January 23, 2022

Dylan Monke
Planner, Jefferson County Planning and Zoning
Jefferson County Government

Mr. Monke:

FSBR, LLC is the Applicant on the Shadow Mountain Bike Park project and is requesting to initiate a sufficiency review and referral process of a Proposed Special Use on the A-2 zoning of the State Land Board's Shadow Mountain parcel, identified as ID 61-163-00-001, commonly known as the "**Shadow Mountain Parcel**", and the "**Property**" that is the subject of this application. The Property is depicted on Map 16-61 of the Jefferson County Assessor, with a legal description of:

> *S2NW, SW, and a fractional part of the NWNW (S of Shadow Mtn Drive) of Section 16, Township 6 South, Range 71 West of the 6th Principal Meridian*

Approval of this application would support a Class III commercial recreation facility (the "**Proposed Special Use**") on 235 acres of the 306-acre[1] parcel (the "**Project**"). See the Zoning Map attached hereto as Exhibit A for a depiction of the property and surrounding land uses.

As further described in the Application Narrative, the Proposed Special Use and Project as a whole will align with the vision and goals of the 2020 Jefferson County Master Plan and the 2020 Conifer/285 Corridor Area Plan.

This application includes an accompanying Application Narrative and application materials as required by the Jefferson County Zoning Resolution.

Along with this application, the Applicant team has provided the following list of supplemental application documents. Pursuant to Zoning Resolution Section 9.B., certain documents are required to be submitted with this application. Additionally, the Case Manager provided a separate list of submittal document requirements (many of which are consistent with Zoning Resolution Section 9.B. requirements) described in the County's Submittal Document Requirements Form. The below Item numbers correspond to the County's Submittal Document Requirements Form.

- Item 1: Application Form, Cover Letter and Fees (*Fee provided separately*) [satisfies Zoning Resolution Section 9.B., Items 1, 2, and 3]
- Item 2: Official Development/Special Use/Site Approval Plan [satisfies Zoning Resolution Section 9.B., Item 10]
    - Concept Master Plan
    - Written Restrictions
- Item 6: Site Plan [satisfies Zoning Resolution Section 9.B., Item 11]
- Item 9: Proof of Ownership [satisfies Zoning Resolution Section 9.B., Item 4]
- Item 11: Ownership Documentation
- Item 12: Water [satisfies Zoning Resolution Section 9.B., Item 21]
    - Water Supply Information Summary
    - Water Well Permit Application

[1] Jefferson County Assessor data presents this parcel number as 483 acres, however, State Land Board ownership records describe the parcel as +/- 306 acres. The parcel acreage will be described henceforth as it is on the record.

- Item 13: Wastewater [satisfies Zoning Resolution Section 9.B., Item 22]
    - Onsite Wastewater Treatment System Form (6001)
    - Onsite Wastewater Treatment System Report (*pursuant to LDR Section 22.B.2*)
- Item 14: Fire Protection [satisfies Zoning Resolution Section 9.B., Item 23]
    - Proof of Fire Protection letter (*transmitted directly to County; not included in this document*)
    - Wildfire Hazard Mitigation Plan
- Item 15: Transportation Analysis [satisfies Zoning Resolution Section 9.B., Item 27]
- Item 19: Phase I Drainage Report [satisfies Zoning Resolution Section 9.B., Item 29]
- Item 21: Form 6000: Environmental Questionnaire and Disclosure [satisfies Zoning Resolution Section 9.B., Item 34]
- Item 23: Visual Analysis [satisfies Zoning Resolution Section 9.B., Item 17]
- Item 25: Vegetation Preservation Plan [satisfies Zoning Resolution Section 9.B., Item 19]
- Item 29a: Wildlife Summary [Satisfies LDR Section 4.B., Item 31]
- Item 29b: Vegetation Assessment [Satisfies LDR Section 4.B., Item 31]
- Item 37: Mineral Estate Notification Form [satisfies Zoning Resolution Section 9.B., Item 43]
- Recording Fees [satisfies Zoning Resolution Section 9.B., Item 41] – *Recording fees to be provided separate from this application at time of future document recording.*

The materials provided show that the existing and proposed infrastructure are adequate to support the Project, and that there would be minimal impacts to resources in the area given the proposed design criteria and mitigation measures. The Project will benefit the local community and greater Jefferson County through providing an easily accessible recreation opportunity, reducing over congestion on current Jefferson County Open Space land, while benefiting the local economy through creating dozens of primary jobs and putting millions of dollars in economic revenue into the local community annually.

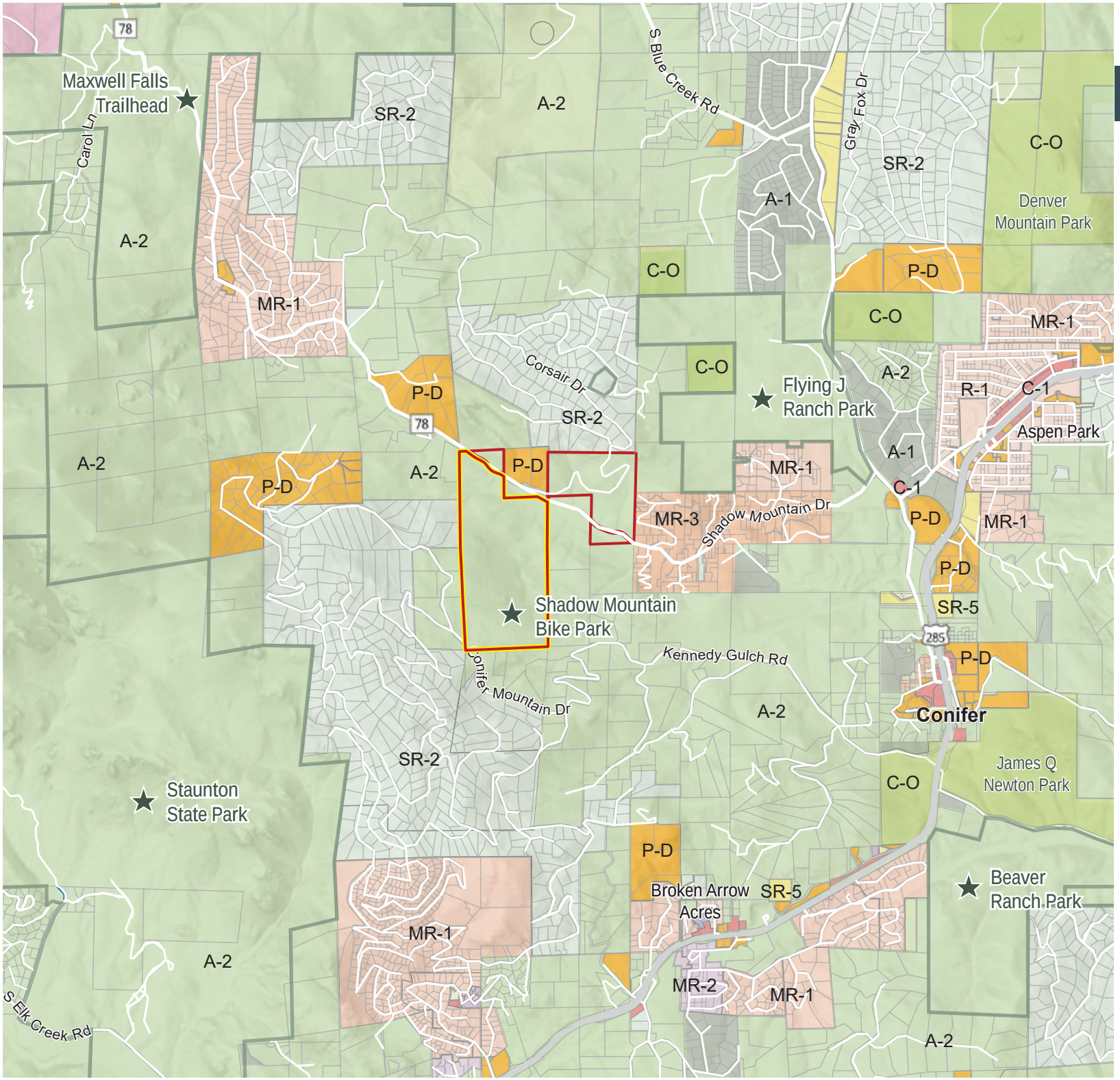
We have completed the Pre-Application process to establish the requirements of this application, and believe that this proposal meets the requirements for approval as determined by the County and our Case Manager. We look forward to moving forward in this process and thank you for the opportunity to do so.

Sincerely,

Phil Bouchard
Shadow Mountain Bike Park

Jason Evans
Shadow Mountain Bike Park

EXHIBIT A: Zoning Map



JEFFERSON COUNTY COLORADO

Shadow MOUNTAIN

SPECIAL USE APPLICATION
Zoning Map

LEGEND

- Parcels
- Highways
- Roads
- Project Area
- Project Parcel
- Parks and Open Space
- Nearby Recreation

Scale (ft)
0 3000

N

Prepared by: SE GROUP

NEARBY RECREATION

Staunton State Park
Zoning: A-2
Distance: <1 mile
Recreation offerings: 30+ miles of trails, visitor center, amphiteater, picnic sites, parking

Flying J Ranch Park
Zoning: A-2
Distance: <1 mile
Recreation offerings: 4.8 miles of trails, picnic shelters, parking

Beaver Ranch Park
Zoning: A-2
Distance: Approx. 2 miles
Recreation offerings: 60 acres of disc golf, zipline, 6.4 miles of trails, picnic areas, parking

Maxwell Falls
Zoning: A-2
Distance: Approx. 2 miles
Recreation offerings: Approx. 5 miles of trails, parking

Source: Jefferson County jMap

January 23, 2023

Dylan Monke
Planner, Jefferson County Planning and Zoning
Jefferson County Government

Application Narrative

This Application Narrative has been prepared to accompany the FSBR, LLC (the "**Applicant**") application for Special Use approval on the Colorado State Land Board's parcel, identified as ID 61-163-00-001, commonly known as the "**Shadow Mountain Parcel**", and the "**Property**" that is the subject of this application. Approval of this application would support a Class III commercial recreation facility (the "**Proposed Special Use**") on 235 acres of the 306-acre parcel (the "**Project**"). As further described below, County staff recommended a Special Use approval to implement the Project. The Property will remain under the ownership of the Colorado State Land Board. The Colorado State Land Board and the Applicant will agree on a permit to enable operations.

Project Background

Shadow Mountain Bike Park ("**SMBP**" or "**Bike Park**") is a recreational development concept created by Phil Bouchard and Jason Evans. The Project started two and half years ago as an idea to bring chairlift-accessed mountain biking to Jefferson County, and since then has evolved into a community-focused partnership between private, public, and nonprofit organizations with the goal of responsibly growing the sport of mountain biking, while delivering meaningful downstream community benefits. SMBP is excited to submit this application with the support of the Colorado State Land Board and the Colorado Mountain Bike Association and hopes to work with Jefferson County and the broader community to make this shared vision a reality that will bring recreational, environmental, economic, and cultural benefits to the region for decades to come.

The Property

The Property is zoned Agricultural Two ("**A2**"), currently undeveloped, and occasionally used for agricultural and grazing purposes. Pursuant to the Jefferson County Zoning Resolution (the "**Zoning Resolution**"), A2 zoned properties have many permitted uses requiring greater intensity and disruption to the natural landscape than the Proposed Special Use – for example, forestry farming, oil and gas drilling and production, and poultry hatcheries and farms. Zoning Resolution § 33.B. Further, alternative special uses permitted in the A2 zone pose much greater infrastructure impact than the Project, as well as noise, light, resource, wildlife, and traffic impacts. Development of the Property for recreational use aligns with the perceived intentions of the County and the Community because the Project will maintain much of the natural landscape.

Project Vision

The Applicant is not a team of developers by trade, but instead a group of lifelong friends and mountain bikers with a shared vision. The Applicant works alongside community members and acknowledges the overcrowding and user group conflicts present on public trails in Jefferson County. Because of this conflict, the Applicant believes SMBP will inevitably improve the overall community trail-use experience for all user groups. Through this engagement, the Colorado Mountain Bike Association, a large non-

profit organization, emerged as a key partner. It has shared its experience in performing meaningful work in Jefferson County to maintain and expand public trail access for all users. Learning from the Colorado Mountain Bike Association's experience and expertise has provided insight into how the benefits of SMBP can extend far beyond the boundaries of the Bike Park.

The Applicant diligently sought the right partners to make this concept a reality, while simultaneously demonstrating that SMBP will be a benefit to the Conifer Area and Jefferson County more broadly. SMBP's relationship with the Colorado State Land Board began with a conversation about how the Bike Park could be a recreational alternative to the historical ways its land has been leveraged. The Applicant proposed an alternative that would largely preserve the existing state of the land, open hundreds of acres of forest to the community for recreation, and deliver meaningful revenue to support the Colorado State Land Board's mission, which is to leverage its properties to generate revenue for public education in Colorado.

Over the last two years, the Applicant team has engaged civil, recreational, and community entities, with the goal of developing a project with positive impacts across the Conifer community. These impacts include: economic development, wildfire mitigation, traffic control, wildlife cultivation, emergency medical response, natural resource management, and education and public health advocacy. The Applicant has closely assessed these impacts by consulting experts and practitioners in their respective fields. The Applicant firmly believes that people who never step onto the pedals of a mountain bike will nonetheless experience an improvement in their quality of life by the creation of SMBP.

Why SMBP

There is currently no dedicated, lift-accessed mountain bike park in the State of Colorado. In Colorado, the lift-access bike park market is dominated by traditional Colorado ski resorts that offer downhill mountain biking limited to a short (approximately 12 week) summer season. The existing bike parks are predominantly located along the I-70 corridor outside of front range communities.

The Applicant recognizes the need for a bike park situated in close proximity to Jefferson County residents. This project would provide a superior riding experience for interested community members, facilitate rider development for those who are new to the sport, and support the local economy in the Conifer area.

The low-impact concept will open more than 300 acres of forest to the public and deliver wide-ranging benefits to the community. Shadow Mountain Bike Park will alleviate pressure on Jefferson County's community trail networks, and will partner with Colorado Mountain Bike Association (COMBA) and other community advocates to provide a safe, responsible, and professionally managed place for users to enjoy the outdoors. The proposal will also protect the property from more disruptive forms of development that conform to its current zoning.

The Colorado State Land Board has authorized the Applicant to pursue this application and supports the project, along with the many identified community benefits.

Compatibility with Criteria for Decisions for Rezoning and Special Use Applications

Pursuant to the Zoning Resolution Section 6.D., in reviewing proposed Special Use applications, the Planning Commission and the Board of County Commissioners may consider five criteria (described below). This application meets each of the criteria for approving a Special Use, as follows:

Special Use Approval Criteria 1. *The compatibility with existing and allowable land uses in the surrounding area.*

The proposed Special Use is compatible with existing and allowable land uses in the surrounding area. Zoning Resolution § 6.D.1

Existing land uses in the surrounding area include land uses under Agricultural, Mountain Residential, Suburban Residential, and Planned Development districts (see Zoning Map attached hereto as Exhibit A). Much of the Property's surrounding neighborhoods maintain single-family dwellings at a moderate to low density. There are also several existing recreational assets such as Staunton State Park and the Cub Creek and Maxwell Falls trailheads along the nearby Black Mountain Drive. Allowable land uses for surrounding areas include public parks and Class I recreation facilities, group homes, telecommunication uses, and energy conversion systems.

In summary, the land surrounding SMBP supports dispersed development with limited infrastructure to the landscape, which the Project intends to mirror. Particularly, the Project has been designed to respect the natural character of Shadow Mountain to the maximum extent possible by concentrating infrastructure development to the base area and the lift corridor (as depicted on the Site Plan). Additionally, a low-impact trail system will be dispersed throughout the Property in a manner which will be shielded from Shadow Mountain Drive.

Special Use Approval Criteria 2. *The degree of conformance with applicable land use plans*.

The proposed Special Use conforms with the County's Comprehensive Master Plan (the "**CMP**"), the Conifer/285 Corridor Area Plan (the "**Area Plan**"), and the Elk Creek & Inter-Canyon Fire Protection Districts Community Wildfire Protection Plan (the "**WPP**"). Zoning Resolution § 6.D.2.

Jefferson County Master Plan

All Development, Goal 1. Encourage development that is appropriate to the area, promotes healthy, active lifestyles, and ensures that there are unique and diverse communities in which to live, work, and enjoy outdoor Recreation.[1]

The purpose of the Project is to create a unique, accessible outdoor recreation facility. The Project location is compatible with surrounding use intensities and will support community member recreation interests. The Project is extremely unique as it would be the only dedicated lift-served bike park facility in all of Colorado, and would be the only developed recreation facility of its kind in the Conifer area.

The Project will provide opportunities in outdoor recreation and skills progression to a range of recreators, from those travelling from the Denver metro area on the weekends to County locals who want to ride before or after school and work. As such, the Bike Park would attract diverse communities and promote healthy lifestyles and skills progression opportunities.

Lastly, the Project will contribute to the health of the local economy by providing desirable recreation opportunities and additional jobs, guest services, and events to the area. The offerings are quite unique and, therefore, would not detract from support of well-established local businesses within the community. Instead, the Project will likely enhance other spending and economic

[1] Jefferson County Master Plan 2020, p. 18.

generation within the County and the Conifer area, such as food and beverage, retail, fuel, and lodging.

<u>All Development, Goal 2</u>: Encourage economic development by promoting a variety of land uses.[2]

As described above, the Project will create jobs and encourage economic generation throughout the community. The Property will be used for a non-traditional, but compatible land use, which adds variety to the region in a responsible manner.

<u>All Development, Policy (General) 4</u>. An analysis of the benefits of New Commercial or Industrial Development project, such as potential job creation or economic benefit, may be considered in the evaluation of a project.

As described above, the Project and mountain biking as a sport can bring great economic benefits. On average, mountain bikers are willing to travel around 400 miles from home for biking opportunities, and it's likely that the location of the Bike Park may serve a population different than that of visitors to existing bike parks further into the Rocky Mountains.

<u>All Development, Policy (General) 6</u>. New Development should strive to properly and reasonably mitigate the harmful effects, if any, on existing and currently entitled (zoned) uses on adjacent parcels.

As described in detail in this application, the resource reports takeaways and Planning Criteria, included in Appendix A, evaluate potential impacts to surrounding areas and resources, in turn providing a roadmap for mitigation. Specially, the Planning Criteria proposes how any harmful effects would be mitigated, therefore, protecting adjacent parcels from negative impacts. Additionally, studies have shown that recreation opportunities are associated with higher property values.[3]

<u>All Development, Policy (General) 10</u>. Encourage land uses that support Active Living and enhance public health.[4]

A new, unique recreation opportunity, such as this Project, exemplifies an opportunity for Active Living and enhancing public health within the Shadow Mountain and broader Conifer community, resulting in various health benefits to County residents. Additionally, by providing a controlled mountain biking experience, some guests may consider outdoor recreation when they hadn't considered it before, feel more comfortable venturing into the forests and outdoor spaces on their own, and seek out a new opportunity to support an active lifestyle.

<u>Site Design, Goal 1</u>. Ensure design is compatible with community character and natural surroundings.[5]

As detailed in the Site Plan and Operational Considerations, the Project has been very intentionally designed to ensure compatibility with community character and natural surroundings, including: concentrating the majority of Project infrastructure in one area; maintaining standard recreation use noise levels; designing signage and lighting to comply with County standards; using native vegetation; and other design considerations further detailed in this application.

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[2] *Id*.
[3] Headwaters Economics 2016
[4] Jefferson County Master Plan 2020, p 19.
[5] *Id*. at p. 29.

Geologic Hazards & Constraints, Goal 1. Ensure New Developments properly address physical constraints.[6]

Per the Jefferson County jMap, the only geologic hazard and constraint affecting the Property is a slope of greater than 30%. As such, the majority of Project infrastructure will be developed at the base of the Property and heavily sloped areas will be preserved for recreation use and necessary infrastructure to serve such use.

Additional Physical Constraints including Floodplains, Wetlands, Wildfire, radiation, landfills, abandoned mines, and Wildlife.[7]

The Applicant team has made the necessary resource inquiries, studies, and sought expert advice to ensure physical constraints, if any, do not negatively impact the Project or the surrounding community.

Community Resources, Air, Light, Odor, and Noise, Goal 1. Encourage the effective management of air quality and the impacts of light, odor, and noise.[8]

Please see Operational Considerations, attached as Appendix C, for an overview of light and noise considerations integrated into Project planning.

Community Resources, Recreational Trails, Goal 1. Provide extensive trail systems throughout the County.[9]

The Project will not only provide additional trails in the County; it also satisfies the current need for distinct mountain biking trails. The Project will relieve trail congestion in other parts of the County, and state.

Community Resources, Infrastructure, Water & Services, Goals 1-4.

- *Protect the quality and quantity of water resources in the County.*
- *Ensure that New Development has appropriate water service and wastewater treatment.*
- *Ensure New Development's water demands can be met by the natural carrying capacity of the land to ensure the long-term viability of the development.*
- *Manage the use of wells and On-Site Wastewater Treatment Systems (OWTSs) to ensure that the quantity and quality of water resources are sustained, and human health and the environment are protected.*

The Project will ensure water is available, water quality is protected, and proper treatment systems are in place. For a more detailed explanation, see Special Use approval criteria #4 below in regard to water and wastewater infrastructure to be provided for the Project.

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[6] *Id.* at p. 33.
[7] *Id*. at pgs. 34-39.
[8] *Id*. at p. 43.
[9] *Id*. at p. 46.

Conifer/285-Corridor Area Plan

The Conifer/285 Corridor Area Plan focuses specifically on the Conifer area and policies, design guidelines, and other standards for various land uses. The Project falls within the Non-Residential and Mixed-Use policies, which are listed below:[10]

1. *Provide retail, office, industrial and community use activities that are needed for employment opportunities and for the convenience of local residents.*

As described herein, the Project would offer employment opportunities to locals for bike patrol, park operations, lift operations, and more. The Applicant will encourage hiring of qualified people from the local community as an equal opportunity employer, while striving to maintain a diverse workforce.

2. *Encourage existing retail, office, and industrial zoning developments to comply with this Plan, Design Guidelines and Architectural Standards.*

As demonstrated in this application, all components of the Project will be compliant with applicable architectural and design guidelines. Specifically, all buildings would be limited to a maximum height of 35 feet and would use colors and materials that blend with the surrounding natural environment. These guidelines are further described in the Planning Criteria.

3. *Ensure that new retail, office, industrial and community use activities are compatible with existing surrounding uses in terms of traffic, water and sewer, noise, visual amenities, and air quality, and comply with this Plan, Design Guidelines and Architectural Standards.*

The Project is compatible with existing surrounding uses and would implement mitigation measures on resources such as traffic, water and sewer, noise, visual amenities, and air quality to reduce our impact on surrounding areas and resources. These measures are further described in the Planning Criteria.

4. *Encourage retail, office, industrial, community use activities, and open space within activity centers to avoid strip development, especially along US 285.*

The Project is not located within an activity center, however, it is promoting minimal development that benefits public health and the economy. It does not promote strip development.

5. *Ensure that retail, office, industrial, and community uses outside of activity centers, in those areas that may be rezoned for such activity, comply with all applicable site design policies to minimize the adverse impacts of dispersed development.*

The Project does not require rezoning. It does, however, require a Special Use approval, the procedures and design policies of which have been and will continue to be followed.

6. *Encourage Jefferson County to adopt and require architectural and design standards that reflect the unique character of this mountain community.*

By preserving a majority of the mountain landscape, the Project promotes maintaining the character of the mountain community. Additionally, Project design guidelines will be consistent with that of the County, approved land use plans, and existing developments in the surrounding area.

[10] Conifer/285 Corridor Area Plan, p. 7.

7. *Local employment should be promoted to support a balanced local economy and minimize vehicle miles traveled.*

The economic impacts of the Project are outlined above and include job opportunities, business for local economies, may result in increases in property value, and more.

Community Wildfire Protection Plan

The Property is located is within the Elk Creek Fire Protection District (ECFPD). In 2021, ECFPD and the Inter-Canyon Fire Protection District (ICFPD) collaborated on their efforts to reduce hazards and prepare their districts for future emergencies. This resulted in the 2021 Community Wildfire Protection Plan (CWPP) for the Elk Creek & Inter-Canyon Fire Protection Districts. The plan was prepared by Ember Alliance, the same firm that prepared the Applicant's Wildfire Hazard Mitigation Plan (Item 14) for this application.

Together, ECFPD and ICFPD cover 154 square miles of land in Jefferson and Park counties.[11] This area has moderate to very heavy fuel loads, which can produce events ranging from surface/grass fires to active crown fires that quickly become uncontained and uncontrollable.[12] The plan covers existing risk within the County and lists community recommendations for mitigation and preparedness.

Community-wide recommendations in the CWPP include suggestions for new developments and expansions of existing developments, as follows:[13]

1. *Multiple egress routes: more than one way in and out of the neighborhood, preferably on opposite sides of the neighborhood, to create options for evacuations. Neighborhoods with only one road to get in or out can be cut off and trap the residents. Multiple helps protect the life safety of the residents.*

The Applicant has considered how to integrate this recommendation into the Project. The base area of the Property is fairly compact and, therefore, does not support providing egress routes on either side of the Project site. While the Project only proposes one way in/out of the Property at this time, the Applicant has considered adding an egress option at the top of Shadow Mountain to evacuate via Conifer Mountain Drive. The access road would be able to connect through a neighboring property into Conifer Mountain Drive. The property owner has agreed and offered this option as an egress route in case of fire. This could be an option in an event where Shadow Mountain Drive cannot be used for egress. The Applicant is open to further discussing and implementing this option if deemed necessary by County staff.

2. *Adequate signage: a well-maintained road network that is signed with reflective signs for streets and addresses helps residents navigate during evacuations when thick smoke or weather makes navigation difficult. It also helps law enforcement personnel find homes to assist with evacuations and firefighters navigate the neighborhood more easily and find homes when defending structures. (see Accessibility and Navigability for Firefighters for individuals, and Accessibility and Navigability for Firefighters for neighborhoods).*

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[11] Community Wildfire Protection Plan for the Elk Creek & Inter-Canyon Fire Protection Districts 2021
[12] *Id*.
[13] *Id*. at p. 45-46.

All proposed signage will comply with County standards and the Applicant will ensure that it would be visible in evacuation scenarios. *See Planning Criteria for further detail.*

3. *<u>Roadway management with maintenance plans</u>: roadway treatments to create survivable roadway conditions for residents evacuating and firefighters working on wildfires. Roadway treatments need maintenance, and planning for that work initially is important to ensure it happens. Regeneration and tree mortality are natural events that can reduce roadway survivability over time and should be planned for (see Accessibility and Navigability for Firefighters and Roadway Fuelbreak Recommendations).*

The Applicant plans to clear the base area of vegetation with high fuel loads and create effective defensible space around the parking lot and day lodge. While the Applicant does not currently plan to complete mitigation along Shadow Mountain Drive, they are more than happy to assist with the effort to do so at the County's request and upon further discussion.

<u>Fuel Treatments</u>

In addition to New Development Evacuation Planning, the CWPP lists general objectives for fuel treatments, which include Home Ignition Zone mitigation, stand-level fuel treatments, and roadway fuel treatments.[14] The Home Ignition Zone establishes defensible space around homes and structures to increase the likelihood of the home surviving in a fire. This includes an area of 100 feet for defensible space which has three zones with different levels of clearing. As described in the Planning Criteria and depicted on the Site Plan, the day lodge and maintenance building will meet this standard.

Stand-level fuel treatments aim to create healthy forests that are resilient to wildfires. This includes reducing dense clumps of dry conifer forests and slash management. The Applicant proposes to conduct slash management (or burning of pine needles, leaves, downed trees, and other natural fuel sources on the ground) in all areas of clearing, as well as selective clearing of conifers throughout the 235-acre Project area to reduce fuel loads and mitigate the risk of active crown fires. Lastly, while roadway fuel treatments along Shadow Mountain Drive would greatly improve evacuation safety, this is not a part of the Project proposal as it is outside of the Property, but, as mentioned above, the Applicant is willing to help with efforts to make this happen in the future.

Lastly, the CWPP stresses the importance of working within communities to create mosaic landscapes with varied fuel types, which can reduce the risk of fire spreading. The Applicant plans to work collaboratively with those who are interested within the Shadow Mountain community to prioritize fire safety and mitigating risk.

<u>General Support Goals</u>

The Project will directly support goals that focus on promoting public health, recreation, and economic vitality. The Project will support a diverse group of new mountain bike riders through family-friendly programming and teaching programs, as well as riders hoping to improve their mountain biking skills on trails with a variety of ability levels and features. This will introduce more members of the community to outdoor recreation and respect for the natural environment in a safe and controlled way.

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[14] *Id*. at p. 51.

Several studies show that outdoor recreation opportunities can improve public health by promoting active lifestyles, which can reduce all-cause mortality.[15] Additionally, the development of an asset such as a lift-served bike park can have a variety of economic impacts for the community by creating primary jobs, increasing services offered, promoting tourism, and increasing surrounding property values. These benefits are explained further in Special Use Approval Criteria 5.

As for wildfire mitigation, the Applicant plans to perform selective clearing in areas with clumps of high fuel loads and will prioritize the clearing of dry-mixed conifers where possible. Additionally, the Applicant will support local projects that aim to reduce wildfire risk and improve evacuation conditions and hopes to collaborate with local community members for a more comprehensive approach to wildfire management.

Special Use Approval Criteria 3. *The ability to mitigate negative impacts upon the surrounding area.*

The proposed Special Use will have protections in place to mitigate any negative impacts upon the surrounding area. Zoning Resolution Section 6.D.3.

As described above, the Applicant has carefully considered ways to mitigate direct impacts upon the surrounding area:

- The Planning Criteria covers resources mitigation measures including, but not limited to: avoiding development on wetlands to the greatest degree feasible; implementing erosion control measures to reduce sediment runoff; limiting water use so as to not impact adjacent water rights; complying with setback distances from neighboring wells for onsite wastewater treatment facilities; using materials and colors that blend with the existing landscape; and strictly enforcing parking rules and regulations.

- The Written Restrictions (Item 2) provide County-enforceable measures related to operating hours, sound, smoking and fires, animals, trash management, signage, access and parking, lighting, landscaping, noxious weeds, and hunting.

Additionally, the Project will reduce impacts on surrounding areas. The Conifer area currently has an abundant network of multi-use trails. Staunton State Park is less than a 10-mile drive from the Property and offers public recreation opportunities ranging from hiking and mountain biking to fishing and picnicking. It is common that multi-use trails for hikers, bikers, and other user groups experience user conflict, and it is difficult to create trails designed specifically for mountain bikers when other uses are also in mind. The Project would offset mountain bike users from existing recreation opportunities, in turn providing a better experience for the balance of trail users. As a result, the Project will relieve a level of user impact and periods of congestion currently existing on trail systems in the County and the State.

Special Use Approval Criteria 4. *The availability of infrastructure and services.*

As described in the Resource Reports submitted with this application, the Applicant has directed expert analysis of traffic, water, wastewater, and wildfire considerations.

- Traffic. The Project is proposed to generate approximately 940 trips per day on peak days, through the Conifer area and on Shadow Mountain Drive. The existing roadway infrastructure has adequate capacity to handle the proposed trips generated, however, there are two

[15] BBC Research and Consulting 2016

intersections that experience delays that would be exacerbated by the Project. The Applicant proposes to work with the County to determine necessary improvements to reduce these delays.

- Water and Wastewater. Water and wastewater facilities to support the Project will be developed on-site. Based on the Water Supply Information Summary (Item 12), the Project's maximum required pump rate of 3.8 gallons per minute (gpm) should be available via well water. The Applicant also proposes a supplemental water storage tank to ensure required water availability, the details of which will be confirmed through further testing and expert guidance. Lastly, as indicated by the Onsite Wastewater Treatment System Report (Item 13), a septic tank will handle all sewage on-site. Therefore, the Project will not divert resources from or place additional pressure on local water and wastewater systems.
- Emergency Services. The Applicant acknowledges the importance of available, reliable emergency services to serve the Project if ever necessary. The Elk Creek Fire District has provided a will-serve letter confirming its capacity to serve the Project. Additionally, the Applicant will integrate wildfire mitigation techniques on the Property. As for recreation-related emergency services, like EMS services, the Project will provide such services on site so as to not place strain on local providers. Bike Park users will only be transported to facilities outside of the Property when the injury or illness cannot be handled at the Project facilities. The Project's on-site emergency services will provide an additional opportunity for jobs to qualified and interested locals.

Special Use Approval Criteria 5. *The effect upon the health, safety, and welfare of the residents and landowners in the surrounding area.*

The Proposed Special Use will not adversely affect the health, safety, and welfare of the residents and landowners in the surrounding area. Mountain biking offers a variety of health and economic benefits. A recent study shows that all-cause mortality is reduced 2 percent in Colorado residents who regularly bicycle.[16] Other studies have shown a positive correlation between proximity to walking and biking infrastructure in the long term.[17] Additionally, the percentage of Colorado residents that ride bicycles per year is approximately 48 percent higher than that of the United States, showing a high demand and popularity for the activity.[18]

The economic benefits from bicycling are evident in Colorado as well, where bicycle tourism attracted 1.7 million tourists between 2015 and 2016 and produced $448 million in out-of-state tourism dollars.[19] Projections based on preliminary revenue figures show that approximately 20 years after initial opening of the Bike Park, the lease agreement with the Colorado State Land Board would produce $500,000 to be distributed for public education.

In addition to health and tourism benefits, the Project will provide primary job opportunities. Employees will be hired for lift operations, retail, general management, maintenance, and bike patrol/EMS services, among other services. The Applicant will prioritize hiring qualified locals and will offer trainings where applicable.

In terms of safety, the Project will meet all human and environmental health standards and provide mitigation where necessary. For example, the Project will provide additional emergency services

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[16] BBC Research and Consulting 2016
[17] Goodman et al. 2014
[18] BBC Research and Consulting 2016
[19] *Id*.

such as the bike patrol that can easily access trails and respond on-site, unlike in surrounding public trails systems. The proposed wildfire mitigation measures on the 235 acres, detailed in Special Use Approval Criteria 2, will also promote public safety by reducing the risk of wildfire spread.

Community Meeting Summary

In the process of preparing this application, the Applicant held community meetings on July 27, 2022 and October 17, 2022. These meetings, along with guidance from the Project Case Manager, steered the content of this application.

July 27, 2022 Meeting. The Applicant team, in conjunction with Jefferson County, hosted a virtual public meeting and Q&A for the public to learn about the project and provide input. There were approximately 300 people in attendance. The Applicant received about 700 questions/comments during the meeting during a live Q&A and through the chat function. The Applicant team replied to as many questions as possible during the meeting and reviewed all questions afterwards.

Primary themes included: County process, Project location, traffic and parking, mountain biking, forest fires, wildlife and environmental concerns, landowner questions, infrastructure, chairlift, water, and emergency services. Primary concerns in questions/comments included: added traffic on Shadow Mountain Drive, development within the Shadow Mountain community, additional cars and people in the area impacting emergency and/or evacuation scenarios, food and beverage facilities (or lack thereof), and inclusivity. The Applicant team also received questions/comments focused on why they chose the Project area, trail details, alternative land uses for the parcel, water source and uses, human/wildlife interactions, and impacts to nearby recreation.

October 17, 2022 Meeting. This additional community meeting was hosted by residents in the Conifer and South Evergreen communities. This meeting focused primarily on public safety issues along Shadow Mountain Drive and featured a member of the Colorado State Patrol responsible for the Conifer area as the guest speaker. Two members of the Applicant team joined this meeting to represent SMBP. Discussion topics focused on previous traffic studies and trends in Jefferson County. In discussing the Project, the guest speaker indicated that it would not make the road more intrinsically unsafe and would not bring the road over capacity in an evacuation scenario.

Discussion

For the Applicant team, the most impactful experience over the past several years has been the abundance of opportunities to engage with the members of the community. The Applicant team has spoken with and listened to thousands of people whose opinions about the Project range from full enthusiasm to doubts and concerns. The outpouring of community support and feedback has been extremely encouraging and will result in the best path forward. The Applicant team appreciates the supporters who have kept the team motivated and focused, as well as the critics who have flagged concerns, allowing the team to work diligently to address. The result of such engagement is the Project before the County, which the Applicant team considers well-balanced and an exciting opportunity for the entire community.

The Applicant team plans to continue engagement with local residents, especially neighbors to the Property, and to pursue local collaboration opportunities with businesses, school groups, and others who may benefit from this Project following County review of this application. The Applicant team is deeply grateful to everyone who has taken the time to engage with this Project, individuals and groups who have used their experience and talents to challenge assumptions, sharpen the vision, and

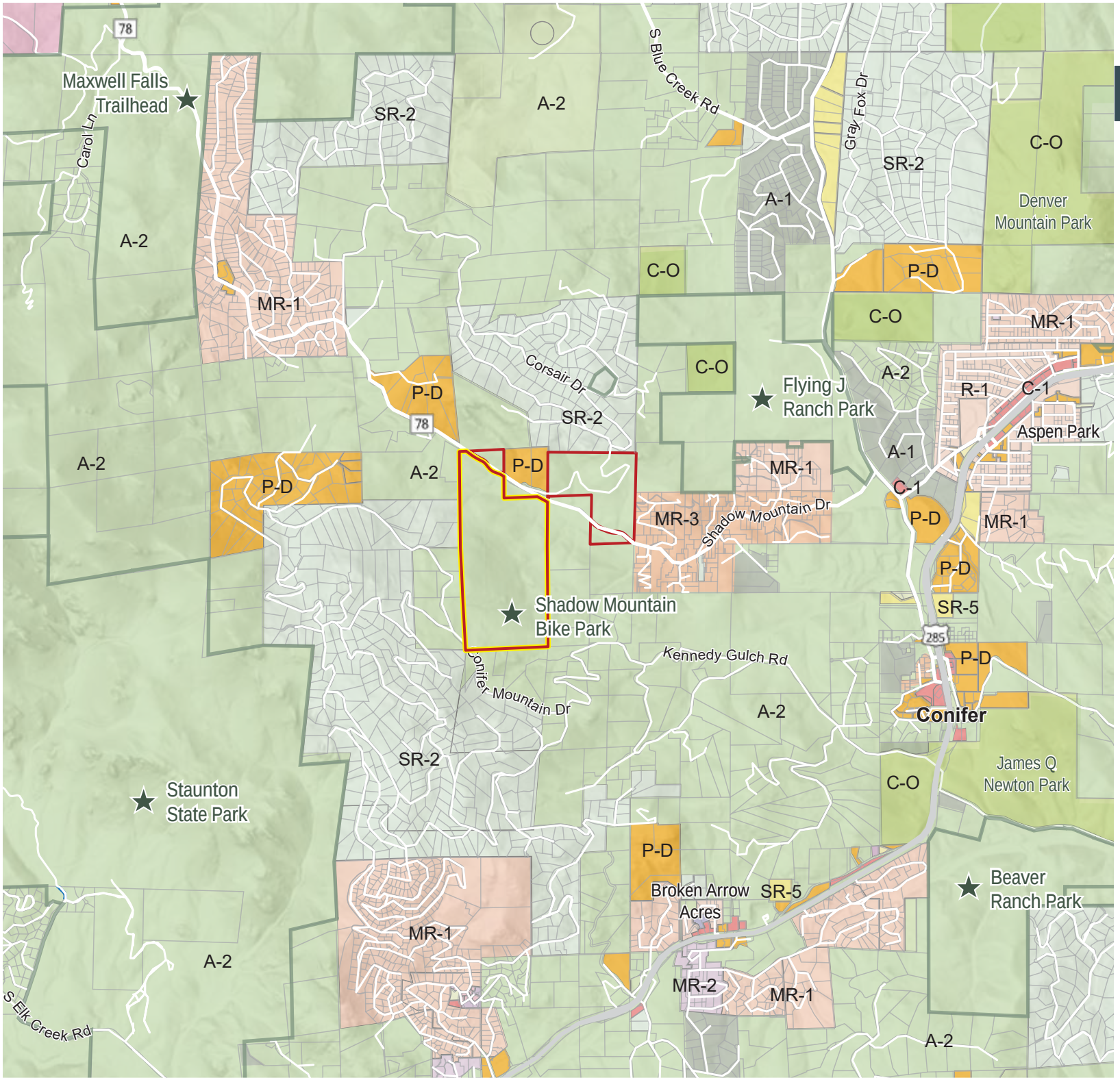
strengthen this application. The Applicant team looks forward to working with the County as the Project proceeds.

Submittal Document Requirements

As a final logistical matter, the Applicant team has provided the following list of supplemental application documents with this application. Pursuant to Zoning Resolution Section 9.B., certain documents are required to be submitted with this application. Additionally, the Case Manager provided a separate list of submittal document requirements (many of which are consistent with Zoning Resolution Section 9.B. requirements) described in the County's Submittal Document Requirements Form. The below Item numbers correspond to the County's Submittal Document Requirements Form.

- Item 1: Application Form, Cover Letter and Fees (*Fee provided separately*) [satisfies Zoning Resolution Section 9.B., Items 1, 2, and 3]
- Item 2: Official Development/Special Use/Site Approval Plan [satisfies Zoning Resolution Section 9.B., Item 10]
    - Concept Master Plan
    - Written Restrictions
- Item 6: Site Plan [satisfies Zoning Resolution Section 9.B., Item 11]
- Item 9: Proof of Ownership [satisfies Zoning Resolution Section 9.B., Item 4]
- Item 11: Ownership Documentation
- Item 12: Water [satisfies Zoning Resolution Section 9.B., Item 21]
    - Water Supply Information Summary
    - Water Well Permit Application
- Item 13: Wastewater [satisfies Zoning Resolution Section 9.B., Item 22]
    - Onsite Wastewater Treatment System Form (6001)
    - Onsite Wastewater Treatment System Report (*pursuant to LDR Section 22.B.2*)
- Item 14: Fire Protection [satisfies Zoning Resolution Section 9.B., Item 23]
    - Proof of Fire Protection letter (*transmitted directly to County; not included in this document*)
    - Wildfire Hazard Mitigation Plan
- Item 15: Transportation Analysis [satisfies Zoning Resolution Section 9.B., Item 27]
- Item 19: Phase I Drainage Report [satisfies Zoning Resolution Section 9.B., Item 29]
- Item 21: Form 6000: Environmental Questionnaire and Disclosure [satisfies Zoning Resolution Section 9.B., Item 34]
- Item 23: Visual Analysis [satisfies Zoning Resolution Section 9.B., Item 17]
- Item 25: Vegetation Preservation Plan [satisfies Zoning Resolution Section 9.B., Item 19]
- Item 29a: Wildlife Summary [Satisfies Land Development Regulation Section 4.B., Item 31]
- Item 29b: Vegetation Assessment [Satisfies Land Development Regulation Section 4.B., Item 31]
- Item 37: Mineral Estate Notification Form [satisfies Zoning Resolution Section 9.B., Item 43]
- Recording Fees [satisfies Zoning Resolution Section 9.B., Item 41] – *Recording fees to be provided separate from this application at time of future document recording.*

EXHIBIT A: Zoning Map



JEFFERSON COUNTY COLORADO

Shadow MOUNTAIN

SPECIAL USE APPLICATION
Zoning Map

LEGEND

- Parcels
- Highways
- Roads
- Project Area
- Project Parcel
- Parks and Open Space
- Nearby Recreation

Scale (ft)
0 3000

N

Prepared by: SE GROUP

NEARBY RECREATION

Staunton State Park
Zoning: A-2
Distance: <1 mile
Recreation offerings: 30+ miles of trails, visitor center, amphiteater, picnic sites, parking

Flying J Ranch Park
Zoning: A-2
Distance: <1 mile
Recreation offerings: 4.8 miles of trails, picnic shelters, parking

Beaver Ranch Park
Zoning: A-2
Distance: Approx. 2 miles
Recreation offerings: 60 acres of disc golf, zipline, 6.4 miles of trails, picnic areas, parking

Maxwell Falls
Zoning: A-2
Distance: Approx. 2 miles
Recreation offerings: Approx. 5 miles of trails, parking

Source: Jefferson County jMap

Appendix A: Resource Report Takeaways and Planning Criteria

The Applicant's goal is to maintain the character of the existing landscape on the Property while improving the recreational opportunities in the area and promoting healthy lifestyles among local and regional visitors. Oftentimes, the more people engage with the natural environment in a recreational sense through activities such as biking, running, rock climbing, skiing, or hunting, the greater appreciation they have for the natural environment and the better stewards of outdoor spaces they become.

The Project would introduce minimal infrastructure to the Property which would be primarily concentrated in the base area (refer to Item 6: Site Plan) and could benefit an average of 70,000 to 80,000 visitors per year. As such, the Applicant's planning process has taken into consideration a number of resources per request of the County and the community. The Applicant has considered the infrastructure necessary for the Project as well as specific criteria to reduce Project impacts. In the Resource Reports included with this Application, it has been determined that impacts will be minimal or mitigated as possible. This Appendix includes a table with high-level takeaways of each Resource Report and Planning Criteria specific to each resource of concern to follow in subsequent processes and through implementation. Please note that the Resource Reports themselves contain the most accurate information. Refer to each respective report to read more about assumptions and findings.

The resource analyses were analyzed to show the impacts of more extreme circumstances than what might be realistic. For example, the Traffic report includes an analysis of 300 cars in the parking lot (which is currently designed for +/- 281 spaces) and maximum turnover rates throughout the day, which indicate days with highest possible visitation to the Property.

Resource and Report	Report Takeaway	Planning Criteria
Water *Item 12: Water Supply Information Summary*	Water will be supplied with an onsite water well and storage tank. Maximum annual withdrawal will be 2 acre-feet per year.	Treating and filtering of water sources will meet Colorado Department of Public Health and Environment (CDPHE) Drinking Water Standards, which require that water supply is disinfected and receives minimum chlorine contact time of 30 minutes before first use.
		Storage reservoirs will be ground mounted and elevated steel tanks designed in accordance with CDPHE standards
Wastewater *Item 13: Onsite Wastewater*	Wastewater will be treated with an onsite wastewater treatment system (OWTS) with a capacity of 1180 gallons per day. The OWTS will consist of a septic tank to process sewage from the day lodge and maintenance building and a	Onsite treatment systems will follow requirements of the CDPHE and Jefferson County.
		Pipe and appurtenances will be designed to meet or exceed Jefferson County standards.

Resource and Report	Report Takeaway	Planning Criteria
Treatment System Report	leach field adjacent to the parking area and access road.	Setback distance of onsite treatment systems of at least 200 feet from neighboring wells.
		Septic tank and leach field located at a lower elevation than the surface elevation of the water well.
Fire *Item 14: Wildfire Hazard Mitigation Plan*	In existing conditions, it would take approximately 2.5 hours for all residents along Shadow Mountain Drive and in the Aspen Park areas to evacuate past an evacuation point on Highway 285. Adding 300 guest and 20 employee vehicles from SMBP would increase this time by approximately 15 minutes, to 2.75 hours total evacuation time. Prioritize removal of conifer trees, dead and down wood, shrubs, and tall grass to reduce the load of fuels.	Use ignition-resistant materials and designs for buildings, including Class A roofing, ignition resistant siding, and building design compliant with Colorado State Forest Service Home Ignition Zone guides.
		Clear as much area as possible (up to 300 ft, except for aspen trees) around the parking lot without diminishing the character of the area to slow the spread of fire around the base area.
		Clear as much area as possible (up to 40 ft or the property line, except for aspen trees) around the top lift terminal to slow the spread of fire at the Top Terminal Area.
		Conduct regular clearing of vegetation along the lift line, under and around the lift towers and cable.
		An evacuation plan is to be developed in coordination with the Jefferson County Sheriff's Office before full operation of the Bike Park commences.
		All park operations are to stop when wildfires are nearby and/or if the area is under mandatory or voluntary evacuation orders.
		Mow the grass in and around parking lots frequently in the summer to remove combustible weeds such as cheatgrass promptly.
		Use pile burning if and when conducting slash management around the Property.
		Design and install signage that is reflective and meets the design guidelines for wildfire safety as outlined in the application Community Wildfire Protection Plan.

Resource and Report	Report Takeaway	Planning Criteria
Traffic *Item 15: Transportation Analysis*	The addition of traffic from SMBP would slightly increase the already long delays of 20 to over 200 seconds at two intersections: a left turn from Shadow Mountain Drive onto County Highway 73 and a left turn from Barkley Road onto County Highway 73. All other intersections of interest experience delays less than 20 seconds in current and proposed conditions. Construction of the recommended mitigation measures (which include acceleration lanes on County Highway 73) would result in delays shorter than existing conditions.	On-site parking is to be limited to 300 or fewer guest vehicles.
Drainage *Item 19: Phase I Drainage Report*	With the addition of the proposed developments, there will be a higher runoff volume due to increased imperviousness, particularly from the parking area. The Project includes construction of a storm sewer and on-site full spectrum detention pond on the site to detain runoff rates to or below existing runoff rates per Mile High Flood District (MHFD) standards. Offsite flows are to be redirected around the proposed developed areas into North Turkey Creek and not collected by the new drainage facilities. These improvements would reduce the impact of increased imperviousness due to the Project and would	Proposed driveway crossing across North Turkey Creek is to be designed and constructed per County and Mile High Flood District (MHFD) standards and best practices.
		The proposed detention basin is to be designed per Jefferson County and MHFD standards and will include forebays at entering storm sewer outfalls, trickle channels, outlet structure, and an emergency overflow embankment.
		The proposed detention basin will be designed to maintain vegetation and have maximum of 3:1 to 4:1 side slopes planted with turf grass that allows for consistent coverage and a mowable surface.
		The proposed detention basin is to be maintained routinely per MHFD Vol III recommendations.

Resource and Report	Report Takeaway	Planning Criteria
	aim to maintain historic drainage patterns for both onsite and offsite flows and manage flow levels above historic flows.	Added imperviousness from trails, lift terminals, access road, and maintenance area are to be mitigated using Low Impact Development best practices and selection and sizing of stormwater BMPs that improve runoff quality and minimize impacts to the existing surfaces. These include debris and litter removal, mowing and plant care, sediment control, stabilized construction entrances, and bridge crossings.
		A Grading, Erosion, and Sediment Control Plan is to be compiled as a part of the Site Development Plan process.
		All new onsite drainage is to be encumbered by drainage easements per County regulations. Easement delineation and language to be provided within final construction documents.
		Trails are to be routinely maintained and inspected to ensure functionality and limit erosion and sediment travel downstream.
Visuals *Item 23: Visual Analysis*	Proposed conditions will introduce developed bike park infrastructure and trails into an area that currently exists in a near natural state. With adherence to planning criteria and best management practices in Table 1, proposed projects would remain visually subordinate to the visual strength of the characteristic landscape.	Vegetation is to be planted and clustered strategically to screen the day lodge, lift terminal, and bike park activity from neighboring properties and Shadow Mountain Drive.
		Maximum building and lift tower/terminal height is 35 feet.
		Buildings are to be constructed using natural materials and colors, compliant with recommendations and regulations in the Architecture section of the Zoning Resolution and the Architectural Design Guidelines in the Conifer/285 Corridor Area Plan.
Vegetation Preservation *Item 25: Vegetation Preservation Plan*	Proposed projects will primarily impact the non-native agricultural meadow in the base area; however, some aspen forest and mixed-conifer forest would also be cleared to accommodate the parking lot and bike park lodge. Existing vegetation along Shadow Mountain Drive and North Turkey Creek will be preserved and	Focus on preservation of healthy, older, and larger trees as well as aspens, fir, spruce, pine, and hardwood species. Prioritize removal of lodgepole pine, Gambel oak, and juniper, and dead and dying trees.
		Priority is to be placed on preserving vegetation along Shadow Mountain Drive and within wetland and riparian areas to the greatest degree feasible.

Resource and Report	Report Takeaway	Planning Criteria
	protected to the greatest extent possible, with priority on existing healthy aspens and conifers.	Vegetation preservation to comply with Preservation criteria in Section 15 of the Zoning Resolution, except for criteria c due to the heavily forested nature of the Property and wildfire risk: *c. Any tree meeting the preservation and protection criteria above which cannot be protected or preserved shall be replaced with 3 trees meeting the size and quality standards in this section. (orig. 7-23-02)*
Wildlife *Item 29a: Wildlife Summary*	There is elk winter habitat within the project area, with no "severe winter range" or other sensitive habitat. There is potential habitat present for one Colorado listed Species of Local Concern: the Northern Leopard Frog. Northern Leopard Frog habitat is likely only present within wetland areas, which would be avoided to the greatest extent possible. No suitable habitat was identified for other Colorado listed Threatened, Endangered, or Species of Local Concern or for IPAC Federally Listed and Proposed Species of Concern.	Wildlife-proof trash, recycling, and composting containers and dumpsters are to be used onsite.
Vegetation	The vegetation assessment identified 10 vegetation types within the existing parcel: 1. Mixed Conifer Forest	A full landscaping plan is to be prepared prior to final project approvals. All proposed vegetation will comply with MHFD Vol III recommendations, which include native grass and other drought tolerant plantings.

Resource and Report	Report Takeaway	Planning Criteria
Item 29b: Vegetation Assessment	2. Lodgepole Pine Forest 3. Aspen – Mixed Conifer 4. Aspen Forest 5. Agricultural Meadow 6. Native Rocky Meadow 7. Rock Outcrop 8. Riparian and Wetland 9. Disturbed Areas 10. Non-Vegetated (Paved Road) Two rare state plants were also identified within the Project area. However, Project construction and activity are not likely to affect the overall viability of these species.	No long-term irrigation is to be required for proposed vegetation.
Noxious Weeds *Item 29b: Vegetation Assessment*	One unlisted noxious and invasive weed was identified in the Project area. Planning Criteria are intended to reduce the threat of this species or other noxious and invasive weeds.	Before construction, the proponent is to pretreat existing noxious weed infestations.
		All off-road construction equipment is to be cleaned to reduce the potential spread of noxious weeds.
		Revegetation mix must be certified noxious weed free.
		Post construction, the site is to be monitored and treated for a period of three years.
		A Noxious Weed Management Plan is to be developed in the Site Development process and implemented pre-, during, and post-construction.
Wetlands *Item 29b: Vegetation Assessment*	The proposed entrance driveway, parking lot, maintenance area, and parts of the access road are anticipated to impact less than 0.1 acre of wetlands within the project area. Proposed trails would avoid and minimize additional wetland	Development within wetland areas is to be avoided to the greatest extent possible.
		All road crossings are to use appropriately sized culverts to allow for flood flows and be armored with proper inlet/outlet protection.

Resource and Report	Report Takeaway	Planning Criteria
	impacts to the greatest extent possible and are not included in this calculation. Planning Criteria in Table 1 have been identified to reduce the impacts to wetlands if they cannot be avoided.	Trail crossings are to utilize boardwalks or small bridges supported by environmentally friendly foundations such as helical piers within jurisdictional wetland features.
		Prior to any grading activities within or adjacent to wetlands, the project proponent is to coordinate fully with the U.S. Army Corps of Engineers to ensure that all tenants of Section 404 of the Clean Water Act are being followed.
		Appropriate sediment controls such as wattles and/or sediment fences during construction or grading activities are to be installed to mitigate impacts to wetlands.
		Prompt revegetation of temporarily disturbed lands is to follow any grading or construction activities.

Appendix B: Project Description

Chairlift and Bike Trails

The Applicant proposes to construct a four-passenger chairlift to transport guests and bikes to the Top Terminal Area (as depicted in the Site Plan) for gravity flow and downhill trails. The chairlift will require one terminal in the base area ("**Bottom Terminal Area**") and one terminal at the top of Shadow Mountain ("**Top Terminal Area**"). Chairlift construction will require a clearing corridor of 40 feet wide to accommodate the infrastructure, and the Applicant will perform selective clearing for wildfire mitigation an additional 10 feet on each side. The chairlift will require power at the Bottom and Top Terminal Areas, as well as a communications line along the lift alignment.

All lift infrastructure (terminals and towers) would comply with the height limit of 35-feet. The chairlift would be colored to harmonize with the surrounding natural environment and would operate for all operating hours when weather permits.

The Bike Park may provide, but would not be limited to, approximately 16 miles of trails with offerings for ability levels ranging from beginner to expert at a range of trail widths. Features would be created to provide a diverse riding experience for guests of all ability levels. Trails will be primarily constructed of earthen materials, and would include wood, steel and other materials. Industry trail design practices would be utilized for construction and maintenance of trails and the lift corridor. The Applicant also proposes that all trails are setback 30 feet from all property lines.

Access and Parking

The Applicant predicts that the majority of guests will access the Property from Denver via U.S. Highway 285 South and exit at Barkley Road. Guests would travel southwest on Barkley Road to the Barkley Road/County Road 73 intersection and turn right/north, travel for less than 1,000 feet on County Road 73, then turn left onto Shadow Mountain Drive and travel approximately 2 miles to the left-hand access turn. At this time, approximately 90 percent of the traffic is expected to travel from this general direction to access the facility from the Conifer area and beyond.

A single access driveway will be constructed from Shadow Mountain Drive, crossing North Turkey Creek with a culverted crossing, into the Property and more specifically the base area. The driveway will be a two-lane access drive (single in/single out) connecting to the guest parking area (as depicted on the Site Plan).

The parking lot will accommodate up to 300 guest vehicles (currently +/- 281 spaces are proposed in the Site Plan) plus approximately 20 employee vehicles. Exact parking spaces are subject to change based on the Site Development Plan process; however, it is not to exceed 300 guest spaces.

Additionally, an access road will be constructed from the main base area to the north and to the Top Terminal Area. This would provide access for construction, maintenance, and emergencies throughout the Bike Park.

Lastly, the Applicant acknowledges that the parking and access areas will create impacts to waters of the U.S., including wetlands located in this area. Anticipated impacts are described in the Resource Reports, which are summarized above in Appendix A.

Facilities

A day lodge will be constructed in the base area to provide guest services including indoor seating, ticketing, restrooms, changing rooms, bike and equipment rentals, and outdoor guest space and seating. Water will be supplied by a commercial water well and sewage would be handled by an onsite wastewater system.

There will be no kitchen space inside of the day lodge in order to reduce water and space needs. To address food and beverage needs for guests, the Applicant plans to partner with locally based food truck vendors to serve guests on-site. Seating areas will be provided inside and outside of the proposed day lodge for guest seating.

A maintenance building will also be constructed along the access road to provide facilities for operations as well as chairlift and bike storage in the winter, as well as providing an additional restroom. In this area, approximately 20 employee parking spots will be provided.

Utilities

Attached to this application is a water well permit application (Item 12) that indicates anticipated well water usage once the Bike Park is fully operating. The Applicant anticipates not needing this full supply of water in the first few years of construction and operation. For the first few years of operation, the Applicant plans to pursue a well permit for "exempt commercial uses" informed by current need. Per Division of Water Resources, the well pumping rate shall not exceed 15 gallons per minute and shall not exceed 108,600 gallons annually for "exempt commercial uses," which will be sufficient during construction of the Project and for the first years of operations. The Applicant understands that they will need to pursue a non-exempt commercial well once guest visitation grows and will work with the Division of Water Resources on a water augmentation plan to meet this need in the meantime. Well usage, especially under the commercial exempt well, will be heavily monitored for pumping rates and total withdrawal. The well would be developed on-site, proximate to the day lodge.

The Applicant will also construct a water storage tank at a point along the access road. This tank would provide adequate fire sprinkler storage for the facilities and will be located at an elevation to allow for gravity flow, rather than pumping. Please refer to the resource report takeaways, summarized above in Appendix A, and Item 12 to this application for more information on the water analysis and proposed well and tank locations.

An on-site wastewater treatment system (OWTS) will also be developed. The Applicant has had a preliminary wastewater analysis prepared to determine projected wastewater loads based on building size, location, uses and water demand. The on-site wastewater treatment system report is summarized in the resource report takeaways, described above in Appendix A, and Item 13 to this application

Power will be buried from Shadow Mountain Drive to the base area facilities. Power is also supplied via an overhead line along the western Property boundary. A spur line will be created to supply power to the Top Terminal Area. Three-phase power is necessary for the chairlift. Communications will pull from the Shadow Mountain Drive. A communication line will also be hung on the chairlift to supply communications to the Top Terminal Area, a requirement of the chairlift. Utility details will be further determined in subsequent site development and planning efforts.

Appendix C: Operational Considerations

The following Operation Considerations are further supported by the Written Restrictions, provided as Item 2 to this application, which includes County enforceable language regarding restrictions on proposed operations. Operation considerations that the Applicant has considered include parking and access, wetlands protections, building heights, seasonal closures, general operating hours, sound, smoking, fires, animals, trash management, wayfinding/signage, lighting, landscaping, and hunting.

Parking and Access

The Applicant proposes a maximum of 300 parking spaces for guests, in addition to 20 employee spaces, and the Site Plan is currently designed to accommodate +/- 281 spaces in the parking area. These numbers are meant to accommodate the number of vehicles anticipated on peak days. As described in the Traffic Analysis, the presence of 320 additional vehicles would exacerbate already poor or congested traffic conditions at two intersections approximately 2 or more miles from the Property, but are not likely to introduce poor traffic conditions or significant congestion near the Property.

Additionally, in response to concerns from the community, the Applicant has considered additional management practices to prepare for days with a full or near-full parking lot. The Applicant will implement a reservation, monitoring, and reporting program similar to other existing recreation facilities and ski areas in order to better manage vehicles on days with higher visitation. The Applicant will also work with the local Sheriff and/or Road and Bridge authority within the Right-of-Way to strictly enforce no parking along Shadow Mountain Drive.

Wetlands Protections

As described in the Vegetation Assessment, attached to this application as Item 29b, the Applicant will minimize wetland impacts where possible. At this time, the Applicant anticipates that trail development will not impact Waters of the U.S. or wetlands, and the Applicant intends to construct environmentally friendly wetland features if trails are required to cross wetland areas.

Building Heights

Building heights will not exceed 35 feet. This includes the day lodge, maintenance building, and lift terminals and towers.

Operating Hours and Seasonal Closures

What makes SMBP unique is its ability to have a longer season than bike parks at ski areas, which is due to not only the fact that it will be a dedicated bike park facility, but also its location near Conifer, at a lower elevation than many of the adjacent ski areas. Therefore, the Applicant proposes to operate from March 1 through the end of November, as weather permits (i.e. we will not continue normal operations with snow on the ground). This extended season, in comparison to current bike park offerings across the state, will allow guests to ride almost year-round. Daily operating hours will vary throughout the seasons and will be primarily driven by sunset time. The generally understood hours of operation would exclude special events, which may occur outside of these hours.

The Applicant will not operate the Bike Park between December 1 and March 1, with the exception of special events. During this time, select trails within the Bike Park will be open to the local community

for hiking and snowshoeing. Special events within this time may include fat tire events or other winter activities.

All special events at SMBP would require approval of a Special Event Permit.

Sound

Normal SMBP operations in the base area will produce the sound of the chairlift, people having conversations, outdoor music at the day lodge, and car engines running. On the mountain, sounds would mostly resemble that of a quiet rural area. Sound levels will adhere to maximum permissible noise levels for Light Industrial uses, pursuant to CRS § 25-12-103, as amended.

The Applicant will not use outdoor amplification for live music or announcements without a Special Event Permit.

Smoking and Fires

Because wildfire is a reality in the Project area, no smoking will be permitted anywhere on the Property. Fires will also not be permitted apart from gas fire pits in the base area.

Animals

At SMBP, guests will be permitted to bring dogs so long as they are kept leashed or controlled by 30-foot voice command within the base area. Dogs will not be permitted on the lift or trails. In order to reduce waste, dog waste dispensers will be provided in the base area in the parking lot and near the day lodge.

Trash Management

The Applicant takes trash management seriously and understands the risk of wildlife finding waste. This is why the Applicant will provide only wildlife-proof trash, compost, and recycling containers on-site and dumpsters will be stored in enclosed structures. Additionally, the Applicant will conduct routine perimeter trash collection to pick up waste that may have not been disposed of correctly on the Property.

Wayfinding/Signage

Signage will be consistent throughout the Property and will be used for wayfinding, marking trail difficulties, for regulatory purposes such as parking, and other directional requirements as necessary. The colors and materials of signage will comply with the colors within the Architecture section of the Zoning Resolution. Off-street signage will be compliant with County standards for Agricultural and Conservation Zone Districts, which include a 10-foot setback, a maximum number of signs requiring a permit, and maximum sign areas and heights.[20]

Lighting

Lighting shall be compliant with Section 12 of the Zoning Resolution. Lighting will be confined to the base area, lift terminals, and maintenance areas. No lighting will be in use after 10pm during normal operations (except for lighting required by insurance and/or local, state, and federal regulations) in order to maintain the mountain and residential character of the area.

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[20] Jefferson County Zoning Resolution 2020

Landscaping

As described above, landscaping areas will only include species native to the location as identified in the Vegetation Assessment, attached to this application as Item 29b. Specifics of landscaping will be determined through a full landscaping plan as approved by County staff and referral experts, if necessary.

Hunting

No hunting will be permitted within the SMBP area of operation, as it would conflict with the Project.

Weather

All operations are subject to weather conditions. The Bike Park will not operate if there is snow on the ground, heavy rain, or high winds that would present hazards to guests.

Development Permit Application

JEFFERSON COUNTY COLORADO
Planning and Zoning

100 Jefferson County Parkway
Suite 3550
Golden CO, 80419
303-271-8700
planning.jeffco.us
pzpermits@jeffco.us

Case Number (for Jeffco employee use only): _____

Please select your application request below:

- ☐ *Rezoning from* _____ *to* _____
- ☒ *Special Use Item No.* A-2 *of the* Agricultural *Zone District*
  to permit Class III Commercial Recreation Facility

☐ *Exemption from Platting*	☐ *Legalization of Property Division*	☐ *Minor Division of Land*	☐ *Minor Modification or Revision*
☒ *Rezoning/Special Use*	☐ *Rural Cluster*	☐ *Site Approval*	☐ *Site Development Plan Approval*
☐ *Subdivision Platting*	☐ *Superlot*	☐ *Superlot Process*	☐ *Vested Rights*

Explanation of Application Request

FSBR, LLC ("the Applicant") submits this application to request a special use for the Colorado State Board of Land Commissioners' (State Land Board) Shadow Mountain property (parcel ID 61-163-00-001). The proposed use would be a lift-served bike park with a parking lot, base area facility, and approximately 16 miles of trails. The State Land Board has issued a Planning Lease for its property to the Applicant to allow the Applicant to explore and request a special use on the property. The State Land Board is signing this application only as a landowner and is not a part of the project development team. Leasing by the State Land Board does not exempt the property from Jefferson County's valid local land use regulations and land use plans. The State Land Board will accept and comply with the final special use permitting decision made by Jefferson County.

Documents Submitted

☒ Architectural Elevations	☐ Historical, Archaeological & Paleontological Report	☒ Proof of Ownership	☒ Wastewater Report
☒ Drainage Report	☐ Landscape Plan	☐ Radiation Report	☒ Water Supply Report
☐ Exemption Survey	☐ Lighting Plan	☐ Reduction of the Plat	☒ Wildlife, Vegetation & Landscaping Report
☒ Fire Protection Report	☐ Parking Plan	☐ Sensory Impact Report	☒ Other: refer to the narrative
☐ Geologic Report	☒ Proof of Access	☐ Soils Report	
		☐ Utility Report	

Instructions for Submittal

1. All applications and supporting documents must be submitted electronically to pzpermits@jeffco.us.
2. Original completed applications must be provided. Copies are not acceptable.
3. Incomplete applications will not be accepted and will delay processing.
4. Pre-Applications are encouraged prior to the formal submittal of a Development Permit Application.

Special Districts

Water	*Post Office*	*Electricity*
Sewage	*Parks & Rec*	*Fire* Elk Creek Fire Protection

Jefferson County Staff Use Only

Case Number	*Date Filed*	*Current Zoning*	*Proposed Zoning/SU*
Planner	*Street Address*	*Acres*	*Map Sheet*
Previous Cases		*Community Plan*	

Development Permit Application

Case Number: _____

Project Team Contact Information

State Board of Land Commissioners	abraham.medina@state.co.us	(303) 866-3454	
Property Owner 1	*Email (required)*	*Phone Number*	
1127 Sherman Street, Suite 300		Denver	80203
Address		*City*	*Zip*
Property Owner 2	*Email (required)*	*Phone Number*	
Address		*City*	*Zip*
FSBR, LLC	phil@shadowmountainbikepark.com	(603) 660-6604	
Developer / Subdivider	*Email (required)*	*Phone Number*	
32372 Lodgepole Drive		Evergreen	80439
Address		*City*	*Zip*
Phil Bouchard	phil@shadowmountainbikepark.com	(603) 660-6604	
Authorized Representative	*Email (required)*	*Phone Number*	
32372 Lodgepole Drive		Evergreen	80439
Address		*City*	*Zip*
Engineer	*Email (required)*	*Phone Number*	
Address		*City*	*Zip*

Property Description

29611 Shadow Mountain Drive (Parcel ID 61-163-00-001)		Conifer	80433
Address of Subject Property and/or Parcel ID Number		*City*	*Zip*
Shadow Mountain Drive	306	Map 61-16	
Access Via	*Acreage*	*Map Sheet*	

Legal Description:

S2NW, SW, and a fractional part of the NWNW (S of Shadow Mountain Drive) in Section 16, Township 6 South, Range 71 West, of the 6th Principal Meridian.

Additional Information (to support or clarify this application):

FSBR, LLC ("the Applicant") submits this application to request a special use for the Colorado State Board of Land Commissioners' (State Land Board) Shadow Mountain property (parcel ID 61-163-00-001) for a Class III Commercial Recreation Facility. The proposed use would be a lift-served bike park with a parking lot, base area facility, and approximately 16 miles of trails. Please refer to the application narrative for a more detailed description of the project and its purpose.

The State Land Board has issued a Planning Lease for its property to the Applicant to allow the Applicant to explore and request a special use of the property for a Class III Commercial Recreation Facility. The State Land Board is signing this application only as a landowner and is not a part of the project development team. Leasing by the State Land Board does not exempt the property from Jefferson County's valid local land use regulations and land use plans. The State Land Board will accept and comply with the final special use permitting decision made by Jefferson County. If Jefferson County approves the special use permit, the State Land Board will subsequently consider whether to issue a Recreation Lease to the Applicant.

Development Permit Application

Case Number: _____

Disclosure of Property Ownership

☐ Owner is an individual. Indicate name exactly as it appears on the deed.

☒ Owner is a corporation, partnership, limited partnership, or other business entity. Name principals and/or managers on a separate page. Include the articles of organization, partnership agreement, resolution of managers, etc., as applicable to establish legal signatures.

Please provide the name(s), mailing address(es), street address(es), and phone number(s) for all owners.

Property Owner Affidavit

I/We _____, being first duly sworn, depose and state under penalties of perjury that I am *(we are)* the owner*(s)* of the property described herein and which is the subject of the application and proposed hearings; that all answers provided to the questions in this application, and all sketches, data, and all other supplementary matter attached hereto and made part of this application, are honest and true to the best of my *(our)* knowledge and belief. I *(we)* understand that this application must be complete and accurate prior to a hearing being scheduled. I *(we)* authorize County staff to visit the site as necessary for proper review of this application.

If there are any special conditions such as guard dogs, locked gates, restricted hours, etc., please give the name and phone number of the person(s) who can provide access to the site.

State Board of Land Commissioners
Name

1127 Sherman St. Denver CO 80203
Address

303 866 3454 Bill.Ryan@State.co.us
Phone *Email*

Bill Ryan, Director
Signature

Name

Address

Phone *Email*

Signature

County of ~~Jefferson~~ Denver]
SS
State of Colorado]

Sworn to and subscribed before me this 30th *(day)* day of November *(month)*, 2022 *(year)*.

By Bill Ryan
(name printed)

Witness my hand and official seal.

SHERRY LEE
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20034013043
MY COMMISSION EXPIRES NOVEMBER 10, 2026

Notary Public

My Commission expires 11/10/2026.
(date)

Development Permit Application

Case Number: _____

Authorized Representative

I/We further permit Phil Bouchard, FSBR, LLC _____ to act as my/our representative in any manner regarding this application, to answer questions and to represent me/us at any meeting and public hearing(s) which may be held on this application.

Note: All correspondence will be sent to the authorized representative. It will be the representative's responsibility to keep the owner(s) adequately informed as to the status of the application.

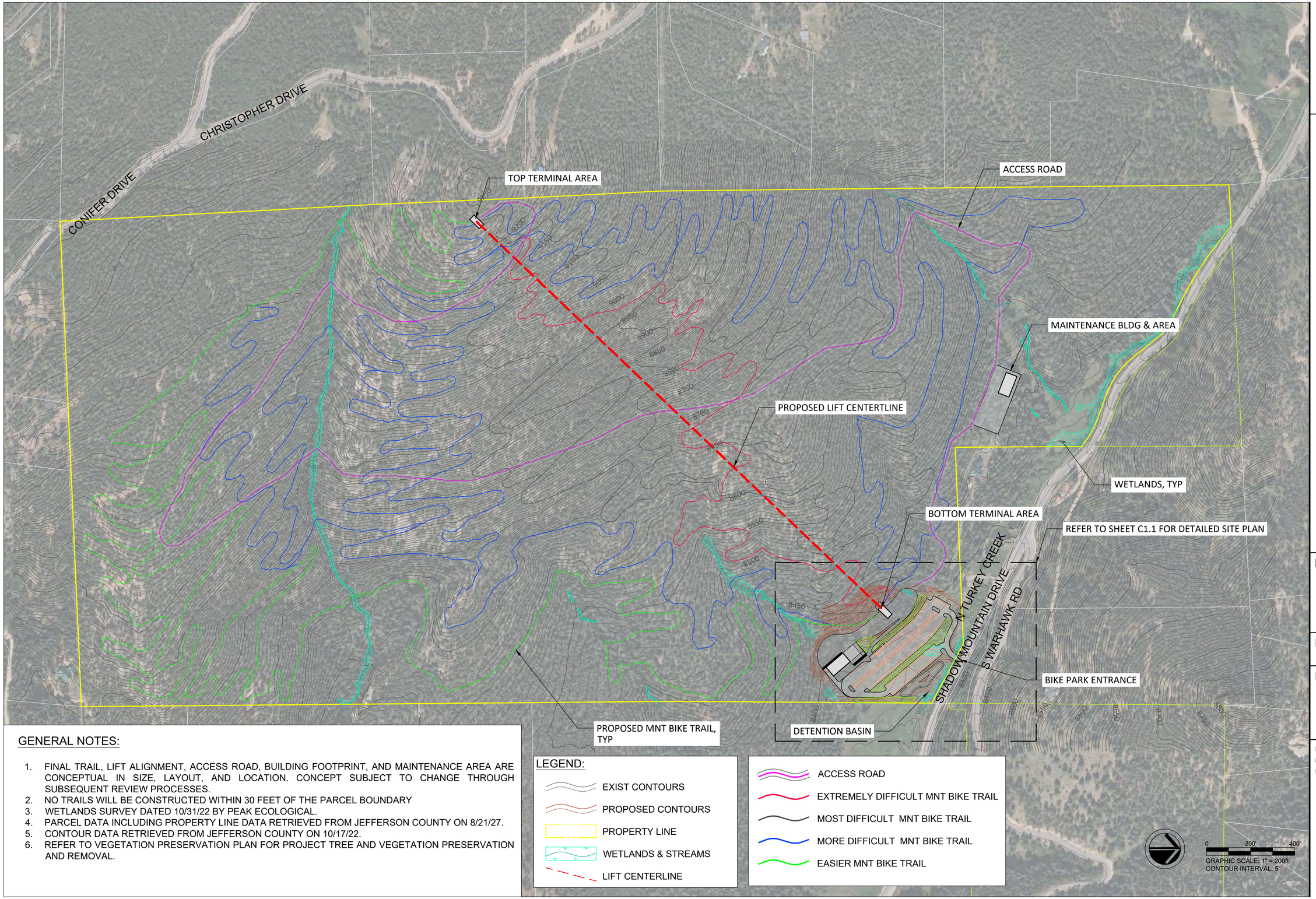
Phil Bouchard, FSBR, LLC
Representative Name

32372 Lodgepole Drive, Evergreen, CO 80439
Address

(603) 660-6604 phil@shadowmountainbikepark.
Phone *Email*

Philip Bouchard
Owner's Signature

11/30/2022
Date



GENERAL NOTES:

1. FINAL TRAIL, LIFT ALIGNMENT, ACCESS ROAD, BUILDING FOOTPRINT, AND MAINTENANCE AREA ARE CONCEPTUAL IN SIZE, LAYOUT, AND LOCATION. CONCEPT SUBJECT TO CHANGE THROUGH SUBSEQUENT REVIEW PROCESSES.
2. NO TRAILS WILL BE CONSTRUCTED WITHIN 30 FEET OF THE PARCEL BOUNDARY
3. WETLANDS SURVEY DATED 10/31/22 BY PEAK ECOLOGICAL.
4. PARCEL DATA INCLUDING PROPERTY LINE DATA RETRIEVED FROM JEFFERSON COUNTY ON 8/21/27.
5. CONTOUR DATA RETRIEVED FROM JEFFERSON COUNTY ON 10/17/22.
6. REFER TO VEGETATION PRESERVATION PLAN FOR PROJECT TREE AND VEGETATION PRESERVATION AND REMOVAL.

LEGEND:

- EXIST CONTOURS
- PROPOSED CONTOURS
- PROPERTY LINE
- WETLANDS & STREAMS
- LIFT CENTERLINE
- ACCESS ROAD
- EXTREMELY DIFFICULT MNT BIKE TRAIL
- MOST DIFFICULT MNT BIKE TRAIL
- MORE DIFFICULT MNT BIKE TRAIL
- EASIER MNT BIKE TRAIL

SE GROUP
323 West Main Street, Suite 202
Frisco, CO 80443
tel: 970.668.3398
www.segroup.com

SHADOW MOUNTAIN BIKE PARK

CONIFER, COLORADO

Not For Construction

ISSUE
SCHEMATIC DESIGN

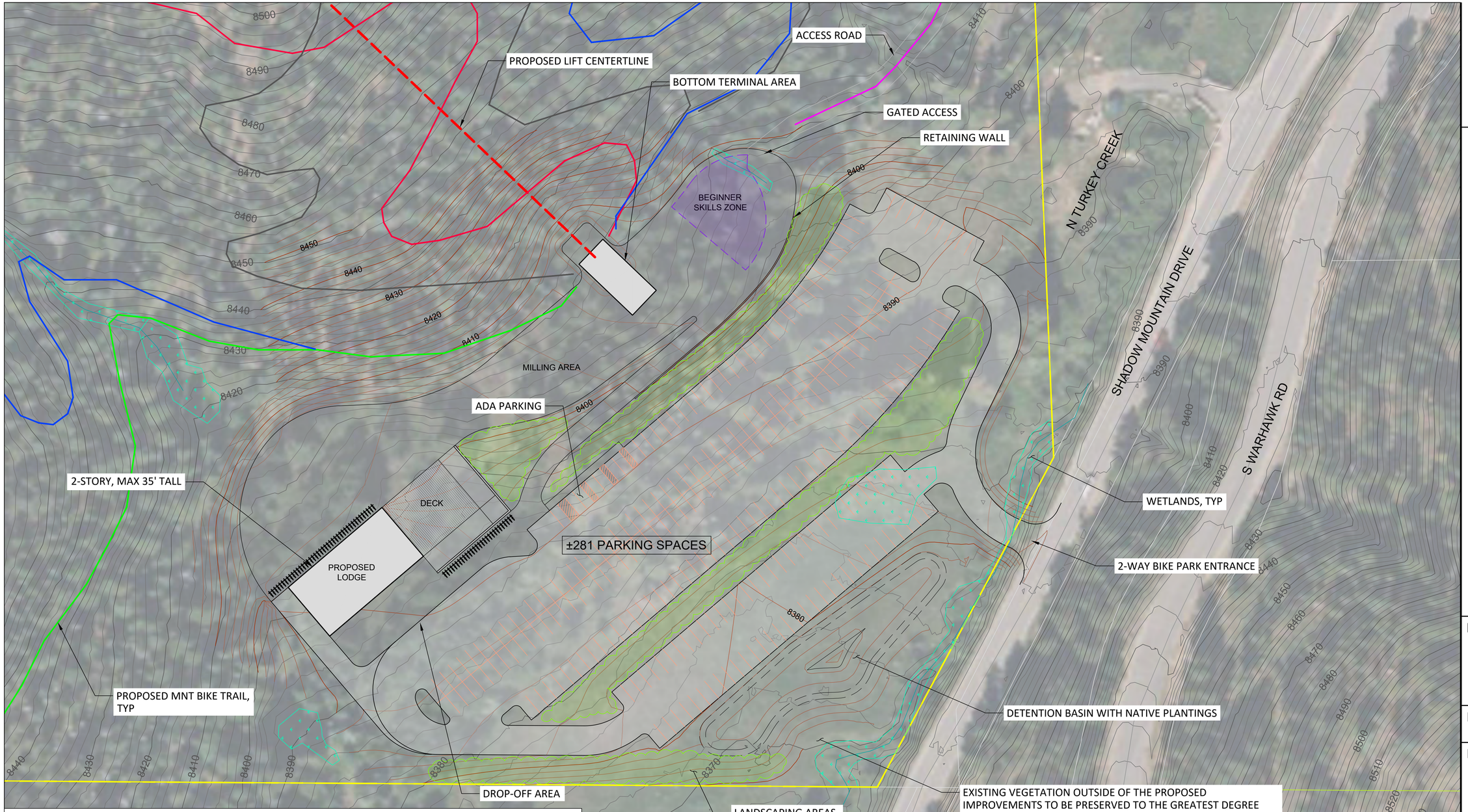
RELEASE DATE
November 22

REVISIONS

PROJECT NO.	22089001
MADE BY	OD
REVIEWED BY	OD

OVERALL SITE PLAN

C1.0



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- EXTREMELY DIFFICULT MNT BIKE TRAIL
- MOST DIFFICULT MNT BIKE TRAIL
- MORE DIFFICULT MNT BIKE TRAIL
- EASIER MNT BIKE TRAIL

0 40' 80'
GRAPHIC SCALE: 1" = 40ft
CONTOUR INTERVAL: 2'

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RELEASE DATE

November 22

REVISIONS

PROJECT NO.	22089001
MADE BY	OD
REVIEWED BY	OD

DETAILED SITE PLAN

C1.1

*The information contained in this document is to be integrated into the Special Use Document.

LAND USE AREAS:

Subject to the intent identified in Section __, the primary uses permitted within the property are described and limited as follows:

CLASS III COMMERCIAL RECREATION FACILITY: A facility for the purpose of sports and recreational activities, excepting therefrom any activity that involves the use of non-domestic animals and/or firearms, which is operated or owned by a commercial enterprise and open to the general public or members for a fee in return for the provision of some recreational activity, and including all uses related to the operation thereof, which may include stand-alone food and beverage for purchase and sale from independent vendors, retail items for purchase and sale, items for rental, and bike patrol and emergency services.

PARKING: Parking area accessory to and for the benefit of the Class III Commercial Recreation Facility use.

DAY LODGE: An indoor facility for the purpose of supporting the Class III Commercial Recreation Facility use, which may include: pre-made food and beverage for purchase and sale, retail items for purchase and sale, items for rental, administrative offices, bike patrol and emergency services, and other services and relief areas related to supporting guests.

TRAINING AREA: An outdoor area for the purpose of training bike skills, which may include: structures, jumps, ramps, and obstacles, paths made of dirt, gravel, or other natural materials, and other mechanisms for the purpose of learning or practicing bike skills.

CHAIRLIFT: All infrastructure required for the operation, maintenance, and support of the Lift structure, including but not limited to terminals, towers, lines, poles, chairs, electrical equipment, and other related components.

TRAILS: Trails constructed for use by cyclists and, in some case, individuals on foot or other non-motorized means of transportation. All trails will be setback 30 feet from all property lines.

USE AREA B ACCESS ROAD(S): Road(s) constructed of dirt, gravel, or a similar material for ingress and egress to and from Use Areas A and B.

MAINTENANCE FACILITIES: Operational, maintenance, and administrative services and facilities associated with the Class III Commercial Recreation Facility use.

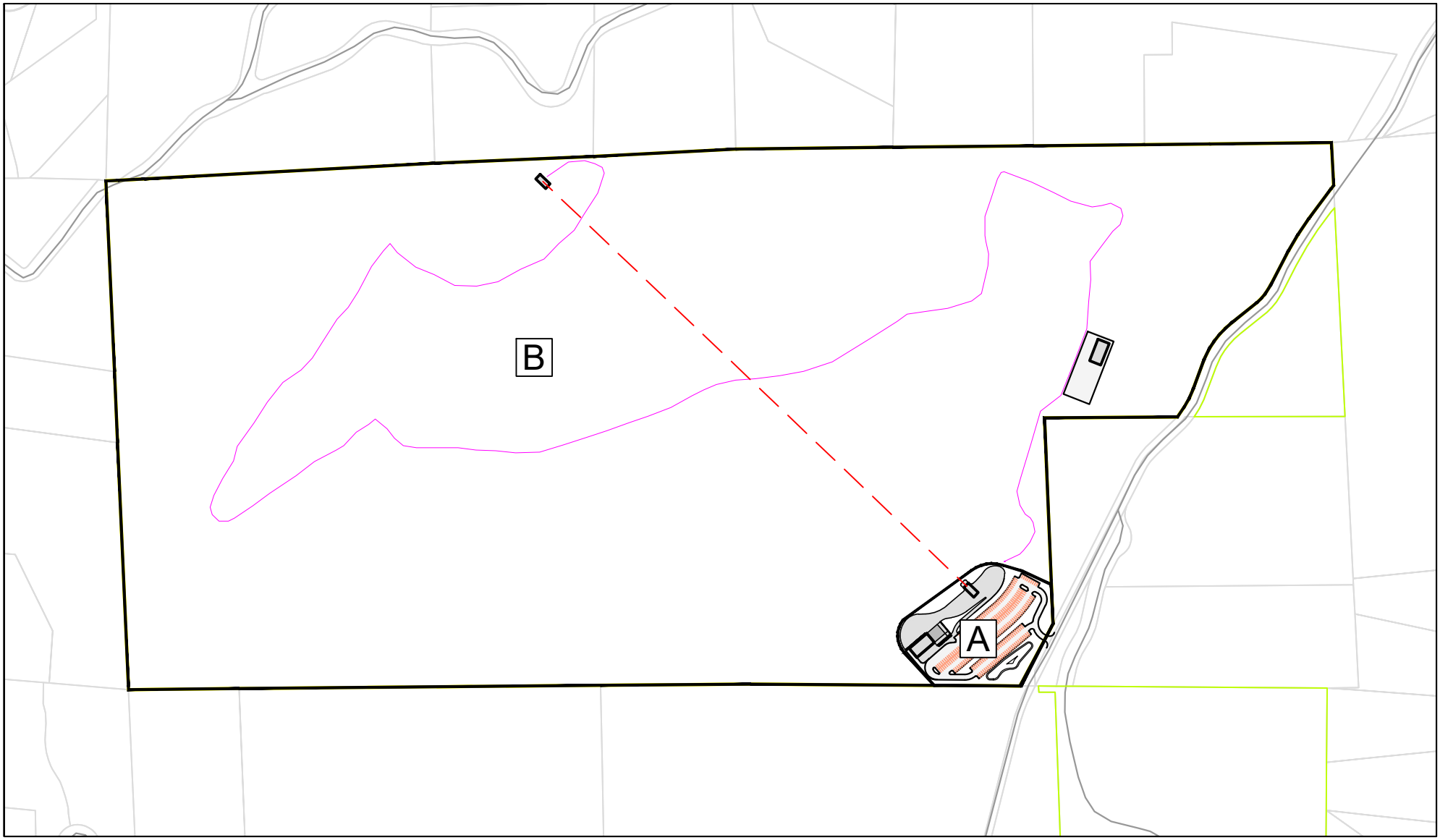
The following table identifies the permitted uses within each of the two land use areas identified on the “Land Use Map” on this sheet.

*The information contained in this document is to be integrated into the Special Use Document.

Table 1: Land Use Areas		
Area	**Acres**	**Permitted Uses**
A	6	Class III Commercial Recreation Facility; Parking, Day Lodge, Training Area, Chairlift Infrastructure; Permitted Uses in the A-2 Zone District
B	229.3	Class III Commercial Recreation Facility; Trails, Chairlift Infrastructure, Use Area B Access Roads, Maintenance Facilities; Permitted Uses in the A-2 Zone District

STANDARD FLEXIBILITY STATEMENT

The Land Use Map is intended to depict general site configuration.



Shadow Mountain Bike Park
LAND USE MAP

0 150 300 600 ft.

DATE: JANUARY 2023

Shadow MOUNTAIN BIKE PARK

SE GROUP

*The information contained in this document is to be integrated into the Special Use Document.

SHADOW MOUNTAIN BIKE PARK
Special Use Case # 20-127140 PA

A. **Intent**. The purpose of this Special Use is to permit a Class III Commercial Recreation Facility use on the subject property, which is zoned Agricultural-Two (A-2).

B. **Written Restrictions**. All the uses and standards of the Agricultural Two Zone District (A-2) and other applicable sections of the Zoning Resolution shall apply to the property further described in the legal description provided in _____, with the following modifications:

1. Permitted Uses
   a. Primary
      i. Class III Commercial Recreation Facility and related uses, excluding therefrom any activity which includes the use of firearms and/or non-domestic animals; all Permitted Uses in the A-2 Zone District
   b. Accessory.
      i. Day lodge; parking; maintenance facilities; and all Permitted Uses in the A-2 Zone District

2. Written Restrictions.
   a. Guest Hours of Operation. The Shadow Mountain Bike Park will be open to guests no earlier than sunrise and no later than sunset.
   b. Seasonal Closure. The Shadow Mountain Bike Park will be closed to guests from December 1 through March 1 (the "**Seasonal Closure**"). During the Seasonal Closure, the Shadow Mountain Bike Park may be open to visitors, but visitors will be unable to use the Lift and unable to access the Lodge.
   c. Infrastructure Height. All chairlift infrastructure (including terminals and towers) will not exceed 35 feet in height.
   d. Sound. Sound levels shall adhere to maximum permissible noise levels for Light Industrial uses, pursuant to CRS § 25-12-103, as amended.
   e. Lighting. No exterior lighting will be permitted in Use Area B after 10:00 pm, except for lighting required by insurance and/or local, state, and federal regulations.
   f. Fires. Outdoor fires using wood or charcoal for fuel are prohibited. All outdoor fires of any type are prohibited in Use Area B.
   g. Trash Management. Only wildlife-proof trash, recycling and composting containers will be used on the Property.

APPROVED FOR RECORDING:

This Special Use Document, titled Shadow Mountain Bike Park, was approved the _____ day of _____2023, by the Board of County Commissioners, of the County of Jefferson, State of Colorado and is approved for recording.

The owner of the property, at the time of approval was: State of Colorado

*The information contained in this document is to be integrated into the Special Use Document.

By: Jefferson County Planning and Zoning Director

Signature: _____
Date: _____

Shadow Mountain
BIKE PARK

CONCEPT MASTER PLAN

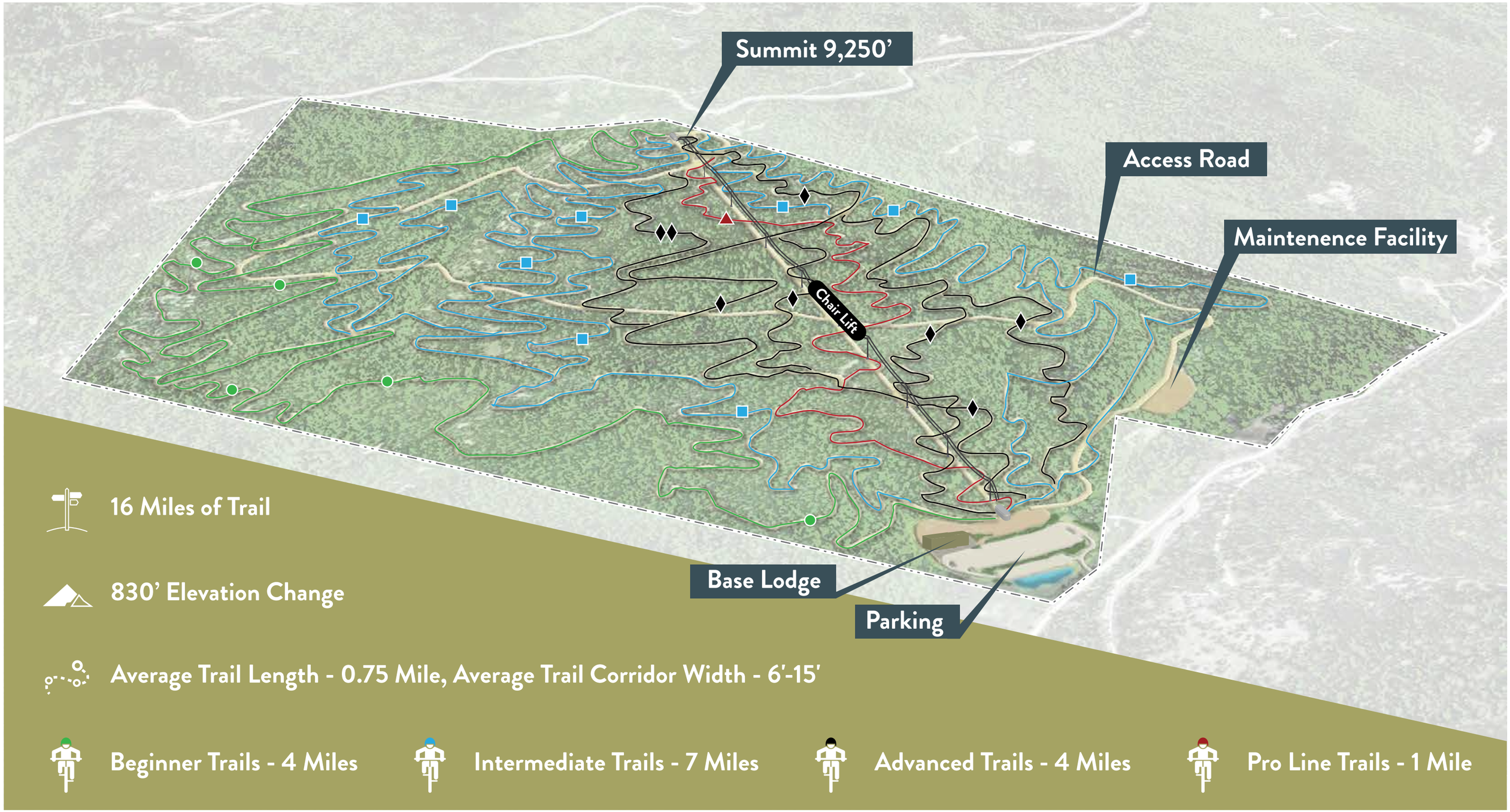
January 2023

SE GROUP

EXISTING CONDITIONS PLAN

Shadow Mountain BIKE PARK

Concept Master Plan
January 2023



16 Miles of Trail

830' Elevation Change

Average Trail Length - 0.75 Mile, Average Trail Corridor Width - 6'-15'

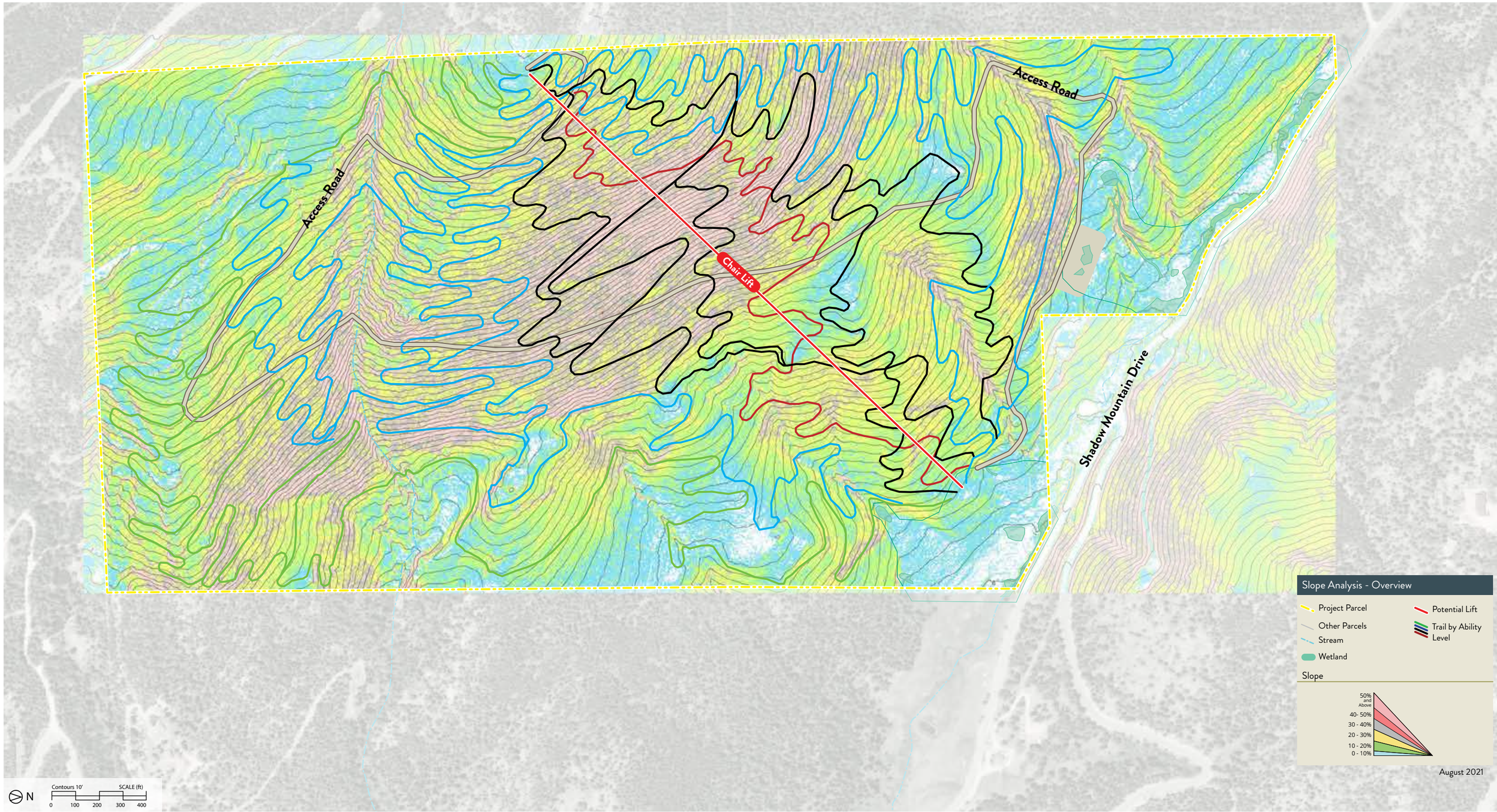
Beginner Trails - 4 Miles

Intermediate Trails - 7 Miles

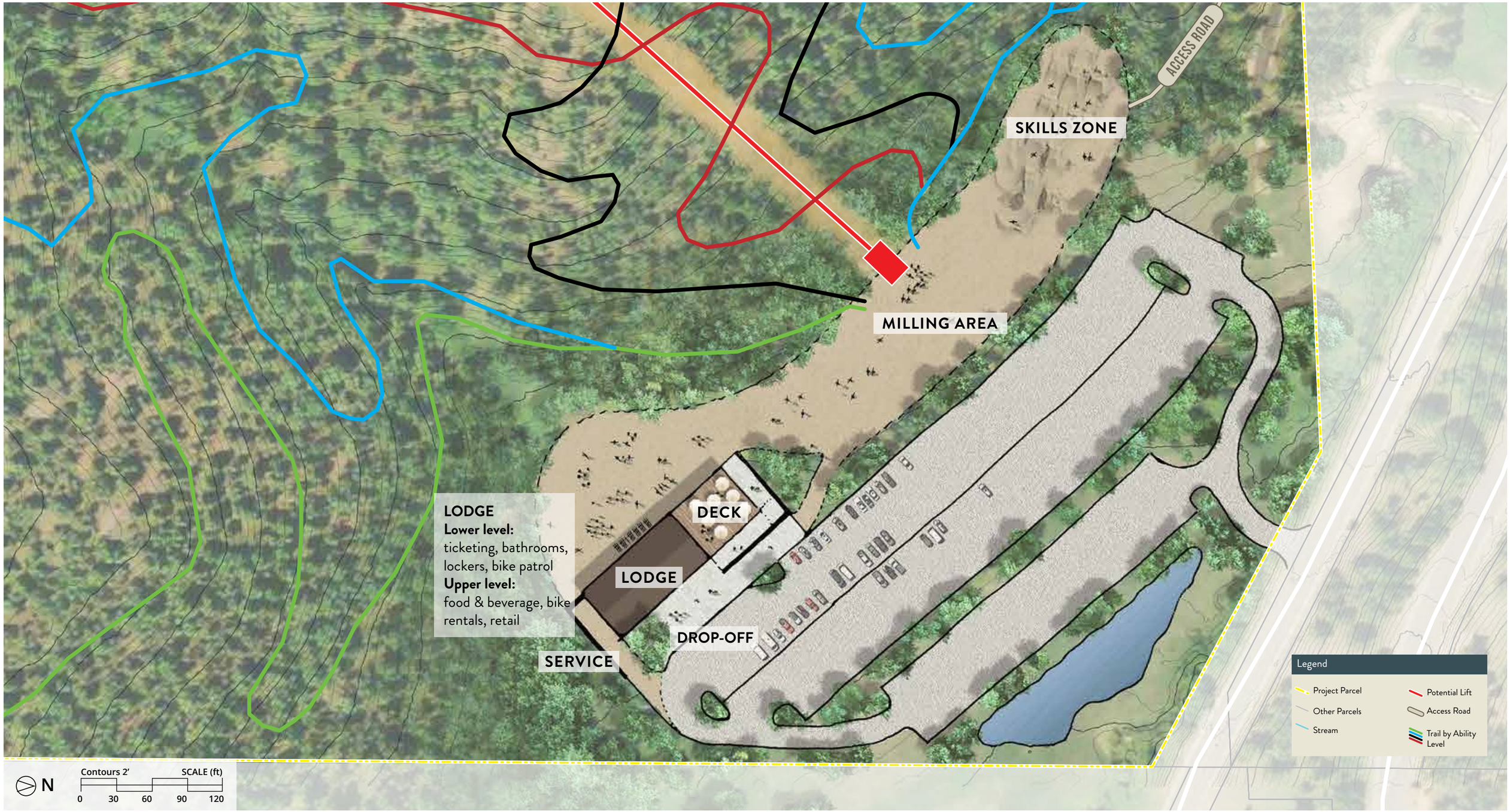
Advanced Trails - 4 Miles

Pro Line Trails - 1 Mile

SLOPE ANALYSIS



BASE AREA CONCEPT PLAN

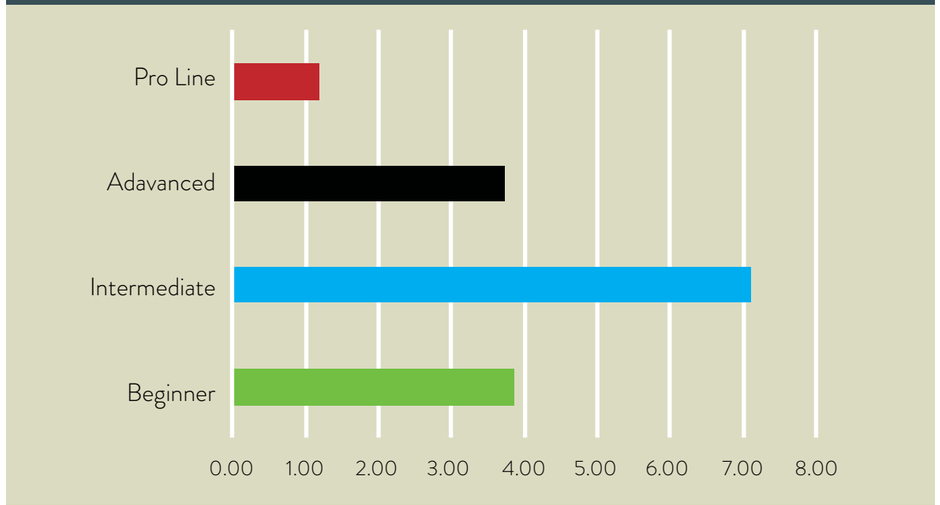


Shadow Mountain BIKE PARK

Concept Master Plan
January 2023

TRAIL	ABILITY LEVEL	FREERIDE/TECHNICAL	LENGTH FEET	LENGTH MILES
1	●	Freeride	16,258.10	3.08
2	●	Freeride	3,593.62	0.68
3	●	Freeride	582.00	0.11
4	■	Freeride	3,322.59	0.63
5	■	Technical	3,128.34	0.59
6	■	Freeride	11,016.89	2.09
7	■	Technical	4,703.06	0.89
8	♦	Technical	2,605.43	0.49
9	▲	Freeride	1,407.41	0.27
10	■	Freeride	1,807.06	0.34
11	♦♦	Freeride	7,416.11	1.40
12	■	Freeride	2,130.34	0.40
13	♦	Freeride	2,025.30	0.38
14	▲	Freeride	2,671.71	0.51
15	♦	Technical	3,786.62	0.72
16	■	Freeride	7,527.59	1.43
17	♦	Freeride	2,647.62	0.50
18	♦	Technical	1,212.43	0.23
19	▲	Freeride	2,127.25	0.40
20	■	Technical	3,929.99	0.74
	Total:		**83,899.46**	**15.89**

TRAIL MILAGE BY ABILITY LEVEL

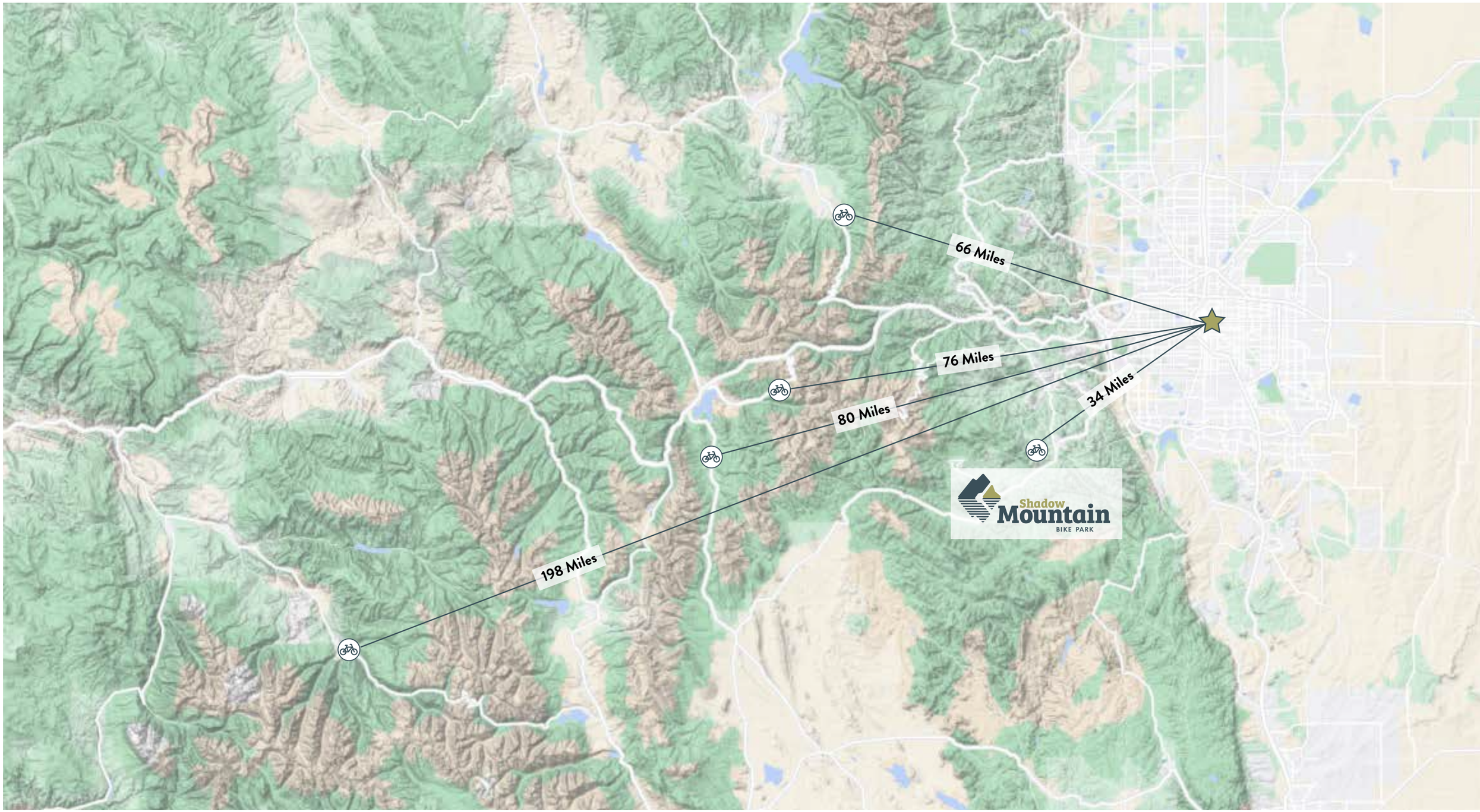


CAPACITY

Chairlift Capacity = 790 riders/day

Parking Capacity (+/- 290 spaces) = 750 riders/peak day

DISTANCE FROM DENVER TO COLORADO LIFT-SERVED BIKE PARKS



COLORADO
State Land Board

October 27, 2020

Jefferson County Planning
100 Jefferson County Parkway
Suite 3550
Golden, CO 80419

RE: State Land Board - Shadow Mountain Parcels

Dear Jefferson County Planning,

This letter provides permission to Phillip Bouchard and his partners to discuss a proposed recreational development (downhill bike park) on the State Land Board's Shadow Mountain property (Parcel ID: 61-163-00-001; Schedule: 300148684).

The State Land Board has notified the project proponent that all uses on state trust land, including the Shadow Mountain property, must adhere to local zoning and land development requirements. Mr. Bouchard and his team are conducting preliminary work to determine if their proposed project is possible under current zoning or through a special use permit.

Sincerely,

Abe Medina, Recreation Program Manager

1127 Sherman Street, Suite 300, Denver, CO 80203-2206
P 303.866.3454 | F 303.866.3152 | slb.colorado.gov

Land Patent Details

Accession Nr: COCOAA 000001 44 **Document Type:** Serial Patent **State:** Colorado **Issue Date:** 8/1/1876 **Cancelled:** No

Names On Document

Military Rank:	---

Miscellaneous Information

Land Office:	Assigned For Automation
US Reservations:	No
Mineral Reservations:	No
Tribe:	---
Militia:	---
State In Favor Of:	---
Authority:	March 3, 1875: Colorado Enabling Act (18 Stat. 474)

Document Numbers

Document Nr:	---
Misc. Doc. Nr:	---
BLM Serial Nr:	COCOAA 000001 44
Indian Allot. Nr:	---

Survey Information

Total Acres:	986383.23
Survey Date:	---
Geographic Name:	---
Metes/Bounds:	No

Land Descriptions

State	Meridian	Twp - Rng	Aliquots	Section	Survey #	County
CO	6th PM	001N - 055W		16		Morgan
CO	6th PM	001N - 055W		36		Morgan
CO	6th PM	001N - 056W		16		Morgan
CO	6th PM	001N - 056W		36		Morgan
CO	6th PM	001N - 059W		16		Morgan
CO	6th PM	001N - 059W		36		Morgan
CO	6th PM	001N - 060W		16		Morgan
CO	6th PM	001N - 060W		36		Morgan
CO	6th PM	001N - 061W		16		Weld
CO	6th PM	001N - 061W		36		Weld
CO	6th PM	001N - 062W		16		Weld
CO	6th PM	001N - 062W		36		Weld
CO	6th PM	001N - 063W		16		Weld
CO	6th PM	001N - 063W		36		Weld
CO	6th PM	001N - 064W		16		Weld
CO	6th PM	001N - 064W		36		Weld
CO	6th PM	001N - 065W		16		Weld
CO	6th PM	001N - 065W		36		Weld
CO	6th PM	001N - 066W		16		Weld
CO	6th PM	001N - 066W		36		Weld
CO	6th PM	001N - 067W		16		Weld
CO	6th PM	001N - 067W	W½	36		Weld
CO	6th PM	001N - 067W	W½NE¼	36		Weld
CO	6th PM	001N - 068W		16		Weld
CO	6th PM	001N - 068W		36		Weld
CO	6th PM	001N - 069W	NW¼	16		Boulder
CO	6th PM	001N - 069W	N½NE¼	16		Boulder
CO	6th PM	001N - 069W		36		Boulder
CO	6th PM	001N - 070W		16		Boulder
CO	6th PM	001N - 070W		36		Boulder
CO	6th PM	001N - 071W	E½	16		Boulder
CO	6th PM	001N - 071W	SW¼	36		Boulder
CO	6th PM	001N - 071W	W½SE¼	36		Boulder
CO	6th PM	001N - 071W	SE¼NW¼	36		Boulder
CO	6th PM	001N - 071W	SE¼SE¼	36		Boulder
CO	6th PM	001N - 073W	NE¼	36		Boulder
CO	6th PM	001N - 077W		16		Grand
CO	6th PM	001N - 077W		36		Grand
CO	6th PM	001N - 078W		16		Grand
CO	6th PM	001N - 079W		36		Grand
CO	6th PM	001N - 080W		16		Grand
CO	6th PM	001S - 050W		16		Washington
CO	6th PM	001S - 050W		36		Washington
CO	6th PM	001S - 051W		16		Washington
CO	6th PM	001S - 051W		36		Washington
CO	6th PM	001S - 052W		16		Washington
CO	6th PM	001S - 052W		36		Washington
CO	6th PM	001S - 053W		16		Washington
CO	6th PM	001S - 053W		36		Washington
CO	6th PM	001S - 054W		16		Washington
CO	6th PM	001S - 054W		36		Washington
CO	6th PM	001S - 055W		16		Washington

CO	6th PM	001S - 055W		36		Washington
CO	6th PM	001S - 056W		16		Washington
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CO	6th PM	001S - 057W		16		Adams
CO	6th PM	001S - 057W		36		Adams
CO	6th PM	001S - 058W		16		Adams
CO	6th PM	001S - 058W		36		Adams
CO	6th PM	001S - 059W		16		Adams
CO	6th PM	001S - 059W		36		Adams
CO	6th PM	001S - 060W		16		Adams
CO	6th PM	001S - 060W		36		Adams
CO	6th PM	001S - 061W		16		Adams
CO	6th PM	001S - 061W		36		Adams
CO	6th PM	001S - 062W		16		Adams
CO	6th PM	001S - 062W		36		Adams
CO	6th PM	001S - 063W		16		Adams
CO	6th PM	001S - 063W		36		Adams
CO	6th PM	001S - 064W		16		Las Animas
CO	6th PM	001S - 064W		36		Las Animas
CO	6th PM	001S - 065W		16		Adams
CO	6th PM	001S - 065W		36		Adams
CO	6th PM	001S - 066W		16		Adams
CO	6th PM	001S - 066W		36		Adams
CO	6th PM	001S - 067W		16		Adams
CO	6th PM	001S - 067W		36		Adams
CO	6th PM	001S - 068W		16		Adams
CO	6th PM	001S - 068W		36		Adams
CO	6th PM	001S - 069W		16		Boulder
CO	6th PM	001S - 069W		36		Boulder
CO	6th PM	001S - 070W	E½NW¼	16		Boulder
CO	6th PM	001S - 070W	NW¼SW¼	16		Boulder
CO	6th PM	001S - 070W		36		Boulder
CO	6th PM	001S - 071W		16		Boulder
CO	6th PM	001S - 071W		36		Boulder
CO	6th PM	001S - 072W		16		Boulder
CO	6th PM	001S - 072W	E½	36		Boulder
CO	6th PM	001S - 072W	W½	36		Gilpin
CO	6th PM	001S - 073W	S½N½	36		Gilpin
CO	6th PM	001S - 073W	NE¼NE¼	36		Gilpin
CO	6th PM	002N - 055W		16		Morgan
CO	6th PM	002N - 055W		36		Morgan
CO	6th PM	002N - 056W		16		Morgan
CO	6th PM	002N - 056W		36		Morgan
CO	6th PM	002N - 059W		16		Morgan
CO	6th PM	002N - 059W		36		Morgan
CO	6th PM	002N - 060W		16		Morgan
CO	6th PM	002N - 060W		36		Morgan
CO	6th PM	002N - 061W		16		Weld
CO	6th PM	002N - 061W		36		Weld
CO	6th PM	002N - 062W		16		Weld
CO	6th PM	002N - 062W		36		Weld
CO	6th PM	002N - 063W		16		Weld
CO	6th PM	002N - 063W		36		Weld
CO	6th PM	002N - 064W		16		Weld
CO	6th PM	002N - 064W		36		Weld
CO	6th PM	002N - 065W		16		Weld
CO	6th PM	002N - 065W		36		Weld
CO	6th PM	002N - 066W		16		Weld
CO	6th PM	002N - 066W		36		Weld
CO	6th PM	002N - 067W		16		Weld
CO	6th PM	002N - 067W		36		Weld
CO	6th PM	002N - 068W	NW¼	16		Weld
CO	6th PM	002N - 068W	N½NE¼	16		Weld
CO	6th PM	002N - 068W	W½SW¼	16		Weld
CO	6th PM	002N - 068W		36		Weld
CO	6th PM	002N - 069W		16		Boulder
CO	6th PM	002N - 069W		36		Boulder
CO	6th PM	002N - 070W		16		Boulder
CO	6th PM	002N - 070W		36		Boulder
CO	6th PM	002S - 050W		16		Washington
CO	6th PM	002S - 050W		36		Washington
CO	6th PM	002S - 051W		16		Washington
CO	6th PM	002S - 051W		36		Washington
CO	6th PM	002S - 052W		16		Washington
CO	6th PM	002S - 052W		36		Washington

CO	6th PM	002S - 053W		16		Washington
CO	6th PM	002S - 053W		36		Washington
CO	6th PM	002S - 054W		16		Washington
CO	6th PM	002S - 054W		36		Washington
CO	6th PM	002S - 055W		16		Washington
CO	6th PM	002S - 055W		36		Washington
CO	6th PM	002S - 056W		16		Washington
CO	6th PM	002S - 056W		36		Washington
CO	6th PM	002S - 057W		16		Adams
CO	6th PM	002S - 057W		36		Adams
CO	6th PM	002S - 058W		16		Adams
CO	6th PM	002S - 058W		36		Adams
CO	6th PM	002S - 059W		16		Adams
CO	6th PM	002S - 059W		36		Adams
CO	6th PM	002S - 060W		16		Adams
CO	6th PM	002S - 060W		36		Adams
CO	6th PM	002S - 061W		16		Adams
CO	6th PM	002S - 061W		36		Adams
CO	6th PM	002S - 062W		16		Adams
CO	6th PM	002S - 062W		36		Adams
CO	6th PM	002S - 063W		16		Adams
CO	6th PM	002S - 063W		36		Adams
CO	6th PM	002S - 064W		16		Las Animas
CO	6th PM	002S - 064W		36		Las Animas
CO	6th PM	002S - 065W		16		Adams
CO	6th PM	002S - 065W		36		Adams
CO	6th PM	002S - 066W		16		Adams
CO	6th PM	002S - 066W		36		Adams
CO	6th PM	002S - 067W	S½	16		Adams
CO	6th PM	002S - 067W	NE¼	16		Adams
CO	6th PM	002S - 067W		36		Adams
CO	6th PM	002S - 068W		16		Adams
CO	6th PM	002S - 068W	SW¼	36		Adams
CO	6th PM	002S - 068W	NW¼NW¼	36		Adams
CO	6th PM	002S - 068W	SE¼SE¼	36		Adams
CO	6th PM	002S - 069W		16		Jefferson
CO	6th PM	002S - 069W		36		Jefferson
CO	6th PM	002S - 070W		16		Jefferson
CO	6th PM	002S - 070W	E½	36		Jefferson
CO	6th PM	002S - 070W	W½	36		Jefferson
CO	6th PM	002S - 071W		16		Jefferson
CO	6th PM	002S - 071W		36		Jefferson
CO	6th PM	002S - 072W		16		Gilpin
CO	6th PM	002S - 072W	E½	36		Jefferson
CO	6th PM	002S - 072W	W½	36		Gilpin
CO	6th PM	003N - 055W		16		Morgan
CO	6th PM	003N - 055W		36		Morgan
CO	6th PM	003N - 056W		16		Morgan
CO	6th PM	003N - 056W		36		Morgan
CO	6th PM	003N - 057W		16		Morgan
CO	6th PM	003N - 057W		36		Morgan
CO	6th PM	003N - 058W		16		Morgan
CO	6th PM	003N - 058W		36		Morgan
CO	6th PM	003N - 059W		16		Morgan
CO	6th PM	003N - 059W		36		Morgan
CO	6th PM	003N - 060W		16		Morgan
CO	6th PM	003N - 060W		36		Morgan
CO	6th PM	003N - 061W		16		Weld
CO	6th PM	003N - 061W		36		Weld
CO	6th PM	003N - 062W		16		Weld
CO	6th PM	003N - 062W		36		Weld
CO	6th PM	003N - 063W		16		Weld
CO	6th PM	003N - 063W		36		Weld
CO	6th PM	003N - 064W		16		Weld
CO	6th PM	003N - 064W		36		Weld
CO	6th PM	003N - 065W		16		Weld
CO	6th PM	003N - 065W		36		Weld
CO	6th PM	003N - 066W		16		Weld
CO	6th PM	003N - 066W		36		Weld
CO	6th PM	003N - 067W		16		Weld
CO	6th PM	003N - 067W	N½N½	36		Weld
CO	6th PM	003N - 067W	S½S½	36		Weld
CO	6th PM	003N - 067W	SE¼NE¼	36		Weld
CO	6th PM	003N - 067W	SW¼NW¼	36		Weld
CO	6th PM	003N - 067W	NW¼SW¼	36		Weld

CO	6th PM	003N - 067W	NE¼SE¼	36		Weld
CO	6th PM	003N - 068W		16		Weld
CO	6th PM	003N - 068W	NW¼	36		Weld
CO	6th PM	003N - 068W	N½NE¼	36		Weld
CO	6th PM	003N - 069W		16		Boulder
CO	6th PM	003N - 069W		36		Boulder
CO	6th PM	003N - 070W		16		Boulder
CO	6th PM	003N - 072W		16		Boulder
CO	6th PM	003N - 072W	N½	36		Boulder
CO	6th PM	003N - 072W	N½S½	36		Boulder
CO	6th PM	003N - 072W	SE¼SW¼	36		Boulder
CO	6th PM	003N - 072W	SW¼SE¼	36		Boulder
CO	6th PM	003S - 050W		16		Washington
CO	6th PM	003S - 050W		36		Washington
CO	6th PM	003S - 051W		16		Washington
CO	6th PM	003S - 051W		36		Washington
CO	6th PM	003S - 052W		16		Washington
CO	6th PM	003S - 052W		36		Washington
CO	6th PM	003S - 053W		16		Washington
CO	6th PM	003S - 053W		36		Washington
CO	6th PM	003S - 054W		16		Washington
CO	6th PM	003S - 054W		36		Washington
CO	6th PM	003S - 055W		16		Washington
CO	6th PM	003S - 055W		36		Washington
CO	6th PM	003S - 056W		16		Washington
CO	6th PM	003S - 056W		36		Washington
CO	6th PM	003S - 057W		16		Adams
CO	6th PM	003S - 057W		36		Adams
CO	6th PM	003S - 058W		16		Adams
CO	6th PM	003S - 059W		16		Adams
CO	6th PM	003S - 059W		36		Adams
CO	6th PM	003S - 060W		16		Adams
CO	6th PM	003S - 060W		36		Adams
CO	6th PM	003S - 061W		16		Adams
CO	6th PM	003S - 061W		36		Adams
CO	6th PM	003S - 062W		16		Adams
CO	6th PM	003S - 062W		36		Adams
CO	6th PM	003S - 063W		16		Adams
CO	6th PM	003S - 063W		36		Adams
CO	6th PM	003S - 064W		16		Las Animas
CO	6th PM	003S - 064W		36		Las Animas
CO	6th PM	003S - 065W		16		Adams
CO	6th PM	003S - 065W		36		Adams
CO	6th PM	003S - 066W		16		Adams
CO	6th PM	003S - 066W		36		Adams
CO	6th PM	003S - 067W		16		Adams
CO	6th PM	003S - 067W		36		Adams
CO	6th PM	003S - 068W	N½N½	16		Adams
CO	6th PM	003S - 068W	S½	16		Denver
CO	6th PM	003S - 068W		36		Denver
CO	6th PM	003S - 069W	N½	16		Jefferson
CO	6th PM	003S - 069W	SE¼	16		Jefferson
CO	6th PM	003S - 069W	N½SW¼	16		Jefferson
CO	6th PM	003S - 069W		36		Jefferson
CO	6th PM	003S - 070W		16		Jefferson
CO	6th PM	003S - 070W		36		Jefferson
CO	6th PM	003S - 071W		16		Jefferson
CO	6th PM	003S - 072W		16		Gilpin
CO	6th PM	004N - 055W		16		Morgan
CO	6th PM	004N - 055W		36		Morgan
CO	6th PM	004N - 056W		16		Morgan
CO	6th PM	004N - 056W		36		Morgan
CO	6th PM	004N - 057W		16		Morgan
CO	6th PM	004N - 057W		36		Morgan
CO	6th PM	004N - 058W		16		Morgan
CO	6th PM	004N - 058W		36		Morgan
CO	6th PM	004N - 059W		16		Morgan
CO	6th PM	004N - 059W		36		Morgan
CO	6th PM	004N - 060W		16		Morgan
CO	6th PM	004N - 060W		36		Morgan
CO	6th PM	004N - 061W		16		Weld
CO	6th PM	004N - 061W		36		Weld
CO	6th PM	004N - 062W		16		Weld
CO	6th PM	004N - 062W		36		Weld
CO	6th PM	004N - 063W		16		Weld

CO	6th PM	004N - 063W		36		Weld
CO	6th PM	004N - 064W		16		Weld
CO	6th PM	004N - 064W		36		Weld
CO	6th PM	004N - 065W		16		Weld
CO	6th PM	004N - 065W		36		Weld
CO	6th PM	004N - 066W		16		Weld
CO	6th PM	004N - 066W		36		Weld
CO	6th PM	004N - 067W		16		Weld
CO	6th PM	004N - 067W		36		Weld
CO	6th PM	004N - 068W		16		Weld
CO	6th PM	004N - 068W		36		Weld
CO	6th PM	004N - 069W		16		Larimer
CO	6th PM	004N - 069W		36		Larimer
CO	6th PM	004N - 070W		16		Larimer
CO	6th PM	004N - 070W	N½	36		Larimer
CO	6th PM	004N - 073W	NE¼NE¼	36		Larimer
CO	6th PM	004N - 073W	W½	36		Larimer
CO	6th PM	004N - 073W	SE¼	36		Larimer
CO	6th PM	004N - 073W	W½NE¼	36		Larimer
CO	6th PM	004N - 073W	SE¼NE¼	36		Larimer
CO	6th PM	004S - 050W		16		Washington
CO	6th PM	004S - 050W		36		Washington
CO	6th PM	004S - 051W		16		Washington
CO	6th PM	004S - 051W		36		Washington
CO	6th PM	004S - 052W		16		Washington
CO	6th PM	004S - 052W		36		Washington
CO	6th PM	004S - 053W		16		Washington
CO	6th PM	004S - 053W		36		Washington
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CO	6th PM	004S - 054W		36		Washington
CO	6th PM	004S - 055W		16		Washington
CO	6th PM	004S - 055W		36		Washington
CO	6th PM	004S - 056W		16		Washington
CO	6th PM	004S - 056W		36		Washington
CO	6th PM	004S - 057W		16		Arapahoe
CO	6th PM	004S - 057W		36		Arapahoe
CO	6th PM	004S - 058W		16		Arapahoe
CO	6th PM	004S - 058W		36		Arapahoe
CO	6th PM	004S - 059W		16		Arapahoe
CO	6th PM	004S - 059W		36		Arapahoe
CO	6th PM	004S - 060W		16		Arapahoe
CO	6th PM	004S - 060W		36		Arapahoe
CO	6th PM	004S - 061W		16		Arapahoe
CO	6th PM	004S - 061W		36		Arapahoe
CO	6th PM	004S - 062W		16		Arapahoe
CO	6th PM	004S - 062W		36		Arapahoe
CO	6th PM	004S - 063W		16		Arapahoe
CO	6th PM	004S - 063W		36		Arapahoe
CO	6th PM	004S - 064W		16		Arapahoe
CO	6th PM	004S - 064W		36		Arapahoe
CO	6th PM	004S - 065W		16		Arapahoe
CO	6th PM	004S - 065W		36		Arapahoe
CO	6th PM	004S - 066W		16		Arapahoe
CO	6th PM	004S - 066W		36		Arapahoe
CO	6th PM	004S - 067W		16		Arapahoe
CO	6th PM	004S - 067W		36		Arapahoe
CO	6th PM	004S - 068W	SW¼	16		Denver
CO	6th PM	004S - 068W	W½NW¼	16		Denver
CO	6th PM	004S - 068W	W½SE¼	16		Denver
CO	6th PM	004S - 068W	SE¼NW¼	16		Denver
CO	6th PM	004S - 068W	S½NW¼	36		Arapahoe
CO	6th PM	004S - 068W	N½SW¼	36		Arapahoe
CO	6th PM	004S - 068W	E½SE¼	36		Denver
CO	6th PM	004S - 069W		16		Jefferson
CO	6th PM	004S - 069W	N½NE¼	36		Jefferson
CO	6th PM	004S - 069W	NW¼NW¼	36		Jefferson
CO	6th PM	004S - 069W	SW¼SW¼	36		Jefferson
CO	6th PM	004S - 070W		16		Jefferson
CO	6th PM	004S - 070W	N½	36		Jefferson
CO	6th PM	004S - 070W	SE¼	36		Jefferson
CO	6th PM	004S - 070W	N½SW¼	36		Jefferson
CO	6th PM	004S - 070W	SE¼SW¼	36		Jefferson
CO	6th PM	004S - 070W	SW¼SW¼	36		Jefferson
CO	6th PM	004S - 071W	S½	16		Jefferson
CO	6th PM	004S - 071W	N½NE¼	16		Jefferson

CO	6th PM	004S - 071W	SE¼NE¼	16		Jefferson
CO	6th PM	004S - 071W		36		Jefferson
CO	6th PM	005N - 053W		16		Washington
CO	6th PM	005N - 053W		36		Washington
CO	6th PM	005N - 054W		16		Washington
CO	6th PM	005N - 054W		36		Washington
CO	6th PM	005N - 055W		16		Morgan
CO	6th PM	005N - 055W		36		Morgan
CO	6th PM	005N - 056W		16		Morgan
CO	6th PM	005N - 056W		36		Morgan
CO	6th PM	005N - 058W		16		Morgan
CO	6th PM	005N - 058W		36		Morgan
CO	6th PM	005N - 059W		16		Morgan
CO	6th PM	005N - 059W		36		Morgan
CO	6th PM	005N - 060W		16		Morgan
CO	6th PM	005N - 060W		36		Morgan
CO	6th PM	005N - 061W		16		Weld
CO	6th PM	005N - 061W		36		Weld
CO	6th PM	005N - 062W		16		Weld
CO	6th PM	005N - 062W		36		Weld
CO	6th PM	005N - 063W		16		Weld
CO	6th PM	005N - 063W		36		Weld
CO	6th PM	005N - 064W		16		Weld
CO	6th PM	005N - 064W		36		Weld
CO	6th PM	005N - 065W	N½	16		Weld
CO	6th PM	005N - 065W	SW¼	16		Weld
CO	6th PM	005N - 065W	N½SE¼	16		Weld
CO	6th PM	005N - 065W	SW¼SE¼	16		Weld
CO	6th PM	005N - 065W		36		Weld
CO	6th PM	005N - 066W		16		Weld
CO	6th PM	005N - 066W	N½	36		Weld
CO	6th PM	005N - 066W	SE¼	36		Weld
CO	6th PM	005N - 067W		16		Weld
CO	6th PM	005N - 067W		36		Weld
CO	6th PM	005N - 068W	N½	16		Larimer
CO	6th PM	005N - 068W	SW¼	16		Larimer
CO	6th PM	005N - 068W	N½SE¼	16		Larimer
CO	6th PM	005N - 068W	SW¼SE¼	16		Larimer
CO	6th PM	005N - 068W		36		Larimer
CO	6th PM	005N - 069W	SW¼	16		Larimer
CO	6th PM	005N - 069W	W½NW¼	16		Larimer
CO	6th PM	005N - 069W	W½SE¼	16		Larimer
CO	6th PM	005N - 069W	NE¼NE¼	16		Larimer
CO	6th PM	005N - 069W	SE¼SE¼	16		Larimer
CO	6th PM	005N - 069W		36		Larimer
CO	6th PM	005N - 072W		16		Larimer
CO	6th PM	005N - 072W		36		Larimer
CO	6th PM	005N - 073W	NE¼	16		Larimer
CO	6th PM	005N - 073W	N½NW¼	16		Larimer
CO	6th PM	005N - 073W	S½SW¼	16		Larimer
CO	6th PM	005N - 073W	SE¼	16		Larimer
CO	6th PM	005N - 073W	S½NW¼	16		Larimer
CO	6th PM	005N - 073W	N½SW¼	16		Larimer
CO	6th PM	005N - 073W		36		Larimer
CO	6th PM	005S - 049W		16		Washington
CO	6th PM	005S - 049W		36		Washington
CO	6th PM	005S - 050W		16		Washington
CO	6th PM	005S - 050W		36		Washington
CO	6th PM	005S - 051W		16		Washington
CO	6th PM	005S - 051W		36		Washington
CO	6th PM	005S - 052W		16		Washington
CO	6th PM	005S - 052W		36		Washington
CO	6th PM	005S - 053W		16		Washington
CO	6th PM	005S - 053W		36		Washington
CO	6th PM	005S - 054W		16		Washington
CO	6th PM	005S - 054W		36		Washington
CO	6th PM	005S - 055W		16		Washington
CO	6th PM	005S - 055W		36		Washington
CO	6th PM	005S - 056W		16		Washington
CO	6th PM	005S - 056W		36		Washington
CO	6th PM	005S - 057W		16		Arapahoe
CO	6th PM	005S - 057W		36		Arapahoe
CO	6th PM	005S - 058W		16		Arapahoe
CO	6th PM	005S - 058W		36		Arapahoe
CO	6th PM	005S - 059W		16		Arapahoe

CO	6th PM	005S - 059W		36		Arapahoe
CO	6th PM	005S - 060W		16		Arapahoe
CO	6th PM	005S - 060W		36		Arapahoe
CO	6th PM	005S - 061W		16		Arapahoe
CO	6th PM	005S - 061W		36		Arapahoe
CO	6th PM	005S - 062W		16		Arapahoe
CO	6th PM	005S - 062W		36		Arapahoe
CO	6th PM	005S - 063W		16		Arapahoe
CO	6th PM	005S - 063W		36		Arapahoe
CO	6th PM	005S - 064W		16		Arapahoe
CO	6th PM	005S - 064W		36		Arapahoe
CO	6th PM	005S - 065W		16		Arapahoe
CO	6th PM	005S - 065W		36		Arapahoe
CO	6th PM	005S - 066W		16		Arapahoe
CO	6th PM	005S - 066W		36		Arapahoe
CO	6th PM	005S - 067W		16		Arapahoe
CO	6th PM	005S - 067W		36		Arapahoe
CO	6th PM	005S - 068W		16		Arapahoe
CO	6th PM	005S - 068W		36		Arapahoe
CO	6th PM	005S - 069W		16		Jefferson
CO	6th PM	005S - 069W		36		Jefferson
CO	6th PM	005S - 070W	E½	16		Jefferson
CO	6th PM	005S - 070W	N½NW¼	16		Jefferson
CO	6th PM	005S - 070W	S½SW¼	16		Jefferson
CO	6th PM	005S - 070W		36		Jefferson
CO	6th PM	005S - 071W	W½	16		Jefferson
CO	6th PM	005S - 071W	S½SE¼	16		Jefferson
CO	6th PM	005S - 071W	NE¼SE¼	16		Jefferson
CO	6th PM	005S - 071W	W½	36		Jefferson
CO	6th PM	005S - 071W	W½SE¼	36		Jefferson
CO	6th PM	005S - 071W	SW¼NE¼	36		Jefferson
CO	6th PM	005S - 071W	SE¼SE¼	36		Jefferson
CO	6th PM	005S - 072W		16		Clear Creek
CO	6th PM	005S - 072W	E½	36		Jefferson
CO	6th PM	005S - 072W	W½	36		Clear Creek
CO	6th PM	006N - 049W		16		Logan
CO	6th PM	006N - 049W		36		Logan
CO	6th PM	006N - 050W		16		Logan
CO	6th PM	006N - 050W		36		Logan
CO	6th PM	006N - 051W		16		Logan
CO	6th PM	006N - 051W		36		Logan
CO	6th PM	006N - 052W		16		Logan
CO	6th PM	006N - 052W		36		Logan
CO	6th PM	006N - 053W		16		Logan
CO	6th PM	006N - 053W		36		Logan
CO	6th PM	006N - 054W		16		Logan
CO	6th PM	006N - 054W		36		Logan
CO	6th PM	006N - 055W		16		Morgan
CO	6th PM	006N - 055W		36		Morgan
CO	6th PM	006N - 056W		16		Morgan
CO	6th PM	006N - 056W		36		Morgan
CO	6th PM	006N - 057W		16		Morgan
CO	6th PM	006N - 057W		36		Morgan
CO	6th PM	006N - 058W		16		Morgan
CO	6th PM	006N - 058W		36		Morgan
CO	6th PM	006N - 060W		16		Morgan
CO	6th PM	006N - 060W		36		Morgan
CO	6th PM	006N - 061W		16		Weld
CO	6th PM	006N - 061W		36		Weld
CO	6th PM	006N - 062W		16		Weld
CO	6th PM	006N - 062W		36		Weld
CO	6th PM	006N - 063W		16		Weld
CO	6th PM	006N - 063W		36		Weld
CO	6th PM	006N - 064W		16		Weld
CO	6th PM	006N - 064W		36		Weld
CO	6th PM	006N - 065W		16		Weld
CO	6th PM	006N - 065W		36		Weld
CO	6th PM	006N - 066W		16		Weld
CO	6th PM	006N - 066W		36		Weld
CO	6th PM	006N - 067W		16		Weld
CO	6th PM	006N - 067W		36		Weld
CO	6th PM	006N - 068W		16		Larimer
CO	6th PM	006N - 068W		36		Larimer
CO	6th PM	006N - 084W		16		Routt
CO	6th PM	006S - 057W		16		Elbert

CO	6th PM	006S - 057W		36		Elbert
CO	6th PM	006S - 058W		16		Elbert
CO	6th PM	006S - 058W		36		Elbert
CO	6th PM	006S - 059W		16		Elbert
CO	6th PM	006S - 059W		36		Elbert
CO	6th PM	006S - 060W		16		Elbert
CO	6th PM	006S - 060W		36		Elbert
CO	6th PM	006S - 061W		16		Elbert
CO	6th PM	006S - 061W		36		Elbert
CO	6th PM	006S - 062W		16		Elbert
CO	6th PM	006S - 062W		36		Elbert
CO	6th PM	006S - 063W		16		Elbert
CO	6th PM	006S - 063W		36		Elbert
CO	6th PM	006S - 064W		16		Elbert
CO	6th PM	006S - 064W		36		Elbert
CO	6th PM	006S - 065W		16		Douglas
CO	6th PM	006S - 065W		36		Elbert
CO	6th PM	006S - 066W		16		Douglas
CO	6th PM	006S - 066W		36		Douglas
CO	6th PM	006S - 067W		16		Douglas
CO	6th PM	006S - 067W		36		Douglas
CO	6th PM	006S - 068W		16		Douglas
CO	6th PM	006S - 068W		36		Douglas
CO	6th PM	006S - 069W		16		Jefferson
CO	6th PM	006S - 069W		36		Douglas
CO	6th PM	006S - 070W		16		Jefferson
CO	6th PM	006S - 070W		36		Jefferson
CO	6th PM	006S - 071W		16		Jefferson
CO	6th PM	006S - 071W		36		Jefferson
CO	6th PM	006S - 072W		16		Park
CO	6th PM	006S - 073W	S½	36		Park
CO	6th PM	006S - 073W	S½NW¼	36		Park
CO	6th PM	007N - 049W		16		Logan
CO	6th PM	007N - 049W		36		Logan
CO	6th PM	007N - 050W		16		Logan
CO	6th PM	007N - 050W		36		Logan
CO	6th PM	007N - 051W		16		Logan
CO	6th PM	007N - 051W		36		Logan
CO	6th PM	007N - 052W		16		Logan
CO	6th PM	007N - 052W		36		Logan
CO	6th PM	007N - 053W		16		Logan
CO	6th PM	007N - 053W		36		Logan
CO	6th PM	007N - 054W		16		Logan
CO	6th PM	007N - 054W		36		Logan
CO	6th PM	007N - 055W		16		Logan
CO	6th PM	007N - 055W		36		Logan
CO	6th PM	007N - 062W		16		Weld
CO	6th PM	007N - 062W		36		Weld
CO	6th PM	007N - 063W		16		Weld
CO	6th PM	007N - 063W		36		Weld
CO	6th PM	007N - 064W		16		Weld
CO	6th PM	007N - 064W		36		Weld
CO	6th PM	007N - 065W		16		Weld
CO	6th PM	007N - 065W		36		Weld
CO	6th PM	007N - 066W		16		Weld
CO	6th PM	007N - 066W		36		Weld
CO	6th PM	007N - 067W		16		Weld
CO	6th PM	007N - 067W		36		Weld
CO	6th PM	007N - 068W		16		Larimer
CO	6th PM	007N - 068W		36		Larimer
CO	6th PM	007N - 069W		16		Larimer
CO	6th PM	007N - 069W		36		Larimer
CO	6th PM	007N - 071W		16		Larimer
CO	6th PM	007N - 071W		36		Larimer
CO	6th PM	007S - 057W		16		Elbert
CO	6th PM	007S - 057W		36		Elbert
CO	6th PM	007S - 058W		16		Elbert
CO	6th PM	007S - 058W		36		Elbert
CO	6th PM	007S - 059W		16		Elbert
CO	6th PM	007S - 059W		36		Elbert
CO	6th PM	007S - 060W		16		Elbert
CO	6th PM	007S - 060W		36		Elbert
CO	6th PM	007S - 061W	NW¼	16		Elbert
CO	6th PM	007S - 061W	N½SW¼	16		Elbert
CO	6th PM	007S - 061W	SW¼SW¼	16		Elbert

CO	6th PM	007S - 061W		36		Elbert
CO	6th PM	007S - 062W		16		Elbert
CO	6th PM	007S - 062W		36		Elbert
CO	6th PM	007S - 063W		16		Elbert
CO	6th PM	007S - 063W		36		Elbert
CO	6th PM	007S - 064W		16		Elbert
CO	6th PM	007S - 064W		36		Elbert
CO	6th PM	007S - 065W		16		Douglas
CO	6th PM	007S - 065W		36		Elbert
CO	6th PM	007S - 066W		16		Douglas
CO	6th PM	007S - 066W		36		Douglas
CO	6th PM	007S - 067W		16		Douglas
CO	6th PM	007S - 067W		36		Douglas
CO	6th PM	007S - 068W	W½	16		Douglas
CO	6th PM	007S - 068W	E½E½	16		Douglas
CO	6th PM	007S - 068W		36		Douglas
CO	6th PM	007S - 070W		16		Jefferson
CO	6th PM	007S - 070W	SW¼NE¼	36		Jefferson
CO	6th PM	007S - 071W		16		Jefferson
CO	6th PM	007S - 071W	E½	36		Jefferson
CO	6th PM	007S - 071W	N½NW¼	36		Jefferson
CO	6th PM	007S - 071W	SE¼SW¼	36		Jefferson
CO	6th PM	007S - 072W	W½	16		Park
CO	6th PM	007S - 072W	SE¼	16		Park
CO	6th PM	007S - 073W		16		Park
CO	6th PM	008N - 049W		16		Logan
CO	6th PM	008N - 049W		36		Logan
CO	6th PM	008N - 050W		16		Logan
CO	6th PM	008N - 050W		36		Logan
CO	6th PM	008N - 051W		16		Logan
CO	6th PM	008N - 051W		36		Logan
CO	6th PM	008N - 052W		16		Logan
CO	6th PM	008N - 052W		36		Logan
CO	6th PM	008N - 053W		16		Logan
CO	6th PM	008N - 053W		36		Logan
CO	6th PM	008N - 062W		16		Weld
CO	6th PM	008N - 062W		36		Weld
CO	6th PM	008N - 063W		16		Weld
CO	6th PM	008N - 063W	N½	36		Weld
CO	6th PM	008N - 063W	S½	36		Weld
CO	6th PM	008N - 064W		16		Weld
CO	6th PM	008N - 064W		36		Weld
CO	6th PM	008N - 065W		16		Weld
CO	6th PM	008N - 065W		36		Weld
CO	6th PM	008N - 066W		16		Weld
CO	6th PM	008N - 066W		36		Weld
CO	6th PM	008N - 067W		16		Weld
CO	6th PM	008N - 067W		36		Weld
CO	6th PM	008N - 068W		16		Larimer
CO	6th PM	008N - 068W		36		Larimer
CO	6th PM	008N - 069W		16		Larimer
CO	6th PM	008N - 069W		36		Larimer
CO	6th PM	008S - 057W		16		Elbert
CO	6th PM	008S - 057W		36		Elbert
CO	6th PM	008S - 058W		16		Elbert
CO	6th PM	008S - 058W		36		Elbert
CO	6th PM	008S - 059W		16		Elbert
CO	6th PM	008S - 059W		36		Elbert
CO	6th PM	008S - 060W		16		Elbert
CO	6th PM	008S - 060W		36		Elbert
CO	6th PM	008S - 061W		16		Elbert
CO	6th PM	008S - 061W		36		Elbert
CO	6th PM	008S - 062W		16		Elbert
CO	6th PM	008S - 062W		36		Elbert
CO	6th PM	008S - 063W		16		Elbert
CO	6th PM	008S - 063W		36		Elbert
CO	6th PM	008S - 064W		16		Elbert
CO	6th PM	008S - 064W		36		Elbert
CO	6th PM	008S - 065W		16		Douglas
CO	6th PM	008S - 065W		36		Elbert
CO	6th PM	008S - 066W		16		Douglas
CO	6th PM	008S - 066W		36		Douglas
CO	6th PM	008S - 067W		16		Douglas
CO	6th PM	008S - 067W		36		Douglas
CO	6th PM	008S - 068W		16		Douglas

CO	6th PM	008S - 068W		36		Douglas
CO	6th PM	008S - 070W	N½	16		Jefferson
CO	6th PM	008S - 070W	SE¼	16		Jefferson
CO	6th PM	008S - 070W	N½SW¼	16		Jefferson
CO	6th PM	008S - 075W		16		Park
CO	6th PM	008S - 076W	S½S½	16		Park
CO	6th PM	008S - 076W		36		Park
CO	6th PM	009N - 049W		16		Logan
CO	6th PM	009N - 049W		36		Logan
CO	6th PM	009N - 050W		16		Logan
CO	6th PM	009N - 050W		36		Logan
CO	6th PM	009N - 051W		16		Logan
CO	6th PM	009N - 051W		36		Logan
CO	6th PM	009N - 052W		16		Logan
CO	6th PM	009N - 052W		36		Logan
CO	6th PM	009N - 058W		16		Weld
CO	6th PM	009N - 058W		36		Weld
CO	6th PM	009N - 059W		16		Weld
CO	6th PM	009N - 059W		36		Weld
CO	6th PM	009N - 060W		16		Weld
CO	6th PM	009N - 060W		36		Weld
CO	6th PM	009N - 061W		16		Weld
CO	6th PM	009N - 061W		36		Weld
CO	6th PM	009N - 062W		16		Weld
CO	6th PM	009N - 062W		36		Weld
CO	6th PM	009N - 063W		16		Weld
CO	6th PM	009N - 063W		36		Weld
CO	6th PM	009N - 064W		16		Weld
CO	6th PM	009N - 064W		36		Weld
CO	6th PM	009N - 065W		16		Weld
CO	6th PM	009N - 065W		36		Weld
CO	6th PM	009N - 066W		16		Weld
CO	6th PM	009N - 066W		36		Weld
CO	6th PM	009N - 067W		16		Weld
CO	6th PM	009N - 067W		36		Weld
CO	6th PM	009N - 068W		16		Larimer
CO	6th PM	009N - 068W		36		Larimer
CO	6th PM	009N - 069W		16		Larimer
CO	6th PM	009N - 069W		36		Larimer
CO	6th PM	009S - 054W		16		Lincoln
CO	6th PM	009S - 054W		36		Lincoln
CO	6th PM	009S - 055W		16		Lincoln
CO	6th PM	009S - 055W		36		Lincoln
CO	6th PM	009S - 056W		16		Lincoln
CO	6th PM	009S - 056W		36		Lincoln
CO	6th PM	009S - 057W		16		Elbert
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CO	6th PM	009S - 058W		36		Elbert
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CO	6th PM	009S - 060W		16		Elbert
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CO	6th PM	009S - 062W		16		Elbert
CO	6th PM	009S - 062W		36		Elbert
CO	6th PM	009S - 063W		16		Elbert
CO	6th PM	009S - 063W		36		Elbert
CO	6th PM	009S - 064W		16		Elbert
CO	6th PM	009S - 064W		36		Elbert
CO	6th PM	009S - 065W		16		Douglas
CO	6th PM	009S - 065W		36		Elbert
CO	6th PM	009S - 066W		16		Douglas
CO	6th PM	009S - 066W		36		Douglas
CO	6th PM	009S - 067W	NE¼	16		Douglas
CO	6th PM	009S - 067W	W½W½	16		Douglas
CO	6th PM	009S - 067W	E½SE¼	16		Douglas
CO	6th PM	009S - 067W	NE¼NW¼	16		Douglas
CO	6th PM	009S - 067W	SE¼SW¼	16		Douglas
CO	6th PM	009S - 067W		36		Douglas
CO	6th PM	009S - 068W		16		Douglas
CO	6th PM	009S - 068W	N½	36		Douglas
CO	6th PM	009S - 068W	SE¼	36		Douglas
CO	6th PM	009S - 068W	N½SW¼	36		Douglas

CO	6th PM	009S - 074W	SE¼	16		Park
CO	6th PM	009S - 074W	SW¼SW¼	16		Park
CO	6th PM	009S - 075W		16		Park
CO	6th PM	009S - 075W		36		Park
CO	6th PM	009S - 076W		16		Park
CO	6th PM	009S - 076W		36		Park
CO	6th PM	009S - 077W		36		Park
CO	6th PM	010N - 046W		16		Sedgwick
CO	6th PM	010N - 046W		36		Sedgwick
CO	6th PM	010N - 047W		16		Sedgwick
CO	6th PM	010N - 047W		36		Sedgwick
CO	6th PM	010N - 048W		16		Logan
CO	6th PM	010N - 048W		36		Logan
CO	6th PM	010N - 049W	N½S½	16		Logan
CO	6th PM	010N - 049W	N½NW¼	16		Logan
CO	6th PM	010N - 049W		36		Logan
CO	6th PM	010N - 050W		16		Logan
CO	6th PM	010N - 050W		36		Logan
CO	6th PM	010N - 051W		16		Logan
CO	6th PM	010N - 051W		36		Logan
CO	6th PM	010N - 052W		16		Logan
CO	6th PM	010N - 052W		36		Logan
CO	6th PM	010N - 058W		16		Weld
CO	6th PM	010N - 058W		36		Weld
CO	6th PM	010N - 059W		16		Weld
CO	6th PM	010N - 059W		36		Weld
CO	6th PM	010N - 060W		16		Weld
CO	6th PM	010N - 060W		36		Weld
CO	6th PM	010N - 061W		16		Weld
CO	6th PM	010N - 061W		36		Weld
CO	6th PM	010N - 062W		16		Weld
CO	6th PM	010N - 062W		36		Weld
CO	6th PM	010N - 063W		16		Weld
CO	6th PM	010N - 063W		36		Weld
CO	6th PM	010N - 064W		16		Weld
CO	6th PM	010N - 064W		36		Weld
CO	6th PM	010N - 065W		16		Weld
CO	6th PM	010N - 065W		36		Weld
CO	6th PM	010N - 066W		16		Weld
CO	6th PM	010N - 066W		36		Weld
CO	6th PM	010N - 067W		16		Weld
CO	6th PM	010N - 067W		36		Weld
CO	6th PM	010N - 068W		16		Larimer
CO	6th PM	010N - 068W		36		Larimer
CO	6th PM	010N - 069W		16		Larimer
CO	6th PM	010N - 069W		36		Larimer
CO	6th PM	010S - 054W		16		Lincoln
CO	6th PM	010S - 054W		36		Lincoln
CO	6th PM	010S - 055W		16		Lincoln
CO	6th PM	010S - 055W		36		Lincoln
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CO	6th PM	010S - 056W		36		Lincoln
CO	6th PM	010S - 057W		16		Elbert
CO	6th PM	010S - 057W		36		Elbert
CO	6th PM	010S - 058W		16		Elbert
CO	6th PM	010S - 058W		36		Elbert
CO	6th PM	010S - 059W		16		Elbert
CO	6th PM	010S - 059W		36		Elbert
CO	6th PM	010S - 060W		16		Elbert
CO	6th PM	010S - 060W		36		Elbert
CO	6th PM	010S - 061W		16		Elbert
CO	6th PM	010S - 061W		36		Elbert
CO	6th PM	010S - 062W		16		Elbert
CO	6th PM	010S - 062W		36		Elbert
CO	6th PM	010S - 063W		16		Elbert
CO	6th PM	010S - 063W		36		Elbert
CO	6th PM	010S - 064W		16		Elbert
CO	6th PM	010S - 064W		36		Elbert
CO	6th PM	010S - 065W		16		Douglas
CO	6th PM	010S - 065W		36		Elbert
CO	6th PM	010S - 066W		16		Douglas
CO	6th PM	010S - 066W		36		Douglas
CO	6th PM	010S - 067W		16		Douglas
CO	6th PM	010S - 067W		36		Douglas
CO	6th PM	010S - 075W		16		Park

CO	6th PM	010S - 075W		36		Park
CO	6th PM	010S - 076W		16		Park
CO	6th PM	010S - 076W		36		Park
CO	6th PM	010S - 077W	SE¼	16		Park
CO	6th PM	010S - 077W	E½NE¼	16		Park
CO	6th PM	010S - 077W		36		Park
CO	6th PM	011N - 043W		16		Sedgwick
CO	6th PM	011N - 043W		36		Sedgwick
CO	6th PM	011N - 044W		16		Sedgwick
CO	6th PM	011N - 044W		36		Sedgwick
CO	6th PM	011N - 045W	S½	36		Sedgwick
CO	6th PM	011N - 046W		16		Sedgwick
CO	6th PM	011N - 046W	S½	36		Sedgwick
CO	6th PM	011N - 047W		16		Sedgwick
CO	6th PM	011N - 047W		36		Sedgwick
CO	6th PM	011N - 048W		16		Logan
CO	6th PM	011N - 048W		36		Logan
CO	6th PM	011N - 052W		16		Logan
CO	6th PM	011N - 052W		36		Logan
CO	6th PM	011N - 053W		16		Logan
CO	6th PM	011N - 053W		36		Logan
CO	6th PM	011N - 054W		16		Logan
CO	6th PM	011N - 054W		36		Logan
CO	6th PM	011N - 055W		16		Logan
CO	6th PM	011N - 055W		36		Logan
CO	6th PM	011N - 056W		16		Weld
CO	6th PM	011N - 056W		36		Weld
CO	6th PM	011N - 057W		16		Weld
CO	6th PM	011N - 057W		36		Weld
CO	6th PM	011N - 058W		16		Weld
CO	6th PM	011N - 058W		36		Weld
CO	6th PM	011N - 059W		16		Weld
CO	6th PM	011N - 059W		36		Weld
CO	6th PM	011N - 060W		16		Weld
CO	6th PM	011N - 060W		36		Weld
CO	6th PM	011N - 061W		16		Weld
CO	6th PM	011N - 061W		36		Weld
CO	6th PM	011N - 062W		16		Weld
CO	6th PM	011N - 062W		36		Weld
CO	6th PM	011N - 063W		16		Weld
CO	6th PM	011N - 063W		36		Weld
CO	6th PM	011N - 064W		16		Weld
CO	6th PM	011N - 064W		36		Weld
CO	6th PM	011N - 065W		16		Weld
CO	6th PM	011N - 065W		36		Weld
CO	6th PM	011N - 066W		16		Weld
CO	6th PM	011N - 066W		36		Weld
CO	6th PM	011N - 067W		16		Weld
CO	6th PM	011N - 067W		36		Weld
CO	6th PM	011N - 068W		16		Larimer
CO	6th PM	011N - 068W		36		Larimer
CO	6th PM	011N - 069W		16		Larimer
CO	6th PM	011N - 069W		36		Larimer
CO	6th PM	011S - 053W		16		Lincoln
CO	6th PM	011S - 053W		36		Lincoln
CO	6th PM	011S - 054W		16		Lincoln
CO	6th PM	011S - 054W		36		Lincoln
CO	6th PM	011S - 055W		16		Lincoln
CO	6th PM	011S - 055W		36		Lincoln
CO	6th PM	011S - 056W		16		Lincoln
CO	6th PM	011S - 056W		36		Lincoln
CO	6th PM	011S - 057W		16		Elbert
CO	6th PM	011S - 057W		36		Elbert
CO	6th PM	011S - 058W		16		Elbert
CO	6th PM	011S - 058W		36		Elbert
CO	6th PM	011S - 059W		16		Elbert
CO	6th PM	011S - 059W		36		Elbert
CO	6th PM	011S - 060W		16		El Paso
CO	6th PM	011S - 060W		36		El Paso
CO	6th PM	011S - 061W		16		El Paso
CO	6th PM	011S - 061W		36		El Paso
CO	6th PM	011S - 062W		16		El Paso
CO	6th PM	011S - 062W		36		El Paso
CO	6th PM	011S - 063W		16		El Paso
CO	6th PM	011S - 063W		36		El Paso

CO	6th PM	011S - 064W		16		El Paso
CO	6th PM	011S - 064W		36		El Paso
CO	6th PM	011S - 065W		16		El Paso
CO	6th PM	011S - 065W		36		El Paso
CO	6th PM	011S - 066W		16		El Paso
CO	6th PM	011S - 066W		36		El Paso
CO	6th PM	011S - 067W	W½NW¼	16		El Paso
CO	6th PM	011S - 067W	SE¼NW¼	16		El Paso
CO	6th PM	011S - 067W	NW¼SE¼	16		El Paso
CO	6th PM	011S - 067W	E½	36		El Paso
CO	6th PM	011S - 067W	E½W½	36		El Paso
CO	6th PM	011S - 067W	SW¼SW¼	36		El Paso
CO	6th PM	011S - 069W	W½E½	16		Teller
CO	6th PM	011S - 075W		16		Park
CO	6th PM	011S - 075W		36		Park
CO	6th PM	011S - 076W		16		Park
CO	6th PM	011S - 076W		36		Park
CO	6th PM	011S - 077W		16		Park
CO	6th PM	011S - 077W		36		Park
CO	6th PM	012N - 043W		36		Sedgwick
CO	6th PM	012N - 044W		36		Sedgwick
CO	6th PM	012N - 047W		36		Sedgwick
CO	6th PM	012N - 048W		36		Logan
CO	6th PM	012N - 052W		36		Logan
CO	6th PM	012N - 053W		36		Logan
CO	6th PM	012N - 054W		36		Logan
CO	6th PM	012N - 055W		36		Logan
CO	6th PM	012N - 056W		36		Weld
CO	6th PM	012N - 057W		36		Weld
CO	6th PM	012N - 058W		36		Weld
CO	6th PM	012N - 059W		36		Weld
CO	6th PM	012N - 060W		36		Weld
CO	6th PM	012N - 061W		36		Weld
CO	6th PM	012N - 062W		36		Weld
CO	6th PM	012N - 063W		36		Weld
CO	6th PM	012N - 064W		36		Weld
CO	6th PM	012N - 065W		36		Weld
CO	6th PM	012N - 066W		36		Weld
CO	6th PM	012N - 067W		36		Weld
CO	6th PM	012N - 068W		36		Larimer
CO	6th PM	012N - 069W		36		Larimer
CO	6th PM	012S - 052W		16		Lincoln
CO	6th PM	012S - 052W		36		Lincoln
CO	6th PM	012S - 053W		16		Lincoln
CO	6th PM	012S - 053W		36		Lincoln
CO	6th PM	012S - 054W		16		Lincoln
CO	6th PM	012S - 054W		36		Lincoln
CO	6th PM	012S - 055W		16		Lincoln
CO	6th PM	012S - 055W		36		Lincoln
CO	6th PM	012S - 057W		16		Elbert
CO	6th PM	012S - 057W		36		Elbert
CO	6th PM	012S - 058W		16		Elbert
CO	6th PM	012S - 058W		36		Elbert
CO	6th PM	012S - 059W		16		Elbert
CO	6th PM	012S - 059W		36		Elbert
CO	6th PM	012S - 060W		16		El Paso
CO	6th PM	012S - 060W		36		El Paso
CO	6th PM	012S - 061W		16		El Paso
CO	6th PM	012S - 061W		36		El Paso
CO	6th PM	012S - 062W		16		El Paso
CO	6th PM	012S - 062W		36		El Paso
CO	6th PM	012S - 063W		16		El Paso
CO	6th PM	012S - 063W		36		El Paso
CO	6th PM	012S - 064W		16		El Paso
CO	6th PM	012S - 064W		36		El Paso
CO	6th PM	012S - 065W		16		El Paso
CO	6th PM	012S - 065W		36		El Paso
CO	6th PM	012S - 066W		16		El Paso
CO	6th PM	012S - 066W		36		El Paso
CO	6th PM	012S - 067W		16		El Paso
CO	6th PM	012S - 067W	SW¼	36		El Paso
CO	6th PM	012S - 072W		16		Park
CO	6th PM	012S - 074W		16		Park
CO	6th PM	012S - 074W		36		Park
CO	6th PM	012S - 075W		16		Park

CO	6th PM	012S - 075W		36		Park
CO	6th PM	012S - 076W		16		Park
CO	6th PM	012S - 076W		36		Park
CO	6th PM	012S - 077W	N½	36		Park
CO	6th PM	012S - 077W	N½SE¼	36		Park
CO	6th PM	012S - 077W	NE¼SW¼	36		Park
CO	6th PM	013S - 050W		16		Cheyenne
CO	6th PM	013S - 050W		36		Cheyenne
CO	6th PM	013S - 051W		16		Cheyenne
CO	6th PM	013S - 051W		36		Cheyenne
CO	6th PM	013S - 052W		16		Lincoln
CO	6th PM	013S - 052W		36		Lincoln
CO	6th PM	013S - 053W		16		Lincoln
CO	6th PM	013S - 053W		36		Lincoln
CO	6th PM	013S - 054W		16		Lincoln
CO	6th PM	013S - 054W		36		Lincoln
CO	6th PM	013S - 057W		16		Elbert
CO	6th PM	013S - 057W		36		Elbert
CO	6th PM	013S - 058W		16		Elbert
CO	6th PM	013S - 058W		36		Elbert
CO	6th PM	013S - 059W		16		Elbert
CO	6th PM	013S - 059W		36		Elbert
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CO	6th PM	013S - 061W		36		El Paso
CO	6th PM	013S - 062W		16		El Paso
CO	6th PM	013S - 062W		36		El Paso
CO	6th PM	013S - 063W		16		El Paso
CO	6th PM	013S - 063W		36		El Paso
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CO	6th PM	013S - 065W		36		El Paso
CO	6th PM	013S - 066W		16		El Paso
CO	6th PM	013S - 066W		36		El Paso
CO	6th PM	013S - 067W		16		El Paso
CO	6th PM	013S - 067W	W½	36		El Paso
CO	6th PM	013S - 067W	W½NE¼	36		El Paso
CO	6th PM	013S - 067W	NW¼SE¼	36		El Paso
CO	6th PM	013S - 068W	S½NW¼	16		El Paso
CO	6th PM	013S - 068W	NE¼NE¼	16		El Paso
CO	6th PM	013S - 068W	NE¼SW¼	16		El Paso
CO	6th PM	013S - 068W	NW¼SE¼	16		El Paso
CO	6th PM	013S - 068W	SE¼SE¼	16		El Paso
CO	6th PM	013S - 068W	S½	36		El Paso
CO	6th PM	013S - 068W	NE¼	36		El Paso
CO	6th PM	013S - 068W	S½NW¼	36		El Paso
CO	6th PM	013S - 068W	NE¼NW¼	36		El Paso
CO	6th PM	013S - 074W		16		Park
CO	6th PM	013S - 074W		36		Park
CO	6th PM	013S - 075W		16		Park
CO	6th PM	013S - 075W		36		Park
CO	6th PM	013S - 076W		16		Park
CO	6th PM	013S - 076W		36		Park
CO	6th PM	014S - 047W		16		Cheyenne
CO	6th PM	014S - 047W		36		Cheyenne
CO	6th PM	014S - 048W		16		Cheyenne
CO	6th PM	014S - 048W		36		Cheyenne
CO	6th PM	014S - 049W		16		Cheyenne
CO	6th PM	014S - 049W		36		Cheyenne
CO	6th PM	014S - 050W		16		Cheyenne
CO	6th PM	014S - 050W		36		Cheyenne
CO	6th PM	014S - 051W		16		Cheyenne
CO	6th PM	014S - 051W		36		Cheyenne
CO	6th PM	014S - 052W		16		Lincoln
CO	6th PM	014S - 052W		36		Lincoln
CO	6th PM	014S - 057W		16		Lincoln
CO	6th PM	014S - 057W		36		Lincoln
CO	6th PM	014S - 058W		16		Lincoln
CO	6th PM	014S - 058W		36		Lincoln
CO	6th PM	014S - 059W		16		Lincoln
CO	6th PM	014S - 059W		36		Lincoln
CO	6th PM	014S - 060W		16		El Paso
CO	6th PM	014S - 060W		36		El Paso

CO	6th PM	014S - 061W		16		El Paso
CO	6th PM	014S - 061W		36		El Paso
CO	6th PM	014S - 062W		16		El Paso
CO	6th PM	014S - 062W		36		El Paso
CO	6th PM	014S - 063W		16		El Paso
CO	6th PM	014S - 063W		36		El Paso
CO	6th PM	014S - 064W		16		El Paso
CO	6th PM	014S - 064W		36		El Paso
CO	6th PM	014S - 065W		16		El Paso
CO	6th PM	014S - 065W		36		El Paso
CO	6th PM	014S - 066W		16		El Paso
CO	6th PM	014S - 066W		36		El Paso
CO	6th PM	014S - 067W		16		El Paso
CO	6th PM	014S - 067W	E½SW¼	36		El Paso
CO	6th PM	014S - 067W	W½SE¼	36		El Paso
CO	6th PM	014S - 068W	NE¼NE¼	16		El Paso
CO	6th PM	014S - 068W	E½NW¼	36		Teller
CO	6th PM	014S - 068W	SW¼NE¼	36		Teller
CO	6th PM	014S - 068W	NE¼SW¼	36		Teller
CO	6th PM	014S - 074W		36		Park
CO	6th PM	014S - 075W		16		Park
CO	6th PM	014S - 075W		36		Park
CO	6th PM	014S - 078W	W½	16		Chaffee
CO	6th PM	014S - 078W	W½SE¼	16		Chaffee
CO	6th PM	014S - 078W		36		Chaffee
CO	6th PM	015S - 047W		16		Cheyenne
CO	6th PM	015S - 047W		36		Cheyenne
CO	6th PM	015S - 048W		16		Cheyenne
CO	6th PM	015S - 048W		36		Cheyenne
CO	6th PM	015S - 049W		16		Cheyenne
CO	6th PM	015S - 049W		36		Cheyenne
CO	6th PM	015S - 057W		16		Lincoln
CO	6th PM	015S - 057W		36		Lincoln
CO	6th PM	015S - 058W	E½	16		Lincoln
CO	6th PM	015S - 058W	N½NW¼	16		Lincoln
CO	6th PM	015S - 058W		36		Lincoln
CO	6th PM	015S - 059W		16		Lincoln
CO	6th PM	015S - 059W		36		Lincoln
CO	6th PM	015S - 060W		16		El Paso
CO	6th PM	015S - 060W		36		El Paso
CO	6th PM	015S - 061W		16		El Paso
CO	6th PM	015S - 061W		36		El Paso
CO	6th PM	015S - 062W		16		El Paso
CO	6th PM	015S - 062W		36		El Paso
CO	6th PM	015S - 063W		16		El Paso
CO	6th PM	015S - 063W		36		El Paso
CO	6th PM	015S - 064W		16		El Paso
CO	6th PM	015S - 064W		36		El Paso
CO	6th PM	015S - 065W		16		El Paso
CO	6th PM	015S - 065W		36		El Paso
CO	6th PM	015S - 066W		16		El Paso
CO	6th PM	015S - 066W		36		El Paso
CO	6th PM	015S - 067W	W½	36		El Paso
CO	6th PM	015S - 067W	N½NE¼	36		El Paso
CO	6th PM	015S - 067W	S½SE¼	36		El Paso
CO	6th PM	015S - 071W		16		Park
CO	6th PM	015S - 071W		36		Teller
CO	6th PM	015S - 078W		16		Chaffee
CO	6th PM	015S - 078W		36		Chaffee
CO	6th PM	016S - 057W		16		Lincoln
CO	6th PM	016S - 057W		36		Lincoln
CO	6th PM	016S - 058W		16		Lincoln
CO	6th PM	016S - 058W		36		Lincoln
CO	6th PM	016S - 059W		16		Lincoln
CO	6th PM	016S - 059W		36		Lincoln
CO	6th PM	016S - 060W		16		El Paso
CO	6th PM	016S - 060W		36		El Paso
CO	6th PM	016S - 061W		16		El Paso
CO	6th PM	016S - 061W		36		El Paso
CO	6th PM	016S - 062W		16		El Paso
CO	6th PM	016S - 062W		36		El Paso
CO	6th PM	016S - 063W		16		El Paso
CO	6th PM	016S - 063W		36		El Paso
CO	6th PM	016S - 064W		16		El Paso
CO	6th PM	016S - 064W		36		El Paso

CO	6th PM	016S - 065W		16		El Paso
CO	6th PM	016S - 065W		36		El Paso
CO	6th PM	016S - 066W	NE¼	16		El Paso
CO	6th PM	016S - 066W	SW¼	16		El Paso
CO	6th PM	016S - 066W	N½NW¼	16		El Paso
CO	6th PM	016S - 066W	S½SE¼	16		El Paso
CO	6th PM	016S - 066W		36		El Paso
CO	6th PM	016S - 067W		16		El Paso
CO	6th PM	016S - 067W		36		El Paso
CO	6th PM	017S - 056W		16		Lincoln
CO	6th PM	017S - 056W		36		Lincoln
CO	6th PM	017S - 057W		16		Lincoln
CO	6th PM	017S - 057W		36		Lincoln
CO	6th PM	017S - 058W		16		Lincoln
CO	6th PM	017S - 058W		36		Lincoln
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CO	6th PM	017S - 059W		36		Lincoln
CO	6th PM	017S - 060W		16		El Paso
CO	6th PM	017S - 060W		36		El Paso
CO	6th PM	017S - 061W		16		El Paso
CO	6th PM	017S - 061W		36		El Paso
CO	6th PM	017S - 062W		16		El Paso
CO	6th PM	017S - 062W		36		El Paso
CO	6th PM	017S - 063W		16		El Paso
CO	6th PM	017S - 063W		36		El Paso
CO	6th PM	017S - 064W		16		El Paso
CO	6th PM	017S - 064W		36		El Paso
CO	6th PM	017S - 065W		16		El Paso
CO	6th PM	017S - 065W		36		El Paso
CO	6th PM	017S - 070W	NE¼	16		Fremont
CO	6th PM	017S - 070W	N½SE¼	16		Fremont
CO	6th PM	017S - 070W	SW¼SW¼	16		Fremont
CO	6th PM	017S - 070W	SE¼SE¼	16		Fremont
CO	6th PM	017S - 070W		36		Fremont
CO	6th PM	017S - 071W		16		Fremont
CO	6th PM	017S - 071W		36		Fremont
CO	6th PM	018S - 056W		16		Crowley
CO	6th PM	018S - 056W		36		Crowley
CO	6th PM	018S - 057W		16		Crowley
CO	6th PM	018S - 057W		36		Crowley
CO	6th PM	018S - 058W		16		Crowley
CO	6th PM	018S - 058W		36		Crowley
CO	6th PM	018S - 059W		16		Crowley
CO	6th PM	018S - 059W		36		Crowley
CO	6th PM	018S - 060W		16		Pueblo
CO	6th PM	018S - 060W		36		Pueblo
CO	6th PM	018S - 061W		16		Pueblo
CO	6th PM	018S - 061W		36		Pueblo
CO	6th PM	018S - 062W		16		Pueblo
CO	6th PM	018S - 062W		36		Pueblo
CO	6th PM	018S - 063W	W½	16		Pueblo
CO	6th PM	018S - 063W	N½NE¼	16		Pueblo
CO	6th PM	018S - 063W	SE¼NE¼	16		Pueblo
CO	6th PM	018S - 063W	NE¼SE¼	16		Pueblo
CO	6th PM	018S - 063W		36		Pueblo
CO	6th PM	018S - 064W		16		Pueblo
CO	6th PM	018S - 064W		36		Pueblo
CO	6th PM	018S - 065W		16		Pueblo
CO	6th PM	018S - 065W		36		Pueblo
CO	6th PM	018S - 066W		16		Pueblo
CO	6th PM	018S - 066W		36		Pueblo
CO	6th PM	018S - 068W		16		Fremont
CO	6th PM	018S - 068W		36		Fremont
CO	6th PM	018S - 070W		16		Fremont
CO	6th PM	018S - 070W		36		Fremont
CO	6th PM	019S - 056W		16		Crowley
CO	6th PM	019S - 056W		36		Crowley
CO	6th PM	019S - 057W		16		Crowley
CO	6th PM	019S - 057W		36		Crowley
CO	6th PM	019S - 058W		16		Crowley
CO	6th PM	019S - 058W		36		Crowley
CO	6th PM	019S - 059W		16		Crowley
CO	6th PM	019S - 059W		36		Crowley
CO	6th PM	019S - 060W		16		Pueblo
CO	6th PM	019S - 060W		36		Pueblo

CO	6th PM	019S - 061W		16		Pueblo
CO	6th PM	019S - 061W		36		Pueblo
CO	6th PM	019S - 062W		16		Pueblo
CO	6th PM	019S - 062W		36		Pueblo
CO	6th PM	019S - 063W		16		Pueblo
CO	6th PM	019S - 063W		36		Pueblo
CO	6th PM	019S - 064W		16		Pueblo
CO	6th PM	019S - 064W		36		Pueblo
CO	6th PM	019S - 065W		16		Pueblo
CO	6th PM	019S - 065W		36		Pueblo
CO	6th PM	019S - 066W		16		Pueblo
CO	6th PM	019S - 066W		36		Pueblo
CO	6th PM	019S - 067W		16		Pueblo
CO	6th PM	019S - 067W		36		Pueblo
CO	6th PM	019S - 068W		16		Fremont
CO	6th PM	019S - 068W	S½	36		Fremont
CO	6th PM	019S - 068W	NE¼	36		Fremont
CO	6th PM	019S - 068W	S½NW¼	36		Fremont
CO	6th PM	019S - 069W	N½NE¼	16		Fremont
CO	6th PM	019S - 069W	NE¼NW¼	16		Fremont
CO	6th PM	019S - 069W	SW¼NE¼	16		Fremont
CO	6th PM	019S - 069W	E½	36		Fremont
CO	6th PM	019S - 069W	N½NW¼	36		Fremont
CO	6th PM	019S - 069W	SW¼NW¼	36		Fremont
CO	6th PM	019S - 070W		16		Fremont
CO	6th PM	019S - 070W	SW¼	36		Fremont
CO	6th PM	020S - 056W		16		Crowley
CO	6th PM	020S - 056W		36		Crowley
CO	6th PM	020S - 057W		16		Crowley
CO	6th PM	020S - 057W		36		Crowley
CO	6th PM	020S - 058W		16		Crowley
CO	6th PM	020S - 058W		36		Crowley
CO	6th PM	020S - 059W		16		Crowley
CO	6th PM	020S - 059W		36		Crowley
CO	6th PM	020S - 060W		16		Pueblo
CO	6th PM	020S - 060W		36		Pueblo
CO	6th PM	020S - 061W		16		Pueblo
CO	6th PM	020S - 061W		36		Pueblo
CO	6th PM	020S - 062W		36		Pueblo
CO	6th PM	020S - 063W		16		Pueblo
CO	6th PM	020S - 063W	N½	36		Pueblo
CO	6th PM	020S - 063W	SE¼	36		Pueblo
CO	6th PM	020S - 063W	E½SW¼	36		Pueblo
CO	6th PM	020S - 064W		16		Pueblo
CO	6th PM	020S - 064W	N½NE¼	36		Pueblo
CO	6th PM	020S - 064W	W½NW¼	36		Pueblo
CO	6th PM	020S - 065W		16		Pueblo
CO	6th PM	020S - 065W	NW¼NE¼	36		Pueblo
CO	6th PM	020S - 066W		16		Pueblo
CO	6th PM	020S - 066W		36		Pueblo
CO	6th PM	020S - 067W		16		Pueblo
CO	6th PM	020S - 067W		36		Pueblo
CO	6th PM	020S - 068W		16		Fremont
CO	6th PM	020S - 068W		36		Fremont
CO	6th PM	020S - 070W		36		Fremont
CO	6th PM	020S - 072W		16		Fremont
CO	6th PM	020S - 072W		36		Fremont
CO	6th PM	021S - 044W		16		Prowers
CO	6th PM	021S - 044W		36		Prowers
CO	6th PM	021S - 045W		16		Prowers
CO	6th PM	021S - 045W		36		Prowers
CO	6th PM	021S - 046W		16		Prowers
CO	6th PM	021S - 046W		36		Prowers
CO	6th PM	021S - 047W		16		Prowers
CO	6th PM	021S - 047W		36		Prowers
CO	6th PM	021S - 048W		16		Bent
CO	6th PM	021S - 048W		36		Bent
CO	6th PM	021S - 049W		16		Bent
CO	6th PM	021S - 049W		36		Bent
CO	6th PM	021S - 050W		16		Bent
CO	6th PM	021S - 050W		36		Bent
CO	6th PM	021S - 051W		16		Bent
CO	6th PM	021S - 051W		36		Bent
CO	6th PM	021S - 052W		16		Bent
CO	6th PM	021S - 052W		36		Bent

CO	6th PM	021S - 053W		16		Bent
CO	6th PM	021S - 053W		36		Bent
CO	6th PM	021S - 054W		16		Otero
CO	6th PM	021S - 054W		36		Otero
CO	6th PM	021S - 055W		16		Crowley
CO	6th PM	021S - 055W		36		Crowley
CO	6th PM	021S - 056W		16		Crowley
CO	6th PM	021S - 056W		36		Crowley
CO	6th PM	021S - 057W		16		Crowley
CO	6th PM	021S - 057W		36		Crowley
CO	6th PM	021S - 058W		16		Crowley
CO	6th PM	021S - 058W		36		Crowley
CO	6th PM	021S - 059W		16		Crowley
CO	6th PM	021S - 059W		36		Crowley
CO	6th PM	021S - 061W	SW¼	16		Pueblo
CO	6th PM	021S - 061W	N½NE¼	16		Pueblo
CO	6th PM	021S - 061W	W½	36		Pueblo
CO	6th PM	021S - 061W	SE¼	36		Pueblo
CO	6th PM	021S - 061W	W½NE¼	36		Pueblo
CO	6th PM	021S - 062W	N½	16		Pueblo
CO	6th PM	021S - 062W		36		Pueblo
CO	6th PM	021S - 063W	S½	16		Pueblo
CO	6th PM	021S - 063W	NE¼	16		Pueblo
CO	6th PM	021S - 063W	S½NW¼	16		Pueblo
CO	6th PM	021S - 063W	NE¼NW¼	16		Pueblo
CO	6th PM	021S - 063W		36		Pueblo
CO	6th PM	021S - 064W		36		Pueblo
CO	6th PM	021S - 065W		16		Pueblo
CO	6th PM	021S - 066W		16		Pueblo
CO	6th PM	021S - 066W		36		Pueblo
CO	6th PM	021S - 067W		16		Pueblo
CO	6th PM	021S - 067W		36		Pueblo
CO	6th PM	021S - 068W	S½	16		Pueblo
CO	6th PM	021S - 068W	NE¼	16		Pueblo
CO	6th PM	021S - 068W	S½NW¼	16		Pueblo
CO	6th PM	021S - 068W	NE¼NW¼	16		Pueblo
CO	6th PM	021S - 068W		36		Pueblo
CO	6th PM	021S - 073W		16		Custer
CO	6th PM	021S - 073W		36		Custer
CO	6th PM	022S - 044W		16		Prowers
CO	6th PM	022S - 044W	S½	36		Prowers
CO	6th PM	022S - 044W	NE¼	36		Prowers
CO	6th PM	022S - 045W		16		Prowers
CO	6th PM	022S - 045W		36		Prowers
CO	6th PM	022S - 046W		16		Prowers
CO	6th PM	022S - 046W	W½	36		Prowers
CO	6th PM	022S - 046W	SE¼	36		Prowers
CO	6th PM	022S - 046W	W½NE¼	36		Prowers
CO	6th PM	022S - 046W	SE¼NE¼	36		Prowers
CO	6th PM	022S - 047W	N½N½	16		Prowers
CO	6th PM	022S - 047W		36		Prowers
CO	6th PM	022S - 048W	N½N½	16		Bent
CO	6th PM	022S - 049W		16		Bent
CO	6th PM	022S - 050W		16		Bent
CO	6th PM	022S - 050W		36		Bent
CO	6th PM	022S - 051W		16		Bent
CO	6th PM	022S - 051W	W½	36		Bent
CO	6th PM	022S - 051W	N½NE¼	36		Bent
CO	6th PM	022S - 052W		16		Bent
CO	6th PM	022S - 052W	N½	36		Bent
CO	6th PM	022S - 052W	N½S½	36		Bent
CO	6th PM	022S - 053W		16		Bent
CO	6th PM	022S - 053W		36		Bent
CO	6th PM	022S - 054W		16		Otero
CO	6th PM	022S - 054W		36		Otero
CO	6th PM	022S - 055W		16		Otero
CO	6th PM	022S - 055W		36		Otero
CO	6th PM	022S - 056W		16		Crowley
CO	6th PM	022S - 056W		36		Otero
CO	6th PM	022S - 057W	W½	36		Otero
CO	6th PM	022S - 057W	W½SE¼	36		Otero
CO	6th PM	022S - 058W		36		Otero
CO	6th PM	022S - 059W	S½	16		Otero
CO	6th PM	022S - 059W		36		Otero
CO	6th PM	022S - 060W		16		Pueblo

CO	6th PM	022S - 060W		36		Pueblo
CO	6th PM	022S - 061W		16		Pueblo
CO	6th PM	022S - 061W		36		Pueblo
CO	6th PM	022S - 062W	S½	16		Pueblo
CO	6th PM	022S - 062W	S½NE¼	16		Pueblo
CO	6th PM	022S - 062W	NE¼NE¼	16		Pueblo
CO	6th PM	022S - 062W		36		Pueblo
CO	6th PM	022S - 063W		16		Pueblo
CO	6th PM	022S - 063W		36		Pueblo
CO	6th PM	022S - 064W		16		Pueblo
CO	6th PM	022S - 064W		36		Pueblo
CO	6th PM	022S - 065W		36		Pueblo
CO	6th PM	022S - 066W		16		Pueblo
CO	6th PM	022S - 066W	SE¼	36		Pueblo
CO	6th PM	022S - 066W	S½SW¼	36		Pueblo
CO	6th PM	022S - 067W		16		Pueblo
CO	6th PM	022S - 067W		36		Pueblo
CO	6th PM	022S - 068W		36		Pueblo
CO	6th PM	022S - 071W		36		Custer
CO	6th PM	022S - 072W		36		Custer
CO	6th PM	022S - 073W		16		Custer
CO	6th PM	022S - 073W	SW¼	36		Custer
CO	6th PM	022S - 073W	N½NE¼	36		Custer
CO	6th PM	022S - 073W	SW¼NE¼	36		Custer
CO	6th PM	022S - 073W	SW¼SE¼	36		Custer
CO	6th PM	023S - 042W		16		Prowers
CO	6th PM	023S - 042W		36		Prowers
CO	6th PM	023S - 043W	W½	16		Prowers
CO	6th PM	023S - 043W	SE¼	16		Prowers
CO	6th PM	023S - 043W	W½NE¼	16		Prowers
CO	6th PM	023S - 043W		36		Prowers
CO	6th PM	023S - 048W	S½	16		Bent
CO	6th PM	023S - 048W		36		Bent
CO	6th PM	023S - 049W		16		Bent
CO	6th PM	023S - 049W		36		Bent
CO	6th PM	023S - 050W		16		Bent
CO	6th PM	023S - 050W		36		Bent
CO	6th PM	023S - 051W		16		Bent
CO	6th PM	023S - 051W		36		Bent
CO	6th PM	023S - 052W		16		Bent
CO	6th PM	023S - 052W		36		Bent
CO	6th PM	023S - 053W		16		Bent
CO	6th PM	023S - 053W		36		Bent
CO	6th PM	023S - 054W		36		Otero
CO	6th PM	023S - 055W		16		Otero
CO	6th PM	023S - 055W	NW¼	36		Otero
CO	6th PM	023S - 055W	N½NE¼	36		Otero
CO	6th PM	023S - 055W	SW¼NE¼	36		Otero
CO	6th PM	023S - 056W	S½	16		Otero
CO	6th PM	023S - 056W		36		Otero
CO	6th PM	023S - 057W		16		Otero
CO	6th PM	023S - 057W		36		Otero
CO	6th PM	023S - 058W		16		Otero
CO	6th PM	023S - 058W		36		Otero
CO	6th PM	023S - 059W		16		Otero
CO	6th PM	023S - 059W		36		Otero
CO	6th PM	023S - 060W		16		Pueblo
CO	6th PM	023S - 060W		36		Pueblo
CO	6th PM	023S - 061W		16		Pueblo
CO	6th PM	023S - 061W		36		Pueblo
CO	6th PM	023S - 062W		16		Pueblo
CO	6th PM	023S - 062W		36		Pueblo
CO	6th PM	023S - 063W		16		Pueblo
CO	6th PM	023S - 064W		16		Pueblo
CO	6th PM	023S - 065W		16		Pueblo
CO	6th PM	023S - 065W		36		Pueblo
CO	6th PM	023S - 066W		16		Pueblo
CO	6th PM	023S - 066W		36		Pueblo
CO	6th PM	023S - 067W		16		Pueblo
CO	6th PM	023S - 067W	N½	36		Pueblo
CO	6th PM	023S - 067W	S½SE¼	36		Pueblo
CO	6th PM	023S - 067W	NW¼SW¼	36		Pueblo
CO	6th PM	023S - 067W	NE¼SE¼	36		Pueblo
CO	6th PM	023S - 068W		16		Pueblo
CO	6th PM	023S - 068W		36		Pueblo

CO	6th PM	023S - 069W		16		Custer
CO	6th PM	023S - 072W		16		Custer
CO	6th PM	023S - 072W		36		Custer
CO	6th PM	024S - 049W		16		Bent
CO	6th PM	024S - 049W		36		Bent
CO	6th PM	024S - 052W		16		Bent
CO	6th PM	024S - 052W		36		Bent
CO	6th PM	024S - 053W		16		Bent
CO	6th PM	024S - 053W		36		Bent
CO	6th PM	024S - 054W		16		Otero
CO	6th PM	024S - 054W		36		Otero
CO	6th PM	024S - 055W		16		Otero
CO	6th PM	024S - 055W		36		Otero
CO	6th PM	024S - 056W		16		Otero
CO	6th PM	024S - 056W		36		Otero
CO	6th PM	024S - 057W		16		Otero
CO	6th PM	024S - 057W		36		Otero
CO	6th PM	024S - 058W		16		Otero
CO	6th PM	024S - 058W		36		Otero
CO	6th PM	024S - 059W		16		Otero
CO	6th PM	024S - 059W		36		Otero
CO	6th PM	024S - 060W		16		Pueblo
CO	6th PM	024S - 060W		36		Pueblo
CO	6th PM	024S - 061W		16		Pueblo
CO	6th PM	024S - 061W		36		Pueblo
CO	6th PM	024S - 062W		16		Pueblo
CO	6th PM	024S - 062W		36		Pueblo
CO	6th PM	024S - 065W		16		Pueblo
CO	6th PM	024S - 065W		36		Pueblo
CO	6th PM	024S - 066W		16		Pueblo
CO	6th PM	024S - 066W		36		Pueblo
CO	6th PM	024S - 067W		16		Pueblo
CO	6th PM	024S - 067W	NW¼	36		Pueblo
CO	6th PM	024S - 068W	N½S½	16		Pueblo
CO	6th PM	024S - 068W	W½NE¼	16		Pueblo
CO	6th PM	024S - 068W	E½NW¼	16		Pueblo
CO	6th PM	024S - 068W	SE¼NE¼	16		Pueblo
CO	6th PM	024S - 068W	N½	36		Pueblo
CO	6th PM	024S - 068W	N½S½	36		Pueblo
CO	6th PM	024S - 068W	SW¼SW¼	36		Pueblo
CO	6th PM	024S - 068W	SE¼SE¼	36		Pueblo
CO	6th PM	025S - 049W		16		Bent
CO	6th PM	025S - 049W		36		Bent
CO	6th PM	025S - 052W		16		Bent
CO	6th PM	025S - 052W		36		Bent
CO	6th PM	025S - 053W		16		Bent
CO	6th PM	025S - 053W		36		Bent
CO	6th PM	025S - 054W		16		Otero
CO	6th PM	025S - 054W		36		Otero
CO	6th PM	025S - 057W		16		Otero
CO	6th PM	025S - 057W		36		Otero
CO	6th PM	025S - 058W		16		Otero
CO	6th PM	025S - 058W		36		Otero
CO	6th PM	025S - 059W		16		Otero
CO	6th PM	025S - 059W		36		Otero
CO	6th PM	025S - 060W		16		Pueblo
CO	6th PM	025S - 060W	N½	36		Pueblo
CO	6th PM	025S - 060W	SE¼	36		Pueblo
CO	6th PM	025S - 060W	N½SW¼	36		Pueblo
CO	6th PM	025S - 060W	SW¼SW¼	36		Pueblo
CO	6th PM	025S - 061W		16		Pueblo
CO	6th PM	025S - 061W		36		Pueblo
CO	6th PM	025S - 062W		16		Pueblo
CO	6th PM	025S - 062W		36		Pueblo
CO	6th PM	025S - 063W	N½N½	36		Pueblo
CO	6th PM	025S - 063W	SE¼NE¼	36		Pueblo
CO	6th PM	025S - 063W	SW¼	36		Huerfano
CO	6th PM	025S - 063W	S½SE¼	36		Huerfano
CO	6th PM	025S - 064W	N½NE¼	16		Pueblo
CO	6th PM	025S - 064W	NE¼NW¼	16		Pueblo
CO	6th PM	025S - 064W	SW¼	16		Huerfano
CO	6th PM	025S - 064W	W½SE¼	16		Huerfano
CO	6th PM	025S - 064W	SE¼SE¼	16		Huerfano
CO	6th PM	025S - 064W		36		Huerfano
CO	6th PM	025S - 065W	E½	16		Huerfano

CO	6th PM	025S - 065W	S½SW¼	16		Huerfano
CO	6th PM	025S - 065W	NE¼SW¼	16		Huerfano
CO	6th PM	025S - 065W		36		Huerfano
CO	6th PM	025S - 066W		16		Huerfano
CO	6th PM	025S - 066W	S½	36		Huerfano
CO	6th PM	025S - 066W	S½N½	36		Huerfano
CO	6th PM	025S - 067W		16		Huerfano
CO	6th PM	025S - 067W		36		Huerfano
CO	6th PM	025S - 068W		36		Huerfano
CO	6th PM	025S - 069W		16		Huerfano
CO	6th PM	026S - 053W		16		Bent
CO	6th PM	026S - 053W		36		Bent
CO	6th PM	026S - 054W		16		Otero
CO	6th PM	026S - 054W		36		Otero
CO	6th PM	026S - 057W		16		Otero
CO	6th PM	026S - 057W		36		Otero
CO	6th PM	026S - 058W		16		Otero
CO	6th PM	026S - 058W		36		Otero
CO	6th PM	026S - 059W		16		Otero
CO	6th PM	026S - 059W		36		Otero
CO	6th PM	026S - 060W		16		Pueblo
CO	6th PM	026S - 060W	N½	36		Pueblo
CO	6th PM	026S - 060W	N½SE¼	36		Pueblo
CO	6th PM	026S - 060W	SW¼SW¼	36		Las Animas
CO	6th PM	026S - 064W		16		Huerfano
CO	6th PM	026S - 064W		36		Huerfano
CO	6th PM	026S - 065W		16		Huerfano
CO	6th PM	026S - 065W		36		Huerfano
CO	6th PM	026S - 066W	NW¼	16		Huerfano
CO	6th PM	026S - 066W	NW¼NE¼	16		Huerfano
CO	6th PM	026S - 066W	NW¼SW¼	16		Huerfano
CO	6th PM	026S - 066W	SE¼SE¼	16		Huerfano
CO	6th PM	026S - 066W		36		Huerfano
CO	6th PM	026S - 067W		16		Huerfano
CO	6th PM	026S - 067W		36		Huerfano
CO	6th PM	026S - 069W		16		Huerfano
CO	6th PM	026S - 069W		36		Huerfano
CO	6th PM	026S - 070W		16		Huerfano
CO	6th PM	026S - 070W		36		Huerfano
CO	6th PM	026S - 071W		16		Huerfano
CO	6th PM	026S - 071W		36		Huerfano
CO	6th PM	027S - 055W		16		Otero
CO	6th PM	027S - 055W		36		Otero
CO	6th PM	027S - 058W		16		Otero
CO	6th PM	027S - 058W		36		Otero
CO	6th PM	027S - 060W		16		Las Animas
CO	6th PM	027S - 060W		36		Las Animas
CO	6th PM	027S - 061W		16		Las Animas
CO	6th PM	027S - 061W		36		Las Animas
CO	6th PM	027S - 064W		16		Huerfano
CO	6th PM	027S - 064W	S½	36		Las Animas
CO	6th PM	027S - 064W	NE¼	36		Las Animas
CO	6th PM	027S - 064W	S½NW¼	36		Las Animas
CO	6th PM	027S - 064W	NE¼NW¼	36		Las Animas
CO	6th PM	027S - 065W	N½	16		Huerfano
CO	6th PM	027S - 065W	SW¼	16		Huerfano
CO	6th PM	027S - 065W	W½SE¼	16		Huerfano
CO	6th PM	027S - 065W		36		Huerfano
CO	6th PM	027S - 066W		16		Huerfano
CO	6th PM	027S - 066W	W½	36		Huerfano
CO	6th PM	027S - 066W	N½NE¼	36		Huerfano
CO	6th PM	027S - 066W	SE¼NE¼	36		Huerfano
CO	6th PM	027S - 066W	SW¼SE¼	36		Huerfano
CO	6th PM	027S - 067W		16		Huerfano
CO	6th PM	027S - 067W		36		Huerfano
CO	6th PM	027S - 068W		16		Huerfano
CO	6th PM	027S - 068W		36		Huerfano
CO	6th PM	027S - 069W		16		Huerfano
CO	6th PM	027S - 069W		36		Huerfano
CO	6th PM	027S - 070W		16		Huerfano
CO	6th PM	027S - 070W		36		Huerfano
CO	6th PM	027S - 071W		16		Huerfano
CO	6th PM	027S - 071W	N½	36		Huerfano
CO	6th PM	027S - 071W	SE¼	36		Huerfano
CO	6th PM	027S - 071W	N½SW¼	36		Huerfano

CO	6th PM	027S - 071W	SE¼SW¼	36		Huerfano
CO	6th PM	028S - 055W		16		Las Animas
CO	6th PM	028S - 055W		36		Las Animas
CO	6th PM	028S - 061W		16		Las Animas
CO	6th PM	028S - 061W		36		Las Animas
CO	6th PM	028S - 062W		16		Las Animas
CO	6th PM	028S - 062W		36		Las Animas
CO	6th PM	028S - 063W		16		Las Animas
CO	6th PM	028S - 063W		36		Las Animas
CO	6th PM	028S - 065W		16		Huerfano
CO	6th PM	028S - 065W		36		Huerfano
CO	6th PM	028S - 066W	N½SE¼	16		Huerfano
CO	6th PM	028S - 066W	SE¼SE¼	16		Huerfano
CO	6th PM	028S - 066W		36		Huerfano
CO	6th PM	028S - 067W		16		Huerfano
CO	6th PM	028S - 067W		36		Huerfano
CO	6th PM	028S - 068W		16		Huerfano
CO	6th PM	028S - 068W		36		Huerfano
CO	6th PM	028S - 069W		16		Huerfano
CO	6th PM	028S - 069W		36		Huerfano
CO	6th PM	028S - 070W		36		Huerfano
CO	6th PM	029S - 056W		16		Las Animas
CO	6th PM	029S - 056W		36		Las Animas
CO	6th PM	029S - 058W		16		Las Animas
CO	6th PM	029S - 058W		36		Las Animas
CO	6th PM	029S - 060W	S½	16		Las Animas
CO	6th PM	029S - 060W	NE¼	16		Las Animas
CO	6th PM	029S - 060W	SE¼NW¼	16		Las Animas
CO	6th PM	029S - 060W		36		Las Animas
CO	6th PM	029S - 061W		16		Las Animas
CO	6th PM	029S - 061W		36		Las Animas
CO	6th PM	029S - 062W		16		Las Animas
CO	6th PM	029S - 062W		36		Las Animas
CO	6th PM	029S - 063W		16		Las Animas
CO	6th PM	029S - 063W		36		Las Animas
CO	6th PM	029S - 065W		16		Huerfano
CO	6th PM	029S - 065W		36		Las Animas
CO	6th PM	029S - 066W		16		Huerfano
CO	6th PM	029S - 066W		36		Huerfano
CO	6th PM	029S - 067W		16		Huerfano
CO	6th PM	029S - 067W		36		Huerfano
CO	6th PM	029S - 068W	N½	16		Huerfano
CO	6th PM	029S - 068W	N½S½	16		Huerfano
CO	6th PM	029S - 068W	SW¼SW¼	16		Huerfano
CO	6th PM	029S - 068W		36		Huerfano
CO	6th PM	029S - 069W		16		Huerfano
CO	6th PM	029S - 069W		36		Huerfano
CO	6th PM	029S - 073W	N½	16		Alamosa
CO	6th PM	029S - 073W	SW¼	16		Alamosa
CO	6th PM	030S - 058W		16		Las Animas
CO	6th PM	030S - 058W	SE¼	36		Las Animas
CO	6th PM	030S - 058W	E½NE¼	36		Las Animas
CO	6th PM	030S - 058W	S½SW¼	36		Las Animas
CO	6th PM	030S - 058W	N½NW¼	36		Las Animas
CO	6th PM	030S - 058W	SW¼NW¼	36		Las Animas
CO	6th PM	030S - 061W		16		Las Animas
CO	6th PM	030S - 061W		36		Las Animas
CO	6th PM	030S - 062W		16		Las Animas
CO	6th PM	030S - 062W		36		Las Animas
CO	6th PM	030S - 063W		16		Las Animas
CO	6th PM	030S - 063W		36		Las Animas
CO	6th PM	030S - 064W		16		Las Animas
CO	6th PM	030S - 064W		36		Las Animas
CO	6th PM	030S - 065W		16		Las Animas
CO	6th PM	030S - 065W		36		Las Animas
CO	6th PM	030S - 066W		16		Huerfano
CO	6th PM	030S - 066W		36		Las Animas
CO	6th PM	030S - 067W		16		Huerfano
CO	6th PM	030S - 067W	S½	36		Huerfano
CO	6th PM	030S - 067W	S½NE¼	36		Huerfano
CO	6th PM	030S - 067W	SE¼NW¼	36		Huerfano
CO	6th PM	030S - 068W		16		Huerfano
CO	6th PM	031S - 059W	N½NE¼	16		Las Animas
CO	6th PM	031S - 059W	S½	16		Las Animas
CO	6th PM	031S - 059W	SW¼NW¼	16		Las Animas

CO	6th PM	031S - 059W		36		Las Animas
CO	6th PM	031S - 062W		16		Las Animas
CO	6th PM	031S - 062W		36		Las Animas
CO	6th PM	031S - 063W		16		Las Animas
CO	6th PM	031S - 063W		36		Las Animas
CO	6th PM	031S - 064W		16		Las Animas
CO	6th PM	031S - 064W		36		Las Animas
CO	6th PM	031S - 065W		16		Las Animas
CO	6th PM	031S - 065W		36		Las Animas
CO	6th PM	031S - 066W		16		Las Animas
CO	6th PM	031S - 066W		36		Las Animas
CO	6th PM	031S - 067W		16		Las Animas
CO	6th PM	031S - 067W		36		Las Animas
CO	6th PM	032S - 061W		16		Las Animas
CO	6th PM	032S - 061W	N½	36		Las Animas
CO	6th PM	032S - 061W	N½SE¼	36		Las Animas
CO	6th PM	032S - 061W	NE¼SW¼	36		Las Animas
CO	6th PM	032S - 061W	SE¼SE¼	36		Las Animas
CO	6th PM	032S - 062W		16		Las Animas
CO	6th PM	032S - 062W		36		Las Animas
CO	6th PM	032S - 063W		16		Las Animas
CO	6th PM	032S - 063W		36		Las Animas
CO	6th PM	032S - 064W		16		Las Animas
CO	6th PM	032S - 064W		36		Las Animas
CO	6th PM	032S - 065W		16		Las Animas
CO	6th PM	032S - 065W		36		Las Animas
CO	6th PM	032S - 066W		16		Las Animas
CO	6th PM	032S - 066W		36		Las Animas
CO	6th PM	032S - 067W		16		Las Animas
CO	6th PM	032S - 067W	SW¼	36		Las Animas
CO	6th PM	032S - 067W	E½NE¼	36		Las Animas
CO	6th PM	032S - 067W	W½NW¼	36		Las Animas
CO	6th PM	032S - 068W		16		Las Animas
CO	6th PM	032S - 068W		36		Las Animas
CO	6th PM	033S - 059W		16		Las Animas
CO	6th PM	033S - 059W		36		Las Animas
CO	6th PM	033S - 060W		16		Las Animas
CO	6th PM	033S - 060W		36		Las Animas
CO	6th PM	033S - 061W		16		Las Animas
CO	6th PM	033S - 061W		36		Las Animas
CO	6th PM	033S - 062W		16		Las Animas
CO	6th PM	033S - 062W		36		Las Animas
CO	6th PM	033S - 063W	W½	16		Las Animas
CO	6th PM	033S - 063W	SE¼	16		Las Animas
CO	6th PM	033S - 063W	W½NE¼	16		Las Animas
CO	6th PM	033S - 063W	E½	36		Las Animas
CO	6th PM	033S - 064W		16		Las Animas
CO	6th PM	033S - 064W		36		Las Animas
CO	6th PM	033S - 065W		16		Las Animas
CO	6th PM	033S - 065W	N½N½	36		Las Animas
CO	6th PM	033S - 065W	S½S½	36		Las Animas
CO	6th PM	033S - 065W	SW¼NW¼	36		Las Animas
CO	6th PM	033S - 065W	NW¼SW¼	36		Las Animas
CO	6th PM	033S - 066W		16		Las Animas
CO	6th PM	033S - 066W	N½	36		Las Animas
CO	6th PM	033S - 066W	N½S½	36		Las Animas
CO	6th PM	033S - 067W		16		Las Animas
CO	6th PM	034S - 059W		16		Las Animas
CO	6th PM	034S - 059W		36		Las Animas
CO	6th PM	034S - 060W		16		Las Animas
CO	6th PM	034S - 060W		36		Las Animas
CO	6th PM	034S - 061W		16		Las Animas
CO	6th PM	034S - 061W		36		Las Animas
CO	6th PM	034S - 062W		16		Las Animas
CO	6th PM	034S - 062W		36		Las Animas
CO	New Mexico PM	033N - 008E		16		Conejos
CO	New Mexico PM	033N - 008E		36		Conejos
CO	New Mexico PM	033N - 009E		16		Conejos
CO	New Mexico PM	033N - 009E		36		Conejos
CO	New Mexico PM	033N - 010E		16		Conejos
CO	New Mexico PM	033N - 010E		36		Conejos
CO	New Mexico PM	034N - 008E		16		Conejos
CO	New Mexico PM	034N - 008E		36		Conejos
CO	New Mexico PM	034N - 010E		16		Conejos
CO	New Mexico PM	034N - 010E		36		Conejos

CO	New Mexico PM	035N - 008E		16		Conejos
CO	New Mexico PM	035N - 008E		36		Conejos
CO	New Mexico PM	035N - 009E		16		Conejos
CO	New Mexico PM	035N - 009E		36		Conejos
CO	New Mexico PM	035N - 010E		16		Conejos
CO	New Mexico PM	035N - 010E		36		Conejos
CO	New Mexico PM	036N - 008E		16		Conejos
CO	New Mexico PM	036N - 008E		36		Conejos
CO	New Mexico PM	036N - 010E		16		Alamosa
CO	New Mexico PM	036N - 010E		36		Conejos
CO	New Mexico PM	037N - 008E		16		Rio Grande
CO	New Mexico PM	037N - 008E		36		Rio Grande
CO	New Mexico PM	037N - 009E		16		Alamosa
CO	New Mexico PM	037N - 009E		36		Alamosa
CO	New Mexico PM	037N - 010E		16		Alamosa
CO	New Mexico PM	037N - 010E		36		Alamosa
CO	New Mexico PM	038N - 008E		16		Rio Grande
CO	New Mexico PM	038N - 008E		36		Rio Grande
CO	New Mexico PM	038N - 009E		16		Alamosa
CO	New Mexico PM	038N - 009E		36		Alamosa
CO	New Mexico PM	038N - 010E		16		Alamosa
CO	New Mexico PM	038N - 010E		36		Alamosa
CO	New Mexico PM	038N - 011E		16		Alamosa
CO	New Mexico PM	038N - 011E		36		Alamosa
CO	New Mexico PM	038N - 012E		16		Alamosa
CO	New Mexico PM	038N - 012E		36		Alamosa
CO	New Mexico PM	039N - 006E		16		Rio Grande
CO	New Mexico PM	039N - 006E		36		Rio Grande
CO	New Mexico PM	039N - 007E		16		Rio Grande
CO	New Mexico PM	039N - 007E		36		Rio Grande
CO	New Mexico PM	039N - 008E		16		Rio Grande
CO	New Mexico PM	039N - 008E	N½	36		Rio Grande
CO	New Mexico PM	039N - 008E	N½SE¼	36		Rio Grande
CO	New Mexico PM	039N - 008E	NE¼SW¼	36		Rio Grande
CO	New Mexico PM	039N - 009E		16		Alamosa
CO	New Mexico PM	039N - 009E		36		Alamosa
CO	New Mexico PM	039N - 010E		16		Alamosa
CO	New Mexico PM	039N - 010E		36		Alamosa
CO	New Mexico PM	039N - 011E		16		Alamosa
CO	New Mexico PM	039N - 011E		36		Alamosa
CO	New Mexico PM	040N - 004E		16		Rio Grande
CO	New Mexico PM	040N - 004E		36		Rio Grande
CO	New Mexico PM	040N - 005E		16		Rio Grande
CO	New Mexico PM	040N - 005E	S½	36		Rio Grande
CO	New Mexico PM	040N - 005E	NE¼	36		Rio Grande
CO	New Mexico PM	040N - 005E	W½NW¼	36		Rio Grande
CO	New Mexico PM	040N - 005E	SE¼NW¼	36		Rio Grande
CO	New Mexico PM	040N - 006E		16		Rio Grande
CO	New Mexico PM	040N - 006E		36		Rio Grande
CO	New Mexico PM	040N - 007E		16		Rio Grande
CO	New Mexico PM	040N - 007E		36		Rio Grande
CO	New Mexico PM	040N - 008E		16		Rio Grande
CO	New Mexico PM	040N - 008E		36		Rio Grande
CO	New Mexico PM	040N - 012E		16		Alamosa
CO	New Mexico PM	040N - 012E		36		Alamosa
CO	New Mexico PM	041N - 006E		36		Saguache
CO	New Mexico PM	041N - 007E	W½	16		Saguache
CO	New Mexico PM	041N - 007E	SE¼	16		Saguache
CO	New Mexico PM	041N - 007E	E½NE¼	16		Saguache
CO	New Mexico PM	041N - 007E		36		Saguache
CO	New Mexico PM	041N - 008E		16		Saguache
CO	New Mexico PM	041N - 008E		36		Saguache
CO	New Mexico PM	042N - 006E		16		Saguache
CO	New Mexico PM	042N - 006E	W½	36		Saguache
CO	New Mexico PM	042N - 006E	SE¼	36		Saguache
CO	New Mexico PM	042N - 006E	SW¼NE¼	36		Saguache
CO	New Mexico PM	042N - 007E		16		Saguache
CO	New Mexico PM	042N - 007E		36		Saguache
CO	New Mexico PM	042N - 008E		16		Saguache
CO	New Mexico PM	042N - 008E		36		Saguache
CO	New Mexico PM	043N - 009E		16		Saguache
CO	New Mexico PM	043N - 009E		36		Saguache
CO	New Mexico PM	043N - 010E		16		Saguache
CO	New Mexico PM	043N - 010E	W½W½	36		Saguache
CO	New Mexico PM	044N - 007E		16		Saguache

CO	New Mexico PM	044N - 007E		36		Saguache
CO	New Mexico PM	044N - 008E		16		Saguache
CO	New Mexico PM	044N - 008E		36		Saguache
CO	New Mexico PM	044N - 009E		16		Saguache
CO	New Mexico PM	044N - 009E		36		Saguache
CO	New Mexico PM	044N - 010E		16		Saguache
CO	New Mexico PM	044N - 010E		36		Saguache
CO	New Mexico PM	044N - 011E	NW¼	16		Saguache
CO	New Mexico PM	044N - 011E	E½E½	16		Saguache
CO	New Mexico PM	044N - 011E	W½SW¼	16		Saguache
CO	New Mexico PM	044N - 011E	NW¼NE¼	16		Saguache
CO	New Mexico PM	044N - 011E	SW¼SE¼	16		Saguache
CO	New Mexico PM	045N - 005E		16		Saguache
CO	New Mexico PM	045N - 005E		36		Saguache
CO	New Mexico PM	045N - 006E	S½	16		Saguache
CO	New Mexico PM	045N - 006E	S½NE¼	16		Saguache
CO	New Mexico PM	045N - 006E	W½NW¼	16		Saguache
CO	New Mexico PM	045N - 006E	NE¼NE¼	16		Saguache
CO	New Mexico PM	045N - 006E		36		Saguache
CO	New Mexico PM	045N - 009E		16		Saguache
CO	New Mexico PM	045N - 009E		36		Saguache
CO	New Mexico PM	045N - 010E	N½	16		Saguache
CO	New Mexico PM	045N - 010E	SW¼SW¼	16		Saguache
CO	New Mexico PM	045N - 010E	SE¼SE¼	16		Saguache
CO	New Mexico PM	045N - 010E		36		Saguache
CO	New Mexico PM	046N - 008E		16		Saguache
CO	New Mexico PM	046N - 009E	N½	16		Saguache
CO	New Mexico PM	046N - 009E		36		Saguache
CO	New Mexico PM	046N - 010E		16		Saguache
CO	New Mexico PM	046N - 010E	N½	36		Saguache
CO	New Mexico PM	046N - 010E	S½S½	36		Saguache
CO	New Mexico PM	047N - 009E		16		Saguache
CO	New Mexico PM	047N - 009E		36		Saguache
CO	New Mexico PM	049N - 008E	N½	16		Chaffee
CO	New Mexico PM	049N - 008E	SW¼	16		Chaffee
CO	New Mexico PM	049N - 008E	W½SE¼	16		Chaffee
CO	New Mexico PM	049N - 008E	SE¼SE¼	16		Chaffee
CO	New Mexico PM	049N - 009E		36		Fremont
CO	New Mexico PM	050N - 008E	NW¼	16		Chaffee
CO	New Mexico PM	050N - 008E	N½SW¼	16		Chaffee
CO	New Mexico PM	050N - 008E	SW¼SW¼	16		Chaffee
CO	New Mexico PM	050N - 008E	N½SE¼	36		Chaffee
CO	6th PM	003S - 068W	SW¼NE¼	16		Adams
CO	6th PM	003S - 068W	SE¼NE¼	16		Adams
CO	6th PM	003S - 068W	SW¼NW¼	16		Adams
CO	6th PM	003S - 068W	SE¼NW¼	16		Adams
CO	6th PM	004S - 068W	NE¼NE¼	36		Denver
CO	6th PM	004S - 068W	NW¼NE¼	36		Denver
CO	6th PM	004S - 068W	SW¼NE¼	36		Arapahoe
CO	6th PM	004S - 068W	SE¼NE¼	36		Denver
CO	6th PM	004S - 068W	NE¼NW¼	36		Denver
CO	6th PM	004S - 068W	NW¼NW¼	36		Denver
CO	6th PM	004S - 068W	SW¼SW¼	36		Arapahoe
CO	6th PM	004S - 068W	SE¼SW¼	36		Arapahoe
CO	6th PM	004S - 068W	NW¼SE¼	36		Denver
CO	6th PM	004S - 068W	SW¼SE¼	36		Denver
CO	6th PM	020S - 065W	SW¼NE¼	36		Pueblo
CO	6th PM	020S - 065W	SW¼NW¼	36		Pueblo
CO	6th PM	020S - 065W	SE¼NW¼	36		Pueblo
CO	6th PM	020S - 065W	NE¼SW¼	36		Pueblo
CO	6th PM	020S - 065W	NW¼SW¼	36		Pueblo
CO	6th PM	020S - 065W	NE¼SE¼	36		Pueblo
CO	6th PM	025S - 063W	SW¼NE¼	36		Pueblo
CO	6th PM	025S - 063W	SW¼NW¼	36		Pueblo
CO	6th PM	025S - 063W	SE¼NW¼	36		Pueblo
CO	6th PM	025S - 063W	NE¼SE¼	36		Pueblo
CO	6th PM	025S - 063W	NW¼SE¼	36		Pueblo
CO	6th PM	025S - 064W	SW¼NE¼	16		Pueblo
CO	6th PM	025S - 064W	SE¼NE¼	16		Pueblo
CO	6th PM	025S - 064W	NW¼NW¼	16		Pueblo
CO	6th PM	025S - 064W	SW¼NW¼	16		Pueblo
CO	6th PM	025S - 064W	SE¼NW¼	16		Pueblo
CO	6th PM	025S - 064W	NE¼SE¼	16		Pueblo
CO	6th PM	026S - 060W	NE¼SW¼	36		Pueblo
CO	6th PM	026S - 060W	NW¼SW¼	36		Pueblo

CO	6th PM	026S - 060W	SE¼SW¼	36		Pueblo
CO	6th PM	026S - 060W	SW¼SE¼	36		Pueblo
CO	6th PM	026S - 060W	SE¼SE¼	36		Pueblo
CO	6th PM	027S - 064W	NW¼NW¼	36		Las Animas
CO	6th PM	029S - 060W	NE¼NW¼	16		Las Animas
CO	6th PM	029S - 060W	NW¼NW¼	16		Las Animas
CO	6th PM	029S - 060W	SW¼NW¼	16		Las Animas
CO	6th PM	029S - 073W	NE¼SE¼	16		Alamosa
CO	6th PM	029S - 073W	SW¼SE¼	16		Alamosa
CO	6th PM	029S - 073W	SE¼SE¼	16		Alamosa
CO	6th PM	030S - 058W	NW¼NE¼	36		Las Animas
CO	6th PM	030S - 058W	SW¼NE¼	36		Las Animas
CO	6th PM	030S - 058W	SE¼NW¼	36		Las Animas
CO	6th PM	030S - 058W	NE¼SW¼	36		Las Animas
CO	6th PM	030S - 058W	NW¼SW¼	36		Las Animas
CO	6th PM	030S - 067W	NE¼NE¼	36		Huerfano
CO	6th PM	030S - 067W	NW¼NE¼	36		Huerfano
CO	6th PM	030S - 067W	NE¼NW¼	36		Huerfano
CO	6th PM	030S - 067W	NW¼NW¼	36		Huerfano
CO	6th PM	030S - 067W	SW¼NW¼	36		Las Animas
CO	6th PM	031S - 059W	SW¼NE¼	16		Las Animas
CO	6th PM	031S - 059W	SE¼NE¼	16		Las Animas
CO	6th PM	031S - 059W	NE¼NW¼	16		Las Animas
CO	6th PM	031S - 059W	NW¼NW¼	16		Las Animas
CO	6th PM	031S - 059W	SE¼NW¼	16		Las Animas
CO	6th PM	003N - 072W	Lot/Trct 1	36		Boulder
REMARKS: LOT 1 OF SWSW						
CO	6th PM	003N - 072W	Lot/Trct 2	36		Boulder
REMARKS: LOT 2 OF SESE						
CO	6th PM	011N - 045W	Lot/Trct 1	36		Sedgwick
REMARKS: LOT 1 OF SENE						
CO	6th PM	011N - 045W	Lot/Trct 2	36		Sedgwick
REMARKS: LOT 2 OF SWNE						
CO	6th PM	011N - 045W	Lot/Trct 3	36		Sedgwick
REMARKS: LOT 3 OF SENW						
CO	6th PM	011N - 045W	Lot/Trct 4	36		Sedgwick
REMARKS: LOT 4 OF SWNW						
CO	6th PM	011N - 046W	Lot/Trct 1	36		Sedgwick
REMARKS: LOT 1 OF SENE						
CO	6th PM	011N - 046W	Lot/Trct 2	36		Sedgwick
REMARKS: LOT 2 OF SWNE						
CO	6th PM	011N - 046W	Lot/Trct 3	36		Sedgwick
REMARKS: LOT 3 OF SENW						
CO	6th PM	011N - 046W	Lot/Trct 4	36		Sedgwick
REMARKS: LOT 4 OF SWNW						
CO	6th PM	012N - 064W	Lot/Trct 1	16		Weld
REMARKS: LOT 1 OF SESE						
CO	6th PM	012N - 064W	Lot/Trct 2	16		Weld
REMARKS: LOT 2 OF SWSE						
CO	6th PM	012N - 064W	Lot/Trct 3	16		Weld
REMARKS: LOT 3 OF SESW						
CO	6th PM	012N - 064W	Lot/Trct 4	16		Weld
REMARKS: LOT 4 OF SWSW						
CO	6th PM	012N - 065W	Lot/Trct 1	16		Weld
REMARKS: LOT 1 OF SESE						
CO	6th PM	012N - 065W	Lot/Trct 2	16		Weld
REMARKS: LOT 2 OF SWSE						
CO	6th PM	012N - 065W	Lot/Trct 3	16		Weld
REMARKS: LOT 3 OF SESW						
CO	6th PM	012N - 065W	Lot/Trct 4	16		Weld
REMARKS: LOT 4 OF SWSW						
CO	6th PM	012S - 072W	Lot/Trct 1	36		Park
REMARKS: LOT 1 OF NENE						
CO	6th PM	012S - 072W	Lot/Trct 10	36		Park
REMARKS: LOT 10 OF SENE						
CO	6th PM	012S - 072W	Lot/Trct 11	36		Park
REMARKS: LOT 11 OF NESE						
CO	6th PM	012S - 072W	Lot/Trct 12	36		Park
REMARKS: LOT 12 OF NESE						
CO	6th PM	012S - 072W	Lot/Trct 13	36		Park
REMARKS: LOT 13 OF NWSE						
CO	6th PM	012S - 072W	Lot/Trct 14	36		Park
REMARKS: LOT 14 OF NESW						
CO	6th PM	012S - 072W	Lot/Trct 15	36		Park
REMARKS: LOT 15 OF NWSW						

CO	6th PM	012S - 072W	Lot/Trct 16	36		Park
REMARKS: LOT 16 OF SWSW						
CO	6th PM	012S - 072W	Lot/Trct 17	36		Park
REMARKS: LOT 17 OF SESW						
CO	6th PM	012S - 072W	Lot/Trct 18	36		Park
REMARKS: LOT 18 OF SWSE						
CO	6th PM	012S - 072W	Lot/Trct 19	36		Park
REMARKS: LOT 19 OF SESE						
CO	6th PM	012S - 072W	Lot/Trct 2	36		Park
REMARKS: LOT 2 OF NENE						
CO	6th PM	012S - 072W	Lot/Trct 20	36		Park
REMARKS: LOT 20 OF SESE						
CO	6th PM	012S - 072W	Lot/Trct 3	36		Park
REMARKS: LOT 3 OF NWNE						
CO	6th PM	012S - 072W	Lot/Trct 4	36		Park
REMARKS: LOT 4 OF NENW						
CO	6th PM	012S - 072W	Lot/Trct 5	36		Park
REMARKS: LOT 5 OF NWNW						
CO	6th PM	012S - 072W	Lot/Trct 6	36		Park
REMARKS: LOT 6 OF SWNW						
CO	6th PM	012S - 072W	Lot/Trct 7	36		Park
REMARKS: LOT 7 OF SENW						
CO	6th PM	012S - 072W	Lot/Trct 8	36		Park
REMARKS: LOT 8 OF SWNE						
CO	6th PM	012S - 072W	Lot/Trct 9	36		Park
REMARKS: LOT 9 OF SENE						
CO	6th PM	014S - 068W	Lot/Trct 1	16		El Paso
REMARKS: LOT 1 OF NWNE						
CO	6th PM	014S - 068W	Lot/Trct 2	16		El Paso
REMARKS: LOT 2 OF S HALF OF NE						
CO	6th PM	014S - 068W	Lot/Trct 3	16		El Paso
REMARKS: LOT 3 OF NESE						
CO	6th PM	014S - 068W	Lot/Trct 4	16		El Paso
REMARKS: LOT 4 OF SESE						
CO	6th PM	020S - 064W	Lot/Trct 3	36		Pueblo
REMARKS: LOT 3 OF SWSW						
CO	6th PM	020S - 064W	Lot/Trct 4	36		Pueblo
REMARKS: LOT 4 OF NWSW						
CO	6th PM	020S - 064W	Lot/Trct 5	36		Pueblo
REMARKS: LOT 5 OF SWSW						
CO	6th PM	020S - 064W	Lot/Trct 7	36		Pueblo
REMARKS: LOT 7 OF SESE						
CO	6th PM	021S - 061W	Lot/Trct 1	16		Pueblo
REMARKS: LOT 1 OF SENE						
CO	6th PM	021S - 061W	Lot/Trct 2	16		Pueblo
REMARKS: LOT 2 OF SWNE						
CO	6th PM	021S - 061W	Lot/Trct 3	16		Pueblo
REMARKS: LOT 3 OF E HALF OF NW						
CO	6th PM	021S - 061W	Lot/Trct 4	16		Pueblo
REMARKS: LOT 4 OF NWNW						
CO	6th PM	021S - 061W	Lot/Trct 1	36		Pueblo
REMARKS: LOT 1 OF E HALF OF NE						
CO	6th PM	021S - 061W	Lot/Trct 5	36		Pueblo
REMARKS: LOT 5 OF E HALF OF NE						
CO	6th PM	021S - 062W	Lot/Trct 1	16		Pueblo
REMARKS: LOT 1 OF SE						
CO	6th PM	021S - 062W	Lot/Trct 2	16		Pueblo
REMARKS: LOT 2 OF S HALF OF SW						
CO	6th PM	021S - 062W	Lot/Trct 3	16		Pueblo
REMARKS: LOT 3 OF NESE						
CO	6th PM	021S - 062W	Lot/Trct 4	16		Pueblo
REMARKS: LOT 4 OF NWSE						
CO	6th PM	021S - 062W	Lot/Trct 5	16		Pueblo
REMARKS: LOT 5 OF NESW						
CO	6th PM	021S - 062W	Lot/Trct 6	16		Pueblo
REMARKS: LOT 6 OF NWSW						
CO	6th PM	021S - 063W	Lot/Trct 1	16		Pueblo
REMARKS: LOT 1 OF NWNW						
CO	6th PM	021S - 063W	Lot/Trct 2	16		Pueblo
REMARKS: LOT 2 OF NWNW						
CO	6th PM	022S - 046W	Lot/Trct 1	36		Prowers
REMARKS: LOT 1 OF NENE						
CO	6th PM	022S - 047W	Lot/Trct 1	16		Prowers
REMARKS: LOT 1 OF SENE						
CO	6th PM	022S - 047W	Lot/Trct 2	16		Prowers

REMARKS: LOT 2 OF SWNE						
CO	6th PM	022S - 047W	Lot/Trct 3	16		Prowers
REMARKS: LOT 3 OF SENW						
CO	6th PM	022S - 047W	Lot/Trct 4	16		Prowers
REMARKS: LOT 4 OF SWNW						
CO	6th PM	022S - 048W	Lot/Trct 1	16		Bent
REMARKS: LOT 1 OF SENE						
CO	6th PM	022S - 048W	Lot/Trct 2	16		Bent
REMARKS: LOT 2 OF SWNE						
CO	6th PM	022S - 048W	Lot/Trct 3	16		Bent
REMARKS: LOT 3 OF SENW						
CO	6th PM	022S - 048W	Lot/Trct 4	16		Bent
REMARKS: LOT 4 OF SWNW						
CO	6th PM	022S - 049W	Lot/Trct 4	36		Bent
REMARKS: LOT 4 OF N HALF OF SW						
CO	6th PM	022S - 049W	Lot/Trct 5	36		Bent
REMARKS: LOT 5 OF S HALF OF NW						
CO	6th PM	022S - 049W	Lot/Trct 8	36		Bent
REMARKS: LOT 8 OF N HALF OF NW						
CO	6th PM	022S - 052W	Lot/Trct 1	36		Bent
REMARKS: LOT 1 OF S HALF OF SE						
CO	6th PM	022S - 052W	Lot/Trct 2	36		Bent
REMARKS: LOT 2 OF S HALF OF SW						
CO	6th PM	022S - 057W	Lot/Trct 1	36		Otero
REMARKS: LOT 1 OF E HALF OF SE						
CO	6th PM	022S - 057W	Lot/Trct 2	36		Otero
REMARKS: LOT 2 OF S HALF OF NE						
CO	6th PM	022S - 057W	Lot/Trct 3	36		Otero
REMARKS: LOT 3 OF N HALF OF NE						
CO	6th PM	022S - 058W	Lot/Trct 1	16		Crowley
REMARKS: LOT 1 OF NENE						
CO	6th PM	022S - 058W	Lot/Trct 2	16		Crowley
REMARKS: LOT 2 OF NWNE						
CO	6th PM	022S - 058W	Lot/Trct 3	16		Crowley
REMARKS: LOT 3 OF NENW						
CO	6th PM	022S - 058W	Lot/Trct 4	16		Crowley
REMARKS: LOT 4 OF NWNW						
CO	6th PM	022S - 059W	Lot/Trct 1	16		Otero
REMARKS: LOT 1 OF E HALF OF NE						
CO	6th PM	022S - 059W	Lot/Trct 2	16		Otero
REMARKS: LOT 2 OF W HALF OF NE						
CO	6th PM	023S - 055W	Lot/Trct 1	36		Otero
REMARKS: LOT 1 OF SENE						
CO	6th PM	023S - 055W	Lot/Trct 2	36		Otero
REMARKS: LOT 2 OF NESE						
CO	6th PM	023S - 055W	Lot/Trct 3	36		Otero
REMARKS: LOT 3 OF NWSE						
CO	6th PM	023S - 055W	Lot/Trct 4	36		Otero
REMARKS: LOT 4 OF NESW						
CO	6th PM	023S - 055W	Lot/Trct 5	36		Otero
REMARKS: LOT 5 OF NWSW						
CO	6th PM	023S - 055W	Lot/Trct 6	36		Otero
REMARKS: LOT 6 OF SWSW						
CO	6th PM	023S - 056W	Lot/Trct 1	16		Otero
REMARKS: LOT 1 OF E HALF OF NE						
CO	6th PM	023S - 056W	Lot/Trct 2	16		Otero
REMARKS: LOT 2 OF W HALF OF NE						
CO	6th PM	023S - 056W	Lot/Trct 3	16		Otero
REMARKS: LOT 3 OF NENW						
CO	6th PM	023S - 056W	Lot/Trct 4	16		Otero
REMARKS: LOT 4 OF W HALF OF NW						
CO	6th PM	027S - 071W	Lot/Trct 1	36		Huerfano
REMARKS: LOT 1 OF SWSW						
CO	6th PM	033S - 067W	Lot/Trct 1	36		Las Animas
REMARKS: LOT 1 OF NENE						
CO	6th PM	033S - 067W	Lot/Trct 2	36		Las Animas
REMARKS: LOT 2 OF NWNE						
CO	6th PM	033S - 067W	Lot/Trct 3	36		Las Animas
REMARKS: LOT 3 OF NENW						
CO	6th PM	033S - 067W	Lot/Trct 4	36		Las Animas
REMARKS: LOT 4 OF NWNW						
CO	6th PM	033S - 067W	Lot/Trct 5	36		Las Animas
REMARKS: LOT 5 OF SWNW						
CO	6th PM	033S - 067W	Lot/Trct 6	36		Las Animas
REMARKS: LOT 6 OF SENW						

CO	6th PM	033S - 067W	Lot/Trct 7	36		Las Animas
REMARKS: LOT 7 OF SWNE						
CO	6th PM	033S - 067W	Lot/Trct 8	36		Las Animas
REMARKS: LOT 8 OF SENE						
CO	New Mexico PM	043N - 010E	Lot/Trct 1	36		Saguache
REMARKS: LOT 1 OF NENW						
CO	New Mexico PM	043N - 010E	Lot/Trct 2	36		Saguache
REMARKS: LOT 2 OF SENW						
CO	New Mexico PM	043N - 010E	Lot/Trct 3	36		Saguache
REMARKS: LOT 3 OF NESW						
CO	New Mexico PM	043N - 010E	Lot/Trct 4	36		Saguache
REMARKS: LOT 4 OF SESW						
CO	6th PM	003N - 080W	Lot/Trct 46	9		Grand
CO	6th PM	003N - 080W	Lot/Trct 46	10		Grand
CO	6th PM	003N - 080W	Lot/Trct 46	15		Grand
CO	6th PM	003N - 080W	Lot/Trct 46	16		Grand
CO	6th PM	003N - 080W	Lot/Trct 64	25		Grand
CO	6th PM	003N - 080W	Lot/Trct 64	26		Grand
CO	6th PM	003N - 080W	Lot/Trct 64	35		Grand
CO	6th PM	003N - 080W	Lot/Trct 64	36		Grand
CO	6th PM	023S - 069W	Lot/Trct 46	35		Custer
CO	6th PM	023S - 069W	Lot/Trct 46	36		Custer
CO	New Mexico PM	036N - 006E	Lot/Trct 43	15		Conejos
CO	New Mexico PM	036N - 006E	Lot/Trct 43	16		Conejos
CO	New Mexico PM	036N - 006E	Lot/Trct 48	16		Conejos
CO	New Mexico PM	036N - 006E	Lot/Trct 49	21		Conejos
CO	New Mexico PM	036N - 006E	Lot/Trct 49	22		Conejos
CO	6th PM	027S - 071W		36		Costilla
CO	New Mexico PM	043N - 010E		36		Saguache
CO	6th PM	003N - 072W		36		Boulder

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES
1313 SHERMAN ST, RM 821, DENVER, CO 80203
Main: (303) 866-3581 dwrpermitsonline@state.co.us

Office Use Only

Form GWS-45 (01/2020)

GENERAL PURPOSE
Water Well Permit Application

Review instructions on reverse side prior to completing form.
The form must be computer generated, typed or in black or blue ink.

1. Applicant Information

Name of applicant: FSBR, LLC

Mailing address: 32372 Lodgepole Drive

City	State	Zip code
Evergreen	CO	80439

Telephone # (area code & number)	E-mail (online filing required)
603-660-6604	phil@shadowmountainbikepark.com

2. Type Of Application (check applicable boxes)

- [x] Construct new well
- [ ] Replace existing well
- [ ] Change source (aquifer)
- [ ] COGCC Well
- [ ] Use existing well
- [ ] Change or increase use
- [ ] Reapplication (expired permit)
- [ ] Other: _____

3. Refer To (if applicable)

Well permit #	Water Court case #
Designated Basin Determination #	Well name or #

4. Location Of Proposed Well

County: Jefferson

_____ 1/4 of the _____ 1/4

Section	Township	N or S	Range	E or W	Principal Meridian
16	6	[ ] N [x] S	71	[ ] E [x] W	6

Distance of well from section lines (section lines are typically not property lines)
1930 Ft. from [x] N [ ] S 2105 Ft. from [ ] E [x] W

For replacement wells only – distance and direction from old well to new well
feet direction

Well location address (Include City, State, Zip) [ ] Check if well address is same as in Item 1.
29611 Shadow Mountain Drive, Conifer, CO 80433

Optional: GPS well location information in UTM format You must check GPS unit for required settings as follows:

Format must be UTM
[ ] Zone 12 or [ ] Zone 13
Units must be Meters
Datum must be NAD83
Unit must be set to true north
Was GPS unit checked for above? [ ] YES

Easting _____
Northing _____
Remember to set Datum to NAD83

5. Parcel On Which Well Will Be Located
(PLEASE ATTACH A CURRENT DEED FOR THE SUBJECT PARCEL)

A. Legal Description (may be provided as an attachment):
S2NW, SW, and a fractional part of the NWNW (S of Shadow Mtn Drive) of Section 16, Township 6 South, Range 71 West of the 6th Principal Meridian

B. # of acres in parcel	C. Owner
306	Colorado State Land Board

D. Will this be the only well on this parcel? [x] YES [ ] NO (if no list other wells)

E. State Parcel ID# (optional):
61-163-00-001

6. Use Of Well (check applicable boxes)

Attach a detailed description of uses applied for.

- [ ] Industrial
- [ ] Municipal
- [ ] Irrigation
- [x] Commercial
- [ ] Dewatering System
- [ ] Geothermal (production or reinjection
- [ ] Other (describe): _____

7. Well Data (proposed)

Maximum pumping rate	Annual amount to be withdrawn
3.8 gpm	2 acre-feet
Total depth	**Aquifer**
600 feet	unnamed

8. Land On Which Ground Water Will Be Used

Legal Description of Land (may be provided as an attachment):
S2NW, SW, and a fractional part of the NWNW (S of Shadow Mtn Drive) of Section 16, Township 6 South, Range 71 West of the 6th Principal Meridian

(If used for crop irrigation, attach a scaled map that shows irrigated area.)

A. # Acres	B. Owner
306	Colorado State Land Board

C. List any other wells or water rights used on this land:

9. Proposed Well Driller License #(optional):

10. Sign or Entered Name Of Applicant(s) Or Authorized Agent

The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge.

Sign or enter name(s) of person(s) submitting application	Date (mm/dd/yyyy)

If signing print name and title

Office Use Only

USGS map name	DWR map no.	Surface elev.

Receipt area only

AQUAMAP
WE
WR
CWCB
TOPO
MYLAR
SB5

DIV _____ WD _____ BA _____ MD _____

GENERAL PURPOSE WELL PERMIT APPLICATION INSTRUCTIONS

Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned to the applicant for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online see online filing instructions! You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us For further information please visit dwr.colorado.gov

FEES: This application requires a nonrefundable $100.00 filling fee. Please visit DWR's Online Form Submittal web page for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-45) is to be used to apply for commercial, industrial, municipal, irrigation, feed lot, geothermal (see Geothermal Rules for fee requirements), recovery wells, and other uses not otherwise noted in the following list:

RESIDENTIAL use wells – Use of form GWS-44 is required
LIVESTOCK watering on a farm, ranch, range or pasture (not feedlots) – Use form GWS-44
MONITORING/OBSERVATION wells – Use form GWS-46
GRAVEL PITS – Use form GWS-27
REGISTRATION of an existing well – Use form GWS-12 (must have been in use prior to May 8, 1972)
GEOEXCHANGE SYSTEM LOOP FIELDS – Use form GWS-72
REPLACEMENTS OF WELLS FOR THE ABOVE USES

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

1. The applicant is the entity for whom the permit is to be issued. Provide the applicant name and the mailing address where all correspondence will be sent.

2. Check all boxes that apply.

3. Complete all boxes that apply. If the permit is to be issued pursuant to a water court decree or a Designated Basin determination of water right, the case number or determination number must be indicated. If applying to replace or change the use of an existing well, the permit number of the existing well must be indicated.

4. The county, ¼ of the ¼ section designation, section #, township, range, principal meridian, and distances from section lines for the proposed well must be provided. (An option to providing distances from section lines and the ¼ of the ¼ section designation is to provide an accurate GPS location in UTM format. The required GPS unit settings must be as indicated on this form.) Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone. Provide the property address of the well location if one exists. If it is the same as the mailing address, check the box next to the well location address.

5. **Please attach a current deed for the subject parcel.** Complete all boxes and provide a complete legal description of the parcel of land on which the well will be located. **If filing online please see online filing instructions for how to submit deed and or legal description attachments.**

6. Check all boxes that apply and attach a detailed description of the uses applied for.

7. Complete all boxes.

8. Complete all boxes and provide a legal description of the land areas on which ground water from the proposed well will be used. If agricultural irrigation is a proposed use, provide a map of the land area with proposed irrigated areas accurately drawn, including section numbers and section lines. A list of all other wells or water rights used on the described land must be provided.

9. The well must be constructed by a Colorado licensed well driller, an authorized individual in accordance with the Water Well Construction Rules, 2 CCR 402-2, or under the "private driller" provision as defined in CRS 37-91-102(12). A listing of licensed well drillers/pump installers is available here.

10. The individual signing the application or entering their name and title must be the applicant or an officer of the corporation/company/agency identified as the applicant or their attorney. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. If you filled the form out on-line you may save or print, sign, scan and email the form to the Division of Water Resources. Payment must be received via phone, fax or mail prior to processing the application.

IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at dwr.colorado.gov for general information, additional forms, and access to state rules or statutes.

ENGINEERING STUDY
for
SHADOW MOUNTAIN BIKE PARK
CONCEPT MASTER PLAN
WATER SYSTEM IMPROVEMENTS

Prepared For:

Colorado State Land Board
Shadow Mountain Bike Park
SE Group
Frisco, Colorado
PO Box 2729
323 West Main Street, Suite 202
Frisco, CO 80443-2729

Prepared By:

Stantec
5725 Mark Dabling Blvd. Suite 190
Colorado Springs CO 80919

November 2022
Project No. 181711248

*** * * * * * C O N T E N T S * * * * * ***

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******APPENDICES******

Appendix A	100-Year Flood Plain Certification
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Figure 1	Vicinity Map

Section 1
EXECUTIVE SUMMARY

This report presents the results of the engineering study for water system improvements serving Shadow Mountain Bike Park proposed on State Land Board Shadow Mountain parcels in Jefferson County, Colorado. Shadow Mountain Bike Park is proposed on undeveloped property with a designated address of 29611 Shadow Mountain Drive, Conifer, Colorado 80433.

The proposed parcel currently has no water facilities on site. Shadow Mountain Bike Park proposes construction of a minimum of one water well to provide potable water to the site facilities through a private water system.

Shadow Mountain Bike Park facilities will consist of a Base Lodge operating as a Class III Recreation facility to welcome guests and provide basic needs such as welcoming center including drinking water and restrooms.

The average annual water demand for Shadow Mountain Bike Park is estimated to be 1.57 acre-feet of water per year. Average day usage is estimated to be approximately 1400 gpd or 0.97 gpm. This water will be provided by water wells as permitted by the Colorado State Engineers Office.

To meet Drinking Water Standards water will be filtered (if required) and disinfected prior to storage and will meet Colorado Department of Health and Environment Drinking Water Standards.

Section 2
INTRODUCTION

2.1 Purpose

The purpose of this report is to present water system improvements recommended to serve Shadow Mountain Bike Park; a proposed recreational development project located in Jefferson County. It is also intended to serve as a guideline for the ensuing design of recommended improvements.

2.2 Scope

The scope of this report includes:

1. The definition of the service areas as well as identification of significant physical and environmental characteristics and constraints.

2. An analysis of available data to determine existing and to project future water supplies, demands and quality.

3. A description of legal, institutional and managerial arrangements that ensure adequate control of the proposed improvements; and,

4. A preliminary recommendation for a selected supply, treatment, pumping and transmission alternatives.

Section 3
EXISTING CONDITIONS

3.1 Description of the Service Area

Shadow Mountain Bike Park consists of approximately 235 acres of Base Lodge (10 acres +/-) and open space uses and is located northwest of Conifer, Colorado, within Township 6 South, Range 71 West, Section 16.

3.2 Land Use

Shadow Mountain Bike Park is in Jefferson County northwest of Conifer, Colorado and about 35 miles southwest of the Denver Metroplex. Surrounding areas are primarily large tract residential properties and large undeveloped tracts.

3.3 Topography and Floodplains

The topography of the service area is typical of a Colorado Front Range Mountain parcel with elevations ranging from 8400 ft. to 9250 ft. above sea level. Existing slopes range from 5% at base camp to 25% or greater in some areas. Vegetation is typical Colorado mountain woodlands with a mix of Ponderosa Pine, Spruce, Fir and ground cover plants and grasses. The area drains generally northeast to North Turkey Creek.

There is no Federal Emergency Management Agency (FEMA 08059CO365F) established floodplain within the boundaries of Shadow Mountain Bike Park. See Appendix A.

3.4 Geology

The site is comprised of several different soil types. From the NRCS Soil Survey of Jefferson County, the site falls into the following soil types:

1.“67” Kittredge-Earcree, 9 to 20 percent slopes; Type A Soil
2.“76” Legault-Hiwan stony loamy sands, 15 to 30 percent slopes; Type D Soil
3.“77” Legault-Hiwan-Rock outcrop complex, 30 to 50 percent slopes; Type D Soil
4.“138” Rock outcrop, igneous and metamorphic; Type D Soil
5.“141” Rogert, very stony-Herbman-Rock outcrop complex, 30 to 70 percent slopes; Type D Soil
Note: “#” indicates Soil Conservation Survey soil classification number.

3.5 Groundwater

The proposed water supply for the Shadow Mountain Bike Park is an onsite water well. The applicant has been in discussion with the State Engineers Office concerning a well permit for the site including the type of permit and the uses permitted to ensure proper permitting. There are numerous wells in the area and discussions with the State indicate issuance of a permit could be made based on water rights associated with the property without injury to adjacent water rights.

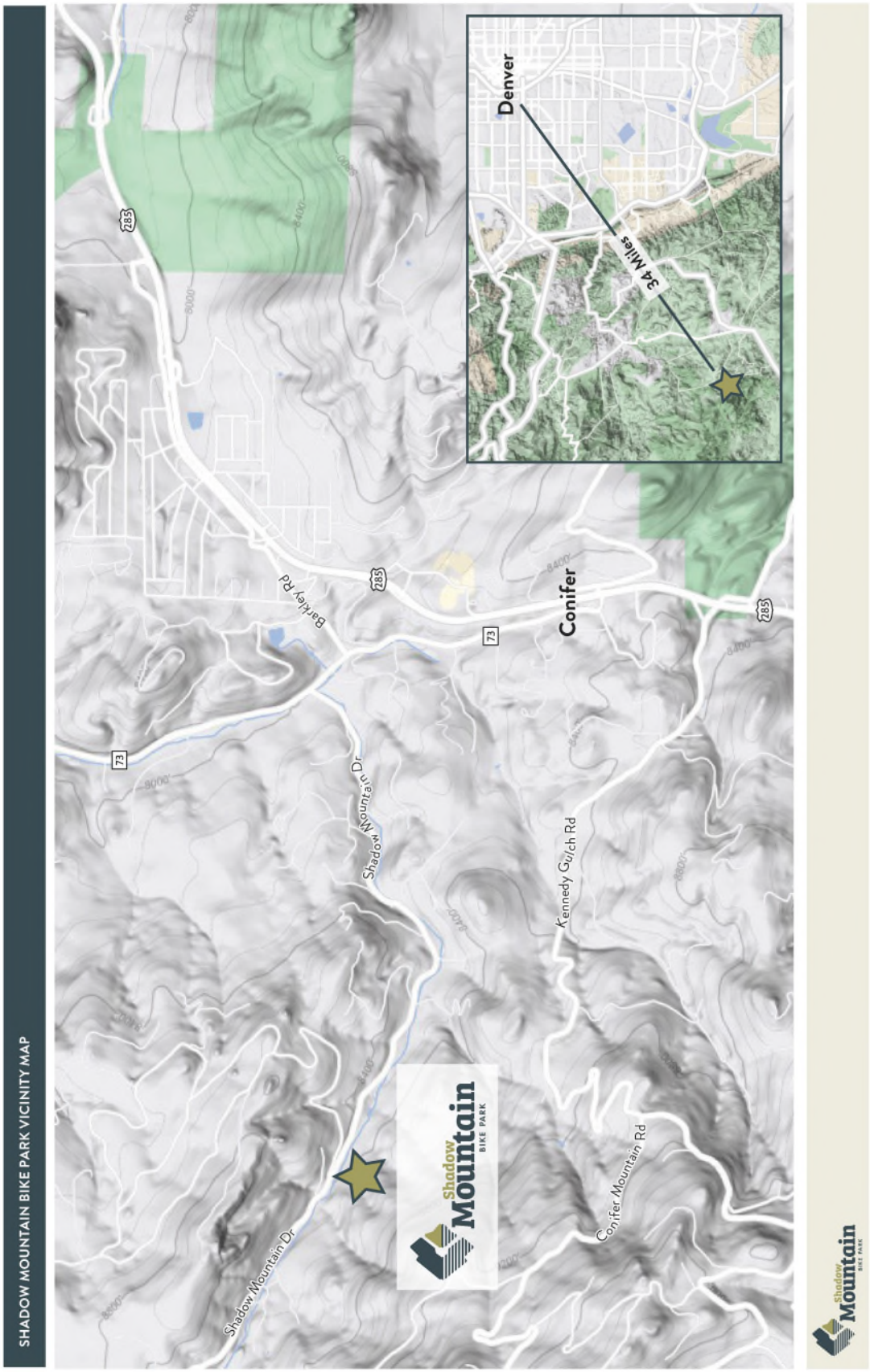


Figure 1: Vicinity Map

3.6 Climate

The climate of the study area is characterized by mild summers and moderately severe winters, moderate precipitation, high evaporation, and moderately high wind velocities.

The average annual monthly temperature is 43.5 F with an average monthly low of 10.3 F in the winter and an average monthly high of 76.1 F in the summer.

Precipitation averages 17.3 inches annually, with 50% of this falling as snow. August is the wettest month and January is the driest. The average annual Class A pan evaporation is 45 inches.

3.7 Natural Hazards Analysis

Natural hazards analysis indicates that no unusual surface or subsurface hazards are located in the service area. However, because the soils are cohesionless, sloughing of steep banks during drilling and/or excavation could occur. By siting improvements in a manner that provides an opportunity to lay the banks of excavations back at a 1:1 slope during construction, the problems associated with sloughing soils can be minimized.

3.8 Organizational Context

Shadow Mountain Bike Park is situated within the North Turkey Creek basin of Jefferson County. The closest public water supplier would Mountain Water and Sanitation District in Conifer, Colorado. The distance and topography to Conifer in general is cost prohibitive in terms of a water supplier for the bike park.

The amount of water required for the facility and the distance to other providers makes an onsite private water system the best for meeting on-site demands. The Mountain Shadow Bike Park will be the entity responsible to finance, construct and ensure the continuing operation and maintenance of improvements.

3.9 Water Facilities

The proposed water system will consist of a minimum of one water well onsite and water treatment and disinfection based on source water conditions and Colorado Department of Health and Environment requirements. In addition, there will be a 6-inch water transmission line from the water well to the storage tank. Water will be stored to provide peak hour demand and fire sprinkler water for the onsite Base Lodge.

3.10 Relationship to Neighboring Water and Wastewater Facilities

Mountain Water and Sanitation District near Conifer, Colorado is the closest potential provider of water and wastewater facilities. The distance and topography between the site and the town make any connection cost prohibitive.

3.11 Water Demand

The Shadow Mountain Bike Park recreational development will be serviced by a private water system constructed by the developer of the bike park. The projected water demand for the facility is calculated in Section 4.3 Water Demand based on uses recorded at other Bike Park facilities.

Section 4

DEVELOPED CONDITIONS

4.1 Land Use

Mountain Shadow Bike Park consists of approximately 235 acres of State Land Board undeveloped property. Most of the site will be left undeveloped except for the addition of Bike Trails, a bike lift and development of approximately 10 acres for a base lodge including one building for welcoming, ticketing, water facilities and restrooms.

Assumptions: Employees water usage is estimated to be 10 gallons per day (gpd)
Guest Water Usage is estimated to be 4 gpd
Irrigation will be minimal or not required with xeriscape or extensions of the natural surroundings.

4.2 Population and Employment

The applicant estimates that there will be 20 onsite employees in a given day. The average day guest population is estimated to be 300.

4.3 Water Demand

Water demand is estimated to be as follows:

Employees	20 x 10 gpd =	200 gpd
Guests	300 x 4 gpd =	1200 gpd
	Total =	1400 gpd =511,000 gallons/year =1.57 ac-ft/year

Unit water demands are based on the applicants' experience at other similar facilities.

Water demand is calculated in acre-feet per year (AFY) to determine water supply needs. This value is then factored to determine the average daily demand (ADD) in gallons per minute (gpm), which is used to project maximum day and peak hour demands as well as to estimate revenues and operating costs. Maximum day demand (MDD) and peak hour demand (PHD) have been determined by applying accepted peaking factors of 2.5 and 4.0 to the ADD, respectively. The MDD is used to determine storage needs and the PHD is used for modeling system delivery pressures and to size distribution piping.

Demand	
Ac-Ft/Year =	1.57
Gallons/day=	1400
ADD gpm=	0.97
MDD gpm=	2.43
PHD gpm=	3.8

Estimated Building Sprinkler demand is 20 gpm for 2 hours or 2400 gallons.

4.4 Water Supply

The proposed water supply for the Shadow Mountain Bike Park is an onsite water well. The applicant has been in discussion with the State Engineers Office concerning a well permit for the site including the type of permit and the uses permitted to insure proper permitting. There are numerous wells in the area and discussions with the State indicate issuance of a permit could be made based on water rights associated with the property without injury to adjacent water rights. Most of the wells in the area range between 350 ft to over 600 ft. in depth. The nearby wells all indicate access to an "unnamed" aquifer and are all located in a "non-designated" basin.

Based on information from adjacent properties we would anticipate construction and completion of a water well between 500 and 600 ft. in depth in an unnamed aquifer.

The water well permit should be for a well capable of producing at a minimum the anticipated Peak Hour Demand and overall, yearly withdraw limits should exceed 2 ac-ft (651,657 gallon) annually.

4.5 Water Quality

The water quality and any mitigation required will be determined after construction of the well based on the permit obtained from the State Engineers Office. Mitigation anticipated may include filtering and disinfection. Anticipated treatments expected would be easily obtained with standard readily available locally provided treatment and disinfection equipment.

Section 5
WATER SYSTEM IMPROVEMENTS

5.1 General

The water system would be operated by the Shadow Mountain Bike Park and would be classified as a private water system and would be operated to meet the applicable requirements of the Colorado Department of Health and Environment (CDHE). The system may be operated by a third party contracted by Shadow Mountain Bike Park and licensed by the State of Colorado.

Filtration and disinfection facilities provide treatment of the raw water sources to ensure good water quality. In addition, storage facilities and distribution piping will be provided to ensure that residual pressure requirements are achieved both during peak hour demands and during maximum day demands. The system will also by designed to deliver the required fire sprinkler water to the onsite building.

5.2 Groundwater Wells

The proposed water supply for the Shadow Mountain Bike Park is an onsite water well. As mentioned previously, the applicant has been in contact with the State Engineers Office concerning the parameters of a permit.

The water well permit should be for a well capable of producing at a minimum the anticipated Peak Hour Demand and overall, yearly withdraw limit should exceed 2 ac-ft annually.

The well will be equipped with a submersible well pump capable of delivering in excess of the Peak Hour Demand of 3.8 gpm. The well pump would be designed to deliver water to the storage tank.

5.3 Water Treatment

Treating and filtering of the water sources will meet CDHE Drinking Water Standards.

In addition, CDHE standards require that the water supply be disinfected and that the supply receives minimum chlorine contact time of 30 minutes before first use.

5.4 Storage

Storage reservoirs will be ground mounted and elevated steel tanks designed in accordance with CDHE and AWWA Standards.

Storage is sized to provide a minimum of 30% of maximum day demand and includes a reserve to supply a fire sprinkler flow of 50 gpm for two hours.

Required storage is calculated as follows:

Maximum Day Demand is 3.8 gpm.	3.8 x 60 x 24 =	5,472 gallons
Estimated Fire Sprinkler storage requirement is	50 x 60 x 2 =	6,000 gallons
Estimated Storage Requirement	=	11,472 gallons say 15,000 gallons

5.5 Distribution

The water distribution system provides water at a maximum static pressure of 45 psi during periods of low use and at a minimum residual pressure of 40 psi during peak hour demand. The storage tank will be located at an elevation sufficient to meet these pressure requirements along with associated distribution and conveyance piping. Anticipated transmission and distribution piping is 6-inch.

5.6 Estimated Costs

Estimated Costs

Item	Units	Quantity	Unit Price	Extension
Shadow Mountain Bike Park				
Water Well	LS	1	$50,000	$50,000
Well Pump and Controls	LS	1	$15,000	$15,000
Water Transmission	LF	5,800	$20	$116,000
Storage	Gallons	15,000	$3	$45,000
Treatment	LS	1	$25,000	$25,000
Total Estimated Cost				*$251,000*

The above system improvements are all constructed as part of Shadow Mountain Bike Park. These costs do not include other costs or gains that may be incurred in the acquisition of land, financing, investment, local distribution, the salvage value of equipment or other necessary infrastructure, among others, unless specifically noted.

5.7 Rates and Charges

The waters system will be operated within the overall operation of the Shadow Mountain Bike Park through user fees charged to guests for the recreational facility.

Appendix A

100 Year Flood Plain Certification

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be viewed in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coordinates on the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on the FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1998 or later.

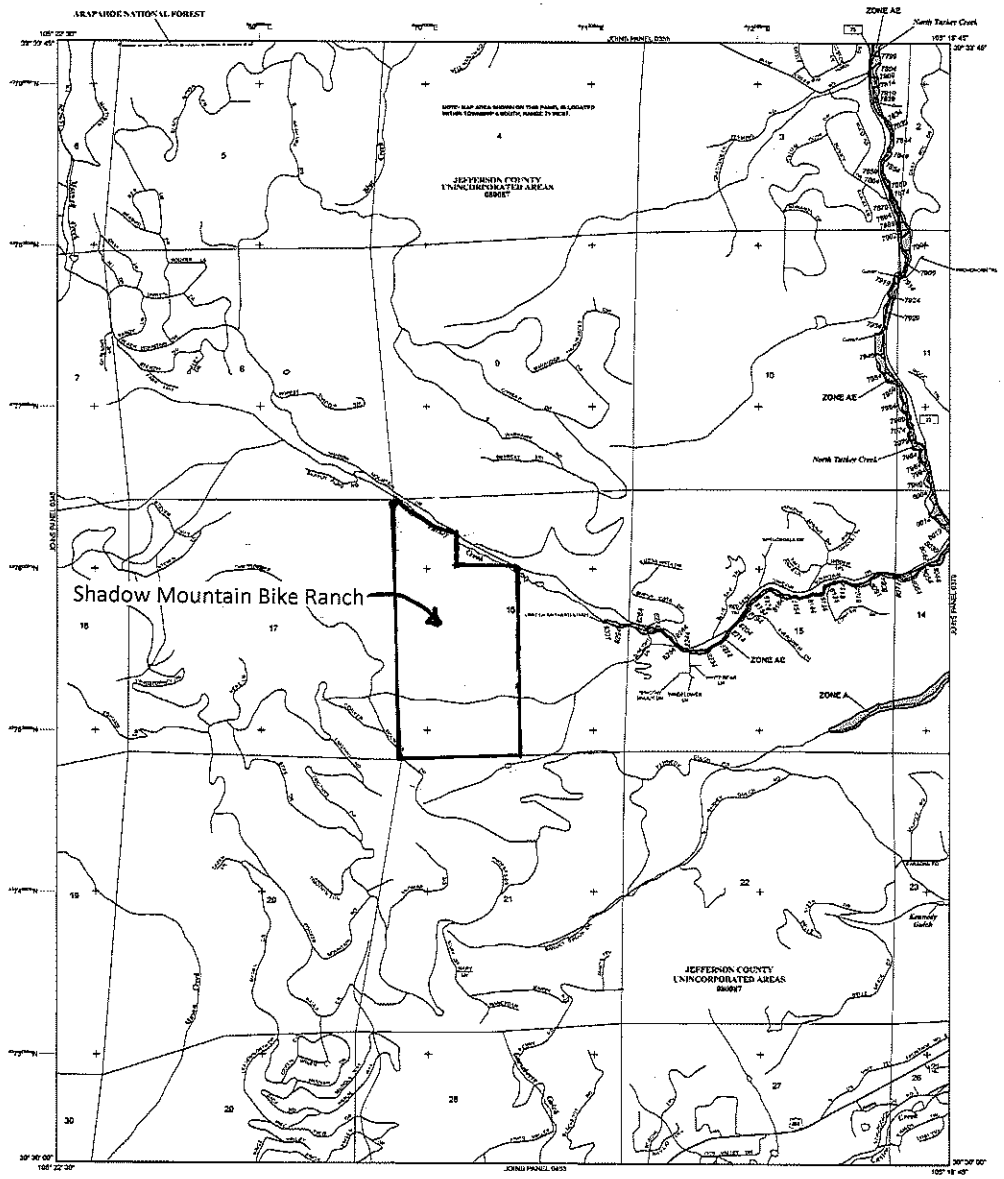
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in conjunction with the Flood Insurance Study Report for both communities (Summary of Stillwater Elevations tables) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM, visit the FEMA Map Service Center (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are generally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway Boundary
	Zone D Boundary
	CBRS and OPA Boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
(EL 987)	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - - -(23)	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western hemisphere
4976000 m N	Universal Transverse Mercator grid values, zone 15N
5000000 FT X	Lambert zone grid coordinates (zone indicated in parentheses)
* M1.2	Map Ref.

MAP REPOSITORY(S)
Refer to Map Repository list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 17, 2008

EFFECTIVE DATES OF REVISIONS TO THIS PANEL
February 5, 2014 - To update corporate limits, to change base (100-year) floodplains, to add base flood elevations, to add special flood hazard areas, to apply map format, to add roads and hydrologic features, to include updated topographic information. In accordance previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

600 0 1000 2000
METERS
FEET
150 0 300 600

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0365F

FIRM
FLOOD INSURANCE RATE MAP

JEFFERSON COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 365 OF 875
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JEFFERSON COUNTY	080087	0365	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
08059C0365F
MAP REVISED
FEBRUARY 5, 2014

Federal Emergency Management Agency

Appendix B

Water System Improvements

Stantec

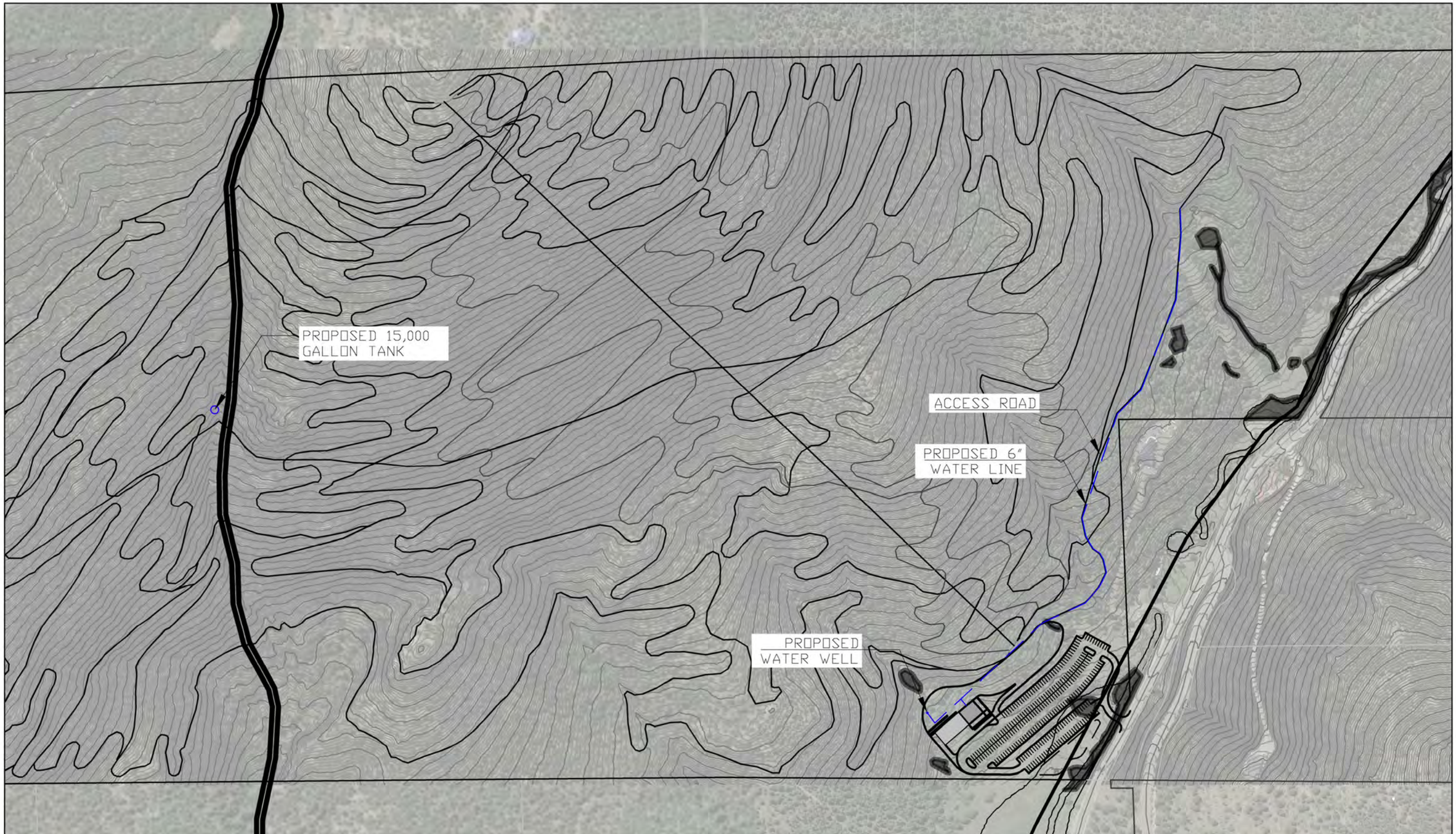
2000 S COLORADO BLVD
SUITE 300
DENVER, CO 80222

WATER SYSTEM SITE DRAWING (A)

SHADOW MOUNTAIN BIKE PARK

SCALE: 1"=60'

N



Stantec

2000 S COLORADO BLVD
SUITE 300
DENVER, CO 80222

WATER SYSTEM SITE DRAWING (B)

SHADOW MOUNTAIN BIKE PARK

SCALE: 1"=300'

N

JEFFERSON COUNTY COLORADO | Public Health

FORM 6001

Environmental Health Services Division 645 Parfet Street, Lakewood, CO 80215
(303) 232-6301 FAX (303) 271-5760 jeffco.us/public-health

ONSITE WASTEWATER REPORT

Jefferson County Public Health has developed this form to allow the applicant to determine the submittal requirements for properties that will be served by onsite wastewater treatment (septic) system whenever required by the Jefferson County Land Development Regulation (LDR) Section 22.B.

NOTE: Do not use this form for developments that will be served by a PUBLIC SEWER SYSTEM – see LDR Section 22.A for those submittal requirements.

INSTRUCTIONS FOR COMPLETING THIS FORM

- Complete the Parts I and II on the following page, then see PART III for the required supporting documents and include those with your submittal.
- Unless otherwise noted, the supporting documents must be prepared by a professional engineer licensed in the State of Colorado.
- Health Department staff will review this form and the supporting documents and provide comments to the Planning and Zoning case manager. Staff reserves the right to request additional information and / or documentation that is not referenced on this application.

FEE: The initial health department review fee will be collected by the Planning and Zoning Department at the time of application.

PROCESSING TIME

Typically, five (5) working days are required to review the information provided. If your case requires Board of Health review, allow up to an additional eight weeks for this process. There may be additional submittal requirements and a fee for the Board hearing.

CONTACTS:

Tracy Volkman	Mary Sloan (for BOH cases only)
303 271-5763	303 271-7529
tvolkman@jeffco.us	mksloan@jeffco.us

REVISED 9/30/2022

JEFFERSON COUNTY PUBLIC HEALTH, Environmental Health Services Division
645 PARFET STREET, LAKEWOOD CO 80215 (303) 232-6301 FAX (303) 271-5760
jeffco.us/public-health

P&Z Case No. and Project Name	20-127140 PA	Shadow Mountain Bike Park
Property Address	29611 Shadow Mountain Drive, Conifer, CO 80433	
Applicant Name	FSBR, LLC	
Applicant Phone / Email	603-660-6604	phil@shadowmountainbikepark.com

PART I –WATER SERVICE AND LIST OF EXISTING STRUCTURES AND ADDRESSES

- Water service will be provided by: ( ) PUBLIC WATER SYSTEM (X) INDIVIDUAL WATER WELLS
- Acreage of the proposed development: 306 acres Number of platted lots
- In the boxes below, provide the types and addresses of all structures on the property served by water. If property is vacant, write "NA" and go on to Part II.

RESIDENTIAL STRUCTURES			NON-RESIDENTIAL
Structure Type (house, cabin, guest house)	**Address, if different from above**	**Bedrooms**	**Structure Type (barn, garage, etc.)**
NA			NA

PART II – INCREASE IN BUILDING SITES (check applicable box)

( ) NO additional building sites will be created. Submit this form with the PART I information only. See Part III for All Applicants.

(X) ADDITIONAL building sites will be created. See PART III for the required supporting documents.

PART III – SUPPORTING DOCUMENTS REQUIRED

ALL APPLICANTS:

- Submit a statement from a registered professional engineer regarding any limiting environmental factors (shallow bedrock, steep slopes, high groundwater, etc.) that would prevent the location, construction and operation of onsite wastewater treatment systems anywhere in the proposed development.

IN ADDITION TO THE ABOVE:

- **FOR EACH LOT THAT WILL BE LESS THAN 5 ACRES BUT GREATER THAN 3.5 ACRES,** submit an engineering design that meets Section 4.2.C. of the Jefferson County onsite wastewater treatment system regulation,
- **FOR EACH LOT THAT WILL BE LESS THAN 3.5 ACRES (or 1 acre with public water)** submit an engineering design that meets Section 4.1.A.g of the Jefferson County onsite wastewater treatment system regulations. Board of health approval is required. Contact Mary Sloan (303 271-7529 or mksloan@jeffco.us) for information on this process. Please note that Board of Health approval is not guaranteed for any particular proposal.

NOTE: JCPH MAY REQUEST ADDITIONAL DOCUMENTATION FOR ANY PROPOSAL.

ENGINEERING STUDY
for
SHADOW MOUNTAIN BIKE PARK
CONCEPT MASTER PLAN
WASTEWATER SYSTEM IMPROVEMENTS

Prepared For:

Colorado State Land Board
Shadow Mountain Bike Park
SE Group
Frisco, Colorado
PO Box 2729
323 West Main Street, Suite 202
Frisco, CO 80443-2729

Prepared By:

Stantec
5725 Mark Dabling Blvd. Suite 190
Colorado Springs CO 80919

November 2022
Project No. 181711248

*** * * * * * C O N T E N T S * * * * * ***

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******APPENDICES******

Appendix A	100-Year Flood Plain Certification
Appendix B	Wastewater Improvements

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Figure 1	Vicinity Map

Section 1
EXECUTIVE SUMMARY

This report presents the results of the engineering study for wastewater system improvements serving Shadow Mountain Bike Park proposed on State Land Board Shadow Mountain parcels in Jefferson County, Colorado. Shadow Mountain Bike Park is proposed on undeveloped property with a designated address of 29611 Shadow Mountain Drive, Conifer, Colorado 80433.

The proposed parcel currently has no wastewater facilities on site. Shadow Mountain Bike Park proposes construction of a On-site Wastewater Treatment System (OWTS) to provide wastewater treatment per Jefferson County requirements. The facility is anticipated to be a Septic System with a capacity of less than 2000 gpd.

Shadow Mountain Bike Park facilities will consist of a Base Lodge operating as a Class III Recreation facility to welcome guests and provide basic needs such as welcoming center including drinking water and restrooms.

The average annual water demand for Shadow Mountain Bike Park is estimated to be 1.57 acre-feet of water per year. Average day usage is estimated to be 1400 gpd or 0.97 gpm. This water will be provided by water wells as permitted by the Colorado State Engineers Office.

Wastewater is estimated to be 80% of water demand. The Shadow Mountain Bike Park wastewater treatment requirements is estimated to be 1120 gpd (1400 x 0.8). An OWTS constructed per Jefferson County requirements will be constructed to treat the wastewater prior to discharge through an anticipated leach field.

Section 2
INTRODUCTION

2.1 Purpose

The purpose of this report is to present wastewater system improvements recommended to serve Shadow Mountain Bike Park; a proposed recreational development project located in Jefferson County. It is also intended to serve as a guideline for the ensuing design of recommended improvements.

2.2 Scope

The scope of this report includes:

1. The definition of the service areas as well as identification of significant physical and environmental characteristics and constraints;

2. An analysis of available data to determine existing and to project future wastewater demands and treatment;

3. A description of legal, institutional and managerial arrangements that ensure adequate control of the proposed improvements; and,

4. A preliminary recommendation for a selected collection, treatment and potential pumping and transmission alternatives.

Section 3
EXISTING CONDITIONS

3.1 Description of the Service Area

Shadow Mountain Bike Park consists of approximately 235 acres of Base Lodge (10 acres +/-) and open space uses and is located northwest of the Conifer Colorado, within Township 6 South, Range 71 West, Section 16.

3.2 Land Use

Shadow Mountain Bike Park is in Jefferson County northwest of Conifer, Colorado and about 35 miles southwest of the Denver Metroplex. Surrounding areas are primarily large tract residential properties and large undeveloped tracts.

3.3 Topography and Floodplains

The topography of the service area is typical of a Colorado Front Range Mountain parcel with elevations ranging from 8400 ft. to 9250 ft. above sea level. Existing slopes range from 5% at base camp to 25% or greater in some areas. Vegetation is typical Colorado mountain woodlands with a mix of Ponderosa Pine, Spruce, Fir and ground cover plants and grasses. The area drains generally northeast to North Turkey Creek.

There is no Federal Emergency Management Agency (FEMA 08059CO365F) established floodplain within the boundaries of Shadow Mountain Bike Park. See Appendix A.

3.4 Geology

The site is comprised of several different soil types. From the NRCS Soil Survey of Jefferson County, the site falls into the following soil types:

1.“67” Kittredge-Earcree, 9 to 20 percent slopes; Type A Soil
2.“76” Legault-Hiwan stony loamy sands, 15 to 30 percent slopes; Type D Soil
3.“77” Legault-Hiwan-Rock outcrop complex, 30 to 50 percent slopes; Type D Soil
4.“138” Rock outcrop, igneous and metamorphic; Type D Soil
5.“141” Rogert, very stony-Herbman-Rock outcrop complex, 30 to 70 percent slopes; Type D Soil
Note: “#” indicates Soil Conservation Survey soil classification number.

3.5 Groundwater

The proposed water supply for the Shadow Mountain Bike Park is an onsite water well. The applicant has been in discussion with the State Engineers Office concerning a well permit for the site including the type of permit and the uses permitted to ensure proper permitting. There are numerous wells in the area and discussions with the State indicate issuance of a permit could be made based on water rights associated with the property without injury to adjacent water rights.

Any water well constructed on site would be constructed at an elevation and distance from the OWTS as required by Jefferson County and the State Engineers Office.

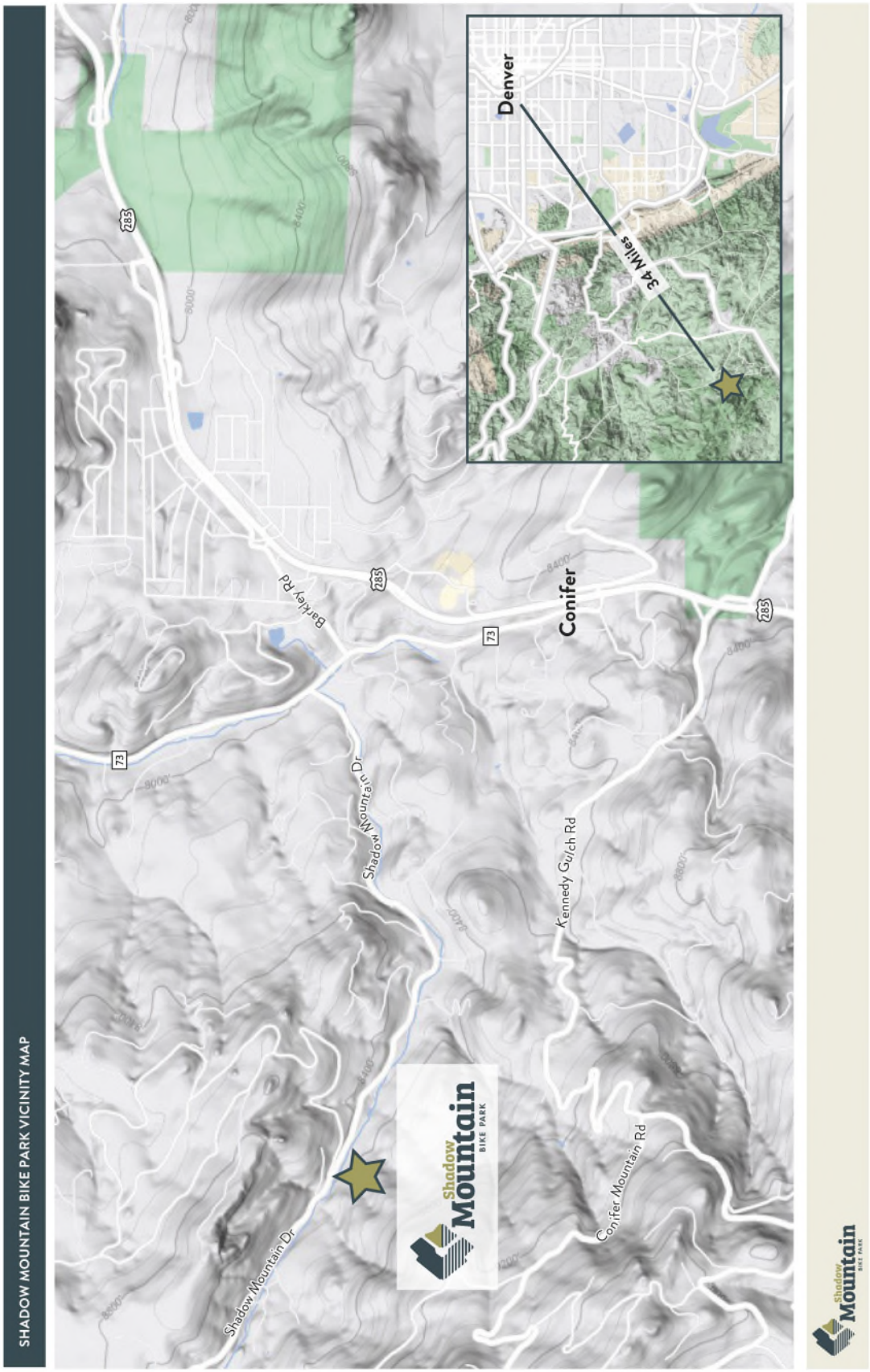


Figure 1: Vicinity Map

3.6 Climate

The climate of the study area is characterized by mild summers and moderately severe winters, moderate precipitation, high evaporation, and moderately high wind velocities.

The average annual monthly temperature is 43.5 F with an average monthly low of 10.3 F in the winter and an average monthly high of 76.1 F in the summer.

Precipitation averages 17.3 inches annually, with 50% of this falling as snow. August is the wettest month and January is the driest. The average annual Class A pan evaporation is 45 inches.

3.7 Natural Hazards Analysis

Natural hazards analysis indicates that no unusual surface or subsurface hazards are located in the service area. However, because the soils are cohesionless, sloughing of steep banks during drilling and/or excavation could occur. By siting improvements in a manner that provides an opportunity to lay the banks of excavations back at a 1:1 slope during construction, the problems associated with sloughing soils can be minimized.

3.8 Organizational Context

Shadow Mountain Bike Park is situated within the North Turkey Creek basin of Jefferson County. The closest public wastewater service would be from the Mountain Water and Sanitation District near Conifer, Colorado. The distance and topography to Conifer in general is cost prohibitive in terms of a wastewater servicer for the bike park.

The amount of wastewater produced at the facility and the distance to other providers makes an onsite OWTS the best for meeting on site demands. The Mountain Shadow Bike Park will be the entity responsible to finance, construct and ensure the continuing operation and maintenance of improvements.

3.9 Wastewater Facilities

The proposed OWTS is anticipated to consist of a septic tank and leach field designed to treat in excess of 1180 gpd. Design and construction of the OWTS will be in accordance with Jefferson County OWTS requirements.

3.10 Relationship to Neighboring Water and Wastewater Facilities

The Town of Conifer is the closest potential provider of water and wastewater facilities. The distance and topography between the site and the town make any connection cost prohibitive.

Section 4
DEVELOPED CONDITIONS

4.1 Land Use

Mountain Shadow Bike Park consists of approximately 235 acres of State Land Board undeveloped property. Most of the site will be left undeveloped except for the addition of Bike Trails, a bike lift and development of approximately 10 acres for a base lodge including one building for welcoming, ticketing, water facilities and restrooms.

Assumptions: Employees water usage is estimated to be 10 gallons per day (gpd)
Guest Water Usage is estimated to be 4 gpd
Irrigation will be minimal or not at all with xeriscape or extensions of the natural surroundings.

4.2 Population and Employment

The applicant estimates that there will be 20 onsite employees in a given day. The average day guest population is estimated to be 300.

4.3 Wastewater Demand

Wastewater is estimated to be 80% of water demand. The Shadow Mountain Bike Park wastewater treatment requirements is estimated to be 1120 gpd (1400 x 0.8). An OWTS constructed per Jefferson County requirements will be constructed to treat the wastewater prior to discharge through an anticipated leach field.

4.4 Wastewater Discharge Permit

Wastewater Discharge will be permitted through Jefferson County and the associated OWTS design and construction process.

Section 5
WASTEWATER SYSTEM IMPROVEMENTS

5.1 General

The OWTS will be operated by the Shadow Mountain Bike Park and would be classified as a private OWTS and would be operated to meet the applicable requirements of the Colorado Department of Health and Environment (CDHE) and Jefferson County. The system may be operated by a third party contracted by Shadow Mountain Bike Park and licensed by the State of Colorado.

5.3 Wastewater Treatment

The OWTS is anticipated to be a septic system with a leach field. The OWTS design is anticipated to be for a system capacity of 1180 gpd. The Wastewater Improvements drawing in Appendix B indicates the location of an existing water well on the adjacent property. The location of the proposed septic tank and leach field is indicated to be in excess of 200 ft away from the existing well. In addition the septic tank in leach field are located at a lower elevation then the surface elevation of the water well.

5.4 Collection

The wastewater collection system will collect waste flow at the Base Lodge and convey it through a 6-inch main to a septic tank for treatment. After proper treatment through the septic system treated wastewater will be conveyed through pipes to a leach field for discharge. All pipe and appurtenances will be designed to meet or exceed Jefferson County standards.

5.5 Estimated Costs

Estimated Costs

Item	Units	Quantity	Unit Price	Extension
Shadow Mountain Bike Park				
Wastewater Interceptor	LF	600	$20	$1200
Septic Tank	LS	1	$5,500	$5,500
Leach Field	LS	1	$8,000	$8,000
Total Estimated Cost				*$14,700*

The above system improvements are all constructed as part of Shadow Mountain Bike Park. The costs included above only include capital costs for wastewater system improvements required to serve the site and are estimated from best available data. These costs do not include other costs or gains that may be incurred in the acquisition of land, financing, investing, local distribution, the salvage value of equipment or other necessary infrastructure, among others, unless specifically noted.

5.6 Rates and Charges

The wastewater system will be operated within the overall operation of the Shadow Mountain Bike Park through user fees charged to guests for the recreational facility.

Appendix A

100 Year Flood Plain Certification

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be viewed in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coordinates on the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on the FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1998 or later.

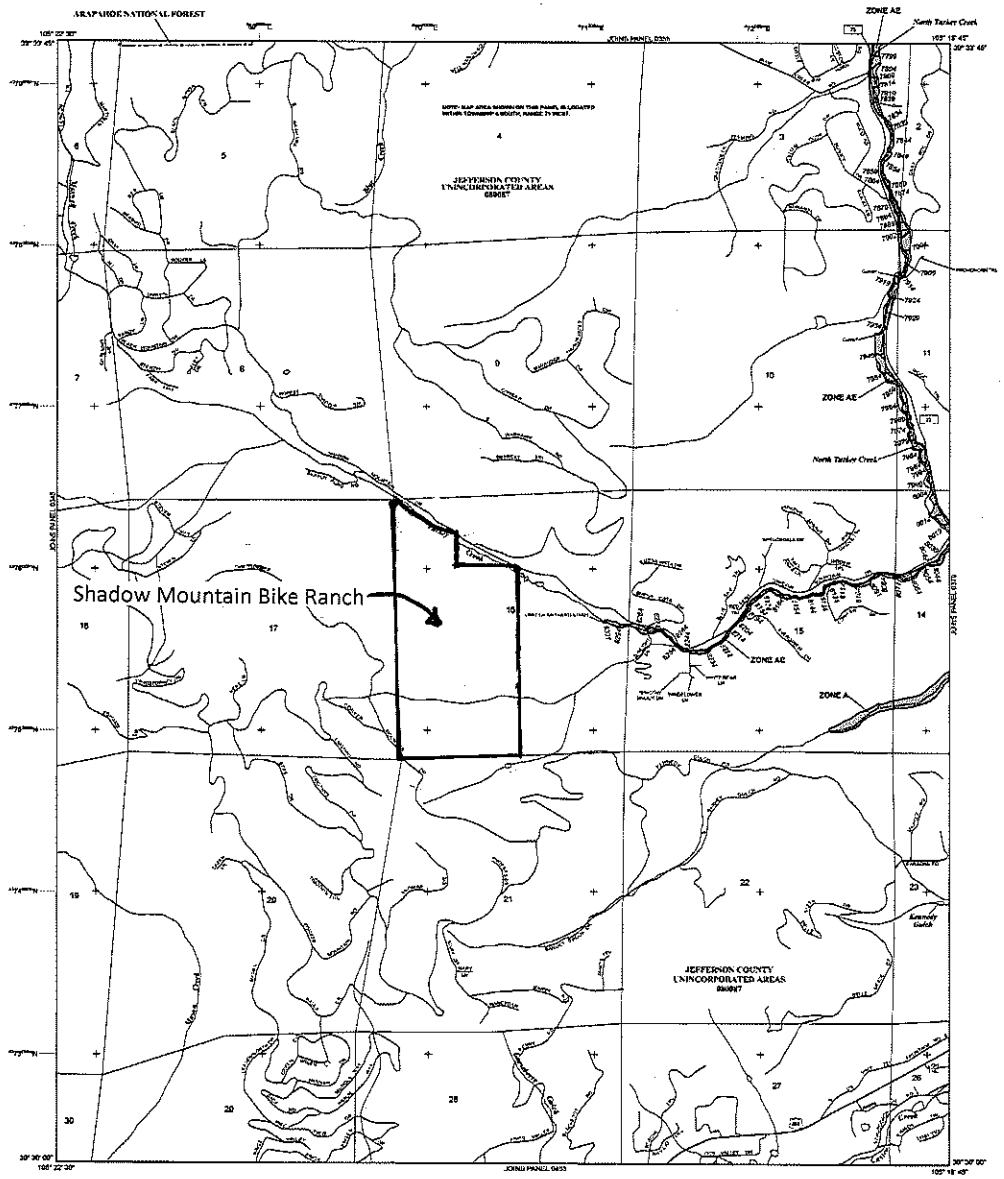
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in conjunction with the Flood Insurance Study Report for both communities (Summary of Stillwater Elevations tables) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM, visit the FEMA Map Service Center (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are generally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway Boundary
	Zone D Boundary
	CBRS and OPA Boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
(EL 987)	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - - -(23)	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western hemisphere
4976000 m N	Universal Transverse Mercator grid values, zone 15N
5000000 FT X	Lambert zone grid coordinates (zone indicated in parentheses)
* M1.2	Map Ref.

MAP REPOSITORY(S)
Refer to Map Repository list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 17, 2008

EFFECTIVE DATES OF REVISIONS TO THIS PANEL
February 5, 2014 - To update corporate limits, to change base (100-year) floodplains, to add base flood elevations, to add special flood hazard areas, to apply map format, to add roads and hydrologic features, to include updated topographic information. In accordance previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

600 0 1000 2000
METERS
FEET
150 0 300 600

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0365F

FIRM
FLOOD INSURANCE RATE MAP

JEFFERSON COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 365 OF 875
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JEFFERSON COUNTY	080087	0365	F

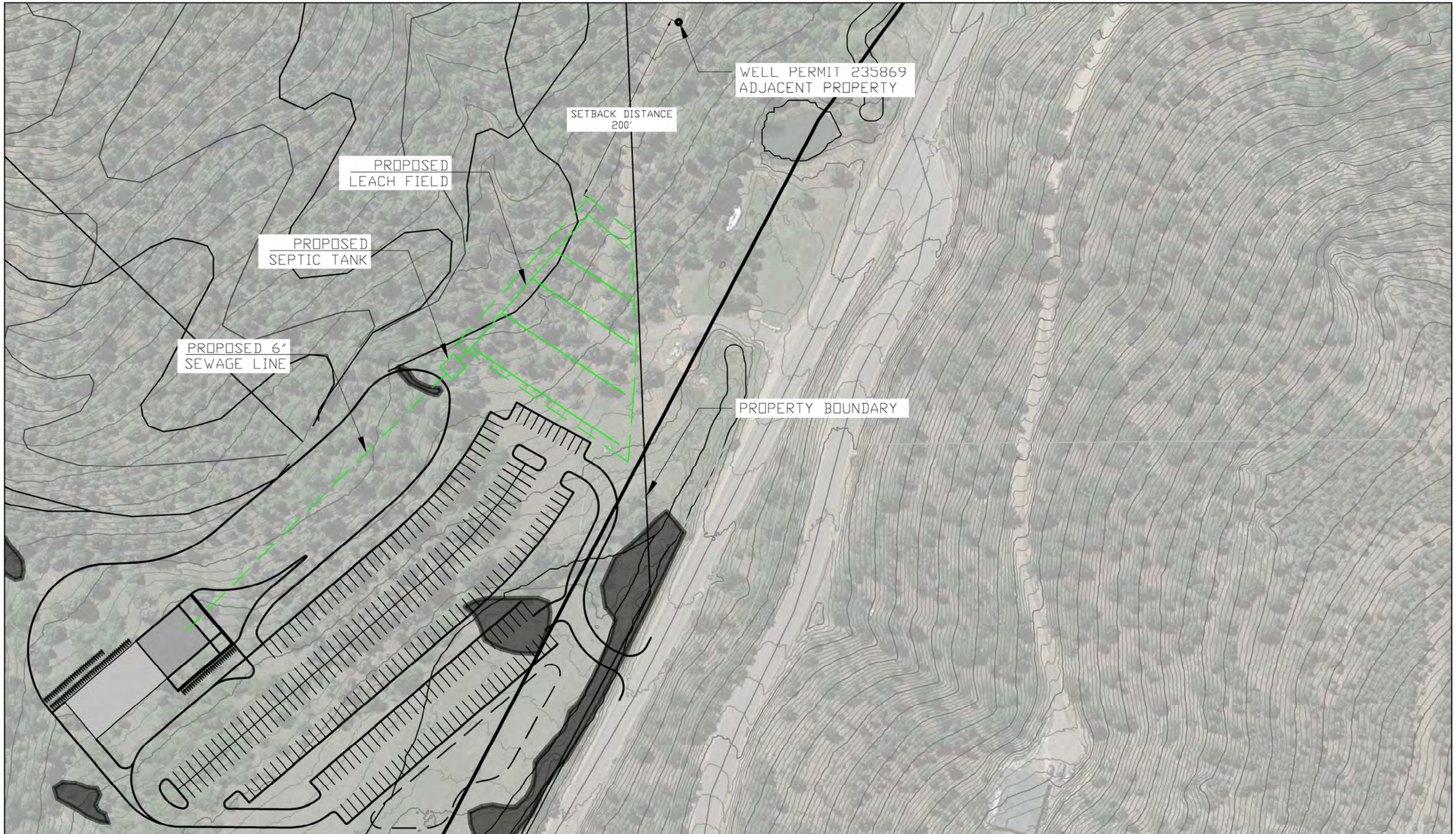
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
08059C0365F
MAP REVISED
FEBRUARY 5, 2014

Federal Emergency Management Agency

Appendix B

Wastewater System Improvements



Stantec

2000 S COLORADO BLVD
SUITE 300
DENVER, CO 80222

WASTEWATER SYSTEM SITE DRAWING

SHADOW MOUNTAIN BIKE PARK

SCALE: 1"=100'

N

THE Ember Alliance

Shadow Mountain Bike Park Wildfire Risk Assessment

Prepared for:

Shadow Mountain Bike Park
FSBR, LLC

- and -

SE Group
PO Box 2729
Frisco, CO 80443

Prepared by:

The Ember Alliance
PO Box 2084
Fort Collins, CO 80522

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Introduction

Site Description

Shadow Mountain Bike Park (SMBP) is in west-central Jefferson County, CO. It is west of Conifer and Aspen Park and located within the Elk Creek Fire Protection District (Figure 1). The proposed bike park will be built on a 250-acre parcel of undeveloped land off Shadow Mountain Drive. This risk assessment focuses on the parcel proposed for the SMBP and includes the area surrounding the parcel.

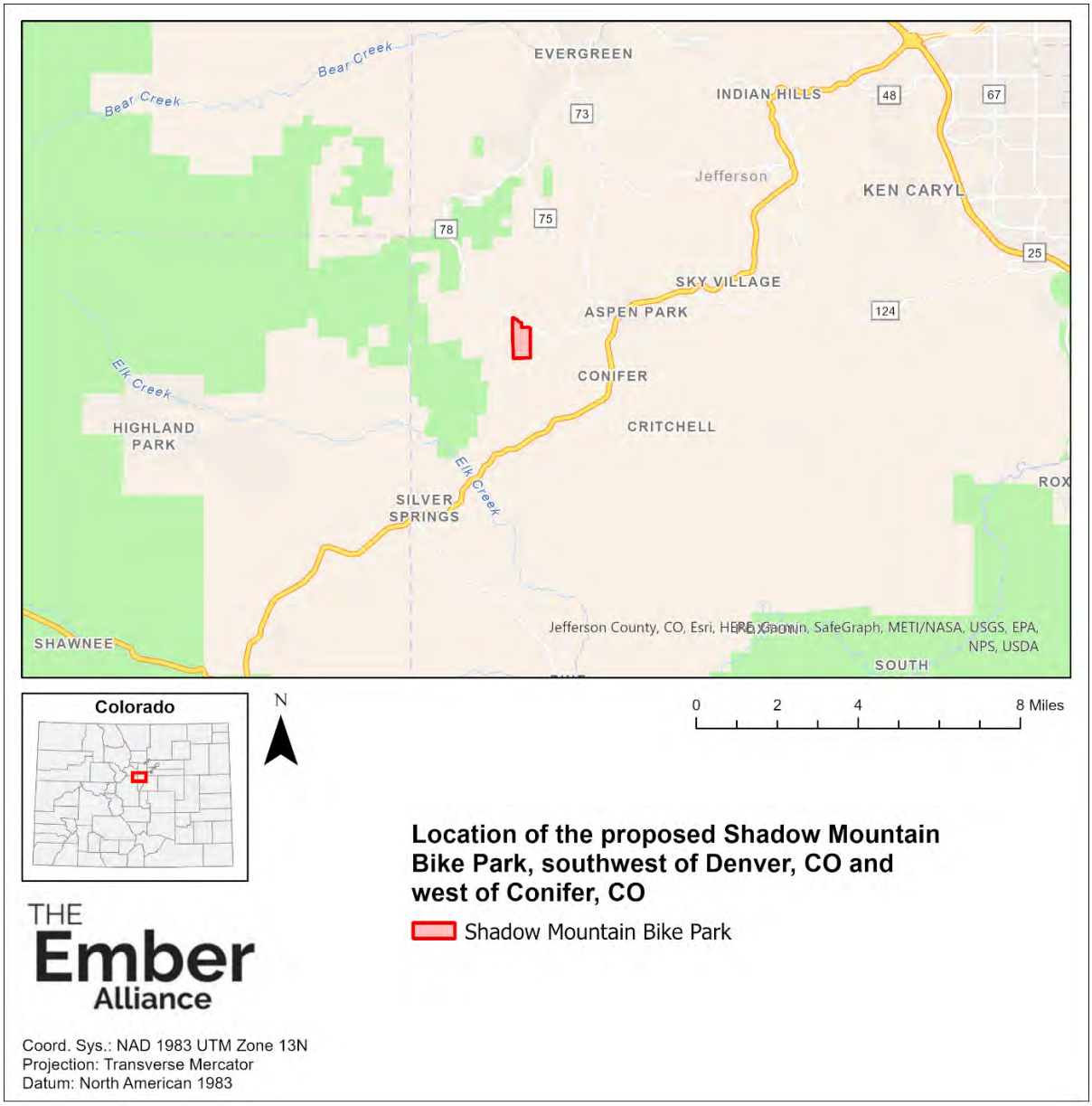

Figure 1. Proposed location for the Shadow Mountain Bike Park west of Conifer, CO.

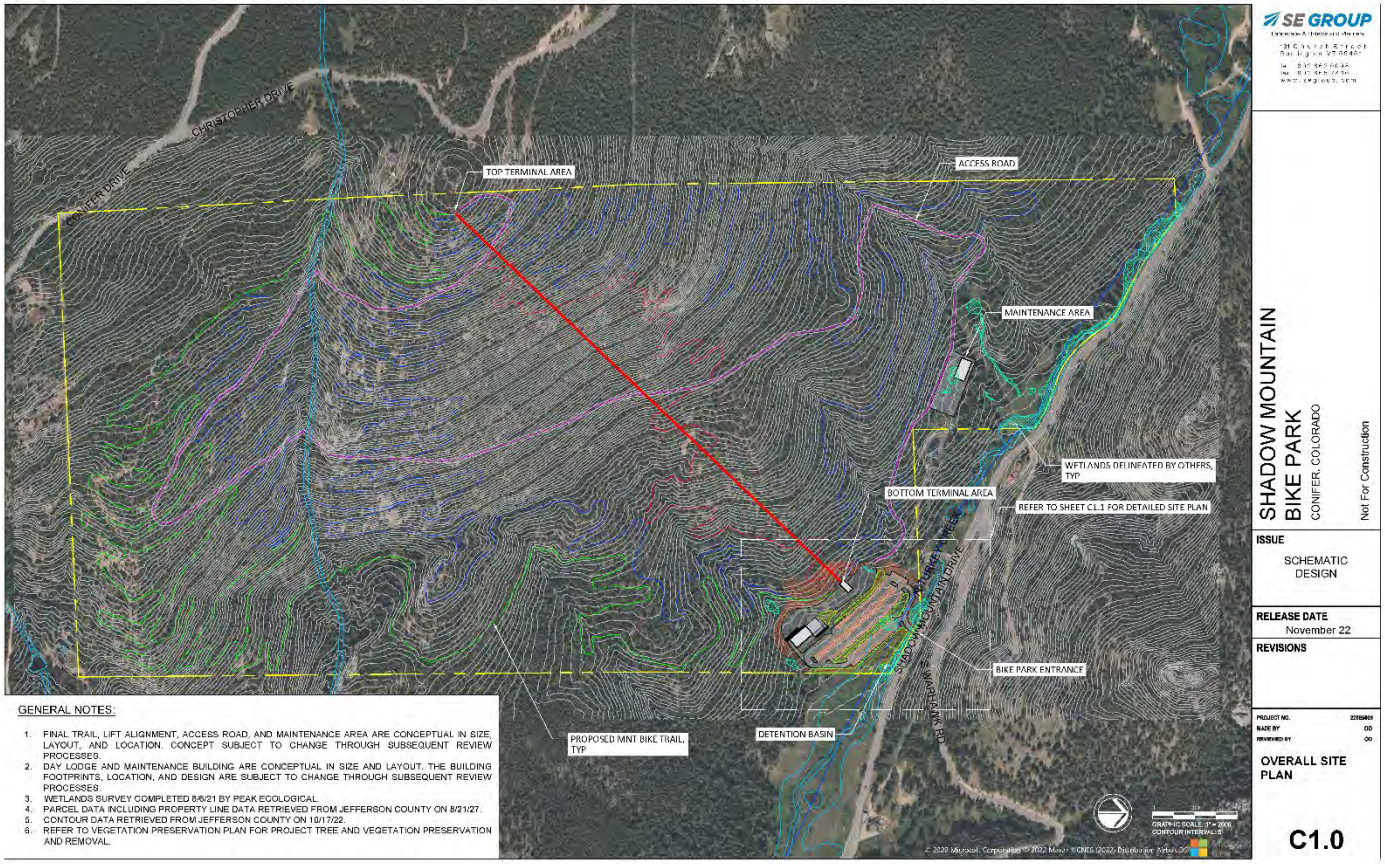

Figure 2. Site plan for the Shadow Mountain Bike Park. Source: SE Group.

The wildland-urban interface (WUI) is where structures and other human developments meet or intermingle with wildland vegetation (Colorado State Forest Service, 2020). Multiple definitions exist for defining and describing the WUI (Stewart et al., 2007). The SMBP is located in the WUI and should take wildland fire into account when building the site and planning for use and evacuations.

Wildfires can be both destructive and deadly, especially for unprepared communities. The 2020 East Troublesome Fire destroyed at least 366 buildings and took two lives, and the 2021 Marshall Fire destroyed 1084 homes and took two lives.

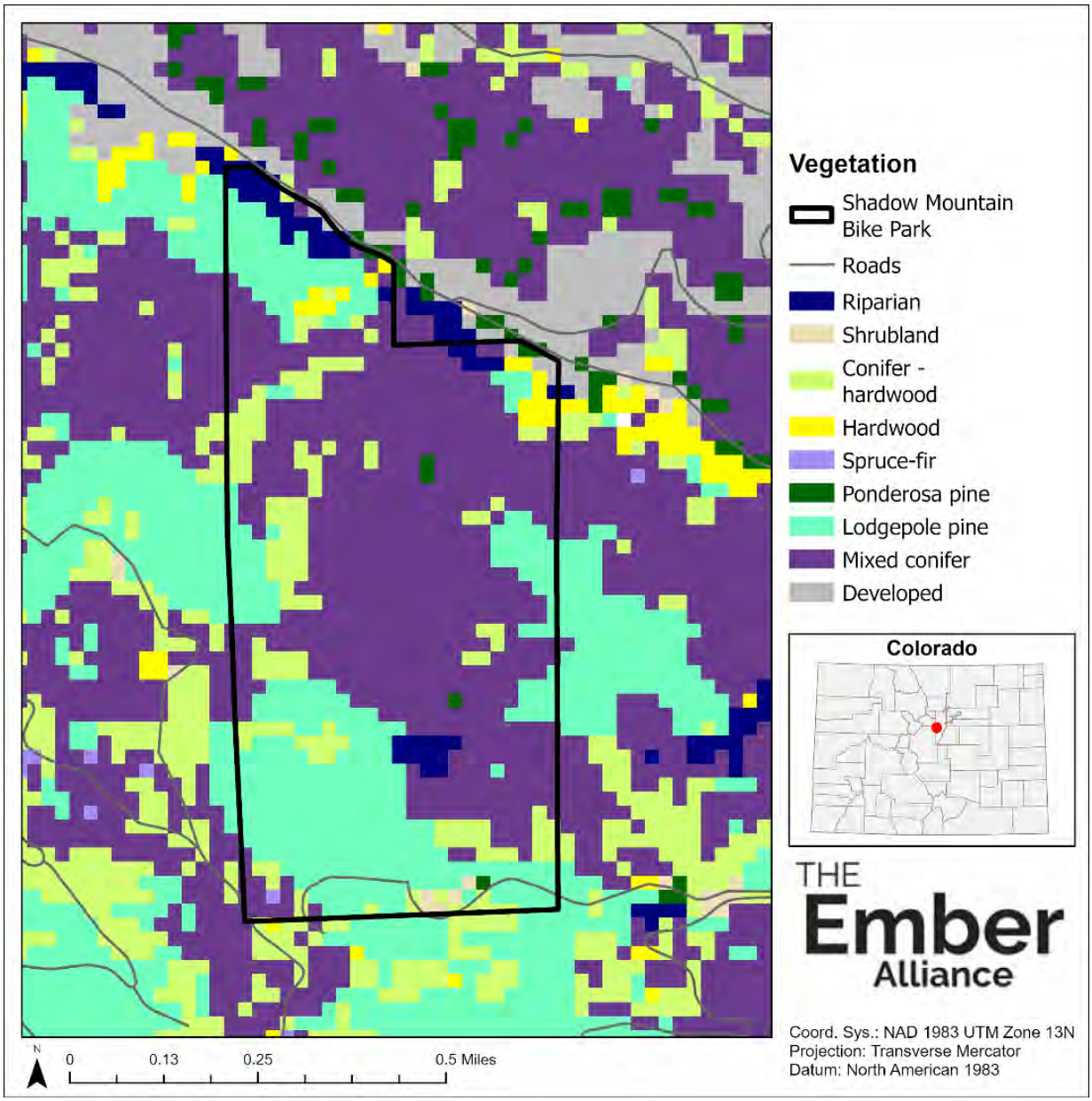

Figure 3. Vegetation data across the parcel was obtained from the Colorado State Forest Service and confirmed by on-the-ground observation by TEA staff (Source: Colorado Forest Atlas).

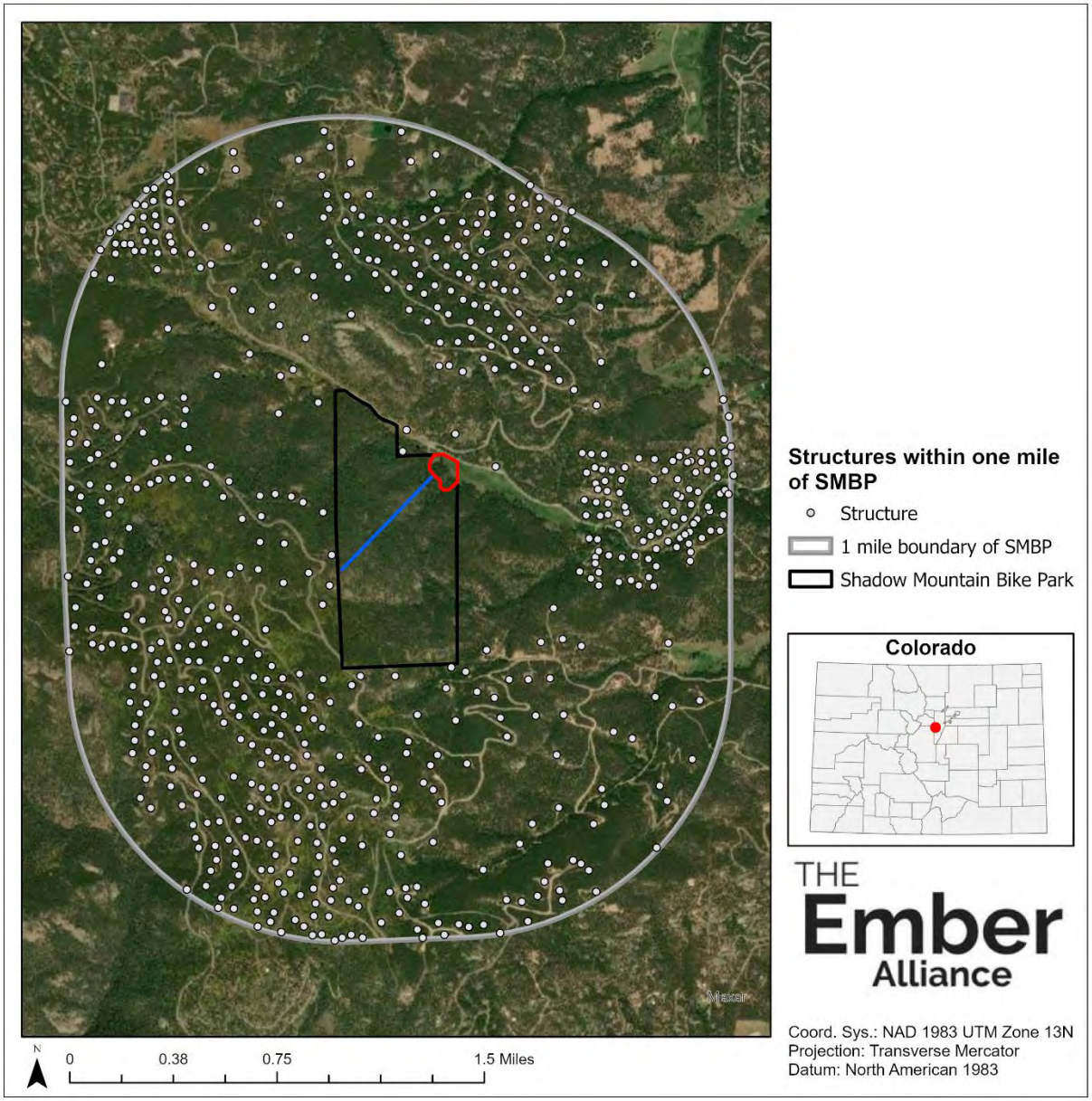

Figure 4. Density of surrounding housing and structures within one mile of the proposed bike park.

Fire Behavior

Fire behavior models have been rigorously developed and tested based on over 40 years of experimental and observational research (Sullivan, 2009). Fire behavior modeling helps identify areas that could experience high-severity wildfires that pose a risk to lives, property, and other values at risk.

This report relies on analyses completed in the software package FlamMap, a fire analysis desktop application that simulates potential fire behavior and spread under constant weather and fuel moisture (Finney, 2006). FlamMap is one of the most common models used by land managers to assist with fuel treatment prioritization, and is used by fire behavior analysts during wildfire incidents. In this analysis, fire spread was modeled with FlamMap's "minimum travel time" algorithm to predict fire growth between cells and account for fire spread through spotting. Fire growth was modeled for approximately 500 random ignitions across the landscape; fires were allowed to grow for 4 hours in the absence of firefighter suppression and control measures. The area of analysis was 60 times larger than the parcel to capture the landscape-scale movement of fire.

Model Specifications and Inputs

Fire behavior fuel model inputs were thoroughly quality controlled by assessing the RAWS weather data for accuracy and modifying the fire behavior fuel models to better reflect local conditions (Figure 5). Maps of fire behavior predictions include areas indicated as "unburnable / not modeled"—parking lots, roadways, bodies of water, and barren areas are considered unburnable; areas dominated by homes and buildings were classified as "not modeled" because fire behavior models do not include structures as a fuel type (Scott & Burgan, 2005)

Fire behavior models require estimates of fire weather conditions, and a common practice is to model fire behavior under hot, dry, and windy conditions for an area—not the average conditions, but extreme conditions. Wildfires that grow to large sizes, exhibit high-severity behavior, and overwhelm suppression capabilities tend to occur under extreme fire weather conditions (Williams, 2013).

To account for both average and extreme fire weather, potential wildfire behavior under 60th and 90th percentile fire weather conditions was modeled. 60th percentile weather condition are average fire weather conditions; during fire season, only 40% of days are more extreme than these conditions. Under 90th percentile weather conditions, only 10% of days in the fire season have more extreme fire weather. Weather parameters came from data collected at the Bailey

Remote Automatic Weather Station (RAWS) and fuel moisture conditions from FireFamilyPlus (Table 1).

Table 1. Fire weather conditions utilized for fire behavior modeling are based on weather observations from the Bailey Remote Automatic Weather Station between 2002 and 2020, fuel moisture predictions from FireFamilyPlus, and wind speeds and directions from the Hayman Fire presented for comparison.

Variable	60th percentile	90th percentile	Hayman Fire (for comparison)
Temperature	77° Fahrenheit	84° Fahrenheit	83° Fahrenheit
Relative humidity	21%	11%	8%
Wind Direction	90° East and 245° West-Southwest	90° East and 245° West-Southwest	194° South-Southwest
20-foot wind speed[1]	15 mph	19 mph	14 mph, gusting up to 44
Fuel moisture[2]	-	-	-
1-hour	4%	2%	1.6%
10-hour	5%	3%	2.5%
100-hour	9%	6%	6.5%
1000-hour[3]	11%	9%	10.8%
Live woody	80%	73%	84%
Live herbaceous	30%	30%	48%
Crown foliage	100%	80%	

Prevailing winds on days that experienced 60th and 90th percentile weather conditions were blowing in from approximately 245° West-Southwest, and sometimes from 90° East. Flame length, crown fire activity, and rate of spread were modeled based on 245° West-Southwest wind, and burn probability was modeled based on both wind directions.

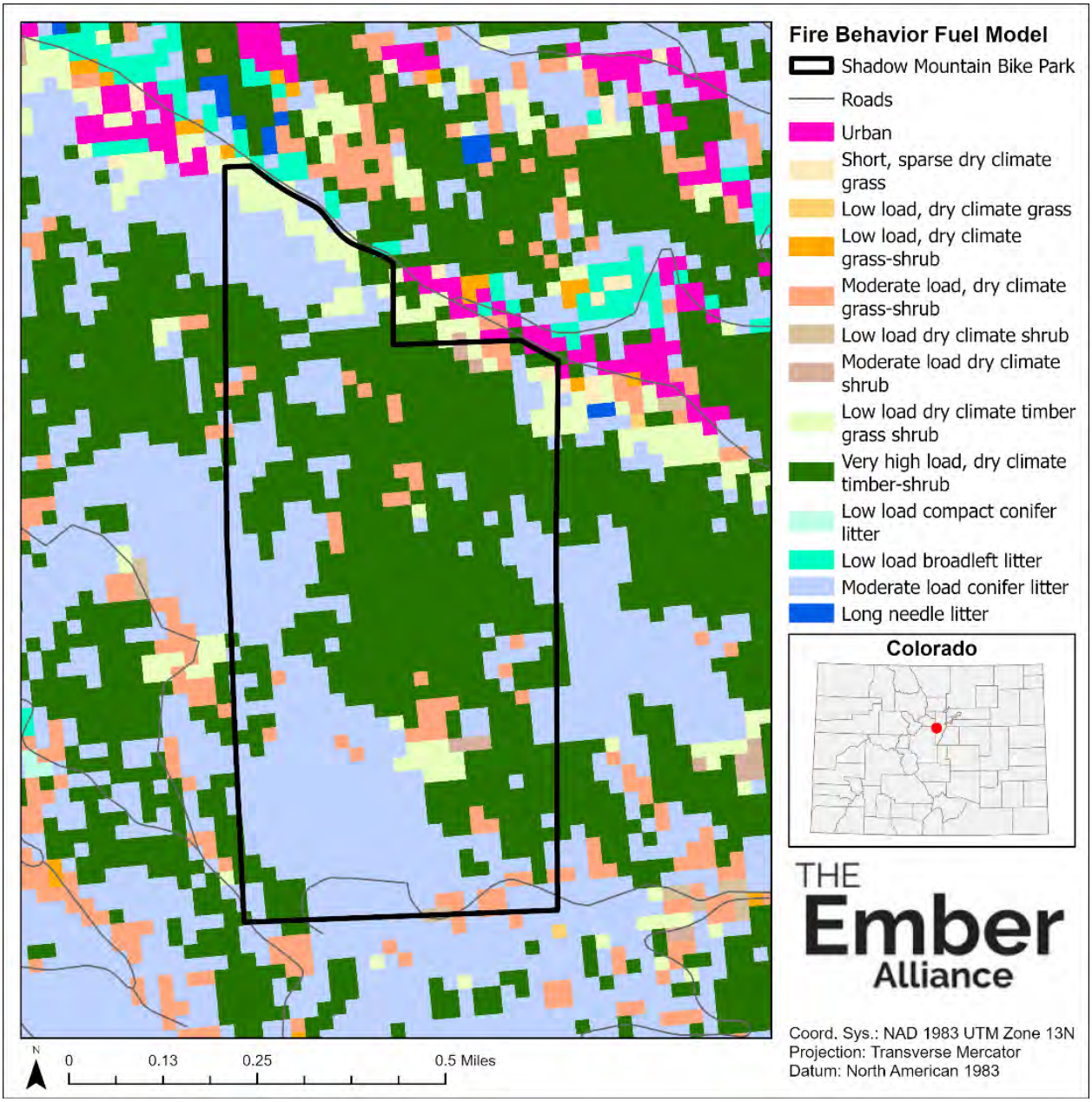

Figure 5. Fire behavior fuel model inputs used for Shadow Mountain Bike Park.

Flame Length

Flame length is the distance measured from the average flame tip to the middle of the flaming zone at the base of the fire and is an indicator of fireline intensity. Following breakpoints in the "haul chart" (a standardized chart for assessing firefighting tactics), areas in the parcel under both 60th and 90th percentile weather conditions are at risk of high flame lengths that present significant control issues (Figure 6). These areas correlate with the lodge and main bike trail locations.

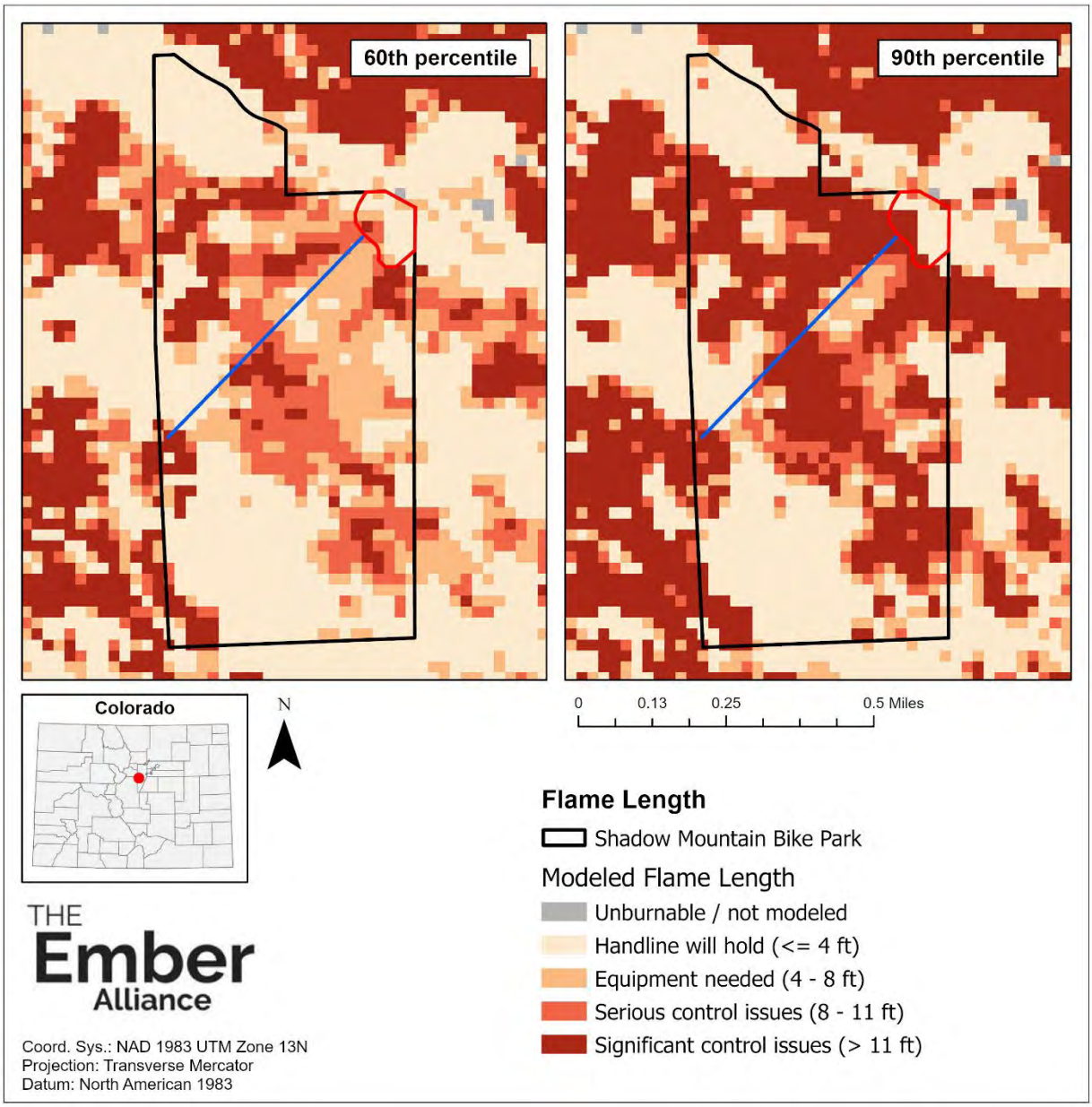

Figure 6. Flame lengths under 60th and 90th percentile weather conditions across the Shadow Mountain Bike Park.

Rate of Spread

Rate of spread describes the forward speed of a moving wildfire. It is a useful metric for assessing the challenges to control faced by firefighters. The SMBP parcel is not expected to experience high or extreme rates of spread, but nearby areas are. The area near the top of the chairlift could experience extreme fire rate of spread. (Figure 7).

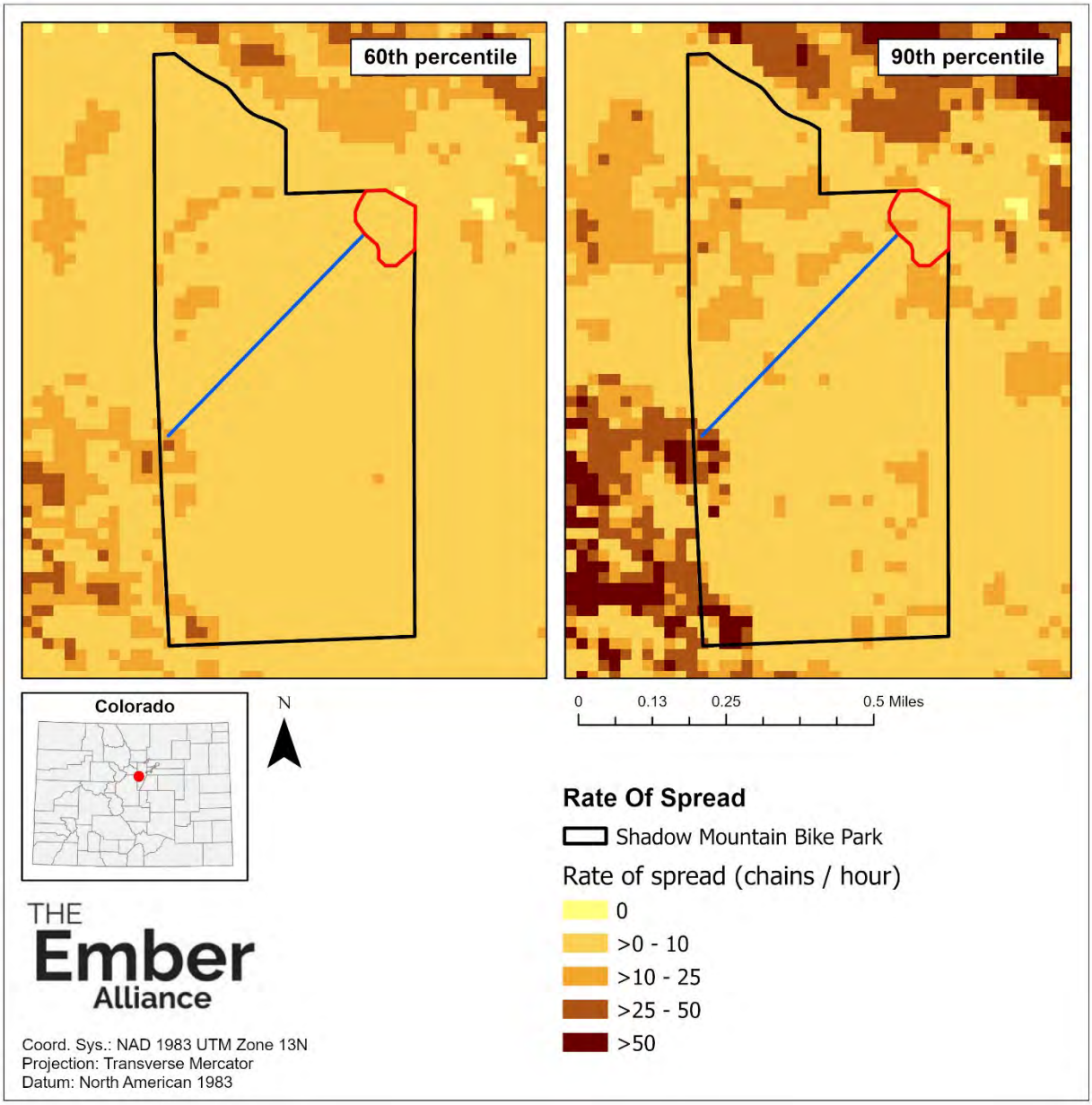

Figure 7. Rate of Spread under 60th and 90th percentile weather conditions across the Shadow Mountain Bike Park.

Crown Fire Activity

FlamMap models three types of fire activity: surface fires, passive crown fires, and active crown fires. Both passive and active crown fires pose a significant risk to the safety of firefighters and recreationalists and can destroy structures through radiant and convective heating and ember production. The parcel is likely to experience both surface fire and passive crown fire under both modeled weather conditions (Figure 8).

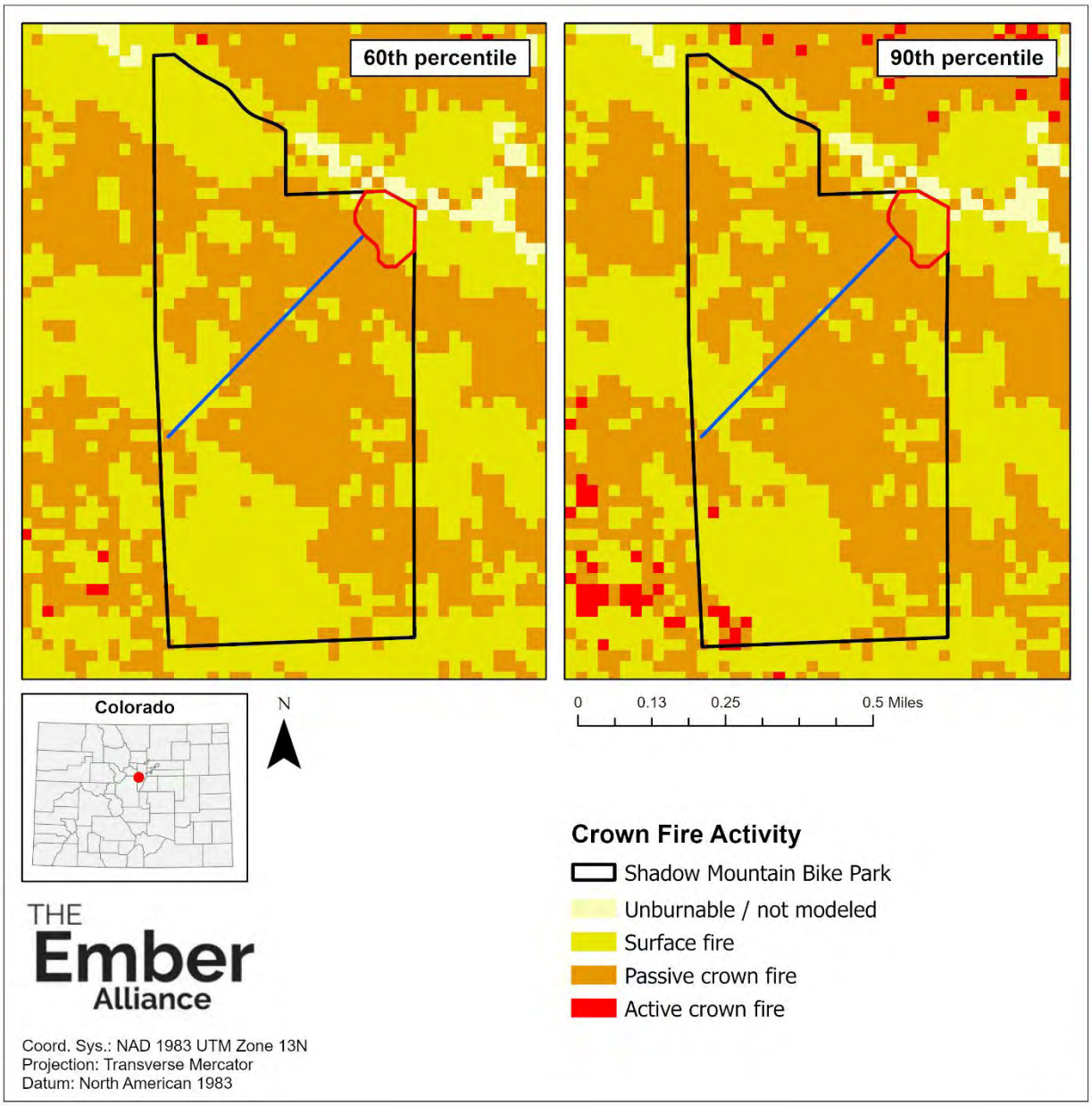

Figure 8. Crown fire activity under 60th and 90th percentile weather conditions across the Shadow Mountain Bike Park.

Burn Probability

FlamMap modelled approximately 500 randomly generated fires for each weather scenario and prevailing wind direction over an area 60 times larger than the parcel. Burn probability measures how many of those modeled fires burned over any point; pixels with higher burn probability had more simulated fires burn that area than pixels with lower burn probability. Burn probability is moderate to lower across the parcel, but it is important to remember that this is only relative to the surrounding area – Jefferson County is still one of the highest fire danger counties in the state (Figure 9).

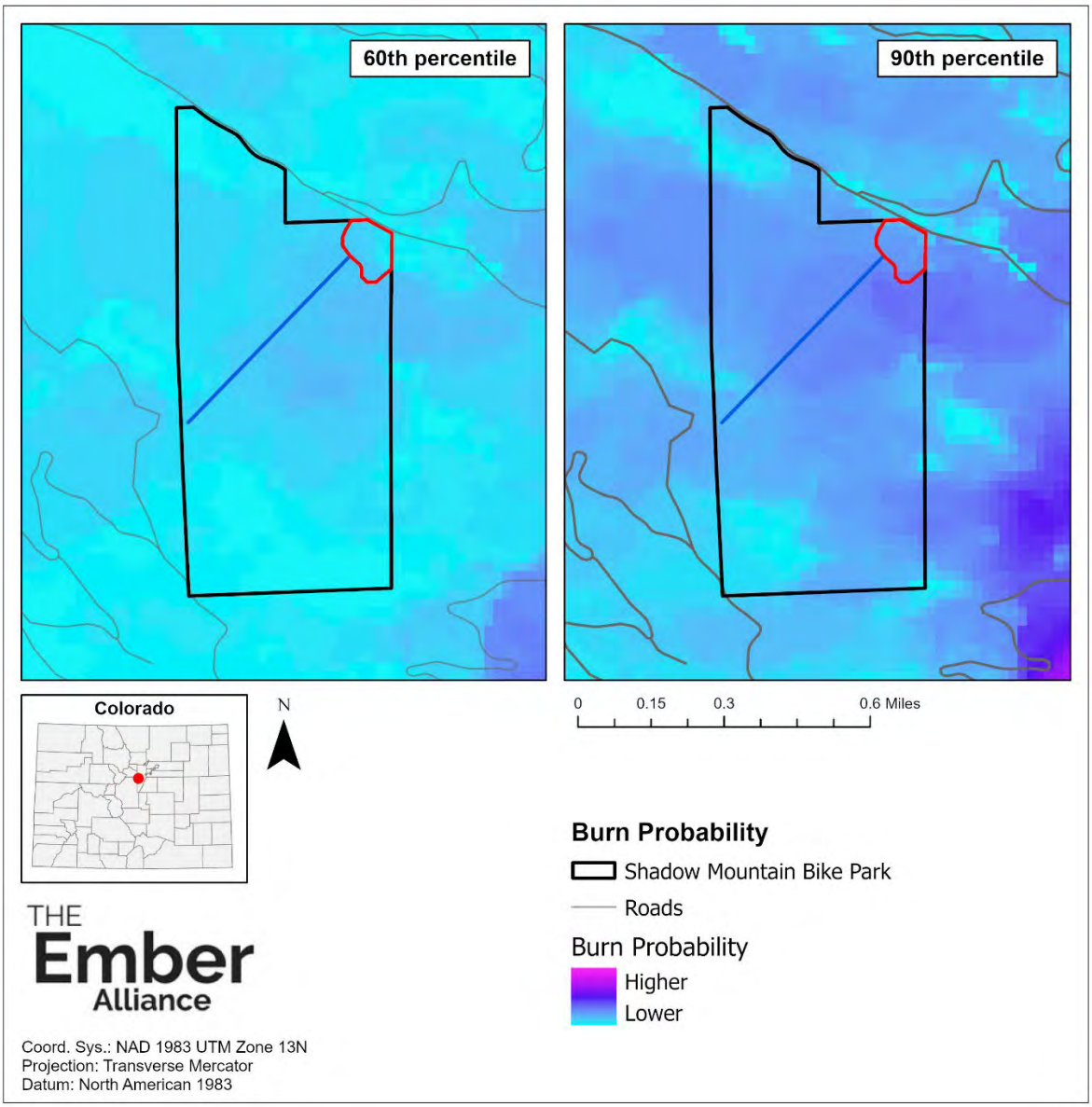

Figure 9. Conditional burn probability under 60th and 90th percentile weather conditions across the Shadow Mountain Bike Park.

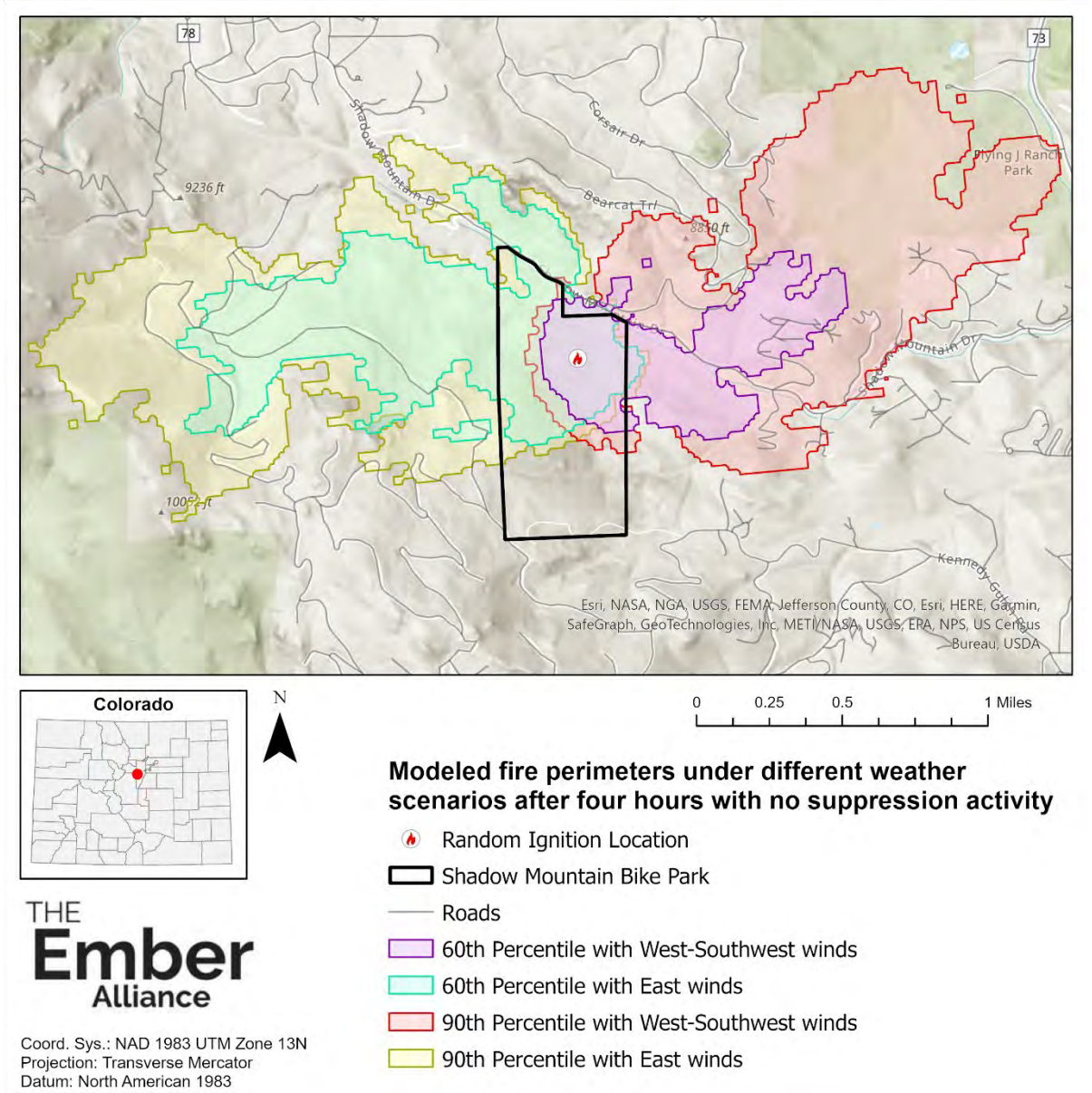

Figure 10. Simulated fire perimeters as they intersect with Shadow Mountain Bike Park. Each of these four fire perimeters was ignited at the same location and simulated under four different weather conditions for four hours without suppression action. This figure is intended only to illustrate the scale of a wildfire compared to the project area.

Wildfire Risk

Risk assessments involve quantifying the potential for loss (probability and intensity) as they relate to human life, health, property, and the environment, which are generally called “values” (Aven et al., 2018). Values used for this risk assessment were identified as the proposed future developments for the bike park and surrounding residential structures.

Roadway Survivability

Residents who get stranded on roadways during evacuation can perish without a safe route out, as seen in the 2018 Camp Fire. Modeled flame lengths are overlayed on roadways to see where along roadways flame lengths could exceed 8 feet, which is considered potentially non-survivable conditions according to the firefighting haul chart. While there are no roads within the parcel currently, there are areas of Shadow Mountain Drive between the parcel and Highway 285, the main evacuation route, that are potentially non-survivable under average 60th-percentile weather conditions.

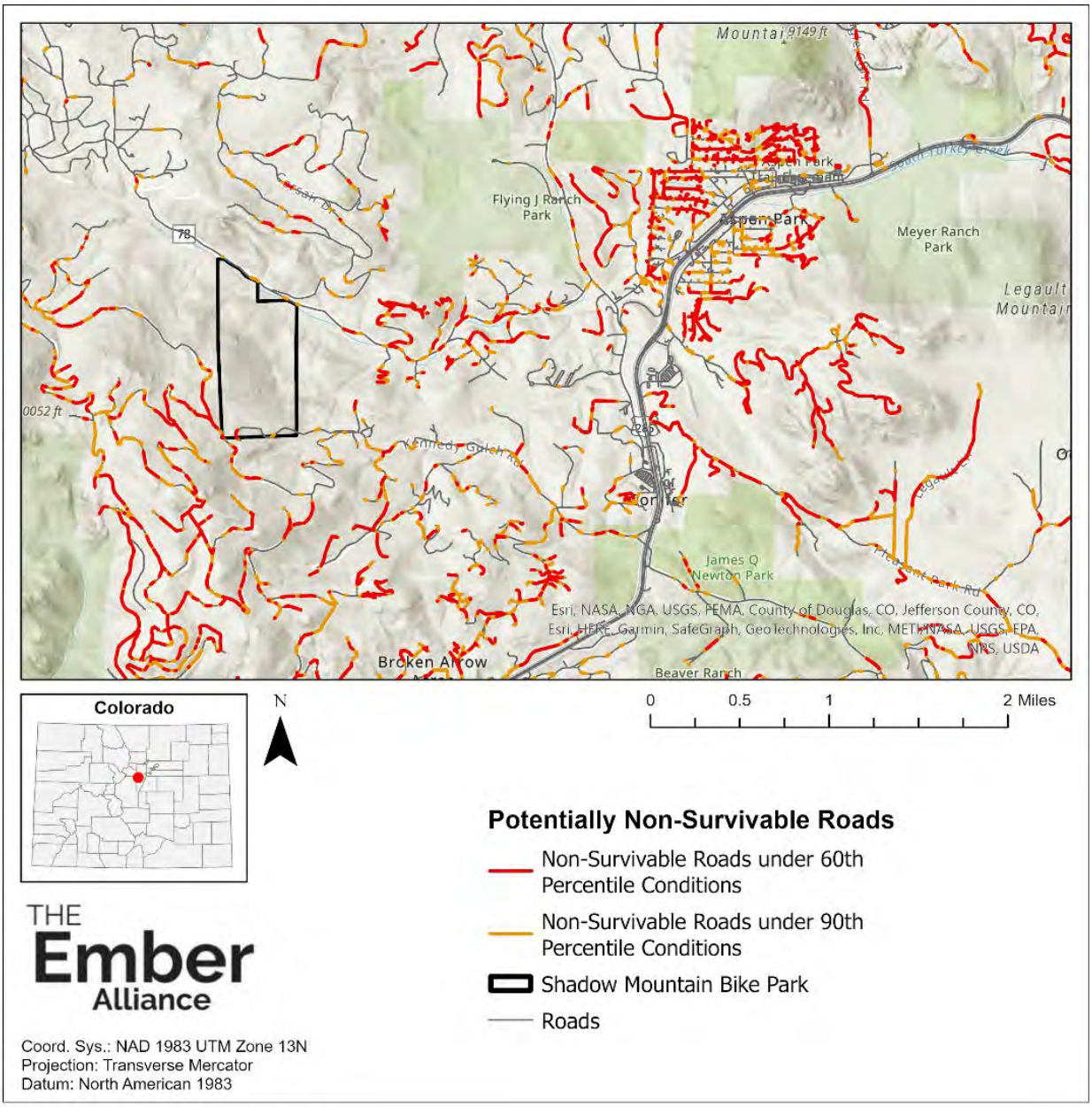

Figure 11. Non-survivable roadways near the Shadow Mountain Bike Park.

Evacuations

Evacuation concerns weigh heavily on the minds of many residents and emergency managers in densely populated, wildfire-prone communities. Considering potential impacts of the SMBP on traffic is vital to planning and preparing for wildfire emergencies.

Evacuation time and roadway congestion were modeled for the area around SMBP using ArcCASPER (Shahabi and Wilson, 2014). The ArcCASPER model considers roadway capacity, road speed, number of cars evacuating per address, and the relationship between roadway congestion and reduction in travel speed. The purpose of the model is to minimize the time it takes to evacuate every single evacuee in the simulation, not to minimize the evacuation time for each individual evacuee.

Estimates from ArcCASPER are useful for determining relative evacuation capacity and congestion and are not intended to predict location-specific evacuation times or depict what will occur during a specific evacuation event. ArcCASPER does not account for unpredictable events, such as roadway blockage from accidents or reduced visibility from smoke. It also does not consider emergency vehicles traveling the opposite direction of evacuation traffic.

Estimates of evacuation times assume that all addresses are occupied, and a mandatory evacuation time is issued for everyone simultaneously. Estimates were produced for current conditions in the area without SMBP and for a scenario adding 320 cars from the SMBP parking lot, which is the anticipated parking capacity of 300 visitor cars and 20 employee cars. Evacuation scenarios were run until all evacuees passed a location on east-bound Highway 285 based on the assumption that conditions would be survivable for evacuees stuck in traffic on the highway during a wildfire (Figure 11). Specifications and locations used for evacuation modeling for SMBP are provided in Table 2 and Figure 12.

There is a high likelihood of evacuation congestion and long evacuation times during a wildfire in the area around the proposed SMBP. The time to evacuate all residents along Shadow Mountain Drive and in Aspen Park to east-bound Highway 285 could take about 2.5 hours under current conditions. The addition of 320 vehicles from the SMBP could increase the time required to evacuate all residents in this area to about 2.75 hours. The impact of additional traffic from the SMBP would be experienced primarily by residents around and north of the SMBP parking lot on Shadow Mountain Drive. Additional traffic from the SMBP could also increase evacuation times for residents south of the SMBP parking lot on Shadow Mountain Drive, although to a lesser degree due to their proximity to Highway 285 (Figure 13).

The addition of the SMBP would increase the percentage of road miles that could experience severe evacuation congestion from 2% to 6%. However, evacuation congestion could be substantial regardless of the addition of the SMBP. Travel times along southern portions of

Shadow Mountain Drive, County Road 73, Barkley, and Highway 285 could take 5-8 times longer under evacuation traffic even without additional traffic from the bike park. With the addition of traffic from the bike park, travel times could take over 9 times longer along portions of County Road 73 and Highway 285 than without evacuation traffic. The potential for evacuation congestion is great in this area due to high home density and a road network that funnels into two onramps onto Highway 285 (Figure 14).

Table 2. Parameters and specifications used to model evacuation times and congestion with ArcCASPER.

Modeling Parameter	Condition Used for Scenarios
ArcCASPER traffic model	Exponential model with a critical density of 10 and saturation density of 100
Scenario end point	East-bound location on Highway 285
Time required for evacuees to gather their belongings, reach their vehicle, and depart	30 minutes (based on research from Beloglazov et al., 2016)
Number of vehicles / evacuee location	2 vehicles / residential address 10 vehicles / business or commercial address 320 vehicles / SMBP parking lot
Total number of evacuating vehicles	2,369 vehicles along Shadow Mountain and in Aspen Park + 320 vehicles from SMBP

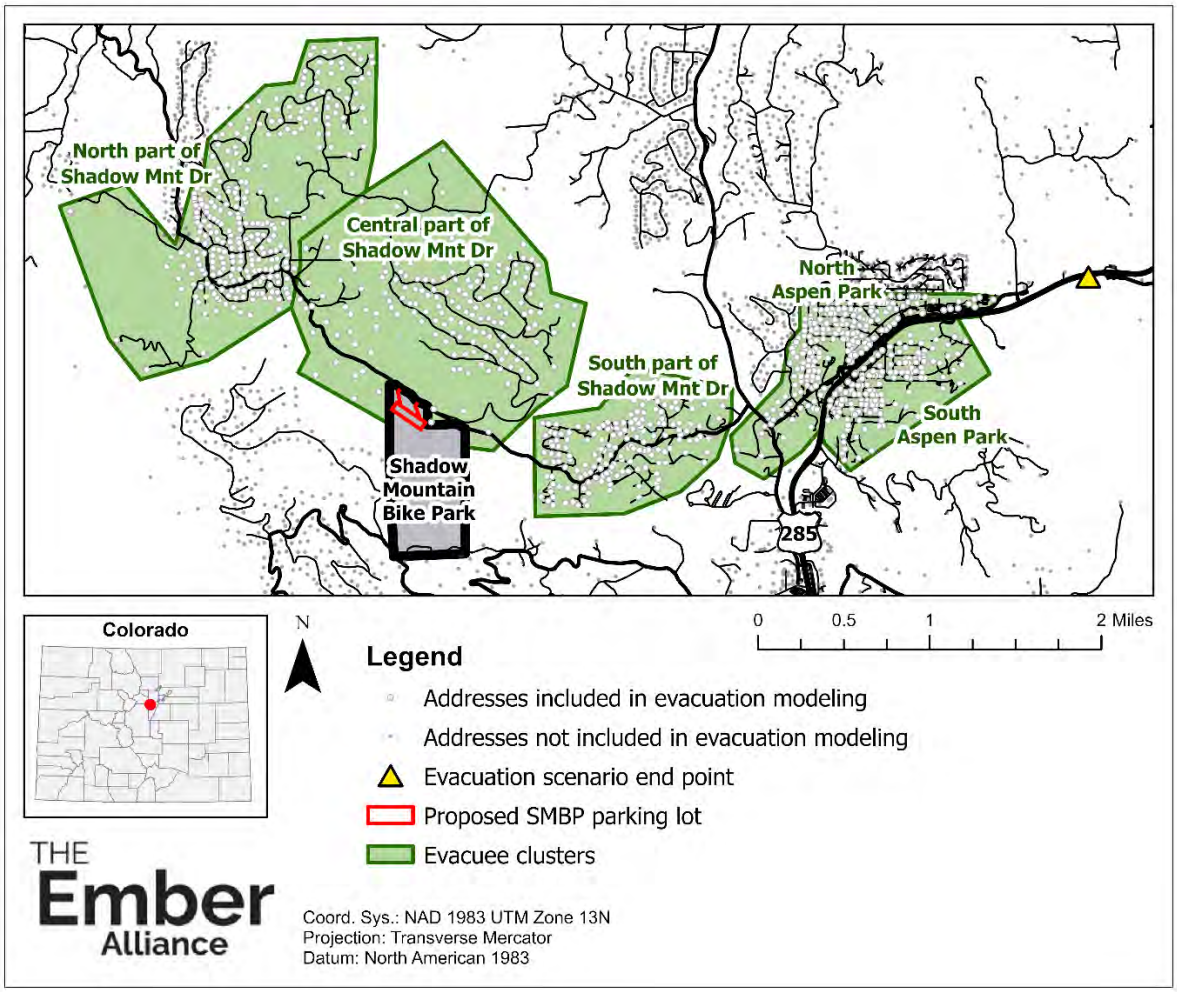

Figure 12. Locations of addresses included in evacuation modeling and the scenario end point for assessing the potential impact of additional traffic from the proposed SMBP

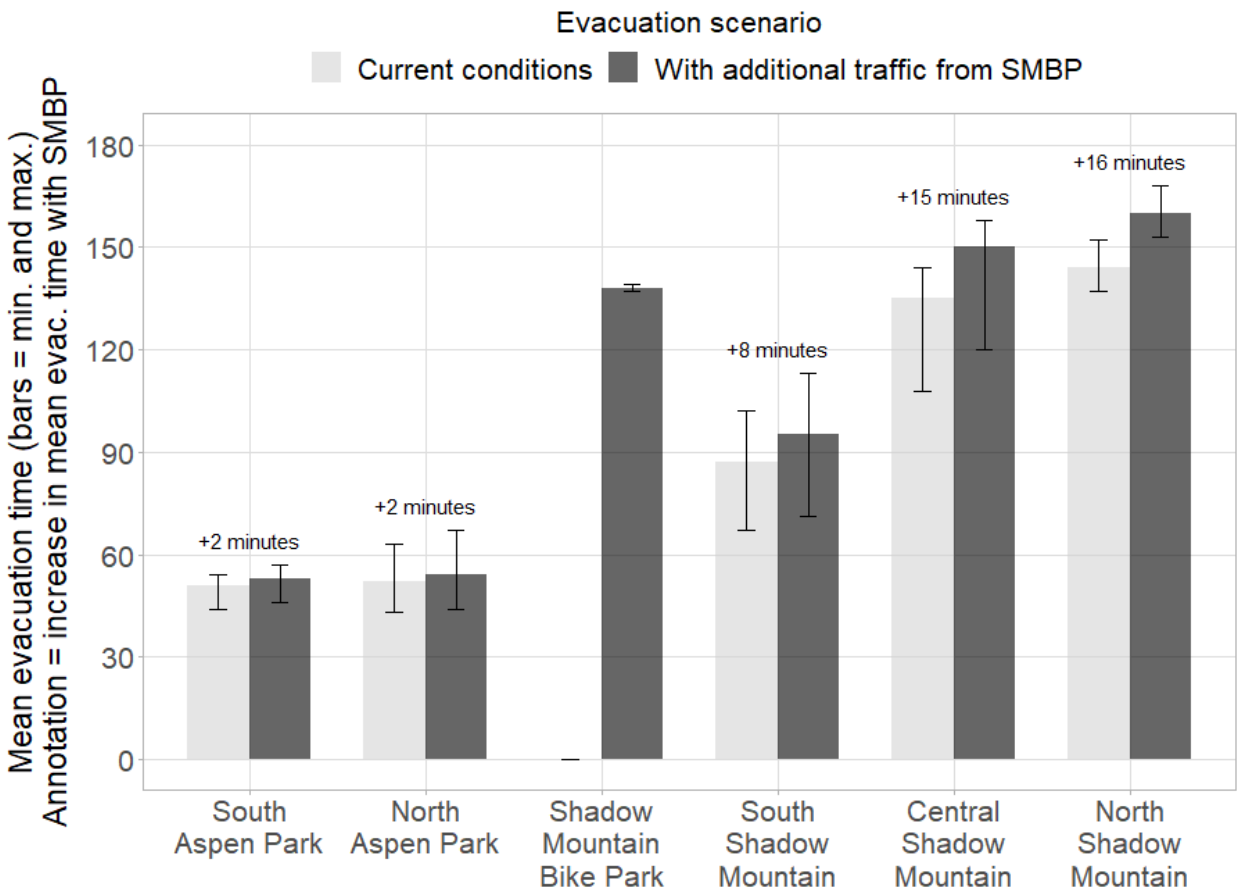

Figure 13. Distribution of potential evacuation times for residents along Shadow Mountain Drive and in Aspen Park under current conditions and with additional traffic from the proposed SMBP. The evacuation scenarios assume that all addresses are occupied, and a mandatory evacuation time is issued for all addresses indicated in Figure 12 simultaneously. See Figure 12 for the boundaries of evacuation clusters.

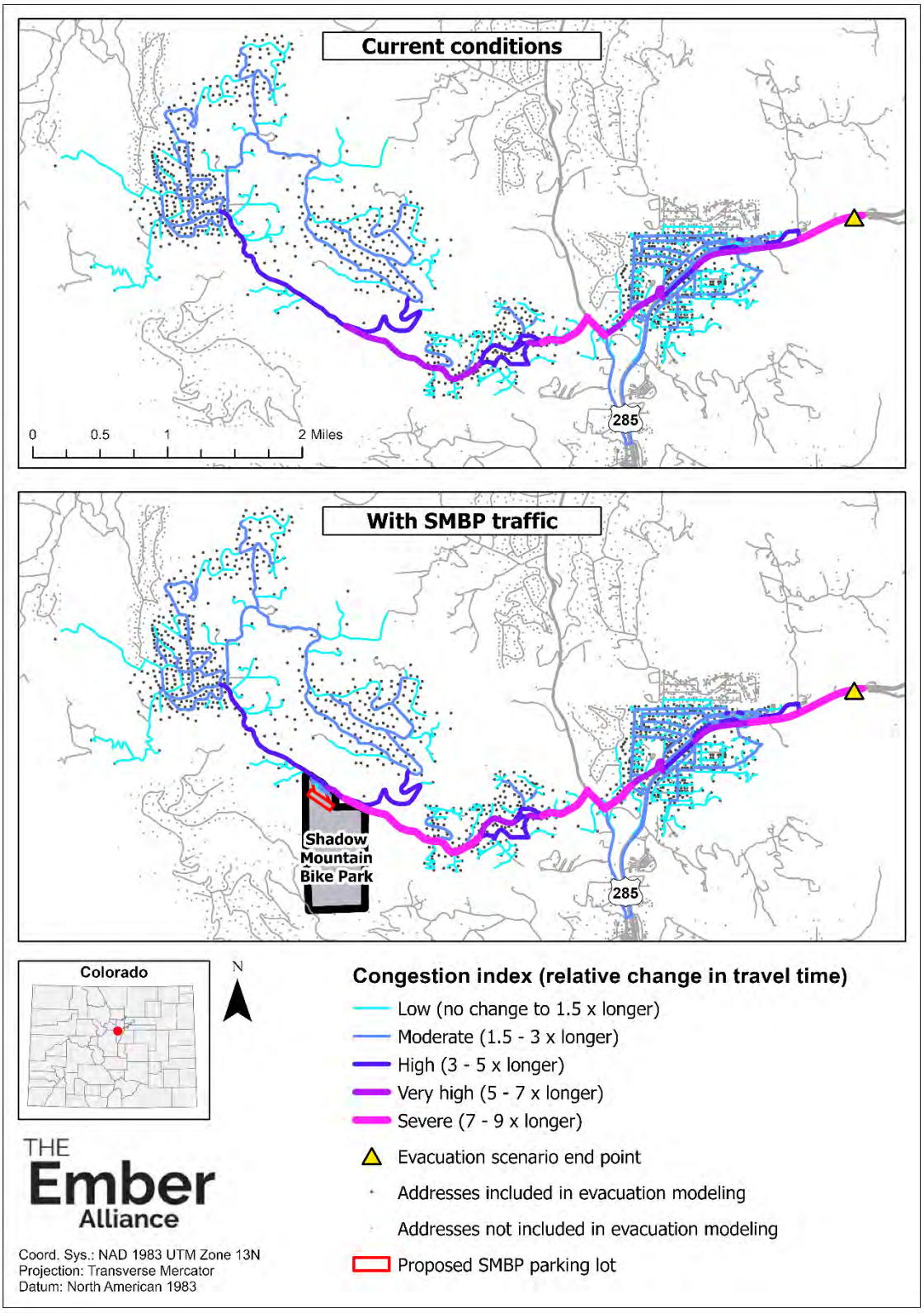

Figure 14. Potential evacuation congestion measured as the relative increase in time to traverse sections of roads with evacuation congestion vs without congestion under current conditions and with additional traffic from the proposed SMBP.

Temporary Area of Refuge

Temporary areas of refuge, also called shelter-in-place locations or safety zones, are locations that a person could survive a fire without a fire shelter. For significant numbers of people, such as the predicted 1000 users at SMBP on the busiest summer weekends, safe locations should be accessible by car and have no burnable fuels nearby. Under extreme weather conditions, the safe separation distance would need to be up to 2350 ft away from the parking lot, which is approximately the distance to the top of the lift line (Campbell et al., 2022).

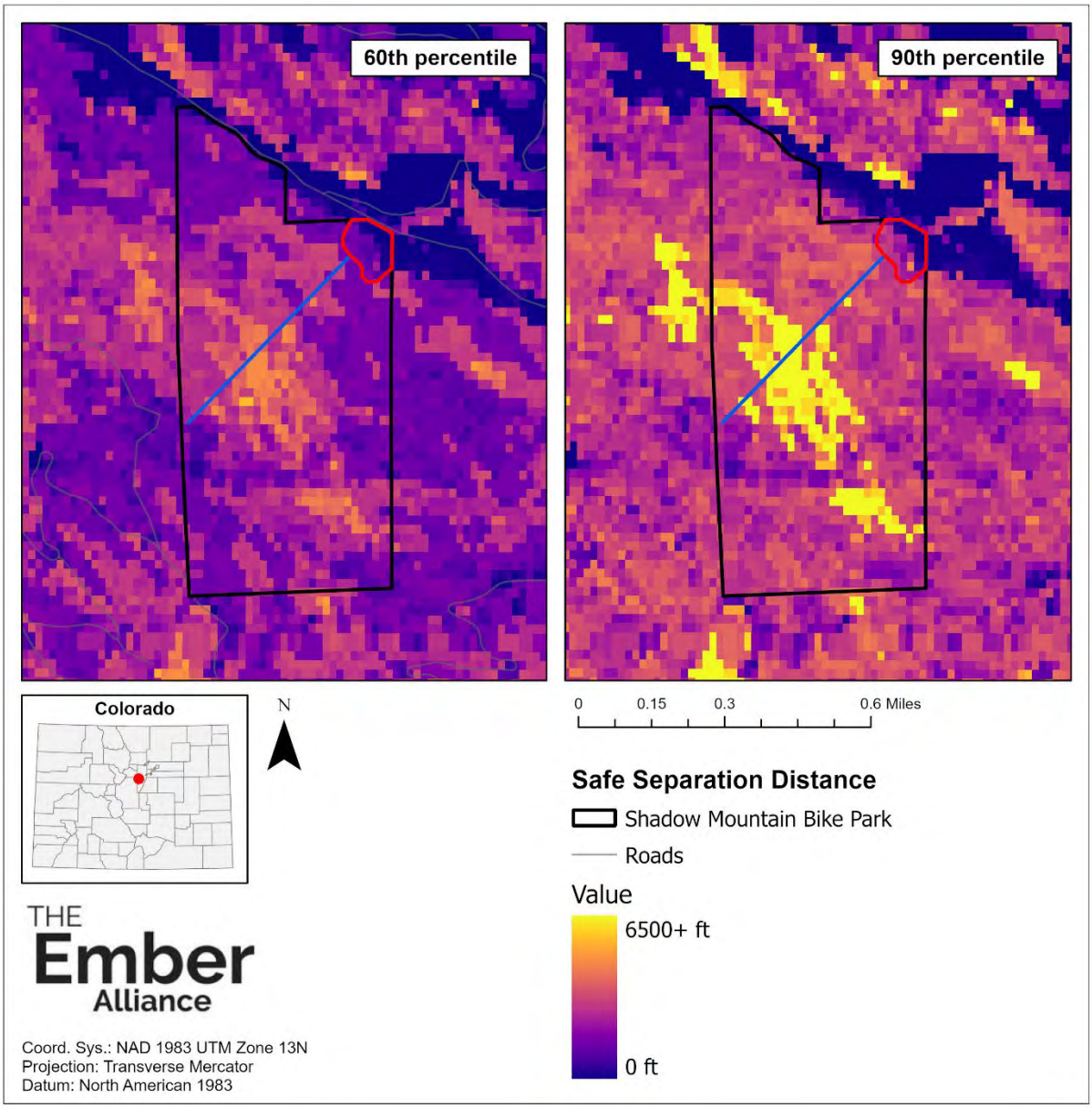

Figure 15. Safe Separation Distance analysis for Shadow Mountain Bike Park. The average safe separation distance for the parking lot area is 1100 ft, or 1/5th of a mile.

Site Visit

Staff at The Ember Alliance completed a site visit on July 12, 2022. A wildfire planning and operations specialist and wildland firefighter walked the property assessing data accuracy, potential fire behavior, and treatment options. They found significant ladder fuel loading and high canopy densities consistent with a history of fire exclusion in the past 150 years.

Important findings from the site visit include juniper as a highly flammable ladder fuel, dense tree stands throughout, and thick vegetation in proposed development areas.

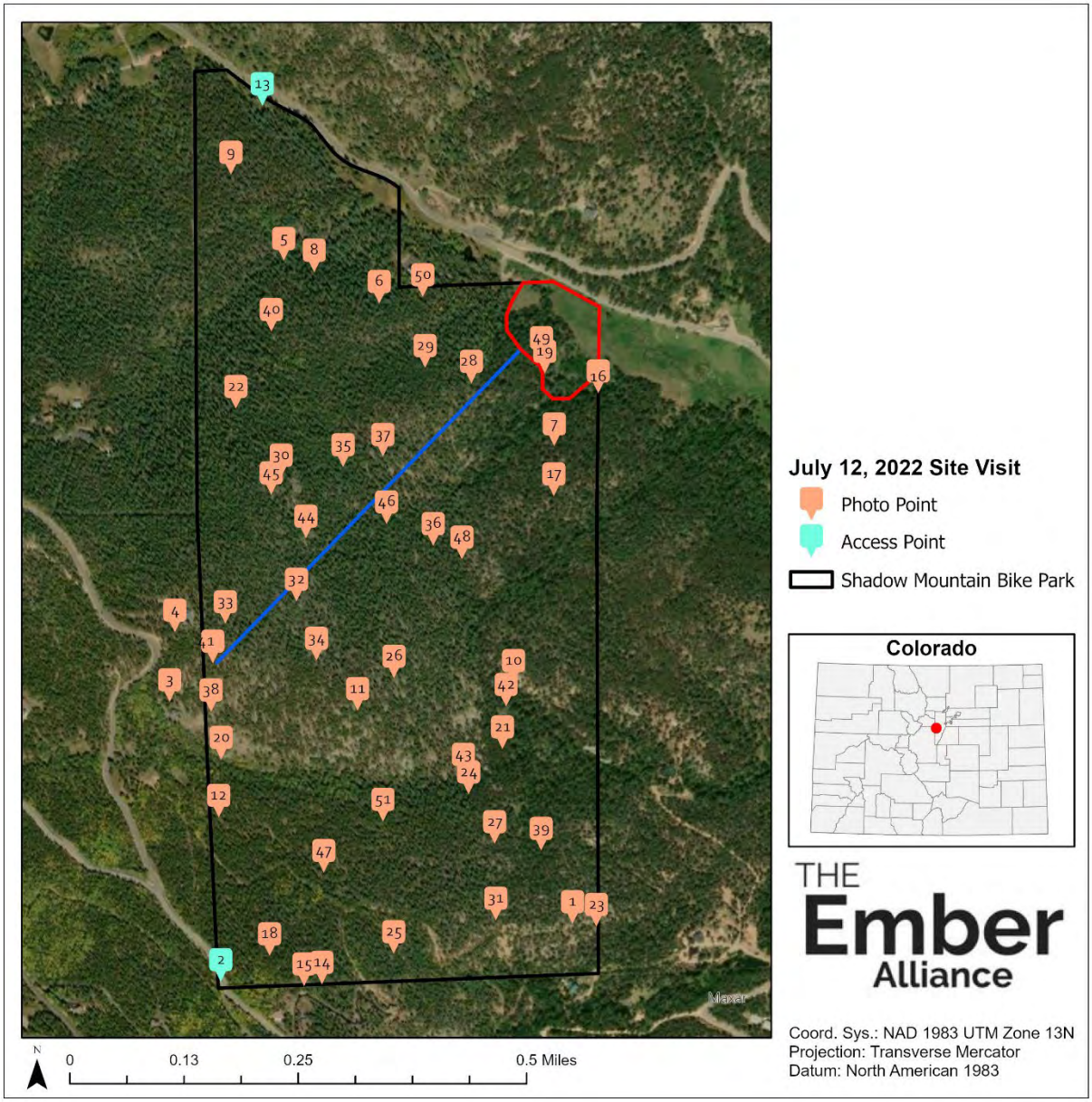

Figure 16. Site visit photos and noted locations.

Risk Assessment

Risk assessment analysis followed methods modified from wildfire risk assessment techniques widely adopted by federal land management agencies (Scott et al., 2013). Proposed structures and trail areas (Figure 2) were overlayed with the modeled flame lengths and crown fire activity (intensity of impact) and normalized burn probability (probability of impact) as simulated at 60th and 90th percentile weather conditions. All fire impacts on structures and locations where people would interact on the landscape were considered negatively impactful, with increasing intensity and probability considered increasingly negative.

This does not imply that fire itself is a negative process, just that wildfire impacting lives and structures on the property is a negative outcome for the client. Fire has been part of this landscape for thousands of years and is a natural and necessary process within the landscape of the bike park, and fire mitigation actions can help residents and businesses mitigate the impact of this process on their lives and livelihoods.

Values at risk on the property were identified as the proposed lodge, lift line, parking lot, and trail system (Figure 2). There are also 675 structures (mostly residential) within one mile of the SMBP boundary (Figure 4). The nearest structure to the lodge site is a private residence that is approximately 150 feet away, and the nearest structures to the top of the lift line are residences that are approximately 400-475 feet away.

The lodge, lift line, trails, and parking lot were at low to moderate relative burn probability, however they are predicted to experience high to extreme flame lengths and passive crown fire activity (Figure 6, Figure 8, Figure 9).

Evacuation times for SMBP visitors are expected to take over two and a half hours if there are 320 vehicles evacuating the parking lot. Congestion to the east of the park on Shadow Mountain Drive and the connecting roads to Highway 285 overlaps with roadways that are potentially non-survivable, leading to conditions that are dangerous for the life safety of residents, visitors, and first responders - especially on Red Flag Warning days.

Recommendations

Recommendations in this section are based on fire behavior models, evacuation models, results from the site visit, and collaborative input from TEA staff with extensive backgrounds in fire behavior analysis, fire suppression, and community wildfire preparedness. The changing climate, increasing size and intensity of wildfires, and increased recreation pressure along the Front Range were considered during decision making and prioritization.

During the site visit, we found lots of juniper trees and bushes, which are a very flammable fuel and a ladder fuel, bringing surface fire up to the tree canopy easily. We recommend removal of all junipers within the basecamp and mountain top units, and selective removal of juniper in the central trails unit where it poses a threat as a ladder fuel.

There were areas of dense vegetation, closed canopies, and significant ladder fuels on the site. These conditions are likely diverged from historical conditions in this area due to fire suppression and logging activities during the past 150 years. This condition is not unusual for the area; however, it is increasingly common along the Colorado Front Range to implement fire risk mitigation through forest restoration. The Ember Alliance believes that returning most of the area to historical conditions and mimicking natural disturbance is an appropriate treatment for most of this property.

Stand Mitigation

Stand mitigation is broken out into four categories for four different treatment recommendations (Figure 15). Recommendations for each unit are based on vegetation, topography, predicted fire behavior, values at risk, and treatment feasibility. Treatments are consistent with current best practices for ponderosa and dry mixed conifer (Addington et al., 2018), lodgepole pine (Dennis et al., 2009), and the wildland-urban interface (CSFS, 2021).

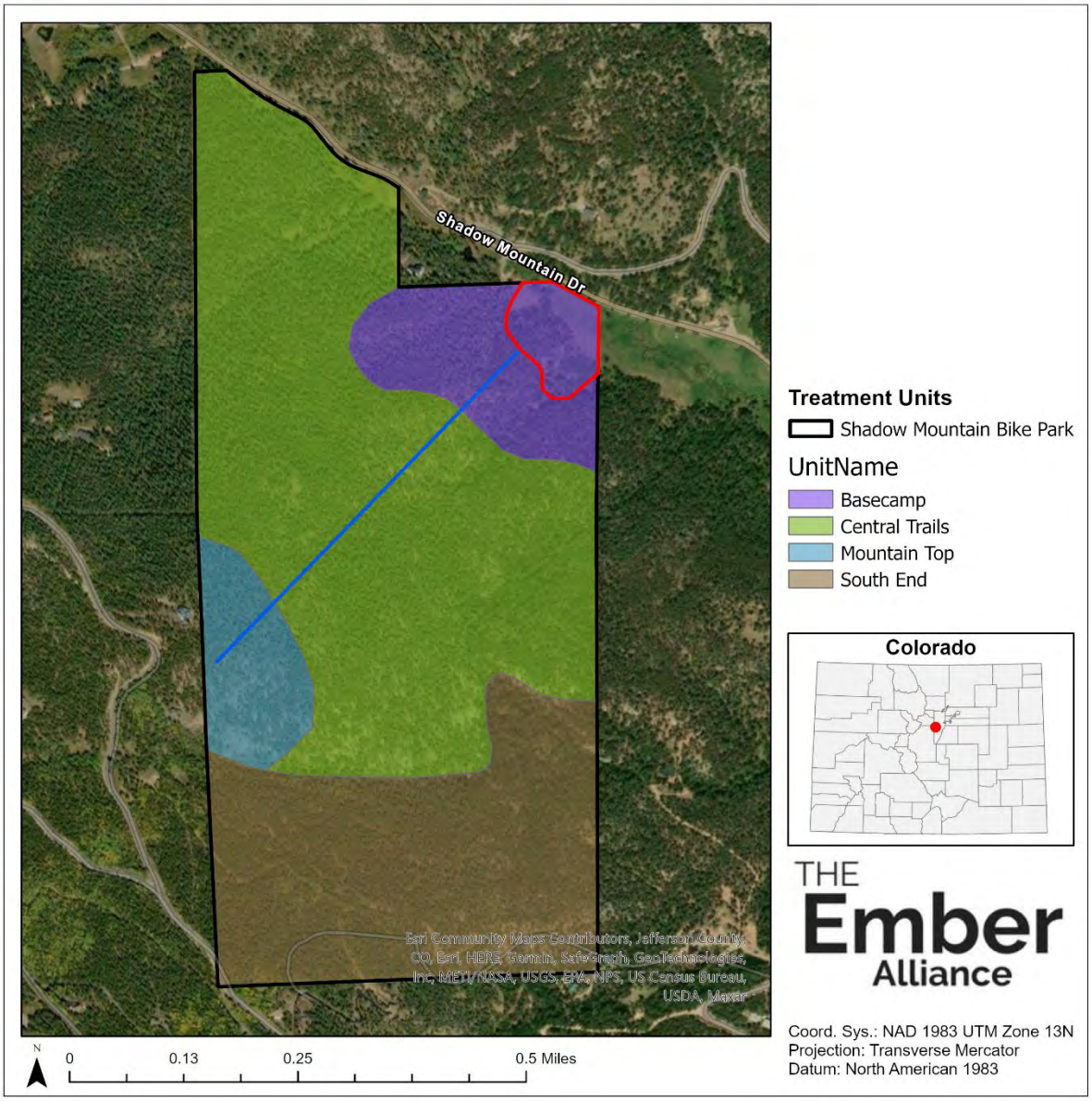

Figure 17. Treatment units across the Shadow Mountain Bike Park.

Basecamp

The basecamp area is the location where people will be most concentrated and is the only potential temporary area of refuge on site, therefore the recommendations made are the most aggressive on the property and the highest priority. The goal for the basecamp area is structure defense and ignition prevention, and a temporary area of refuge in the event of fire where evacuation is not an option.

First, we recommend using only ignition-resistant materials and designs for the lodge and lift structures, including Class A roofing, ignition-resistant siding, and building design that is fully compatible with the Colorado State Forest Service Home Ignition Zone guides. We recommend

that the defensible space around the lodge and other structures meet the minimum standards laid out in the guide and that they are expanded to increase the defensible area around the lodge.

Second is clearing as much area around the parking lot as possible. See **Temporary Areas of Refuge** below for specifications on this.

Third is vegetation maintenance. All conifer trees should be removed from the area, and all shrubs, dead and down wood, and tall grass should be removed. Large aspen trees are fire-resistant and the species is very resilient to fire. It can act as a natural fuel break and assist in reducing the severity of fire spreading in the area (USFS 2022). It is present near the drainages and creeks on the property, including along North Turkey Creek. These should be kept, protected, and encouraged. Aspen growing near the creek can create a privacy and noise barrier between the road and the property while maintaining some vegetation within this zone. They also protect the health of the stream by creating wildlife habitat and stabilizing the soil. Gambel oak and juniper may be present on the site and should not be retained; they are extremely flammable vegetation.

The basecamp area is also closest in proximity to the road and residential buildings. Clearing trees in this area should be preceded by connecting with neighbors. Considerations for privacy between the lodge and residences nearby should be made but should not include wood fencing or trees other than aspen. The closest structures are approximately 750 feet apart in the current designs, meaning that the structures do not have overlapping defensible space zones, however they are capable of exposing each other to short-range embers. Vegetation, wooden fencing or furniture, and decking between the structures increases the risk of ignition for both structures. Ignition of one building will significantly increase the likelihood of ignition of another, so reducing the likelihood of ignition on the lodge and other structures is important in protecting all neighboring structures.

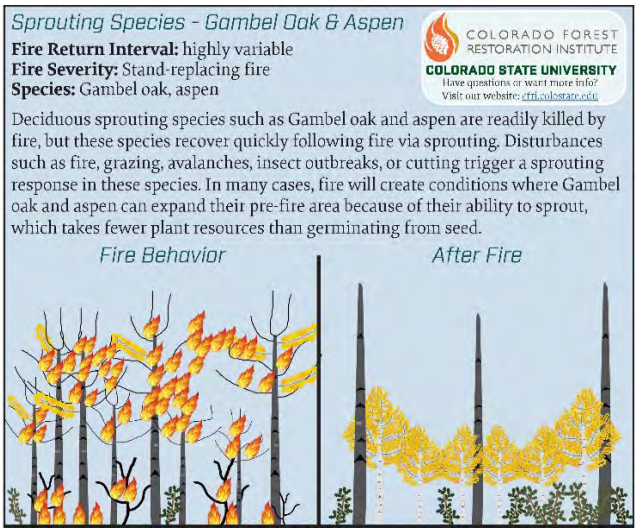

Figure 18. The desired ecological outcome for the basecamp unit is aspen stands with short montane grasslands (CFRI 2021).

Mountain Top

The mountain top area is the highest point on the property and the location of the top of the lift line. Similar to the basecamp, it will be a gathering location for park users and is close to two other residential structures (400-475 feet away), making it the second highest priority. Clearing around the lift top is recommended, with certain trees retained for habitat.

Clearing most trees at the top of the lift line in the Mountain Top unit will enable recreationalists to see views around the valley more clearly, enhancing their experience. It will also increase visibility of any nearby smoke to lift operators or recreationalists, who can then take action to protect visitors. Third, it can slow the spread of fire as it reaches the top of the hill, offering a small amount of protection for the top of the lift line and to the homes closest by.

Trees can be retained when spaced a minimum of 30 ft apart, or more if on a slope. Any trees retained should be in good health and should tend to preserve the older and larger trees; prioritize fir, spruce, pine and hardwood species and remove lodgepole pine, Gambel oak, and juniper. Small clumps of trees can be retained with the same spacing guidelines between clumps. Any aspen in this area can be retained and encouraged as natural fuel breaks (USFS 2022). Privacy concerns between the lift top and nearby homes are similar to those noted in the base camp area, but at an anticipated 400 feet apart, they do not share overlapping HIZs and can have vegetation between them that is healthy and does not contain ladder fuels. All junipers should be removed from this area.

Figure 19. The desired ecological outcome for the mountain top unit is high-elevation open woodland. Lodgepole pine, Gambel oak, and juniper should be cleared from the area. Aspen should be encouraged, and lone conifer trees or well-spaces clumps of conifers can be maintained (CFRI 2021).

Central Trails

This area makes up the bulk of fire risk on the property. The unit covers most of the area with high flame lengths, crown fire activity, and the highest burn probability within the parcel. It does not contain structures except lift line poles but will still have many bikers on summer days. This unit is the third priority location.

We recommend thinning and removal of ladder fuels across this unit. This is a mixed conifer stand with a frequent to semi-frequent irregular fire interval and should be maintained as such. Some areas within this stand have open canopies, especially on aspects that face south, and they can be maintained. The rest of the area should have more variety in canopy density and should be thinned to foster a variety of tree species, ages, and densities.

Treat the lift line like a power line right-of-way with regular clearing of the vegetation under and around the poles and lines.

Figure 20. The desired ecological outcome for the central trails unit is restoration of historical mixed conifer stands, meaning a healthy mix of tree species favoring larger, older healthy trees and very few ladder fuels (CFRI 2021).

South End

The south end will see the fewest number of people on it regularly. It is a northeast facing slope dense with lodgepole pine and aspen stands. Lodgepole pine restoration requires patch cuts, rather than thinning, to mimic its historical fire regime. This unit is the fourth priority area in the park.

We recommend patch cuts through this unit and encouraging aspen with exclosures after the treatment. Exclosures are fenced areas around aspen stands that exclude browsing animals such as deer, elk, and moose from eating the young aspen and allows them to grow without excessive disturbance.

Figure 21. The desired ecological outcome for the south end unit is restoration of historical lodgepole pine stand and mimicking their natural fire regime. This includes patch cuts at varying sizes and intervals and encouraging aspen stands as an early successional species (CFRI 2021).

Evacuations

We recommend the following steps for the SMBP to increase the likelihood of a safe and efficient evacuation in the case of fire or other emergencies:

- Develop an evacuation plan in coordination with the Jefferson County Sheriff's Office. This plan should include methods for directing traffic and set evacuation routes.
- Conduct tree removal, cut low limbs, and mow grass along roadways to increase the likelihood of survivable conditions during a wildfire. Prioritize the roads with the most traffic and congestion and work out to the less congested roads. (See **Roadway Mitigation** below).
- Share information about the Jefferson County warning system (Lookout Alert) at all parking lot exists and on all visitor information. Post a QR code to make it easy for visitors to sign up for Lookout Alert notifications.
- Share information about evacuation etiquette with visitors (i.e., follow directions of law enforcement personnel, drive safely, allow other vehicles to merge, do not stop and take pictures).

Lookout Alert is the official emergency alert system (aka, reverse 911) used by JeffCom to contact residents during emergencies, including during wildfire evacuations. Residents should register their cell phones and email addresses with Lookout Alert. Learn more about Lookout Alert and emergency notifications from the Jefferson County Sheriff's Office.

Lookout Alert
EMERGENCY NOTIFICATIONS

- Consider installing warning sirens that indicate when visitors need to go directly to the basecamp and leave the park. Research suggests that individuals trust and are more likely to respond to sirens than other warning systems like social media (NASEM, 2018).
- Ensure warnings and alerts can be understood by all residents, including those with English as a second language and with hearing impairments.
- Shut down the park when wildfires are nearby area. Do not operate lifts or permit recreation when anywhere along Shadow Mountain Drive is under mandatory or voluntary evacuation orders. All visitors should leave promptly when they receive an evacuation order.

Roadway Mitigation

It is important to reduce fuels along roadways where evacuation could progress slowly due to congestion. Clearing vegetation along roads can also increase access for fire engines and create safer egress for firefighters. We prioritized treatments along roadway corridors based on predicted roadway survivability under 60th and 90th percentile fire weather conditions and potential evacuation congestion.

Collaborative roadway mitigation is recommended along Shadow Mountain Drive both east and west of the parcel, and along roadways that connect Shadow Mountain Drive to Highway 285. Residents and visitors all along Shadow Mountain Drive could have significantly increased traffic between them and a safe location, and mitigating risk on that road will improve life safety.

We recommend clearing trees and ladder fuels 100 feet back on each side of the road and mowing tall grasses 12 feet back. This creates a fuel break to shield cars along the roadways from direct flame contact. This mitigation needs to be kept up with semi-frequent maintenance of tree and ladder fuels and regular mowing of tall grasses during fire seasons.

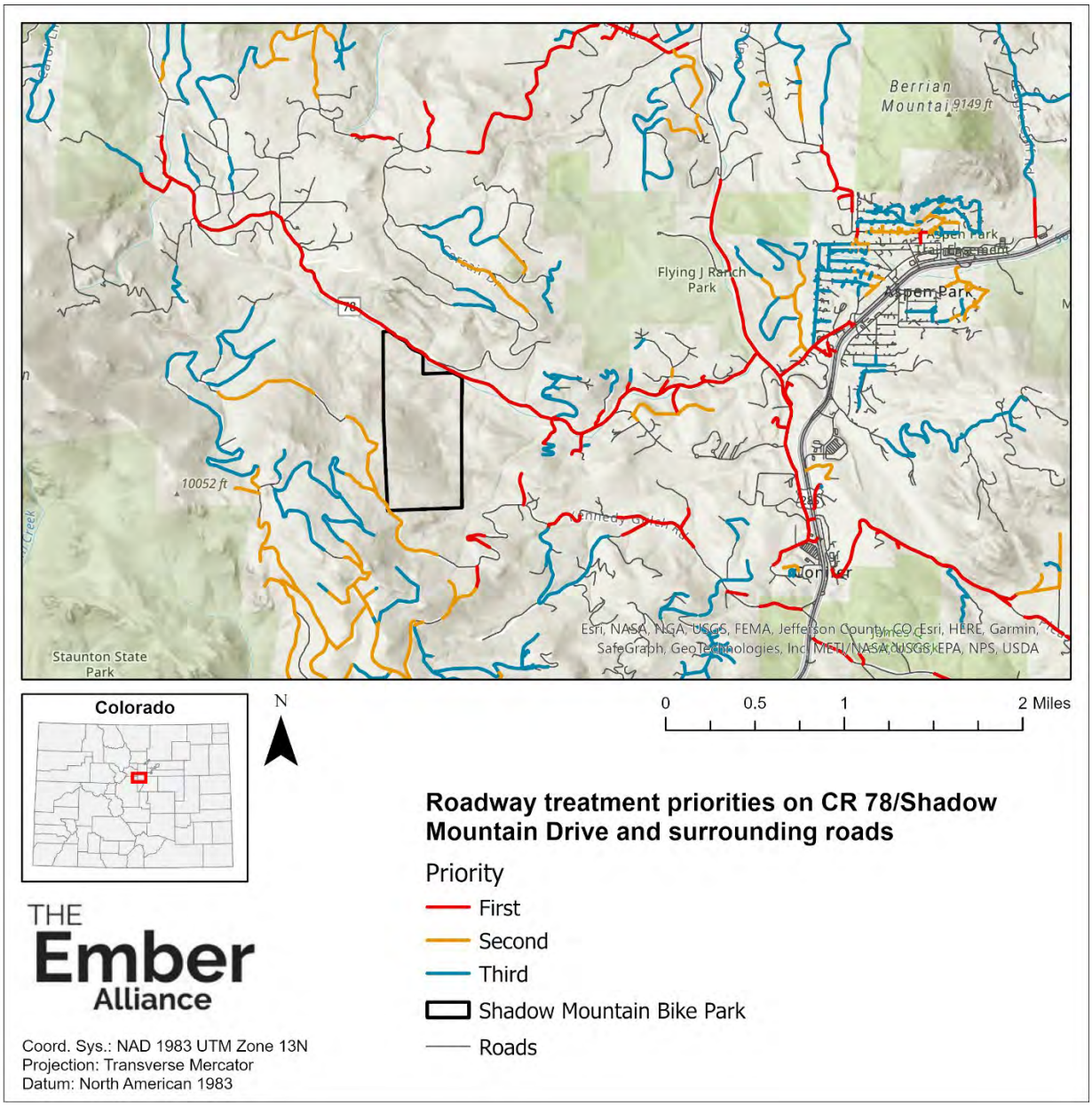

Figure 22. Roadway treatment prioritization around Shadow Mountain Bike Park. All of CR 78 / Shadow Mountain Drive near the park should be treated to reduce the risk of fire during evacuations in the area.

Temporary Area of Refuge

Under extreme weather conditions and current vegetation, the safe separation distance between people and fire would need to be up to 2350 ft away from the parking lot, which is approximately the distance from the parking lot to the top of the lift line. Understanding that it is not feasible to clear an area that large, and that SMBP has no control over the areas outside its boundary, we

recommend clearing all trees in the basecamp area except aspen and regularly removing any ladder fuels.

Firefighter safety zones are calculated as four times the flame length as the distance away from potential fire. Under 90th percentile weather conditions, flame lengths around the basecamp area are as high as 37 feet, making a safe distance under flat and windless conditions approximately 150 feet around the area. The area is not flat and there is expected to be wind during fire events, so doubling that safe zone would make a buffer of at least 300 feet around the parking lot. Completing the basecamp unit mitigation recommended above would create at least 300 feet of barrier around the parking lot everywhere except to the north and east where the parking lot is adjacent to the edge of the property. This can be addressed by moving the edge of the parking lot further in or working with the neighboring landowners to complete collaborative mitigation to achieve the 300-foot buffer.

To further prevent flames from coming in direct contact with cars that people may be sheltering in, we recommend mowing the grass in and around the parking lot throughout the summer and fall, and to remove all combustible weeds such as cheatgrass promptly. Regularly clearing and mowing the basecamp unit outlined above is the best option to create a potentially survivable area.

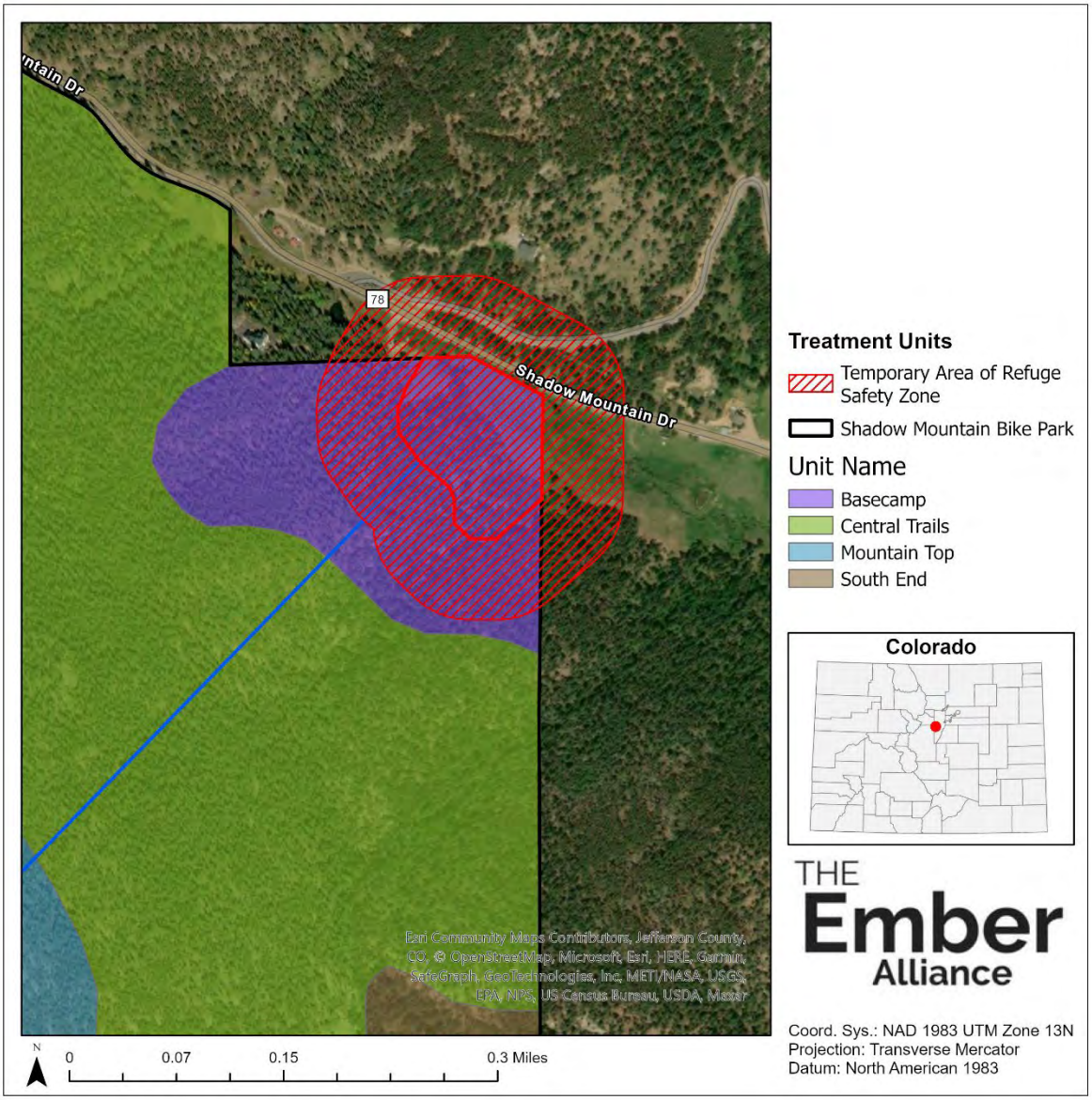

Figure 23. Temporary area of refuge safety zone for approximately 320 cars all contained within the parking lot area defined by the red rectangle. Collaboration with neighbors is essential for successful mitigation.

Slash Management

Thinning, harvesting, or other forest management operations often increase surface fuel loads and can fail to achieve fire mitigation objectives if fuels created by the harvest activities (also known as slash) are not addressed (Agee and Skinner, 2005). Slash can include small trees, limbs, bark, and treetops. Slash management is a critical step in the forest management process, and it is unwise, ineffective, and even dangerous to conduct poor-quality fuels treatments that fail to

reduce canopy fuels, result in increased surface fuel loads, and do not receive maintenance treatments. Such treatments can lead to a false sense of security among residents and fire suppression personnel (Dennis, 2005), and they divert limited funds away from more effective, strategic projects.

We recommend pile burning as the most effective form of slash management on the property. It reduces the surface fuel load while returning nutrients to the ground they came from. Pile burning is a relatively straightforward slash management technique where fire is limited to discrete piles, and piles can be burned when snow covers the ground. Burning piles can produce embers, but the risk of these embers igniting spot fires or structures is low. Piles are typically burned on days with snowpack, high fuel moistures, and low to moderate wind speeds. Embers from burn piles travel shorter distances than embers from passive and active crown fires because the burning material is closer to the ground (Evans and Wright, 2017). It is critical to properly construct piles and to burn them as soon as conditions allow (see the 2015 Colorado pile construction guide from the DFPC and CSFS for guidance). Mitigation measures, such as raking the burnt soil and seeding with native plants, are sometimes warranted after pile burning if the soil was completely sterilized by extreme heat or if invasive species are prevalent in the area (Miller, 2015).

Citation: The Ember Alliance. 2022. *Shadow Mountain Bike Park Wildfire Risk Assessment*. Fort Collins, CO.

References

Agee, J.K., Skinner, C.N., 2005. Basic principles of forest fuel reduction treatments. Forest Ecology and Management 211, 83–96.

Aven, T., Ben-Haim, Y., Boje Andersen, H., Cox, T., Droguett, E. L., Greenberg, M., Guikema, S., Kröger, W., Renn, O., Thompson, K. M., & others. 2018. Society for risk analysis glossary. Society for Risk Analysis, August.

Campbell, M. J.; Dennison, P. E.; Thompson, M. P.; Butler, B. W. 2022. Assessing Potential Safety Zone Suitability Using a New Online Mapping Tool. Fire 5, no. 1: 5. https://doi.org/10.3390/fire5010005

Colorado Forest Restoration Institute. 2021. Fires behavior differently in different forest types [WWW Document]. Colorado State University, Colorado Forest Restoration Institute. https://cfri.colostate.edu/wp-content/uploads/sites/22/2021/01/FireEd-Infographic-Web_Print-1.pdf

Colorado State Forest Service. 2020. 2020 Colorado Forest Action Plan. Colorado State University. https://csfs.colostate.edu/media/sites/22/2020/10/2020-ForestActionPlan.pdf

Colorado State Forest Service 2021. The home ignition zone: A guide to preparing your home for wildfire and creating defensible space. Colorado State University, Colorado State Forest Service, Fort Collins, CO.

Dennis, F.C. 2005. Fuelbreak guidelines for forested subdivisions and communities. Colorado State University, Colorado State Forest Service, Fort Collins, CO.

Dennis, F.C., Burke, J., Duda, J., Green, C., Hessel, D., Kaufmann, M., Lange, D., Lee, B., Rinke, H., Sheppard, W., Sturtevant, B., Thinnes, J., Underhill, J., Woodmansee, B., 2009. Lodgepole pine management guidelines for land managers in the wildland-urban interface. Colorado State Forest Service, Colorado State University, Fort Collins, CO.

Evans, A.M., Wright, C.S., 2017. Unplanned wildfire in areas with slash piles (Unpublished report for the Joint Fire Science Program No. 11-1-8–4).

FEMA. 2019. FEMA Incident Stabilization Guide (Operational Draft). https://www.fema.gov/emergency-managers/practitioners/lifelines-toolkit

Finney, M. A. 2006 An overview of FlamMap fire modeling capabilities. In: Andrews, P. L.; Butler, B. W., Comps. 2006. Fuels Management-How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 213-220, 41.

Miller, S., 2015. Slash from the past: Rehabilitating pile burn scars (Science You Can Use Bulletin No. Issue 15). U.S. Department of Agriculture, U.S. Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

National Academies of Sciences, Engineering, and Medicine, 2018. Emergency Alert and Warning Systems: Current Knowledge and Future Research Directions. The National Academies Press, Washington, DC. https://doi.org/10.17226/24935

Radeloff, V. C. H., Kramer, D. P., Mockrin, H. A., Alexandre, M. H., Massada, P. M. B., Butsic, A., Hawbaker, V., Martinuzzi, T. J., Syphard, S., Stewart, A. D., & others. 2017 The 1990-2010 wildland-urban interface of the conterminous United States-geospatial data.

Scott, J. H., Burgan, R. E. 2005. Standard fire behavior fuel models: A comprehensive set for use with Rothermel's surface fire spread model. US Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Shahabi, K., Wilson, J.P. 2014. CASPER: Intelligent capacity-aware evacuation routing. Computers, Environment and Urban Systems 46, 12–24. https://doi.org/10.1016/j.compenvurbsys.2014.03.004.

Stewart, S. I., Radeloff, V. C., Hammer, R. B., & Hawbaker, T. J. 2007. Defining the wildland–urban interface. Journal of Forestry, 105(4), 201–207.

Sullivan, A. L. 2009. Wildland surface fire spread modelling, 1990–2007. 1: Physical and quasi-physical models. International Journal of Wildland Fire, 18(4), 349–368.

USFS. Accessed Aug 9 2022. Aspen Ecology: Role of Fire. https://www.fs.fed.us/wildflowers/beauty/aspen/ecology.shtml

Williams, J. 2013. Exploring the onset of high-impact mega-fires through a forest land management prism. Forest Ecology and Management, 294, 4–10.

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December 5, 2022

Mr. Travis Beck
SE Group
tbeck@segroup.com

Re: Shadow Mountain
Bike Park
Jefferson County, CO
LSC #220850

Dear Mr. Beck:

In response to your request, LSC Transportation Consultants, Inc. has prepared this traffic impact analysis for the proposed Shadow Mountain Bike Park development. As shown on Figure 1, the site is located south of Shadow Mountain Drive about two miles west of County Highway 73 in Jefferson County, Colorado.

REPORT CONTENTS

The report contains the following: the existing roadway and traffic conditions in the vicinity of the site including the lane geometries, traffic controls, posted speed limits, etc.; the existing weekday, Saturday, and Sunday peak-hour traffic volumes; the existing daily traffic volumes in the area; the typical weekday, Saturday, and Sunday site-generated traffic volume projections; the assignment of the projected traffic volumes to the area roadways; the projected long-term background and resulting total traffic volumes on the area roadways; the site's projected traffic impacts; and any recommended roadway improvements to mitigate the site's traffic impacts or the impacts from growth in background traffic.

LAND USE AND ACCESS

The site is proposed to include a downhill mountain bike park with lift service. The site is proposed to have about 300 parking spaces and with about 20 employees. Full movement access is proposed from Shadow Mountain Drive as shown in the conceptual site plan in Figure 2.

The applicant plans to implement ticketing and parking technology to avoid guests arriving with nowhere to park to help reduce impacts to the surrounding area.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The major roadways in the site's vicinity are shown on Figure 1 and are described below.

- **County Highway 73** is a north-south, two-lane major collector roadway east of the site. The intersection with Shadow Mountain Drive is stop-sign controlled. The posted speed limit in the vicinity of the site is 40 mph.

- **Shadow Mountain Drive** is an east-west, two-lane collector roadway north of the site. The intersection with County Highway 73 is stop-sign controlled. The posted speed limit in the vicinity of the site is 40 mph but reduces to 30 mph to the east closer to County Highway 73.

- **Barkley Road** is an east-west, two-lane major collector roadway east of the site. The intersection with County Highway 73 is stop-sign controlled. The posted speed limit in the vicinity of the site is 30 mph.

Existing Traffic Conditions

Figure 3a shows the existing lane geometries, traffic controls, and traffic volumes in the site's vicinity on a typical weekday afternoon peak-hour and the daily traffic for five consecutive days. Figures 3b and 3c show the typical peak-hour volumes on a Saturday and Sunday, respectively. The peak-hour traffic volumes and daily traffic counts are from the attached traffic counts conducted by Counter Measures in August, 2022.

2025 and 2042 Background Traffic

Figure 4a shows the estimated 2025 weekday background traffic which assumes an annual growth rate of one percent. Figure 4b shows the estimated 2025 Saturday background traffic which assumes an annual growth rate of one percent. Figure 4c shows the estimated 2025 Sunday background traffic which assumes an annual growth rate of one percent. The Sunday daily volumes are based on multiplying the Sunday peak-hour rates by the ratio of Saturday peak-hour trips to Saturday daily trips.

Figure 5a shows the estimated 2042 weekday background traffic; Figure 5b shows the estimated 2042 Saturday background traffic; and Figure 5c shows the estimated 2042 Sunday background traffic. These 2042 background volumes assume an annual growth rate of one percent.

Existing, 2025, and 2042 Background Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A is indicative of little congestion or delay and LOS F is indicative of a high level of congestion or delay. Attached are specific level of service definitions for unsignalized intersections.

The intersections in Figures 3a through 5c were analyzed as appropriate to determine the existing, 2025 background, and 2042 background levels of service using Synchro. Table 1a shows the existing and 2025 level of service analysis results and Table 1b shows the 2042 level of service results. The level of service reports are attached.

1. **Shadow Mountain Drive/County Highway 73:** All movements at this unsignalized intersection currently operate at LOS "D" or better during all five scenarios and are expected

to do so through 2025. By 2042, all movements are expected to operate at LOS "D" or better in all scenarios with the following exception: The northeastbound to northwestbound left-turn movement is expected to operate at LOS "E" during the weekday afternoon peak-hour and LOS "F" during the Saturday mid-day peak-hour.

2. **County Highway 73/Barkley Road:** All movements at this unsignalized intersection currently operate at LOS "D" or better during all five scenarios with the following exception: The southwestbound to southeastbound left-turn movement operates at LOS "F" during the weekday afternoon peak-hour and the Saturday mid-day peak-hour. By 2025, the southwestbound left-turn movement is expected to operate at LOS "E" or "F" during the weekday afternoon peak-hour, and the Saturday morning and mid-day peak-hour. By 2042, the movement is expected to operate at LOS "E" or "F" during the weekday afternoon peak-hour, the Saturday morning and mid-day peak-hour, and the Sunday mid-day peak-hour.

3. **Shadow Mountain Drive/Site Access:** This unsignalized intersection was analyzed only in the total traffic scenarios.

TRIP GENERATION

Table 2 shows the estimated trip generation for the proposed site per the rates developed by LSC based on coordination with the applicant and project team.

The site is projected to generate about 490 vehicle-trips on the average weekday, with about half entering and half exiting during a 24-hour period. During the morning peak-hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 115 vehicles would enter and about 11 vehicles would exit the site. During the afternoon peak-hour, which generally occurs for one hour between 4:00 and 6:00 p.m., about 8 vehicles would enter and about 80 vehicles would exit.

On the average Saturday and Sunday, the site is projected to generate about 940 vehicle-trips with about half entering and half exiting during a 24-hour period. During the morning peak-hour, which generally occurs for one hour between 8:30 and 10:30 a.m., about 220 vehicles would enter and about 21 vehicles would exit the site. During the mid-day peak-hour, which generally occurs for one hour between 12:00 and 2:00 p.m., about 15 vehicles would enter and about 155 vehicles would exit.

TRIP DISTRIBUTION

Figure 6 shows the estimated directional distribution of the site-generated traffic volumes on the area roadways. The estimates were based on the location of the site with respect to the regional population, employment, and activity centers; and the site's proposed land use.

TRIP ASSIGNMENT

Figure 7a shows the estimated weekday site-generated traffic volumes based on the weekday trip generation estimate (from Table 2) and the directional distribution in Figure 6.

Figure 7b shows the estimated Saturday/Sunday site-generated traffic volumes based on the Saturday/Sunday trip generation estimate (from Table 2) and the directional distribution in Figure 6.

2025 AND 2042 TOTAL TRAFFIC

Figure 8a shows the 2025 weekday total traffic which is the sum of the 2025 weekday background traffic volumes (from Figure 4a) and the weekday site-generated traffic volumes (from Figure 7a). Figure 8a also shows the recommended lane geometry and traffic control.

Figure 8b shows the 2025 Saturday total traffic which is the sum of the 2025 Saturday background traffic volumes (from Figure 4b) and the weekend site-generated traffic volumes (from Figure 7b). Figure 8b also shows the recommended lane geometry and traffic control.

Figure 8c shows the 2025 Sunday total traffic which is the sum of the 2025 Sunday background traffic volumes (from Figure 4c) and the weekend site-generated traffic volumes (from Figure 7b). Figure 8c also shows the recommended lane geometry and traffic control.

Figure 9a shows the 2042 weekday total traffic which is the sum of the 2042 weekday background traffic volumes (from Figure 5a) and the weekday site-generated traffic volumes (from Figure 7a). Figure 9a also shows the recommended lane geometry and traffic control.

Figure 9b shows the 2042 Saturday total traffic which is the sum of the 2042 Saturday background traffic volumes (from Figure 5b) and the weekend site-generated traffic volumes (from Figure 7b). Figure 9b also shows the recommended lane geometry and traffic control.

Figure 9c shows the 2042 Sunday total traffic which is the sum of the 2042 Sunday background traffic volumes (from Figure 5c) and the weekend site-generated traffic volumes (from Figure 7b). Figure 9c also shows the recommended lane geometry and traffic control.

PROJECTED LEVELS OF SERVICE

The intersections in Figures 8a through 9c were analyzed to determine the 2025 and 2042 total traffic levels of service. Table 1a shows the existing and 2025 total level of service analysis results and Table 1b shows the 2042 total level of service results. The level of service reports are attached.

1. **Shadow Mountain Drive/County Highway 73:** All movements at this unsignalized intersection are expected to operate at LOS "D" or better during all five scenarios through 2042 with the following exception: The northeastbound left-turn movement is expected to operate at LOS "E" or "F" during three of the five scenarios by 2025 and four of the five scenarios by 2042. With the recommended improvements all movements are expected to operate at LOS "D" or better in all five scenarios through 2042.

2. **County Highway 73/Barkley Road:** All movements at this unsignalized intersection are expected to operate at LOS "D" or better during all five scenarios through 2042 with the following exception: The southwestbound left-turn movement is expected to operate at LOS "E" or "F" during four of the five scenarios in both 2025 and 2042. With the recommended improvements all movements are expected to operate at LOS "D" or better in all five sce-

narios with the following exception: The southwestbound left-turn movement is expected to operate at LOS "F" during the Saturday mid-day peak-hour in 2025 and during the weekday afternoon peak-hour and the Saturday mid-day peak-hour in 2042. It is important to note that the estimated delay after the proposed mitigation will be less than the estimated delay for the existing condition.

3. **Shadow Mountain Drive/Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "A" during all five scenarios through 2042.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

1. The site is projected to generate about 490 vehicle-trips on the average weekday, with about half entering and half exiting during a 24-hour period. During the morning peak-hour, about 115 vehicles would enter and about 11 vehicles would exit the site. During the afternoon peak-hour, about 8 vehicles would enter and about 80 vehicles would exit.

2. On the average Saturday and Sunday, the site is projected to generate about 940 vehicle-trips with about half entering and half exiting during a 24-hour period. During the morning peak-hour, about 220 vehicles would enter and about 21 vehicles would exit the site. During the mid-day peak-hour, about 15 vehicles would enter and about 155 vehicles would exit

Projected Levels of Service

3. All movements at the unsignalized intersections analyzed are expected to operate at LOS "D" or better through 2042 in all five scenarios with the following exceptions: The northeastbound left-turn movement at the Shadow Mountain Drive/County Highway 73 and the southwestbound left-turn movement at the County Highway 73/Barkley Road intersection are expected to operate at LOS "E" or "F" during several of the five scenarios. With the recommended improvements these movements are expected to operate at LOS "D" or better during all scenarios with the following exception: The southwestbound left-turn movement at the County Highway 73/Barkley Road intersection is expected to operate at LOS "F" during the Saturday mid-day peak-hour in 2025 and during the weekday afternoon peak-hour and the Saturday mid-day peak-hour in 2042. It is important to note that the estimated delay after the proposed mitigation will be less than for the existing condition.

Recommendations

4. The recommended improvements to mitigate poor levels of service are shown in Figures 10 and 11. These improvements are expected to result in lower delays in the future than exist today without the proposed development.

* * * * *

We trust our findings will assist you in gaining approval of the proposed Shadow Mountain Bike Park development. Please contact me if you have any questions or need further assistance.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By_____
Christopher S. McGranahan, PE, PTOE
Principal

CSM/wc 12-5-22

Enclosures: Tables 1a through 2
Figures 1 - 11
Traffic Count Reports
Level of Service Definitions
Level of Service Reports

W:\LSC\Projects\2022\220850-ShadowMountainBikePark\Report\ShadowMountainBikePark-120522.wpd

Table 1a
Intersection Levels of Service Analysis - Existing and 2025
Shadow Mountain Bike Park
Jefferson County, CO
LSC #220850; December, 2022

		Existing Traffic					2025 Background					2025 Total					2025 Total - Mitigated (1)				
		Weekday	Saturday		Sunday		Weekday	Saturday		Sunday		Weekday	Saturday		Sunday		Weekday	Saturday		Sunday	
Intersection No. & Location	Traffic Control	Level of Service PM	Level of Service AM	Level of Service Mid-Day	Level of Service AM	Level of Service Mid-Day	Level of Service PM	Level of Service AM	Level of Service Mid-Day	Level of Service AM	Level of Service Mid-Day	Level of Service PM	Level of Service AM	Level of Service Mid-Day	Level of Service AM	Level of Service Mid-Day	Level of Service PM	Level of Service AM	Level of Service Mid-Day	Level of Service AM	Level of Service Mid-Day
1) Shadow Mountain Drive/County Highway 73	TWSC																				
NEB Left		D	C	D	B	C	D	C	D	C	C	F	E	E	D	D	D	C	C	C	C
NEB Right		B	B	B	B	B	B	B	B	B	B	B	B	C	B	B	B	B	C	B	B
NWB Left		A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	B	A	A	A	A
Critical Movement Delay		30.4	17.2	30.7	14.7	22.6	32.3	17.8	32.9	15.0	23.6	51.8	37.1	40.1	30.8	27.0	25.7	22.9	20.9	20.8	17.9
2) County Highway 73/Barkley Road	TWSC																				
SEB Left		A	A	B	A	A	A	A	B	A	A	A	A	B	A	A	A	A	B	A	A
SWB Left		F	D	F	C	D	F	E	F	C	C	F	E	F	C	E	D	C	F (2)	C	C
SWB Right		B	B	B	B	B	B	B	B	B	B	C	B	B	B	B	C	B	B	B	B
Critical Movement Delay		74.3	33.8	186.0	18.2	25.9	90.2	37.6	233.5	18.8	24.1	108.2	48.1	>240	20.8	49.8	31.1	22.7	67.6	15.2	23.1
3) Shadow Mountain Drive/Site Access	TWSC																				
NB Approach		--	--	--	--	--	--	--	--	--	--	A	A	A	A	A	--	--	--	--	--
WB Approach		--	--	--	--	--	--	--	--	--	--	A	A	A	A	A	--	--	--	--	--
Critical Movement Delay		--	--	--	--	--	--	--	--	--	--	8.7	8.9	9.8	8.9	9.7	--	--	--	--	--

(1) Recommended mitigation is to add left-turn acceleration lanes at Intersections #1 and #2 to benefit the left-turn movement from the existing stop-sign controlled approaches.
(2) The mitigated delay is less than for the existing condition.

Table 1b
Intersection Levels of Service Analysis
Shadow Mountain Bike Park- 2042
Jefferson County, CO
LSC #220850; December, 2022

		2042 Background					2042 Total					2042 Total - Mitigated				
		Weekday	Saturday		Sunday		Weekday	Saturday		Sunday		Weekday	Saturday		Sunday	
Intersection No. & Location	Traffic Control	Level of Service PM	Level of Service AM	Level of Service Mid-Day	Level of Service AM	Level of Service Mid-Day	Level of Service PM	Level of Service AM	Level of Service Mid-Day	Level of Service AM	Level of Service Mid-Day	Level of Service PM	Level of Service AM	Level of Service Mid-Day	Level of Service AM	Level of Service Mid-Day
1) Shadow Mountain Drive/County Highway 73	TWSC															
NEB Left		E	C	F	C	D	F	F	F	E	D	D	D	D	C	C
NEB Right		B	B	C	B	B	C	B	D	B	C	C	B	D	B	C
NWB Left		B	A	A	A	A	B	A	A	A	A	B	A	A	A	A
Critical Movement Delay		48.5	21.6	52.9	17.6	25.6	86.9	50.5	72.5	40.2	29.6	33.2	26.8	26.3	23.9	18.3
2) County Highway 73/Barkley Road	TWSC															
SEB Left		A	A	B	A	A	A	A	C	A	B	A	A	C	A	B
SWB Left		F	F	F	C	E	F	F	F	D	F	F (2)	D	F (2)	C	D
SWB Right		B	B	C	B	B	C	C	C	B	B	C	C	C	B	B
Critical Movement Delay		>240	84.3	>240	23.2	40.8	>240	122.2	>240	26.0	95.7	58.8	31.5	171.6	17.0	29.3
3) Shadow Mountain Drive/Site Access	TWSC															
NB Approach		--	--	--	--	--	A	A	A	A	A	--	--	--	--	--
WB Approach		--	--	--	--	--	A	A	A	A	A	--	--	--	--	--
Critical Movement Delay		--	--	--	--	--	8.8	9.0	9.9	8.9	9.8	--	--	--	--	--

(1) Recommended mitigation is to add left-turn acceleration lanes at Intersections #1 and #2 to benefit the left-turn movement from the existing stop-sign controlled approaches.
(2) The mitigated delay is less than for the existing condition.

Table 2
ESTIMATED TRAFFIC GENERATION
Shadow Mountain Bike Park
Jefferson County, CO
LSC #220850; December, 2022

	Vehicle-Trips Generated									
	Weekday					Saturday & Sunday				
		AM Peak-Hour (2)		PM Peak-Hour (2)			AM Peak-Hour (2)		PM Peak-Hour (2)	
Trip Generating Category	Daily (1)	In	Out	In	Out	Daily (1)	In	Out	In	Out
Guests	450	105	11	8	75	900	210	21	15	150
Employees	40	10	0	0	5	40	10	0	0	5
Total =	**490**	**115**	**11**	**8**	**80**	**940**	**220**	**21**	**15**	**155**

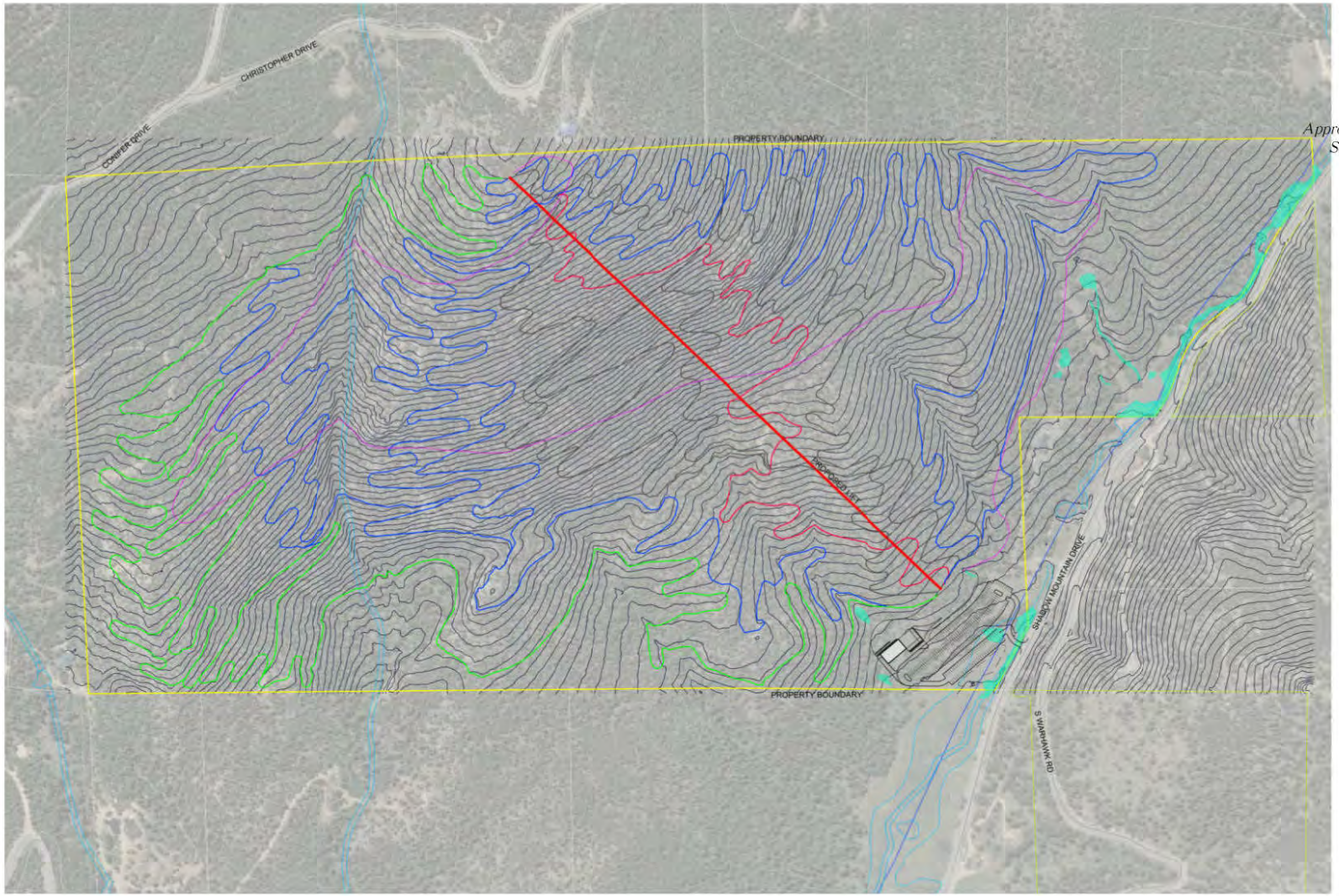
Notes:
(1) Assumes 300 parking spaces and a 1.5 turn over ratio for a total of 450 round-trips on the weekend with half that usage on a typical weekday. Assumes 20 employees with 20 round-trips.
(2) Assumes 70 percent of arrival trips occur during the weekday afternoon peak-hour or Saturday/Sunday morning peak-hour with ten percent being dropped off and 50 percent of departure trips occur during the weekend midday peak-hour with ten percent being dropped off. Assumes half of the employees arrive during the peak-hour and a quarter depart during the peak-hour.

Figure 1

Vicinity Map

Shadow Mountain Bike Park (LSC #220850)

LSC TRANSPORTATION CONSULTANTS, INC.



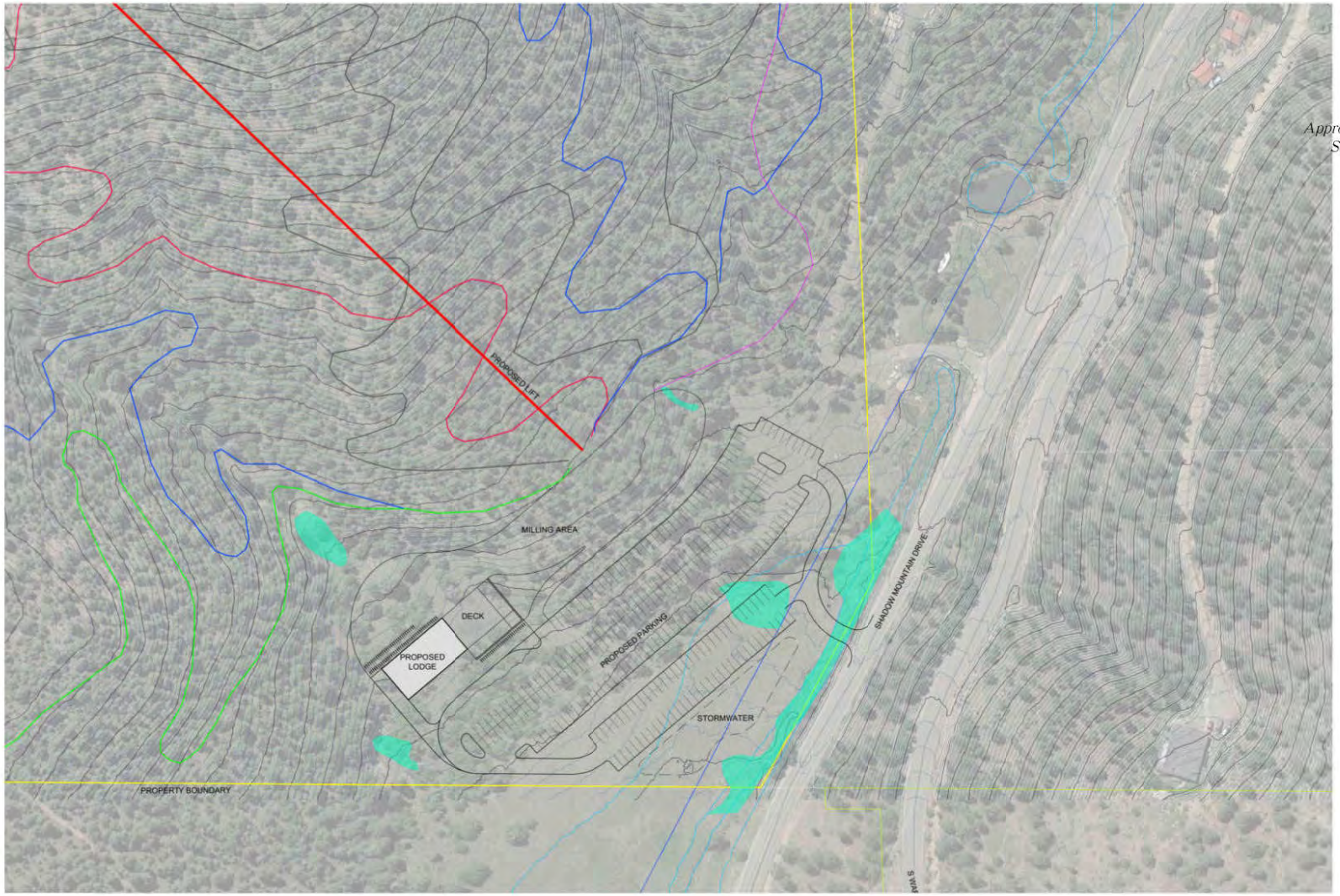
Approximate Scale
Scale: NTS

Figure 2a

Overall Site Plan

Shadow Mountain Bike Park (LSC #220850)

LSC TRANSPORTATION CONSULTANTS, INC.



Approximate Scale
Scale: NTS

Figure 2b

Parking Lot & Access Detail

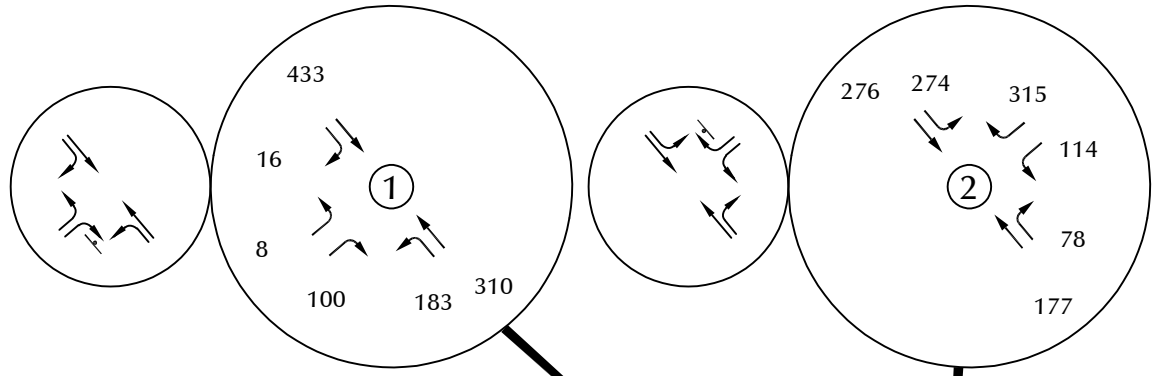
Shadow Mountain Bike Park (LSC #220850)

LSC TRANSPORTATION CONSULTANTS, INC.

N

Approximate Scale
Scale: 1"=1,200'

LEGEND:
⊦ = Stop Sign
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)



1	2	3	4	5
Tues 8/23/2022 = 2,455	Tues 8/23/2022 = 2,680	Tues 8/23/2022 = 3,170	Tues 8/23/2022 = No Data	Tues 8/23/2022 = 11,390
Wed 8/24/2022 = 2,525	Wed 8/24/2022 = 2,750	Wed 8/24/2022 = 3,220	Wed 8/24/2022 = No Data	Wed 8/24/2022 = 11,380
Thur 8/25/2022 = 2,405	Thur 8/25/2022 = 2,655	Thur 8/25/2022 = 3,120	Thur 8/25/2022 = 3,155	Thur 8/25/2022 = 11,205
Fri 8/26/2022 = 2,365	Fri 8/26/2022 = 2,625	Fri 8/26/2022 = 3,125	Fri 8/26/2022 = 3,160	Fri 8/26/2022 = 11,470
Sat 8/27/2022 = 2,325	Sat 8/27/2022 = 2,550	Sat 8/27/2022 = 2,970	Sat 8/27/2022 = 3,005	Sat 8/27/2022 = 10,455

Figure 3a

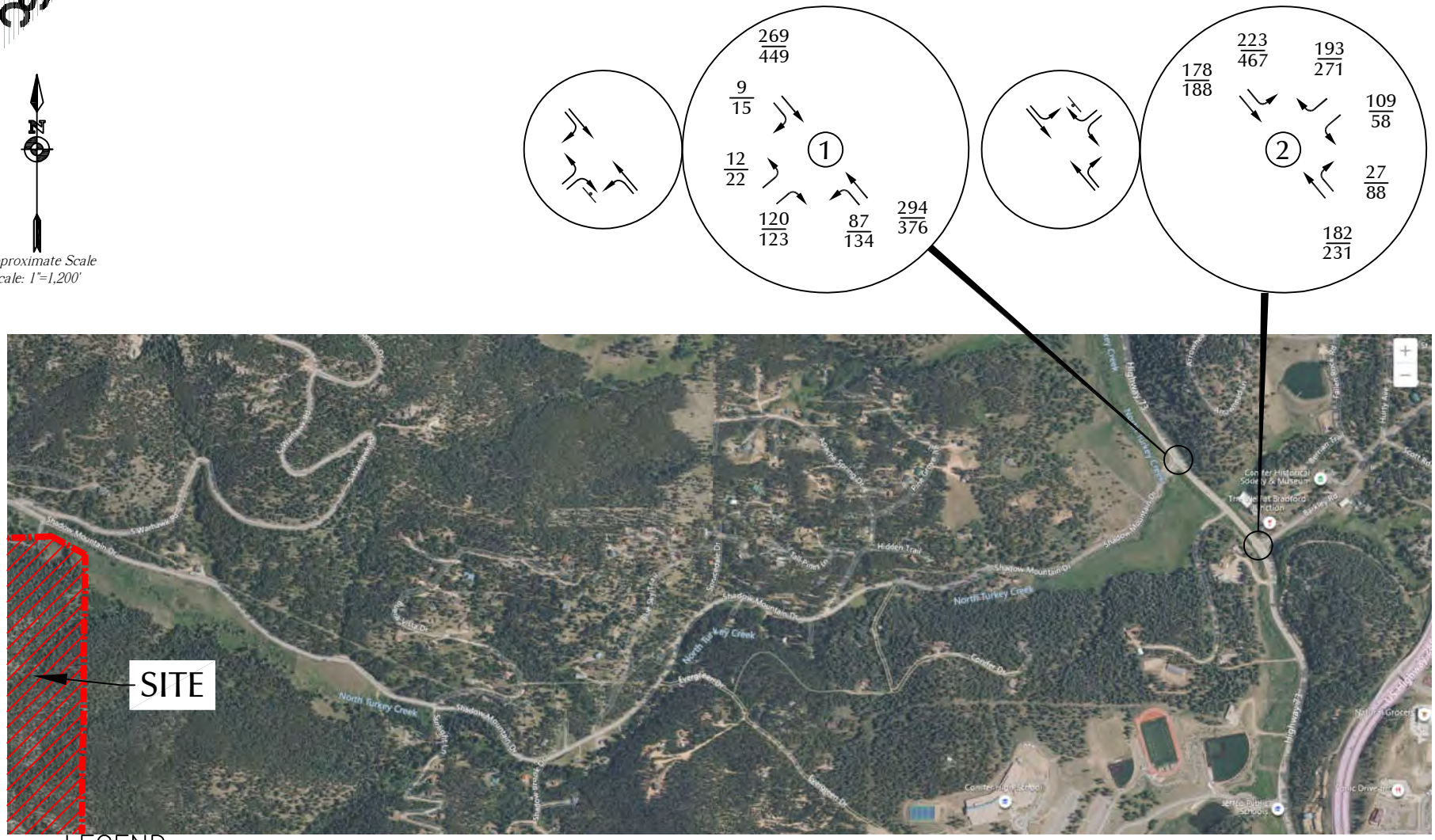
Existing Weekday Peak Hour & All Daily Traffic

Shadow Mountain Bike Park (LSC #220850)

LSC TRANSPORTATION CONSULTANTS, INC.

N

Approximate Scale
Scale: 1"=1,200'



LEGEND:

= Stop Sign

$\frac{26}{35}$ = Saturday Morning Peak Hour Traffic (9:00am–10:00am) / Saturday Midday Peak Hour Traffic (12:00pm–1:00pm)

Figure 3b

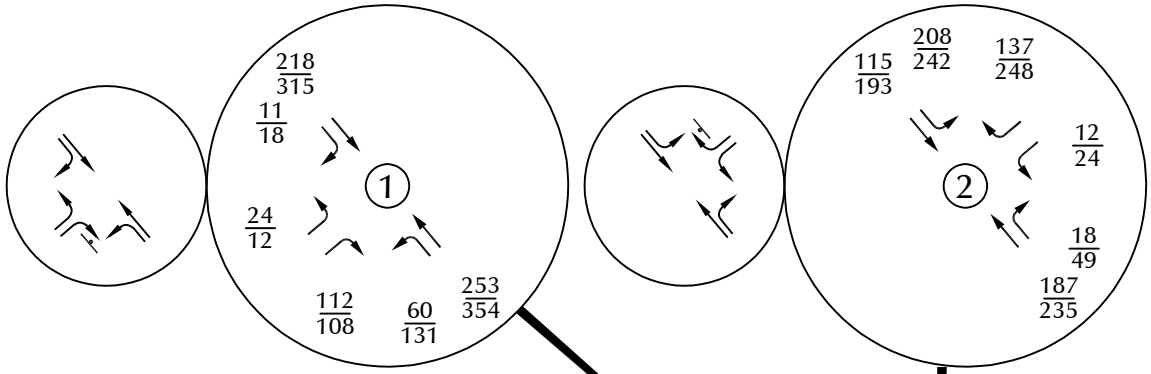
Existing Saturday Peak Hour Traffic

Shadow Mountain Bike Park (LSC #220850)

LSC TRANSPORTATION CONSULTANTS, INC.

N

Approximate Scale
Scale: 1"=1,200'



LEGEND:

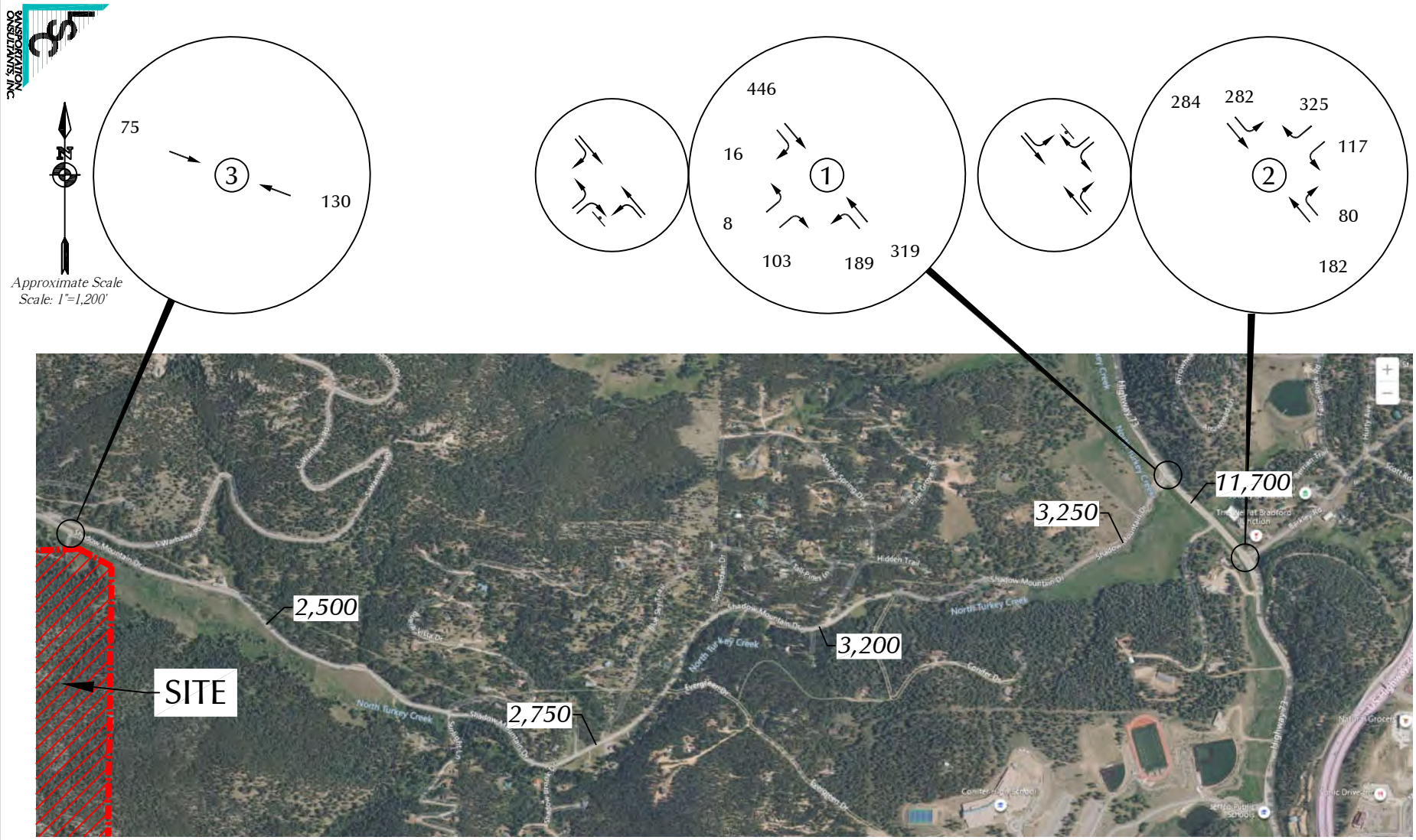
| = Stop Sign

$\frac{26}{35}$ = Sunday Morning Peak Hour Traffic (9:00am–10:00am) / Sunday Midday Peak Hour Traffic (12:30pm–1:30pm)

Figure 3c

Existing Sunday Peak Hour Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

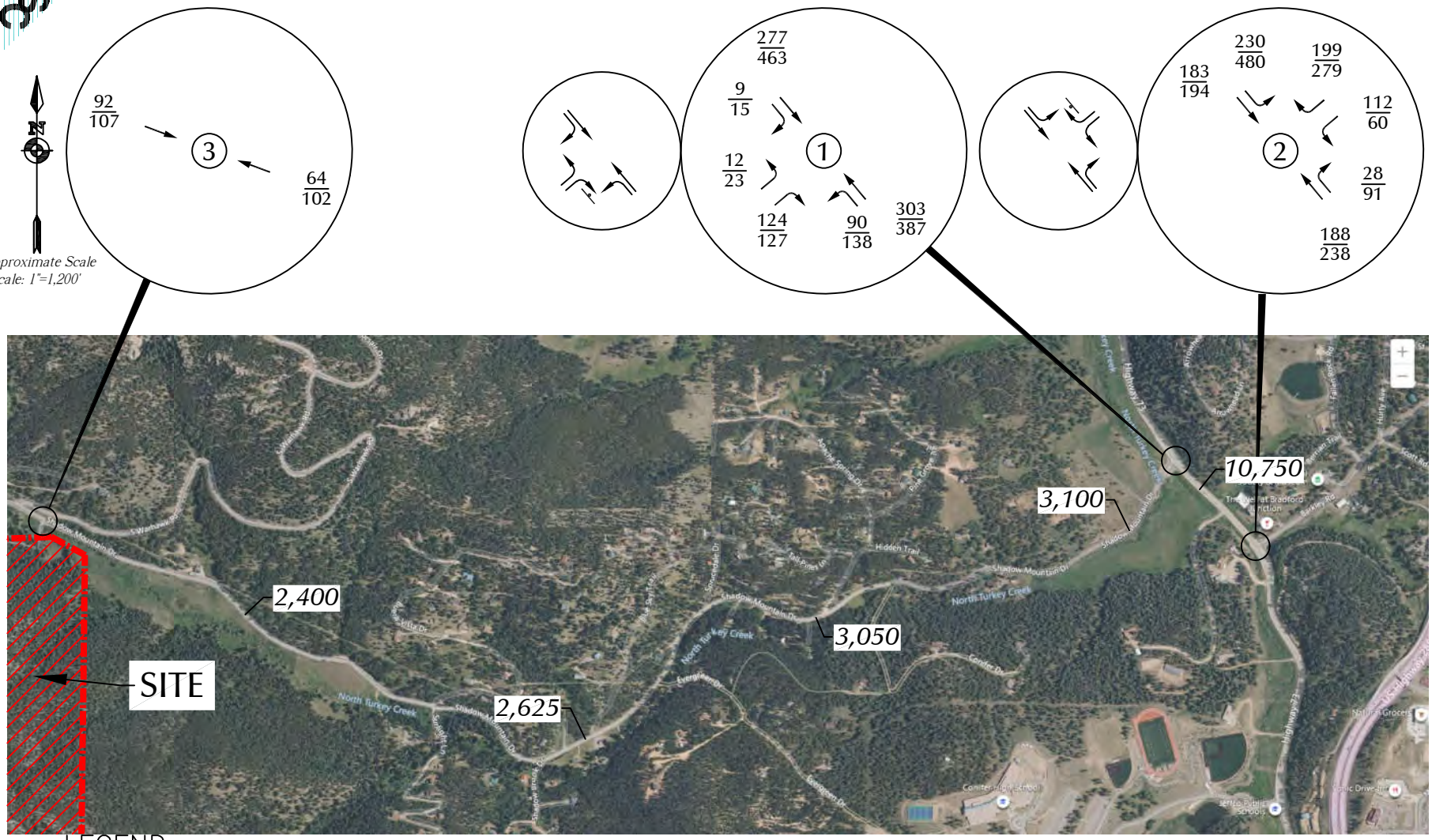
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)

Note: Assumes annual growth rate of one percent.

Figure 4a

Year 2025 Weekday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

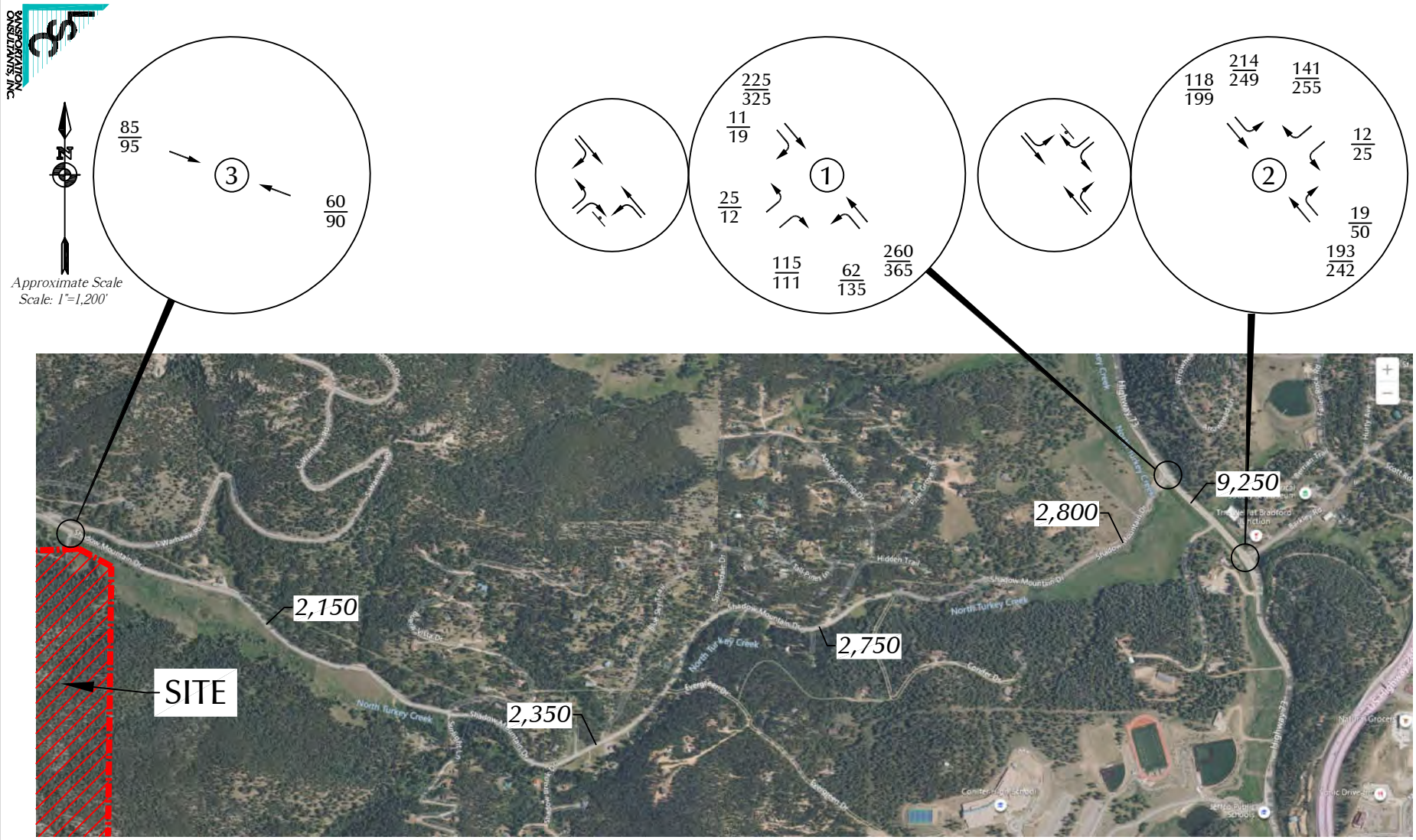
$\frac{26}{35}$ = Saturday Morning Peak Hour Traffic (9:00am–10:00am) / Saturday Midday Peak Hour Traffic (12:00pm–1:00pm)

Note: Assumes annual growth rate of one percent.

Figure 4b

Year 2025 Saturday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

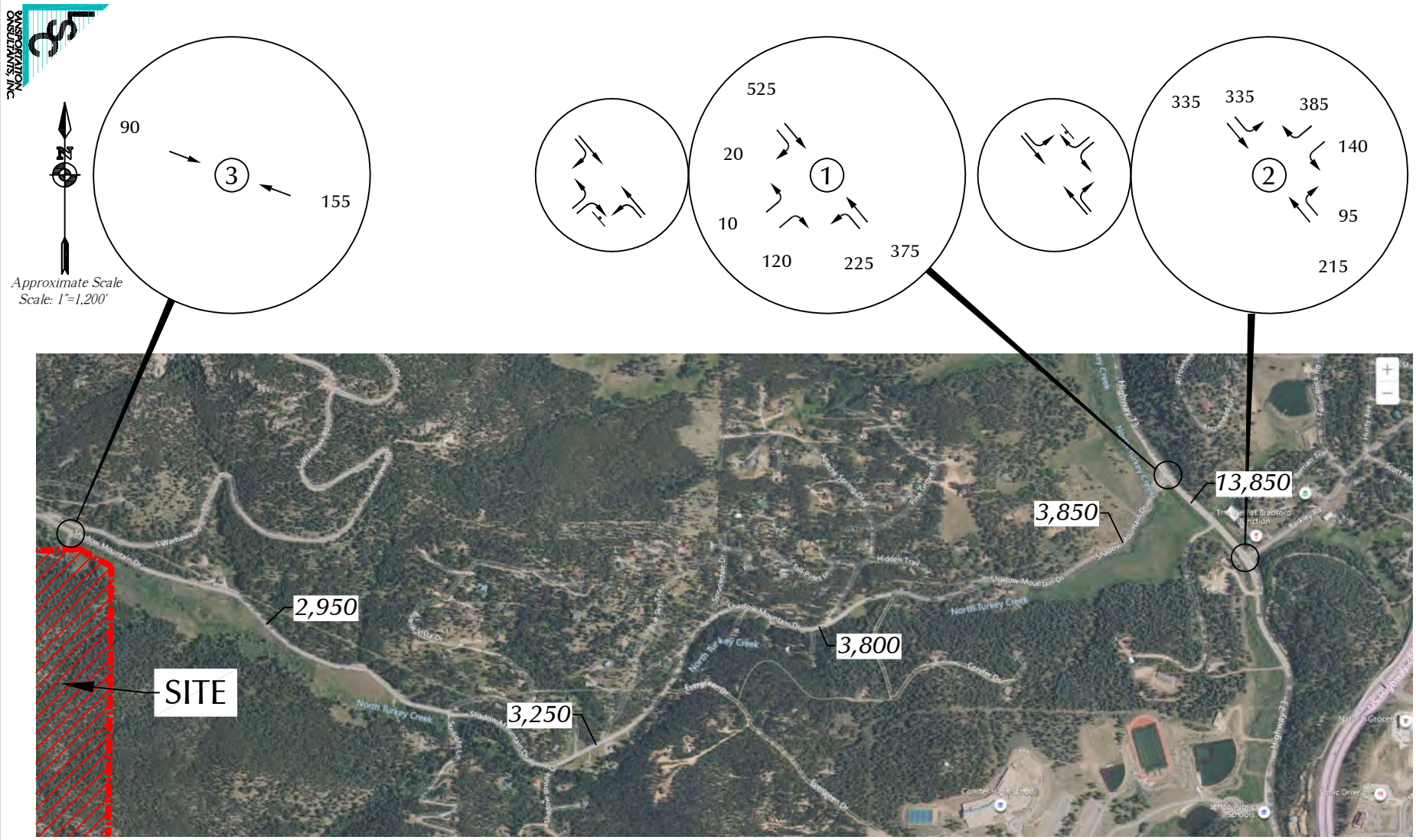
$\frac{26}{35}$ = $\frac{\text{Sunday Morning Peak Hour Traffic (9:00am–10:00am)}}{\text{Sunday Midday Peak Hour Traffic (12:30pm–1:30pm)}}$

Note: Assumes annual growth rate of one percent. Daily volumes based on ratio of Saturday peak hour trips to Saturday daily trips.

Figure 4c

Year 2025 Sunday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

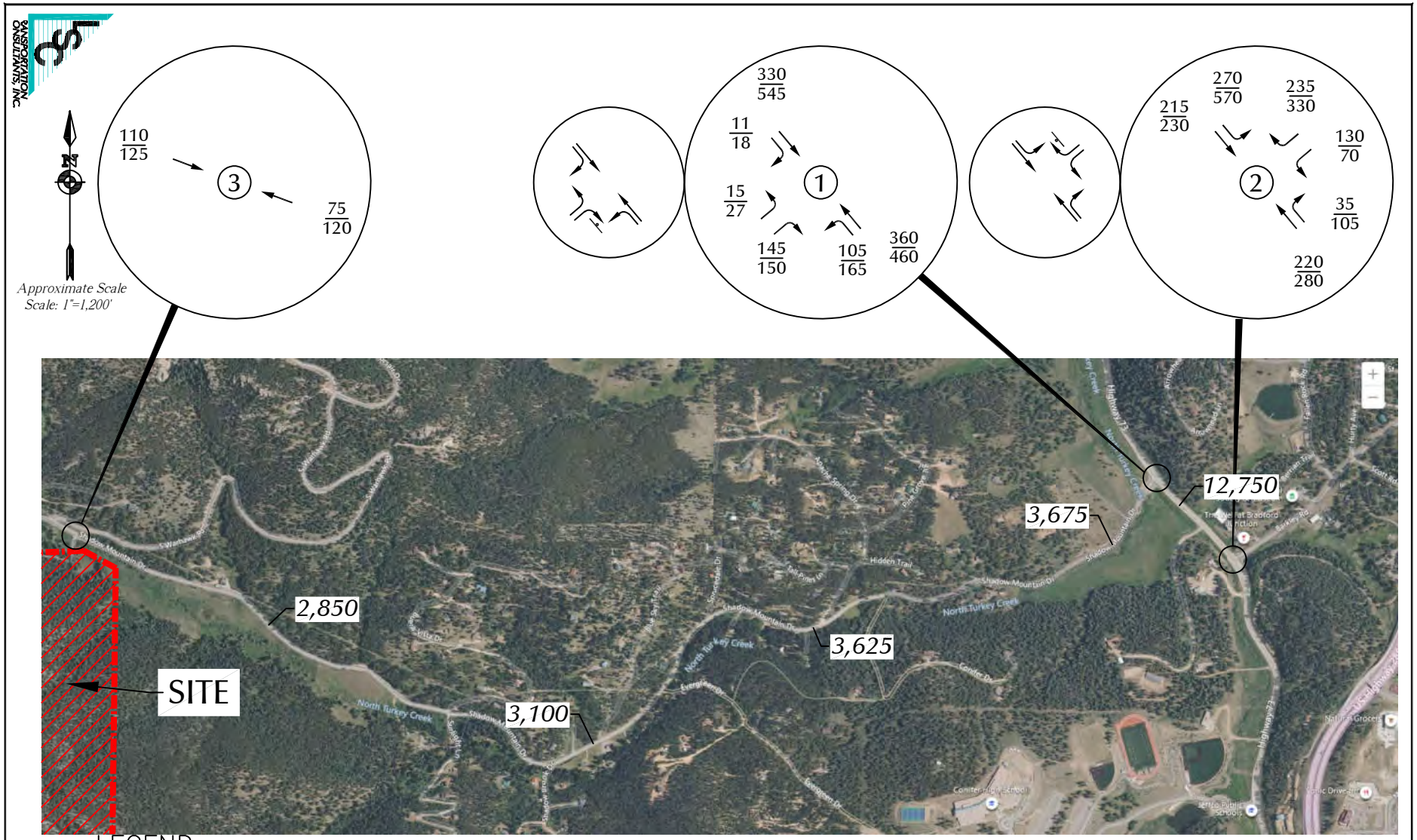
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)

Note: Assumes annual growth rate of one percent.

Figure 5a

Year 2042 Weekday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

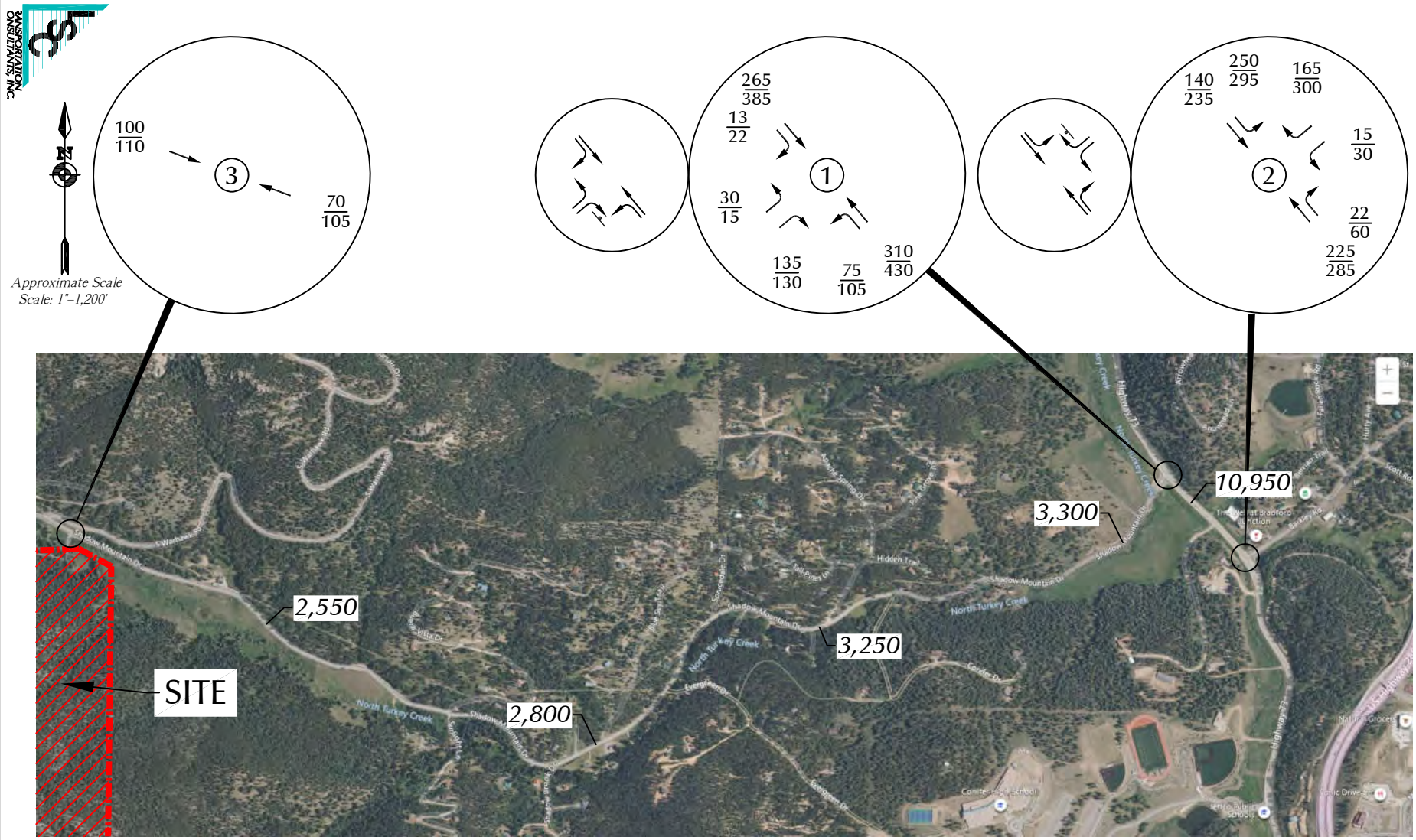
$\frac{26}{35}$ = Saturday Morning Peak Hour Traffic (9:00am–10:00am) / Saturday Midday Peak Hour Traffic (12:00pm–1:00pm)

Note: Assumes annual growth rate of one percent.

Figure 5b

Year 2042 Saturday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

$\frac{26}{35}$ = $\frac{\text{Sunday Morning Peak Hour Traffic (9:00am–10:00am)}}{\text{Sunday Midday Peak Hour Traffic (12:30pm–1:30pm)}}$

Note: Assumes annual growth rate of one percent.

Figure 5c

Year 2042 Sunday Background Traffic

Shadow Mountain Bike Park (LSC #220850)

Approximate Scale
Scale: 1"=3,000'

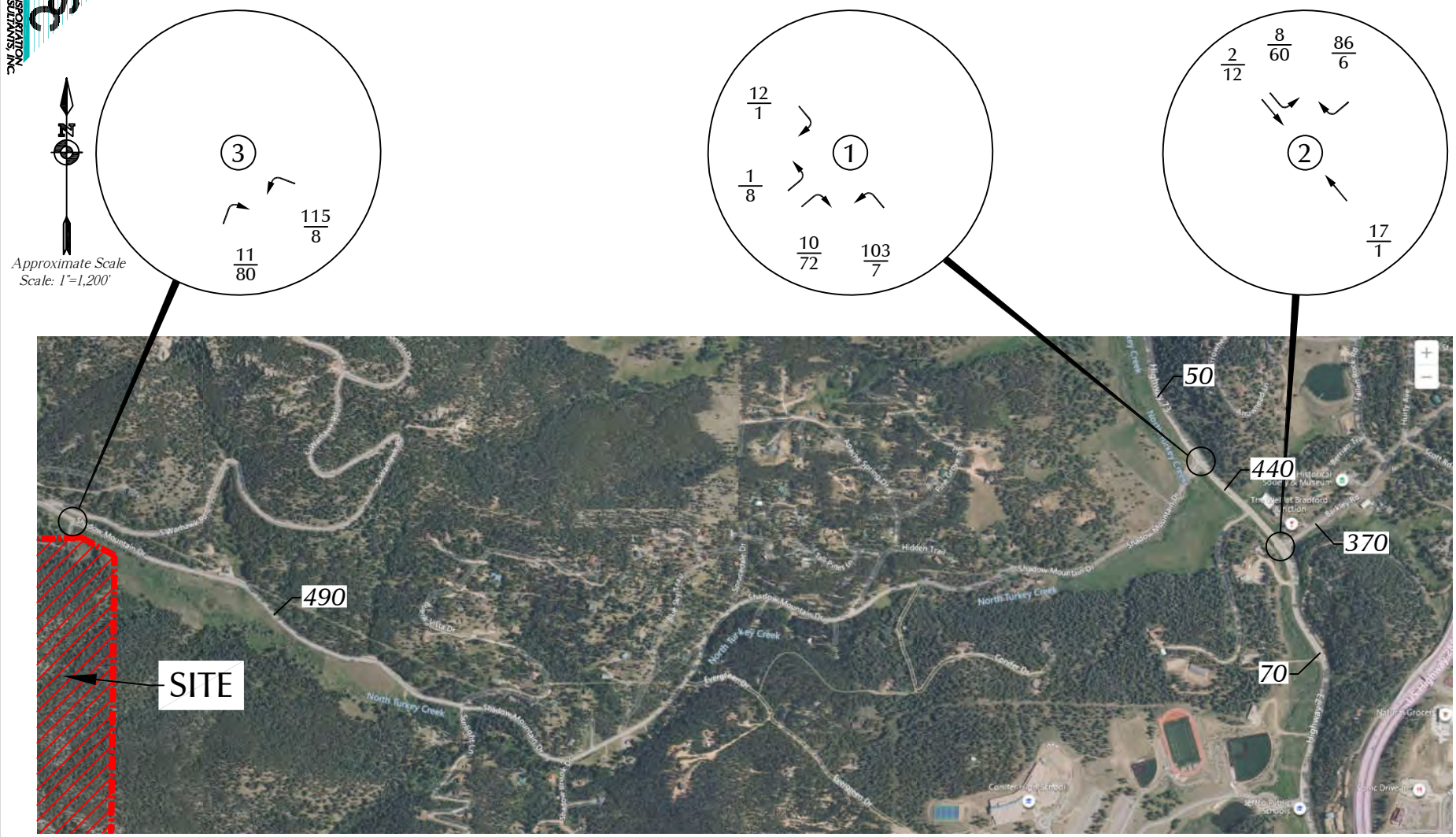
LEGEND:

65% = Percent Directional Distribution

Figure 6

Directional Distribution of Site-Generated Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

$\frac{26}{35} = \frac{\text{Weekday Morning Peak Hour Traffic}}{\text{Weekday Afternoon Peak Hour Traffic}}$

Figure 7a

Assignment of Weekday Site-Generated Traffic

Shadow Mountain Bike Park (LSC #220850)

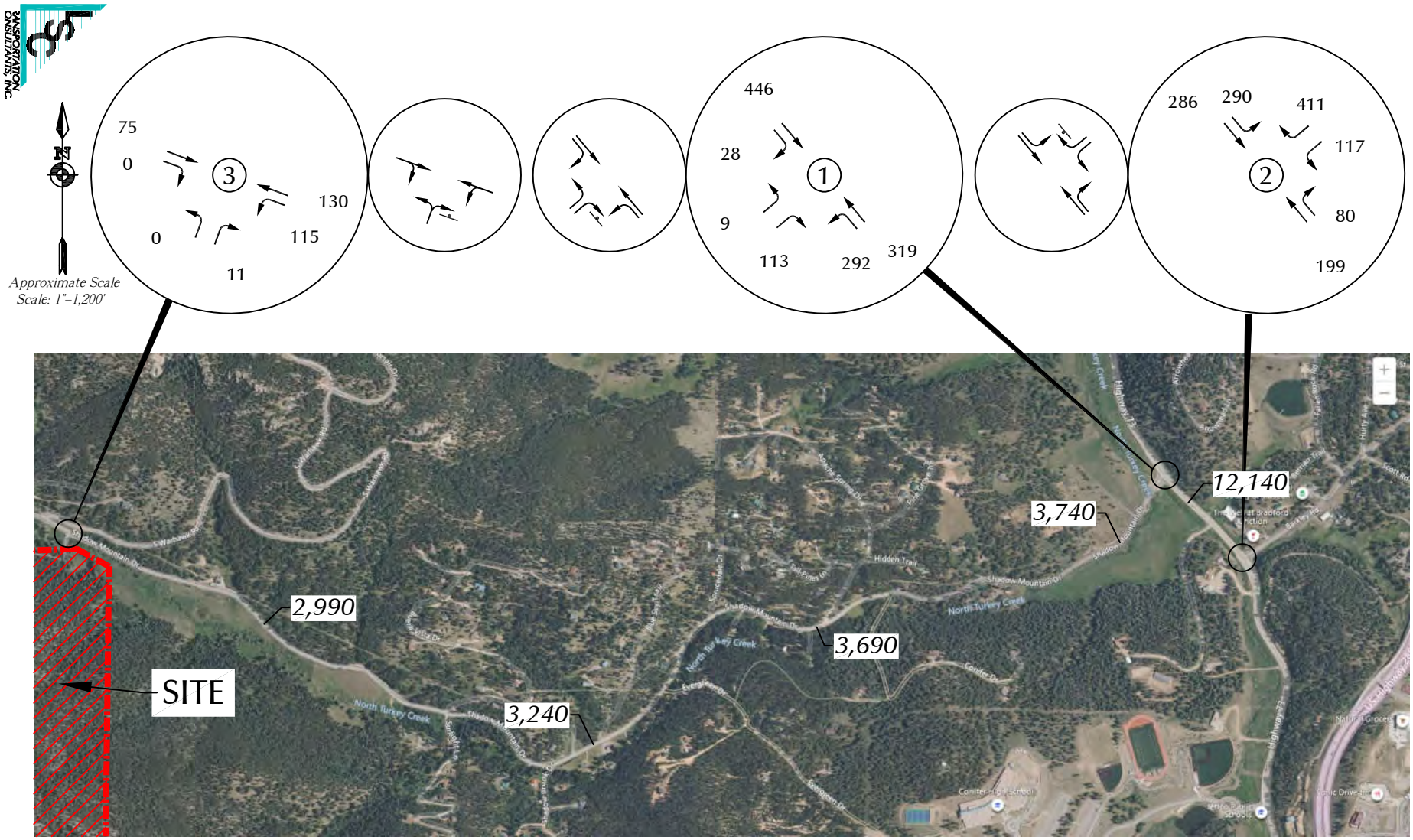
LEGEND:

$$\frac{26}{35} = \frac{\text{Weekend Morning Peak Hour Traffic}}{\text{Weekend Afternoon Peak Hour Traffic}}$$

Figure 7b

Assignment of Weekend Site-Generated Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

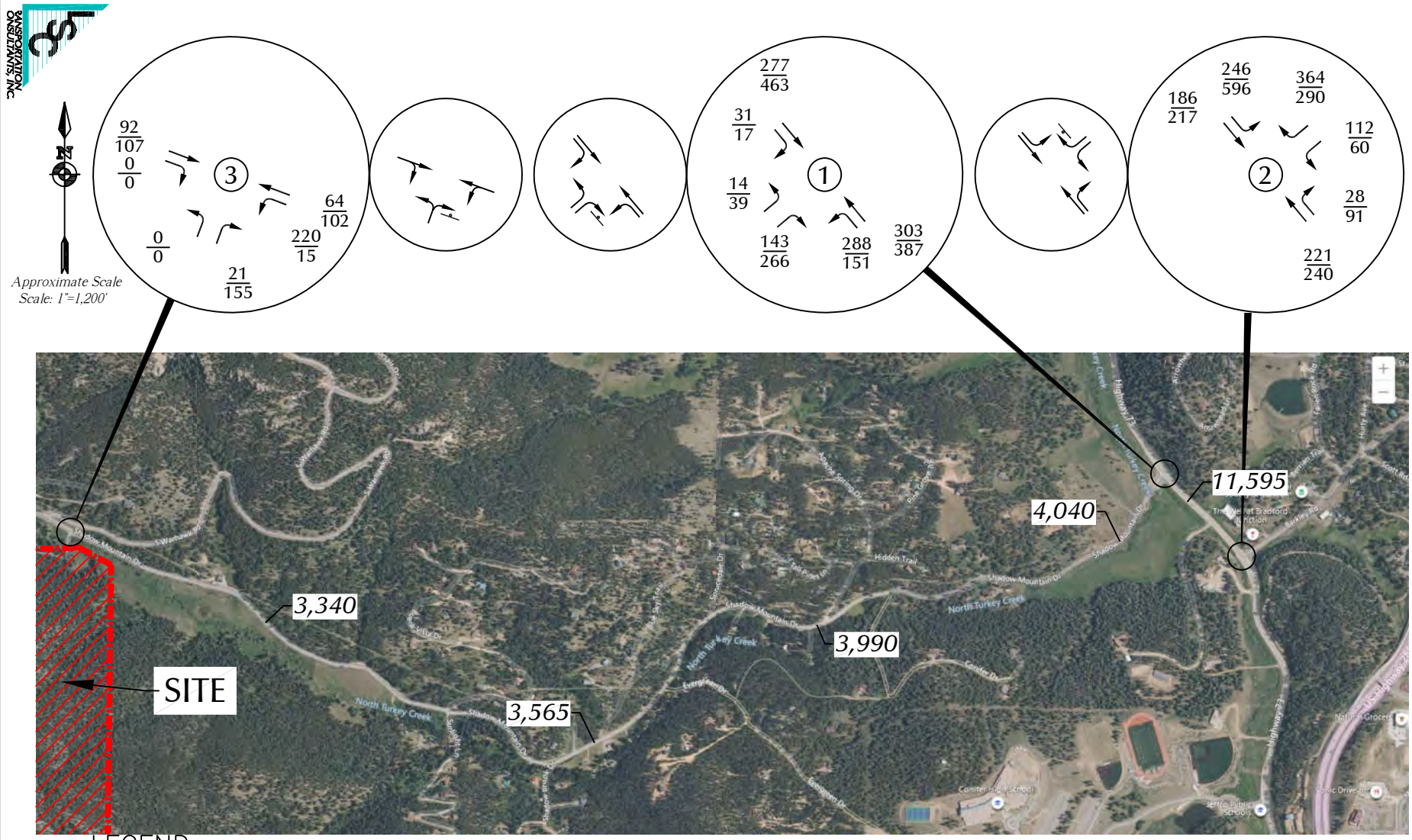
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)

Note: These volumes are the sum of the volumes in Figures 4a and 7a.

Figure 8a

Year 2025 Weekday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

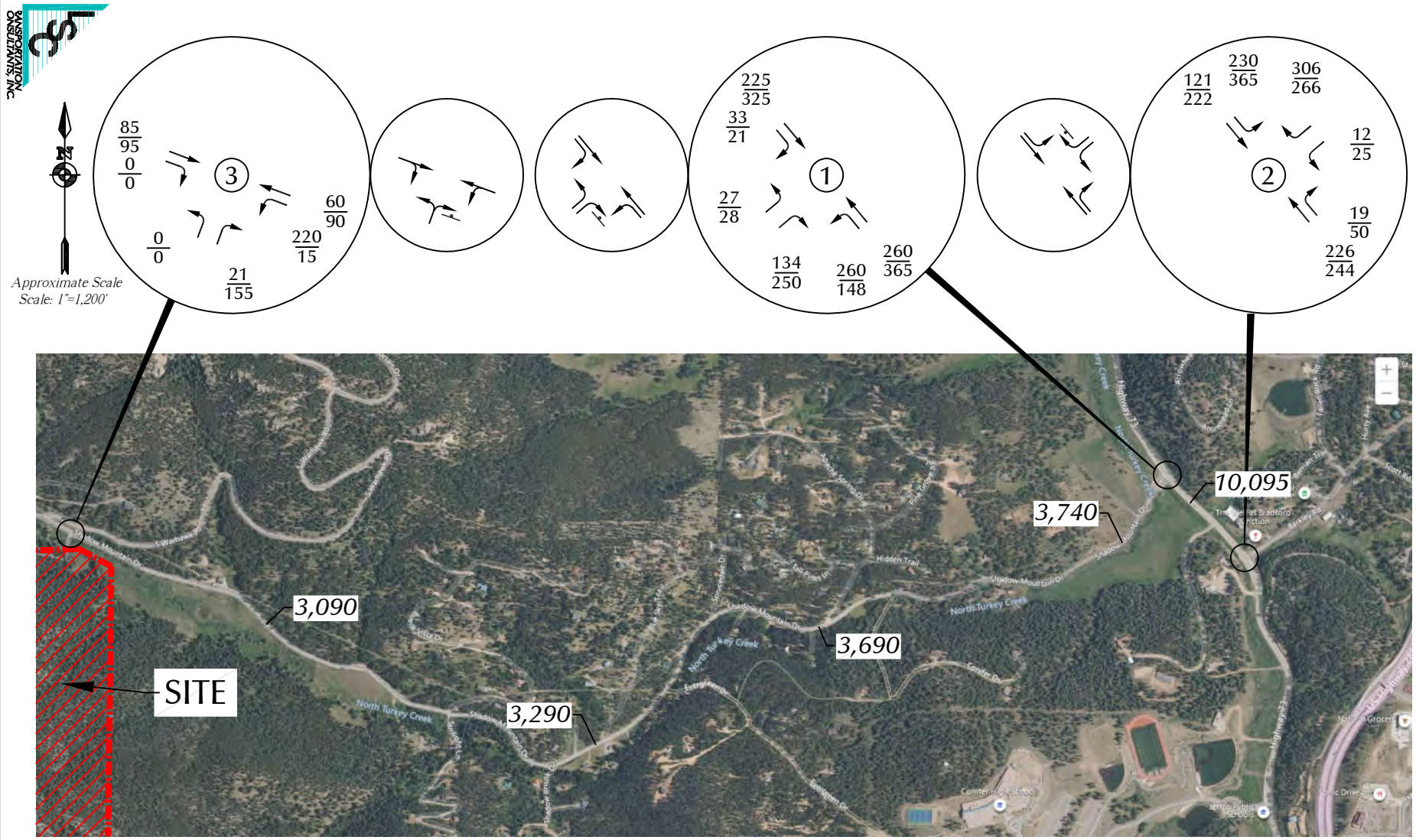
26/35 = Saturday Morning Peak Hour Traffic (9:00am–10:00am) / Saturday Midday Peak Hour Traffic (12:00pm–1:00pm)

Note: These volumes are the sum of the volumes in Figures 4b and 7b.

Figure 8b

Year 2025 Saturday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

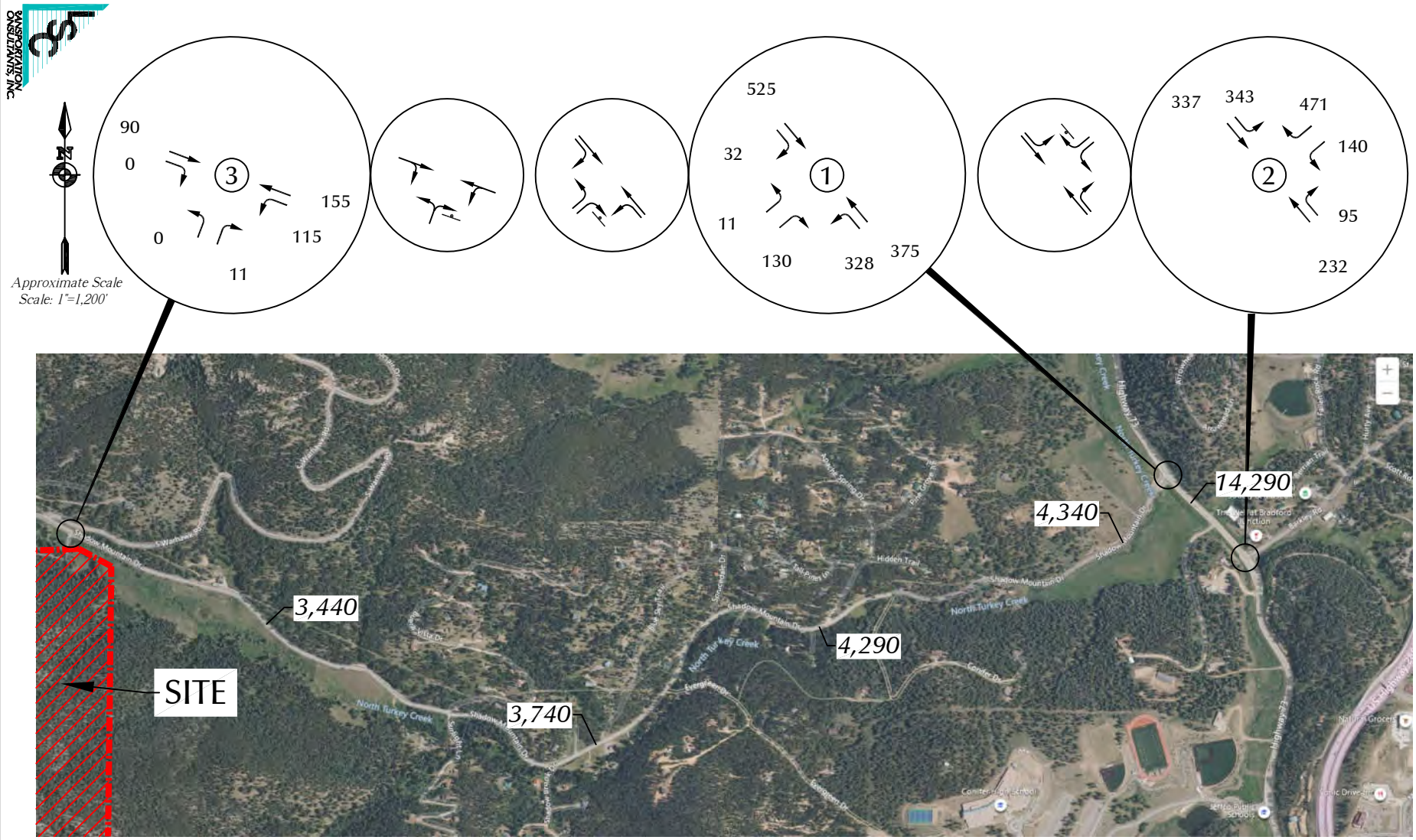
$\frac{26}{35}$ = Sunday Morning Peak Hour Traffic (9:00am–10:00am) / Sunday Midday Peak Hour Traffic (12:30pm–1:30pm)

Note: These volumes are the sum of the volumes in Figures 4c and 7b.

Figure 8c

Year 2025 Sunday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

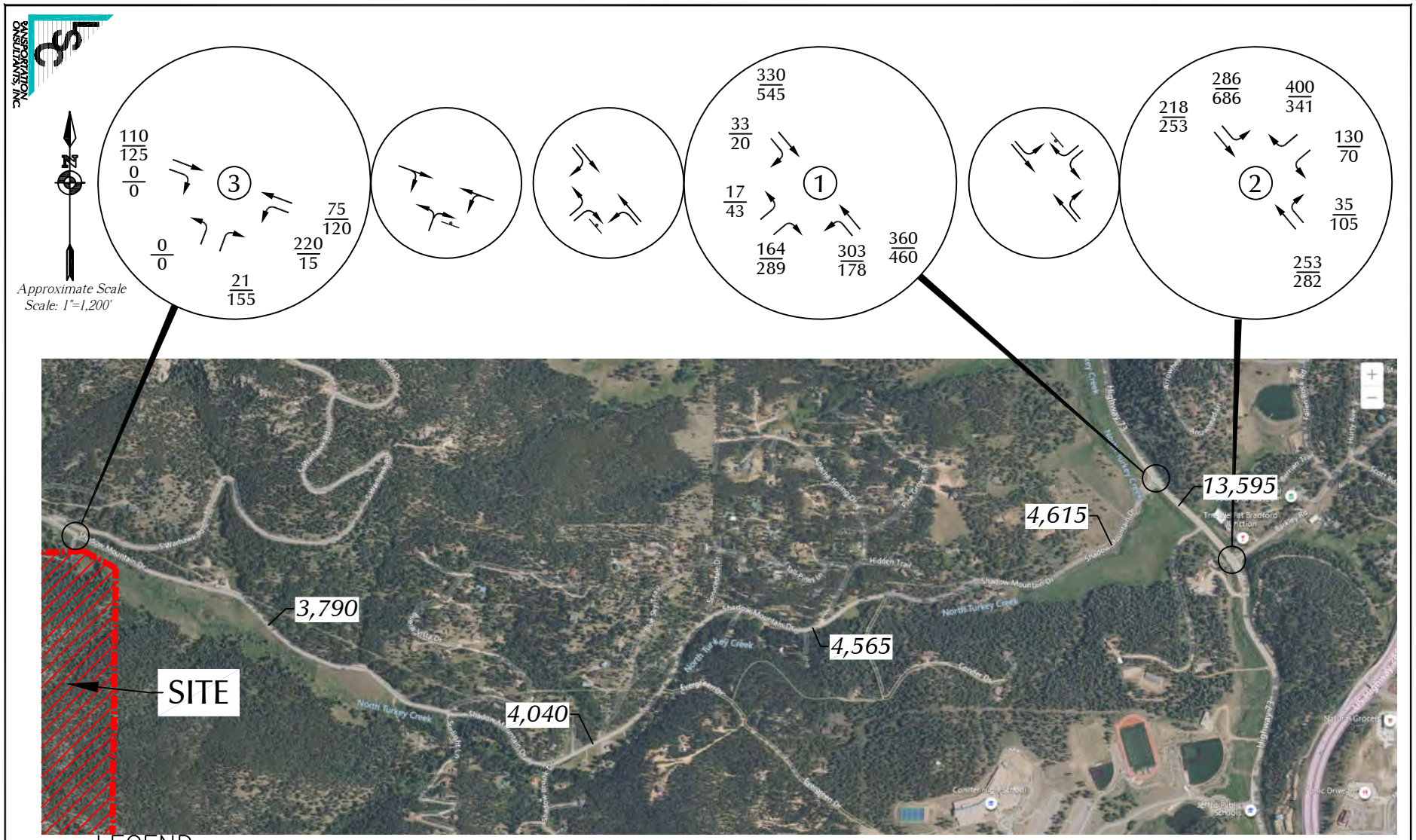
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)

Note: These volumes are the sum of the volumes in Figures 5a and 7a.

Figure 9a

Year 2042 Weekday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

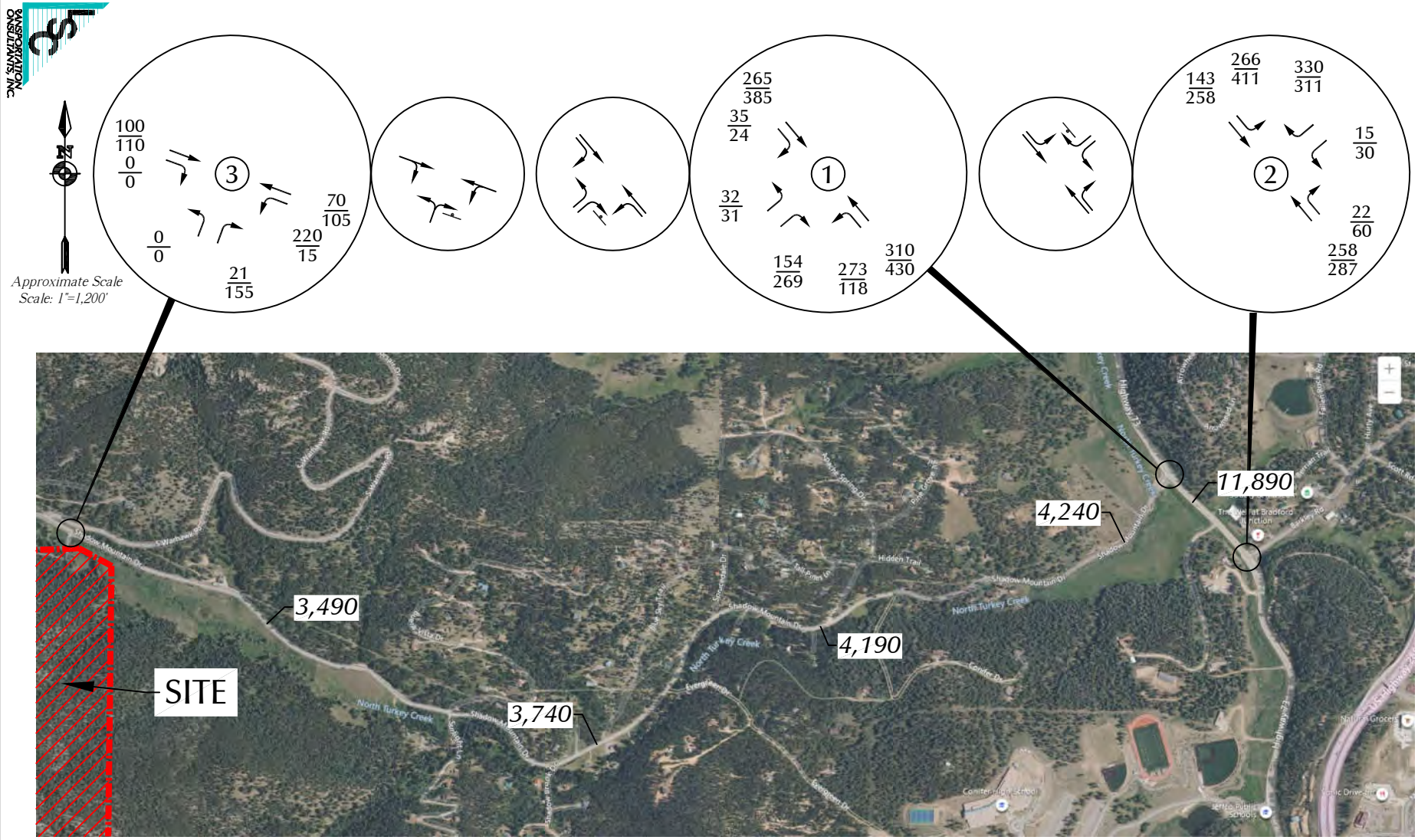
$\frac{26}{35}$ = Saturday Morning Peak Hour Traffic (9:00am–10:00am) / Saturday Midday Peak Hour Traffic (12:00pm–1:00pm)

Note: These volumes are the sum of the volumes in Figures 5b and 7b.

Figure 9b

Year 2042 Saturday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

$\frac{26}{35}$ = Sunday Morning Peak Hour Traffic (9:00am–10:00am) / Sunday Midday Peak Hour Traffic (12:30pm–1:30pm)

Note: These volumes are the sum of the volumes in Figures 5c and 7b.

Figure 9c

Year 2042 Sunday Total Traffic

Shadow Mountain Bike Park (LSC #220850)

Note: The recommended mitigation is to add a left-turn acceleration lane on County Highway 73.

Figure 10

Recommended Improvements Intersection CH 73/Shadow Mountain Dr.

Shadow Mountain Bike Park (LSC #220850)

Note: The recommended mitigation is to add a left-turn acceleration lane on County Highway 73.

Figure 11

Recommended Improvements Intersection CH 73/Barkley Rd.

Shadow Mountain Bike Park (LSC #220850)

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK
Site Code : 00000025
Start Date : 8/24/2022
Page No : 1

Groups Printed- VEHICLES

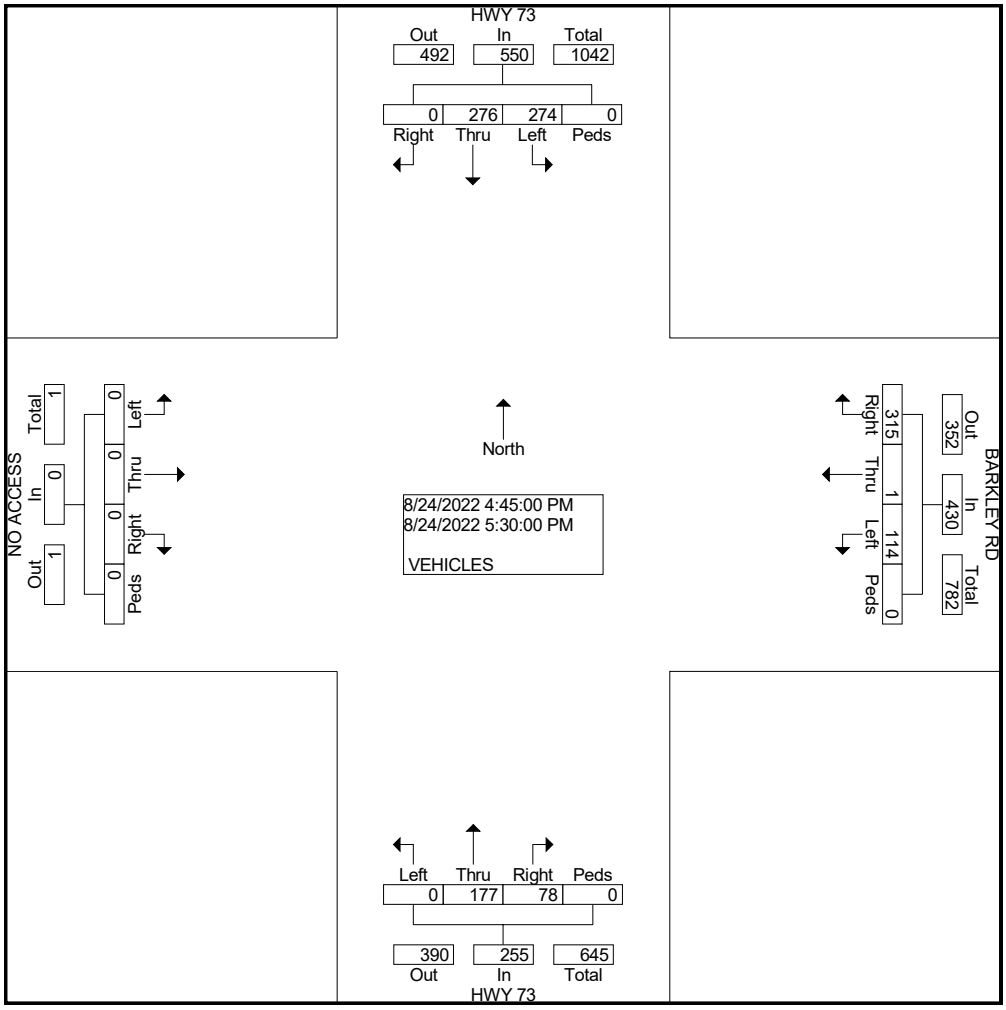
	HWY 73 Southbound				BARKLEY RD Westbound				HWY 73 Northbound				NO ACCESS Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	66	69	0	0	8	0	59	0	0	51	9	0	0	0	0	0	262
04:15 PM	67	56	0	0	7	0	65	0	0	51	15	1	0	0	0	0	262
04:30 PM	65	50	0	0	12	0	66	0	0	50	22	0	0	0	0	0	265
04:45 PM	66	65	0	0	25	0	96	0	0	31	19	0	0	0	0	0	302
Total	264	240	0	0	52	0	286	0	0	183	65	1	0	0	0	0	1091
05:00 PM	66	76	0	0	32	1	84	0	0	43	16	0	0	0	0	0	318
05:15 PM	63	74	0	0	36	0	70	0	0	44	20	0	0	0	0	0	307
05:30 PM	79	61	0	0	21	0	65	0	0	59	23	0	0	0	0	0	308
05:45 PM	68	60	0	0	12	0	82	0	0	47	22	0	0	0	0	0	291
Total	276	271	0	0	101	1	301	0	0	193	81	0	0	0	0	0	1224
Grand Total	540	511	0	0	153	1	587	0	0	376	146	1	0	0	0	0	2315
Apprch %	51.4	48.6	0.0	0.0	20.6	0.1	79.2	0.0	0.0	71.9	27.9	0.2	0.0	0.0	0.0	0.0	
Total %	23.3	22.1	0.0	0.0	6.6	0.0	25.4	0.0	0.0	16.2	6.3	0.0	0.0	0.0	0.0	0.0	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK
Site Code : 00000025
Start Date : 8/24/2022
Page No : 2

	HWY 73 Southbound					BARKLEY RD Westbound					HWY 73 Northbound					NO ACCESS Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	274	276	0	0	550	114	1	315	0	430	0	177	78	0	255	0	0	0	0	0	1235
Percent	49.8	50.2	0.0	0.0		26.5	0.2	73.3	0.0		0.0	69.4	30.6	0.0		0.0	0.0	0.0	0.0		
05:00 Volume	66	76	0	0	142	32	1	84	0	117	0	43	16	0	59	0	0	0	0	0	318
Peak Factor																					0.971
High Int.	05:00 PM					04:45 PM					05:30 PM					3:45:00 PM					
Volume	66	76	0	0	142	25	0	96	0	121	0	59	23	0	82						
Peak Factor					0.968					0.888					0.777						



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: SHADOW MTN DR
E/W STREET: HWY 73
CITY: CONIFER
COUNTY: JEFFERSON

File Name : SHAD73PM2
Site Code : 00000020
Start Date : 8/24/2022
Page No : 1

Groups Printed- VEHICLES

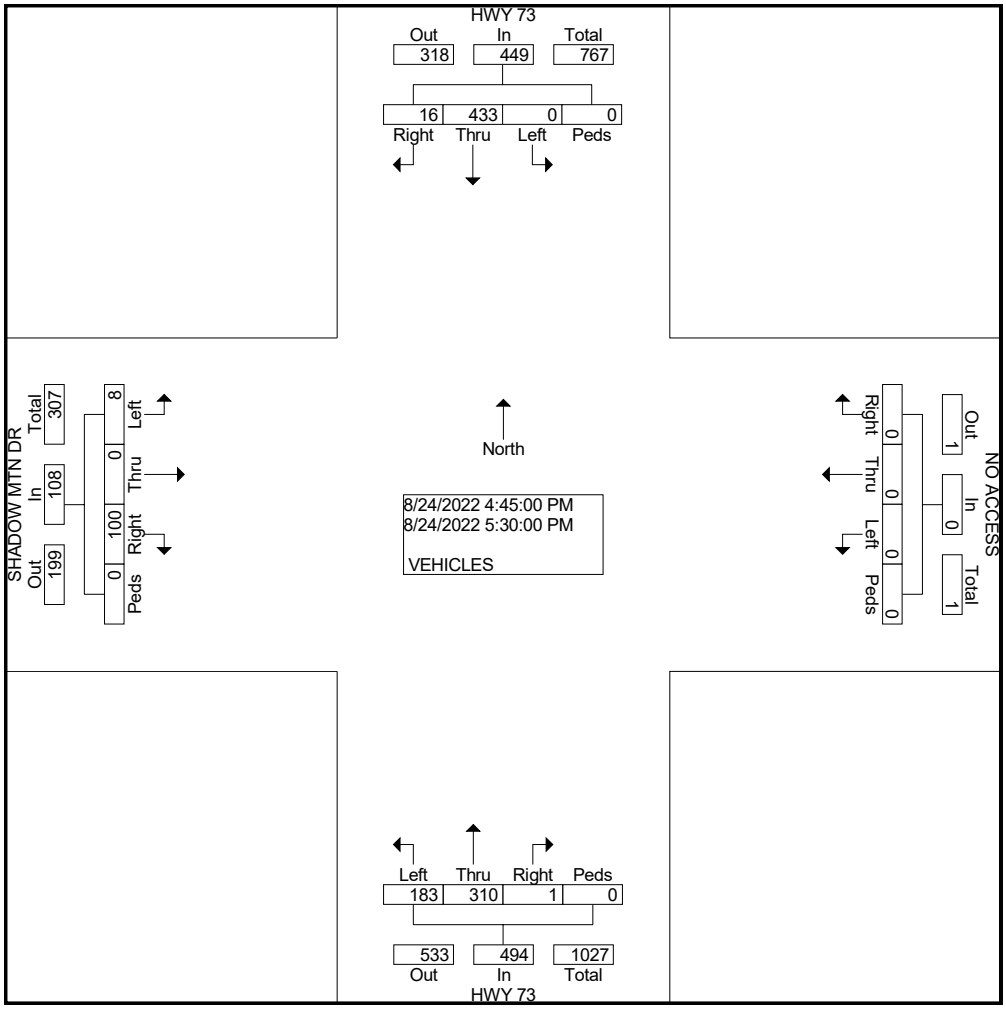
	HWY 73 Southbound				NO ACCESS Westbound				HWY 73 Northbound				SHADOW MTN DR Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	101	4	0	0	0	0	0	30	85	0	0	7	0	20	0	247
04:15 PM	0	98	6	0	0	0	0	0	44	77	0	1	4	0	27	0	257
04:30 PM	0	95	6	0	0	0	0	0	40	82	0	0	7	0	19	0	249
04:45 PM	0	101	6	0	0	0	0	0	56	73	0	0	6	0	25	0	267
Total	0	395	22	0	0	0	0	0	170	317	0	1	24	0	91	0	1020
05:00 PM	0	121	4	0	0	0	0	0	32	89	1	0	1	0	23	0	271
05:15 PM	0	104	5	0	0	0	0	0	45	68	0	0	1	0	30	0	253
05:30 PM	0	107	1	0	0	0	0	0	50	80	0	0	0	0	22	0	260
05:45 PM	0	101	7	0	0	0	0	0	43	91	0	0	1	0	24	0	267
Total	0	433	17	0	0	0	0	0	170	328	1	0	3	0	99	0	1051
Grand Total	0	828	39	0	0	0	0	0	340	645	1	1	27	0	190	0	2071
Apprch %	0.0	95.5	4.5	0.0	0.0	0.0	0.0	0.0	34.4	65.3	0.1	0.1	12.4	0.0	87.6	0.0	
Total %	0.0	40.0	1.9	0.0	0.0	0.0	0.0	0.0	16.4	31.1	0.0	0.0	1.3	0.0	9.2	0.0	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: SHADOW MTN DR
E/W STREET: HWY 73
CITY: CONIFER
COUNTY: JEFFERSON

File Name : SHAD73PM2
Site Code : 00000020
Start Date : 8/24/2022
Page No : 2

	HWY 73 Southbound					NO ACCESS Westbound					HWY 73 Northbound					SHADOW MTN DR Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	0	433	16	0	449	0	0	0	0	0	183	310	1	0	494	8	0	100	0	108	1051
Percent	0.0	96.4	3.6	0.0		0.0	0.0	0.0	0.0		37.0	62.8	0.2	0.0		7.4	0.0	92.6	0.0		
05:00 Volume	0	121	4	0	125	0	0	0	0	0	32	89	1	0	122	1	0	23	0	24	271
Peak Factor																					0.970
High Int.	05:00 PM					3:45:00 PM					05:30 PM					04:45 PM					
Volume	0	121	4	0	125	0	0	0	0	0	50	80	0	0	130	6	0	25	0	31	
Peak Factor					0.898										0.950					0.871	



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK0827
Site Code : 00000013
Start Date : 8/27/2022
Page No : 1

Groups Printed- VEHICLES

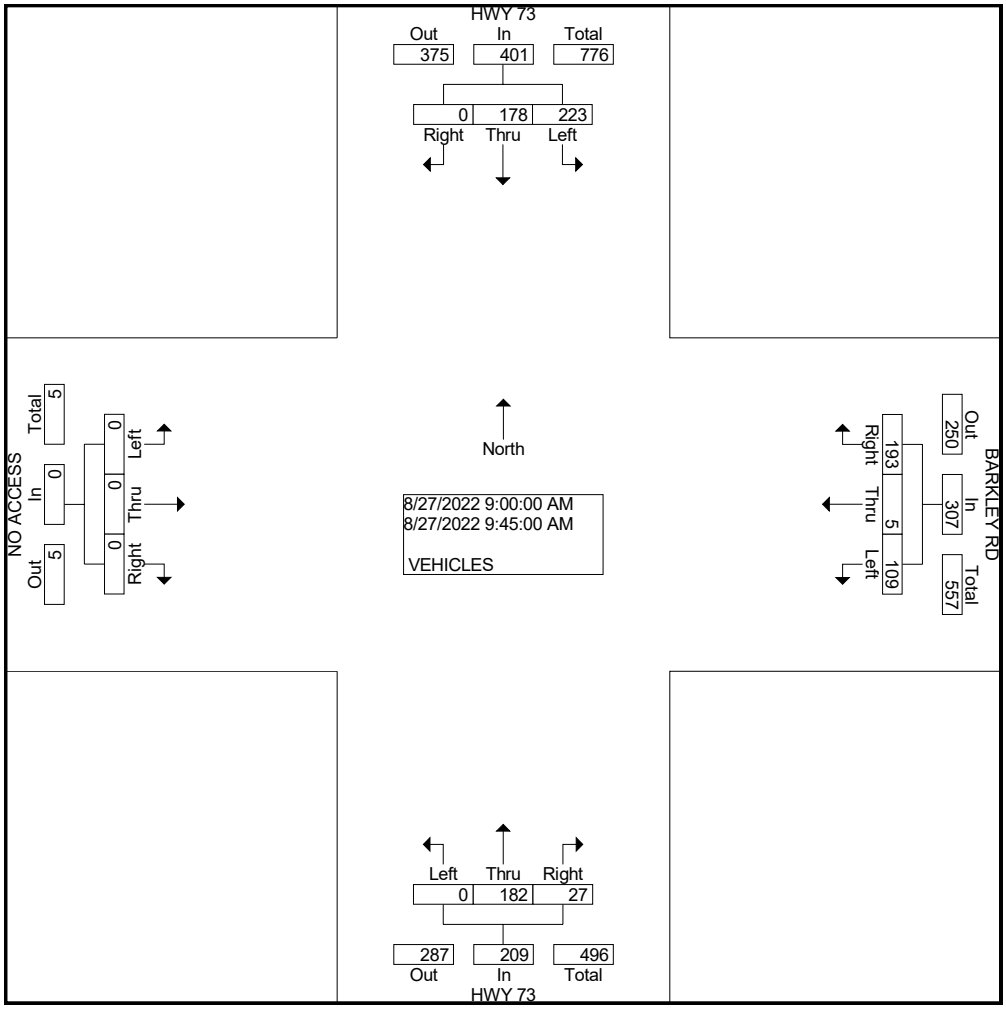
	HWY 73 Southbound			BARKLEY RD Westbound			HWY 73 Northbound			NO ACCESS Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
08:00 AM	41	22	0	5	0	28	0	24	2	0	0	0	122
08:15 AM	40	26	0	5	0	30	0	37	3	0	0	0	141
08:30 AM	30	36	0	19	1	42	0	30	9	0	0	0	167
08:45 AM	63	35	0	14	1	36	0	39	16	0	0	0	204
Total	174	119	0	43	2	136	0	130	30	0	0	0	634
09:00 AM	44	25	0	8	0	34	0	31	7	0	0	0	149
09:15 AM	62	41	0	31	0	55	0	45	4	0	0	0	238
09:30 AM	55	48	0	24	1	53	0	54	10	0	0	0	245
09:45 AM	62	64	0	46	4	51	0	52	6	0	0	0	285
Total	223	178	0	109	5	193	0	182	27	0	0	0	917
12:00 PM	67	44	0	21	0	58	0	63	17	0	0	0	270
12:15 PM	71	44	0	15	0	75	0	54	7	0	0	0	266
12:30 PM	241	52	0	5	0	56	0	48	25	0	0	0	427
12:45 PM	88	48	0	17	0	82	0	66	39	0	0	0	340
Total	467	188	0	58	0	271	0	231	88	0	0	0	1303
01:00 PM	70	60	0	18	1	59	0	43	18	0	0	0	269
01:15 PM	63	60	0	4	0	70	0	51	10	0	0	0	258
01:30 PM	75	43	0	7	0	73	0	52	12	0	0	0	262
01:45 PM	74	52	0	17	0	165	0	49	10	0	0	0	367
Total	282	215	0	46	1	367	0	195	50	0	0	0	1156
Grand Total	1146	700	0	256	8	967	0	738	195	0	0	0	4010
Apprch %	62.1	37.9	0.0	20.8	0.6	78.6	0.0	79.1	20.9	0.0	0.0	0.0	
Total %	28.6	17.5	0.0	6.4	0.2	24.1	0.0	18.4	4.9	0.0	0.0	0.0	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK0827
Site Code : 00000013
Start Date : 8/27/2022
Page No : 2

	HWY 73 Southbound				BARKLEY RD Westbound				HWY 73 Northbound				NO ACCESS Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 08:00 AM to 09:45 AM - Peak 1 of 1																	
Intersection	09:00 AM																
Volume	223	178	0	401	109	5	193	307	0	182	27	209	0	0	0	0	917
Percent	55.6	44.4	0.0		35.5	1.6	62.9		0.0	87.1	12.9		0.0	0.0	0.0		
09:45 Volume	62	64	0	126	46	4	51	101	0	52	6	58	0	0	0	0	285
Peak Factor																	0.804
High Int.	09:45 AM				09:45 AM				09:30 AM				7:45:00 AM				
Volume	62	64	0	126	46	4	51	101	0	54	10	64					
Peak Factor				0.796				0.760				0.816					

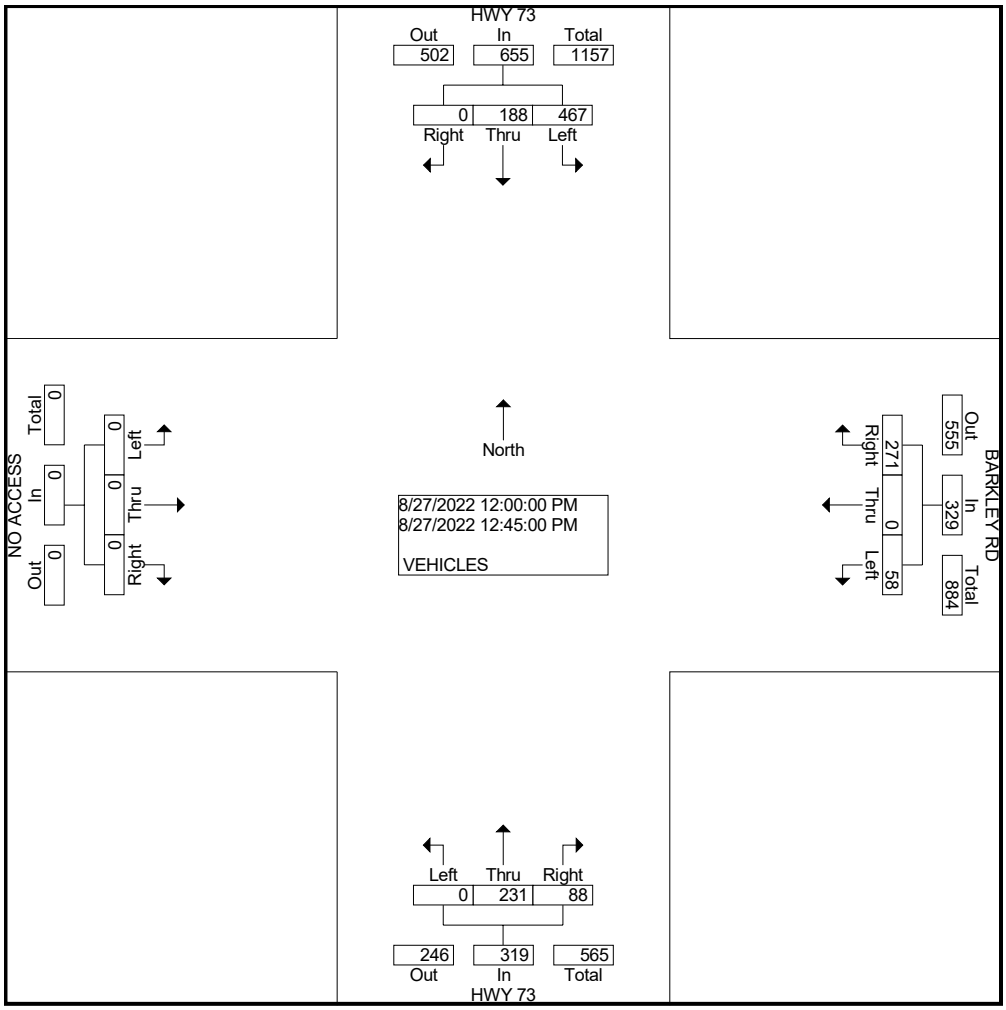


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK0827
Site Code : 00000013
Start Date : 8/27/2022
Page No : 3

	HWY 73 Southbound				BARKLEY RD Westbound				HWY 73 Northbound				NO ACCESS Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 12:00 PM to 01:45 PM - Peak 1 of 1																	
Intersection	12:00 PM																
Volume	467	188	0	655	58	0	271	329	0	231	88	319	0	0	0	0	1303
Percent	71.3	28.7	0.0		17.6	0.0	82.4		0.0	72.4	27.6		0.0	0.0	0.0		
12:30 Volume	241	52	0	293	5	0	56	61	0	48	25	73	0	0	0	0	427
Peak Factor																	0.763
High Int.	12:30 PM				12:45 PM				12:45 PM								
Volume	241	52	0	293	17	0	82	99	0	66	39	105					
Peak Factor				0.559				0.831				0.760					



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK0828
Site Code : 00000013
Start Date : 8/28/2022
Page No : 1

Groups Printed- VEHICLES

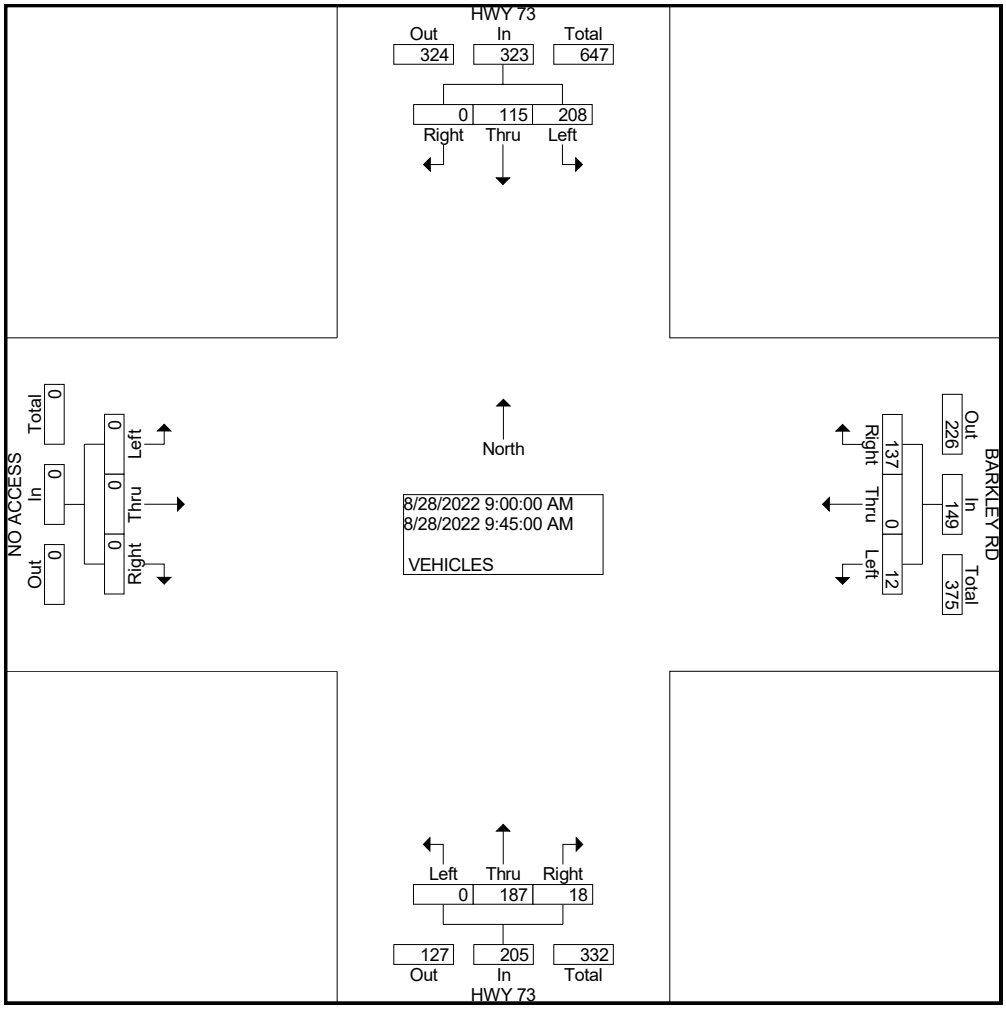
	HWY 73 Southbound			BARKLEY RD Westbound			HWY 73 Northbound			NO ACCESS Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
08:00 AM	37	18	0	0	0	25	0	19	4	0	0	0	103
08:15 AM	31	14	0	3	0	22	0	23	1	0	0	0	94
08:30 AM	31	25	0	1	0	29	0	26	6	0	0	0	118
08:45 AM	38	34	0	0	0	26	0	35	12	0	0	0	145
Total	137	91	0	4	0	102	0	103	23	0	0	0	460
09:00 AM	33	27	0	1	0	28	0	27	4	0	0	0	120
09:15 AM	74	23	0	1	0	36	0	36	4	0	0	0	174
09:30 AM	47	27	0	4	0	29	0	61	6	0	0	0	174
09:45 AM	54	38	0	6	0	44	0	63	4	0	0	0	209
Total	208	115	0	12	0	137	0	187	18	0	0	0	677
12:00 PM	52	59	0	12	0	62	0	48	10	0	0	0	243
12:15 PM	63	58	0	6	0	38	0	58	10	0	0	0	233
12:30 PM	53	51	0	7	0	59	0	57	10	0	0	0	237
12:45 PM	54	43	0	8	0	76	0	57	16	0	0	0	254
Total	222	211	0	33	0	235	0	220	46	0	0	0	967
01:00 PM	79	46	0	5	0	60	0	65	6	0	0	0	261
01:15 PM	56	53	0	4	1	53	0	56	17	0	0	0	240
01:30 PM	45	45	0	5	1	57	0	51	10	0	0	0	214
01:45 PM	52	41	0	0	0	52	0	45	12	0	0	0	202
Total	232	185	0	14	2	222	0	217	45	0	0	0	917
Grand Total	799	602	0	63	2	696	0	727	132	0	0	0	3021
Apprch %	57.0	43.0	0.0	8.3	0.3	91.5	0.0	84.6	15.4	0.0	0.0	0.0	
Total %	26.4	19.9	0.0	2.1	0.1	23.0	0.0	24.1	4.4	0.0	0.0	0.0	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK0828
Site Code : 00000013
Start Date : 8/28/2022
Page No : 2

	HWY 73 Southbound				BARKLEY RD Westbound				HWY 73 Northbound				NO ACCESS Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 08:00 AM to 09:45 AM - Peak 1 of 1																	
Intersection	09:00 AM																
Volume	208	115	0	323	12	0	137	149	0	187	18	205	0	0	0	0	677
Percent	64.4	35.6	0.0		8.1	0.0	91.9		0.0	91.2	8.8		0.0	0.0	0.0		
09:45 Volume	54	38	0	92	6	0	44	50	0	63	4	67	0	0	0	0	209
Peak Factor																	0.810
High Int.	09:15 AM				09:45 AM				09:30 AM				7:45:00 AM				
Volume	74	23	0	97	6	0	44	50	0	61	6	67					
Peak Factor				0.832				0.745				0.765					

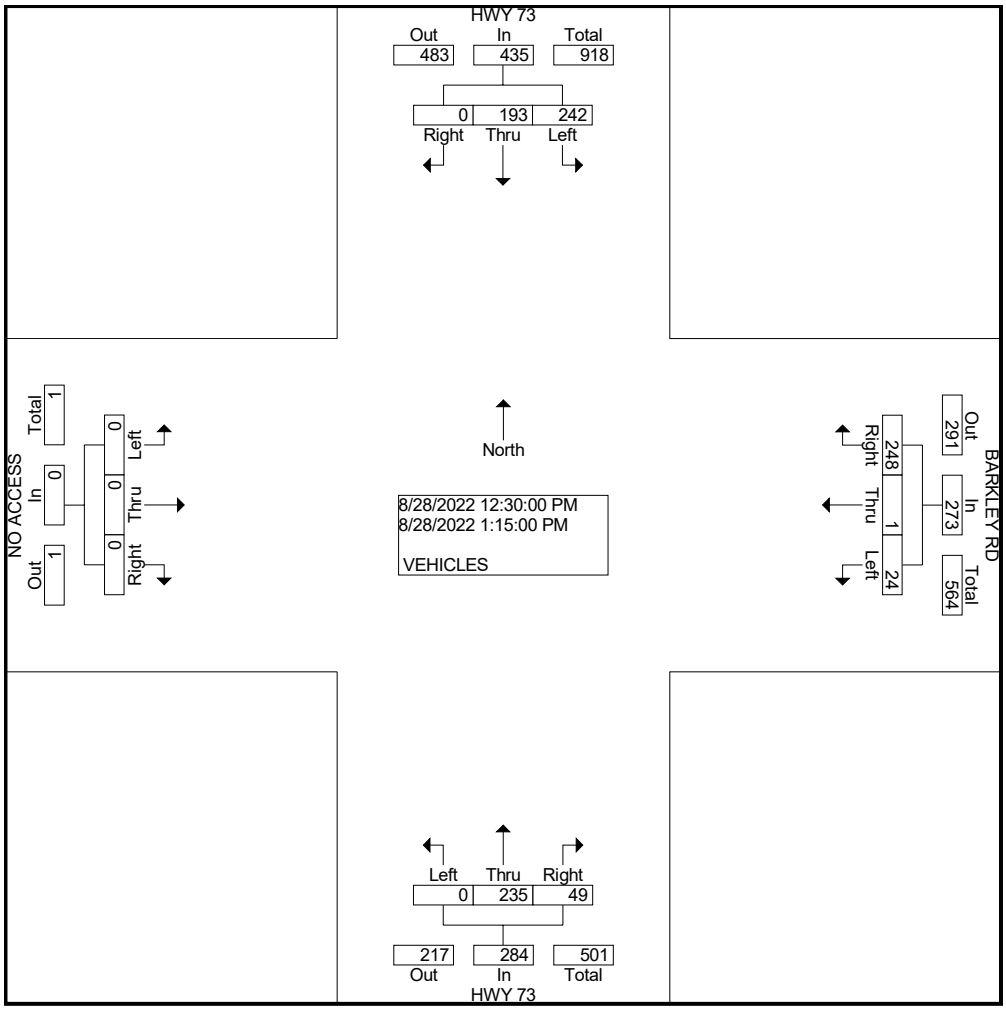


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: BARKLEY RD
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73BARK0828
Site Code : 00000013
Start Date : 8/28/2022
Page No : 3

	HWY 73 Southbound				BARKLEY RD Westbound				HWY 73 Northbound				NO ACCESS Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 12:00 PM to 01:45 PM - Peak 1 of 1																	
Intersection	12:30 PM																
Volume	242	193	0	435	24	1	248	273	0	235	49	284	0	0	0	0	992
Percent	55.6	44.4	0.0		8.8	0.4	90.8		0.0	82.7	17.3		0.0	0.0	0.0		
01:00 Volume	79	46	0	125	5	0	60	65	0	65	6	71	0	0	0	0	261
Peak Factor																	0.950
High Int.	01:00 PM				12:45 PM				12:45 PM								
Volume	79	46	0	125	8	0	76	84	0	57	16	73					
Peak Factor				0.870				0.813				0.973					



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: SHADOW MOUNTAIN DR
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73SHADOW 0827
Site Code : 00000011
Start Date : 8/27/2022
Page No : 1

Groups Printed- VEHICLES

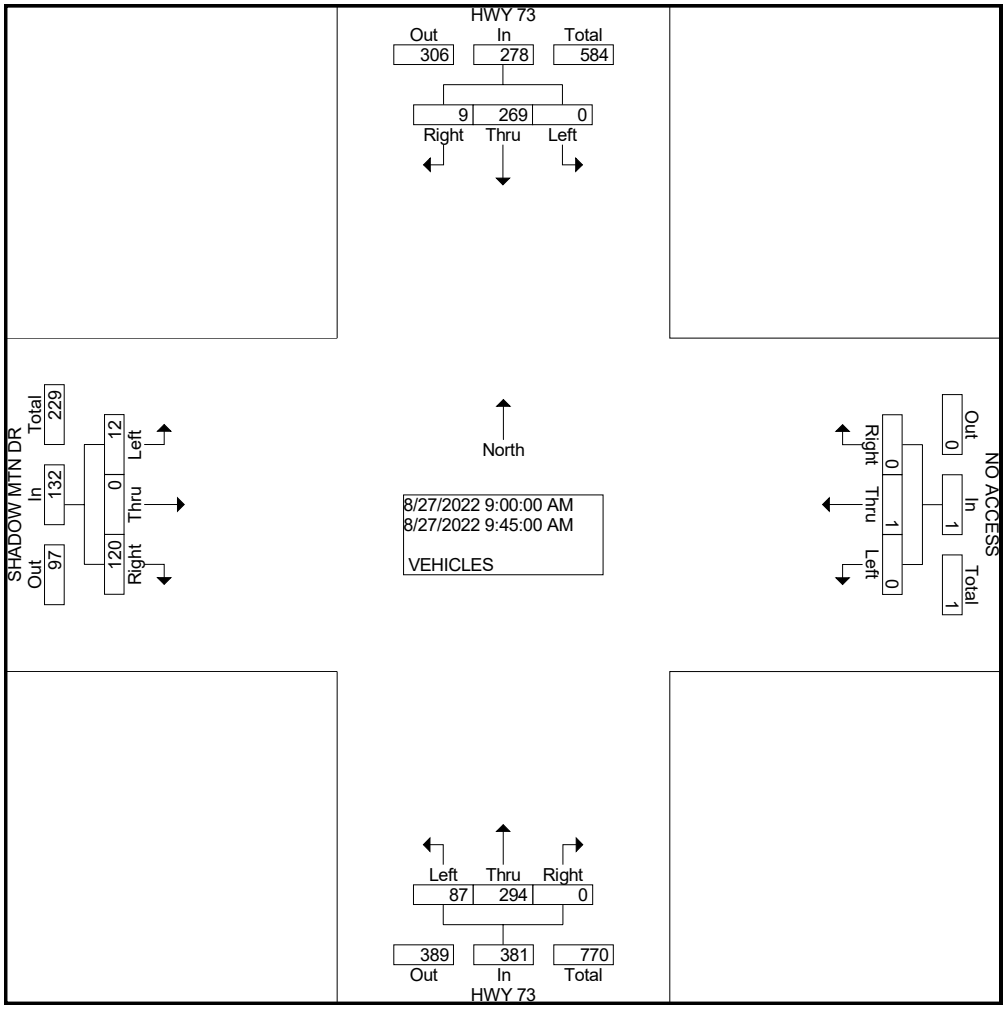
	HWY 73 Southbound			NO ACCESS Westbound			HWY 73 Northbound			SHADOW MTN DR Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
08:00 AM	0	37	1	0	0	0	10	40	0	6	0	20	114
08:15 AM	0	44	1	0	0	0	16	55	0	3	0	22	141
08:30 AM	0	43	2	0	0	0	16	60	0	6	0	32	159
08:45 AM	0	68	2	0	0	0	21	50	0	6	0	22	169
Total	0	192	6	0	0	0	63	205	0	21	0	96	583
09:00 AM	0	39	1	0	1	0	14	47	0	1	0	29	132
09:15 AM	0	71	4	0	0	0	23	81	0	5	0	30	214
09:30 AM	0	75	2	0	0	0	24	94	0	1	0	29	225
09:45 AM	0	84	2	0	0	0	26	72	0	5	0	32	221
Total	0	269	9	0	1	0	87	294	0	12	0	120	792
12:00 PM	0	78	3	0	0	0	30	89	0	6	0	29	235
12:15 PM	0	72	3	0	0	0	38	89	0	2	0	29	233
12:30 PM	0	218	3	0	0	0	31	83	0	6	0	24	365
12:45 PM	0	81	6	0	0	0	35	115	0	8	0	41	286
Total	0	449	15	0	0	0	134	376	0	22	0	123	1119
01:00 PM	0	99	4	0	0	0	33	71	0	5	0	34	246
01:15 PM	0	82	5	0	0	0	38	94	0	6	0	30	255
01:30 PM	0	89	7	0	0	0	30	88	0	4	0	32	250
01:45 PM	0	95	2	0	0	0	32	176	0	4	0	25	334
Total	0	365	18	0	0	0	133	429	0	19	0	121	1085
Grand Total	0	1275	48	0	1	0	417	1304	0	74	0	460	3579
Apprch %	0.0	96.4	3.6	0.0	100.0	0.0	24.2	75.8	0.0	13.9	0.0	86.1	
Total %	0.0	35.6	1.3	0.0	0.0	0.0	11.7	36.4	0.0	2.1	0.0	12.9	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: SHADOW MOUNTAIN DR
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73SHADOW 0827
Site Code : 00000011
Start Date : 8/27/2022
Page No : 2

	HWY 73 Southbound				NO ACCESS Westbound				HWY 73 Northbound				SHADOW MTN DR Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 09:00 AM to 09:45 AM - Peak 1 of 1																	
Intersection	09:00 AM																
Volume	0	269	9	278	0	1	0	1	87	294	0	381	12	0	120	132	792
Percent	0.0	96.8	3.2		0.0	100.0	0.0		22.8	77.2	0.0		9.1	0.0	90.9		
09:30 Volume	0	75	2	77	0	0	0	0	24	94	0	118	1	0	29	30	225
Peak Factor																	0.880
High Int.	09:45 AM				09:00 AM				09:30 AM				09:45 AM				
Volume	0	84	2	86	0	1	0	1	24	94	0	118	5	0	32	37	
Peak Factor				0.808				0.250				0.807				0.892	

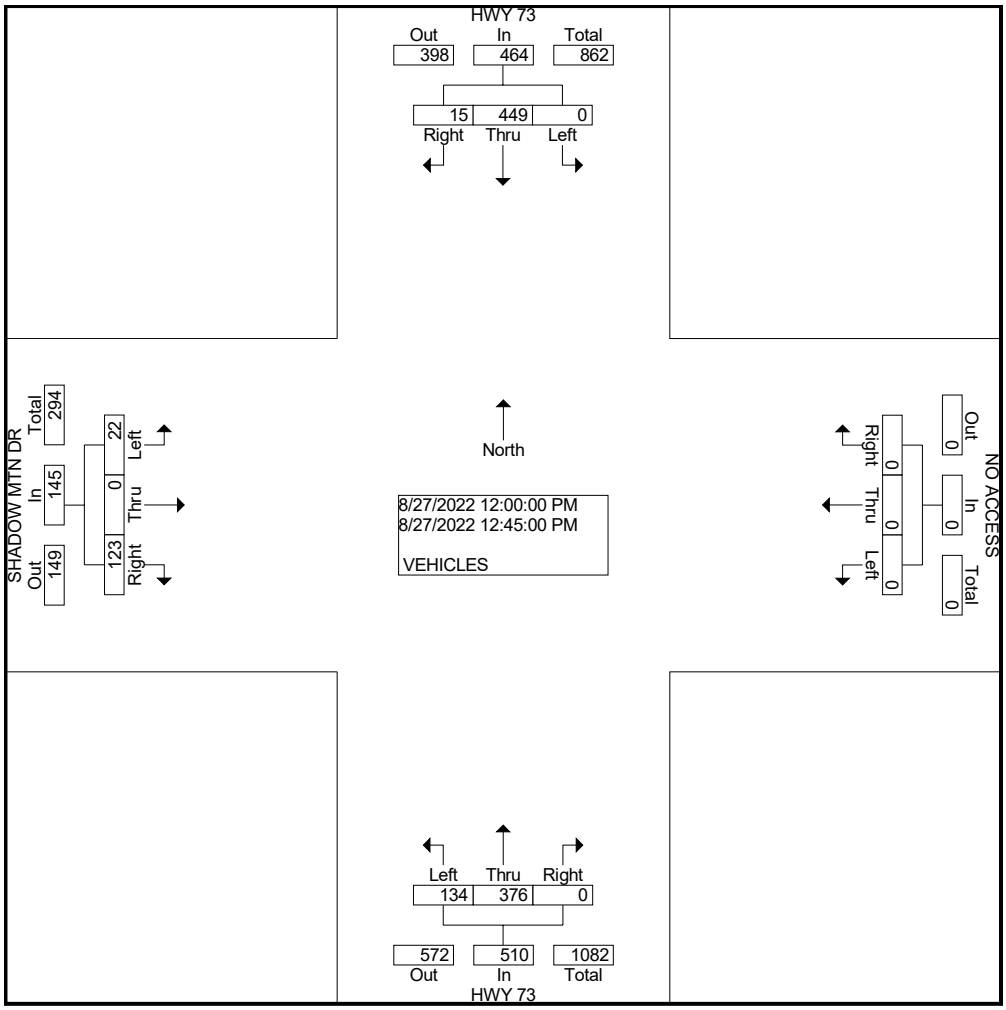


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: SHADOW MOUNTAIN DR
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73SHADOW 0827
Site Code : 00000011
Start Date : 8/27/2022
Page No : 3

	HWY 73 Southbound				NO ACCESS Westbound				HWY 73 Northbound				SHADOW MTN DR Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 12:00 PM to 12:45 PM - Peak 1 of 1																	
Intersection	12:00 PM																
Volume	0	449	15	464	0	0	0	0	134	376	0	510	22	0	123	145	1119
Percent	0.0	96.8	3.2		0.0	0.0	0.0		26.3	73.7	0.0		15.2	0.0	84.8		
12:30 Volume	0	218	3	221	0	0	0	0	31	83	0	114	6	0	24	30	365
Peak Factor																	0.766
High Int.	12:30 PM								12:45 PM				12:45 PM				
Volume	0	218	3	221	0	0	0	0	35	115	0	150	8	0	41	49	
Peak Factor				0.525								0.850				0.740	



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: SHADOW MOUNTAIN DR
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73SHADOW0828
Site Code : 00000112
Start Date : 8/28/2022
Page No : 1

Groups Printed- VEHICLES

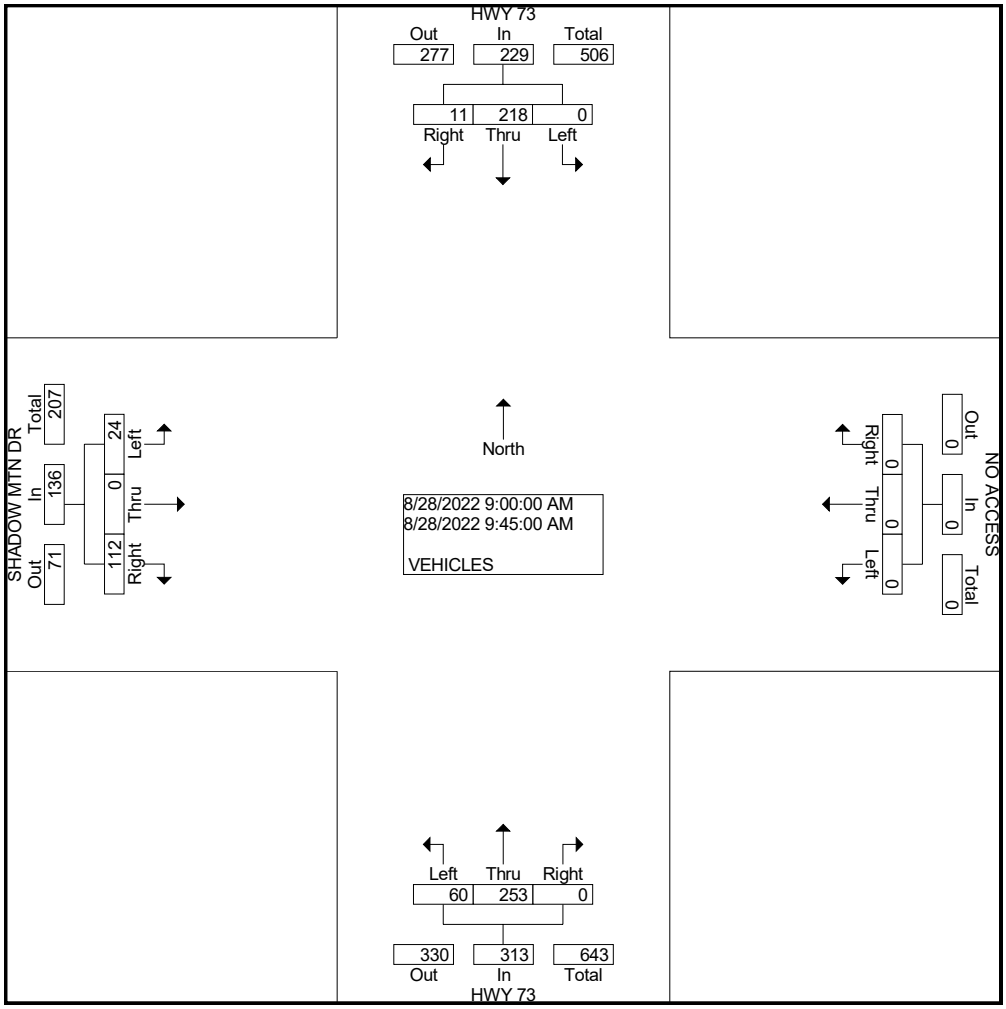
	HWY 73 Southbound			NO ACCESS Westbound			HWY 73 Northbound			SHADOW MTN DR Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
08:00 AM	0	34	0	0	0	0	10	33	0	1	0	16	94
08:15 AM	0	32	2	0	0	0	11	34	0	1	0	16	96
08:30 AM	0	44	2	0	0	0	10	44	0	1	0	15	116
08:45 AM	0	56	2	0	0	0	11	52	0	2	0	17	140
Total	0	166	6	0	0	0	42	163	0	5	0	64	446
09:00 AM	0	41	5	0	0	0	9	41	0	2	0	19	117
09:15 AM	0	68	2	0	0	0	23	53	0	5	0	28	179
09:30 AM	0	48	0	0	0	0	13	78	0	7	0	35	181
09:45 AM	0	61	4	0	0	0	15	81	0	10	0	30	201
Total	0	218	11	0	0	0	60	253	0	24	0	112	678
12:00 PM	0	83	3	0	0	0	18	88	0	2	0	23	217
12:15 PM	0	92	3	0	0	0	32	69	0	3	0	23	222
12:30 PM	0	71	1	0	1	0	32	85	0	1	0	27	218
12:45 PM	0	81	7	0	0	0	33	97	0	1	0	24	243
Total	0	327	14	0	1	0	115	339	0	7	0	97	900
01:00 PM	0	87	6	0	0	0	39	84	0	4	0	32	252
01:15 PM	0	76	4	0	0	0	27	88	0	6	0	25	226
01:30 PM	0	71	4	0	0	0	32	77	0	4	0	17	205
01:45 PM	0	74	6	0	0	0	26	72	0	5	0	21	204
Total	0	308	20	0	0	0	124	321	0	19	0	95	887
Grand Total	0	1019	51	0	1	0	341	1076	0	55	0	368	2911
Apprch %	0.0	95.2	4.8	0.0	100.0	0.0	24.1	75.9	0.0	13.0	0.0	87.0	
Total %	0.0	35.0	1.8	0.0	0.0	0.0	11.7	37.0	0.0	1.9	0.0	12.6	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: SHADOW MOUNTAIN DR
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73SHADOW0828
Site Code : 00000112
Start Date : 8/28/2022
Page No : 2

	HWY 73 Southbound				NO ACCESS Westbound				HWY 73 Northbound				SHADOW MTN DR Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 09:00 AM to 09:45 AM - Peak 1 of 1																	
Intersection	09:00 AM																
Volume	0	218	11	229	0	0	0	0	60	253	0	313	24	0	112	136	678
Percent	0.0	95.2	4.8		0.0	0.0	0.0		19.2	80.8	0.0		17.6	0.0	82.4		
09:45 Volume	0	61	4	65	0	0	0	0	15	81	0	96	10	0	30	40	201
Peak Factor																	0.843
High Int.	09:15 AM								09:45 AM				09:30 AM				
Volume	0	68	2	70	0	0	0	0	15	81	0	96	7	0	35	42	
Peak Factor				0.818								0.815				0.810	

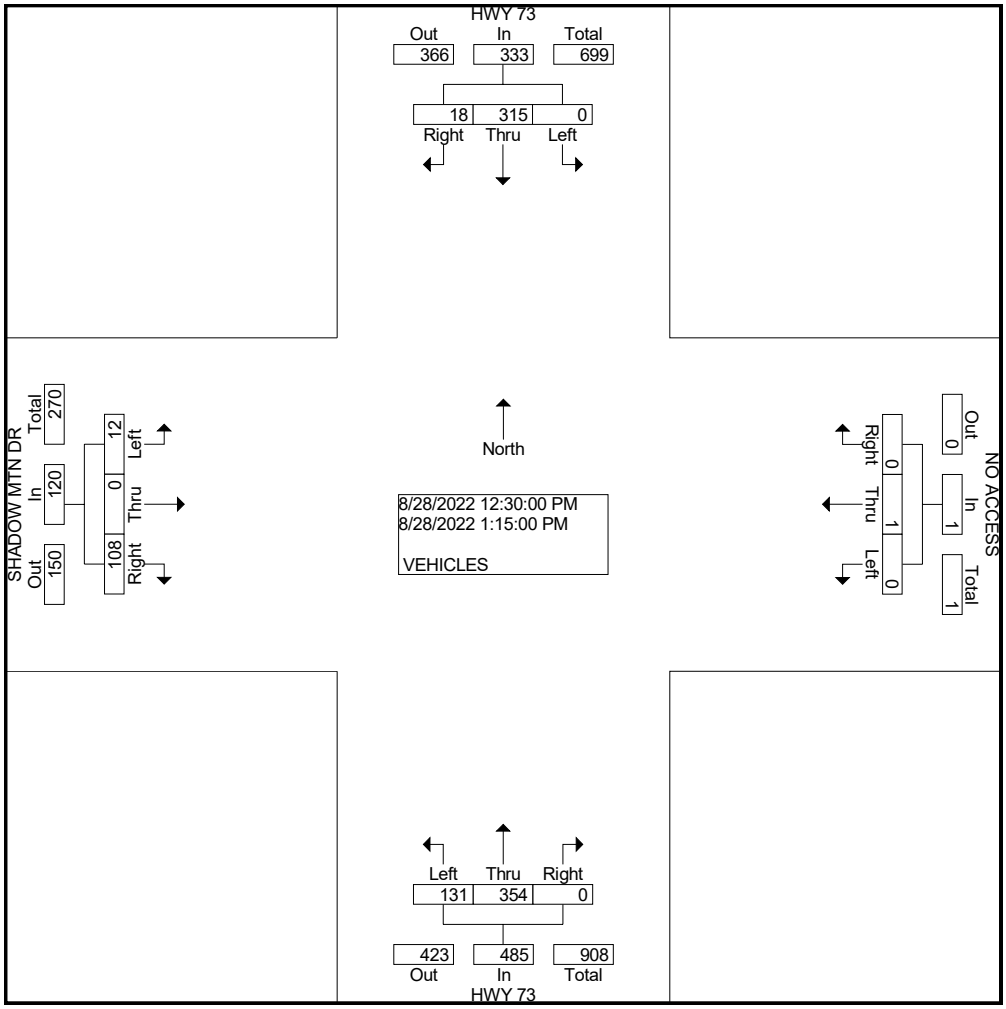


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HWY 73
E/W STREET: SHADOW MOUNTAIN DR
CITY: CONIFER
COUNTY: JEFFERSON

File Name : HWY73SHADOW0828
Site Code : 00000112
Start Date : 8/28/2022
Page No : 3

	HWY 73 Southbound				NO ACCESS Westbound				HWY 73 Northbound				SHADOW MTN DR Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 12:30 PM to 01:15 PM - Peak 1 of 1																	
Intersection	12:30 PM																
Volume	0	315	18	333	0	1	0	1	131	354	0	485	12	0	108	120	939
Percent	0.0	94.6	5.4		0.0	100.0	0.0		27.0	73.0	0.0		10.0	0.0	90.0		
01:00 Volume	0	87	6	93	0	0	0	0	39	84	0	123	4	0	32	36	252
Peak Factor																	0.932
High Int.	01:00 PM				12:30 PM				12:45 PM				01:00 PM				
Volume	0	87	6	93	0	1	0	1	33	97	0	130	4	0	32	36	
Peak Factor				0.895				0.250				0.933				0.833	



COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: HWY 73 N-O BARKLEY RD
City: CONIFER
County: JEFFERSON
Direction: NORTH/SOUTH

Site Code: 222208
Station ID: 222208

Start Time	22-Aug-22 Mon	NORTH	SOUTH							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
12:00 PM		*	*							*
01:00		*	*							*
02:00		488	370							858
03:00		**545**	345							**890**
04:00		501	381							882
05:00		454	**429**							883
06:00		260	378							638
07:00		159	190							349
08:00		127	135							262
09:00		43	78							121
10:00		29	30							59
11:00		10	21							31
Total		2616	2357							4973
Percent		52.6%	47.4%							
AM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
PM Peak	-	15:00	17:00	-	-	-	-	-	-	15:00
Vol.	-	545	429	-	-	-	-	-	-	890

Location: HWY 73 N-O BARKLEY RD
City: CONIFER
County: JEFFERSON
Direction: NORTH/SOUTH

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222208
Station ID: 222208

Start Time	23-Aug-22 Tue	NORTH	SOUTH							Total
12:00 AM		10	10							20
01:00		6	6							12
02:00		6	1							7
03:00		5	5							10
04:00		40	12							52
05:00		88	42							130
06:00		237	118							355
07:00		**552**	**389**							**941**
08:00		391	371							762
09:00		375	304							679
10:00		390	273							663
11:00		445	312							757
12:00 PM		441	278							719
01:00		503	244							747
02:00		547	298							845
03:00		**599**	356							955
04:00		581	359							940
05:00		549	**424**							**973**
06:00		365	335							700
07:00		244	239							483
08:00		148	206							354
09:00		73	97							170
10:00		15	51							66
11:00		16	36							52
Total		6626	4766							11392
Percent		58.2%	41.8%							
AM Peak	-	07:00	07:00	-	-	-	-	-	-	07:00
Vol.	-	552	389	-	-	-	-	-	-	941
PM Peak	-	15:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	599	424	-	-	-	-	-	-	973

Location: HWY 73 N-O BARKLEY RD
City: CONIFER
County: JEFFERSON
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222208
Station ID: 222208

Start Time	24-Aug-22 Wed	NORTH	SOUTH							Total
12:00 AM		9	12							21
01:00		5	6							11
02:00		2	6							8
03:00		6	10							16
04:00		30	15							45
05:00		94	43							137
06:00		227	139							366
07:00		**489**	356							845
08:00		453	**398**							**851**
09:00		407	317							724
10:00		400	224							624
11:00		461	275							736
12:00 PM		440	332							772
01:00		395	311							706
02:00		442	420							862
03:00		**557**	399							956
04:00		555	412							967
05:00		556	**451**							**1007**
06:00		314	341							655
07:00		176	271							447
08:00		147	175							322
09:00		87	101							188
10:00		28	49							77
11:00		15	20							35
Total		6295	5083							11378
Percent		55.3%	44.7%							
AM Peak	-	07:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	489	398	-	-	-	-	-	-	851
PM Peak	-	15:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	557	451	-	-	-	-	-	-	1007

Location: HWY 73 N-O BARKLEY RD
City: CONIFER
County: JEFFERSON
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222208
Station ID: 222208

Start Time	25-Aug-22 Thu	NORTH	SOUTH							Total
12:00 AM		8	11							19
01:00		5	6							11
02:00		8	6							14
03:00		12	4							16
04:00		24	19							43
05:00		93	42							135
06:00		233	127							360
07:00		**561**	**375**							**936**
08:00		387	370							757
09:00		445	341							786
10:00		393	261							654
11:00		420	328							748
12:00 PM		452	367							819
01:00		397	338							735
02:00		429	425							854
03:00		**532**	446							**978**
04:00		421	431							852
05:00		449	**475**							924
06:00		278	300							578
07:00		186	223							409
08:00		126	144							270
09:00		68	94							162
10:00		36	46							82
11:00		18	46							64
Total		5981	5225							11206
Percent		53.4%	46.6%							
AM Peak	-	07:00	07:00	-	-	-	-	-	-	07:00
Vol.	-	561	375	-	-	-	-	-	-	936
PM Peak	-	15:00	17:00	-	-	-	-	-	-	15:00
Vol.	-	532	475	-	-	-	-	-	-	978

Location: HWY 73 N-O BARKLEY RD
City: CONIFER
County: JEFFERSON
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222208
Station ID: 222208

Start Time	26-Aug-22 Fri	NORTH	SOUTH							Total
12:00 AM		5	21							26
01:00		7	2							9
02:00		7	11							18
03:00		7	6							13
04:00		35	15							50
05:00		87	37							124
06:00		214	126							340
07:00		**495**	333							**828**
08:00		398	323							721
09:00		378	**395**							773
10:00		437	326							763
11:00		484	338							822
12:00 PM		**539**	304							843
01:00		456	365							821
02:00		521	432							953
03:00		510	**505**							**1015**
04:00		457	389							846
05:00		438	407							845
06:00		287	310							597
07:00		205	242							447
08:00		114	153							267
09:00		78	110							188
10:00		47	54							101
11:00		28	31							59
Total		6234	5235							11469
Percent		54.4%	45.6%							
AM Peak	-	07:00	09:00	-	-	-	-	-	-	07:00
Vol.	-	495	395	-	-	-	-	-	-	828
PM Peak	-	12:00	15:00	-	-	-	-	-	-	15:00
Vol.	-	539	505	-	-	-	-	-	-	1015

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: HWY 73 N-O BARKLEY RD
City: CONIFER
County: JEFFERSON
Direction: NORTH/SOUTH

Site Code: 222208
Station ID: 222208

Start Time	27-Aug-22 Sat	NORTH	SOUTH								Total
12:00 AM		11	27								38
01:00		12	6								18
02:00		12	8								20
03:00		13	2								15
04:00		14	11								25
05:00		44	33								77
06:00		89	57								146
07:00		232	141								373
08:00		294	256								550
09:00		417	359								776
10:00		493	351								844
11:00		**522**	**378**								**900**
12:00 PM		503	457								960
01:00		**545**	**458**								**1003**
02:00		483	412								895
03:00		475	330								805
04:00		411	358								769
05:00		336	316								652
06:00		269	256								525
07:00		186	207								393
08:00		133	150								283
09:00		76	101								177
10:00		46	76								122
11:00		43	48								91
Total		5659	4798								10457
Percent		54.1%	45.9%								
AM Peak	-	11:00	11:00	-	-	-	-	-	-		11:00
Vol.	-	522	378	-	-	-	-	-	-		900
PM Peak	-	13:00	13:00	-	-	-	-	-	-		13:00
Vol.	-	545	458	-	-	-	-	-	-		1003

Location: HWY 73 N-O BARKLEY RD
City: CONIFER
County: JEFFERSON
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222208
Station ID: 222208

Start Time	28-Aug-22 Sun	NORTH	SOUTH							Total
12:00 AM		22	30							52
01:00		18	4							22
02:00		11	5							16
03:00		7	3							10
04:00		10	13							23
05:00		27	16							43
06:00		62	40							102
07:00		139	113							252
08:00		238	199							437
09:00		335	312							647
10:00		418	346							764
11:00		**481**	**360**							**841**
12:00 PM		**469**	395							**864**
01:00		437	**424**							861
02:00		41	39							80
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		2715	2299							5014
Percent		54.1%	45.9%							
AM Peak	-	11:00	11:00	-	-	-	-	-	-	11:00
Vol.	-	481	360	-	-	-	-	-	-	841
PM Peak	-	12:00	13:00	-	-	-	-	-	-	12:00
Vol.	-	469	424	-	-	-	-	-	-	864
Grand Total		36126	29763							65889
Percent		54.8%	45.2%							
ADT		ADT 9,827		AADT 9,827						

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location:SHADOW MTN DR E-O S. WARHAWK RD 1
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 22220
Station ID: 22220

Start Time	22-Aug-22 Mon	EAST	WEST							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
12:00 PM		61	76							137
01:00		82	78							160
02:00		61	73							134
03:00		**92**	110							**202**
04:00		85	108							193
05:00		62	**125**							187
06:00		48	116							164
07:00		18	60							78
08:00		11	51							62
09:00		6	30							36
10:00		4	11							15
11:00		2	17							19
Total		532	855							1387
Percent		38.4%	61.6%							
AM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
PM Peak	-	15:00	17:00	-	-	-	-	-	-	15:00
Vol.	-	92	125	-	-	-	-	-	-	202

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location:SHADOW MTN DR E-O S. WARHAWK RD 1
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 22220
Station ID: 22220

Start Time	23-Aug-22 Tue	EAST	WEST							Total
12:00 AM		1	3							4
01:00		2	0							2
02:00		1	1							2
03:00		3	0							3
04:00		22	0							22
05:00		38	0							38
06:00		100	8							108
07:00		**150**	53							**203**
08:00		123	49							172
09:00		65	63							128
10:00		82	64							146
11:00		77	**73**							150
12:00 PM		84	79							163
01:00		70	72							142
02:00		79	86							165
03:00		**97**	104							201
04:00		78	113							191
05:00		82	**132**							**214**
06:00		43	110							153
07:00		25	69							94
08:00		20	54							74
09:00		4	30							34
10:00		2	23							25
11:00		4	15							19
Total		1252	1201							2453
Percent		51.0%	49.0%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	07:00
Vol.	-	150	73	-	-	-	-	-	-	203
PM Peak	-	15:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	97	132	-	-	-	-	-	-	214

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location:SHADOW MTN DR E-O S. WARHAWK RD 1
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 22220
Station ID: 22220

Start Time	24-Aug-22 Wed	EAST	WEST							Total
12:00 AM		1	8							9
01:00		2	1							3
02:00		0	2							2
03:00		3	1							4
04:00		21	1							22
05:00		38	2							40
06:00		79	15							94
07:00		**151**	55							**206**
08:00		133	59							192
09:00		80	**67**							147
10:00		77	43							120
11:00		92	65							157
12:00 PM		80	76							156
01:00		78	82							160
02:00		82	83							165
03:00		**117**	118							**235**
04:00		99	**124**							223
05:00		74	112							186
06:00		45	123							168
07:00		24	86							110
08:00		12	54							66
09:00		4	27							31
10:00		3	19							22
11:00		1	6							7
Total		1296	1229							2525
Percent		51.3%	48.7%							
AM Peak	-	07:00	09:00	-	-	-	-	-	-	07:00
Vol.	-	151	67	-	-	-	-	-	-	206
PM Peak	-	15:00	16:00	-	-	-	-	-	-	15:00
Vol.	-	117	124	-	-	-	-	-	-	235

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location:SHADOW MTN DR E-O S. WARHAWK RD 1
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 22220
Station ID: 22220

Start Time	25-Aug-22 Thu	EAST	WEST							Total
12:00 AM		1	8							9
01:00		0	4							4
02:00		1	1							2
03:00		1	0							1
04:00		16	1							17
05:00		38	1							39
06:00		88	8							96
07:00		**149**	47							196
08:00		141	66							**207**
09:00		97	62							159
10:00		82	54							136
11:00		67	**76**							143
12:00 PM		71	86							157
01:00		84	72							156
02:00		89	62							151
03:00		74	108							182
04:00		**90**	114							**204**
05:00		57	**136**							193
06:00		38	88							126
07:00		17	64							81
08:00		12	53							65
09:00		8	33							41
10:00		4	18							22
11:00		1	15							16
Total		1226	1177							2403
Percent		51.0%	49.0%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	08:00
Vol.	-	149	76	-	-	-	-	-	-	207
PM Peak	-	16:00	17:00	-	-	-	-	-	-	16:00
Vol.	-	90	136	-	-	-	-	-	-	204

Location:SHADOW MTN DR E-O S. WARHAWK RD 1
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 22220
Station ID: 22220

Start Time	26-Aug-22 Fri	EAST	WEST							Total
12:00 AM		0	7							7
01:00		2	2							4
02:00		2	1							3
03:00		1	2							3
04:00		19	0							19
05:00		35	1							36
06:00		68	9							77
07:00		**130**	45							**175**
08:00		114	42							156
09:00		89	61							150
10:00		90	**69**							159
11:00		88	69							157
12:00 PM		86	89							175
01:00		74	64							138
02:00		68	72							140
03:00		76	95							171
04:00		**89**	111							**200**
05:00		80	**116**							196
06:00		54	92							146
07:00		32	76							108
08:00		14	46							60
09:00		8	32							40
10:00		10	20							30
11:00		2	12							14
Total		1231	1133							2364
Percent		52.1%	47.9%							
AM Peak	-	07:00	10:00	-	-	-	-	-	-	07:00
Vol.	-	130	69	-	-	-	-	-	-	175
PM Peak	-	16:00	17:00	-	-	-	-	-	-	16:00
Vol.	-	89	116	-	-	-	-	-	-	200

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location:SHADOW MTN DR E-O S. WARHAWK RD 1
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 22220
Station ID: 22220

Start Time	27-Aug-22 Sat	EAST	WEST							Total
12:00 AM		3	10							13
01:00		0	5							5
02:00		4	3							7
03:00		4	0							4
04:00		10	0							10
05:00		9	1							10
06:00		37	9							46
07:00		70	19							89
08:00		88	48							136
09:00		89	62							151
10:00		**119**	**84**							**203**
11:00		105	80							185
12:00 PM		**104**	99							203
01:00		100	**105**							**205**
02:00		80	104							184
03:00		92	104							196
04:00		76	77							153
05:00		73	68							141
06:00		51	66							117
07:00		53	54							107
08:00		27	43							70
09:00		10	29							39
10:00		9	18							27
11:00		3	20							23
Total		1216	1108							2324
Percent		52.3%	47.7%							
AM Peak	-	10:00	10:00	-	-	-	-	-	-	10:00
Vol.	-	119	84	-	-	-	-	-	-	203
PM Peak	-	12:00	13:00	-	-	-	-	-	-	13:00
Vol.	-	104	105	-	-	-	-	-	-	205

Location:SHADOW MTN DR E-O S. WARHAWK RD 1
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 22220
Station ID: 22220

Start Time	28-Aug-22 Sun	EAST	WEST							Total
12:00 AM		1	10							11
01:00		3	4							7
02:00		0	1							1
03:00		1	1							2
04:00		5	2							7
05:00		11	1							12
06:00		17	6							23
07:00		46	17							63
08:00		57	34							91
09:00		**107**	49							156
10:00		84	72							156
11:00		96	**88**							**184**
12:00 PM		**100**	76							176
01:00		91	**101**							**192**
02:00		52	41							93
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		671	503							1174
Percent		57.2%	42.8%							
AM Peak	-	09:00	11:00	-	-	-	-	-	-	11:00
Vol.	-	107	88	-	-	-	-	-	-	184
PM Peak	-	12:00	13:00	-	-	-	-	-	-	13:00
Vol.	-	100	101	-	-	-	-	-	-	192
Grand Total		7424	7206							14630
Percent		50.7%	49.3%							
ADT		ADT 2,137		AADT 2,137						

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: SHADOW MTN DR E-O SHADOW BROOK DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 222214
Station ID: 222214

Start Time	22-Aug-22 Mon	EAST	WEST							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
12:00 PM		*	*							*
01:00		92	93							185
02:00		74	77							151
03:00		**105**	120							**225**
04:00		91	113							204
05:00		82	122							204
06:00		57	**129**							186
07:00		22	71							93
08:00		18	51							69
09:00		18	25							43
10:00		5	11							16
11:00		2	16							18
Total		566	828							1394
Percent		40.6%	59.4%							
AM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
PM Peak	-	15:00	18:00	-	-	-	-	-	-	15:00
Vol.	-	105	129	-	-	-	-	-	-	225

Location: SHADOW MTN DR E-O SHADOW BROOK DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222214
Station ID: 222214

Start Time	23-Aug-22 Tue	EAST	WEST							Total
12:00 AM		1	3							4
01:00		2	0							2
02:00		1	1							2
03:00		2	0							2
04:00		22	0							22
05:00		42	0							42
06:00		106	10							116
07:00		**164**	53							**217**
08:00		140	53							193
09:00		72	65							137
10:00		90	68							158
11:00		90	**73**							163
12:00 PM		87	86							173
01:00		76	78							154
02:00		82	88							170
03:00		**111**	118							229
04:00		95	120							215
05:00		94	**143**							**237**
06:00		43	120							163
07:00		35	74							109
08:00		20	66							86
09:00		6	38							44
10:00		3	19							22
11:00		4	14							18
Total		1388	1290							2678
Percent		51.8%	48.2%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	07:00
Vol.	-	164	73	-	-	-	-	-	-	217
PM Peak	-	15:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	111	143	-	-	-	-	-	-	237

Location: SHADOW MTN DR E-O SHADOW BROOK DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222214
Station ID: 222214

Start Time	24-Aug-22 Wed	EAST	WEST								Total
12:00 AM		8	3								11
01:00		2	1								3
02:00		0	2								2
03:00		3	1								4
04:00		18	0								18
05:00		45	2								47
06:00		85	17								102
07:00		**158**	55								**213**
08:00		148	65								213
09:00		82	68								150
10:00		86	48								134
11:00		93	**77**								170
12:00 PM		87	83								170
01:00		84	93								177
02:00		87	101								188
03:00		**121**	129								**250**
04:00		90	**154**								244
05:00		85	123								208
06:00		60	124								184
07:00		25	100								125
08:00		19	49								68
09:00		7	33								40
10:00		4	20								24
11:00		1	6								7
Total		1398	1354								2752
Percent		50.8%	49.2%								
AM Peak	-	07:00	11:00	-	-	-	-	-	-		07:00
Vol.	-	158	77	-	-	-	-	-	-		213
PM Peak	-	15:00	16:00	-	-	-	-	-	-		15:00
Vol.	-	121	154	-	-	-	-	-	-		250

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: SHADOW MTN DR E-O SHADOW BROOK DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 222214
Station ID: 222214

Start Time	25-Aug-22 Thu	EAST	WEST							Total
12:00 AM		3	8							11
01:00		0	4							4
02:00		1	1							2
03:00		2	1							3
04:00		16	0							16
05:00		39	2							41
06:00		88	12							100
07:00		161	54							215
08:00		**162**	68							**230**
09:00		103	71							174
10:00		85	57							142
11:00		74	**83**							157
12:00 PM		83	89							172
01:00		88	81							169
02:00		**95**	75							170
03:00		89	125							214
04:00		90	131							**221**
05:00		60	**150**							210
06:00		49	97							146
07:00		23	71							94
08:00		19	57							76
09:00		9	35							44
10:00		8	16							24
11:00		16	3							19
Total		1363	1291							2654
Percent		51.4%	48.6%							
AM Peak	-	08:00	11:00	-	-	-	-	-	-	08:00
Vol.	-	162	83	-	-	-	-	-	-	230
PM Peak	-	14:00	17:00	-	-	-	-	-	-	16:00
Vol.	-	95	150	-	-	-	-	-	-	221

Location: SHADOW MTN DR E-O SHADOW BROOK DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222214
Station ID: 222214

Start Time	26-Aug-22 Fri	EAST	WEST							Total
12:00 AM		0	7							7
01:00		2	2							4
02:00		2	2							4
03:00		1	2							3
04:00		19	0							19
05:00		39	1							40
06:00		72	9							81
07:00		**138**	47							**185**
08:00		135	48							183
09:00		100	66							166
10:00		106	76							182
11:00		87	**82**							169
12:00 PM		**91**	96							187
01:00		85	74							159
02:00		78	82							160
03:00		90	109							199
04:00		90	128							**218**
05:00		76	**141**							217
06:00		53	101							154
07:00		45	82							127
08:00		14	46							60
09:00		9	39							48
10:00		17	19							36
11:00		4	15							19
Total		1353	1274							2627
Percent		51.5%	48.5%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	07:00
Vol.	-	138	82	-	-	-	-	-	-	185
PM Peak	-	12:00	17:00	-	-	-	-	-	-	16:00
Vol.	-	91	141	-	-	-	-	-	-	218

Location: SHADOW MTN DR E-O SHADOW BROOK DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222214
Station ID: 222214

Start Time	27-Aug-22 Sat	EAST	WEST							Total
12:00 AM		2	10							12
01:00		9	0							9
02:00		8	0							8
03:00		4	0							4
04:00		10	0							10
05:00		10	1							11
06:00		39	9							48
07:00		71	21							92
08:00		92	54							146
09:00		101	65							166
10:00		**132**	90							**222**
11:00		111	**93**							204
12:00 PM		**103**	120							223
01:00		99	**127**							**226**
02:00		86	116							202
03:00		95	117							212
04:00		81	91							172
05:00		80	77							157
06:00		57	81							138
07:00		50	58							108
08:00		27	50							77
09:00		7	37							44
10:00		10	22							32
11:00		13	13							26
Total		1297	1252							2549
Percent		50.9%	49.1%							
AM Peak	-	10:00	11:00	-	-	-	-	-	-	10:00
Vol.	-	132	93	-	-	-	-	-	-	222
PM Peak	-	12:00	13:00	-	-	-	-	-	-	13:00
Vol.	-	103	127	-	-	-	-	-	-	226

Location: SHADOW MTN DR E-O SHADOW BROOK DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222214
Station ID: 222214

Start Time	28-Aug-22 Sun	EAST	WEST							Total
12:00 AM		2	9							11
01:00		3	4							7
02:00		1	2							3
03:00		1	1							2
04:00		3	3							6
05:00		15	1							16
06:00		20	5							25
07:00		46	17							63
08:00		61	39							100
09:00		**113**	56							169
10:00		100	80							180
11:00		109	**89**							**198**
12:00 PM		**92**	104							196
01:00		88	**114**							**202**
02:00		38	37							75
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		692	561							1253
Percent		55.2%	44.8%							
AM Peak	-	09:00	11:00	-	-	-	-	-	-	11:00
Vol.	-	113	89	-	-	-	-	-	-	198
PM Peak	-	12:00	13:00	-	-	-	-	-	-	13:00
Vol.	-	92	114	-	-	-	-	-	-	202
Grand Total		8057	7850							15907
Percent		50.7%	49.3%							
ADT		ADT 2,351		AADT 2,351						

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: SHADOW MTN DR W-O CONIFER DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 222218
Station ID: 222218

Start Time	22-Aug-22 Mon	EAST	WEST							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
12:00 PM		*	*							*
01:00		84	138							222
02:00		95	100							195
03:00		129	138							**267**
04:00		109	**152**							261
05:00		122	130							252
06:00		**142**	86							228
07:00		78	32							110
08:00		65	18							83
09:00		38	7							45
10:00		13	7							20
11:00		17	2							19
Total		892	810							1702
Percent		52.4%	47.6%							
AM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
PM Peak	-	18:00	16:00	-	-	-	-	-	-	15:00
Vol.	-	142	152	-	-	-	-	-	-	267

Location: SHADOW MTN DR W-O CONIFER DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222218
Station ID: 222218

Start Time	23-Aug-22 Tue	EAST	WEST							Total
12:00 AM		4	2							6
01:00		0	4							4
02:00		1	1							2
03:00		0	4							4
04:00		1	23							24
05:00		1	51							52
06:00		14	120							134
07:00		58	**189**							**247**
08:00		55	167							222
09:00		77	96							173
10:00		74	97							171
11:00		**104**	91							195
12:00 PM		100	103							203
01:00		104	72							176
02:00		117	87							204
03:00		158	104							262
04:00		147	110							257
05:00		**169**	**118**							**287**
06:00		123	92							215
07:00		92	36							128
08:00		81	22							103
09:00		34	17							51
10:00		24	3							27
11:00		18	4							22
Total		1556	1613							3169
Percent		49.1%	50.9%							
AM Peak	-	11:00	07:00	-	-	-	-	-	-	07:00
Vol.	-	104	189	-	-	-	-	-	-	247
PM Peak	-	17:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	169	118	-	-	-	-	-	-	287

Location: SHADOW MTN DR W-O CONIFER DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222218
Station ID: 222218

Start Time	24-Aug-22 Wed	EAST	WEST							Total
12:00 AM		7	5							12
01:00		1	3							4
02:00		2	0							2
03:00		1	4							5
04:00		0	20							20
05:00		3	52							55
06:00		21	99							120
07:00		61	**183**							244
08:00		70	180							**250**
09:00		76	104							180
10:00		57	101							158
11:00		**94**	95							189
12:00 PM		98	92							190
01:00		111	88							199
02:00		125	92							217
03:00		163	**132**							**295**
04:00		**173**	106							279
05:00		146	122							268
06:00		145	79							224
07:00		106	42							148
08:00		64	19							83
09:00		35	8							43
10:00		25	3							28
11:00		7	1							8
Total		1591	1630							3221
Percent		49.4%	50.6%							
AM Peak	-	11:00	07:00	-	-	-	-	-	-	08:00
Vol.	-	94	183	-	-	-	-	-	-	250
PM Peak	-	16:00	15:00	-	-	-	-	-	-	15:00
Vol.	-	173	132	-	-	-	-	-	-	295

Location: SHADOW MTN DR W-O CONIFER DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222218
Station ID: 222218

Start Time	25-Aug-22 Thu	EAST	WEST							Total
12:00 AM		10	1							11
01:00		4	0							4
02:00		1	2							3
03:00		2	4							6
04:00		0	17							17
05:00		3	48							51
06:00		11	98							109
07:00		53	**192**							245
08:00		79	180							**259**
09:00		71	148							219
10:00		66	98							164
11:00		**99**	86							185
12:00 PM		112	91							203
01:00		89	111							200
02:00		86	106							192
03:00		138	**115**							253
04:00		151	103							254
05:00		**168**	90							**258**
06:00		117	56							173
07:00		92	30							122
08:00		73	18							91
09:00		41	13							54
10:00		24	4							28
11:00		19	1							20
Total		1509	1612							3121
Percent		48.3%	51.7%							
AM Peak	-	11:00	07:00	-	-	-	-	-	-	08:00
Vol.	-	99	192	-	-	-	-	-	-	259
PM Peak	-	17:00	15:00	-	-	-	-	-	-	17:00
Vol.	-	168	115	-	-	-	-	-	-	258

Location: SHADOW MTN DR W-O CONIFER DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222218
Station ID: 222218

Start Time	26-Aug-22 Fri	EAST	WEST							Total
12:00 AM		8	0							8
01:00		2	2							4
02:00		3	3							6
03:00		0	4							4
04:00		0	21							21
05:00		2	45							47
06:00		7	84							91
07:00		52	**166**							218
08:00		58	165							223
09:00		85	107							192
10:00		85	144							**229**
11:00		**102**	100							202
12:00 PM		121	99							220
01:00		91	89							180
02:00		94	113							207
03:00		120	**131**							251
04:00		150	99							249
05:00		**161**	97							**258**
06:00		111	62							173
07:00		102	48							150
08:00		54	19							73
09:00		46	10							56
10:00		29	13							42
11:00		17	4							21
Total		1500	1625							3125
Percent		48.0%	52.0%							
AM Peak	-	11:00	07:00	-	-	-	-	-	-	10:00
Vol.	-	102	166	-	-	-	-	-	-	229
PM Peak	-	17:00	15:00	-	-	-	-	-	-	17:00
Vol.	-	161	131	-	-	-	-	-	-	258

Location: SHADOW MTN DR W-O CONIFER DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222218
Station ID: 222218

Start Time	27-Aug-22 Sat	EAST	WEST							Total
12:00 AM		14	2							16
01:00		7	1							8
02:00		3	5							8
03:00		0	5							5
04:00		0	10							10
05:00		2	10							12
06:00		10	40							50
07:00		22	82							104
08:00		58	115							173
09:00		74	132							206
10:00		**111**	**135**							**246**
11:00		111	124							235
12:00 PM		140	**120**							260
01:00		**153**	108							**261**
02:00		144	91							235
03:00		145	94							239
04:00		105	90							195
05:00		80	118							198
06:00		93	80							173
07:00		70	56							126
08:00		63	28							91
09:00		43	10							53
10:00		25	12							37
11:00		12	16							28
Total		1485	1484							2969
Percent		50.0%	50.0%							
AM Peak	-	10:00	10:00	-	-	-	-	-	-	10:00
Vol.	-	111	135	-	-	-	-	-	-	246
PM Peak	-	13:00	12:00	-	-	-	-	-	-	13:00
Vol.	-	153	120	-	-	-	-	-	-	261

Location: SHADOW MTN DR W-O CONIFER DR
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222218
Station ID: 222218

Start Time	28-Aug-22 Sun	EAST	WEST							Total
12:00 AM		12	3							15
01:00		4	4							8
02:00		2	1							3
03:00		1	2							3
04:00		3	4							7
05:00		2	15							17
06:00		6	21							27
07:00		20	54							74
08:00		39	65							104
09:00		61	**138**							199
10:00		105	109							214
11:00		**118**	117							**235**
12:00 PM		**123**	101							224
01:00		98	**156**							**254**
02:00		68	78							146
03:00		1	0							1
04:00		0	0							0
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		663	868							1531
Percent		43.3%	56.7%							
AM Peak	-	11:00	09:00	-	-	-	-	-	-	11:00
Vol.	-	118	138	-	-	-	-	-	-	235
PM Peak	-	12:00	13:00	-	-	-	-	-	-	13:00
Vol.	-	123	156	-	-	-	-	-	-	254
Grand Total		9196	9642							18838
Percent		48.8%	51.2%							
ADT		ADT 2,776		AADT 2,776						

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: SHADOW MTN DR W-O HWY 73
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 222207
Station ID: 222207

Start Time	22-Aug-22 Mon	EAST	WEST							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
12:00 PM		*	*							*
01:00		99	102							201
02:00		90	99							189
03:00		**110**	155							**265**
04:00		100	145							245
05:00		79	**162**							241
06:00		60	156							216
07:00		29	84							113
08:00		18	61							79
09:00		7	38							45
10:00		7	14							21
11:00		2	16							18
Total		601	1032							1633
Percent		36.8%	63.2%							
AM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
PM Peak	-	15:00	17:00	-	-	-	-	-	-	15:00
Vol.	-	110	162	-	-	-	-	-	-	265

Location: SHADOW MTN DR W-O HWY 73
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222207
Station ID: 222207

Start Time	23-Aug-22 Tue	EAST	WEST							Total
12:00 AM		2	4							6
01:00		4	0							4
02:00		1	1							2
03:00		4	0							4
04:00		23	1							24
05:00		51	1							52
06:00		122	16							138
07:00		**185**	66							**251**
08:00		169	63							232
09:00		84	78							162
10:00		93	82							175
11:00		102	**92**							194
12:00 PM		158	**60**							218
01:00		184	0							184
02:00		207	0							207
03:00		270	0							270
04:00		266	0							266
05:00		**290**	0							**290**
06:00		217	0							217
07:00		125	0							125
08:00		105	0							105
09:00		52	0							52
10:00		27	0							27
11:00		21	0							21
Total		2762	464							3226
Percent		85.6%	14.4%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	07:00
Vol.	-	185	92	-	-	-	-	-	-	251
PM Peak	-	17:00	12:00	-	-	-	-	-	-	17:00
Vol.	-	290	60	-	-	-	-	-	-	290

Location: SHADOW MTN DR W-O HWY 73
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222207
Station ID: 222207

Start Time	24-Aug-22 Wed	EAST	WEST							Total
12:00 AM		12	0							12
01:00		4	0							4
02:00		3	0							3
03:00		5	0							5
04:00		20	0							20
05:00		55	0							55
06:00		121	0							121
07:00		253	0							253
08:00		**260**	0							**260**
09:00		180	0							180
10:00		157	0							157
11:00		196	0							196
12:00 PM		**191**	0							191
01:00		144	69							213
02:00		105	119							224
03:00		134	162							296
04:00		119	**178**							**297**
05:00		96	170							266
06:00		64	171							235
07:00		33	106							139
08:00		17	64							81
09:00		8	33							41
10:00		3	25							28
11:00		1	7							8
Total		2181	1104							3285
Percent		66.4%	33.6%							
AM Peak	-	08:00	-	-	-	-	-	-	-	08:00
Vol.	-	260	-	-	-	-	-	-	-	260
PM Peak	-	12:00	16:00	-	-	-	-	-	-	16:00
Vol.	-	191	178	-	-	-	-	-	-	297

Location: SHADOW MTN DR W-O HWY 73
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222207
Station ID: 222207

Start Time	25-Aug-22 Thu	EAST	WEST							Total
12:00 AM		1	11							12
01:00		0	3							3
02:00		2	1							3
03:00		4	2							6
04:00		17	0							17
05:00		48	3							51
06:00		100	11							111
07:00		**180**	67							247
08:00		180	85							**265**
09:00		124	80							204
10:00		98	65							163
11:00		95	**98**							193
12:00 PM		94	115							209
01:00		96	96							192
02:00		108	94							202
03:00		**113**	144							257
04:00		103	158							**261**
05:00		80	**180**							260
06:00		60	122							182
07:00		30	95							125
08:00		16	76							92
09:00		12	41							53
10:00		4	24							28
11:00		1	20							21
Total		1566	1591							3157
Percent		49.6%	50.4%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	08:00
Vol.	-	180	98	-	-	-	-	-	-	265
PM Peak	-	15:00	17:00	-	-	-	-	-	-	16:00
Vol.	-	113	180	-	-	-	-	-	-	261

Location: SHADOW MTN DR W-O HWY 73
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222207
Station ID: 222207

Start Time	26-Aug-22 Fri	EAST	WEST							Total
12:00 AM		0	7							7
01:00		2	3							5
02:00		3	2							5
03:00		2	2							4
04:00		22	0							22
05:00		45	3							48
06:00		87	7							94
07:00		166	59							225
08:00		**168**	63							**231**
09:00		102	84							186
10:00		130	88							218
11:00		107	**104**							211
12:00 PM		102	123							225
01:00		92	95							187
02:00		101	109							210
03:00		**118**	122							240
04:00		96	**167**							**263**
05:00		95	151							246
06:00		63	116							179
07:00		49	108							157
08:00		21	55							76
09:00		10	48							58
10:00		12	28							40
11:00		6	18							24
Total		1599	1562							3161
Percent		50.6%	49.4%							
AM Peak	-	08:00	11:00	-	-	-	-	-	-	08:00
Vol.	-	168	104	-	-	-	-	-	-	231
PM Peak	-	15:00	16:00	-	-	-	-	-	-	16:00
Vol.	-	118	167	-	-	-	-	-	-	263

Location: SHADOW MTN DR W-O HWY 73
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 222207
Station ID: 222207

Start Time	27-Aug-22 Sat	EAST	WEST							Total
12:00 AM		2	15							17
01:00		1	7							8
02:00		5	3							8
03:00		5	0							5
04:00		10	0							10
05:00		10	2							12
06:00		40	11							51
07:00		82	23							105
08:00		116	60							176
09:00		126	81							207
10:00		**151**	**108**							**259**
11:00		135	102							237
12:00 PM		**128**	142							**270**
01:00		115	**146**							261
02:00		99	146							245
03:00		108	141							249
04:00		95	107							202
05:00		95	101							196
06:00		65	93							158
07:00		54	69							123
08:00		28	62							90
09:00		8	44							52
10:00		8	26							34
11:00		7	23							30
Total		1493	1512							3005
Percent		49.7%	50.3%							
AM Peak	-	10:00	10:00	-	-	-	-	-	-	10:00
Vol.	-	151	108	-	-	-	-	-	-	259
PM Peak	-	12:00	13:00	-	-	-	-	-	-	12:00
Vol.	-	128	146	-	-	-	-	-	-	270

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: SHADOW MTN DR W-O HWY 73
City: CONIFER
County: JEFFERSON
Direction: EAST/WEST

Site Code: 222207
Station ID: 222207

Start Time	28-Aug-22 Sun	EAST	WEST							Total
12:00 AM		3	13							16
01:00		4	3							7
02:00		1	2							3
03:00		3	1							4
04:00		4	3							7
05:00		15	4							19
06:00		22	7							29
07:00		56	21							77
08:00		67	43							110
09:00		131	61							192
10:00		127	99							226
11:00		**132**	**107**							**239**
12:00 PM		102	126							228
01:00		**105**	**136**							**241**
02:00		26	30							56
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		798	656							1454
Percent		54.9%	45.1%							
AM Peak	-	11:00	11:00	-	-	-	-	-	-	11:00
Vol.	-	132	107	-	-	-	-	-	-	239
PM Peak	-	13:00	13:00	-	-	-	-	-	-	13:00
Vol.	-	105	136	-	-	-	-	-	-	241
Grand Total		11000	7921							18921
Percent		58.1%	41.9%							
ADT		ADT 2,782		AADT 2,782						

LEVEL OF SERVICE DEFINITIONS

From *Highway Capacity Manual*, Transportation Research Board, 2016, 6th Edition

UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS)

Applicable to Two-Way Stop Control, All-Way Stop Control, and Roundabouts

LOS	Average Vehicle Control Delay	Operational Characteristics
A	<10 seconds	Normally, vehicles on the stop-controlled approach only have to wait up to 10 seconds before being able to clear the intersection. Left-turning vehicles on the uncontrolled street do not have to wait to make their turn.
B	10 to 15 seconds	Vehicles on the stop-controlled approach will experience delays before being able to clear the intersection. The delay could be up to 15 seconds. Left-turning vehicles on the uncontrolled street may have to wait to make their turn.
C	15 to 25 seconds	Vehicles on the stop-controlled approach can expect delays in the range of 15 to 25 seconds before clearing the intersection. Motorists may begin to take chances due to the long delays, thereby posing a safety risk to through traffic. Left-turning vehicles on the uncontrolled street will now be required to wait to make their turn causing a queue to be created in the turn lane.
D	25 to 35 seconds	This is the point at which a traffic signal may be warranted for this intersection. The delays for the stop-controlled intersection are not considered to be excessive. The length of the queue may begin to block other public and private access points.
E	35 to 50 seconds	The delays for all critical traffic movements are considered to be unacceptable. The length of the queues for the stop-controlled approaches as well as the left-turn movements are extremely long. There is a high probability that this intersection will meet traffic signal warrants. The ability to install a traffic signal is affected by the location of other existing traffic signals. Consideration may be given to restricting the accesses by eliminating the left-turn movements from and to the stop-controlled approach.
F	>50 seconds	The delay for the critical traffic movements are probably in excess of 100 seconds. The length of the queues are extremely long. Motorists are selecting alternative routes due to the long delays. The only remedy for these long delays is installing a traffic signal or restricting the accesses. The potential for accidents at this intersection are extremely high due to motorist taking more risky chances. If the median permits, motorists begin making two-stage left-turns.

Intersection	
Int Delay, s/veh	3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	433	16	183	310	8	100
Future Vol, veh/h	433	16	183	310	8	100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	492	18	208	352	9	114

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	510	0	1260	492
Stage 1	-	-	-	-	492	-
Stage 2	-	-	-	-	768	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1055	-	188	577
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	458	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1055	-	151	577
Mov Cap-2 Maneuver	-	-	-	-	151	-
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	368	-

Approach	SE	NW	NE
HCM Control Delay, s	0	3.4	14.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	151	577	1055	-	-	-
HCM Lane V/C Ratio	0.06	0.197	0.197	-	-	-
HCM Control Delay (s)	30.4	12.8	9.2	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.7	0.7	-	-	-

Intersection	
Int Delay, s/veh	12

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	274	276	177	78	114	315
Future Vol, veh/h	274	276	177	78	114	315
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	311	314	201	89	130	358

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	290	0	-	0	1137	201
Stage 1	-	-	-	-	201	-
Stage 2	-	-	-	-	936	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1272	-	-	-	223	840
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	382	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1272	-	-	-	169	840
Mov Cap-2 Maneuver	-	-	-	-	169	-
Stage 1	-	-	-	-	630	-
Stage 2	-	-	-	-	382	-

Approach	SE	NW	SW
HCM Control Delay, s	4.4	0	28.8
HCM LOS			D

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1272	-	169	840
HCM Lane V/C Ratio	-	-	0.245	-	0.767	0.426
HCM Control Delay (s)	-	-	8.7	-	74.3	12.4
HCM Lane LOS	-	-	A	-	F	B
HCM 95th %tile Q(veh)	-	-	1	-	4.9	2.2

Intersection	
Int Delay, s/veh	2.9

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	269	9	87	294	12	120
Future Vol, veh/h	269	9	87	294	12	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	306	10	99	334	14	136

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	316	0	838	306
Stage 1	-	-	-	-	306	-
Stage 2	-	-	-	-	532	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1244	-	336	734
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	589	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1244	-	309	734
Mov Cap-2 Maneuver	-	-	-	-	309	-
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	542	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.9	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	309	734	1244	-	-	-
HCM Lane V/C Ratio	0.044	0.186	0.079	-	-	-
HCM Control Delay (s)	17.2	11	8.1	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.1	0.7	0.3	-	-	-

Intersection	
Int Delay, s/veh	8.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	223	178	182	27	109	193
Future Vol, veh/h	223	178	182	27	109	193
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	253	202	207	31	124	219

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	238	0	-	0	915	207
Stage 1	-	-	-	-	207	-
Stage 2	-	-	-	-	708	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1329	-	-	-	303	833
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	488	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1329	-	-	-	245	833
Mov Cap-2 Maneuver	-	-	-	-	245	-
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	488	-

Approach	SE	NW	SW
HCM Control Delay, s	4.6	0	19.2
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1329	-	245	833
HCM Lane V/C Ratio	-	-	0.191	-	0.506	0.263
HCM Control Delay (s)	-	-	8.3	-	33.8	10.9
HCM Lane LOS	-	-	A	-	D	B
HCM 95th %tile Q(veh)	-	-	0.7	-	2.6	1.1

Intersection	
Int Delay, s/veh	3.2

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	449	15	134	376	22	123
Future Vol, veh/h	449	15	134	376	22	123
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	510	17	152	427	25	140

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	527	0	1241	510
Stage 1	-	-	-	-	510	-
Stage 2	-	-	-	-	731	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1040	-	193	563
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	476	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1040	-	165	563
Mov Cap-2 Maneuver	-	-	-	-	165	-
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	407	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.4	16.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	165	563	1040	-	-	-
HCM Lane V/C Ratio	0.152	0.248	0.146	-	-	-
HCM Control Delay (s)	30.7	13.5	9.1	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.5	1	0.5	-	-	-

Intersection	
Int Delay, s/veh	14.7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	467	188	231	88	58	271
Future Vol, veh/h	467	188	231	88	58	271
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	531	214	263	100	66	308

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	363	0	-	0	1539	263
Stage 1	-	-	-	-	263	-
Stage 2	-	-	-	-	1276	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1196	-	-	-	127	776
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	262	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1196	-	-	-	71	776
Mov Cap-2 Maneuver	-	-	-	-	71	-
Stage 1	-	-	-	-	434	-
Stage 2	-	-	-	-	262	-

Approach	SE	NW	SW
HCM Control Delay, s	7.4	0	43.3
HCM LOS			E

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1196	-	71	776
HCM Lane V/C Ratio	-	-	0.444	-	0.928	0.397
HCM Control Delay (s)	-	-	10.4	-	186	12.7
HCM Lane LOS	-	-	B	-	F	B
HCM 95th %tile Q(veh)	-	-	2.3	-	4.7	1.9

Intersection	
Int Delay, s/veh	2.9

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	218	11	60	253	24	112
Future Vol, veh/h	218	11	60	253	24	112
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	248	13	68	288	27	127

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	261	0	672	248
Stage 1	-	-	-	-	248	-
Stage 2	-	-	-	-	424	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1303	-	421	791
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	660	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1303	-	399	791
Mov Cap-2 Maneuver	-	-	-	-	399	-
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	626	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.5	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	399	791	1303	-	-	-
HCM Lane V/C Ratio	0.068	0.161	0.052	-	-	-
HCM Control Delay (s)	14.7	10.4	7.9	-	-	-
HCM Lane LOS	B	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.6	0.2	-	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	208	115	187	18	12	137
Future Vol, veh/h	208	115	187	18	12	137
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	236	131	213	20	14	156

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	233	0	-	0	816	213
Stage 1	-	-	-	-	213	-
Stage 2	-	-	-	-	603	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1335	-	-	-	347	827
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	546	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1335	-	-	-	286	827
Mov Cap-2 Maneuver	-	-	-	-	286	-
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	546	-

Approach	SE	NW	SW
HCM Control Delay, s	5.3	0	11
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1335	-	286	827
HCM Lane V/C Ratio	-	-	0.177	-	0.048	0.188
HCM Control Delay (s)	-	-	8.3	-	18.2	10.4
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.6	-	0.1	0.7

Intersection	
Int Delay, s/veh	2.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	315	18	131	354	12	108
Future Vol, veh/h	315	18	131	354	12	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	358	20	149	402	14	123

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	378	0	1058	358
Stage 1	-	-	-	-	358	-
Stage 2	-	-	-	-	700	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1180	-	249	686
Stage 1	-	-	-	-	707	-
Stage 2	-	-	-	-	493	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1180	-	218	686
Mov Cap-2 Maneuver	-	-	-	-	218	-
Stage 1	-	-	-	-	707	-
Stage 2	-	-	-	-	431	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.3	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	218	686	1180	-	-	-
HCM Lane V/C Ratio	0.063	0.179	0.126	-	-	-
HCM Control Delay (s)	22.6	11.4	8.5	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.6	0.4	-	-	-

Intersection	
Int Delay, s/veh	5.9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	242	193	235	49	24	248
Future Vol, veh/h	242	193	235	49	24	248
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	275	219	267	56	27	282

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	323	0	-	0	1036	267
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	769	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1237	-	-	-	256	772
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	457	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1237	-	-	-	199	772
Mov Cap-2 Maneuver	-	-	-	-	199	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	457	-

Approach	SE	NW	SW
HCM Control Delay, s	4.9	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1237	-	199	772
HCM Lane V/C Ratio	-	-	0.222	-	0.137	0.365
HCM Control Delay (s)	-	-	8.7	-	25.9	12.3
HCM Lane LOS	-	-	A	-	D	B
HCM 95th %tile Q(veh)	-	-	0.9	-	0.5	1.7

Intersection	
Int Delay, s/veh	3.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	446	16	189	319	8	103
Future Vol, veh/h	446	16	189	319	8	103
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	507	18	215	363	9	117

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	525	0	1300	507
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	793	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1042	-	178	566
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	446	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1042	-	141	566
Mov Cap-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	354	-

Approach	SE	NW	NE
HCM Control Delay, s	0	3.5	14.4
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	141	566	1042	-	-	-
HCM Lane V/C Ratio	0.064	0.207	0.206	-	-	-
HCM Control Delay (s)	32.3	13	9.3	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.8	0.8	-	-	-

Intersection	
Int Delay, s/veh	13.5

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	282	284	182	80	117	325
Future Vol, veh/h	282	284	182	80	117	325
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	320	323	207	91	133	369

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	298	0	-	0	1170	207
Stage 1	-	-	-	-	207	-
Stage 2	-	-	-	-	963	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1263	-	-	-	213	833
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	370	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1263	-	-	-	159	833
Mov Cap-2 Maneuver	-	-	-	-	159	-
Stage 1	-	-	-	-	619	-
Stage 2	-	-	-	-	370	-

Approach	SE	NW	SW
HCM Control Delay, s	4.4	0	33.2
HCM LOS			D

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1263	-	159	833
HCM Lane V/C Ratio	-	-	0.254	-	0.836	0.443
HCM Control Delay (s)	-	-	8.8	-	90.2	12.7
HCM Lane LOS	-	-	A	-	F	B
HCM 95th %tile Q(veh)	-	-	1	-	5.6	2.3

Intersection	
Int Delay, s/veh	2.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	277	9	90	308	12	124
Future Vol, veh/h	277	9	90	308	12	124
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	315	10	102	350	14	141

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	325	0	869	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	554	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1235	-	322	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	575	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1235	-	295	725
Mov Cap-2 Maneuver	-	-	-	-	295	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	527	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.8	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	295	725	1235	-	-	-
HCM Lane V/C Ratio	0.046	0.194	0.083	-	-	-
HCM Control Delay (s)	17.8	11.2	8.2	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.1	0.7	0.3	-	-	-

Intersection	
Int Delay, s/veh	8.9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	230	183	188	28	112	199
Future Vol, veh/h	230	183	188	28	112	199
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	261	208	214	32	127	226

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	246	0	-	0	944	214
Stage 1	-	-	-	-	214	-
Stage 2	-	-	-	-	730	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1320	-	-	-	291	826
Stage 1	-	-	-	-	822	-
Stage 2	-	-	-	-	477	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1320	-	-	-	233	826
Mov Cap-2 Maneuver	-	-	-	-	233	-
Stage 1	-	-	-	-	659	-
Stage 2	-	-	-	-	477	-

Approach	SE	NW	SW
HCM Control Delay, s	4.7	0	20.6
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1320	-	233	826
HCM Lane V/C Ratio	-	-	0.198	-	0.546	0.274
HCM Control Delay (s)	-	-	8.4	-	37.6	11
HCM Lane LOS	-	-	A	-	E	B
HCM 95th %tile Q(veh)	-	-	0.7	-	3	1.1

Intersection	
Int Delay, s/veh	3.3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	463	15	138	387	23	127
Future Vol, veh/h	463	15	138	387	23	127
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	526	17	157	440	26	144

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	543	0	1280	526
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	754	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1026	-	183	552
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	465	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1026	-	155	552
Mov Cap-2 Maneuver	-	-	-	-	155	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	394	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.4	16.7
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	155	552	1026	-	-	-
HCM Lane V/C Ratio	0.169	0.261	0.153	-	-	-
HCM Control Delay (s)	32.9	13.8	9.1	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.6	1	0.5	-	-	-

Intersection	
Int Delay, s/veh	16.9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	480	194	238	91	60	279
Future Vol, veh/h	480	194	238	91	60	279
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	545	220	270	103	68	317

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	373	0	-	0	1580	270
Stage 1	-	-	-	-	270	-
Stage 2	-	-	-	-	1310	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1185	-	-	-	120	769
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	252	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1185	-	-	-	~ 65	769
Mov Cap-2 Maneuver	-	-	-	-	~ 65	-
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	252	-

Approach	SE	NW	SW
HCM Control Delay, s	7.6	0	51.9
HCM LOS			F

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1185	-	65	769
HCM Lane V/C Ratio	-	-	0.46	-	1.049	0.412
HCM Control Delay (s)	-	-	10.6	-	233.5	12.9
HCM Lane LOS	-	-	B	-	F	B
HCM 95th %tile Q(veh)	-	-	2.5	-	5.3	2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	225	11	62	260	25	115
Future Vol, veh/h	225	11	62	260	25	115
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	256	13	70	295	28	131

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	269	0	691	256
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	435	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1295	-	410	783
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	653	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1295	-	388	783
Mov Cap-2 Maneuver	-	-	-	-	388	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	618	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.5	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	388	783	1295	-	-	-
HCM Lane V/C Ratio	0.073	0.167	0.054	-	-	-
HCM Control Delay (s)	15	10.5	7.9	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.6	0.2	-	-	-

Intersection	
Int Delay, s/veh	5

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	214	118	193	19	12	141
Future Vol, veh/h	214	118	193	19	12	141
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	243	134	219	22	14	160

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	241	0	-	0	839	219
Stage 1	-	-	-	-	219	-
Stage 2	-	-	-	-	620	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1326	-	-	-	336	821
Stage 1	-	-	-	-	817	-
Stage 2	-	-	-	-	536	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1326	-	-	-	275	821
Mov Cap-2 Maneuver	-	-	-	-	275	-
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	536	-

Approach	SE	NW	SW
HCM Control Delay, s	5.4	0	11.1
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1326	-	275	821
HCM Lane V/C Ratio	-	-	0.183	-	0.05	0.195
HCM Control Delay (s)	-	-	8.3	-	18.8	10.4
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.7	-	0.2	0.7

Intersection	
Int Delay, s/veh	2.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	325	19	135	365	12	111
Future Vol, veh/h	325	19	135	365	12	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	369	22	153	415	14	126

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	391	0	1090	369
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	721	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1168	-	238	677
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	482	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1168	-	207	677
Mov Cap-2 Maneuver	-	-	-	-	207	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	419	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.3	12.7
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	207	677	1168	-	-	-
HCM Lane V/C Ratio	0.066	0.186	0.131	-	-	-
HCM Control Delay (s)	23.6	11.5	8.5	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.7	0.5	-	-	-

Intersection	
Int Delay, s/veh	5.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	199	249	242	50	25	255
Future Vol, veh/h	199	249	242	50	25	255
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	226	283	275	57	28	290

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	332	0	-	0	1010	275
Stage 1	-	-	-	-	275	-
Stage 2	-	-	-	-	735	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1227	-	-	-	266	764
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	474	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1227	-	-	-	217	764
Mov Cap-2 Maneuver	-	-	-	-	217	-
Stage 1	-	-	-	-	629	-
Stage 2	-	-	-	-	474	-

Approach	SE	NW	SW
HCM Control Delay, s	3.8	0	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1227	-	217	764
HCM Lane V/C Ratio	-	-	0.184	-	0.131	0.379
HCM Control Delay (s)	-	-	8.6	-	24.1	12.6
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.7	-	0.4	1.8

Intersection	
Int Delay, s/veh	4.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	446	28	292	319	9	113
Future Vol, veh/h	446	28	292	319	9	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	507	32	332	363	10	128

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	539	0	1534	507
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	1027	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1029	-	128	566
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	345	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1029	-	87	566
Mov Cap-2 Maneuver	-	-	-	-	87	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	234	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.9	16
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	87	566	1029	-	-	-
HCM Lane V/C Ratio	0.118	0.227	0.322	-	-	-
HCM Control Delay (s)	51.8	13.2	10.2	-	-	-
HCM Lane LOS	F	B	B	-	-	-
HCM 95th %tile Q(veh)	0.4	0.9	1.4	-	-	-

Intersection	
Int Delay, s/veh	15.5

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	290	286	199	80	117	411
Future Vol, veh/h	290	286	199	80	117	411
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	330	325	226	91	133	467

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	317	0	-	0	1211	226
Stage 1	-	-	-	-	226	-
Stage 2	-	-	-	-	985	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1243	-	-	-	201	813
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	362	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1243	-	-	-	148	813
Mov Cap-2 Maneuver	-	-	-	-	148	-
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	362	-

Approach	SE	NW	SW
HCM Control Delay, s	4.5	0	35.8
HCM LOS			E

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1243	-	148	813
HCM Lane V/C Ratio	-	-	0.265	-	0.898	0.574
HCM Control Delay (s)	-	-	8.9	-	108.2	15.2
HCM Lane LOS	-	-	A	-	F	C
HCM 95th %tile Q(veh)	-	-	1.1	-	6.2	3.7

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	0	115	130	0	11
Future Vol, veh/h	75	0	115	130	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	85	0	131	148	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	85	0	495	85
Stage 1	-	-	-	-	85	-
Stage 2	-	-	-	-	410	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1512	-	534	974
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	670	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1512	-	484	974
Mov Cap-2 Maneuver	-	-	-	-	484	-
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	607	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	974	-	-	1512	-
HCM Lane V/C Ratio	0.013	-	-	0.086	-
HCM Control Delay (s)	8.7	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.3	-

Intersection	
Int Delay, s/veh	4.5

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	277	31	288	303	14	143
Future Vol, veh/h	277	31	288	303	14	143
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	315	35	327	344	16	163

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	350	0	1313	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	998	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1209	-	175	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	357	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1209	-	128	725
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	261	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.4	13.7
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	128	725	1209	-	-	-
HCM Lane V/C Ratio	0.124	0.224	0.271	-	-	-
HCM Control Delay (s)	37.1	11.4	9.1	-	-	-
HCM Lane LOS	E	B	A	-	-	-
HCM 95th %tile Q(veh)	0.4	0.9	1.1	-	-	-

Intersection	
Int Delay, s/veh	11

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	246	186	221	28	112	364
Future Vol, veh/h	246	186	221	28	112	364
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	280	211	251	32	127	414

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	283	0	-	0	1022	251
Stage 1	-	-	-	-	251	-
Stage 2	-	-	-	-	771	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1279	-	-	-	261	788
Stage 1	-	-	-	-	791	-
Stage 2	-	-	-	-	456	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1279	-	-	-	204	788
Mov Cap-2 Maneuver	-	-	-	-	204	-
Stage 1	-	-	-	-	618	-
Stage 2	-	-	-	-	456	-

Approach	SE	NW	SW
HCM Control Delay, s	4.9	0	22.4
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1279	-	204	788
HCM Lane V/C Ratio	-	-	0.219	-	0.624	0.525
HCM Control Delay (s)	-	-	8.6	-	48.1	14.5
HCM Lane LOS	-	-	A	-	E	B
HCM 95th %tile Q(veh)	-	-	0.8	-	3.6	3.1

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	92	0	220	64	0	21
Future Vol, veh/h	92	0	220	64	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	105	0	250	73	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	105	0	678	105
Stage 1	-	-	-	-	105	-
Stage 2	-	-	-	-	573	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1486	-	418	949
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	564	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1486	-	345	949
Mov Cap-2 Maneuver	-	-	-	-	345	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	465	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	949	-	-	1486	-
HCM Lane V/C Ratio	0.025	-	-	0.168	-
HCM Control Delay (s)	8.9	-	-	7.9	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-

Intersection	
Int Delay, s/veh	6.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	463	17	151	387	39	266
Future Vol, veh/h	463	17	151	387	39	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	526	19	172	440	44	302

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	545	0	1310	526
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	784	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1024	-	175	552
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	450	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1024	-	146	552
Mov Cap-2 Maneuver	-	-	-	-	146	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	374	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.6	21.8
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	146	552	1024	-	-	-
HCM Lane V/C Ratio	0.304	0.548	0.168	-	-	-
HCM Control Delay (s)	40.1	19.1	9.2	-	-	-
HCM Lane LOS	E	C	A	-	-	-
HCM 95th %tile Q(veh)	1.2	3.3	0.6	-	-	-

Intersection	
Int Delay, s/veh	36.3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	596	217	240	91	60	290
Future Vol, veh/h	596	217	240	91	60	290
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	677	247	273	103	68	330

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	376	0	-	0	1874	273
Stage 1	-	-	-	-	273	-
Stage 2	-	-	-	-	1601	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1182	-	-	-	79	766
Stage 1	-	-	-	-	773	-
Stage 2	-	-	-	-	182	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1182	-	-	-	~ 34	766
Mov Cap-2 Maneuver	-	-	-	-	~ 34	-
Stage 1	-	-	-	-	330	-
Stage 2	-	-	-	-	182	-

Approach	SE	NW	SW
HCM Control Delay, s	8.8	0	134.4
HCM LOS			F

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1182	-	34	766
HCM Lane V/C Ratio	-	-	0.573	-	2.005	0.43
HCM Control Delay (s)	-	-	12	-	$ 720.1	13.2
HCM Lane LOS	-	-	B	-	F	B
HCM 95th %tile Q(veh)	-	-	3.8	-	7.6	2.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	4.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	107	0	15	102	0	155
Future Vol, veh/h	107	0	15	102	0	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	122	0	17	116	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	122	0	272	122
Stage 1	-	-	-	-	122	-
Stage 2	-	-	-	-	150	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1465	-	717	929
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	878	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1465	-	708	929
Mov Cap-2 Maneuver	-	-	-	-	708	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	867	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	929	-	-	1465	-
HCM Lane V/C Ratio	0.19	-	-	0.012	-
HCM Control Delay (s)	9.8	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection	
Int Delay, s/veh	4.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	225	33	260	260	27	134
Future Vol, veh/h	225	33	260	260	27	134
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	256	38	295	295	31	152

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	294	0	1141	256
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	885	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1268	-	222	783
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	403	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1268	-	170	783
Mov Cap-2 Maneuver	-	-	-	-	170	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	309	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.3	14.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	170	783	1268	-	-	-
HCM Lane V/C Ratio	0.18	0.194	0.233	-	-	-
HCM Control Delay (s)	30.8	10.7	8.7	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.6	0.7	0.9	-	-	-

Intersection	
Int Delay, s/veh	6.8

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	230	121	226	19	12	306
Future Vol, veh/h	230	121	226	19	12	306
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	261	138	257	22	14	348

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	279	0	-	0	917	257
Stage 1	-	-	-	-	257	-
Stage 2	-	-	-	-	660	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1284	-	-	-	302	782
Stage 1	-	-	-	-	786	-
Stage 2	-	-	-	-	514	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1284	-	-	-	241	782
Mov Cap-2 Maneuver	-	-	-	-	241	-
Stage 1	-	-	-	-	626	-
Stage 2	-	-	-	-	514	-

Approach	SE	NW	SW
HCM Control Delay, s	5.6	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1284	-	241	782
HCM Lane V/C Ratio	-	-	0.204	-	0.057	0.445
HCM Control Delay (s)	-	-	8.5	-	20.8	13.2
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.8	-	0.2	2.3

Intersection	
Int Delay, s/veh	5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	85	0	220	60	0	21
Future Vol, veh/h	85	0	220	60	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	97	0	250	68	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	97	0	665	97
Stage 1	-	-	-	-	97	-
Stage 2	-	-	-	-	568	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1496	-	425	959
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	567	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1496	-	351	959
Mov Cap-2 Maneuver	-	-	-	-	351	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	468	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.2	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	959	-	-	1496	-
HCM Lane V/C Ratio	0.025	-	-	0.167	-
HCM Control Delay (s)	8.9	-	-	7.9	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-

Intersection	
Int Delay, s/veh	4.9

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	325	21	148	365	28	250
Future Vol, veh/h	325	21	148	365	28	250
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	369	24	168	415	32	284

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	393	0	1120	369
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	751	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1166	-	228	677
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	466	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1166	-	195	677
Mov Cap-2 Maneuver	-	-	-	-	195	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	399	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.5	15.4
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	195	677	1166	-	-	-
HCM Lane V/C Ratio	0.163	0.42	0.144	-	-	-
HCM Control Delay (s)	27	14.1	8.6	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.6	2.1	0.5	-	-	-

Intersection	
Int Delay, s/veh	6.9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	365	222	244	50	25	266
Future Vol, veh/h	365	222	244	50	25	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	415	252	277	57	28	302

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	334	0	-	0	1359	277
Stage 1	-	-	-	-	277	-
Stage 2	-	-	-	-	1082	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1225	-	-	-	164	762
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	325	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1225	-	-	-	108	762
Mov Cap-2 Maneuver	-	-	-	-	108	-
Stage 1	-	-	-	-	509	-
Stage 2	-	-	-	-	325	-

Approach	SE	NW	SW
HCM Control Delay, s	5.9	0	16
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1225	-	108	762
HCM Lane V/C Ratio	-	-	0.339	-	0.263	0.397
HCM Control Delay (s)	-	-	9.4	-	49.8	12.8
HCM Lane LOS	-	-	A	-	E	B
HCM 95th %tile Q(veh)	-	-	1.5	-	1	1.9

Intersection	
Int Delay, s/veh	4.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	95	0	15	90	0	155
Future Vol, veh/h	95	0	15	90	0	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	0	17	102	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	108	0	244	108
Stage 1	-	-	-	-	108	-
Stage 2	-	-	-	-	136	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1483	-	744	946
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	890	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1483	-	735	946
Mov Cap-2 Maneuver	-	-	-	-	735	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	879	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	946	-	-	1483	-
HCM Lane V/C Ratio	0.186	-	-	0.011	-
HCM Control Delay (s)	9.7	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection	
Int Delay, s/veh	3.9

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	446	28	292	319	9	113
Future Vol, veh/h	446	28	292	319	9	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	507	32	332	363	10	128

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	539	0	1534	507
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	1027	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1029	-	128	566
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	345	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1029	-	87	566
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	234	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.9	14.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	184	566	1029	-	-	-
HCM Lane V/C Ratio	0.056	0.227	0.322	-	-	-
HCM Control Delay (s)	25.7	13.2	10.2	-	-	-
HCM Lane LOS	D	B	B	-	-	-
HCM 95th %tile Q(veh)	0.2	0.9	1.4	-	-	-

Intersection	
Int Delay, s/veh	9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	290	286	199	80	117	411
Future Vol, veh/h	290	286	199	80	117	411
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	330	325	226	91	133	467

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	317	0	-	0	1211	226
Stage 1	-	-	-	-	226	-
Stage 2	-	-	-	-	985	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1243	-	-	-	201	813
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	362	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1243	-	-	-	148	813
Mov Cap-2 Maneuver	-	-	-	-	267	-
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	362	-

Approach	SE	NW	SW
HCM Control Delay, s	4.5	0	18.7
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1243	-	267	813
HCM Lane V/C Ratio	-	-	0.265	-	0.498	0.574
HCM Control Delay (s)	-	-	8.9	-	31.1	15.2
HCM Lane LOS	-	-	A	-	D	C
HCM 95th %tile Q(veh)	-	-	1.1	-	2.6	3.7

Intersection	
Int Delay, s/veh	4.3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	277	31	288	303	14	143
Future Vol, veh/h	277	31	288	303	14	143
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	315	35	327	344	16	163

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	350	0	1313	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	998	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1209	-	175	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	357	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1209	-	128	725
Mov Cap-2 Maneuver	-	-	-	-	217	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	261	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.4	12.4
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	217	725	1209	-	-	-
HCM Lane V/C Ratio	0.073	0.224	0.271	-	-	-
HCM Control Delay (s)	22.9	11.4	9.1	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.9	1.1	-	-	-

Intersection	
Int Delay, s/veh	8.6

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	246	186	221	28	112	364
Future Vol, veh/h	246	186	221	28	112	364
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	280	211	251	32	127	414

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	283	0	-	0	1022	251
Stage 1	-	-	-	-	251	-
Stage 2	-	-	-	-	771	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1279	-	-	-	261	788
Stage 1	-	-	-	-	791	-
Stage 2	-	-	-	-	456	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1279	-	-	-	204	788
Mov Cap-2 Maneuver	-	-	-	-	329	-
Stage 1	-	-	-	-	618	-
Stage 2	-	-	-	-	456	-

Approach	SE	NW	SW
HCM Control Delay, s	4.9	0	16.4
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1279	-	329	788
HCM Lane V/C Ratio	-	-	0.219	-	0.387	0.525
HCM Control Delay (s)	-	-	8.6	-	22.7	14.5
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.8	-	1.8	3.1

Intersection	
Int Delay, s/veh	5.5

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	463	17	151	387	39	266
Future Vol, veh/h	463	17	151	387	39	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	526	19	172	440	44	302

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	545	0	1310	526
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	784	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1024	-	175	552
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	450	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1024	-	146	552
Mov Cap-2 Maneuver	-	-	-	-	271	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	374	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.6	19.3
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	271	552	1024	-	-	-
HCM Lane V/C Ratio	0.164	0.548	0.168	-	-	-
HCM Control Delay (s)	20.9	19.1	9.2	-	-	-
HCM Lane LOS	C	C	A	-	-	-
HCM 95th %tile Q(veh)	0.6	3.3	0.6	-	-	-

Intersection	
Int Delay, s/veh	10.1

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	596	217	240	91	60	290
Future Vol, veh/h	596	217	240	91	60	290
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	677	247	273	103	68	330

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	376	0	-	0	1874	273
Stage 1	-	-	-	-	273	-
Stage 2	-	-	-	-	1601	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1182	-	-	-	79	766
Stage 1	-	-	-	-	773	-
Stage 2	-	-	-	-	182	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1182	-	-	-	~ 34	766
Mov Cap-2 Maneuver	-	-	-	-	121	-
Stage 1	-	-	-	-	330	-
Stage 2	-	-	-	-	182	-

Approach	SE	NW	SW
HCM Control Delay, s	8.8	0	22.5
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1182	-	121	766
HCM Lane V/C Ratio	-	-	0.573	-	0.563	0.43
HCM Control Delay (s)	-	-	12	-	67.6	13.2
HCM Lane LOS	-	-	B	-	F	B
HCM 95th %tile Q(veh)	-	-	3.8	-	2.7	2.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	4.5

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	225	33	260	260	27	134
Future Vol, veh/h	225	33	260	260	27	134
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	256	38	295	295	31	152

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	294	0	1141	256
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	885	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1268	-	222	783
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	403	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1268	-	170	783
Mov Cap-2 Maneuver	-	-	-	-	259	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	309	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.3	12.4
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	259	783	1268	-	-	-
HCM Lane V/C Ratio	0.118	0.194	0.233	-	-	-
HCM Control Delay (s)	20.8	10.7	8.7	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.4	0.7	0.9	-	-	-

Intersection	
Int Delay, s/veh	6.8

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	230	121	226	19	12	306
Future Vol, veh/h	230	121	226	19	12	306
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	261	138	257	22	14	348

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	279	0	-	0	917	257
Stage 1	-	-	-	-	257	-
Stage 2	-	-	-	-	660	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1284	-	-	-	302	782
Stage 1	-	-	-	-	786	-
Stage 2	-	-	-	-	514	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1284	-	-	-	241	782
Mov Cap-2 Maneuver	-	-	-	-	366	-
Stage 1	-	-	-	-	626	-
Stage 2	-	-	-	-	514	-

Approach	SE	NW	SW
HCM Control Delay, s	5.6	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1284	-	366	782
HCM Lane V/C Ratio	-	-	0.204	-	0.037	0.445
HCM Control Delay (s)	-	-	8.5	-	15.2	13.2
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.8	-	0.1	2.3

Intersection	
Int Delay, s/veh	4.7

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	325	21	148	365	28	250
Future Vol, veh/h	325	21	148	365	28	250
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	369	24	168	415	32	284

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	393	0	1120	369
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	751	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1166	-	228	677
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	466	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1166	-	195	677
Mov Cap-2 Maneuver	-	-	-	-	311	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	399	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.5	14.5
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	311	677	1166	-	-	-
HCM Lane V/C Ratio	0.102	0.42	0.144	-	-	-
HCM Control Delay (s)	17.9	14.1	8.6	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.3	2.1	0.5	-	-	-

Intersection	
Int Delay, s/veh	6.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	365	222	244	50	25	266
Future Vol, veh/h	365	222	244	50	25	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	415	252	277	57	28	302

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	334	0	-	0	1359	277
Stage 1	-	-	-	-	277	-
Stage 2	-	-	-	-	1082	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1225	-	-	-	164	762
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	325	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1225	-	-	-	108	762
Mov Cap-2 Maneuver	-	-	-	-	227	-
Stage 1	-	-	-	-	509	-
Stage 2	-	-	-	-	325	-

Approach	SE	NW	SW
HCM Control Delay, s	5.9	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1225	-	227	762
HCM Lane V/C Ratio	-	-	0.339	-	0.125	0.397
HCM Control Delay (s)	-	-	9.4	-	23.1	12.8
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	1.5	-	0.4	1.9

Intersection	
Int Delay, s/veh	3.6

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	525	20	225	375	10	120
Future Vol, veh/h	525	20	225	375	10	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	597	23	256	426	11	136

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	620	0	1535	597
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	938	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	960	-	128	503
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	381	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	960	-	94	503
Mov Cap-2 Maneuver	-	-	-	-	94	-
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	279	-

Approach	SE	NW	NE
HCM Control Delay, s	0	3.8	17.4
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	94	503	960	-	-	-
HCM Lane V/C Ratio	0.121	0.271	0.266	-	-	-
HCM Control Delay (s)	48.5	14.8	10.1	-	-	-
HCM Lane LOS	E	B	B	-	-	-
HCM 95th %tile Q(veh)	0.4	1.1	1.1	-	-	-

Intersection	
Int Delay, s/veh	36.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	335	335	215	95	140	385
Future Vol, veh/h	335	335	215	95	140	385
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	381	381	244	108	159	438

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	352	0	-	0	1387	244
Stage 1	-	-	-	-	244	-
Stage 2	-	-	-	-	1143	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1207	-	-	-	~ 158	795
Stage 1	-	-	-	-	797	-
Stage 2	-	-	-	-	304	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1207	-	-	-	~ 108	795
Mov Cap-2 Maneuver	-	-	-	-	~ 108	-
Stage 1	-	-	-	-	545	-
Stage 2	-	-	-	-	304	-

Approach	SE	NW	SW
HCM Control Delay, s	4.7	0	98.3
HCM LOS			F

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1207	-	108	795
HCM Lane V/C Ratio	-	-	0.315	-	1.473	0.55
HCM Control Delay (s)	-	-	9.4	-	$ 327.6	14.9
HCM Lane LOS	-	-	A	-	F	B
HCM 95th %tile Q(veh)	-	-	1.4	-	11.6	3.4

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	330	11	105	360	15	145
Future Vol, veh/h	330	11	105	360	15	145
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	375	13	119	409	17	165

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	388	0	1022	375
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	647	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1170	-	261	671
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	521	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1170	-	234	671
Mov Cap-2 Maneuver	-	-	-	-	234	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	468	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.9	13
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	234	671	1170	-	-	-
HCM Lane V/C Ratio	0.073	0.246	0.102	-	-	-
HCM Control Delay (s)	21.6	12.1	8.4	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	1	0.3	-	-	-

Intersection	
Int Delay, s/veh	14.6

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	270	215	220	35	130	235
Future Vol, veh/h	270	215	220	35	130	235
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	307	244	250	40	148	267

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	290	0	-	0	1108	250
Stage 1	-	-	-	-	250	-
Stage 2	-	-	-	-	858	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1272	-	-	-	232	789
Stage 1	-	-	-	-	792	-
Stage 2	-	-	-	-	415	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1272	-	-	-	176	789
Mov Cap-2 Maneuver	-	-	-	-	176	-
Stage 1	-	-	-	-	601	-
Stage 2	-	-	-	-	415	-

Approach	SE	NW	SW
HCM Control Delay, s	4.9	0	37.7
HCM LOS			E

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1272	-	176	789
HCM Lane V/C Ratio	-	-	0.241	-	0.839	0.338
HCM Control Delay (s)	-	-	8.7	-	84.3	11.9
HCM Lane LOS	-	-	A	-	F	B
HCM 95th %tile Q(veh)	-	-	0.9	-	5.9	1.5

Intersection	
Int Delay, s/veh	4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	545	18	165	460	27	150
Future Vol, veh/h	545	18	165	460	27	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	619	20	188	523	31	170

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	639	0	1518	619
Stage 1	-	-	-	-	619	-
Stage 2	-	-	-	-	899	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	945	-	131	489
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	397	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	945	-	105	489
Mov Cap-2 Maneuver	-	-	-	-	105	-
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	318	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.6	21.9
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	105	489	945	-	-	-
HCM Lane V/C Ratio	0.292	0.349	0.198	-	-	-
HCM Control Delay (s)	52.9	16.3	9.8	-	-	-
HCM Lane LOS	F	C	A	-	-	-
HCM 95th %tile Q(veh)	1.1	1.5	0.7	-	-	-

Intersection	
Int Delay, s/veh	47.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	570	230	280	105	70	330
Future Vol, veh/h	570	230	280	105	70	330
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	648	261	318	119	80	375

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	437	0	-	0	1875	318
Stage 1	-	-	-	-	318	-
Stage 2	-	-	-	-	1557	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1123	-	-	-	~ 79	723
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	191	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1123	-	-	-	~ 33	723
Mov Cap-2 Maneuver	-	-	-	-	~ 33	-
Stage 1	-	-	-	-	312	-
Stage 2	-	-	-	-	191	-

Approach	SE	NW	SW
HCM Control Delay, s	8.9	0	170
HCM LOS			F

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1123	-	33	723
HCM Lane V/C Ratio	-	-	0.577	-	2.41	0.519
HCM Control Delay (s)	-	-	12.5	-	$ 899.5	15.2
HCM Lane LOS	-	-	B	-	F	C
HCM 95th %tile Q(veh)	-	-	3.8	-	9.1	3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3.2

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	265	13	75	310	30	135
Future Vol, veh/h	265	13	75	310	30	135
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	301	15	85	352	34	153

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	316	0	823	301
Stage 1	-	-	-	-	301	-
Stage 2	-	-	-	-	522	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1244	-	343	739
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	595	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1244	-	320	739
Mov Cap-2 Maneuver	-	-	-	-	320	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	555	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.6	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	320	739	1244	-	-	-
HCM Lane V/C Ratio	0.107	0.208	0.069	-	-	-
HCM Control Delay (s)	17.6	11.1	8.1	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.4	0.8	0.2	-	-	-

Intersection	
Int Delay, s/veh	5.3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	250	140	225	22	15	165
Future Vol, veh/h	250	140	225	22	15	165
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	284	159	256	25	17	188

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	281	0	-	0	983	256
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	727	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1282	-	-	-	276	783
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	478	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1282	-	-	-	215	783
Mov Cap-2 Maneuver	-	-	-	-	215	-
Stage 1	-	-	-	-	612	-
Stage 2	-	-	-	-	478	-

Approach	SE	NW	SW
HCM Control Delay, s	5.5	0	12
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1282	-	215	783
HCM Lane V/C Ratio	-	-	0.222	-	0.079	0.239
HCM Control Delay (s)	-	-	8.6	-	23.2	11
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.8	-	0.3	0.9

Intersection	
Int Delay, s/veh	2.7

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	385	22	105	430	15	130
Future Vol, veh/h	385	22	105	430	15	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	438	25	119	489	17	148

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	463	0	1165	438
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	727	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1098	-	215	619
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	478	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1098	-	192	619
Mov Cap-2 Maneuver	-	-	-	-	192	-
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	426	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.7	13.9
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	192	619	1098	-	-	-
HCM Lane V/C Ratio	0.089	0.239	0.109	-	-	-
HCM Control Delay (s)	25.6	12.6	8.7	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.3	0.9	0.4	-	-	-

Intersection	
Int Delay, s/veh	6.9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	295	235	285	60	30	300
Future Vol, veh/h	295	235	285	60	30	300
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	335	267	324	68	34	341

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	392	0	-	0	1261	324
Stage 1	-	-	-	-	324	-
Stage 2	-	-	-	-	937	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1167	-	-	-	188	717
Stage 1	-	-	-	-	733	-
Stage 2	-	-	-	-	381	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1167	-	-	-	134	717
Mov Cap-2 Maneuver	-	-	-	-	134	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	381	-

Approach	SE	NW	SW
HCM Control Delay, s	5.2	0	16.9
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1167	-	134	717
HCM Lane V/C Ratio	-	-	0.287	-	0.254	0.475
HCM Control Delay (s)	-	-	9.3	-	40.8	14.5
HCM Lane LOS	-	-	A	-	E	B
HCM 95th %tile Q(veh)	-	-	1.2	-	1	2.6

Intersection	
Int Delay, s/veh	4.7

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	525	32	328	375	11	130
Future Vol, veh/h	525	32	328	375	11	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	597	36	373	426	13	148

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	633	0	1769	597
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	1172	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	950	-	92	503
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	294	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	950	-	56	503
Mov Cap-2 Maneuver	-	-	-	-	56	-
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	178	-

Approach	SE	NW	NE
HCM Control Delay, s	0	5.2	20.7
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	56	503	950	-	-	-
HCM Lane V/C Ratio	0.223	0.294	0.392	-	-	-
HCM Control Delay (s)	86.9	15.1	11.2	-	-	-
HCM Lane LOS	F	C	B	-	-	-
HCM 95th %tile Q(veh)	0.8	1.2	1.9	-	-	-

Intersection	
Int Delay, s/veh	40.7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	343	337	232	95	140	471
Future Vol, veh/h	343	337	232	95	140	471
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	390	383	264	108	159	535

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	372	0	-	0	1427	264
Stage 1	-	-	-	-	264	-
Stage 2	-	-	-	-	1163	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1186	-	-	-	~ 149	775
Stage 1	-	-	-	-	780	-
Stage 2	-	-	-	-	297	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1186	-	-	-	~ 100	775
Mov Cap-2 Maneuver	-	-	-	-	~ 100	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	297	-

Approach	SE	NW	SW
HCM Control Delay, s	4.8	0	102.5
HCM LOS			F

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1186	-	100	775
HCM Lane V/C Ratio	-	-	0.329	-	1.591	0.691
HCM Control Delay (s)	-	-	9.5	-	$ 382.4	19.3
HCM Lane LOS	-	-	A	-	F	C
HCM 95th %tile Q(veh)	-	-	1.4	-	12.3	5.6

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	90	0	115	155	0	11
Future Vol, veh/h	90	0	115	155	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	0	131	176	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	102	0	540	102
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	438	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1490	-	503	953
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	651	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1490	-	454	953
Mov Cap-2 Maneuver	-	-	-	-	454	-
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	588	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.3	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	953	-	-	1490	-
HCM Lane V/C Ratio	0.013	-	-	0.088	-
HCM Control Delay (s)	8.8	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.3	-

Intersection	
Int Delay, s/veh	4.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	330	33	303	360	17	164
Future Vol, veh/h	330	33	303	360	17	164
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	375	38	344	409	19	186

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	413	0	1472	375
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	1097	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1146	-	140	671
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	320	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1146	-	98	671
Mov Cap-2 Maneuver	-	-	-	-	98	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	224	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.3	16
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	98	671	1146	-	-	-
HCM Lane V/C Ratio	0.197	0.278	0.3	-	-	-
HCM Control Delay (s)	50.5	12.4	9.5	-	-	-
HCM Lane LOS	F	B	A	-	-	-
HCM 95th %tile Q(veh)	0.7	1.1	1.3	-	-	-

Intersection	
Int Delay, s/veh	19.1

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	286	218	253	35	130	400
Future Vol, veh/h	286	218	253	35	130	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	325	248	288	40	148	455

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	328	0	-	0	1186	288
Stage 1	-	-	-	-	288	-
Stage 2	-	-	-	-	898	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1232	-	-	-	208	751
Stage 1	-	-	-	-	761	-
Stage 2	-	-	-	-	398	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1232	-	-	-	153	751
Mov Cap-2 Maneuver	-	-	-	-	153	-
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	398	-

Approach	SE	NW	SW
HCM Control Delay, s	5.1	0	42.7
HCM LOS			E

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1232	-	153	751
HCM Lane V/C Ratio	-	-	0.264	-	0.966	0.605
HCM Control Delay (s)	-	-	9	-	122.2	16.9
HCM Lane LOS	-	-	A	-	F	C
HCM 95th %tile Q(veh)	-	-	1.1	-	7.1	4.1

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	110	0	220	75	0	21
Future Vol, veh/h	110	0	220	75	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	125	0	250	85	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	125	0	710	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	585	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1462	-	400	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	557	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1462	-	328	926
Mov Cap-2 Maneuver	-	-	-	-	328	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	457	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.9	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	926	-	-	1462	-
HCM Lane V/C Ratio	0.026	-	-	0.171	-
HCM Control Delay (s)	9	-	-	8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-

Intersection	
Int Delay, s/veh	8.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	545	20	178	460	43	289
Future Vol, veh/h	545	20	178	460	43	289
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	619	23	202	523	49	328

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	642	0	1546	619
Stage 1	-	-	-	-	619	-
Stage 2	-	-	-	-	927	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	943	-	126	489
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	385	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	943	-	99	489
Mov Cap-2 Maneuver	-	-	-	-	99	-
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	303	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.8	32.1
HCM LOS			D

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	99	489	943	-	-	-
HCM Lane V/C Ratio	0.494	0.672	0.214	-	-	-
HCM Control Delay (s)	72.5	26.1	9.9	-	-	-
HCM Lane LOS	F	D	A	-	-	-
HCM 95th %tile Q(veh)	2.2	4.9	0.8	-	-	-

Intersection	
Int Delay, s/veh	100.3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	686	253	282	105	70	341
Future Vol, veh/h	686	253	282	105	70	341
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	780	288	320	119	80	388

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	439	0	-	0	2168	320
Stage 1	-	-	-	-	320	-
Stage 2	-	-	-	-	1848	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1121	-	-	-	~ 52	721
Stage 1	-	-	-	-	736	-
Stage 2	-	-	-	-	137	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1121	-	-	-	~ 16	721
Mov Cap-2 Maneuver	-	-	-	-	~ 16	-
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	137	-

Approach	SE	NW	SW
HCM Control Delay, s	11.1	0	$ 398.6
HCM LOS			F

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1121	-	16	721
HCM Lane V/C Ratio	-	-	0.695	-	4.972	0.537
HCM Control Delay (s)	-	-	15.2	$	2264.6	15.6
HCM Lane LOS	-	-	C	-	F	C
HCM 95th %tile Q(veh)	-	-	6	-	10.7	3.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	125	0	15	120	0	155
Future Vol, veh/h	125	0	15	120	0	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	142	0	17	136	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	142	0	312	142
Stage 1	-	-	-	-	142	-
Stage 2	-	-	-	-	170	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1441	-	681	906
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	860	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1441	-	672	906
Mov Cap-2 Maneuver	-	-	-	-	672	-
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	849	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	906	-	-	1441	-
HCM Lane V/C Ratio	0.194	-	-	0.012	-
HCM Control Delay (s)	9.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection	
Int Delay, s/veh	5.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	265	35	273	310	32	154
Future Vol, veh/h	265	35	273	310	32	154
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	301	40	310	352	36	175

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	341	0	1273	301
Stage 1	-	-	-	-	301	-
Stage 2	-	-	-	-	972	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1218	-	185	739
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	367	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1218	-	138	739
Mov Cap-2 Maneuver	-	-	-	-	138	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	273	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.2	16.4
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	138	739	1218	-	-	-
HCM Lane V/C Ratio	0.264	0.237	0.255	-	-	-
HCM Control Delay (s)	40.2	11.4	9	-	-	-
HCM Lane LOS	E	B	A	-	-	-
HCM 95th %tile Q(veh)	1	0.9	1	-	-	-

Intersection	
Int Delay, s/veh	7.3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	266	143	258	22	15	330
Future Vol, veh/h	266	143	258	22	15	330
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	302	163	293	25	17	375

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	318	0	-	0	1060	293
Stage 1	-	-	-	-	293	-
Stage 2	-	-	-	-	767	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1242	-	-	-	248	746
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	458	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1242	-	-	-	188	746
Mov Cap-2 Maneuver	-	-	-	-	188	-
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	458	-

Approach	SE	NW	SW
HCM Control Delay, s	5.7	0	15.1
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1242	-	188	746
HCM Lane V/C Ratio	-	-	0.243	-	0.091	0.503
HCM Control Delay (s)	-	-	8.8	-	26	14.6
HCM Lane LOS	-	-	A	-	D	B
HCM 95th %tile Q(veh)	-	-	1	-	0.3	2.9

Intersection	
Int Delay, s/veh	4.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	100	0	220	70	0	21
Future Vol, veh/h	100	0	220	70	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	114	0	250	80	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	114	0	694	114
Stage 1	-	-	-	-	114	-
Stage 2	-	-	-	-	580	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1475	-	409	939
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	560	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1475	-	337	939
Mov Cap-2 Maneuver	-	-	-	-	337	-
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	461	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	939	-	-	1475	-
HCM Lane V/C Ratio	0.025	-	-	0.169	-
HCM Control Delay (s)	8.9	-	-	7.9	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-

Intersection	
Int Delay, s/veh	5.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	385	24	118	430	31	269
Future Vol, veh/h	385	24	118	430	31	269
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	438	27	134	489	35	306

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	465	0	1195	438
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	757	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1096	-	206	619
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	463	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1096	-	181	619
Mov Cap-2 Maneuver	-	-	-	-	181	-
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	407	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.9	17.8
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	181	619	1096	-	-	-
HCM Lane V/C Ratio	0.195	0.494	0.122	-	-	-
HCM Control Delay (s)	29.6	16.4	8.7	-	-	-
HCM Lane LOS	D	C	A	-	-	-
HCM 95th %tile Q(veh)	0.7	2.7	0.4	-	-	-

Intersection	
Int Delay, s/veh	8.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	411	285	287	60	30	311
Future Vol, veh/h	411	285	287	60	30	311
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	467	324	326	68	34	353

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	394	0	-	0	1584	326
Stage 1	-	-	-	-	326	-
Stage 2	-	-	-	-	1258	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1165	-	-	-	119	715
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	268	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1165	-	-	-	71	715
Mov Cap-2 Maneuver	-	-	-	-	71	-
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	268	-

Approach	SE	NW	SW
HCM Control Delay, s	6	0	22
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1165	-	71	715
HCM Lane V/C Ratio	-	-	0.401	-	0.48	0.494
HCM Control Delay (s)	-	-	10.1	-	95.7	14.9
HCM Lane LOS	-	-	B	-	F	B
HCM 95th %tile Q(veh)	-	-	2	-	1.9	2.8

Intersection	
Int Delay, s/veh	4.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	110	0	15	105	0	155
Future Vol, veh/h	110	0	15	105	0	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	125	0	17	119	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	125	0	278	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	153	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1462	-	712	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	875	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1462	-	703	926
Mov Cap-2 Maneuver	-	-	-	-	703	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	865	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	926	-	-	1462	-
HCM Lane V/C Ratio	0.19	-	-	0.012	-
HCM Control Delay (s)	9.8	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection	
Int Delay, s/veh	4.3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	525	32	328	375	11	130
Future Vol, veh/h	525	32	328	375	11	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	597	36	373	426	13	148

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	633	0	1769	597
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	1172	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	950	-	92	503
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	294	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	950	-	56	503
Mov Cap-2 Maneuver	-	-	-	-	140	-
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	178	-

Approach	SE	NW	NE
HCM Control Delay, s	0	5.2	16.5
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	140	503	950	-	-	-
HCM Lane V/C Ratio	0.089	0.294	0.392	-	-	-
HCM Control Delay (s)	33.2	15.1	11.2	-	-	-
HCM Lane LOS	D	C	B	-	-	-
HCM 95th %tile Q(veh)	0.3	1.2	1.9	-	-	-

Intersection	
Int Delay, s/veh	12.7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	343	337	232	95	140	471
Future Vol, veh/h	343	337	232	95	140	471
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	390	383	264	108	159	535

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	372	0	-	0	1427	264
Stage 1	-	-	-	-	264	-
Stage 2	-	-	-	-	1163	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1186	-	-	-	~ 149	775
Stage 1	-	-	-	-	780	-
Stage 2	-	-	-	-	297	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1186	-	-	-	~ 100	775
Mov Cap-2 Maneuver	-	-	-	-	214	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	297	-

Approach	SE	NW	SW
HCM Control Delay, s	4.8	0	28.4
HCM LOS			D

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1186	-	214	775
HCM Lane V/C Ratio	-	-	0.329	-	0.743	0.691
HCM Control Delay (s)	-	-	9.5	-	58.8	19.3
HCM Lane LOS	-	-	A	-	F	C
HCM 95th %tile Q(veh)	-	-	1.4	-	5	5.6

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	4.4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	330	33	303	360	17	164
Future Vol, veh/h	330	33	303	360	17	164
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	375	38	344	409	19	186

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	413	0	1472	375
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	1097	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1146	-	140	671
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	320	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1146	-	98	671
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	224	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.3	13.8
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	184	671	1146	-	-	-
HCM Lane V/C Ratio	0.105	0.278	0.3	-	-	-
HCM Control Delay (s)	26.8	12.4	9.5	-	-	-
HCM Lane LOS	D	B	A	-	-	-
HCM 95th %tile Q(veh)	0.3	1.1	1.3	-	-	-

Intersection	
Int Delay, s/veh	10.2

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	286	218	253	35	130	400
Future Vol, veh/h	286	218	253	35	130	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	325	248	288	40	148	455

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	328	0	-	0	1186	288
Stage 1	-	-	-	-	288	-
Stage 2	-	-	-	-	898	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1232	-	-	-	208	751
Stage 1	-	-	-	-	761	-
Stage 2	-	-	-	-	398	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1232	-	-	-	153	751
Mov Cap-2 Maneuver	-	-	-	-	279	-
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	398	-

Approach	SE	NW	SW
HCM Control Delay, s	5.1	0	20.5
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1232	-	279	751
HCM Lane V/C Ratio	-	-	0.264	-	0.529	0.605
HCM Control Delay (s)	-	-	9	-	31.5	16.9
HCM Lane LOS	-	-	A	-	D	C
HCM 95th %tile Q(veh)	-	-	1.1	-	2.9	4.1

Intersection	
Int Delay, s/veh	6.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	545	20	178	460	43	289
Future Vol, veh/h	545	20	178	460	43	289
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	619	23	202	523	49	328

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	642	0	1546	619
Stage 1	-	-	-	-	619	-
Stage 2	-	-	-	-	927	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	943	-	126	489
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	385	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	943	-	99	489
Mov Cap-2 Maneuver	-	-	-	-	217	-
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	303	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.8	26.1
HCM LOS			D

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	217	489	943	-	-	-
HCM Lane V/C Ratio	0.225	0.672	0.214	-	-	-
HCM Control Delay (s)	26.3	26.1	9.9	-	-	-
HCM Lane LOS	D	D	A	-	-	-
HCM 95th %tile Q(veh)	0.8	4.9	0.8	-	-	-

Intersection	
Int Delay, s/veh	16

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	686	253	282	105	70	341
Future Vol, veh/h	686	253	282	105	70	341
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	780	288	320	119	80	388

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	439	0	-	0	2168	320
Stage 1	-	-	-	-	320	-
Stage 2	-	-	-	-	1848	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1121	-	-	-	~ 52	721
Stage 1	-	-	-	-	736	-
Stage 2	-	-	-	-	137	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1121	-	-	-	~ 16	721
Mov Cap-2 Maneuver	-	-	-	-	84	-
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	137	-

Approach	SE	NW	SW
HCM Control Delay, s	11.1	0	42.2
HCM LOS			E

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1121	-	84	721
HCM Lane V/C Ratio	-	-	0.695	-	0.947	0.537
HCM Control Delay (s)	-	-	15.2	-	171.6	15.6
HCM Lane LOS	-	-	C	-	F	C
HCM 95th %tile Q(veh)	-	-	6	-	5.2	3.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	4.7

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	265	35	273	310	32	154
Future Vol, veh/h	265	35	273	310	32	154
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	301	40	310	352	36	175

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	341	0	1273	301
Stage 1	-	-	-	-	301	-
Stage 2	-	-	-	-	972	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1218	-	185	739
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	367	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1218	-	138	739
Mov Cap-2 Maneuver	-	-	-	-	227	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	273	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.2	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	227	739	1218	-	-	-
HCM Lane V/C Ratio	0.16	0.237	0.255	-	-	-
HCM Control Delay (s)	23.9	11.4	9	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.6	0.9	1	-	-	-

Intersection	
Int Delay, s/veh	7.2

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	266	143	258	22	15	330
Future Vol, veh/h	266	143	258	22	15	330
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	302	163	293	25	17	375

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	318	0	-	0	1060	293
Stage 1	-	-	-	-	293	-
Stage 2	-	-	-	-	767	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1242	-	-	-	248	746
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	458	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1242	-	-	-	188	746
Mov Cap-2 Maneuver	-	-	-	-	316	-
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	458	-

Approach	SE	NW	SW
HCM Control Delay, s	5.7	0	14.7
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1242	-	316	746
HCM Lane V/C Ratio	-	-	0.243	-	0.054	0.503
HCM Control Delay (s)	-	-	8.8	-	17	14.6
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	1	-	0.2	2.9

Intersection	
Int Delay, s/veh	4.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	385	24	118	430	31	269
Future Vol, veh/h	385	24	118	430	31	269
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	245	485	-	105	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	438	27	134	489	35	306

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	465	0	1195	438
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	757	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1096	-	206	619
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	463	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1096	-	181	619
Mov Cap-2 Maneuver	-	-	-	-	305	-
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	407	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.9	16.6
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	305	619	1096	-	-	-
HCM Lane V/C Ratio	0.115	0.494	0.122	-	-	-
HCM Control Delay (s)	18.3	16.4	8.7	-	-	-
HCM Lane LOS	C	C	A	-	-	-
HCM 95th %tile Q(veh)	0.4	2.7	0.4	-	-	-

Intersection	
Int Delay, s/veh	7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	411	285	287	60	30	311
Future Vol, veh/h	411	285	287	60	30	311
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	325	-	-	270	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	467	324	326	68	34	353

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	394	0	-	0	1584	326
Stage 1	-	-	-	-	326	-
Stage 2	-	-	-	-	1258	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1165	-	-	-	119	715
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	268	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1165	-	-	-	71	715
Mov Cap-2 Maneuver	-	-	-	-	182	-
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	268	-

Approach	SE	NW	SW
HCM Control Delay, s	6	0	16.2
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1165	-	182	715
HCM Lane V/C Ratio	-	-	0.401	-	0.187	0.494
HCM Control Delay (s)	-	-	10.1	-	29.3	14.9
HCM Lane LOS	-	-	B	-	D	B
HCM 95th %tile Q(veh)	-	-	2	-	0.7	2.8

Shadow Mountain Bike Park
Phase I Drainage Report

November 2022

Prepared For:

Shadow Mountain BIKE PARK

Prepared By:

SE GROUP

PHASE I DRAINAGE REPORT

For

Shadow Mountain Bike Park

November 2022

Prepared For

Shadow Mountain Bike Park

Conifer, CO

Prepared By

SE Group

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I. General Location and Description

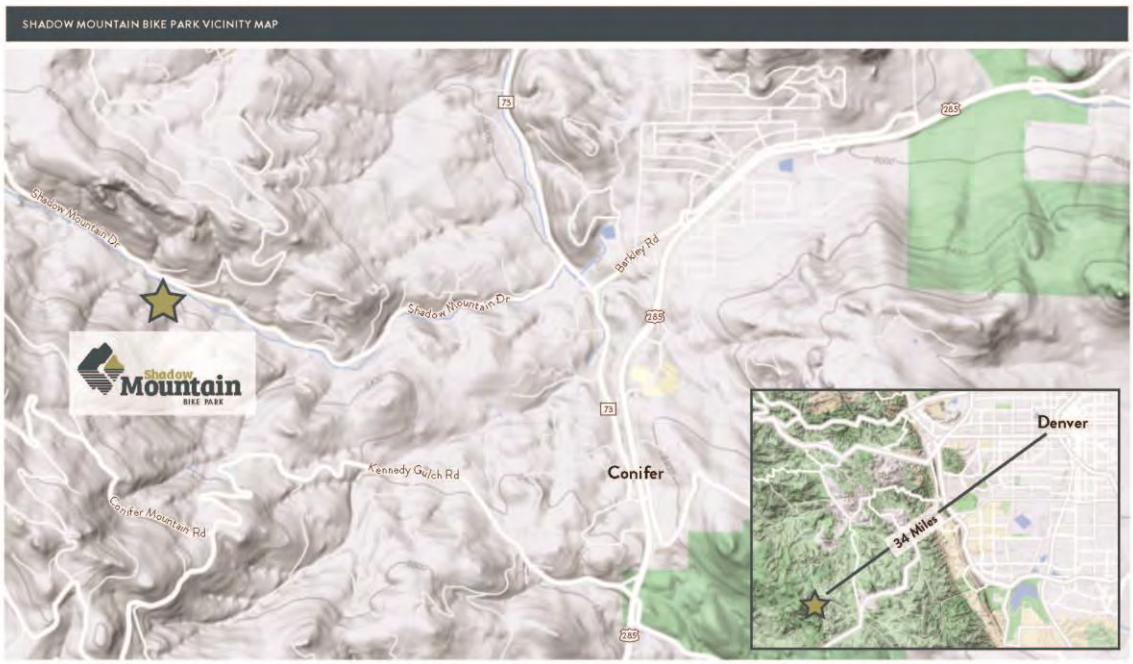
The Shadow Mountain Bike Park is to be designed in accordance with the Jefferson County Storm Drainage criteria. This report will review at a conceptual level the feasibility and design characteristics of the proposed development and is to accompany the project's Special Use Application materials. The Phase I Drainage Report is prepared in accordance with Jefferson County standards.

A. LOCATION

The Shadow Mountain Bike Park is proposed to be located at 29611 Shadow Mountain Drive in Conifer, CO. Conifer is an unincorporated community of Jefferson County, and the property is subject to the rules and regulations set by the County. The property is in Section 16, Township 6 South, Range 71 West of the 6th Principal Meridian, County of Jefferson, State of Colorado and is owned by the State Land Board. The property is comprised of approximately 306 acres of undeveloped land per County Assessor records, but the project is proposed only within the approximately 235-acre portion of the property south of Shadow Mountain Drive. It is proposed that the bike park would lease this southern portion of the property from the State Land Board and only develop and disturb a small fraction of the parcel.

The site is in a primarily rural, residential setting, bounded by residential neighborhoods along all property lines. The Conifer Senior High School and US Highway 285 are due east of the project. North Turkey Creek runs along the south side of Shadow Mountain Dr and bisects the front portion of the property; there are no exiting drainage facilities. The project site is about four (4) miles from downtown Conifer and approximately 34 miles from Denver.

Figure 1. Vicinity Map



B. DESCRIPTION OF PROPERTY

The 235-ac portion of the property to be developed is located on an undeveloped hillside, sloping towards the North Turkey Creek and Shadow Mountain Dr. The northeastern portion of the site along Shadow Mountain Dr is relatively flat, from approximately 4% to 8%, as it extends from the roadway and then steepens up the mountain heading south-southwest, from 12% to 45%. The high point is in the southwestern most portion of the property at approximately 9250' and flows primarily due east-northeast into North Turkey Creek. The total vertical fall across the site is approximately 870 vertical feet. The flatter areas are predominantly meadows and grassy areas, and the hillside is primarily wooded. There are a series of low flow channels that bisect the property and flow into the North Turkey Creek. Throughout the site there are also wetlands on both the hillside and along the creek. The hillside is relatively consistent in grade with some knolls but no defined ridge. There are a series of small gullies formed by the low flow channels.

The property is in Zone X (unshaded) according to FIRM Map No 08059C0365F in Jefferson County, CO last revised February 5, 2014. Zone X (unshaded) is defined by FEMA as areas of minimal flood hazard, outside of the Special Flood Hazard Area (SFHA), and higher than the elevation of the 0.2-percent-annual-chance flood. A copy of the property FIRMette is included in Appendix A.

Shadow Mountain Bike Park is a lift-served mountain bike park. The facility would include driveway access from Shadow Mountain Dr, onsite vehicular parking and guest drop-off, a base lodge with guest services (food & beverage, restrooms, seating, and bike/equipment rentals), and a mid-mountain maintenance building area. All access into the property would be via a two-lane (single in/single out) culvert crossing over North Turkey Creek. Water would be supplied by a water well and sewage would be handled by an onsite septic system.

The driveway access, internal drives & walkways, landscaping, and parking space design are to comply with the standards outlined by the Jefferson County Section 14 – Off-Street Parking and Loading. The parking and access would create impacts to waters of the U.S., including wetlands located in this area. Permitting would be required with the U.S. Army Corps of Engineers to comply with the Clean Water Act and County regulations. The culvert crossing of North Turkey Creek is to be sized according to the criteria set in Chapter 11.5 Culvert Sizing of the Jefferson County Storm Drainage Design & Technical Criteria.

It is anticipated that mountain access be provided via a four-passenger chairlift to be constructed to transport guests and bikes to the top of the property for gravity flow and downhill trails. The proposed lift would include a bottom and top terminal building with an accessory lift attendant building; all lift infrastructure (terminals and towers) would comply with the height limit of 35-feet. The facility may provide, but would not be limited to, approximately 20 miles of trails. These trails would be primarily constructed of earthen materials, and would include wooden, steel and other materials. Vegetation removal would be necessary for the construction of the chairlift and trails. Industry trail design practices would be utilized for construction and maintenance of trails and the lift corridor.

A work road would be constructed from the main base area to the north to the location of a maintenance shop. The work road would also be constructed to the chairlift top terminal location providing construction and maintenance access, as well as emergency access through the bike park. The maintenance shop is likely to be located mid-mountain and constructed atop a hard, gravel surface. The approximate location is provided on the attached Drainage Map, but the final footprint and location is subject to change.

The maintenance access road and designated bike trails will likely cross the existing low flow channels within the site. Both the trails and road are to be routed and designed to minimize impacts to the channels and delineated wetland areas.

II. Drainage Basins and Sub-Basins

A. MAJOR BASIN DESCRIPTION

The proposed site is tributary to the North Turkey Creek and is part of the Turkey Creek Major Drainage Basin. The North Turkey Creek begins in the hillside above Shadow Mountain Dr, flows east-northeast alongside Rte. 285 and N. Turkey Creek Rd before its confluence with Turkey Creek. According to the Hydrologic Conditions and Assessment of Water Resources in the Turkey Creek Watershed completed in 2001, the site is entirely within the North Turkey Creek sub-basin. This sub-basin is designated as Subbasin K. Applicable sections of the report are included in Appendix B.

Subbasin K is approximately 4,800 acres and is largely undeveloped with areas of residential and limited commercial development, and some roadways, both gravel and paved county roads. The basin encompasses much of the unincorporated community of Conifer, including the commercial district along Rte. 285 and the Conifer High School; the basin does not include the Aspen Park area. Historically, flows start from the ridgeline along the southwest edge of the Major Basin and sheet flows or enters small drainageways to the north/northeast into North Turkey Creek. The basin also includes minor flows from the north of the creek. North Turkey Creek flows to the east and the Major Basin delineation ends at Route 70. The creek continues to flow north before its confluence with Turkey Creek. Slopes vary throughout the Major Basin ranging from steep slopes at upwards of 40-45% to flat grassy areas from 2-5%.

There are no existing major drainage facilities within the Major Basin.

Added imperviousness for the developed site is assumed to be negligible within the Major Basin because full spectrum detention is to be provided onsite and attenuated to historic levels. Thus, no negative impacts are anticipated to the North Turkey Creek major drainageway basin because all increases in site imperviousness, although very small, are treated and detained onsite.

The Major Basin follows Jefferson County zoning and is a mix of Mountain Residential (MR) & Suburban Residential (SR), Planned Development (PD), Commercial (C), and Agricultural (A) Districts. The property is zoned for A-2 Agricultural Two District. The project's proposed development would be defined as a Class III Commercial Recreational Facility and is thus subject to a Special Use/Rezoning review process before proceeding with the Site Development Plan process. The project aligns with the goals of the Conifer-285 Corridor Area Plan by providing an active recreational area that maintains the mountain community character.

There are no known irrigation facilities such as ditches that will or would be influenced by the North Turkey Creek in the vicinity of the property.

B. SUB-BASIN DESCRIPTION

Historically, the property drains into the North Turkey Creek via sheet flow or channelized flow in a series of low flow channels bisecting the hillside. Runoff largely flows to the east-northeast into the abutting property before entering the creek. The site is undeveloped with majority of the surface area covered by wooded areas and meadows along Shadow Mountain Drive.

The USDA Soils Survey states that the site is largely Legualt-Hiwan stony loamy sands, 5 to 15 and 5 to 30 percent slopes, or rock outcrop complex 30 to 50 percent slopes on the hillside and then Kittredge-Earcree complex, 9 to 20 percent slopes, along the street frontage. The stony loamy sands and rock outcrop complex are Hydrologic Soil Group (HSG) D and the Kittredge-Earcree complex is HSG B. Soils with a B HSG rating are in the above average soils class for infiltration and D HSG rating is the lowest group and has the least amount of runoff infiltration. According to the USDA, 95% of the property has a HSG D soils rating. A copy of the Soils Survey is provided in Appendix C.

The property is split into distinct developed areas that impact the existing property: the new mountain bike trails, the lift and associated terminal and tower structures, the maintenance building and access road, and base services and parking area. It is proposed that the trails, lift areas, access road, and maintenance building use stormwater best management practices to mitigate impacts. Runoff generated by the new base lodge and parking area is to be redirected to an onsite detention facility to treat and detain access flows prior to being released into the North Turkey Creek. The detention facility is to be designed per Jefferson County and Mile High Flood District (MHFD) standards; preliminary calculations are provided in this report. The site improvements will not alter the existing minor and major drainage patterns of the property and all flows will continue to enter the creek.

The section of North Turkey Creek that crosses the property is to remain functional and stay adequately protected during construction to the greatest extent possible. The proposed driveway crossing over the creek is to be designed and constructed per county and MHFD standards and best practices. The functionality and capacity of the existing drainageway is to be restored to the historic conditions.

III. DRAINAGE FACILITY DESIGN

The preliminary drainage facility design has been prepared in accordance with Jefferson County Storm Drainage Design & Technical Criteria and the latest MHFD Urban Storm Drainage Criteria Manuals (USDCM), Vol. I revised August 2018, Vol. II revised September 2017, and Vol. III revised January 2021 and MHFD design tools for Detention Design, v4.06 revised July 2022 and Rational Method revised May 2017.

A. GENERAL CONCEPT

Historically the runoff from the site is un-detained and directly discharging to North Turkey Creek. The developed site will produce a higher runoff volume due to increased imperviousness from the base lodge and parking area, and this runoff is to be detained to or below existing runoff rates per MHFD standard through the addition of storm sewer and the on-site full spectrum detention pond. All new onsite drainage facilities are to be encumbered by drainage easements per County regulations. Easement delineation and language to be provided within final construction documents.

There are flows that enter the site from the abutting properties to the west. All offsite flows are to be redirected around the proposed developed areas to the creek and not collected by the new drainage facilities.

The added imperviousness from the mountain bike trails, lift terminals, access road, and maintenance area are to be mitigated using Low Impact Development (LID) best practices and selection and sizing of stormwater BMPs that improve runoff quality and minimize impacts to the existing surfaces.

Surface disturbance from construction activities to be mitigated and controlled by temporary erosion control measures and follow a Grading, Erosion and Sediment Control Plan. The plan is to be provided as part of the final construction documents and reviewed during the Site Development Plan process.

1. *HYDROLOGIC CRITERIA*

The Rational Method (Q=CIA) is used to determine runoff peak discharges for the historic and developed site basins at given design points. The composite runoff coefficients (C) are calculated using site imperviousness and hydrologic soil type (HSG B & C/D) to define an area-weighted coefficient per basin. The rainfall intensity (I) in inches per hour are defined using the time of concentration (tc) and provided intensity-duration curve table provided within the County Storm Criteria Manual Chapter 5.4 for Jefferson County Rainfall Zone IIB. The Time-Intensity-Frequency curves for each zone were developed by distributing the one-hour point rainfall values using the factors obtained from the NOAA Atlas 14 for durations of less than one hour. The point rainfall values from Table 501 within the Criteria Manual are as follows:

Table 1: One-Hour Point Rainfall Values for Jefferson County Rainfall Zone IIB (in)

2-YR	5-YR	10-YR	50-YR	100-YR
0.85	1.19	1.39	1.93	2.20

Each basin was evaluated based on area (A) in acres. Final peak discharge (Q) is defined in cubic feet per second (cfs). Post-development time of concentration calculations for each subbasin, corresponding rainfall intensities, and composite runoff coefficients for each sub-basin as calculated using the MHFD UD-Rational Method spreadsheet are provided in Appendix D.

The proposed base lodge and parking facilities are to disturb approximately 6.75 acres of historically undeveloped area:

- **Basin H:** The historic basin, labelled as Basin H is split into two sub-basins H1 and H2 for the HSG D and HSG B soils respectively.
- **Basin D:** The developed basin, labelled as Basin D, is split into two sub-basins D1 and D2 for the HSG and HSG soils respectively as well. Basin D represents all disturbed areas that are tributary to the proposed detention basin.
- **Basin OS:** All flows that cannot be conveyed to the basin are analyzed within the OS (offsite) basin. All soils within the Basin OS are HSG B.

Per Chapter 6 of the MHFD Urban Storm Drainage Criteria Manual (USDCM) Vol. I, Table 6-3, packed gravel surfaces are 40%, drive and walks are 90%, and roofs are 90% impervious. The proposed plaza area around the building and bottom lift terminal is likely to be a hardpacked dirt surface and is assumed 25% imperviousness.

The calculated peak flows for the minor storm event (5-year) and the major storm event (100-year) for the base lodge and parking area are as follows:

Table 2: Runoff Summary Table

Basin	Total Area (ac)	HSG	Imperviousness (%)	Q5 (cfs)	Q100 (cfs)
H1	2.74	D	2	0.43	7.68
H2	4.01	B	2	0.10	6.89
D1	2.74	D	43	2.98	11.06
D2	3.61	B	31	3.04	10.93
OS	0.40	B	2	0.56	0.81

The calculated release rates through the Rationals Method to be used as reference only. The final detention basin design and required release rates to be determined using the MHFD standards outlined below.

The proposed detention basin is to be designed to MHFD standards for an Extended Detention Basin (EDB). An EDB is proposed for the site in lieu of other drainage options, such as bioretention, because there is at least 5 acres of tributary area to the basin. The EDB is to be sized to store the tributary water quality control volume (WQCV), excess urban runoff volume (EURV), and 100-year storm event using the latest MHFD Detention Basin Design Workbook.

Preliminary calculations for basin storage are provided in Appendix E.

2. *HYDRAULIC CRITERIA*

Site runoff is proposed to be conveyed via sheet flow into a series of storm inlets and storm sewers before outfalling into the EDB. All site drainage design within the parking facilities to comply with the standards set by the Jefferson County Zoning Resolution, Section 14 – Off-Street Parking and Loading. Per the manual, sheet flow shall not exceed 200 feet, parking areas wider than 42 feet shall control concentrated flow via swales and/or underdrains, and no drainage from areas other than parking shall be diverted to and cross parking areas.

Final hydraulic design to be provided during the Site Development Plan process as part of a Phase III Drainage Report. The final storm sewer system is to be designed in accordance with MHFD USDCM Volume I Chapter 7 and sized accordingly. The storm sewer network is to be analyzed for the 5-year and 100-year storm events and is to include capacity, minimum and maximum velocity, and HGL considerations; it is the intent for the final storm sewer design to be sized so that the 100-year HGL remains below the finished grade. The storm inlets are to also be analyzed for the minor and major storm event to ensure adequate capacity and bypass in accordance with Chapter 7 design criteria.

The driveway culvert crossing at North Turkey Creek is to be designed and constructed in accordance with the Criteria Manual Chapter 11, specifically complying with 11.5.1 Culverts within Drainageways; final calculations and details to be provided during the Site Development Plan process. The culvert is to be designed to the minimum design standard set by the Criteria because the crossing remains outside of the 100-year floodplain. If only a small increase in culvert size is required to prevent overtopping, then a larger culvert is to be proposed. Final culvert sizing is to require additional major basin flow analysis using the Colorado Urban Hydrograph Procedure (CUHP) to establish the 10-year and 100-year flows within the creek.

B. SPECIFIC DETAILS

The EDB is to be designed to MHFD standard and include forebays at entering storm sewer outfalls, trickle channels, outlet structure, and an emergency overflow embankment. Each structure within the basin is to be designed and sized with calculations, design considerations, and construction details provided in the construction documents. The basin is also to be designed to maintain vegetation and have max 3:1 to 4:1 side slopes planted with turf grass that allows for consistent coverage and a mowable surface. Detailed access is also to be provided into the basin which may include a stabilized path to the internal structures or a detailed maintenance plan for sediment removal within the outlet structure, micropool, forebays, etc. The final basin footprint is to be as naturally and aesthetically shaped as possible with the outlet structure remaining as hidden from the right of way as possible and not deter its functionality.

The preliminary volume calculations and water surface elevations are as follows:

Table 3: Preliminary Basin Summary

Drainage Area (ac)	Required WQCV (ac-ft)	Required 100-year Volume (ac-ft)	Required Total Basin Volume (ac-ft)	Volume Provided (ac-ft)	100-yr Release Rate (cfs)
6.35	0.095	0.184	0.440	0.578	7.9

PERMANENT STORMWATER BMPS & MAINTENANCE

EDBs have low to moderate maintenance requirements with potentially significant maintenance required every 15-25 years. The proposed site EDB is to be maintained routinely per MHFD Vol III recommendations. Routine maintenance includes debris and litter removal, mowing and plant care, sediment removal, and erosion and structural repairs. Native grass and other drought tolerant plantings may be proposed to maintain effective vegetation without requiring permanent irrigation facilities.

The mountain bike trails are to be routinely inspected and maintained to ensure functionality and limit erosion and sediment travel downstream. Temporary erosion control measures to be implemented during active construction may include sediment fencing or sediment control logs, sediment basins, temporary rock check dams, and stabilized construction entrances. Permanent structures may include bridge crossings or cross culverts at existing seasonal waterways, ditch turnouts or constructed filter berms, and drainage swales.

IV. CONCLUSION

The Shadow Mountain Bike Park is to comply with the design criteria set by Jefferson County. This Phase I Drainage Report reviews at a conceptual review the feasibility and design characteristics of the proposed bike park development.

A. COMPLIANCE WITH STANDARDS

The proposed drainage facilities for the development of Shadow Mountain Bike Park are to be designed in accordance with Jefferson County rules and regulations including the criteria set by the Storm Drainage Design & Technical Criteria and the Zoning Resolution. Per County recommendations, the facilities are to follow design criteria and recommendations set by the MHFD within the USDCM Criteria Manuals.

B. DRAINAGE CONCEPT

The proposed drainage facilities at the base area are to be designed for full spectrum detention and will thus not have a negative impact on downstream properties and the existing North Turkey Creek functionality. The project is to be subject to a sitewide Grading, Erosion and Sediment Control Plan that will dictate temporary construction stormwater BMPs and construction practices to protect the area during active earthwork and construction. The bike trails, lift areas, access road, and maintenance area are to be constructed with stormwater BMPs to provide permanent solutions erosion and sediment control. All proposed improvements are to be adequately maintained to ensure functionality.

V. REFERENCES

Storm Drainage Design & Technical Criteria, Jefferson County. Revised December 2019.

Zoning Resolution, Jefferson Country. Published June 2022.

Conifer/285 Corridor Area Community Plan, Jefferson County. September 2003.

Hydrologic Conditions and Assessment of Water Resources in the Turkey Creek Watershed, Jefferson, Colorado, 1998 – 2001. US Geological Survey, Water-Resources Investigations Report 03-4034. Published 2003.

Urban Storm Drainage Criteria Manual, Vol. 1: Management, Hydrology and Hydraulics, Revised August 2018.

Urban Storm Drainage Criteria Manual, Vol. 2: Structures, Storage and Recreation. Revised September 2017.

Urban Storm Drainage Criteria Manual, Vol. 3: Stormwater Best Management Practices (BMPs). Revised January 2021.

FIRM Flood Insurance Rate Map, Map Number 08059C0365F, Jefferson County, Colorado. Federal Emergency Management Agency. Revised February 5, 2014.

United States Department of Agriculture, Natural Resources Conservation Service. Custom Soil Resource Report.

APPENDICES

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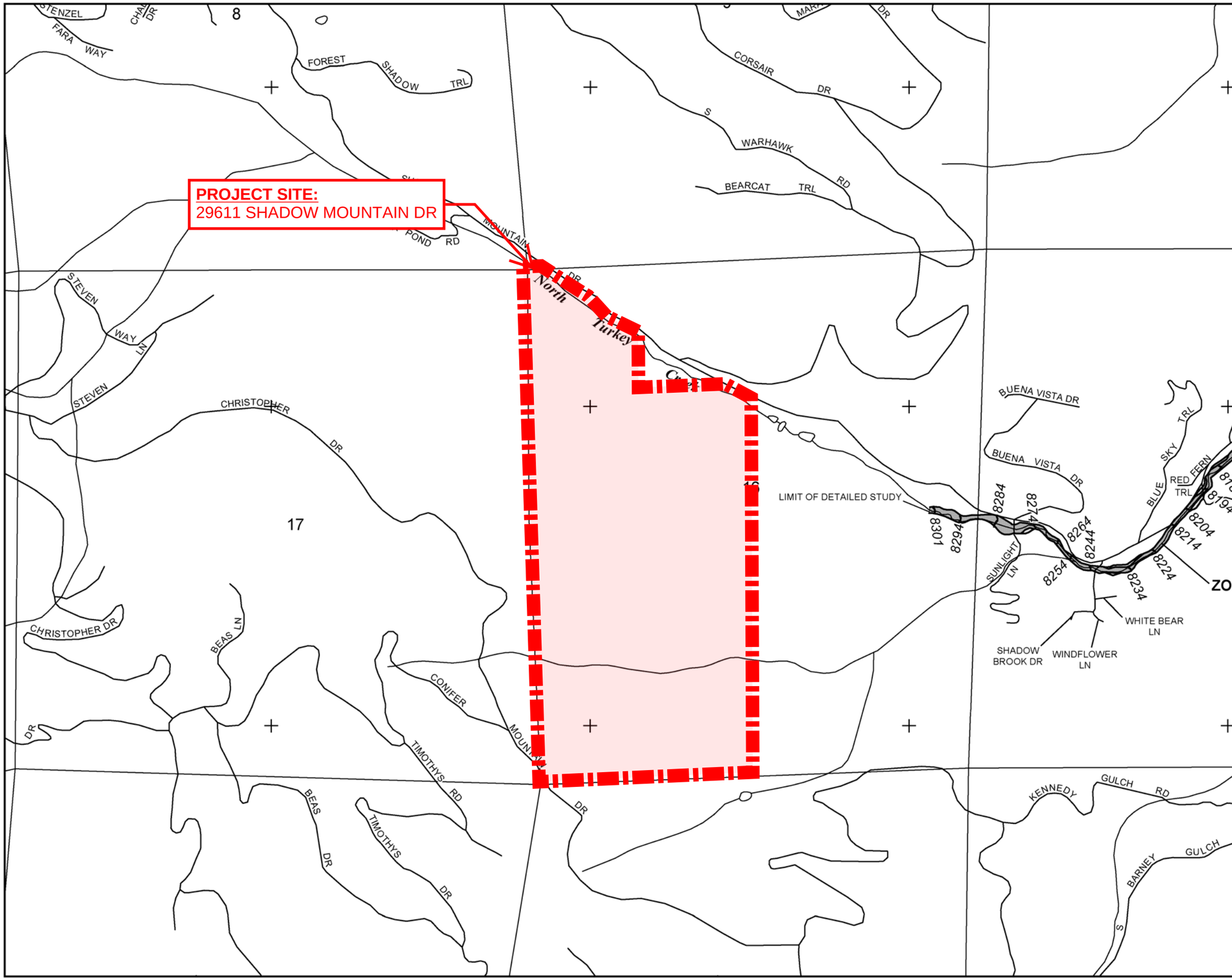
APPENDIX E – PRELIMINARY DETENTION BASIN CALCULATIONS

DPE – GENERAL LOCATION MAP
DPP – DEVELOPED DRAINAGE PLANS



MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0365F

FIRM

FLOOD INSURANCE RATE MAP

JEFFERSON COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 365 OF 675

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JEFFERSON COUNTY	080087	0365	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08059C0365F

MAP REVISED
FEBRUARY 5, 2014

Federal Emergency Management Agency

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at https://msc.fema.gov.

Hydrologic Conditions and Assessment of Water Resources in the Turkey Creek Watershed, Jefferson County, Colorado, 1998–2001

By Clifford R. Bossong, Jonathan Saul Caine, David I. Stannard, Jennifer L. Flynn, Michael R. Stevens, and Janet S. Heiny-Dash

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U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 03–4034

SHADOW MOUNTAIN BIKE PARK - PHASE I DRAINAGE REPORT

Only sections of this report as they apply to the project site for the proposed Shadow Mountain Bike Park are included to be used as reference only. A full report can be located at https://pubs.usgs.gov

Prepared in cooperation with the
JEFFERSON COUNTY PLANNING AND ZONING DEPARTMENT

Denver, Colorado
2003

U.S. DEPARTMENT OF THE INTERIOR
GALE A. NORTON, Secretary

U.S. GEOLOGICAL SURVEY
Charles G. Groat, Director

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CONVERSION FACTORS, VERTICAL DATUM, AND ABBREVIATIONS

Multiply	By	To obtain
	Length	
inch	2.54	centimeter (cm)
inch	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
acre	0.004047	square kilometer (km^2)
square mile (mi^2)	2.590	square kilometer (km^2)
square mile (mi^2)	640	acre
	Volume	
liter (L)	0.2642	gallon
acre-foot (acre-ft)	1,233	cubic meter (m^3)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]
gallon per minute (gal/min)	0.06309	liter per second (L/s)
	Power	
watt	1	joules per second

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

°F = 1.8 (°C) + 32

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

°C = (°F – 32) / 1.8

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929. Horizontal is referenced to the North American Datum of 1927.

Elevation, as used in this report, refers to distance above or below NGVD29. NGVD29 can be converted to the North American Vertical Datum of 1988 by using the the National Geodetic Survey Conversion Utility available at URL http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25°C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L).

Additional Abbreviations

mL	milliliter
m^2/m^3	square meter per cubic meter
$g\ m^{-2}\ s^{-1}$	gram per square meter per second
Wm^{-2}	watt per square meter
kPa	kilopascal
J	joule
min	minute

GLOSSARY OF SELECTED TERMS

The following terms are defined as they are used in this report.

Aperture.—The width of individual fracture openings in rock. Aperture is measured across the fracture, perpendicular to the fracture length.

Base flow.—Streamflow that emanates from ground water contained in a conceptual base-flow reservoir that exists in the subsurface. It is base flow that typically sustains streamflow during rainless periods.

Brittle structures.—Fractures, joints, and faults in rocks that are the result of brittle rather than ductile deformation.

Contemporary.—This term is used in this report to indicate data that were collected as part of this study, or to indicate methods that were applied to data that were collected for this study.

Evapotranspiration.—The process of moisture moving from the surface and near-surface areas of the Earth to the atmosphere; it is the sum of evaporation from wet surfaces (leaves, wet soils and rock, surface-water bodies, for example), sublimation from snow or ice, and transpiration, which is water evaporated from plant stomates.

Fracture set.—A group of fractures that have a set of properties such as orientation or length, or both, that are similar.

Fracture network.—A group of fracture sets that comprise all of the fractures in a volume of rock.

Fracture porosity.—Porosity resulting from open fractures, faults, or cracks.

Ground water.—As used in this report, water in the subsurface under water-table conditions. Some unknown amount of ground water is not asscoaited with local streamflow. As used in this report, ground water represents the contents of interflow and base-flow reservoirs and additional unaccounted for ground water that is not associated with local streamflow.

GSNK.—Ground water that percolates to a conceptual area of the watershed that is not available to support local streamflow.

Hydrologic response unit (HRU).—A land surface with similar slope and aspect properties defined for modeling surface and near-surface hydrologic processes.

Interflow.—Streamflow that emanates from ground water in direct response to precipitation or snowmelt, or both, that is contained in a conceptual interflow reservoir in the subsurface. Interflow may consist of streamflow contributions from subsurface areas that are saturated or perched, or some combination of both.

Interflow and base-flow reservoirs.—Conceptual subsurface portions of the watershed used for accounting purposes in runoff modeling.

Overland flow.—That part of precipitation that passes over the surface of the land and into the nearest surface-water body without first passing beneath the surface. Generally in direct response to precipitation.

Potential porosity.—An estimate of porosity made on the basis of mathematical characterizations of outcrop fracture measurements extrapolated to rock groups.

Recharge.—As used in this report, water added to the subsurface below the soil zone; it is the residual of precipitation, evapotranspiration, and overland flow. Recharge supports interflow, base flow, and underflow.

Rock group.—An assemblage of mappable rock types aggregated into a group on the basis of similarities.

Transmissivity.—Rate of movement of a volume of fluid through a medium. Units of measurement are L2/T, where L is length and T is time.

Underflow.—Ground water that leaves the watershed by means other than streamflow or evapotranspiration.

Hydrologic Conditions and Assessment of Water Resources in the Turkey Creek Watershed, Jefferson County, Colorado, 1998–2001

By Clifford R. Bossong, Jonathan Saul Caine, David I. Stannard, Jennifer L. Flynn, Michael R. Stevens, *and* Janet S. Heiny-Dash

Abstract

The 47.2-square-mile Turkey Creek watershed, in Jefferson County southwest of Denver, Colorado, is relatively steep with about 4,000 feet of relief and is in an area of fractured crystalline rocks of Precambrian age. Water needs for about 4,900 households in the watershed are served by domestic wells and individual sewage-disposal systems. Hydrologic conditions are described on the basis of contemporary hydrologic and geologic data collected in the watershed from early spring 1998 through September 2001. The water resources are assessed using discrete fracture-network modeling to estimate porosity and a physically based, distributed-parameter watershed runoff model to develop estimates of water-balance terms.

A variety of climatologic and hydrologic data were collected. Direct measurements of evapotranspiration indicate that a large amount (3 calendar-year mean of 82.9 percent) of precipitation is returned to the atmosphere. Surface-water records from January 1, 1999, through September 30, 2001, indicate that about 9 percent of precipitation leaves the watershed as streamflow in a seasonal pattern, with highest streamflows generally occurring in spring related to snowmelt and precipitation. Although conditions vary considerably within the watershed, overall watershed streamflow, based on several records collected during the 1940's, 1950's, 1980's, and 1990's near the downstream part of watershed, can be as high as about 200 cubic feet per second on a daily basis during spring. Streamflow typically recedes to about 1 cubic foot per second or less during rainless periods and is rarely zero. Ground-water level data indicate a seasonal pattern similar to that of surface water in which water levels are highest, rising tens of feet in some locations, in the spring and then receding during rainless periods at relatively constant rates until recharged. Synoptic measurements of water levels in 131 mostly domestic wells in fall of 2001 indicate a water-table surface that conforms to topography. Analyses of reported well-construction records indicate a median reported well yield of 4 gallons per minute and a spatial distribution for reported well yield that has relatively uniform conditions of small-scale variability. Results from quarterly samples collected in water year 1999 at about 112 wells and 22 streams indicate relatively concentrated calcium-bicarbonate to calcium-chloride type water that has a higher concentration of chloride than would be expected on the basis of chloride content in precipitation and evapotranspiration rates. Comparison of the 1999 data to similar data collected in the 1970's indicates that concentrations for many constituents appear to have increased. Reconnaissance sampling in the fall of 2000 indicates that most ground water in the watershed was recharged recently, although some ground water was recharged more than 50 years ago. Additional reconnaissance sampling in the spring and fall of 2001 identified some compounds indicative of human wastewater in ground water and surface water.

Outcrop fracture measurements were used to estimate potential porosities in three rock groups (metamorphic, intrusive, and fault zone) that have distinct fracture characteristics. The characterization, assuming a uniform aperture size of 100 microns, indicates very low potential fracture porosities, on the order of hundredths of a percent for metamorphic and intrusive rocks and up to about 2 percent for fault-zone rocks. A fourth rock group, Pikes Peak Granite, was defined on the basis of weathering characteristics. Short-term continuous and synoptic measurements of streamflow were used to describe base-flow characteristics in areas of the watershed underlain by each of the four rock groups and are the basis for characterization of base flow in a physically based, distributed-parameter watershed model.

The watershed model, the Precipitation-Runoff Modeling System (PRMS), was used to characterize hydrologic conditions on the basis of precipitation and air temperature in 112 hydrologic response units for which physical characteristics were derived from mostly digital data. The watershed model also was used to characterize hydrologic conditions in subsurface portions of the watershed that are associated with streamflow. The model was conditioned, using a relatively small set of parameters, to match measurements of watershed and intrawatershed streamflow and point measurements of evapotranspiration, air temperature, and soil moisture. Results from the watershed model provide simulated estimates for water-balance terms in a contemporary simulation (January 1, 1999, through September 30, 2001) using precipitation and adjusted temperature data from within the watershed, and in a long-term simulation (October 1, 1948, through September 30, 1999) using precipitation and temperature data from near the watershed. The results of both simulations indicate that, on a watershed scale, base-flow reservoirs consistently contain about enough water to cover the watershed with 0.1 to 0.2 inch of water. The long-term simulations indicate that during a year with about 14 inches of precipitation, the watershed base-flow reservoir may have about a –0.06 inch change in contents during periods with relatively small amounts of recharge. The results from watershed simulations also indicate that contents of base-flow reservoirs vary within the watershed; base-flow reservoirs contain little or no recoverable water for significant portions of many years in about 90 percent of the watershed. In areas where base-flow reservoirs contain no water, the only source of water for wells is water that has percolated to relatively deep parts of the system that are not associated with local streamflow; water withdrawn under these conditions will need to be replaced before base flow can resume. Estimates of the amount of water withdrawn by wells in 2001 in the Turkey Creek watershed are equal to a watershed depth of about 0.43 to 0.65 inch (about 0.0012 to 0.0018 inch per day).

INTRODUCTION

Water quality, water quantity, and population growth in the foothill portions of Jefferson County are of concern to the Jefferson County Board of County Commissioners and the Planning and Zoning Department. The Planning and Zoning Department desires to meet the needs of current residents for adequate supplies of good quality water and to prepare for the projected growth and demands on the water resource from future development. The Turkey Creek watershed is representative of the foothills portions of Jefferson County. Contemporary (2001) population in the Turkey Creek watershed is estimated at 11,064 residents with projected population growth, using a 2-percent per year rate, at 13,186 residents in 2010, and 15,313 residents in 2020 (Jefferson County Planning and Zoning Department, written commun., 2001).

Water supply in the foothills portions of Jefferson County is typically derived from domestic wells developed in the fractured crystalline rocks. There are many anecdotal reports of wells “going dry” or requiring modifications to maintain production, and the prospect of continued development raises some questions regarding water supply. In addition, domestic water is treated in individual sewage-disposal systems (ISDS) and returned to the local system as ISDS effluent from leach fields, and this has raised some concerns regarding the quality of water.

An understanding of hydrologic processes, especially those related to ground water, is a fundamental step in assessing contemporary (2001) quality and quantity of ground water. Together, the U.S. Geological Survey (USGS) and Jefferson County undertook a cooperative study of hydrologic conditions and assessment of water resources in Turkey Creek watershed beginning in 1998.

Purpose and Scope

The purpose of this report is to describe contemporary (2001) hydrologic conditions and to provide a hydrologic assessment of water resources in the Turkey Creek watershed. Hydrologic conditions are described on the basis of evapotranspiration, surface water, ground water, and water quality. In addition, a description of rock-fracture characteristics based on outcrop-scale measurements is included. The watershed assessment includes estimates of fracture porosity and a characterization of water-balance terms using a watershed precipitation-runoff model.

The scope of the study includes historical climatologic data collected by study-area residents, contemporary data collected during the study from 1998 to 2001, and historical data from agencies such as the Colorado Climate Center, State Engineers Office (SEO), and the USGS. Various methods, including geologic mapping and precipitation-runoff modeling, were used to assess water resources in the study area.

Location and Setting

The study area is the 47.2-mi^2 Turkey Creek watershed (fig. 1), in Jefferson County southwest of Denver, Colo., in the foothills of the Front Range Section of the Southern Rocky Mountains physiographic province (Fenneman, 1931). Included in the study area are many developed areas such as Conifer, Aspen Park, and Indian Hills. It is estimated that there are about 4,900 households in the study area, or, on average, about one household for every 6 acres (Jefferson County Planning and Zoning Department, written commun., 2001). About 62 percent of households in the watershed are single-family detached homes.

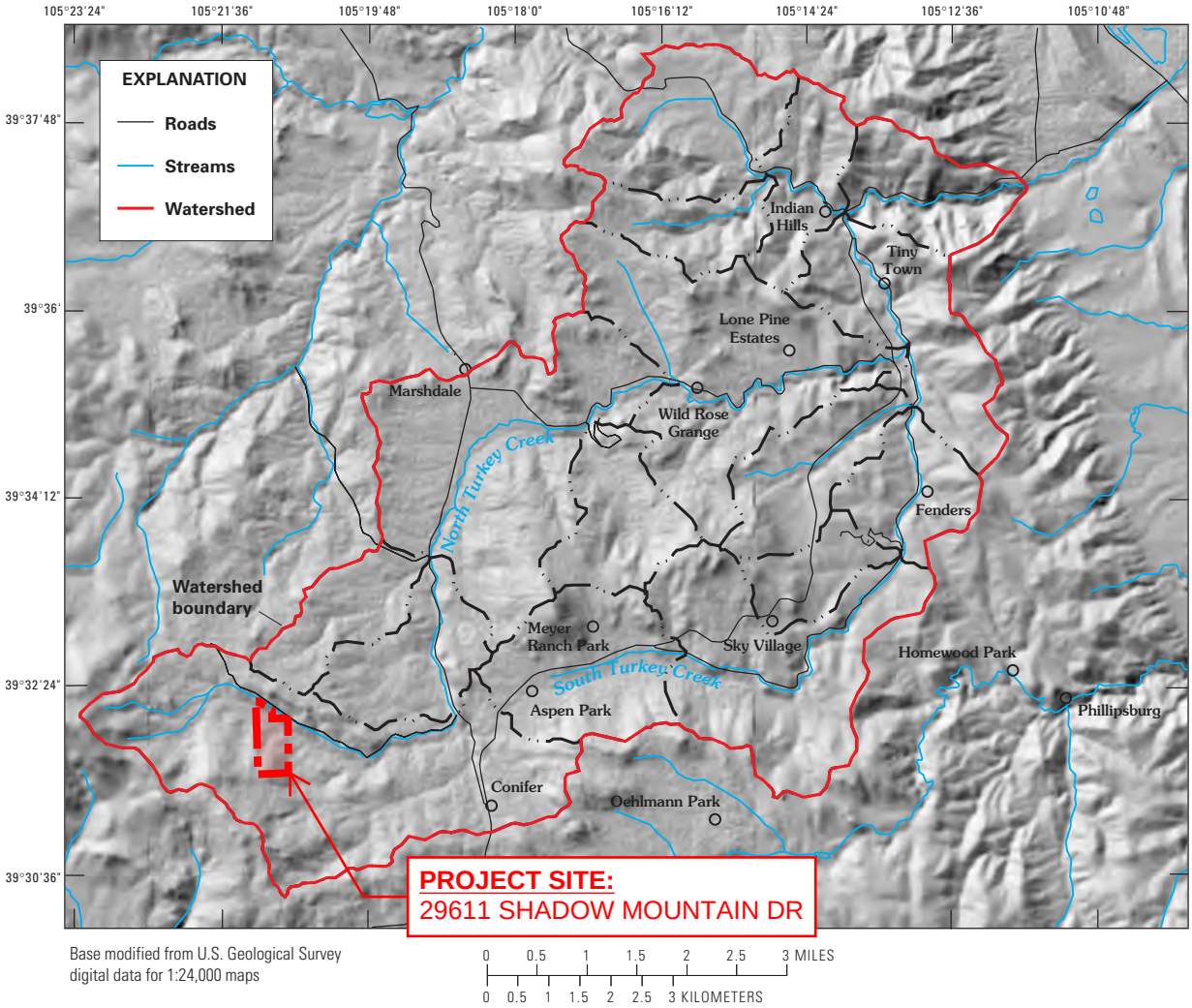
The watershed topography is mostly steep and often rocky with elevations ranging from about 10,500 ft in the southwestern part of the watershed to about 6,000 ft at the mouth of Turkey Creek canyon where the stream exits the foothills. Numerous bedrock outcrops in the study area border relatively gentle, open parks, such as Aspen Park, and stream valleys, such as North and South Turkey Creeks. Bedrock consists of fractured igneous and metamorphic crystalline rocks of Precambrian age that are extensively deformed. A more detailed geologic description is presented in the “Geologic Framework” section.

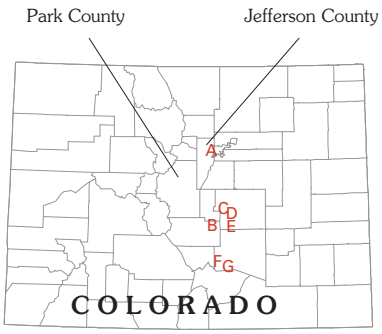
Previous Investigations

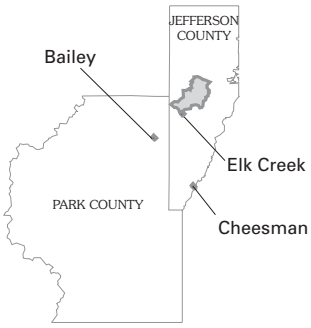
Several previous studies have been done on the chemical quality and physical quantity of the water resource in the Turkey Creek watershed. Snow (1968, 1972) and Waltz (1972) discussed the importance of fractured-bedrock aquifer characteristics in influencing the ground-water flow regime. Hofstra and Hall (1975a, 1975b) collected, compiled, and analyzed water-quality data for Phase I of an investigation to determine the effects of development on the water availability, water quality, and controlling factors in several mountain communities. Phase II of that investigation (Hall and Johnson, 1979) indicated that, although water quality was degrading, it was still acceptable for drinking. Seasonal fluctuations in water levels were observed (Hall and Johnson, 1979), and over a 3-year period there was an overall decline in water levels that may reflect short-term climatological factors or increased withdrawal from ground water. Recent work by Bruce and McMahon (1997) and Stevens and others (1997) provides water-quality data from the Turkey Creek watershed and other Front Range mountainous settings that can be compared to the results of this study.

Acknowledgments

The authors thank various local, State, and Federal agencies for their cooperation in providing information and data that were used in preparing this report, specifically the Colorado Department of Public Health and Environment; Colorado Division of Water Resources; Jefferson County Board of Commissioners; Jefferson County Planning and Zoning Department;







EXPLANATION

C **Site with specific-conductance measurement**

Figure 1. Location of Turkey Creek watershed in Jefferson County, Colorado; identifier and locations for sites with specific-conductance measurement; and location of Bailey, Cheesman, and Elk Creek climatologic monitoring stations.

members of the Mountain Ground-Water Resource Study Steering Committee; and the U.S. Environmental Protection Agency, Region VIII. Thanks also to Stephanie R.A. Tomusiak, Department of Geological Sciences, University of Colorado, Boulder, for her contributions to the fracture-data collection, analyses, and modeling efforts. Field assistance for outcrop measurements of fracture characteristics was provided by Ari Menitove, Jessica Beck, Sonya Cadle, Ben Glass, David Gardner, and Jared Lewis. Special appreciation also is expressed to Dick Burrows and Dorothy Hatch, dedicated volunteers that made monthly water-level measurements throughout the watershed during the study, as well as individuals who collected precipitation data, and homeowners who allowed various activities on their property such as water-level measurements, precipitation measurements, access to outcrops for fracture measurements, access to stream-sampling sites, and ground-water sample collection.

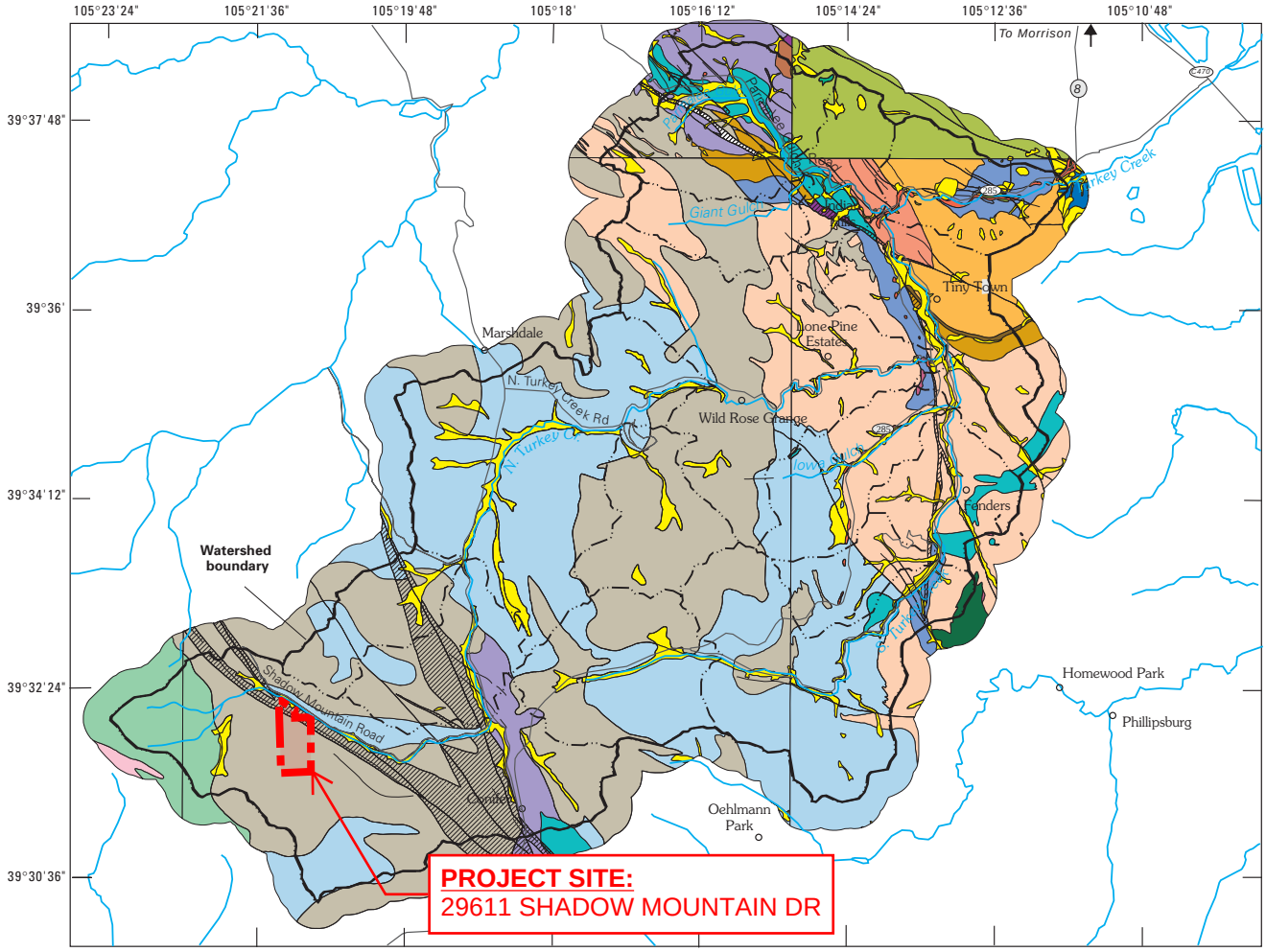
GEOLOGIC FRAMEWORK

A compilation of existing USGS geologic quadrangle maps for the Turkey Creek watershed shows a complex arrangement of Precambrian-age crystalline metamorphic and intrusive rock types (fig. 2 and table 1; Char, 2000, modified from Sheridan and others, 1972; Bryant and others, 1973; Scott, 1972; Bryant, 1974). Figure 3 is a simplified version of the geology shown in figure 2 and the rock types in table 1, produced by combining individual rock types into rock groups. Rock groups were identified on the basis of lithologic similarity, structural history, and geologic setting. For each rock group it is assumed that (1) ground-water flow and storage predominantly occurs in fracture networks, and that (2) because each rock group is composed of similar rock types that have a similar geological history and response to brittle deformation, they will exhibit similar hydrogeological properties (for example, porosity). Three important rock groups that contain subgroups were used to aid in establishing a geologic and hydrologic framework model. The rock groups are (1) metamorphosed and foliated gneisses and schists, referred to as the “metamorphic rock group;” (2) large-scale intrusive quartz monzonites found in plutons and consisting mostly of the Silver Plume Quartz Monzonite, referred to as the “intrusive rock group;” and (3) major fault zones that cut all rock types, referred to as the “fault-zone rock group” (fig. 3). Further division of the metamorphic and intrusive rock groups results in three subgroups: (1a) amphibolites, calc-silicates, and quartzites, (2a) the Pikes Peak Granite, and (2b) granitic pegmatite dikes that cross-cut the metamorphic and intrusive rock groups (table 1). The metamorphic, intrusive, and fault-zone rock groups plus subgroup 2a (the Pikes Peak Granite) are collectively referred to as the “four rock groups” in this report; group 1a is included in the metamorphic rocks and group 2b is included in the intrusive rocks.

The major rock types include approximately 1.7-billion-year-old gneisses and schists (metamorphic rocks). These rocks are typically well layered due to original compositional variations and metamorphic processes (Bryant, 1974; Bryant and others, 1975). They are part of the Turkey Creek Formation and are similar to the rocks in the Idaho Springs Formation (Lickus and LeRoy, 1968). The metamorphic rocks are intruded or cut by the approximately 1.4-billion-year-old Silver Plume Quartz Monzonite, which is a rock type similar to granite (intrusive rocks) (Bryant, 1974). These intrusive rocks are heterogeneously distributed in the watershed. The intrusive bodies range in size from small, dikelike features 50–100 ft long to large and irregular plutonlike bodies with large apophyses miles long. Pegmatitic dikes also cut the intrusive rocks. The pegmatites are highly irregular in shape and size and are less than a few feet to several miles long.

The major geologic structures in the watershed include folds and fault zones. The layering in the metamorphic rocks is generally steeply to moderately tilted and generally strikes northwest to southeast. This tilting is associated with the proximity of the observed outcrops to the limbs of several regional scale folds (Bryant and others, 1973). Many local- to outcrop-scale folds and highly contorted layering zones are present throughout the watershed.

A variety of brittle fault structures or fault zones are present in the watershed (fig. 3), and the Appendix contains a detailed discussion of these features. Brittle fault zones are in the form of unusually wide fracture networks (tens of feet to greater than miles wide) where most of the zone is composed of open fractures with little offset on them and a few discrete fractures where most of the offset has occurred. Other brittle fault zones are relatively narrow (a few feet wide) fault breccia zones that have anastomosing and discrete fractures where motion has taken place and where fracture networks have been mineralized with quartz, calcite, and other associated minerals.



Base modified from U.S. Geological Survey digital data for 1:24,000 maps

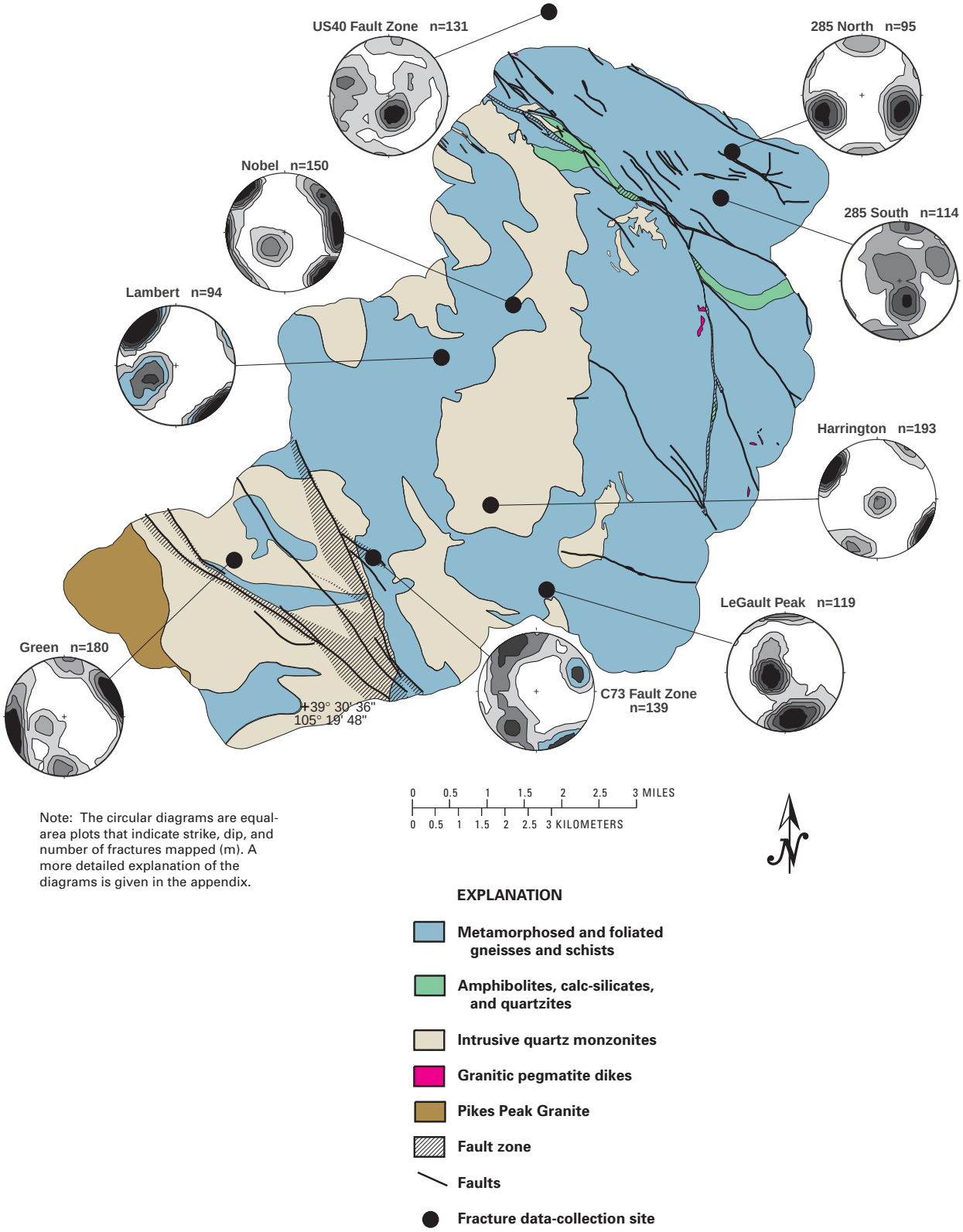
0 0.5 1 1.5 2 2.5 3 MILES

0 0.5 1 1.5 2 2.5 3 KILOMETERS

EXPLANATION

- Artificial fill
- Amphibolite, quartzite, marble, and associated rocks
- Well-foliated, medium-grained biotite-quartz monzonitic or granitic gneiss
- Felsic gneiss
- Garnet-mica gneiss
- Coarse-grained pegmatite
- Fountain Formation (Permian- and Pennsylvanian-age sediments)
- Quaternary alluvium
- Rutile-bearing sillimanite quartzite
- Shonkinite
- Biotite gneiss and associated rocks
- Sillimanitic biotite gneiss containing garnet-bearing layers, and cordierite-feldspar-rich gneiss
- Feldspar-rich gneiss
- Migmatitic quartzo-feldspathic gneiss
- Gneissic quartz monzonite
- Interlayered hornblende and calc-silicate gneiss and amphibolite
- Migmatite
- Mafic granodiorite and quartz monzonite
- Fine-grained porphyritic phase of Pikes Peak Granite
- Pikes Peak Granite
- Silver Plume Quartz Monzonite
- Fault zone
- Fault
- Subbasins
- Drainage
- Roads
- Marshdale Population centers

Figure 2. Compilation of parts of the existing Evergreen, Indian Hills, Morrison, Conifer, and Meridian Hills U.S. Geological Survey Geologic Quadrangle Maps.



Note: The circular diagrams are equal-area plots that indicate strike, dip, and number of fractures mapped (m). A more detailed explanation of the diagrams is given in the appendix.

Figure 3. Simplified geologic map, locations of outcrops where fracture characteristics were measured or observed, and fracture-orientation data for measurements at each location.

Table 1. Individual rock types assigned to rock groups in the Turkey Creek watershed

[Individual rock types taken from the explanation in figure 2 are assigned to rock groups based on lithologic similarity, structural history, and geologic setting. The groups include (1) metamorphosed and foliated gneisses and schists; (1a) amphibolites, calc-silicates, and quartzites; (2) large-scale intrusive quartz monzonites found in plutons and consisting mostly of the Silver Plume Quartz Monzonite; (2a) Pikes Peak Granite and other granites; (2b) granitic pegmatites; and (3) major fault zones that cut all rock types. NP indicates rock types not present in the study area and Quaternary-age deposits have not been included. Y indicates Precambrian-age rocks that formed between 1.04 and 1.44 billion years ago, and X indicates rocks between 1.71 and 1.75 billion years old for this area. All other units are undated Precambrian-age rocks unless otherwise stated. The following is from Char, 2000, modified from Sheridan and others, 1972; Bryant and others,1973; Scott, 1972; and Bryant, 1974]

Rock type name	Rock group assignment
Shonkinite	NP
Fountain Formation (Permian and Pennsylvanian-age sediments)	NP
Pikes Peak Granite	2a
Silver Plume Quartz Monzonite	2
Fine-grained porphyritic phase of Pikes Peak Granite	2a
Granitic rock	2a
Coarse-grained pegmatite	2b
Mafic granodiorite and quartz diorite	2
Gneissic granodiorite and quartz monzonite	1
Gneissic quartz monzonite	1
Migmatitic quartzo-feldspathic gneiss	1
Migmatite	1
Amphibolite, quartzite, marble, and associated rocks	1a
Amphibolite	1a
Biotite gneiss and associated rocks	1
Sillimanitic biotite gneiss containing garnet-bearing layers, and cordierite-feldspar-rich gneiss	1
Interlayered hornblende and calc-silicate gneiss and amphibolite	1a
Feldspar-rich gneiss	1
Garnet-mica gneiss	1
Well-foliated, medium-grained biotite-quartz monzonitic or granitic gneiss	1
Felsic gneiss	1
Rutile-bearing sillimanite quartzite	1a
Fault zone	3

The Colorado Rocky Mountain Front Range has a long and complex geologic history and associated brittle deformation. There are at least three generations of brittle deformation associated with the Precambrian rock in the watershed: (1) early Paleozoic-age burial and late Paleozoic-age Ancestral Rocky Mountain uplift, (2) mid- to late Mesozoic-age burial and late Mesozoic-age to early Cenozoic-age Laramide uplift, and (3) late Cenozoic-age volcanism, uplift, and possible extension (for example, Sonnenberg and Bolyard, 1997). This protracted geologic history and the response of the various rock types to deformation led to the complex joint (fractures with no shearing motion along them) and fault patterns that are observed today. The Turkey Creek watershed represents a relatively undeformed portion of the Front Range relative to areas to the north in the Colorado Mineral Belt (Tweto and Sims, 1963).

Quaternary-age alluvium in the Turkey Creek watershed is sparse and is present primarily along stream channels and in open areas locally known as parks (fig. 2). The dominant soil types (stony loams to rock outcrops) are generally thin (about 2 to 3 ft thick), have generally low water availability, have moderate to high permeability, and are on moderate to steep slopes (U.S. Department of Agriculture, 1980). In addition, locally derived, very near-surface, bedrock weathering may be hydraulically significant. Thicker zones of weathered bedrock exist predominantly where there are coarse-grained intrusive rocks,

especially overlying the Pikes Peak Granite. Significant areas of weathered bedrock also occur where there are metamorphic rocks that are dominantly composed of hornblende and a variety of amphiboles. Field observations and anecdotal information from water-well drillers indicate that weathered bedrock is rare to absent except in the southwestern part of the watershed where the Pikes Peak Granite crops out (fig. 2). Weathering probably extends to depths of about 10 ft or less and is nonuniformly distributed where the Pikes Peak Granite crops out and in particular where it has been glaciated.

Surficial deposits of alluvium and soils are thin and not present everywhere in the Turkey Creek watershed; although the surficial deposits contain water, most wells in the watershed are completed in the crystalline bedrock and most water used for domestic supply in the watershed is withdrawn from the crystalline bedrock. The crystalline bedrock has very low primary, or intergranular, porosity; rather, open space that may contain water in the crystalline rocks consists mostly of fractures and fracture networks. The fractured bedrock aquifer system in the Turkey Creek watershed is the fractures and fracture networks in the crystalline rocks.

DATA COLLECTION AND METHODS

Data used as part of this study are described in this section. Data collected in previous USGS studies and data compiled or collected by other agencies are referred to as “historical data,” and data collected as part of this study, beginning in 1998 and continuing through September 2001, are referred to as “contemporary data.” Some of the methods used in analyzing these data also are described in this section. Detailed descriptions of specialized methods used in developing estimates of fracture-network porosity, measurements of evapotranspiration, and characterization of spatial characteristics for some well-construction records are described in the Appendix. The preferred system of units for reporting in this report is the English inch-pound system; however, some data, such as those related to energy measures and rock fractures, are described in metric units as this is a standard and accepted practice.

Historical Data

Much data for the Turkey Creek watershed collected as part of previous studies or maintained by agencies other than the USGS were used in this study. These data provide some descriptions of historical climatologic, streamflow, ground-water level, and water-quality conditions in or around the watershed. The data also include well-construction records available from the Colorado State Engineer’s Office (SEO) and miscellaneous data available from the Jefferson County Planning and Zoning Department including summaries of U.S. Census Bureau information, projections of population growth, locations of occupied households, some historical land-use classifications, and digital orthophoto imagery.

The Colorado Climate Center, in cooperation with the National Weather Service, maintains climatologic records for many locations in Colorado (Colorado Climate Center, 2002). Records for precipitation and daily air temperature extremes from three stations—Bailey (station 50454), Cheesman (station 51528), and Elk Creek (station 52633)—were used as part of this study (fig. 1). In addition, a detailed precipitation record covering more than 40 years (1956–99) was available from John and Marguerite Schoonhoven of Flying J Ranch (RG12 in table 2). Several other intermittent and short-term records of snowfall and temperature were available from various sources.

Historical records include those collected previous to this study and consist of data from two stream gages on Turkey Creek in the vicinity of the present gage (06710992, fig. 4). A summary for time-series data indicating periods of record for stream gages and other data is presented in table 2. Some historical records, from the late 1980’s, of surface-water discharge, or streamflow, in the Turkey Creek watershed are available from the Automatic Data Processing System (ADAPS) part of the National Water Inventory System (NWIS) (Bartholoma, 1997). NWIS is a computer system established by the USGS to manage and provide some analytical capabilities for a wide variety of hydrologic information; ADAPS addresses continuous records of many hydrologic data, including surface-water records. Additional historical records of streamflow from the 1940’s and 1950’s are not included in the NWIS but have been compiled in publications (U.S. Geological Survey, 1942–53).

Table 2. List of sites with time-series records

[Note: primary identifier, U.S. Geological Survey (USGS) station identification number or National Weather Service (NWS) station number; identifier type refers to source for identifier (1 - USGS, 2 - Colorado Climate Center, 3 - State Engineers Office); Local identifier, local identifier used by this study; Location, latitude and longitude in nad27; Elevation, feet above NGVD29; Type, defines type of data collected at site (1 - total daily precipitation [a - tipping bucket, b - weighing bucket], 2 - daily minimum and maximum air temperature, 3 - mean daily discharge, 4 - soil moisture, 5 - solar radiation, 6 - evapotranspiration, 7 - daily mean diversion, 8 - intermittent or monthly depth-to-water measurements, 9 - mean daily depth to water); --, not applicable]

Identifier								
primary	type	local	Location	Elevation	Type	Period of record	Site name
				DISCHARGE AND DIVERSIONS			
06710992	1	--	393703 1051324	6420	3	April 13, 2001 - continuing	Turkey Creek near Indian Hills
06710995	1	SWA01	393713 1051141	6040	3	April 1, 1998 - April 13, 2001	Turkey Creek at mouth of Canyon near Morrison
06711040	1	--	393827 1050934	5635	3	June 19, 1942 - September 30, 1953	Turkey Creek above Bear Creek Lake near Morrison
06711000	1	--	393809 1051003	--		April 25, 1986 - September 30, 1989	Turkey Creek near Morrison
393203105221600	1	STR-1	393203 1052216	9100	3	April 10, 2001 - August 1, 2001	North Turkey Creek upper tributary above Aspen Park
393210105205500	1	STR-2	393210 1052055	8435	3	April 10, 2001 - August 1, 2001	North Turkey Creek above Warhawk near Aspen Park
393141105200500	1	STR-3	393141 1052005	8350	3	April 17, 2001 - August 1, 2001	North Turkey Creek tributary above Aspen Park
393443105165800	1	STR-4	393443 1051658	7615	3	April 13, 2001 - August 1, 2001	North Turkey Creek tributary near Gartner Drive near Aspen Park
--	3	head 12	393714 1051155	6115	7	-- - --	Headgate Independent Highline # 12
--	3	head 27	393714 1051141	6015	7	-- - --	Headgate Bergen # 27
				CLIMATOLOGIC			
393213105142100	1	RG1	393213 1051421	7460	1a	December 1, 1998 - September 30, 2001	RG1
393145105195900	1	RG2	393145 1051959	8250	1a	no record	RG2
393204105141700	1	RG3	393204 1051417	7900	1a	December 1, 1998 - September 30, 2001	RG3
393404105182701	1	RG4	393404 1051822	7820	1a	December 1, 1998 - September 30, 2001	RG4
393143105135600	1	RG5	393143 1051356	8480	1a	December 1, 1998 - September 30, 2001	RG5
393459105170300	1	RG6	393459 1051703	7560	1a	December 1, 1998 - September 30, 2001	RG6
393552105144201	1	RG7	393552 1051442	7480	1a	December 1, 1998 - September 30, 2001	RG7
393700105114500	1	RG8	393700 1051145	6040	1b,2	August 28, 1998 - September 30, 2001	RG8/AT1
393423105131000	1	RG9	393423 1051310	7160	1b	September 23, 1998 - September 30, 2001	RG9
393249105181900	1	RG10	393248 1051819	8240	1b	February 2, 1999 - September 30, 2001	RG10
393340105201500	1	RG11	393340 1052015	8180	1b	November 25, 1998 - November 23, 20011	RG11
--	1	RG12	393237 1051912	7980	1,2	January 1, 1956 - December 30, 1999	RG12
50454	1	RG13	392421 1052822	7730	11,2	August 1, 1948 - December 31, 1997	Bailey
51520	2	RG14	391313 1051640	6890	11,2	August 1, 1948 - June 30, 2000	Cheesman
52633	2	RG15	392953 1052000	8440	11,2	August 1, 1948 - September 30, 1951	Elk Creek
--	2	RG16	393227 1051925	8180	1a,2, 4,5,6	February 3, 1999 - December 31, 2001	RG16/ *ET* Forest site/ *ET* Tower
--	2	RG17	393429 1051638	7770	1a,2, 4,5,6	June 2, 2000 - December 31, 2001	RG17/ *ET* Meadow site
--	2	RG18	393429 1051638	7770	1b	December 6, 2000 - September 30, 2001	RG18/ *ET* Forest site
--	2	AT2	393104 1052109	9760	2	April 1, 2001 - September 30, 2001	Elk Creek Fire Station at Conifer Mountain
--	2	AT3	393304 1051621	8200	2	March 23, 2001 - September 30, 2001	North Meyer Ranch Park
--	2	AT4	393223 1051624	8200	2	March 23, 2001 - September 30, 2001	South Meyer Ranch Park
				DEPTH TO WATER			
393821105161001	1	MH1	393820 1051612	7310	8	September 5, 1973 - February 14, 1983 August 25, 1998 - continuing	MH1
					9	May 23, 2001 - September 30, 2001	
393604105132100	1	MH2	393604 1051321	6900	8	November 4, 1998 - continuing	MH2
393513105181300	1	MH3	393513 1051813	7751	8	July 9, 1998 - continuing	MH3
393459105165701	1	MH4	393459 1051657	7672	8	December 3, 1998 - continuing	MH4
393350105184401	1	MH5	393350 1051844	7900	8	September 5, 1973 - February 14, 1983 August 25, 1998 - continuing	MH5
					9	May 23, 2001 - September 30, 2001	
393348105171400	1	MH6.1	393348 1051714	8375	8	December 3, 1998 - continuing	MH6.1
393344105171400	1	MH6.2	393344 1051714	8352	8	December 3, 1998 - continuing	MH6.2
393342105171500	1	MH6.3	393342 1051715	8340	8	December 3, 1998 - continuing	MH6.3
39333210515 800	1	MH7	393332 1051508	8337	8	December 3, 1998 - continuing	MH7
393301105150201	1	MH8	393301 1051532	8050	8	September 6, 1973 - February 14, 1983 July 9, 1998 - continuing	MH8
					9	May 23, 2001 - September 30, 2001	
393121105110600	1	MH9	393121 1051106	6720	8	September 6, 1973 - February 14, 1983 August 25, 1998 - September 30, 2001	MH9
392958105164601	1	MH10	392958 1051646	7950	8	September 6, 1973 - February 14, 1983 August 25, 1998 - September 30, 2001	MH10
393112105182100	1	MH11	393112 1051821	8477	8	June 18, 1998 - continuing	MH11
393143105195400	1	MH12	393143 1051954	8187	8	July 10, 1998 - continuing	MH12
393717105145300	1	MH13	393717 1051453	7279	8	May 11, 1999 - continuing	MH13

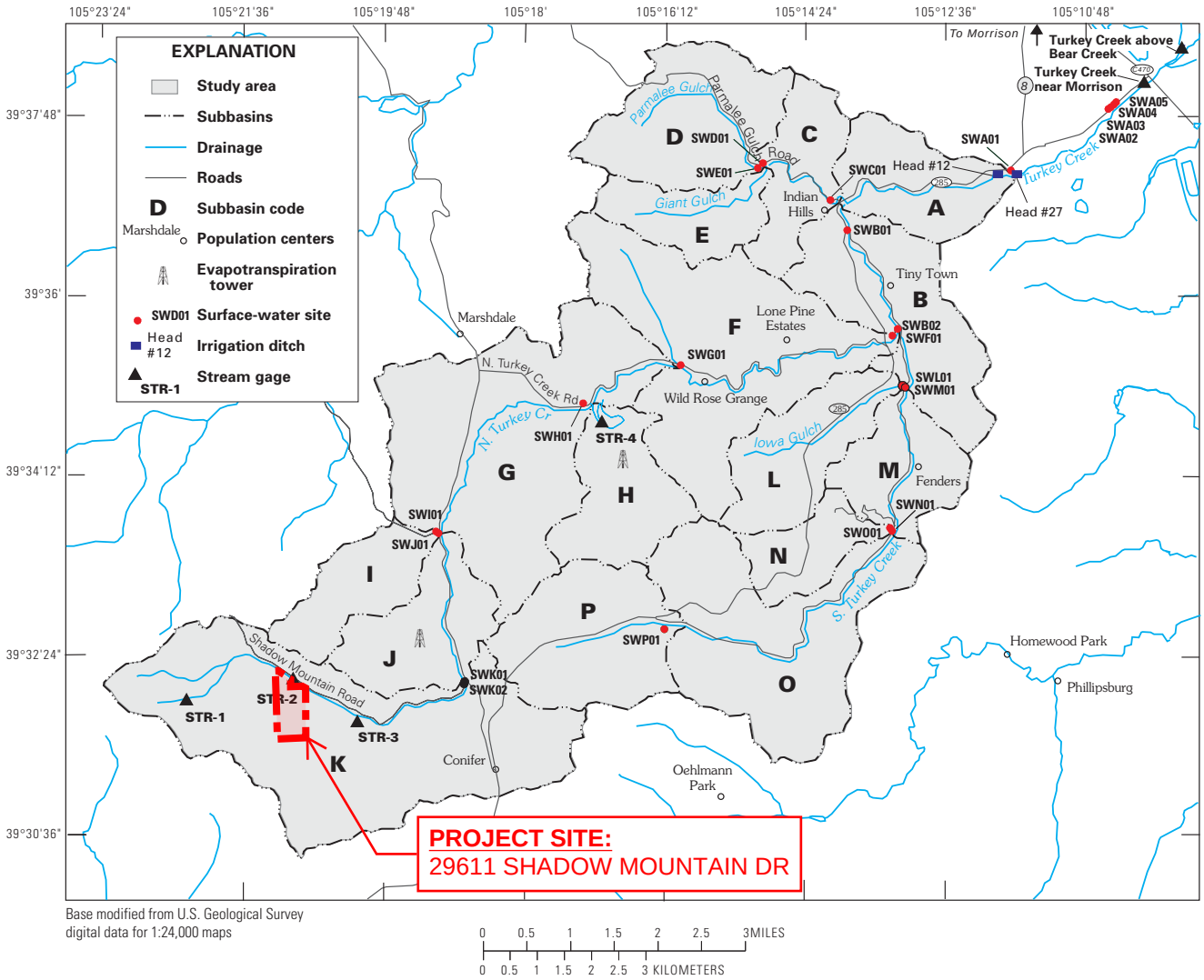


Figure 4. Locations of surface-water streamflow measurement and sampling sites, stream gages, and irrigation ditches.

Two stream gages on Turkey Creek were operated by the USGS at various times previous to this study. Station 06711040, Turkey Creek above Bear Creek Lake near Morrison, about 1.5 mi downstream from the present gage (station 06710992) (fig. 4), has data available from April 25, 1986, through September 30, 1989. Station 06711000, Turkey Creek near Morrison, about 1 mi downstream from the present gage, has data available from June 19, 1942, through September 30, 1953. Diversions from Turkey Creek upstream from these stations complicate streamflow records. Although streamflow records at these stations have an acceptable level of accuracy, they are not representative of stream regulation that occurs upstream from the gages. Regulation activity typically consists of diversions. The water diverted from streams is not measured at the gages; consequently, the gage record is "low biased," or consistently less than the sum of measured streamflow and the diversion, during times of diversion. Regulation also may include addition of water to streams. Records for diversions from the Independent Highline and Bergen ditches (fig. 4) are available from the SEO; other records from potential additional diversions or additions are not available.

The SEO is responsible for issuing permits for well construction in Colorado. As part of the permitting process, many well-construction details are obtained by the SEO and retained in their files. Many of these data, such as legal description, drillers' logs,

and well-completion diagrams, are only available in paper format or scanned images of original paper copies. However, some data are available electronically as digital records. The SEO has about 3,300 digital well records with construction details on file for the Turkey Creek watershed. About 1,100 of those wells, referred to in this report as “permitted wells,” have defined locations that are shown in figure 5. The digital data describe reported well yield, total depth, and depth to water.

Water-quality data from previous studies were available for use in this study. Most of these data were collected in the 1970’s as part of the work by Hofstra and Hall (1975a) and Hall and others (1981). Bruce and McMahon (1997) also collected water-quality data from a number of wells in Front Range settings, a few of which are in the watershed. In addition, Bruce and McMahon (1997) and Stevens and others (1997) collected water-quality data from wells completed in fractured rocks in other Front Range areas that can be compared to data collected during this study. All of these data include analyses for many water-quality properties and constituents addressed by this study as well as other constituents that are useful to this study. The locations for samples collected during previous studies in the Turkey Creek watershed are shown in figure 6. Univariate statistics for water-quality properties and constituents including major ions and some nutrients collected in previous studies are listed in table 3.

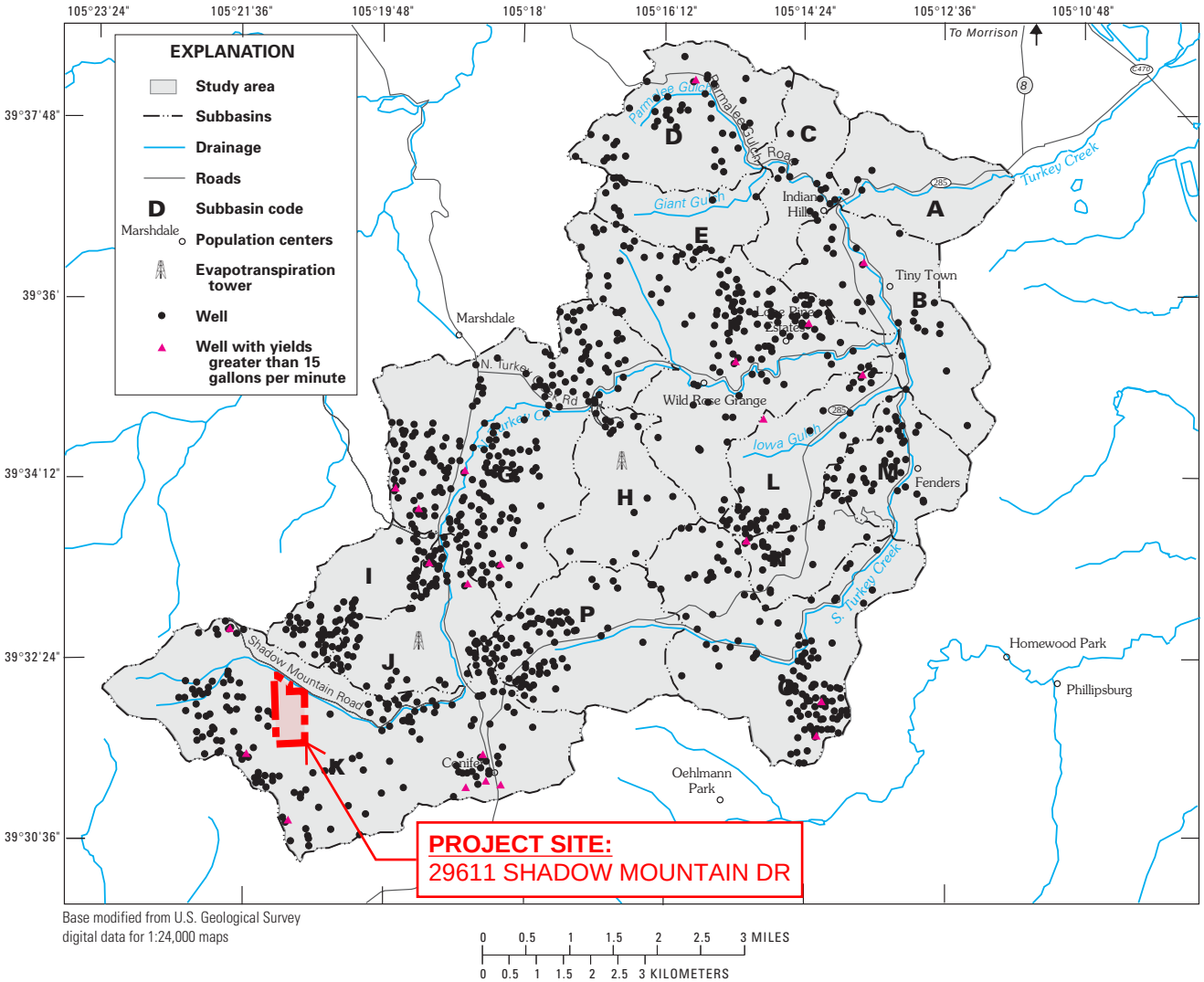


Figure 5. Locations of permitted wells from the State Engineers Office.

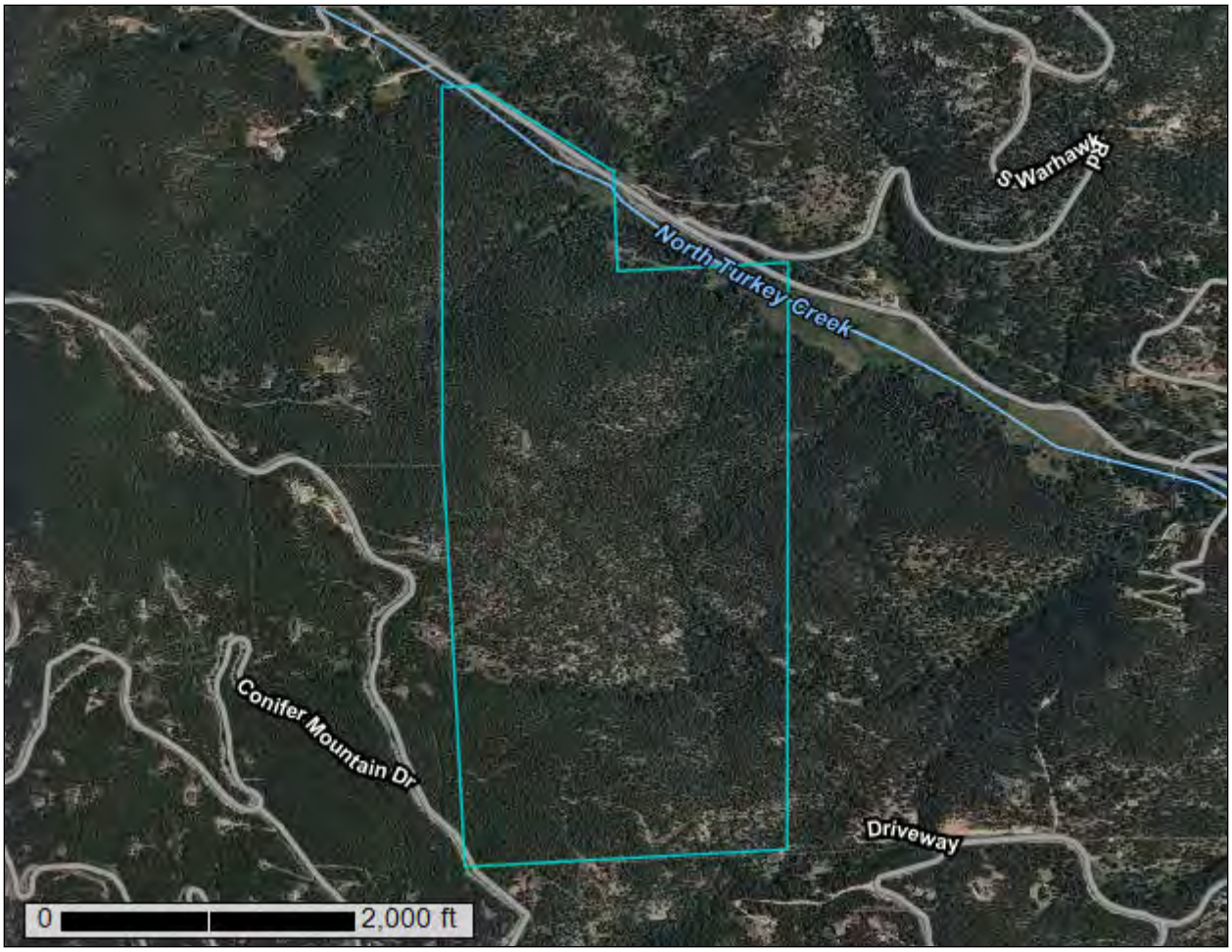
United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Golden Area, Colorado, Parts of Denver, Douglas, Jefferson, and Park Counties

Shadow Mountain Bike Park



September 16, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

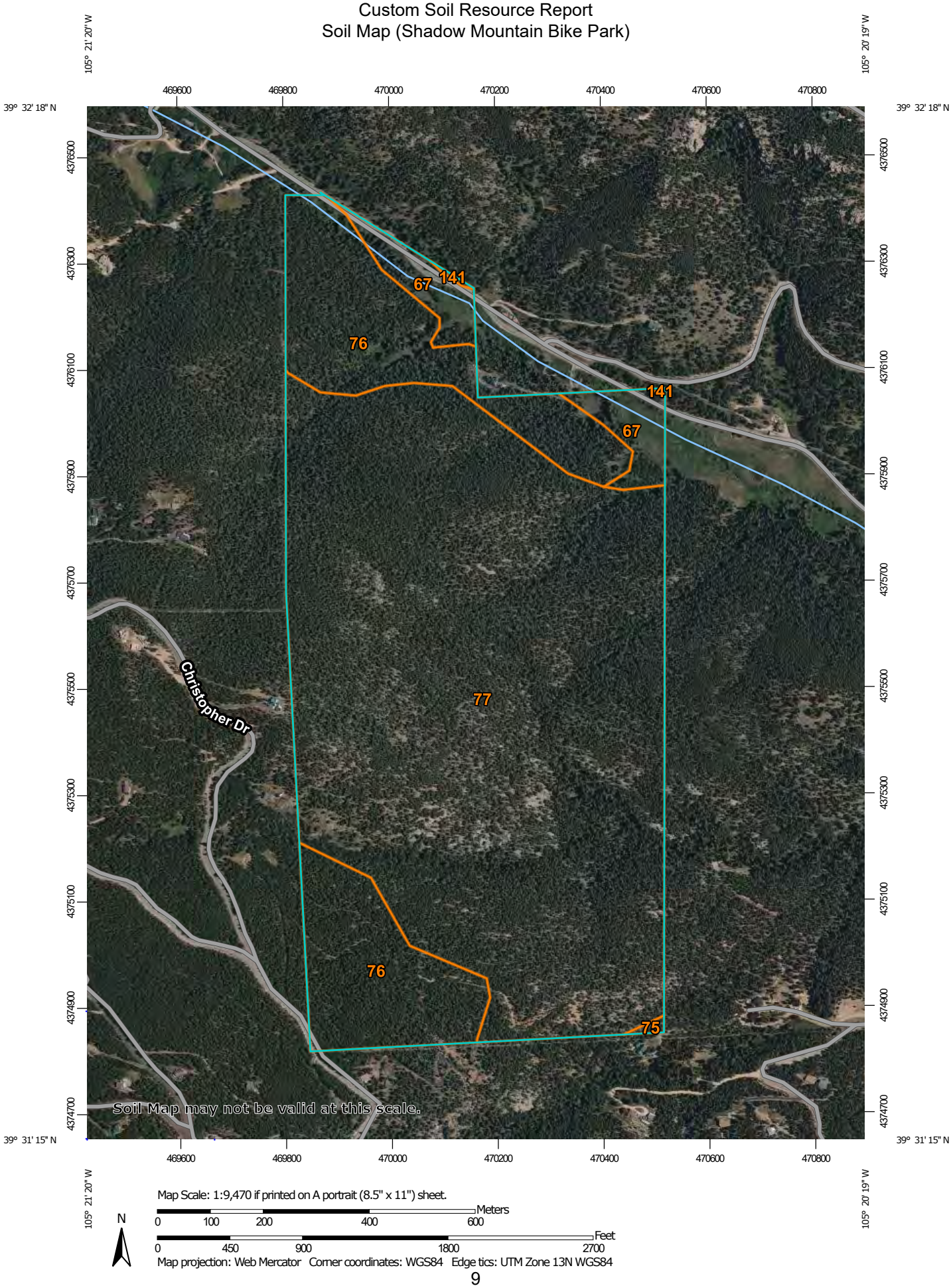
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Shadow Mountain Bike Park)



Map Scale: 1:9,470 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Golden Area, Colorado, Parts of Denver, Douglas, Jefferson, and Park Counties
Survey Area Data: Version 16, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 1, 2020—Jul 2, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Shadow Mountain Bike Park)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
67	Kittredge-Earcree complex, 9 to 20 percent slopes	10.1	4.2%
75	Legault-Hiwan stony loamy sands, 5 to 15 percent slopes	0.3	0.1%
76	Legault-Hiwan stony loamy sands, 15 to 30 percent slopes	48.5	20.3%
77	Legault-Hiwan-Rock outcrop complex, 30 to 50 percent slopes	179.8	75.3%
141	Rogert, very stony-Herbman-Rock outcrop complex, 30 to 70 percent slopes	0.2	0.1%
Totals for Area of Interest		**238.9**	**100.0%**

Map Unit Descriptions (Shadow Mountain Bike Park)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a

given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Golden Area, Colorado, Parts of Denver, Douglas, Jefferson, and Park Counties

67—Kittredge-Earcree complex, 9 to 20 percent slopes

Map Unit Setting

National map unit symbol: jppt
Elevation: 7,600 to 9,500 feet
Mean annual precipitation: 17 to 20 inches
Mean annual air temperature: 41 to 43 degrees F
Frost-free period: 55 to 75 days
Farmland classification: Not prime farmland

Map Unit Composition

Kittredge and similar soils: 45 percent
Earcree and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kittredge

Setting

Landform: Mountain slopes, terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium and/or colluvium derived from igneous and metamorphic rock

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 29 inches: sandy clay loam
H3 - 29 to 60 inches: sandy loam

Properties and qualities

Slope: 9 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Description of Earcree

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Noncalcareous, gravelly and loamy alluvium and/or colluvium derived from igneous and metamorphic rock

Typical profile

H1 - 0 to 11 inches: gravelly sandy loam
H2 - 11 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 9 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Cryofluvents

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R048AY010UT - Wet Fresh Streambank (Willow)
Hydric soil rating: No

Urban land

Percent of map unit: 3 percent
Hydric soil rating: No

Rogert

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Troutdale

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Venable

Percent of map unit: 3 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R048AY241CO - Mountain Meadow
Hydric soil rating: Yes

75—Legault-Hiwan stony loamy sands, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: jpq3
Elevation: 7,600 to 10,000 feet
Mean annual precipitation: 17 to 20 inches
Mean annual air temperature: 41 to 43 degrees F
Frost-free period: 55 to 75 days
Farmland classification: Not prime farmland

Map Unit Composition

Legault and similar soils: 45 percent
Hiwan and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Legault

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Acidic, gravelly, stony, and sandy residuum weathered from igneous and metamorphic rock

Typical profile

H1 - 0 to 2 inches: gravelly loamy sand
H2 - 2 to 14 inches: very gravelly loamy sand
H3 - 14 to 18 inches: weathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Description of Hiwan

Setting

Landform: Mountain slopes, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Mountainflank, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acidic, stony, gravelly, and sandy residuum weathered from igneous and metamorphic rock

Typical profile

H1 - 0 to 1 inches: very gravelly loamy sand
H2 - 1 to 15 inches: very gravelly loamy sand
H3 - 15 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Earcree

Percent of map unit: 3 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Grimstone

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Peeler

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F048AY908CO - Mixed Conifer
Other vegetative classification: ABLA-PIEN/VASC (subalpine fir, Engelmann's spruce, grouse whortleberry) (null_6)
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Landform: Mountain slopes, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Free face, mountainflank, side slope, crest, free face
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Herbman

Percent of map unit: 2 percent
Landform: Mountain slopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Urban land

Percent of map unit: 1 percent
Hydric soil rating: No

76—Legault-Hiwan stony loamy sands, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: jpq4
Elevation: 7,600 to 10,000 feet
Mean annual precipitation: 17 to 20 inches
Mean annual air temperature: 41 to 43 degrees F
Frost-free period: 55 to 75 days
Farmland classification: Not prime farmland

Map Unit Composition

Legault and similar soils: 45 percent
Hiwan and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Legault

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Acidic, gravelly, stony, and sandy residuum weathered from igneous and metamorphic rock

Typical profile

H1 - 0 to 1 inches: gravelly loamy sand
H2 - 1 to 13 inches: very gravelly loamy sand
H3 - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Description of Hiwan

Setting

Landform: Mountain slopes, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Mountainflank, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acidic, stony, gravelly, and sandy residuum weathered from igneous and metamorphic rock

Typical profile

H1 - 0 to 1 inches: very gravelly loamy sand
H2 - 1 to 15 inches: very gravelly loamy sand
H3 - 15 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Grimstone

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Landform: Mountain slopes, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Mountainflank, free face, side slope, crest, free face
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Peeler

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F048AY908CO - Mixed Conifer
Other vegetative classification: ABLA-PIEN/VASC (subalpine fir, Engelmann's spruce, grouse whortleberry) (null_6)
Hydric soil rating: No

Earcree

Percent of map unit: 3 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Herbman

Percent of map unit: 2 percent
Landform: Mountain slopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Urban land

Percent of map unit: 1 percent
Hydric soil rating: No

77—Legault-Hiwan-Rock outcrop complex, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: jpq5
Elevation: 7,600 to 10,000 feet
Mean annual precipitation: 17 to 20 inches
Mean annual air temperature: 41 to 43 degrees F
Frost-free period: 55 to 75 days
Farmland classification: Not prime farmland

Map Unit Composition

Legault and similar soils: 35 percent
Hiwan and similar soils: 30 percent
Rock outcrop: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Legault

Setting

Landform: Ridges, mountain slopes
Landform position (three-dimensional): Mountainflank, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acidic, gravelly, stony, and sandy residuum weathered from igneous and metamorphic rock

Typical profile

H1 - 0 to 1 inches: gravelly loamy sand
H2 - 1 to 13 inches: very gravelly loamy sand
H3 - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Description of Hiwan

Setting

Landform: Mountain slopes, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Mountainflank, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acidic, stony, gravelly, and sandy residuum weathered from igneous and metamorphic rock

Typical profile

H1 - 0 to 1 inches: very gravelly loamy sand
H2 - 1 to 15 inches: very gravelly loamy sand
H3 - 15 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Mountain slopes, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Mountainflank, free face, side slope, crest, free face
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Igneous and metamorphic rock

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Grimstone

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Herbman

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Rogert

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Peeler

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F048AY908CO - Mixed Conifer
Other vegetative classification: ABLA-PIEN/VASC (subalpine fir, Engelmann's spruce, grouse whortleberry) (null_6)
Hydric soil rating: No

Tolvar

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

141—Rogert, very stony-Herbman-Rock outcrop complex, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: 2tz4y
Elevation: 7,590 to 10,000 feet
Mean annual precipitation: 17 to 23 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 25 to 75 days
Farmland classification: Not prime farmland

Map Unit Composition

Rogert, very stony, and similar soils: 45 percent
Herbman and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rogert, Very Stony

Setting

Landform: Ridges, mountain slopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Colluvium over residuum weathered from igneous and metamorphic rock

Typical profile

A - 0 to 8 inches: very cobbly sandy loam
C - 8 to 16 inches: very gravelly sandy loam
R - 16 to 79 inches: bedrock

Properties and qualities

Slope: 30 to 70 percent
Surface area covered with cobbles, stones or boulders: 2.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R048AY237CO - Stony Loam
Hydric soil rating: No

Description of Herbman

Setting

Landform: Mountain slopes, ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop, mountainflank, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium over residuum weathered from igneous and metamorphic rock

Typical profile

A - 0 to 4 inches: very gravelly sandy loam
AC - 4 to 14 inches: very gravelly sandy loam
Cr - 14 to 79 inches: bedrock

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R048AY237CO - Stony Loam
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Mountain slopes, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Mountainflank, free face, side slope, crest, free face
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Rock outcrops, talus, and large boulders of igneous and metamorphic rock

Interpretive groups

Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Troutdale

Percent of map unit: 3 percent
Landform: Ridges, mountain slopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountainflank, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R048AY228CO - Mountain Loam
Hydric soil rating: No

Kittredge

Percent of map unit: 3 percent
Landform: Alluvial fans, mountain slopes
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R048AY228CO - Mountain Loam
Hydric soil rating: No

Sprucedale

Percent of map unit: 2 percent
Landform: Ridges, mountain slopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Mountaintop, mountainflank, side slope, crest

Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R048AY228CO - Mountain Loam
Hydric soil rating: No

Pettingell

Percent of map unit: 2 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R048AY237CO - Stony Loam
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Calculation of Peak Runoff using Rational Method

Designer: Olivia Dawson, P.E.
Company: SE Group
Date: 11/2/2022
Project: Shadow Mountain Bike Park
Location: 29611 Shadow Mnt Dr Conifer, CO

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K_v\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Computed } t_c = t_i + t_t$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$t_{minimum} = 5$ (urban)
$t_{minimum} = 10$ (non-urban)

$$\text{Selected } t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.85	1.19	1.39		1.93	2.20	

	a	b	c
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

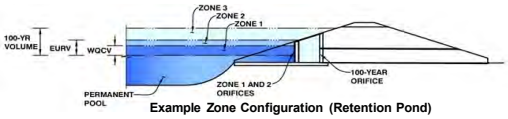
Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
H1	2.74	D	2.00	0.01	0.05	0.15	0.33	0.40	0.49	0.59	230.00	8432.97	8390.54	0.184	10.97	5.00			0.010	5	0.50	0.17	11.14	25.75	11.14	2.20	3.08	3.60		5.00	5.70		0.06	0.43	1.45		5.52	7.68	
H2	4.01	B	2.00	0.01	0.01	0.07	0.26	0.34	0.44	0.54	500.00	8405.21	8371.58	0.067	23.41	5.00			0.010	2.5	0.25	0.33	23.75	25.75	23.75	1.52	2.13	2.49		3.46	3.95		0.05	0.10	0.73		4.71	6.89	
D1	2.74	D	43.0	0.32	0.39	0.45	0.56	0.61	0.66	0.72	300.00	8432.97	8389.33	0.145	9.24	5.00			0.010	10	1.00	0.08	9.32	18.75	9.32	2.36	3.31	3.86		5.37	6.12		2.09	3.49	4.74		8.90	11.06	
D2	3.61	B	31.0	0.21	0.24	0.31	0.44	0.50	0.57	0.65	200.00	8379.40	8368.23	0.056	12.45	185.00	8389.33	8379.40	0.054	20	4.63	0.67	13.12	21.73	13.12	2.05	2.87	3.36		4.66	5.31		1.57	2.49	3.72		8.43	10.93	
OS	0.40	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	200.00	8378.00	8369.00	0.045	16.91	5.00			0.010	2.5	0.25	0.33	17.24	25.75	17.24	1.80	2.53	2.95		4.10	4.67		0.01	0.01	0.09		0.56	0.81	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Shadow Mountain Bike Park**

Basin ID: **Developed Drainage Plan Basin**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	6.35	acres
Watershed Length =	700	ft
Watershed Length to Centroid =	350	ft
Watershed Slope =	0.060	ft/ft
Watershed Imperviousness =	40.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	65.0%	percent
Percentage Hydrologic Soil Groups C/D =	35.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

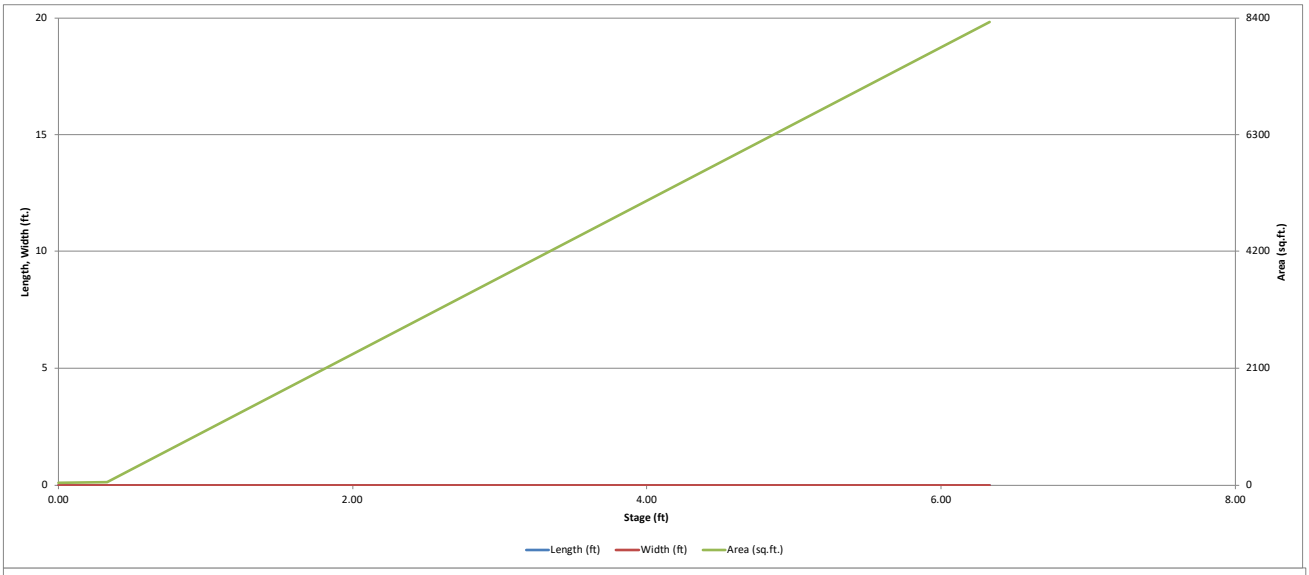
			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.095	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.256	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	0.149	acre-feet	0.85	inches
5-yr Runoff Volume (P1 = 1.19 in.) =	0.251	acre-feet	1.19	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	0.330	acre-feet	1.39	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.507	acre-feet		inches
50-yr Runoff Volume (P1 = 1.93 in.) =	0.624	acre-feet	1.93	inches
100-yr Runoff Volume (P1 = 2.2 in.) =	0.785	acre-feet	2.20	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.271	acre-feet		inches
Approximate 2-yr Detention Volume =	0.143	acre-feet		
Approximate 5-yr Detention Volume =	0.231	acre-feet		
Approximate 10-yr Detention Volume =	0.297	acre-feet		
Approximate 25-yr Detention Volume =	0.352	acre-feet		
Approximate 50-yr Detention Volume =	0.374	acre-feet		
Approximate 100-yr Detention Volume =	0.440	acre-feet		

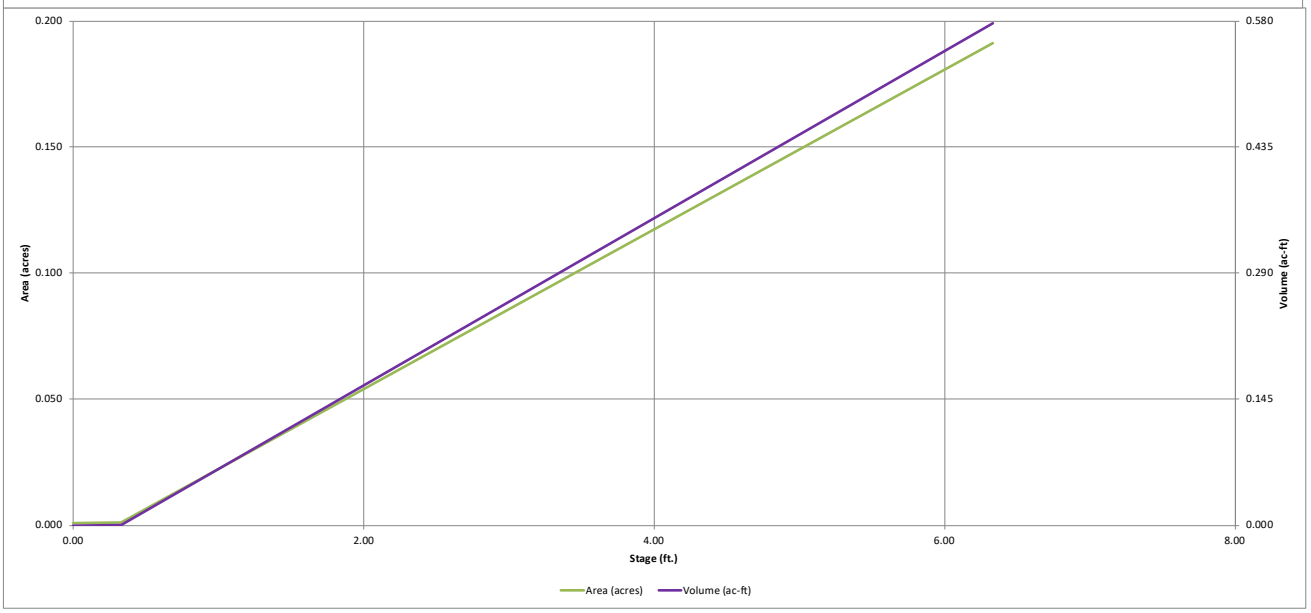
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.095	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.161	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.184	acre-feet
Total Detention Basin Volume =	0.440	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	40	0.001		
8372	--	0.33	--	--	--	50	0.001	15	0.000
8378	--	6.33	--	--	--	8,331	0.191	25,158	0.578


Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

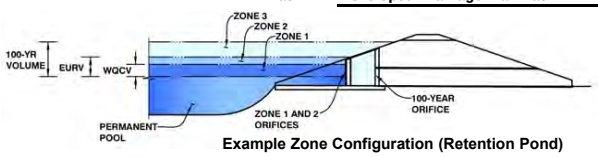

Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Shadow Mountain Bike Park**

Basin ID: **Developed Drainage Plan Basin**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.75	0.095	Orifice Plate
Zone 2 (EURV)	4.32	0.161	Circular Orifice
Zone 3 (100-year)	5.56	0.184	Weir&Pipe (Restrict)
Total (all zones)		0.440	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.569E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.75	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	11.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.37	sq. inches (diameter = 11/16 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.92	1.83					
Orifice Area (sq. inches)	0.37	0.37	0.37					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.75	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	4.32	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	2.17	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.03	N/A	ft^2
Vertical Orifice Centroid =	0.09	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.32	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Close Mesh Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	5.32	N/A	feet
Overflow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	16.33	N/A	
Overflow Grate Open Area w/o Debris =	9.78	N/A	ft^2
Overflow Grate Open Area w/ Debris =	4.89	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.70		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.60	N/A	ft^2
Outlet Orifice Centroid =	0.33	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.31	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.40	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.29	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	6.29	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.19	acres
Freeboard above Max Water Surface =	0.60	feet	Basin Volume at Top of Freeboard =	0.57	acre-ft

Calculated Parameters for Spillway

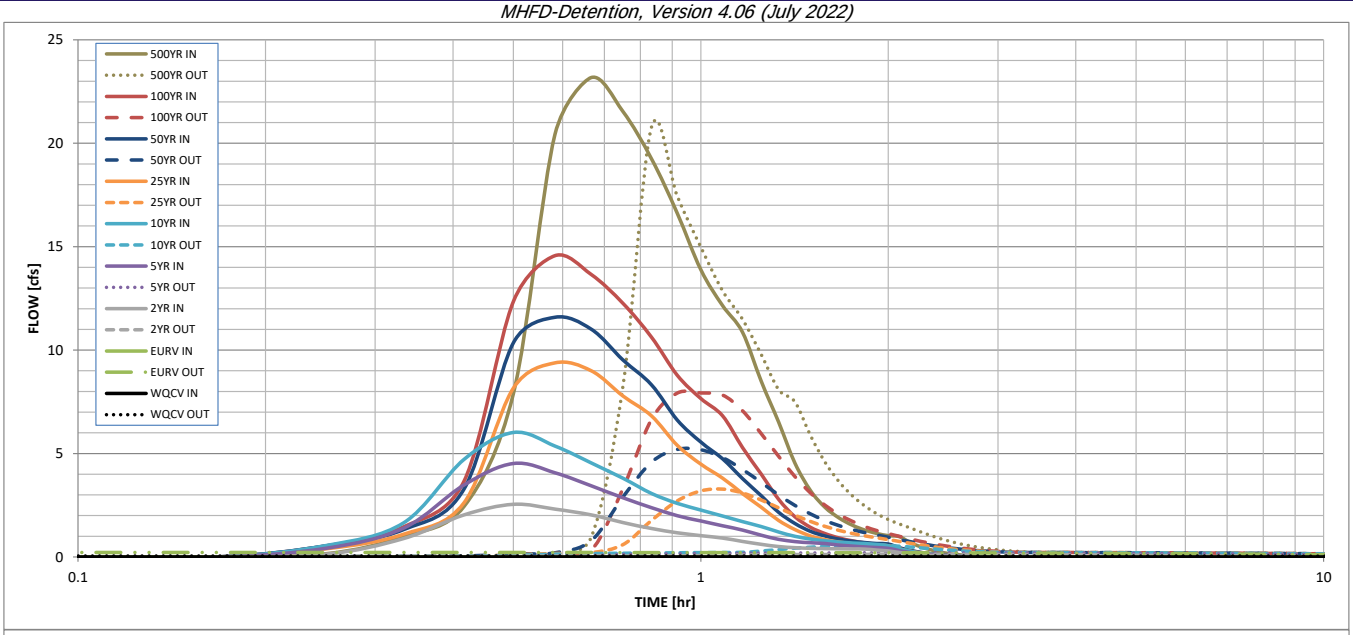
Routed Hydrograph Results

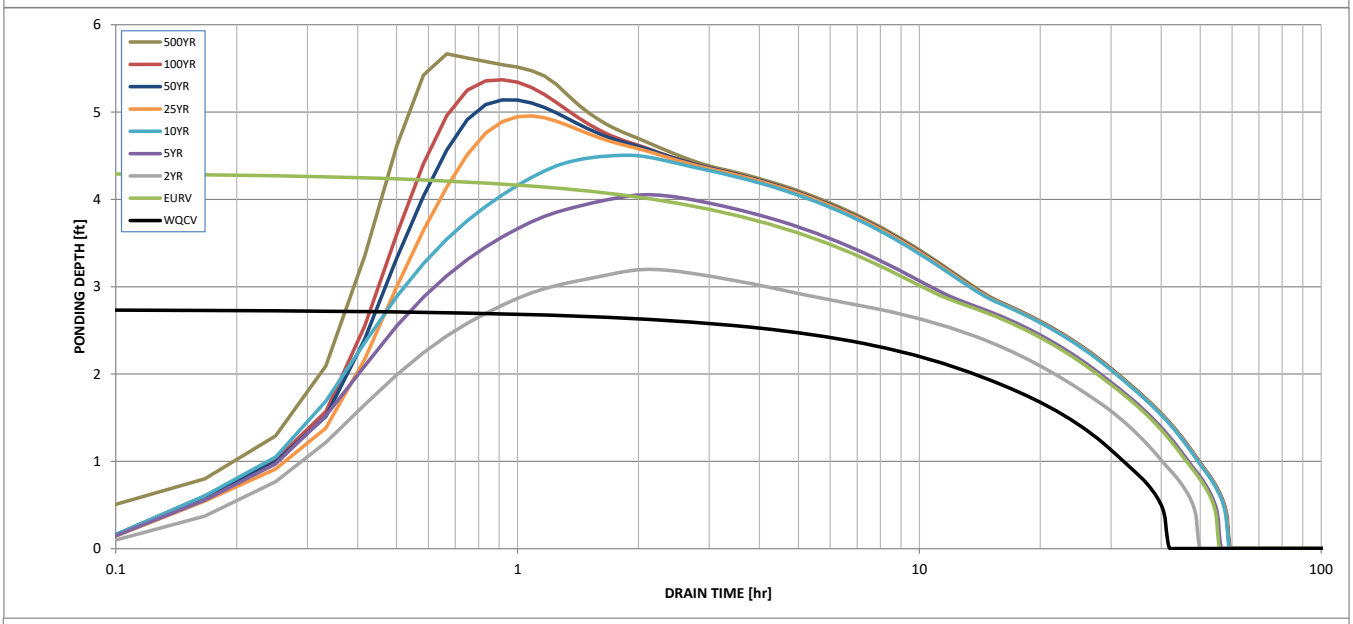
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

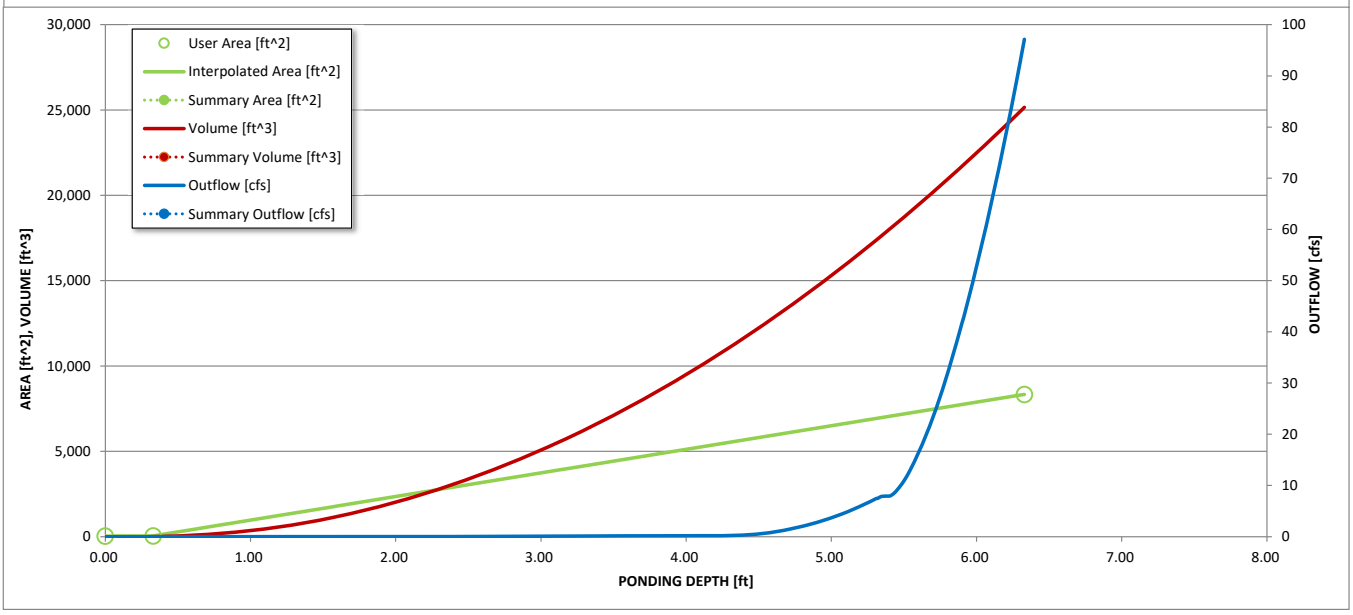
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.19	1.39	1.69	1.93	2.20	3.14
CUHP Runoff Volume (acre-ft) =	0.095	0.256	0.149	0.251	0.330	0.507	0.624	0.785	1.271
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.149	0.251	0.330	0.507	0.624	0.785	1.271
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.9	1.9	4.9	6.5	8.5	14.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.14	0.30	0.77	1.02	1.35	2.34
Peak Inflow Q (cfs) =	N/A	N/A	2.5	4.5	6.0	9.4	11.6	14.6	23.2
Peak Outflow Q (cfs) =	0.0	0.2	0.1	0.2	0.6	3.3	5.2	7.9	20.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.3	0.7	0.8	0.9	1.4
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.3	0.5	0.8	0.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	47	44	47	48	45	43	41	34
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	47	53	54	53	51	50	47
Maximum Ponding Depth (ft) =	2.74	4.32	3.20	4.05	4.50	4.96	5.14	5.37	5.67
Area at Maximum Ponding Depth (acres) =	0.08	0.13	0.09	0.12	0.13	0.15	0.15	0.16	0.17
Maximum Volume Stored (acre-ft) =	0.095	0.257	0.133	0.224	0.281	0.344	0.371	0.407	0.457

DETENTION BASIN OUTLET STRUCTURE DESIGN

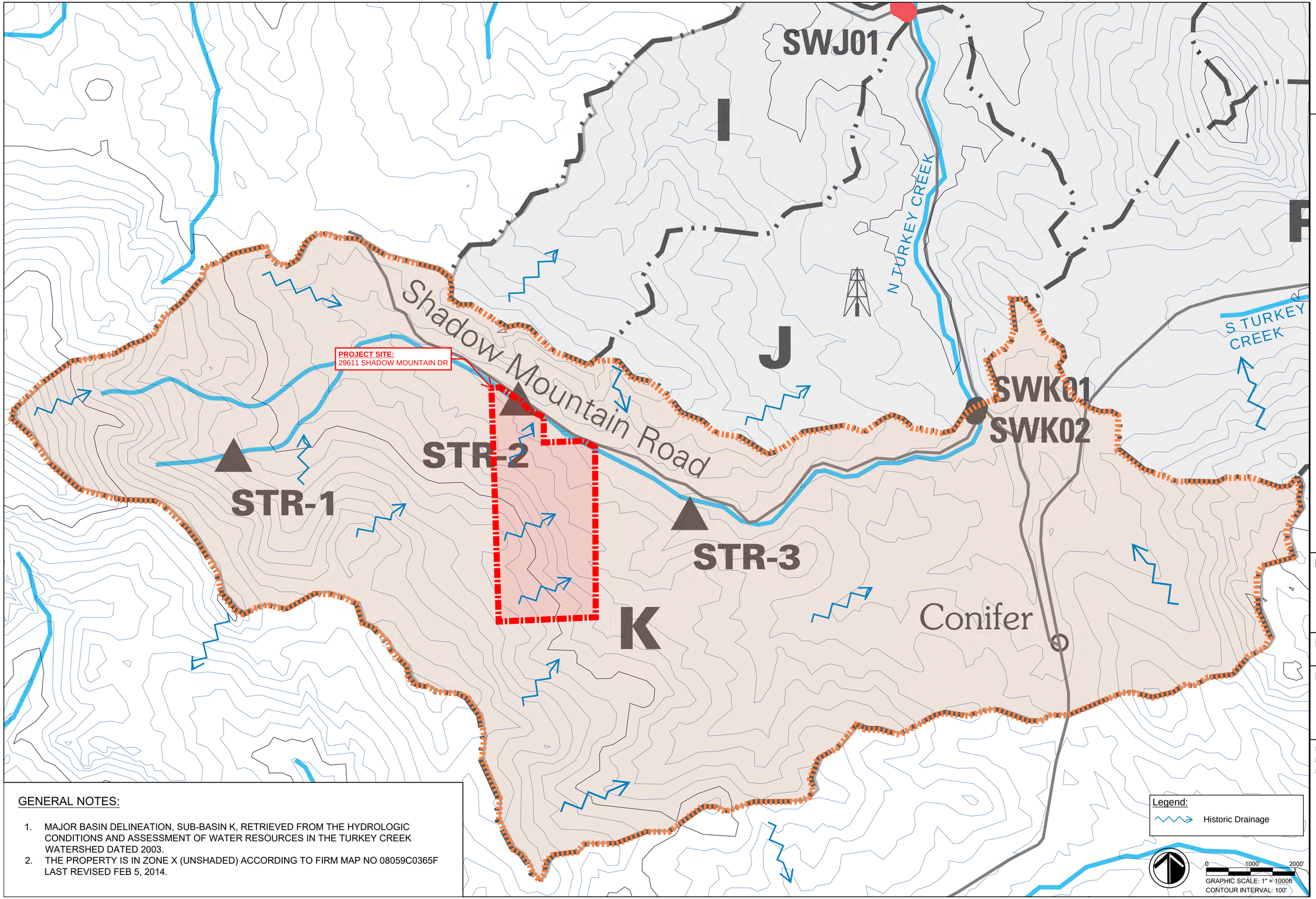
MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			



GENERAL NOTES:

1. MAJOR BASIN DELINEATION, SUB-BASIN K, RETRIEVED FROM THE HYDROLOGIC CONDITIONS AND ASSESSMENT OF WATER RESOURCES IN THE TURKEY CREEK WATERSHED DATED 2003.
2. THE PROPERTY IS IN ZONE X (UNSHADED) ACCORDING TO FIRM MAP NO 08059C0365F LAST REVISED FEB 5, 2014.

SE GROUP
323 West Main Street, Suite 202
Frisco, CO 80443
tel: 970.668.3398
www.segroup.com

SHADOW MOUNTAIN BIKE PARK

CONIFER, COLORADO

Not For Construction

ISSUE
SCHEMATIC DESIGN

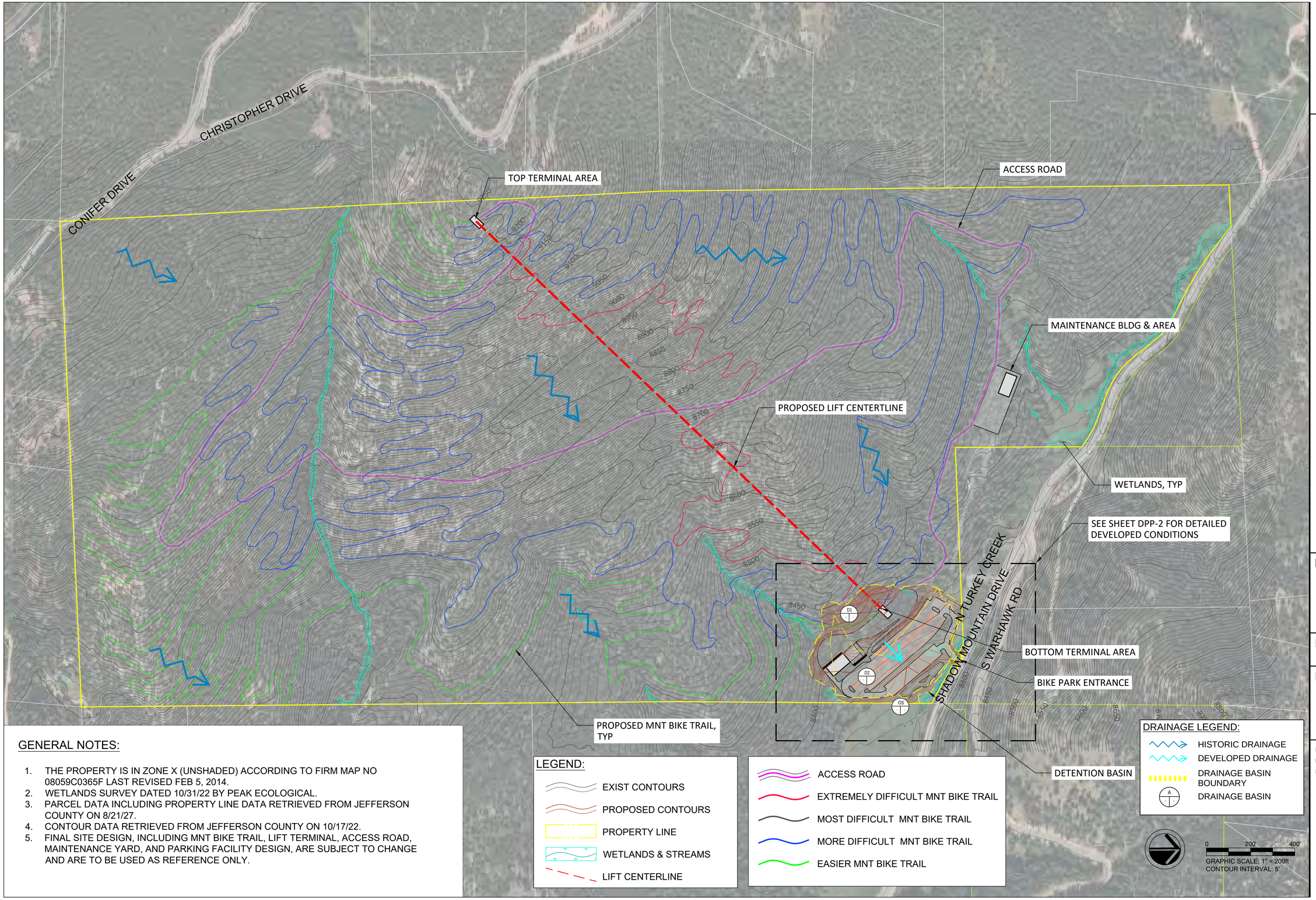
RELEASE DATE
November 22

REVISIONS

PROJECT NO.	22089001
MADE BY	OD
REVIEWED BY	OD

GENERAL LOCATION MAP

DPE



GENERAL NOTES:

1. THE PROPERTY IS IN ZONE X (UNSHADED) ACCORDING TO FIRM MAP NO 08059C0365F LAST REVISED FEB 5, 2014.
2. WETLANDS SURVEY DATED 10/31/22 BY PEAK ECOLOGICAL.
3. PARCEL DATA INCLUDING PROPERTY LINE DATA RETRIEVED FROM JEFFERSON COUNTY ON 8/21/27.
4. CONTOUR DATA RETRIEVED FROM JEFFERSON COUNTY ON 10/17/22.
5. FINAL SITE DESIGN, INCLUDING MNT BIKE TRAIL, LIFT TERMINAL, ACCESS ROAD, MAINTENANCE YARD, AND PARKING FACILITY DESIGN, ARE SUBJECT TO CHANGE AND ARE TO BE USED AS REFERENCE ONLY.

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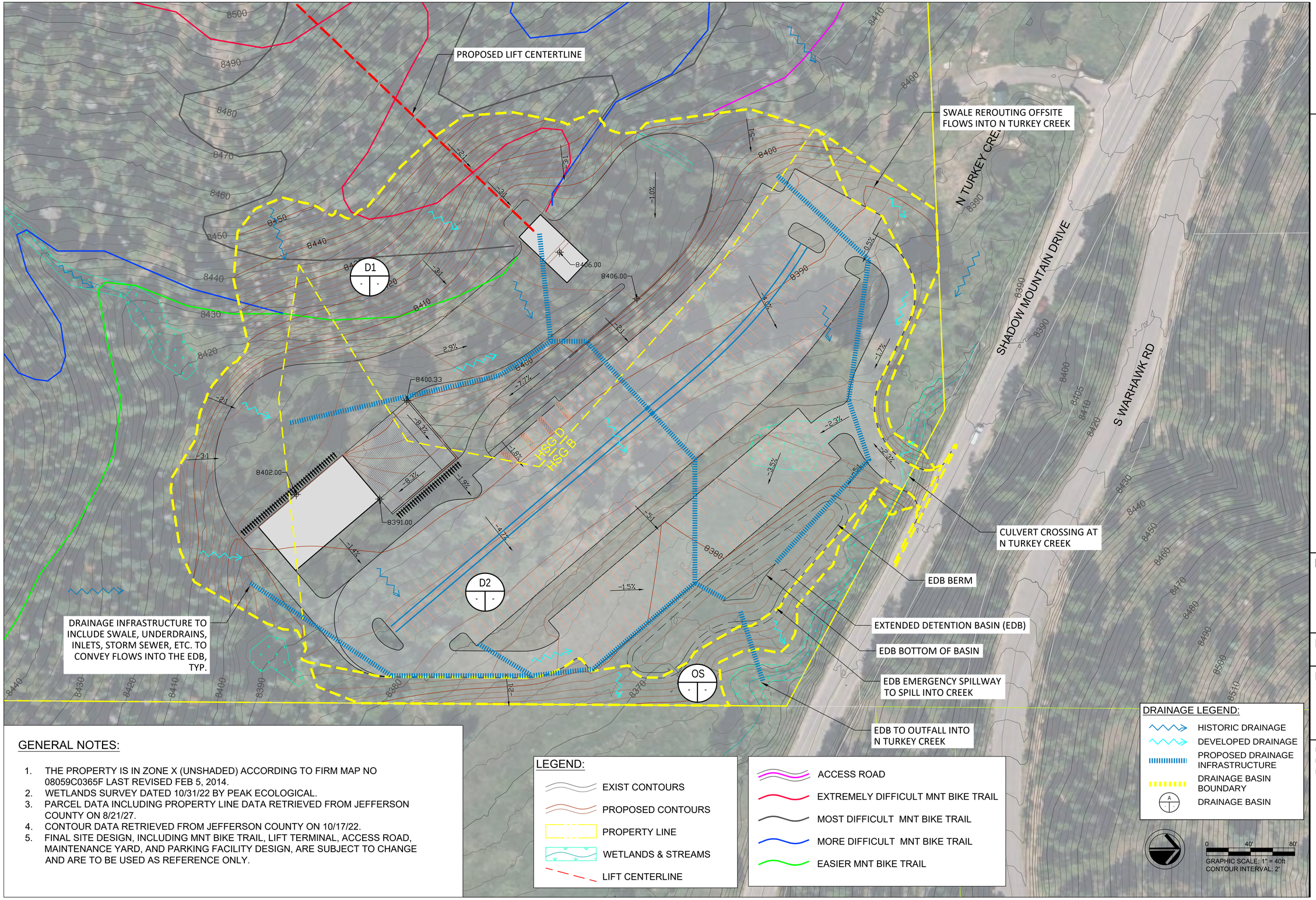
DEVELOPED DRAINAGE CONDITIONS

DPP-1



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MADE BY	OD
REVIEWED BY	OD

DEVELOPED DRAINAGE CONDITIONS

DPP-2

JEFFERSON COUNTY COLORADO | Public Health

FORM 6000

Environmental Health Services Division 645 Parfet Street, Lakewood, CO 80215
(303) 232-6301 FAX (303) 271-5760 jeffco.us/public-health

Environmental Questionnaire and Disclosure

USE THIS PACKET TO PROVIDE INFORMATION REGARDING THE PAST AND CURRENT ENVIRONMENTAL CONDITIONS ON YOUR PROPERTY AS PART OF THE LAND DEVELOPMENT PROCESS.

PURPOSE

To identify recognized environmental conditions that pose a threat to human health and/or the environment. To prevent the County from acquiring contaminated land and/or environmental liability.

BACKGROUND

Jefferson County Public Health requires an Environmental Question and Disclosure Statement for all Zoning Resolution and Land Development Regulation cases or any action that has the potential to transfer or dedicate land to the County.

This form is the initial step in that process. In it you will be asked to provide specific and detailed information concerning any past or current activities that may have resulted in negative environmental impacts. It will often require some research by you to determine what these activities may have been. It also requires you to submit citations, surveys, analyses and test results, remediation reports and other documents that may have been generated relating to these activities. To avoid delays, please be sure that your submittal is thorough and accurate.

After evaluating this information and other resources that the Department has available, the Department will make recommendations regarding the need (if any) for further environmental assessments, which may include the preparation of a Phase I Environmental Site Assessment. Subsequent assessments and possibly even remediation may also be required if environmental contamination is found.

INSTRUCTIONS

See page 1 for instructions to completing this form. This form has five (5) pages. Attach additional pages if necessary to completely respond to the questions.

FEE: There is no fee for processing this document.

PROCESSING TIME

Please allow 7-10 business days for review of this form. Incomplete or missing documents will delay this process.

The contact person shown on this application must be able to answer questions concerning information reported on this form or on any attached documents. Please provide a phone number where they can be reached during normal working hours (M-F 8:00am – 5:00pm).

DEPARTMENT CONTACT: Tracy Volkman (303) 271-5763
tvolkman@jeffco.us

REVISED 5/14/2018

ENVIRONMENTAL QUESTIONNAIRE AND DISCLOSURE STATEMENT

NAME OF PROJECT: Shadow Mountain Bike Park

CONTACT PERSON: Phil Bouchard PH 603-660-6604

PROPERTY LOCATION: 29611 Shadow Mountain Drive, Conifer, CO 80433

On this property, do any of the following conditions exist, or have any of the following conditions existed at any time in the past?

SECTION	CONDITION	NO	YES
A	Placement of earthen fill from an outside source, operation of a solid waste disposal site or landfill, whether private or commercial, legal or illegal	✓	
B	Asbestos or asbestos-containing materials used or stored within any existing buildings or anywhere else onsite	✓	
C	Storage or use of electrical equipment such as transformers or capacitors, other than in the provision of normal electrical service	✓	
D	Above or underground storage tanks containing gasoline, diesel, fuel oil, waste oil or any other liquid chemical storage	✓	
E	Storage or use of pesticides and herbicides or any other agricultural chemicals, other than for typical household or garden use	✓	
F	Hazardous or dangerous chemicals stored, released or otherwise emitted anywhere on the property	✓	
G	Storage or use of explosives, including dynamite, blasting caps, or unexploded ordinance such as bullets and bombs	✓	
H	Radiation hazards such as radiation from uranium mine and mill tailings, nuclear reactors, and/or the processing, handling, disposal and/or deposition of radioactive materials.	✓	

If you answered "NO" to ALL of the above, please sign below in the presence of a NOTARY PUBLIC and return this page only to the Department.

If you answered "YES" to ANY of the above, please complete Parts I and II on page 2 AND complete any SECTION on pages 3-5 to which you responded "YES" above. Then sign below in the presence of a NOTARY PUBLIC and return the entire packet (pages 1-5) to the Department.

As the present owner of the Property or as an officer or a general partner of the present owner of the Property (or duly authorized representative of such owner), I am familiar with all of the operations presently conducted on the Property. I have made a diligent inquiry into the former uses of the property; and hereby certify to and for the benefit of Jefferson County that to the best of my knowledge and belief the information disclosed on or attached to this form is true and correct.

NAME: BILL RYAN, DIRECTOR, STATE BOARD OF LAND COMMISSIONERS DATE: 11/30/2022

State of Colorado)
) ss.
County of Denver)

The above and foregoing Environmental Questionnaire and Disclosure Statement was acknowledged before me this 30th day of November, 2022, by Bill Ryan.

WITNESS my hand and official seal.

NOTARY PUBLIC

MY COMMISSION EXPIRES: 11/10/2026

SHERRY LEE
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20034013043
MY COMMISSION EXPIRES NOVEMBER 10, 2026

PART I - NOTICES, COMPLAINTS AND REPORTS

- **Attach** copies of all written governmental environmental reports, citations or complaints regarding this property that are in your possession or control.
- **Attach** copies of all non-governmental environmental reports regarding this property in your possession or control, except to the extent limited by confidentiality restrictions. For each such report so labeled confidential, state the name of the person or entity who rendered such report and the date thereof.

PART II- CURRENT/FORMER USES OF THE PROPERTY FOR THE PREVIOUS *60 YEARS*

Name of current and former owner(s) – attach additional pages if necessary:

State Board of Land Commissioners (owners since 8/1/1876)

Description of current use(s) of the Property (provide name(s) of current occupant(s) and date(s) of occupancy) – attach additional pages if necessary:

Agricultural livestock (cattle) grazing

Date of completion of original construction and any substantial renovations (including tenant improvements) – attach additional pages if necessary:

N/A

Description of previous use(s) of the Property– attach additional pages if necessary:

Agricultural livestock (cattle) grazing, Big game/small game hunting

Description of uses of adjacent properties – attach additional pages if necessary:

Residential

CONTINUE ONLY IF YOU ANSWERED "YES" TO ANY QUESTION IN THE TABLE ON Pg 1

A

If you answered YES to Section A (Waste Disposal) on Page 1, complete the following (attach additional pages for your response, if needed):

1. Has any fill material been place on the site? **NO ( )** **YES ( )**

   *If **YES**, describe the fill (source, characteristics and chemicals lists and material safety data sheets for those chemicals, if contained in the fill material).*

2. Have any liquid wastes (other than waste water described in part F) and solid wastes been generated at the Property or currently located on the Property.
   NO ( ) **YES ( )**

   *If **YES**, describe those liquid and solid wastes and the manner in which they were generated at the Property are how they have been disposed.*

3. Has the Property ever been used for disposal of any liquid or solid waste?
   NO ( ) **YES ( )**

   *If **YES**, describe the location of all disposal sites, the type of wastes disposed of at each site, the results of any soil or groundwater samples taken in the vicinity of each site and the manner in which each site not presently in use was closed.*

4. Have landfills, evaporation or storage pits, ponds, lagoons or surface impoundments ever been located on the Property? **NO ( )** **YES ( )**

   *If **YES**, describe the location of all units, the type of wastes placed in each, the results of any soil or groundwater samples taken in the vicinity of each and the manner in which each not presently in use was closed.*

5. Have wastewater treatment facilities, such as acid neutralization units, been located on (or are currently located on) the Property? **NO ( )** **YES ( )**

   *If **YES**, describe the location of all facilities, the type of wastes treated in each facility, the results of any soil or groundwater samples taken in the vicinity of each facility and the manner in which each facility not presently in use was closed.*

6. Are there raw chemical or waste chemical storage areas on the Property?
   NO ( ) **YES ( )**

   *If **YES**, describe the location of all such areas, the type of products or wastes stored in each area, the amount of products or wastes stored in each area, the results of any soil or groundwater samples taken in the vicinity of each area and the manner in which each area not presently in use was closed.*

7. Attach copies of any waste disposal permits or licenses pertaining to operations on the Property.

B

If you answered YES to Section B on Page 1 (Asbestos), please complete the following (attach additional pages for your response if necessary):

1. Is there or has there been asbestos in any of the construction materials contained in the building(s)? **NO ( ) YES ( )**

   IF YES, has it been removed? **NO ( ) YES ( )**

   If YES, when and by whom? _____

2. Was a survey conducted to assess the type, amount, location and condition of asbestos? **NO ( ) YES ( )**

   *If **YES**, attach a copy of any survey report.*

3. Have asbestos air samples been taken? **NO ( ) YES ( )**

   *If **YES**, attach a copy of the results*

C

If you answered YES to Section C on Page 1 (electrical equipment or transformers), please complete the following (attach additional pages for your response if necessary):

1. Have polychlorinated biphenyls ("PCBs") been used in electrical transformers, capacitors or other equipment at the Property? **NO ( ) YES ( )**

   *If **YES**, describe the use and quantity of PCBs used on the Property.*

D

If you answered YES to Section D on Page 1 (above or underground storage tanks), please complete the following (attach additional pages for your response if necessary):

1. Are there (or have there been) any above-ground or underground gasoline, diesel, fuel oil, waste or other chemical storage tanks on the Property? **NO ( ) YES ( )**

   *If **YES**, describe location of tanks, substances stored and capacity of tank(s).*

2. Have the tanks been inspected or tested for leakage? **NO ( ) YES ( )**

   *If **YES**, provide the most recent test and results*

3. Are the tanks registered? **NO ( ) YES ( )**

   *If **YES**, provide registration numbers.*

4. Are any other wastes or chemicals stored on the Property in drums or other containers? **NO ( ) YES ( )**

   *If **YES**, describe the location, substances, quantities stored and types of containers.*

5. Have there been any spills, leaks or other releases of wastes or chemicals on the Property? **NO ( ) YES ( )**

   *If **YES**, describe the location of the substances and quantities released, any cleanup measures taken and the results of any soil or groundwater samples performed to detect the presence of the chemicals spilled, leaked or released on the Property.*

6. Attach copies of any permits, licenses, and registration materials pertaining to the use, storage, handling or disposal of wastes, chemicals and underground storage tanks on the Property.

E

If you answered YES to Section E on Page 1 (herbicides and pesticides), please complete the following (attach additional pages for your response if necessary):

1. Have pesticides, herbicides or other agricultural chemicals been applied to the Property?
NO ( ) **YES ( )**

*If **YES**, describe the locations where such pesticides, herbicides or chemicals were applied, the type of pesticides, herbicides or chemicals applied in each area and the results of any soil or groundwater analyses performed to detect pesticides, herbicides or chemicals used at the site.*

2. Have pesticides, herbicides or other agricultural chemicals been stored, mixed, formulated, rinsed or disposed of on the Property? **NO ( )** **YES ( )**

*If **YES**, describe the locations where such pesticides, herbicides or chemicals were stored, mixed, formulated, rinsed or disposed of-, the type of pesticides, herbicides or chemicals stored, mixed, formulated or disposed of at each location; and the results of any soil or groundwater analyses performed to detect pesticides, herbicides or chemicals stored, mixed, formulated, rinsed or disposed of at the site.*

3. Has creosote been used on the property or have creosote coated materials such as railroad ties and telephone poles been stored on the property? **NO ( )** **YES ( )**

*If **YES**, describe the locations where creosote has been used or creosote-containing materials have been stored, and the results of any soil or groundwater analyses performed to detect the present of creosote.*

F

If you answered YES to Section F on Page 1 (hazardous or dangerous materials), please complete the following (attach additional pages for your response if necessary):

1. Are any hazardous chemicals or dangerous released at the Property?
NO ( ) **YES ( )**

*If **YES**, provide copies of all toxic chemical release forms, inventory forms and material safety data sheets for those chemicals.*

G

If you answered YES to Section G on Page 1 (hazardous ordinance and explosives), please complete the following (attach additional pages for your response if necessary):

1. Are there or have there been explosives, dynamite blasting caps, unexploded ordinance (bullets and bombs) stored or used on the property? **NO ( )** **YES ( )**

*If **YES**, provide information regarding the type, amount, location and use of such agents.*

H

If you answered YES to Section H on Page 1 (radiation hazards), please complete the following (attach additional pages for your response if necessary):

2. Are there or have there been radiation hazards such as uranium mill tailings, nuclear reactors, processing, handling, disposal and/or deposition of radioactive materials on the property?
NO ( ) **YES ( )**

*If **YES**, provide information regarding the type, amount, location and use of these radiation materials and an evaluation of the public health impact related to the radiation hazards associated with these materials.*

Visual Analysis

of proposed projects at Shadow Mountain Bike Park

November 2022

Prepared for:

Shadow Mountain Bike Park

Prepared by:

SE Group
PO Box 2729
Frisco, CO 80443

and

Perkins&Will

Introduction

This visual analysis includes a summary of visual resource management guidelines, a description of the existing visual conditions in the project area, and an analysis of impacts associated with implementation of the proposed project. The analysis also includes mitigation measures designed to minimize or avoid impacts to visual resources.

The proposed project is the development of a lift-served bike park on Shadow Mountain Drive in Conifer, Colorado. The project would require tree clearing and grading to construct a base area that includes parking spaces for up to 300 cars, a guest services facility, and the top and bottom terminals of a chairlift, as well as tree clearing along the lift corridor, bike trails, and service road.

Local Guidelines

Local guidelines for the visual resource include the Conifer/285 Corridor Area Plan and the Jefferson County Zoning Resolution.

Community Plan Compliance

The Jefferson County 2020 Comprehensive Master Plan was originally adopted by the Planning Commission in 2010 and updated in 2020. It includes eight area plans that provide more specific guidance when considering rezoning, special use, or site approval. The Conifer/285 Corridor Area Plan applies to the proposed project area and its direction for the visual resource is provided below.

The perception of open space is enhanced by unrestricted views.

The visual resources of the Conifer/285 Corridor Area are among its most important values. Views of the area's beauty attract people to the community and provide pleasure to its residents. These resources should be protected.

1. *Visually sensitive areas, and landscapes that have special qualities, (e.g. major rock outcrops, mountain meadows, steep slopes, ridgelines and peaks) should be treated as environmentally sensitive areas, and New Development in these areas should only be allowed if visual impacts can be adequately mitigated.*
2. *Visual impacts of New Developments in mountain meadows cannot be adequately mitigated through planting trees.*
3. *If a mountain meadow is discovered on a property, which is not already designated on the Plan Recommendation maps, development should be placed outside of mountain meadows. Buildings may be placed at the edge of meadows within the trees; however, the following items should be taken into consideration for this to occur. Density recommendations should not change.*
    a. *Using the natural topography to minimize the visual impacts of the buildings, as much as practicable.*
    b. *Constructing only open-style fencing in the meadow area.*
    c. *Minimize disturbance in the 'wet' portion of the meadow, if such an area exists.*
4. *In addition, the following should be included in the architectural design.*
    a. *Using colors that help the structures blend into the natural surroundings.*
    b. *Using more than one building material. One of the materials used should be stone, faux stone, cultured stone, or timbers.*

   c. *Minimize the impact of other non-building structures on the meadow, such as driveways, septic systems and detention areas.*
5. *Structures, roads and utilities should be designed so they do not visually dominate the landscape. Techniques that should be considered include:*
   a. *Structures should be below the ridgeline, and natural materials and colors should be used;*
   b. *Roads should be constructed parallel to contours, rather than a bold cut on a hillside; and*
6. *Development within activity centers should be designed to achieve a visually cohesive appearance by using natural materials and colors compatible with the mountain backdrop of the area.*[1]

A-2 Zoning

The proposed project would be located on a parcel zoned as Agricultural-Two, or A-2. There are no specific guidelines for the visual resource, however, there are guidelines for building heights and other parameters. They are the following:[2]

Districts	Building Height	Lot Size (see a & b below)
A-1	35 ft.	5 Acre (217,800 s.f.)
A-2	35 ft.	10 Acre (435,600 s.f.)
A-35	35 ft.	35 Acre (1,524,600 s.f.)

Existing Conditions

The existing parcel is undeveloped. It is characterized by slopes from 5 to 25 percent with some steeper areas of rock outcrops. Vegetation consists of mixed conifer, aspen forest, lodgepole pine, agricultural and rocky meadows, as well and some riparian areas and wetlands.[3] Most of the proposed development would occur in a meadow area that was previously cleared of vegetation for agricultural purposes. The area has not been identified by the Conifer/285 Corridor Area Plan as a mountain meadow.

Two viewpoints were selected for analysis in order to simulate the visual impacts of the proposed project. These include a viewpoint along Shadow Mountain Drive, looking directly at the proposed base area development and lift corridor, and a viewpoint from South Warhawk Road from which the lift corridor would likely be visible. These viewpoints were selected because the local community was concerned about modifications to the visual resource from these particular areas and because they are the most frequented areas with direct views of the proposed project area. Many other viewpoints along Shadow Mountain Drive and South Warhawk Road were considered, however, visibility of proposed projects from most other viewpoints considered would be minimal to none. Refer to Figure 1 for a map of the viewpoints included in this analysis.

Shadow Mountain Drive passes through the parcel and is on the northwestern edge of the proposed parcel for development. This is the main viewpoint from which visitors to the area can see the parcel

---

[1] Conifer/285 Corridor Area Plan, updated 2020
[2] Jefferson County Zoning Resolution, 2020 Edition, Section 33
[3] Shadow Mountain Bike Park Vegetation Assessment, prepared for this application.

(refer to Figure 2). Most viewers currently see the parcel along an approximately 0.75-mile stretch of road while driving along Shadow Mountain Drive. When driving the posted speed limit of 30 miles per hour, there is an approximately 90 second window in which the project area is visible. In its existing condition, the only built structures on the parcel are a wooden fence and metal posts close to the road, where a stream crosses.

South Warhawk Road stems from Shadow Mountain Drive and travels uphill, across from the project parcel to the northeast. Most visitors in this area are residents. While driving, there are short windows where the trees break and reveal the higher elevation areas within the parcel (refer to Figure 4). This window of visibility only lasts a couple seconds at a time. In its existing condition, the only built structures in view are houses on the mountain side and communications infrastructure along the ridgeline.

Additionally, there are some private residences bordering the project area that have direct views of the parcel. Adjacent residences include homes on the other side of Shadow Mountain Drive, as well as homes directly adjacent to the parcel. Most viewers at these locations are likely local residents in their homes or on their property. The duration of their view likely lasts anywhere between a couple seconds and several minutes, depending on what they are doing.

Proposed Conditions

Development of the proposed project would introduce developed bike park infrastructure and trails into an area that currently exists in a near natural state. The project would result in modest additions to a largely undeveloped landscape when viewed from both critical viewpoints.

As illustrated in the visual simulations, the proposed base area and parking facilities would be prominent in the foreground of viewpoint 1 and the chairlift and lift corridor would be prominent in the middleground of viewpoint 2. The service road and bike trails would have negligible visual impacts as they would be shielded by existing vegetation from most views in the analysis area.

As illustrated in Figure 3, implementation of the proposed project would introduce recreation infrastructure to the largely undeveloped landscape along Shadow Mountain Drive. Visual impacts would be most severe in the foreground, where the proposed parking facility, base area facility, and chairlift/terminal would be viewed by members of the public driving down the road. Given the topography, vegetation, and winding nature of Shadow Mountain Drive, it is anticipated that the proposed base area would only be visible for approximately 90 seconds over a 0.75-mile segment of the road. Project-specific design criteria and best management practices would be utilized to minimize or avoid visual impacts from this viewpoint.

As illustrated in Figure 5, implementation of the proposed project would introduce recreation infrastructure to the largely undeveloped landscape viewed from South Warhawk Road. Visual impacts would be evident in the middleground, where the proposed chairlift, top terminal, and lift corridor would be visible for members of the public driving down the road. Given the topography, vegetation, and winding nature of South Warhawk Road, it is anticipated that the proposed chairlift infrastructure would occasionally become visible in short windows where the trees break and reveal the higher elevation areas within the parcel. These views are not anticipated to last more than a couple of seconds, and project-specific design criteria and best management practices would be utilized to minimize or

avoid these impacts. While the proposed projects would introduce recreation infrastructure to the mountainside, with adherence to PDC, the proposed projects would remain visually subordinate to the visual strength of the characteristic landscape.

It is likely that the residences in the area would also experience the visual impacts of the proposed project. These are the areas from which the views would last the longest. The two residences closest to the project parcel (one across from the parcel and one bordered by the project parcel along Shadow Mountain Drive) would have the most direct views of the proposed base area development. The character of their viewscapes would change from largely undeveloped to developed.

Mitigation Measures

As demonstrated in Figure 3, vegetation would be planted and clustered along the edge of the parking lots strategically to screen the base area facility, lift terminal, and bike park activity. While these are not considered mitigation according to the Conifer/285 Corridor Area Plan, they would provide screening of the development for drivers along Shadow Mountain Drive and for the nearby residences.

The planned base area facility would also follow design criteria to mitigate its presence in the viewshed of Shadow Mountain Drive. The building would be nestled into the hillside, minimizing vertically into the majority of the facades. Maximum building height is currently designed at 32’6”, compliant with the A-2 building height limit of 35’. The roof planes would be sloped to match the grade of the hillside and ‘replace’ the hillside that was removed, so one’s eye naturally connects the rooflines into the mountainside. Although an exact material palette has not been selected at this point, the building facades will be comprised of natural materials and tones of grey, brown, and black. Utilizing wood, stone, concrete, and steel allows the building to blend into the shadows and trunk lines of the forest surrounding it.

Viewshed Analysis

The viewshed of the proposed project is displayed in Figure 6. This viewshed was analyzed from the highest point within the parcel, from the proposed top lift terminal. As described in the figure, the viewshed displays a 10km (approximately 6.22 mile) radius, where green indicates areas from which the viewpoint would be visible.

The viewshed from this point is primarily visible north and west of the project area. It is likely that the areas further away would have trouble seeing a lift terminal given the presence of vegetation and the scale of it from a distance. This being said, it is likely that the viewshed areas that would be most highly impacted are those closest to the project area.

Shadow Mountain Dr
S Warhawk Rd
Shadow Mountain Dr
1
2
Shadow MOUNTAIN
VISUAL ANALYSIS
Figure 1: Viewpoint Locations
LEGEND
Viewpoints
Viewing angle
Project Area
Prepared by:
SE GROUP
N
Scale (ft)
0
600

VISUAL ANALYSIS
Figure 2: Viewpoint 1
Shadow Mountain Drive
Existing Conditions

Shadow MOUNTAIN BIKE PARK

Prepared by:
SE GROUP
Simulations prepared by:
Perkins&Will

VISUAL ANALYSIS
Figure 3: Viewpoint 1
Shadow Mountain Drive
Proposed Conditions

Shadow MOUNTAIN BIKE PARK

Prepared by:
SE GROUP
Simulations prepared by:
Perkins&Will

VISUAL ANALYSIS
Figure 4: Viewpoint 2
South Warhawk Road
Existing Conditions

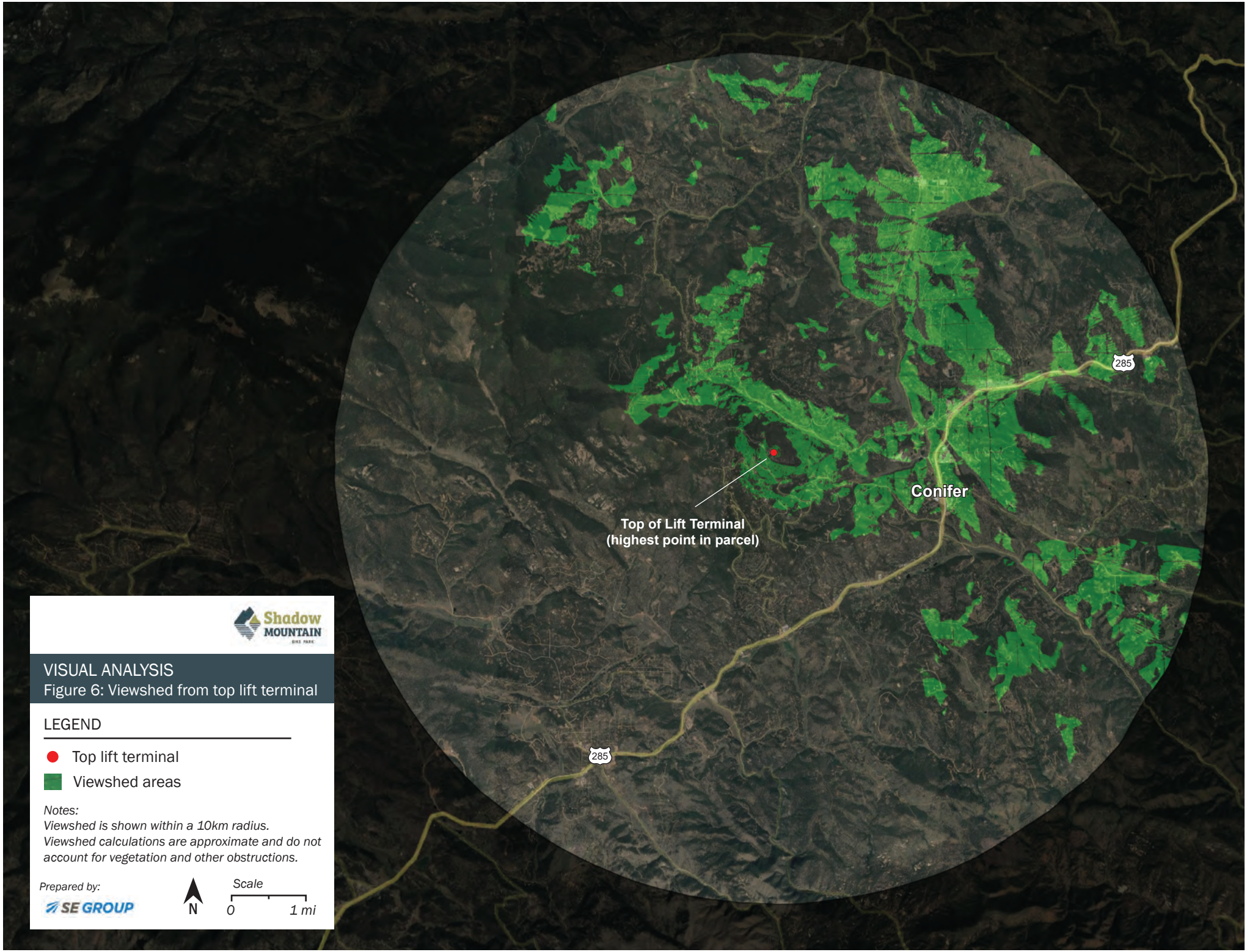
Shadow MOUNTAIN BIKE PARK

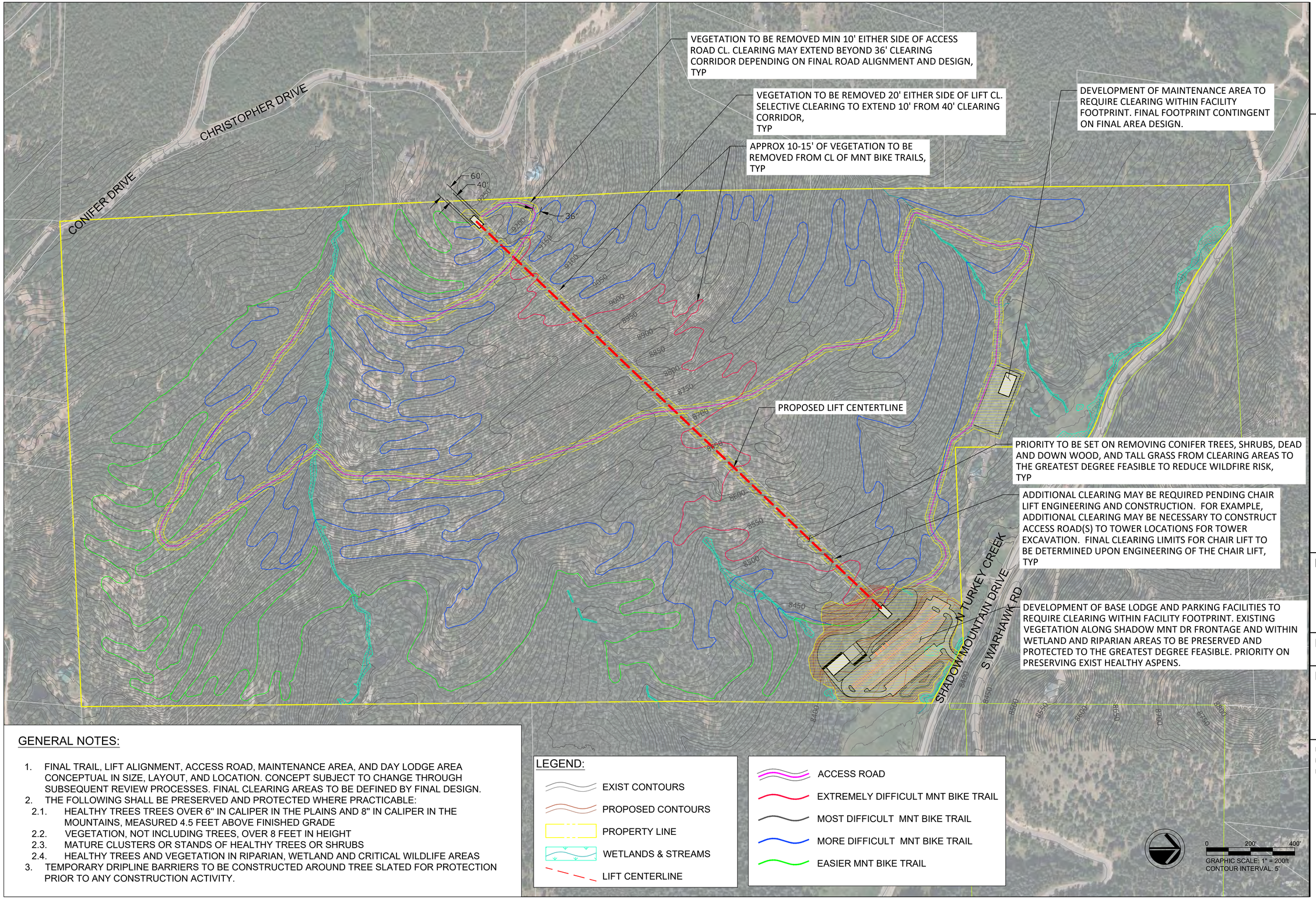
Prepared by:
SE GROUP
Simulations prepared by:
Perkins&Will

VISUAL ANALYSIS
Figure 5: Viewpoint 2
South Warhawk Road
Proposed Conditions

Shadow MOUNTAIN BIKE PARK

Prepared by:
SE GROUP
Simulations prepared by:
Perkins&Will


Conifer
285
285
Top of Lift Terminal
(highest point in parcel)
Shadow
MOUNTAIN
VISUAL ANALYSIS
Figure 6: Viewshed from top lift terminal
LEGEND
Top lift terminal
Viewshed areas
Notes:
Viewshed is shown within a 10km radius.
Viewshed calculations are approximate and do not account for vegetation and other obstructions.
Prepared by:
SE GROUP
N
Scale
0
1 mi



GENERAL NOTES:

1. FINAL TRAIL, LIFT ALIGNMENT, ACCESS ROAD, MAINTENANCE AREA, AND DAY LODGE AREA CONCEPTUAL IN SIZE, LAYOUT, AND LOCATION. CONCEPT SUBJECT TO CHANGE THROUGH SUBSEQUENT REVIEW PROCESSES. FINAL CLEARING AREAS TO BE DEFINED BY FINAL DESIGN.
2. THE FOLLOWING SHALL BE PRESERVED AND PROTECTED WHERE PRACTICABLE:
   - 2.1. HEALTHY TREES TREES OVER 6" IN CALIPER IN THE PLAINS AND 8" IN CALIPER IN THE MOUNTAINS, MEASURED 4.5 FEET ABOVE FINISHED GRADE
   - 2.2. VEGETATION, NOT INCLUDING TREES, OVER 8 FEET IN HEIGHT
   - 2.3. MATURE CLUSTERS OR STANDS OF HEALTHY TREES OR SHRUBS
   - 2.4. HEALTHY TREES AND VEGETATION IN RIPARIAN, WETLAND AND CRITICAL WILDLIFE AREAS
3. TEMPORARY DRIPLINE BARRIERS TO BE CONSTRUCTED AROUND TREE SLATED FOR PROTECTION PRIOR TO ANY CONSTRUCTION ACTIVITY.

LEGEND:

- EXIST CONTOURS
- PROPOSED CONTOURS
- PROPERTY LINE
- WETLANDS & STREAMS
- LIFT CENTERLINE
- ACCESS ROAD
- EXTREMELY DIFFICULT MNT BIKE TRAIL
- MOST DIFFICULT MNT BIKE TRAIL
- MORE DIFFICULT MNT BIKE TRAIL
- EASIER MNT BIKE TRAIL

SE GROUP
323 West Main Street, Suite 202
Frisco, CO 80443
tel: 970.668.3398
www.segroup.com

SHADOW MOUNTAIN BIKE PARK

CONIFER, COLORADO

Not For Construction

ISSUE

SCHEMATIC DESIGN

RELEASE DATE

November 22

REVISIONS

PROJECT NO.	22089001
MADE BY	OD
REVIEWED BY	AP

OVERALL VEGETATION PRESERVATION PLAN

C2.0

Wildlife Specialties LLC

"Practical, science-based applications for wildlife and ecological studies benefiting all clients"

September 22, 2022

Travis Beck, Director of Environmental Services
SE Group
PO Box 2729, 323 West Main Street, Suite 202
Frisco, CO 80443-2729

Subject: Jefferson County Shadow Mountain Bike Park Wildlife Resources

Dear Travis:

This letter provides the results of a field review and review of Colorado Parks and Wildlife (CPW) GIS wildlife mapping of the proposed Shadow Mountain Bike Park. The field review was conducted on June 15, 2022. A pedestrian survey of the project area was conducted by the Mr. Jerry Powell, Wildlife Biologist, traveling in a grid search pattern with transects separated by approximately 50 meters. This allowed for a thorough review of the wildlife resources using the project area as well as to identify the presence of any forest raptor (i.e., Accipiter) nests. Additionally, the area was assessed for its capacity to provide habitat to state or federally recognized sensitive species (i.e., Endangered Species Acts protected, etc.).

CPW mapping identifies several elk sensitive habitat types near the project area (Figure 1) but only identified the project area as 'winter range', with no 'severe winter range' or other sensitive (e.g., 'production area') habitat mapped. There are also Resident Elk Populations located to the northeast and southwest of the project. It is important to note that, based on the observations of physical evidence (e.g., scat, beds, rubs, etc.) made during the field review, the project area is used year-round by elk. Numerous rubs (showing used during the fall rutting period) were observed as well as scat from all times of the year and fresh and old tracks were observed on the numerous elk trails that bisect the project area. Additionally, elk were observed feeding in the wetlands on the north end of the project area. The project area provides important habitat to the local elk herd. The project area is heavily utilized by elk because it is undeveloped and does not have the development and associated human presence that surrounding residential properties do. The habitat fragmentation as well as the constant use of the bike park would significantly decrease it value to elk and other wildlife (e.g., small mammals, birds).

The project area does not offer any habitat for species protected under the Endangered Species Act (Table 1). The project area does have potential habitat (wetlands) for the Northern Leopard Frog (*Rana pipiens*) but does not contain habitat for other species identified by the state of Colorado as sensitive (Table 2).

Please contact me if you have questions.

Jerry Powell, M.S.
Certified Ecologist

Table 1. IPAC Federally Listed & Proposed Species of Concern			
Species	**Status**	**Habitat Requirements**	**Potential for occurrence at Project site**
Fishes			
Pallid Sturgeon *Scaphirhynchus albus*	FE	Lower reaches of the Platte River and upper Missouri River.	None – suitable habitat not present.
Birds			
Mexican Spotted Owl *Strix occidentalis lucida*	FT	Narrow rocky canyons with trees.	None – suitable habitat not present.
Piping Plover *Charadrius melodus*	FT	Open ground away from water, often on broad exposed sand bars.	None – suitable habitat not present.
Whooping Crane *Grus americana*	FE	Muskeg, prairie pools, marshes.	None – suitable habitat not present.
Mammals			
Canada Lynx *Lynx canadensis*	FT	High altitude spruce-fir forests.	None – suitable habitat not present.
Gray Wolf *Canis lupus*	FE	Wild areas free from human disturbance.	None – suitable habitat not present.
FE = Federally Endangered; FT = Federally Threatened			

TABLE 2 **State of Colorado Endangered, Threatened, & Species of Special Concern**				
Scientific Name	**Common Name**	**State Status**	**Habitat Requirements**	**Potential for Occurrence**
Fish				
Etheostoma cragini	Arkansas Darter	ST	Found only in tributaries of the Arkansas River	None
Hybognathus hankinsoni	Brassy Minnow	ST	Found in S. Platte and Republican Rivers.	None
Oncorhynchus clarki pleuriticus	Colorado River Cutthroat Trout	SC	Found in the Colorado River Basin.	None
Gila robusta	Colorado Roundtail Chub	SC	A large river fish found in western Colorado.	None
Luxilus cornutus	Common Shiner	ST	Found in tributary streams of the S. Platte River.	None
Platygobio gracilus	Flathead Chub	SC	Found in mainstems of turbid streams and rivers.	None
Etheostoma exile	Iowa Darter	SC	Found in some plain's streams in northeastern Colorado.	None
Couesius plumbeus	Lake Chub	SE	Extirpated in Colorado (Woodling 1985).	None
Catostomus playtrhynchus	Mountain Sucker	SC	Found in smaller rivers and streams in northwestern Colorado.	None
Phoxinus eos	Northern Redbelly Dace	SE	Upper reach tributaries of the S. Platte and Platte River.	None
Hybognathus placitus	Plains Minnow	SE	Prefer main channel areas with some current and sandy bottoms. Found in eastern Colorado.	None
Etheostoma spectabile	Plains Orangethroat Darter	SC	Found in small streams of the Republican Basin.	None
Gila pandora	Rio Grande Chub	SC	Restricted to the Rio Grande Basin in Colorado.	None
Oncorhynchus clarki virginalis	Rio Grande Cutthroat Trout	SC	Restricted to the Rio Grande Basin in Colorado.	None
Catostomus plebeius	Rio Grande Sucker	SE	Restricted to the Rio Grande Basin in southern Colorado.	None
Phoxinus	Southern	SE	One population known in	None

TABLE 2 **State of Colorado Endangered, Threatened, & Species of Special Concern**				
Scientific Name	**Common Name**	**State Status**	**Habitat Requirements**	**Potential for Occurrence**
erythrogaster	Redbelly Dace		Arkansas River tributary.	
Noturus flavus	Stonecat	SC	Found in fast water riffles and runs of streams.	None
Phenacobius mirabilis	Suckermouth Minnow	SE	Found in riffle areas of warm prairie streams of all sizes.	None
Birds				
Falco peregrinus anatum	American Peregrine Falcon	SC	Nests of ledges of high cliffs.	None
Haliaeetus leucocephalus	Bald Eagle	SC	Large, mature cottonwoods or pines near large water bodies.	None
Athene cunicularia	Burrowing Owl	ST	Nest in rodent burrows in grasslands, shrublands, deserts, and grassy urban areas (golf courses).	None
Tympanuchus phasianellus columbianus	Columbian Sharp-Tailed Grouse	SC	Sagebrush shrublands.	None
Buteo regalis	Ferruginous Hawk	SC	Vast expanses of ungrazed or lightly grazed grassland and shrubland and shortgrass prairie.	None
Centrocercus urophasianus	Greater Sage-Grouse	SC	Sagebrush shrublands in northwestern Colorado.	None
Grus canadensis tabida	Greater Sandhill Crane	SC	Breed in wetland habitats, particularly flooded fields and beaver ponds.	None
Centrocercus minimus	Gunnison Sage-Grouse	SC	Sage communities in the Gunnison Basin.	None
Tympanuchus pallidicinctus	Lesser Prairie-Chicken	ST	Optimal habitat is midgrass to tallgrass prairie for nests and winter cover.	None
Numenius americanus	Long-Billed Curlew	SC	Shortgrass prairie.	None
Charadrius montanus	Mountain Plover	SC	Grazed shortgrass prairie and fallow fields.	None
Tympanuchus phasianellus jamesii	Plains Sharp-Tailed Grouse	SE	Rolling hills with scrub oak thickets and grassy glades.	None

TABLE 2 **State of Colorado Endangered, Threatened, & Species of Special Concern**				
Scientific Name	**Common Name**	**State Status**	**Habitat Requirements**	**Potential for Occurrence**
Charadrius alexandrinus	Western Snowy Plover	SC	Sandy open beaches, dry salt flats, dredge spoils, and river bars.	None
Coccyzus americanus	Western Yellow-billed Cuckoo	SC	Found along major river drainages.	None
Mammals				
Cynomys ludovicianus	Black-tailed prairie dog	SC	Found along the Front Range where suitable soil types are present.	None
Thomomys bottae rubidus	Botta's pocket gopher	SC	Occurs in southern Colorado.	None
Vulpes macrotis	Kit Fox	SE	Western Colorado, Delta and Montrose Counties.	None
Thomomys talpoides macrotis	Northern Pocket Gopher	SC	Deep, tractable soils, heavily compacted soils, and shallow gravels	None
Lontra canadensis	River Otter	ST	Riparian habitat, usually live in bank dens abandoned by beavers.	None
Vulpes velox	Swift Fox	SC	Short grass and mixed-grass prairies of the Great Plains.	None
Corynorhinus townsendii pallenscens	Townsend's Big-Eared Bat	SC	Abandoned mine sites, attics.	None
Gulo gulo	Wolverine	SE	Alpine and montane	None
Amphibians				
Anaxyrus boreas boreas	Boreal Toad	SE	High altitude wetlands, ponds, etc.	None
Scaphiopus couchii	Couch's Spadefoot	SC	Southeastern Colorado	None
Gastrophryne olivacea	Great Plains Narrowmouth Toad	SC	Extreme southeastern Colorado.	None
Acris crepitans	Northern Cricket Frog	SC	Found in Yuma, Weld and Morgan Counties at elevations between 3,500–3,600 feet.	None

TABLE 2 **State of Colorado Endangered, Threatened, & Species of Special Concern**				
Scientific Name	**Common Name**	**State Status**	**Habitat Requirements**	**Potential for Occurrence**
Rana pipiens	Northern Leopard Frog	SC	Wet meadows and the banks of and shallows of marshes, ponds, lakes, streams, irrigation ditches.	Potential habitat present.
Rana blairi	Plains Leopard Frog	SC	Eastern Colorado and southeastern Colorado.	None
Rana sylvatica	Wood Frog	SC	Montane forest woodlands in north central Colorado.	None
Reptiles				
Cnemidophorus neotesselatus	Triploid Checkered Whiptail	SC	Foothills of the Rocky Mountains in Fremont County eastward to Pueblo and Stone City in Pueblo County.	None
Crotalus viridis concolor	Midget Faded Rattlesnake	SC	Desert lands in northwestern Colorado.	None
Gambelia wislizenii	Longnose Leopard Lizard	SC	Occurs in west-central Colorado and extreme southwestern Colorado.	None
Kinosternon flavescens	Yellow Mud Turtle	SC	Occurs in eastern Colorado.	None
Lampropeltis getula	Common King Snake	SC	Occurs in southwestern and southeastern Colorado.	None
Leptotyphlops dulcis	Texas Blind Snake	SC	Occurs in extreme southeastern Colorado.	None
Phrynosoma cornutum	Texas Horned Lizard	SC	Occurs in southeastern Colorado.	None
Phrynosoma modestum	Roundtail Horned Lizard	SC	Occurs in extreme northwestern Otero County.	None
Sistrurus catenatus	Massasauga	SC	Occurs in shortgrass prairie habitats in southeastern Colorado.	None
Thamnophis sirtalis	Common Garter Snake	SC	Restricted to aquatic, wetland and riparian habitats at elevations below 6,000 feet: seldom found at isolated ponds.	None
SE = State Endangered; ST = State Threatened; SC = State Special Concern (not a statutory category)				

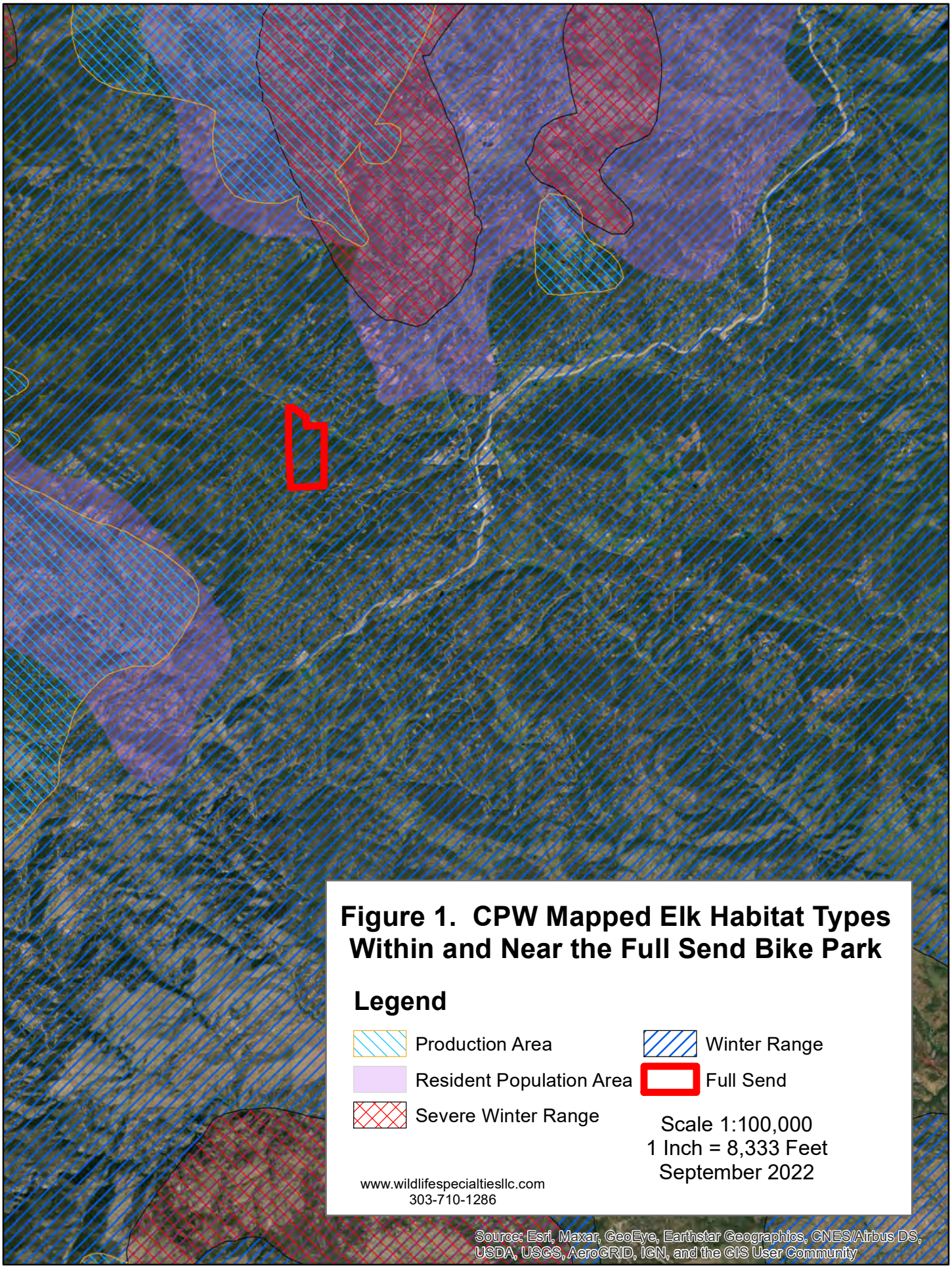


Figure 1. CPW Mapped Elk Habitat Types Within and Near the Full Send Bike Park

VEGETATION ASSESSMENT

November 2022

Shadow Mountain Bike Park
Jefferson County, Colorado

Prepared for:
SE Group
PO Box 2729, 323 West Main Street, Suite 202
Frisco, CO 80443-2729

Prepared by:
Peak Ecological Services, LLC
301 Boulder Canyon Drive, PO Box 827
Nederland, Colorado 80466

VEGETATION ASSESSMENT

Shadow Mountain Bike Park
Jefferson County, Colorado

revision date: November 9, 2022

Summary

This Vegetation Assessment was prepared for the proposed Shadow Mountain Bike Park in accordance with Jefferson County Land Development Regulation Section 28. This assessment details the vegetative habitats and floristic species composition of the project area, with special attention given to Federally threatened or endangered plant species and their associated habitats as well as state rare plants. A description of all wetlands present on site is also given and an analysis of potential impacts to wetlands and riparian areas is provided. Finally, we describe noxious weeds encountered onsite and provide recommendations to limit their spread. Finally maps illustrating the project area, existing vegetation types, as well as wetlands and streams overlain with the proposed project plan are provided.

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1.0 Introduction

Shadow Mountain Bike Park would be Colorado's first dedicated lift-accessed freeride downhill mountain bike park. The park is being proposed on State Land Trust property near Conifer, in Jefferson County, Colorado. The property is located on Shadow Mountain Drive and is currently undeveloped. Shadow Mountain Bike Park would be a seasonal, day-use, mountain bike park that operates seasonally from April through October. Approximately 16 miles of proposed mountain biking trails, a parking lot, day-use lodge, and skills park are proposed. This report describes the vegetation of the project site and provides descriptions of the vegetation communities, wetlands and riparian areas, rare plants, and noxious weeds. In addition, the impacts of the proposed project on these resources and recommended mitigation measures are discussed.

2.0 Environmental Setting

The 235-acre project area ranges in elevation from a low of 8,400 feet (ft) along North Turkey Creek in the northeast to a high of 9,250 ft along the western property boundary (Figure 1). In addition to the perennial North Turkey Creek, there is another perennial stream in the southern portion of the project area, named herein as the South Fork N. Turkey Creek. There is past evidence of logging within the project area with some unimproved dirt roads in the south. Portions of the site along North Turkey Creek are currently used for cattle grazing. The vegetation types include a mixed-conifer forest, lodgepole pine forest, aspen-mixed conifer forest, aspen forest, agricultural meadows, native rocky meadows, rock outcrop, and wetland and riparian habitats. The surrounding land use is primarily rural residential homesites. See Appendix A for representative site photographs.

3.0 Vegetation Types & Flora

3.1 Existing Vegetation Types

An inventory of vegetation communities and flora for the Shadow Mountain Bike Park occurred during three field visits on August 4, 2021, June 10, 2022, and September 20, 2022. Each of the vegetation communities is described below and a plant species list may be found in Appendix B. See Table 1 of the approximate acreage of each vegetation type and Figure 2 for a Vegetation Type Map. In total 152 species of plants were identified including eight species of trees, 23 shrubs/subshrubs, 31 perennial graminoids, 77 perennial forbs, seven ferns/fern-allies, and six annual/biennial forbs. Of the total, 14 are non-native or about 9.2%.

TABLE 1. VEGETATION TYPES

VEGETATION TYPE	AREA (ACRES)	PERCENT
Mixed Conifer Forest	156.79	66.6%
Lodgepole Pine Forest	58.54	24.9%
Aspen – Mixed Conifer	2.64	1.1%
Aspen Forest	2.69	1.1%
Agricultural Meadow	3.40	1.4%
Native Rocky Meadow	0.62	0.3%
Rock Outcrop	5.91	2.5%
Riparian and Wetland	2.61	1.1%

Table 1. Vegetation Types		
Vegetation Type	Area (acres)	Percent
Disturbed Areas	1.95	0.8%
Non-Vegetated (Paved Road)	0.16	0.1%
Total	**235.32**	**100.0%**

3.1.1 Mixed Conifer Forest

The dominant vegetation type of the project area is mixed conifer forest dominated by Douglas fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta* subsp. *latifolia*). The understory consists of shrubs and subshrubs such as common juniper (*Juniperus communis* subsp. *alpina*), kinnickinnick (*Arctostaphylos uva-ursi*), snowberry (*Symphoricarpos rotundifolius*), ninebark (*Physocarpus monogynous*), grouse whortleberry (*Vaccinium myrtillus* subsp. *oreophilum*), prince's plume (*Chimaphila umbellata*) as well as native graminoids and forbs such as of elk sedge (*Carex geyeri*), northern bedstraw (*Galium boreale*), and heartleaf arnica (*Arnica cordifolia*).

3.1.2 Lodgepole Pine Forest

Forests dominated by lodgepole pine primarily occur in the southern portion of the project area, however there are also small, scattered stands elsewhere, including the northwest portion of the project area. These forests have a depauperate understory of scattered common juniper, elk sedge, heartleaf arnica, and grouse whortleberry. There are several old skid or mining roads present throughout the lodgepole pine stands in the southern portion of the property.

3.1.3 Aspen – Mixed Conifer Forest

Aspen trees intergrade into many of mixed conifer stand and the more open forest structure leads to a greater sunlight penetration to the forest floor and greater cover of herbaceous plant cover including fringed brome (*Bromus ciliatus*), roughleaf ricegrass (*Oryzopsis asperifolia*), spreadfruit goldenbanner (*Thermopsis divaricarpa*), and elk sedge (*Carex geyeri*).

3.1.4 Aspen Forest

Small stands of aspen occur just south of the agricultural meadow in the eastern portion of the project area. The aspen boles are heavily "barked" by ungulate use. Common species in the understory include pasture grasses such as smooth brome (*Bromus inermis*), timothy (*Phleum pratense*), and orchardgrass (*Dactylis glomerata*) along with native forbs such as spreadfruit goldenbanner, black-eyed susan (*Rudbeckia hirta*), osha (*Ligusticum porteri*), and giant lousewort (*Pedicularis procera*).

3.1.5 Agricultural Meadow

Agricultural meadows occur along North Turkey Creek and Shadow Mountain Drive and are dominated by non-native pasture grasses, primarily smooth brome, but timothy and orchardgrass are present as well. Weeds are common and include Canada thistle (*Cirsium arvense*), common toadflax (*Linaria vulgaris*), and musk thistle (*Carduus nutans* subsp. *macrolepis*). Portions of the meadow contain small stands of reed canarygrass (*Phalaris arundinacea*), non-native invasive species of mesic habitats, as well as the native wetland grass bluejoint reedgrass (*Calamagrostis canadensis*).

3.1.6 Native Rocky Meadow

A native upland meadow occurs on the south-facing slope between the South Fork N. Turkey Creek and the project area high point. This meadow supports native upland grasses such as junegrass (*Koeleria macrantha*), sandberg bluegrass (*Poa secunda*), Parry's oatgrass (*Danthonia parryi*), Ross's sedge (*Carex rossii*) along with native forbs such as Britton's skullcap (*Scutellaria brittonii*), blue mist penstemon (*Penstemon virens*), Fendler's ragwort (*Packera fendleri*), white sage (*Artemisia ludoviciana*), spreading goldenbanner, and stonecrop (*Sedum lanceolatum*). Scattered shrubs of common juniper, mountain spray (*Holodiscus discolor*), waxflower (*Jamesia americana*), and Woods' rose (*Rosa woodsii*) also occur. Some scattered plants of mullein (*Verbascum thapsus*), a noxious weed, also occur here.

3.1.7 Rock Outcrop Habitat

Rocky granitic outcrops and slabs of rock are common in the southern portion of the project area. These areas supported scattered evergreen trees and a sparse herbaceous vegetative cover of species such as Rocky Mountain spikemoss (*Selaginella densa*), bigflower cinquefoil (*Potentilla fissa*), spotted saxifrage (*Saxifraga bronchialis* var. *austromontana*), and spreading fleabane (*Erigeron divergens*). Shrubs of waxflower (*Jamesia americana*), mountain spray, wax currant (*Ribes cereum*), and common juniper also occur. The uncommon Rocky Mountain polypody fern (*Polypodium saximontanum*) is found in this habitat type.

3.1.8 Riparian & Wetland Habitats

The riparian habitat along North Turkey Creek is dominated by a mixed conifer forest along the western portion of the stream and a willow-dominated riparian system along the eastern portion of the stream. Common conifers include blue spruce, Engelmann spruce (*Picea engelmannii*), along with scattered lodgepole pine and Douglas-fir. The understory is dominated by softleaf sedge (*Carex disperma*), twisted stalk (*Streptopus amplexicaulis*), monkshood (*Aconitum columbianum*), and scattered shrubs of river birch (*Betula occidentalis*) and alder (*Alnus incana* subsp. *tenuifolia*). The scrub-shrub wetlands along North Turkey Creek include Drummond willow (*Salix drummondiana*), mountain willow (*Salix monticola*), Bebb willow (*Salix bebbiana*), alder, river birch, along with bluejoint reedgrass, monkshood, smallfruit bulrush (*Scirpus microcarpus*), chiming bells (*Mertensia ciliata*), and giant angelica (*Angelica ampla*). The stream bank varies from two to three feet wide.

Along the South Fork N. Turkey Creek, there is a mixed conifer overstory in the eastern downstream section and an aspen-mixed conifer overstory in the western upstream section. Here plant species include blue spruce, Doug-fir, aspen, twinberry (*Lonicera involucrata*), mountain maple (*Acer glabrum*), ballhead waterleaf (*Hydrophllyum capitatum*), Canadian white violet (Viola *canadensis*), fragile fern (*Cystopteris fragilis*), littleleaf alumroot (*Heuchera parviflora*), bunchberry dogwood (*Cornus canadensis*), chiming bells, brook saxifrage (*Micranthes odontoloma*), and bluntseed sweet cicely (*Osmorhiza depauperata*). Numerous moist mossy boulders and rock outcrops occur along this small stream and small cascading waterfalls are also present. The stream width varies with amount of water flow but is generally within the one to three ft wide range. The western upper portion of the stream was observed to have no to minimal flow during the late September site visit.

Several forested wetland seeps occur throughout the project area and are dominated by species such as tall and fowl mannagrass (*Glyceria elata*, *G. striata*), millet woodrush (*Luzula parviflora*), bluejoint reedgrass, arrowleaf groundsel (*Senecio triangularis*), chiming bells, Macoun's buttercup (*Ranunculus macounii*), American alpine speedwell (*Veronica americana*), bunchberry dogwood, twisted stalk,

shooting star (*Dodecatheon pulchellum*), softleaf sedge (*Carex disperma*), dwarf red blackberry (*Rubus pubescens*), and muskroot (*Adoxa moschatellina*). River birch is occasionally present.

3.1.9 Disturbed Areas

Several disturbed areas were noted along 2-track roads in the southern portion of the project area. These areas generally lack vegetation except for a few regenerating conifer trees and some ruderal herbaceous plants.

3.2 Vegetation Type Impacts

The proposed base area would primarily impact non-native agricultural meadow; however, some aspen forest and mixed-conifer forest would also be cleared to accommodate the bike park parking lot and day-use lodge. There would also be some impacts to wetlands, however all wetland impacts would be avoided to the greatest extent practicable (See Section 4.3 for additional details). Existing vegetation along Shadow Mountain Drive and North Turkey Creek will be preserved and protected to the greatest degree feasible, with priority on existing healthy aspens and conifers. A full landscaping plan would be developed prior to final project approvals and all proposed vegetation will comply with Mile High Flood District Vol III recommendations, which include native grass and other drought-tolerant plantings and no long-term irrigation for the plantings is proposed. Finally, the proposed bike trails would also require the removal of some trees, primarily conifers, throughout the project site. The focus of the removal would be dead and down wood or diseased trees wherever practicable.

4.0 Wetlands and Other Waters of the U.S.

4.1 Wetland Delineation Methods

Wetlands and other waters of the U.S. were delineated in accordance with the U.S. Army Corps of Engineers' Wetland Delineation Manual (U.S. Army Corps of Engineers 1987) and 2010 Mountain West Supplement (U.S. Army Corps of Engineers 2010) on September 20, 2022. The wetland boundaries in the vicinity of all ground disturbing activities were delineated and flagged based on the prevalence of hydrophytic vegetation, on indicators of wetland hydrology, and on the presence of hydric soils. Rea Orthner, a wetland plant ecologist and David Buscher, a professional soil scientist, completed the delineation. The flagged wetland boundaries were surveyed by Peak Ecological Services LLC using a Trimble Geo7x GPS Unit, which has differential correction technology and sub-meter accuracy.

4.2 Results

The results of the wetland delineation are provided below. Figure 3 illustrates the wetlands and other waters of the U.S. upon an aerial photo base and Table 2 lists the acreage of each of the aquatic resources. Associated wetland data forms may be found in the project file and are available upon request. In addition, 4,209 linear feet of perennial streams (North Turkey Creek and South Fork N. Turkey Creek) were identified as well as nine intermittent streams totaling 2,473 linear feet in length were documented. Appendix B contains a list of the wetland plants encountered and the wetland status of plants follows the 2020 Plant List for the Western Mountain Valleys and Coast Region (U.S. Army Corps of Engineers 2020).

Table 2. Summary of USACE Delineated Aquatic Resources			
Cowardin Classification	Number of Wetlands & Location	Area (sq.ft.)	Area (acres)
Palustrine Forested Wetlands (PFO)	12 – along North Turkey Creek, South Fork N. Turkey Creek, and scattered elsewhere along small intermittent drainages	88,568	2.033
Palustrine Scrub-Shrub Wetlands (PSS)	1 – Along North Turkey Creek	20,676	0.475
Palustrine Emergent Wetlands (PEM)	4 – Small seeps in agricultural meadow and open aspen forest	6,934	0.159
Total		113,819	2.613
Wetland areas calculated using ESRI ArcMap Ver. 10.8.1 software. Total Survey area is 235 acres. In addition, 2 perennial streams totaling 4,209 linear feet (lf) in length and 9 intermittent streams, totaling 2,473 lf were identified.			

4.3 Aquatic Resource Impacts

The current concept design for the proposed bike park would permanently impact less than one-tenth of an acre of wetlands and associated streams. As detailed in Table 2 below and illustrated in Figure 3, the entrance road would fill 166 sq.ft. of wetlands along approximately 20 lf of North Turkey Creek for a culvert (P1) and the parking lot would impact 2,755 sq.ft. of low-quality herbaceous wetland in the agricultural meadow just south of North Turkey Creek (P2). A proposed staging area may additionally impact 439 sq. of a small, forested wetland drainage (P3) and the access road to the top terminal would additionally fill 756 sq. ft. of wetlands (P4 and P5) and associated small stream along the South Fork, and a small intermittent drainage without wetlands (P6 & P7). All road crossings are expected to use appropriately sized culverts to allow for flood flows and be armored with proper inlet/outlet protection. Additional impacts could potentially occur due to bike trail crossings of wetlands; however, several design criteria would be implemented to ensure that any additional wetlands impacts are first avoided and if avoidance is not possible, then the impact minimized to the greatest extent possible. In addition, any bike trail crossings would utilize boardwalks or small bridges supported by environmentally friendly foundations such as helical piers within jurisdictional wetland features. Finally, prior to any grading activities within or adjacent to wetlands, the project proponent would coordinate fully with the U.S. Army Corps of Engineers (USACE) to ensure that all tenants of Section 404 of the Clean Water Act are being followed. This would entail submittal of an Aquatic Resource Delineation Report for USACE approval, and submittal of a Nationwide Permit application for the proposed project. Any indirect impacts to wetlands due to grading activities would be mitigated by installing appropriate sediment controls (i.e., wattles and/or sediment fence), prompt revegetation of any temporarily disturbed lands.

Table 3. Potential Impacts to Wetlands and Streams			
Impact Number	Project Component & Impact Detail	Area (sq.ft.)	Area (acres)
P1	Entrance Driveway – North Turkey Creek and associated wetland habitat	166	0.004
P2	Parking Lot – Low quality herbaceous wetland seep	2,775	0.064
P3	Staging Area – Forested wetland along small intermittent stream	439	0.011

Table 3. Potential Impacts to Wetlands and Streams			
Impact Number	Project Component & Impact Detail	Area (sq.ft.)	Area (acres)
P4	Road to Top Terminal – South Fork N. Turkey Creek and associated wetland habitat	383	0.009
P5	Road to Top Terminal - South Fork N. Turkey Creek and associated wetland habitat	373	0.009
P6	Road to Top Terminal – 2 ft wide intermittent drainage without wetlands	40	<0.001
P7	Road to Top Terminal – 2 ft wide intermittent drainage without wetlands	40	<0.001
Total		4,216	0.097
P = Permanent Impact. Note: proposed bike trails would avoid and minimize additional wetland impacts to the greatest extent practicable and are not included in the table above.			

5.0 Federally Listed and State Rare Plant Species

5.1 Methods

5.1.1 Pre-Field Review

A pre-field review of available information was conducted to assemble occurrence records, describe habitat needs and ecological requirements, and determine timing of field reconnaissance to best capture rare plant occurrences. Sources of information included the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC) website for federally listed and proposed species, the Colorado Natural Heritage Program (CNHP 1997+, 2021), NatureServe's Conservation Data Explorer (CODEX), SEINet (SEINet 2022), and local floras (Weber and Wittmann 2012, Ackerfield 2015). Collectively, this represents consideration of the best available science.

Federally Listed Plants. The USFWS IPAC species list that was received for the project area includes two plants, the federally Threatened Ute ladies'-tresses orchid (*Spiranthes diluvialis*) and the western prairie fringed orchid (*Platanthera praeclara*). Ute ladies'-tresses is a perennial, terrestrial orchid endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams and along riparian edges, gravel bars, old oxbows, and high flow channels at an elevation of up to 7,800 ft (Jennings 1990, USFWS 1995, Fertig et al. 2005). However, the project area lies above the known upper elevational limit of this species and field reconnaissance in 2021 and 2022 confirmed that there is no habitat for this species within project area and hence this species will not be discussed further. Western prairie fringed orchid is a plant of moist tallgrass prairies but is not found in Colorado. This plant only needs to be considered if there are water depletions affect the South Platte River. As no water depletions would occur as part of this proposed project, this plant species will not be discussed further.

State Rare Plants. The project area lies within the USGS 7.5' Conifer Quadrangle. An element list of species and natural communities that resulted from the CNHP query for the nine quadrangles centered on the Conifer Quadrangle is included in Appendix C, along with the USFWS IPAC species list. Information on the regulatory status (if any), habitat requirements and occurrence within the project area are detailed in this appendix.

There are no known Potential Conservation Areas (PCA) identified by the CNHP within the project area, however PCAs in the vicinity of the project area include North Turkey Creek which supports an occurrence of the globally and state vulnerable (G3/S3) Blue Spruce / Alder Montane Riparian Forest. In addition, PCAs associated with Staunton State Park, which is about a mile west of the project area, include Black Mountain at Aspen Park, Black Mountain Creek, and Rock Outcrop West of Mason Creek. These PCAs and are known for supporting occurrences of the budding monkeyflower (*Mimulus gemmiparus*) a US Forest Service Sensitive plant as well as James' Telesonix (*Telesonix jamesii*), which is globally and state vulnerable (G3/S3).

5.1.2 Field Reconnaissance

A site-specific field reconnaissance for state rare plants was conducted on August 4, 2021, June 10, 2022, and September 20, 2022. The survey had two objectives: 1) to look at a representative sample of all plant community types; and 2) to focus the search effort on habitats known to contain target plants. The site-specific surveys focused on areas with a potential for direct and indirect impacts from the proposed project. While the entire 235-acre project area was included in the survey, the survey was focused on wetland and riparian habitats as well as the proposed parking lot, road, and lift alignment. None of the proposed bike trails were included in the survey as their exact location had not yet been determined at the time of the survey.

The field surveys were conducted by Ms. Rea Orthner, a professional botanist. Any potential rare plant habitat was closely and systematically searched for target species/communities. Survey intensity was intuitively controlled so that a greater search effort was used in areas with the highest potential for finding target plants/communities. If a target species or community were located, notes were taken on the number of individuals, habitat, associated species, slope, aspect, and any evidence of disease, predation, or injury.

5.2 Results & Impacts

Field reconnaissance documented the presence of two plant species of state rarity within the project area. Dwarf red raspberry (*Rubus pubescens*) was documented in numerous forested wetland seeps and along the riparian habitat along North Turkey Creek and the South Fork N. Turkey Creek. This small raspberry is relictual eastern woodland species of the Colorado Front Range is ranked as globally secure (G5), but state imperiled (S2). Other eastern relictual species were also encountered including bunchberry dogwood (*Cornus canadensis*) and wild sarsaparilla (*Aralia nudicaulis*), however neither one of these latter plant species is tracked by the CNHP or is considered state rare. It is possible a small percentage of the dwarf raspberry plants identified within the project area could be impacted by proposed project activities, however the impacts would be negligible and would not affect the overall viability of this plant species within the project area. The second rare plant identified is the Rocky Mountain polypody (*Polypodium saximontanum*), which is a diminutive fern that grows in granitic rock crevices. This fern is ranked as globally and state vulnerable (G3/S3) and was found south of South Fork N. Turkey Creek. No adverse impacts to these plants are expected as a result of project activities.

Please note, no mountain bike trails were surveyed for rare plants as their exact location had not yet been determined at at the time field assessments. However, it is recommended that once the trail locations are determined that additional rare plant surveys be conducted to ensure that any additional populations of rare plants can be avoided, or impacts minimized.

6.0 Noxious Weeds

6.1 Methods

A site-specific field reconnaissance for noxious and other invasive weeds was conducted concurrent with other field reconnaissance onsite. The noxious and invasive plant inventory was conducted by Rea Orthner, a professional botanist, and several associates.

6.2 Results & Impacts

Noxious weeds primarily occur in the agricultural meadow along North Turkey Creek but are also scattered in a few other locations. Documented noxious weeds include Canada thistle (*Cirsium arvense*), toadflax (*Linaria vulgaris*), scentless chamomile (*Tripleurospermum perforatum*), musk thistle (*Carduus nutans* subsp. *macrolepis*), and mullein (*Verbascum thapsus*). Canada thistle appears to be most common and is present within or adjacent to many of the wetlands onsite.

The Colorado Noxious Weed Act (8 CCR 1206-2) directs the Colorado Department of Agriculture to develop and implement management plans for all List A and List B noxious weed species. There are no List A Noxious Weeds within the Shadow Mountain Bike Park project area. However, there are four List B species, three of which are slated for suppression in Jefferson County. The other one, musk thistle is designated for elimination in Jefferson County. Table 4 provides a list of noxious and invasive weeds encountered in the project area, along with their weed class and management status. Finally, one other plant species, reed canarygrass (*Phalaris arundinacea*) was commonly encountered along the North Fork Turkey Creek and the adjacent low-lying areas of the agricultural meadow. Reed canarygrass is known to be highly invasive and can create dense monocultures swamping native plants lowering overall biodiversity. This plant is thought to be native to temperate regions of Europe, Asia, and North America. However, an Eurasian ecotype has been planted throughout the US since the early 1800s and has become naturalized and is thought that most Colorado populations are the non-native ecotype (Culver and Lemly 2013).

Ground disturbing construction activities have the potential to not only introduce new species of noxious and invasive plant species, but also increase the existing populations to unacceptable levels. However, with proper implementation of Noxious Weed Best Management Practices, this threat would be lessened. Such practices include 1) pretreatment of existing infestations; 2) cleaning all off-road construction equipment; 3) revegetation with approved seed mixes that are certified noxious weed free; and 4) monitoring and treatment of the project area for three years.

Under the proposed project, the existing populations of noxious and invasive weeds could potentially spread into the relatively uninfested areas of the project site as well as increase in abundance and density in their current locations. The greatest risk of noxious weed dispersal occurs when ground disturbing activities take place in mid- to late summer when the majority of weed species are producing seeds. If grading activities occur in weed infested areas when weeds are actively producing seed, the seeds could potentially become transferred to other sites via soil or plant parts embedded on construction equipment or attached to clothing and footwear of construction personnel.

It is recommended that a Noxious Weed Management Plan be developed and implemented for the proposed project to reduce the threat of increased weed spread. The Plan should include not only a description of the biology of existing noxious weeds present on site, but also include weed control methodologies (mechanical, chemical, cultural control) to be used pre-construction, during

construction, and post-construction. A three-year post-construction monitoring and follow-up treatment timeframe is strongly encouraged.

TABLE 4. NOXIOUS AND INVASIVE WEEDS OF THE PROJECT AREA			
Scientific Name	Common Name	Noxious Weed Class	Management Status
Perennial Forbs			
Cirsium arvense	Canada thistle	List B	Suppression
Linaria vulgaris	Toadflax	List B	Suppression
Annual/Biennial Forbs			
Carduus nutans subsp. *macrolepis*	Musk thistle	List B	Elimination
Tripleurospermum perforatum	Scentless chamomile	List B	Suppression
Verbascum thapsus	Mullein	List C	Not applicable
Perennial Graminoids			
Phalaris arundinacea	Reed canarygrass	None	Not applicable

Source: https://www.colorado.gov/pacific/agconservation/county-weed-programs; and List B Management Plan Web Database for Jefferson County (updated Apr-01-2017).

Elimination: means the removal or destruction of all emerged, growing plants of a population of List A or List B species designated for eradication by the Commissioner.

Suppression: means reducing the vigor of noxious weed populations within an infested region, decreasing the propensity of noxious weed species to spread to surrounding lands, and mitigating the negative effects of noxious weed populations on infested lands.

Note: List C species are not mandated for control by the State. Instead, instead the State aids local governing bodies to facilitate more effective integrated weed management on private and public lands.

7.0 References

Ackerfield, J. 2015. Flora of Colorado Page 818 pp. Brit Press

CNHP. 1997+. Colorado Rare Plant Guide Online. Colorado Natural Heritage Program (CNHP). Available: www.cnhp.colostate.edu.

CNHP. 2021. Colorado Natural Heritage Program (CNHP), Element Occurrence Tracking Lists by State and County (updated September 2021). [Online]. Available: http://www.cnhp.colostate.edu.

Culver, D. R., and J. M. Lemly. 2013. Field Guide to Colorado's Wetland Plants. Identification, Ecology and Conservation. Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University.

Fertig, W., R. Black, and P. Wolken. 2005. Rangewide Status Review of Ute Ladies'-Tresses (*Spiranthes diluvialis*). . Prepared for the U.S. Fish and Wildlife Service and Central Utah Water Conservancy District. 101 pp.

Jennings, W. 1990. Final Report. Species studied: S*piranthes diluvialis, Sisyrinchium pallidum*. . Report for the Nature Conservancy under the Colorado Natural History Small Grants Program. The Nature Conservancy, Boulder, Colorado. 29 pp.

SEINet. 2022. SEINet Portal Network. 2022. http//:swbiodiversity.org/seinet/index.php. .

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetland Delineation Manual. U.S. Army Corps of Engineers. Waterways Experiment Statio. 3909 Halls Ferry Road. vicksburg, MS. 39180-6199.

U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Army Corps of Engineers. 2020. National Wetland Plant List, version 3.5. Available online at: https://cwbi-app.sec.usace.army.mil/nwpl_static/v34/home/home.html. U.S. Army Corps of Engineers. Engineer Research and Development Center.

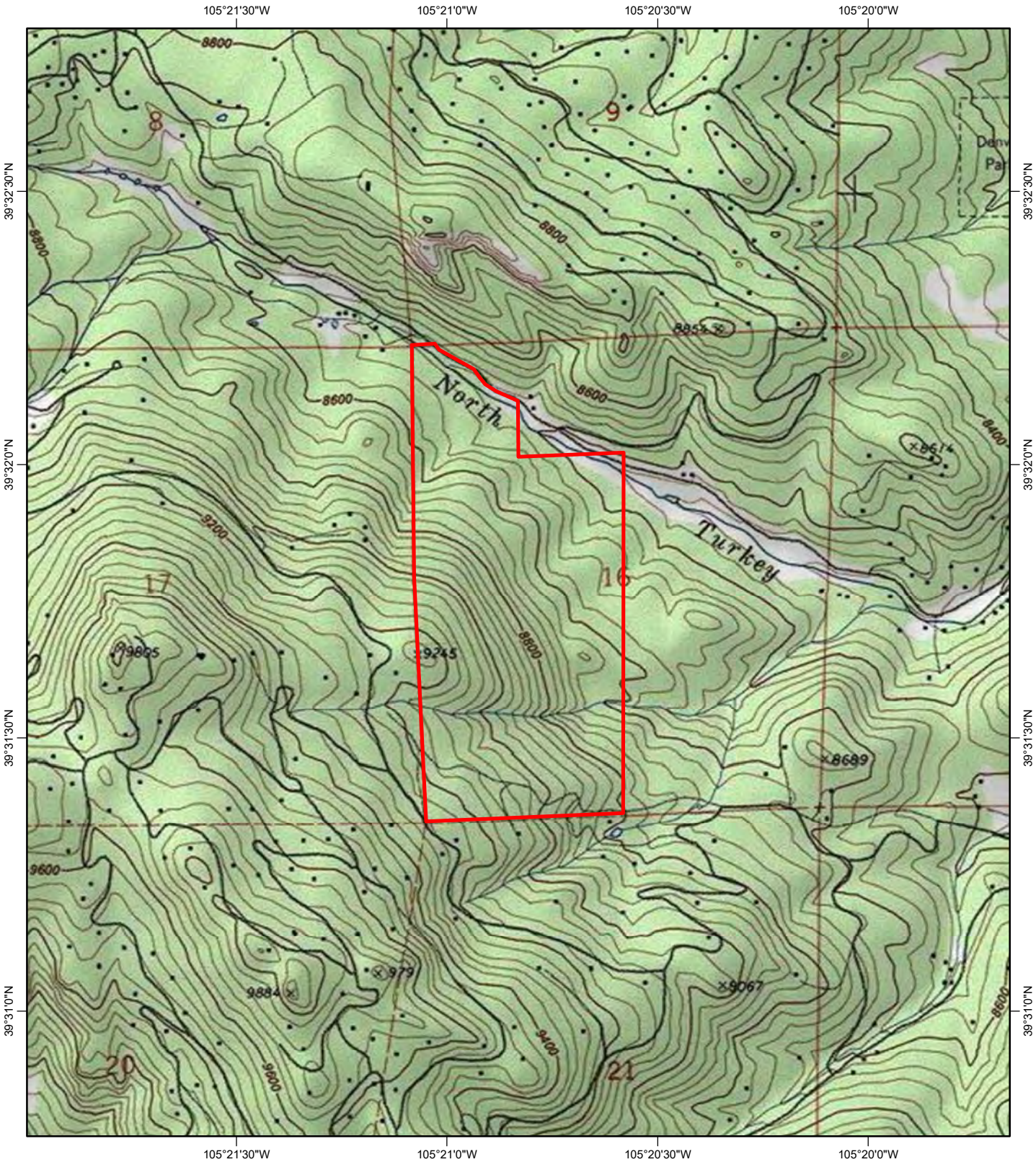
Cold Regions Research and Engineering Laboratory, Hanover, NH.

.

USFWS. 1995. Ute Ladies'-tresses (*Spiranthes diluvialis*) recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado. 46 pp. .

Weber, W. A., and R. C. Wittmann. 2012. Colorado Flora, Eastern Slope, A Field Guide to the Vascular Plants, Fourth Edition. University Press of Colorado, Boulder, Colorado.

8.0 Figures



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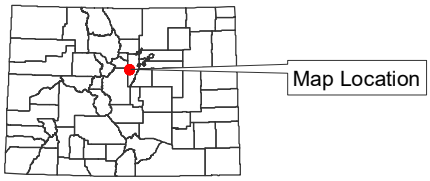
Grid Lat/Long WGS 1984



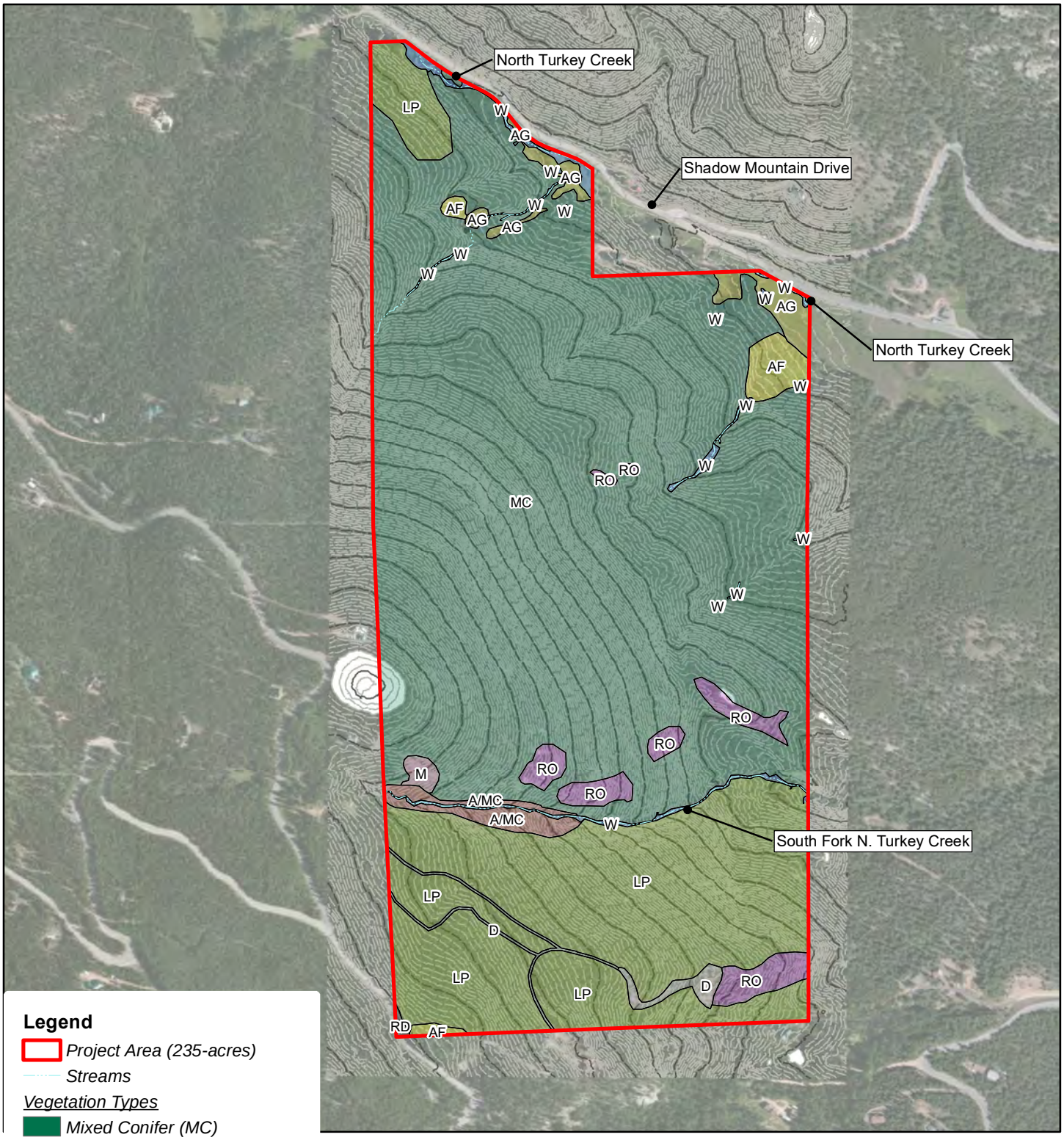
COLORADO

N

Scale: 1:24,000
1 inch = 2,000 feet

Figure 1. Project Location Map
Shadow Mountain Bike Park
State Land Board Property
Jefferson County, Colorado

Peak Ecological Services LLC
301 Boulder Canyon Drive
Nederland, CO 80466
info@peakecological.com



Legend

- *Project Area (235-acres)*
- *Streams*

Vegetation Types

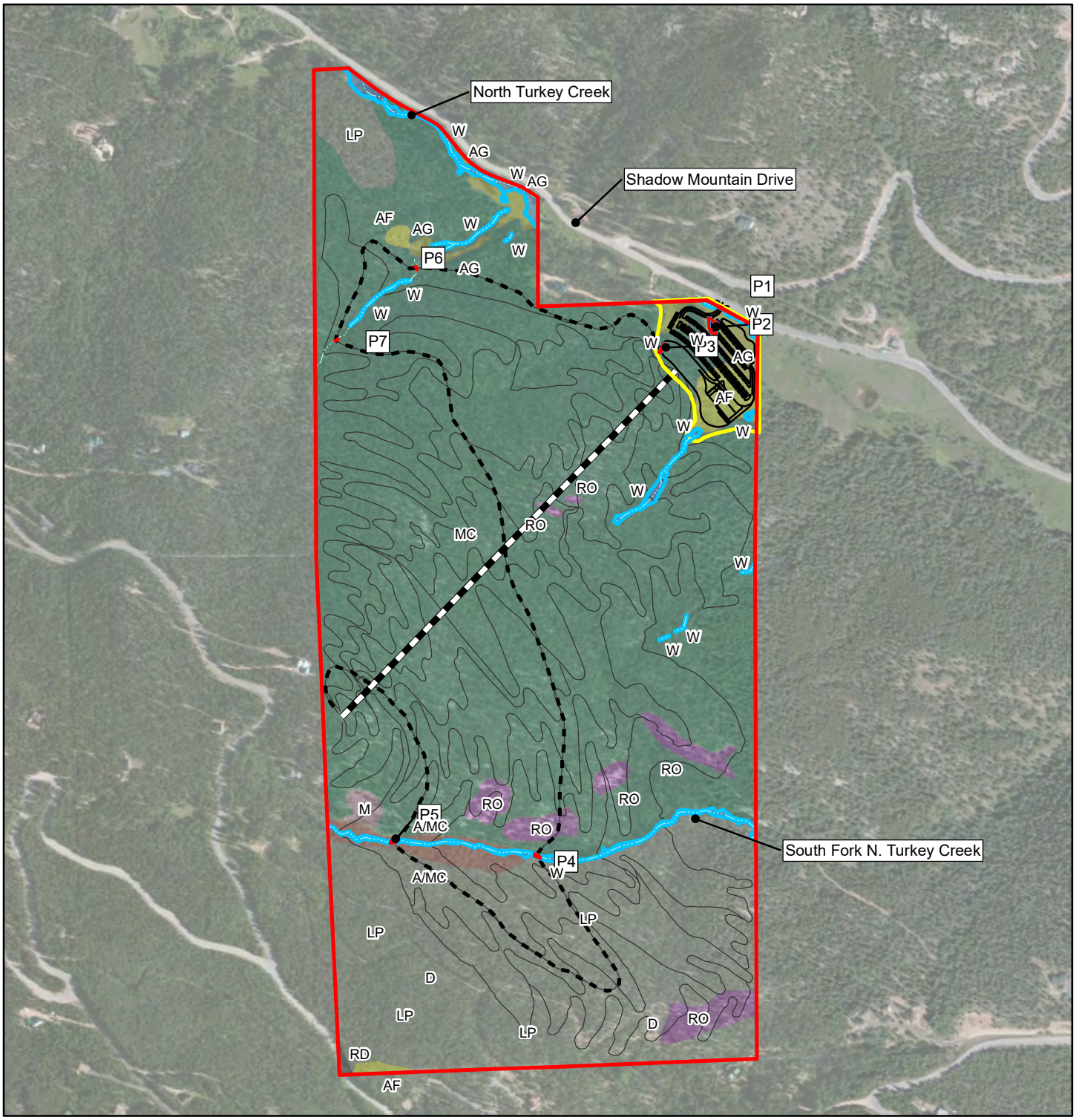
- *Mixed Conifer (MC)*
- *Lodgepole Pine (LP)*
- *Aspen - Mixed Conifer (A/MC)*
- *Aspen Forest (AF)*
- *Ag Meadow (AG)*
- *Native Rocky Meadow (M)*
- *Wetland (W)*
- *Disturbed (D)*
- *Paved Road (RD)*
- *Rock Outcrop (RO)*

N

1:9,000
1 inch = 750 feet
Contour Interval - 5 ft
BASE: ESRI Imagery Clarity

Figure 2. Vegetation Type Map
Shadow Mountain Bike Park
State Land Board Property
Jefferson County, Colorado

Peak Ecological Services
301 Boulder Canyon Drive
Nederland, CO 80466
info@peakecological.cm



Legend

- *Project Area (235-acres)*
- *Wetlands*
- *Streams*
- *Proposed Wetland Impacts*

Proposed Project Components

- *Access Road*
- *Base Area*
- *Lift*
- *Base Area Parking Lot / Lodge*
- *Concept Bike Trails*

Vegetation Types

- *Mixed Conifer (MC)*
- *Lodgepole Pine Forest (LP)*
- *Aspen - Mixed Conifer (A/MC)*
- *Aspen Forest (AF)*
- *Ag Meadow (AG)*
- *Native Rocky Meadow (M)*
- *Wetland (W)*
- *Disturbed (D)*
- *Paved Road (RD)*
- *Rock Outcrop (RO)*

N

1:9,000
1 inch = 750 feet
BASE: ESRI Imagery Clarity

Figure 3. Wetland Map
Shadow Mountain Bike Park
State Land Board Property
Jefferson County, Colorado

Peak Ecological Services
301 Boulder Canyon Drive
Nederland, CO 80466
info@peakecological.cm

Appendix A. Representative Site Photographs

PHOTO 1. MIXED CONIFER FOREST.

PHOTO 2. LODGEPOLE PINE FOREST.

PHOTO 3. MIXED CONIFER - ASPEN FOREST.

PHOTO 4. ASPEN FOREST.

PHOTO 5. AGRICULTURAL MEADOW.

PHOTO 6. NATIVE UPLAND MEADOW.

PHOTO 7. DISTURBED AREA.

PHOTO 8. NORTH TURKEY CREEK - BLUE SPRUCE RIPARIAN.

PHOTO 9. NORTH TURKEY CREEK - WILLOW RIPARIAN.

PHOTO 10. SOUTH FORK N. TURKEY CREEK.

PHOTO 11. WETLAND SEEP, SE OF PROPOSED PARKING LOT.

PHOTO 12. WETLAND SEEP, S OF PROPOSED PARKING LOT.

Appendix B. Vascular Plant Species List

2022 Plant Species List - Shadow Mountain Bike Park - Jefferson County, Colorado

Scientific Name	Common Name	Family	PLANTS Code	Origin	Wetland Status (WMVC)
Trees					
Abies lasiocarpa (=A. bifolia)	Subalpine fir	Pinaceae	ABLAL	N	FACU
Picea engelmannii	Engelmann spruce	Pinaceae	PIEN	N	FAC
Picea pungens	Blue spruce	Pinaceae	PIPU	N	FAC
Pinus contorta var. latifolia	Lodgepole pine	Pinaceae	PICOL	N	FAC
Pinus flexilis	Limber pine	Pinaceae	PIFL2	N	UPL
Pinus ponderosa subsp. scopulorum	Ponderosa pine	Pinaceae	PIPOS	N	FACU
Populus tremuloides	Quaking aspen	Salicaceae	POTR5	N	FACU
Pseudotsuga menziesii	Douglas fir	Pinaceae	PSME	N	FACU
Shrubs/Subshrubs					
Acer glabrum	Rocky Mountain maple	Sapindaceae	ACGL	N	FACU
Alnus incana subsp. tenuifolia	Thinleaf alder	Betulaceae	ALINT	N	FACW
Arctostaphylos uva-ursi	Kinnikinnick	Ericaceae	ARUV	N	FACU
Berberis repens (Mahonia)	Oregon grape	Berberidaceae	MARE11	N	UPL
Betula occidentalis (=B. fontinalis)	River birch	Betulaceae	BEOC2	N	FACW
Cornus canadensis	Bunchberry dogwood	Cornaceae	COCA13	N	FAC
Holodiscus discolor	Rock spirea; Oceanspray	Rosaceae	HODI	N	FACU
Jamesia americana	Waxflower	Hydrangeaceae	JAAM	N	FACU
Juniperus communis subsp. alpina	Common juniper	Cupressaceae	JUCOS2	N	UPL
Lonicera involucrata (=Distegia)	Twinberry honeysuckle	Caprifoliaceae	LOINI	N	FAC
Orthilia secunda	Sidebells wintergreen	Ericaceae	ORSE	N	FACU
Physocarpus monogynus	Mountain ninebark	Rosaceae	PHMO4	N	UPL
Prunus virginiana var. melanocarpa	Chokecherry	Rosaceae	PRVIM	N	FACU
Ribes cereum	Wax currant	Grossulariaceae	RICE	N	UPL
Rosa woodsii (=R. blanda)	Woods' rose	Rosaceae	ROWO	N	FACU
Rubus idaeus var. strigosus	Red raspberry	Rosaceae	RUIDS2	N	FACU
Salix bebbiana	Bebb willow	Salicaceae	SABE2	N	FACW
Salix drummondiana	Drummond's willow	Salicaceae	SADR	N	FACW
Salix monticola	Mountain willow	Salicaceae	SAMO2	N	OBL
Sambucus microbotrys (=S. racemosa)	Red elderberry	Adoxaceae	SARAR3	N	FACU

Scientific Name	Common Name	Family	PLANTS Code	Origin	Wetland Status (WMVC)
Symphoricarpos occidentalis	Western snowberry	Caprifoliaceae	SYOC	N	FAC
Symphoricarpos rotundifolius (=S. oreophilus)	Roundleaf snowberry	Caprifoliaceae	SYRO	N	UPL
Vaccinium myrtillus	Whortleberry	Ericaceae	VAMY2	N	UPL
Perennial Graminoids					
Achnatherum lettermanii	Letterman's needlegrass	Poaceae	ACLE9	N	UPL
Agrostis gigantea	Redtop	Poaceae	AGGI2	I	FAC
Bromus ciliatus (=Bromopsis canadensis)	Fringed brome	Poaceae	BRCIC3	N	FAC
Bromus inermis	Smooth brome	Poaceae	BRINI2	I	UPL
Calamagrostis canadensis	Bluejoint reedgrass	Poaceae	CACA4	N	FACW
Calamagrostis purpurascens	Purple reedgrass	Poaceae	CAPU	N	UPL
Carex aquatilis	Water sedge	Cyperaceae	CAAQ	N	OBL
Carex disperma	Softleaf sedge	Cyperaceae	CADI6	N	FACW
Carex geyeri	Elk sedge	Cyperaceae	CAGE2	N	UPL
Carex pachystachya	Chamisso sedge	Cyperaceae	CAPA14	N	FAC
Carex praegracilis	Clustered field sedge	Cyperaceae	CAPR5	N	FACW
Carex rossii	Ross' sedge	Cyperaceae	CARO5	N	UPL
Dactylis glomerata	Orchardgrass	Poaceae	DAGL	I	FACU
Danthonia parryi	Parry's oatgrass	Poaceae	DAPA2	N	UPL
Deschampsia cespitosa	Tufted hairgrass	Poaceae	DECE	N	FACW
Dodecatheon pulchellum	Shootingstar	Primulaceae	DOPU	N	FACW
Glyceria elata	Fowl mannagrass	Poaceae	GLST	N	FACW
Glyceria striata	Fowl mannagrass	Poaceae	GLST	N	OBL
Juncus arcticus var. balticus (=J. balticus)	Baltic rush	Juncaceae	JUARL	N	FACW
Koeleria macrantha	Prairie Junegrass	Poaceae	KOMA	N	UPL
Luzula parviflora	Millet woodrush	Juncaceae	LUPA4	N	FAC
Muhlenbergia montana	Mountain muhly	Poaceae	MUMO	N	UPL
Oryzopsis asperifolia	Roughleaf ricegrass	Poaceae	ORAS	N	UPL
Phalaris arundinacea	Reed canarygrass	Poaceae	PHAR3	I	FACW
Phleum pratense	Timothy	Poaceae	PHPR3	I	FAC
Poa fendleriana	Muttongrass	Poaceae	POFE	N	UPL
Poa palustris	Fowl bluegrass	Poaceae	POPA2	N	FAC
Poa pratensis	Kentucky bluegrass	Poaceae	POPR	I	FAC
Poa secunda	Sandberg bluegrass	Poaceae	POSE	N	FACU

Scientific Name	Common Name	Family	PLANTS Code	Origin	Wetland Status (WMVC)
Podagrostis humilis	alpine bentgrass	Poaceae	AGHU	N	FACW
Scirpus microcarpus	Panicled bulrush	Cyperaceae	SCMI2	N	OBL
Perennial Forbs					
Achillea lanulosa	Yarrow	Asteraceae	ACMIO	N	FACU
Aconitum columbianum	Monkshood	Ranunculaceae	ACCO4	N	FACW
Actaea rubra	Red baneberry	Ranunculaceae	ACRUA8	N	FACU
Adoxa moschatellina	muskroot	Adoxaceae	ADMO	N	FAC
Androsace septentrionalis	Pygmyflower rockjasmine	Primulaceae	ANSE4	N	FACU
Angelica ampla	Giant angelica	Apiaceae	ANAM	N	FACW
Antennaria parvifolia	Small-leaf pussytoes	Asteraceae	ANPA4	N	UPL
Antennaria rosea	Rosy pussytoes	Asteraceae	ANRO2	N	UPL
Aralia nudicaulis	Wild sarsaparilla	Araliaceae	ARNU2	N	FACU
Arnica cordifolia	Heartleaf arnica	Asteraceae	ARCO9	N	UPL
Artemisia frigida	Fringed sage, prairie sagewort	Asteraceae	ARFR4	N	UPL
Artemisia ludoviciana	White sage	Asteraceae	ARLU	N	FACU
Atragene columbiana	Rock clematis	Ranunculaceae	CLCOC2	N	UPL
Calypso bulbosa	Fairy slipper orchid	Orchidaceae	CABU	N	FACU
Campanula rotundifolia	Harebell	Campanulaceae	CARO2	N	FACU
Chimaphila umbellata	Prince's plume, Pipsissewa	Ericaceae	CHUMO2	N	UPL
Cirsium arvense (=Breea)	Canada thistle	Asteraceae	CIAR4	I+ B	FAC
Conioselinum scopulorum	Hemlock parsley	Apiaceae	COSC2	N	FACW
Corallorhiza maculata	Spotted coralroot orchid	Orchidaceae	COMA25	N	UPL
Corallorhiza wisteriana	Spring coralroot orchid	Orchidaceae	COWI5	N	FAC
Cymopterus lemmonii (Pseudocymopterus montanus)	Moutain spring parsley	Apiaceae	PSMO	N	UPL
Epilobium saximontanum	Rocky Mountain willowherb	Onagraceae	EPSA	N	FACW
Erigeron compositus	Cutleaf daisy	Asteraceae	ERCO4	N	UPL
Erigeron divergens	Spreading fleabane	Asteraceae	ERDI4	N	UPL
Erysimum capitatum	Western wallflower	Brassicaceae	ERCA14	N	UPL
Fragaria vesca subsp. bracteata	Woodland strawberry	Rosaceae	FRVEB2	N	FACU
Fragaria virginiana	Mountain strawberry	Rosaceae	FRVIG2	N	FACU
Galium boreale (=G. septentrionale)	Northern bedstraw	Rubiaceae	GABO2	N	FACU
Geranium richardsonii	Richardson's geranium	Geraniaceae	GERI	N	FAC

Scientific Name	Common Name	Family	PLANTS Code	Origin	Wetland Status (WMVC)
Geum macrophyllum var. perincisum	Largeleaf avens	Rosaceae	GEMAP	N	FAC
Geum rivale	Purple avens	Rosaceae	GERI2	N	FACW
Goodyera oblongifolia	Rattlesnake plantain orchid	Orchidaceae	GOOB2	N	FACU
Heracleum maximum (=H. sphondylium subsp. montanum)	Cow parsnip	Apiaceae	HEMA80	N	FAC
Heuchera parvifolia	Littleleaf alumroot	Saxifragaceae	HEPA11	N	UPL
Hieracium albiflorum (=Chlorocrepis)	White hawkweed	Asteraceae	HIAL2	N	UPL
Hydrophyllum capitatum	Ballhead waterleaf	Hydrophyllaceae	HYCA4	N	UPL
Iris missouriensis	Rocky Mountain iris	Iridaceae	IRMI	N	FACW
Ligularia bigelovii var. hallii	Hall's ragwort	Asteraceae	SEBIH	N	UPL
Ligusticum porteri	Osha, lovage	Apiaceae	LIPO	N	FACU
Linaria vulgaris	Butter and eggs, toadflax	Plantaginaceae	LIVU2	I+ B	UPL
Maianthemum stellatum	Starry false Solomon's seal	Ruscaceae	MAST4	N	FAC
Mertensia ciliata	Chiming bells	Boraginaceae	MECI3	N	FACW
Mertensia lanceolata	Bluebells	Boraginaceae	MELA3	N	FACU
Micranthes odontoloma	Brook saxifrage	Saxifragaceae	SAOD2	N	FACW
Osmorhiza depauperata	Bluntseed sweet cicely	Apiaceae	OSDE	N	UPL
Packera fendleri	Fendler's ragwort	Asteraceae	PAFE4	N	UPL
Pedicularis procera	Giant lousewort	Orobanchaceae	PEPR7	N	FACU
Penstemon virens	Blue mist penstemon; Front Range beardtongue	Plantaginaceae	PEVI3	N	UPL
Platanthera aquilonis	Northern green orchid	Orchidaceae	PLHY2	N	FACW
Potentilla fissa (=Drymocallis)	Bigflower cinquefoil	Rosaceae	POFI3	N	UPL
Potentilla pulcherrima	Beautiful cinquefoil	Rosaceae	POPU9	N	FAC
Pterospora andromedea	Woodland pinedrops	Ericaceae	PTAN2	N	UPL
Pyrola rotundifolia subsp. asarifolia	Roundleaf wintergreen	Ericaceae	PYASA	N	FACU
Ranunculus inamoenus	Graceful buttercup	Ranunculaceae	RAIN	N	FACW
Ranunculus macounii	Macoun's buttercup	Ranunculaceae	RAMA2	N	OBL
Rubus pubescens (=Cylactis)	Dwarf red blackberry	Rosaceae	RUPUP2	N	FAC
Rudbeckia hirta	Blackeyed Susan	Asteraceae	RUHI2	N	FACU
Rudbeckia lacinata var. ampla	Cutleaf coneflower; goldenglow	Asteraceae	RULAA	N	FAC
Rumex densiflorus	Denseflowered dock	Polygonaceae	RUDE2	N	FACW

Scientific Name	Common Name	Family	PLANTS Code	Origin	Wetland Status (WMVC)
Saxifraga bronchialis var. austromontana (=Ciliaria austromontana)	Spotted saxifrage	Saxifragaceae	SABRA2	N	FACU
Saxifraga cernua	Nodding saxifrage	Saxifragaceae	SACE2	N	
Scrophularia lanceolata	Lanceleaf figwort	Scrophulariaceae	SCLA	N	FAC
Scutellaria brittonii	Britton's skullcap	Lamiaceae	SCBR3	N	UPL
Sedum lanceolatum	Stonecrop	Crassulaceae	SELAL	N	UPL
Senecio triangularis	Arrowleaf groundsel	Asteraceae	SETR	N	FACW
Senecio wootonii	Wooton's ragwort	Asclepiadaceae	SEWO	N	UPL
Streptopus amplexifolius (=S. fassettii)	Claspleaf twisted stalk	Liliaceae	STAMC	N	FAC
Symphyotrichum foliaceum (=Aster)	Leafy bracted aster	Asteraceae	SYFOF	N	FACU
Symphyotrichum porteri	Smooth white aster	Asteraceae	SYPO4	N	FACU
Taraxacum officinale	Dandelion	Asteraceae	TAOF	I	FACU
Thalictrum fendleri	Fendler's meadow-rue	Ranunculaceae	THFE	N	FAC
Thermopsis divaricarpa	Spreadfruit goldenbanner	Fabaceae	THDI4	N	FAC
Trifolium hybridum	Alsike clover	Fabaceae	TRHY	I	FAC
Veronica americana	American speedwell	Plantaginaceae	VEAM2	N	OBL
Viola adunca	Hookedspur violet	Violaceae	VIAD	N	FAC
Viola canadensis (=V. rydbergii)	Canadian white violet	Violaceae	VICAR	N	FACU
Viola scopulorum	Canadian white violet	Violaceae	VICAS2	N	FACU
Ferns and Fern Allies					
Athyrium filix-femina	Common ladyfern	Dryopteridaceae	ATFI	N	FAC
Cryptogramma acrostichoides	American rockbrake	Pteridaceae	CRAC3	N	UPL
Cystopteris fragilis	Fragile fern	Dryopteridaceae	CYFR2	N	FACU
Equisetum arvense	Field horsetail	Equisetaceae	EQAR	N	FAC
Equisetum hyemale subsp. affine (=Hippochaete)	Scouringrush horsetail	Equisetaceae	EQHYA	N	FACW
Polypodium saximontanum	Rocky Mountain polypody	Polypodiceae	POSA19	N	UPL
Selaginella densa	Rocky Mountain spikemoss	Selaginellaceae	SEDE2	N	UPL
Annual/Biennial Forbs					
Carduus nutans subsp. macrolepis	Musk thistle (Nodding plumeless thistle)	Asteraceae	CANU4	I+ B	UPL
Collinsia parviflora	Blue-eyed Mary	Plantaginaceae	COPA3	N	UPL
Corydalis aurea	Golden smoke	Fumariaceae	COAU2	N	UPL
Lactuca serriola	Prickly lettuce	Asteraceae	LASE	I	FACU

Scientific Name	Common Name	Family	PLANTS Code	Origin	Wetland Status (WMVC)
Matricaria perforatum (=Tripleurospermum)	Scentless chamomile	Asteraceae	TRPE21	I+ B	FACU
Verbascum thapsus	Mullein	Scrophulariaceae	VETH	I+ C	FACU

Notes: Nomenclature generally follows Flora of Colorado (Ackerfield 2015) with Weber and Wittmann (2012) synonyms in parantheses. Origin: N=Native; I=Introduced, I+A,B,C,W = Colorado Listed Noxious Weed and Rank. Wetland Status from Lichvar et al., 2020. OBL = Obligate, FACW = Facultative Wetland, FAC = Faculative, FACU = Faculative Upland, UPL = Upland, NL = Not listed. Plants Code: National Code from the NRCS PLANTS National database. Prepared by Rea Orthner of Peak Ecological Services, LLC of Nederland, CO.

Date Prepared: 01-Nov-22

Appendix C. Rare Plant Assessment Details

Table C1. Rare Plant Assessment Details. Shadow Mountain Bike Park.						
Scientific Name	Common Name	Global Rank	State Rank	Status	Species Found ?	Colorado Habitat
Agastache foeniculum	Lavender Hyssop	G5	S2		No	Uncommon in forest openings. 6,500 - 8,000 ft.
Anemone virginiana var. cylindroidea	Tall Thimbleweed	G5T4T5	S1		No	Found in meadows, along streams, and in thickets. 5,000-9,000 ft.
Aquilegia chrysantha	Golden Columbine	G4	S2	BLM/USFS	No	Uncommon in moist gulches and ravines, often near waterfalls. 5,400-7,000 ft.
Aquilegia saximontana	Rocky Mountain Columbine	G3	S3		No	Cliffs and rocky slopes, subalpine and alpine. 9,000-12,300 ft
Argyrochosma fendleri	Fendler Cloak-fern	G3	S3		No	Known from small occurrences scattered throughout central and southern Colorado; most occurrences are in remote, rocky sites that are somewhat naturally protected.
Aristida basiramea	Forktip Threeawn	G5	S2		No	Occurs on several kinds of sandy substrates, including sandy soil of an outwash mesa, and rock outcrops of Fox Hills sandstone, Dakota sandstone, Lyons sandstone, Ingleside sandstone, and Silver Plume granite. On rock outcrops it grows in crevices and gentle slopes where loose sand has accumulated. 5,102 - 6,522 ft.
Asclepias hallii	Hall's Milkweed	G3	S3		No	Common in sandy and gravelly soil of roadsides and sagebrush, pinyon-juniper, or cottonwood communities Sloping creek banks on the plains. 9,400 - 9,900 ft
Astragalus sparsiflorus	Front Range Milkvetch	G2	S2	SWAP Tier 2	No	Evergreen forests, dry gravelly banks, meadows, open hillsides and sandy canyon bottoms, sometimes on road cuts or natural talus. 5,469 - 9,970 ft.
Carex backii	Back's sedge	G5	S1		No	Limestone soils on hills and at dry calcareous bluffs and ledges; also in open calcareous forests representing relatively sparse canopy or early successional stage. 6,000-7,000 ft.
Carex conoidea	Open Field Sedge	G5	S1		No	Rare in moist meadows and along streams, 7,500-8,000 ft.
Carex oreocharis	Grassy-slope Sedge	G3	S3		No	Dry slopes and grassland hills in granitic soils, montane and subalpine. 5,900-10,500 ft.
Carex peckii	Peck Sedge	G5	S1		No	Cool valleys in the foothills of the Front Range. 6,500-7500 ft.
Carex sartwellii	Sartwell's Sedge	G5	S2		No	Rare along creeks and pond margins and in moist meadows. 7,000-10,500 ft.

Table C1. Rare Plant Assessment Details. Shadow Mountain Bike Park.						
Scientific Name	Common Name	Global Rank	State Rank	Status	Species Found ?	Colorado Habitat
Carex saximontana	Rocky Mountain Sedge	G5	S1		No	Found in dry to mesic, sandy to rocky soils in mixed conifer forests, thickets, woodlands, and canyons. 6,000-7,500 ft.
Carex sprengelii	Sprengel's Sedge	G5	S2		No	Uncommon along streams and lakes and in forests. 5,000-8,000 ft.
Carex torreyi	Torrey Sedge	G4G5	S1		No	Found in dry woodlands, gulches, shrubby slopes, and in fir and pine forests. Also found in on grassy slopes, in openings among Ponderosa Pine, at the base of talus slides, and rooted between loose rocks, but in the shade of mesic herbs and shrubs. 6,660 - 8,307 ft.
Claytonia rubra	Redstem Spring Beauty	G5	S1		No	Found on eroding slopes and trail-sides, in moist, shady places, cool canyons and ravines. 5,581 - 7,175 ft.
Crataegus chrysocarpa	Yellow Hawthorn	G5	S1		No	Included with C. succulenta (Ackerfield, 2015). Common along streams and in gulches and canyons, 4,500-8,000 ft.
Crocanthemum bicknellii	Plains Frostweed	G5	S2		No	Found in dry pine forests and open meadows, sometimes in hotly burned areas that are no longer forested. 6,079 - 7,644 ft.
Cypripedium calceolus ssp. parviflorum	American Yellow Lady's-slipper	G5	S2	USFS	No	Aspen groves and ponderosa pine/Douglas-fir forests. 7,400- 8,500 ft.
Desmodium obtusum	Stiff Tick-trefoil	G4G5	SH		No	Historical occurrence. Very rare in rocky, open prairie. Presumed extinct in the state.
Eriophorum gracile	Slender Cottongrass	G5	S1S2	USFS	No	Fens, wet meadows, and pond edges. 8,100-12,000 ft.
Geranium bicknellii	Bicknell's Cranesbill	G5	S2		No	Open woods, fields, lake shores, roadsides, old campfire sites, disturbed soils, and recent burns. 5,500 - 9,000 ft.
Halimolobos virgata	Virgate Halimolobos	G3	S2		No	Uncommon in grasslands, fens, and meadows, 8,000-11,000 ft.
Juncus vaseyi	Vasey Bulrush	G5	S1		No	Wetland habitats including damp thickets; meadows; shores; and seasonally inundated swales with sandy soils, including low sandy ground with pines, wet prairie, lakeplain wet prairie, and other intermittently wet ground. 7,500-10,000 ft.
Liatris ligulistylis	Rocky Mountain Gay-feather	G5?	S2		No	Dry, rocky slopes, rocky woods, gravelly ground in valleys, along streams, prairies, and railroad embankments, open often moist sites. 4,000-8,000 ft.

Table C1. Rare Plant Assessment Details. Shadow Mountain Bike Park.						
Scientific Name	Common Name	Global Rank	State Rank	Status	Species Found ?	Colorado Habitat
Mimulus gemmiparus	Rocky Mountain Monkeyflower	G1	S1	SWAP Tier 1/USFS	No	Found on granite outcrops with surface seepage water and on moist forest soils near seeps and springs. Usually found in areas protected by granite overhangs. 8,400-11,000 ft.
Nuttallia speciosa	Jeweled Blazingstar	G3	S3		No	Found in sandy soils derived from granitic parent materials within pinyon-juniper woodlands. Plants have also been documented in gravel and ash soils, and in association with Ponderosa pine, Douglas fir, and Gambel's oak. 5,387 - 10,853 ft.
Physaria vitulifera	Fiddleleaf Twinpod	G3	S3		No	This species is found on rocky slopes and dry hillsides, often on decaying granite. 5,712 - 10,230 ft.
Polypodium saximontanum	Rocky Mountain Polypody	G3?	S3		Yes	Found on cracks and ledges on rocks confined to granitic substrates. Habitats tend to be shaded but somewhat dry. 5,800 - 9,800 ft.
Potentilla ambigens	Southern Rocky Mountain Cinquefoil	G3	S2		No	Found on grassy or colluvial slopes, but may also occur in montane woods. 6,608 - 9,062 ft.
Rubus pubescens	Dwarf Red Raspberry	G5	S2		Yes	Uncommon in shady moist places. 7,000-8,000 ft.
Spiranthes diluvialis	Ute Ladies' Tresses	G2G3	S2	SWAP Tier 1 / LT	No	Found in moist meadows at moderate elevations, usually occurring on floodplains in the vicinity of abandoned stream channels and meanders where the vegetation is not too dense or overgrown. Subirrigated alluvial soils along streams and in open meadows in floodplains. 4,500-7,000 ft.
Telesonix jamesii	James' Telesonix	G3G4	S3	SWAP Tier 2	No	The occurrences are scattered sporadically in the crevices of granite rock faces and talus of the eastern central Rocky Mountains.
Viola pedatifida	Prairie Violet	G5	S2		No	Prairies, open woodlands, and forest openings; rocky sites (Spackman et al. 1997, Ackerfield 2015)
Notes: SWAP = Colorado State Wildlife Action Plan (CPW, 2015). Tier 1 = species which are truly of highest conservation priority in the state. Tier 2 = species remain important						

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Colorado Ecological Services Field Office
Denver Federal Center
P.O. Box 25486
Denver, CO 80225-0486
(303) 236-4773

Project Summary

Project Code: 2023-0004553
Project Name: Shadow Mountain Bike Park
Project Type: Recreation - New Construction
Project Description: Proposed Downhill Mountain Bike Park
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.5297379,-105.347158171801,14z

Counties: Jefferson County, Colorado

Endangered Species Act Species

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Canada Lynx *Lynx canadensis* Population: Wherever Found in Contiguous U.S. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf *Canis lupus* Population: U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, IA, IN, IL, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, ND, NE, NH, NJ, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, and WV; and portions of AZ, NM, OR, UT, and WA. Mexico. There is **final** critical habitat for this species. This species only needs to be considered under the following conditions: ▪ Lone, dispersing gray wolves may be present throughout the state of Colorado. If your activity includes a predator management program, please consider this species in your environmental review. Species profile: https://ecos.fws.gov/ecp/species/4488	Endangered

Birds

NAME	STATUS
Mexican Spotted Owl *Strix occidentalis lucida* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8196	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Project includes water-related activities and/or use in the N. Platte, S. Platte, and Laramie River Basins which may affect listed species in Nebraska. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Fishes

NAME	STATUS
Pallid Sturgeon *Scaphirhynchus albus* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Project includes water-related activities and/or use in the N. Platte, S. Platte, and Laramie River Basins which may affect listed species in Nebraska. Species profile: https://ecos.fws.gov/ecp/species/7162	Endangered

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Ute Ladies'-tresses *Spiranthes diluvialis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2159	Threatened
Western Prairie Fringed Orchid *Platanthera praeclara* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1669	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

CERTIFICATION OF NOTIFICATION OF MINERAL ESTATE OWNER

The applicant must check one of the three following statements, sign and date the form, and attach a list of mineral owners and lessees to whom notice was sent (if applicable).

I/We, FSBR, LLC _____

_____, (the "Applicant" or authorized representative of the Applicant),

by signing below, hereby declare and certify as follows:

With respect to the property located at:

Physical Address: 29611 Shadow Mountain Drive, Conifer, CO 80433

Legal Description (attach as applicable): _____

S2NW, SW, and a fractional part of the NWNW (S of Shadow Mtn Drive) of Section 16, Township 6 South, Range 71 West of the 6th Principal Meridian

Case Number 20-127140 PA

_____ I /We have searched the records of the Jefferson County Tax Assessor and the Jefferson County Clerk and Recorder for the above identified parcel and have found that no mineral estate owner is identified therein pursuant to section 24-65.5-103(1) of the Colorado Revised Statutes.

__✓__ I/We certify that, not less than thirty (30) days before the initial public hearing, notice of application for surface development was provided to mineral estate owners pursuant to section 24-65.5-103(1) of the Colorado Revised Statutes.

_____ The mineral estate has been severed from the surface estate, and each mineral estate owner and lessee has waived the right to notice as per CRS 24-65.5-103(5).

I hereby further certify that I am the Applicant, or I am authorized by the Applicant to make the representations contained herein and to act as the Applicant's agent for purposes of this Certification of Notification and bind the Applicant to these representations by my signature below.

Philip Bouchard

Applicant or Authorized Representative

11/16/2022

Date

February 15, 2023

Jefferson County – Planning and Zoning
100 Jefferson County Parkway, Suite 3550
Golden, CO 80419
Attn: Dylan Monke, Planner

Re: Application for Special Use - 23-102980 RZ, General Sufficiency Response

Dear Mr. Monke:

Per your e-mail correspondence dated February 1, 2023, we understand that the Jefferson County Planning and Zoning staff is seeking additional information in regard to the Special Use Application, Case No. 23-101397 RZ. Additionally, on February 13, 2023, we received a request to resubmit the application with new Case No. 23-102980 RZ (the "**Application**"). For a sufficient application, staff requested further Applicant response regarding (1) the Water Supply Information and (2) consistency with the Jefferson County Comprehensive Master Plan, particularly in regard to the Land Use Recommendations. The Applicant has considered this feedback and has drafted the following response for County review to accompany the Application.

Water Supply

According to the Engineering Study for Shadow Mountain Bike Park Concept Master Plan Water System Improvements (the "**Engineering Study**"), the bike park (also referred to herein as the "**Project**" or "**SMBP**") would require 2 acre-feet of water per year. This assumes water use of approximately 4 gallons per day (gpd) per guest and 10 gpd per employee.

It is an industry standard across day-use facilities that each guest uses approximately 10 gpd. This is derived from effluent sewage flows paired with visitation data. The 10 gpd estimate has been proven accurate across a variety of recreation facilities including those at ski areas in the U.S., many of which operate similarly to the proposed Project. However, this figure assumes that the day use facility includes a restaurant and kitchen. According to the EPA, more than half (52 percent) of restaurant water use is due to kitchen space.[1] Domestic and restroom uses will be the primary water use for the SMBP base area, as there will not be kitchen space within the Day Lodge. The EPA estimates that domestic and restroom use accounts for between 30 and 37 percent of hotel, restaurant, and office buildings' water use.[2] With this logic, water use per guest at the SMBP Day Lodge facility will be up to 4 gpd, rather than 10 gpd.

The Engineering Study also considered a similar day-use facility at a ski area in Summit County, CO. This facility offers grab-and-go food and drink (vending machines) as well as restrooms and no kitchen space. Water usage data and visitation estimates suggest water usage of up to 3 gpd per guest at the comparative facility. This estimate is based on winter use, when temperatures are cooler and guests may require less water. It is possible that water usage in the summer would be higher with higher

[1] EPA 2022
[2] Ibid.

temperatures. The Engineering Study's higher estimate of 4 gpd in comparison to this data purposefully accounts for the variability in water use by season and facility.

Employee use is assumed to be higher because employees would likely be spending more time at the SMBP Day Lodge and Maintenance Building. While guests may spend 3 to 6 hours at SMBP, employees may spend up to 10 hours, depending on operating hours and seasonality. Therefore, employee water usage estimates have been adjusted accordingly.

Additionally, the Engineering Study estimates the 2 acre-feet per year (afy) water usage based on 1,400 gpd for guest and employee uses combined and assuming 365 days of operations. However, SMBP will only operate between March 1 and December 1 (275 days) with limited employee visits for maintenance between December 1 and March 1. This would suggest usage of approximately 0.129 acre feet (42,000 gallons) of water use per month, or approximately 1.16 acre feet (approximately 378,000 gallons) of water use per operating season. The estimated 1.16 acre feet per operating season is accurate for the Project, whereas considering water usage of 1,400 gpd for twelve months would unduly inflate projected use. Per County request, a cover letter describing the Applicant's plan for obtaining adequate water supply has been attached to the Water Supply submission.

Compliance with the Jefferson County Comprehensive Master Plan

The proposed Special Use conforms with the Jefferson County Comprehensive Master Plan (the "**CMP**"), the Conifer/285 Corridor Area Plan (the "**Area Plan**"), and the Elk Creek & Inter-Canyon Fire Protection Districts Community Wildfire Protection Plan (the "**WPP**"). Zoning Resolution § 6.D.2. The Special Use Application narrative described the overwhelming degree of conformance with the applicable land use plans.

Further though, the CMP notes that, pursuant to "All Development, Policy (General) 3" at CMP page 19:

> *For New Development proposals that are not consistent with the Land Use Recommendations of the Comprehensive Master Plan, the following factors should be considered:*
>
> *a. How the impacts associated with the proposed land use(s) will be mitigated compared with the recommended Land Uses;*
> *b. How the proposed land uses are compatible with the surrounding Land Use Recommendations and community character; and*
> *c. What change of circumstance has occurred in the local area since the Land Use Recommendation was adopted.*

The Project is consistent with its zoning of Agricultural-Two, which allows a Class III Commercial Recreational Facility as a special use. However, the proposed use is not consistent with the Land Use Recommendation from the CMP, which describes the area as recommended for Residential use (refer to **Exhibit A: Land Use Recommendations Map**). This section considers the following three factors, consistent with All Development, Policy (General) 3 noted above.

a. How the impacts associated with the proposed land use(s) will be mitigated compared with the recommended Land Uses

As detailed in the Site Plan and Operational Considerations (each submitted with the Application), the Project has been intentionally designed to ensure compatibility with community character and natural surroundings, including: concentrating the majority of Project infrastructure at the base of Shadow

Mountain; maintaining standard recreation use noise levels, which would be comparable to residential noise levels; designing signage and lighting to comply with County standards; using native vegetation; and other design considerations detailed in the Planning Criteria Summary at Appendix A of the Application narrative.

Development of the Property for the proposed special use has a number of benefits for maintaining the mountain character of the larger community around Shadow Mountain. When compared with the recommended Residential use for the Property, the Project also mitigates the potential impacts of residential development. Specifically, according to jMap, the Property lies within Area 5: 1 dwelling unit (du) per 10 acres. This would allow approximately 25 homes to be built on the Property, assuming that one fourth of the Parcel (approximately 50 acres) has slopes greater than 30 percent and would not allow housing development. It also assumes that the developer would not pursue a higher density housing development, which is common in development projects. In comparison, the proposed Special Use includes just three built structures within the entirety of the 306-acre Parcel: the day lodge, maintenance facility, and the chairlift. While there would be a large amount of vegetation removal in the base area, tree removal for the access road and mountain biking trails would not create significant impacts to the scenic corridor along Shadow Mountain Drive, particularly when in comparison to the potential clearing required for residential development and roads.

Additionally, per the Area Plan, household domestic water use is not to exceed 298 gallons per day (gpd) for one single family home. With this consideration, a housing development with up to 25 homes would need significantly more water (i.e. 25 homes with up to 298 gpd, which amounts to 7,450 gpd) than the proposed 1,400 gpd at SMBP.

As described in detail in the Application, the resource reports takeaways and Planning Criteria included in Appendix A of the Application narrative evaluate potential impacts to surrounding areas and resources, in turn providing a roadmap for mitigation. Specifically, the Planning Criteria proposes how any harmful effects would be mitigated, therefore, protecting adjacent parcels from negative impacts.

b. How the proposed land uses are compatible with the surrounding Land Use Recommendations and community character

Existing land uses in the areas surrounding SMBP include Residential and Open Space land uses under Agricultural, Mountain Residential, Suburban Residential, and Planned Development districts. Much of the Property's surrounding neighborhoods maintain single-family dwellings at a moderate to low density. The nearby areas with recommended Open Space uses include several existing recreational assets such as Staunton State Park and the Cub Creek and Maxwell Falls trailheads along the nearby Black Mountain Drive. Lands with recommended Open Space uses are primarily lands owned privately or by the state, county, or federal government to be used as parks for the public, as the Applicant intends to do. Additionally, some parcels near the Project that offer recreation uses, such as Flying J Ranch Park and the Maxwell Falls open space area, include parcels with the Land Use Recommendation of Residential (refer to **Exhibit A: Land Use Recommendations Map**). These examples display the compatibility between Residential and Open Space uses within this area.

The Project intends to mirror the land surrounding SMBP, which supports dispersed development with limited infrastructure to the landscape. Particularly, the Project has been designed to respect the natural character of Shadow Mountain to the maximum extent possible by concentrating infrastructure

development to the base area and the lift corridor (as depicted on the Site Plan). The Project's low-impact trail system will be dispersed throughout the Property in a manner which will be shielded from Shadow Mountain Drive, with the intention of being compatible with the character of the surrounding area.

In addition to its compatibility with surrounding land uses, the Project's proposed use intends to directly support the surrounding land uses through enhancing the local recreation offerings already enjoyed by the community and benefitting existing residential uses. The Conifer area currently has an abundant network of multi-use trails. Staunton State Park is less than a 10-mile drive from the Property and offers public recreation opportunities ranging from hiking and mountain biking to fishing and picnicking. It is common that multi-use trails for hikers, bikers, and other user groups experience user conflict, and it is difficult to create trails designed specifically for mountain bikers when other uses are also in mind. The Project would offset mountain bike users from existing recreation opportunities, in turn providing a better experience for the balance of trail users. As a result, the Project will relieve a level of user impact and periods of congestion currently existing on trail systems in the County and the State and will better the experience on existing trails for residents of the area.

The Project will benefit residential uses in the area by providing opportunities for improved health and economic growth. Mountain biking has a number of health and economic benefits. A recent study shows that all-cause mortality is reduced 2 percent in Colorado residents who regularly bicycle.[3] Other studies have shown a positive correlation between proximity to walking and biking infrastructure in the long term.[4] In addition to these benefits, studies show that recreation opportunities are associated with higher property values, which will directly support landowners in the areas surrounding the Project.[5]

In summary, the Project has a number of benefits that will support the existing land uses in the surrounding areas and do so in a manner that does not conflict with the surrounding residential character.

c. *What change of circumstance has occurred in the local area since the Land Use Recommendation was adopted.*

The Jefferson County Comprehensive Master Plan was originally adopted in 2010 and most recently amended in 2020. Since the original plan adoption, which included the Land Use Recommendations described herein, a number of changes have occurred in Jefferson County and in the Conifer area.

Population in the Denver metropolitan area, which includes Adams, Arapahoe, Broomfield, Denver, Douglas, and Jefferson Counties, grew 17 percent between 2010 and 2020.[6] This amount of growth has surpassed projections, including the prediction of 10 percent growth in the Denver Metro Area by 2020 as described in the Jefferson County Open Space 2014-2019 Master Plan on page 15.[7]

Jefferson County offers open space and recreational opportunities to the growing population in the Denver Metro Area. As such, recreation demand in the County has grown with population. Between

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[3] BBC Research and Consulting 2016
[4] Goodman et al. 2014
[5] Headwaters Economics 2016
[6] Outside 285 Master Plan 2021
[7] Jeffco Open Space Master Plan 2014

2016 and 2020, Staunton State Park visitation increased from approximately 15,000 visitors on its busiest months to over 40,000, a 160 percent increase.[8] This represents a greater demand for trails and open space not only in Jefferson County as a whole but specifically in the Conifer area as well. Additionally, the Applicant has heard from members of the community that there is a need for professionally managed recreation outlets that cater to skills development, particularly for families and children. This type of recreation opportunity does not currently exist in the area, and recent population growth has created more demand for this type of facility.

Another change of circumstance has been the onset of the COVID-19 pandemic and the recreation challenges that came with it. Trail use increased as residents of the area were spending more time at home and seeking outdoor activities. This created challenges for management at trailheads and user conflict on trails, which caused the Jefferson County's Open Space department to reconsider their travel management plan and make decisions to better manage and restrict uses. For example, in September 2020, the County established designated use days at Apex Park on select trails, where only mountain bikers are allowed on even calendar days and no bikes are allowed on odd calendar days.[9] These management considerations were a result of heavy use and user conflict, presenting a need for more facilities with designated use.

Due to the unprecedented population increase and the need for additional open space and trails amenities or management in Jefferson County as a whole and specifically in the Conifer area, the Applicant recognizes a need to expand the County's trail offerings. SMBP will specifically make approximately 235 acres available to the Conifer community and create a designated area for mountain biking use, thus adding to the recreational opportunities nearby, relieving trail congestion, and reducing user conflict in other parts of the County and State. SMBP will also satisfy the need for lessons, skills development, and family-friendly activities for the local community. SMBP provides a response to this change in circumstance, which was not apparent at the original drafting of the CMP but is clear today.

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The Applicant appreciates the opportunity to respond to the County's initial sufficiency review and looks forward to continuing this process.

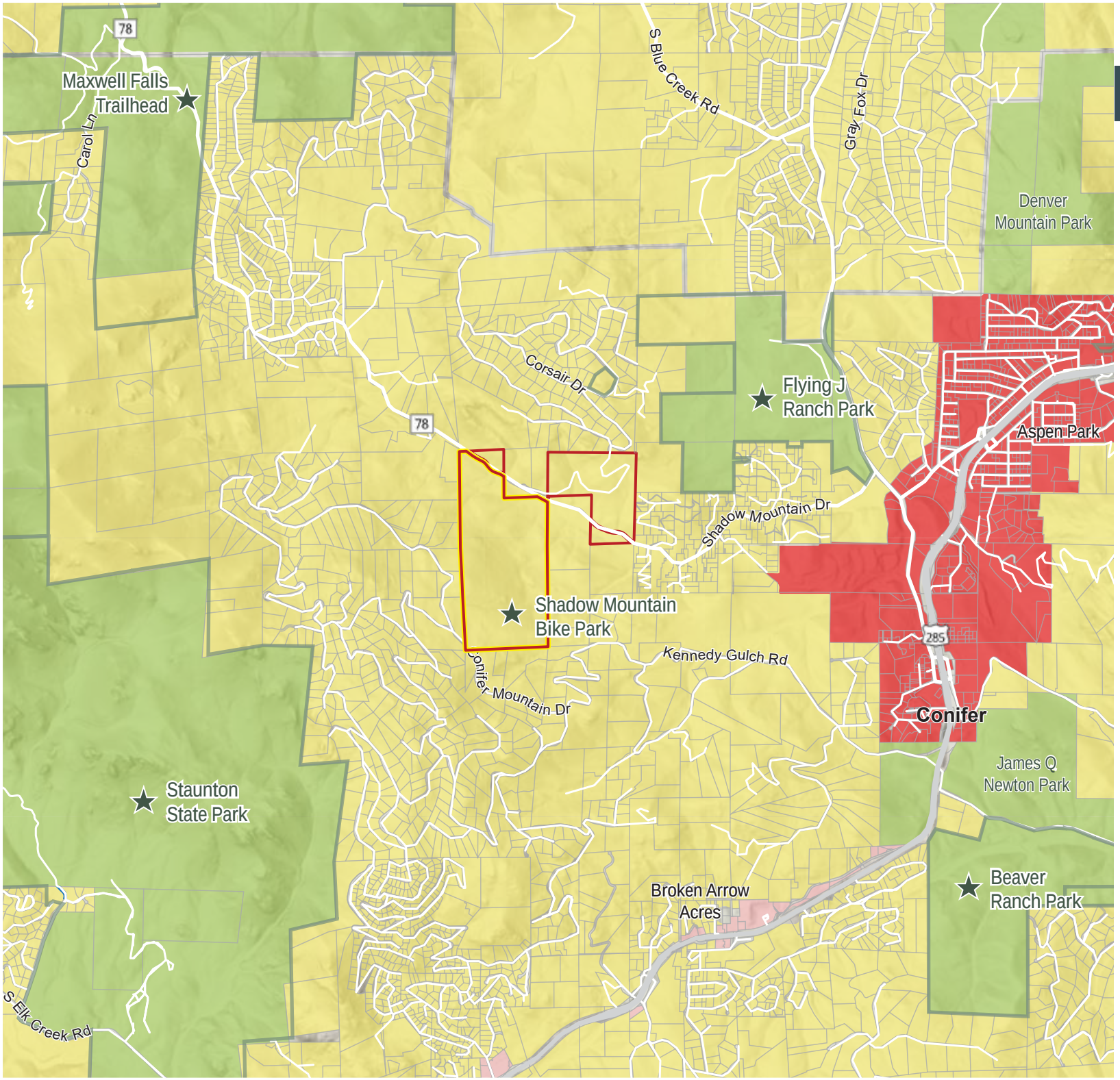
Sincerely,

Phil Bouchard
Shadow Mountain Bike Park

Jason Evans
Shadow Mountain Bike Park

[8] Outside 285 Master Plan 2021
[9] Singletracks 2020

EXHIBIT A: Land Use Recommendations Map



JEFFERSON COUNTY COLORADO

Shadow MOUNTAIN

SPECIAL USE APPLICATION
Land Use Recommendations Map

LEGEND

- Parcels
- Highways
- Roads
- Project Area
- Project Parcel
- Parks and Open Space
- Nearby Recreation

LAND USE RECOMMENDATIONS

- Residential
- Open Space
- Activity Center

N

Scale (ft)

0 3000

Prepared by: SE GROUP

NEARBY RECREATION

Staunton State Park
Zoning: A-2
Distance: <1 mile
Recreation offerings: 30+ miles of trails, visitor center, amphi-theater, picnic sites, parking

Flying J Ranch Park
Zoning: A-2
Distance: <1 mile
Recreation offerings: 4.8 miles of trails, picnic shelters, parking

Beaver Ranch Park
Zoning: A-2
Distance: Approx. 2 miles
Recreation offerings: 60 acres of disc golf, zipline, 6.4 miles of trails, picnic areas, parking

Maxwell Falls
Zoning: A-2
Distance: Approx. 2 miles
Recreation offerings: Approx. 5 miles of trails, parking

Source: Jefferson County jMap

February 15, 2023

Jefferson County – Planning and Zoning
100 Jefferson County Parkway, Suite 3550
Golden, CO 80419
Attn: Dylan Monke, Planner

Re: Application for Special Use - 23-102980 RZ, Additional Water Supply Information

Dear Mr. Monke:

Per your e-mail correspondence dated February 1, 2023, we understand that the Jefferson County Planning and Zoning staff is seeking additional information in regard to the Water Supply Information Summary, included as part of the Applicant's Special Use Application, Case No. 23-102980 RZ (formerly Case No. 23-101397 RZ; the "**Application**"). This letter has been prepared to accompany the Water Supply Information Summary (Item 12 of the Application) in an effort to provide further clarity on the matter. The proposed bike park (the "**Project**") will require water use for daily operations, specifically in the proposed Day Lodge and in the Maintenance Building.

The Applicant intends to construct a well for water use during normal operations. Normal operations include bike park operations in March through November outside of Special Events, as well as occasional employee use for maintenance from December through February. Well water will be used for toilets, sinks, and water fountains. The Applicant will pursue a nonexempt commercial well permit and water augmentation plan. The water augmentation plan will supply the facility with up to 2 acre-feet per year (afy) of water, as anticipated based on the assumptions described herein. The Applicant anticipates that pursuing a nonexempt well permit and water augmentation plan for up to 2 afy will be a long process and therefore plans to pursue an exempt commercial well permit, limited by a maximum annual withdrawal of 108,600 gallons per year (approximately 0.33 afy), for uses during construction and the start of operations. This would be a temporary use and water use would be highly monitored so as to not exceed the maximum annual withdrawal under the duration of this permit.

The following engineer's report describes the water needs of the Project as well as the Project context and other considerations that support this water use analysis. Please refer to the Applicant's Sufficiency Response Letter for more information on the assumptions used in the report.

Sincerely,

Phil Bouchard
Shadow Mountain Bike Park

Jason Evans
Shadow Mountain Bike Park