

City of Golden Fire Department
Golden, CO
Community Wildfire Protection Plan
Update
January 2022



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MUTUAL AGREEMENT PAGE

This Community Wildfire Protection Plan developed by Golden Fire:

- Was collaboratively developed. Interested parties, fire management agencies, and state and county land management agencies managing land in or adjacent to the study area have been consulted.
- This plan identifies and prioritizes areas for hazardous fuel reductions treatments and recommends the types of treatment that will aid in protecting communities in the study area.
- This plan recommends measures to reduce the ignitability of structures throughout the area addressed by the plan.

The following entities attest the standards listed above have been met and mutually agree with the content of this Community Wildfire Protection Plan:

City of Golden Fire Department, by Jerry Stricker, Fire Chief

Colorado State Forest Service, Golden District

City of Golden - Emergency Management

INTRODUCTION

This CWPP update was developed at the request of the City of Golden Fire Department (GFD) with the support of Jefferson County, Colorado and the Colorado State Forest Service (CSFS). Information in this plan will be provided at the level of specificity determined by the community and appropriate agencies.

This document presents the results of a study to identify and quantify changes in conditions or values at risk that could affect fire protection planning and response in the Wildland-Urban Interface (WUI) and Wildland Intermix (WI) portions of the study area. The WUI is also known as the Urban Edge Ember Zone. It is the area where encroaching wildland fuels could create a fire hazard to what would be an urban development in a different setting. The WI consists of communities where wildland fuels surround homes.

This report neither replaces nor intends to duplicate information found in the 2007 joint Jefferson County/Golden Fire-Rescue Plan Community Wildfire Protection Plan (CWPP). The original Jefferson County/Golden CWPP was a county-wide effort developed at a macro level. This study provides a more detailed analysis of the WUI and WI areas included in the GFD boundary. As such, it should be considered an updated supplement to the 2007 CWPP.

This study focuses on areas of the highest residential density and deals primarily with life safety and structural ignitability. Future updates may be necessary should the need arise to focus on unpopulated land, sparsely populated areas, other values at risk, or areas of special interest.

A current analysis of the probability of a severe fire occurrence and expected severity of fire effects using updated technology and a detailed discussion of structural ignitability are included in this study. This information allows for the prioritization of mitigation efforts. From an analysis of this data, solutions and mitigation recommendations are provided to aid land managers, residents, fire officials, and other collaborators in planning and implementation. This format is designed to help communities clarify and refine priorities for protecting life, property, and critical infrastructure in the WUI/WI. It can also lead community members through valuable discussions regarding management options and implications for any areas of special interest.

GOALS AND OBJECTIVES

Strategic goals for this project include the following:

1. Enhance the life safety of the residents, visitors, and responders.
2. Present methods to mitigate undesirable fire effects on property, infrastructure, and the environment.
3. Enhance previous and existing efforts.

To accomplish these goals, the following objectives have been identified for this report:

1. Establish an approximate level of probability (the likelihood of a significant wildfire event in the study area).
2. Provide a scientific analysis of the fire behavior potential of the study area.
3. Group relatively densely populated areas into residential “Hazard Zones” that represent relatively similar hazard factors.
4. Identify and quantify factors that limit (mitigate) undesirable fire effects to the Values at Risk and recommend actions to reduce those hazards.
5. Quantify any significant changes related to hazards or Values at Risk that have taken place since the Jefferson County/Golden CWPP was written in 2007.

GFD recognizes the potential for complex problems associated with achieving fire safety and healthy vegetation management and a need to balance this mission with environmental and economic concerns of the residents.

UNDERSTANDING NO-HARM RATINGS

No-HARM Severity ratings attempt to quantify the severity of fire effects on values at risk and the ecosystem by combining flame length and crown fire development into a single rating. Like other numeric ratings generated by No-HARM, Severity assigns a value between one and 50 to each FireShed based on an aggregation of all the pixels in that FireShed. A value of one indicates the lowest severity of damaging fire effects and 50 the highest. It is essential to understand the Severity model may under-predict the effects of ember cast, especially under extreme weather conditions. A more detailed methodology can be found in Appendix C “Custom NoHARM Product Guide”

The No-HARM Risk 50 rating is a mathematical model combining Severity with Frequency. That is to say, the model considers both the likelihood of a significant fire developing within the rated FireShed and the severity of damaging fire effects to create a composite rating of fire risk in that FireShed. Although most of the weighting in the model is in these two elements, other factors are included in the Risk 50 rating. They vary depending on whether FireSheds are located in the Wildland-Urban Interface (WUI), Wildland Intermix (WI), or wildland. As with other No-HARM ratings, a value of one indicates the lowest risk and 50 the highest.

No-HARM is based on an analysis of wildland fire behavior and, other than the exclusion of non-burnable areas, does not take structural flammability into consideration. To provide a complete analysis in a single rating scale, the principal elements of the WHR model of structural ignitability and operational response factors have been incorporated into the No-HARM Risk 50 rating for the residential hazard zones described in this study.

In Interface Zones (see Figure 2), under moderate and high fire weather conditions, only the fringes of large towns and cities are threatened by wildfire. Beyond the distance where large numbers of embers could commonly threaten homes, wildfire risk becomes much lower. No-HARM refers to this as "Low Probability Exposure." However, when extreme fire weather events such as extreme drought, strong sustained winds and critically dry fuels align, the risk increases exponentially due to the possibility of home to home ignition which creates an urban conflagration that is outside the scope of this model.

WHR was explicitly developed to evaluate communities within the WUI/WI for their relative wildfire hazard. The WHR model combines physical infrastructure such as structure density and roads, and the fire behavior Severity modeling of No-HARM, with the field experience and knowledge of wildland fire experts. It has been proven and refined by use in rating thousands of neighborhoods throughout the United States. Much of NFPA 1144 has been integrated into this methodology to ensure compatibility with national standards. Additionally, aspects of NFPA 1142 regarding water supply for rural and suburban firefighting are included in the assessments by looking at the proximity and capacity of the water supply.

This model was developed from the perspective of performing structural triage on a threatened community in the path of an advancing wildfire with No-HARM predicted fire behavior for average conditions on a fire season day. The WHR survey and fuel model ground-truthing are

accomplished by field surveyors with WUI/WI fire experience. WHR ratings are related to what's customary for the area. For example, a high-hazard area on the plains of Kansas may not look like a high-hazard area in the Sierra-Nevada. The system creates a relative ranking of community hazards in relation to the other communities in the study area. For the No-HARM analysis of the residential Hazard Zones described in the *Community Ignitability Analysis* section of this report, WHR ratings have been incorporated into the No-HARM Risk 50 rating for each Hazard Zone.

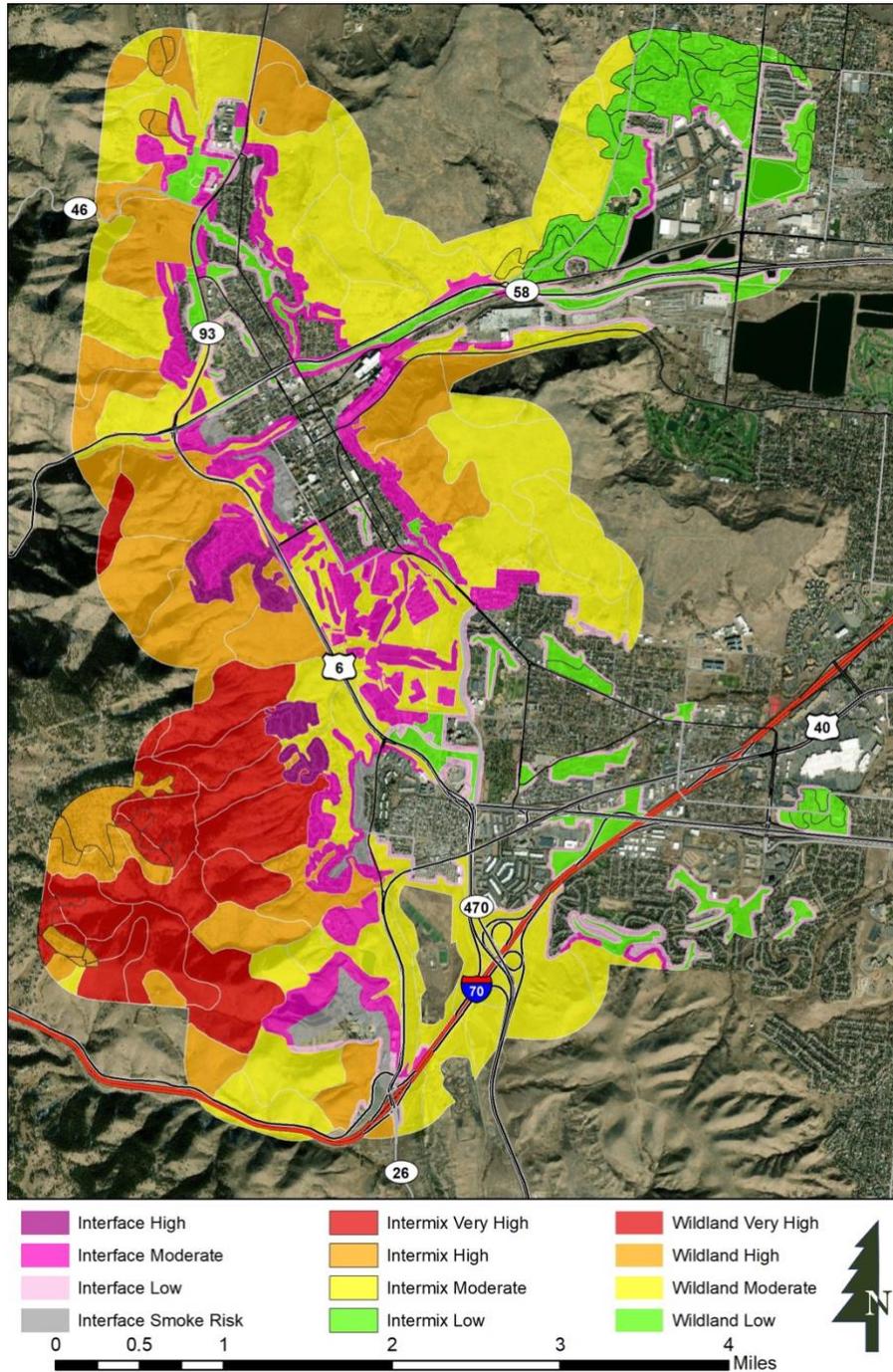


Figure 1 NoHARM Combined Results

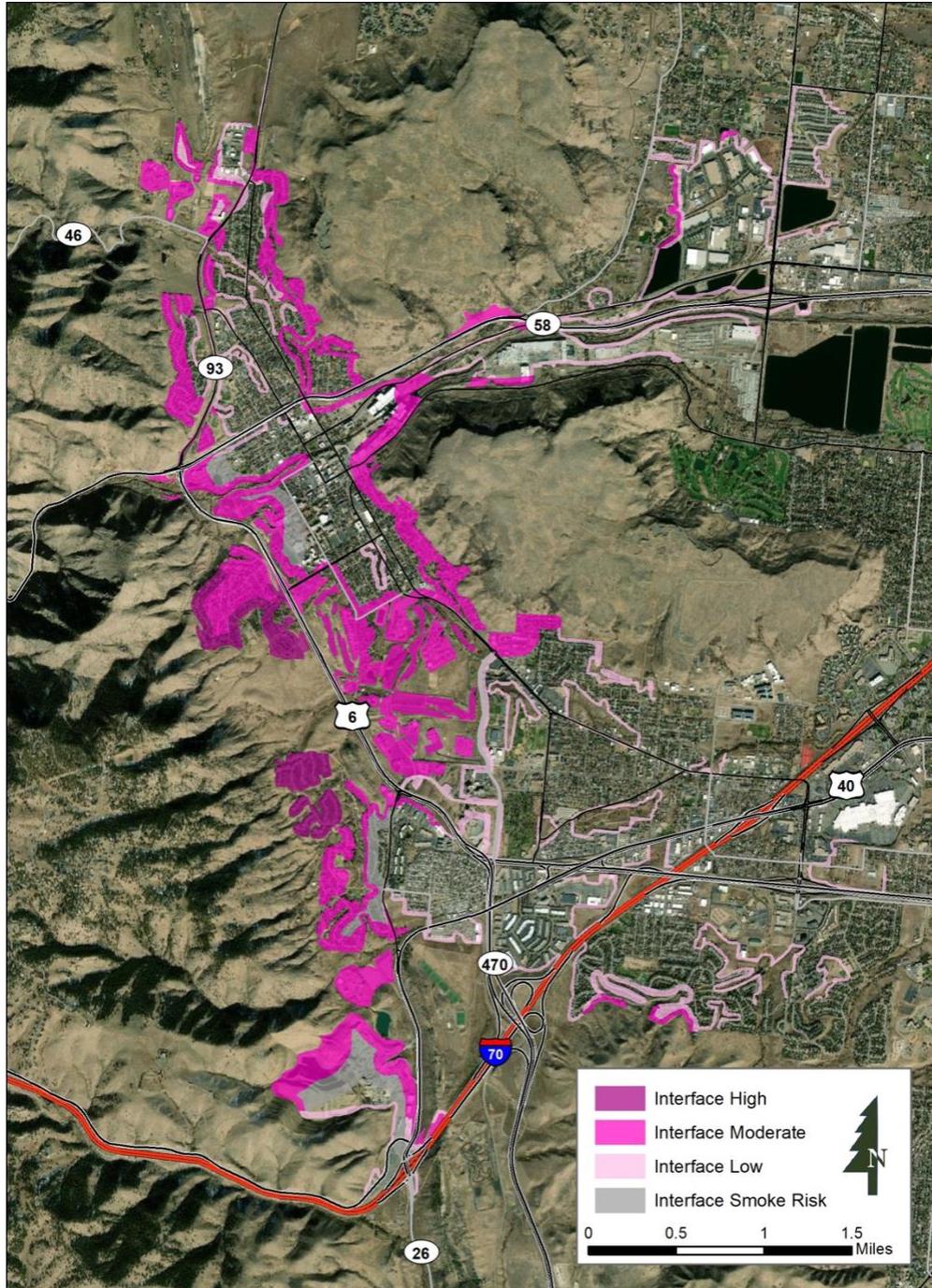


Figure 2 NoHARM Interface Results

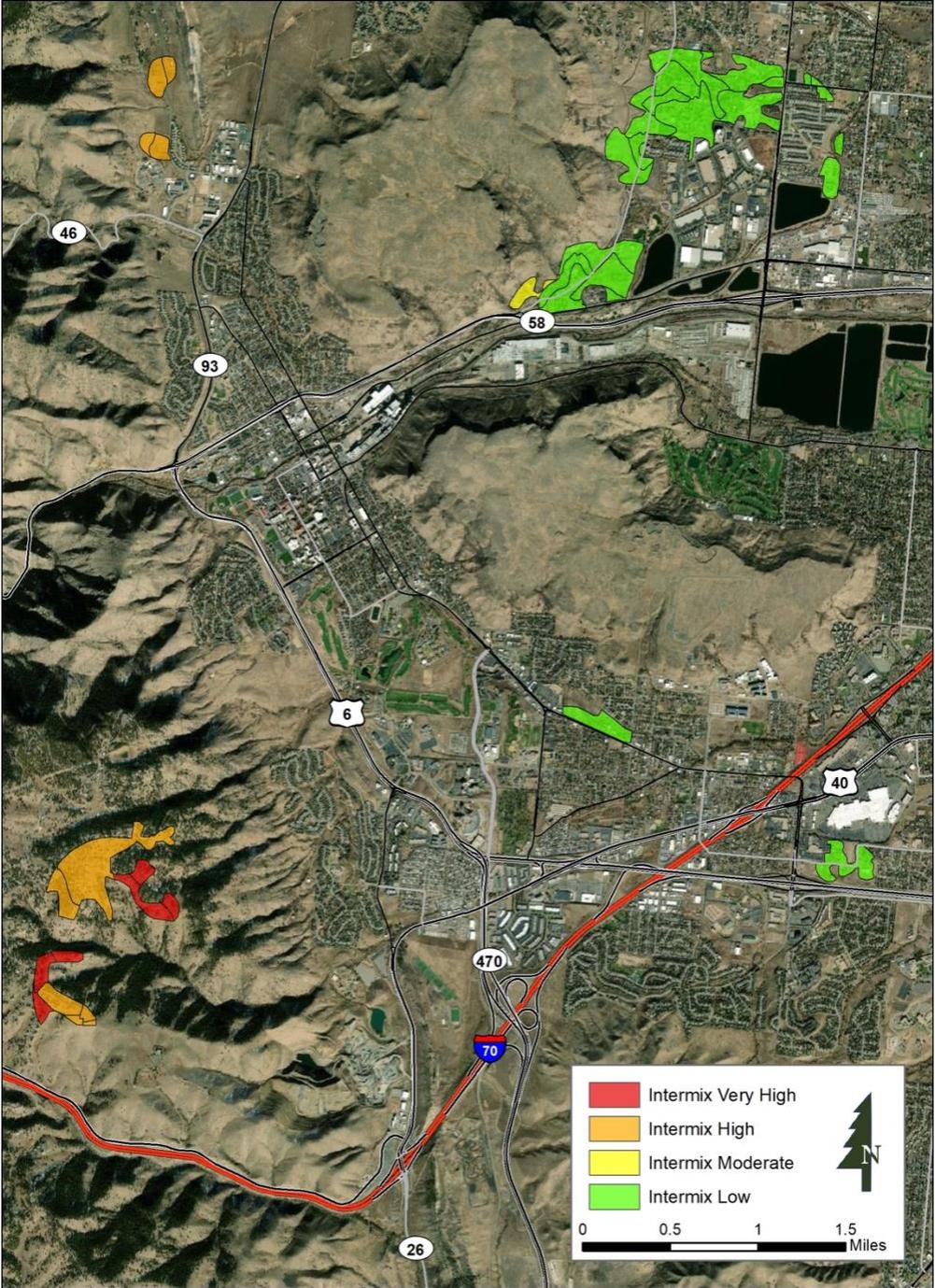


Figure 3 NoHARM Intermix Results

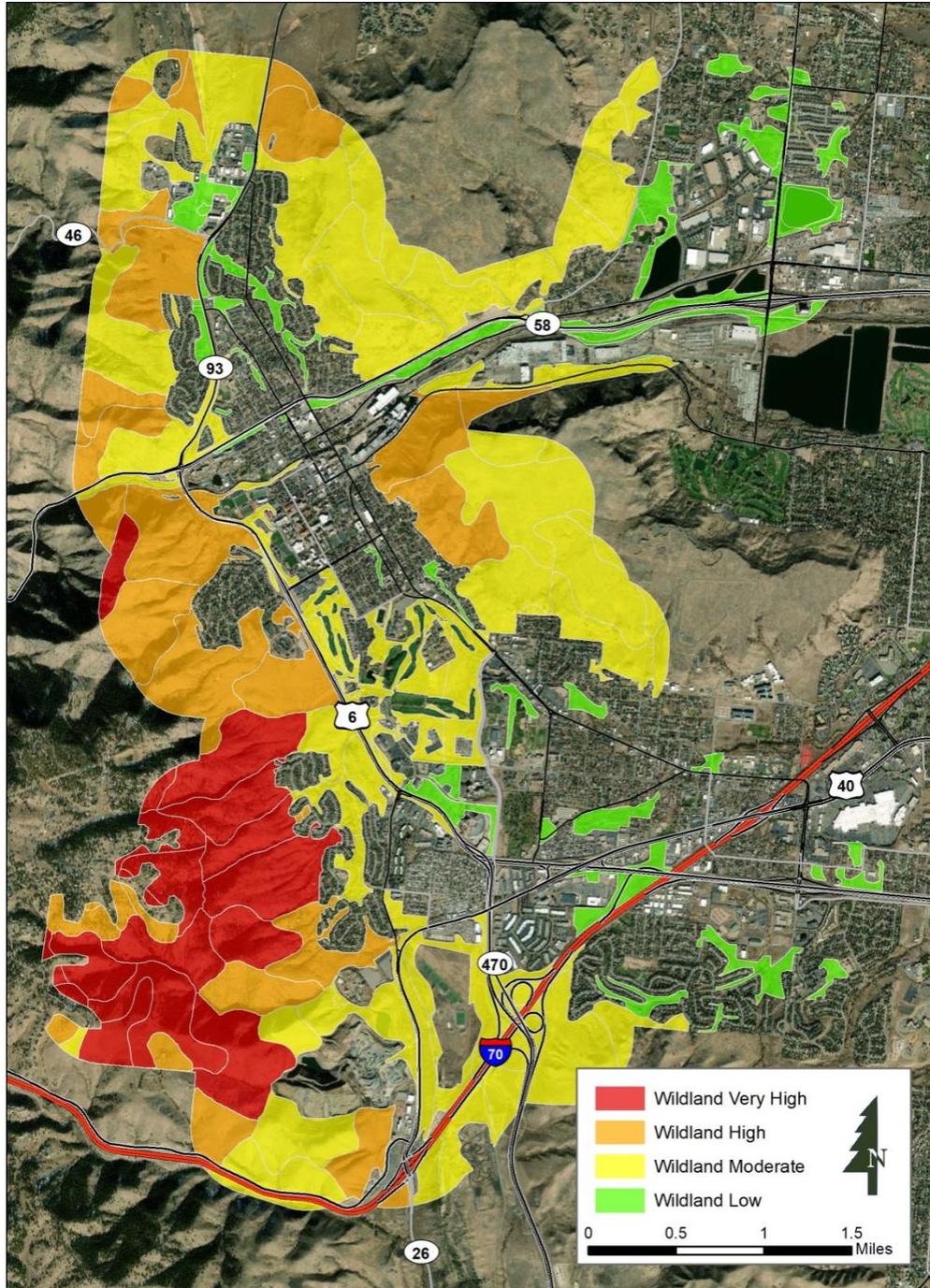


Figure 4 NoHARM Wildland Results

COMMUNITY IGNITABILITY ANALYSIS AND RECOMMENDATIONS

Purpose

The purpose of dividing residential areas into hazard zones is to perform a structural ignitability analysis to sort residential areas into hazard categories to prioritize recommendations. This is accomplished by using No-HARM ratings weighted with the Wildfire Hazard Rating (WHR) tool, which is intended to analyze Wildland Urban Interface and Wildland Intermix (WUI/WI) development.

Methodology

No-HARM Risk 50 ratings, weighted with the WHR model described above, have been included in the description of the residential Hazard Zones presented below. Adjective ratings in No-HARM are as follows: 14 or less = Low, 15-24 = Moderate, 25-28 = High, and >28 = Very High. For an introduction to the methodology behind these ratings, please see the *Understanding No-HARM Ratings* section of this report. A field analysis by a Wildland Fire Mitigation Specialist verifies this information and adjusts the final ratings if necessary.

Description

There are ten residential hazard zones in the study area. No-HARM calculates a Risk 50 score that sorts these zones into one of four adjective rating categories: low, moderate, high, and very high. These residential hazard zone boundaries are different from the “community” boundaries described in the 2007 CWPP due to detailed input from GFD, physical changes caused by additional development, improvements in hazard and probability analysis methodology, and other information provided by NoHARM.

The following Hazard Zone descriptions are an overview of the general characteristics of the area. They focus on the built environment and vegetation based on field observations. This overview is not intended to describe every home or street but rather what is average or typical for that zone.

Table 1 Hazard Zones in Project Area

City of Golden Fire Community Risk-50 Ratings		
Community Name	Score	Rating
Golden Southwest	28	High
Beverly Heights	27	High
Rooney Road	23	High
North Table Mountain	21	Moderate
South Table Mountain	20	Moderate
Junction/Canyon Point	19	Moderate
The Village at Mountain Ridge	18	Moderate
Golden North	15	Moderate
Red Rocks	10	Low
Table Mountain Parkway	6	Low

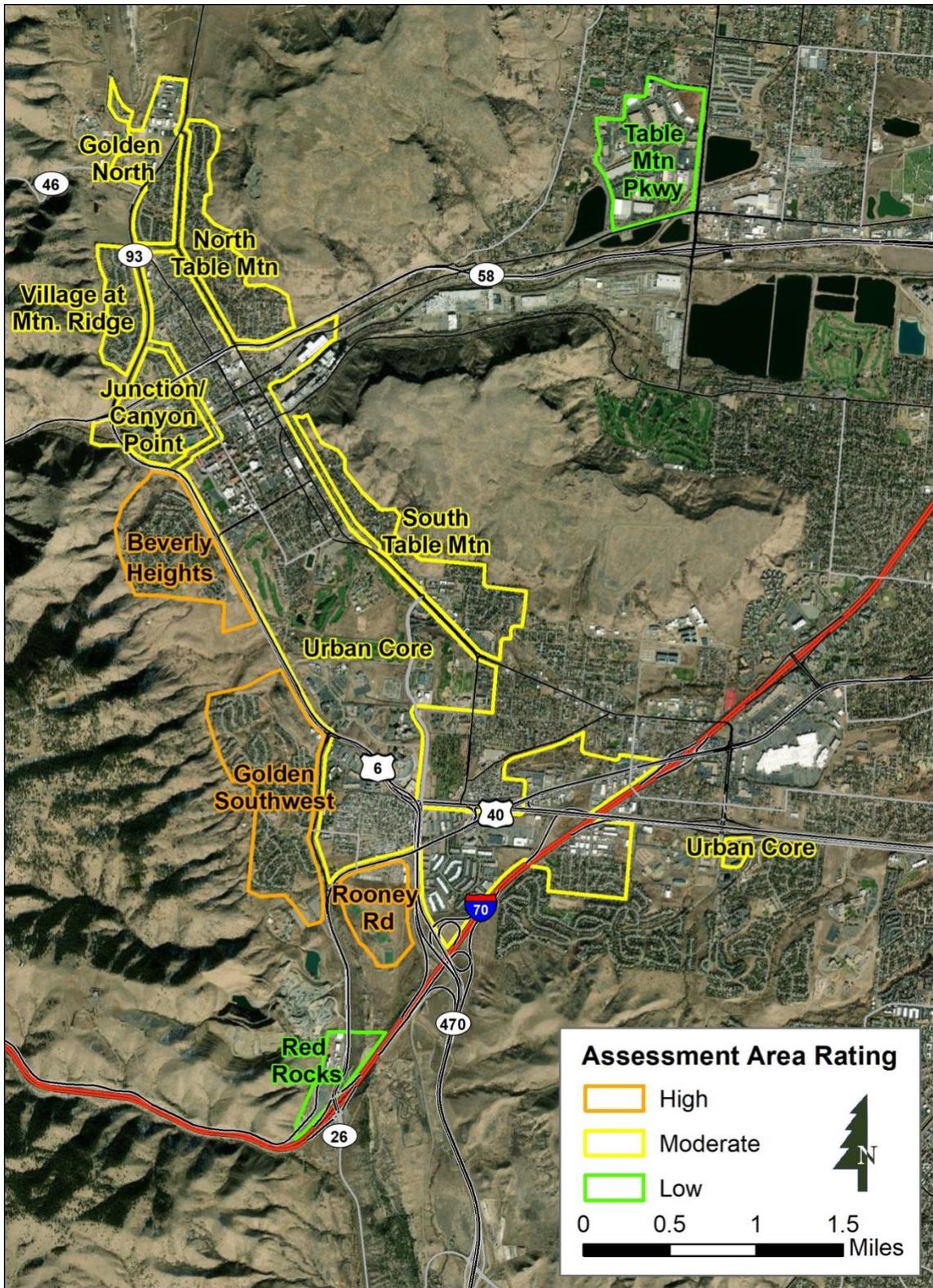


Figure 5 Hazard Zones with No-HARM Rating

Structural Ignitability Discussion, Golden North

Hazard Rating:	MODERATE
Utilities Above or Below Ground:	Mixed
General Construction:	<p>Jessie Lane: New construction 70% brick/30% siding design Class A ignition resistant roofing</p> <p>Brickyard: New commercial construction, cinder block walls, Class A ignition resistant roofing</p> <p>Mesa Dr.: Mix of 1960's and new home construction, 50% brick/stone 50% wood siding design. Class B ignition resistant roofing</p>
Average Lot Size:	Small
Dual Access Roads:	Mixed. West Mesa Dr, single access. East Mesa Dr, dual access but restricted north/south access through Ford St. Brickyard and Jessie Lane multiple secondary access points, primary evac through Pine Ridge Rd.
Road Widths, Slope and Surface:	Generally adequate with minimal slope
Water Supply:	Hydrants
Mean Distance to Staffed Fire Station:	2.3 miles

The Golden North hazard assessment area is located on the northwest margin of Golden's city limits. It is bisected by Colorado State HWY 93 which runs N/S through the area and shares an eastern boundary along Ford St. with the North Table Mtn. assessment area. The area includes the **Jessie Lane** subdivision and **The Brickyard** commercial area west of HWY 93 and **Mesa Dr** with homes west of Ford St on the east of HWY 93. These areas have diverse characteristics but share a common boundary with open space lands with light to moderate loads of native grass.

Jessie Lane Assessment Area Characteristics and Hazards

This is a new subdivision of 34 homes with a common construction design of ignition resistant brick/stone lower and wood siding upper with Class A ignition resistant roofing throughout. Homes are large and lots are small. Structure density is high with tight setbacks between homes. Roads within the subdivision are paved and of adequate width. There is one dead end with an adequate turnaround for fire apparatus.

There are two points of ingress/egress onto Pine Ridge Rd which provides access to roughly 40 additional homes north of the subdivision, as well as White Open Space trailhead and Ralston Reservoir (gated access). To the north of Jessie Lane Pine Ridge Rd converts to West 56TH Ave which intersects with HWY 93, providing an additional route for Jessie Lane residents to HWY 93

Topography within the community is low but a prominent topographic hogback is located immediately to the north and east. Native vegetation is dominated by native grasses and shrubs on these steeper slopes.

The community as a whole is bordered by a two-lane paved county road to the west and south and a groomed gravel walking path to the north and east which provide a significant defensible space boundary. Surrounding native vegetation is dominated by light loads of grasses and shrubs. The general design and layout of the subdivision has significantly reduced the threat of wildfire ignition within the subdivision.

Ornamental landscaping within the subdivision is immature and represents a minimal ignition threat. Many backyards are designed with an outer non-flammable gravel border but some homes have flammable wooden fencing. No wildland fuel islands or corridors are located within the community. There is an interior manicured and irrigated park approximately 1.5 acres in size.

- Street signs are reflective and addresses are well marked.
- Utilities are buried.
- Hydrants are present.

Traffic congestion on HWY 93 in the event of an evacuation is the primary hazard facing the community.

The Brickyard Assessment Area Characteristics and Hazards

The Brickyard is a commercial area located north of Golden Gate Canyon Rd and extends along the west side of HWY 93 for 500 meters (.3 miles) north of the Pine Ridge Rd intersection. The area is comprised of 1 and 2-story commercial warehouse/office buildings. The Golden Lodge Assisted Living facility is located at the intersection of HWY 93 and Golden Gate Canyon Rd at the area's southern boundary. The area is being actively developed and will reach 100% build out with a few years.

Buildings are primarily cinder block construction with rolled asphalt or gravel flat roofing posing minimal ignition threat.

Roads within the commercial area are paved and of adequate width. There are no dead ends or cul de sacs and there are multiple points of ingress/egress to HWY 93, Pine Ride Rd., and Golden Gate Canyon Rd from the Brickyard commercial area.

Topography within the Brickyard is relatively flat but a prominent topographic hogback is located immediately to the north and west. Native vegetation is dominated by native grasses and shrubs on these steeper slopes.

There is a grass-line drainage corridor running west to east in the northern portion of the complex but otherwise non-irrigated landscapes are absent.

- Adequate defensible space is present on all boundaries.
- Street signs are reflective and addresses are well marked.
- Utilities are buried.
- Hydrants are present.

Traffic congestion on HWY 93 in the event of an evacuation is the primary hazard facing the commercial complex.

Mesa Drive Characteristics and Hazards

The Mesa Dr. portion of the Golden North assessment area is located East of HWY 93 at the northern-most margin of the City of Golden. It includes a new residential subdivision along Mesa Dr, older homes located west of Ford St., as well as the Golden Pond retirement and assisted community at the north end of the assessment area. The actual Mesa Dr. subdivision is a recent addition to the City of Golden with larger homes and tight setbacks. Homes located west of Ford St are older, smaller, with larger setbacks although structural density remains high.

Homes are generally constructed with a mix of brick or stone and flammable wood or composite siding. Roofs are generally constructed with ignition resistant Class B asphalt shingles.

Topography is low with HWY 93 to the immediate west and Tucker Gulch neighborhoods to the east, most bordering defensible space is adequate.

Roads here are paved and of adequate width. Mesa Dr. is limited to a single point of ingress/egress and has 2 cul de sacs with adequate turn arounds for small to mid-sized fire apparatus. Neighborhoods to the east have multiple point of entry on to Ford St. There is no access between Mesa Dr. and the Ford St. neighborhoods.

Direct exposure to wildland fuels is limited to a riparian corridor that is contiguous with Golden Gate Canyon drainage west of HWY 93 and cuts through the central portion of the assessment area. The corridor is over 50m in width and supports a variety of unmanaged wildland grasses, shrubs and deciduous trees. Other vegetation within the assessment area is typical of both new and older subdivisions.

There is a pedestrian/bike path that runs along the southern margin of the corridor and connects with open space lands to the west via an underpass under HWY 93. The paved path provides an adequate defensible space buffer for homes on the south side but homes to the north back directly to fuels with flammable fenced back yards

- Street signs are reflective and addresses are well marked.
- Utilities are buried along Mesa Dr. and above ground in the Ford St. area.
- Hydrants are present.

With roadside ignitions common along HWY 93 and westerly wind prevailing, fire carrying into this corridor once vegetation is cured is possible. With no access to Ford St. traffic congestion on HWY 93 in the event of an evacuation is an additional hazard facing Mesa Dr. residents

Golden North Recommendations (See Appendix A for additional information)

- Create and maintain a seasonal fuel buffer zone between homes on the eastern margin of Jessie Lane and open space property.
- Seasonal reduction of fuels in the riparian corridor south of Mesa Dr.
- Fire hardening of homes and private property bordering open space and native vegetation
- Community outreach and preparedness for evacuation logistics and planning.



Figure 6 Golden North Recommendations

Structural Ignitability Discussion, North Table Mountain

Hazard Rating:	MODERATE
Utilities Above or Below Ground:	Mixed
General Construction:	Mixed. Many newer homes in the north end of the area are ignition resistant stucco construction with a mix of ignition resistance class A and class B roofing. Homes further south are older and generally constructed with a mix of wood siding and ignition resistant brick with ignition resistant class B roofing.
Average Lot Size:	Small. Tight building setbacks
Dual Access Roads:	Dual access but the northern area is restricted to ingress/egress on Ford St. Ridge Road lacks adequate turnaround. Multiple dead ends in Peery Pkwy
Road Widths, Slope and Surface:	Roads are paved and generally sufficient to support 2-way traffic with some grades exceeding 15 %.
Water Supply:	Hydrants
Mean Distance to Fire Station:	1.5 miles

The North Table Mountain assessment area includes the neighborhoods of **Tucker Gulch** and **Peery Parkway** that border North Table Mountain. The area is also known as Mesa Meadows. These neighborhoods are located in Golden’s northeast margin and vary in age with newer, larger homes in the north and older, smaller homes typical of 1950’s and 1960’s construction design to the south.

All neighborhoods have been built out to the boundaries of public lands on the lower slopes of North Table Mountain and homes on these eastern margins are in direct contact with grass and shrub wildland fuels typical of the lower slopes of North and South Table Mountain. The riparian corridor that bisects the Mesa Dr subdivision to the north turns south and continues through the length of this assessment area. This seasonal drainage is known as Tucker Gulch. Ford Street runs north/south along the western boundary of the assessment area and serves as the area’s primary ingress/egress route.

Tucker Gulch Characteristics and Hazards

Tucker Gulch constitutes the northern and central portion of the North Table Mtn. assessment area and is named for the seasonal drainage that runs through its length. The area is bounded on the west by Ford St. and North Table Mountain open space to the east. North Table Mountain is a popular local outdoor recreational area for year-round hiking, biking, and climbing. Primary trail head parking and emergency access is located just north of the subdivision.

New larger homes with tight setbacks are located in the northern portion of the area. These homes are primarily constructed with ignition resistant stucco siding and a mix of ignition resistant Class A and Class B roofing. Homes in the central and southern portions are older,

smaller and constructed with a mix of brick, stone and wood siding. Building density is high throughout. Roofing is primarily ignition resistant Class B.

Roads are paved and of adequate width. Road grade in some areas exceeds 15%. There are multiple cul de sacs with adequate turnarounds. Ridge Rd. is the only cul de sac in the area that lacks a turnaround. Roads that provide access to mid-slope homes on the eastern margin are of steeper grade. Multiple points of ingress/egress are available for the neighborhoods but through traffic is somewhat restricted with primary egress along Ford St.

Topography along the eastern Ford St. boundary is generally low but increases significantly to the east as the neighborhoods climb the lower slopes of North Table Mountain.

Light to moderate fuel beds of native grasses and shrubs are common on the lower slopes of North Table Mountain. Fuel loads are denser in gullies. Native grasses and shrubs are present in several interior parks and open space features. Some of these design features are contiguous with open space wildland fuels. A continuous riparian corridor with mature deciduous trees and shrubs runs through the length of the assessment area.

Homes that back directly to open space lands lack defensible space and fencing, if present, is flammable. Most properties are landscaped with mature flammable vegetation.

- Street signs are reflective and addresses are generally well marked.
- Utilities in the area are buried.
- Hydrants are present.

North Table Mountain open space supports heavy year-round outdoor recreational traffic. Back yard amenities for homes that back to open space include BBQ's and fire pits. The primary hazards facing Tucker Gulch neighborhoods involve the increased risk of ignition from these sources, the presence of mid-slope homes, and the lack of defensible space between homes and open space fuel beds.

Peery Parkway

Peery Parkway is an older subdivision, circa 1950's, located at the southern end of the North Table Mountain assessment area. The neighborhood is bordered on the west by Ford St., on the south by HWY 58, and on the east by North Table Mountain Open Space.

Homes in the area were originally constructed with brick or brick and flammable wood siding. Some redevelopment is replacing original designs with more modern ignition resistant stucco architecture. Roofing is primarily ignition resistant Class B. Lot size and building density vary.

Primary and secondary roads are paved and of adequate width to support two-way traffic. Road grade in some areas exceeds 15%. There are several dead ends without turn arounds. The Peery Pkwy neighborhood technically has 2 points of ingress/egress but most traffic is routed to a single point of access on to Ford St.

Topography at the southern margin along HWY 58 is generally flat but increases significantly to the north and east along the lower slopes of Table Mountain.

Light to moderate fuel beds of native grasses and shrubs are common on the lower slopes of North Table Mountain. Fuel loads are denser in gullies. Some larger lots back to each other and vegetation is unmanaged creating inaccessible interior fuel islands. The Tucker Gulch riparian corridor borders the Peery Pkwy assessment area to the west.

Homes that back directly to open space lands lack defensible space and fencing, if present, is flammable. Most properties are landscaped with mature flammable vegetation. Limited seasonal fuel reduction is evident adjacent to homes along Butte Pkwy.

- Street signs are reflective and addresses are generally well marked.
- Utilities in the area are buried.
- Hydrants are present.

North Table Mountain open space supports heavy outdoor recreational traffic and Peery Pkwy is the primary access to North Table Mountain Golden Cliffs climbing area. Back yard amenities for homes that back to open space include BBQ's and fire pits. The primary hazards facing the Peery Pkwy neighborhood involve the increased risk of ignition from these sources, the presence of mid-slope homes, and the lack of defensible space between homes and open space fuel beds.

North Table Mountain Recommendations (See Appendix A for additional information)

- Create and maintain a seasonal buffer between native grass and shrub fuel loads and homes that back to open space property.
- Fire hardening of homes and private property bordering open space and native vegetation
- Community outreach and preparedness for evacuation logistics and planning.



Figure 7 North Table Mtn Recommendations

Structural Ignitability Discussion, The Village at Mountain Ridge

Hazard Rating:	MODERATE
Utilities Above or Below Ground:	Buried
General Construction:	Single family homes with mixed construction of stone or brick with wood siding and Class B roofing.
Average Lot Size:	Moderate
Dual Access Roads:	Dual access to HWY 93
Road Widths, Slope and Surface:	Road widths are adequate. Moderate slopes. Community is designed around 2 main road loops with multiple dead end cul de sacs with adequate turnarounds
Water Supply:	Hydrants
Mean Distance to Fire Station:	1.4 miles

The Village at Mountain Ridge Characteristics and Hazards

The Village at Mountain Ridge is a planned community comprised of several hundred homes built in the mid-1990's. The community is located on the west side of HWY 93 on the lower east facing slopes of Mt Galbraith with homes backing to open space lands to the north, west and south.

The homes of The Village at Mountain Ridge are generally larger single-family homes on small lots with tight. Setbacks. Structure density is high. Homes share variations of a common design theme and are generally constructed with a mix of decorative brick or stone with flammable wood or composite siding. Roofing is primarily ignition resistant Class asphalt shingle.

The community is designed around a main primary road loop and 9 secondary cul de sacs. All roads are paved and of adequate width. All cul de sacs have adequate turnarounds. There are two primary access points to HWY 93.

Topography is moderate within the community with slopes increasing to the west. Homes on the southern margin border a topographic chimney that extends west from HWY 93 and continues up the east slopes of Mt. Galbraith.

Homes on the western perimeter back directly to open space lands dominated by light to moderate loads of native grasses. Heavier loads of shrub and riparian vegetation are found in the ravine on the southern margin. Homes here back directly into these fuel beds. Homes along the northern margin border managed pasture/grazing lands. There is an interior grassy fuel island in the northern-most section of the community separating two smaller neighborhoods. Interior vegetation is dominated by 25-year-old landscaping.

Defensible space is lacking on these margins and flammable wooden fencing is common. Homes along the eastern margin back to a 50 m wide strip of native grass bordering HWY 93 that was replanted following construction. A paved bike path provides an effective fuel buffer for homes along this eastern margin south of Iowa St.

- Street signs are reflective and addresses are generally well marked.
- Utilities in the area are buried.
- Hydrants are present.

With frequent roadside ignitions along HWY 93 and rapid rates of spread associated with grass fuel beds fuels pose a risk for homes located upslope. The threat of roadside ignition is also a risk factor for homes backing to the ravine on the community's southern margin.

Ignitions upslope to the west may pose an additional threat for homes that back directly to open space on the area's western margin.

The Village at Mountain Ridge Recommendations (See Appendix A for additional information)

- Create and maintain a seasonal buffer between native grass and shrub fuel loads and homes that back to open space property. Special consideration should be given to fuel reduction in the ravine bordering the community's southern margin.
- Fire hardening of homes and private property bordering open space and native vegetation
- Community outreach and preparedness for evacuation logistics and planning.



Figure 8 The Village at Mountain Ridge Recommendations

Structural Ignitability Discussion, Junction/Canyon Point

Hazard Rating:	MODERATE
Utilities Above or Below Ground:	Mixed
General Construction:	Mixed and diverse. The assessment zone is comprised of a small neighborhood of wood sided duplexes, a 4-story brick sided hotel, 3 and 4 story brick sided apartments, City of Golden Municipal buildings, a recreation center, and homes of old town Golden west of Illinois St.
Average Lot Size:	N/A
Dual Access Roads:	Mixed. Restricted access.
Road Widths, Slope and Surface:	Generally adequate. Hwy 93 and HWY 58 intersect in the assessment area with very limited points of access. Areas to the east feed into downtown Golden Street networks.
Water Supply:	Hydrants
Mean Distance to Fire Station:	1.2 miles

Junction/Canyon Point Characteristics and Hazards

Junction/Canyon Point assessment area is located in the proximity of the 4-way intersection of Hwy 93 and HWY 58. Illinois St at the edge of old town Golden bounds the area to the east. The assessment area consists of a mix of recreational, residential, commercial, and municipal assets, including the intake site for City’s municipal water supply. The Colorado School of Mine’s sports complex is located here just south of Clear Cleek. The Clear Creek riparian and recreational corridor runs through the central portion of the area. There is a second riparian corridor on the south side of HWY 58 that runs along an irrigation ditch positioned between the highway and the apartment buildings.

4 distinct residential zones are found within the assessment area, including several “Old Town” Golden neighborhoods north and south of HWY 58 with no exposure to wildland fuels and minimal risk of ignition. Several multi-story apartment buildings and the multi-story BaseCamp Hotel are located along HWY 58 in the central portion of the assessment area. These structures are constructed with ignition resistant commercial materials. A small subdivision of approximately 30 duplexes is located on High Point Dr. north of HWY 58 and east of HWY 93. These duplexes are constructed of flammable wood siding and ignition resistant Class B roofing. The condominium complex is located southwest of the intersection of HWY 93 and Hwy 58. The Canyonside Condominiums are located south of HWY 58 and west of HWY 93/6th Ave. This is an older 25-unit complex constructed of a mix of stone and flammable wood siding and Class B ignition resistant asphalt roofing.

Travel across Junction/Canyon Point assessment area is highly restricted around the 4-way intersection of HWY’s 58 and 93 and limited points of access. Secondary roads are paved and of adequate width. Road grades within the area are low. Most cul de sacs have adequate turnarounds. Access is very limited to the Base Camp Hotel and apartment complex. High Point

Dr subdivision and Canyonside Condos are limited to a single point of ingress/egress. Clear Creek Lane which serves Canyonside Condos is a narrow dead end access road.

The Clear Creek flood plain bisects the assessment area and topography within the assessment area is low. Lookout Mountain rises 1,400 ft immediately to the west of area.

Vegetation consists primarily of moderate to heavy grasses, deciduous trees, and shrubs long Clear Creek corridor. Light to moderate loads of grass is common along the HWY margins. Vegetation closer downtown Golden is typical of mature urban landscaping.

- Street signs are reflective and addresses are generally well marked.
- Overhead and buried utilities are present.
- Hydrants are present.

Junction/Canyon Point is an area that experiences significant transient and illegal camping activity as well as heavy recreational use along the Clear Creek corridor and bike path. Escaped campfires and roadside ignitions here are common. The Clear Creek riparian corridor creates a continuous fuel bed between Lookout Mountain, Clear Creek Canyon and downtown Golden.

Junction/Canyon Point Recommendations (See Appendix A for additional information)

- The area is prone to frequent unintended ignitions from traffic and transient encampments. Mitigation of heavier fuels in the Clear Creek riparian corridor is recommended to reduce the threat of ignitions impacting infrastructure east of 6th Ave.
- Fuel load reduction around the Canyonside Condominiums and the Clear Creek Lane access road is recommended.
- Expansion of the Canyonside Condominium parking lot to accommodate emergency apparatus and possible staging is recommended.
- Evacuation of Junction/Canyon Point will be complex with limited highway access and route restrictions. The creation of a strategic plan for each zone within the assessment area and neighborhood-level public outreach and education is recommended. For more information on roadside vegetative management and evacuation planning

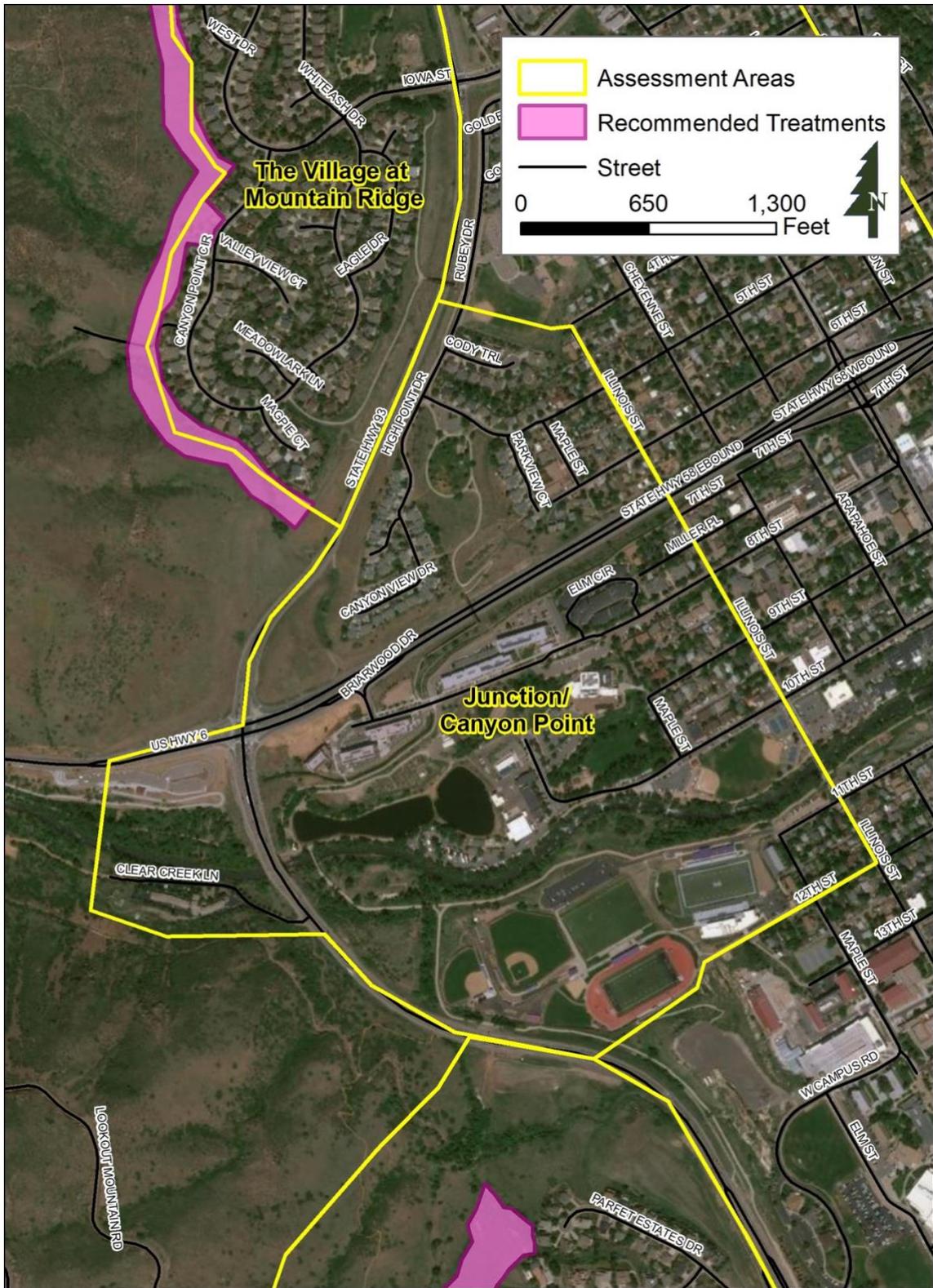


Figure 9 Junction/Canyon Point Recommendations

Structural Ignitability Discussion, Beverly Heights

Hazard Rating:	HIGH
Utilities Above or Below Ground:	Mixed
General Construction:	Predominantly single family 1 and 2 story homes with ignition resistant brick and flammable wood siding trim. Most roofing material is ignition resistant Class B asphalt shingles. Mines Park is a new CSM student residential complex is located south of Lookout Mtn. Rd. with 25 -2 story multi-family residences constructed of flammable composite siding and ignition resistant brick trim. Roofing is Ignition resistant Class B shingles.
Average Lot Size:	Subdivision lot sizes vary medium to small with moderate to tight building setbacks.
Dual Access Roads:	Beverly Heights subdivision has 6 points of entry on to Lookout Mtn. Rd. but travel within the subdivision is restrictive. CSM residential campus has 2 points of entry on to Lookout Mtn. Rd.
Road Widths, Slope and Surface:	All roads are paved. Primary roads are of adequate width with several narrow secondary roads. There are 3 cul de sacs with adequate turn arounds and 2 dead ends within the subdivision. Slope on some streets exceed 15% grade. Mines Park has 1 cul de sac with a restrictive turn around.
Water Supply:	Hydrants
Mean Distance to Fire Station:	2.6 miles

Beverly Heights Characteristics and Hazards

With construction starting in the 1950's Beverly Heights is Golden's first residential expansion located west of HWY93/6th Ave. The subdivision is constructed on the lower slopes of Lookout Mountain, north of Lookout Mtn. Rd. with a predominant east-facing aspect. Build-out with over 280 homes was completed by 2007. Included in Beverly Heights assessment area is a Colorado School of Mines off-campus residential complex located south of Mt. Zion Dr.

Construction design has varied over the years but predominant building materials are a mix of ignition resistant brick/stone, flammable wood or composite siding, and ignition-resistant Class B roofing. Lots vary but are generally small to medium in size with tight lateral building setbacks. The student housing complex was completed more recently and is comprised of 25 2-story multi-family residences with flammable composite siding, ignition resistant brick trim, and Class B ignition resistant roofing.

The Beverly Heights subdivision is located north of Lookout Mtn. Rd. on the lower eastern slopes of Lookout Mtn. Roads within the subdivision are paved and are generally of adequate width for 2-way traffic although several interior secondary roads are narrow enough for restricted 2-way traffic flow. Road grade is in some areas is in excess of 15%. There are

unimproved 2 dead ends and 3 cul de sacs with adequate turnarounds. Beverly Heights has 6 points of access to Lookout Mtn. Rd. Roads within Mines Park are paved and of adequate width with extended resident parking. There is 1 restricted turnaround and 2 points of access to Lookout Mtn. Rd.

Topography within the community and the surrounding area is dominated by the lower east facing slopes of Lookout Mountain. Slope grades increase to the west. Chimney Gulch is located north and downslope of the homes on the area's northern margin.

Beverly Heights is bordered on the north by Chimney Gulch with dense stands of shrub and heavy loads of native grass located downslope from homes. To the west along Lookout Mtn. Rd. east facing terrain supports alternating beds of native grass and sparse shrub. Light to moderate loads of native grass dominate the flat open space lands south of Mines Park. Several interior fuel islands are found within both Beverly Heights and the Mines Park housing complex.

Defensible space is generally lacking for homes in the assessment area that back to open space. This includes homes that are upslope from Chimney Gulch and homes that are down slope from lighter fuels along Lookout Mtn. Rd. 6th Ave offers a significant fuel-free zone to the east. Parking lots, streets and other fuel-free zones provide an adequate defensible space buffer for the Mines Park residential complex.

- Street signs are reflective and addresses are generally well marked.
- Some utilities in the area are buried but most are above ground.
- Hydrants are present.

The area is prone to frequent ignitions along 6th Ave. and transient encampments. The likelihood of Chimney Gulch supporting a slope driven fire with rapid rates of spread is significant. Upslope ignitions to the west in a wind-drive wildfire event could impact the grass and shrub fuel beds on adjacent lands as well as fuel islands located within the assessment area. Colorado School of Mines maintains two explosives storage sheds south of Mines Park surrounded by a 9m -15m fuel-free perimeter.

Beverly Heights Recommendations (See Appendix A for additional information)

- Create and maintain a seasonal buffer between native grass and shrub fuel loads and homes that back to open space property along the south ridge of Chimney Gulch.
- Many homes located on exterior lots back directly to fuel beds of native grass and shrubs. Flammable fencing is common. Fire hardening of homes and private property bordering open space and native vegetation is recommended.
- Reduction of fuels within interior fuel islands on private property is recommended.

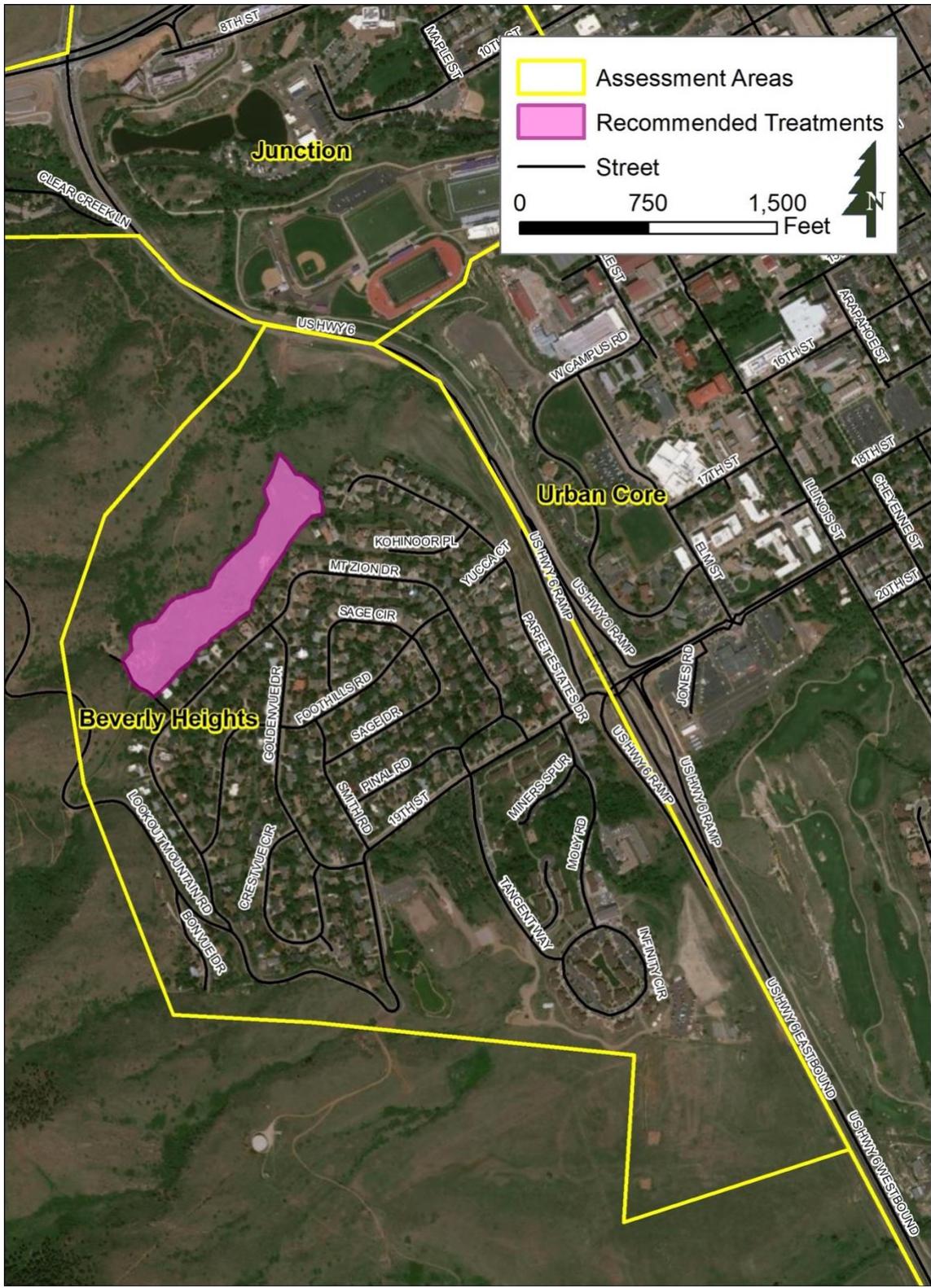


Figure 10 Beverly Heights Recommendations

Structural Ignitability Discussion, South Table Mountain

Hazard Rating:	MODERATE
Utilities Above or Below Ground:	Above Ground
General Construction:	Mixed. Newer homes ignition resistant stucco with a mix of ignition resistance class A and class B roofing. Older homes constructed with a mix of flammable wood siding and ignition resistant brick with ignition resistant class B roofing.
Average Lot Size:	Small. Tight building setbacks
Dual Access Roads:	Present
Road Widths, Slope and Surface:	Roads are paved, widths are adequate to support 2-way traffic with some grades exceeding 15 %.
Water Supply:	Hydrants
Mean Distance to Fire Station:	1.7 miles

South Table Mountain Assessment Area Characteristics and Hazards

The South Table Mountain assessment area is located on the eastern margin of south-central Golden and borders the lower western slopes of South Table Mountain. The area consists of two distinct neighborhoods that are physically separated by a parcel of open space but share common construction characteristics and a common boundary with South Table Mountain. The northern portion spans a mile-long strip of residential homes several blocks wide between Ford St. and South Table Mountain. The southern portion is the Rimrock neighborhood. A parcel of open space land separates the 2 neighborhoods. Several businesses and multi-family units are located along Ford St in the South Table Mountain neighborhood. A commercial zone with several churches, a preschool, and an apartment complex are located along South Golden Rd (Ford St) south of the Rimrock residences.

Both neighborhoods were constructed in the early 1960's and share common design characteristics. These are primarily single family detached homes with ignition resistant brick or a mix of brick with flammable wood siding and Class B asphalt roofing. Several new larger homes of ignition resistant stucco have been built on mid-slope road extensions. Rimrock commercial structures are ignition resistant siding and Class B ignition resistant roofing. The apartment complexes are a mix of ignition resistant brick, flammable wood siding and Class B ignition resistant roofing.

All neighborhoods have multiple points of ingress/egress to the downtown Golden area. Roads are paved and of adequate width to support 2-way traffic. Belvedere drive is a mid-slope dead end street serving five homes that lacks a turnaround. Grades on some streets bordering South Table Mountain open space are in excess of 15%.

Topography along Ford St is low but increases significantly to the east along the base of South Table Mountain

The lower slopes of South Table Mountain are dominated by light to moderate loads of native grass and shrub. Predominant Interior fuels consist of mature flammable decorative residential

landscaping. There is one interior park with light loads of native grass as well as an irrigation ditch running the length of the area that supports a riparian corridor. Homes along Lookout View Ct. back to heavy riparian fuels located at the base of a topographic chimney.

- Street signs are reflective and addresses are generally well marked.
- Utilities in the area are above ground.
- Hydrants are present.

Homes in both neighborhoods are situated downslope from South Table Mountain open space property and back directly to contiguous fuel beds of grass and shrub with no defensible space. Flammable wood fencing and decks are common back yard features. There are many trail heads and points of access to South Table Mountain open space throughout the assessment area. The area is prone to heavy year-round recreational use and ignitions here are frequent. High tension power lines bisect the area.

South Table Mountain Recommendations (See Appendix A for additional information)

- Create and maintain a seasonal buffer between native grass and shrub fuel loads and homes that back to open space property.
- Fire hardening of homes and private property bordering open space and native vegetation
- Community outreach and preparedness for evacuation logistics and planning.

Structural Ignitability Discussion, Golden Southwest

Hazard Rating:	HIGH
Utilities Above or Below Ground:	Mixed
General Construction:	Mixed. Design varies between ignition resistant stucco, stone, brick and flammable wood siding, or a mix of thereof
Average Lot Size:	Small. Tight building setbacks
Dual Access Roads:	Present, but limited to 2 points of ingress/egress
Road Widths, Slope and Surface:	Roads are paved, widths are adequate to support 2-way traffic with some grades exceeding 15 %.
Water Supply:	Hydrants
Mean Distance to Fire Station:	4.5 miles

Golden Southwest Assessment Area Characteristics and Hazards

The Golden Southwest assessment area is located at the southwest margin of Golden’s city limits south of 6th Ave and west of Heritage Rd. The assessment area is comprised of 3 distinct neighborhoods that were constructed in the late 1970’s - early 1980’s along the lower slopes of Apex Park, a popular Denver area outdoor recreational hiking and biking destination. There is a concentration of high-density smaller homes and several businesses, including a day care, medical offices, and an urgent care/ER facility along the area’s eastern Heritage Rd. City of Golden Fire Dept’s Station 4 is located on Heritage Rd. at the southern edge of the assessment area. This is a staffed secondary facility with multiple apparatus.

To the west neighborhoods climb the lower slopes of Apex Park. Many homes in these upper neighborhoods are located on saddles or within topographic chimneys. Homes and lots in the Eagle Ridge and Heritage Dells communities are larger with many built on saddles or within topographic chimneys. Neighborhoods are designed around cul de sacs that are separated by expanses of open space. The Shelton Elementary School is centrally located here.

Homes along Heritage Rd. are constructed of flammable wood siding with class B asphalt roofing. Commercial buildings in the area are mostly single-story ignition resistant stone and stucco. Predominant construction materials in Eagle Ridge and Heritage Dells subdivisions are decorative brick, flammable wood siding and Class B asphalt roofing. The Shelton elementary School is ignition resistant cinderblock construction.

Nearly 500 residences in the assessment area share only 2 primary points and 1 secondary point of ingress/egress on to Heritage Rd. All homes in Eagle Ridge and Heritage Dells are accessed via a primary main road loop over 3 miles in length with multiple cul de sacs and secondary neighborhood loops. All cul de sacs are designed with adequate turnarounds. Roads are paved and of adequate width to support 2-way traffic. Road grades increase to the west with some in excess of 15%.

Topography in the assessment area is typical of foothills with heavily dissected east facing slopes with grades increasing significantly to the west. A low hogback separates Eagle Ridge and Heritage Dells from the Heritage Rd. neighborhood

Due to the unique landscape design elements, significant interior loads of native grass and shrub are common throughout the assessment area. These interior zones of vegetation are designed around drainages and gullies that are contiguous with open space lands to the north and west. As a result, a majority of homes back directly to moderate to heavy fuel loads of grass and shrub. Fingers of dense conifer stands extend downslope from Apex Park on the north aspects of multiple drainages. These stands transition to shrub within ¼ mile of homes and extend far into the neighborhoods. Flammable wood fencing is common throughout the area.

- Street signs are reflective and addresses are generally well marked.
- Utilities in the area are above ground.
- Hydrants are present.
- A city-owned solar microgrid is located adjacent to City of Golden Fire Dept's station 4.

Ignitions on surrounding open space lands and riparian corridors are frequent. The area is subject to heavy recreational and transient activity. There is a higher occurrence of lightening here as well as frequent north-south valley winds. There is a delayed 20-minute response time to Apex Park for upslope ignition suppression with contiguous fuels into and throughout the community.

Golden Southwest Recommendations (See Appendix A for additional information)

- For individual homes that back directly to open space fuels establishing a defensible space zone is critical. Create and maintain a seasonal buffer between native grass and shrub fuel loads and homes that back to open space property.
- Seasonal reduction of native grass and shrub fuel loads within open space corridors is critical. Expand any current interior mitigation programs.
- An additional emergency access point for Heritage Dells is recommended. Consider constructing an emergency evacuation access route from Burgess Ave along Kinney Run trail to the upper Apex Trail head parking lot to provide additional egress for Heritage Dells residents.
- Fire hardening of homes and private property bordering open space and native vegetation
- Community outreach and preparedness for evacuation logistics and planning.

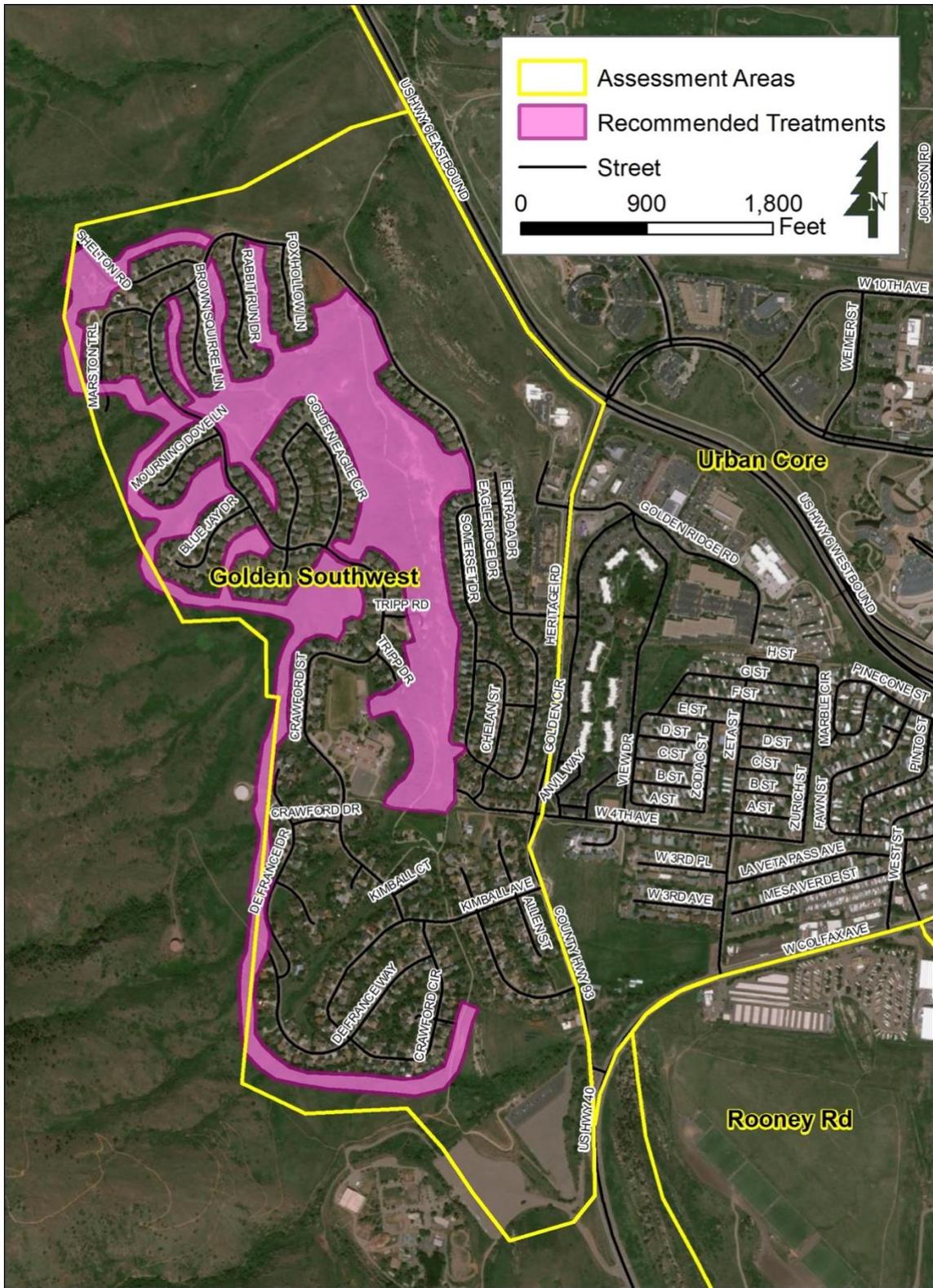


Figure 12 Golden Southwest Recommendations

Structural Ignitability Discussion, Rooney Road

Hazard Rating:	HIGH
Utilities Above or Below Ground:	Above
General Construction:	N/A sports fields. Storage facility. RV park.
Average Lot Size:	N/A
Dual Access Roads:	Single ingress/egress
Road Widths, Slope and Surface:	Single lane paved then dirt
Water Supply:	None
Mean Distance to Fire Station:	5.5 miles

Rooney Road Assessment Area Characteristics and Hazards

The Rooney Road assessment area is located on a section of land between West Colfax Ave, SH 470, and I70. This is the site of an old landfill that closed operations in 1980. It is now the home of a household hazardous waste facility and the Rooney Road Sports Complex consisting of 5 soccer fields constructed of crumb rubber base and synthetic grass surface. The playing fields were completed in 2007 after the landfill was recapped.

To the north of the sports complex is a small commercial complex consisting of a public storage facility, 2 warehouse businesses and an RV park. The commercial zone is not accessible from the sports complex, has no boundary with wildland fuels and is considered part of Golden’s “urban core”.

The hazardous waste facility is the only structure in the assessment area and is constructed of non-flammable metallic siding.

There is a single point of access to the area from Rooney Road that is paved but restricted width for 2-way traffic flow. Pavement ends before the facility entrance and unpaved surface is rough. Road grade is low.

Topography is graded flat within the complex. A topographic hogback borders the area to the west.

Light to moderate fuel loads of native grass and shrub are present on the slopes of the hogback with scattered conifer present along the ridge top. The landfill surface has been reclaimed with native short prairie grass and interior and surround fuel loads are light to moderate.

Defensible space is present surrounding the hazardous waste recycling center and on the west side of the playing fields.

- Street signage is absent
- Utilities are above ground
- High tension power lines run along the eastern margin
- There are no hydrants or static water source

Roadside and transient encampment ignitions are common and the assessment area is subject to high burn frequencies. High winds are common along the I70 corridor. Suppression efforts are complicated in the absence of hydrants. The presence of a hazardous waste recycling facility and synthetic/crushed rubber playing fields may pose a hazmat threat to responding units.

Rooney Road Assessment Area Recommendations

- Consideration should be given to establishing and maintaining a static on-site source of water to augment the need for water tenders.
- Firefighters should be briefed on the area's potential hazmat threats

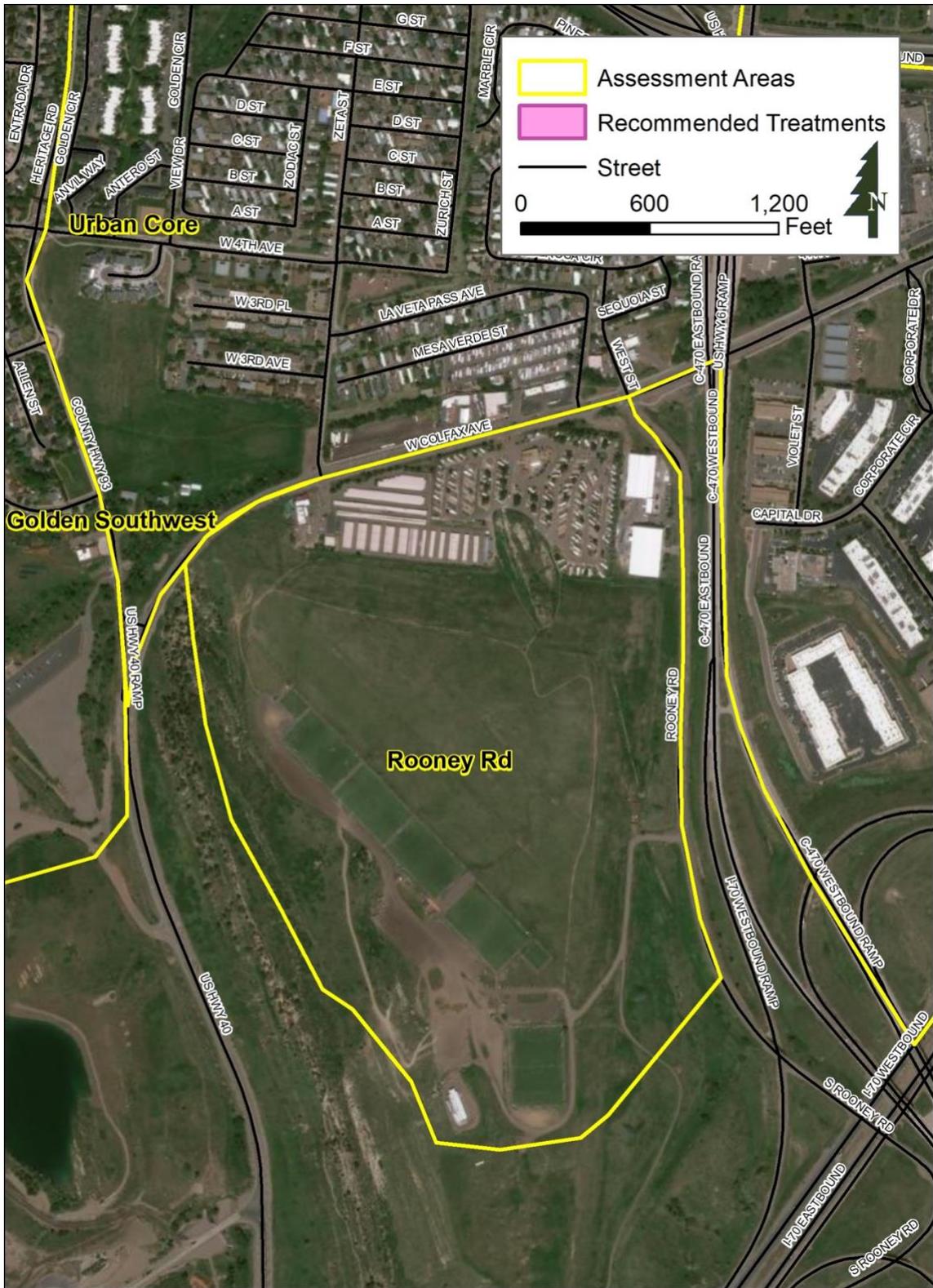


Figure 13 Rooney Road Recommendations

Structural Ignitability Discussion, Red Rocks

Hazard Rating:	LOW
Utilities Above or Below Ground:	Mixed
General Construction:	Commercial-ignition resistant
Average Lot Size:	N/A
Dual Access Roads:	Dual access but restricted
Road Widths, Slope and Surface:	Paved, adequate width, low to moderate slope
Water Supply:	Hydrants
Mean Distance to Fire Station:	5.6 miles

Red Rocks Assessment Area Characteristics and Hazards

The Red Rocks assessment area is a small commercial zone located just north and west of the confluence of I70 and West Colfax Ave/HWY 40/HWY 93. Paved RTD Park and Ride commuter parking lots occupy most of the central portion of the area. A small isolated commercial complex is located north of the parking lots and is occupied by a 4-story hotel and several small retail businesses including a gas station. An additional gas station is located immediately southwest of the parking lots. The assessment area extends east along the north side of I70 through the road cut, to the east side of the hogback that borders Rooney Road. The Martin Marietta quarry borders the area to the north. No residential structures are present in the area. The commercial structures are constructed of ignition resistant materials. Roofs are flat and not assessed.

Roads within the commercial complex are paved, of adequate width, and generally low grade. There are 2 points of access onto Hwy 40 which runs east of the commercial area cutting through the central portion before running parallel to I70 to the west. Road grade on HWY 40 is moderate. There is limited access to I70 which borders the assessment area to the south.

The commercial zone and parking lots located at the base of the foothills and the area has been graded flat. To the east of HWY 40 the topographic hogback that borders Rooney Road assessment area rises nearly 250' and trends north-south. The I70 road cut dissects the hogback, essentially creating a man-made canyon.

Light to moderate fuel loads of native grass and shrub are present on the slopes of the hogback. Scattered individual conifer are present along the ridge top. Light loads of native grass and shrub border the area to the west. A topographic chimney is located near the area's west margin with heavier loads of grass and shrub in the gullies and north slopes. Light loads of grass border most roads. With paved parking lots surrounding structures and road networks bordering the entire assessment area defensible space is adequate.

The area is prone to frequent ignitions from transient camps and passing traffic. High winds are common. Call frequency and delayed response time due to traffic congestion and distance from Golden's main fire station is a concern.

Red Rock Assessment Area Recommendations

- Work with law enforcement to patrol area regularly.

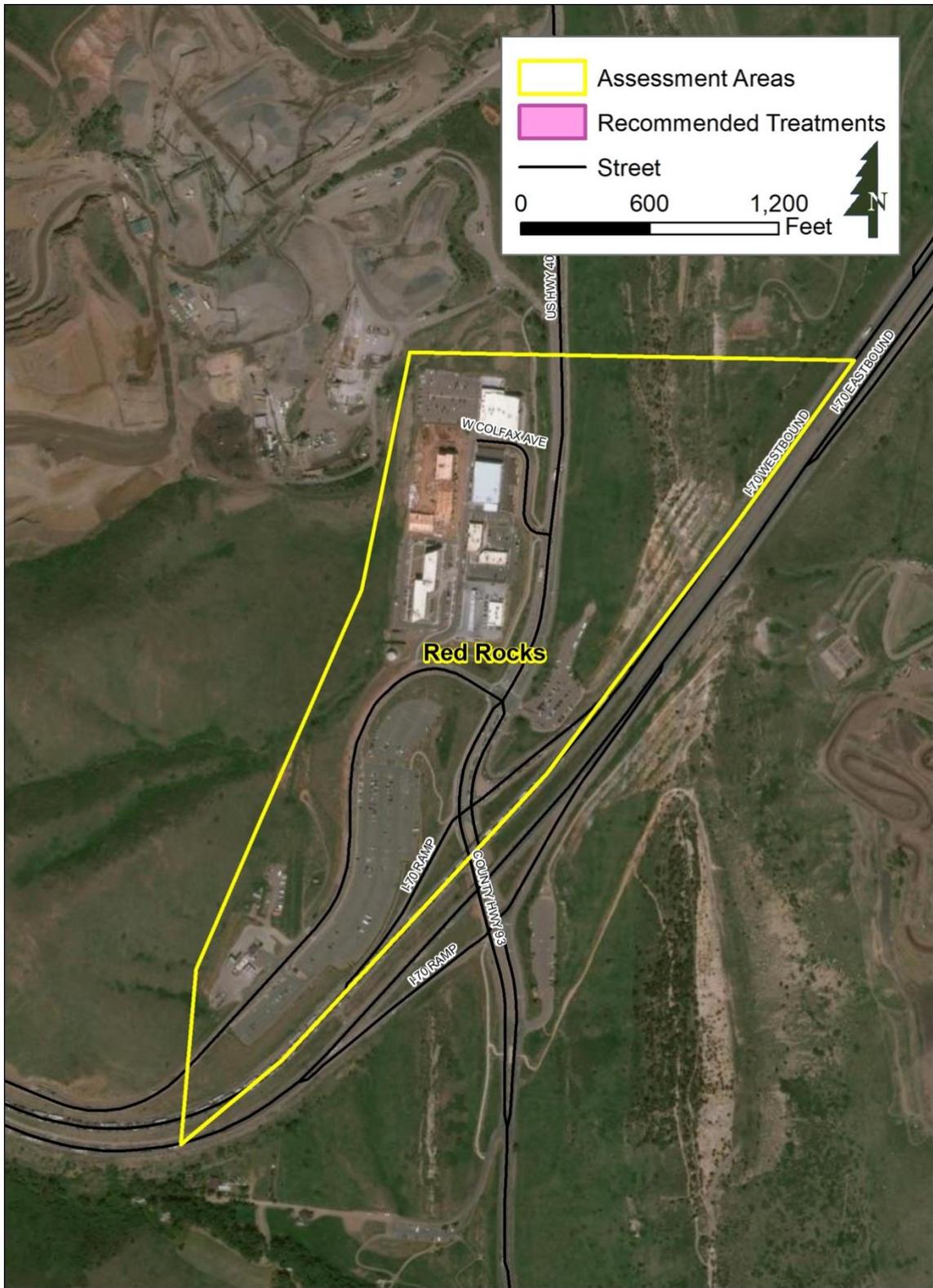


Figure 14 Red Rocks Recommendations

Structural Ignitability Discussion, Table Mountain Parkway

Hazard Rating:	LOW
Utilities Above or Below Ground:	Mixed
General Construction:	Commercial-ignition resistant
Average Lot Size:	N/A
Dual Access Roads:	Dual access
Road Widths, Slope and Surface:	Paved, adequate width, minimal slope
Water Supply:	Hydrants
Mean Distance to Fire Station:	3.3 miles

Table Mountain Parkway Assessment Area Characteristics and Hazards

The Table Mountain Parkway assessment area is a large commercial zone located northeast of the Coors complex corridor, east of North Table Mountain. A group of small reservoirs border the area to the southwest, south and southeast. An irrigated park, a small section of unmanaged land, and a small residential neighborhood provide a physical buffer with North Table Mountain open space to the west. A rural residential neighborhood and a seasonal wetland area border the area to the north. An irrigation ditch bisects the area southwest to northeast.

Structures within the assessment zone are 1 and 2-story commercial office, warehouse and manufacturing facilities constructed with ignition resistant materials. Composition of roofing material was not observed.

The complex is designed around a looping boulevard approximate 1.25 miles in length. There are 3 points of ingress/egress to McIntyre St. and W. 44th Ave. Roads are paved, of adequate width for 2-way traffic, with large parking lots adjacent to structures. Road slope is negligible.

The area has been graded and topography is minimal. North Table Mountain borders the area ¼ mile to the west with 800 vertical feet of relief.

Other than a 20-acre parcel of grass to the west there is minimal direct exposure with external wildland fuels. Interior fuels are limited to commercial landscaping and scattered riparian vegetation along the irrigation ditch

- Street signs are reflective and addresses are generally well marked.
- Utilities in the area are above ground.
- Hydrants are present.

Primary concerns here relate to possible delayed response due to distance from Golden’s downtown station and the checkerboarded nature of district boundaries and response areas with Fairmount Fire District. There is currently an automatic emergency response mutual aid agreement aid agreement with the Fairmount Fire Dept due to expire 2024.

Table Mountain Parkway Recommendations

- Consolidate district boundaries in the neighborhoods surrounding the assessment area.
- Review, update and extend automatic mutual aid agreement with Fairmount Fire

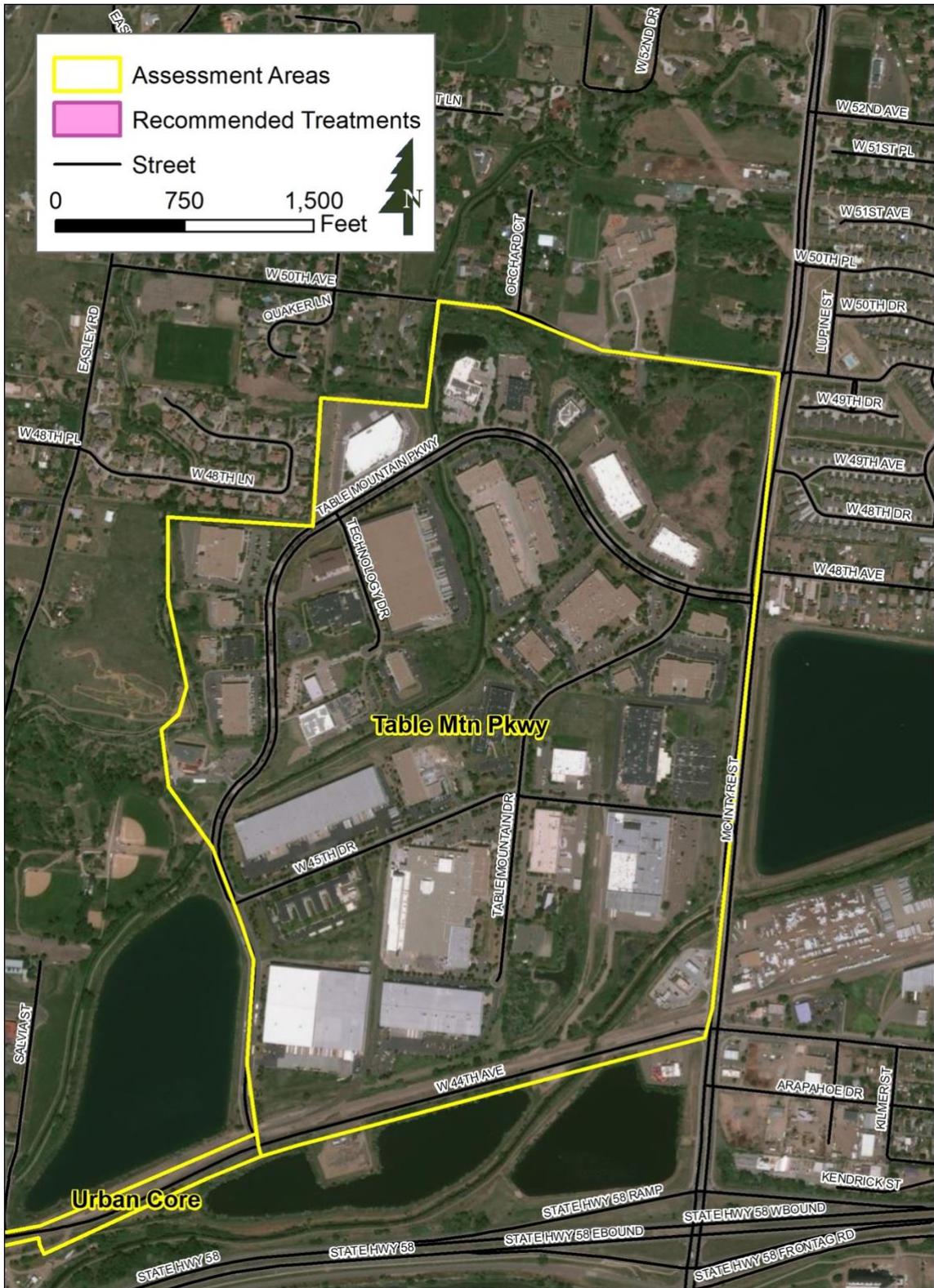


Figure 15 Table Mtn Parkway Recommendations

GENERAL RECOMMENDATIONS

The two most important recommendations in this report are;

1) to incorporate defensible space techniques and ignition resistant construction in future development plans, and 2) for existing structures to be fire hardened to the greatest extent practical. Detailed information on achieving these goals is available in *Appendix A, Home Ignition Zone Recommendations*.

For homes to fully benefit from landscape scale fuel treatments, homeowners should take a few basic steps to reduce the risk of ignition on their side of the fence. It is important to remember that treatment zones will significantly reduce but not eliminate the rate of spread of a wildfire. Embers will fall and wooden fences will burn. Making your house safe and easy for responders to access and protect will make the difference between a win and a loss.

- Clean roofs and gutters at least twice a year. It is vital to remove pine needles and other flammable litter from roofs and gutters.
- Keep embers out by screening vent openings, window wells, and under decks.
- Don't store firewood or other combustibles under decks, stairs, or wooden projections.
- Maintain an irrigated greenbelt or other non-combustible ground cover around buildings.
- Maintain and clean spark arresters on any chimneys.
- Connect and have available a minimum of 50 feet of garden hose near all buildings to extinguish small fires before they spread. For large buildings, two or more hoses may be required to provide adequate coverage.
- Trees, large shrubs, and other vegetation along driveways should be pruned as necessary to maintain a minimum of 15 feet of vertical clearance for emergency vehicle access. This recommendation is for both conifers and deciduous trees.
- For driveways longer than 150 feet, a cleared turnaround for fire apparatus should be provided. Turnarounds may consist of a 96-foot circle, 60-foot "Y", or 120-foot "Hammerhead" described in the 2018 International Fire Code. Driveways should be at least 20 feet wide where possible.
- Maintain the defensible space around buildings by:
 - Mowing grass and weeds to a height of four inches or less
 - Removing any branches overhanging roofs or chimneys.
 - Removing all trash, debris, and cuttings from the defensible space. Debris and cuttings should be removed entirely from the area and never dumped into adjacent wildlands or vacant lots.
- Collaborate with neighbors. In dense communities your home is as fireproof as your neighbor's weakest links.

It is essential to remember that fire mitigation is not a one-time job. Defensible space should be maintained year-round, and reducing structural ignitability is an ongoing process. For more information, please see *Appendix A, Home Ignition Zone Recommendations*.

ACCESS/EGRESS ROUTES & EVACUATION

The assessment of Golden's outlying residential neighborhoods that border the open space lands surrounding the city is the focus of this report. Factors affecting evacuation have been identified for each of these assessment areas. However, the close proximity of many of these areas to Golden's "urban core" adds a level of complexity to evacuation logistics with the likelihood of traffic congestion throughout the area hampering timely evacuation of individual neighborhoods.

The main transportation corridors through the study area are I-70, C-470, SH-93/US-6, US-40, SH-58, 19th St./Lookout Mtn Rd., Ford St./S. Golden Rd. and Heritage Road. The City of Golden is positioned at the confluence of several major highways and road networks running north-south and east-west across central Colorado. These major highways offer limited local access and generally restrict traffic flow from one part of town to another.

SH-93/US-6, Heritage Road, US-40 form the major north-south corridor through the assessment area. Primary evacuation egress for six of the ten hazard zones identified in this report utilize this corridor. The primary evacuation route for the North and South Table Mountain assessment area neighborhoods is Ford St, a 2-lane heavily trafficked downtown Golden thoroughfare.

The Golden Southwest assessment area warrants mention here as over 500 homes are limited to two points of egress on to the Heritage Road corridor. The construction of a 3rd point of egress for this area is recommended and detailed in the Golden Southwest Assessment section of this report. For more information see: *Appendix B, Evacuation Discussion and Recommendations*.

LANDSCAPE SCALE FUELS MODIFICATION

Reducing combustible vegetation that is in close proximity to homes and other values at risk is the most effective way to reduce a community's wildfire risk. In forested areas the process of reducing and modifying fuels can be a long term, complex, and costly endeavor. In other areas wildland fuels impacting communities may be less obvious to the casual observer. Golden, Colo may lack stands of trees in the surrounding lands but the native grass and shrubs that dominate these areas ignite easily, spread rapidly, and are in direct contact with hundreds of homes on the margins of the assessment areas.

Establishing and maintaining fuel buffers around these neighborhood margins is necessary to reduce the likelihood of wildland fire encroachment. It is recommended that GFD collaborate with affected property owners, homeowner associations, and open space land managers to create the most effective sustainable seasonal fuel reduction programs for each impacted assessment area.

Standard treatment protocols recommend that grass and shrub fuels should be treated for a distance of 100 feet from the property line into open space property as appropriate. Grasses should be mowed annually after curing to a height of no more than four inches. Shrub fuels should be reduced to clusters no larger than 40 feet in any direction with a spacing between groupings of at least 2 ½ times the height of the tallest remaining shrubs. In areas where short grasses are the dominant fuel, prescribed fire should be considered as a viable treatment method.

In areas where fuels are adjacent to homes in chimneys or ravines, vegetation should be mechanically thinned for 100 feet downslope or 50 feet upslope from the property line or the bottom of the slope, whichever distance is less.

Any trees located in this buffer zone should be limbed to a height of eight feet or 1/3 the tree height for trees less than 24 feet tall. Dead, dying, diseased, and damaged trees should also be removed.

Depending on fuels and topography, more extensive treatment areas may be necessary. The recommendations in this report are general. The specific design of any fuelbreak should be referred to qualified experts familiar with both the vegetation and fire behavior of the area. Standards and guidance provided by the Colorado State Forest Service should be a primary source for this information.

Prescribed Fire Use

The use of fire to eliminate accumulations of undesirable and hazardous fuel loads is an ancient technique used by indigenous peoples all over the world where uncontrolled fire is a risk to life and property. Although mechanical thinning has traditionally been the preferred method of fuels treatment in the American WUI, there is an increased interest in the use of prescribed fires as a management tool. The history of this practice in the American Southwest is discussed in a 2020 article published in the Proceedings of the National Academy of Sciences of the United States available at the following link: <https://www.pnas.org/content/118/4/e2018733118> .

In some parts of the study area, large native fuel beds exist adjacent to residential structures where the dominant native vegetation is grass or light loads of discontinuous grass/shrub. In these areas, prescribed fire could be a valuable tool to lower rate of spread, lessen ember cast, remove hazardous accumulations of dead surface fuels and reduce regrowth. Short-duration burns will be preferable in most communities to minimize the effects of smoke and embers on residents. This tactic could be especially useful in the South Table Mountain, Green Mountain Park, and Green Mountain Ravines communities. Prescribed fire use also provides excellent training opportunities for local fire departments in partnership with Open Space agencies.

CONCLUSION

The scientific analysis performed during the preparation of this report shows significant potential for wildfires to affect the study area. Due to high numbers of residents and visitors, fires in this area have considerable potential for loss of life and damage to property. Several fires have been started in open space areas by transients and children playing with fire or fireworks. The following summary is a distillation of what we think should be the highest priority actions to preserve life and property:

- Individual property owners must realize the survival of their homes will rely heavily on their ability and willingness to create defensible space and harden their structures to the greatest extent practical against ignitability from embers and firebrands.
- GFD, Jefferson County, and CSFS should support mitigation efforts of residents by advising and assisting those efforts wherever possible and by ensuring any existing statutes regarding fire hazard abatement are enforced.
- Existing fuels mitigations projects should be completed and combined with the projects recommended in this report.
- Coordination of fuels mitigation efforts between GFD, Golden Parks & Recreation, and Jefferson County, will be needed to produce the most efficient fuels management in the study area.
- Recommendations to monitor and remove dangerous fuel loads along primary and alternative access roads that could threaten access and egress should be a high priority. Mitigation efforts must be ongoing to be effective.
- Some areas have limited water for fire suppression. The development of an adequate water supply for fire suppression is a critical need in these areas.
- Efforts to improve addressing and street markers will be needed along with pre-planning and public awareness of evacuation routes to prevent bottlenecks and delays in evacuation and responder access during a fire.

Definitions

For the purposes of this report, the following definitions apply:

FireShed - No-HARM divides the landscape into units based on topography. FireSheds tend to correlate to the vegetation, and the direction fires will burn in the absence of wind. FireSheds are helpful for dividing the landscape into planning units and providing data in a spatial context that matches fire behavior. FireShed units tend to be roughly 150 to 200 acres in size.

Frequency - A simulation-based prediction of the probability of future wildfire occurrences derived from No-HARM. No-HARM assigns a numeric value of 1-50, where one is the least likely for a wildfire occurrence, and 50 is the most likely. Frequency is different from probability of ignition in that frequency only considers ignitions likely to develop into fires large enough to create a significant threat to Values at Risk.

Hazard - The combination of the Wildfire Hazard Ratings (WHR) of the WUI/WI neighborhood surveys and the fire behavior potential analysis, which is derived from No-HARM Severity analysis outputs. The principle elements of the WHR analysis have been integrated into the No-HARM model in this report to provide a single measure of hazard in the developed portions of the study area. Hazard attempts to quantify the severity of undesirable outcomes to the values at risk.

No-HARM - The National Hazard and Risk Model (No-HARM) is a decision support tool for wildfire hazard assessment. No-HARM calculates relative fire danger ratings by taking the predicted severity and the predicted frequency of wildfire in a given location and incorporating elements that affect the vulnerability of structures in and around communities. No-HARM provides a comprehensive view of the threat context a structure, or group of structures is exposed to during a wildland fire.

Probability - The likelihood of a significant fire occurrence. This is primarily determined by the fire history of the area and a probability model (Frequency) derived from No-HARM.

Risk 50 - The result of the No-HARM composite analysis of Frequency, Severity, and other input variables. By combining the likelihood of a significant fire occurrence and the severity of undesirable fire effects to the values at risk, Risk 50 assigns a numeric value to FireSheds where a 1 represents the lowest level of risk and 50 represents the most extreme level of risk.

Severity - An estimate derived from No-HARM of how severe fire behavior would be in the event of an ignition. No-HARM assigns a numeric value of 1-50, where 1 is the lowest severity and 50 is the highest.

Values at Risk - The tangible values identified by citizens and collaborators as essential to life in the study area (e.g., life safety, property conservation, and critical infrastructure.)

Wildfire Hazard Rating (WHR) - A model designed to evaluate communities within the Wildland Urban Interface/Wildland Intermix (WUI/WI) for their relative wildfire hazard. WHR focuses on structural ignitability and suppression factors and uses a different rating system from

No-HARM, which focuses on the Frequency and Severity of fire in the wildland fuels of the FireSheds. The analysis in this report incorporates the principal elements of the WHR model into the No-HARM model to provide a complete examination in one rating system.

Wildland Intermix (WI) – Areas of concentrated residential development (communities) where wildland fuels surround homes. Homes in these areas exist in the context of natural fuels rather than as typical urban development.

Wildland-Urban Interface (WUI) – (AKA Urban Edge Ember Zone). The area where encroaching wildland fuels could create a fire hazard to structures that in a different setting would be considered a traditional urban development.

GRANT RESOURCES

One of the biggest obstacles to overcome when trying to implement CWPP recommendations and wildfire mitigation projects is funding. A certified CWPP opens a multitude of funding sources to complete work outlined in the plan. For many mitigation projects, federal, state and county funds are available to begin work. The list below is not exhaustive, but rather serves as a starting point for the most commonly available sources of funding and outreach.

Federal Emergency Management Agency (FEMA)

- **Assistance to Firefighters Grant Program**
 - Purpose: to improve firefighting operations, purchase firefighting vehicles, equipment and personal protective equipment; fund fire prevention programs; and establish wellness and fitness programs.
 - Necessary information includes a DUNS number, Tax ID number and Central Contractor Registration
 - <https://www.fema.gov/welcome-assistance-firefighters-grant-program>
- **SAFER: Staffing for Adequate Fire and Emergency Response**
 - Purpose: to provide funding directly to fire departments and volunteer firefighter interest organizations in order to help them increase the number of trained, “front line” firefighters available in their communities. The goal of SAFER is to enhance the ability of local fire departments to comply with staffing, response and operational standards established by NFPA and OSHA.
 - <https://www.fema.gov/staffing-adequate-fire-emergency-response-grants>
- **Fire Prevention and Safety Grants (FP&S)**
 - Purpose: FP&S Grants are part of the Assistance to Firefighters Grants and are under the purview of the Grant Programs Directorate in FEMA. Their purpose is to support projects that enhance the safety of the public and firefighters from fire and related hazards.
 - <https://www.fema.gov/fire-prevention-safety-grants>
- **Hazard Mitigation Assistance Grant Program (HMA)**
 - Purpose: to provide grants to state and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The goal of HMA is to reduce the loss of life and property due to natural disasters and enable mitigation measures to be implemented during the immediate recovery from a disaster.
 - https://www.fema.gov/media-library-data/1441133724295-0933f57e7ad4618d89debd1ddc6562d3/FEMA_HMA_Grants_4pg_2015_508.pdf

- **Pre-Disaster Mitigation Grant Program (PDM)**

- Purpose: to provide funds to states, territories, Tribal governments, communities, and universities for hazard-mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces the overall risks to the population and structures.
- <https://www.fema.gov/pre-disaster-mitigation-grant-program>

Firewise Communities

- Purpose: a multi-agency organization designed to increase education of homeowners, community leaders, developers, and others regarding the Wildland-Urban Interface and the actions they can take to reduce fire risk to protect lives, property and ecosystems.
- <http://www.firewise.org>

National Volunteer Fire Council

- Purpose: to support volunteer fire protection districts. Includes both federal and non-federal funding options and grant writing assistance.
- <http://www.nvfc.org/>

National Resources Conservation Service Emergency Watershed Protection Program

- Purpose: to undertake emergency measures including the purchase of flood plain easements for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed.
- <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/ewp/>

USFS Cooperative Forestry Assistance

- Purpose: to assist in the advancement of forest resources management, the control of insects and diseases affecting trees and forests, the improvement and maintenance of fish and wildlife habitat, and the planning and conduct of urban and community forestry programs.
- <https://www.fs.fed.us/spf/coop/programs/loa/>