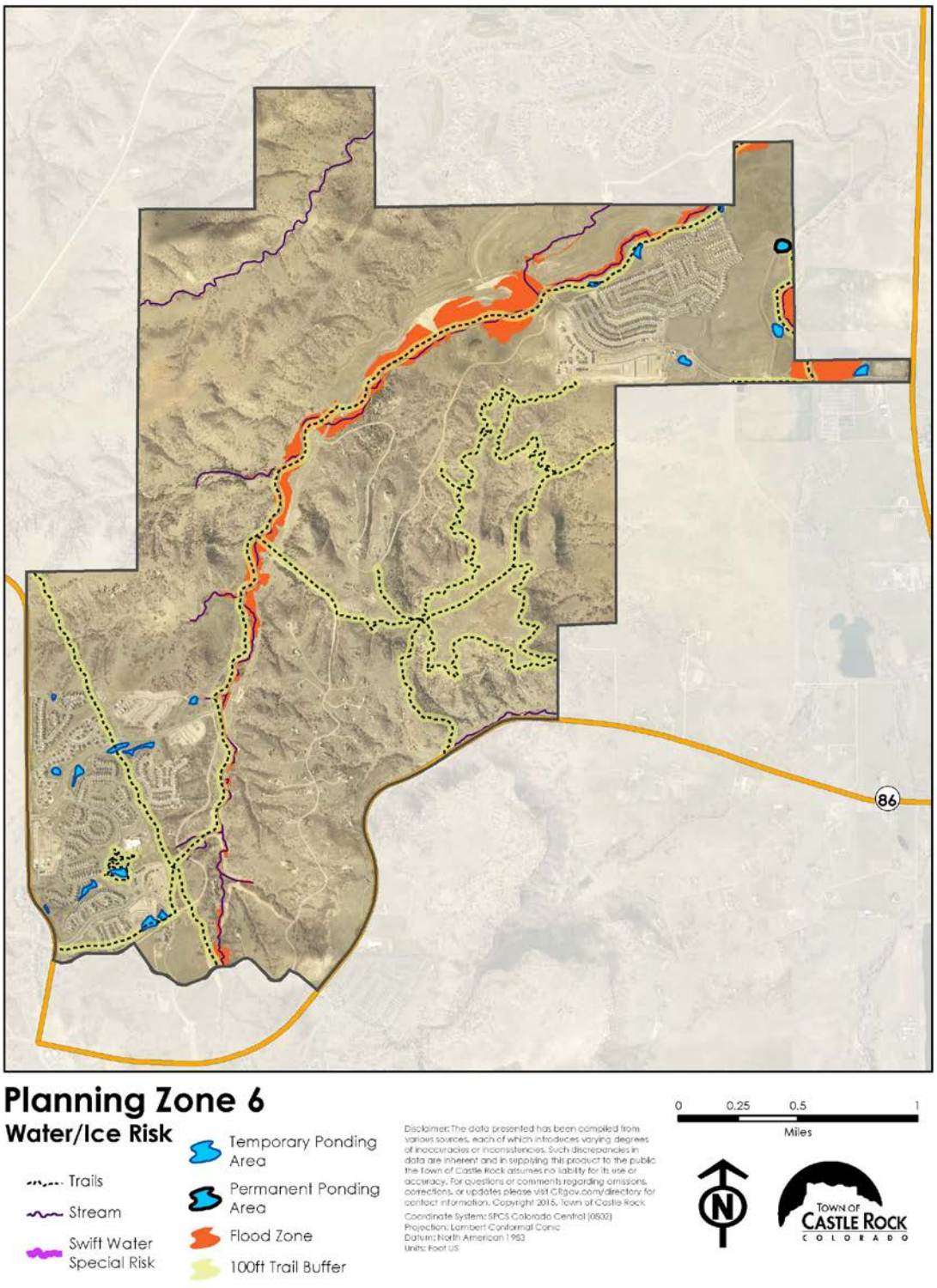
N

Town of Castle Rock Colorado

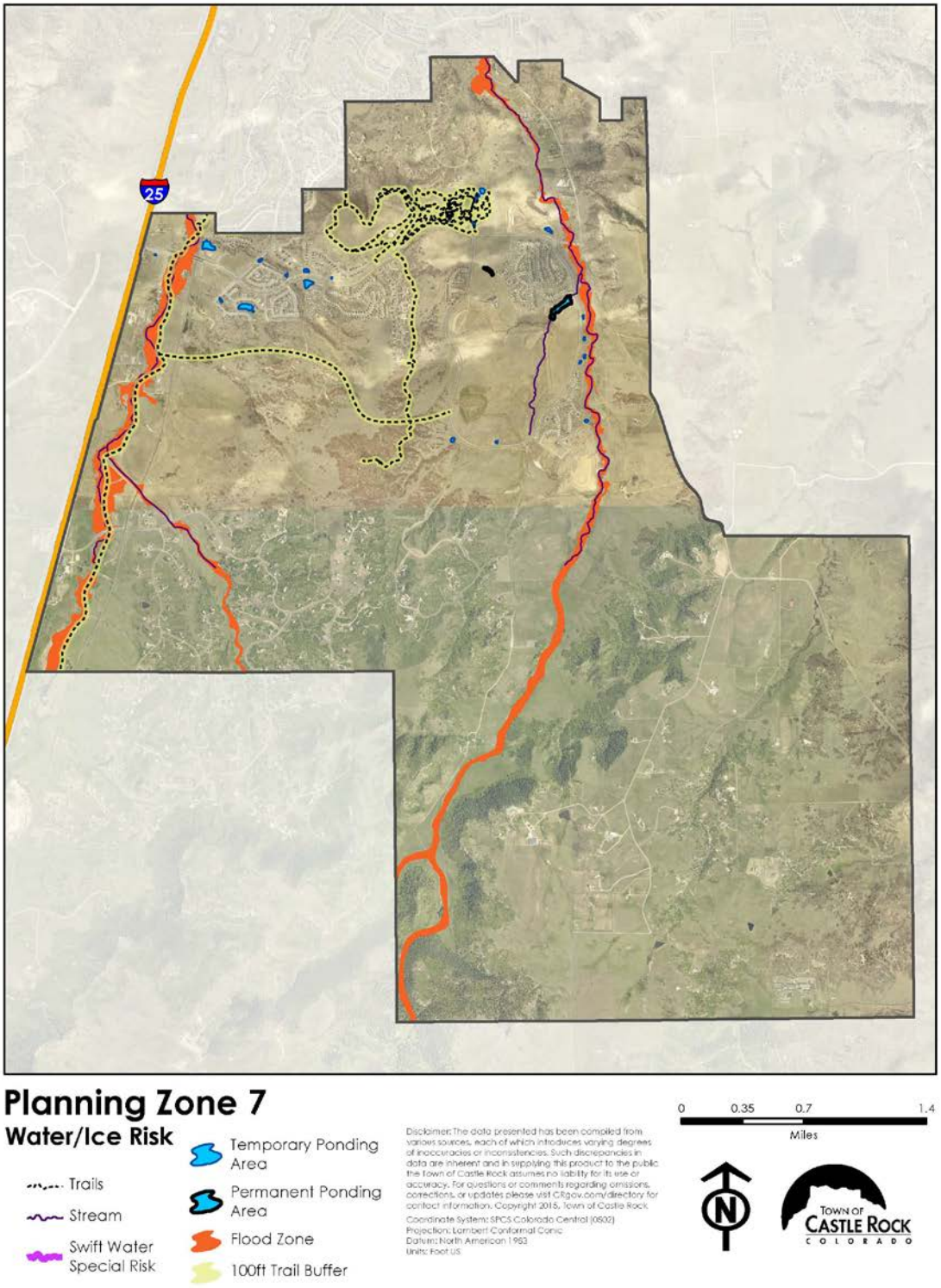
Map 6.15 Water/Ice Rescue Risk PZ5 (return to Tech Rescue Risks)



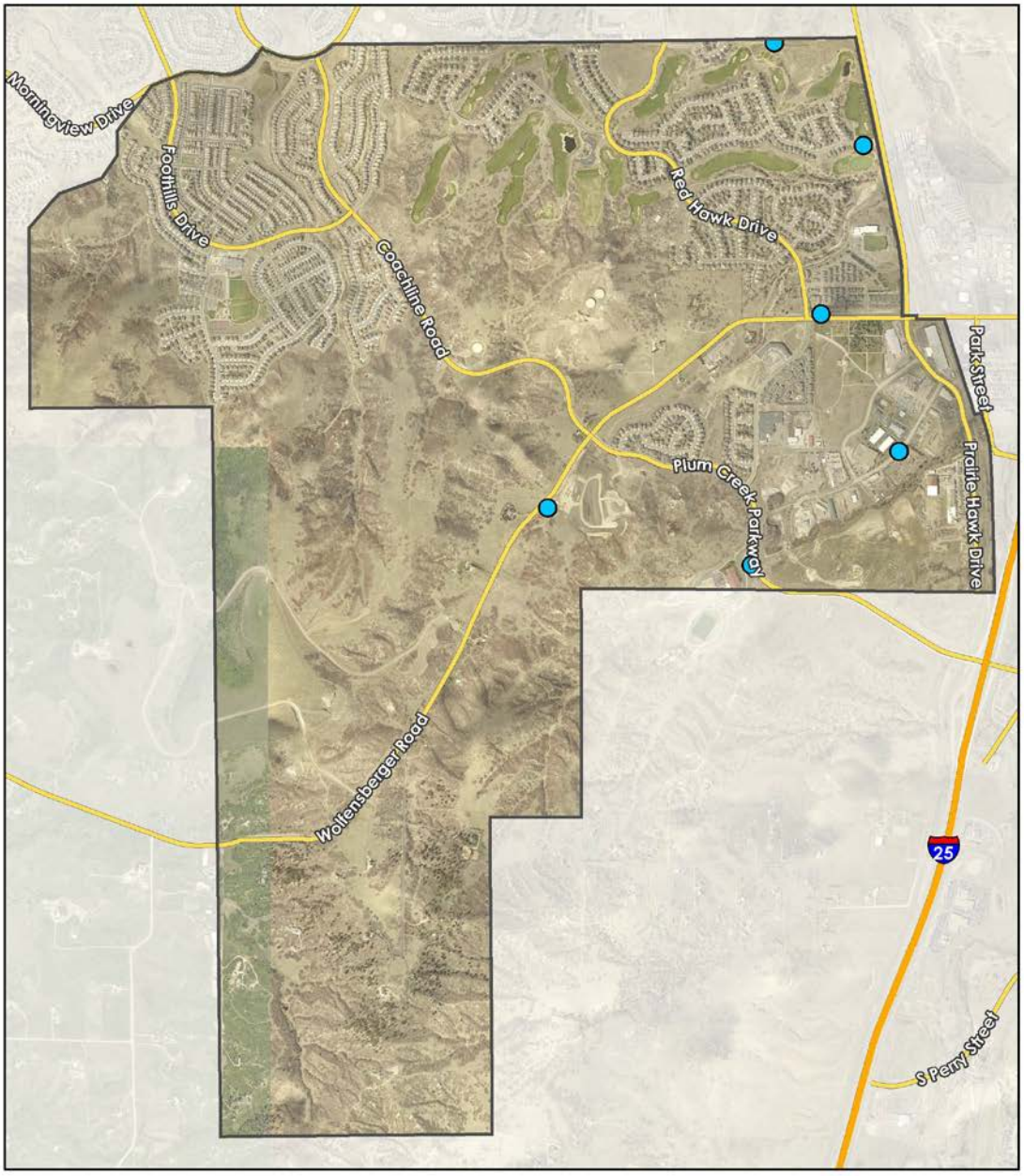
Map 6.16 Water/Ice Rescue Risk PZ6 (return to Tech Rescue Risks)



Map 6.17 Water/Ice Rescue Risk PZ7 (return to Tech Rescue Risks)



Water/Ice Rescue Risk Map 6.19 PZ9 (return to Tech Rescue Risks)



Planning Zone 9
Confined Space

Confined Space Location

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Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

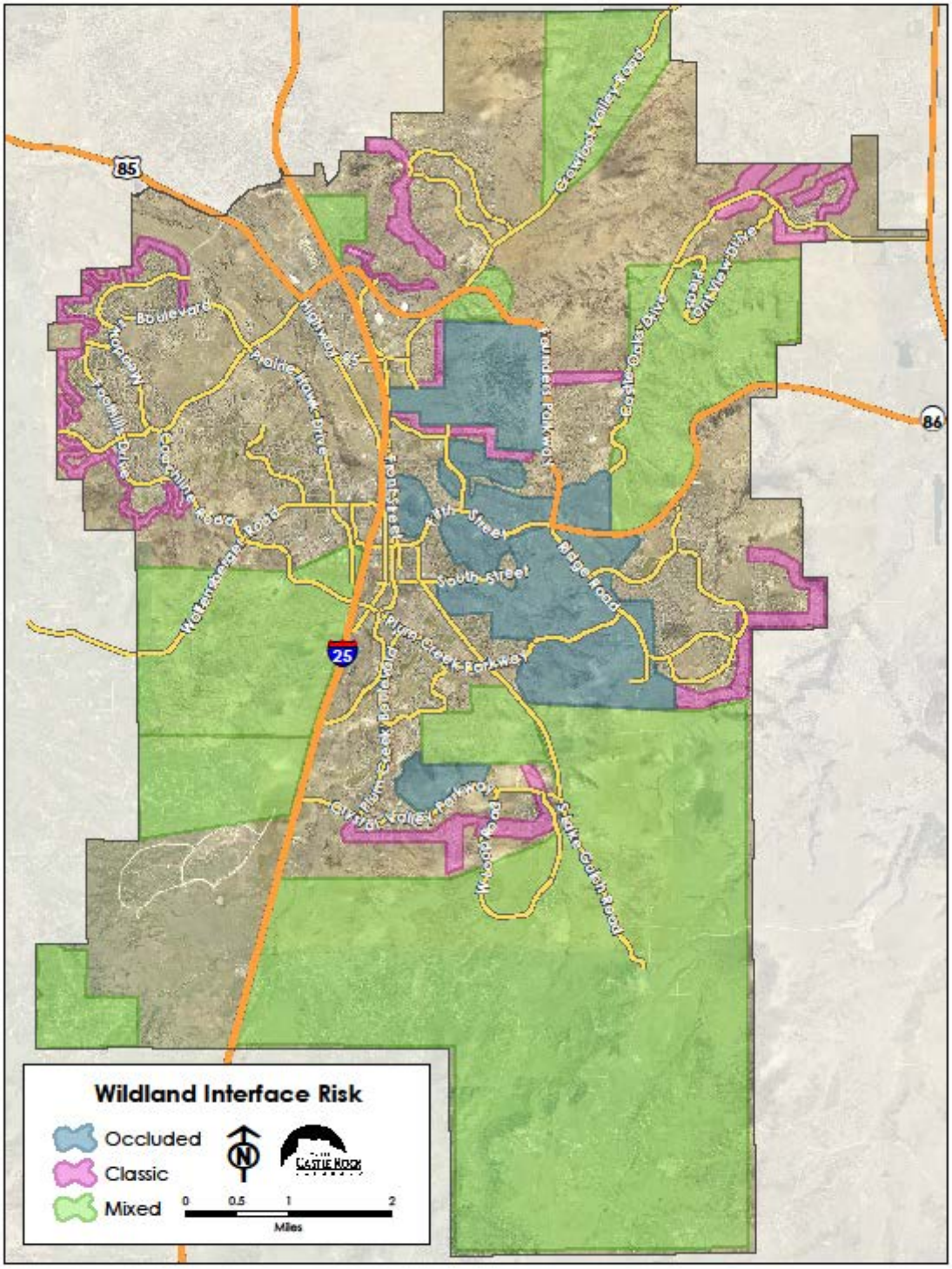
0 0.175 0.35 0.7
Miles

N

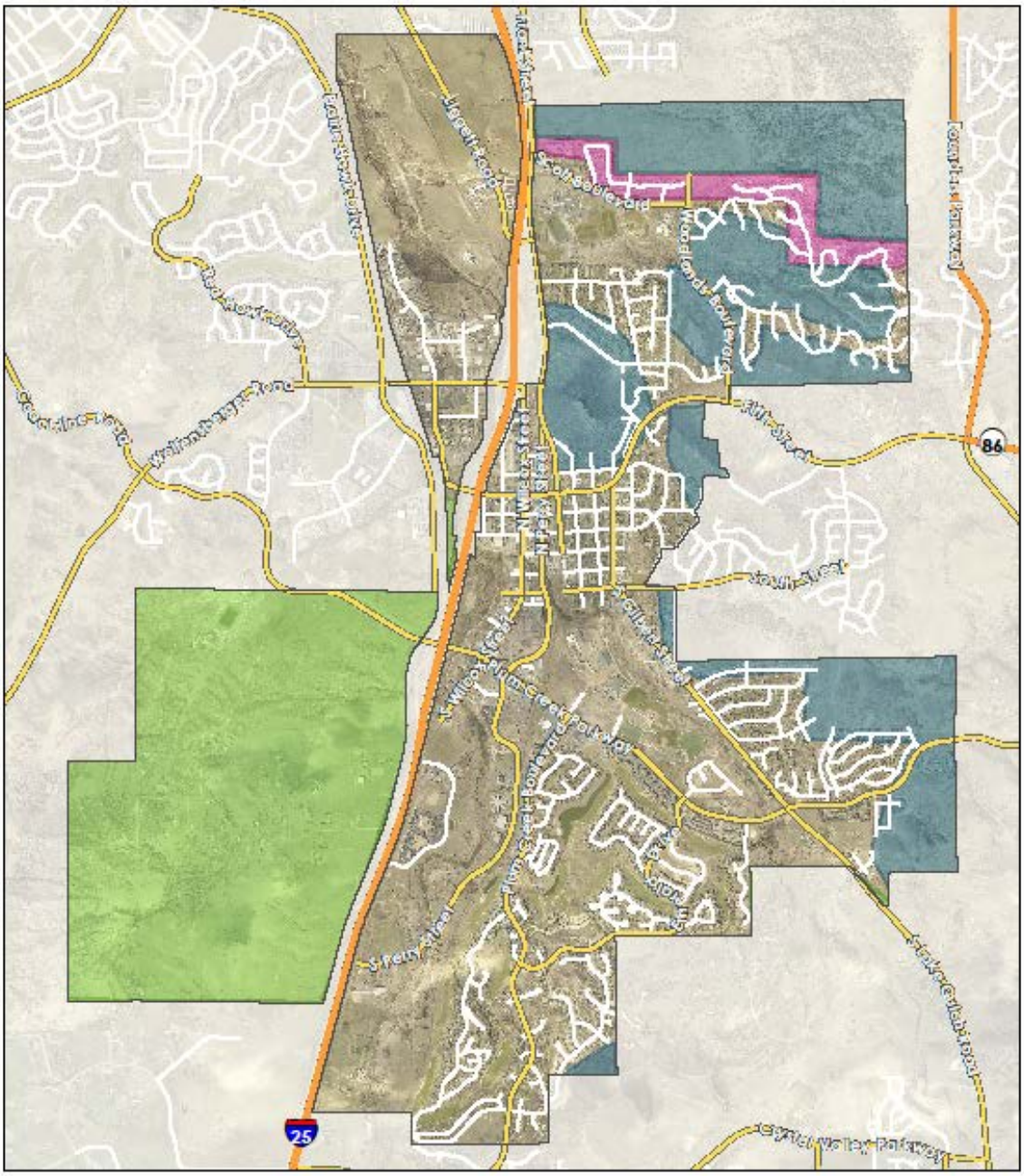
TOWN OF CASTLE ROCK COLORADO

Appendix E Wildland Risk Assessment Maps

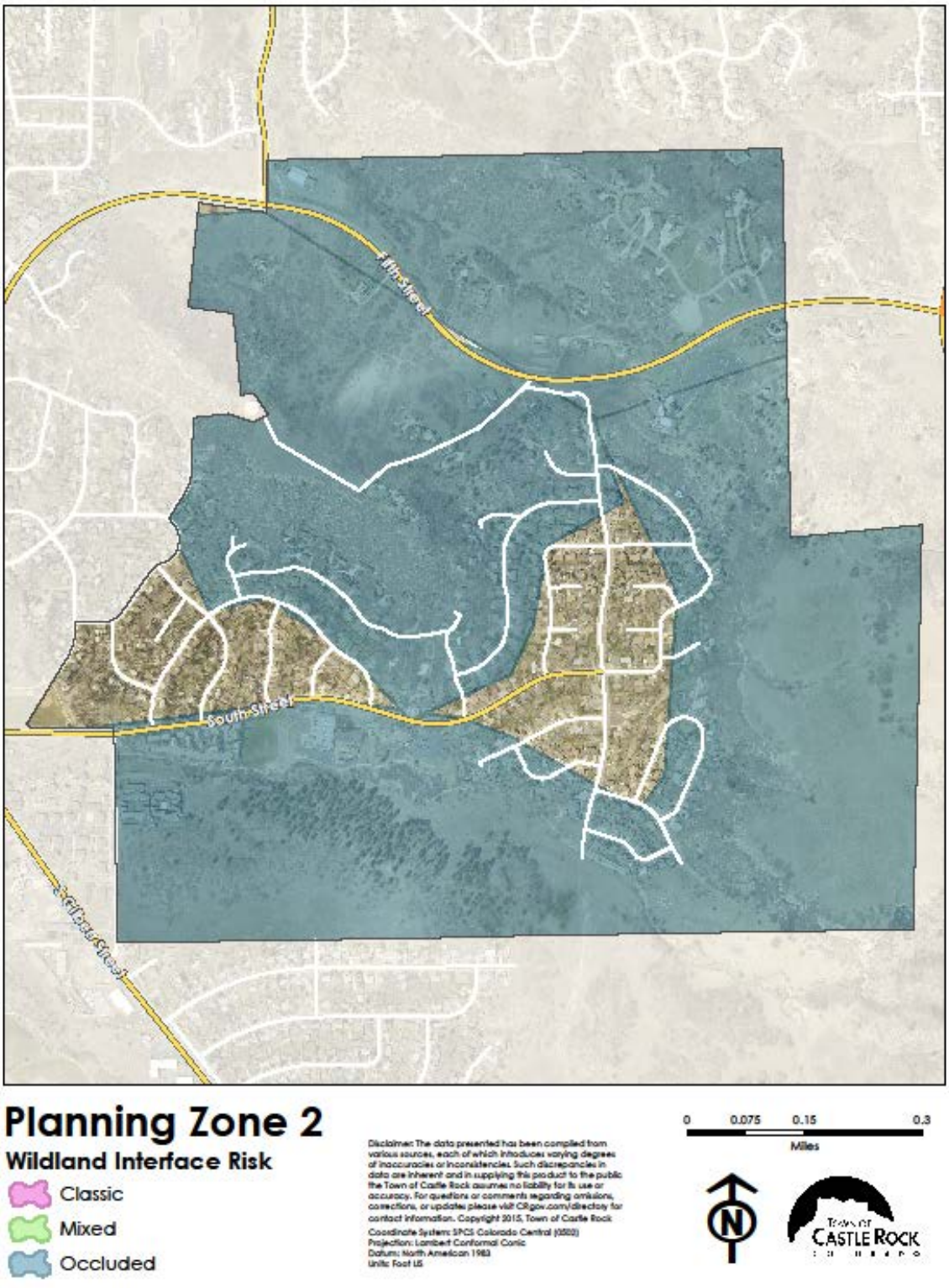
Map 7.1 Wildland Fire Risk CRFD (return to Wildland Risks)



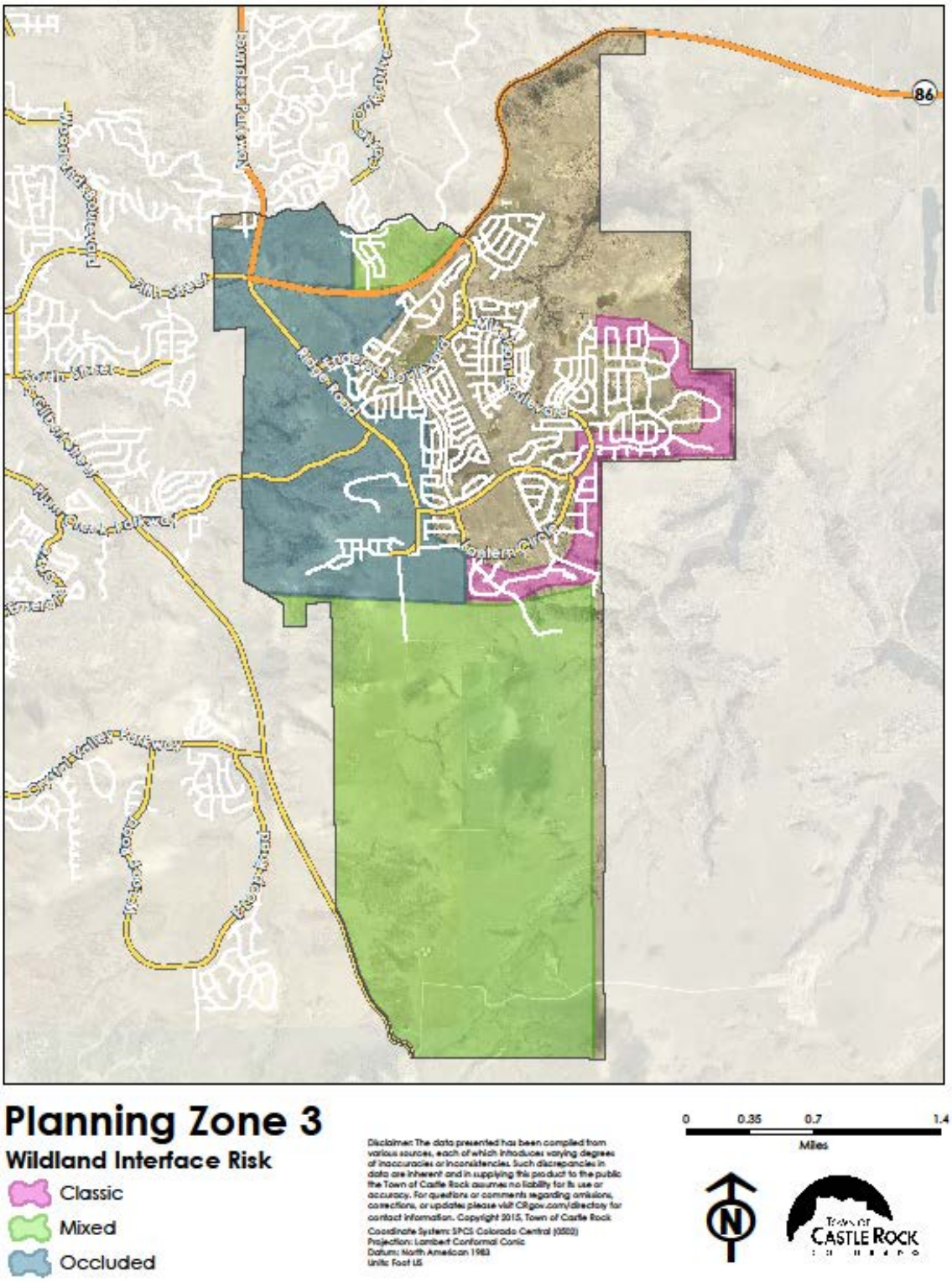
Map 7.2 Wildland Fire Risk PZ1 (return to Wildland Risks)



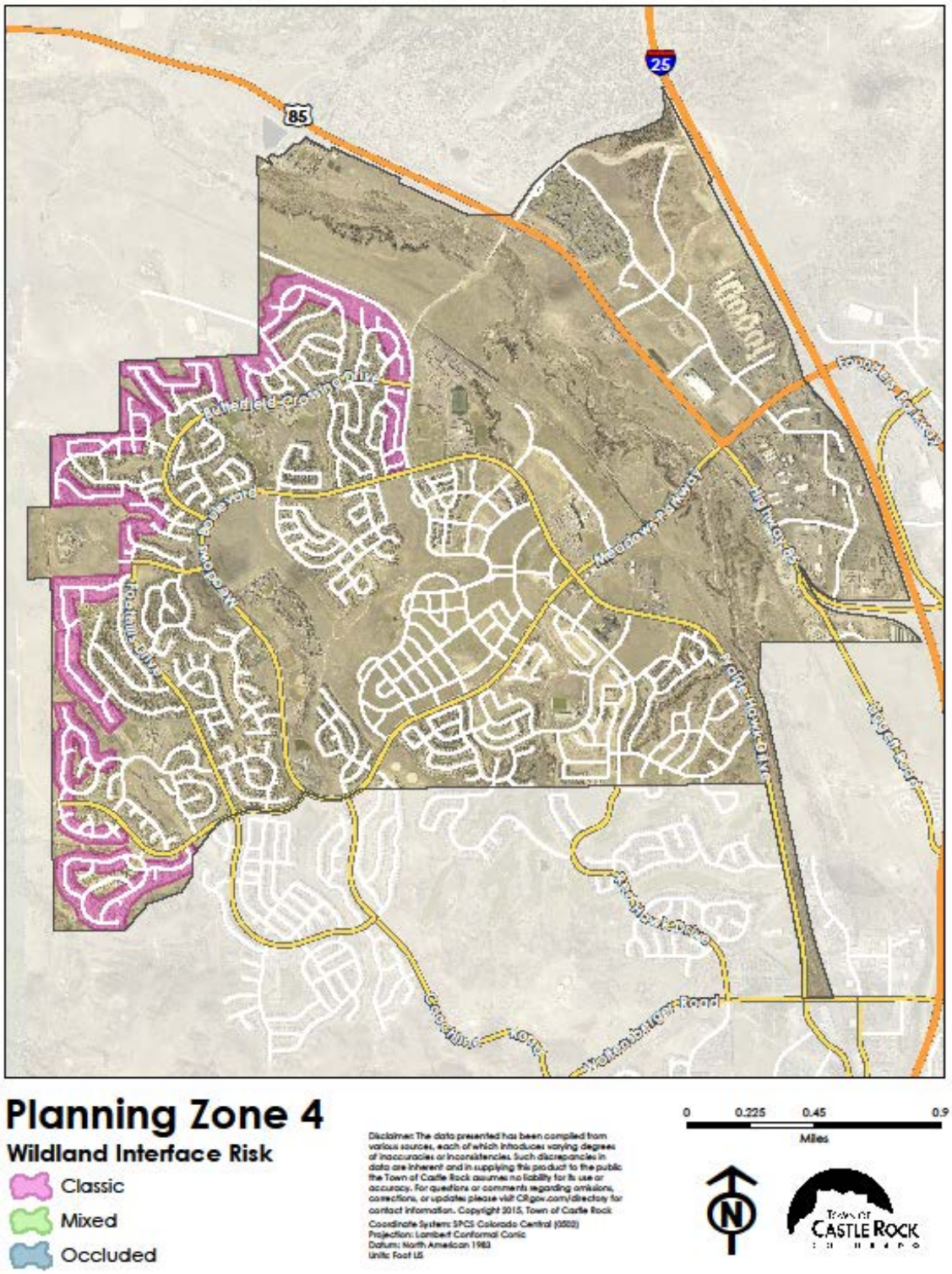
Map 7.3 Wildland Fire Risk PZ2 (return to Wildland Risks)



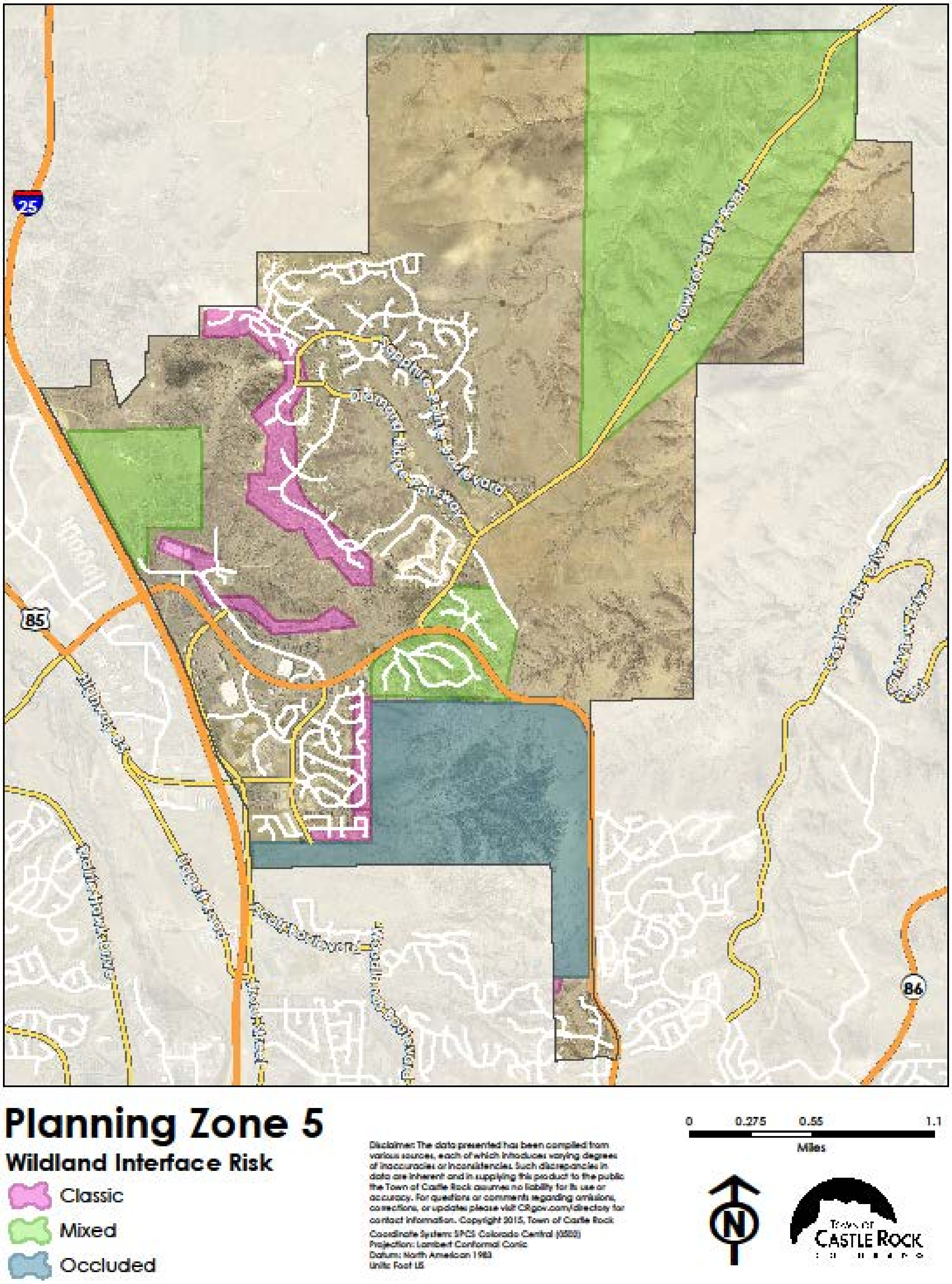
Map 7.4 Wildland Fire Risk PZ3 (return to Wildland Risks)



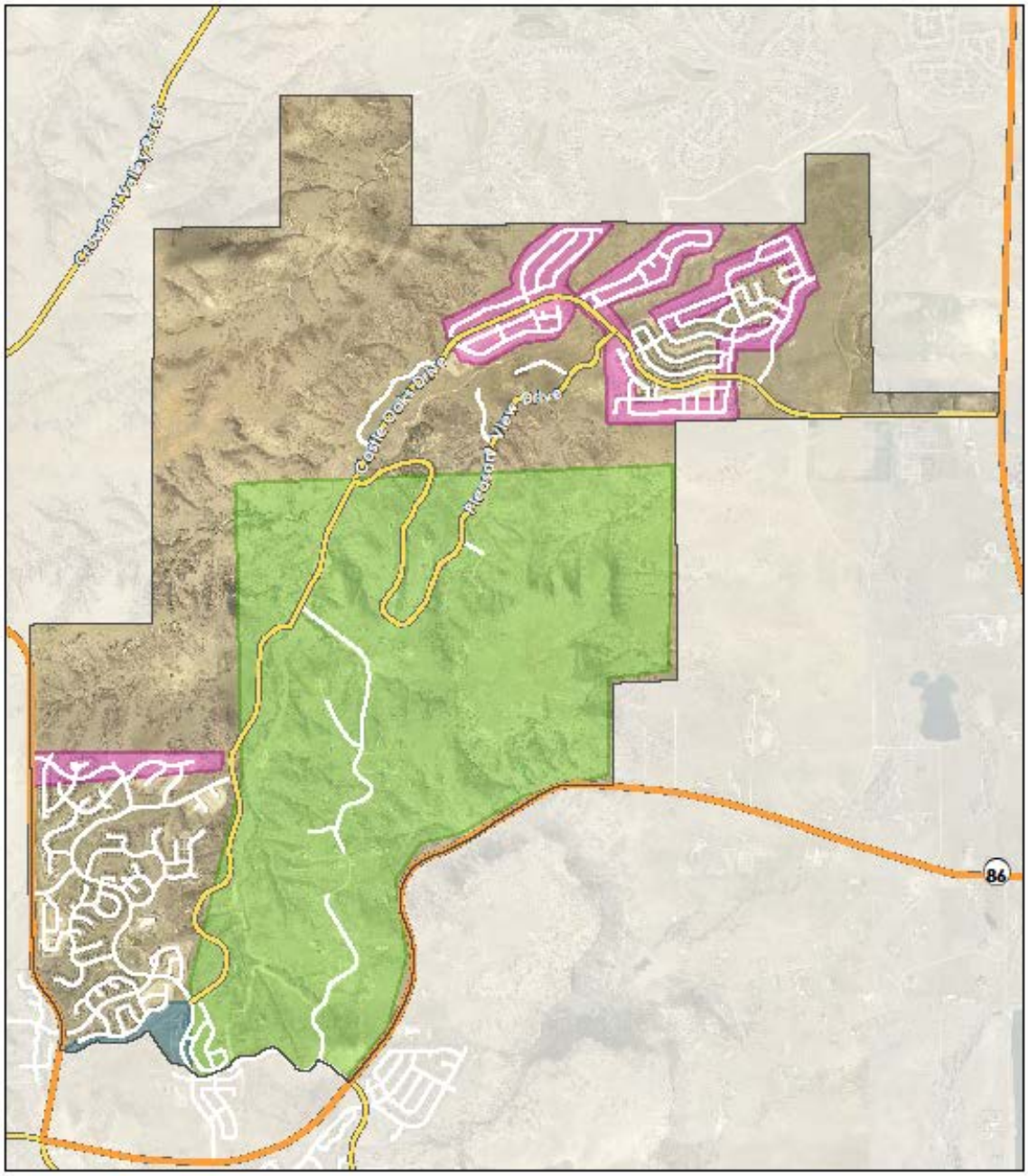
Map 7.5 Wildland Fire Risk PZ4 (return to Wildland Risks)



Map 7.6 Wildland Fire Risk PZ5 (return to Wildland Risks)



Map 7.7 Wildland Fire Risk PZ6 (return to Wildland Risks)



Planning Zone 6

Wildland Interface Risk

- Classic
- Mixed
- Occluded

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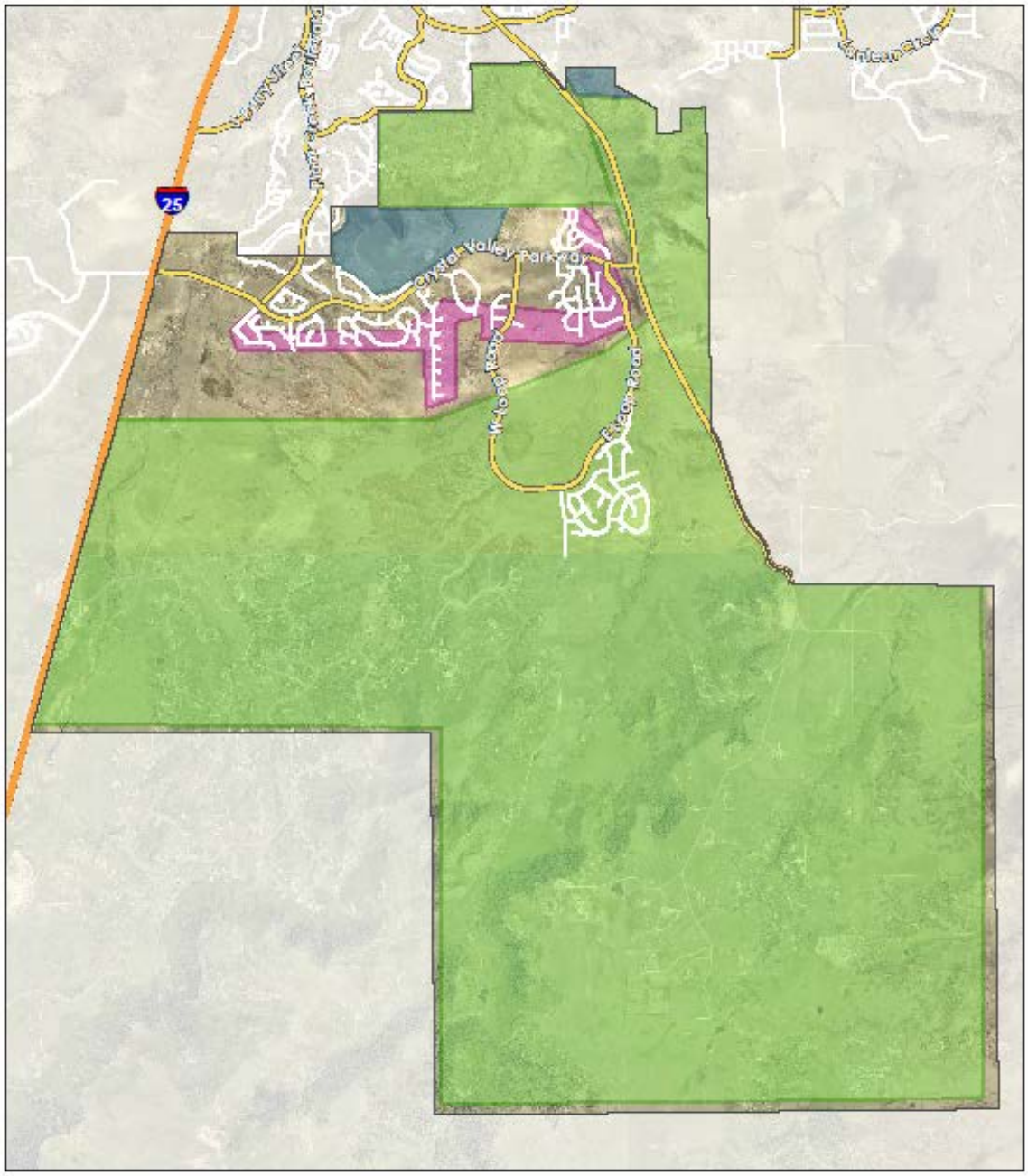
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.25 0.5 1
Miles

N

Town of Castle Rock Colorado

Map 7.8 Wildland Fire Risk PZ7 (return to Wildland Risks)



Planning Zone 7

Wildland Interface Risk

- Classic
- Mixed
- Occluded

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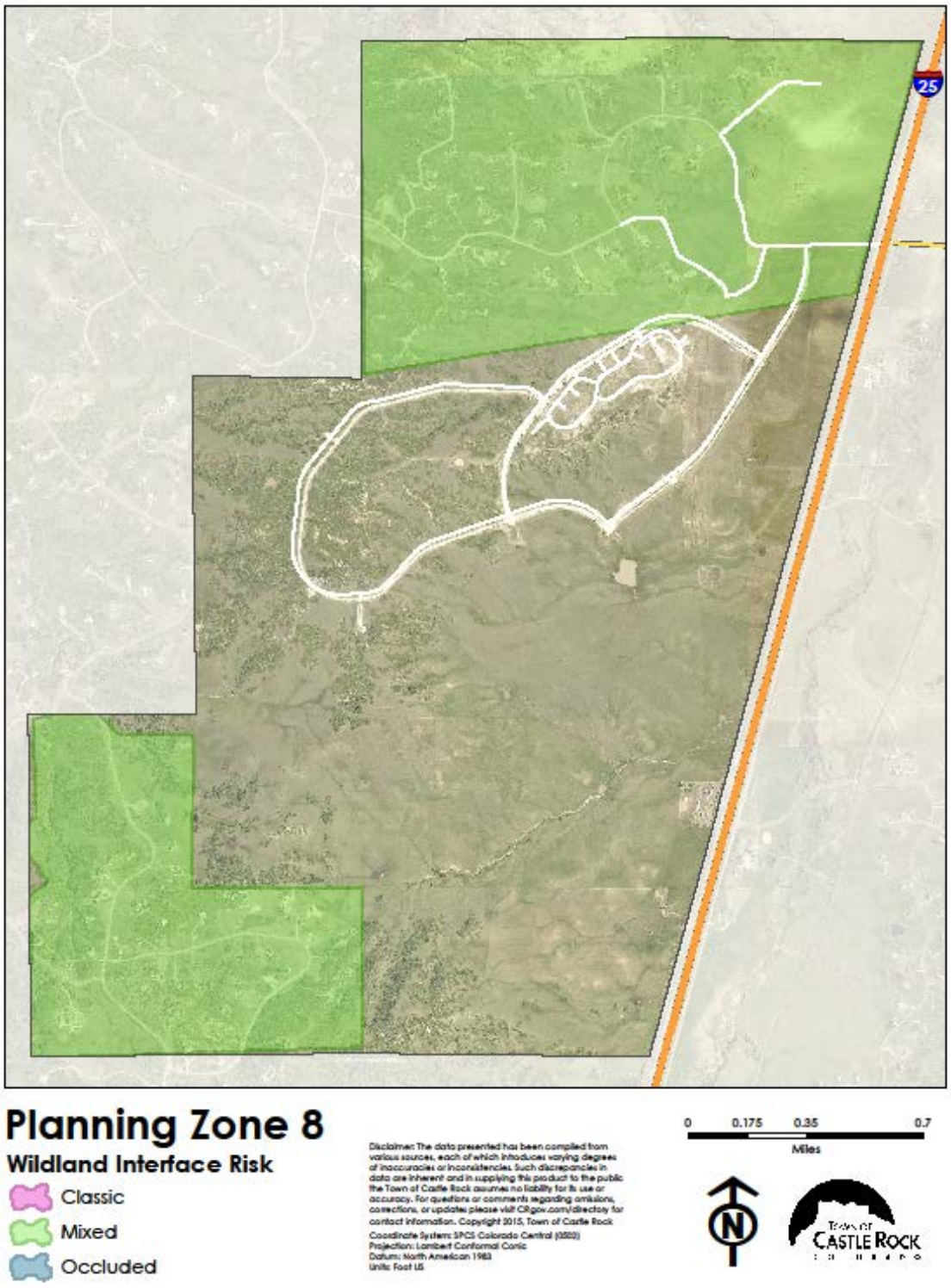
Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.35 0.7 1.4
Miles

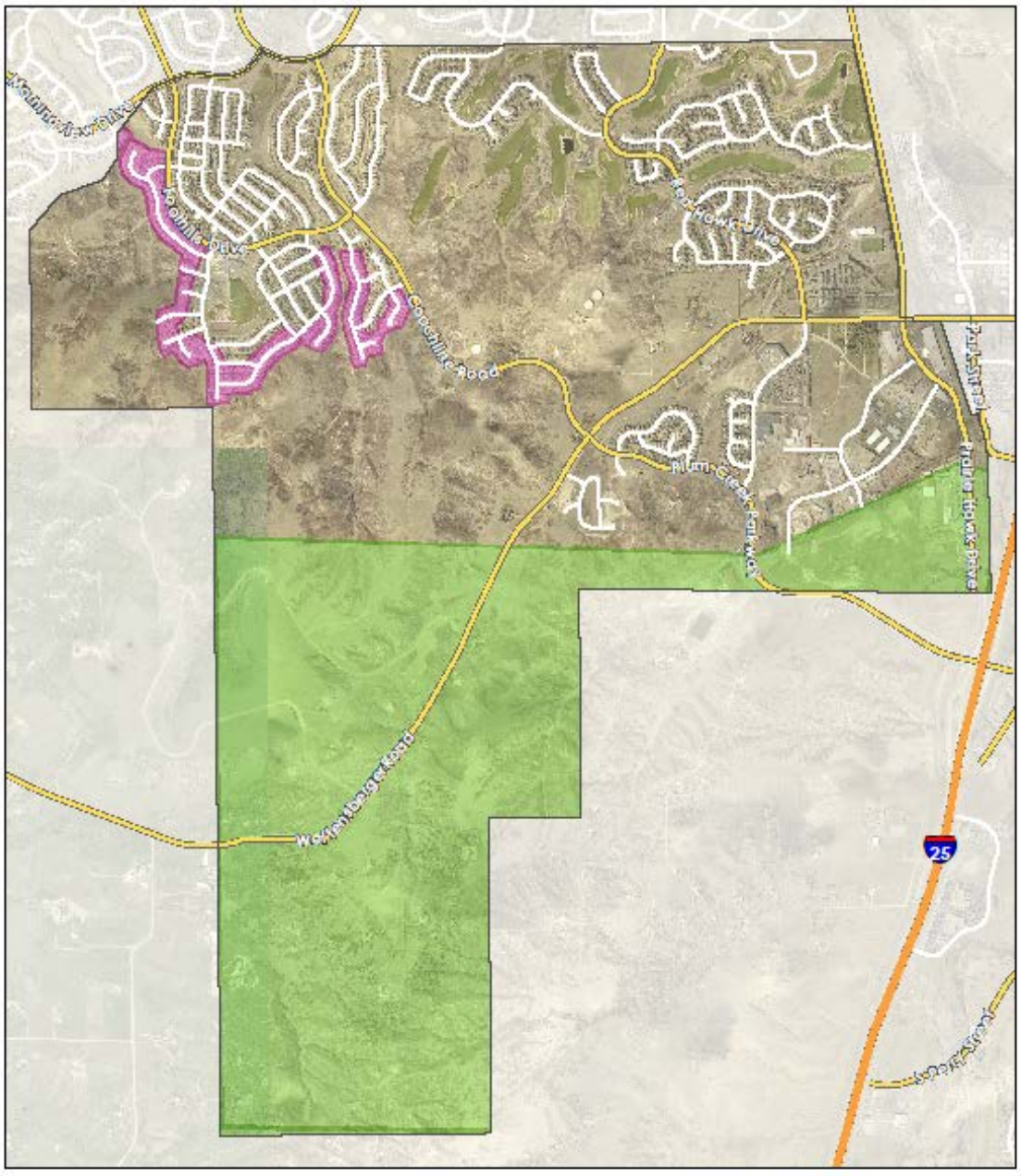
N

Town of Castle Rock Colorado

Map 7.8 Wildland Fire Risk PZ8 (return to Wildland Risks)



Map 7.10 Wildland Fire Risk PZ9 (return to Wildland Risks)



Planning Zone 9

Wildland Interface Risk

- Classic
- Mixed
- Occluded

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Coordinate System: SPCS Colorado Central (0502)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

0 0.175 0.35 0.7
Miles

N

Town of Castle Rock Colorado

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