Pre-Disaster Mitigation (PDM) Plan for Colorado Springs, Colorado

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Originally prepared by
Squire Consulting Services, Inc.
under contract
with the City of Colorado Springs

Pre-Disaster Mitigation (PDM) Plan for Colorado Springs

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1. Albuquerque District, U.S. Army Corps of Engineers
2. Colorado Division of Emergency Management
3. Colorado Geological Survey
4. Colorado Springs:
    i. City Attorneys Office
    ii. City Engineering
    iii. Colorado Springs Fire Department
    iv. Office of Budget & Financial Analysis (Springs Community Improvements Program (SCIP))
    v. Colorado Springs Office of Emergency Management
    vi. Colorado Springs Planning Department
5. Colorado Springs Utilities
6. El Paso County Sheriff's Office, Emergency Services Division, Office of Emergency Management
7. Federal Emergency Management Agency
8. National Fire Protection Association
9. National Weather Service
10. Pikes Peak Regional Building Department- Flood Plain Administration
11. Pikes Peak Area Council of Governments
12. Special Collections Section Pikes Peak Library District

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Executive Summary

The Pre-Disaster Mitigation (PDM) Plan is a requirement of the Disaster Mitigation Act of 2000. There are federal financial benefits to completing the PDM Plan, having it approved by FEMA, and sustaining as well as maintaining the Plan for the future.

The Colorado Springs area has endured numerous major disasters over the past 150 years plus. These include flooding, wildfire, landslides and numerous large damage events from severe weather. There is no certainty that subsequent disasters will be equal, less or greater than the magnitude of previous disasters. As the City continues to grow the consequences from a major disaster are exponentially increasing.

The Federal Emergency Management Agency (FEMA) initiated the Pre-Disaster Mitigation Program to further the institutionalizing of processes and programs at the state and community level and facilitate the identification of additional activities that should be undertaken to reduce future disaster losses and improve the disaster resistance of local communities.

Various natural disasters are inherent to the geographic area. While natural disasters cannot be avoided measures can be taken to reduce their effect as well as reduce the time and resources required for response and recovery.

Mitigation and preparedness are an insurance policy that can never provide all the protection that is needed. Officials of the City and its enterprises, other stakeholders and the public must have a clear vision of the potential consequences and a commitment to providing sufficient resources to long-term programs that sustain and improve disaster preparedness. All stakeholders must share responsibility for reducing the risks in an open and trusting environment.

The PDM Plan highlights a few of the major disasters that have struck the City in the past as well as providing data to provide a historical perspective. The most important point that can be gleaned from this document is that additional preparation is necessary or the City will continue to be at risk from disasters and potentially suffer catastrophic losses. If a major flood or fire occurs in the city today, that is equivalent to a past event, the losses in property damage alone can easily be in the billions of dollars.

The 4 hazards (flood, wildfire, landslides and severe weather) are the disasters that are most likely to affect the City.

Introduction

The Pre-Disaster Mitigation (PDM) Plan is a requirement of the Disaster Mitigation Act of 2000. The Plan is a single-jurisdiction plan for the City of Colorado Springs.

The purpose of the Pre-Disaster Mitigation Plan (PDM) is to establish a policy and blueprint to institutionalize existing and new programs, processes, and procedures to continuously reduce disaster losses and sustain this effort in future years.

It is only a question of time before another major natural disaster strikes the City. Colorado Springs has not endured a major disaster for several decades and while smaller storms and smaller disasters will continue to occur on a periodic basis a large disaster will eventually occur and the consequences of not being prepared are severe. The risk is great enough that within the City a large flood or wildfire, if it occurred today, can result in a significant loss of property and life and jeopardize the economic foundation of the city.

Historical evidence is a compelling argument that future natural disasters will occur in such a magnitude that external assistance will be required to respond and recover from these disasters.

As an example of the severity of a major disaster compare the 1935 Flood with the 1999 Flood. The National Weather Service reported in a summary of the 19th century weather in the Pueblo region that Fountain Creek, south of Colorado Springs, was 6 feet above normal during the 1999 storm. During the 1935 Flood Monument Creek was estimated at 22 feet above normal as it passed Colorado Avenue, and in vicinity of South Nevada Avenue, Fountain Creek was an estimated 20 feet above normal. If the 1935 Flood were to occur today the infrastructure losses, property loss, human lives lost and other consequences could bring Colorado Springs very close to a standstill. The losses could easily be in the billions of dollars.

The recent drought and lack of major storms is a false sense of security. These disaster voids provide opportunities for improving the disaster resistance of Colorado Springs. By the same token they provide opportunities for complacency and self-denial. Preparedness for natural disasters requires constant vigilance and constant preparation.

Time and again communities have short memories and as a result natural disasters wreak havoc when they strike. Too often, only in the immediate aftermath of a disaster, does the community relearn the lessons from a previous disaster. Unfortunately, the costs to the community can be far greater than if proactive measures had been taken in advance of the disaster.

This PDM Plan provides a foundation upon which subsequent efforts can build upon as resources permit.

It is critical that an educational program continuously informs the public on potential disasters in a variety of forums and through multi-media means. This component is essential to making the public aware, sustaining the awareness, and facilitating other proactive measures needed to reduce the exposure to disaster losses.

The 4 hazards (flood, wildfire, landslides and severe weather) discussed in this plan are in general the disasters that are most likely to affect the City and the ones that experts and officials agree may impact the City the most.

One of the keys to preparedness is advance mitigation as part of comprehensive programs that operate over time. Each year the programs improve the disaster resistance of the community. This requires that adequate resources be made available on a steady and consistent basis to those tasks and activities that reduce disaster losses and ensure public safety.

Colorado Springs is a good steward of taxpayers' dollars. In the recent past the City has received significant FEMA funding for both disaster relief (Landslide Acquisition Program) as well as small amounts of funds for mitigation measures. The City has managed these programs exceptionally well and in both cases additional funding was made available because of this demonstrated performance. Colorado Springs has integrated a number of mitigation measures into existing City processes and programs.

There are a number of on-going initiatives that were already underway before the PDM Plan became a requirement. The Pre-Disaster Mitigation (PDM) Plan briefly reviews a number of on-going programs that help reduce potential disaster losses. The PDM Plan is also a start in identifying additional programs and activities that should be considered by Colorado Springs for implementation for further reduction of the City's risk to natural disasters.

The PDM Plan's intent is to create or reemphasize awareness by all stakeholders, sustain and improve existing beneficial programs, initiate additional preparedness and mitigation actions in a comprehensive manner, take positive steps to reduce future disaster losses and ensure the framework for success is put in place and or sustained. The Plan:

1. Establishes a framework for reducing future disaster losses
2. Helps prepare for, mitigate, avoid, reduce and minimize the disruption, damage and losses that occur from a disaster
3. Sustains existing programs that improve the City's disaster preparedness
4. Encourages public participation
5. Documents hazards, risk assessments, and vulnerabilities
6. Defines a strategy with goals and objectives for long-term and comprehensive mitigation measures and activities
7. Institutionalizes the programs and processes needed to implement, sustain and improve disaster preparedness, mitigation measures, and the PDM Program

8. Creates additional benefits such as improving the Community's ability to respond and recover, improves public safety, and improves the capabilities of emergency services

The PDM Plan highlights the importance of preparedness and mitigation and provides an incentive so that the local community and its leaders learn and understand what policies, programs and other measures are already in place and to take action to adopt additional measures and programs that enhance the disaster preparedness of the community. It is critical to ensure that there is a concerted and dedicated effort towards continually reducing disaster losses. As part of the PDM process the local community is to encourage citizen participation and buy in.

The information in the PDM Plan should be considered representative in nature and the lack of discussion should not be interpreted, as meaning there are no additional issues, hazards, risks or vulnerabilities. There are many additional factors and details that can be developed in the future that fall within the scope of the PDM Plan. With time the Plan can be further developed to include more details for all topics that belong in the Plan and serve as a more comprehensive document for the community. One of the desired outcomes of the PDM Plan and the ensuing process is that Colorado Springs in a collaborative and comprehensive manner moves forward and ensures that disaster preparedness and mitigation remain priorities. An additional outcome is that the community and its leaders do not lose sight of the fact that future disasters will occur and there are significant risks that must be recognized and addressed.

The following page is a map of the Colorado Springs area and gives the reader a general view of where Colorado Springs is with respect to Denver and the Rocky Mountains.

Background, General Location, Natural Environment, Climate and History of Colorado Springs

General Location

The City of Colorado Springs, located in southeastern Colorado at the elevation of 6,035 feet above sea level, is the second largest city in the state and is in the foothills of the eastern slope of the Rocky Mountains. Colorado Springs is the largest municipality in El Paso County with an estimated population of 361,000. The City accounts for over one half of the county's population of approximately 517,000 (2000 census). The County contains 2,126 square miles, much of it rural agricultural and grazing land to the east of Colorado Springs. Other population centers in the County include, but are not limited to Monument and Palmer Lake to the north; Security, Widefield, and Fountain to the south; and Manitou Springs, Cascade, and Green Mountain Falls to the west.

Natural Environment

Colorado Springs is protected from harsh weather by two natural barriers: the Rocky Mountains to the west and Palmer Divide to the north. Its meteorological classification is a semi-arid alpine desert with approximately 250 days of sunshine and only 16.24 inches of precipitation per year. Humidity is typically very low.

Despite a moderately high-altitude location near the Rocky Mountains, Colorado Springs on average gets less snow than Denver, Salt Lake City, or Minneapolis. The mountains capture most of the precipitation from east-moving systems, giving the Pikes Peak region dry and sunny weather during most of the year.

Climate

Colorado Springs' pleasant climate is a key element in the area's high quality of life. Temperatures in the Pikes Peak region are surprisingly mild; uncomfortable extremes are rare. July is the hottest month with an average high temperature of 84 degrees; January is the coldest month with an average low temperature of 16 degrees. Relative humidity is normally low and wind movement is moderately high in all seasons.

The average annual snowfall is 42 inches. While snow is not uncommon, snowfalls do not remain on the ground long. Sunny days are abundant during the winter and the sun's intensity quickly melts snow from streets and sidewalks. Warm Chinook winds also help moderate the winter climate. An additional advantage of Colorado Springs' climate is the relief it offers persons who suffer from allergies and asthma.

Colorado Springs History

Approximately 15,000 years ago, the first Native Americans may have appeared in Colorado. The earliest inhabitants were hunters and nomadic foragers on the plains, as well as the western plateau. Agricultural settlements began appearing along river valleys in the eastern part of Colorado from approximately 5,000 B.C. as people learned farming techniques from the Mississippi River Native Americans.

The first Europeans to venture into Colorado were the Spanish. In 1540-41, Coronado led an expedition north from Mexico in search of the Seven Cities of Cibola where the streets were allegedly paved with gold. Although this exact route is unknown, it is likely Coronado and his party passed through the present-day area of southeastern Colorado. Over the next 250 years, the Spanish made other expeditions into the Colorado area.

In 1800, Spain ceded a vast area, including Colorado, to Napoleon Bonaparte and the French. Three years later, the same parcel of land was sold by Napoleon to the United States as the "Louisiana Purchase". In 1806, President Jefferson commissioned Lieutenant Zebulon Pike to explore the recently purchased territory. Among the sites mentioned by Pike in his report of the expedition was the 14,110-foot peak, which today bears his name.

Originally called Fountain Colony, Colorado Springs was founded in 1871 by General William Jackson Palmer. His vision for this new City of Colorado Springs was one of culture, beauty, and a good quality of life at the foot of Pikes Peak. Colorado Springs became especially popular with the British and acquired the nickname Little London. Riding the rails, visitors came to see the area's beauty and were inspired to stay by a mild climate and the region's growing resort accommodations.

In 1861, a bill to create the Colorado Territory was passed and President Lincoln appointed William Gilpin as the state's first territorial governor. The population of Colorado in 1861 was 21,000. The first legislature, sitting in Denver, selected Colorado City (west of present day Colorado Springs) as the capitol. The second legislature met there only a few days, in 1862, and adjourned to Denver. The assembly met in Denver and Golden up to 1867 when Denver was named the permanent seat of the territory. In 1876 - fifteen years after becoming a territory - Colorado was admitted as the thirty-eighth state in the union. Colorado was called the "Centennial State" in honor of the one-hundredth year of the Declaration of Independence.

In the 1890s, Colorado Springs found it was surrounded by more than scenic wealth. Historians estimate that approximately 50,000 people came to Colorado in search of gold in 1858-59.

Gold was discovered in nearby Cripple Creek in 1891, and Colorado Springs became a thriving financial center. The gold rush had a dramatic affect on Colorado Springs. Miners became millionaires, mansions were built and fortunes were spent all to the betterment of Colorado Springs. General Palmer's wisdom and planning along with the gold from Cripple Creek gave this beautiful City a wonderful legacy and many invaluable gifts. The City benefited in the form of office buildings, mansions, luxury hotels, parks and recreation, and a reputation of being a City of healthful and gracious living.

The golden years lasted until 1917, when the U.S. went to silver for its coinage and the local economy once again emphasized tourism. Looking to expand its economic base, the City offered land to the military in 1942. With the start of World War II, Fort Carson was established on 137,000 acres to the south of Colorado Springs. The military's presence grew in the 1950s with the opening of the U.S. Air Force Academy. Over the next 30 years, Peterson Air Force Base, Cheyenne Mountain Air Force Station, and Schriever Air

Force Base helped create Colorado Springs' reputation as the nation's military space capital, housing the North American Aerospace Defense Command (NORAD), and other Space Command centers. Since September 11, 2001 US Northern Command (NORTHCOM) has been activated and located in Colorado Springs.

Manufacturing expanded tremendously when the area's quality of life and cost advantages were recognized in the 1960s and 1970s. Today, computers, electronic equipment, semiconductors, precision parts, plastics, equipment and countless other high-quality products are manufactured in the Pikes Peak region and shipped to national and international markets.

The amateur sports segment is one of several service industries expanding in the region. Colorado Springs is home to the headquarters of the U.S. Olympic Committee and Olympic Training Center, the world's finest multi-sport training facility. Many other national nonprofit organizations have moved their headquarters to the Pikes Peak region.

Downtown Colorado Springs has experienced a revival, and a vibrant mixture of small business, parks, street art, professionals, and students creates a diverse and comfortable atmosphere.

Colorado Springs has experienced dramatic changes in its history. Now military bases, high-tech companies, higher education facilities, and a thriving community of small businesses offer many opportunities here on the edge of the Rocky Mountains.

Adoption by the City of Colorado Springs 201.6(c)(5)

The Pre-Disaster Mitigation Plan for Colorado Springs is under review by the State of Colorado Division of Emergency Management (CDEM) and the Federal Emergency Management Agency (FEMA). When the suggested plan updates from CDEM, FEMA, and public input are incorporated and approved by CDEM and FEMA, the Pre-Disaster Mitigation Plan will be presented to City Council for adoption. In addition, a supplemental memorandum has been included indicating this procedure for the City of Colorado Springs.

Planning Process 201.6(c)(1)

Background

The development of the Pre-Disaster Mitigation (PDM) Plan has created a blueprint for reducing the City's risk and vulnerability due to natural hazards. The Plan in conjunction with other similar plans, programs, policies, ordinances, etc. will serve as a guide:

1. For decision makers
2. For allocation and prioritization of resources
3. To establish a long-term vision and strategy

The PDM Plan is not a comprehensive encyclopedia of all disaster that have affected Colorado Springs or a summary of all initiatives and actions that are related to disaster preparedness, mitigation, response and recovery. The PDM Plan is strategic plan that identifies the continued threat of natural disasters and a strategy (which includes goals and objectives) to address these threats as well as maintain the PDM Plan as a living relevant Plan.

The PDM Plan has integrated existing reports and studies as applicable. The ones selected or referenced are representative of other documents and works that may also exist. The PDM Plan will also be integrated, through Adoption, into existing planning processes and procedures that address natural hazards. These include:

1. Studies and reports that must be performed as part of the development process
2. Specific ordinances for dealing with specific hazards (e.g. Geo-Hazard Ordinance and the non-combustible roof ordinance)
3. Requiring development to perform mitigation in advance of final approval (e.g. earth and rock dams for containing Cheyenne Mountain rockfall debris flows and as a temporary flash flood impediment; subsurface drainage and toe berms for potentially unstable slopes and so forth)
4. Improving regulatory codes for dealing with hazards (e.g. floodplain regulations)
5. A well defined public process that involves public hearings and a public comment period for nearly all development and construction to include comments on measures taken to address natural hazards
6. Tiered review process from the individual Planner through the Planning Commission and ultimately to City Council for final review and action

How the PDM Plan was prepared

The planning process utilized in Colorado Springs was based on Section 322 local planning requirements of the DMA of 2000 and supporting guidance documents developed by FEMA. The Planning process included the following steps:

1. Public Involvement
2. Coordination with other agencies
3. Hazard area inventory
4. Problem identification
5. Review and analysis of possible mitigation activities
6. Local adoption following a public hearing
7. Periodic review and update

The PDM Plan was developed in collaboration with local, state and federal agencies that have responsibilities for issues that are related to natural disasters as well as those agencies and organizations that are charged with preparedness, mitigation and response. The methodology used for the development of the Plan consisted of the following tasks:

Numerous interviews were conducted in order to document the existing environment with respect to perceived hazards, perceived risk and vulnerability, current regulations, ordinances and measures that address natural hazard mitigation. A number of existing city processes, plans, reports and procedures, some of which are referenced in this Plan, are also incorporated into the Plan.

This PDM Plan has been distributed for comment to the public, city officials, regulatory agencies and other stakeholders. Feedback from stakeholders has been incorporated into the Plan where appropriate.

Information has been included in this Plan that was provided from stakeholders when the first draft was distributed for comment. Additional public involvement was solicited through the city's website. The PDM Plan was available for public comment for one (1) month and is still available through this medium.

Information in this Plan was also drawn from on-going and past initiatives, projects, and studies, which also had a public process component or extensive documentation of public involvement. They include:

1. Corps of Engineers' Studies-in the 1970s, 1965 Flood Study, and 1999 Disaster Assessment Report
2. NFPA Standards are developed through a consensus process of experts with input from across the nation. These Standards are reviewed for applicability and those that may be applicable are considered for adoption by Colorado Springs (proponent is the Colorado Springs Fire Department).
    a. NFPA Standard 1143: Wildland Fire Management (formerly NFPA 295)

   b. NFPA Standard 1144: Protection of Life and Property from Wildfire (formerly NFPA 299)
   c. NFPA Standard 1600: Disaster/Emergency Management and Business Continuity Programs

Other references are listed in the bibliography

Who was involved in the process

The representatives of the following agencies participated in the plan process by providing historical data, providing comment, providing studies and reports or reviewing the draft Plan:

1. Albuquerque District, US Army Corps of Engineers
2. Colorado Springs:
   a. City Attorneys Office
   b. City Engineering
   c. Colorado Springs Fire Department (OEM and Wildfire Mitigation & FireWise)
   d. Office of Budget and Financial Analysis (Springs Community Improvements Program (SCIP))
   e. Office of Emergency Management
   f. Planning
   g. Colorado Springs Utilities (FIMS)
3. El Paso County Sheriff's Office, Emergency Services Division, Office of Emergency Management
4. National Weather Service
5. Pikes Peak Area Council of Governments
6. Pikes Peak Regional Building Department – Floodplain Administration
7. Academia – Dr. Claire Hay provided structure and methodology to the Colorado Springs Fire Department's survey of individual parcels during formulation of the City's 2001 Wildfire Mitigation Plan.
8. Various non-profit organizations
9. Various community experts
10. Agencies with authority to regulate developments (City, Regional Building Department, and El Paso County)
11. Local business leaders (during the SCIP process and during changes to flood, zoning, and building codes)
12. Public (during the related public processes)
13. The Metropolitan Medical Response System (MMRS), which was developed for the Colorado Springs region addresses the response to the use of a weapon of mass destruction. Close to 80 agencies and organizations participate in this program and many elements and components are applicable to natural disasters.

How the public was involved

The public has been involved in the PDM process.

- This involvement was through public meetings for projects considered within the scope or under the umbrella of the PDM. These include watershed studies, a landslide acquisition project, public discussions on passing a Geo-Hazard Ordinance, public meetings to address the serious backlog and the inadequacy of storm drainage systems, public meetings concerning proper land use of property that is being developed in vicinity of an active landslide, and public comments received with respect to the Watershed Plan.

- From mid-2003 through completion of this PDM Plan, there were at least twenty-eight public meetings held to discuss wildland urban interface fire mitigation. These meetings are chronologically listed in the Appendices.

- Request for public comment solicited during development of the Plan via the city website and incorporated into the Plan.

Risk Assessment 201.6(c)(2)

The City of Colorado Springs has an exposure to the following natural hazards:

Flood
Wildfire
Landslides
Severe Weather
Drought
Earthquake
Tornados

There are four primary hazards that have been identified by experts and officials as posing the most risk to Colorado Springs. These are flooding, wildfire, landslides, and severe weather, all considered high priorities.

The other hazards identified that face the City but they typically do not have the magnitude or severity to cause the amount of damage that the above four hazards have caused in the past are not discussed in detail. While tornadoes are a threat the chances of one occurring in the City is very small. As the City expands to the east and further onto the plains this threat from a tornado will be expected to increase and this is addressed in the Risk Assessment for Severe Weather.

The four high priority hazards are discussed using the 7 requirements below. The following sections of the risk assessment are addressed in this section for each hazard:

1. Disaster specific background
2. Identifying Hazards **201.6(c)(2)(i)**
3. Profiling Hazard Events **201.6(c)(2)(i)**
4. Assessing Vulnerability: Overview **201.6(c)(2)(ii)**
5. Assessing Vulnerability: Identifying Assets **201.6(c)(2) (ii) (A)**
6. Assessing Vulnerability: Estimating Potential Losses **201.6(c)(2) (ii) (B)**
7. Assessing Vulnerability: Analyzing Development Trends **201.6(c)(2) (ii) (C)**

The information in this Risk Assessment section provides enough detail to justify why the four hazards are a threat and the City is vulnerable to them. There is sufficient historical evidence to support this.

Risk Assessment – Floods

Background

Flooding costs between $4 to $6 billion annually in the United States (in 1990 dollars, The Citizens Guide to Geologic Hazards, Nuhfer, Ed).

The two largest creeks in Colorado Springs are Fountain Creek and Monument Creek. Monument Creek flows south and enters the City near the Air Force Academy. Fountain Creek flows east and enters the city just east of Manitou Springs. Monument Creek empties into Fountain Creek near the intersection of I-25 and Highway 24 or just west of the downtown area. Once Monument Creek reaches this confluence it empties into Fountain Creek and the combined Creek is known as Fountain Creek. The Fountain Creek then flows south to Pueblo. There are other, smaller drainages within Colorado Springs.

Flooding has occurred on a periodic basis throughout the City. This type of natural disaster is the one that the City can expect the most often. The effects can, in general, be determined in advance.

In 1999 the flooding as a result of the April/May 1999 storm was considered a 10-year event by the Corps of Engineers. The estimated peak discharge on Fountain Creek near Fountain was 20,100 cubic feet per second. Damages in El Paso, a Pueblo, Otero and Bent county was in excess of $61 million. By contrast the 1935 Flood that started in Colorado Springs along Monument Creek was estimated between 50,000 cubic feet per second (1971 Corps of Engineers Report) and 53,000 cubic feet per second (USDA report on the 1935 Flood). 331 lives have been lost in Colorado between 1900 and 1993 and there has been over $6.6 billion dollars (1995 State estimate) in damage due to flooding (Corps of Engineers Report 1999).

There are varying estimates of what constitutes a 10 year, 100 year, or Standard Project Flood flowrate. This PDM does not list them because it is outside the scope of this report. The point of the PDM Plan is to underscore that flooding is a natural disaster that has a high probability of occurring again in Colorado Springs. It is important that everyone realize this arid area can have devastating floods that can result in loss of property and potentially lives.

The 1935 Flood was perhaps the worse flood the City has had to recover from. If the 1935 Flood occurred today the losses within the City alone could easily be in the billions of dollars with major facilities and critical infrastructure heavily damaged or destroyed. At least 4 deaths were attributed to the 1935 Flood.

There are a number of on-going initiatives and studies that are looking at the risk to the City posed by flooding in the watersheds, drainage basins, creeks and waterways as well as how inner-city waterways are affected by drainage areas outside of the City that flow into the City.

Numerous flood studies and reports have been reviewed as part of the PDM Project. The information provided in this Plan can only provide a glimpse of how serious the risk of a flood is to the City of Colorado Springs. The infrastructure in the City for storm water and conveying floodwaters is old, undersized in many locations, and does not meet acceptable criteria. The critical part of the problem is funding and this is addressed by on-going initiatives by the City as well as in the Mitigation Strategy section of this Plan.

Other issues related to storm water flow are related to debris and blockages. Properties along drainage ways should be cleared of any debris or junk that can get into the waterway. If not this debris creates more problems by either getting hung up on bridges or culverts and causing more damages or creating major blockages, which in turn affects a creek's hydraulics and as a result unintended damage can occur due to unforeseen scour and other changes in the water's behavior.

Some creeks have capacities that are much smaller than common flood flows (per the Corps of Engineers). For example, the Fountain Creek channel in Manitou Springs can only handle 1,000 cubic feet per second and this equates to a 10-year storm event. The bank capacity of Fountain Creek near the south end of Colorado Springs is estimated to only be able to handle 4,470 cubic feet per second (Corps of Engineers Report 1999 "Post Flood Assessment Report Arkansas River Southern Colorado"). In 1935 it was estimated that near the confluence of Monument Creek and Fountain Creek (up stream of this 4,470 cubic feet per second capacity zone) the flow was 50,000 cubic feet per second.

In the 1935 Flood houses and cars that were carried by the flood waters hung up on bridges, becoming the catalyst that destroyed other buildings or facilities. In some cases this caused the death of several persons. The entire storm drainage system in the City should be considered a high priority resource because if it is not designed, constructed or maintained to the appropriate standards then it compounds problems during a disaster.

Many of the current issues with drainage in the City are due to capital improvements funding shortfall.

Flood-Identifying the Hazard 201.6(c)(2)(i)

Floods are the most deadly and the greatest cause of natural hazard damage in Colorado Springs. This natural disaster poses a high-priority threat to Colorado Springs. Flooding can occur in one drainage area or in larger watersheds.

Currently several creek beds suffer extensive erosion and other damage during any major precipitation/storm event.

The City of Manitou Springs, located west of the City of Colorado Springs, is especially vulnerable to flooding and has limited flood protective measures. This situation may have an adverse impact on Colorado Springs in that debris, houses, trees, and other items

that are destroyed by a large flood will be carried downstream in Fountain Creek towards Colorado Springs and may complicate an already dangerous situation.

There have been many attempts to model flooding in the local watersheds. The end results can typically vary by a large margin. This is one reason the PDM Plan is looking at the 1935 Flood because that is an actual flood and has some valuable lessons for Colorado Springs.

Flood-Profiling Hazard Events 201.6(c)(2)(i)

Flooding, including flash floods are quite frequent in Colorado Springs despite the arid environment. An average frequency is somewhere around 5 years or less. Flooding is not limited to Monument Creek and Fountain Creek. It has occurred in nearly all creeks in the City. In 1921 Cheyenne Creek flooded and some of the pictures from this flood are shown later in this section.

There have been significant flooding events in the past in the City. The following excerpts from the Gazette Telegraph describe the numerous flood occurrences in Colorado Springs and surrounding areas.

Floods in El Paso County – Colorado Springs Area

(As referenced by the ***Gazette Telegraph***, 1885-2000; t*his information has not necessarily been corroborated by other sources.*

June 10, 1864	20-30 foot rise in Fountain creek swept away almost all of Colorado City – several victims
July 3, 1882	Flood down Ute Pass in Manitou, bridges and railroad tracks destroyed, 1 victim
July 26, 1885	*Flash Flood Swept Away Homes, People and Livestock* "Water Spout" (sudden downpour) caused Shooks Run, Fountain and Cheyenne creeks to overflow, railroad bridges on the Manitou branch wiped out, demolished the Rio Grande bridge --- storm dumped 16 inches of rain and hail in one hour, devastating downtown Colorado Springs, 1 victim
August 1, 1886	Repeat of 1885 Flood
August 1, 1915	"Great Sand Creek Flood" – east Colorado Springs – 3 victims
June 21, 1921	*Deluge of Water Submerges Springs – Pueblo Inundated* Sand Creek – 15 feet deep, Fountain Creek overflowed, Shooks Run a river with water flooding several blocks in northwestern part of Colorado Springs – South Nevada Avenue flooded

Sept.1, 1929	*Flood Hits Summer Homes – Mountain Resort is Wiped Out* College Gulch flooded by 15 ft. wall of water caused by the breaking of dams on Ute Pass Fish Club – wiped out Crystola, Midland tracks washed out, 1 victim
May 30, 1935	*Memorial Day Flood* Monument Creek floods 200 square blocks of City, southern end of Colorado Springs under water, 8 victims – estimated $1.769 million in damages. Monument Creek had a peak flow of 50,000 cubic feet per second into Fountain Creek.
June 15-19, 1965	*Storm in Region Causes Wide Damage* 7" of rain, 2-3" hail in Security and Fountain areas – Sand, Squirrel, and Fountain Creek overflowed, Hancock Expressway. Section washed away, 8-10 bridges swept away. *Tornados, Floods Continue to Plague Pikes Peak Region* Jimmy Camp Creek runs at 124,000 cubic feet per second, Fountain Creek rampaging, all out of town public transportation at a standstill, highways closed, bridges torn out, flash flood down Crews Gulch, Stratmoor Valley evacuated, Fountain Valley School Reservoir dam burst, Janitel Bridge damaged, hundreds seek refuge in Colorado Springs Auditorium – estimated $ 3.4 million in damages for El Paso County.
July 24, 1965	Flash floods cause landslide on Cheyenne Mountain Zoo, damage to ape and hippo houses, Seven Falls area. Boulders dislodged from Cheyenne Mountain crossed Highway 115 onto Fort Carson, also blocking entrances to NORAD. Flood resulted in four fatalities and caused major destruction in currently developed areas.
July 24, 1970	Flash floods cover Constitution Ave. to Fountain Blvd, 1 victim
August 20, 1970	9-11" of rain cause flooding, rock slides in Rock Creek Canyon
July 21, 1972	Jimmy Camp Creek Washout, $50K damage to roads and bridges
July 2, 1980	Heavy rains cause flooding
July 21, 1985	I-25 closed down, nearly 2-5" of rain, Gold Camp and Old Stage Roads closed

July 14, 1996	El Paso County hardest hit with numerous washed-out roads and bridges – statewide flood damage estimates exceed $38 million
July 27, 1996	*Springs is Hammered Again* Flooding, hail, power outages, 1-3" rain – (1.5" in 45 minutes) Fountain and Monument creeks overflowed, water 3 ft. deep on streets
June 11, 1997	*Flood Waters Still Raging Through Area* 6-10" rain, roads closed, Fountain and Cheyenne creeks washed out bridges, evacuations in Red Rock Canyon and Manitou Springs, Seven Falls closed
July 30, 1998	3-4" rain in El Paso County, washes out County Fair, streets flood, bridge collapses
May 2, 1999	*Waterlogged* Four days of rain/snow – 13" in Seven Falls, 12.16" in Manitou Springs, Monument 7.9" - Fountain Creek overflowed

The 1935 Flood appears to have been worse than previously documented. This flood was chosen for more analysis because it was an actual historical event. The intent of the Flood Section of the PDM is to emphasize the need to continue to look at the flood risks in all sections of the City that affect public safety, utilities, residential areas, commercial facilities, businesses, non-profit organizations, and so forth. The 1935 flood is used as an example because it is beyond the scope of the PDM to address every flood in detail. The 1935 Flood boundaries, high water elevations, and other parameters were determined based on the historical evidence. This was then mapped onto a map of the City. In addition, present day photos of the area were taken and overlaid with the boundaries and some high water marks. As the details of the 1935 Flood were analyzed a number of facts emerged that are included on the following pages. Like most disasters it would have been more beneficial if there was better documentation of the 1935 Flood but like disasters that occur today – documentation is secondary to people trying to save a persons life, property, and animals.

The following pictorial or graphical items follow this page and highlight the severity of the flood risk to Colorado Springs.

1. The 1935 Flood in Colorado Springs (1921 Flood and 1935 Flood pictures)
2. The 1935 Flood boundaries overlaid on present day Colorado Springs
3. 1973 Corps of Engineers flood map for southwest Colorado Springs
4. Present day photographs with 1935 Flood boundaries and high water marks
5. Flood CD with present day photos compared to the 1935 Flood (located on the inside of the binder cover)
6. Floodplain data for Colorado Springs
7. FEMA Flood Maps with data for values, structures, and persons

8. Floodplain Regulation Flow Chart

Probability of future occurrence

Flooding has occurred frequently in Colorado Springs. It is common to have some sort of flood every 5 years or less. The history of the area and of Colorado Springs contains a wealth of information that documents earlier floods. Based on the past 140 years of documented flood history it is safe to estimate that floods will reoccur in the future. Historical data is a good indicator of the future. There have been numerous small or singular drainage basin flooding events to major flooding events that affected the entire region.

The magnitude or severity of a future flood is not as easy to predict as the likelihood of a future flooding event. A wise course of action is to assume the worse and establish mitigation plans and other long-term planning based on a worse case scenario (e.g. repeat of the 1935 flood).

The geographical extent or areas that may be affected

The entire geographical area with locations within 20-30 vertical feet of an existing streambed are at the greatest risk.

The City of Manitou Springs, located west of the City of Colorado Springs, is especially vulnerable to flooding and has limited flood protective measures. This situation may have an adverse impact on Colorado Springs in that debris, houses, trees, and other items that are destroyed by a large flood will be carried downstream in Fountain Creek towards Colorado Springs and may complicate an already dangerous situation.

Conditions such as topography, soil characteristics, meteorological conditions, etc. make the area prone to flooding. The saturation level of the soil/ground, drought history, previous near-term precipitation record, vegetation or lack thereof, precipitation rate, slope of the ground, condition of the stream bed, condition and capacity of storm sewers and other factors all have a bearing on the amount of runoff and ability of the existing natural and man-made systems to handle any given storm event. These in turn influence the severity of the flood.

Flood-Assessing Vulnerability: Overview201.6(c)(2)(ii)

Floods are the most deadly and the greatest cause of natural hazard damage in Colorado Springs. This is the natural disaster that poses the greatest threat to Colorado Springs based on its severe impact on the community. The area with the most risk to structures and the population is in the Southwest part of Colorado Springs. This can be seen on the maps where the floodplain data is listed. There are over 1900 structures in the 100 Year Flood Plain and over 1200 structures in the 500 Year Flood Plain. In addition, there is significant major critical utility infrastructure in the flood-plain.

Flood-Assessing Vulnerability: Identifying Assets 201.6(c)(2) (ii) (A) & Estimating Potential Losses 201.6(c)(2)(ii)(B)

Floodplain Data for Colorado Springs

	100 Year floodplain	500-year floodplain
Number of structures:	1,958	1,214
Value ($):	$328,072,000	$209,840,000
Number of people:	3,522	266

The data is based on the best data available from the Colorado Springs Planning Department and the El Paso County Assessor's Office.

The number of structures does include some commercial and categories other than residential. There are some apartments included in the structure count and it was not possible to determine the exact number of residents in these facilities. Likewise, if a single family home is rented to a group of tenants (such as college students), this is not addressed in this count. Therefore the number of persons in the above count may be low and could be substantially higher.

There is no central list of special populations that may be in the floodplain. The City Emergency Manager, Director of Emergency Management, and organizations that work with these individuals have a general knowledge of where some of the key facilities are located. In addition, this information is available via GIS overlay. In general, retirement homes and other large facilities for special populations are not in a floodplain. The 911 dispatchers have a reverse 911 system that can be used to initiate calls to homes in any given area as a tool to assist in notification and evacuation.

The numbers above do not include the cost of utility infrastructure in the floodplains. Utility infrastructure is estimated to be greater than $500 million. There is significant major critical utility infrastructure in the flood plain. The critical utility infrastructure in the floodplain include the Drake Power Plant, the Las Vegas Wastewater Treatment Plant, substations, high voltage transmission line towers, and other facilities. Drake Power Plant and the Las Vegas Wastewater Treatment Plant are major utility plants that if damaged or destroyed during a flood would have major economic, public health, safety and quality of life impacts. In fact, they may cause at a minimum, a number of other critical facilities (hospitals, airport, etc.) and or large sections of Colorado Springs to be vacated or operations suspended. A future goal of this Pre-Disaster Mitigation Plan is to continue to work with Colorado Springs Utilities to identify actions and mitigation strategies for utility infrastructure located within floodplain locations.

No major medical facility is in a floodplain.

The local emergency public safety radio/communications network is not in the floodplain and has sufficient redundancy that even if one of the towers became non-operational the system can still perform its critical function. Other communication lines are adjacent to the interstate but the exact impact on routine calls and other community functions cannot be estimated at the present time.

The table above does not include estimates for future construction in the floodplain as this would be just guesswork at this time. New construction is minimal and typically only involves property that was platted many years ago or someone wants to modernize a structure that is already in the floodplain. In either scenario, assuming the modernization is more than 50% of the value of the structure the construction must meet new codes and these codes are being made more stringent all the time.

The area with the most risk to structures and the population is in the Southwest part of Colorado Springs. This can be seen on the maps where the floodplain data is listed.

If the 1935 Flood were to occur again there is the potential that in addition to major utility infrastructure and facility damage there would also be major damage and destruction of highway infrastructure such as bridges and portions of the interstate. This impact to transportation infrastructure would in turn impact public safety, public health and hospitals. Emergency services would not be able to respond as quickly and would not be able to get from one location to another if the route had to cross a bridge that was heavily damaged or destroyed.

Response times are increased for public safety and emergency services to reach victims and normal day-to-day citizens that have life-safety issues.

An attempt was made to collect the costs of damages and destruction from the 1999 Storm period (which resulted in a Presidential Disaster Declaration) and correlate that information with the cumulative precipitation for various parts of Colorado Springs. However, the cost data was fragmented, spread across multiple agencies and what was obtained was incomplete. The information on cost that was collected did not provide a true representation of the incident so that idea was discarded.

Flood-Assessing Vulnerability: Analyzing Development Trends 201.6(c)(2) (ii) (C)

The majority of development in Colorado Springs will occur in large open spaces to the east and northeast of town. No new structure can be built in the floodway portion of a flood zone. Structures *in the flood zone* that are damaged more than 49% must comply with regulations that require flood proofing or elevation as a means of mitigation.

Future development is controlled by existing and forthcoming revised regulations but existing structures will be at risk unless removed from the flood area. The local government agencies have a regional Floodplain Administration Office that utilizes FEMA regulations as a baseline set of criteria and has added a number of other

restrictions. The end result is a policy that seeks to reduce the damages and destruction that a flood can cause.

All activity in the floodplain is controlled by the Floodplain Administration Office, which is part of the Regional Building Department. The Floodplain Administration Office works with the Corps of Engineers with respect to permitting activities.

As regulations are improved there will be more restrictions placed on existing structures when owners want to extend their economic life, make additions or otherwise want to perform some project.

The end result of the above regulation of activity in the floodplain is that there will never be large numbers of new projects or new structures that will be placed in the floodplain. The new growth in Colorado Springs is to the east and northeast of the City in areas that are outside of the floodplain. New developments cannot have any lot or portion thereof in the floodplain. If a development includes part of a floodplain that area is a “no-build” area and must be permanently restricted from any building activity.

In the Mitigation Strategy portion of the PDM Plan Colorado Springs proposes establishing a long-term program for eventually acquiring all properties that are in a floodplain. This idea is only in the concept stage and will require more investigation and development.

Risk Assessment – Wildfire

Background

The expanding development in the Colorado Springs area has created an extremely complex landscape based on the interaction of people and flammable vegetation -- where natural areas and development meet and create conflict.

The encroachment of buildings or structures into forested areas is referred to as the "Wildland/Urban Interface." Interface fires predominate in the West. Every state in this part of the country has reported problems of this nature from the eastern plains to extreme concerns in Colorado, South Dakota, Utah, Nevada, New Mexico, Washington, and California.

With development and encroachment into formerly natural or wildland areas, (where existing “natural” forested land is now frequently overgrown, diseased and “unnatural”), catastrophic wildfires are becoming increasingly more common. The threats to life and property, the assets lost, and the costs for fighting fires are escalating at astounding rates.

There are many factors that influence an ecosystem - climate, topography, aspect, soils, vegetation, animal life, and others. Fire is a natural occurrence in the Wildland/Urban Interface and is a vital part of the mountain’s ecology. When forests are permitted to grow without fires to thin them out, they become too dense to support healthy trees. In these dense forests, the level of competition that each tree must face for survival increases. Stressed vegetation, migration of human population groups to the forest and the suppression of surface fire have interrupted the natural cycle, allowing overgrowth and disease to take over. Compounding the problem, weather-driven events are cyclical, and when drought and wind are in alignment with overgrown vegetation, the risk of a conflagration is significant.

The ultimate goal is not to stop wildland fires, but to minimize the risks inherent in building homes in formerly wild areas. Fire is part of the normal ecosystem of the land. The traditional destructive cycle of living in the interface must be changed -- building in a non-compatible environment, destruction by wildfires ... rebuilding ... destruction, etc. Homes are still being built in the interface where wildfires have burned before. A wildfire occurs and homes are destroyed again. Even though low-cost loans and insurance funding are made available to rebuild, it is not a rational decision to build again. Features that contributed to the original loss continue to be incorporated into rebuilt homes. People rebuild the same home they lost or create even larger ones. Vegetation re-grows and the stage is set for the next wildfire – continuing the wildfire disaster cycle.

In general, the public does not perceive a risk from a fire in the Wildland/Urban Interface. The trend of increasing population along the Front Range creates further pressure and encroachment on stressed ecological and biological systems in the wildland areas. There are also more fires caused by humans. When increased ignitions are

combined with homes in dangerous topography, overgrown vegetation, and severe weather, conditions are ripe for wildfire.

The United States, as well as the City of Colorado Springs, has a significant history and experience with wildfire. Wildland/Urban Interface protection is important because federally managed lands are located adjacent to or among state lands and developed private properties. For many years, federal policy dictated the quick extinguishment and control of forest fires. This has resulted in a dangerously overgrown and diseased forest in many of our western states. This overgrowth results in serious large fires.

In pre-settlement times, forest fires in the Northern Rockies burned in a natural cycle of stand/replacement fires. Unsuppressed surface fires in unpopulated forests cleaned down and dead surface debris and controlled insect populations and disease. Fires burned approximately half of the forests in the Rocky Mountains every 100 years. Thirty-three percent of the trees within the forests were less than 40 years old. With the suppression of fire, the aging process of the forests has changed, causing trees to be much older.

In 1910, the worst fire year record for the Northern Rocky Mountains was set. Fires burned across Idaho and Montana killing 85 people including 75 U.S.F.S firefighters. Following this devastating fire season, new federal policy required all fires to be suppressed by 10 a.m. on the day following its discovery. This stringent policy led to many years of suppression, which, in turn, led to an unnatural level of vegetation or fuel accumulating in the forests.

Fires of a low intensity clean up the forest floor. They prevent the build up of excessive vegetation loads, thereby reducing the likelihood of more severe fires. The problem faced throughout the Wildland Urban Interface is that these frequent, low intensity fires have been suppressed for over 70 years and have not been able to clean the forest floors from forest debris.

History

In-pre settlement times in Colorado, there were often fires in what today is Colorado Springs. Fire was and is the result of both human and natural causes. Earlier inhabitants of the Pikes Peak region, the Cherokee, Pawnee, Ute, Osage, Kiowa, and Comanche, set large fires to herd game, raid on rival tribes, and as a defense strategy. Other examples are on record, i.e., The Big Burn of 1854, The Camp Carson/Cheyenne Mountain Fire of 1950 (which notably occurred in January of that year), and a few others of lesser note. From past history, it is evident that wildfire in Colorado Springs has a return interval of approximately 50 years. They are often severe and very destructive. In the past, forests were primarily affected, but now there are significant assets at risk.

Early in the 2000 fire season, fires close to home revealed flaws in the current wildfire management system. The Cerro Grande, High Meadow, and Bobcat fires provided a peek into our future. Serious fires in a forest packed with buildings are disastrous. Hillside development along the foothills is expected to continue well into the future. Homes are

not the only assets at risk to such fires; Colorado Springs has many historical, cultural, and exclusive sites located in “at-risk” areas. The "value" or worth of these sites remains very high to the citizens of our City.

As a result of detailed study and evaluation, it is readily apparent that in Colorado Springs there is potential for a large-scale conflagration such as occurred in Los Alamos, New Mexico and Oakland, California that would have catastrophic impact. With consideration for vegetation overgrowth, weather patterns, and increasing population, it is anticipated that someday a small fire will grow rapidly into a firestorm surpassing the Colorado Springs Fire Department's ability to extinguish it - unless we collectively do more to reduce the hazard.

Fires also increase the risk of erosion. Plant roots are a primary source of hillside surface stabilization. The roots branch out underground, forming a matrix that holds soils together. When a fire burns off the plants, the matrix is lost, and soils are more easily washed downstream or eroded.

The communities of Broadmoor Bluffs and Cedar Heights are good examples of wildland urban interface within Colorado Springs. The fuel, weather and topography of Cheyenne Mountain contribute to a history of experiencing large catastrophic fires in a 50-year cycle. Now million dollar homes are sitting in the path of these past Cheyenne Mountain fires. Homes have been built with wood shake roofs, and wood siding which in some cases is more combustible than the brush surrounding it. These homes add to the fuel load, and actually increase the fire danger. Unlike urban settings where homes are less connected by fuels, when a fire breaks out in a wildland urban interface, there are often vegetative fuels between houses that carry the fire from one to another.

Not only are homes at risk to such fires, but Colorado Springs has many historical, cultural or special sites located in “at-risk” areas, including:

- The Broadmoor
- Cheyenne Mountain Zoo
- NORAD
- Will Rogers Shrine
- The Flying W Ranch
- The Cragmoor Sanatorium
- Glen Eyrie
- Rock Ledge Ranch
- Mount Saint Francis
- North Cheyenne Canyon
- The Garden of the Gods
- Helen Hunt Falls
- Seven Falls
- Ute Valley Park
- Stratton Open Space
- Pulpit Rock

• Palmer Park
• Bear Creek Nature Center
• Starsmore Discovery Center
[*Source: Colorado Springs Fire Department Wildfire Mitigation Plan 2001]

Wildfire in the City's Wildland Urban Interface will occur at some point in the future. This natural disaster is more unpredictable than flooding and has many variables. Variables include climate, location, slope, elevation, human acts, etc. as well as vegetation characteristics such as:

1. Type of vegetation
2. Health of the vegetation
3. Density
4. Soil type
5. Amount of deadfall or down and dead

Colorado Springs Fire Department has been a national leader in establishing a Wildfire Mitigation Plan (2001) and educating the public in measures to mitigate the hazard. This is a living, dynamic program that is in place and continues to evolve into a more robust and outstanding program.

Wildfire-Identifying the Hazard 201.6(c)(2)(i)

Much of Colorado Springs is within the Wildland Urban Interface and because the city is located in the foothills of the Rocky Mountains much of the Interface is adjacent to steep mountainous forests. This discussion supplements the material presented earlier in this section.

There are many scenarios for an uncontrolled fire in a Wildland Urban Interface in Colorado Springs. A cigarette, a lightning strike, a fire on Fort Carson (from firing live ammunition) spreads northwest, a spark and so on could all be ways a fire is initiated.

A worse case scenario could also be similar to what happened in California to the NW of LA, in San Bernardino County and in vicinity of San Diego in October 2003 as well as a scenario such as the Hayman fire in 2002. These two fires had peak burn rates at one point in time that exceeds man's ability to marshal enough resources to fight the fire.

The prolonged 3-year drought that Colorado is enduring at the present time is aggravating an already potentially volatile situation. According to the Colorado State Forestry Office the moisture content of some trees in the Wildland Urban Interface that appear to be alive is less than the moisture content of some lumber that can be purchased at Home Depot.

In large portions of the Wildland Urban Interface in western Colorado Springs the dominant type of vegetation is scrub oak (Gamble Oak) at approximately 6,000 feet elevation. This particular tree does not grow higher than say 20 or 25 feet but it generates new growth rapidly and has a high rate of limbs or the entire tree itself dying. The net

result is that dead vegetation is on the ground, still attached to the tree (if the tree is still living) and is a plentiful supply of fuel for a fire.

Wildfire-Profiling Hazard Events 201.6(c)(2)(i)

The return frequency of major fires in the Colorado Springs area is 50 years or less. This is not anywhere near the return frequency of a flood in Colorado Springs but it is a major concern because of the large amount of fuels that exist in the Wildland Urban Interface.

As future development occurs in the Wildland Urban Interface the likelihood of a fire is further enhanced. Even without further development, as long as fuels are not removed, over time the increase in dead vegetation will continue to cause fuels to accumulate.

Suppression of wildfires over the years has also allowed fuels to collect in most forests. In hindsight this human intervention into a normal cycle of fire has allowed fuels to collect so that if there is a fire its effects and damages are far greater than if fire had been allowed to take its natural course during the past.

On the following pages are a number of maps that illustrate the wildfire risk in Colorado Springs. These are as follows:

The Big Burn of 1854

This map shows a large region in central Colorado that suffered a number of large fires up until the map was printed in 1898. One the fires that contributed to this map is described on the page preceding the map. The Big Burn of 1854 refers to a fire that burned from Cheyenne Mountain (southwest Colorado Springs) approximately 70 miles to Wilkerson Pass, which is west of Colorado Springs.

Wildland Urban Interface in Colorado Springs

There are three map sheets here that show the extent of the Wildland Urban Interface in Colorado Springs. Most parcels within the City limits and within the Interface have been assessed as to the risk they pose with respect to a wildfire. The third map shows an enlarged risk assessment at the neighborhood level for a neighborhood in southwest Colorado Springs.

Illustration of the maximum Hayman Fire burn rate if it occurs in Colorado Springs.

These two maps show how much of a geographical area will be affected by a fire if it burns at the same peak rate as the Hayman Fire in 2002. One map is a typical topographical map and the second map is an orthographic aerial photo with the burn rate annotated on the map.

The final enclosure is a poster that illustrates defensive measures for owners that live in the Wildland Urban Interface and the source for this information is the FireWise Program.

Description of past occurrences of the hazard

The majority of the information in this section came from the 2001 Colorado Springs Fire Department's Wildfire Mitigation Plan.

1850s to the present, *very limited data and information is available.* Only in the past 10 to 25 years has more data been available that documents the risk and dangers of wildfires. The documented large fires that occurred in vicinity of Colorado Springs include the Big Burn of 1854 (see previous map), the Camp Carson/Cheyenne Mountain Fire of January 1950 and the Hayman Fire of 2002.

The Hayman Fire in 2002, at the peak burn rate, burned 68,000 acres in one day. The Wildland Urban Interface in Colorado Springs is 45 square miles or 28,800 acres. It is recognized that the City's Wildland Urban Interface is not one big cluster so there is no insinuation that this could all burn in one day but this fact does provide for an interesting comparison.

The Hayman Fire also burned at a peak rate of ½ mile in 4 minutes. Most people, unless they are in a vehicle and on a road that is going in a direction away from the fire could not escape a fire that is burning ½ mile in 4 minutes. This rate (7.5 mph) is the equivalent of a fire moving from Highway 115 to Fire Station 16 in 8 minutes. Or the fire could burn from the Cheyenne Mountain Zoo to NORAD in 16 minutes. (See previous maps).

Probability of future occurrence

Wildfires occur every year in Colorado, only the location varies. Severity will depend on preparedness, weather, moisture levels, and type of fuels, current environmental conditions as well as other variables. Currently Colorado is in a very serious drought. Colorado Springs has been under water restrictions for well over a year. The environmental conditions, even in winter months are currently very conducive to a large wildfire starting and spreading quite quickly.
Preparedness depends on pre-fire mitigation and other variables that are strongly influenced by a wide variety of property owners and their interpretation of what is acceptable risk and mitigation.

Wildfire-Assessing Vulnerability: Overview201.6(c)(2)(ii)

As a result of detailed study and evaluation, it is readily apparent that in Colorado Springs there is potential for a large-scale conflagration such as occurred in Los Alamos, New Mexico and Oakland, California that would have catastrophic impact. With consideration for vegetation overgrowth, weather patterns, and increasing population, it is

anticipated that someday a small fire will grow rapidly into a firestorm surpassing the Colorado Springs Fire Department's ability to extinguish it - unless we collectively do more to reduce the hazard. On the periphery of Colorado Springs, in El Paso County, are several areas of concern for the County. These include the Black Forest (north of the City), southwest part of the County (southwest of the City) and Ute Pass (west of the City). These are also great concerns for the City.

Wildfire-Assessing Vulnerability: Identifying Assets 201.6(c)(2) (ii) (A)

This section discusses the methodology and how the numbers of structures in the Wildland Urban Interface that are listed below were derived. Most of the Wildland Urban Interface is built out (83%) so an estimate of how many future buildings will be constructed was not done as the remaining 17% will be infill and done one structure at a time in an unpredictable schedule as opposed to large subdivisions being constructed all at once.

The Wildland Urban Interface in Colorado Springs is largely residential with some light commercial uses such as small shopping centers. Larger mall like shopping centers for the most are not in the Interface. Some schools are in the Interface because of the population they serve.

There are some critical facilities in the Wildland Urban Interface. These are primarily utilities. Many of the utilities are underground so the main distribution components would not be affected by a wildfire but the point at where the utility enters a building or above ground components such as a gas pressure-reducing valve would be vulnerable. The exception is that there are some utilities such as overhead electrical transmission lines, domestic water storage reservoirs, pumps, etc. that are in the Interface and if affected by the fire may impact the availability of water in distribution systems that may be needed to fight a wildfire.

No major medical facility is in the Wildland Urban Interface. Communication lines in the Interface are primarily for small businesses but mostly residential.

The Department of Defense has some infrastructure in the City's Wildland Urban Interface but for the most part they are buried.

Wildland Urban Interface inventory:

1. Only areas at high risk, very high risk or extreme risk in the Wildland Urban Interface were inventoried for developing the base line information. These are shown on the previous maps.

2. A preliminary count of parcels in the Wildland Urban Interface was performed by the City's Fire Department's GIS Section. The El Paso County Information Technology's GIS section took the base numbers of parcels and determined the number of total structures (29,938), commercial structures (962), residential

structures (28,250) and other structures (636) and parcels with non-structure improvements (90). The County GIS Section also queried the El Paso County's Tax Assessor's database to determine the value of the above structures and parcels. Due to time constraints the exact type of property (multi-family, vacant land, business, etc.) was not captured but the total estimated market value was captured. For determining the number of people the 2000 Census data was used. The average number of occupants in owner-occupied and renter-occupied is roughly 2.5 people (2.27 persons in renter-occupied units and 2.65 persons in owner-occupied units). Based on 29,938 residential units the minimum number of persons that live in the Interface are 74,845. The actual number is probably closer to 90,000 persons because of apartment complexes and single-family homes that are used by multiple tenants (e.g. college students).

There is no central list of special populations that may be in the Wildland Urban Interface. The City Emergency Manager, Director of Emergency Management and organizations that work with these individuals have a general knowledge of where some of the key facilities are located. In addition, this information is available via GIS overlay. In general, retirement homes and other large facilities for special populations are not in the Interface. The 911 dispatchers have a reverse 911 system that can be used to initiate calls to homes in any given area as a tool to assist in notification and evacuation.

If a wildfire occurs it will mean that there will be road closures and emergency equipment will be tying up the roads. Citizens will not be allowed in certain areas for their safety and to preclude interfering with emergency equipment. Colorado Springs' Emergency Evacuation Ordinance will be put into effect.

There will be some damage and destruction to utilities as previously noted. Above ground utilities and local residential phone lines may be damaged or destroyed. Emergency communications for the most part will not be impacted because of the redundancy in the transmission system towers.

The largest assets at risk in the Wildland Urban Interface are residential structures.

A major concern is if a wildfire were to develop in the southwest part of town and destroy the above ground electrical lines that feed several small water storage reservoirs at the base of Cheyenne Mountain. This could limit the amount of time the hydrants in that area would be able to provide adequate water pressure for firefighting operations. A preliminary estimate by CSU and the Colorado Springs Fire Department indicates that if electrical service to these reservoirs is lost then the fire department may have no more than 2 hours of water pressure unless back-up pumps or work arounds were able to be deployed and set up before the 2 hours had expired. This issue is addressed in the Colorado Springs Mitigation Strategy at the end of the PDM Plan.

The speed of the fire would dictate the available time for evacuation. It is highly possible that there would be little to no warning for evacuation, especially in times of high wind or other extreme environmental conditions and or in locations near the source of origin.

Wildfire-Assessing Vulnerability: Estimating Potential Losses 201.6(c)(2) (ii) (B)

The numbers below do not include the value of building contents, economic losses (i.e. 5 people out of a job at a building x due to the wildfire, etc.) and do not include the value of utilities that are in the Wildland Urban Interface.

Wildfire Hazard - Structure Value Analysis

Category	County	City	Total
Total Number of Parcels	13496	31863	45359
Total Number of Structures	12888	29938	42826
Commercial	603	962	1565
Residential	10454	28250	38704
Other	1809	636	2445
Non-Structure Improvements	22	90	112
Parcels - Land Values	$1,344,884,517	$1,764,782,002	$ 3,109,666,519
Parcels - Total Improvement Structure Values	$3,514,441,641	$6,472,597,724	$ 9,987,039,365
Commercial	$ 122,056,100	$ 650,746,938	$ 772,803,038
Residential	$1,863,631,674	$5,619,935,114	$ 7,483,566,788
Other	$1,527,301,657	$ 197,211,565	$ 1,724,513,222
Non-Structure Improvements	$ 1,452,210	$ 4,704,107	$ 6,156,317

** City Parcels provided by the City of Colorado Springs
** Values shown reflect market value

The value for the parcels and the structures came from the El Paso County Tax Assessor's database. The total value for the entire City's Wildland Urban Interface is $6.5 billion for structures and $1.8 billion for land. These values do not include any costs for structure contents or economic losses. These values also do not include the value of any Utility infrastructure in the Wildland Urban Interface.

A future goal of Colorado Springs' mitigation strategy for wildfire will be to further assess and accurately quantify the total number of persons and the value of the structures that are vulnerable within Colorado Springs' City limits to wildfire. This goal will be included within the plan maintenance of the Pre-Disaster Mitigation Plan and will be accomplished in future revisions utilizing FEMA 386-2 "Understanding Your Risks."

Assessing Vulnerability: Analyzing Development Trends 201.6(c)(2) (ii) (C)

The majority of development in Colorado Springs will occur in large open spaces to the east and northeast of town. The Wildland Urban Interface is 83% developed and infill will continue in the future as the vacant developable land is built upon in small piecemeal fashion. The majority of the Interface is west of I-25 in the foothills of the Rocky Mountains. There is some Interface just east of I-25 but it is well within the City limits and in areas that are mostly developed already. Because the Wildland Urban Interface area in Colorado Springs is largely built out there will probably be very few large- scale new developments.

Land Development Code is being revised with an emphasis of requiring mitigation of wildland fire issues up front instead of at the end of the development cycle when the motivation for compliance does not have a sense of urgency.

Land use codes and regulations, to include wildfire mitigation planning and implementation are being strengthened at the present time and will continue to improve in the future. As an example non-combustible roofs (Class A roof) are now required throughout Colorado Springs to include the Wildland Urban Interface areas. Wildfire fuels mitigation is being considered as a mandatory front-end task for any new development.

Risk Assessment – Landslides

Background

Landslides cause more than $2 billion dollars (in 1990 dollars, The Citizens' Guide to Geologic Hazards, Nuhfer, Ed) in damages and destruction in the United States annually. This type of disaster is frequently under the thresholds to initiate major disaster relief funding because it occurs over a long period of time in discrete areas and the cumulative dollar amount of damage or effects are never really known because there is no local, state or federal mechanism to investigate (particularly with respect to small landslides that occur on private property as opposed to large landslides that affect public infrastructure and critical facilities) and track these events. In many areas of the world and in the U.S. the science and engineering related to landslides have not advanced to the point of where definitive assessments or precise predictions of the long-term stability of some hillsides are possible. Part of the problem of being able to predict stability of a hillside is that it is a very expensive project to attempt to gather subsurface information in sufficient quantity and quality to predict the long-term stability of a hillside.

Landslides in the Colorado Springs area date back to at least 1959. Where landslides will occur in the Colorado Springs is predictable at the regional assessment level but not as predictable at the parcel or individual lot level. Many of the geotechnical or geological variables cannot be determined accurately or if determined may not be representative of a given area. Landslides are financially devastating to residents, especially when no financial relief is available. Normal homeowner's insurance does not cover landslides so an owner can easily have a large mortgage to pay on a house that is worth nothing. Landslides in some geological conditions can potentially be catastrophic if the failure occurs in a very brief period of time and the mass of material is large. While debris flows are not technically landslides, debris flows and rock fall can be significant hazards during periods of significant precipitation (debris flow and rock fall) and freeze-thaw cycles (rock fall).

There are limited on-going initiatives in the landslide arena that are applicable to the problems in the local area. There is one on-going project in conjunction with the University of Colorado at Colorado Springs that is monitoring several landslides as well as conducting research into the mechanisms of failure but this project is underfunded at the present time and consequently it may be years until definitive conclusions can be presented.

Landslides-Identifying the Hazard 201.6(c)(2)(i)

The unfortunate thing about some of the slope failures or landslides in Colorado Springs is that you may not know there is a problem until it happens. Homes that were previously thought to be stable, have weathered many years of above normal precipitation then without any warning the underlying slope fails and the home is badly damaged or destroyed.

The majority of the landslides in Colorado Springs occur in the foothills of the Rocky Mountains and west of the Interstate (I-25). This is a large area and there are many locations west of I-25 that are very stable and have been stable for decades. A landslide in 1965 resulted in damage to I-25 itself.

Landslides-Profiling Hazard Events 201.6(c)(2)(i)

In the case of landslides the historical documentation of landslides is very incomplete and in many cases would never be noticed unless someone was living in vicinity of the landslide and happened to notice subtle changes in a hillside. In Colorado Springs, along the Front Range, and in the mid west landslides are part of the geography and natural events that occur on a periodic basis at unpredictable locations.

In a number of areas in Colorado Springs you can observe the terrain and by its hummocky appearance know that at some point in the past the hillside failed. In other areas it is not so obvious, even if you have conducted a formal geotechnical subsurface investigation. This problem has occurred for hundreds and thousands if not millions of years at some locations.

The dilemma is essentially that some open space hillsides are stable but they are much steeper than others that have failed. In other cases a hillside that is not steep but has a house on top has failed whereas a house on top of another slope (that is steep) appears to be in perfect condition. Development is frequently cited as a condition that precipitates failure but this is not a universal contributing factor.

In late 1999 FEMA received several hundred million dollars from Congress to help with some of the nation's disasters in states that still had "Unmet Needs." FEMA set aside over $4 million for landslides in Colorado Springs. Hence, the name of the program became the "Unmet Needs Program." This relief was an acquisition of landslide properties "Unmet Needs Program" that began in February 2000.

After the program began some of the owners, at several of the sites, declined further participation in the FEMA "Unmet Needs Program" (Colorado Springs Office of Emergency Management Project 2000-1) out of concern that the various inspections performed as part of the validation of the landslide damage would jeopardize their real estate values so they withdrew.

The Colorado Geological Survey was asked to assist in mapping the landslides and 8 sites (including the two from 1995) were mapped. This part of the Program was for owners that wanted to be considered for acquisition. The prioritized list for acquisition was finalized in early April 2000.

In May 2000 the Small Business Administration (SBA) offered to provide low interest disaster loans to owners affected by the landslides. At about this time other owners who did not come forward for the acquisition program indicated that they too had landslide damages. As a result of this there was a second phase to the validation of the landslide

damages. The second phase was for owners that missed the opportunity to be considered for acquisition but wanted to go on record as having damages and or be considered by the SBA for a low-interest loans. As a result of this second phase Colorado Springs asked the Colorado Geological Survey to inspect several more homes in July 2000. These inspections resulted in documenting 4 more sites bringing the total officially documented landslide sites to 12 (including the 2 from 1995).

Since the year 2000 other owners have come forward to identify homes that are on slopes that have failed. Unfortunately, there is nothing that could be done because the window of opportunity for applying for the FEMA/City acquisition program was only open for February 2000. Some of these later problems materialized in 2002 and 2003. This delayed reaction by the ground is not unusual. It takes years for water to work itself through some types of clay. Typically when the shale that is near the ground surface weathers due to ground water or chemicals in the ground water or from other causes it will turn into clay. As a result water that saturated the ground several years ago may still be continuing to affect the stability of slopes.

The landslide problem will probably be a problem for many years to come. Once a slope has failed the strength of the underlying shale or clay that is in the failure zone will never go back to its original strength and even in dry years these slopes can continue to show movement (it may slow down to almost zero but it does not take the same force to sustain movement after failure).

An unreported landslide exists on the west side of town where a hill is failing above about 12-15 residential structures. The owners below this hill probably have no idea that the slope is failing. None of the owners have come forward in the past 4 years to identify this problem. Perhaps it will reach equilibrium and completely stop but this is not the likely outcome. This slope has been in this condition for over 4 years and may have been precipitated by the spring 1999 rains. At the present time it does not appear to be affecting any homes at its toe.

In summary, the landslide problem in Colorado Springs is not a natural disaster where you can accurately predict what slopes are going to fail or predict what slopes will remain stable. This unpredictability places a large fuzzy cloud over any attempt to quantify future losses.

The following photographs, documents and maps follow this section:

1. Landslide Aerial and Ground Photographs: These are samples of areas in Colorado Springs that have active landslides and some of the buildings that had damage or were completely destroyed. These photographs are representative of the situation and do not show all areas or all buildings that were destroyed, damaged or threatened and they do not show all areas of town.

2. Regency Drive Landslide Map (with the Colorado Springs Utilities Facilities Information Management System (FIMS) Base Map): This is a typical map that

was done for each landslide site that was in the acquisition program and was the result of the FEMA "Unmet Needs Program" where homes were prioritized for acquisition if the owner wanted to participate and the home was destroyed, damaged, or threatened by active landslides. The maps were produced in March 2000 by the Colorado Geological Survey in coordination with the Colorado Springs Office of Emergency Management (one of these maps - Regency Drive Landslide - is included in this section to provide an example of the mapping that was done to support this FEMA grant).

3. Before and After Photographs of several homes that were acquired as part of the FEMA "Unmet Needs Program" or OEM Project 2000-1. These photographs were taken before homes were removed and then taken again in January 2004. The final closeout of the FEMA "Unmet Needs Program" was completed 31 March 2004.

4. Map Series 42 by the Colorado Geological Survey (CGS). This is the latest of a number of geologic hazard maps produced by the CGS and others. Its title is "Map of Potential Areas of Landslide Susceptibility in Colorado Springs, El Paso County, Colorado." Only a small portion of one of 3 map sheets that is included in the report is included in this Plan. It is a collection of various studies and other reports and attempts to highlight areas in Colorado Springs that may be susceptible to landslides but it is by no means definitive in nature.

Previous occurrences of the hazard

1995

There was more precipitation in the spring time than normal and this appears to be the reason that two slopes failed in the southwest part of town. 2 owners had structures that were destroyed and 2 owners had homes that were badly damaged. One of the two destroyed homes was demolished in 1998.

1999

The rain in April/May 1999 that precipitated a local Presidential Disaster Declaration for flooding was an apparent factor in causing additional slopes to fail in residential neighborhoods. The slopes that failed in 1995 were further destabilized by the rains in 1999. There were at least 10 additional slopes or hillsides that had movement as a result of the rains in 1999.

Probability of future occurrence

Historical data is generally a good indicator of the future but in the case of landslides it is only a general statement and specific locations cannot be identified (unlike floods where the potential problems can be readily identified).

Other slopes have failed besides those included in FEMA "Unmet Needs Program" project that was in response to the 1999 Disaster.

There is no precise or accurate way to predict what other slopes may fail in the future or to what extent slope failures may continue to be a problem. The extent of future damage can be from light or minimal damage to total destruction of structures.

A worse case scenario could develop for subsequent landslides in the future if several prolonged low intensity saturating rainstorms (e.g. where it drizzles for 4 or more days continuously per storm) occur over a few months. Under these conditions slope failures may begin to develop. Depending on the condition of the underlying material some of this moisture may be able to penetrate quickly to reach material that is susceptible to failure. At other locations it may take quite a bit of time for the moisture to reach a potential weak layer or zone.

Landslides that have already occurred could be reactivated by excess moisture conditions.

Eventually the drought that is currently in the mid west will be over and moisture content and precipitation levels will increase. Additional slope failures will occur – it is just a question of time and how wide spread the destruction and damage will be. The probability of occurrence is higher in areas that have weak underlying rock.

Once a slope has failed in the weak bedrock the strength of the failed material is permanently decreased so that it does not take a lot of moisture or maybe none at all to allow continued movement.

Landslides- Assessing Vulnerability: Overview201.6(c)(2)(ii)

Landslides in the Colorado Springs area date back to at least 1959. Where landslides will occur in the Colorado Springs is predictable at the regional assessment level but not as predictable at the parcel or individual lot level. Many of the geotechnical or geological variables cannot be determined accurately or if determined may not be representative of a given area. Landslides are financially devastating to residents, especially when no financial relief is available. Normal homeowner's insurance does not cover landslides so an owner can easily have a large mortgage to pay on a house that is worth nothing. Landslides in some geological conditions can potentially be catastrophic if the failure occurs in a very brief period of time and the mass of material is large. While debris flows are not technically landslides, debris flows and rock fall can be significant hazards during periods of significant precipitation (debris flow and rock fall) and freeze-thaw cycles (rock fall).

Conditions such as topography, aspect, moisture content, previous failure history at the specific site, soil properties or characteristics, slope, angle of bedrock bedding planes/joints, presence of human activity and other variables, etc. influence the probability of occurrence

Landslides-Assessing Vulnerability: Identifying Assets 201.6(c)(2) (ii) (A)

The structures and facilities that are most at risk from landslides are residential structures in Colorado Springs in the foothills of the Rocky Mountains that are west of I-25. There is no real way to identify the number of residential structures at risk. There are no major medical facilities in vicinity of active landslides. There are no public safety facilities or headquarters (fire and police) in vicinity of any known active landslides. The emergency public safety communication system has no facilities in any active landslide and even if it did there is sufficient redundancy in the system that the communication system would be able to continue to function.

In the past there have been some commercial properties and several apartment complexes that have had a slope failure or landslide. The detailed information from these commercial properties is not available.

Utilities that service homes in vicinity of active landslides are at risk as well. As part of the demolition of homes acquired under the FEMA "Unmet Needs Program" gas and electric to a residential structure were severed in the street to keep the point of severance as far away as possible from the failed hill. In several cases utilities are in close proximity of the toe of the landslide or in the active landslide itself. In this later situation there are several sites where homes are within the footprint of an active landslide. For the time being the home is still habitable and the utility systems are serviceable. The plus side of this situation is that a failed hill does not move as a contiguous mass of soil and earth. There are pockets that do not move very much and there are other areas where the movement is more rapid. The down side is that any home in an active landslide will be destroyed at some point in the future – it could be 5 years or 5,000 years –it's nearly impossible to say. This means that electrical and natural gas (the City Utilities distributes natural gas through their underground distribution system) at some point become a risk themselves. Immediately following the 1999 landslides the gas lines in vicinity of the active landslides and the damaged or destroyed homes were checked with leak detection equipment on a periodic basis.

If a road is affected by a landslide it may also affect public infrastructure (e.g. Broadmoor Bluffs Drive, South Club Drive, Appian Court, Regency Drive, 30th Street, Cedar Heights, Hofstead Terrace, Hofstead Court, etc.). Most roads that are affected by landslides are in residential neighborhoods but there are exceptions.

At the time this document is prepared (January 2004) there are no known schools or other large buildings in vicinity of active landslides.

The numbers of persons that may be affected by landslides are relatively low when compared to other hazards.

There are an estimated 10 to 20 homes that should be acquired because they have been extensively damaged or destroyed and were not part of the FEMA "Unmet Needs Program" acquisition. There are probably another 30 to 40 homes that should be acquired to create a buffer around the known active landslides. Based on the experiences from the FEMA "Unmet Needs Program" there is probably a maximum of 300 homes that should be acquired under a worse case scenario (assuming at some point in the future there is a very long prolonged period of time with a lot of moisture that is able to saturate into the ground). There is no way to validate the 300 homes. It is strictly a guess based on experiences from the past 4-5 years.

Estimating 2.5 to 3 adults per structure then for 300 structures we are still less than 1,000 persons. However, the consequences of landslides can be financial ruin, bankruptcy and other negative outcomes.

Landslides-Assessing Vulnerability: Estimating Potential Losses-Estimate of potential dollar losses to vulnerable structures and description of the methodology used to prepare the estimate. **201.6(c)(2) (ii) (B)**

There is no real way to get an accurate estimate of either the number of homes involved or the cost. The process is based on using an educated guess based on the FEMA "Unmet Needs Program" acquisition project. The historical cost data from the FEMA project was:

> $6.5 million for 27 structures (includes local cost-share). This equates to about $241,000 per structure, which includes all project wide costs such as demolition, permits, and fees for the Colorado Geological Survey, asbestos abatement and so forth. If homes are acquired in the future the average cost will most likely be higher than this.

Therefore 300 homes (using $250,000 per home (including all project wide costs)) equates to a total of $75 million dollars.

These dollar amounts do not include any costs for the contents of the structures.

Landslides-Assessing Vulnerability: Analyzing Development Trends 201.6(c)(2) (ii) (C)

In the past few years after enduring a number of landslides the City has established some parameters for development and construction in hillside areas in an attempt to avoid the hazard. These include mandatory geo-hazard studies in potentially questionable areas, mitigation of subsurface water and other mitigation actions.

Future development in steep terrain is partially regulated by regulations that require geo-hazard studies. This is not a foolproof measure because the cost to get accurate and sufficient information is enormous. An additional issue is that no one owner, in general, owns sufficient property to perform a regional stability analysis, which is needed in most cases. This is a situation where multiple owners must cooperate for the common good but, in general, there are competing interests that make this difficult if impossible to occur.

Most of the hillside areas in Colorado Springs have been developed. There will continue to be infill as individual lots are sold and built upon. There are some areas where a developer has decided not to develop the property and donated the land to the City for permanent open space. In this situation the developer did not want to risk encountering stability issues and the decision to donate the land was in the best interest of the community.

There are some additional areas that are undeveloped but with the increase in scrutiny there is a significant amount of effort being directed to try and either avoid potential slope stability problems or mitigate them in advance.

Risk Assessment – Severe Weather

Background

The Colorado Springs area is subject to a number of severe weather phenomena; including intense, localized thunderstorms with high rates of precipitation, hail, floods, tornadoes, lightning strikes, heavy snow and ice storms.

Located in the middle of two major topographic influences - the Rocky Mountains and the Palmer Divide – Colorado Springs experiences some extreme weather conditions.

Thunderstorms

The National Weather Service considers a thunderstorm severe if it produces hail at least 3/4-inch in diameter, winds of 58 mph or stronger, or a tornado. Thunderstorms affect relatively small areas -- typically 15 miles in diameter, yet are considered dangerous due to hail, flooding and lightning.

Hail

Colorado is considered "the hail capital of the U.S."* Numerous and severe hailstorms are an unavoidable part of life east of the Rockies. Hail causes more than $1 billion in crop and property damage nationwide each year.

The percentage of larger hailstones increases in Colorado. The high frequency of larger stone sizes contributes directly to the excessive property damage that occurs. The most common size range for damaging hail in Colorado is 1 to 1.5" in diameter. Large stones can fall at speeds approaching 90 mph and livestock fatalities from hail are fairly common.

Severe hail is not a problem statewide -- it is limited to eastern Colorado beginning in the eastern foothills and extending across all the Eastern Plains. El Paso and Weld Counties are the leaders in reported storms. Meteorological evidence points to the Palmer Ridge (high ground between Denver and Colorado Springs that extends eastward beyond Limon) as one of the most hail-prone regions of Colorado.

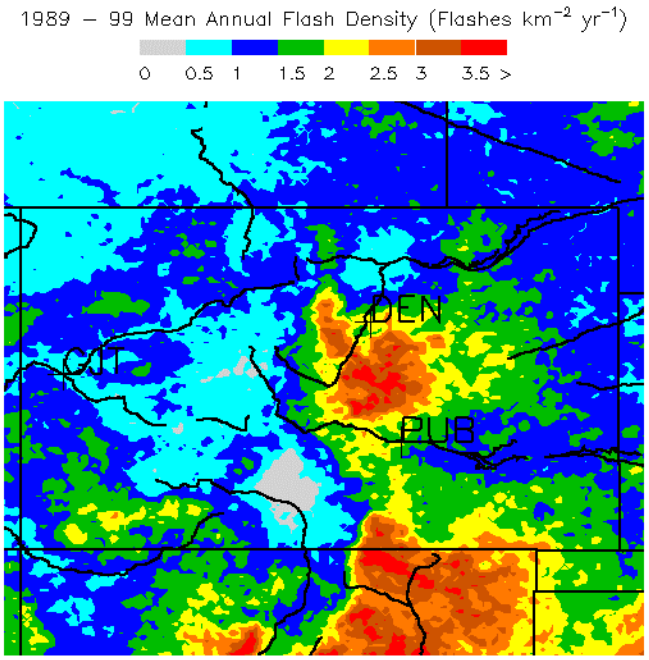
(**Source: Doesken, Nolan J**.** HAIL, HAIL, HAIL -- THE SUMMERTIME HAZARD OF EASTERN COLORADO**,** Colorado Climate publication, Volume 17, Number 7, Special Feature Section, April 1994)

Lightning

Over the years, lightning has been the most dangerous weather phenomenon in Colorado. Each year, on average, 500,000 cloud-to-ground lightning strikes occur in Colorado – ranking it 15th out of the lower 48 states. The flash density is around 5 cloud-to-ground flashes per square mile per year, around 25th out of the lower 48 states. Yet Colorado

ranks 11th in the nation in deaths per population. Lightning kills, on average, 3 people and injuring 20 each year in Colorado. Many fires in the western United States are started by lightning.

Lightning activity, on average, is greatest on Monument Ridge (between Denver and Colorado Springs), the Pikes Peak Region around Colorado Springs, and over the Raton Ridge around Trinidad. This is due to available moisture and upslope flow during the warm season. Taking into account population and tourist volume, the most dangerous lightning area in Colorado is El Paso county (the greater Colorado Springs area), where, on average, over 27,000 cloud to ground flashes occur each year (13 cloud to ground flashes per square mile per year).



Courtesy of the Lightning Project at Texas A&M University

[***Source: Tom Magnuson, Warning Coordination Meteorologist at the National Weather Service in Pueblo]

Tornadoes

In an average year in the United States, 1,200 tornadoes will cause 70 fatalities and 1,500 injuries nationwide. Tornadoes can occur at any time of the year and are most frequent east of the Rocky Mountains during the spring and summer months.

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. They can be one mile wide and stay on the ground over 50 miles.

The average forward speed is 30 mph, but may vary from nearly stationary to 70 mph. The strongest tornadoes have rotating winds of more than 250 mph.

Heavy Snow Storms

Storms tend to develop over southeast Colorado in the lee of the Rockies. These storms move east or northeast and use both the southward plunge of cold air from Canada and the northward flow of moisture from the Gulf of Mexico to produce heavy snow and sometimes blizzard conditions.
Heavy snow has immobilized the Colorado Springs region in the past; paralyzing the city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow have collapsed buildings and taken down trees and power lines. In rural parts of El Paso County, homes and farms may be isolated for days, and unprotected livestock may be lost. In the mountains, heavy snow leads to deadly commuter roads and avalanches. The cost of snow removal, repairing damages, and loss of business has large economic impacts.

Ice Storms

Heavy accumulations of ice bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power have been disrupted for days while utility companies work to repair extensive damages. Even small accumulations of ice may be extremely hazardous to motorists and pedestrians.
Winter Deaths
All residents are potentially at risk during winter storms. Recent observations of storm fatalities related to ice and snow are:
About 70% occur in automobiles.
About 25% are people caught out in the storm.
Related to exposure to cold:
50% are people over 60 years old.
Over 75% are males.
About 20% occur in the home.
[Source: U.S. DEPARTMENT OF COMMERCE, National Oceanic and Atmospheric Administration,
National Weather Service, Warning and Forecast Branch, November 1991]

Severe Weather-Identifying the Hazard 201.6(c)(2)(i)

Damages due to severe weather are greater than $3 billion in the US annually (1997 – 2002) (NOAA Severe Weather Statistics @ NWS Website) for Lightning, Hail, Tornadoes and Winter Storms. This does not include tropical storms, hurricanes, high wind and other forms of weather that are considered Severe Weather.

This section considers lightning, hail, tornadoes, winter storms, high wind and other significant weather as severe weather.

Severe weather is very unpredictable with respect to estimating the duration, location, strength and so forth. Part of this unpredictability has to do with Colorado Springs being located in the foothills of the Rocky Mountains. While some preparation and mitigation can be accomplished in advance there is little to no control over where and when severe weather will occur.

There are several Colorado Springs and El Paso County on going initiatives in the severe weather arena. These are primarily in the areas of weather monitoring and flood warning systems and the dissemination of that information.

Colorado Springs has some of the most severe weather (lightning, hail, etc.) in the state. Tornadoes do occur occasionally but they are not frequent enough to pose a major risk to the City.

The primary sources for information related to severe weather are the Colorado Climate Center, the National Weather Service and the National Oceanic Atmospheric Administration. The Denver Museum of Nature and Science and the Rocky Mountain Insurance Information Association are also sources of information related to severe weather.

Mr. Tom Magnuson was interviewed as part of the Pre-Disaster Mitigation (PDM) Plan Project and his information is summarized or included in this section.

NWS data is only comprehensive starting in 1995. This short time span is not sufficient to draw long-term conclusions about severe weather.

Severe Weather-Profiling Hazard Events 201.6(c)(2)(i)

Historical frequency is not a valid parameter for assessing severe weather effects. The unpredictability of weather is a reason insurance for automobiles and homes are so high in Colorado. If major hail storms concentrated in one area under certain conditions at specific timeframes during the year then the solution would be simply to make building codes more stringent and take measures to avoid damage to automobiles. Of all the types of severe weather lightning is probably the most predictable, not in the location it will strike but in the fact that El Paso County and the Colorado Springs area receive the second most number of lightning strikes in Colorado. In Colorado Springs the average number of strikes is 15-20 cloud to ground flashes per square mile per year and for El Paso County 13 cloud to ground flashes per square mile per year (Source: Tom Magnuson, National Weather Service, Pueblo).

Hail generally occurs most severely in the foothills of the Rocky Mountains and continuing to the east.

Tornadoes have occurred in the foothills and to the east but they are about 2% of the severe weather events from 1995 to 2000. With respect to tornadoes the question

becomes - Do you invest precious mitigation resources to address a tornado when the probability is very low? Typically tornadoes are F3 or weaker.

Winter storms have affected different areas at different times. In 2003 northern Colorado, including the Denver area was hit hard. Denver received close to 30 inches of snow during the March 17-20 blizzard (Colorado Division of Emergency Management Website "2003 in Review"). In 1997 Colorado Springs endured a blizzard.

Number of Severe Weather Events per Colorado County 1995 – 2000*

County	# of Severe Weather Events	Hail	Size of Hailstones		Tornado	Wind > 58 mph	Annual Lightning Strikes**
El Paso	**235**	**203**	**113**	.75 to< 1"	**5**	**27**	27,500
			82	1 to< 2"			
			8	2 to< 3"			
			0	>3 "			
Fremont	**13**	**9**	**7**	.75 to< 1"	**1**	**3**	10,700
			1	1 to< 2"			
			0	**2 to<3"**			
			1	3 to 4"			
			0	>4 "			
Pueblo	**79**	**62**	**42**	.75 to< 1"	**3**	**14**	15,500
			18	1 to < 2"			
			2	2 to< 3"			
			0	>3 "			
Teller	**14**	**12**	**8**	.75 to< 1"	**1**	**1**	5,700
			4	1 to 2"			
			0	> 2"			

(*Source: National Weather Service, Warning Coordination Meteorologist Tom Magnuson, 2003)
[Cloud to Ground Lightning Strikes]**

The following pages contain an article by Tom Magnuson of the National Weather Service:

Lightning in Colorado's High Country

Severe Weather- Assessing Vulnerability: Overview 201.6(c)(2)(ii)

This section considers lightning, hail, tornadoes, winter storms, high wind and other significant weather as severe weather.

Severe weather is very unpredictable with respect to estimating the duration, location, strength and so forth. Part of this unpredictability has to do with Colorado Springs being located in the foothills of the Rocky Mountains. While some preparation and mitigation can be accomplished in advance there is little to no control over where and when severe weather will occur.

There are several Colorado Springs and El Paso County on going initiatives in the severe weather arena. These are primarily in the areas of weather monitoring and flood warning systems and the dissemination of that information.

Colorado Springs has some of the most severe weather (lightning, hail, etc.) in the state. Tornadoes do occur occasionally but they are not frequent enough to pose a major risk to the City.

Severe Weather-Assessing Vulnerability: Identifying Assets 201.6(c)(2) (ii) (A)

This is a large open ended question because in theory every person, structure, facility, building, truck, car, etc. can be affected by lightning, hail, tornadoes and winter storms. Proper precautions will limit the damage of some forms of severe weather as follows:

Lightning

Personnel should remain indoors and away from any material or device that can act as a lightning rod. Lightning rod/grounding systems can improve a building's performance in the event it takes a hit. Staying off of high ridges, away from large elevated open spaces will reduce the chances of the person or facility taking a hit. Every location in Colorado Springs is susceptible to lightning with ridgelines, elevated locations and open areas being more susceptible

Hail

Hail is very unpredictable. Commercial construction that is made of brick, stone or other durable material tends to handle a hail storm better than typical residential or a wood frame constructed building. Automobiles and light trucks are very susceptible to hail damage if they are not under protective cover. All structures in Colorado Springs are vulnerable to being struck by hail and the damage is related to the type of materials used in construction.

Tornadoes

An F3 hit Manitou Springs in June 1979. An F2 hit Ellicott on 28 May 2001. Normal tornadoes in Colorado are F0 to F1. F2 and F3 tornadoes are not very common. The only F4 on record in Colorado was in Baca County in 1977 (Tornado Project website). The stronger tornadoes occur more often on the plains further east of Colorado Springs.

On 1 January 2004 high winds in excess of 100 mph hit southwest Colorado Springs and while not a tornado tore off concrete tile roofs from residential structures. Some of the broken tiles became projectiles and penetrated part way into nearby wood decks.

An F0 tornado can do damage to buildings that are under construction and loose material that may be at construction sites, in yards and things like outdoor furniture. An F1 can turn loose items into missiles. F2s and above can destroy mobile homes, wood frame homes and just about any building that man can make. It is very uncommon for a tornado to be within the city limits. This fact may change as Colorado Springs continues to expand eastward onto the plains. In summary, the assets that will probably be most vulnerable to tornadoes in Colorado Springs have minimal risk and are located east of I-25 where the plains start and continue to the Kansas border.

Fujita Tornado Scale*

F0	40-72 mph
F1	73-112 mph
F2	113-157 mph
F3	158-206 mph
F4	207-260 mph
F5	261-318 mph

[*Source: National Climate Data Center, NOAA website]

Winter Storms

Colorado Springs has dealt with large snowstorms/blizzards in the past. The impact is usually only temporary. In Colorado Springs most of the year consists of sunny days and this helps melt snow and clear roads and sidewalks. This fact is taken in to consideration by the city in reducing the amount of snow clearing equipment that is needed to recover from a storm. Most snowfalls are less than a foot and this does not pose a significant problem for the city – usually in less than several hours, when the sun is shining, the main roads are in good condition. When the city receives any accumulation of snow the

school districts typically delay the start of school by 2 hours. This is sufficient time for the sun to melt snow and the priority roads to be cleared. Larger amounts of snow falls take a little longer to clear but the impact is usually no more than one or two days. All areas in Colorado Springs are subject to large amounts of snowfall. Sometimes it will only occur in certain parts of town while during other storms it will hit the entire City.

No one section of town and no one type of population is more at risk because of their location because for the most part severe weather can occur anywhere. The highly variable nature of severe weather could affect small or large geographical areas.

Severe Weather-Assessing Vulnerability: Estimating Potential Losses 201.6(c)(2) (ii) (B)

Damages due to severe weather are greater than $3 billion in the US annually (1997 – 2002) (NOAA Severe Weather Statistics @ NWS Website) for Lightning, Hail, Tornadoes and Winter Storms (This does not include tropical storms, hurricanes, high wind and other forms of weather that are considered Severe Weather)

The table below gives a summary of the damages annually in the United States due to Lightning, Hail, Tornadoes and Winter Storms.

United States Severe Weather Statistics
(Property and Crop Damages in billions of dollars)
(Source: NOAA Severe Weather Statistics @ NWS website)

	Lightning	Hail		Tornadoes	Winter Storms
1997	0.041	0.401		0.737	0.774
1998	0.041	1.5		1.74	.528
1999	0.032	0.600		1.998	0.062
2000	0.039	.571		0.430	1.035
2001	0.046	2.64		0.638	.104
2002	0.044	.479		.802	.752
Total	0.243	6.19		6.345	3.26

In June 2002 Colorado Springs was hit by a significant hailstorm that caused an estimated $24.1 million dollars in damages. 5,500 auto claims and 2,500 homeowner claims were filed by 19 June 2002. Hail was up to 2 inches in diameter. (Rocky Mountain Insurance Information Association website)

Other costly hailstorms were in the Denver-metro area. On July 11, 1990 there was $625 million in insured damages in the Denver-metro area. (Rocky Mountain Insurance Information Association website)

The F2 Tornado that struck Ellicott on May 28, 2001 caused several million dollars in damage by destroying several mobile homes and causing severe damage to the Ellicott Junior-Senior High School. (2002 Instructional Services, Jefferson County Public Schools, CO website for the Ellicott Tornado) In summary, severe weather can cause millions of dollars in damage if it affects large areas within the city or it can affect small geographical areas.

Assessing Vulnerability: Analyzing Development Trends 201.6(c)(2) (ii) (C)

Future development for the most part is not any more vulnerable to severe weather than those parts of Colorado Springs that are already developed. Development east of Colorado Springs will be in areas where tornadoes are more likely than along the foothills. These areas are still relatively close to the foothills so there may not be any additional risk from tornadoes.

Colorado Springs requires a Class A roof (non-combustible material) on all new residential structures so this will reduce future hail damage to homes. Most businesses, government office buildings, commercial structures, etc. are largely protected from hail damage because they typically use more durable building materials than residential structures.

Lightning protection systems enhance protection from lightning strikes. Outdoor structures such as high voltage transmission towers, electrical primary lines, residential electrical service panels, etc. are typically grounded. Many residential areas in Colorado Springs are fed electrical power by underground distribution systems, which help minimize the effect of lightning, if it occurs in those areas.

Masonry or concrete structures are typically able to withstand higher winds and therefore offer the best protection for a lower rated tornado. At the higher F ratings all buildings should be evacuated or the personnel move into basement areas that are capable of supporting the building should it collapse. It is not normal in Colorado Springs to design and construct a building that can withstand a tornado.

Future growth in Colorado Springs will primarily be to the east and the northeast and will not increase or decrease the risk of damage from severe weather because it can happen virtually anywhere in town. Severe weather (lightning, hail, tornadoes and winter storms) is a fact of life and owners typically must take it upon themselves to be prepared.

The western side of Colorado Springs is bordered by National Forests, steep terrain and Manitou Springs. The Northwest part of town borders the United States Air Force Academy. The southern part of town is bordered by Fort Carson. The Southeast part of town is bordered by the airport, Security, Widefield and Fountain. This is the primary reason major growth occurs to the east and northeast.

Mitigation Strategy 201.6(c)(3)

General

Per FEMA, the Local Hazard Mitigation Plan developed by Colorado Springs must *"include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools."*

The Colorado Springs PDM Plan goals are developed based on FEMA's vision, the City's strategy, existing policies, regulations and local requirements. Objectives are developed from goals and specific mitigation actions, activities and projects are derived from the objectives. In the PDM development process, if applicable, mitigation actions, activities and projects are prioritized according to a Benefit-Cost Analysis and other key criteria. A large number of mitigation activities and projects are already implemented as these programs were established at some point in the past and they are rolled into the PDM Plan to provide a comprehensive overview.

Colorado Springs Mitigation Strategy

1. Natural disasters are inherent to the geographic area. Natural disasters will continue to occur and affect people, businesses, government functions, and other community activities, functions and processes.

2. Pro-active comprehensive preparedness and mitigation programs involving city entities, in partnership with other agencies, other partners and the public is in the best interest of the community by helping to reduce the effects of a disaster as well as reducing the time and resources required for response and recovery.

3. The long-term strategy and vision for the City is to sustain successful measures that reduce exposure to future disaster losses and implement other measures that strengthen the disaster preparedness of the Community.

Mitigation Strategy Discussion

The Pre-Disaster Mitigation Plan for Colorado Springs provides a comprehensive framework for current and future mitigation that continuously improves the community's disaster preparedness over time. Pre-Disaster Mitigation programs and activities, when implemented, are a high value return on investment in mitigation and preparedness because of the reduction in potential losses and the elimination of potential costs and losses for which there is no way to quantify the value (e.g. human lives, family treasures, personal and business records and so forth).

The PDM programs and activities also have an additional benefit in that an investment in mitigation and preparedness also enhances public safety, response and recovery and helps

protect life, health and welfare, businesses, the economy, the quality of life and other activities of the population, governmental entities, businesses and other organizations.

Colorado Springs Mitigation Goals/Description of mitigation goals to reduce or avoid/eliminate long-term vulnerabilities 201.6(c)(3)(i)

The intent of the Colorado Springs Pre-Disaster Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. The Plan goals describe the overall direction that area agencies, organizations, local government and citizens can take to work toward mitigating risk from natural hazard.

GOALS

1. Recognize and reduce or eliminate the exposure to damage, destruction and other losses from floods.

2. Recognize and reduce or eliminate the exposure to damage, destruction and other losses from wildfires.

3. Recognize and reduce or eliminate the exposure to damage and destruction and other losses from landslides.

4. Recognize and reduce or eliminate the exposure to damage, destruction and other losses from severe weather.

5. Recognize and reduce or eliminate the exposure to damage and destruction from other natural disasters not specifically identified in this Plan, which may become a significant problem in the future.

The action items are listings of activities in which area agencies and citizens can be engaged to reduce risk. Short-term action items are activities that may be implemented with existing resources and authorities within one to two years. Long-term actions items may require new or additional resources or authorities, and may take between one and five years to implement.

ACTIONS

Short-term and long-term action items are identified below. Most short-term items will be priority due to cost effectiveness and available resources. Long-term actions will need additional analysis and funding to implement. Activities that mitigate multiple hazards will also be considered priority.

1. Continually assess on-going disaster preparedness programs and activities to implement changes that improve the disaster preparedness of the City. **Implementation: For all hazards, short-term implementation, OEM will lead, priority high.**

2. Capitalize on and leverage existing programs, processes, procedures, organizations, agencies and other elements in executing a comprehensive Pre-Disaster Mitigation Program.
   Implementation: For all hazards, short-term implementation, OEM will lead, priority high.

3. In conjunction with preparedness activities, where feasible and cost-effective, initiate improvements to public safety, response and recovery programs and capabilities as additional measures to further reduce the City's risk and vulnerability to a disaster.
   Implementation: For all hazards, short-term implementation, OEM will lead, priority high.

4. Assist in providing information and guidance to private property owners to provide them with the necessary information to make informed decisions regarding hazards in vicinity of their property and thereby enabling them to be part of the process in reducing the community's risk and vulnerabilities.
   Implementation: For all hazards, short-term implementation, OEM will lead, priority medium.

5. Continue to build a broad based grass roots knowledgeable community among the public, businesses, non-profit organizations, government and regulatory agencies and others by continuing to develop and enhance comprehensive public education programs related to preparedness and mitigation that improves awareness and provides the information necessary to recognize issues related to hazards, make informed decisions and take positive actions.
   Implementation: For all hazards, short-term implementation, OEM will lead, priority high.

6. Improve the disaster preparedness of the community by continuing to refine the comprehensive PDM Plan that incorporates objectives and activities to reduce the exposure of the community to future natural disasters. The City and its partners provide the resources to implement, sustain and maintain the PDM Plan including the programs and activities within the Plan.
   Implementation: For all hazards, short-term implementation, OEM will lead, priority high.

7. Establish programs and activities and projects that address the hazards that have been identified in this Plan
   Implementation: For all hazards, long-term implementation, OEM will lead, priority high.

8. The City will leverage external financial aid and other available resources to the extent possible to strengthen its disaster resistance posture.
   Implementation: For all hazard, long-term implementation, OEM, Fire Department, Public Works, OEM will lead, priority medium.

9. Develop an acquisition program to acquire properties in or near hazardous locations that are affected by natural processes where the structure has been severely damaged, is no longer inhabitable or destroyed due to hazards from environmental or natural processes.
   Implementation: For all hazards, long-term implementation, OEM will lead, priority high.

10. Develop a long-term acquisition program that acquires structures located in known hazard zones (e.g. floodplain) with the acquisition occurring at some point in the future beyond the structure's economic life.
    Implementation: For all hazards, long-term implementation, OEM will lead, priority high.

11. Assist Colorado Springs Utilities to develop a PDM Plan, which includes critical utility infrastructure mapping.
    Implementation: For all hazards, long-term implementation, Colorado Springs Utilities will lead, priority medium.

12. Continue efforts to improve the process for regulatory review of development and construction in vicinity of natural hazards as well as addressing these natural hazards.
    Implementation: For all hazards, short and long term implementation, OEM and City regulatory offices, priority high.

13. Continue to support a comprehensive natural hazards website that is a collection of various products and maps concerning a number of natural hazards that are of interest to the jurisdiction as well as to the public.
    Implementation: For all hazards, short-term implementation, OEM will lead, priority medium.

14. Continue to strengthen, if necessary, existing policies and procedures that identify all natural hazard risks in the early planning stages of any project or proposed development.
    Implementation: For all hazards, short and long term implementation, OEM and City regulatory offices, priority medium.

15. Continue to make improvements in the communication of Severe Weather Warnings, Flood Warning and related information.
    Implementation: For all hazards, short-term implementation, OEM will lead, priority high.

16. Expand the capabilities of GIS systems and applications by assisting health departments and hospitals with surveillance and epidemiology functions Fire Department.

Implementation: For all hazards, long-term implementation, OEM and IT office, priority medium.

17. Develop and implement plans for large-scale evacuations. Ensure a proactive public education component is developed and disseminated. Put a plan in place to implement the evacuation ordinance.
    Implementation: For all hazards, long-term implementation, OEM will lead, priority high.

18. Continue to develop the PDM in a deliberate long-term interactive process that draws in a diverse representation of stakeholders as well as the public. This requires extensive coordination over a long period of time in order to maximize the value of the process and allow all entities sufficient time to review, suggest improvements, prepare appropriate regulatory and other documents as well as integrate the products into the local jurisdiction's organizational and regulatory processes. This includes integration into the City's strategic plan, long-term plans, goals, objectives and planning documents. Timeframe is a minimum 24 months.
    Implementation: For all hazards, long-term implementation, OEM will lead, priority high.

19. Continue to coordinate for and seek improvements in the Community Rating System (CRS) rating for floodplain management to take the City from a rating of 9 to a rating of 7 in the CRS Program, which can be achieved by increasing the regulation of construction and other activity in the flood plain.
    Implementation: For all hazards, long-term implementation, OEM will lead, priority medium.

20. Assist the public to determine if their property is in or out of the flood plain. This is one of several services the local floodplain administration office provides.
    Implementation: For flood hazard, short-term implementation, Flood Plain Administration Office will lead, high priority.

21. Perform a more detailed risk assessment of floods for the City. This should include a more accurate accounting for properties in the flood plain (i.e. field validation or inspection of parcels that have conflicting information in the databases), identify any potential life-safety issues, inventory debris sources, inventory potential hazardous material and potential water quality issues that may arise due to flooding, determine what critical community processes or functions may be disrupted and acquiring other important data to improve risk assessments as well as helping to identify where the priority of disaster response resources should go.
    Implementation: For flood hazard, long-term implementation, OEM will lead, high priority.

22. Inventory, upgrade and improve aging infrastructure that could be affected during a major disaster. Continue to develop and expand a program for identifying and documenting (via GIS and other automated means) problem drainage areas and developing a plan to monitor these sites during significant storm events. In addition, meet other FEMA criteria for performing detailed assessments, inventories, maintenance and other requirements pertaining to storm drainage systems. There is a collateral benefit to this in that it helps raise the score, for Community Rating System (CRS) purposes, and may improve the City's CRS rating, which in turn reduces flood insurance costs.
    Implementation: For all hazards, long-term implementation, Colorado Springs Utilities, Public Works OEM will lead. medium priority.

23. Develop a funding program for drainage and flood control projects, maintenance of drainage facilities as well as related studies.
    Implementation: For flood hazard, long-term project, OEM and Public Works will lead, medium priority.

24. Investigate the feasibility of establishing a program for periodic clean-up of trash and other debris that is in the drainage ways/stream beds that can affect downstream structures in the event of a flood. This was a major problem during the 1935 flood and may have been a direct contributor to several deaths and additional damage.
    Implementation: For flood hazard, long-term project, OEM and Public Works will lead, low priority.

25. While parcels have been identified as to whether they are in the floodplain little data is available for the value of contents, the indirect costs and total economic impact as a result of the loss of functions for all parcels. This was in the PDM guidance distributed by FEMA. The process and data will require time and other resources to collect and analyze to create decision- making information. Many interviews and on site visits will be required. In addition, there may be a large percentage of the population that will not participate. This should be a low priority for funding when compared to other critical tasks/actions. The cost to obtain this information is probably not worth the value of the information that may be obtained. What may be of value is to gather a list of critical infrastructure and critical functions performed by businesses or non-profits and other organizations along with data for public safety as stated in the previous activity.
    Implementation: For flood hazard, long-term project, OEM will lead, medium priority.

26. Perform new drainage basin studies, update drainage basin studies, review previous drainage basin studies and flood studies for recommendations that are still valid and make an assessment as to status and validity.
    Implementation: For flood hazard, long-term project, Public Works will lead, medium priority.

27. Continue to develop programs and allocate resources for the reduction of fuels in potential wildfire areas. This includes continuing an educational FireWise program as well as organizing and providing resources that can be used to reduce natural fuels.
    Implementation: For wildland fire hazard, long-term project, OEM and Fire Department will lead, high priority.

28. Investigate the development of partnerships with non-profits and other organizations for their assistance in implementing Wildfire Mitigation Plans and other hazard reduction programs. This would include investigating the establishment of a vegetation management enterprise capability; a non-profit or other organization to help senior citizens, families with significant physical limitations, governmental agencies, etc. to mitigate wildfire hazards (e.g. fuels).
    Implementation: For wildland fire hazard, long-term project, OEM and Fire Department will lead, medium priority.

29. Continue the planned update of the 2001 Wildfire Mitigation Plan, including reassessments of parcels identified in the Wildland Urban Interface, as was previously done for the formulation of the Wildfire Mitigation Plan 2001
    Implementation: For wildland fire hazard, long-term project, OEM and Fire Department will lead, high priority.

30. Perform a more detailed analysis of Wildfire Risk Assessment for the City (either in conjunction with the update of the 2001 Wildfire Mitigation Plan or separately.
    Implementation: For wildland fire hazard, long-term project, OEM and Fire Department will lead, high priority.

31. Continue to investigate the adoption of National Fire Protection Association (NFPA) standard codes or other standards of good practice that are applicable to managing a program for wildland fire.
    Implementation: For wildland fire hazard, long-term project, OEM and Fire Department will lead, medium priority.

32. While parcels have been assigned a wildfire hazard rating little data is available for the value of contents, the indirect costs and total economic impact as a result of the loss of functions for all parcels. What may be of value is to gather a list of critical infrastructure and critical functions performed by businesses or non-profits and other organizations along with data for public safety as identified in an earlier activity.
    Implementation: For wildland fire hazard, long-term project, OEM and Fire Department will lead, medium priority.

33. Continue to involve the Colorado Geological Survey in land reviews and hazard assessments.
    Implementation: For landslide hazard, short-term project, OEM and Planning will take the lead, medium priority.

34. Continue monitoring programs and support other monitoring programs for active landslides and slopes that show signs of potential failure.
    Implementation: For landslide hazard, long-term project, OEM will lead, high priority.

35. To the extent possible continue to encourage and or support initiatives and landslide research projects (either through in-kind contributions, providing data, GPS survey support, facilitating easy access to geological, geotechnical, geo-hazard and other related reports that are submitted to the City or support in other ways that are feasible).
    Implementation: For landslide hazard, short-term project, OEM and Fire Department will lead, medium priority.

36. A future goal of this Pre-Disaster Mitigation Plan is to further explore and refine the identified loss reduction activities. Examples of continuing to refine the loss reduction activities are to explore the feasibility and benefit versus cost analysis of the current and future projects.
    Implementation: For all hazards, short-term project, OEM, Fire Department, Public Works will take the lead, high priority.

37. A future goal of Colorado Springs' mitigation strategy for severe weather will be to further assess and accurately quantify the total number of person and structures that are vulnerable within Colorado Springs'. This goal will be included within the plan maintenance of the Pre-Disaster Mitigation Plan and will be accomplished in future revisions utilizing FEMA 386-2 "Understanding Your Risks."
    Implementation: For severe weather hazard, long-term project, OEM will take the lead, high priority.

38. A future goal of Colorado Springs' mitigation strategy for landslide will be to further assess and accurately quantify the total number of person and structures that are vulnerable within Colorado Springs' landslide prone areas. This goal will be included within the plan maintenance of the Pre-Disaster Mitigation Plan and will be accomplished in future revisions utilizing FEMA 386-2 "Understanding Your Risks."
    Implementation: For landslide hazard, long-term project, OEM will take the lead, high priority.

39. A future goal of Colorado Springs' mitigation strategy for flooding will be to further assess and accurately quantify the total number of person and structures that are vulnerable within Colorado Springs' floodplains.
    Implementation: For flood hazard, long-term project, OEM will take the lead, high priority.

Identification and analysis of a comprehensive range of specific mitigation actions, activities and projects 201.6(c)(3)(ii)

The goals and action items for the Plan were developed from interviews and meetings with experts and local government officials.

The criteria used for developing the goals and actions that given no funding constraints would be doable and contribute to the community's preparedness. Actions are not included if it is obvious that they serve no value towards disaster mitigation.

The methodology is that if a vision with defined strategies, goals, objectives and loss reduction activities is developed in an unconstrained environment then this can serve a set of goals and objectives. Rather than eliminate actions because there are insufficient resources are not a choice Colorado Springs would desire to make. While funding and other resource constraints may preclude executing many of the activities and projects (loss reduction activities) this should not be the factor that eliminates them from the list. It is important that all identified activities and projects (loss reduction activities) remain on the list to ensure that our view of the ideal path is not lost. Later, if the activity is important enough, and with an acceptable benefit versus cost analysis, funds may become available or other solutions may be found. Similarly, Colorado Springs will identify other activities in the future that should be added to the list. On the other hand, if an activity and project (loss reduction activity) becomes obsolete and no longer useful it is removed.

Rating them high, medium, or low prioritizes each of the loss reduction activities within each category. While some activities have been completed, it is recognized that not every activity can be completed. Factors related to prioritization include those projects that are most vulnerable, have great social impact, are technically feasible, have limited environmental impact, have favorable economic impact, and for which the administrative capabilities exist. Other input is considered related to the potential politics involved and the total cost.

Implementation of Mitigation Measures 201.6 (c)(3)(iii)

The action items were developed for specific mitigation projects or for processes. Some of the action items have already been implemented. Some of the actions are listed only as future goals for mitigation projects.

Priorities have been assigned to all of the mitigation actions and projects based on information available at the time this document was prepared. The priority was determined based on information from interviews with experts and local governing officials.

Funding is a major issue that confronts Colorado Springs as well as other local jurisdictions. In addition, funding has to be reprioritized on a frequent basis to address changes in needs and requirements. Therefore, specific timelines and funding sources will not be shown on this list of actions.

Colorado Springs will implement action items identified based on a positive cost/benefit ration, community goals, planning objectives, funding availability, environmental concerns and public support.

Plan Maintenance Procedures 201.6(c)(4)

Monitoring, Evaluating and Updating the Plan 201.6(c)(4)(i)

The Colorado Springs Office of Emergency Management will be the lead agency for this task. The Plan will be periodically reviewed by the public and other stakeholders and revised on a 2 to 3 year cycle. The PDM Plan will be updated if risks, vulnerabilities, goals, objectives or other components of the PDM Plan change. As objectives, activities and projects are accomplished they will be reviewed and either removed or modified to reflect the current situation. The Plan will be modified as necessary in order to address changing requirements and to meet current conditions/situations. The Plan will be kept current to meet any changes in laws or regulations. Regardless of whether there are content changes to the Plan it will be updated no later than the 2 to 3 year cycle.

All city entities, city enterprises, the public and other stakeholders will be part of any review and update process for the PDM. Part of the review process will include a Total Quality Improvement assessment so that lessons learned can be integrated back into the PDM Program and make it that much better. A report will be provided to the City Council, the State and FEMA after each of the reviews and updates along with a revised document.

Implementation through existing programs 201.6(c)(4)(ii)

Within the list of action items that are included with this Plan there are a significant number that are already implemented using existing programs and policies. Others will be implemented as they go through the public process and are further coordinated and staffed to ensure they are viable.

The City of Colorado Springs already practices many forms of mitigation activities. General examples of mitigation practices include zoning, development standards and permitting, building and fire code standards, land use regulations, and floodplain administration. Specifically, the Colorado Springs Fire Department actively incorporates ongoing FireWise mitigation activities for areas that include the Wildland Urban Interface and the City Engineering department is an active participant in the ongoing Fountain Creek Watershed Study. These mitigation activities will continue to be utilized in their current format as well as be improved upon in the future.

Funding issues will prevent some of the activities and projects from being implemented. It is too early in the process at this point to know how this will eventually fall out. Some of the activities, projects and programs will require action at the City Council level to authorize the expenditure of tax dollars for these programs. This is a formal process that will involve all the affected City Departments working together to create the legal documents and necessary support material in order for City Council to make a final decision for those activities that are implemented in this manner. The Colorado Springs Office of Emergency Management has the lead on ensuring the PDM Plan is implemented after all changes are made and final approvals are received.

Continued public involvement 201.6(c)(4)(iii)

The Colorado Springs Office of Emergency Management has lead on the public process for the PDM Plan for Colorado Springs. During subsequent reviews and updates the public will also have an opportunity to suggest constructive changes to the Plan. The Plan is available to the extent possible on the City's website as well as having hard copies located at convenient locations. There will also be formal public meetings at the time the Plan is being considered for revision. Minutes will be taken at these meetings and all action items will be identified and acted upon as part of the process. Upon completion of the public process the City Council will be briefed and final approval will rest with them. The City Council allows for comments during the time they are considering the document for approval.

Acronyms

APA	**American Planning Association**
ARC	**American Red Cross**
CASFM	**Colorado Association of Stormwater and Floodplain Managers**
CDBG	**Community Development Block Grant**
CDEM	**Colorado Division of Emergency Management**
CDOT	**Colorado Department of Transportation**
CDOW	**Colorado Division of Wildlife**
CDPHE	**Colorado Department of Public Health and Environment**
CGS	**Colorado Geologic Survey**
CNHMC	**Colorado Natural Hazards Mitigation Council**
CSFD	**Colorado Springs Fire Department**
CSPD	**Colorado Springs Police Department**
CSU	**Colorado Springs Utilities**
CTAB	**Citizens' Transportation Advisory Board**
CWCB	**Colorado Water Conservation Board**
DH	**Disaster Housing**
DOLA	**Colorado Department of Local Affairs**
EPA	**Environmental Protection Agency**
EWP	**Emergency Watershed Protection Program**
FCO	**Federal Coordinating Officer**
FEMA	**Federal Emergency Management Agency**
FHWA	**Federal Highway Administration**
FMA	**Flood Mitigation Assistance Program**
FSA	**Farm Services Agency**
GAR	**Governor's Authorized Representative**
HM	**Hazard Mitigation**
HMGP	**Hazard Mitigation Grant Program**
HUD	**Housing and Urban Development**
IFG	**Individual and Family Grant**
ICBO	**International Conference of Building Officials**
IHMT	**Interagency Hazard Mitigation Team**
IRF	**Intermediate Regional Flood**
NFIP	**National Flood Insurance Program**
NFPA	**National Fire Protection Association**
NRCS	**Natural Resources Conservation Service**
NWS	**National Weather Service**
OEM	**Colorado Springs Office of Emergency Management**
PA	**Public Assistance**
PDM	**Pre-Disaster Mitigation Plan**
SCO	**State Coordinating Officer**
SBA	**Small Business Administration**
SHMO	**State Hazard Mitigation Officer**
SHPO	**State Historic Preservation Officer**
SPF	**Standard Project Flood**
USACE	**United States Army Corps of Engineers**
USDA	**United States Department of Agriculture**

Definitions/Glossary *(Source FEMA unless noted otherwise)*

Acquisition of hazard-prone structures: Local governments can acquire lands in high hazard areas through conservation easements, purchase of development rights, or outright purchase of property.

Base Flood Elevation (BFE): Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as a standard for the National Flood Insurance Program.

Benefit: Net project outcomes, usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of conducting a benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable risk reduction factors, including a reduction in expected property losses (building, contents, and function) and protection of human life.

Benefit-Cost Analysis (BCA): A systematic, quantitative method of comparing the projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building: A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheel and axles carry no weight.

Capability assessment: An assessment that provides a description and analysis of a community or state's current capacity to address the threats associated with hazards. The capability assessment attempts to identify and evaluate existing policies, regulations, programs, and practices that positively or negatively affect the community or state's vulnerability to hazards or specific threats.

CTAB: Citizens' Transportation Advisory Board (source: Colorado Springs Office of Budget and Financial Analysis)

Coastal zone: The area along the shore where the ocean meets the land as the surface of the land rises above the ocean. This land/water interface includes barrier islands, estuaries, beaches, coastal wetlands, and land areas with direct drainage to the ocean.

Community Emergency Response Team (CERT): CERT is the mechanism to establish, train and maintain a local cadre of residents to act as first responders in the event of an emergency. A CERT team is especially critical in the first three days following a disaster when conditions may prevent access by emergency response personnel.

Community Rating System (CRS): CRS is a program that provides incentives for National Flood Insurance Program communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of these policyholders in communities are reduced.
Comprehensive plan: A document, also known as a "general plan," covering the entire geographic area of a community and expressing community goals and objectives. The plan lays out the vision, policies, and strategies for the future of the community, including all of the physical elements that will determine the community's future

development. This plan can discuss the community's desired physical development, desired rate and quantity of growth, community character, transportation services, location of growth, and siting of public facilities and transportation. In most states, the comprehensive plan has no authority in and of itself, but serves as a guide for community decision-making.

Cost-Effectiveness: Cost-effectiveness is a key evaluation criterion for federal grant programs. Cost- effectiveness has several possible definitions, although for grant-making purposes FEMA defines a cost-effective project as one whose long-term benefits exceed its costs. That is, a project should prevent more expected damages than it costs initially to fund the effort. This is done to ensure that limited public funds are used in the most efficient manner possible. Benefit-cost analysis is one way to illustrate that a project is cost-effective.

Critical facilities: Facilities vital to the health, safety, and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.

Critical facility: (page 3-19 of Interim Plan Criteria) – A facility in either the public or private sector that provides essential services and products to the general public, is otherwise necessary to preserve the welfare and quality of life in the region, or fulfills important public safety, emergency response, and/or disaster recovery functions. A facility could be a building, a transportation route, and a complex of facilities, utilities, hospital or other similar building.

Critical functions: Critical functions are public or private services that are necessary to protect the general public and ensure that public health, life safety, and welfare is sustained.

Debris: The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.

Disaster Mitigation Act of 2000 (DMA 2000): DMA 2000 (Public Law 106-390) is the latest legislation to improve the planning process. Signed into law on October 30, 2000, this new legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.

Earthquake: A sudden motion or trembling caused by a release of strain accumulated within or along the edge of the earth's tectonic plates.

Elevation of structures: Raising structures above the base flood elevation to protect structures located in areas prone to flooding.
Emergency response services: The actions of first responders such as firefighters, police, and other emergency services personnel at the scene of a hazard event. The first responders take appropriate action to contain the hazard, protect property, conduct search and rescue operations, provide mass care, and ensure public safety.

Federal Emergency Management Agency (FEMA): Agency created in 1979 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery. FEMA is now part of the Department of Homeland Security.

Fire ecology: a branch of ecology that focuses on the origins of wildland fire and its relationship to the environment, both living and non-living, in which it occurs. Fire ecologists recognize that fire is a natural process, and that it often operates as an integral part of the ecosystem in which it occurs. The main factors that are addressed in fire ecology are fire dependence and adaptation of plants and animals, fire history, fire regime and fire effects on ecosystems.

Fire regime: Fire regime refers to the patterns of fire that occur over long periods of time, and the immediate effects of fire in the ecosystem in which it occurs. It is a function of the frequency of fire occurrence, fire intensity, and the amount of fuel consumed. The frequency is determined largely by the ecosystem characteristics, the duration and the character of the weather (whether the season is drier or wetter than normal, etc.) and ignition sources. The intensity of a fire is determined by the quantity of fuel available, the fuel's combustion rates and existing weather conditions. Interactions between frequency and intensity are influenced by wind, topography and fire history.

Flood Hazard Area: The area on a map shown to be inundated by a flood of a given magnitude.

Flood Insurance Rate Map (FIRM): Map of a community, prepared by FEMA, which shows both the special flood hazard areas and the risk premium zones applicable to the community under the National Flood insurance Program.

Flood Mitigation Assistance (FMA) Program: A program created as part of the National Flood Insurance Reform Act of 1994. FMA provides funding to assist communities and states in implementing actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other NFIP insurable structures, with a focus on repetitive loss properties.

Floodplain: Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.

Flood proofing: Actions that prevent or minimize future flood damage. Making the areas below the anticipated flood level watertight or intentionally allowing floodwaters to enter the interior to equalize flood pressures are examples of flood proofing.

Flood Zone: A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.

Goals: General guidelines that explain what you want to achieve. They are usually broad policy-type statements, long term in nature, and represent global visions.

Hazard: A source of potential danger or adverse condition.

Hazard Event: A specific occurrence of a particular type of hazard.

Hazard Identification: The process of identifying hazards that threaten an area.

Hazard information center: Information booths, publication kiosks, exhibits, etc. that display information to educate the public about hazards that affect the jurisdiction and hazard mitigation activities people can undertake.

Hazard Mitigation: Sustained actions taken to reduce or eliminate long-term risk from hazards to human life and property.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation activities to be implemented as a community recovers from a disaster.

Hazard profile: A description of the physical characteristics of hazards and a determination of various descriptors, including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.

HAZUS, HAZUS-MH: A GIS-based, nationally standardized, loss estimation tool developed by FEMA. HAZUS-MH is the new multi-hazard version that includes earthquake, wind, hurricane, and flood loss estimate components.

Hurricane: An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160ºE longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

Infrastructure: Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology, such as phone lines or Internet access; vital services, such as public water supplies and sewer treatment facilities; and an area's transportation system: airports, heliports, highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, drydocks, piers, and regional dams.

Intermediate Regional Flood (IRF): Typically this is referred to as a 100 year flood.

Landslide: Downward movement of a slope and materials under the force of gravity.

Loss estimation: Forecasts of human and economic impacts and property damage from future hazard events, based on current scientific and engineering knowledge.

Memorandum of Agreement (MOA): A non-binding statement that defines the duties, responsibilities, and commitment of the different parties or individuals; provides a clear statement of values, principles, and goals; and establishes an organizational structure to assist in measuring and evaluating progress.

Mitigate: To cause something to become less harsh or hostile, to make less severe or painful.

Mitigation actions: Activities or projects that help achieve the goals and objectives of a mitigation plan.

Mitigation plan: The document that articulates results from the systematic process of identifying hazards and evaluating vulnerability, identifying goals, objectives and actions to reduce or eliminate the effects of identified hazards, and an implementation plan for carrying out the actions.

National Flood Insurance Program (NFIP): Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3.

Objectives: Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

OEM: Colorado Springs, Office of Emergency Management.

Open space preservation: Preserving undeveloped areas from development through any number of methods, including low-density zoning, open space zoning, easements, or public or private acquisition. Open space preservation is a technique that can be used to prevent flood damage in flood-prone areas, land failures on steep slopes or liquefaction-prone soils, and can enhance the natural and beneficial functions of floodplains.

Ordinance: A term for a law or regulation adopted by a local government.

Planning: The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.

Policy: A course of action or specific rule of conduct to be followed in achieving goals and objectives.
Post-disaster mitigation: Mitigation actions taken after a disaster has occurred, usually during recovery and reconstruction.

Post-disaster recovery ordinance: An ordinance authorizing certain governmental actions to be taken during the immediate aftermath of a hazard event to expedite implementation of recovery and reconstruction actions identified in a pre-event plan.

Post-disaster recovery planning: The process of planning those steps the jurisdiction will take to implement long-term reconstruction with a primary goal of mitigating its exposure to future hazards. The post-disaster recovery planning process can also involve coordination with other types of plans and agencies, but it is distinct from planning for emergency operations.

Preparedness: Actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Probability: A statistical measure of the likelihood that a hazard event will occur.

PSST: Public Safety Sales Tax (source: Colorado Springs Office of Budget and Financial Analysis)

Public education and outreach programs: Any campaign to make the public more aware of hazard mitigation and mitigation programs, including hazard information centers, mailings, public meetings, etc.

Recovery: The actions taken by an individual or community after a catastrophic event to restore order and lifelines in a community.

Regulation: Most states have granted local jurisdictions broad regulatory powers to enable the enactment and enforcement of ordinances that deal with public health, safety, and welfare. These include building codes, building inspections, zoning, floodplain and subdivision ordinances, and growth management initiatives.

Regulatory power: Local jurisdictions have the authority to regulate certain activities in their jurisdiction. With respect to mitigation planning, the focus is on such things as regulating land use development and construction through zoning, building codes, subdivision regulations, design standards, and floodplain regulations.

Relocation out of hazard areas: A mitigation technique that features the process of demolishing or moving a building to a new location outside the hazard area.

Resources: Resources include the people, materials, technologies, money, etc., required to implement strategies or processes. The costs of these resources are often included in a budget.

Response: The actions taken during and immediately an event to address immediate life and safety needs and to minimize further damage to properties.

Resolutions: Expressions of a governing body's opinion, will, or intention that can be executive or administrative in nature. Most planning documents must undergo a council resolution, which must be supported in an official vote by a majority of representatives to be adopted. Other methods of making a statement or announcement about a particular issue or topic include proclamations and declarations.

Risk: The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

SCIP: Springs Community Improvements Program (source: Colorado Springs Office of Budget and Financial Analysis)

Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

Stakeholder: Stakeholders are individuals or groups that will be affected in any way by an action or policy, including businesses, private organizations, and citizens, that will be affected in any way by an action or policy.

Standard Project Flood: (Source: Bet Lotosky, FPMS Program Manager, United States Army Corps of Engineers, Albuquerque District District). The Standard Project Flood is defined as a

percentage (usually 40% to 60%) of the Probable Maximum Flood. In project construction, the Standard Project Flood is often used to set the spillway crest elevation for flood control, and the Probable Maximum Flood is used to set the top of dam elevation. The Probable Maximum Flood is defined as the flood resulting from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The term "reasonably possible" describes the probable maximum precipitation that, although extreme, could occur given the climatologic and geographic conditions of the area as determined by the National Weather Service. The Corps does not recommend assigning a frequency to the Standard Project Flood, although some will loosely say that the flood falls between the 200-year and the 1,000-year. The floodplain delineations for the Standard Project Flood are computed by running a HEC-2 or HEC-HAS hydraulic model that incorporates the Standard Project Flood peaks.

State Hazard Mitigation Officer (SHMO): The state government representative who is the primary point of contact with FEMA, other state and federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.

Structural retrofitting: Modifying existing buildings and infrastructure to protect them from hazards.

Subdivision: The division of a tract of land into two or more lots for sale or development.

Subdivision and development regulations: Regulations and standards governing the division of land for development or sale. Subdivision regulations can control the configuration of parcels, set standards for developer-built infrastructure, and set standards for minimizing runoff, impervious surfaces, and sediment during development. They can be used to minimize exposure of buildings and infrastructure to hazards.

Tornado: A violently rotating column of air extending from a thunderstorm to the ground.

Vulnerability: Describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power—if an electric substation is flooded, it not only affects the substation but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.

Vulnerability assessment: The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address the effects of hazard events on the existing and future built environment.

Wildfire: An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

Zoning: The division of land within a local jurisdiction by local legislative regulation into zones of allowable types and intensities of land uses.

Zoning ordinance: Designation of allowable land use & intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

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Appendices: Original Scope of PDM Work for SCS, Inc.

The following documents were the initial scope of work for this project. In August 2003 the scope was modified for SCS, Inc. to perform nearly all work on the Pre-Disaster Mitigation (PDM) Plan. Following this page is Appendix E (Summary of criteria related to the PDM) and Appendix F (examples of date and information needed from various stakeholders). Work began in August 2003 on the PDM although some preliminary meetings were held prior to that date.