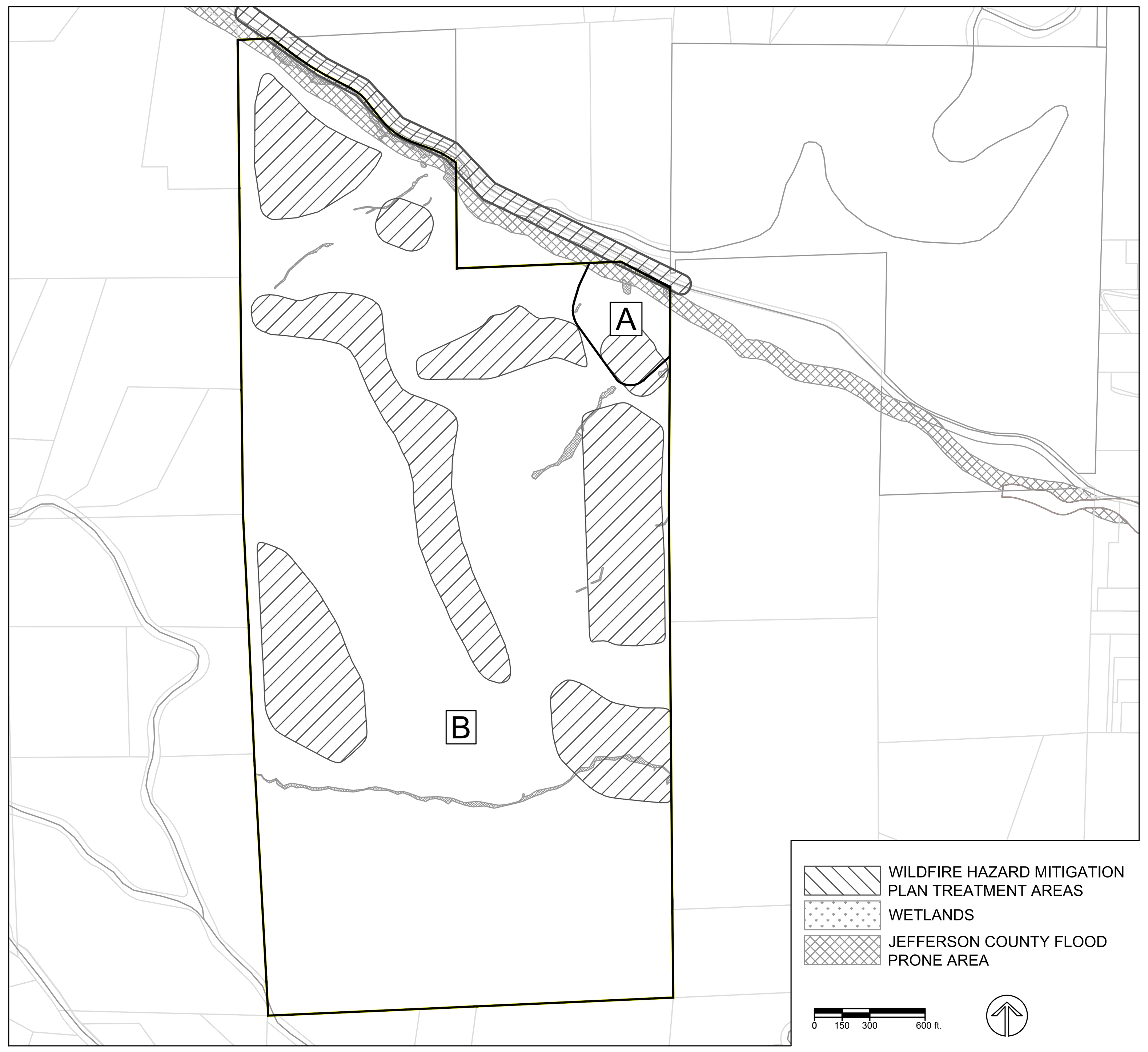
Shadow Mountain Bike Park
SPECIAL USE DOCUMENT

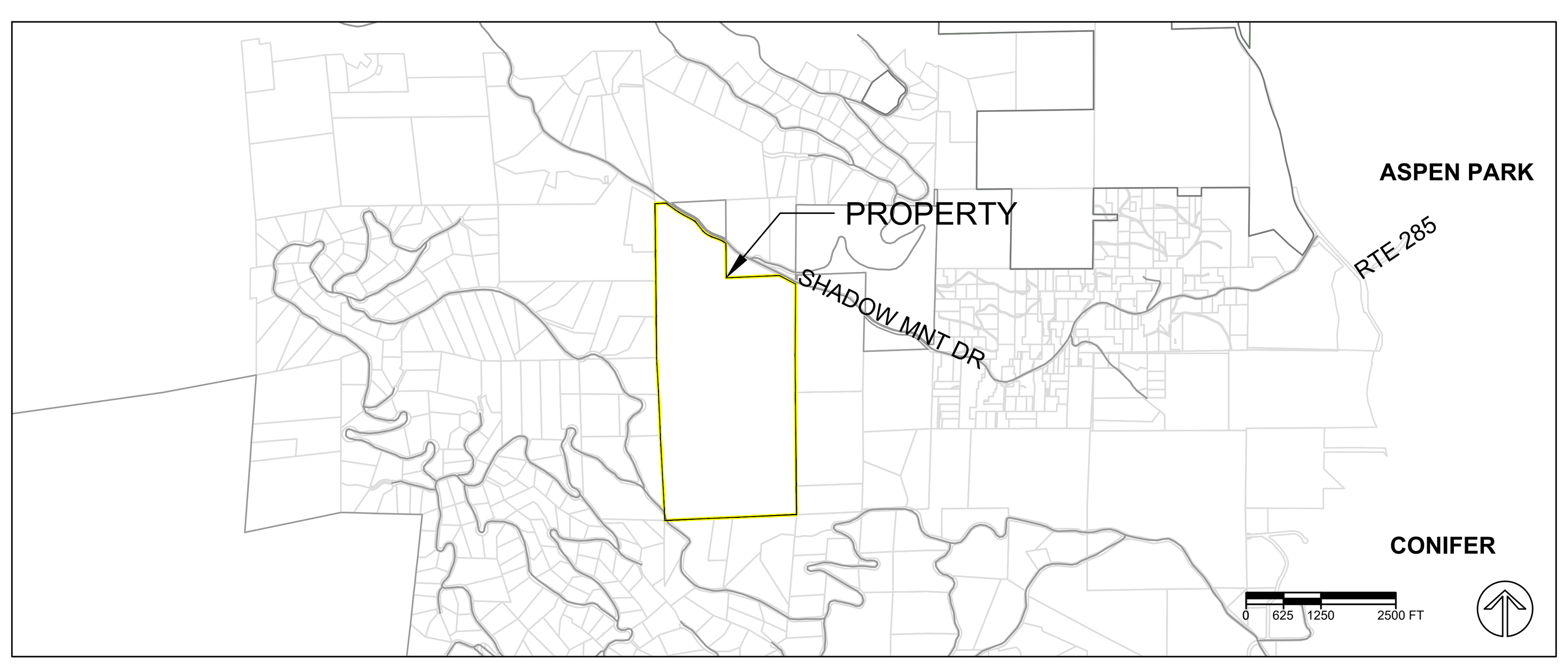
CASE NUMBER: 23-102980 RZ

SECTION 16, TOWNSHIP 6 SOUTH, RANGE 71 WEST, OF THE 6TH PRINCIPAL MERIDIAN

COUNTY OF JEFFERSON, STATE OF COLORADO



USE AREAS
SCALE 1"=600'



VICINITY MAP
SCALE 1"=2500'

LEGAL DESCRIPTION

All of the West Half (W1/2) of Section 16, Township 6 South, Range 71 West of the Sixth Principal Meridian, Jefferson County, Colorado.

SAVE AND EXCEPT, that portion thereof lying northerly of the south right of way line of Shadow Mountain Drive, as described in that document recorded in the records of the Jefferson County Clerk and Recorder at Reception No. F0829056 and that Parcel of Land described and depicted as Parcel 1 of the Plat of Exemption Sec. 16, T6S, R71W, 99015231EXP1 as recorded in the records of said Clerk and Recorder at Reception No. F1152563.

Said Parcel being subject to any existing easements and/or rights of way of whatsoever nature.

APPROVED FOR RECORDING:

This Special Use Document, titled Shadow Mountain Bike Park, was approved the ___________ day of ____________ 2024, 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: Colorado State Land Board

By: Jefferson County Planning and Zoning Director

Signature: ________________________________

Date: ________________________________

CLERK AND RECORDER'S CERTIFICATE

Accepted for filing in the Office of the County Clerk and Recorder of Jefferson County at

Golden, Colorado, this ____________ day of __________________ , 20 _____.

________________________________ ________________________________

County Clerk and Recorder Deputy Clerk

STANDARD FLEXIBILITY STATEMENT

The graphic drawing contained within this Official Development Plan is intended to depict general locations and illustrate concepts of the textual provisions of this Official Development Plan. During the plotting or Site Development Plan process the Planning and Zoning director may allow minor variations for the purpose of establishing:

A. Final road alignments
B. Final configuration of lot and tract sizes and shapes
C. Final building envelopes
D. Final access and parking locations
E. Landscaping adjustments

APPLICABILITY STATEMENT

Except as expressly provided otherwise in this Official Development Plan, development of this property shall conform to the Jefferson County Zoning Resolution in effect at the time of platting, Site Development Plan, and building permit application.

OWNER'S CERTIFICATE

We, Colorado State Land Board, as owners of the land affected by this Planned Development, accept and approve all conditions set forth.

____

Abraham Medina
Recreation Program Manager
State Land Board

Accepted for filing in the Office of the County Clerk and Recorder of Jefferson County at Golden, Colorado, this __ day of __________________ , 20 _____.

____
County Clerk and Recorder

____
Deputy Clerk

DATE	ISSUED FOR	REVISION #

PREPARED BY:

SE GROUP, INC.
PO BOX 2729
FRISCO, CO 80443
www.segroup.com

Shadow Mountain Bike Park
SPECIAL USE DOCUMENT

CASE NUMBER: 23-102980 RZ

SECTION 16, TOWNSHIP 6 SOUTH, RANGE 71 WEST, OF THE 6TH PRINCIPAL MERIDIAN

COUNTY OF JEFFERSON, STATE OF COLORADO

WRITTEN RESTRICTIONS

A. **Intent**. The purpose of this Special Use is to permit a Class III Commercial Recreation Facility use for lift-assisted mountain biking and associated uses.

B. **Written Restrictions**. All standards of the Agricultural Two Zone District (A-2) and other applicable sections of the Zoning Resolution shall apply to the Property, with the modifications contained herein. Capitalized terms not defined herein shall have the meanings ascribed to them in the Jefferson County Zoning Resolution.

1. **Permitted Uses**.
   a. Primary Uses.
      i. Class III Commercial Recreation Facility, excepting therefrom any activity that involves the use of non-domestic animals and/or firearms
   b. Accessory Uses.
      i. Food and beverage vendors
         1. Maximums: Two food trucks and one grab and go vendor during hours of operation
         2. Food Truck Setbacks: 300 feet from N Property line and 100 feet from all other Property lines and located south of (behind) the Day Lodge
      ii. Maintenance Facilities Setbacks: 50 feet from all Property lines
      iii. Water Storage
         1. Maximum height above ground: 15 feet
         2. Maximum storage capacity: 202,000 gallons
         3. Setbacks: 50 feet from all Property lines
      iv. Training Area Setbacks: 50 ft from all Property lines
2. **Development Standards**
   a. Use Area A. (6 acres)
      i. Building Standards
         1. Max Building Square Footage: 15,000 feet
         2. Setbacks: 300 feet from N Property boundary, 100 feet from all other Property lines
      ii. Maintenance Road(s) Setback: 50 feet from all Property lines
      iii. Parking Setback: 50 feet from all Property lines
   b. Use Area B. (229.3 acres)
      i. Only permitted for accessory maintenance facilities
      ii. Building Standards
         1. Max Building Square Footage: 5,000 square feet
         2. Setbacks: 300 feet from N Property boundary, 100 feet from all other Property lines
      iii. Trail Standards
         1. Setbacks: 50 feet from all Property lines
         2. Trail clearing width: 30 feet maximum
      iv. Chairlift Standards
         1. Max Chairlift Height: All Chairlift infrastructure (including terminals and towers) and accessory structures will not exceed 35 feet in height
         2. Setbacks: 150 feet from all Property lines
         3. Chairlift corridor clearing width: 40 to 60 feet in accordance with safety or chairlift commission regulations
         4. Chairlift terminals clearing: 200 feet maximum surrounding terminals
      v. Maintenance Road(s) Setback: 50 feet from all Property lines
3. **Overlay Areas**.
   a. Wildfire Hazard Mitigation Overlay.
      i. Mitigation strategies as outlined in the Wildfire Hazard Mitigation Plan, attached hereto as Exhibit A, will be implemented as part of Defensible Space Permit requirements
   b. Wetlands Overlay.
      i. No building, parking area, nor Chairlift is permitted in the Wetlands Overlay
      ii. In the event that Trail(s) cross the Wetlands Overlay, impacts must be avoided by bridging, raised platforms, or similar design
      iii. One Access Road shall cross N Turkey Creek and abutting Wetlands Overlay once in Use Area A for vehicular access from Shadow Mountain Drive into the Property and one Maintenance Road shall cross the Wetlands Overlay at two points within Use Area B. Construction of the Access and Maintenance Roads will require the installation of three culverts, up to 50 ft in length, at each of these crossing points within the Wetlands Overlay. This work will be accomplished in accordance with State legislation and local authority guidance
   c. Jefferson County Flood Prone Area Overlay
      i. No building, parking area, trail, nor Chairlift is permitted in the Flood Prone Area Overlay
4. **Lighting**.
   a. No lighting is permitted in the Wetlands Overlay or Use Area B, except for lighting required in connection with the Chairlift
   b. Lighting in Use Area A is permitted to be illuminated from one hour before to one hour after Guest Hours of Operation, except for security lighting, the use of which is not limited to certain hours
   c. Lighting will be directed away from the Wetlands and Flood Prone Overlays
   d. Building wall-mounted floodlights and rotating spotlights are prohibited
   e. Light fixtures attached to any buildings shall not project above the fascia or roofline of such building, and shall not exceed 14 feet above the building foundation
5. **Signage**.
   a. No more than one permanent sign is permitted per building
   b. Signs will be no closer than 50 feet from all Property lines, except for Entry Feature Sign(s) which are permitted on the Property
   c. Sign illumination is prohibited
   d. Signs will match the architectural elements of the primary building and be integrated into the overall landscape and building design
6. **Sound**.
   a. Sound levels shall adhere to maximum permissible noise levels for residential uses
   b. Outdoor amplification is prohibited except for announcements and Special Event Permit occurrences
7. **Fencing**.
   a. Only wildlife friendly fencing is permitted on the Property as defined by Colorado Parks and Wildlife (CPW)-recommended standards in the "Fencing With Wildlife in Mind" document or a similar document if CPW updates these standards
8. **Fires**.
   a. Outdoor fires using wood or charcoal for fuel are prohibited
   b. All outdoor fires of any type are prohibited in Use Area B
9. **Trash Management**.
   a. Only wildlife-proof trash, recycling and composting containers are permitted to be used on the Property
   b. Outside composting is prohibited
10. **Landscaping**.
   a. Landscaping plans will integrate Wildfire Hazard Mitigation Plan and Vegetation Preservation Plan recommendations
   b. The County landscaping regulations shall not apply except those standards for Parking Lot Areas as defined in Section 15 of the Jefferson County Zoning Resolution
11. **Architecture.**
   a. Buildings shall be designed to remain in context with the landscape and structures surrounding the Property
   b. Buildings and lift infrastructure will adhere to a color palette resembling the surrounding landscape including reds, browns, and blacks
   c. The scenic character of the area will be protected through the use of low-impact materials and colors (e.g., indigenous construction materials, such as stone and wood, as well as low-reflective glass and roofing materials)
   d. Any reflective materials (metal, glass, plastics, or other materials with smooth surfaces) shall be covered, painted, stained, chemically treated, etched, sandblasted, corrugated, or otherwise treated to reduce reflectivity in the landscape
   e. Building roofs will be slanted and planar angled, preferably to align with the hillside
   f. Flat roofs on buildings are prohibited
12. **Parking**.
   a. The maximum number of parking spaces will not exceed 320 spaces
   b. The minimum number of parking spaces shall adhere to a ratio of 1.0 space per 6 occupancy rating
   c. Parking will only occur in designated parking spaces
   d. Overnight visitor parking is prohibited; maintenance vehicles may be parked on the Property overnight, as necessary
13. **Wildlife**
   a. Bird feeders are prohibited on the property between April 1st and the Thanksgiving holiday
   b. Only round door knobs are permitted on all exterior doors on the property
   c. All crawl spaces and areas under ground level decks shall be fully enclosed to prevent wildlife access
14. **Operations**.
   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 January 1 through April 1 (the "**Seasonal Closure**")
   c. Motorized Use.
      i. Motorized use is prohibited on trails
      ii. Class I or II e-bikes are permitted on trails
   d. Guest Count. The maximum number of guests visiting Shadow Mountain Bike Park in one day will not exceed 1,200 guests
15. **Definitions**
   a. 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.
   b. Maintenance Facilities: Operational, maintenance, and administrative services and facilities associated with the Class III Commercial Recreation Facility use.
   c. Trails: Trails constructed for use by cyclists and, in some cases, individuals on foot or other non-motorized means of transportation.
   d. Food and Beverage Vendors: Temporary food trucks outside of the Day Lodge or grab and go vendors within the Day Lodge, limited to vendors that do not require full kitchen space.
   e. Water Storage: Permanent storage facilities for operational and fire flow uses, including above-ground reservoirs or ground storage/cisterns.
   f. 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.
   g. Seasonal Closure: An annual closure of Shadow Mountain Bike Park between January 1 and April 1 that does not permit guest access but does allow staff access and maintenance activities such as: construction of trails and infrastructure on an annual basis during development, trail maintenance, drainage maintenance, vehicle maintenance, facilities maintenance, or safety improvements.

DATE	ISSUED FOR	REVISION #

PREPARED BY:

SE GROUP, INC.
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Shadow Mountain Bike Park
Phase I Drainage Report

November 2022
Last Revised February 2024

Prepared For:

Shadow Mountain
BIKE PARK

Prepared By:

SE GROUP

PHASE I DRAINAGE REPORT

For

Shadow Mountain Bike Park

November 2022

Last Revised February 2024

Prepared For

Shadow Mountain Bike Park

Conifer, CO

Prepared By

SE Group

Table of Contents

I. General Location and Description

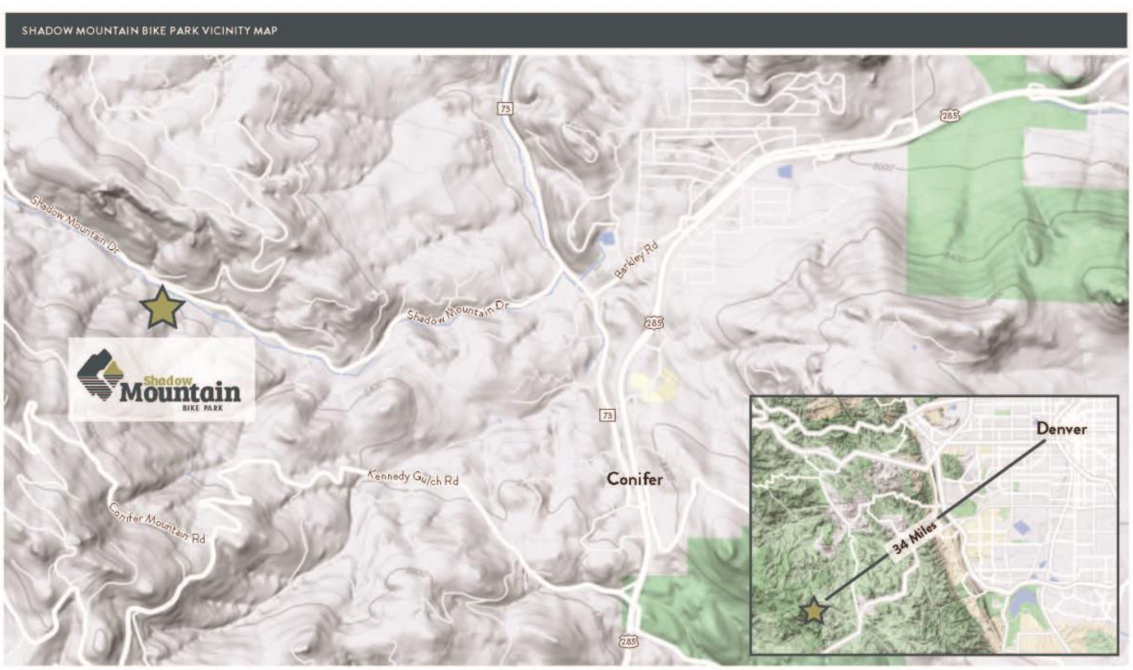
The Shadow Mountain Bike Park is to be designed in accordance with the Jefferson County Storm Drainage criteria. This report will review at a conceptual level the feasibility and design characteristics of the proposed development and is to accompany the project's Special Use Application materials. The 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.

However, the Jefferson County floodplain include 100-year floodplains as identified by FEMA and flood prone areas as separately identified by the County. Per the County's public GIS Interactive Map (retrieved 2/21/23), a portion of the property is categorized as Jefferson County Flood Prone Areas. The floodplain layers in the Jefferson County Interactive Map include Jefferson County designated floodplains that have not been acknowledged by FEMA in addition to FEMA designated floodplains. The flood prone area is a buffer along the North Turkey Creek that bisects the site.

Per County requirement, floodplain development permits (FDP) will be required as part of the site development process and will be included in subsequent permitting processes.

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. A Floodplain Development Permit will be required and approved prior to construction for all work within the County Flood Prone Areas.

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.

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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.

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Urban Storm Drainage Criteria Manual, Vol. 3: Stormwater Best Management Practices (BMPs). Revised January 2021.

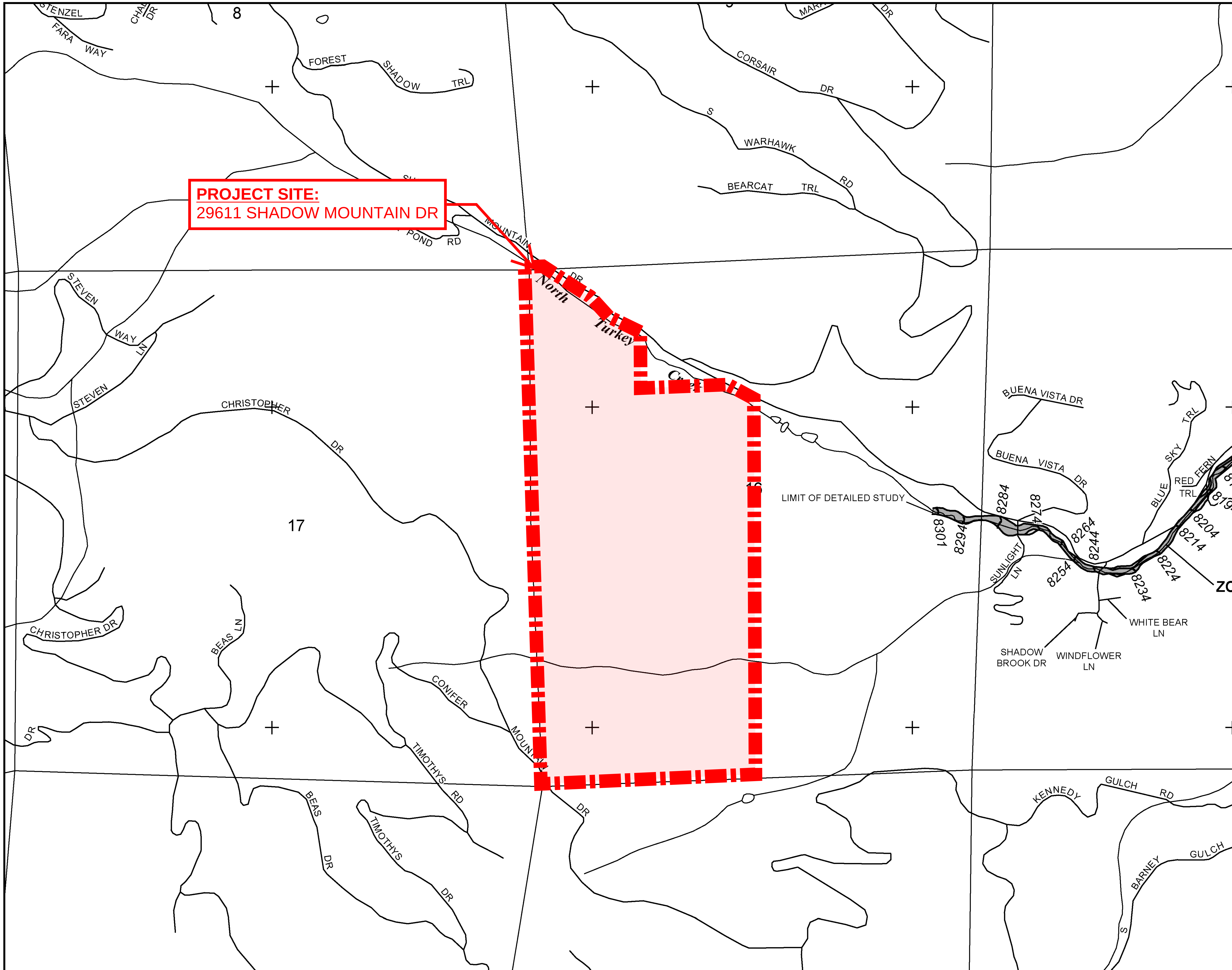
FIRM Flood Insurance Rate Map, Map Number 08059C0365F, Jefferson County, Colorado. Federal Emergency Management Agency. Revised February 5, 2014.

United States Department of Agriculture, Natural Resources Conservation Service. Custom Soil Resource Report.

APPENDICES

APPENDIX A – FIRM MAP
APPENDIX B – REDACTED MAJOR DRAINAGEWAY PLAN
APPENDIX C – SOILS SURVEY
APPENDIX D – SITE SUB-BASIN RATIONAL CALCULATIONS
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

For additional information write to:

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Denver, CO 80225–0046

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U.S. Geological Survey
Information Services
Box 25286
Denver Federal Center
Denver, CO 80225

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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;

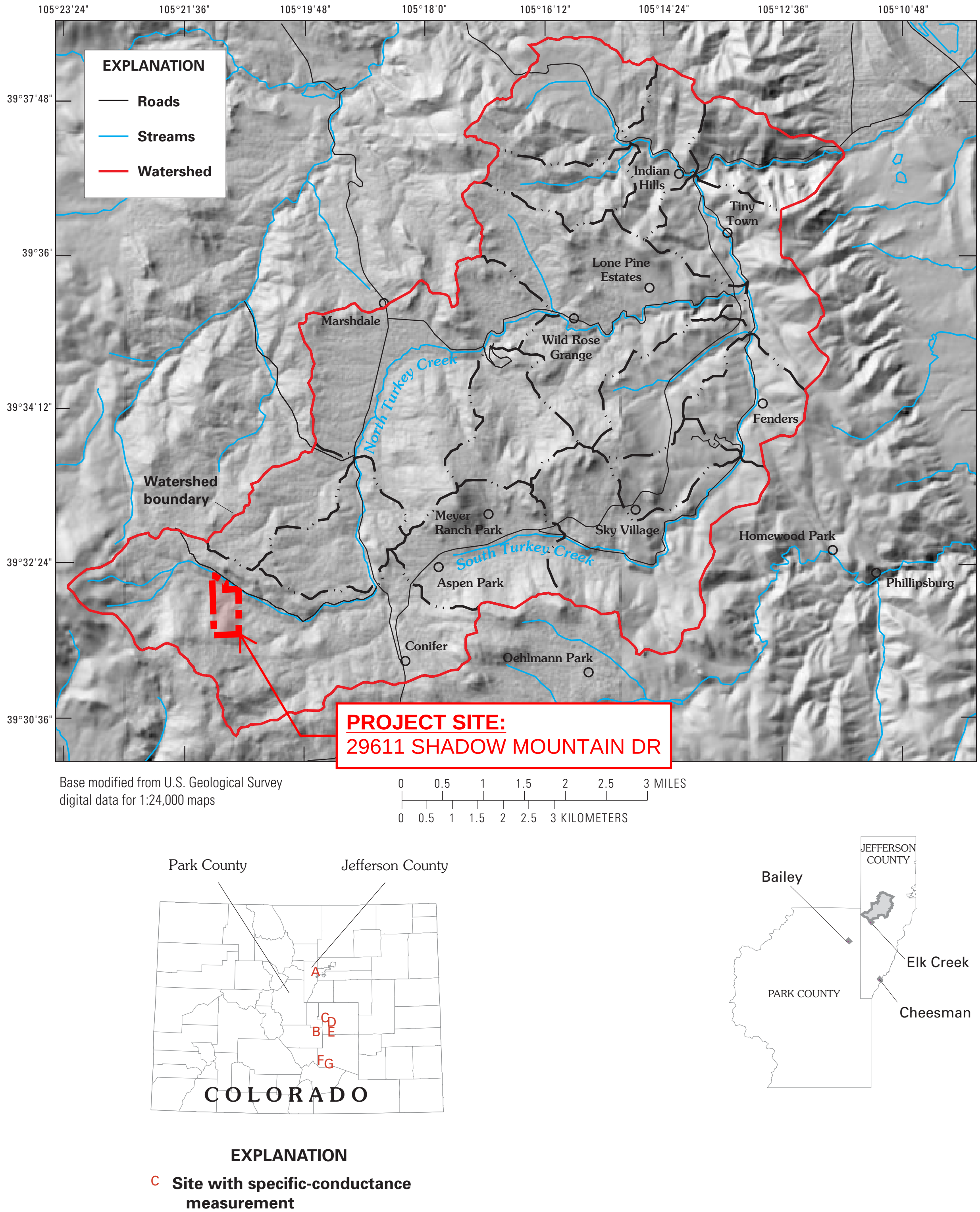


Figure 1. Location of Turkey Creek watershed in Jefferson County, Colorado; identifier and locations for sites with specific-conductance measurement; and location of Bailey, Cheesman, and Elk Creek climatologic monitoring stations.

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.

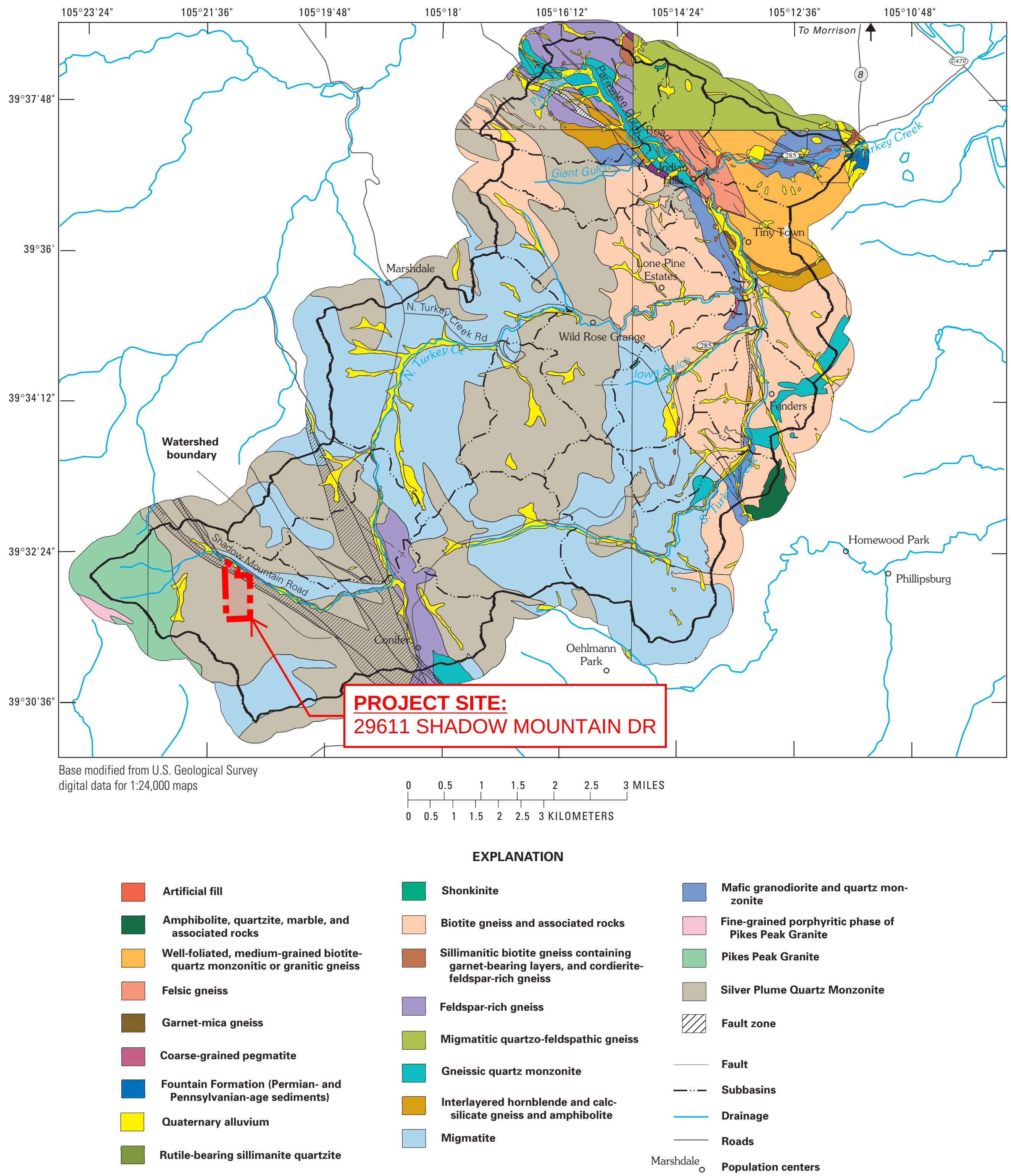
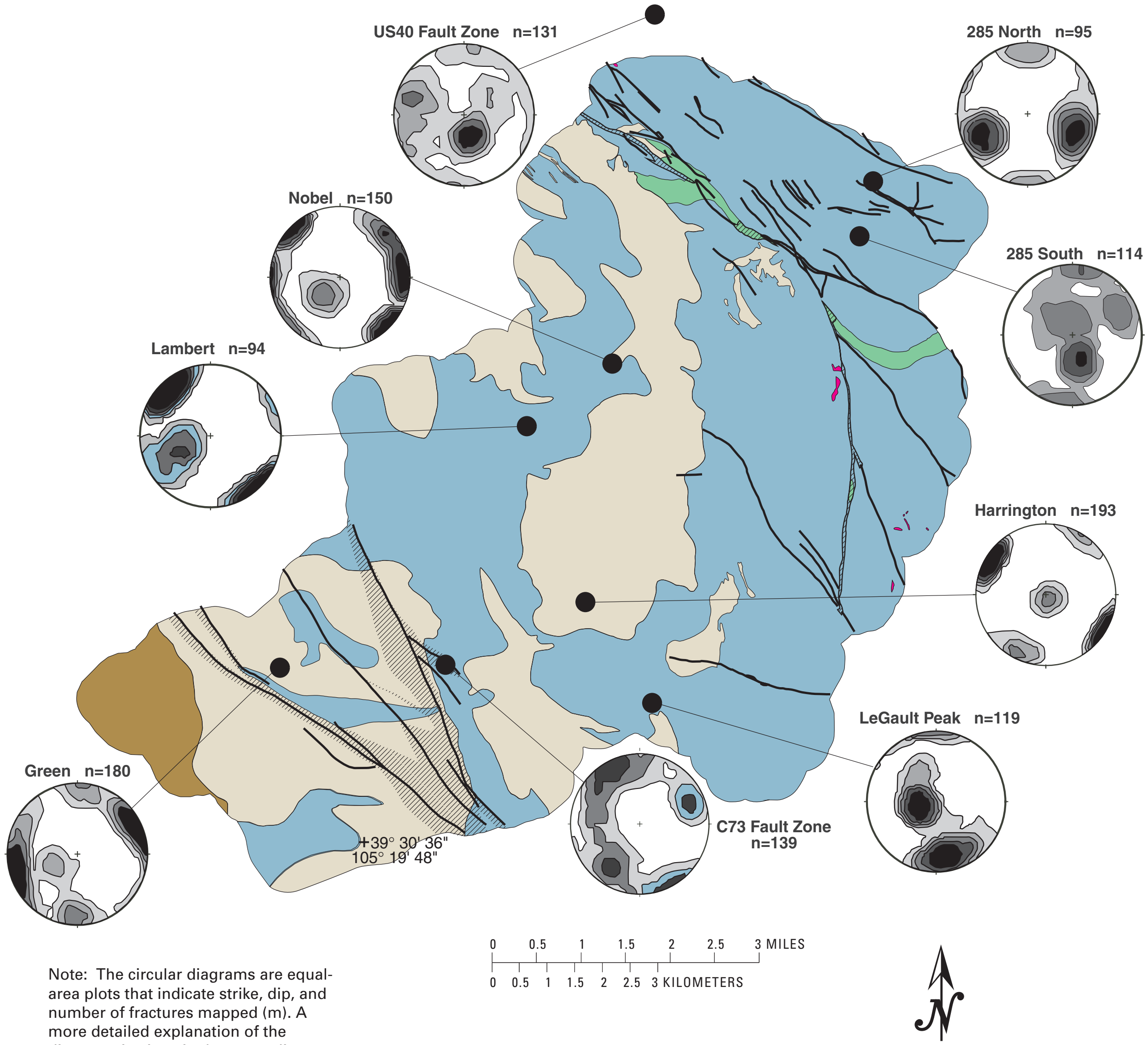


Figure 2. Compilation of parts of the existing Evergreen, Indian Hills, Morrison, Conifer, and Meridian Hills U.S. Geological Survey Geologic Quadrangle Maps.



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.

EXPLANATION

- Metamorphosed and foliated gneisses and schists
- Amphibolites, calc-silicates, and quartzites
- Intrusive quartz monzonites
- Granitic pegmatite dikes
- Pikes Peak Granite
- Fault zone
- Faults
- Fracture data-collection site

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	MH1
						August 25, 1998 - continuing	
					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	MH5
						August 25, 1998 - continuing	
					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	MH8
						July 9, 1998 - continuing	
					9	May 23, 2001 - September 30, 2001	
393121105110600	1	MH9	393121 1051106	6720	8	September 6, 1973 - February 14, 1983	MH9
						August 25, 1998 - September 30, 2001	
392958105164601	1	MH10	392958 1051646	7950	8	September 6, 1973 - February 14, 1983	MH10
						August 25, 1998 - September 30, 2001	
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

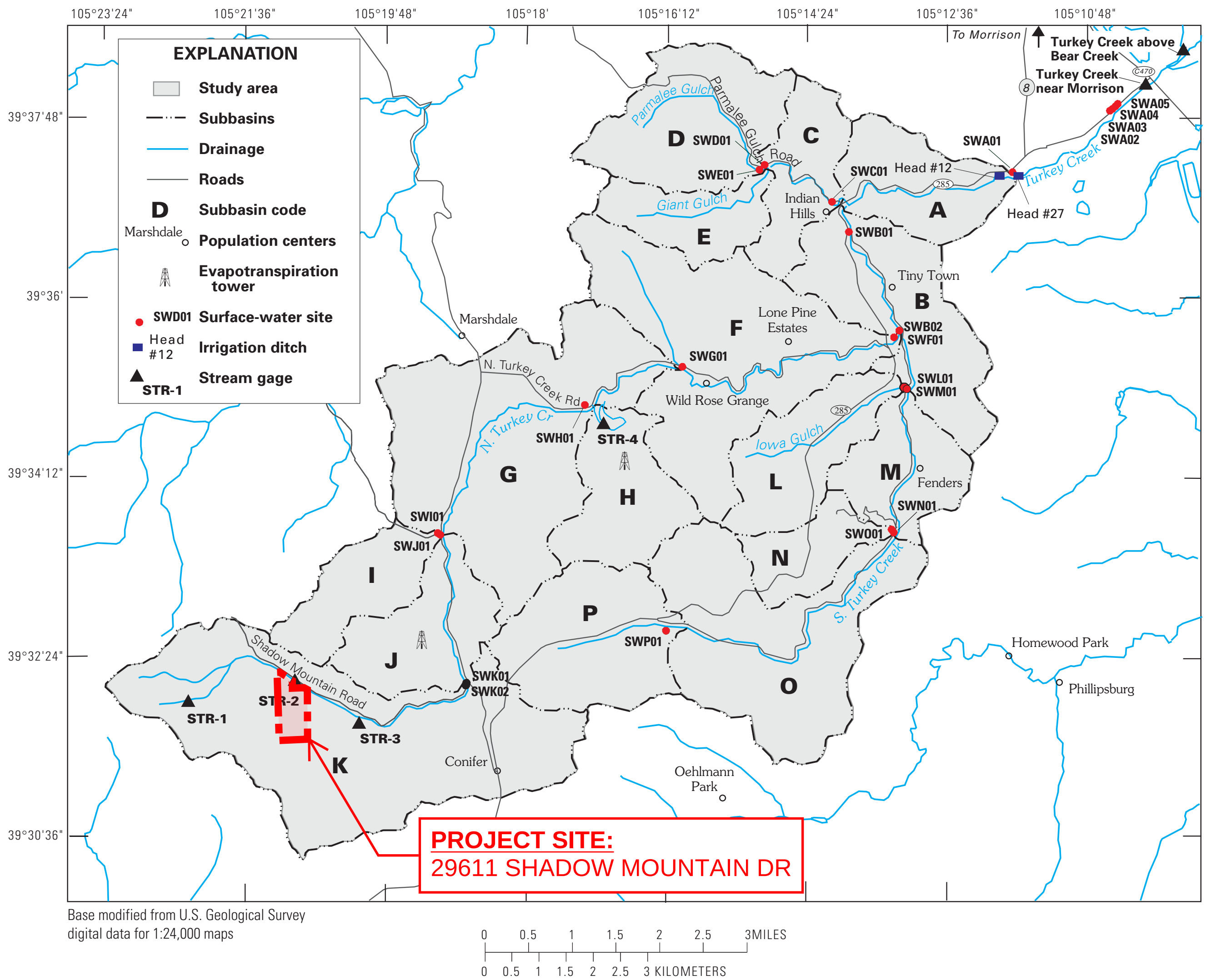


Figure 4. Locations of surface-water streamflow measurement and sampling sites, stream gages, and irrigation ditches.

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.

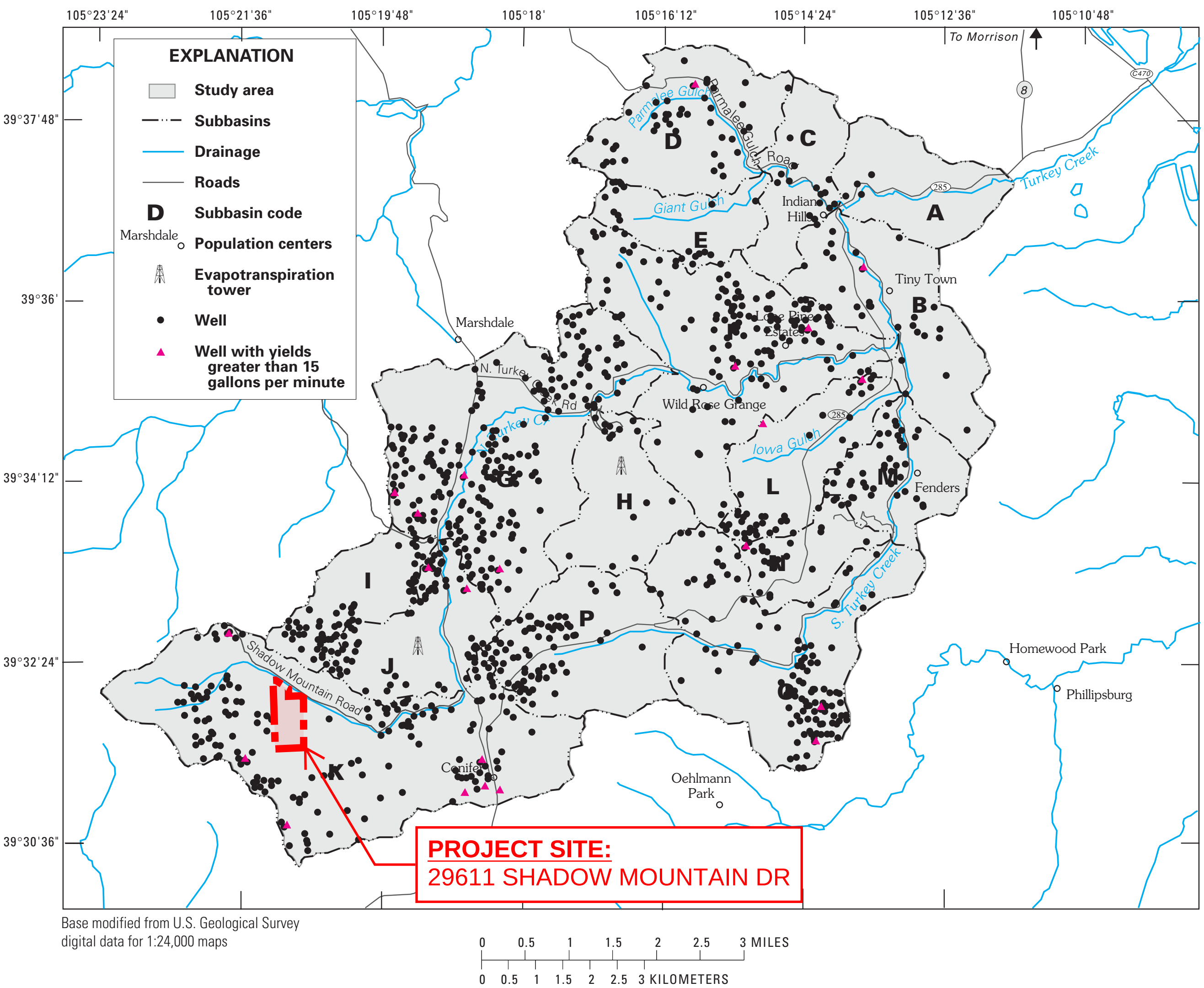


Figure 5. Locations of permitted wells from the State Engineers Office.

United States Department of Agriculture

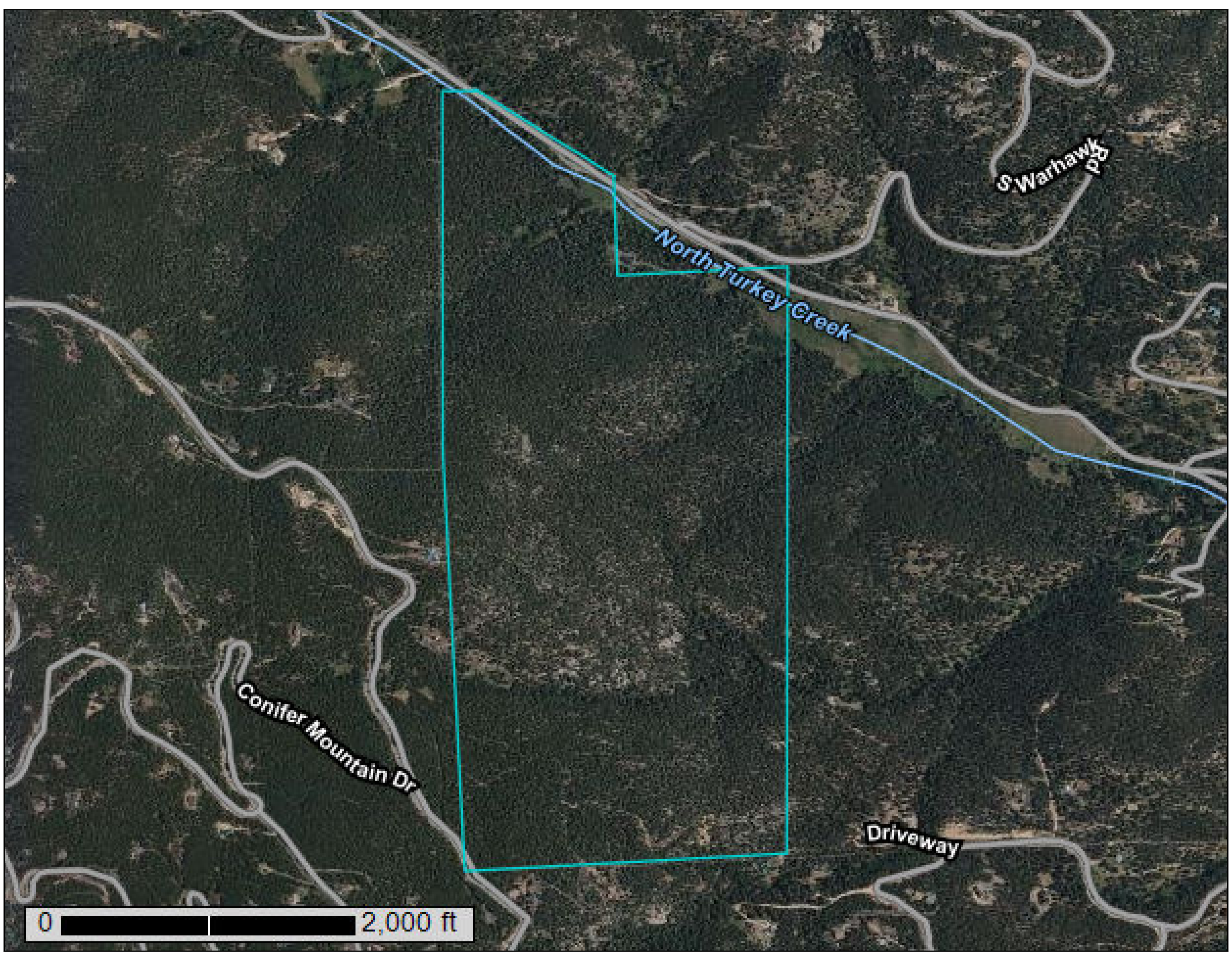
NRCS

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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Contents

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.

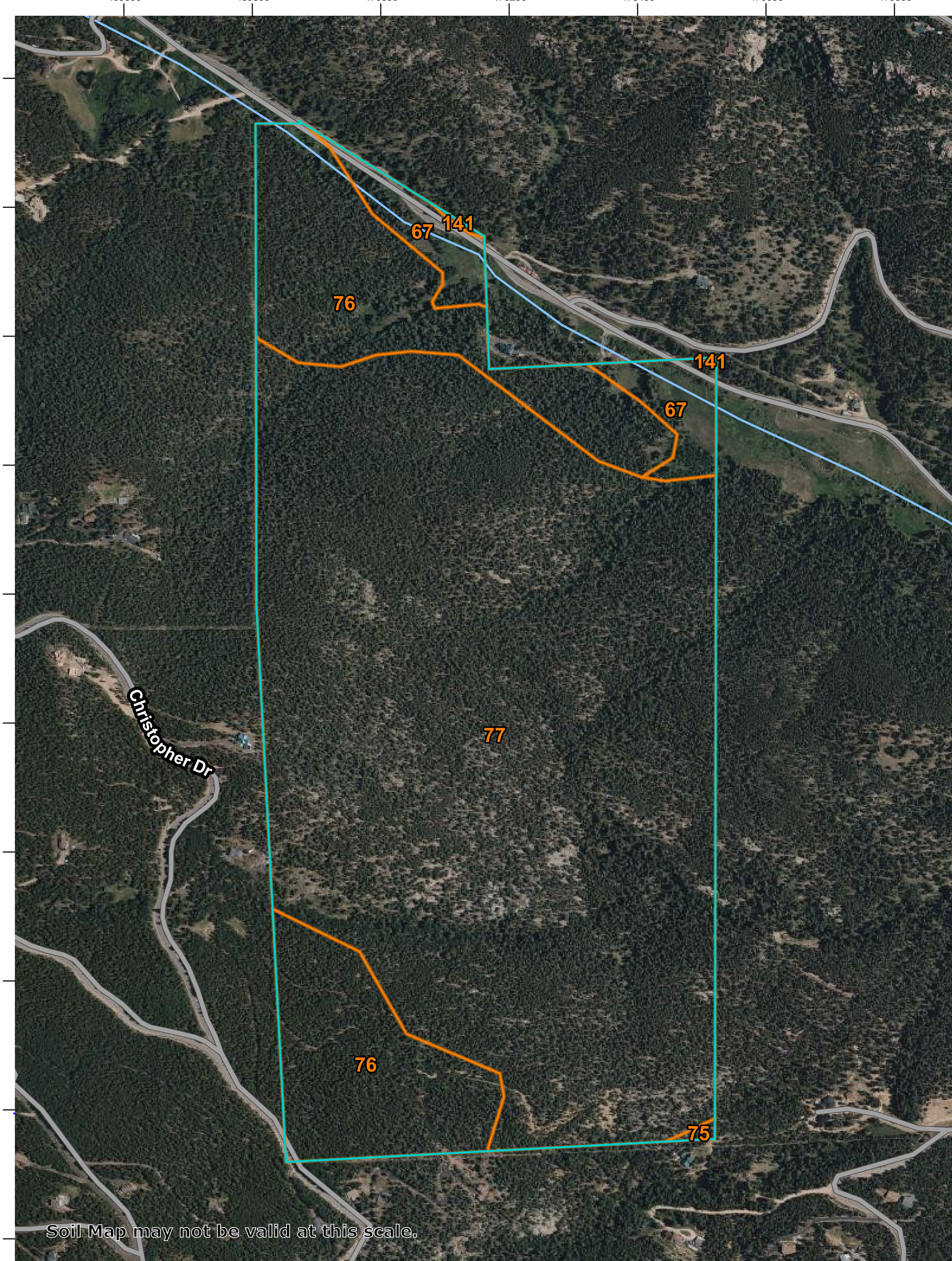
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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.

Soil Map (Shadow Mountain Bike Park)



Map Scale: 1:9,470 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 100, 200, 400, 600

Feet: 0, 450, 900, 1800, 2700

N

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

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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

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Computed } t_c = t_i + t_t$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$t_{minimum}$ = 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: 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
H2	4.01	B	2.00	0.01	0.01	0.07	0.26	0.34	0.44	0.54
D1	2.74	D	43.0	0.32	0.39	0.45	0.56	0.61	0.66	0.72
D2	3.61	B	31.0	0.21	0.24	0.31	0.44	0.50	0.57	0.65
OS	0.40	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54

Subcatchment Name	Overland (Initial) Flow Time: 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)
H1	230.00	8432.97	8390.54	0.184	10.97
H2	500.00	8405.21	8371.58	0.067	23.41
D1	300.00	8432.97	8389.33	0.145	9.24
D2	200.00	8379.40	8368.23	0.056	12.45
OS	200.00	8378.00	8369.00	0.045	16.91

Subcatchment Name	Channelized (Travel) Flow Time: 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)
H1	5.00			0.010	5	0.50	0.17
H2	5.00			0.010	2.5	0.25	0.33
D1	5.00			0.010	10	1.00	0.08
D2	185.00	8389.33	8379.40	0.054	20	4.63	0.67
OS	5.00			0.010	2.5	0.25	0.33

Subcatchment Name	Time of Concentration: Computed t_c (min)	Regional t_c (min)	Selected t_c (min)
H1	11.14	25.75	11.14
H2	23.75	25.75	23.75
D1	9.32	18.75	9.32
D2	13.12	21.73	13.12
OS	17.24	25.75	17.24

Subcatchment Name	Rainfall Intensity, I (in/hr): 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
H1	2.20	3.08	3.60		5.00	5.70	
H2	1.52	2.13	2.49		3.46	3.95	
D1	2.36	3.31	3.86		5.37	6.12	
D2	2.05	2.87	3.36		4.66	5.31	
OS	1.80	2.53	2.95		4.10	4.67	

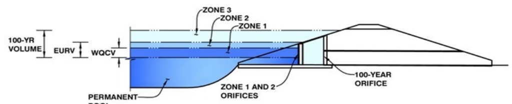
Subcatchment Name	Peak Flow, Q (cfs): 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
H1	0.06	0.43	1.45		5.52	7.68	
H2	0.05	0.10	0.73		4.71	6.89	
D1	2.09	3.49	4.74		8.90	11.06	
D2	1.57	2.49	3.72		8.43	10.93	
OS	0.01	0.01	0.09		0.56	0.81	

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
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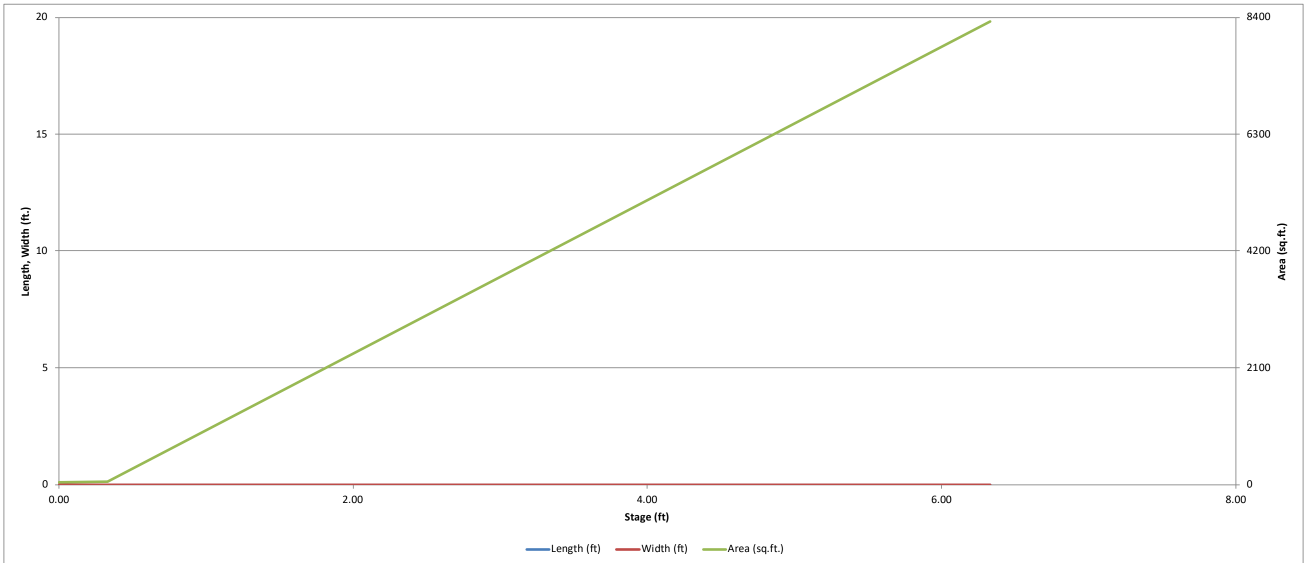
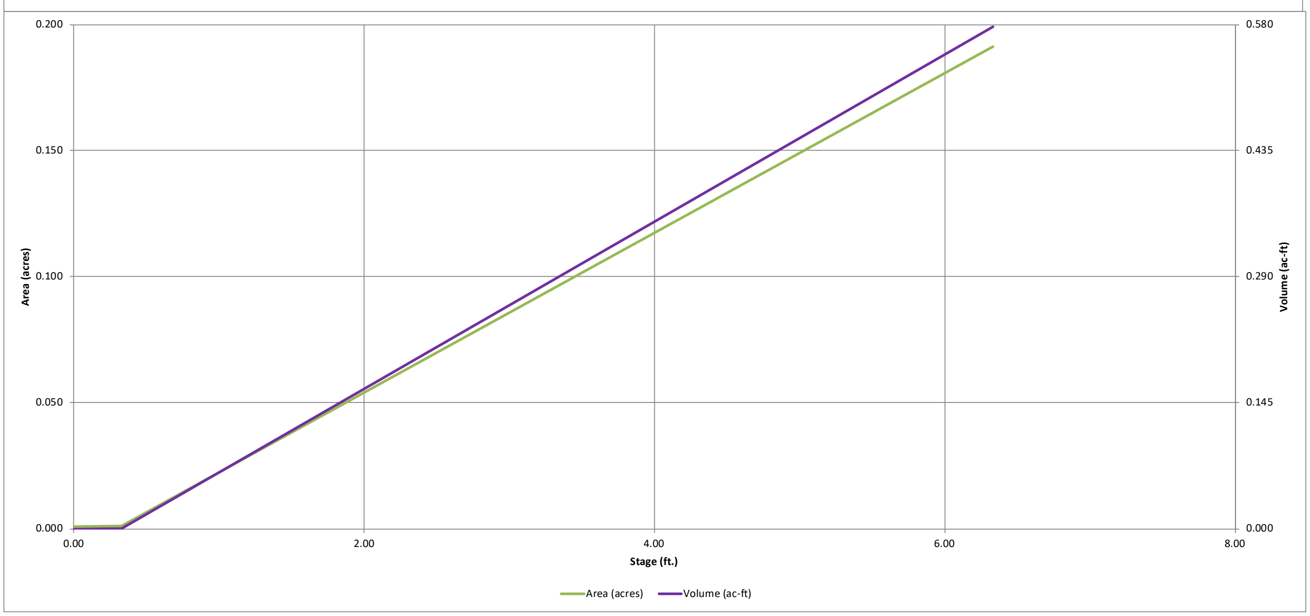
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

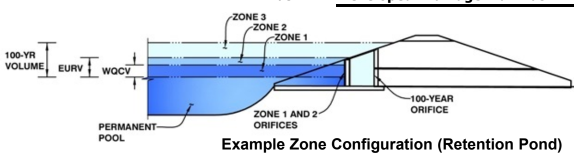




DETENTION BASIN OUTLET STRUCTURE DESIGN

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

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)
Depth at top of Zone using Orifice Plate =	2.75	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	11.00	inches
Orifice Plate: Orifice Area per Row =	0.37	sq. inches (diameter = 11/16 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =	2.569E-03	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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 Crest Length =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	0.60	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.29	feet
Stage at Top of Freeboard =	6.29	feet
Basin Area at Top of Freeboard =	0.19	acres
Basin Volume at Top of Freeboard =	0.57	acre-ft

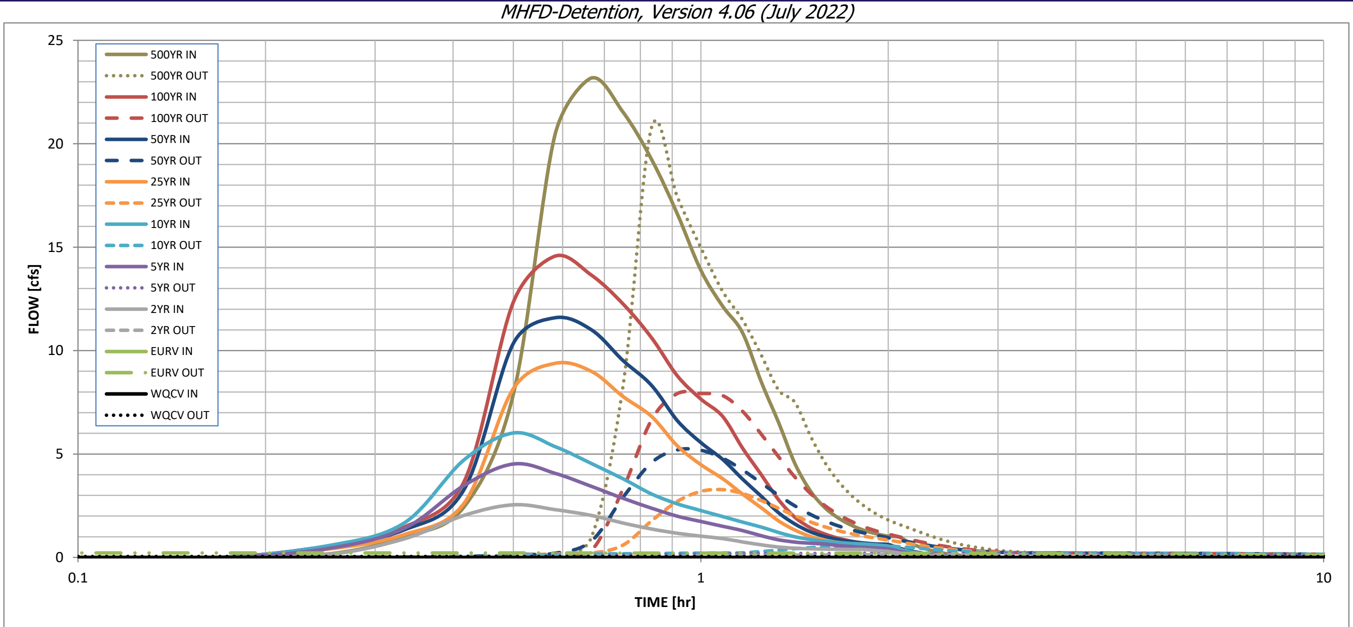
Routed Hydrograph Results

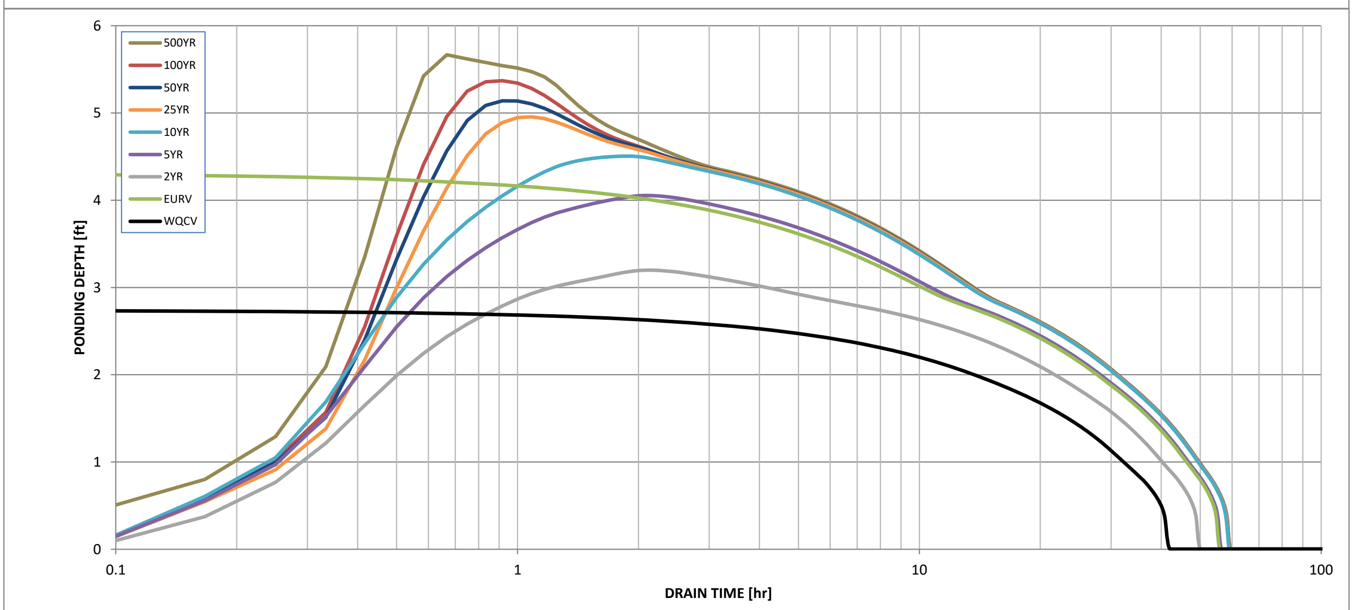
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

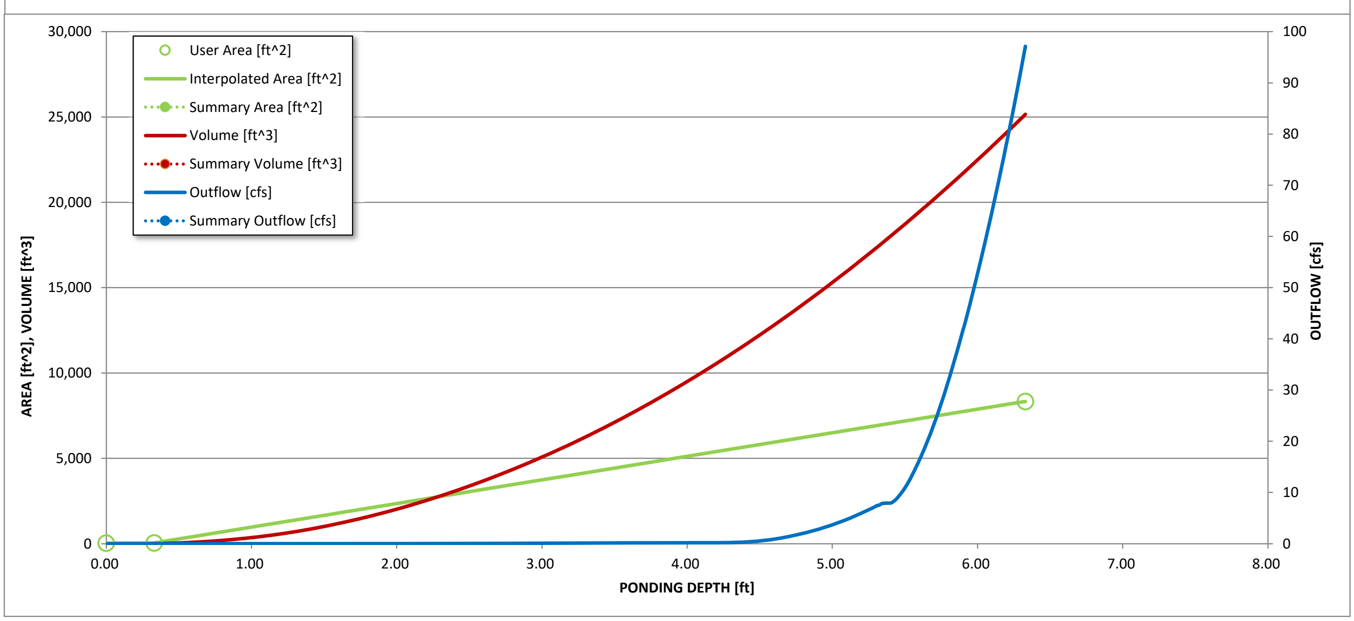
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.85	1.19	1.39	1.69	1.93	2.20	3.14
CUHP Runoff Volume (acre-ft) =	0.095	0.256	0.149	0.251	0.330	0.507	0.624	0.785	1.271
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.149	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

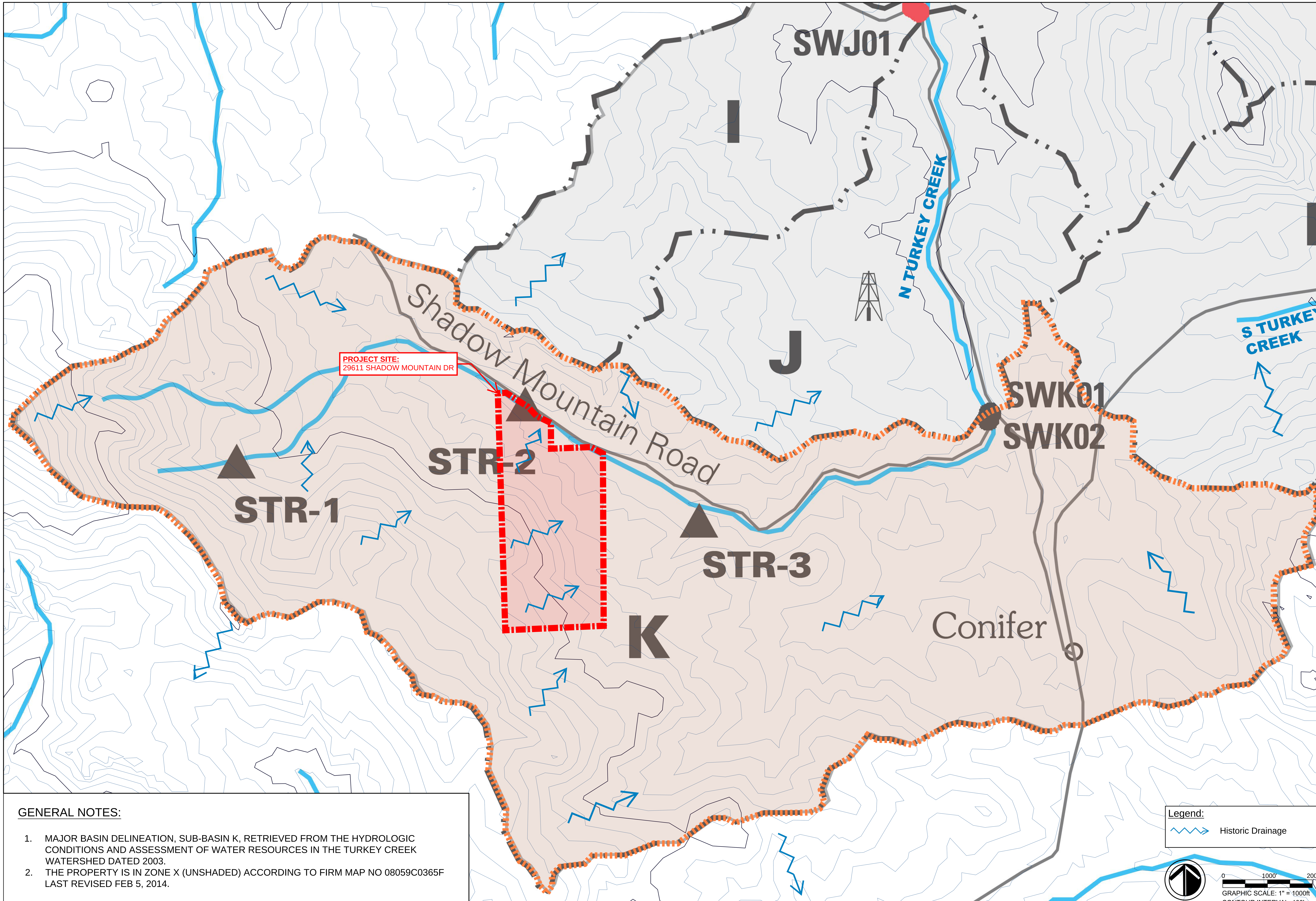
MHFD-Detention, Version 4.06 (July 2022)







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

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SHADOW MOUNTAIN BIKE PARK

CONIFER, COLORADO

Not For Construction

ISSUE

SCHEMATIC DESIGN

RELEASE DATE

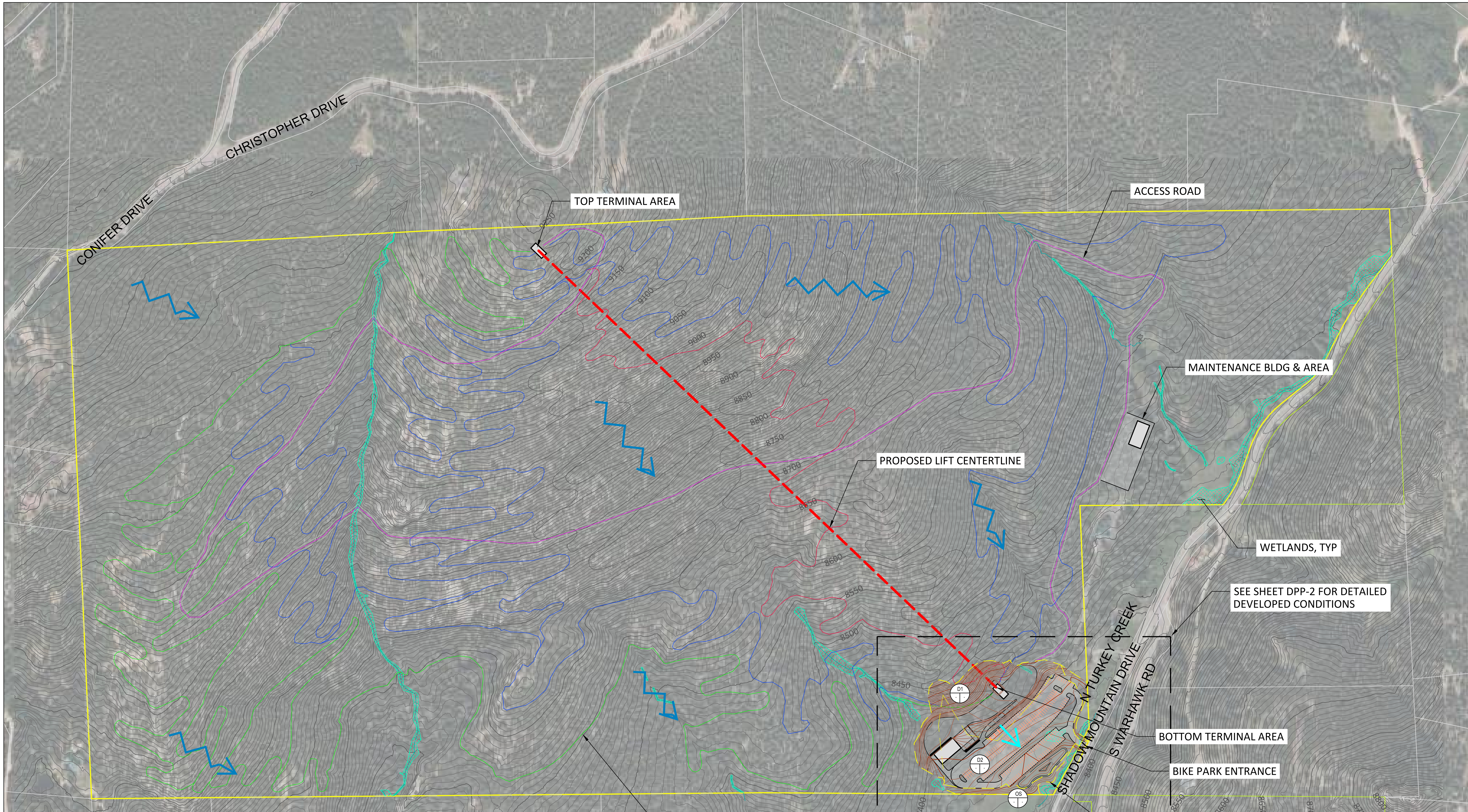
November 22

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.

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

DRAINAGE LEGEND:

- HISTORIC DRAINAGE
- DEVELOPED DRAINAGE
- DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN

0 200' 400'
GRAPHIC SCALE: 1" = 200ft
CONTOUR INTERVAL: 5'

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

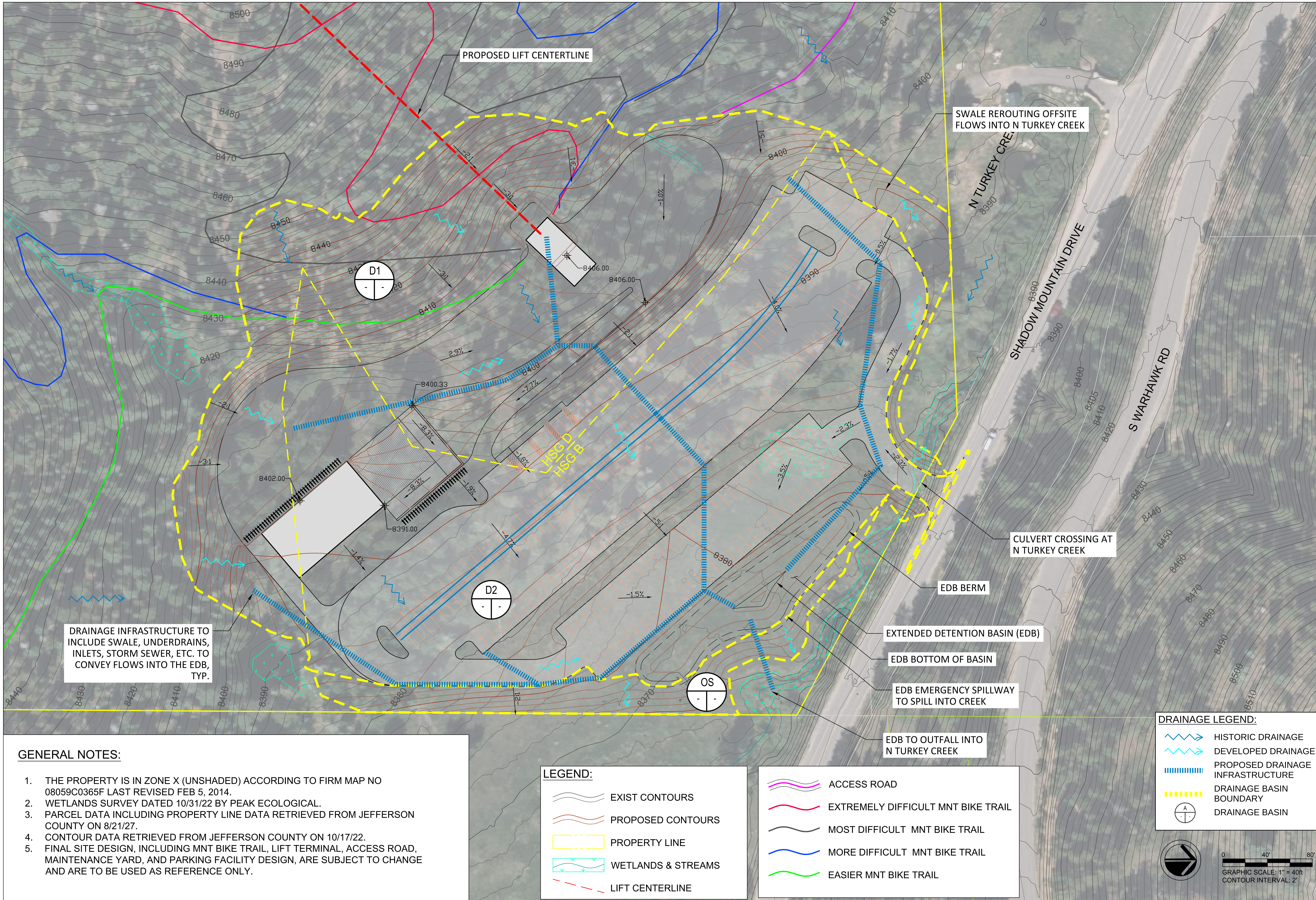
RELEASE DATE
November 22

REVISIONS

PROJECT NO.	22089001
MADE BY	OD
REVIEWED BY	OD

DEVELOPED DRAINAGE CONDITIONS

DPP-1



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.
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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

DRAINAGE LEGEND:

- HISTORIC DRAINAGE
- DEVELOPED DRAINAGE
- PROPOSED DRAINAGE INFRASTRUCTURE
- DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN

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

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SHADOW MOUNTAIN BIKE PARK

CONIFER, COLORADO

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ISSUE

SCHEMATIC DESIGN

RELEASE DATE
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REVISIONS

PROJECT NO.	22089001
MADE BY	OD
REVIEWED BY	OD

DEVELOPED DRAINAGE CONDITIONS

DPP-2

Shadow Mountain Bike Park Sensory Impact Assessment - Noise

Final Report

March 21, 2023

Prepared for:
SE Group
323 W Main St.
Frisco CO 80443

Prepared by:
Stantec Consulting Services Inc.
733 Marquette Avenue, Suite 1000
Minneapolis, MN 55402

Project Number:
195602713

Limitations and Sign-off

The conclusions in this report Titled Shadow Mountain Bike Park Sensory Impact Assessment – Noise, are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from SE Group (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

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Abbreviations

dB	Decibel
dBA	Decibel (A-weighted)
GA	Ground absorption
Hz	Hertz
ISO	International Standards Organization
L_{eq}	Equivalent continuous sound level
L_0	Sound level exceeded for 0% of the time
L_{10}	Sound level exceeded for 10% of the time
L_{25}	Sound level exceeded for 25% of the time
L_{50}	Sound level exceeded for 50% of the time
L_{90}	Sound level exceeded for 90% of the time
L_{max}	Maximum sound level
L_{min}	Minimum sound level
LDR	Land Development Regulations
SIA	Sensory Impact Assessment
SLM	Sound level meter
SMBP	Shadow Mountain Bike Park

Executive Summary

The SE Group has retained Stantec Consulting Services Inc. (Stantec) to complete a Sensory Impact Assessment (SIA) to evaluate noise impacts generated by the proposed Shadow Mountain Bike Park (SMBP). The proposed location of the SMBP is along Shadow Mountain Drive in Conifer, Jefferson County, Colorado (the Site). The proposed SMBP will consist of a downhill mountain bike park with lift services, 320 parking spaces, a day lodge building, and a maintenance building.

This SIA was completed in accordance with the requirements of the Jefferson County Colorado Land Development Regulation (LDR), amended December 6, 2022, which requires that proposed Developments not create sensory impacts including noise, odor, and visual impacts at nearby sensitive receptors such as parks, schools, or residentials buildings. The scope of this SIA is limited to the evaluation of the impacts of noise resulting from the operation of the proposed SMBP only.

Operational noise from the SMBP was modelled using CADNA/A acoustic modelling software (version 2021 MR2) published by Datakustik GmBH, configured to implement ISO-9613-2 environmental noise propagation algorithms. Operational noise sources from Stantec's database were used for this assessment as final equipment selections and final design of the SMBP have yet to be completed at the time of writing of this report.

Stantec recommends that this study be updated when final design of the SMBP is complete to validate the assumptions of this SIA.

Predicted sound levels indicate that the noise generated by the proposed SMBP at nearby noise sensitive areas and highest impacted/worst case property line locations is below the applicable daytime and nighttime noise limits for nearby residential receptors. The results of this SIA demonstrate that the SMBP is expected to comply with the Jefferson County LDR noise limits.

1 Introduction

The SE Group has retained Stantec Consulting Services Inc. (Stantec) to complete a Sensory Impact Assessment (SIA) to evaluate noise impacts generated by the Shadow Mountain Bike Park (SMBP). The proposed location of the SMBP is along Shadow Mountain Drive in Conifer, Jefferson County, Colorado (The Site). The proposed SMBP will consist of a downhill mountain bike park with lift services, 320 parking spaces, a day lodge building, and a maintenance building.

This SIA was prepared in accordance with Section 26 of the Jefferson County Land Development Regulations (LDR) amended December 6, 2022.

Figure A.1 included in **Appendix A** shows the location of the Site.

2 Noise Terminology

Sound is caused by vibrations that generate waves of minute pressure fluctuations in the surrounding air. Sound levels are measured using a logarithmic decibel (dB) scale. Human hearing varies in sensitivity for different sound frequencies, and the frequency sensitivity changes based on the overall sound level. The ear is most sensitive to sound at frequencies between 800 and 8,000 hertz (Hz) and is least sensitive to sound at frequencies below 400 Hz or above 12,500 Hz. Consequently, several different frequency weighting schemes have been used to approximate the way the human ear responds to various frequencies at different sound levels. The A-weighted decibel, or dBA, scale is the most widely used for regulatory requirements, as it discriminates against low frequency noise similar to the response of the human ear at the low to moderate sound levels typical of environmental sources. Sound levels without a frequency weighting applied, referred to as unweighted or linear, are generally reported as dB or dBZ.

The sound power level (PWL or L_w) of a noise source is the strength or intensity of noise that the source emits regardless of the environment in which it is placed. Sound power is a property of the source, and therefore is independent of distance. The radiating sound power then produces a sound pressure level (SPL or L_p) at a point of which human beings can perceive as audible sound. The sound pressure level is dependent on the acoustical environment (e.g., indoor, outdoor, absorption, reflections) and the distance from the noise source. Unless otherwise stated, sound levels in this report are sound pressure levels.

Numerous metrics and indices have been developed to quantify the temporal characteristics (changes over time) of community noise. The equivalent continuous sound level, L_{eq}, metric is the level of a hypothetical steady sound that would have the same energy as the fluctuating sound level over a defined period of time. The L_{eq} represents the time average of the fluctuating sound pressure level. The maximum and minimum sound levels, or L_{max} and L_{min}, are the loudest and quietest instantaneous sound levels occurring during a period of time. The L_{max} is particularly useful for evaluating loud, impulsive noise events.

Other statistical metrics useful to understanding environmental sound levels include the n-percent exceedance sound percentile levels, or L_n. This report includes the L_{25} metric, or the noise level that is exceeded 25% of the time and the L_0 which is the sound level exceeded 0% of the time. The L_0 can be considered equivalent to the L_{max} or maximum sound level. The L_{10} can be approximated as the sound level between L_{max} and L_{25}.

A change in sound levels of 3 decibels is generally considered to be the threshold of perception, whereas a change of 5 decibels is clearly perceptible, and a change of 10 decibels is perceived as a doubling or halving of loudness.

3 Facility Description

The proposed SMBP will consist of a four-passenger chairlift to transport guests and bikes to the top terminal area for gravity flow and downhill trails. The SMBP will operate during daytime hours, as defined by Section 26 of the Jefferson County LDR, between 7 a.m. to 7 p.m. The chairlift will require one terminal in the base area and the terminal area at the top of Shadow Mountain. Chairlift construction will require a 40-foot-wide corridor to accommodate the associated infrastructure. The corridor will be cleared during the construction phase of the project. The chairlift will require power at the bottom and top terminal areas as well as communication lines along the lift infrastructure.

The SMBP will provide approximately 16 miles of trails with varying levels of difficulty. Trails will be constructed of earth, wood, steel, and other materials. All trails will be setback a minimum of 50 feet from property lines.

Parking for approximately 300 guest vehicles will be provided near the base area using the access road along Shadow Mountain Drive. A day lodge will be constructed in the base area of the SMBP 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 will be handled by an onsite wastewater system.

There will be no permanent kitchen space in the day lodge. To address the food and beverage needs of guests, food truck vendors will be brought on site during operational hours.

A maintenance building will be constructed along the maintenance access road for facility operations. Parking for approximately 20 employees will be provided adjacent to the maintenance building.

4 Noise Sources

Based on the facility description, the primary sources of noise from the SMBP are assumed to be the following:

- Chairlift terminals at the base area and top of Shadow Mountain.
- HVAC equipment at the day lodge, maintenance building, and chairlift buildings.
- Vehicle noise from movements in the parking lot.
- Vehicle noise along the maintenance road from the maintenance shop to the mountain top.
- Speakers near the day lodge outside dining area.
- A food truck idling adjacent to the day lodge.

The primary noise sources expected to operate at the proposed SMBP are consistent with the definition of steady state or quasi steady state impulsive sound. Steady state or quasi steady state impulsive sound can generally be defined as a sequence of impulsive sound emitted from the same source having a time interval of less than 0.5 seconds between successive impulsive sounds. Impulsive sound can be generally defined as a single pressure pulse or a single burst of pressure pulses with a time interval of equal or greater than 0.5 seconds. Examples of impulsive sound can include dump truck gate banging or impact pile driver operation.

Other potential sources of noise on site such as human or electric powered mountain bikes travelling along the proposed SMBP trails or noise along the chairlift line are assumed to have an insignificant impact to nearby sensitive noise receptors.

5 Noise Sensitive Areas

Noise sensitive areas (NSAs) were identified around the SMBP based on a review of satellite imagery and zoning. Thirteen NSA locations were selected to evaluate the noise impact from steady state noise SMBP sources at residences. Five (5) additional locations were selected near the property lines of the Site as representative worst-case locations. Property line locations were assessed 25 feet from the property limits of the proposed SMBP consistent with the evaluation requirements of the Jefferson County LDR. A summary of NSAs is provided in **Table 5.1**. A location map of NSAs is included as **Figure A.2** in **Appendix A**. A zoning map for the area surrounding the site is included as **Figure A.3** in **Appendix A.**

Table 5.1: Noise Sensitive Location Summary

Noise Sensitive Area ID	Description and Approximate Street Address[1]	UTM NAD 83 Coordinates		
		Zone	Easting	Northing
NSA01	Residence at 30812 Shadow Mountain Drive	13S	469462	4376303
NSA02	Residence at 10188 Christopher Drive	13S	469795	4375463
NSA03	Residence at 10178 Christopher Drive	13S	469781	4375299
NSA04	Residence at 10218 Christopher Drive	13S	469621	4375781
NSA05	Residence at 29795 Kennedy Gulch Road	13S	470473	4374826
NSA06	Residence at 30241 Shadow Mountain Drive	13S	470491	4376172
NSA07	Residence at 29611 Shadow Mountain Drive	13S	470742	4375981
NSA08	Residence at 29365 Kennedy Gulch Road	13S	471070	4375165
NSA09	Residence at 30772 Shadow Mountain Drive	13S	469711	4376453
NSA10	Residence at 30192 Shadow Mountain Drive	13S	470205	4376076
NSA11	Residence at 29455 Kennedy Gulch Road	13S	470684	4374893
NSA12	Residence at 29405 Kennedy Gulch Road	13S	470988	4374980
NSA13	Residence at 29152 Shadow Mountain Drive	13S	471269	4375568
NSA14	25 ft. from West Property Line	13S	469810	4375391
NSA15	25 ft. from North Property Line	13S	470170	4376056
NSA16[2]	50 ft. from Northeast Property Line	13S	470456	4376057
NSA17	25 ft. from East Property Line	13S	470525	4375820
NSA18	25 ft. from East Property Line	13S	470523	4375937

[1] All residences conservatively assumed to be two-story residences. Property line assessment height assumed to be one story.

[2] NSA16 has been assessed at approximately 50 ft. from the northeast property line as 25 ft. from the northeast property line is in the center of Shadow Mountain Drive within the public right-of-way. The assessment point at 50 ft. from the northeast property line is located along a pathway which is more representative of a noise sensitive assessment location.

6 Assessment Criteria

The December 6, 2022, revision of the Jefferson County, Colorado LDR regulates the development of lands in the County with consideration given to protecting land, environment, and natural resources. Section 26 of the LDR regulates sensory impacts from a Development which can include noise, odor, and visual impacts. This assessment is limited to assessing the noise impact of the proposed SMBP.

The applicable criteria for the project under Section 4, Subsection A is:

> *"Noise generated from the proposed development shall not exceed the dBA levels set forth in Section 25-12-103, C.R.S. or as may be amended from time to time. The dBA levels are depicted in the dBA Table: (reloc. 7-12-05; am. 4-4-06)"*

The table referenced in the LDR is provided as **Table 6.1**.

Table 6.1: Jefferson County LDR Noise Criteria[1]

dBA Table					
Time	**7 a.m. to 7 p.m.**	**7 a.m. to 7 p.m.**	**7 a.m. to 7 p.m.**	**7 p.m. to 7 a.m.**	**7 p.m. to 7 a.m.**
Frequency	**L_{25}**	**L_0**	**Periodic/Impulsive**	**L_0**	**Periodic/Impulsive**
Park/School, Residential	55	65	50	50	45
Commercial	60	70	55	55	50
Light Industrial	70	80	65	65	60
Industrial	80	90	75	75	70

[1] Source Jefferson County Colorado Land Development Regulation December 2022

The area surrounding the proposed SMBP is zoned primarily residential or agricultural with existing residences. Stantec has adopted the steady state (i.e., non-periodic/impulsive) noise limits for residential areas and property line evaluation locations for this assessment. The applicable limits for residential areas are L_{25} of 55 dBA or L_0 of 65 dBA during daytime hours and L_0 of 50 dBA during nighttime hours for steady state noise sources measured 25 ft. from the property limits of the SMBP.

The SMBP is not expected to have any significant sources of periodic or impulsive noise and operations will be limited to daytime hours only, with the exception of HVAC units. The L_{10} noise level of a noise source can typically be estimated by adding 3 dBA to the LA_{eq} noise level[1] and, by definition, the L_{25} noise level for a piece of equipment will be lower than the L_{10} noise level. For this study, the L_{25} noise level was conservatively estimated by adding a 3 dBA correction factor to modelled LA_{eq} noise levels. The L_0 noise level, which is higher than both the L_{10} and L_{25}, was conservatively estimated by adding a 6 dBA correction factor to modelled LA_{eq} noise levels.

[1] Federal Highway Administration Roadway Construction Noise Model (RCNM) User's Guide. January 2006.

7 Methodology

7.1 Operational Noise Analysis

The proposed SMBP will include several sources of steady state noise as described in **Section 4**. As final equipment selections have not been completed at the time of writing of this report, Stantec has selected representative sound power levels to model the predicted impact of the SMBP.

The representative equipment sound power levels used in the analysis are summarized in **Table 7.1.**

Table 7.1: Equipment Sound Power Levels

Equipment Type	Type	Octave Band Sound Power Level (dB)									Total Sound Power Level (dBA)
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	
Chair Lift Terminal	Leq	73	78	93	90	93	88	96	83	78	98
Vehicle Passby	Lmax	64	59	65	58	55	54	50	45	40	90
HVAC Unit	Leq	85	86	82	78	76	73	69	64	56	78
Truck Idle	Leq	30	94	96	94	88	85	81	78	74	91
Speaker	Leq	86	93	91	86	90	95	91	87	81	98

Table 7.2 summarizes the modelling assumptions used for equipment quantities, operating parameters including speed and operating time, and other modelling parameters.

Table 7.2: Modelling Assumption Summary

Equipment Type	Quantity	Operation Time	Operational Notes
Chair Lift Terminal	2	7 a.m. to 7 p.m.	Operations at the top terminal area and at the base terminal area. Operating continuously during daytime hours only. Top terminal area to be located 150 ft. from west property line.
Transport Truck	1	7 a.m. to 7 p.m.	One truck per hour along the maintenance road connecting the top terminal to the maintenance building. Speed assumed to be 10 mph and operating during daytime hours only.
HVAC Unit	6	24-hour operation	One HVAC unit at the top terminal chairlift, one at the bottom terminal chairlift, two at the day lodge building, and two at the maintenance building. All operating continuously over a 24-hour period
Truck Idle	1	7 a.m. to 7 p.m.	One food truck idling along the southwest side of the lodge building operating continuously during daytime hours only.
Speaker	1	7 a.m. to 7 p.m.	One speaker adjacent to the outdoor seating area at the southwest side of the lodge building operating continuously during daytime hours only
Vehicle Parking Noise	241	7 a.m. to 7 p.m.	A worst case 241 vehicles per hour entering and exiting the site in the parking lot area has been assumed.

Noise modeling was completed using the Datakustik CadnaA environmental noise modeling software. The operational noise modeling followed typical modeling standards, input parameters, and assumptions, namely:

- The ISO 9613-2 standard[2] algorithm for outdoor sound propagation was used.
- Ground absorption factor of G=0.8 was used.
- Ground elevations were included in the model using equal height contour lines.
- Meteorology parameters were set to 10 degrees Celsius and 70 percent relative humidity.
- Receptor height of 4.5 m (15 ft.) to be representative of a two-storey residence.
- No sound attenuation from vegetation (foliage) to simulate a worst-case condition when leaves have fallen off trees.
- Meteorological conditions are conducive to sound propagation with all receptors located downwind of all noise sources.

[2] ISO 9613-2: 1996. Acoustics – Attenuation of sound during propagation outdoors. Part 2: General method of calculation.

7.2 Construction Noise Assessment

Construction activities related to the Development of the proposed SMBP will occur in phases and generally consist of site preparation including tree clearing and road construction, installation of the chair lift, construction of the lodge, and installation of utilities. Construction activities will typically be limited to daytime only.

In accordance with the Jefferson County Regulatory Policy – Noise Abatement adopted April 24, 2007 ("*Policy No. Part 3, Regulations, Chapter 1, Noise, Section 1")* construction activities are subject to the noise limits summarized in **Table 7.3**.

Table 7.3: Construction Noise Limits

Time Period	Limits[1]
7 a.m. to 7 p.m.	80 dB(A)
7 p.m. to 7 a.m.	75 dB(A)

[1] Noise limits are applicable 25 ft. from the property line of the Development.

At this stage of the proposed SMBP development, detailed construction phasing including equipment selections and timelines have not been finalized. In general, noise impacts from construction equipment will vary by type, age of equipment, overall condition, and operators. During construction of the proposed SMBP, noise from construction activities may be audible at nearby sensitive receptors; however, not all construction equipment required for the construction of the SMBP will be operating at the same time. Additionally, activities will be spread across the Project area and be temporary in duration which will reduce the overall noise impact of construction activities.

The minimum setback distance of noise sensitive areas identified in **Section 5** is approximately 200 feet from major project components such as the chairlift, parking lot, and day lodge. A summary of representative noise levels for anticipated construction equipment is provided in Table 7.4 at 50 ft. Maximum sound levels from equipment is expected to below the applicable construction noise limits identified in **Table 7.3**; however, Stantec recommends that the construction equipment list and setback distances be reviewed and confirmed prior to construction.

Table 7.4: Construction Equipment Noise Levels[1]

Equipment	Noise Level at 50 feet from Source (dBA L_{max})	Noise Level at 200 feet from Source (dBA L_{max})
Bulldozer	85	73
Crane	85	73
Chainsaw	85	73
Excavator	81	69
Front end loader	79	67
Concrete batch plant	83	71
Drill Rig Truck	79	67

Equipment	Noise Level at 50 feet from Source (dBA L_{max})	Noise Level at 200 feet from Source (dBA L_{max})
Grader	85	73
Haul/Dump Truck	84	72
Flat Bed Truck	74	62
Pneumatic Tools	85	73
Backhoe	80	68

[1] Source: Federal Highway Administration Roadway Construction Noise Model (RCNM) User's Guide. January 2006.

7.2.1 Construction Noise Mitigation

Construction noise is typically mitigated by implementing best practices such as ensuring construction equipment and associated mufflers are in good working order, limiting the loudest construction activities to daytime hours, using alternative quieter construction methods and/or scheduling work to minimize concurrent use of the loudest equipment, and establishing a noise complaint resolution process. Placement of noise barriers around work sites can be considered for activities in the near vicinity of noise-sensitive land uses.

8 Operational Noise Assessment

Operational noise modelling was completed for the proposed SMBP with the modelling assumptions and methodology outlined in **Section 7.1**. With the exception of HVAC equipment, on-site noise sources will operate during daytime hours only. Due to the varying nature of vehicle passbys as they travel along a modelled path, Stantec has conservatively evaluated vehicle passbys using the LA_0 noise metric. As all other sources of noise are stationary, they have been evaluated using the LA_{25} noise metric.

Predicted project-generated noise levels at the noise sensitive areas and property lines are summarized in **Table 8.1** and **Table 8.2** for stationary noise sources. Predicted project-generated noise levels at the noise sensitive areas and representative property line locations are summarized in **Table 8.3** for mobile noise sources. Mobile noise source impacts were evaluated as a result of vehicle passbys along the maintenance road and parking lot. The LA_{25} is the noise level exceeded 25 percent of the time and the LA_0 is the maximum noise level.

Table 8.1: Noise Impact Summary Table – LA_{25} Stationary Noise Sources

Noise Sensitive Area ID	Description	Daytime Project Noise Level (LA_{25} dBA)[1]	Nighttime Project Noise Level (LA_{25} dBA)[1]	Day Limit (LA_{25} dBA)[1]	Night Limit (LA_{25} dBA)[1]	Complies with Limits?
NSA01	Residence at 30812 Shadow Mountain Drive	25	13	55	-	Yes
NSA02	Residence at 10188 Christopher Drive	50	31	55	-	Yes
NSA03	Residence at 10178 Christopher Drive	41	24	55	-	Yes
NSA04	Residence at 10218 Christopher Drive	32	20	55	-	Yes
NSA05	Residence at 29795 Kennedy Gulch Road	22	10	55	-	Yes
NSA06	Residence at 30241 Shadow Mountain Drive	45	27	55	-	Yes
NSA07	Residence at 29611 Shadow Mountain Drive	40	23	55	-	Yes
NSA08	Residence at 29365 Kennedy Gulch Road	27	13	55	-	Yes
NSA09	Residence at 30772 Shadow Mountain Drive	31	20	55	-	Yes
NSA10	Residence at 30192 Shadow Mountain Drive	45	33	55	-	Yes
NSA11	Residence at 29455 Kennedy Gulch Road	27	14	55	-	Yes
NSA12	Residence at 29405 Kennedy Gulch Road	26	12	55	-	Yes
NSA13	Residence at 29152 Shadow Mountain Drive	31	16	55	-	Yes
NSA14	25 ft. from West Property Line	55	36	55	-	Yes
NSA15	25 ft. from North Property Line	44	34	55	-	Yes
NSA16	50 ft. from Northeast Property Line	53	32	55	-	Yes
NSA17	25 ft. from East Property Line	50	31	55	-	Yes
NSA18	25 ft. from East Property Line	53	31	55	-	Yes

[1] LA_{25} estimated based on LA_{eq} sound level with +3 dBA correction factor.

Table 8.2: Noise Impact Summary Table – LA_0 Stationary Noise Sources

Noise Sensitive Area ID	Description	Daytime Project Noise Level (LA_0 dBA)[1]	Nighttime Project Noise Level (LA_0 dBA)[1]	Day Limit (LA_0 dBA)[1]	Night Limit (LA_0 dBA)[1]	Complies with Limits?
NSA01	Residence at 30812 Shadow Mountain Drive	27	16	65	50	Yes
NSA02	Residence at 10188 Christopher Drive	53	34	65	50	Yes
NSA03	Residence at 10178 Christopher Drive	44	27	65	50	Yes
NSA04	Residence at 10218 Christopher Drive	34	23	65	50	Yes
NSA05	Residence at 29795 Kennedy Gulch Road	24	12	65	50	Yes
NSA06	Residence at 30241 Shadow Mountain Drive	48	30	65	50	Yes
NSA07	Residence at 29611 Shadow Mountain Drive	43	26	65	50	Yes
NSA08	Residence at 29365 Kennedy Gulch Road	30	15	65	50	Yes
NSA09	Residence at 30772 Shadow Mountain Drive	34	23	65	50	Yes
NSA10	Residence at 30192 Shadow Mountain Drive	48	36	65	50	Yes
NSA11	Residence at 29455 Kennedy Gulch Road	29	15	65	50	Yes
NSA12	Residence at 29405 Kennedy Gulch Road	29	14	65	50	Yes
NSA13	Residence at 29152 Shadow Mountain Drive	33	18	65	50	Yes
NSA14	25 ft. from West Property Line	58	38	65	50	Yes
NSA15	25 ft. from North Property Line	46	36	65	50	Yes
NSA16	50 ft. from Northeast Property Line	54	35	65	50	Yes
NSA17	25 ft. from East Property Line	53	34	65	50	Yes
NSA18	25 ft. from East Property Line	54	34	65	50	Yes

[1] LA_0 estimated based on LA_{eq} sound level with +6 dBA correction factor.

Table 8.3: Noise Impact Summary Table – LA_0 Mobile Noise Sources

Noise Sensitive Area ID	Description	Daytime Project Noise Level (LA_0 dBA)[1]	Nighttime Project Noise Level (LA_0 dBA)[1]	Day Limit (LA_0 dBA)[1]	Night Limit (LA_0 dBA)[1]	Complies with Limits?
NSA01	Residence at 30812 Shadow Mountain Drive	20	-	65	50	Yes
NSA02	Residence at 10188 Christopher Drive	49	-	65	50	Yes
NSA03	Residence at 10178 Christopher Drive	39	-	65	50	Yes
NSA04	Residence at 10218 Christopher Drive	28	-	65	50	Yes
NSA05	Residence at 29795 Kennedy Gulch Road	27	-	65	50	Yes
NSA06	Residence at 30241 Shadow Mountain Drive	35	-	65	50	Yes
NSA07	Residence at 29611 Shadow Mountain Drive	31	-	65	50	Yes
NSA08	Residence at 29365 Kennedy Gulch Road	19	-	65	50	Yes
NSA09	Residence at 30772 Shadow Mountain Drive	27	-	65	50	Yes
NSA10	Residence at 30192 Shadow Mountain Drive	46	-	65	50	Yes
NSA11	Residence at 29455 Kennedy Gulch Road	26	-	65	50	Yes
NSA12	Residence at 29405 Kennedy Gulch Road	20	-	65	50	Yes
NSA13	Residence at 29152 Shadow Mountain Drive	20	-	65	50	Yes
NSA14	25 ft. from West Property Line	52	-	65	50	Yes
NSA15	25 ft. from North Property Line	56	-	65	50	Yes
NSA16	50 ft. from Northeast Property Line	56	-	65	50	Yes
NSA17	25 ft. from East Property Line	38	-	65	50	Yes
NSA18	25 ft. from East Property Line	54	-	65	50	Yes

[1] LA_0 estimated based on LA_{eq} sound level with +6 dBA correction factor.

The above tables demonstrate that Project sound levels are predicted to be below the applicable daytime and nighttime noise criteria at all nearby existing sensitive receptors and 25 feet from the property line of the SMBP for NSA14, NSA15, NSA17, and NSA18.

The noise level at NSA16, representing the northeast property line, was assessed using a setback distance of 50 ft. rather than 25 ft. The location that is 25 ft. from the property line is situated at the center of Shadow Mountain Drive, which is not a noise sensitive location. The 50 ft. setback distance situates NSA16 along the pathway on the north side of Shadow Mountain drive which is a more representative noise sensitive location.

Stationary sound level contours at 15 feet above ground are presented in **Figure A.4** and **Figure A.5** for LA_{25} noise levels and **Figure A.6** and **Figure A.7** for L_0 noise levels in **Appendix A**. Mobile sound level contours at 15 ft above ground from vehicle passbys are presented as **Figure A.8** in **Appendix A**. The sound level contours illustrate how sound is expected to propagate in the area surrounding the Project and account for the effects of local site topography. The sound level contours further show that Project noise levels are below the applicable limits at nearby receptors and at locations 25 feet from the property line of the proposed SMBP.

9 Conclusion

This sensory impact assessment was completed to evaluate the noise impact of the proposed Shadow Mountain Bike Park the Jefferson County Land Development Regulations. An operational noise model was developed and used to predict the noise impacts of proposed equipment on the Site.

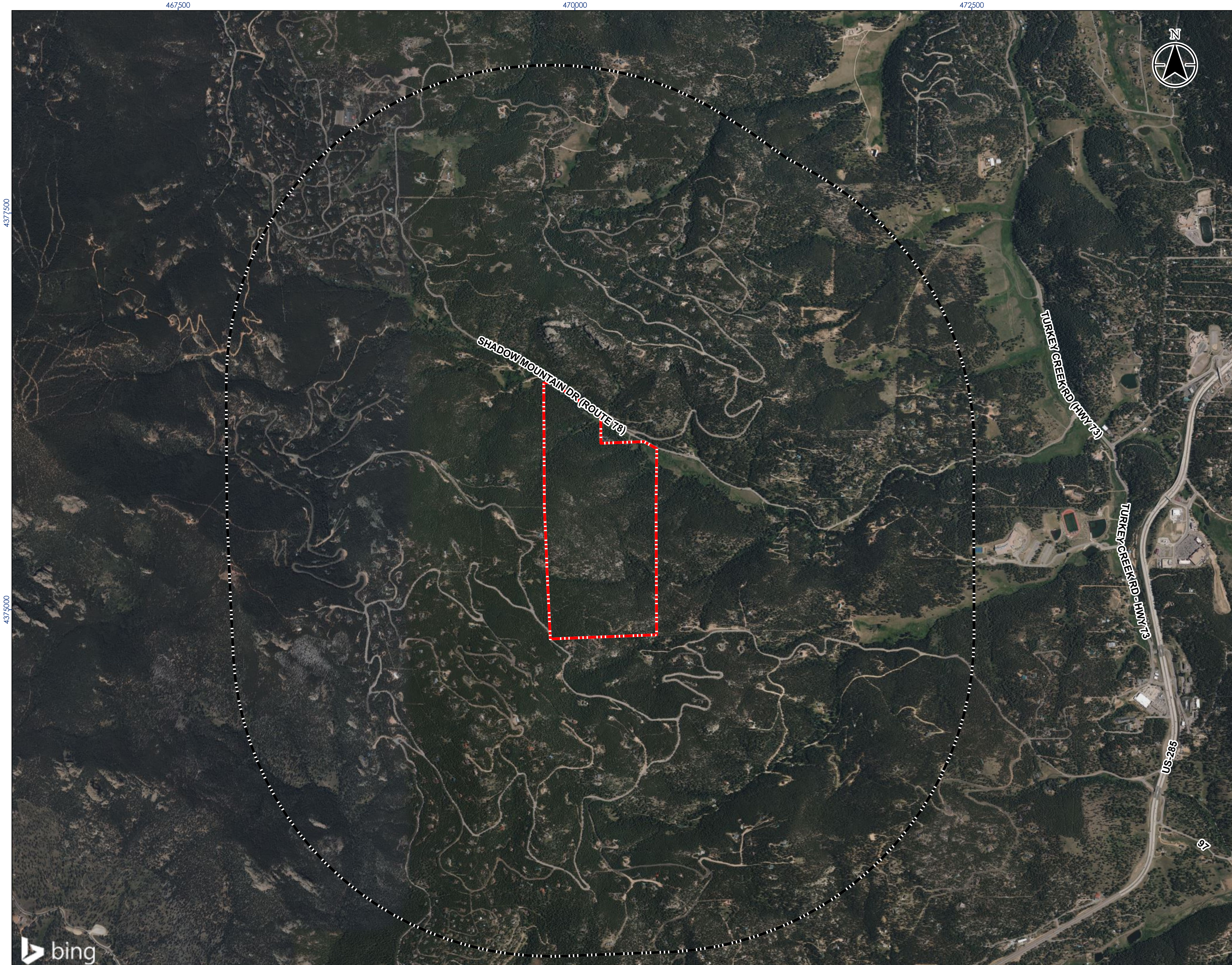
The results of the noise modelling for operational noise predict that noise levels at the nearby sensitive noise receivers will comply with the Jefferson County requirements.

Additionally, construction noise impacts from equipment predicted to be required for the construction of the Shadow Mountain Bike Park are expected to be below the applicable construction noise limits.

This assessment was completed using the preliminary site layout and equipment locations provided by the SE group. Locations of equipment and equipment selection may change and additional construction equipment, not considered in this assessment, such as impact pile drivers may be required during construction. Stantec recommends that this study be updated when final design is completed to evaluate compliance with applicable noise criteria and validate the assumptions made for this assessment.

Appendices

Appendix A Figures



Stantec

Legend

Site Limits

Site Limits (2km buffer)

0 0.5 1 km

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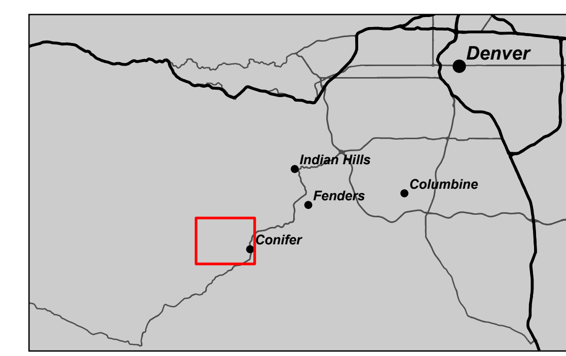


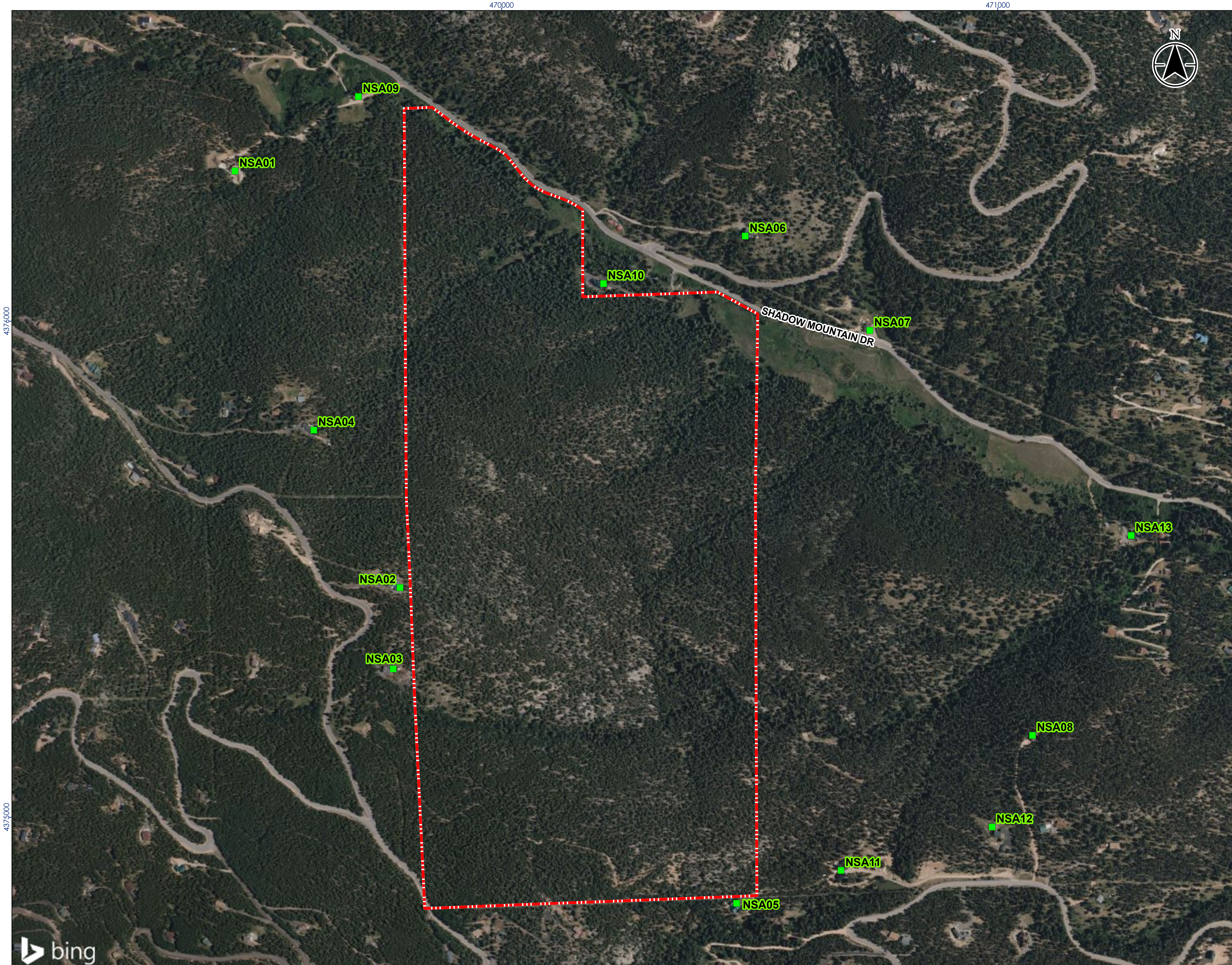
Project Location
Jefferson County, CO

181711248 REVA
Prepared by MDA on 2024-03-20
Technical Review by BCC on 2023-11-30

Client/Project
SE Group
Shadow Mountain Sensory Impact Study - Noise

Figure No.
A.1

Title
Site Plan



Legend
- Site Limits
- Noise Receptor

0 250 500 m

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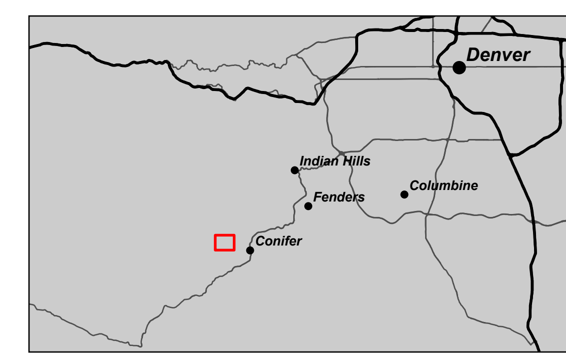


Project Location
Jefferson County, CO

181711248 REVA
Prepared by MDA on 2024-03-20
Technical Review by BCC on 2023-11-30

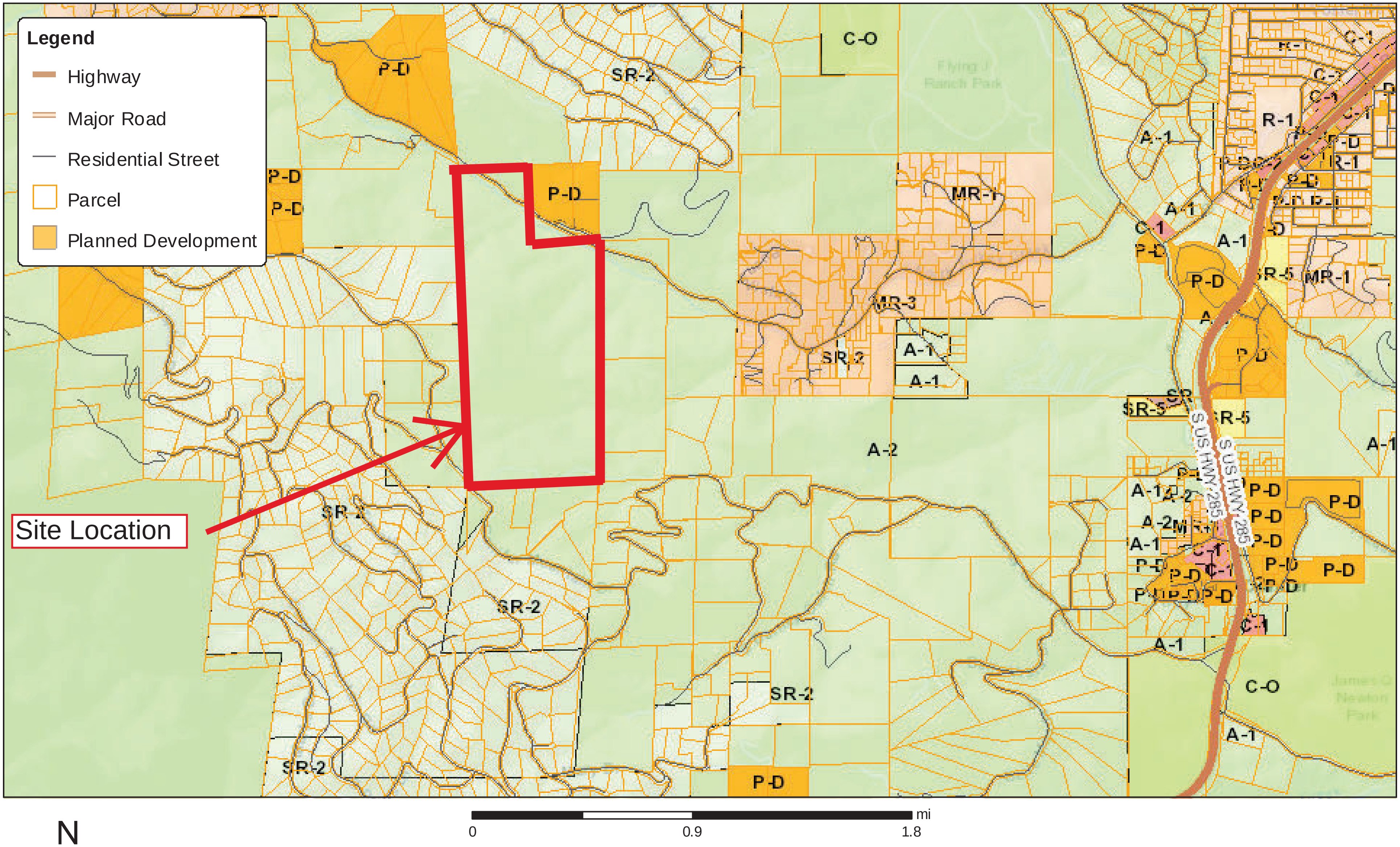
Client/Project
SE Group
Shadow Mountain Sensory Impact Study - Noise

Figure No.
A.2

Title
Noise Source Plan

Revised: 2024-03-20 By: malcazeren

Jefferson County, Colorado



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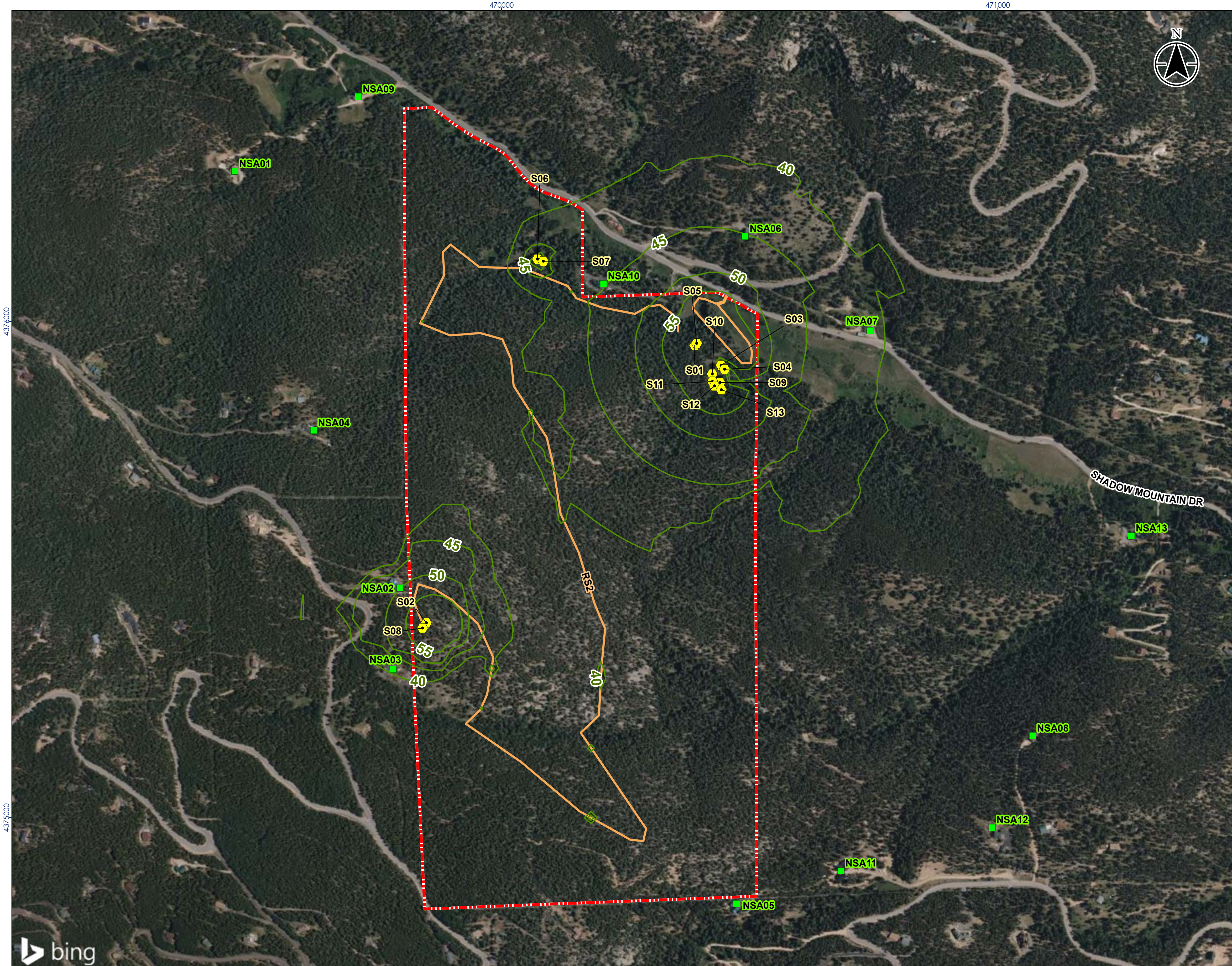
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Author: ArcGIS Web AppBuilder
Date: 11/27/2023

Figure A.3 Zoning Map



Stantec

Legend

- Site Limit
- Noise Receptor
- Point Source
- Line Source
- Daytime Noise Contour 4.5m (15ft.) AG

0 250 500 m

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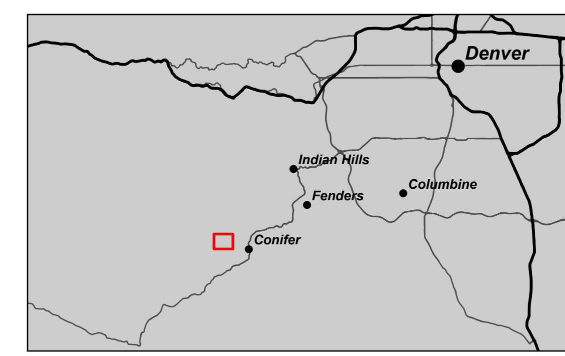


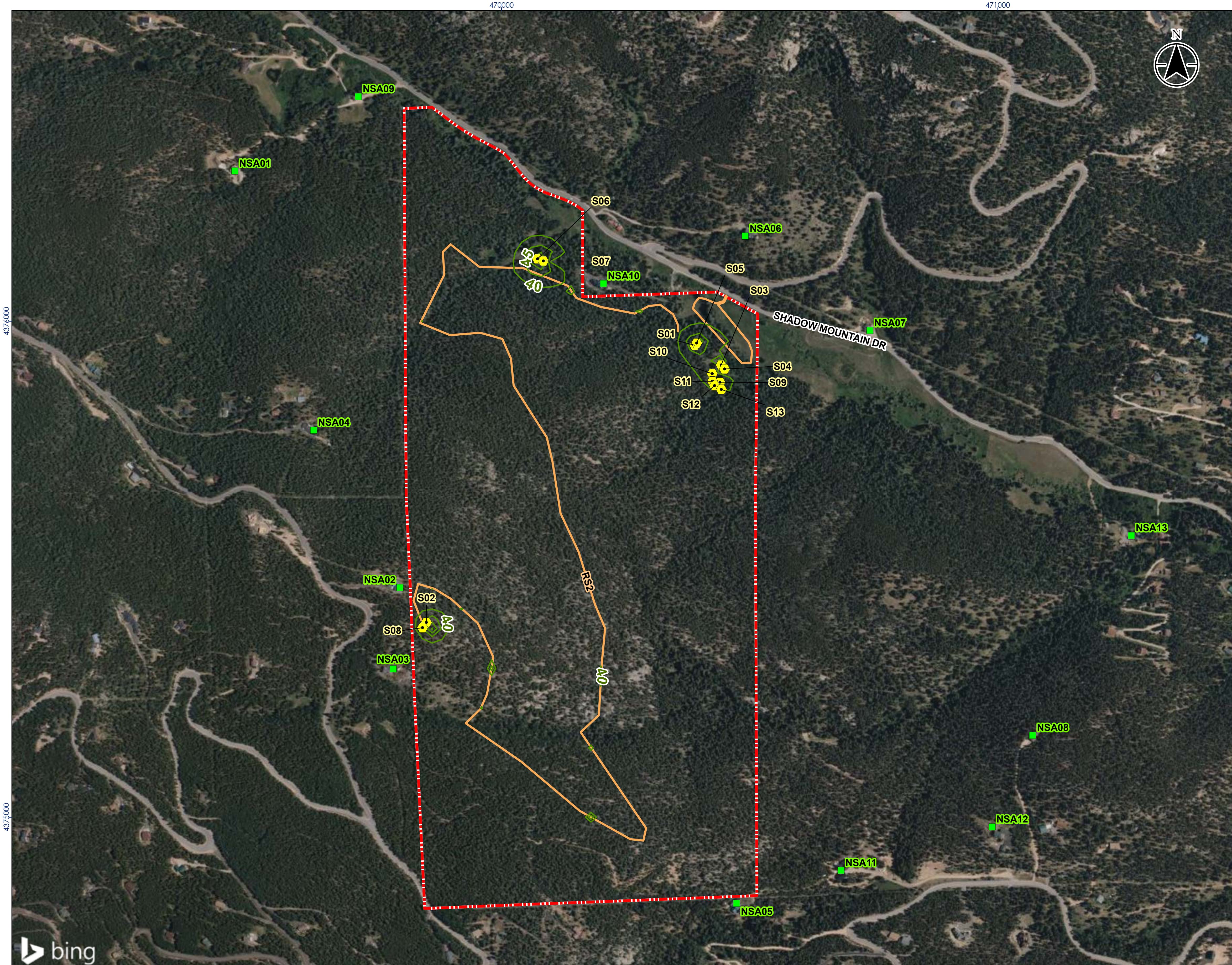
Project Location
Jefferson County, CO

181711248 REVA
Prepared by MDA on 2024-03-19
Technical Review by BCC on 2023-11-30

Client/Project
SE Group
Shadow Mountain Sensory Impact Study - Noise

Figure No.
A.4

Title
Daytime Stationary Noise Contour LA_{25} 4.5m (15 ft. AG)



Stantec

Legend

- Site Limit
- Noise Receptor
- Point Source
- Line Source
- Nighttime Noise Contour 4.5m (15 ft.) AG

0 250 500 m

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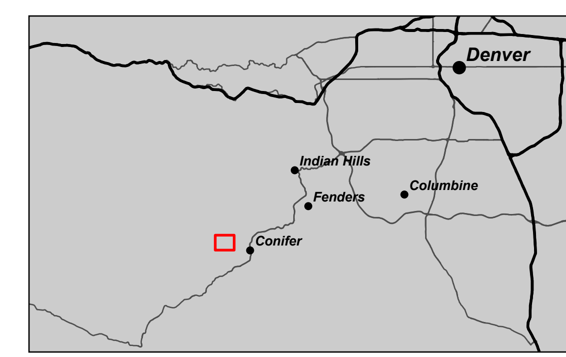


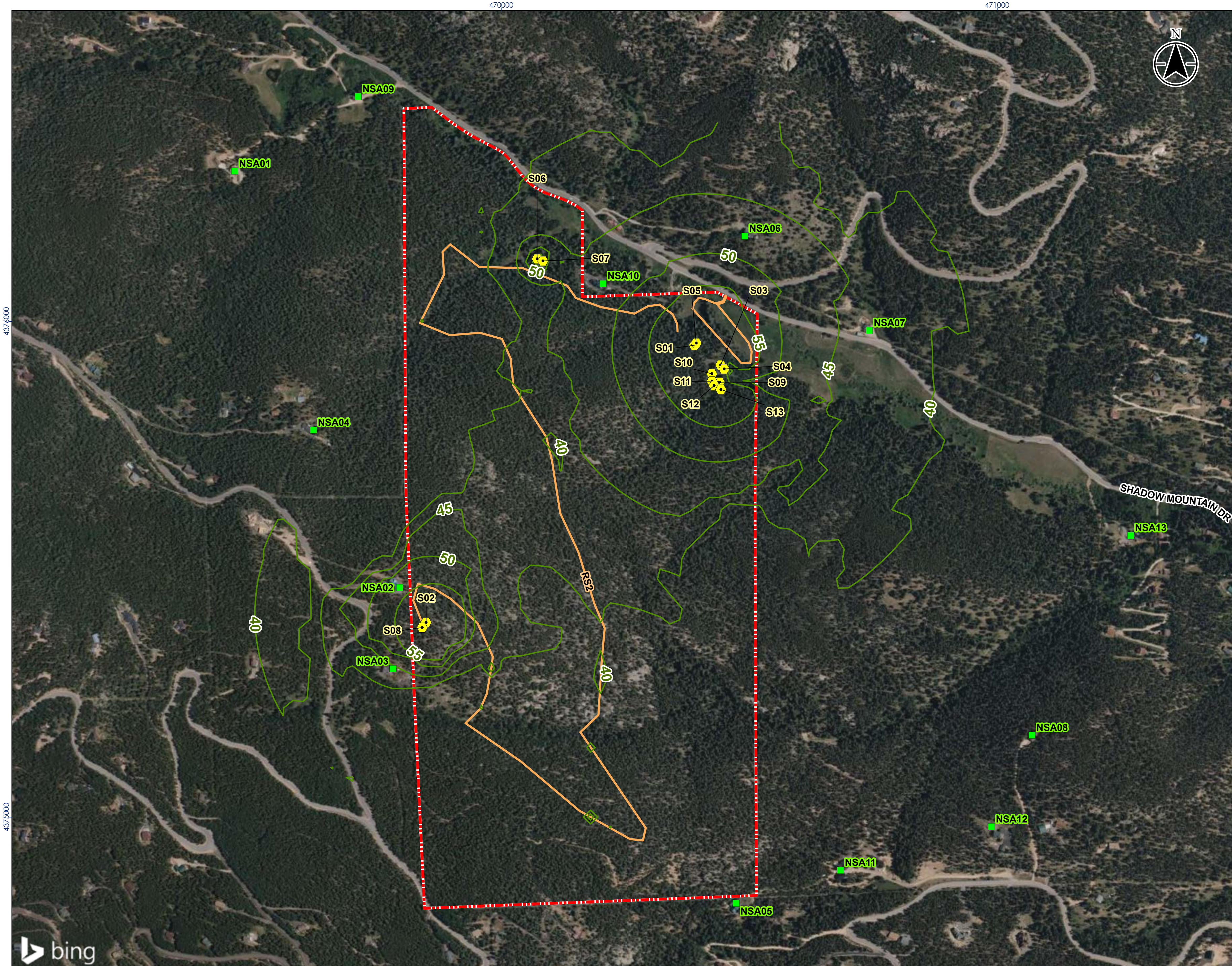
Project Location
Jefferson County, CO

181711248 REVA
Prepared by MDA on 2024-03-19
Technical Review by BCC on 2023-11-30

Client/Project
SE Group
Shadow Mountain Sensory Impact Study - Noise

Figure No.
A.5

Title
Nighttime Stationary Noise Contour LA_{25} 4.5m (15 ft. AG)



Stantec

Legend

- Site Limit
- Noise Receptor
- Point Source
- Line Source
- Daytime Noise Contour 4.5m (15ft.) AG

0 250 500 m

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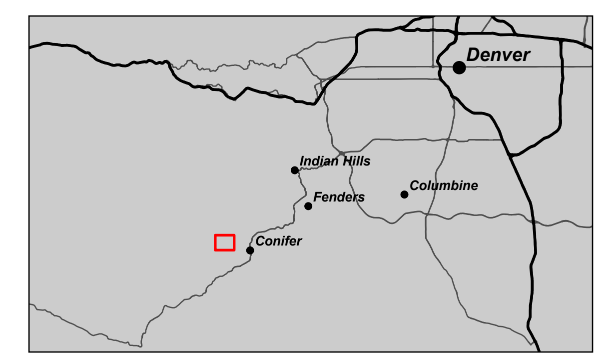


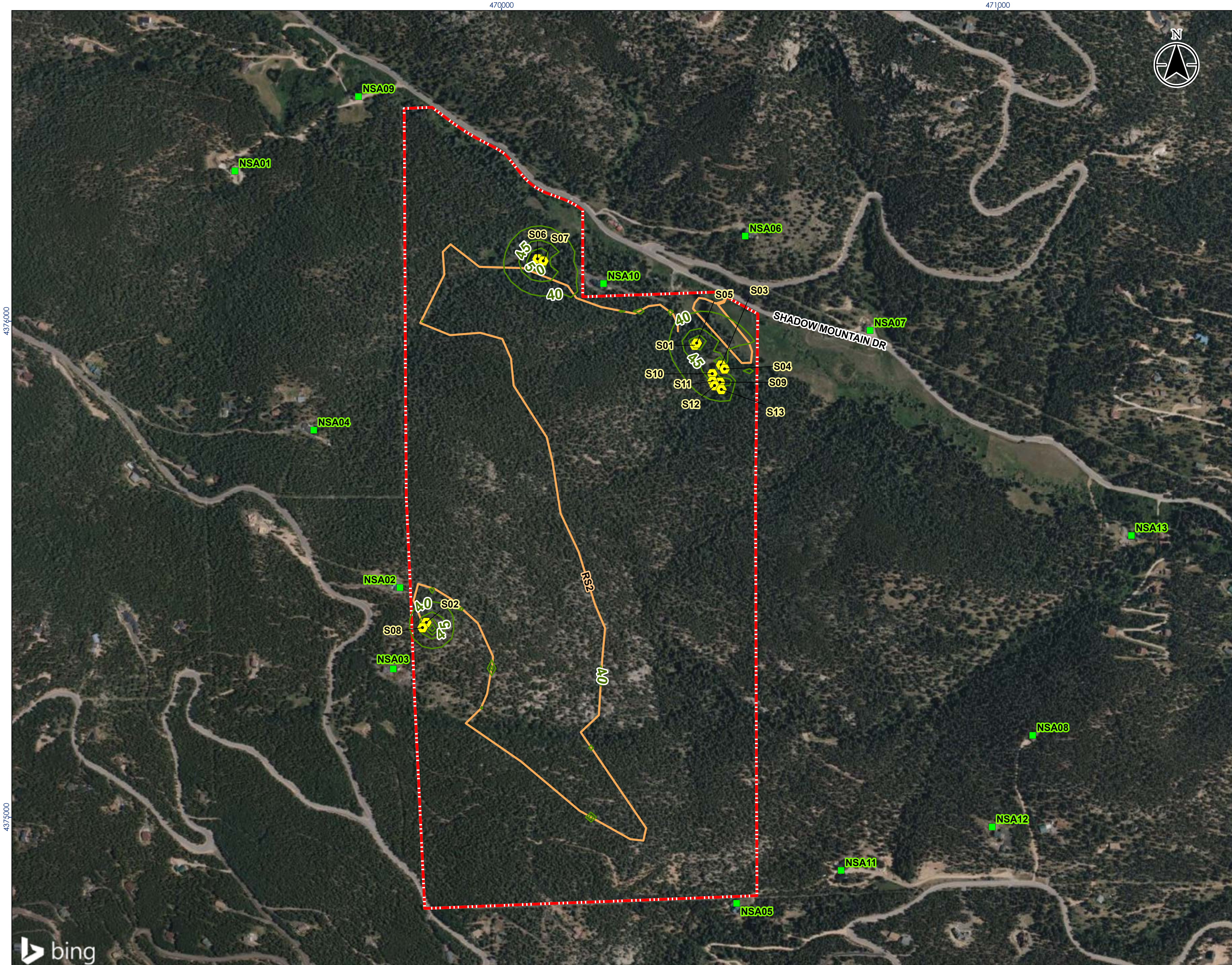
Project Location
Jefferson County, CO

181711248 REVA
Prepared by MDA on 2024-03-20
Technical Review by BCC on 2023-11-30

Client/Project
SE Group
Shadow Mountain Sensory Impact Study - Noise

Figure No.
A.6

Title
Daytime Stationary Noise Contour LA_0 4.5m (15 ft. AG)



Stantec

Legend

- Site Limit
- Noise Receptor
- Point Source
- Nighttime Noise Contour 4.5m (15 ft.) AG
- Line Source

0 250 500 m

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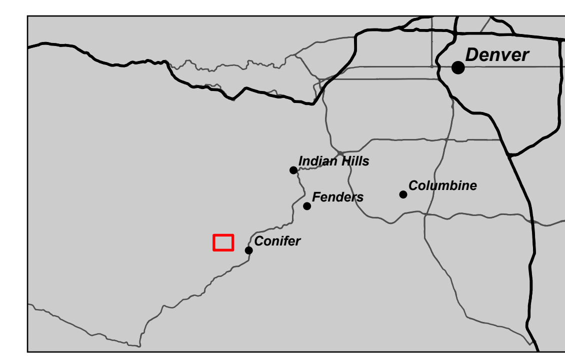

Project Location
Jefferson County, CO

181711248 REVA
Prepared by MDA on 2024-03-19
Technical Review by BCC on 2023-11-30

Client/Project
SE Group
Shadow Mountain Sensory Impact Study - Noise

Figure No.
A.7

Title
Nighttime Stationary Noise Contour LA_0 4.5m (15 ft. AG)

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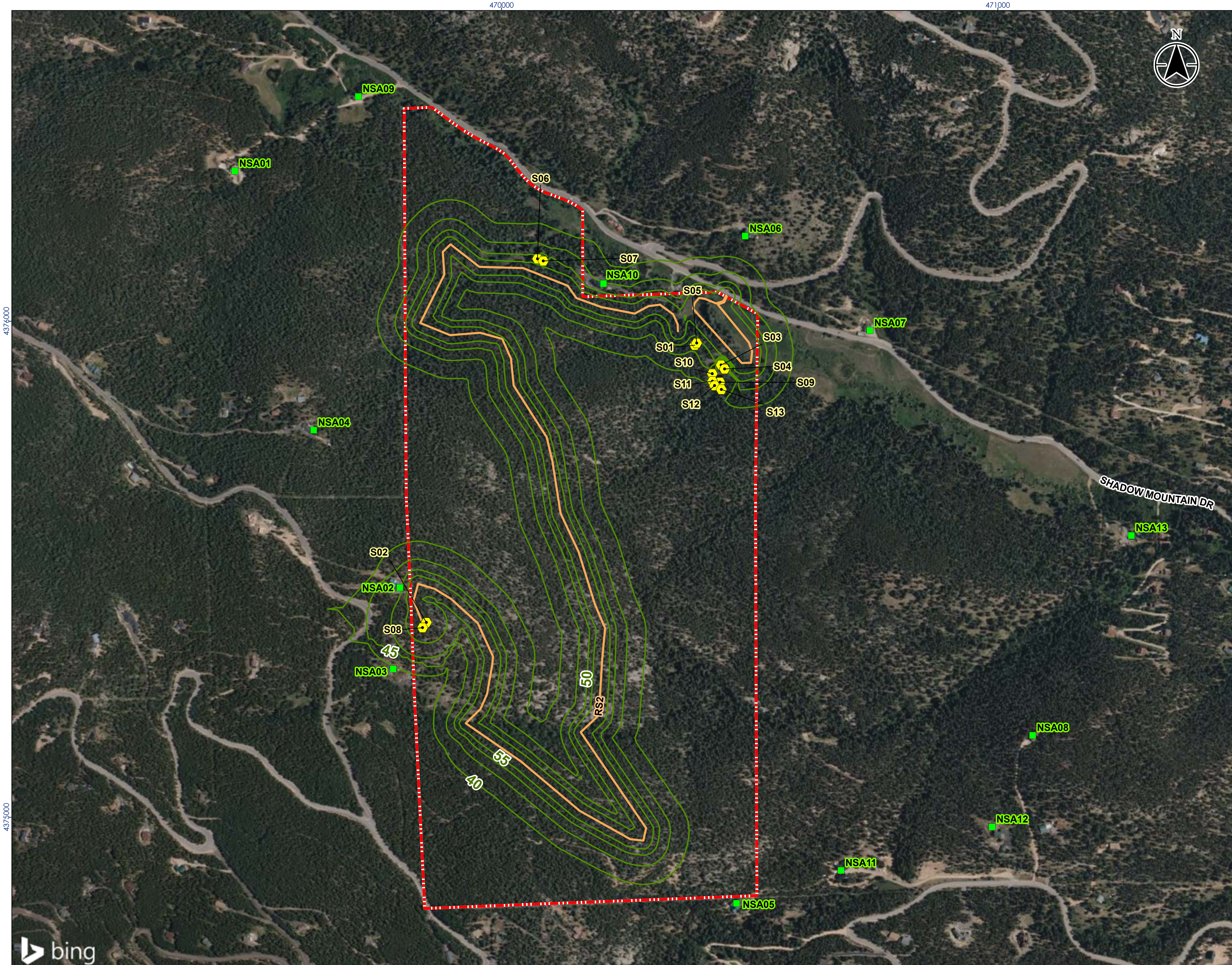

Stantec

Legend

- Site Limit
- Noise Receptor
- Point Source
- Line Source
- Daytime Noise Contour Lmax (dBA)

0 250 500 m

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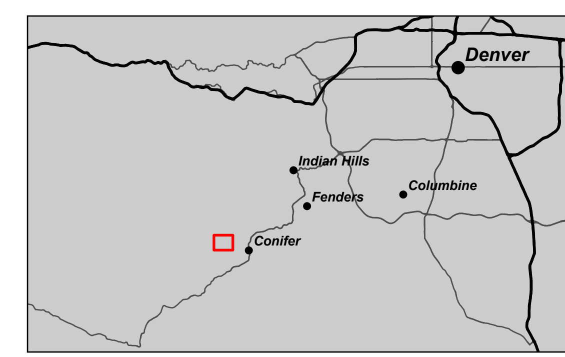


Project Location
Jefferson County, CO

181711248 REVA
Prepared by MDA on 2024-03-19
Technical Review by BCC on 2023-11-30

Client/Project
SE Group
Shadow Mountain Sensory Impact Study - Noise

Figure No.
A.8

Title
Daytime Mobile Noise Contour LA_0 4.5 AG (15 ft. AG)

TRANSPORTATION
CONSULTANTS, INC.

LSC TRANSPORTATION CONSULTANTS, INC.

1889 York Street
Denver, CO 80206
(303) 333-1105
FAX (303) 333-1107
E-mail: lsc@lscdenver.com

April 3, 2024

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 updated traffic impact analysis for the proposed Shadow Mountain Bike Park development to address County comments. 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. This process is described as follows:

Parking Reservations

The applicant (SMBP) will implement a parking reservation system that will be available at the time that visitors purchase bike park passes. SMBP will strongly encourage visitors to purchase tickets online prior to arrival, with the goal of making sure visitors do not arrive at the bike park without a parking reservation. SMBP has decided to implement this system to benefit the visitor experience and surrounding community in the following ways:

1. The parking reservation system will control the amount of riders the bike park sees on any given day, thereby limiting pressure on SMBP's trail network and ensuring the bike park is never over visitor capacity. Limiting visitor capacity will also limit pressure on local roadways, thereby benefitting the surrounding neighborhood as well. The reservation system will allow visitors to relinquish their parking spot when they're done riding so that the parking reservation system stays up-to-date for incoming visitors.

2. The parking reservation system has the ability to reduce the potential for roadway congestion around morning and evening peak-hours because visitors will have a reservation and will have no incentive to rush to SMBP to find parking during opening hours or other peak times.

3. SMBP's parking reservation system will allow staff to closely manage the activity of bike park visitors, which will allow staff to quickly remedy any issues that arise between visitors and residential traffic using the roadways near SMBP.

Cell Phone Service

The base area, in its existing condition, has cell coverage. The rest of the project area has limited coverage. SMBP plans to provide Wifi from the day lodge and work with major providers to improve cell service in the project area for riders.

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 volumes for five consecutive days. Figures 3b and 3c show the typical peak-hour and daily traffic 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 2043 Background Traffic

Figure 4a shows the estimated 2025 weekday background traffic which assumes an annual growth rate of one-half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road to maintain a conservative analysis. DRCOG (Denver Regional Council of Governments) shows minimal growth is expected on Shadow Mountain Drive over time. Figure 4b shows the estimated 2025 Saturday background traffic which assumes an annual growth rate of one-half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road to maintain a conservative analysis. 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 2043 weekday background traffic; Figure 5b shows the estimated 2043 Saturday background traffic; and Figure 5c shows the estimated 2043 Sunday background traffic. These 2043 background volumes assume an annual growth rate of one percent.

Existing, 2025, and 2043 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 2043 background levels of service using Synchro. Table 1a shows the existing and 2025 level of service analysis results and Table 1b shows the 2043 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 2043, the intersection is planned to be converted to a modern roundabout and is expected to operate at an overall LOS "A" during all scenarios.

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 2043, the intersection is planned to be converted to a modern roundabout and is expected to operate at an overall LOS "A" during all scenarios.

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 520 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 up to about 1,000 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.

The average daily traffic during the peak season is expected to be between 520 and 1,000 trips; most weekdays are expected to have 520 or fewer trips.

Details on Vehicle Turnover

This report assumes a vehicle/parking stall turnover estimate of 1.6 (i.e., a parking stall will have 1.6 vehicles parked each day). This estimate is based on a number of factors, including trail mileage, vertical relief, chairlift length, lap time, number of laps/visit, vehicular travel distance to bike park, ticket type (day pass vs. season pass), and length of stay. Specifically, based on these factors, it is estimated that an average lap would be approximately 30 minutes, the average number of laps would be 8 laps, and the amount of milling time (i.e., parking, ticketing, break time/lunch) would be approximately 1 hour. With this information, the average guest would stay approximately 5 hours. For an average operating time of 8 hours, the average vehicle turnover would be the average operating time divided by the average guest stay. This results in an average turnover of 1.6, meaning that on days with a full parking lot, about 60 percent of the spaces could be vacated and then replaced by another vehicle.

The average vehicle turnover is a planning metric used to inform traffic and parking estimates. In this study, it directly informs the average number of vehicles entering and exiting the parking lot and thus the average vehicle trips per day, however, has a less direct correlation with peak traffic patterns because it applies to the full day of operation. Because of the uniqueness of the operation and the variety of planning factors considered to determine the vehicular turnover, there is not an “industry-standard” planning metric.

Details on Visitation

The traffic study assumes 300 parking spaces with a 1.6 turnover ratio per day for a total of 480 guest vehicles per day. Each vehicle enters and exits the site once for a total of 960 daily trips. An additional 40 trips (20 vehicles) were added for employee trips to arrive at 1,000 daily trips. A vehicle occupancy of 2.5 people per vehicle in 480 vehicles would result in 1,200 guests. There are also 20 employees for a total of 1,220 unique people per day. Our parking turnover assumptions mean these 1,220 people can't all be on the site at the same time. The most people on the site at any given time would be 300 vehicles x 2.5 people/vehicle for 750 guests plus 20 employees for a total of 770 people.

These assumptions are dependent on the assumed 2.5 vehicle occupancy which could vary slightly from day to day. As described above, the Applicant will implement a reservation system to carefully monitor the number of vehicles and guests visiting the site so as to not exceed stated maximums.

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 2043 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 2043 weekday total traffic which is the sum of the 2043 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 2043 Saturday total traffic which is the sum of the 2043 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 2043 Sunday total traffic which is the sum of the 2043 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 2043 total traffic levels of service. Table 1a shows the existing and 2025 total level of service analysis results and Table 1b shows the 2043 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 2043 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. By 2043, the intersection is planned to be converted to a modern roundabout by Jefferson County and is expected to operate at an overall LOS "B" or better during all scenarios.

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 2043 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 2025 and 2043. By 2043, the intersection is planned to be converted to a modern roundabout by Jefferson County and is expected to operate at an overall LOS "C" or better during all scenarios.

3. **Shadow Mountain Drive/Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "A" during all five scenarios through 2043.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

1. The site is projected to generate about 520 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 up to about 1,000 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 2043 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 inter-

section are expected to operate at LOS "E" or "F" during several of the five scenarios. By 2043, both intersections are planned to be converted to modern roundabouts and are expected to operate at an overall LOS "C" or better during all scenarios. It is important to note that minimal site traffic is expected to make the movements with poor levels of service.

Recommendations

4. The recommended improvements to mitigate poor levels of service are shown in Figure 10. These future roundabouts are planned by Jefferson County; the Applicant would work with the County to agree upon a contribution for these improvements. Figure 10 shows the peak season site-generated trips will comprise about 15 percent of Saturday peak-hour trips at the northern roundabout and about 12 percent at the southern roundabout. These percentages will be lower on weekdays and during the off-season.

5. The recommended improvements at the site access intersection are per feedback from Jefferson County and are shown in Figures 8a through 8c and 9a through 9c. The westbound left-turn lane is a requirement per the County's feedback. The potential acceleration lane will provide minimal benefit so should be discussed further with County staff as the project moves forward.

* * * * *

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.

COLORADO LICENSED
CHRISTOPHER S. McGRANAHAN
39018
PROFESSIONAL ENGINEER

By____________________________________
Christopher S. McGranahan, PE
Principal/President

CSM/wc 4-3-24

Enclosures: Tables 1a through 2
Figures 1 - 10
Traffic Count Reports
Level of Service Definitions
Level of Service Reports

W:\LSC\Projects\2022\220850-ShadowMountainBikePark\Report\April-2024\ShadowMountainBikePark-040324.wpd

Table 1a
Intersection Levels of Service Analysis - Existing and 2025
Shadow Mountain Bike Park
Jefferson County, CO
LSC #220850; April, 2024

Intersection No. & Location	Traffic Control	Existing Traffic: Weekday Level of Service PM	Existing Traffic: Saturday Level of Service AM	Existing Traffic: Saturday Level of Service Mid-Day	Existing Traffic: Sunday Level of Service AM	Existing Traffic: Sunday Level of Service Mid-Day	2025 Background: Weekday Level of Service PM	2025 Background: Saturday Level of Service AM	2025 Background: Saturday Level of Service Mid-Day	2025 Background: Sunday Level of Service AM	2025 Background: Sunday Level of Service Mid-Day	2025 Total - Scenario 1 (1) (2): Weekday Level of Service PM	2025 Total - Scenario 1 (1) (2): Saturday Level of Service AM	2025 Total - Scenario 1 (1) (2): Saturday Level of Service Mid-Day	2025 Total - Scenario 1 (1) (2): Sunday Level of Service AM	2025 Total - Scenario 1 (1) (2): Sunday Level of Service Mid-Day	2025 Total - Scenario 2 (1) (2): Weekday Level of Service PM	2025 Total - Scenario 2 (1) (2): Saturday Level of Service AM	2025 Total - Scenario 2 (1) (2): Saturday Level of Service Mid-Day	2025 Total - Scenario 2 (1) (2): Sunday Level of Service AM	2025 Total - Scenario 2 (1) (2): Sunday Level of Service Mid-Day
1) Shadow Mountain Drive/County Highway 73	TWSC																				
NEB Left		D	C	D	B	C	D	C	D	B	C	F	E	E	D	D	F	E	E	D	D
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	31.7	17.5	32.4	14.9	23.5	50.6	36.8	39.0	30.4	26.8	50.6	36.8	39.0	30.4	26.8
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	D	F	E	F	C	E	F	E	F	C	E
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	86.1	37.6	233.5	18.8	27.4	102.8	48.1	>240	20.8	49.8	102.8	48.1	>240	20.8	49.8
3) Shadow Mountain Drive/Site Access	TWSC																				
NB Approach		--	--	--	--	--	--	--	--	--	--	A	A	A	A	A	A	A	A	A	A
WB Left		--	--	--	--	--	--	--	--	--	--	A	A	A	A	A	A	A	A	A	A
Critical Movement Delay		--	--	--	--	--	--	--	--	--	--	8.7	8.9	9.8	8.9	9.7	7.6	7.9	7.5	7.9	7.5

(1) Scenario 1 assumes the construction of a WB left-turn lane on Shadow Mountain Road approaching the site access. Scenario 2 assumes the construction of a WB left-turn lane on Shadow Mountain Road approching the site access and a right-turn acceleration lane on Shadow Mountain Road departing the site access.
(2) Intersection #3: The critical movement delay is for the NB approach in Scenario 1 and for the WB left in Scenario 2.

Table 1b
Intersection Levels of Service Analysis
Shadow Mountain Bike Park- 2043
Jefferson County, CO
LSC #220850; April, 2024

		2043 Background					2043 Total - Scenario 1 (1) (2)					2043 Total - Scenario 2 (1) (2)				
		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	Roundabout															
SEB Approach		B	A	B	A	A	B	A	B	A	A	B	A	B	A	A
NWB Appoach		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
NEB Approach		A	A	A	A	A	A	A	B	A	A	A	A	B	A	A
Entire Intersection Delay		9.1	6.1	9.1	5.4	7.4	11.3	8.4	10.4	7.4	8.1	11.3	8.4	10.4	7.4	8.1
Entire Intersection LOS		A	A	A	A	A	B	A	B	A	A	B	A	B	A	A
2) County Highway 73/Barkley Road	Roundabout															
SEB Approach		B	A	B	A	A	B	A	C	A	A	B	A	C	A	A
NWB Approach		A	A	C	A	A	A	A	D	A	B	A	A	D	A	B
SWB Approach		B	A	A	A	A	B	B	A	A	A	B	B	A	A	A
Entire Intersection Delay		10.4	7.8	13.5	5.9	8.0	11.6	9.9	20.0	7.0	9.6	11.6	9.9	20.0	7.0	9.6
Entire Intersection LOS		B	A	B	A	A	B	A	C	A	A	B	A	C	A	A
3) Shadow Mountain Drive/Site Access	TWSC															
NB Approach		--	--	--	--	--	A	A	A	A	A	A	A	A	A	A
WB Left		--	--	--	--	--	A	A	A	A	A	A	A	A	A	A
Critical Movement Delay		--	--	--	--	--	8.8	8.9	9.9	8.9	9.8	7.6	7.9	7.5	7.9	7.5

(1) Scenario 1 assumes the construction of a WB left-turn lane on Shadow Mountain Road approaching the site access. Scenario 2 assumes the construction of a WB left-turn lane on Shadow Mountain Road approching the site access and a right-turn acceleration lane on Shadow Mountain Road departing the site access.
(2) Intersection #3: The critical movement delay is for the NB approach in Scenario 1 and for the WB left in Scenario 2.

Table 2
ESTIMATED TRAFFIC GENERATION
Shadow Mountain Bike Park
Jefferson County, CO
LSC #220850; April, 2024

	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	480	105	11	8	75	960	210	21	15	150
Employees	40	10	0	0	5	40	10	0	0	5
Total (3) =	**520**	**115**	**11**	**8**	**80**	**1,000**	**220**	**21**	**15**	**155**

Notes:
(1) Assumes 300 parking spaces and a 1.6 turn over ratio for a total of 480 round-trips on the weekend with half that usage on a typical weekday. Assumes 20 employees with 20 round-trips. A vehicle occupancy of 2.5 would result in 1,200 guests on a capacity day.
(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.
(3) The average daily traffic for the site during the peak season is expected to be between 520 and 1,000 trips considering most weekdays are expected to have 520 or fewer trips per day.

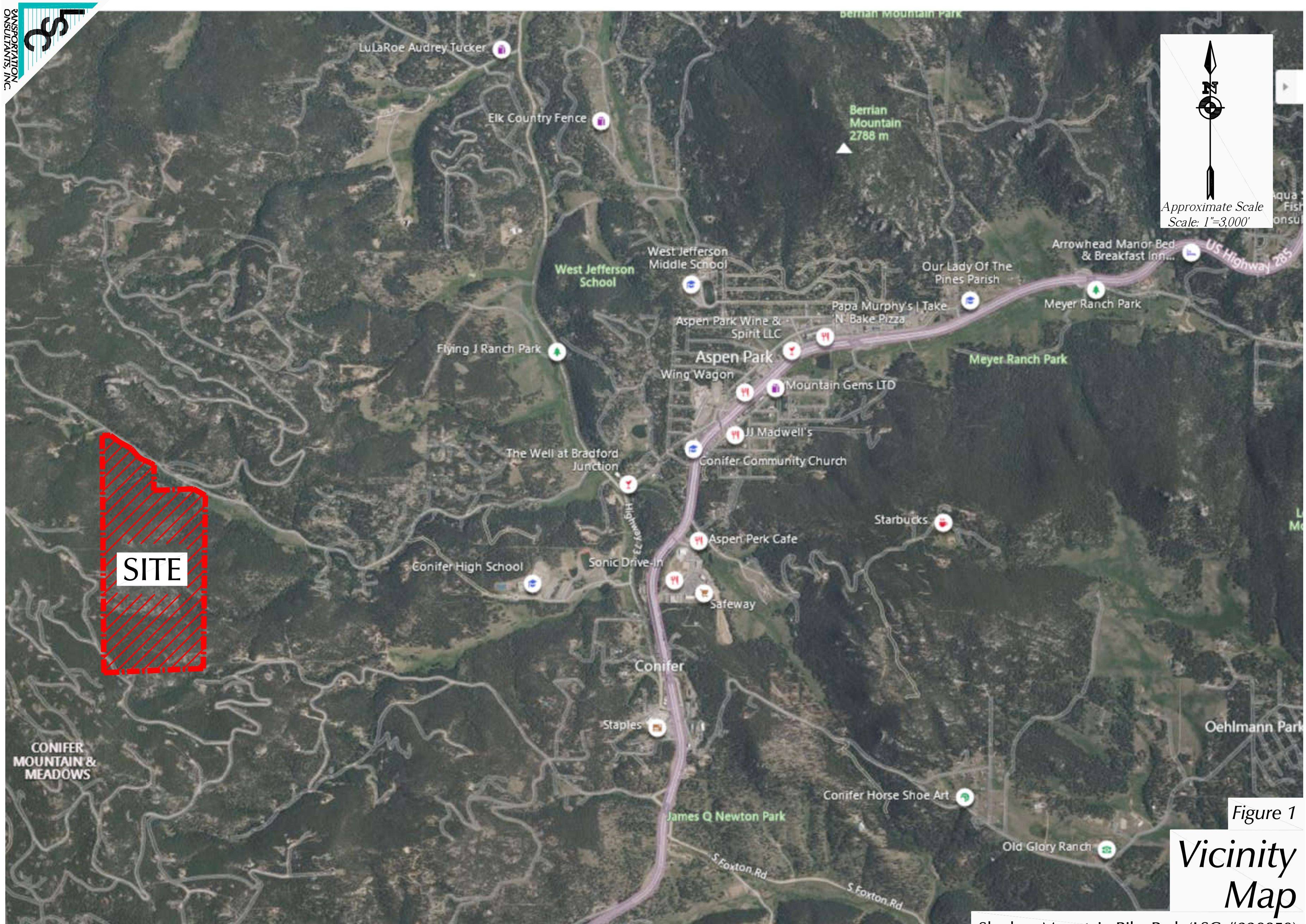


Figure 1

Vicinity Map

Shadow Mountain Bike Park (LSC #220850)

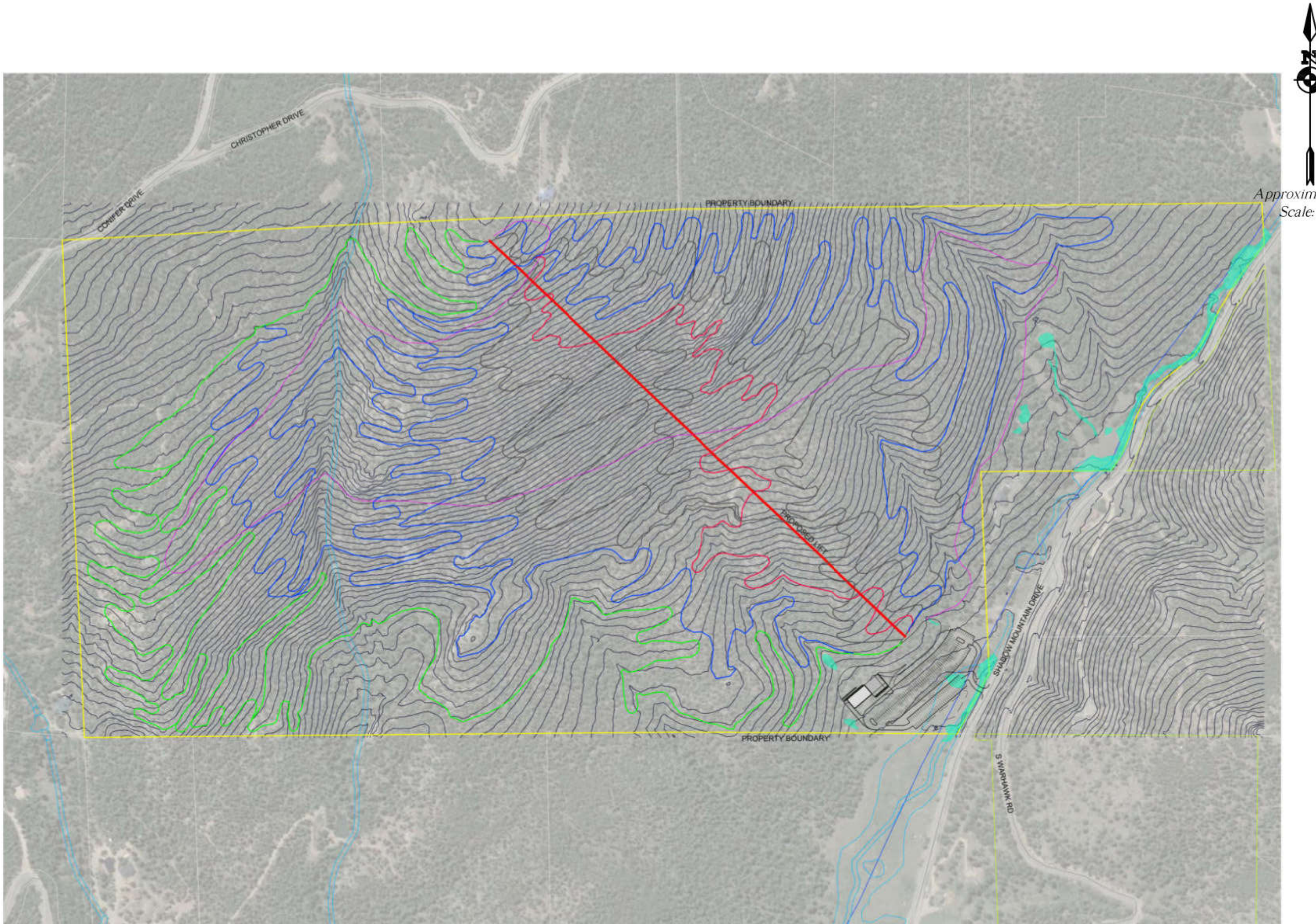


Figure 2a

Overall Site Plan

Shadow Mountain Bike Park (LSC #220850)

Note: This site plan is conceptual in size, layout and location. It is subject to change through subsequent review processes.

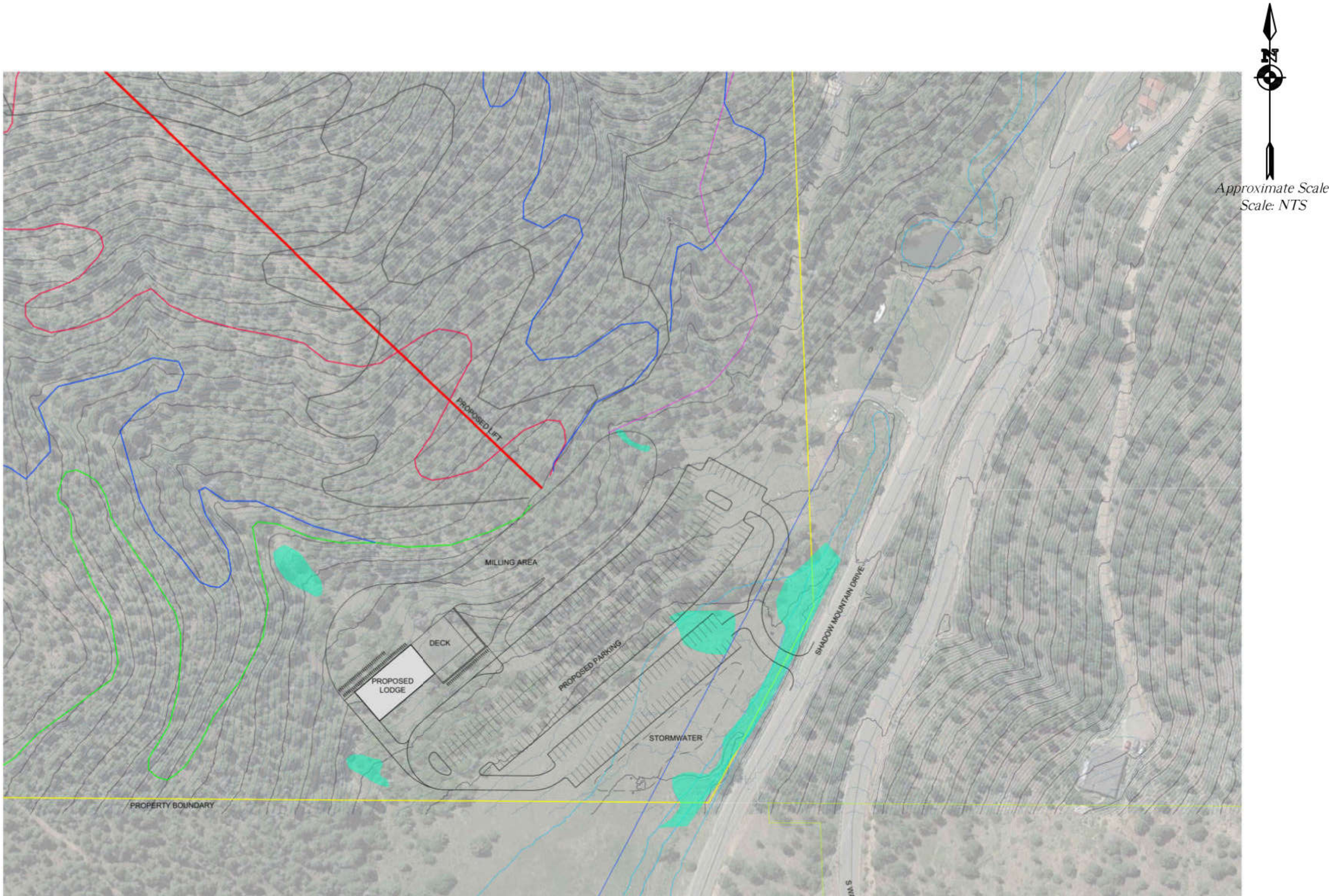


Figure 2b

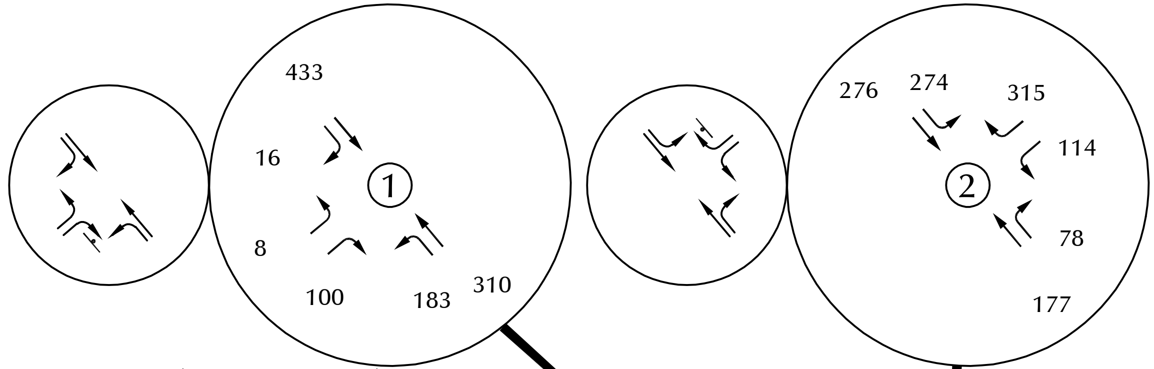
Parking Lot & Access Detail

Shadow Mountain Bike Park (LSC #220850)

Note: This site plan is conceptual in size, layout and location. It is subject to change through subsequent review processes.

Approximate Scale
Scale: 1"=1,200'

LEGEND:
= Stop Sign
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)
SPEED LIMIT 40 = Posted Speed Limit



(1) Tues 8/23/2022 = 2,455
Wed 8/24/2022 = 2,525
Thur 8/25/2022 = 2,405
Fri 8/26/2022 = 2,365

(2) Tues 8/23/2022 = 2,680
Wed 8/24/2022 = 2,750
Thur 8/25/2022 = 2,655
Fri 8/26/2022 = 2,625

(3) Tues 8/23/2022 = 3,170
Wed 8/24/2022 = 3,220
Thur 8/25/2022 = 3,120
Fri 8/26/2022 = 3,125

(4) Tues 8/23/2022 = No Data
Wed 8/24/2022 = No Data
Thur 8/25/2022 = 3,155
Fri 8/26/2022 = 3,160

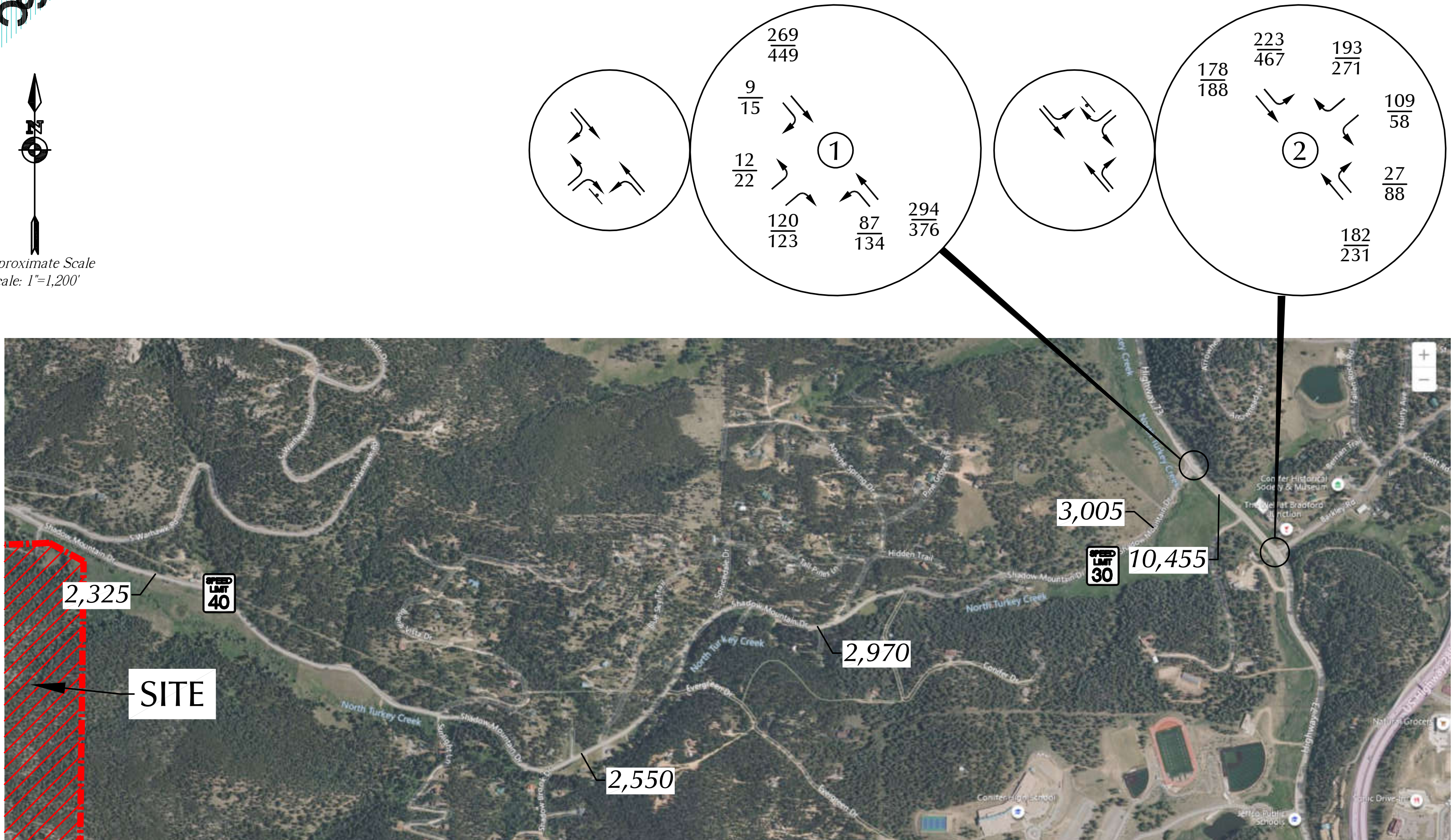
(5) Tues 8/23/2022 = 11,390
Wed 8/24/2022 = 11,380
Thur 8/25/2022 = 11,205
Fri 8/26/2022 = 11,470

Figure 3a

Existing Weekday Peak Hour & All Daily Traffic

Shadow Mountain Bike Park (LSC #220850)

Approximate Scale
Scale: 1"=1,200'



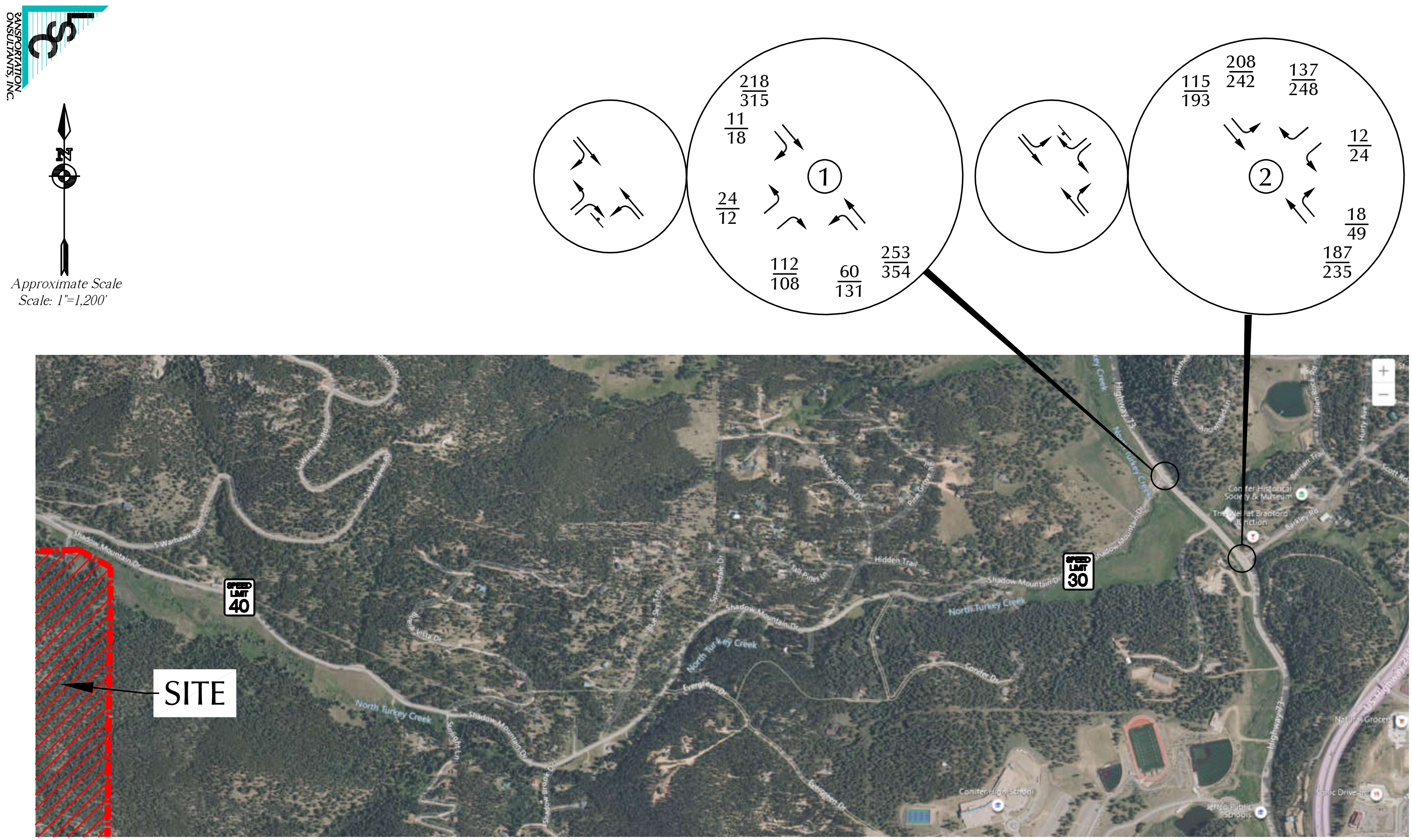
LEGEND:

- ⊦ = Stop Sign
- 26/35 = Saturday Morning Peak Hour Traffic (9:00am–10:00am) / Saturday Midday Peak Hour Traffic (12:00pm–1:00pm)
- 30 = Saturday Peak Hour Traffic
- SPEED LIMIT 40 = Posted Speed Limit

Figure 3b

Existing Saturday Peak Hour Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

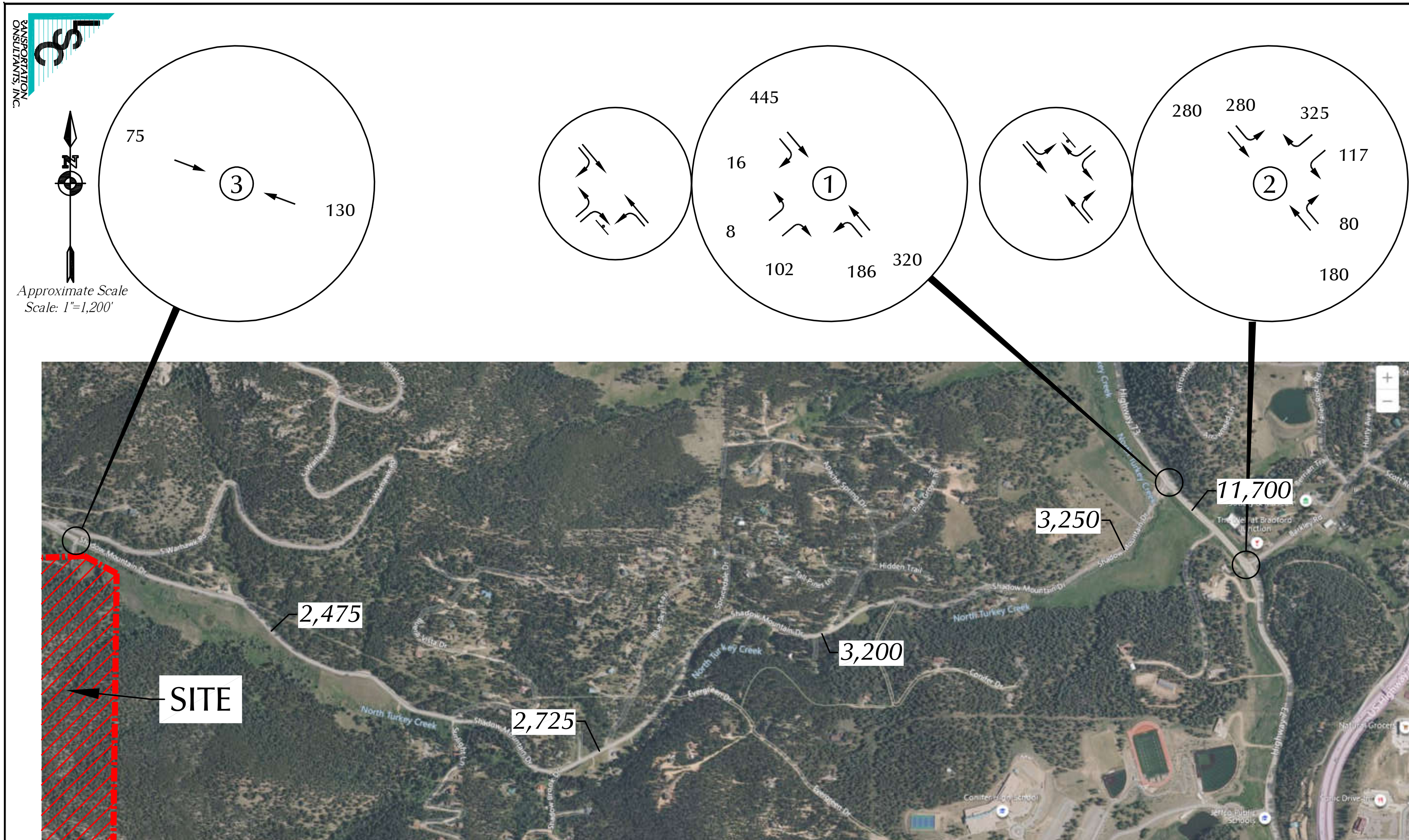
26/35 = Sunday Morning Peak Hour Traffic (9:00am–10:00am) / Sunday Midday Peak Hour Traffic (12:30pm–1:30pm)

SPEED LIMIT 40 = Posted Speed Limit

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)

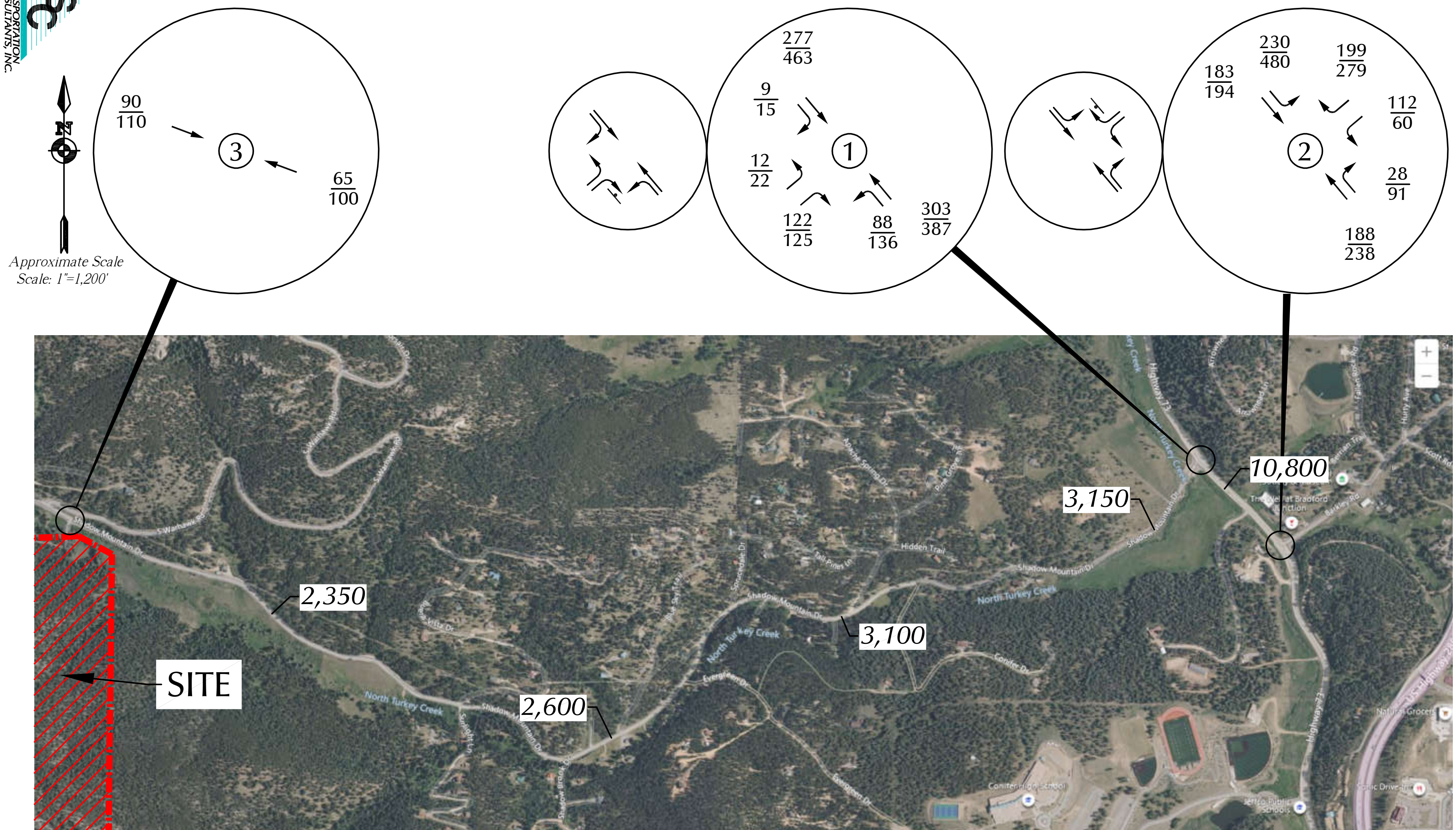
Note: Assumes annual growth rate of one half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road to maintain a conservative analysis because DRCOG model predicts little or no growth on Shadow Mountain Drive.

DRCOG = Denver Regional Council of Governments

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)

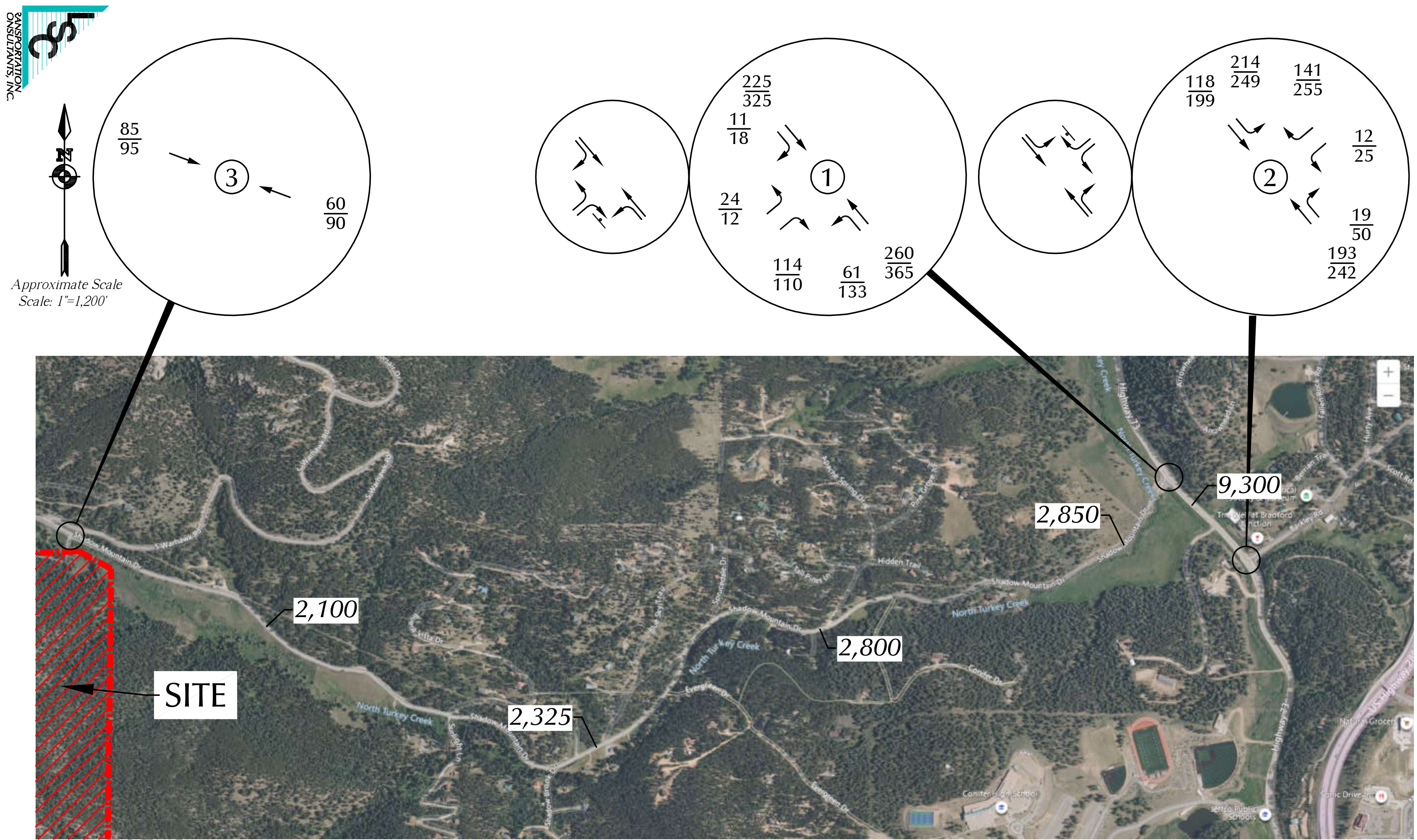
Note: Assumes annual growth rate of one half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road to maintain a conservative analysis because DRCOG model predicts little or no growth on Shadow Mountain Drive.

DRCOG = Denver Regional Council of Governments

Figure 4b

Year 2025
Saturday Background 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)

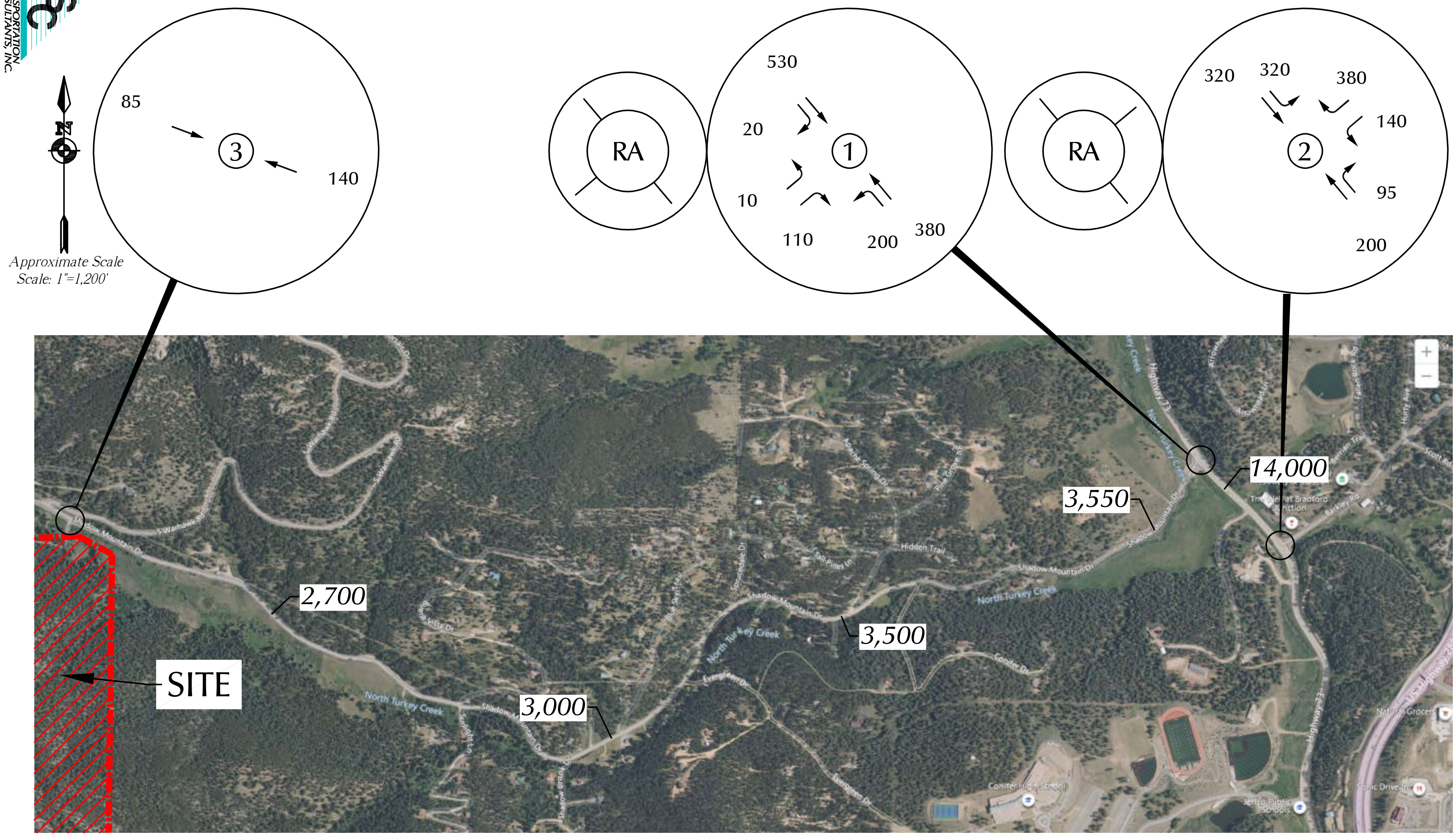
Note: Assumes annual growth rate of one half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road to maintain a conservative analysis because DRCOG model predicts little or no growth on Shadow Mountain Drive. Daily volumes based on ratio of Saturday peak hour trips to Saturday daily trips.

DRCOG = Denver Regional Council of Governments

Figure 4c

Year 2025
Sunday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

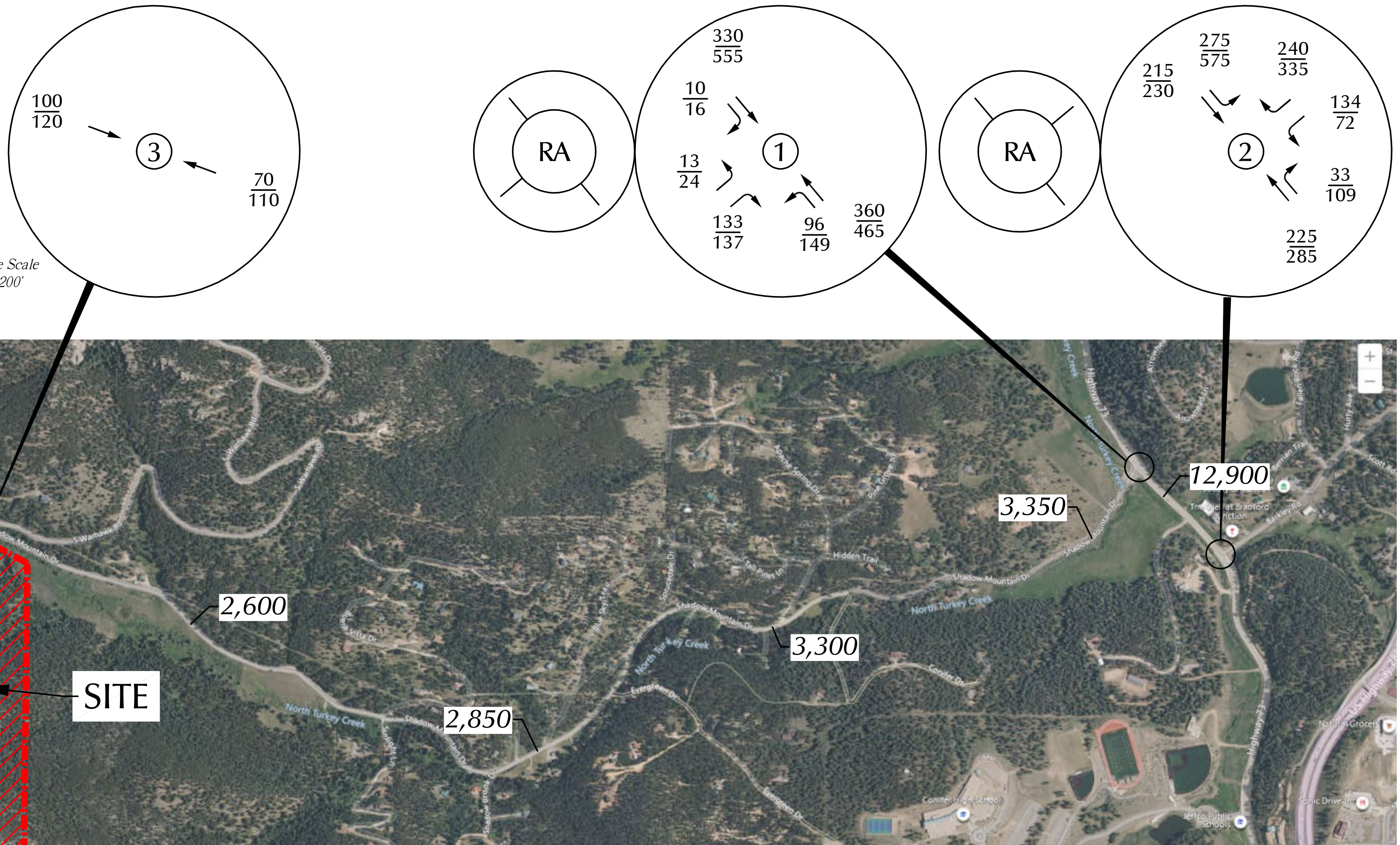
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)

Notes:
1. Assumes annual growth rate of one half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road.
2. Assumes roundabout control at Intersection #1 and #2 per feedback from Jefferson County.

Figure 5a

Year 2043
Weekday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



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)

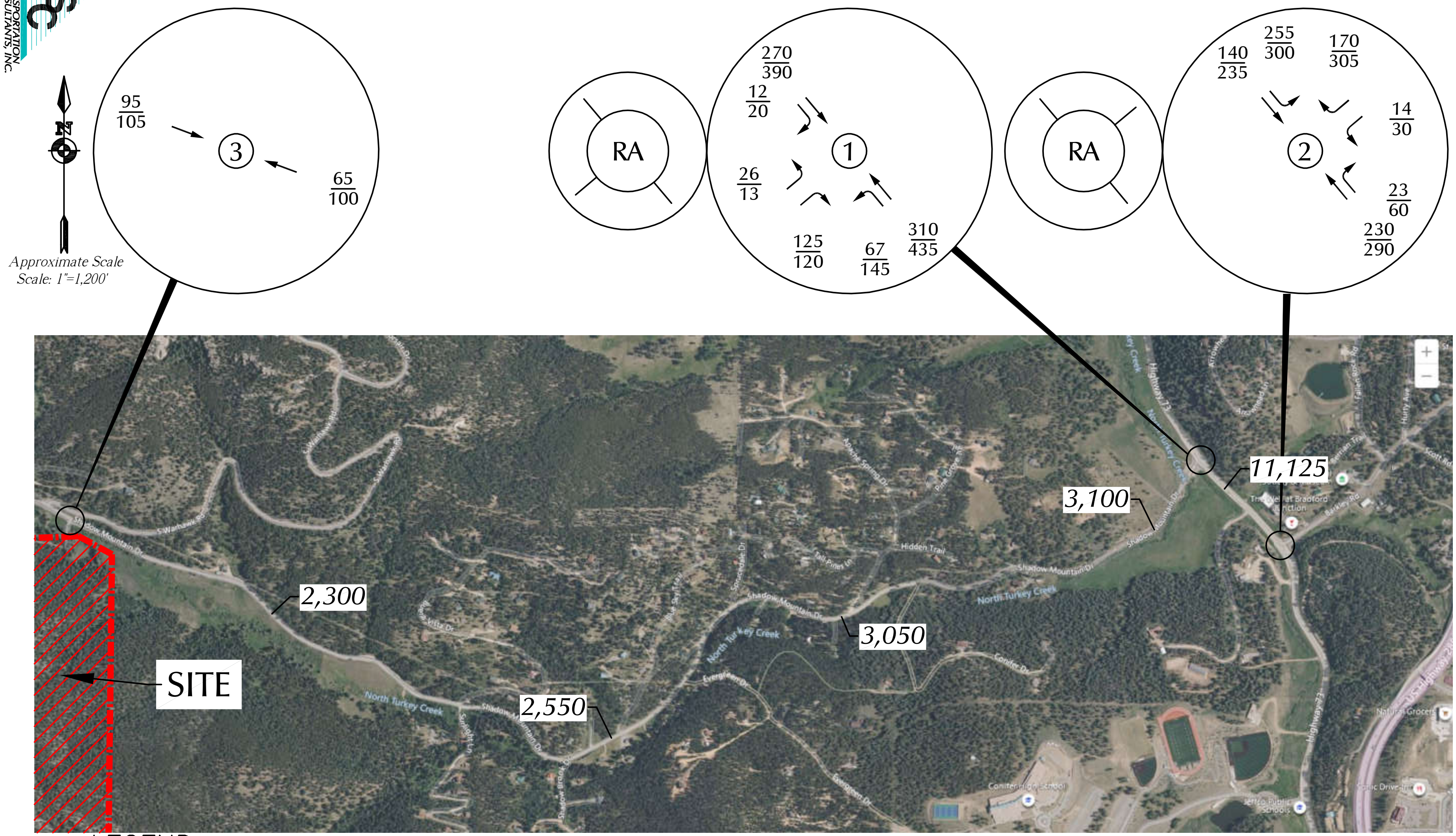
Notes:

1. Assumes annual growth rate of one half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road.
2. Assumes roundabout control at Intersection #1 and #2 per feedback from Jefferson County.

Figure 5b

Year 2043
Saturday Background Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

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

Notes:

1. Assumes annual growth rate of one half percent on Shadow Mountain Drive and one percent on Highway 73 and Barkley Road.
2. Assumes roundabout control at Intersection #1 and #2 per feedback from Jefferson County.

Figure 5c

Year 2043
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)

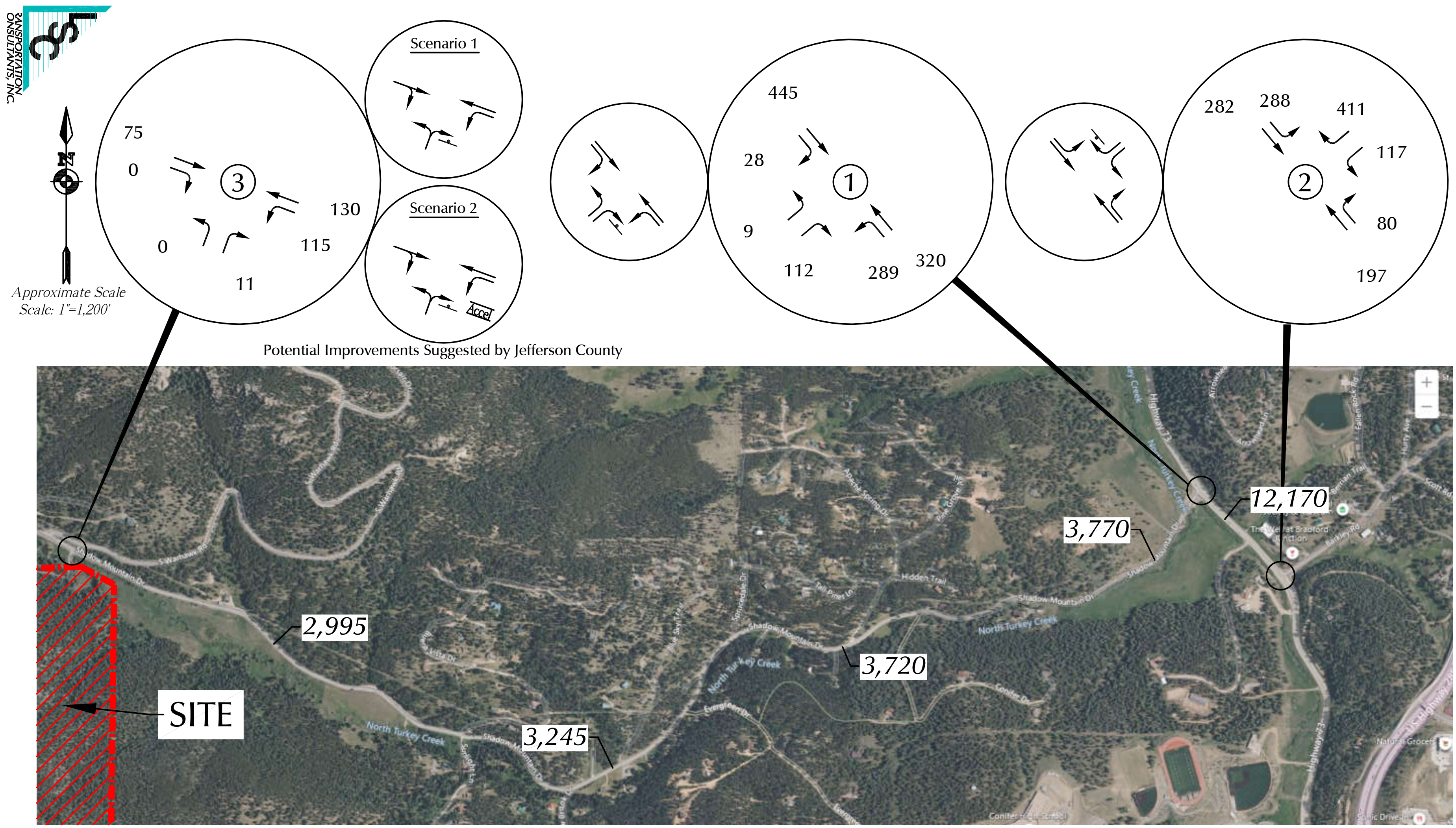
LEGEND:

26/35 = Weekend Morning Peak Hour Traffic / Weekend Afternoon Peak Hour Traffic

Figure 7b

Assignment of Weekend Site-Generated Traffic

Shadow Mountain Bike Park (LSC #220850)



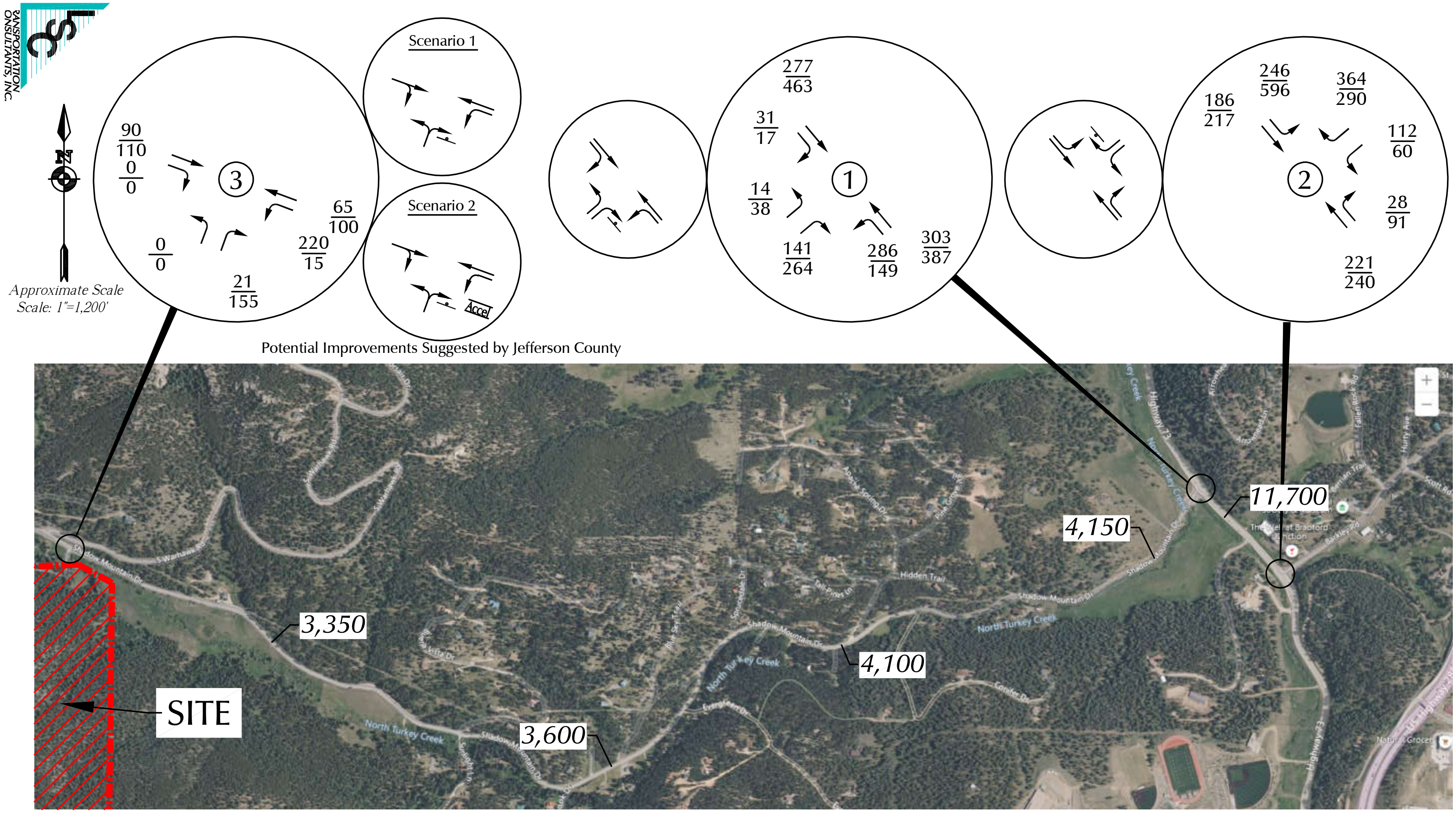
LEGEND:
= Stop Sign
30 = Weekday Afternoon Peak Hour Traffic (4:45–5:45pm)

Notes:
1. These volumes are the sum of the volumes in Figures 4a and 7a.
2. The potential site access improvements suggested by Jefferson County are a left-turn lane for ingress and a right-turn acceleration lane for egress. The acceleration lane is not expected to provide much benefit but a left-turn lane for ingress could be beneficial if there are no existing constraints preventing it such as right-of-way or wetland limitations. An appropriate length for a left-turn lane would be 280 feet plus a 140-foot transition taper and 45:1 redirect taper. The appropriate length for a right-turn acceleration lane is 380 feet plus a 180-foot transition taper.

Figure 8a

Year 2025 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)

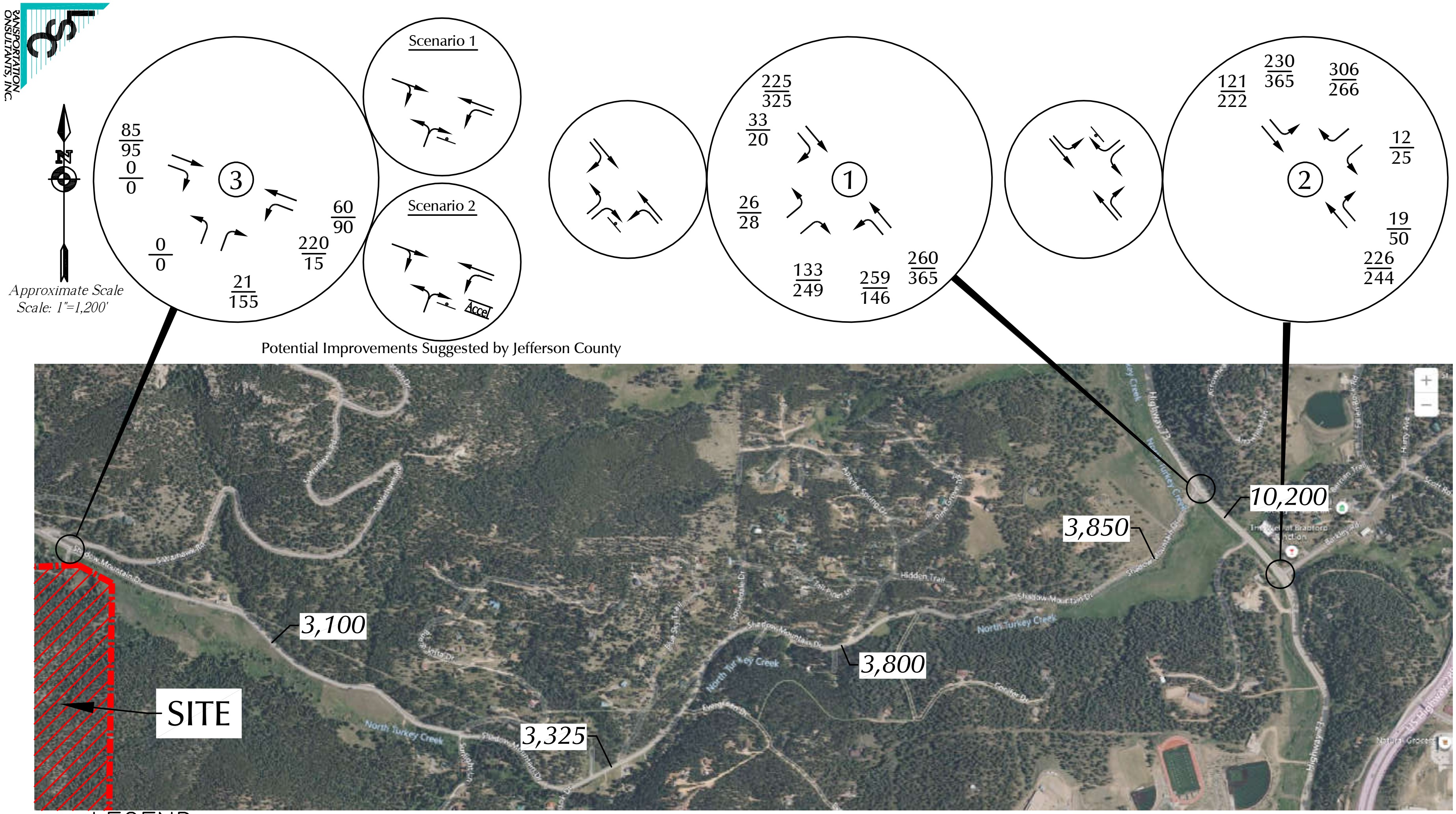
Notes:

1. These volumes are the sum of the volumes in Figures 4b and 7b.
2. The potential site access improvements suggested by Jefferson County are a left-turn lane for ingress and a right-turn acceleration lane for egress. The acceleration lane is not expected to provide much benefit but a left-turn lane for ingress could be beneficial if there are no existing constraints preventing it such as right-of-way or wetland limitations. An appropriate length for a left-turn lane would be 280 feet plus a 140-foot transition taper and 45:1 redirect taper. The appropriate length for a right-turn acceleration lane is 380 feet plus a 180-foot transition taper.

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)

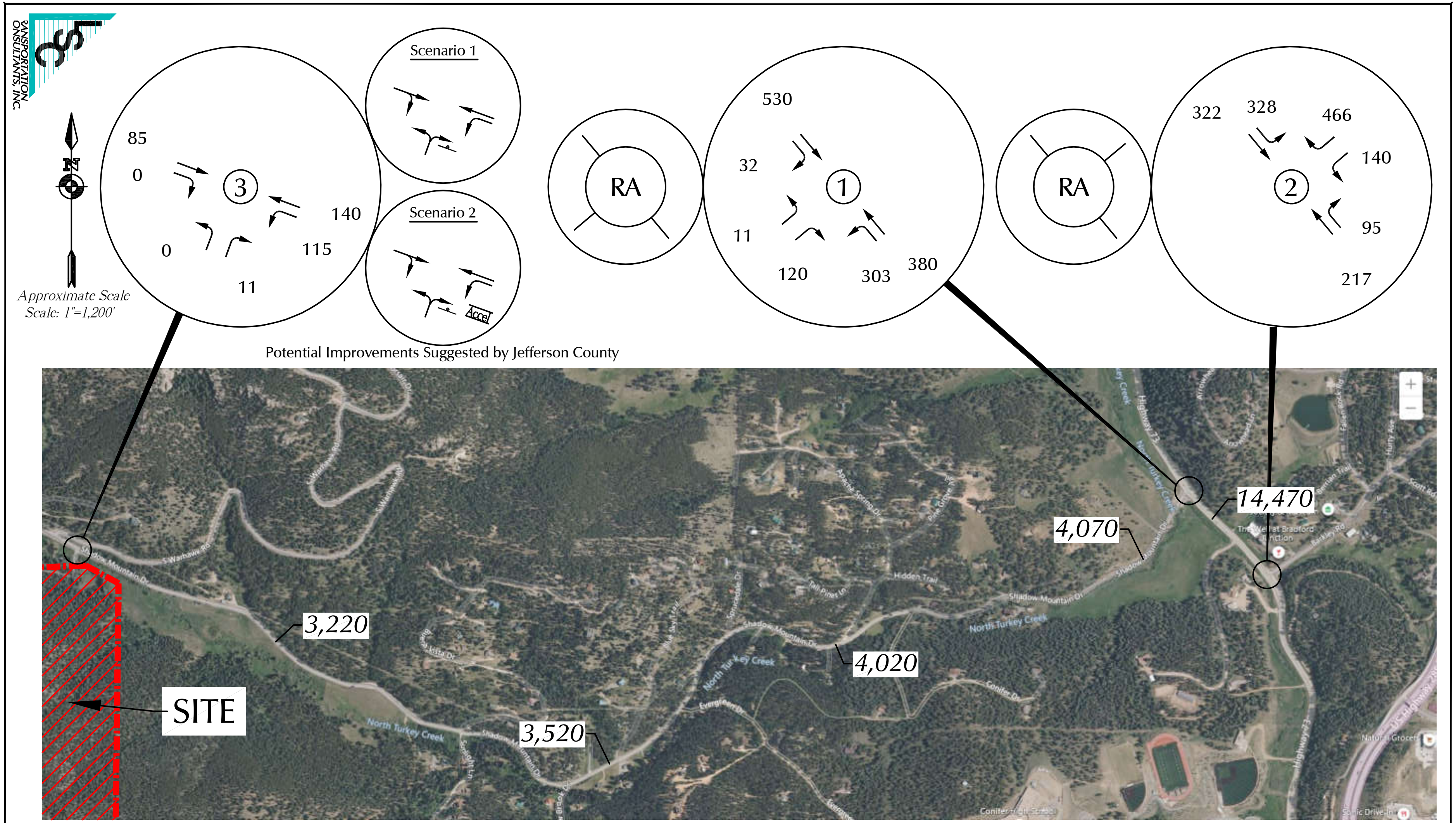
Notes:

1. These volumes are the sum of the volumes in Figures 4c and 7b.
2. The potential site access improvements suggested by Jefferson County are a left-turn lane for ingress and a right-turn acceleration lane for egress. The acceleration lane is not expected to provide much benefit but a left-turn lane for ingress could be beneficial if there are no existing constraints preventing it such as right-of-way or wetland limitations. An appropriate length for a left-turn lane would be 280 feet plus a 140-foot transition taper and 45:1 redirect taper. The appropriate length for a right-turn acceleration lane is 380 feet plus a 180-foot transition taper.

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)

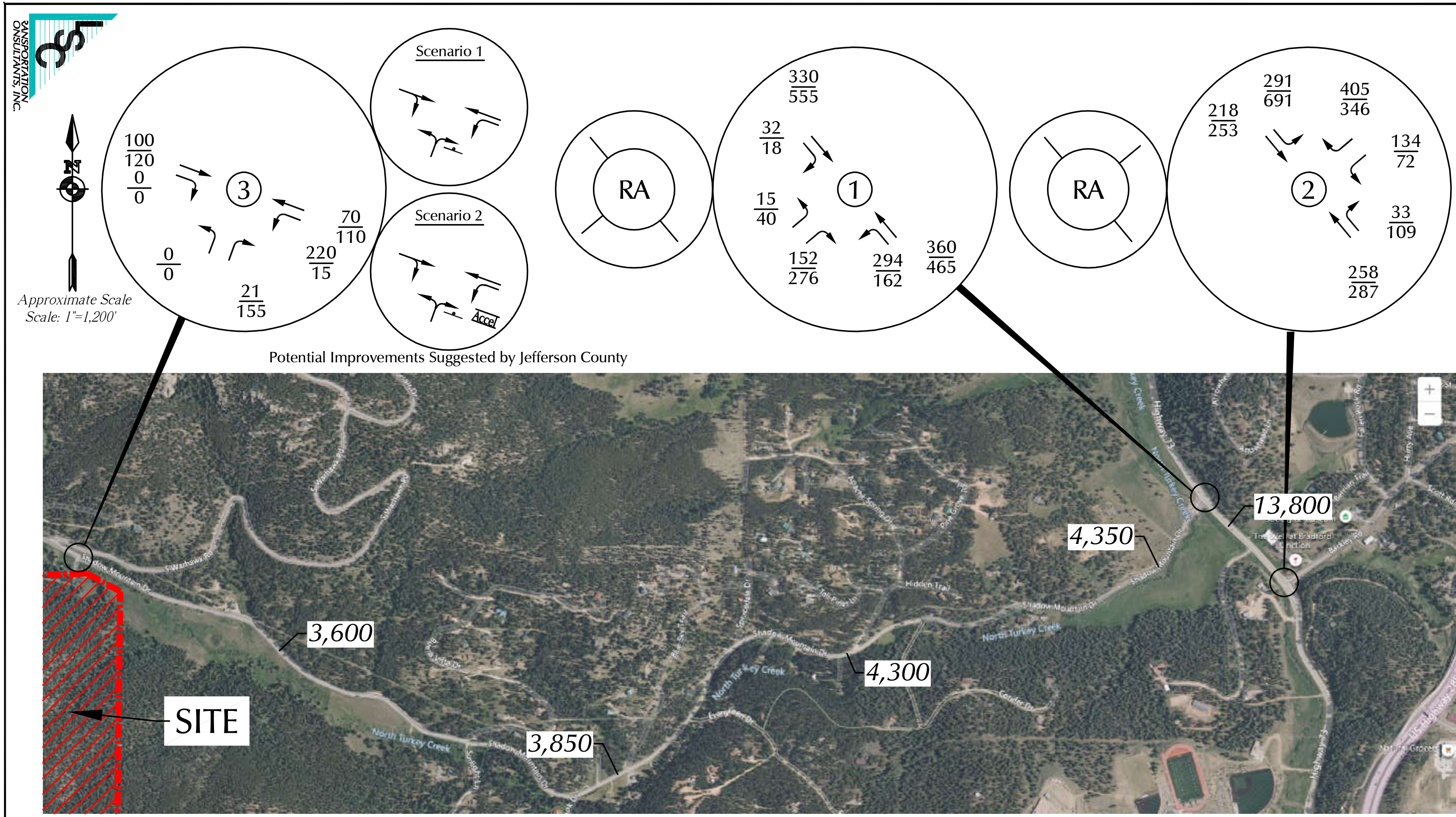
Notes:

1. These volumes are the sum of the volumes in Figures 5a and 7a.
2. The potential site access improvements suggested by Jefferson County are a left-turn lane for ingress and a right-turn acceleration lane for egress. The acceleration lane is not expected to provide much benefit but a left-turn lane for ingress could be beneficial if there are no existing constraints preventing it such as right-of-way or wetland limitations. An appropriate length for a left-turn lane would be 280 feet plus a 140-foot transition taper and 45:1 redirect taper. The appropriate length for a right-turn acceleration lane is 380 feet plus a 180-foot transition taper.

Figure 9a

Year 2043 Weekday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

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

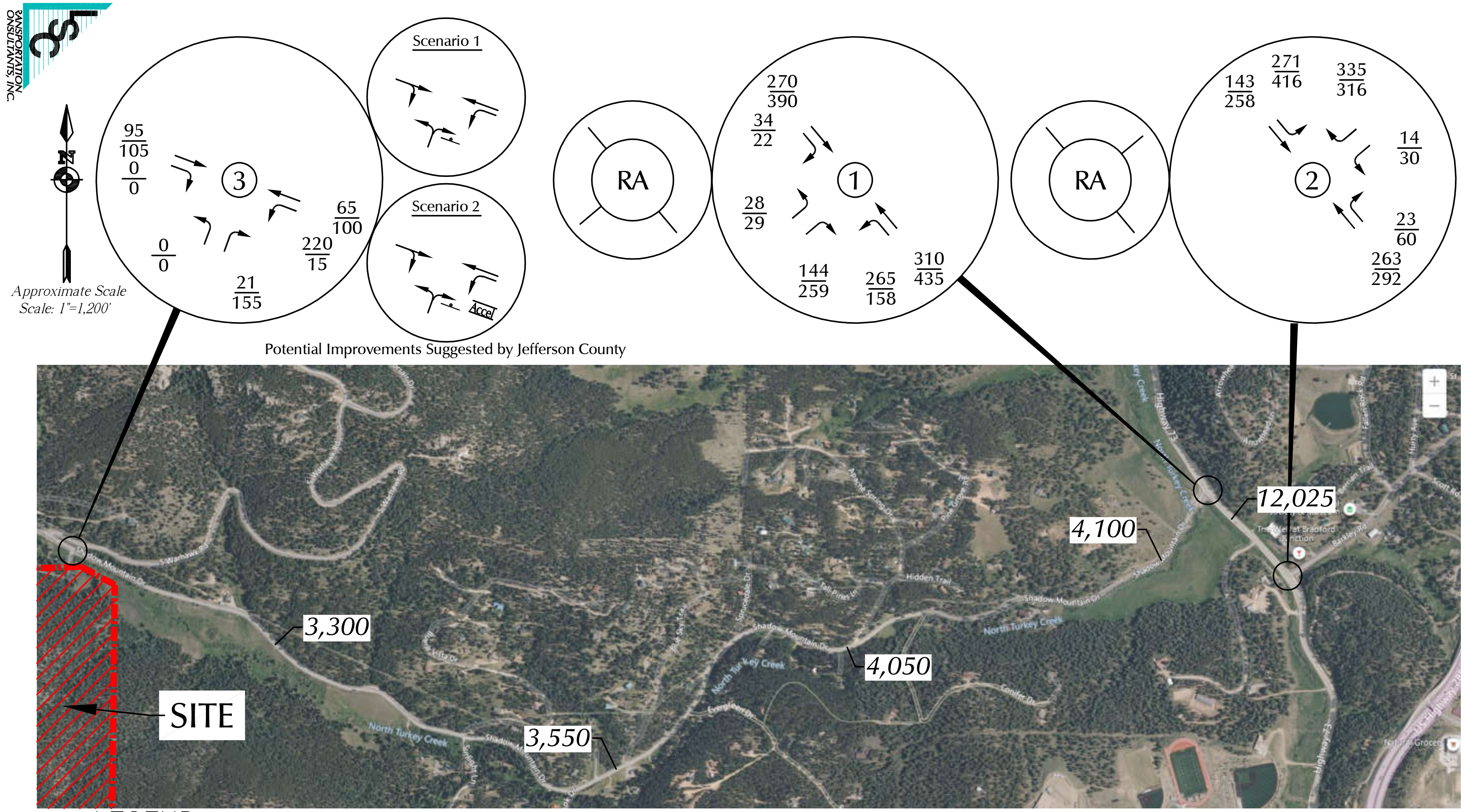
Notes:

1. These volumes are the sum of the volumes in Figures 5b and 7b.
2. The potential site access improvements suggested by Jefferson County are a left-turn lane for ingress and a right-turn acceleration lane for egress. The acceleration lane is not expected to provide much benefit but a left-turn lane for ingress could be beneficial if there are no existing constraints preventing it such as right-of-way or wetland limitations. An appropriate length for a left-turn lane would be 280 feet plus a 140-foot transition taper and 45:1 redirect taper. The appropriate length for a right-turn acceleration lane is 380 feet plus a 180-foot transition taper.

Figure 9b

Year 2043 Saturday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



LEGEND:

= Stop Sign

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

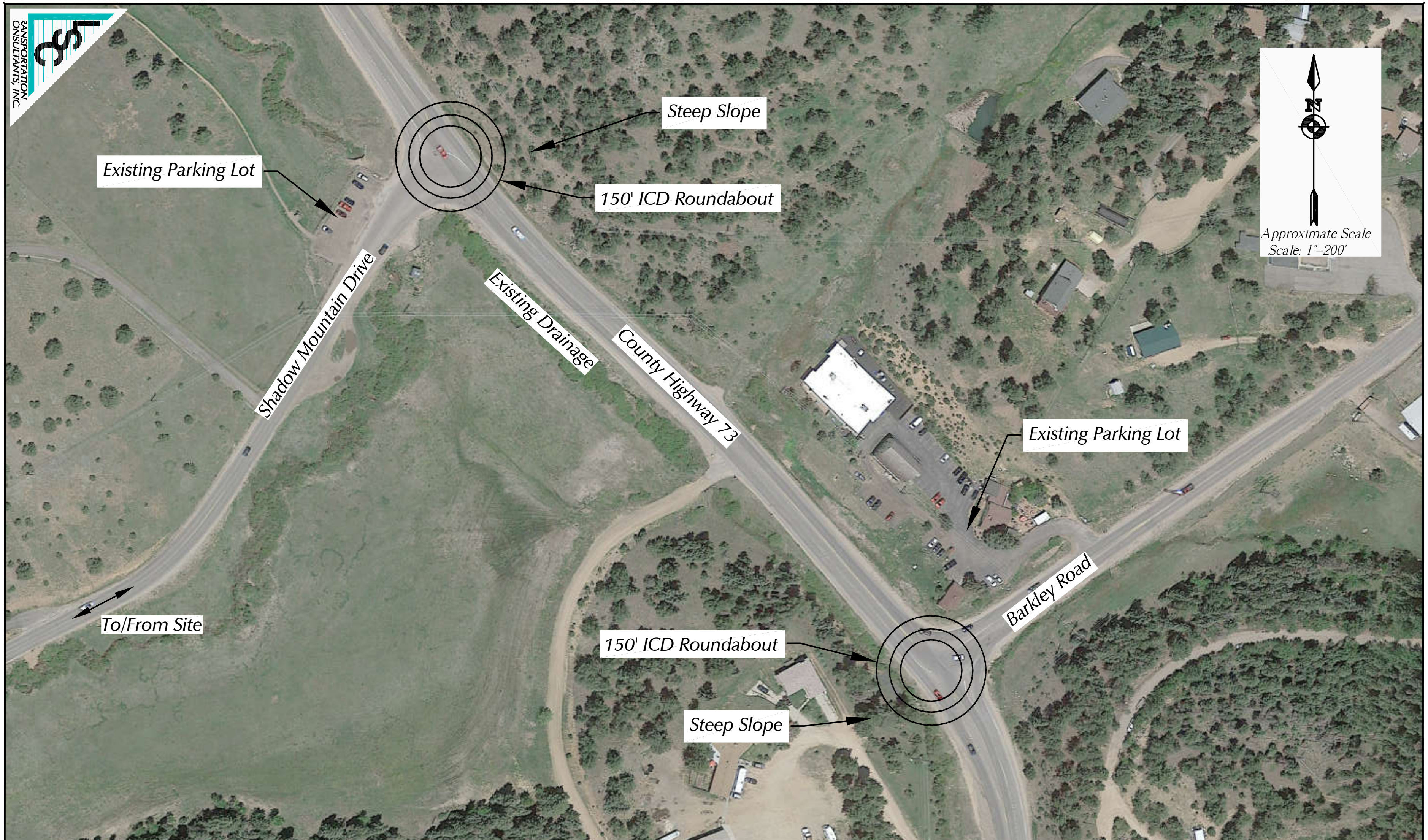
Notes:

1. These volumes are the sum of the volumes in Figures 5c and 7b.
2. The potential site access improvements suggested by Jefferson County are a left-turn lane for ingress and a right-turn acceleration lane for egress. The acceleration lane is not expected to provide much benefit but a left-turn lane for ingress could be beneficial if there are no existing constraints preventing it such as right-of-way or wetland limitations. An appropriate length for a left-turn lane would be 280 feet plus a 140-foot transition taper and 45:1 redirect taper. The appropriate length for a right-turn acceleration lane is 380 feet plus a 180-foot transition taper.

Figure 9c

Year 2043
Sunday Total Traffic

Shadow Mountain Bike Park (LSC #220850)



Notes:

1. The recommended mitigation over time is to construct a single lane roundabout at both locations consistent with feedback from Jefferson County.
2. Some of the potential design constraints are labeled above.
3. The site-generated trips are expected to comprise about 15 percent of Saturday peak hour trips by 2043 at CR73/Shadow Mountain Drive. This percentage will be much lower on weekdays and in the off-season.
4. The site-generated trips are expected to comprise about 12 percent of Saturday peak hour trips by 2043 at CR 73/Barkley Road. This percentage will be much lower on weekdays and in the off-season.

Figure 10

Potential Improvements Along CH 73 Based on County Feedback

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

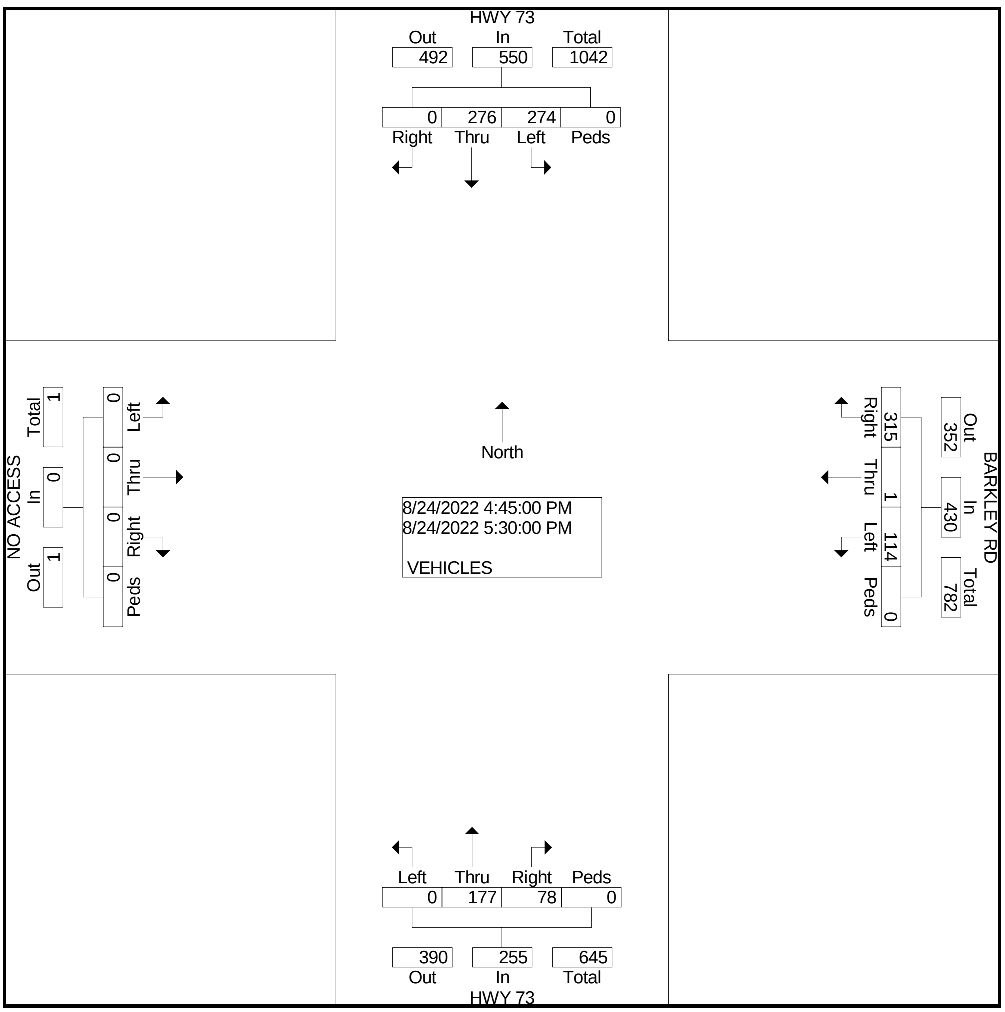
	HWY 73 Southbound				BARKLEY RD Westbound				HWY 73 Northbound				NO ACCESS Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	66	69	0	0	8	0	59	0	0	51	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

	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	

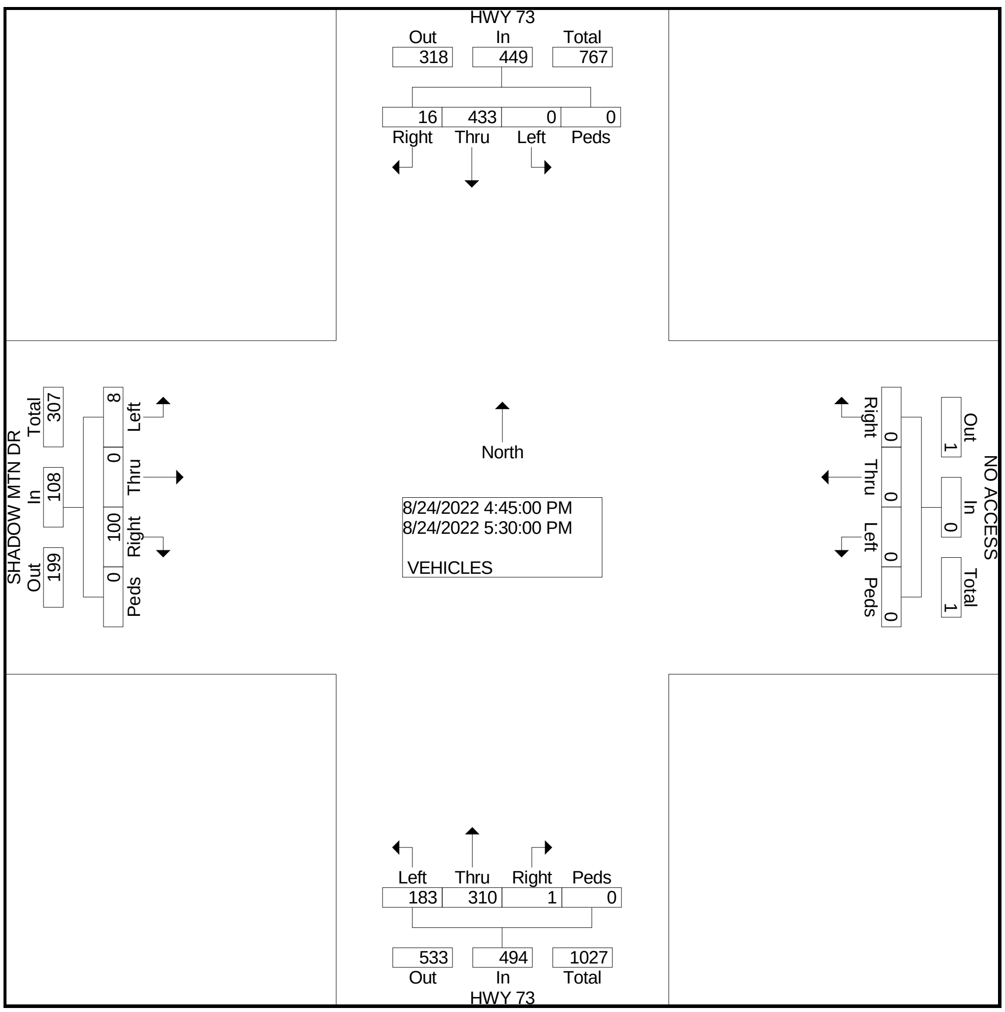
COUNTER MEASURES INC.

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	

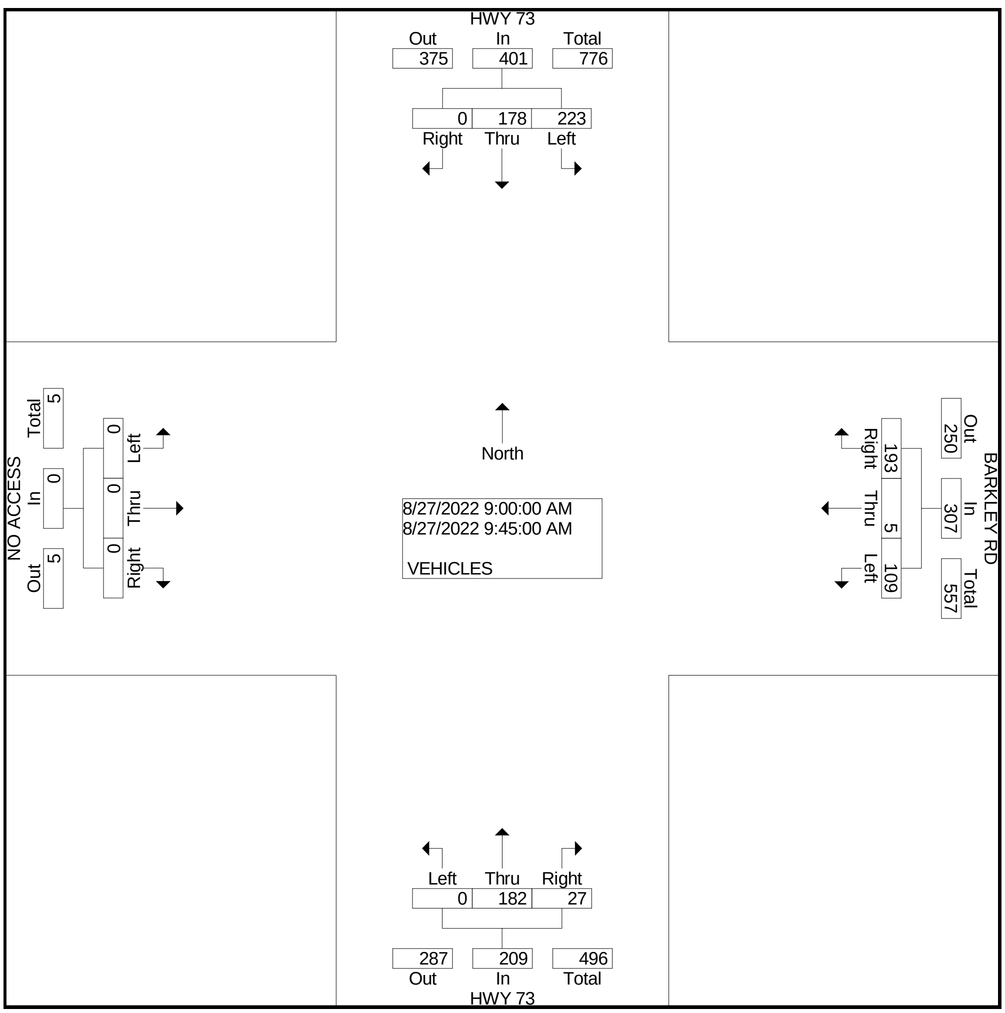
COUNTER MEASURES INC.

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					

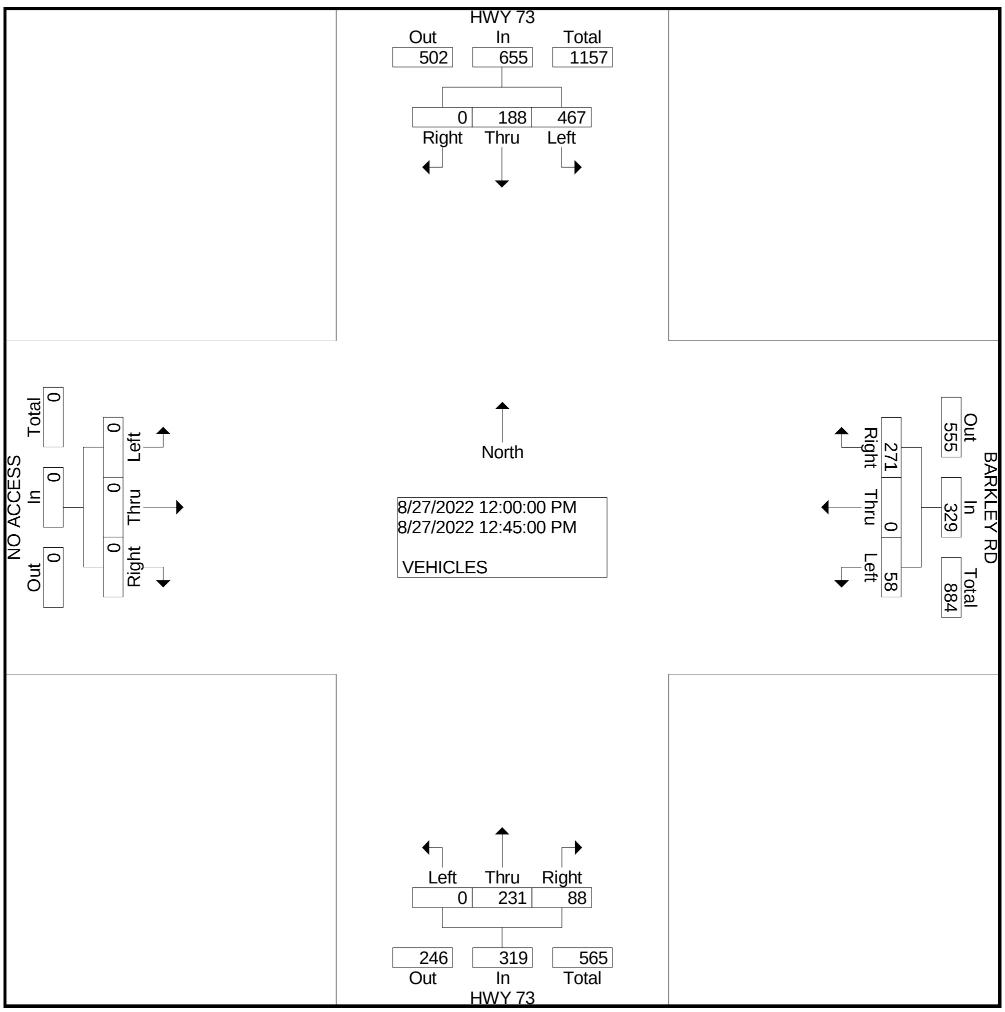


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

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

	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	

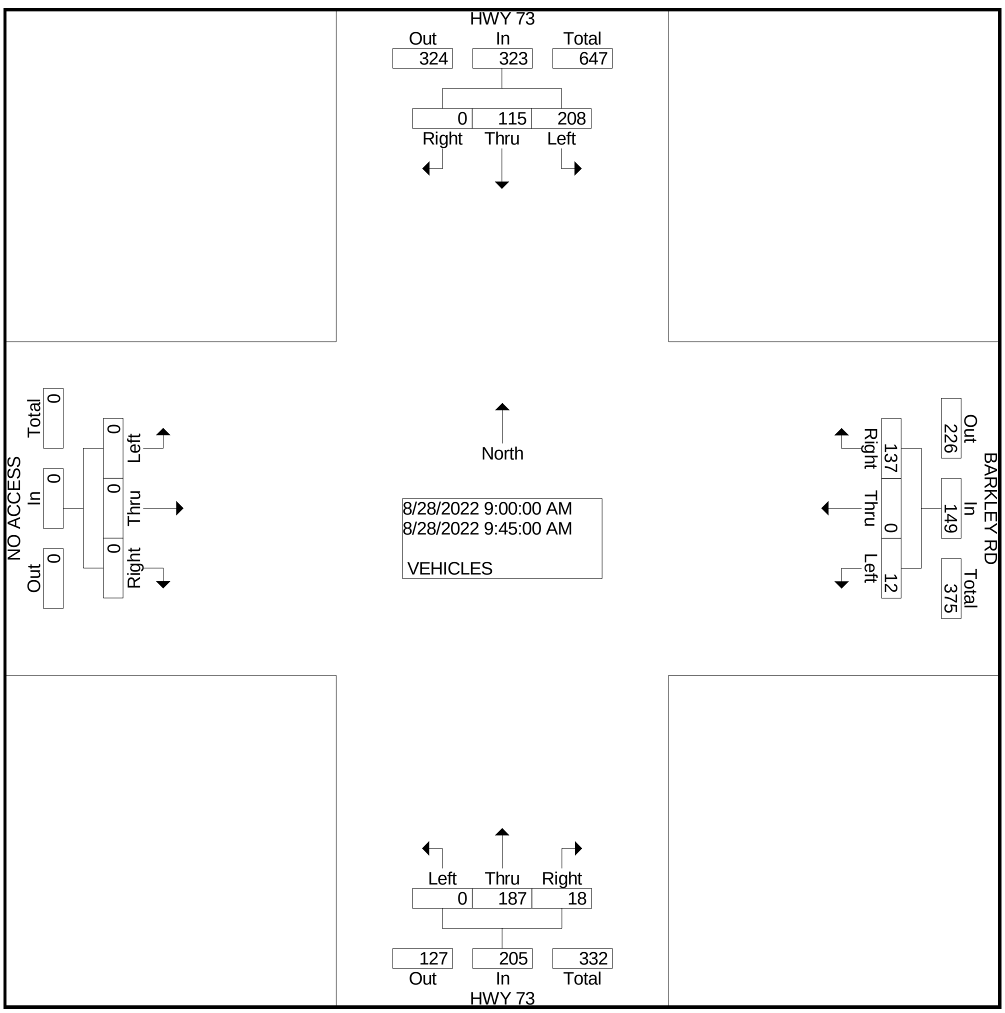
COUNTER MEASURES INC.

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

	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					

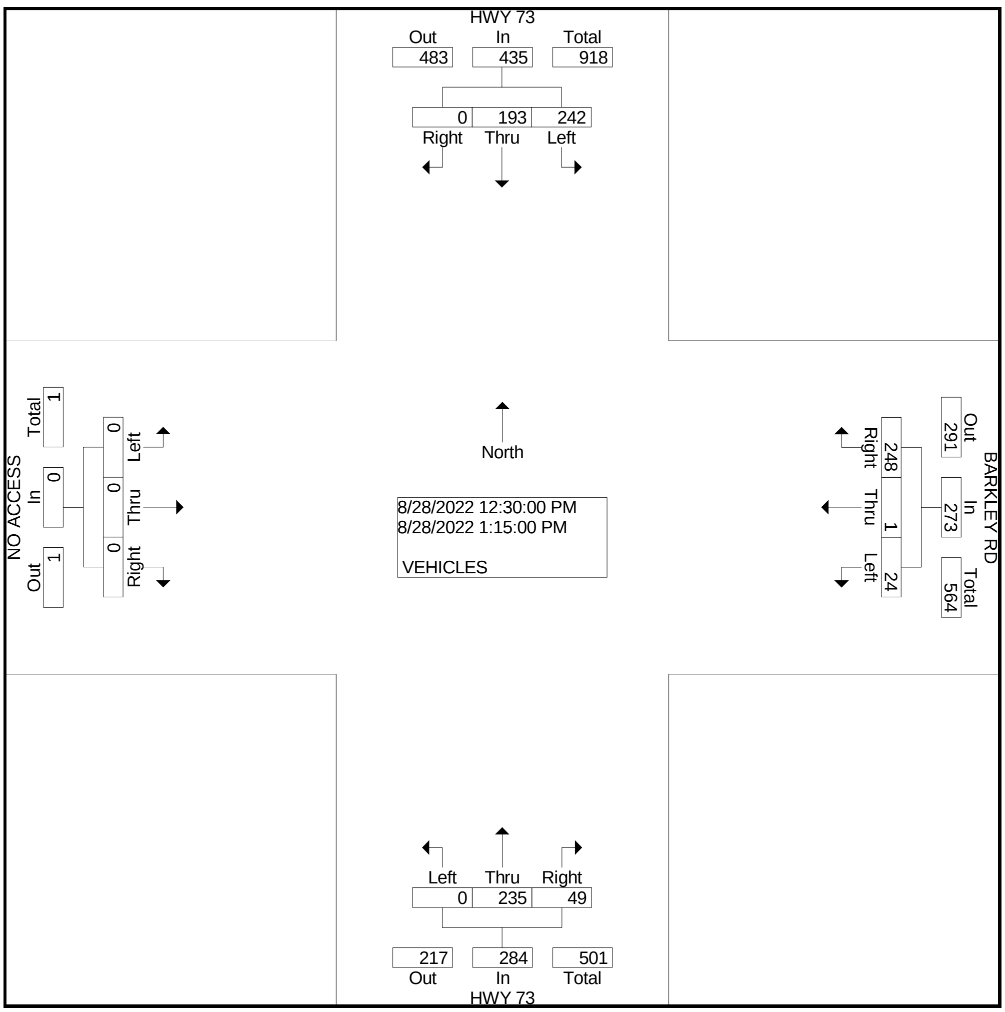


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

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

	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	

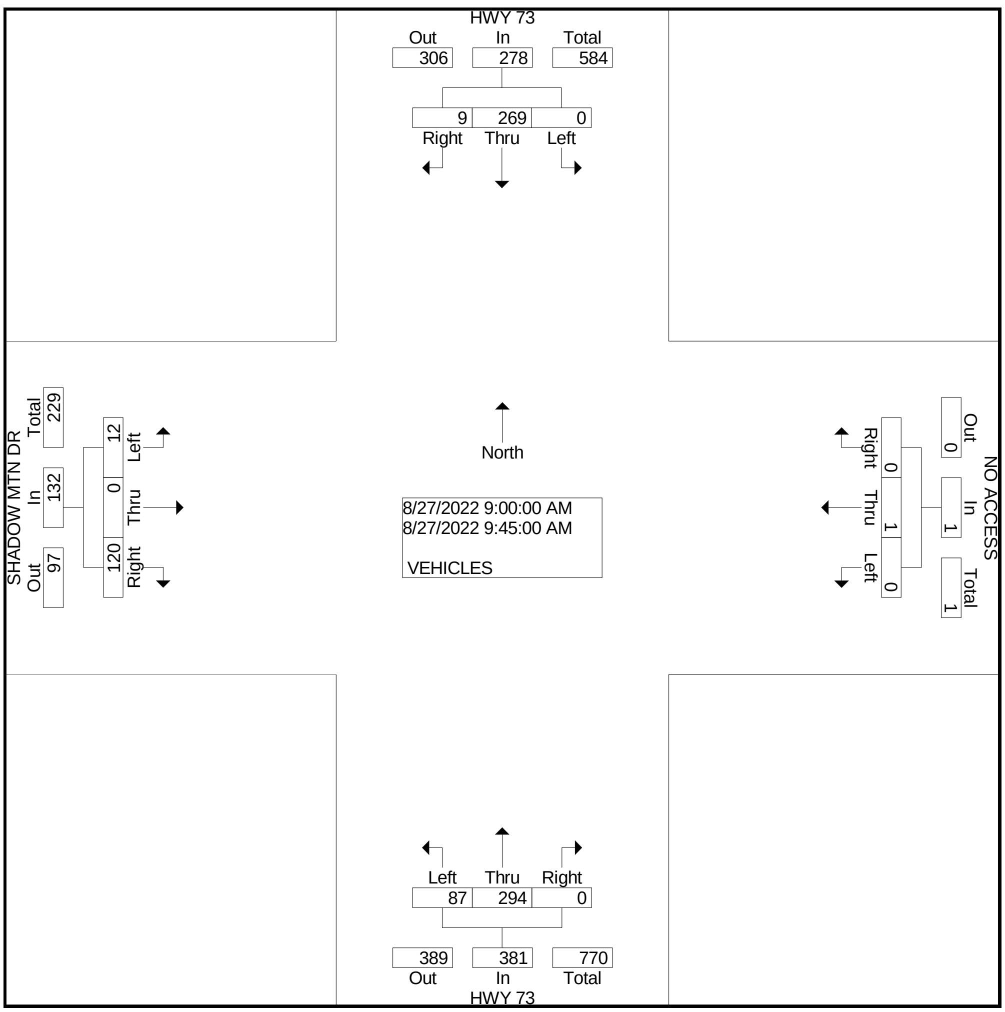
COUNTER MEASURES INC.

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

	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	



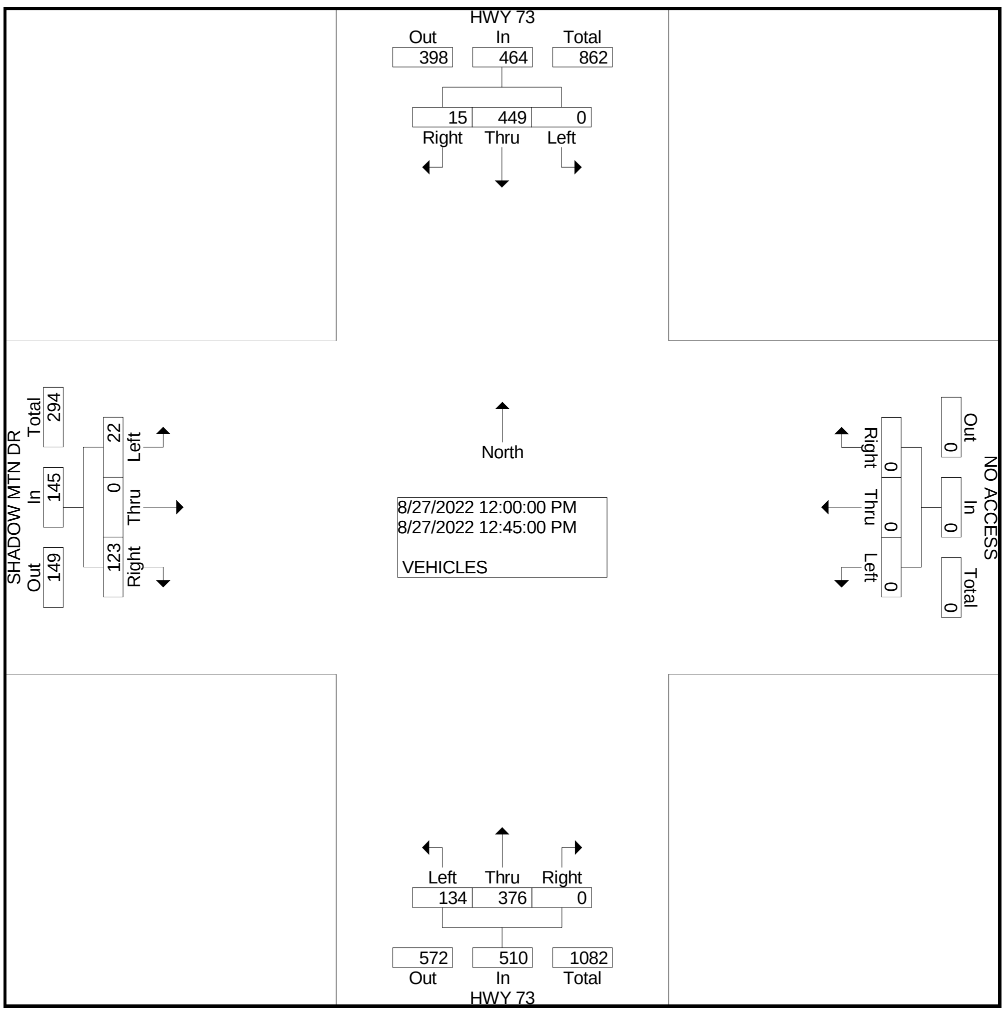
COUNTER MEASURES INC.

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

	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	

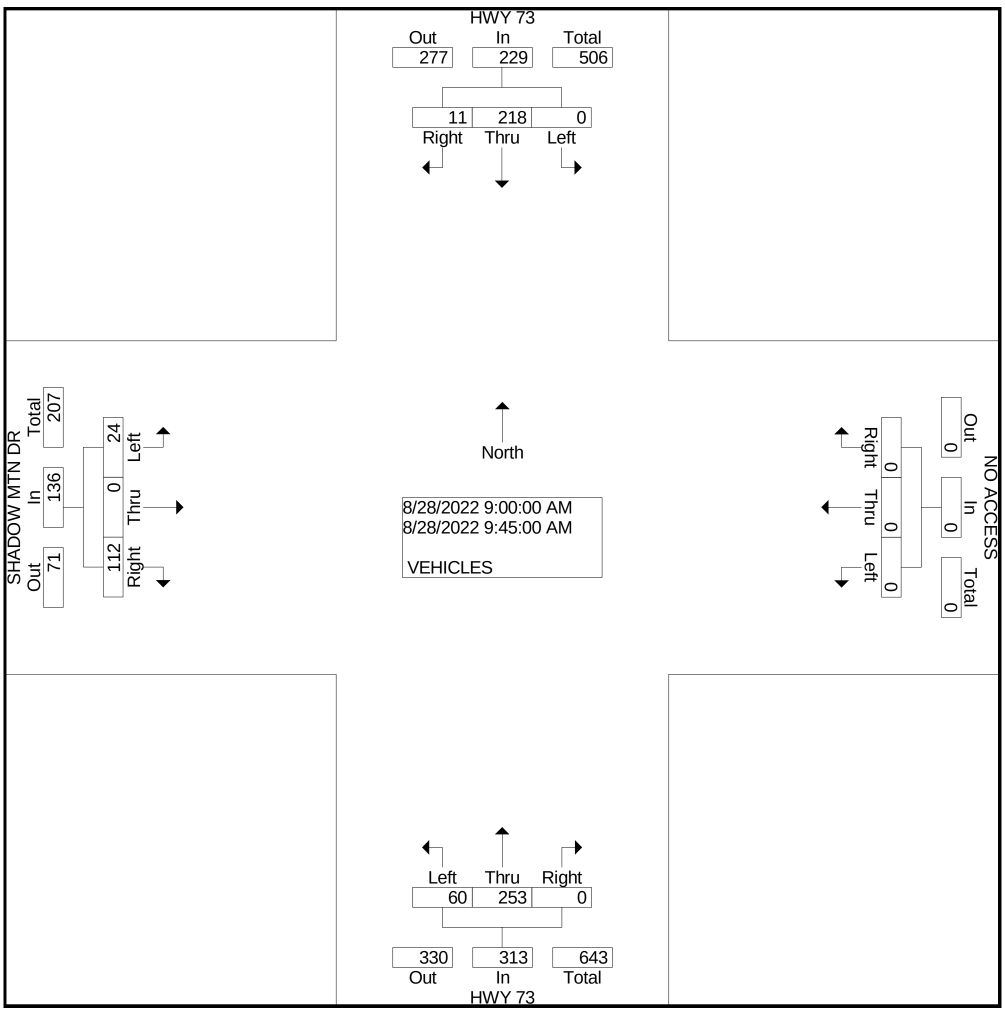
COUNTER MEASURES INC.

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

	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	

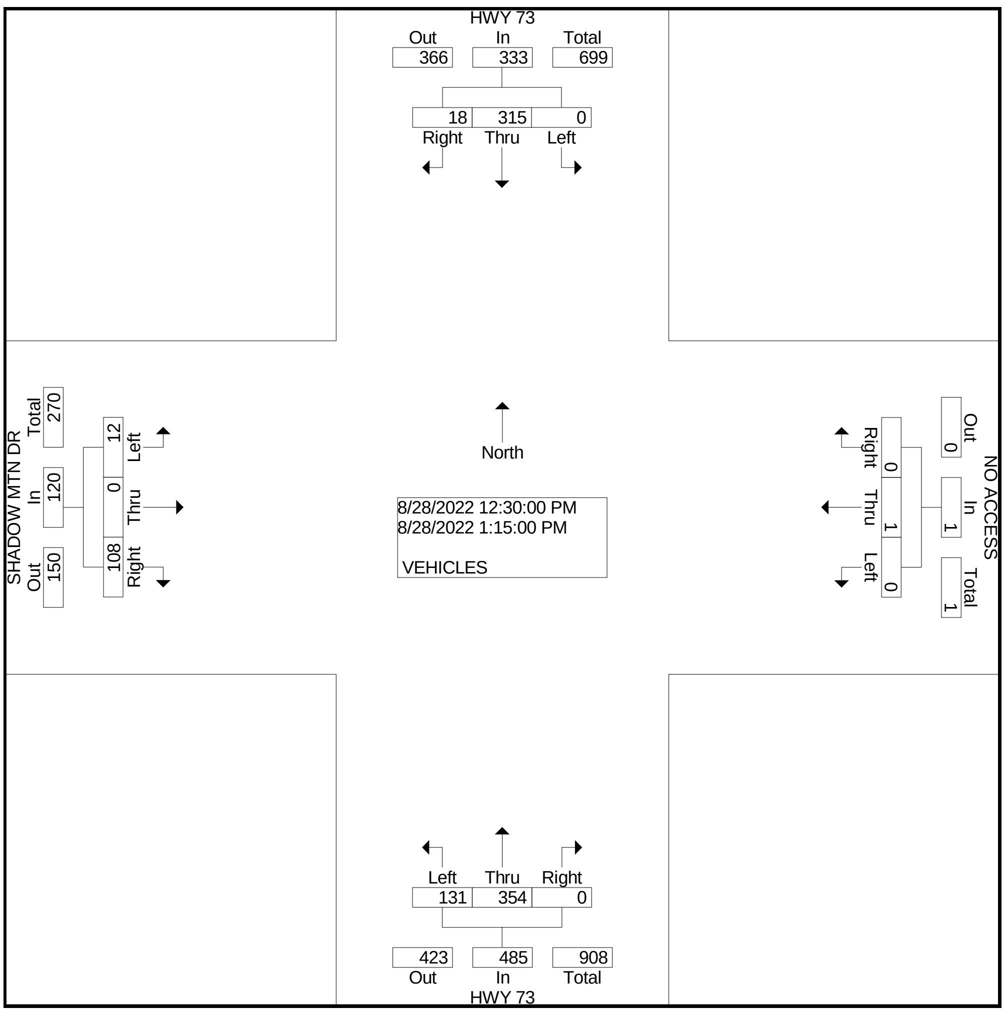


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

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

	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	



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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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

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	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	445	16	186	320	8	102
Future Vol, veh/h	445	16	186	320	8	102
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	506	18	211	364	9	116

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	524	0	1292	506
Stage 1	-	-	-	-	506	-
Stage 2	-	-	-	-	786	-
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	-	-	1043	-	180	566
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	449	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1043	-	144	566
Mov Cap-2 Maneuver	-	-	-	-	144	-
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	358	-

Approach	SE	NW	NE
HCM Control Delay, s	0	3.4	14.4
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	144	566	1043	-	-	-
HCM Lane V/C Ratio	0.063	0.205	0.203	-	-	-
HCM Control Delay (s)	31.7	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	13.2

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	280	280	180	80	117	325
Future Vol, veh/h	280	280	180	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	318	318	205	91	133	369

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	296	0	-	0	1159	205
Stage 1	-	-	-	-	205	-
Stage 2	-	-	-	-	954	-
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	1265	-	-	-	216	836
Stage 1	-	-	-	-	829	-
Stage 2	-	-	-	-	374	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1265	-	-	-	162	836
Mov Cap-2 Maneuver	-	-	-	-	162	-
Stage 1	-	-	-	-	621	-
Stage 2	-	-	-	-	374	-

Approach	SE	NW	SW
HCM Control Delay, s	4.4	0	32.1
HCM LOS			D

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1265	-	162	836
HCM Lane V/C Ratio	-	-	0.252	-	0.821	0.442
HCM Control Delay (s)	-	-	8.8	-	86.1	12.7
HCM Lane LOS	-	-	A	-	F	B
HCM 95th %tile Q(veh)	-	-	1	-	5.5	2.3

Intersection	
Int Delay, s/veh	2.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	277	9	88	303	12	122
Future Vol, veh/h	277	9	88	303	12	122
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	100	344	14	139

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	325	0	859	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	544	-
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	-	327	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	582	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1235	-	301	725
Mov Cap-2 Maneuver	-	-	-	-	301	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	535	-

Approach	SE	NW	NE
HCM Control Delay, s	0	1.8	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	301	725	1235	-	-	-
HCM Lane V/C Ratio	0.045	0.191	0.081	-	-	-
HCM Control Delay (s)	17.5	11.1	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	3.2

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	463	15	136	387	22	125
Future Vol, veh/h	463	15	136	387	22	125
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	155	440	25	142

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	543	0	1276	526
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	750	-
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	-	184	552
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	467	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1026	-	156	552
Mov Cap-2 Maneuver	-	-	-	-	156	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	396	-

Approach	SE		NW		NE	
HCM Control Delay, s	0		2.4		16.6	
HCM LOS					C	

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	156	552	1026	-	-	-
HCM Lane V/C Ratio	0.16	0.257	0.151	-	-	-
HCM Control Delay (s)	32.4	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	2.9					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	225	11	61	260	24	114
Future Vol, veh/h	225	11	61	260	24	114
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	69	295	27	130

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	269	0	689	256
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	433	-
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	-	412	783
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	654	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1295	-	390	783
Mov Cap-2 Maneuver	-	-	-	-	390	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	619	-

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)	390	783	1295	-	-	-
HCM Lane V/C Ratio	0.07	0.165	0.054	-	-	-
HCM Control Delay (s)	14.9	10.5	7.9	-	-	-
HCM Lane LOS	B	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	18	133	365	12	110
Future Vol, veh/h	325	18	133	365	12	110
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	20	151	415	14	125

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	389	0	1086	369
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	717	-
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	-	239	677
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	484	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1170	-	208	677
Mov Cap-2 Maneuver	-	-	-	-	208	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	422	-

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)	208	677	1170	-	-	-
HCM Lane V/C Ratio	0.066	0.185	0.129	-	-	-
HCM Control Delay (s)	23.5	11.5	8.5	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0.7	0.4	-	-	-

Intersection						
Int Delay, s/veh	6					

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	249	199	242	50	25	255
Future Vol, veh/h	249	199	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	283	226	275	57	28	290

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	332	0	-	0	1067	275
Stage 1	-	-	-	-	275	-
Stage 2	-	-	-	-	792	-
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	-	-	-	246	764
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	446	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1227	-	-	-	189	764
Mov Cap-2 Maneuver	-	-	-	-	189	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	446	-

Approach	SE	NW	SW
HCM Control Delay, s	4.9	0	13.9
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1227	-	189	764
HCM Lane V/C Ratio	-	-	0.231	-	0.15	0.379
HCM Control Delay (s)	-	-	8.8	-	27.4	12.6
HCM Lane LOS	-	-	A	-	D	B
HCM 95th %tile Q(veh)	-	-	0.9	-	0.5	1.8

Intersection	
Int Delay, s/veh	4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	445	28	289	320	9	112
Future Vol, veh/h	445	28	289	320	9	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	506	32	328	364	10	127

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	538	0	1526	506
Stage 1	-	-	-	-	506	-
Stage 2	-	-	-	-	1020	-
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	-	-	1030	-	130	566
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	348	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1030	-	89	566
Mov Cap-2 Maneuver	-	-	-	-	89	-
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	237	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.8	16
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	89	566	1030	-	-	-
HCM Lane V/C Ratio	0.115	0.225	0.319	-	-	-
HCM Control Delay (s)	50.6	13.2	10.1	-	-	-
HCM Lane LOS	F	B	B	-	-	-
HCM 95th %tile Q(veh)	0.4	0.9	1.4	-	-	-

Intersection	
Int Delay, s/veh	15.2

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	288	282	197	80	117	411
Future Vol, veh/h	288	282	197	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	327	320	224	91	133	467

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	315	0	-	0	1198	224
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	974	-
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	1245	-	-	-	205	815
Stage 1	-	-	-	-	813	-
Stage 2	-	-	-	-	366	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1245	-	-	-	151	815
Mov Cap-2 Maneuver	-	-	-	-	151	-
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	366	-

Approach	SE	NW	SW
HCM Control Delay, s	4.5	0	34.6
HCM LOS			D

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1245	-	151	815
HCM Lane V/C Ratio	-	-	0.263	-	0.88	0.573
HCM Control Delay (s)	-	-	8.9	-	102.8	15.2
HCM Lane LOS	-	-	A	-	F	C
HCM 95th %tile Q(veh)	-	-	1.1	-	6	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	-	-	280	-	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	-	488	974
Mov Cap-2 Maneuver	-	-	-	-	488	-
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	612	-

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	-
HCM Lane LOS	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	286	303	14	141
Future Vol, veh/h	277	31	286	303	14	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	-	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	325	344	16	160

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	350	0	1309	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	994	-
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	-	176	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1209	-	129	725
Mov Cap-2 Maneuver	-	-	-	-	129	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	262	-

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)	129	725	1209	-	-	-
HCM Lane V/C Ratio	0.123	0.221	0.269	-	-	-
HCM Control Delay (s)	36.8	11.4	9.1	-	-	-
HCM Lane LOS	E	B	A	-	-	-
HCM 95th %tile Q(veh)	0.4	0.8	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	4.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	90	0	220	65	0	21
Future Vol, veh/h	90	0	220	65	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	-	-	280	-	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	250	74	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	102	0	676	102
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	574	-
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	-	419	953
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	563	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1490	-	349	953
Mov Cap-2 Maneuver	-	-	-	-	349	-
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	468	-

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)	953	-	-	1490	-
HCM Lane V/C Ratio	0.025	-	-	0.168	-
HCM Control Delay (s)	8.9	-	-	7.9	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-

Intersection	
Int Delay, s/veh	6

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	463	17	149	387	38	264
Future Vol, veh/h	463	17	149	387	38	264
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	169	440	43	300

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	545	0	1304	526
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	778	-
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	-	177	552
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	453	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1024	-	148	552
Mov Cap-2 Maneuver	-	-	-	-	148	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	378	-

Approach	SE		NW		NE	
HCM Control Delay, s	0		2.6		21.5	
HCM LOS					C	

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	148	552	1024	-	-	-
HCM Lane V/C Ratio	0.292	0.543	0.165	-	-	-
HCM Control Delay (s)	39	19	9.2	-	-	-
HCM Lane LOS	E	C	A	-	-	-
HCM 95th %tile Q(veh)	1.1	3.2	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	110	0	15	100	0	155
Future Vol, veh/h	110	0	15	100	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	-	-	280	-	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	114	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	125	0	273	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	148	-
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	-	716	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1462	-	707	926
Mov Cap-2 Maneuver	-	-	-	-	707	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	869	-

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)	926	-	-	1462	-
HCM Lane V/C Ratio	0.19	-	-	0.012	-
HCM Control Delay (s)	9.8	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection						
Int Delay, s/veh	4.7					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	225	33	259	260	26	133
Future Vol, veh/h	225	33	259	260	26	133
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	294	295	30	151

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	294	0	1139	256
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	883	-
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	-	223	783
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	404	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1268	-	171	783
Mov Cap-2 Maneuver	-	-	-	-	171	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	310	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.3	13.9
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	171	783	1268	-	-	-
HCM Lane V/C Ratio	0.173	0.193	0.232	-	-	-
HCM Control Delay (s)	30.4	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	-	-	280	-	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	-	354	959
Mov Cap-2 Maneuver	-	-	-	-	354	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	472	-

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	-
HCM Lane LOS	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	20	146	365	28	249
Future Vol, veh/h	325	20	146	365	28	249
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	23	166	415	32	283

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	392	0	1116	369
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	747	-
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	-	230	677
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	468	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1167	-	197	677
Mov Cap-2 Maneuver	-	-	-	-	197	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	402	-

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)	197	677	1167	-	-	-
HCM Lane V/C Ratio	0.162	0.418	0.142	-	-	-
HCM Control Delay (s)	26.8	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	-	-	280	-	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	-	736	946
Mov Cap-2 Maneuver	-	-	-	-	736	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	880	-

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	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection						
Int Delay, s/veh	4					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	445	28	289	320	9	112
Future Vol, veh/h	445	28	289	320	9	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	506	32	328	364	10	127

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	538	0	1526	506
Stage 1	-	-	-	-	506	-
Stage 2	-	-	-	-	1020	-
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	-	-	1030	-	130	566
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	348	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1030	-	89	566
Mov Cap-2 Maneuver	-	-	-	-	89	-
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	237	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.8	16
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	89	566	1030	-	-	-
HCM Lane V/C Ratio	0.115	0.225	0.319	-	-	-
HCM Control Delay (s)	50.6	13.2	10.1	-	-	-
HCM Lane LOS	F	B	B	-	-	-
HCM 95th %tile Q(veh)	0.4	0.9	1.4	-	-	-

Intersection	
Int Delay, s/veh	15.2

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	288	282	197	80	117	411
Future Vol, veh/h	288	282	197	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	327	320	224	91	133	467

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	315	0	-	0	1198	224
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	974	-
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	1245	-	-	-	205	815
Stage 1	-	-	-	-	813	-
Stage 2	-	-	-	-	366	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1245	-	-	-	151	815
Mov Cap-2 Maneuver	-	-	-	-	151	-
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	366	-

Approach	SE	NW	SW
HCM Control Delay, s	4.5	0	34.6
HCM LOS			D

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1245	-	151	815
HCM Lane V/C Ratio	-	-	0.263	-	0.88	0.573
HCM Control Delay (s)	-	-	8.9	-	102.8	15.2
HCM Lane LOS	-	-	A	-	F	C
HCM 95th %tile Q(veh)	-	-	1.1	-	6	3.7

Intersection						
Int Delay, s/veh	2.8					

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	-	Free
Storage Length	-	-	280	-	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	-
Stage 1	-	-	-	-	85	-
Stage 2	-	-	-	-	410	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1512	-	534	0
Stage 1	-	-	-	-	938	0
Stage 2	-	-	-	-	670	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1512	-	488	-
Mov Cap-2 Maneuver	-	-	-	-	488	-
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	612	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1512	-
HCM Lane V/C Ratio	-	-	-	0.086	-
HCM Control Delay (s)	0	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.3	-

Intersection	
Int Delay, s/veh	4.5

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	277	31	286	303	14	141
Future Vol, veh/h	277	31	286	303	14	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	-	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	325	344	16	160

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	350	0	1309	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	994	-
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	-	176	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1209	-	129	725
Mov Cap-2 Maneuver	-	-	-	-	129	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	262	-

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)	129	725	1209	-	-	-
HCM Lane V/C Ratio	0.123	0.221	0.269	-	-	-
HCM Control Delay (s)	36.8	11.4	9.1	-	-	-
HCM Lane LOS	E	B	A	-	-	-
HCM 95th %tile Q(veh)	0.4	0.8	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	4.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	90	0	220	65	0	21
Future Vol, veh/h	90	0	220	65	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	280	-	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	250	74	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	102	0	676	-
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	574	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1490	-	419	0
Stage 1	-	-	-	-	922	0
Stage 2	-	-	-	-	563	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1490	-	349	-
Mov Cap-2 Maneuver	-	-	-	-	349	-
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	468	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1490	-
HCM Lane V/C Ratio	-	-	-	0.168	-
HCM Control Delay (s)	0	-	-	7.9	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.6	-

Intersection						
Int Delay, s/veh	6					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	463	17	149	387	38	264
Future Vol, veh/h	463	17	149	387	38	264
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	169	440	43	300

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	545	0	1304	526
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	778	-
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	-	177	552
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	453	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1024	-	148	552
Mov Cap-2 Maneuver	-	-	-	-	148	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	378	-

Approach	SE	NW	NE
HCM Control Delay, s	0	2.6	21.5
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	148	552	1024	-	-	-
HCM Lane V/C Ratio	0.292	0.543	0.165	-	-	-
HCM Control Delay (s)	39	19	9.2	-	-	-
HCM Lane LOS	E	C	A	-	-	-
HCM 95th %tile Q(veh)	1.1	3.2	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	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	110	0	15	100	0	155
Future Vol, veh/h	110	0	15	100	0	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	280	-	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	114	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	125	0	273	-
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1462	-	716	0
Stage 1	-	-	-	-	901	0
Stage 2	-	-	-	-	880	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1462	-	707	-
Mov Cap-2 Maneuver	-	-	-	-	707	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	869	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1462	-
HCM Lane V/C Ratio	-	-	-	0.012	-
HCM Control Delay (s)	0	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	4.7

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	225	33	259	260	26	133
Future Vol, veh/h	225	33	259	260	26	133
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	294	295	30	151

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	294	0	1139	256
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	883	-
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	-	223	783
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	404	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1268	-	171	783
Mov Cap-2 Maneuver	-	-	-	-	171	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	310	-

Approach	SE	NW	NE
HCM Control Delay, s	0	4.3	13.9
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	171	783	1268	-	-	-
HCM Lane V/C Ratio	0.173	0.193	0.232	-	-	-
HCM Control Delay (s)	30.4	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	4.8

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	-	Free
Storage Length	-	-	280	-	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	-
Stage 1	-	-	-	-	97	-
Stage 2	-	-	-	-	568	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1496	-	425	0
Stage 1	-	-	-	-	927	0
Stage 2	-	-	-	-	567	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1496	-	354	-
Mov Cap-2 Maneuver	-	-	-	-	354	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	472	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.2	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1496	-
HCM Lane V/C Ratio	-	-	-	0.167	-
HCM Control Delay (s)	0	-	-	7.9	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.6	-

Intersection	
Int Delay, s/veh	4.9

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	325	20	146	365	28	249
Future Vol, veh/h	325	20	146	365	28	249
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	23	166	415	32	283

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	392	0	1116	369
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	747	-
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	-	230	677
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	468	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1167	-	197	677
Mov Cap-2 Maneuver	-	-	-	-	197	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	402	-

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)	197	677	1167	-	-	-
HCM Lane V/C Ratio	0.162	0.418	0.142	-	-	-
HCM Control Delay (s)	26.8	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	0.6

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	-	Free
Storage Length	-	-	280	-	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	-
Stage 1	-	-	-	-	108	-
Stage 2	-	-	-	-	136	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1483	-	744	0
Stage 1	-	-	-	-	916	0
Stage 2	-	-	-	-	890	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1483	-	736	-
Mov Cap-2 Maneuver	-	-	-	-	736	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	880	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1483	-
HCM Lane V/C Ratio	-	-	-	0.011	-
HCM Control Delay (s)	0	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Intersection Delay, s/veh	9.1
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	625	659	136
Demand Flow Rate, veh/h	637	673	139
Vehicles Circulating, veh/h	232	11	614
Vehicles Exiting, veh/h	452	741	255
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.9	7.8	7.1
Approach LOS	B	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	637	673	139
Cap Entry Lane, veh/h	1089	1364	738
Entry HV Adj Factor	0.981	0.980	0.978
Flow Entry, veh/h	625	659	136
Cap Entry, veh/h	1069	1337	722
V/C Ratio	0.585	0.493	0.188
Control Delay, s/veh	10.9	7.8	7.1
LOS	B	A	A
95th %tile Queue, veh	4	3	1

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	728	335	591
Demand Flow Rate, veh/h	742	342	603
Vehicles Circulating, veh/h	162	371	232
Vehicles Exiting, veh/h	673	533	481
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	11.6	7.9	10.2
Approach LOS	B	A	B

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	742	342	603
Cap Entry Lane, veh/h	1170	945	1089
Entry HV Adj Factor	0.981	0.981	0.980
Flow Entry, veh/h	728	335	591
Cap Entry, veh/h	1147	927	1067
V/C Ratio	0.634	0.362	0.554
Control Delay, s/veh	11.6	7.9	10.2
LOS	B	A	B
95th %tile Queue, veh	5	2	4

Intersection	
Intersection Delay, s/veh	6.1
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	386	518	166
Demand Flow Rate, veh/h	393	528	169
Vehicles Circulating, veh/h	111	15	382
Vehicles Exiting, veh/h	432	536	122
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	6.0	6.4	5.7
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	393	528	169
Cap Entry Lane, veh/h	1232	1359	935
Entry HV Adj Factor	0.981	0.981	0.982
Flow Entry, veh/h	386	518	166
Cap Entry, veh/h	1209	1333	918
V/C Ratio	0.319	0.389	0.181
Control Delay, s/veh	6.0	6.4	5.7
LOS	A	A	A
95th %tile Queue, veh	1	2	1

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	556	294	425
Demand Flow Rate, veh/h	567	300	433
Vehicles Circulating, veh/h	155	318	261
Vehicles Exiting, veh/h	539	404	357
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.4	6.8	7.9
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	567	300	433
Cap Entry Lane, veh/h	1178	998	1057
Entry HV Adj Factor	0.981	0.980	0.982
Flow Entry, veh/h	556	294	425
Cap Entry, veh/h	1155	977	1038
V/C Ratio	0.481	0.301	0.410
Control Delay, s/veh	8.4	6.8	7.9
LOS	A	A	A
95th %tile Queue, veh	3	1	2

Intersection	
Intersection Delay, s/veh	9.1
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	649	697	183
Demand Flow Rate, veh/h	662	711	187
Vehicles Circulating, veh/h	172	28	644
Vehicles Exiting, veh/h	567	803	190
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.2	8.4	8.3
Approach LOS	B	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	662	711	187
Cap Entry Lane, veh/h	1158	1341	715
Entry HV Adj Factor	0.981	0.981	0.979
Flow Entry, veh/h	649	697	183
Cap Entry, veh/h	1136	1315	700
V/C Ratio	0.572	0.530	0.261
Control Delay, s/veh	10.2	8.4	8.3
LOS	B	A	A
95th %tile Queue, veh	4	3	1

Intersection	
Intersection Delay, s/veh	13.5
Intersection LOS	B

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	909	437	455
Demand Flow Rate, veh/h	927	445	464
Vehicles Circulating, veh/h	82	661	324
Vehicles Exiting, veh/h	706	348	782
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	13.9	16.9	9.3
Approach LOS	B	C	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	927	445	464
Cap Entry Lane, veh/h	1269	703	992
Entry HV Adj Factor	0.980	0.981	0.981
Flow Entry, veh/h	909	437	455
Cap Entry, veh/h	1244	690	972
V/C Ratio	0.730	0.633	0.468
Control Delay, s/veh	13.9	16.9	9.3
LOS	B	C	A
95th %tile Queue, veh	7	5	3

Intersection	
Intersection Delay, s/veh	5.4
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	321	428	172
Demand Flow Rate, veh/h	327	437	176
Vehicles Circulating, veh/h	78	31	313
Vehicles Exiting, veh/h	390	458	92
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.2	5.7	5.3
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	327	437	176
Cap Entry Lane, veh/h	1274	1337	1003
Entry HV Adj Factor	0.981	0.979	0.977
Flow Entry, veh/h	321	428	172
Cap Entry, veh/h	1250	1309	980
V/C Ratio	0.257	0.327	0.176
Control Delay, s/veh	5.2	5.7	5.3
LOS	A	A	A
95th %tile Queue, veh	1	1	1

Intersection	
Intersection Delay, s/veh	5.9
Intersection LOS	A

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	449	287	209
Demand Flow Rate, veh/h	458	293	213
Vehicles Circulating, veh/h	16	296	266
Vehicles Exiting, veh/h	463	178	323
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.8	6.5	5.4
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	458	293	213
Cap Entry Lane, veh/h	1358	1020	1052
Entry HV Adj Factor	0.980	0.979	0.981
Flow Entry, veh/h	449	287	209
Cap Entry, veh/h	1330	999	1032
V/C Ratio	0.337	0.287	0.202
Control Delay, s/veh	5.8	6.5	5.4
LOS	A	A	A
95th %tile Queue, veh	2	1	1

Intersection	
Intersection Delay, s/veh	7.4
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	466	659	151
Demand Flow Rate, veh/h	475	672	154
Vehicles Circulating, veh/h	168	15	452
Vehicles Exiting, veh/h	519	591	191
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.4	7.8	6.0
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	475	672	154
Cap Entry Lane, veh/h	1163	1359	870
Entry HV Adj Factor	0.981	0.981	0.981
Flow Entry, veh/h	466	659	151
Cap Entry, veh/h	1141	1333	853
V/C Ratio	0.409	0.495	0.177
Control Delay, s/veh	7.4	7.8	6.0
LOS	A	A	A
95th %tile Queue, veh	2	3	1

Intersection	
Intersection Delay, s/veh	8.0
Intersection LOS	A

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	608	398	381
Demand Flow Rate, veh/h	620	406	389
Vehicles Circulating, veh/h	35	348	337
Vehicles Exiting, veh/h	691	307	417
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.5	8.6	8.2
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	620	406	389
Cap Entry Lane, veh/h	1331	968	979
Entry HV Adj Factor	0.980	0.981	0.979
Flow Entry, veh/h	608	398	381
Cap Entry, veh/h	1305	949	958
V/C Ratio	0.466	0.420	0.398
Control Delay, s/veh	7.5	8.6	8.2
LOS	A	A	A
95th %tile Queue, veh	3	2	2

Intersection	
Intersection Delay, s/veh	11.3
Intersection LOS	B

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	638	776	148
Demand Flow Rate, veh/h	651	792	151
Vehicles Circulating, veh/h	351	12	614
Vehicles Exiting, veh/h	453	753	388
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	14.7	9.3	7.3
Approach LOS	B	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	651	792	151
Cap Entry Lane, veh/h	965	1363	738
Entry HV Adj Factor	0.980	0.980	0.980
Flow Entry, veh/h	638	776	148
Cap Entry, veh/h	945	1336	723
V/C Ratio	0.675	0.581	0.205
Control Delay, s/veh	14.7	9.3	7.3
LOS	B	A	A
95th %tile Queue, veh	5	4	1

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	739	355	689
Demand Flow Rate, veh/h	753	362	703
Vehicles Circulating, veh/h	162	380	252
Vehicles Exiting, veh/h	793	535	490
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	11.8	8.3	13.1
Approach LOS	B	A	B

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	753	362	703
Cap Entry Lane, veh/h	1170	937	1067
Entry HV Adj Factor	0.981	0.981	0.980
Flow Entry, veh/h	739	355	689
Cap Entry, veh/h	1147	919	1046
V/C Ratio	0.644	0.387	0.659
Control Delay, s/veh	11.8	8.3	13.1
LOS	B	A	B
95th %tile Queue, veh	5	2	5

Intersection	
Int Delay, s/veh	2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	85	0	115	140	0	11
Future Vol, veh/h	85	0	115	140	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	-	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	131	159	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	97	0	518	97
Stage 1	-	-	-	-	97	-
Stage 2	-	-	-	-	421	-
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	-	518	959
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	662	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1496	-	472	959
Mov Cap-2 Maneuver	-	-	-	-	472	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	604	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	959	-	-	1496	-
HCM Lane V/C Ratio	0.013	-	-	0.087	-
HCM Control Delay (s)	8.8	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	-

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	411	743	190
Demand Flow Rate, veh/h	419	758	193
Vehicles Circulating, veh/h	341	17	382
Vehicles Exiting, veh/h	434	558	378
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.7	8.9	6.0
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	419	758	193
Cap Entry Lane, veh/h	975	1356	935
Entry HV Adj Factor	0.980	0.980	0.984
Flow Entry, veh/h	411	743	190
Cap Entry, veh/h	955	1329	920
V/C Ratio	0.430	0.559	0.207
Control Delay, s/veh	8.7	8.9	6.0
LOS	A	A	A
95th %tile Queue, veh	2	4	1

Intersection	
Intersection Delay, s/veh	9.9
Intersection LOS	A

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	579	331	612
Demand Flow Rate, veh/h	591	338	624
Vehicles Circulating, veh/h	155	338	299
Vehicles Exiting, veh/h	768	408	377
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.7	7.5	12.2
Approach LOS	A	A	B

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	591	338	624
Cap Entry Lane, veh/h	1178	978	1017
Entry HV Adj Factor	0.980	0.980	0.981
Flow Entry, veh/h	579	331	612
Cap Entry, veh/h	1154	958	998
V/C Ratio	0.502	0.346	0.613
Control Delay, s/veh	8.7	7.5	12.2
LOS	A	A	B
95th %tile Queue, veh	3	2	4

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	-	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	-	340	939
Mov Cap-2 Maneuver	-	-	-	-	340	-
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	465	-

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	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	651	712	359
Demand Flow Rate, veh/h	664	727	366
Vehicles Circulating, veh/h	188	46	644
Vehicles Exiting, veh/h	585	964	208
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.5	8.9	12.9
Approach LOS	B	A	B

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	664	727	366
Cap Entry Lane, veh/h	1139	1317	715
Entry HV Adj Factor	0.981	0.980	0.981
Flow Entry, veh/h	651	712	359
Cap Entry, veh/h	1117	1290	702
V/C Ratio	0.583	0.552	0.512
Control Delay, s/veh	10.5	8.9	12.9
LOS	B	A	B
95th %tile Queue, veh	4	4	3

Intersection	
Intersection Delay, s/veh	20.0
Intersection LOS	C

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1073	450	475
Demand Flow Rate, veh/h	1095	459	485
Vehicles Circulating, veh/h	84	801	333
Vehicles Exiting, veh/h	734	378	927
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	22.1	25.8	9.8
Approach LOS	C	D	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1095	459	485
Cap Entry Lane, veh/h	1267	610	983
Entry HV Adj Factor	0.980	0.981	0.979
Flow Entry, veh/h	1073	450	475
Cap Entry, veh/h	1241	598	962
V/C Ratio	0.865	0.753	0.494
Control Delay, s/veh	22.1	25.8	9.8
LOS	C	D	A
95th %tile Queue, veh	12	7	3

Intersection						
Int Delay, s/veh	4.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	120	0	15	110	0	155
Future Vol, veh/h	120	0	15	110	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	-	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	136	0	17	125	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	136	0	295	136
Stage 1	-	-	-	-	136	-
Stage 2	-	-	-	-	159	-
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	-	-	1448	-	696	913
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	870	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1448	-	688	913
Mov Cap-2 Maneuver	-	-	-	-	688	-
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	860	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	913	-	-	1448	-
HCM Lane V/C Ratio	0.193	-	-	0.012	-
HCM Control Delay (s)	9.9	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection			
Intersection Delay, s/veh	7.4		
Intersection LOS	A		

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	346	653	196
Demand Flow Rate, veh/h	353	666	200
Vehicles Circulating, veh/h	307	33	313
Vehicles Exiting, veh/h	392	480	347
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.3	8.0	5.6
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	353	666	200
Cap Entry Lane, veh/h	1009	1334	1003
Entry HV Adj Factor	0.980	0.980	0.980
Flow Entry, veh/h	346	653	196
Cap Entry, veh/h	989	1308	983
V/C Ratio	0.350	0.499	0.199
Control Delay, s/veh	7.3	8.0	5.6
LOS	A	A	A
95th %tile Queue, veh	2	3	1

Intersection			
Intersection Delay, s/veh	7.0		
Intersection LOS	A		

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	470	325	397
Demand Flow Rate, veh/h	479	332	405
Vehicles Circulating, veh/h	16	314	305
Vehicles Exiting, veh/h	694	181	341
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.9	7.1	8.0
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	479	332	405
Cap Entry Lane, veh/h	1358	1002	1011
Entry HV Adj Factor	0.981	0.979	0.980
Flow Entry, veh/h	470	325	397
Cap Entry, veh/h	1331	981	991
V/C Ratio	0.353	0.331	0.401
Control Delay, s/veh	5.9	7.1	8.0
LOS	A	A	A
95th %tile Queue, veh	2	1	2

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	95	0	220	65	0	21
Future Vol, veh/h	95	0	220	65	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	-	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	250	74	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	108	0	682	108
Stage 1	-	-	-	-	108	-
Stage 2	-	-	-	-	574	-
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	-	415	946
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	563	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1483	-	345	946
Mov Cap-2 Maneuver	-	-	-	-	345	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	468	-

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)	946	-	-	1483	-
HCM Lane V/C Ratio	0.025	-	-	0.169	-
HCM Control Delay (s)	8.9	-	-	7.9	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	468	674	327
Demand Flow Rate, veh/h	478	688	334
Vehicles Circulating, veh/h	184	34	452
Vehicles Exiting, veh/h	538	752	209
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.6	8.2	8.8
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	478	688	334
Cap Entry Lane, veh/h	1144	1333	870
Entry HV Adj Factor	0.979	0.980	0.979
Flow Entry, veh/h	468	674	327
Cap Entry, veh/h	1120	1306	852
V/C Ratio	0.418	0.516	0.384
Control Delay, s/veh	7.6	8.2	8.8
LOS	A	A	A
95th %tile Queue, veh	2	3	2

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	766	400	393
Demand Flow Rate, veh/h	781	408	401
Vehicles Circulating, veh/h	35	482	339
Vehicles Exiting, veh/h	705	334	551
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	9.5	10.8	8.4
Approach LOS	A	B	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	781	408	401
Cap Entry Lane, veh/h	1331	844	977
Entry HV Adj Factor	0.981	0.981	0.980
Flow Entry, veh/h	766	400	393
Cap Entry, veh/h	1306	828	957
V/C Ratio	0.587	0.483	0.411
Control Delay, s/veh	9.5	10.8	8.4
LOS	A	B	A
95th %tile Queue, veh	4	3	2

Intersection						
Int Delay, s/veh	4.4					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	105	0	15	100	0	155
Future Vol, veh/h	105	0	15	100	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	-	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	119	0	17	114	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	119	0	267	119
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	148	-
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	-	-	1469	-	722	933
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1469	-	713	933
Mov Cap-2 Maneuver	-	-	-	-	713	-
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	869	-

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)	933	-	-	1469	-
HCM Lane V/C Ratio	0.189	-	-	0.012	-
HCM Control Delay (s)	9.8	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection	
Intersection Delay, s/veh	11.3
Intersection LOS	B

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	638	776	148
Demand Flow Rate, veh/h	651	792	151
Vehicles Circulating, veh/h	351	12	614
Vehicles Exiting, veh/h	453	753	388
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	14.7	9.3	7.3
Approach LOS	B	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	651	792	151
Cap Entry Lane, veh/h	965	1363	738
Entry HV Adj Factor	0.980	0.980	0.980
Flow Entry, veh/h	638	776	148
Cap Entry, veh/h	945	1336	723
V/C Ratio	0.675	0.581	0.205
Control Delay, s/veh	14.7	9.3	7.3
LOS	B	A	A
95th %tile Queue, veh	5	4	1

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	739	355	689
Demand Flow Rate, veh/h	753	362	703
Vehicles Circulating, veh/h	162	380	252
Vehicles Exiting, veh/h	793	535	490
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	11.8	8.3	13.1
Approach LOS	B	A	B

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	753	362	703
Cap Entry Lane, veh/h	1170	937	1067
Entry HV Adj Factor	0.981	0.981	0.980
Flow Entry, veh/h	739	355	689
Cap Entry, veh/h	1147	919	1046
V/C Ratio	0.644	0.387	0.659
Control Delay, s/veh	11.8	8.3	13.1
LOS	B	A	B
95th %tile Queue, veh	5	2	5

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	85	0	115	140	0	11
Future Vol, veh/h	85	0	115	140	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	0	-	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	131	159	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	97	0	518	-
Stage 1	-	-	-	-	97	-
Stage 2	-	-	-	-	421	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1496	-	518	0
Stage 1	-	-	-	-	927	0
Stage 2	-	-	-	-	662	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1496	-	472	-
Mov Cap-2 Maneuver	-	-	-	-	472	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	604	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		3.4		0	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1496	-
HCM Lane V/C Ratio	-	-	-	0.087	-
HCM Control Delay (s)	0	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.3	-

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	411	743	190
Demand Flow Rate, veh/h	419	758	193
Vehicles Circulating, veh/h	341	17	382
Vehicles Exiting, veh/h	434	558	378
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.7	8.9	6.0
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	419	758	193
Cap Entry Lane, veh/h	975	1356	935
Entry HV Adj Factor	0.980	0.980	0.984
Flow Entry, veh/h	411	743	190
Cap Entry, veh/h	955	1329	920
V/C Ratio	0.430	0.559	0.207
Control Delay, s/veh	8.7	8.9	6.0
LOS	A	A	A
95th %tile Queue, veh	2	4	1

Intersection			
Intersection Delay, s/veh	9.9		
Intersection LOS	A		

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	579	331	612
Demand Flow Rate, veh/h	591	338	624
Vehicles Circulating, veh/h	155	338	299
Vehicles Exiting, veh/h	768	408	377
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.7	7.5	12.2
Approach LOS	A	A	B

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	591	338	624
Cap Entry Lane, veh/h	1178	978	1017
Entry HV Adj Factor	0.980	0.980	0.981
Flow Entry, veh/h	579	331	612
Cap Entry, veh/h	1154	958	998
V/C Ratio	0.502	0.346	0.613
Control Delay, s/veh	8.7	7.5	12.2
LOS	A	A	B
95th %tile Queue, veh	3	2	4

Intersection						
Int Delay, s/veh	4.5					

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	-	Free
Storage Length	-	-	0	-	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	-
Stage 1	-	-	-	-	114	-
Stage 2	-	-	-	-	580	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1475	-	409	0
Stage 1	-	-	-	-	911	0
Stage 2	-	-	-	-	560	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1475	-	340	-
Mov Cap-2 Maneuver	-	-	-	-	340	-
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	465	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1475	-
HCM Lane V/C Ratio	-	-	-	0.169	-
HCM Control Delay (s)	0	-	-	7.9	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.6	-

Intersection			
Intersection Delay, s/veh	10.4		
Intersection LOS	B		

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	651	712	359
Demand Flow Rate, veh/h	664	727	366
Vehicles Circulating, veh/h	188	46	644
Vehicles Exiting, veh/h	585	964	208
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.5	8.9	12.9
Approach LOS	B	A	B

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	664	727	366
Cap Entry Lane, veh/h	1139	1317	715
Entry HV Adj Factor	0.981	0.980	0.981
Flow Entry, veh/h	651	712	359
Cap Entry, veh/h	1117	1290	702
V/C Ratio	0.583	0.552	0.512
Control Delay, s/veh	10.5	8.9	12.9
LOS	B	A	B
95th %tile Queue, veh	4	4	3

Intersection	
Intersection Delay, s/veh	20.0
Intersection LOS	C

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1073	450	475
Demand Flow Rate, veh/h	1095	459	485
Vehicles Circulating, veh/h	84	801	333
Vehicles Exiting, veh/h	734	378	927
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	22.1	25.8	9.8
Approach LOS	C	D	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1095	459	485
Cap Entry Lane, veh/h	1267	610	983
Entry HV Adj Factor	0.980	0.981	0.979
Flow Entry, veh/h	1073	450	475
Cap Entry, veh/h	1241	598	962
V/C Ratio	0.865	0.753	0.494
Control Delay, s/veh	22.1	25.8	9.8
LOS	C	D	A
95th %tile Queue, veh	12	7	3

Intersection						
Int Delay, s/veh	0.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	120	0	15	110	0	155
Future Vol, veh/h	120	0	15	110	0	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	0	-	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	136	0	17	125	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	136	0	295	-
Stage 1	-	-	-	-	136	-
Stage 2	-	-	-	-	159	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1448	-	696	0
Stage 1	-	-	-	-	890	0
Stage 2	-	-	-	-	870	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1448	-	688	-
Mov Cap-2 Maneuver	-	-	-	-	688	-
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	860	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1448	-
HCM Lane V/C Ratio	-	-	-	0.012	-
HCM Control Delay (s)	0	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Intersection Delay, s/veh	7.4
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	346	653	196
Demand Flow Rate, veh/h	353	666	200
Vehicles Circulating, veh/h	307	33	313
Vehicles Exiting, veh/h	392	480	347
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.3	8.0	5.6
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	353	666	200
Cap Entry Lane, veh/h	1009	1334	1003
Entry HV Adj Factor	0.980	0.980	0.980
Flow Entry, veh/h	346	653	196
Cap Entry, veh/h	989	1308	983
V/C Ratio	0.350	0.499	0.199
Control Delay, s/veh	7.3	8.0	5.6
LOS	A	A	A
95th %tile Queue, veh	2	3	1

Intersection	
Intersection Delay, s/veh	7.0
Intersection LOS	A

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	470	325	397
Demand Flow Rate, veh/h	479	332	405
Vehicles Circulating, veh/h	16	314	305
Vehicles Exiting, veh/h	694	181	341
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.9	7.1	8.0
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	479	332	405
Cap Entry Lane, veh/h	1358	1002	1011
Entry HV Adj Factor	0.981	0.979	0.980
Flow Entry, veh/h	470	325	397
Cap Entry, veh/h	1331	981	991
V/C Ratio	0.353	0.331	0.401
Control Delay, s/veh	5.9	7.1	8.0
LOS	A	A	A
95th %tile Queue, veh	2	1	2

Intersection						
Int Delay, s/veh	4.6					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	95	0	220	65	0	21
Future Vol, veh/h	95	0	220	65	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	0	-	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	250	74	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	108	0	682	-
Stage 1	-	-	-	-	108	-
Stage 2	-	-	-	-	574	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1483	-	415	0
Stage 1	-	-	-	-	916	0
Stage 2	-	-	-	-	563	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1483	-	345	-
Mov Cap-2 Maneuver	-	-	-	-	345	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	468	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1483	-
HCM Lane V/C Ratio	-	-	-	0.169	-
HCM Control Delay (s)	0	-	-	7.9	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.6	-

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Approach	SE	NW	NE
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	468	674	327
Demand Flow Rate, veh/h	478	688	334
Vehicles Circulating, veh/h	184	34	452
Vehicles Exiting, veh/h	538	752	209
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.6	8.2	8.8
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	478	688	334
Cap Entry Lane, veh/h	1144	1333	870
Entry HV Adj Factor	0.979	0.980	0.979
Flow Entry, veh/h	468	674	327
Cap Entry, veh/h	1120	1306	852
V/C Ratio	0.418	0.516	0.384
Control Delay, s/veh	7.6	8.2	8.8
LOS	A	A	A
95th %tile Queue, veh	2	3	2

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Approach	SE	NW	SW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	766	400	393
Demand Flow Rate, veh/h	781	408	401
Vehicles Circulating, veh/h	35	482	339
Vehicles Exiting, veh/h	705	334	551
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	9.5	10.8	8.4
Approach LOS	A	B	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	781	408	401
Cap Entry Lane, veh/h	1331	844	977
Entry HV Adj Factor	0.981	0.981	0.980
Flow Entry, veh/h	766	400	393
Cap Entry, veh/h	1306	828	957
V/C Ratio	0.587	0.483	0.411
Control Delay, s/veh	9.5	10.8	8.4
LOS	A	B	A
95th %tile Queue, veh	4	3	2

Intersection						
Int Delay, s/veh	0.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	105	0	15	100	0	155
Future Vol, veh/h	105	0	15	100	0	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	0	-	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	119	0	17	114	0	176

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	119	0	267	-
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.12	-	6.42	-
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	-
Pot Cap-1 Maneuver	-	-	1469	-	722	0
Stage 1	-	-	-	-	906	0
Stage 2	-	-	-	-	880	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1469	-	713	-
Mov Cap-2 Maneuver	-	-	-	-	713	-
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	869	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1469	-
HCM Lane V/C Ratio	-	-	-	0.012	-
HCM Control Delay (s)	0	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

EXHIBIT A

THE Ember Alliance

Shadow Mountain Bike Park Wildfire Mitigation Hazard Plan

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

Table of Contents

1. Introduction

1.a. Site Visit

Staff at The Ember Alliance completed a site visit on September 20 and 21, 2023. A seasonal forestry crew walked the property assessing and delineating planned areas for mitigation and management. The visit also evaluated Shadow Mountain Drive between Highway 73 and the property, following the assessment guidelines in the Colorado State Forest Service (CSFS) Fuelbreak Guidelines document.

1.b. Management Area Maps and Desired Future Conditions

Eight management areas were delineated, along with descriptions of desired future conditions (DFCs) for each management area. These management areas and DFCs cover all the essential areas to treat to achieve SMBP's goals for general wildfire mitigation and user safety. The remainder of the parcel does not have mitigation measures proposed because these areas were either not identified as having elevated wildfire risk or are intended to be monitored and evaluated for treatment in future years. Additionally, leaving the remainder of the parcel as-is will help maintain the character of the surrounding landscape. Wildfires do not follow land ownership boundaries and therefore cross-boundary fuel treatments are always encouraged. For example, private landowners adjacent to the right-of-way can support evacuation safety by building upon right-of-way treatments and implementing guidelines in the CSFS fuelbreak guidance document on their adjoining property.

To define the DFCs, management objectives were first identified. This site is intended to be a recreational area within Jefferson County, so to be consistent with other recreational areas in Jefferson County, the management objectives for this site were defined as the same ones that Jefferson County Open Space uses in the 2022 Forest Health Plan. Ten objectives were identified, as follows:

1. Reduce risk of catastrophic wildfire
2. Reduce forest densities and canopy cover
3. Increase the presence, size, and diversity of forest openings
4. Restore and maintain a mosaic of ecosystems and vegetation cover across the landscape
5. Promote fine scale heterogeneity in tree spatial patterns
6. Protect and enhance old-growth features
7. Where appropriate, reestablish the use of prescribed fire as a management tool
8. Promote long-term ecosystem resilience to natural disturbance
9. Assist with ecosystem adaptation to climate change
10. Create aesthetically pleasing forest stands

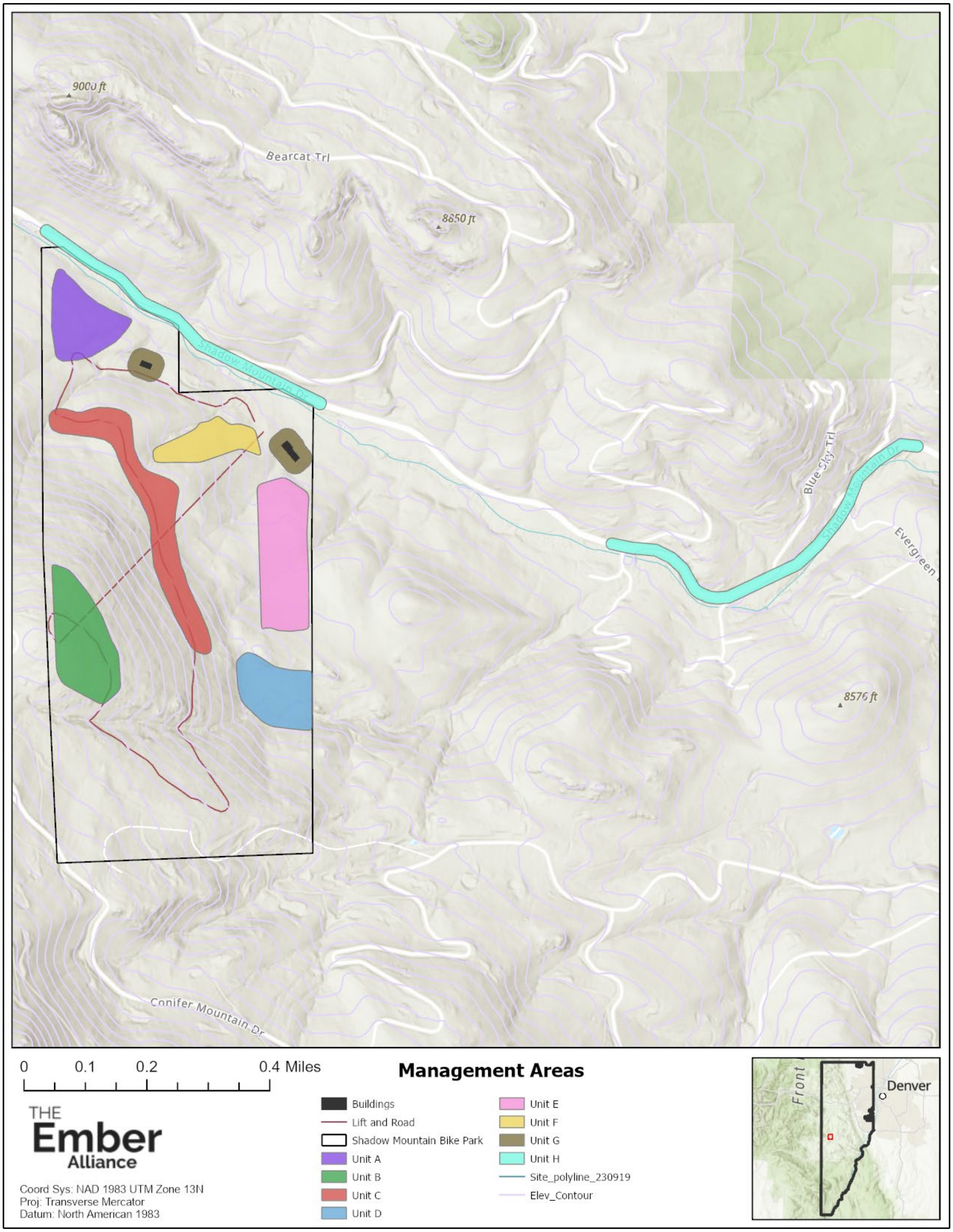


Figure 1. All Management Areas.

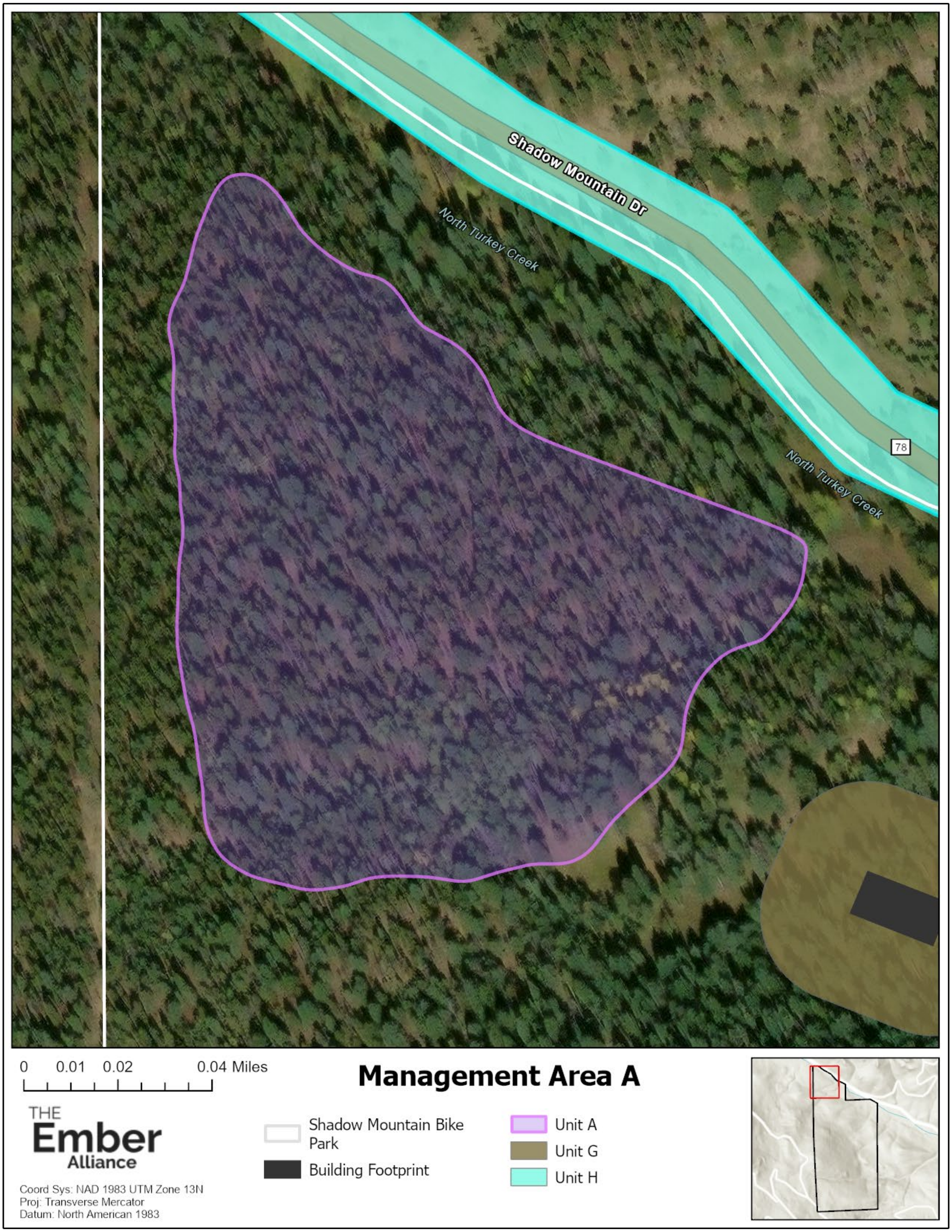


Figure 2. Management Area A.

Management Area A

Approximately 7.5 acres of mixed conifer and ponderosa pine forest.

Desired Future Conditions

Uneven-aged mixed conifer stands with occasional established ponderosa pine. Minimal ladder fuels are present, trees grouped with spacing between groups. Ponderosas have a wide spacing around their canopy. Occasional standing dead trees are retained as habitat trees.

Management Objectives Achieved: 1, 2, 3, 5, 6, 9, 10

Treatment

In Area A, all trees (excluding aspen) with a diameter at breast height (DBH) of 6 inches or under should be removed. All juniper and gamble oak should be removed. Occasional standing dead trees can be retained where they pose no risk to bikers.

Approximately 15-20% of trees with a DBH greater than 6 inches should be removed with an intent to isolate canopy groups. Retain all trees with a DBH greater than 20 inches, and favor removing smaller trees when possible. Favor retaining ponderosa pine to support climate adaptation within this ecosystem.

Limb (prune) all the remaining trees up to 10 feet from the ground. Work east as much as possible to preserve structures while maintaining a transition zone around the nearby private property/homes. Thin conifers as close as possible to the road and retain any aspen and willows near the river to support erosion control and stream health.

This area is best suited for selective hand thinning and chipping for slash management.

Treatment Return Interval

Evaluate the need for small diameter tree thinning and ladder fuel removal every 5 years. Treatment re-entry needed to maintain forest health and historic conditions is estimated to be 8 to 23 years following the treatment. Regeneration can be dense and contribute to increased fire risk and intensity and should be actively managed and mitigated.

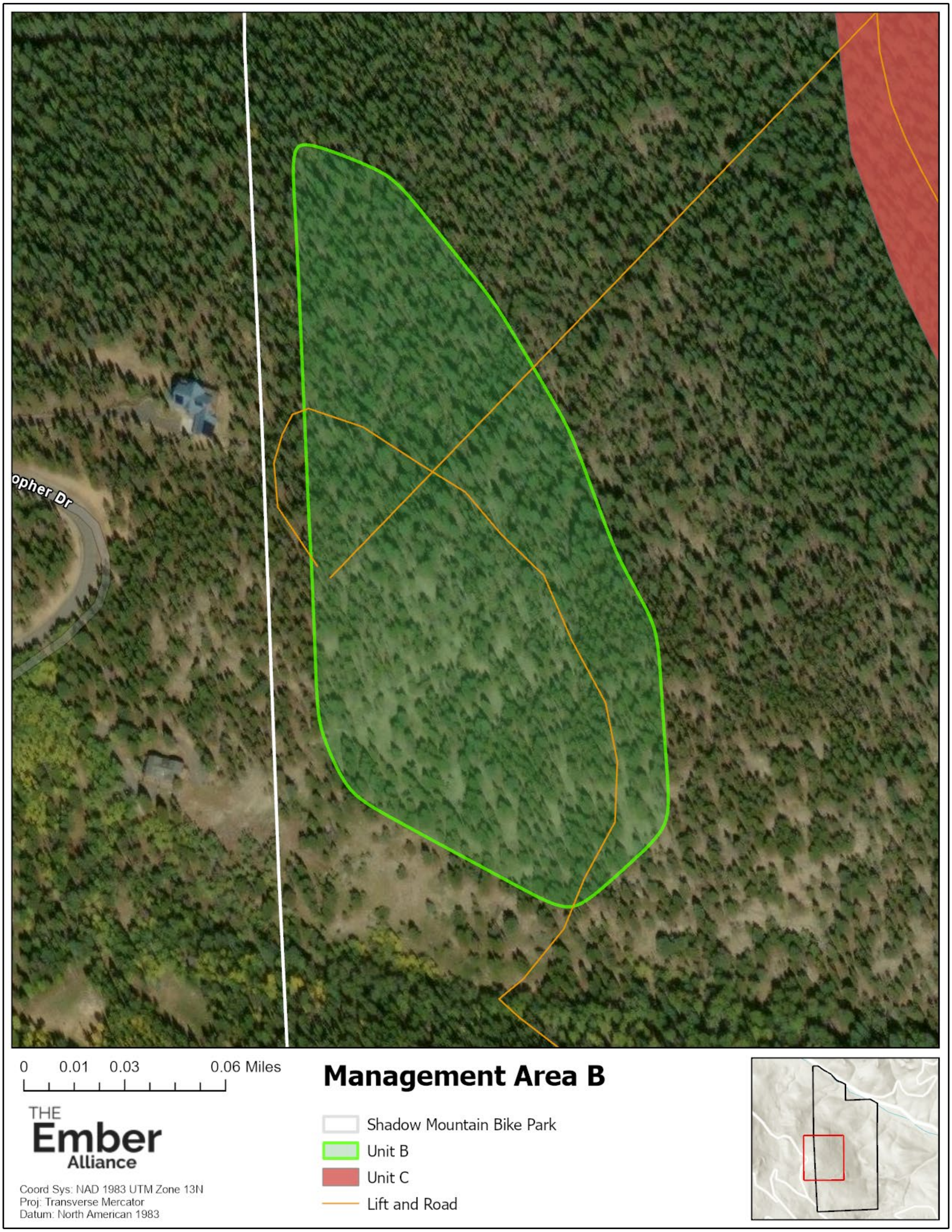


Figure 3. Management Area B.

Management Area B

Approximately 10.5 acres of mixed conifer and spruce-fir forest.

Desired Future Conditions

An uneven-aged mixed conifer/spruce-fir forest with groupings of trees. Conifer forests are maintained and moderately thinned to remove the most hazardous fuels but promote health and vigor of the remaining trees. Minimal ladder fuels are present, and there is enough open space to provide a view/outlook of the surrounding landscape. Trees in this area are in a stand that surrounds the "outlook" area. Trees are retained and managed to provide a visual buffer between the residences and the chairlift. Occasional standing dead trees are retained as habitat trees.

Management Objectives Achieved: 1, 2, 3, 5, 6, 7, 8, 10

Treatment

In Area B, all trees with a diameter at breast height (DBH) of 6 inches or under should be removed. All juniper and gamble oak should be removed. Occasional standing dead trees are retained where they pose no risk to bikers.

All trees with a DBH greater than 6 inches should be removed with the intent to isolate canopy groups. Retain all trees with a DBH greater than 20 inches, and favor removing smaller trees when possible.

Limb all the remaining trees up to 10 feet from the ground. Remove shrubs and ladder fuels under the trees. Maintain a transition zone to the private property.

This area is best suited for mechanical thinning and pile building for slash management.

Treatment Return Interval

Evaluate the need for small tree thinning and ladder fuel removal every 5 years. Treatment re-entry needed to maintain forest health and historic conditions is estimated to be 8 to 23 years following the treatment. Tree regeneration can be dense and contribute to increased fire risk and intensity and should be actively managed and mitigated.

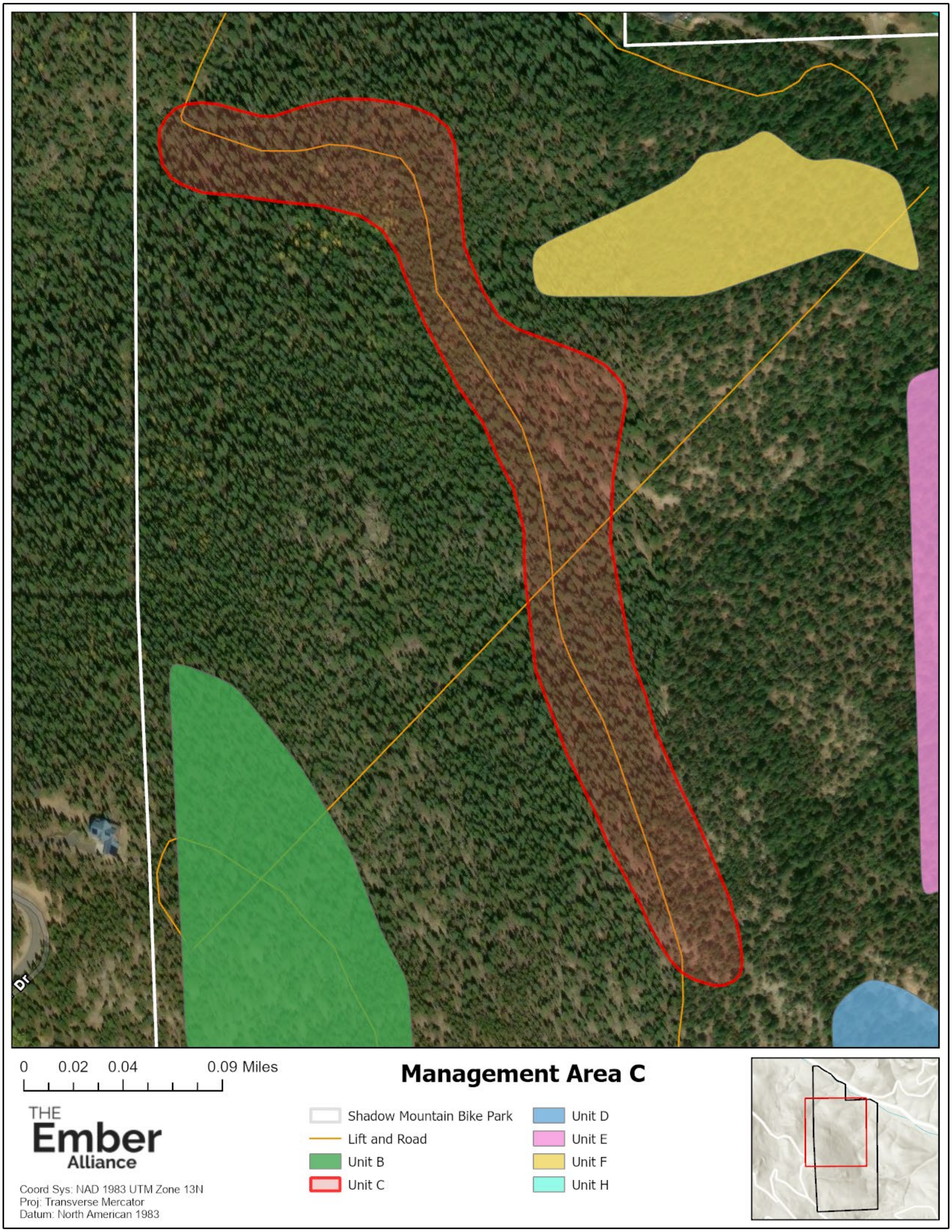


Figure 4. Management Area C.

Management Area C

Approximately 14 acres of mixed conifer, spruce-fir, and ponderosa pine forest.

Desired Future Conditions

A fuel break along the maintenance road/base of the steep slope of the mixed conifer forest. Minimal ladder fuels are present, with wide spacing between tree crowns/groupings of tree crowns. Standing dead trees are not retained.

Management Objectives Achieved: 1, 2, 3, 5, 6, 8, 10

Treatment

In Area C, all trees (excluding aspen) with a diameter at breast height (DBH) of 6 inches or under should be removed. All juniper and gamble oak should be removed.

Approximately 15-20% of trees with a DBH greater than 6 inches should be removed with an intent to isolate canopy groups. Retain all trees with a DBH greater than 20 inches, and favor removing smaller trees when possible.

Limb all the remaining trees up to 10 feet from the ground. Remove ladder fuels/shrube under the trees.

This area is best suited for selective hand thinning and chipping for slash management.

Treatment Return Interval

Evaluate the need for small tree thinning and ladder fuel removal every 5 years. Treatment re-entry needed to maintain forest health and historic conditions is estimated to be 8 to 23 years following the treatment. Tree regeneration can be dense and contribute to increased fire risk and intensity and should be actively managed and mitigated.

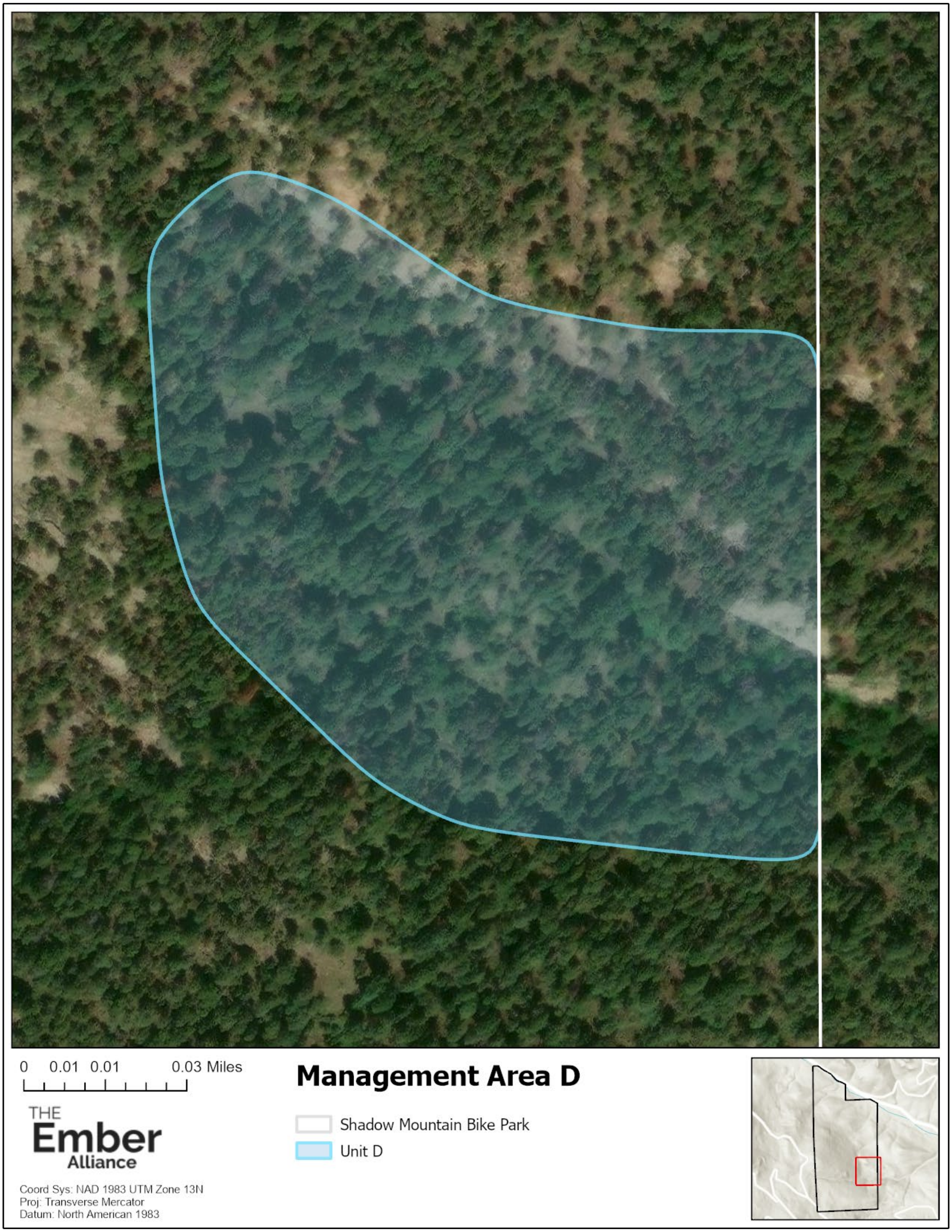


Figure 5. Management Area D.

Management Area D

Approximately 7.5 acres of lodgepole pine forest with some fir.

Desired Future Conditions

Mosaic stands of lodgepole pine. Each stand is even-aged but there is age diversity between the stands. Patch cuts mimic historic fire in this forest type, which would replace entire stands with each fire event. To protect the aesthetic and habitat value of the lodgepole pine area, smaller patch cuts are completed, rather than larger cuts.

Management Objectives Achieved: 1, 2, 3, 4, 5, 6, 8, 9, 10

Treatment

In Area D, patch cut in 3-acre sections, focusing along the west flank until the lodgepole stand gets too steep to cut. Patch cuts remove all sizes and species of trees except aspen, which are retained. Occasional standing dead trees may be retained, if present. The steepness of the site may limit the work that a crew can complete.

This area is best suited for hand crew cutting and pile building/burning for slash management.

Treatment Return Interval

After the initial 3-acre patch cut is completed, that stand is permitted to regenerate without thinning for at least 75 years (the lower end of their historic fire return interval). A second or third entry for patch cuts in other sections of this management area can be completed in the decades following the initial cut. Age diversity between the patch cuts is important as it creates habitat diversity and a mosaic landscape that is more resilient to wildfire. Stands should not frequently reach an average age beyond 300 years, which is the upper end of their fire return interval.

If the land managers have the resources, additional 3- to 6-acre patch cuts can be completed with the same objectives and DFCs in the southwest corner of the property. The north-facing hillside on the very south side of the property can be treated for additional fuels mitigation and habitat diversity.

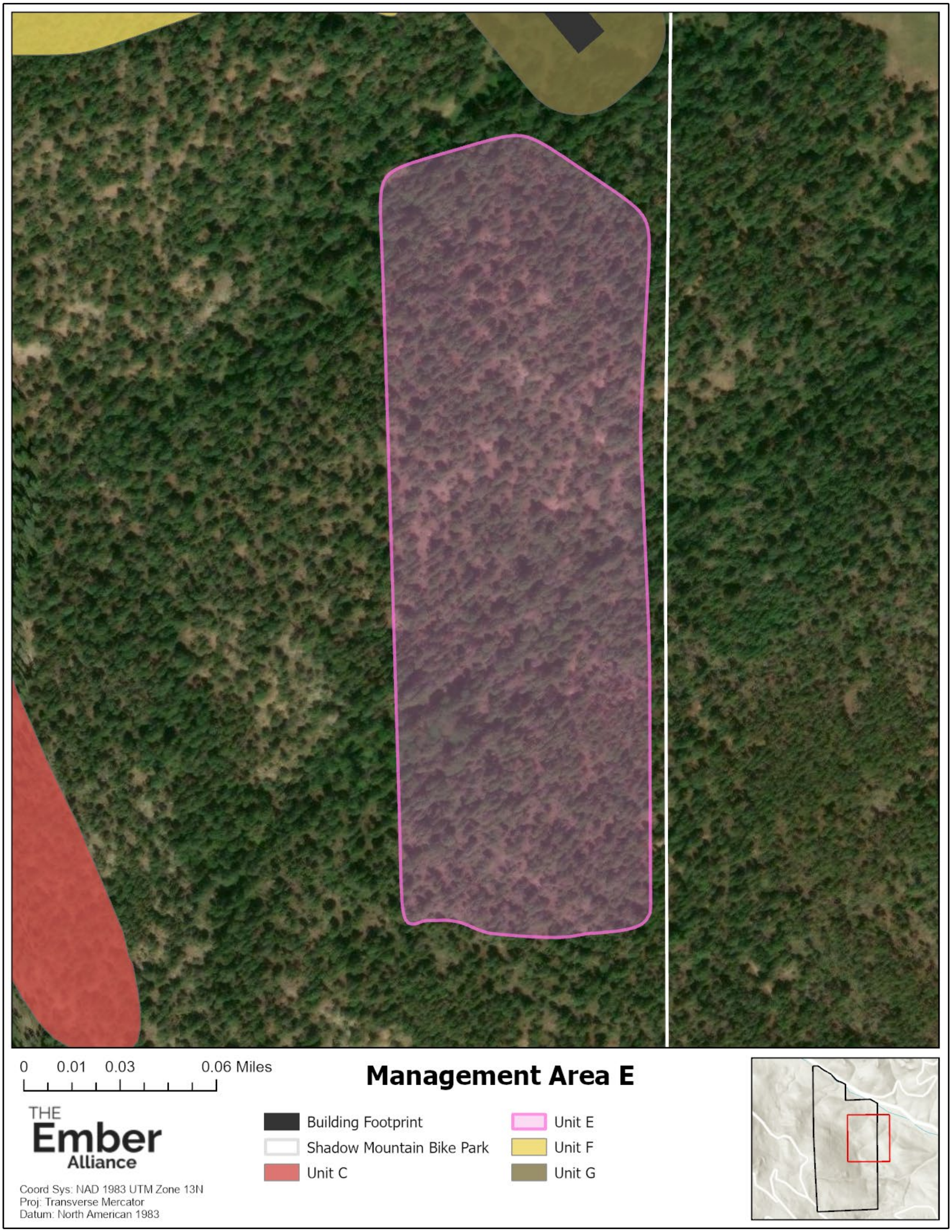


Figure 6. Management Area E.

Management Area E

Approximately 12 acres of mixed conifer forest with aspen.

Desired Future Conditions

An uneven-aged mixed conifer forest with increasingly large aspen stands. Conifer forests are maintained and moderately thinned to remove the most hazardous fuels but promote health and vigor of the remaining trees. Aspen is favored and allowed to grow freely, becoming old growth in time. Small forest openings are present between aspen and conifer, and between groupings of conifers. Minimal ladder fuels are present in the coniferous areas and occasional standing dead trees are retained as habitat trees.

Management Objectives Achieved: 1, 2, 3, 4, 5, 6, 8, 9, 10

Treatment

In Area E, all trees (excluding aspen) with a diameter at breast height (DBH) of 6 inches or under should be removed. All juniper and gamble oak should be removed. Occasional standing dead trees are retained where they pose no risk to bikers.

Approximately 15-20% of trees with a DBH greater than 6 inches should be removed with an intent to isolate canopy groups, cutting smaller trees when possible.

Limb all the remaining trees up to 10 feet from the ground. Remove shrubs and ladder fuels under trees.

This area is best suited for selective hand thinning and pile building/burning for slash management.

Treatment Return Interval

Evaluate the need for small tree thinning and ladder fuel removal every 5 years. Treatment re-entry needed to maintain forest health and historic conditions is estimated to be 8 to 23 years following the treatment. Tree regeneration can be dense and contribute to increased fire risk and intensity and should be actively managed and mitigated.

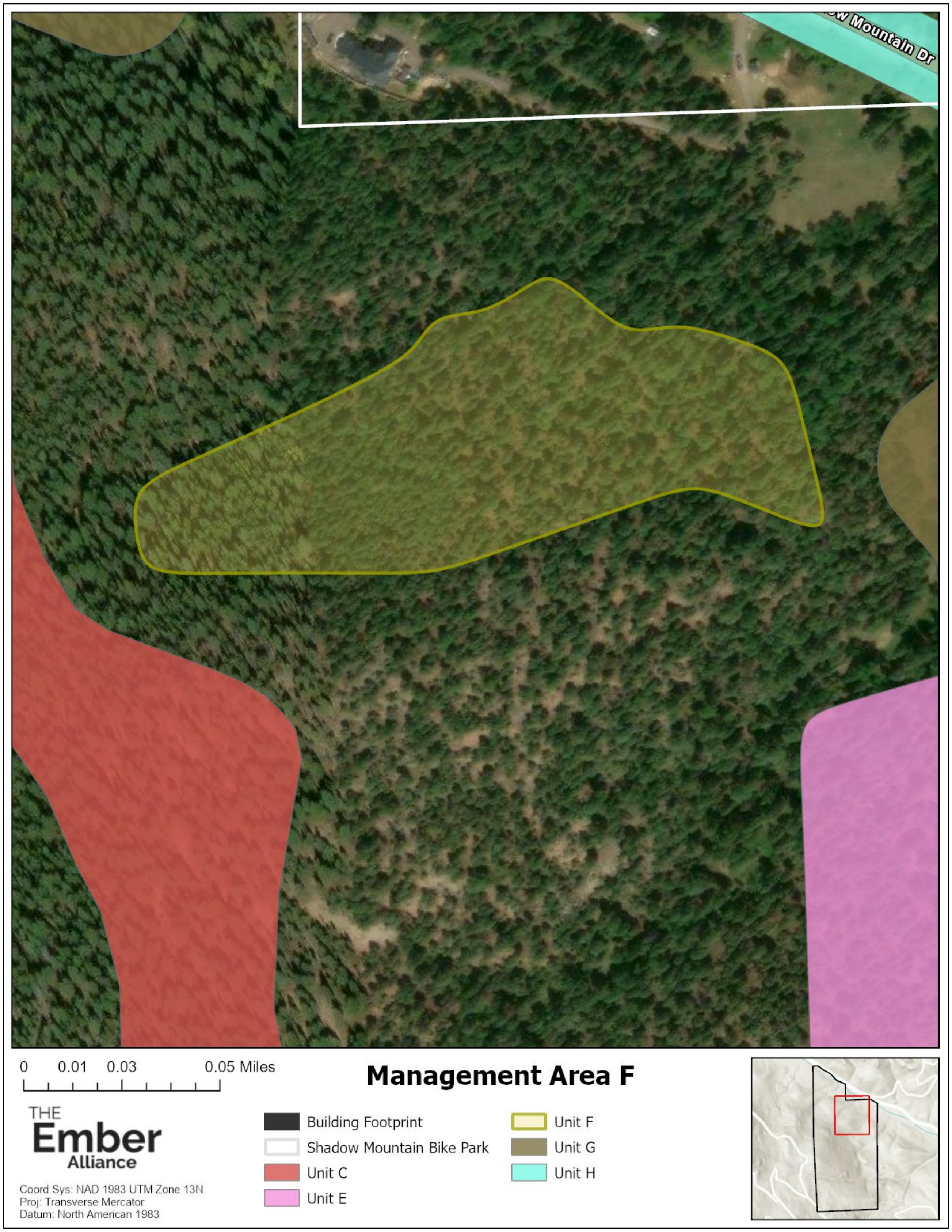


Figure 7. Management Area F.

Management Area F

Approximately 5 acres of mixed conifer forest with aspen.

Desired Future Conditions

An uneven-aged mixed conifer forest with increasingly large aspen stands. Conifer forests are maintained and thinned to remove the most hazardous fuels but promote health and vigor of the remaining trees. Aspen is favored and allowed to grow freely, becoming old growth in time. Small forest openings are present between aspen and conifer, and between groupings of conifers. Minimal ladder fuels are present in the coniferous areas and occasional standing dead trees are retained as habitat trees.

Management Objectives Achieved: 1, 2, 3, 4, 5, 6, 8, 9, 10

Treatment

In Area F, all trees (excluding aspen) with a diameter at breast height (DBH) of 6 inches or under should be removed. All juniper and gamble oak should be removed.

Approximately 15-20% of trees with a DBH greater than 6 inches should be removed with an intent to isolate canopy groups. Retain all trees with a DBH greater than 20 inches, and favor removing smaller trees when possible.

Limb all the remaining trees up to 10 feet from the ground. This area is very dense with lots of saplings. Maintain a transition zone around the nearby private property/homes.

This area is best suited for selective hand thinning and chipping and/or pile building for slash management.

Treatment Return Interval

Evaluate the need for small tree thinning and ladder fuel removal every 5 years. Treatment re-entry needed to maintain forest health and historic conditions is estimated to be 8 to 23 years following the treatment. Tree regeneration can be dense and contribute to increased fire risk and intensity and should be actively managed and mitigated.

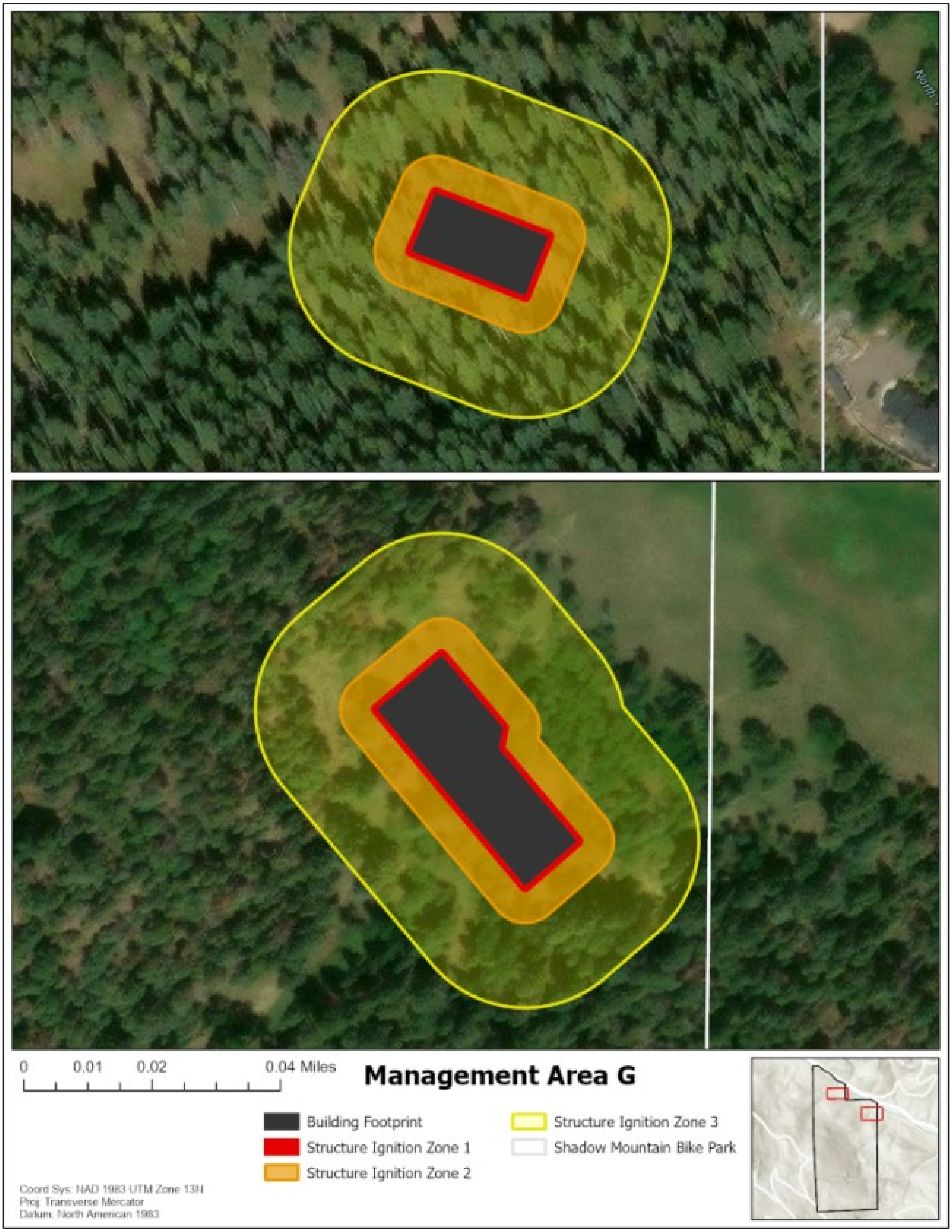


Figure 8. Management Area G.

Management Area G

Approximately 3.5 acres of mixed conifer forest with aspen.

Desired Future Conditions

Structures have home hardening measures taken to be ignition resistant. No vegetation within 5 feet of the structures. Minimal, potentially irrigated vegetation within 30 feet of the structures. Minimal vegetation with wide spacing and no ladder fuels within 100 feet of the structure.

Management Objectives Achieved: 1, 2, 3, 4, 5, 10

Treatment

Zone 1: From 0-5 feet from the edge of the buildings, install concrete, gravel, or another non-flammable groundcover.

Zone 2: From 5-30 feet, there should be no more than 20 trees total left within this zone around the maintenance facility and no more than 30 around the lodge (assuming an average tree crown spread of 30 feet). We recommend aiming for approximately half that number to err on the side of caution, leaving no more than 10 and 15 trees, respectively. If there are aspens, those should be selected to remain over any other species. All trees should have a minimum of 10 feet of spacing between the crowns. If trees are planted following the building construction, include the anticipated crown diameter in this plan. Remove any dead, dying, or diseased trees.

Mow all grasses regularly to keep the height no more than 4 inches. Irrigation is recommended but not necessary, due to water constraints and the desire for a natural aesthetic.

All remaining trees should be limbed (pruned) to a height of 10 feet. This means the distance from the ground to the bottom of the lowest part of the lowest hanging branch.

All juniper and gamble oak should be removed. Any other remaining shrubs, such as mountain mahogany or chokecherry, can remain if they are not under trees or tree canopies. Shrubs should be isolated and not be allowed to grow in groups or continuous clusters.

Zone 3: From 30-100 feet from the end of the structures, there should be no more than 36 trees total left within this zone around the maintenance facility and no more than 48 around the lodge (assuming an average tree crown spread of 30 feet). We recommend aiming for approximately half that number to err on the side of caution, leaving no more than 18 and 24 trees, respectively. If there are aspens, those should be selected to remain over any other species. All trees should have a minimum of 10 feet of spacing between the crowns. Remove any dead, dying, or diseased trees.

The remaining trees should be limbed to a height of 10 feet. This means the distance from the ground to the bottom of the lowest part of the lowest hanging branch. Remove any shrubs that are under tree canopies.

This area is suitable for mechanical or hand thinning. Any and all slash, woody debris, or other flammable material should be removed entirely from these zones. They can be hauled off site or masticated and spread outside the zones.

Treatment Return Interval

Annual maintenance of each of these areas is required.

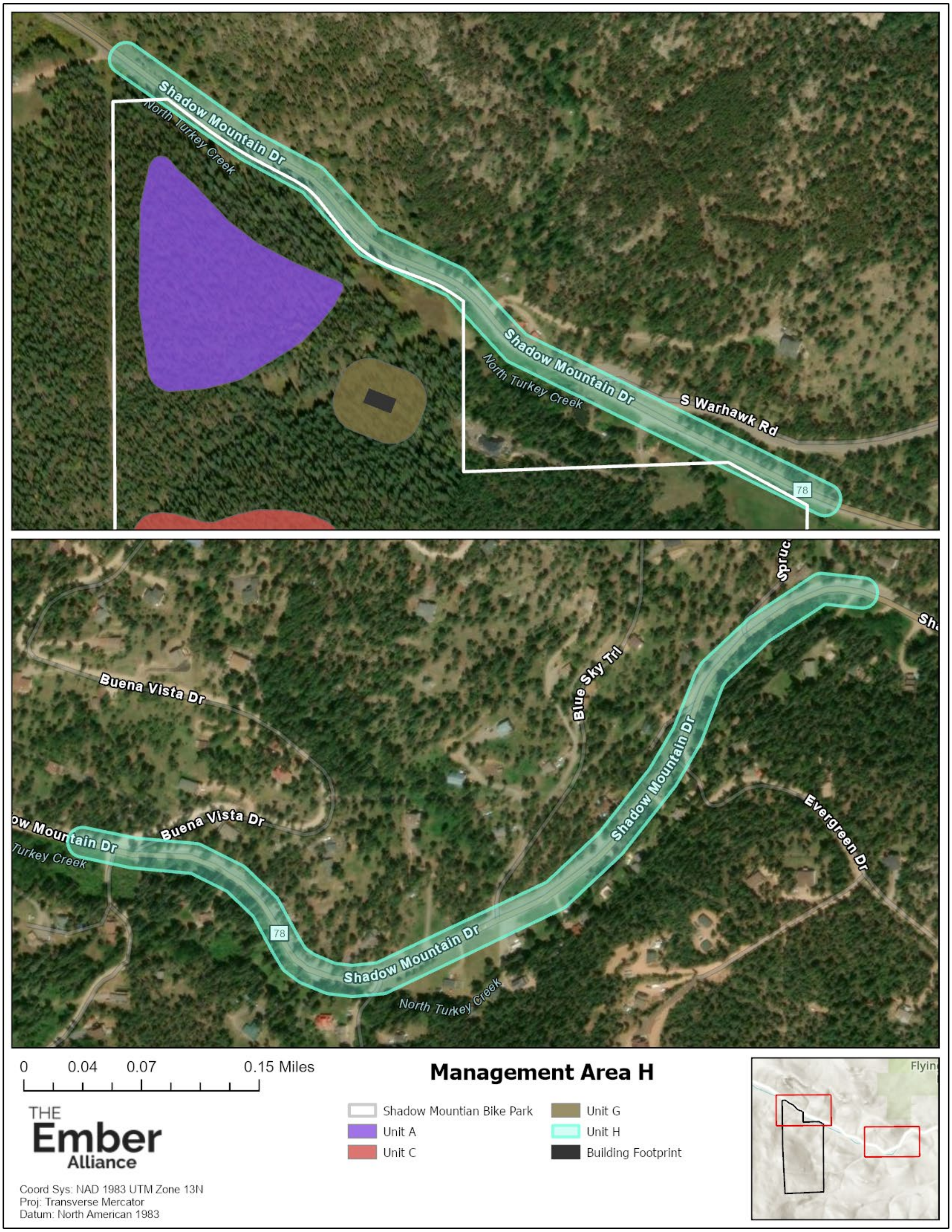


Figure 9. Management Area H.

Management Area H

Approximately 1.25 miles of road. The crowning potential in this area ranges from 3-9, designating it as an area in need of treatment and mitigation.

Desired Future Conditions

The road has space to either side of the lanes that is open enough to keep the flame length down to 8 feet or less. Evacuating residents and incoming firefighters have adequate space to drive and turn around engines without endangering their passengers.

Crowning potential, when assessed to the same CSFS Fuelbreak Guideline standards, should be a 3 or below following the treatment.

Management Objectives Achieved: 1, 2, 3, 4, 5, 6, 8

Treatment

In Area H, remove all trees (excluding aspen) within 15 feet of the edge of the road within the county right-of-way. Beyond that in the right-of-way, thin trees according to the CSFS Fuelbreak Guidelines document along the identified portions of Shadow Mountain Drive. This involves creating 10 feet of space between crowns and removing ladder fuels under and between the trees. Favor retaining larger and older trees, as well as retaining aspen or other riparian species, where they are present. The treatment recommendation is that the fuelbreak is mitigated as far from the road as is feasible using bike park-owned land and county right-of-way easements.

This area is best suited for selective hand thinning and/or use of a roadside masticator head and chipping for slash management.

Treatment Return Interval

Tree regeneration in opened stands such as initial fuelbreak cuts can be dense and contribute to increased fire risk and intensity. This should be actively managed and mitigated over time through follow up treatments. Evaluate the need for thinning, regeneration removal, and ladder fuel removal every 3 years. This is a shorter evaluation time than other management areas due to the life safety aspect of this treatment.

All Remaining Areas

No mitigation action is recommended for the remaining forest areas. We recommend that they be monitored and managed for forest health and that the mitigation plan be revisited in approximately 15 years.

Citation: The Ember Alliance. 2023. *Shadow Mountain Bike Park Wildfire Mitigation Hazard Plan*. Fort Collins, CO.

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