

Environmental Impact Report



East Vail Workforce Housing Subdivision Eagle County, Colorado

prepared for:

Triumph Development
12 Vail Road, Suite 700, Vail, CO 81657

prepared by:

Western Ecological Resource, Inc.
711 Walnut Street, Boulder, CO 80302

May 2019





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Signature Page

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Technical Reports and Supporting Documents Used to Prepare the EIR

- TR-1. Preliminary Subsurface Exploration, East Vail Housing Rock Mitigation and Geotechnical Study**
Prepared by William H. Koechlein, P.E., Senior Consultant, Cesare, Inc., 7108 South Alton Way, Building B, Centennial, CO 80112, November 14, 2018.
- TR-2. Rockfall Hazard Study, East Vail Parcel**
Prepared by Julia M. Frazier, P.G., Senior Geologist, Cesare, Inc., 7108 South Alton Way, Building B, Centennial, CO 80112, June 19, 2017.
- TR-3. East Vail Parcel Geologic Hazard Analysis – Review of Updated Site Plan**
Prepared by Julia M. Frazier, P.G., Owner, Skyline Geoscience, Golden, CO, May 24, 2019.
- TR-4. Wetland Delineation Report, East Vail Workforce Subdivision**
Prepared by Heather Houston, Owner, Birch Ecology, LLC, 429 Main Street, Lyons, CO 80540, February 2019.
- TR-5. Wildlife Monitoring Report for the East Vail Workforce Housing Parcel**
Prepared by Richard W. Thompson, Certified Wildlife Biologist, Western Ecosystems, Inc., 905 West Coach Road, Boulder, CO 80302, August 2018.
- TR-6. East Vail Peregrines – 2018 Nesting Attempt to Date**
Prepared by Richard W. Thompson, Certified Wildlife Biologist, Western Ecosystems, Inc., 905 West Coach Road, Boulder, CO 80302, June 18, 2018.
- TR-7. Booth Heights Neighborhood at the East Vail Workforce Housing Subdivision – Architectural Plans**
Prepared by Triumph Development, 12 Vail Road, Suite 700, Vail, CO 81657, June 10, 2019.
- TR-8. East Vail Housing – Civil Plans**
Prepared by Alpine Engineering, Inc., 34510 Hwy 6, Unit A9, PO Box 97, Edwards, CO 81632, February 21, 2019. Revised May 22, 2019.
- TR-9. Transportation Impact Study for Triumph Development's East Vail Residential**
Prepared by Kari J. McDowell Schroeder, PE, PTOE, McDowell Engineering, LLC, PO Box 4259, Eagle, CO 81631, February 14, 2019. Revised May 21, 2019.
- TR-10. Wildlife Mitigation Plan for the East Vail Workforce Housing Project**
Prepared by Richard W. Thompson, Certified Wildlife Biologist, Western Ecosystems, Inc., 905 West Coach Road, Boulder, CO 80302, May 2019.

1.0 Introduction

Triumph Development has plans to develop a subdivision on a triangular-shaped undeveloped 23.3-acre land parcel located immediately north of the East Vail Interstate 70 (I-70) Interchange in the town of Vail, Colorado. The project purpose is to build a new multi-family community and preserve and enhance wildlife winter range. The East Vail Workforce Subdivision would be developed on 5.4 acres on the west end of the parcel, which is zoned H for Housing. The 17.9 acres to the east, which is zoned NAP (Natural Area Preservation), would be preserved and enhanced for wildlife. The triangular-shaped project site is bordered by the White River National Forest (WRNF) to the north and east. Fall Line Drive and North Frontage Road form the southern boundary. A retaining wall with wooden beams extends along a portion of the southern project boundary. The Pitkin Creek Townhomes are located near the southeast corner of the project site. Specifically, the project is located in the southeast 1/4 of Section 2, Township 4 South, Range 80 West of the 6th P.M. See Figures 1 and 2.

The 23.3-acre undeveloped project site is located on a south-facing slope that ranges in elevation from a low of 8374 feet on the west end to a high of 8940 on the northeast end of the site. The site has slopes that range from 7 to over 45 degrees. However, the slope of the proposed development area is less than 30 degrees. The elevations of the proposed development area on the west end of the project site range from a low of 8374 feet to a high of 8532 feet.

This Environmental Impact Report (EIR), as per Town of Vail's Chapter 12 Environmental Impact Report Guidelines, describes the existing environment of the project site, presents details of the proposed development plan, evaluates potential impacts and mitigation, and assesses cumulative, long-term and irreversible environmental change associated with the proposed development. Numerous technical reports prepared for the proposed development were used to prepare the various sections of this EIR. These reports are referenced in the text and are available as separate attachments to this document.

2.0 Existing Environment

2.1 Hydrology

2.1.1 Surface Water

The west end of the project site is bisected by a 2-foot wide and 68-foot long ephemeral stream which conveys snowmelt and stormwater runoff to a 24-inch culvert located south of the project boundary. This culvert conveys the water south toward Gore Creek. See Figure 3. The perennial Pitkin Creek is located in an incised drainage east of the project site and the perennial Booth Creek is located in a drainage west of the project site. See Figure 1. The area upslope of the development parcel contains a network of erosional drainage channels that convey water from snowmelt and precipitation events toward the project site. See Figure 6.

2.1.2 Groundwater

Cesare, Inc. (2018) excavated nine exploratory pits up to 10 feet deep throughout the development area of the project site. None of the pits encountered groundwater. See Technical Report 1 (TR-1). However, soil saturation is present near the surface in a small wetland seep located along the east boundary of the development parcel. See Figure 3.

2.2 Atmospheric Condition

The Colorado Department of Public Health and Environment (CDPHE) provided data on the estimated ambient air concentrations of six air pollutants for the East Vail Workforce Subdivision project site (Chick, 2018). See Table 1. Please note, local air monitoring data do not exist for Vail, Colorado; therefore, Ms. Chick developed best estimates for the general geographic area using available CDPHE data. The analysis concludes that the estimated levels of carbon monoxide, ozone, sulfur dioxide,

nitrogen dioxide, particulate matter, and lead are below state and federal standards for these pollutants for the area of the project site. The undeveloped project site does not generate any gaseous or particulate pollutants. See Appendix A.

Table 1. Ambient Air Concentration Estimates East Vail Workforce Subdivision, Vail, Colorado				
Pollutant	Averaging Time	Standard	Estimate	Data Source
Carbon Monoxide (CO)	1 Hour Second Maximum	35 ppm	2 ppm	Grand Junction, 2015 - 2017
	8 Hour Second Maximum	9 ppm	1 ppm	
Ozone (O ₃)	8 Hour Fourth Maximum	0.070 ppm	0.064 ppm	Glenwood Springs, Feb - Dec 2015
Sulfur Dioxide (SO ₂)	1 Hour 99 th Percentile	0.075 ppm	0.012 ppm	RM Steel Print Shop, Pueblo, 2013 - 2015
	3 Hour Second Maximum	0.05 ppm	0.008 ppm	
Nitrogen Dioxide (NO ₂)	Annual Mean	0.053 ppm	0.005 ppm	Glenwood Springs, Feb - Dec 2015
	1 Hour 98 th Percentile	0.100 ppm	0.0333 ppm	
Particulate Matter Less Than 10 Microns (PM ₁₀)	24 Hour Second Maximum	150 ug/m ³	40 ug/m ³	Glenwood Springs, Feb - Dec 2015
Particulate Matter Less Than 2.5 Microns (PM _{2.5})	Annual Mean	12.0 ug/m ³	5 ug/m ³	Glenwood Springs, Feb - Dec 2015
	24 Hour 98 th Percentile	35 ug/m ³	13 ug/m ³	
Lead	Rolling 3-Month Average	0.15 ug/m ³	0.006 ug/m ³	Denver Municipal Animal Shelter, 2009
Data provided by Nancy Chick, Environmental Protection Specialist, Air Pollution Control Division, Colorado Department of Public Health and Environment. See AppendixA.				

2.3 Geology & Hazards

Cesare, Inc. (2017) describes the geology and geologic hazards of the project site in the Rockfall Hazard Study, East Vail Parcel, which is appended to this report. Skyline Geoscience's Geologic Hazard Analysis (2019) also documents the geology and the geologic hazards. The geology and geologic hazards described below are taken from these reports. See TR-2 and TR-3.

2.3.1 Geology

The site is underlain by surficial units comprised of artificial fill, colluvium, landslide deposits, and till of the Pinedale glaciation. See Figure 4. The artificial fill is associated with the construction of Fall Line Drive along the southern project boundary. The bedrock underlying with site is mapped as the Minturn Formation (Kellogg and others, 2003; Kellogg and others, 2011). Landslide deposits cover most of the central portion of the project site, and colluvium occurs along the north project boundary. The western end of the project site where development would occur is characterized by the Lower Member of the Minturn Formation and includes conglomerate, sandstone, siltstone, shale, and may contain granite. The eastern end of the project site is characterized by the Robinson Limestone Member of the Minturn Formation, which is comprised of marine limestone and dolomitic limestone.

2.3.2 Geologic Hazards

The Town of Vail's official Rockfall Hazard Map (Figure 5) shows that all of the project site is mapped as a High Severity Rockfall Zone. Vail's official Debris Flow Hazard Map identifies debris flows in the town of Vail, but not on the project site. However, the geologic hazards addressed in the Geologic Hazard Analysis (Skyline Geoscience, 2019; TR-3) include debris flows, rockfall, and an existing landslide on the project site.

Cesare (2017) states that rock outcrops, a rockfall source zone, occur upslope of the project site and have the potential to impact the site and the proposed development. The stability of the rock mass is generally influenced by the underlying support provided by the rock mass and the structural nature of the rock, including the orientation and spacing of discontinuities. After a rock dislocates from a rock mass, the controlling factors for how far the rock will travel downslope include characteristics of the falling rock (composition, size and shape), characteristics of the slope (form, length and angle), the presence or absence of obstructions on the slope, and the height of the initial fall. The rocks exposed upslope of the project site contain fractures and thin layers of siltstone and shale. As time passes, cracks can be enlarged by weathering of the rock, accumulation of soil and vegetation growth, and the forces associated with freeze-thawing of moisture within the cracks.

According to Skyline Geoscience (2019), there is the potential for debris flows at the site. Review of a detailed terrain surface derived from the LiDAR (Light Detection and Ranging) and of aerial photographs of the project site and surrounding area indicates the potential for debris flows. Incised channels with seasonal flowing water are present on the west side of the site (the development area) and on the slopes above, are evidence of active erosive processes. An intense, prolonged precipitation event or rapid snowmelt has the potential to trigger a fast-moving, hyper-concentrated debris flow. Modifications to the existing natural condition may increase the debris flow susceptibility. See Figure 6.

Landslide deposits in the area occur on unstable slopes typically underlain by Minturn Formation shale, siltstone, claystone, or glacial till, and are largely considered inactive. Cesare mapped the extent of a large landslide which originates upslope of the project site and encompasses most of the eastern portion of the project site, but does not extend into the development area. See Figure 7.

The Gore fault, located about 500 feet northeast of the project, is not considered to be active. See Figure 4.

2.4 Soils

Soils at the project area have not been mapped by either the U.S. Forest Service (USFS) nor the Natural Resource Conservation Service. Three soils onsite were described to about 20 inches in depth for the wetland delineation which was conducted on October 24, 2017. The upper horizons of these soils were dark colored (organic rich), fine-loamy, probably deep, and formed from slope alluvium and colluvium derived from sedimentary rocks. The Millerlake soil, which has been mapped by the USFS nearby at Vail Mountain Resort, matches the soils on the project site. The Millerlake soil commonly supports aspen stands, much like those on the project site.

The Millerlake soil belongs to the fine-loamy, mixed, superactive, Pachic Argicryolls family. It is very deep (greater than 60 inches), well drained, and formed from slope alluvium derived from sedimentary rocks. Runoff is medium to rapid, permeability is moderately slow, and available water holding capacity is moderate. Typically, the surface layers are very dark or dark brown loam and clay loam at least 16 inches thick, and below that is clay loam and loam. In the project area, the soils likely have some rocks in the deeper profile.

2.5 Vegetation Resources

2.5.1 Vegetation Types

The project site is characterized by an Aspen Forest (*Populus tremuloides*) with a variable density of aspen and two small wetlands.

Aspen Forest. The Aspen Forest is classified as a Quaking Aspen / Saskatoon Serviceberry – Mountain Snowberry / California Brome (*Populus tremuloides* / *Amelanchier alnifolia* – *Symphoricarpos oreophilus* / *Bromus carinatus*) Forest (NatureServe, 2019). The aspen trees in the area of the landslide (Figure 7) have been impacted by Sudden Aspen Decline (SAD) and thus, there is considerable standing dead as well as trees on the ground. The Aspen Forest in the area of the proposed development has not been impacted by SAD. The aspen trees in this area are young, healthy and dense. See Figure 2.

The woody understory vegetation in this habitat type is typically characterized by serviceberry, snowberry, and chokecherry (*Prunus virginiana*). Other shrubs observed include mountain maple (*Acer glabrum*), mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*), mountain mahogany (*Cercocarpus montanus*), and common juniper (*Juniperus communis* ssp. *alpina*). Elimination of the overstory trees due to SAD and perhaps some management activities that cut aspen has resulted in an increase in the cover of the shrubs and herbaceous species. The understory shrubs have been heavily grazed by big horn sheep (*Ovis canadensis*). Common herbaceous grasses in this habitat type include California brome, blue wildrye (*Elymus glaucus*), slender wheatgrass (*Elymus trachycaulus*), and Kentucky bluegrass (*Poa pratensis*). Characteristic forbs include meadowrue (*Thalictrum fendlerii*), geranium (*Geranium viscoissimum*), sweet-cicely (*Osmorhiza berteroi*), fireweed (*Chomerion angustifolia*), American vetch (*Vicia Americana*), little sunflower (*Heliantella uniflora*), and peavine (*Lathyrus sp.*).

Wetlands. As illustrated by Figure 3, there are two small wetlands on the project site. The eroded channel of the 2-foot wide ephemeral stream, which bisects 68 linear feet of the west end of the project site, is classified as a wetland. This wetland extends south off the project site for 24 linear feet to a culvert which diverts water south and under I-70 toward Gore Creek. However, there is little wetland vegetation along the creek channel. A 705 ft² woody wetland occurs along the east side of the development parcel. However, only 377 ft² of this wetland occurs in the development area. Major plants in the wetland include willows (*Salix bebbiana*, *S. scouleriana*), dogwood (*Cornus sericea*) and honeysuckle (*Distegia involucreta*). The herbaceous understory includes a sparse cover of beaked sedge (*Carex utriculata*), cow parsnip (*Heracleum sphondylium* ssp. *montanum*), and monkshood (*Aconitum columbianum*) (Birch Ecology, 2019 – TR-4).

2.5.2 Federally Listed & Species of Concern

The U.S. Fish & Wildlife Service (USFWS, 2019) Information for Planning & Conservation (IPaC) website identified Ute ladies' tresses orchid (*Spiranthes diluvialis*), classified as a Threatened plant, as potentially present in the project region. See Appendix B. The Ute ladies' tresses orchid is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams (USFWS, 1995; Jennings, 1990). In Colorado, the elevational range of known Ute ladies' tresses orchid populations is between 4,528 and 7,753 feet (CNHP, 2017). This orchid prefers sites with permanent sub-irrigation such as floodplains where the water table is near the surface throughout the growing season and into the late summer or early autumn (USFWS, 1995; Jennings, 1990). The orchid frequently colonizes early-successional riparian habitats including point bars, sand bars, and low lying gravelly, sandy, or cobbly edges. These preferred habitat characteristics suggest that this species requires early to mid-seral riparian habitats created and maintained by streams active within their floodplains (USFWS, 1995). This plant has been documented as present in Garfield and Eagle Counties (near Carbondale). The project site is elevationally above the range of this plant, and furthermore, the project site does not provide suitable habitat for this plant.

Harrington penstemon, a species listed as sensitive by the Bureau of Land Management, is a species of concern in Eagle County. This herbaceous perennial plant occurs primarily in open stands of big sagebrush, or less commonly in pinyon-juniper (*Pinus edulis-Juniperus scopulorum*) woodlands or mountain mahogany (*Cercocarpus montanus*) shrublands at elevations between 6,800-9,200 feet. Within the sagebrush shrubland, Harrington penstemon is often present on windswept ridgetop habitats with an open shrub layer and reduced vegetative cover. There are known populations of Harrington penstemon in Eagle, Garfield, Grand, Pitkin, Routt, and Summit Counties (Spackman, et al., 1997). There are populations of Harrington penstemon in the Eagle River Valley from as far east as Avon. However, the aspen community on the project site does not provide habitat for this plant.

2.6 Wildlife Resources

2.6.1 Habitats Present and Project Setting

2.6.1.1 Habitats Present

The south-facing, 23.3-acre, East Vail parcel consists of several seral stages of an aspen and mountain shrub community. The 5.4-acre development area is dominated by relatively young, pole-stage (30-35 ft. tall) aspen with a mountain shrub (largely chokecherry and serviceberry) understory. A moderate gradient ephemeral stream bisects the western end of the parcel. The 17.9-acre NAP portion of the parcel supports a 14.0-acre, over mature mountain shrub community with sparse sapling aspens and a moderately dense graminoid and herbaceous understory, along with a 3.9-acre, over mature, but regenerating aspen stand with a dense chokecherry understory. Circa 1998, there was some undocumented management effort on a portion of the NAP parcel's now mountain shrub community in response to the mortality of the former mature aspen stand. Jackstrawed aspen remain on the ground covering a moderate portion of the open space.

2.6.1.2 Characteristics Currently Reducing Wildlife Effectiveness on the East Vail Parcel

Some wildlife species using the 5.4-acre development parcel are negatively affected by existing levels of surrounding development and human activity. The following conditions affect current on-site and off-site wildlife use and will limit, to some extent, the additional, negative, potential development effects to wildlife.

I-70, North Frontage Road and Fall Line Drive

The parcel's southern boundary is located as close as 122 feet from the westbound lanes of I-70, one of the major ground transportation corridors across the United States. Locally, I-70 consists of two westbound and two eastbound lanes with a posted 65 mph speed limit and supporting an average daily traffic volume of 26,000 vehicles (2017).¹ The East Vail Interchange and the west-bound on and off ramps are located on the opposite side of North Frontage Road from the parcel. There is virtually no location on the parcel where the sights and sounds of I-70 use are non-discernable 24/7/365. The current average daily traffic volume on the North Frontage Road is approximately 2,200 vehicles per day (vpd) (K. McDowell Schroeder, McDowell Engineering, pers. comm. May 23, 2019) that are greatest during dawn through dusk. Most local wildlife have adapted to this relatively benign and predictable activity. The most acute North Frontage Road and Fall Line Drive traffic effects on wildlife are the harassment effects to bighorn sheep that occur when motorists stop to view sheep when they are close to or on the road.

Human Recreation

There is a level of daily recreational use that occurs along North Frontage Road and Fall Line Drive, some of which extends into the proposed development area, generally via the Booth Creek rockfall berm road and buried electric line corridor. Uses, in order of decreasing frequency, include dog-walking, hiking, jogging, biking, motorcycle riding, and transients camping. This unauthorized use of the parcel occurs year-round, but is greatest from spring through fall when not curtailed by

¹ CDOT Station 103028, monitoring traffic between the Vail and East Vail interchanges. Data from the CDOT website (<http://dtdapps.coloradodot.info/otis/TrafficData#ui/2/1/1/station/103028/criteria/070A/175/181/true/true/>) accessed Jan. 23, 2019.

excessive snow depths. Year-round, low to moderate numbers of primarily hikers also pass by the parcel's eastern flank on the Pitkin Creek Trail extending into the Eagles Nest Wilderness.

Fire Suppression and Habitat Deterioration

The East Vail parcel is located within an approximate 1,800-acre polygon of bighorn sheep winter range that extends along the south-facing slopes, north of I-70. Over the last 20-30 years, aspen forest has encroached onto the East Vail parcel, as it has elsewhere in the local area. While mature aspen stands support some of the highest wildlife diversity values of any local vegetation type, they provide poor quality winter range for the local bighorn sheep herd, which has declined in number over that same time period. Sheep also consider forest stands as restrictions due to their need to visually observe the landscape for predators (e.g., bears, coyotes, mountain lions, dogs, etc.; USFS, 1998). Mature aspen stands have died and fallen, creating jackstrawed deposits of logs that restrict and block sheep and elk movements through the winter range. Lastly, mountain shrubs have become decadent and much of their nutritious foliage has grown out of the reach of wintering ungulates.

In 1998, the CDOW and USFS recognized that there was an increasingly limited amount of accessible winter forage (quality and quantity) and nearby escape terrain for sheep in the vicinity of project area (USFS, 1998). By suppressing wildfires on this winter range, the aspen and shrub components had become over mature and in need of vegetative treatment. The USFS (1998) proposed a habitat enhancement plan whose specific purposes were to (1) create a movement corridor (through downed aspen) for the bighorn sheep to be able to travel from Pitkin Creek west to Spraddle Creek, (2) reduce the fuel loading to lessen the risk of wildfire, (3) regenerate shrubland and aspen stands that were over mature, and (4) improve the quantity and quality of forage (shrubs, grass, forbs) for big game (sheep, elk, and mule deer). What is now the East Vail parcel was one of the USFS's proposed treatment areas. In 1998, the sheep population was estimated at approximately 125 animals (USFS, 1998).

Without implementation of the habitat enhancement plan, the USFS (1998) predicted that aspen stands would continue to age, disease and insect infestations would increase, and the stands would die. Dead and down timber would further restrict big game movements to winter foraging areas and escape terrain. The aspen and aged shrub communities would not regenerate. The shrub component (vital for wintering ungulates) would continue to mature, die, and be replaced by grasses and forbs. Grass/forb communities that are covered by deep snow are largely unavailable to wintering ungulates. Lastly, the USFS (1998) predicted that without enhancement there would be fewer bighorn sheep as a result of continued habitat degradation.

The enhancement project was approved, but not implemented because of community opposition to the use of fire (B. Andree, CPW, Jan. 23, 2018). Although there have been two small scale habitat enhancement projects below the Booth Creek cliffs and on the East Vail parcel, the overall sheep winter range has deteriorated as predicted. Over the 2017-2018 winter, Thompson (2018c) detected a total of 41 sheep largely confined to a small non-forested subset of their former winter range. Availability of effective winter range is arguably the greatest threat to the East Vail sheep herd.

2.6.2 Focal Wildlife Species of Concern

2.6.2.1 Bighorn Sheep

Colorado Parks and Wildlife Seasonal Range Mapping

Figure 8 shows the important bighorn sheep seasonal ranges mapped by CPW in the vicinity of the East Vail parcel. Bighorn sheep winter range and severe winter range cover the same area and overlap most ($\pm 75\%$) of the parcel. **Winter range** is that part of the overall range where 90% of the individuals are located during the average five winters out of ten, from the first heavy snowfall to spring green-up. Colorado Parks and Wildlife has not defined the winter range period for this herd. Based on CPW's generic definition and considering winter range dates for other big game species, average sheep winter range occupancy could be defined, on average, as November 15 to April 15 (dates inclusive). Sheep are present on portions of their winter range (i.e., below the Booth Creek cliffs) outside this period because of illegally-placed salt and mineral blocks.

Severe winter range (SWR) is that part of the winter range where 90% of the individual animals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten. The amounts, quality, and effectiveness of winter range are generally what limit big game populations. For example, “much this this sheep herd was killed off” during severe winter conditions in 2007-2008 (B. Andree, CPW, Vail DWM, pers. comm., Jan. 18, 2018) and the herd has been unable to rebound from that winter die-off (Andree, 2017). The sheep winter range and SWR polygon boundaries are not accurate. In the spirit of the mapping, the polygons were likely intended to extend southeast to the treeline along Pitkin Creek and down to the north side of North Frontage Road. This would include most, if not all, of the East Vail parcel, although, based on the winter sheep study (Thompson, 2018c), only 0.25 acres of the parcel were used for winter foraging. There is no I-70 game fencing in the vicinity of the parcel. Sheep likely used the habitat in what is now the Booth Creek residential area as winter range. Sheep no longer enter the interior of that development and only use peripheral areas when no people are initially present. The winter range and SWR polygons are approximately 1,800 acres² and extend west from Pitkin Creek along the north side of I-70 nearly to I-70’s Vail exit. This is the only sheep winter range polygon mapped on either side of the Gore Range. Two Booth Creek homes located 107 and 177 feet below the rockfall berm that is heavily used by sheep in winter give some indication of sheep tolerance of nearby residences.

Winter concentration area (WCA) is a subset of the winter range where animal densities are at least 200% greater than the surrounding winter range density during the same period used to define the winter range, in the average five winters out of ten. Two WCA polygons occur within the winter range, neither overlapping the East Vail parcel, but habitat effectiveness of the nearest polygon could be influenced by residential development and habitation on the parcel.

Bighorn sheep **production area** is where sheep lamb. Production areas are defined as that part of the overall range occupied by pregnant females during a specific time period in the spring (May 1 to June 30). The polygon occurs above the Booth Creek cliffs, extends 1.6 miles to the north, and is topographically buffered from residential Booth Creek development below. Based on ewes selecting cliff-like terrain inaccessible to terrestrial predators, it is unlikely that any of the forested terrain shown in Figure 8 is actually used for lambing and most lambing likely occurs farther up the Booth Creek drainage. The effectiveness of production areas could be affected by free-ranging dogs and recreation.

A bighorn sheep **migration pattern** is a subjective indication of the general direction taken by migratory ungulate herds. In the study area, bighorns move downhill on the ridge between Pitkin and Booth Creeks during fall towards their winter range, then move uphill and follow this same general route in spring to their alpine summer range.

The bighorn **mineral lick** shown in CPW mapping (not shown in Figure 8) is defined as a natural site known to be utilized by bighorn sheep for obtaining minerals to meet basic nutritional needs. That lick was mapped in the wrong location. There are two licks (unknown if natural or otherwise) at the top of the rockfall berm cut slope that have been so deeply excavated by the sheep that large rocks forming the tops of the shallow caves are inevitably going to fall. Up to three sheep have been observed under the rocks at one time (Jun1418). If there are sheep under the rocks when they fall they will be killed. Three females in a herd of 41 are important. The Town of Vail (TOV) and CPW are aware that the rocks should come down before they kill sheep and they plan to act when it is safe to do so. There are also mineral and salt blocks that have been illegally deposited by well-meaning

² This is a much larger acreage of winter range compared to the approximate 573 acres of winter range mapped by the CDOW in 1995 (CDOW mapping, Sep. 1995) and the <500 acre estimate provided by USFS (1998, p. I-5), (1) when the entire winter range polygon was contained between Pitkin and Booth Creeks, but where an additional 900 acres of habitat to the west was considered suitable, but unreachable due to dead/down aspen that the sheep would not cross, (2) when the sheep herd was near its peak size of 125 animals (USFS 1998), and (3) shortly before the CDOW and USFS proposed enhancement of approximately 800 acres of winter range to counter fire suppression effects (USFS 1998, p. I-4). Severe winter range was not designated for the East Vail herd in 1995. This 1,800-acre number is an update from the 1,880-acre number used in Thompson (2017 and 2018c). It was derived from updated sampling where measurements ranged from 1,784 to 1,880 acres.

sheep enthusiasts.³ Whether natural or otherwise, such licks are particularly important for pregnant and lactating ewes.

Results of the East Vail 2017-2018 Winter Sheep Study

The full East Vail Winter Sheep Study report (Thompson, 2018c; TR-5) is summarized below.

The October 13, 2017 to June 14, 2018 wildlife study was primarily designed to detect and characterize winter bighorn sheep use on and in the vicinity of the East Vail parcel. The study employed five trail cameras (4 on the East Vail parcel, including 3 overlooking the development area, and 1 below the eastern Booth Creek cliffs), winter tracking, and binocular and spotting scope surveys of the 1,800-acre sheep winter range polygon.

Winter severity⁴ affects spatial and temporal, winter, big game use patterns. Compared to the last nine years, winter 2017-2018 was below average for total snowfall (-35%), total snowfall days (-40%), and mean base snowfall depth (-12%), and above average for maximum base depth (+3%). Shallower and less persistent snow in the East Vail project area over the 2017-2018 winter should have allowed sheep to use higher elevation habitats, more forested habitats,⁵ and a larger portion of their winter range than during average and harsher winters.

In total, 93 sheep were detected on (n=50 sheep on 3 days) and in the immediate vicinity (n=43 sheep on 2 days) of the 5.4-acre East Vail development area during winter 2017-2018. This includes 75 animals detected by trail cameras and 18 animals detected by observational surveys. Virtually all foraging on and in the immediate vicinity of the parcel occurred on the smooth brome cut slope above the Frontage Road, most of which is on the CDOT ROW. The south-facing cut slopes above the Frontage Road are non-forested and steeper than the aspen forest portion of the development area, resulting in shallower depths, less persistent snow, and more favorable foraging opportunities. Use of the aspen forest composing the majority of the parcel was limited to escape routes on two occasions. A single sheep was also detected travelling through the NAP portion of the parcel in May, outside the winter period.

The distribution of 847 bighorn sheep sightings over the course of the study was mapped in relation to the East Vail parcel and CPW's sheep winter range, severe winter range, and winter concentration area polygons. No sheep sightings were made outside of CPW's winter range polygon. That 277-acre sighting distribution included the 625 sheep recorded by all trail cameras and 222 sheep visually observed during the study. Fifteen percent of CPW's 1,800-acre winter range polygon was used during winter 2017-2018. That distribution represents a spatial subset of overall habitat use over the relatively mild 2017-2018 winter. That may be a function of (1) CPW's polygon reflecting many winters of sheep use, including the 1990's when the herd was at peak numbers (125 sheep, USFS, 1998; 80-100 sheep, B. Andree, CPW, 2017, pers. comm., Jan. 18, 2018), compared to the present population of 41 sheep, (2) sheep now using the highest quality habitat available, (3) sheep avoiding forested habitats, and (4) sheep restricted from some portions of their winter range by jackstrawed logs.

Sheep were at lower elevations within their overall winter range polygon and used southwest- and south-facing aspects that had the best snow-shedding characteristics, even though it was a mild winter. The cluster of sheep sightings and trail camera results below the Booth Creek cliffs suggests that area

³ Who are apparently unaware that their actions are to the detriment of the herd. The sheep's attraction of the salt blocks prolong sheep use of their winter range, well into spring and even summer, putting additional pressure on the vigor and quantity of forage that should be reserved for winter, in a landscape that has deteriorated as a result of wildfire suppression. Concentrated, prolonged, and predictable sheep use of salt blocks may also attract mountain lions that prey on sheep. Not only might the use of salt blocks result in greater sheep predation, but it might also become necessary to kill the lions for public safety.

⁴ Winter severity is generally an interrelated function of snowfall (standing depths, persistence, and crust presence) and temperature. It only takes one storm with adverse conditions to present severe conditions that may kill big game.

⁵ Which support deeper and more persistent snow depths than non-forested habitats, all else being equal.

is the most heavily used and most important block of winter range within the overall winter range polygon. Four occasions of time lapse images of sheep foraging in the high quality habitat below the Booth Creek cliffs indicated that sheep appeared to select against foraging far into transitional aspen habitat. This “avoidance” behavior was more likely related to the quality, quantity, and availability of forage than to predator detection.

Environmental factors explain the greater sheep use of the high quality, mountain shrub-dominated winter range below the Booth Creek cliffs, compared to that on the East Vail parcel. However, all sheep winter range is important, particularly considering the amount of high quality habitats lost to human developments and aspen encroachment. The entire East Vail parcel should be considered sheep winter range. While sheep may use various parcel habitats differently over multiple years, they can access all portions of the property, and that use contributes to the functionality of the overall winter range.

With respect to minimum herd size and composition, the maximum number of sheep observed during the study at any one time was 39. Based on sex and age composition of sheep observed over the course of the study, the herd was composed of at least 10 lambs, 21 ewes, and 10 rams, totaling 41 sheep. The highest number of lambs seen at any one time was 10 on January 25 and March 14. The 2017, 10:21 lamb: ewe ratio (0.48%) indicates relatively high productivity. There was no detectable overwinter lamb or other sheep mortality. Coincident with June 14, 2018 peregrine monitoring, a minimum of 7 lambs and 12 ewes were observed at the licks on the cut slope above the rockfall berm. Assuming that there was no mortality in the herd since the end of winter, the herd numbered 48 animals at that time. Based on that 2018 productivity, knowing the minimum number of ewes in the herd, and other assumptions, the herd likely numbered at least 53 sheep at that time. The East Vail sheep herd exhibited good productivity in 2017 and 2018.

Results of a Meeting with Colorado Parks and Wildlife

A May 14, 2018 meeting was held between VR and CPW representatives to discuss the East Vail Workforce Housing project, after the sheep winter range study (Thompson, 2018c) had ended. All biologists agreed that the issue of potential development on the 5.4-acre parcel related to sheep was not the loss of habitat on the parcel as much as the potential for impacts (i.e., displacement and reduced habitat effectiveness on nearby winter range) from East Vail parcel residents recreating in the high quality sheep winter range below the Booth Creek cliffs and in the NAP area where winter range enhancement is expected. Some mitigation concepts/measures were discussed along with the development of a comprehensive Wildlife Mitigation Plan that covers the entire affected wildlife community as part of the Environmental Impact Report.

2.6.2.2 Peregrine Falcon

A cliff south of I-70's East Vail Interchange has been used in recent years for peregrine falcon nesting. The cliff is located 0.36 miles from the closest point on the East Vail Parcel, on the opposite side of the Frontage Road, I-70, East Vail Interchange on/off ramps, the East Vail Park and Ride, Vail Trail, Gore Creek, a social trail, and the East Vail Memorial Park. The nest ledge used in 2018 was approximately 600 vertical feet above the valley bottom. Colorado Parks and Wildlife's nesting area polygon is defined as the area that includes good nesting sites and contains one or more active or inactive nest locations (Figure 9). The boundaries are drawn based on professional judgment to include most known nesting habitat in the vicinity. Usually these areas are mapped as polygons around cliffs and include a 0.5-mile buffer.

Viable peregrine falcon nesting sites possess two components: (1) adequate nesting habitat and (2) extensive hunting habitat with an adequate prey base to support the adults and their offspring (Craig 1978). Nesting sites are located on precipitous cliffs ranging in height from 40 to 2,100 feet, averaging 200 to 400 feet tall. Several ledges, potholes, or small caves must be present in the cliff face to function as a suitable nest site. A breeding pair will frequently alternate their nesting activities to different ledges on a cliff face between years, and they will often relocate to adjacent cliff faces. As

a result, protective measures must address an entire cliff complex (and potential nesting areas) rather than an individual cliff.

Generally, nesting peregrines will not tolerate excessive human encroachment or prolonged disturbance in the vicinity of the nesting cliff. Any activity or development above the nesting cliff will likely cause abandonment. Breeding peregrines can become extremely agitated and may abandon the nest site if disturbance occurs during courtship, prior to the initiation of egg laying. Once birds have eggs or young, they have a strong fidelity to their invested resources. The CDOW (2008) recognized that "some individuals within a species also habituate and tolerate human activity at a proximity that would cause the majority of the group to abandon their nests." The East Vail peregrines are examples of how wildlife, in general, can habituate to chronic, but benign, human activities, although residential and golf course development along the valley bottom has reduced their prey base.

In Colorado, peregrines usually return to nesting cliffs in late February or early March and initiate courtship activities, which continue to mid- or late April when eggs are laid. The young hatch from mid- to late May and fledge (i.e., leave the eyrie) in mid- to late June. The young and adults remain in the vicinity of the nesting cliff up to several months after fledging. Peregrine nest cliffs are, therefore, sensitive to disturbance from approximately late February to late June.

Extensive hunting habitat is a second key component of a viable peregrine nest site. Peregrines will frequently travel at least 10 miles from their eyrie to procure prey and they have been documented hunting up to 30 miles away from nest sites (G. Craig, CDOW, pers. comm.). It is, therefore, important to maintain the integrity of important hunting areas within at least 10 miles of the nesting cliff. All habitats within the 10-mile radius need not be considered essential habitat, since only those areas that attract or support peregrine prey need be protected. The primary prey captured by nesting Colorado peregrines are small to moderately-sized birds, such as blackbirds, doves, robins, flickers, jays, nutcrackers, meadowlarks, and pigeons, but prey as large as waterfowl are also taken. Any habitat that supports or concentrates birds should be considered essential to locally nesting peregrines.

Key hunting areas fall into two categories: (1) those habitats that concentrate or support important prey species, and (2) those habitats that expose prey and make them vulnerable to peregrine attack. Peregrines capture their prey through precipitous dives from considerable height above their quarry. Peregrines must, therefore, frequent habitats permitting this type of pursuit. Peregrines do not hunt below the forest canopy, but capture birds flying above forests or across open expanses. Larger prey are raked (with talons) or knocked out of the air and peregrines need open areas on the ground to recover them. Nesting cliffs are generally situated at considerable heights above the surrounding terrain, so peregrines have a broad panorama from favorite hunting perches near the cliff top.

Annual (2011-2017, n=5 yrs.) cliff monitoring by Anne Esson (a long time Vail resident) indicated that the pair(s) successfully fledged at least two birds during each of the five years. Monitoring of the nest cliff in 2018 indicated that the nesting attempt failed approximately 19 days after incubation was expected to have started (Thompson, 2018b; TR-6). It is unknown why the 2018 nesting attempt failed. Construction of a new sanitary water line on the south side of I-70's East Vail Interchange and the falcons selecting a different nest ledge on the cliff in 2018, compared to prior years, were the only known independent variables that differed from those of past years. There could have been other common causes of the nest failure. Subsequent behavior of the female observed on June 14 suggested that the pair may have been in the process of a second nest attempt. However, cliff monitoring was discontinued for the 2018 season after surveys by Thompson and Esson out to July 1 failed to detect any evidence of peregrine presence at the cliff. Monitoring of the nest cliff in 2019 detected at least one peregrine and a pair was suspected of nesting as recently as May 13 (A. Esson, Vail resident, pers. comm., May 13, 2019).

The East Vail parcel represents largely intact undeveloped habitat below and within fairly close proximity to the adjacent nest cliff. Its seral and relatively young aspen forest does not support even moderate concentrations of prey species that would be particularly attractive to peregrines using the adjacent nest cliff, but it does support potential avian prey that could contribute to the local pair's prey base.

2.6.2.3 Elk

Figure 10 shows one elk seasonal range mapped by CPW in the vicinity of the East Vail parcel that warrants consideration. The **elk winter range** definition follows that provided for sheep, above. No elk winter range is shown overlapping the subject parcel, but that mapping is incorrect. The winter range polygon boundary along the north side of I-70 appears to follow an assumed land ownership boundary.

At the time of CPW mapping, the County's and the Town's mapping assumed the East Vail parcel was in CDOT ownership. Colorado Parks and Wildlife appears to have adopted the Town's position and extended the polygon along the USFS property line, rather than bringing it down to the north edge of the Frontage Road and I-70 where it should be. There are no mapped elk SWR or WCAs in the vicinity of the East Vail parcel.

Results of the winter wildlife study (TR-5) indicated that a minimum of 15 elk⁶ were occasionally present and moving back and forth between the Pitkin and Booth Creek drainages through the East Vail parcel. Using the spike in the group as a marker, the same group of elk was captured on the three most widely separated trail cameras in the same night. Compared to the sheep, the local elk were more wary of human activity areas. Although some of their movements closely approached I-70 and the Frontage Road, they only did so under cover of darkness.⁷ Elk were only captured on the trail cameras at night and their movements between the Pitkin and Booth Creek drainages were initiated and completed at night. Evidence of elk foraging was captured on all cameras except one of three within the interior of the 5.4-acre development area. Concerted foraging was noted on cameras located below the cliffs and in the NAP area. Foraging in the meadow in the development area's northeast corner was opportunistic as animals were traveling. Although there are areas of the East Vail parcel that may not be used because of terrain and proximity to human disturbances areas, for all practical purposes, the entire parcel should be mapped as elk winter range.

The elk winter range on the subject parcel is part of a polygon containing the highest elevation elk winter range in the Gore Creek Valley and some of the highest winter range in the Eagle Valley. This higher elevation winter range is used more during the early part of winters and during milder winters when excessive snow depths have not yet pushed animals to lower elevations down valley. Nevertheless, these winter ranges are valuable because they support animals during portions of the winter when animals would otherwise be further down valley on increasingly smaller, more crowded, and less effective winter range because of collective habitat losses and the effects of human activities.

Over the past 50 years there has been a considerable loss of big game winter range to secondary ski area development in the Eagle Valley. Winter ranges generally occur at lower elevations along valley bottoms that are dominated by private lands. Development of those lands has pushed elk further west down valley. In recent years, CPW has increased their hunting permits to increase harvest and reduce the elk and deer populations to levels that the smaller winter range acreage can support.

2.6.2.4 Black Bear

Colorado Parks and Wildlife have mapped two black bear seasonal ranges in the vicinity of the East Vail parcel that warrant consideration (Figure 11). **Black bear summer concentration areas** are defined as those parts of the overall range where activity is greater than the surrounding overall range during that period from June 15 to August 15. This entire polygon extends along and above the valley bottom

⁶ Composed of 12 cows, 2 calves, and a spike.

⁷ On the East Vail parcel, elk got as close to I-70 as the buried electric line corridor. East of Pitkin Creek, elk came down to and grazed up to the edge of I-70 on several occasions, but always at night.

from east of East Vail to west of West Vail. This designation has merit overlapping the subject parcel. During summer, the young, open-canopy aspen stands on the west end of the parcel support a moderate density of berry-rich serviceberry shrubs that represent important summer forage for bears. Bear sign was also detected on the NAP portion of the parcel and on National Forest Service (NFS) lands to the north. A **human/bear conflict area** is represented by the same polygon along the Gore Creek valley bottom. Such areas are defined as that portion of the overall range where two or more confirmed black bear complaints per season were received which resulted in CPW investigation, damage to persons or property (cabins, tents, vehicles, etc.), and/or the removal of the problem bear(s). This does not include damage caused by bears to livestock.

2.6.3 Other Wildlife Groups

2.6.3.1 Threatened, Endangered, and Proposed Species

Federally-listed and proposed animal species that were initially considered in this analysis included those identified by the USFWS's on-line IPaC decision support system for the East Vail project area on February 8, 2019 (Table 2). Humpback chub (*G. cypha*), bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), greenback cutthroat trout (*Oncorhynchus clarkii stomias*), Mexican spotted owl (*Strix occidentalis lucida*), yellow-billed cuckoo (*Coccyzus americanus*), and Canada lynx (*Lynx canadensis*) were identified. None of these species occurs on the East Vail parcel or in habitats that could be affected by the proposed Workforce Housing project and they are excluded from further consideration in this document for the reasons presented in Table 2. Other listed and proposed species known to occur elsewhere on the WRNF and/or in Colorado were considered, but not analyzed because they were not identified by the USFWS as potentially present in the East Vail project area, their habitats do not occur in the project area, they have no affinities to project area habitats, the project area is outside of the species' range, and the on- and off-site development effects would have “no effect” on the species, on their habitats, or on designated critical habitat. There are no designated critical habitats in the vicinity of the project area.

Table 2. Federally listed and proposed animal species that may be affected by the East Vail Workforce Housing project.		
Common and Scientific Name	Status ^a	Rationale for Exclusion from Analysis (Habitat)
Humpback chub, <i>Gila cypha</i>	E	Excluded. No project-related Colorado River water depletions not previously considered (far downstream in Colorado River)
Bonytail chub, <i>G. elegans</i>	E	Excluded. No project-related Colorado River water depletions not previously considered (far downstream in Colorado River)
Colorado pikeminnow, <i>Ptychocheilus lucius</i>	E	Excluded. No project-related Colorado River water depletions not previously considered (far downstream in Colorado River)
Razorback sucker, <i>Xyrauchen texanus</i>	E	Excluded. No project-related Colorado River water depletions not previously considered (far downstream in Colorado River)
Greenback cutthroat trout, <i>Oncorhynchus clarkii stomias</i>	T	Excluded. No suitable on-site habitat. Project outside of historical range (isolated mountain stream headwaters)
Mexican spotted owl, <i>Strix occidentalis</i>	T	Excluded. No breeding habitat present or affected (steep canyons with a Douglas-fir, white fir, ponderosa pine/pinyon-juniper component)
Yellow-billed cuckoo, <i>Coccyzus americanus</i>	T	Excluded. No suitable habitat present or affected (old-growth riparian woodlands with dense understories)
Canada lynx, <i>Lynx canadensis</i>	T	Excluded. No potential foraging, denning, or travel habitat (montane and subalpine forests)
^a Federal status, listed after species, is as follows: E = Endangered, T = Threatened, P = Proposed. Source: List: USFWS's on-line Information, Planning, and Conservation (IPaC) decision support system for the East Vail project area, accessed February 8, 2019 and Western Ecosystems, Inc.		

2.6.3.2 U.S. Forest Service Sensitive Species

The USFS has designated “sensitive species” (USFS, 2015), representing species declining in number or occurrence or whose habitat is declining, either of which could lead to Federal listing if action is not taken to reverse the trend, and species whose habitat or population is stable, but limited. From the updated animal list (Oct. 23, 2015), a subset of sensitive species, including three insects, five fish, two amphibians, 17 birds, and nine mammals (Table 3), was determined to be present or potentially present on the WRNF after consideration of all sensitive species on the list. This subset of species is considered below in phylogenetically ordered taxa (insects, fish, amphibians, birds, and mammals) and discussed individually where appropriate. The proposed Workforce Housing project would have **no impact** on any other sensitive species not on the WRNF list. The East Vail parcel is not on the WRNF, but this list provides a second tier of species (i.e., below Federally-listed species) that are prudent to consider for the East Vail project.

Table 3. USFS sensitive animal species that occur on the WRNF and the rationale for potential project effects related to the East Vail Workforce Housing project.	
Common name, Scientific name	Rationale for Potential Project Effects (Habitat Affinity)
INSECTS	
Western bumblebee , <i>Bombus occidentalis</i>	No habitat (Montane and subalpine meadows)
Great Basin silverspot, <i>Speyeria nokomis nokomis</i>	No habitat (Wetlands supporting violet populations)
Monarch butterfly , <i>Danaus plexippus plexippus</i>	No host plant (milkweed) habitat
FISH	
Roundtail chub, <i>Gila robusta robusta</i>	No suitable habitat (CO River up through Glenwood Canyon)
Mountain sucker, <i>Catostomus platyrhynchus</i>	No suitable habitat (small to medium streams below 7000'; 4 populations documented on the Rifle and Blanco Districts)
Bluehead sucker , <i>Catostomus discobolus</i>	No occupied habitat above Alkali Ck. (CO River upstream to Alkali Ck)
Flannelmouth sucker , <i>Catostomus latipinnis</i>	No occupied habitat above the Eagle River (CO River to Granby, Milk, Piceance, and Divide Creeks, Eagle River)
Colorado River cutthroat trout , <i>Oncorhynchus clarkii pleuriticus</i>	No suitable habitat on or below project area (Isolated, headwater streams and lakes)
AMPHIBIANS	
Boreal western toad , <i>Anaxyrus boreas boreas</i>	No suitable habitat on or below project area (Subalpine marshes and wet meadows; ponds, margins of streams; adjacent uplands 8,500-11,000')
Northern leopard frog , <i>Lithobates pipiens</i>	Outside range (Permanent wetlands)
BIRDS	
Northern goshawk , <i>Accipiter gentilis</i>	Potential foraging habitat (Closed montane forests > 7,500')
Northern harrier , <i>Circus cyaneus</i>	No habitat (Grasslands, agricultural lands, marshes, & alpine)
Ferruginous hawk, <i>Buteo regalis</i>	No habitat (Plains, grasslands)
American peregrine falcon , <i>Falco peregrinus anatum</i>	Potential foraging habitat (Cliffs, habitats concentrating/exposing vulnerable prey)
Bald eagle, <i>Haliaeetus leucocephalus</i>	No habitat (Open water bodies, big game winter range)
White-tailed ptarmigan , <i>Lagopus leucurus</i>	No habitat (Alpine habitat and upper elevation willow stands)

Table 3. USFS sensitive animal species that occur on the WRNF and the rationale for potential project effects related to the East Vail Workforce Housing project.	
Common name, Scientific name	Rationale for Potential Project Effects (Habitat Affinity)
Greater sage grouse, <i>Centrocercus urophasianus</i>	No habitat (Sagebrush)
Columbian sharp-tailed grouse, <i>Tympanuchus phasianellus</i>	No habitat (Sagebrush and mountain shrub)
Flammulated owl , <i>Otus flammeolus</i>	Marginal, but potential habitat (Old-growth ponderosa pine and aspen)
Boreal owl , <i>Aegolius funereus</i>	No habitat (Mature spruce-fir & mixed conifer)
Black swift, <i>Cypseloides niger</i>	No local nesting habitat (Waterfalls, cliffs)
Lewis' woodpecker, <i>Melanerpes lewis</i>	No habitat (Ponderosa pine and cottonwoods)
Olive-sided flycatcher , <i>Contopus cooperi</i>	No habitat (Open, upper elev. conifer forests)
Loggerhead shrike, <i>Lanius ludovicianus</i>	No habitat (Plains, low valleys, shrublands)
Purple martin, <i>Progne subis</i>	No habitat (Old-growth aspen)
Brewer's sparrow, <i>Spizella breweri</i>	No habitat (Sagebrush and other structurally similar shrublands)
Sage sparrow, <i>Amphispiza belli</i>	No habitat (Low elevation big sagebrush and sage/ greasewood)
MAMMALS	
Pygmy shrew , <i>Microsorex hoyi montanus</i>	No habitat (Variety of subalpine habitats)
Fringed myotis, <i>Myotis thysanodes</i>	No habitat (Forests/woodlands to 7,500 ft.; unknown on WRNF)
Hoary bat (<i>Lasiurus cinereus</i>)	No habitat (Mixed conifer and lodgepole pine forest)
Spotted bat, <i>Euderma maculatum</i>	No habitat (Cliffs, arid terrain)
Townsend's big-eared bat, <i>Corynorhinus townsendii</i>	No habitat (Structures, tree cavities <9,500 ft.)
American marten , <i>Martes americana</i>	No habitat (Conifer forests)
River otter , <i>Lontra canadensis</i>	No habitat (Year-round open water and streamflows of ≥ 10 cfs)
Rocky Mountain bighorn sheep , <i>Ovis canadensis canadensis</i>	Present (High visibility habitat near escape terrain)
<p>Note: Species in bold are potentially present and/or are discussed in the text. Wildlife are listed phylogenetically. Other R2 species are not listed because they have not been found on the WRNF, they have no affinities to project area habitats, the project area is outside of the species' range or elevational distribution. Potential occurrence on the project area, potential for project effects, and habitat affinity is summarized for each species.</p> <p>Source: Forest Service Manual, Rocky Mountain Region, Denver, CO, Chapter 2670 – Threatened, Endangered and Sensitive Plants and Animals, Supplement No: 2600-2015-1, Effective Date: Oct. 23, 2015 (J. Austin, USFS, pers. comm., Nov. 17, 2016).</p>	

Determination of potential project effects to sensitive animals considers direct, indirect, and cumulative effects to those species. Determination of potential project effects to sensitive animals (including insects, fish, amphibians, reptiles, birds, and mammals) considers the area, configuration, and function of suitable and occupied habitat affected, home range size and number of individuals affected, size, density, and location of the population, and consequence of negative effects on the species as a whole within the WRNF and within its range. Potential sensitive animal habitats, where a particular species has not been detected, are considered to be occupied, based on the rationale that animals are wide-ranging, that they may be present, but go undetected, and that suitable, but unoccupied habitat can be quickly recolonized. Impacts to such potential, sensitive, animal habitats are considered negative or beneficial effects.

Nevertheless, not every acre of potential habitat is necessarily occupied by a particular species, and not every acre of suitable habitat is of equal importance, nor must it be maintained to maintain effective, well-distributed habitat for any particular species across the Forest. Some habitat loss or impact may affect individuals so long as sufficient habitat components exist which maintain population viability across the Forest. In addition, "impacts" and "negative effects" on individuals considered herein do not necessarily equate to the death of those individuals. In most cases, negative effects on NFS lands refer to the displacement of individuals from a small portion of their home range or potential habitat.

Boreal Western Toad

There is an extant boreal toad breeding site in the vicinity of the project area (M. Grove, USFS, pers. comm., Oct. 29, 2018). It is isolated from the East Vail parcel to the extent that project development (direct effects) and habitation, including potential off-site traffic and recreational activity (indirect effects), should have no effect on that population. This species is dropped from further consideration herein.

Northern Goshawk

Potential goshawk habitat (i.e., that above the Gore Creek valley bottom) in the vicinity of the East Vail project area is large, mature, closed canopy, aspen and conifer habitats. There are no known active goshawk nest territories present in the vicinity of the project area. It is possible that the aspen forest on the parcel could be used as foraging habitat by individual goshawks, but it is disjunct from continuous quality habitat and within the influence of chronic human activities along the Gore Creek valley bottom. There are no raptor stick nests on or in the vicinity of the subject parcel. Goshawks would not be affected by anticipated East Vail project development and this species is dropped from further consideration herein.

American Peregrine Falcon

Peregrine falcons are addressed in Section 2.6.2.2, above.

Flammulated Owl

On the WRNF, flammulated owls have been found in several locations using pure aspen stands and aspen-conifer stands. Most likely, Eagle County habitats are only used by this species during the breeding season, with individuals migrating out for the winter. The East Vail parcel does not support the ponderosa pine/Douglas-fir habitat association representing primary habitat that this species is associated with. While the aspen stand in the open space portion of the parcel provides potential nesting structure, it is too small and disjunct to be considered suitable habitat, particularly when superior surrounding habitats are unoccupied. This species is dropped from further consideration herein.

American Marten

There are no habitats on the East Vail parcel that represent primary marten habitat (upper elevation spruce-fir forest). Marten tracks were detected in the mixed conifer/cottonwood riparian corridor along lower Pitkin Creek in winter, 2017-2018. East Vail parcel development would have no direct or indirect effects on marten and this species is dropped from further consideration herein.

Rocky Mountain Bighorn Sheep

Bighorn sheep are addressed in Section 2.6.2.1, above.

2.6.3.3 Colorado Parks and Wildlife Endangered, Threatened, and Species of Special Concern

The current lists of Colorado endangered and threatened species and Colorado species of state special concern (<http://cpw.state.co.us/learn/Pages/SOC-ThreatenedEndangeredList.aspx>; accessed Jan., 14, 2019) were considered for species that may occur on and around the East Vail project area. Those lists included two mollusks, 23 fish, seven amphibians, 10 reptiles, 19 birds, and 13 mammals. None of the state species contained in those lists occur or have potential habitat that would be influenced by the proposed project, except for those species that have been previously addressed in this analysis.

2.6.3.4 Migratory Birds

The East Vail parcel supports a low to moderate diversity of largely migratory birds that reach peak numbers during the spring and mid-summer breeding season. The avian community is typical of those associated with the habitats present and is largely uninfluenced by chronic human activity associated with the adjacent Frontage Road and I-70.

2.6.3.5 Raptors

Red-tailed hawks (*Buteo jamaicensis*) were the only raptor actually observed on the East Vail parcel. No raptor nests are present and the parcel is within the hunting territory of a pair that nested on the south side of I-70 in 2018. Other raptors observed in the vicinity of the parcel during field surveys that could hunt the parcel include peregrine falcons, golden eagles (*Aquila chrysaetos*), and sharp-shinned hawks (*Accipiter striatus*).

2.6.3.6 Fish

The moderate gradient, ephemeral stream bisecting the East Vail development parcel does not support fish. Stream water enters a 24-inch diameter culvert and flows under the Frontage Road and I-70 before dropping into Gore Creek that supports a fishery. The culvert's drop prevents Gore Creek fish from attempting to colonize the creek during stream flows.

2.6.3.7. Other Big Game Species

Mule Deer

The only mule deer seasonal ranges mapped by CPW in the vicinity of the East Vail parcel are overall range and summer range. The closest mule deer winter range is 8.7 miles to the west, north of I-70. Low numbers of deer are present on and around the parcel from May through October.

Moose

The only moose seasonal ranges mapped by CPW in the vicinity of the East Vail parcel are overall range and summer range. The closest moose winter range is 2.5 miles to the northwest in Spraddle Creek. Moose may occur on or in the vicinity of the parcel, as they may just about anywhere else in Eagle County. Moose is the only ungulate whose population is increasing in the Gore Valley (Andree, 2017).

Mountain Goat

The closest mountain goat seasonal ranges mapped by CPW in the vicinity of the East Vail parcel are overall range and summer range in the Gore Range alpine, 2.3 miles up Booth Creek and 2.8 miles up Pitkin Creek. Goats are dropped from further consideration herein.

Mountain Lion

The East Vail parcel is located within a large polygon designated as a "mountain lion human conflict area" by CPW that includes all residential areas and trailheads from east of East Vail to west of West Vail. Such areas are defined as areas where mountain lions have been involved in incidents (conflicts with humans that have serious results), an attack on a human, predation on domestic pets or livestock held in close proximity to human habitation. Lion conflicts have increased since 2016 with most encounters involving the public encountering lions while hiking with their dogs (B. Andree, CPW, DWM [Ret.] 2017). In 2016, there were two incidents of dogs killed by lions and one lion was euthanized as a result. Lions are occasionally present on and around the East Vail parcel.

2.7 Noise

The undeveloped project site does not generate any noise. The major noise source in the vicinity of the project site includes the I-70 corridor, which generates noise from vehicular traffic.

2.8 Odors

The undeveloped natural habitat of the project site is not a source of any odors. Furthermore, there are no odor generation sources in the vicinity of the project site.

2.9 Visual Resources

Visual amenities of the project site include a landscape dominated by an attractive aspen forest which blends with the larger aspen forest and shrub communities on the south-facing slope of the Gore Creek Valley. The project site affords views to the broad floodplain of Gore Creek which is dominated by attractive woody wetlands, and the steep lower slopes of the 11,816-foot tall Red Mountain which are characterized by an evergreen forest with patches of aspen. Interstate 70 and the East Vail Interchange are also in the view corridor of the project site, as is the residential development along Gore Creek to the southeast.

2.10 Land Use

The proposed development area of the project site, an area of 5.4 acres, is zoned as Housing (H), while the eastern end of the project site (17.9 acres) is zoned as Natural Area Preservation (NAP). Existing land uses of the project site include open space and wildlife habitat.

2.11 Access & Transportation

The project site, which is located north of I-70, is accessed via the East Vail Interchange. Fall Line Drive, located north of I-70, extends east from the interchange to provide access to the Pine Creek townhomes. The I-70 North Frontage Road extends west from the interchange to provide access to existing developments west of the project site. Further west this road goes under I-70 and extends along the south side of I-70 all the way to the Town Center I-70 Interchange for Vail. The undeveloped project site does not generate any traffic.

2.12 Population

The undeveloped project site has no population.

3.0 Proposed Project

3.1 Buildings & Parking

The proposed East Vail Workforce Subdivision would create a multi-family community on the 5.4 acres of the project site zoned H for housing. It would consist of eleven buildings with a total of 42 apartment units and 31 townhomes. The buildings will be a combination of two and three bedroom units. There would be approximately 48 at-grade parking spaces near the buildings, as well as driveways from the Townhomes to accommodate additional parking. See Figure 12, TR-7 and TR-8.

3.2 Natural Area Preservation

The applicant intends to enhance a substantial portion of the 17.9-acre Natural Area to create a movement corridor for wildlife from east to west across the site, and to create grazing enhancements for all wildlife including the East Vail bighorn sheep herd. See Section 4.6.

3.3 Access & Traffic

The project would be accessed via the existing East Vail Interchange of I-70. No road construction or modifications would be required to safely accommodate traffic generated by the development (McDowell Engineering, 2019, as revised May 21, 2019 – TR-9). All improvements, including site access, pedestrian circulation, bus stop, and landscaping will be reviewed and approved by the Colorado Department of Transportation (CDOT).

3.4 Utilities

Water and sewer service would be provided by the Eagle River Water & Sanitation District. These and all other utilities would be buried within the road system.

3.5 Bus Station

A bus station currently exists on the north side of the East Vail Interchange along the southern boundary of the project site. A new bus stop would be located east of the intersection of North Frontage Road and the access road to the development. See Figure 12.

3.6 Drainage Plan

Stormwater will be diverted to underground water quality chambers buried within the road system. Water will flow from these chambers via pipes to the pipe that conveys flows in the ephemeral drainage south toward Gore Creek. There will be one at-grade water quality pond located near the entrance to the project site. See Figure 12.

4.0 Impacts & Mitigation

4.1 Hydrology

4.1.1 Surface Water

The access road to the development would impact the ephemeral stream via piping and riprap, both on and off-site. A 24-inch HDPE pipe would convey water across the project site and off-site to an existing culvert which conveys water south and under I-70 toward Gore Creek. The total length of stream impacted would be 92 linear feet.

4.1.2 Groundwater

Based on preliminary subsurface exploration pits conducted by Cesare, Inc. (2018), groundwater would not likely be encountered by project grading and the construction of the roads, buildings and rockfall barrier.

4.2 Atmospheric Condition

The proposed development would have a small and immeasurable impact on air quality. There would be a short-term increase in hydrocarbon pollutants and dust during the construction process. With development, there would be small releases of hydrocarbon pollutants generated by activities such as heating the development. The traffic study determined that the project would generate 290 vehicle trips on an average weekday, including 17 trips during the morning peak hour and 24 trips during the afternoon/evening peak hour. These vehicle trips would increase the levels of hydrocarbon pollutants. The magnitude of the impact on air quality has not been estimated, but it would likely be small and immeasurable.

4.3 Geology & Hazards

4.3.1 Rockfall & Debris Flow

The rock outcrop upslope of the proposed development is a rockfall source zone and incised drainage channels upslope of the development which seasonally have flowing water have the potential for debris flows. Therefore, a Concept Rockfall & Debris Flow Mitigation Plan has been developed by Skyline Geoscience (2019). Rockfall and debris flows can be mitigated with a single barrier system which will reduce but not eliminate rockfall and debris flow hazards. The barrier system would also act as a wildlife barrier and limit human activity in wildlife habitat. As illustrated by Figure 13, an earthen berm and catchment ditch is being considered. A barrier wall with a smaller footprint is also being considered for the area upslope of the proposed development where there is limited space

between the property boundary and the edge of development. Recommendations for the barrier system include:

- a) Height – 12 feet.
- b) Designed to withstand the maximum impact energy estimated = 2,300kJ.
- c) The impact face of the barrier should be as vertical as possible. A 1:1 slope is assumed for the earthen berm option, although a steeper grade is preferred. A vertical face with minimal to positive batter on the upslope side is recommended for the impact barrier wall option.
- d) Ideal orientation of the barrier is perpendicular to the fall line of the slope. If a perpendicular orientation is not possible, a staggered wall geometry may be considered. There shall be no gaps in the barrier system and staggered sections should have appropriate angles and lengths to accommodate coverage of site development. If the angle of the barrier diverges significantly from perpendicular to the fall line of the slope, the system must be designed to accommodate for containment of rocks within the property boundaries. The orientation of the proposed barrier is perpendicular to the fall line of the slope, except at the western end where the wall deviates about 10 to 15 degrees from the preferred orientation. It is not recommended for the barrier system to deviate more than 20 degrees from perpendicular to the fall line of the slope.
- e) Adequate space uphill of the barrier for catchment and accumulation of rockfall, and for routine access of equipment for removal of accumulated debris. This area should be graded flat. The actual width of the catchment depends on the size of the equipment to be used to remove accumulated debris and the angle of the slope above. The use of explosives or expansion grout can be used to break up large boulders that accumulate in the catchment, creating smaller fragments that can be removed.
- f) The catchment area must be routinely maintained, and accumulated debris removed. Debris should not be allowed to pile up and thus diminish the effectiveness of the catchment.
- g) Surface drainage within the catchment should be controlled with adequate slope of the ground surface. Based on proposed development plans available at the time of the study, the ground surface of the catchment slopes down from east to west with a grade of 2%. Water should not be allowed to accumulate or pond in the catchment. Surface drainage and erosion management related to the deeply incised drainages which had flowing water during the Cesare site visits in May and June 2017 must be considered.
- h) An access road to the catchment area must be designed and maintained.
- i) Routine inspection of the barrier system must be enforced and will assist in determining the maintenance and repair needs of the system. Inspections should be conducted on a regular basis and immediately following a rockfall or debris flow event. Other construction, maintenance and inspection recommendations may be provided by the wall manufacturer.
- j) Observation and inspection by a qualified engineering geologist or geotechnical engineer during construction and upon completion of the rockfall barrier is recommended.

4.3.2 Existing Landslide

Cesare (2017) determined that there is a large landslide on the east end of the project site, but it does not extend into the development area. Cesare found no evidence of recent movement, however they recommend avoiding development within the mapped extent of the landslide and monitoring the slope if construction occurs near the foot of the landslide.

4.4 Soils

The proposed development would impact approximately 5.1 acres of the Millerlake soil as described in Section 2.4. It is recommended that topsoil from the impact area be salvaged and used in areas that are to be landscaped. Specifically, all of the soils on the 5.4-acre development parcel, except for

the area north of the mitigation berm on the northeast corner and a small area on the southeast corner, would be impacted.

4.5 Vegetation Resources

4.5.1 Vegetation Types

The proposed development would impact permanently impact approximately 2.7 acres of an aspen forest. Specifically, all of the aspen forest on the 5.4-acre development parcel, except for the area north of the mitigation berm on the northeast corner and a small area on the southeast corner, would be eliminated. However, there would be a temporary loss of 2.3 acres of aspen forest cleared for the rockfall berm, but reclaimed to a similar habitat.

4.5.2 Wetlands

The access road to the proposed development would impact approximately 92 linear feet of a 2-foot wide ephemeral drainage, which is classified as a wetland. Specifically, 68 linear feet would be impacted on the project site via a culvert and riprap, and 24 linear feet south of the project site would also be piped. The total estimated wetland impact would be approximately 184 ft². Specifically, a 24-inch pipe would be installed under the access road to convey stormwater south toward Gore Creek.

A permit would be required from the U.S. Army Corps of Engineers (Corps) for the wetland impact of the access road. Specifically, a Nationwide Permit 29 for Residential Development would be required. Due to the small size of the wetland impact, the Corps would not likely require any mitigation for the wetland impact.

4.6 Wildlife Resources

The proposed Workforce Housing project would have both negative and beneficial effects on the local wildlife community. There will be a net loss of habitat and wildlife displacement from development and human activity areas when 21.5% of the overall parcel is developed. Negative effects will include approximately five acres of direct habitat losses,⁸ reduced habitat effectiveness of adjacent buffer zones, increased traffic along the Frontage Road and regional highways, and the displacement of wildlife around off-site recreation corridors that will likely be used by housing residents.⁹ Potential negative development effects have already been somewhat reduced through the rezoning process that concentrated development on 23% of the parcel, as well as further avoided, minimized, and compensated with (1) the incorporation of wildlife-oriented design criteria into the development's design, (2) on-site habitat enhancement proposed on 14.6 acres of the parcel that will remain undeveloped, (3) the implementation of wildlife-related construction and operational considerations, and (4) the implementation and enforcement of the human habitation-related minimization measures in the Wildlife Mitigation Plan (TR-10). The beneficial effect would be the enhancement of sheep and elk winter range that is not currently effective for sheep because of fire suppression effects.

Figure 14 shows wildlife habitats that would be affected on and adjacent to the 5.4 acre East Vail Workforce Housing parcel. The development footprint, including the driveway and parking lots, buildings, the rockfall wall, and ancillary facilities, would affect approximately five acres of a relatively young aspen stand with a mountain shrub understory dominated by chokecherry. That area of habitat represents 21.5% of the 23.3-acre parcel; 78.5% of the parcel would remain undeveloped.

⁸ i.e., 2.7 acres from direct habitat losses and fencing blocking wildlife access to another 2.3 acres of the parcel.

⁹ With resident education, fencing/ barriers, and aggressive fines and enforcement, these recreational impacts will be minimized on lands surrounding the East Vail development area that are important for sheep winter range and other wildlife uses. However, additional, incremental recreational impacts will occur along other existing trail corridors in Eagle County that bisect wildlife habitats as a result of increased recreational use of those trails by Workforce Housing residents.

Undeveloped habitat on 14.6 acres of the East Vail parcel would be enhanced as big game (bighorn sheep and elk) winter range.

Undeveloped habitat on 14.6 acres of the East Vail parcel that would be enhanced as big game (bighorn sheep and elk) winter range would result in a moderate-term enhancement and net gain of mountain shrub habitat, whose quality, quantity, and availability to ungulates has declined as a result of wildfire suppression (Figure 15). Proposed enhancement would also result in a moderate-term net gain of 3.9 acres of mountain shrub habitat, as an over-mature aspen stand with a dense chokecherry understory is treated to enhance sheep winter range. Mule deer, elk, and other wildlife with affinities to mountain shrub habitat would also benefit. Using the results of the 2017-2018 wildlife study (Thompson 2018c), additional sheep winter range enhancement, probably involving hundreds of acres, is under consideration on surrounding NFS lands and TOV open space.

Most wildlife present in development areas at the time of construction will be displaced to adjacent habitats, some of which will be occupied. Small mammals, the young of cavity nesting birds, and a reptile (garter snake, *Thamnophis elegans*) may be killed, depending on the time of year that site clearing starts. The size of the development area likely supports the home ranges of several to a handful of individual bird and small mammal species. After project development and habitation, the development parcel will support those wildlife species tolerant of human development.

The effectiveness of habitats surrounding the development to the north, east, and west would be reduced, to a certain extent, by noise, visual, and olfactory disturbances emanating from the development. Distances would vary by species and would be attenuated by screening forest, distance, topography, and the chronic disturbances extending through the parcel from the adjacent Frontage Road and I-70. Birds and small mammals would be the least affected. Elk would exhibit the broadest avoidance zones.

Workforce Housing-related traffic increases may incrementally increase wildlife road-kill probabilities on the Frontage Road and along regional highways. Buildout of the East Vail parcel is expected to generate a total of 290 external vehicle trips over the course of an average weekday, including 17 trips during the morning peak hour and 24 trips during the afternoon/evening peak hour (McDowell Engineering 2019). Ten to 20% (29-58) of those contributions would be on the North Frontage Road, while 70-80% (203-232) would be on I-70. These additional contributions represent an average of 9.9% and 0.8% of the current, average, daily traffic volumes on those respective roads and highways. Increased road-kill probabilities on I-70 resulting from the additional Workforce Housing traffic would be discountable relative to the low mortality associated with current high traffic volumes and should not affect local big game because they don't cross the highway in the vicinity of the project area. Sheep are occasionally present during winter conditions along the Frontage Road and have been known to lick salt off the road, and a few may even cross the road to forage between the road and I-70. Increased sheep road-kill probabilities on the Frontage Road are possible, but unlikely because of good horizontal visibility along the road, because the sheep are habituated to the traffic, and because most road mortality occurs on roads and highways where posted speeds are ≥ 45 mph (Gunther et al. 1998). In the vicinity of the site, the North I-70 Frontage Road has a posted speed limit of 25 mph eastbound and 45 mph westbound. Resident participation in public transportation would reduce potential traffic impacts. The Mitigation Plan contains a section that would educate residents about this issue.

Resident education about the parcel's sensitive location in wildlife habitat and the implementation and enforcement of the Wildlife Mitigation Plan (TR-10), with significant penalties for violators, should reduce and confine potential habitation effects to the parcel's development area and minimize the potential effects of greatest concern (recreationists and dogs) from extending off-site. Issues specific to individual species and wildlife groups are discussed below under those accounts.

4.6.1 Focal Wildlife Species of Concern

4.6.1.1 Bighorn Sheep

Workforce Housing would permanently convert approximately five acres of bighorn sheep winter range into non-habitat and unavailable habitat (Figure 14). The development footprint would affect 2.7 acres of a relatively young aspen stand with a mountain shrub understory dominated by chokecherry. Another 2.3 acres north of the development area would also be disturbed for the rockfall berm, reclaimed as mountain shrub and aspen habitat, but it would be unavailable to big game because of the fencing needed to restrict residents from the important surrounding wildlife habitats. The forested habitat composing most of the development area was only used on two occasions and for travel only (no foraging) during the 2017-2018 winter (Thompson 2018c), although that use contributed to the functionality of the overall winter range. Workforce Housing would permanently convert 0.3 acres of sheep winter foraging habitat, largely composed of smooth brome, into non-habitat.

The effectiveness of habitats surrounding the development to the west, north, and east could also be reduced to a certain extent. Retaining screening aspen forest,¹⁰ planting screening trees along the access driveway, and existing topography and distance would reduce those potential indirect effects. Approximately 1.7 acres of sheep winter foraging habitat, composed of smooth brome stands on the cut slope above the Frontage Road and largely off-site, would not be disturbed,¹¹ but its effectiveness would be reduced by its linear configuration and location between the Frontage Road and the housing project. That habitat was used on three occasions during the 2017-2018 winter (Thompson, 2018c), but even that small amount of foraging took foraging pressure off other accessible winter range. After housing has been built and inhabited, sheep may still enter that area to forage under cover of darkness. The effectiveness of sheep winter range to the west of the housing's driveway could also be impaired by housing-related traffic, although negative effects could be minimized by construction of a screening berm or temporary construction fencing before the first construction season and by planting screening trees (after housing infrastructure, including water for irrigation, is available). The area affected is difficult to quantify, but it could amount to several acres. The level of habituation in the local sheep herd will limit the extent of diurnal displacement. Sheep will likely forage in that area under cover of darkness when humans are not present, as they do now, so the diurnal displacement may have no negative effects.

Bighorn sheep lambing should be unaffected by the direct and indirect impacts of the Workforce Housing project because of distance, intervening screening topography, and the implementation of the Wildlife Mitigation Plan. Current human habitation of the Booth Creek residential development is not thought to be affecting lamb productivity or survival.

To compensate for the direct and indirect impacts to sheep winter range, 14.6 acres of open space on the East Vail parcel would be enhanced to improve the quality and quantity of accessible forage that is normally maintained by wildfires. That enhancement could start in 2019 and the increased forage availability should be available for the upcoming 2019-2020 winter to compensate for the direct and potential indirect winter foraging losses during project construction that could extend over one winter.¹² In spring, 2019, the TOV started habitat enhancement on some of their open space.

¹⁰ For example, an existing screen of relatively dense, approximately 15- to 30-foot-tall, young to medium-aged aspen on the parcel's western tip and extending onto NFS lands to the northwest that is 444-487 ft. wide (see Fig. 8-2 in the Wildlife Mitigation Plan, TR-10) would effectively screen all but the upper floors of the housing and, most importantly, all resident activity on the parcel from the high quality, mountain shrub-dominated, bighorn sheep winter range below the Booth Creek cliffs. In comparison, there are two Booth Creek homes with little aspen buffering located 107 and 177 feet below the rockfall berm that is heavily used by sheep in winter.

¹¹ There would be some disturbance to this habitat resulting from the relocated bus station, however, there are currently no siting or design details available to evaluate.

¹² Construction would occur in phases that would present differing levels of disturbance to adjacent habitat effectiveness. Phases would be scheduled to avoid the most obtrusive disturbances during any winter. Initial clearing and site work, when heavy equipment is operating and when disturbances would be greatest, will not occur during any winter. The framing through dry-in phase would occur over one winter. Thereafter, the final inside finishing

Additional sheep winter range enhancement, probably involving hundreds of acres throughout the winter range polygon as originally proposed in 1998 (USFS 1998), is under consideration on surrounding NFS lands. The need for that widespread enhancement and specific prescriptions that could be implemented near the East Vail parcel was presented to and discussed with TOV, CPW, and USFS representatives on January 11, and February 6 and 8, 2019.

Implementation and strict enforcement of sheep-related rules and regulations in the Wildlife Mitigation Plan (TR-10) would further reduce potential impacts to sheep resulting from residents living in the Workforce Housing and should reduce impacts to a level that would not negatively affect the sheep herd. Key sheep-related rules and regulations include resident education, using fencing along the rockfall berm to restrict residents from hiking out of the development onto important sheep winter range surrounding the parcel, prohibiting resident and guest entry into those areas,¹³ prohibiting trail development on the parcel's open space, limiting dogs on the parcel and enforcing strict dog control measures, and imposing strict fines for violations. The paramount wildlife concern on this project is the potential for inappropriate recreational use extending beyond the Workforce Housing development area that could adversely affect habitat effectiveness on surrounding lands, some of which are vital to the small bighorn sheep herd. The secondary wildlife concern is the potential effect of stray dogs on adjacent winter range. Strictly enforced rules and regulations with significant penalties for first time violators should minimize recreation and stray dog incidents (see TR-10, Section 8.3.2.1). The Workforce Housing project should not jeopardize the viability of the East Vail sheep herd.

4.6.1.2 Peregrine Falcon

Development and habitation of the Workforce Housing parcel should not negatively affect the viability or productivity of the peregrine nest cliff on the opposite side of I-70 from the project area. Regarding buffer zones around peregrine nest cliffs, the CDOW (2008) recommended that "no surface occupancy (beyond that which historically occurred in the area) [occur] within [a] ½ mile radius of active nests" and that there should be a "seasonal restriction to human encroachment within ½ mile of the nest cliff(s) from March 15 to July 31." That recommendation is valid¹⁴ as a general guideline for all peregrine eyries in Colorado. However, the CDOW (2008) also recognized that "some individuals within a species also habituate and tolerate human activity at a proximity that would cause the majority of the group to abandon their nests." Such is the case with the birds that have nested in East Vail since at least 2011 (Thompson, 2018b; TR-6). A cautionary consideration, however, is that "the tolerance of a particular pair may change when a mate is replaced with a less tolerant individual and this may cause the pair to react to activities that were previously ignored" (CDOW, 2008). The proposed Workforce Housing project (0.36 mi. away from the base of the nest cliff) represents the same type of surface occupancy that is currently associated with the Booth Creek residential area, the Falls at Vail Townhomes, and the East Vail residential area south of I-70, where the closest home on Lupine Drive is 989 horizontal feet (0.19 mi.) away from and ± 600 vertical feet below the 2018 nest ledge. All of the intervening, chronic, human developments and activities (see Section 2.6.3.2) should adequately buffer the nest cliff from construction and habitation of the Workforce Housing parcel. Mitigation (TR-10) is presented that would avoid and minimize potential construction effects associated with blasting.

4.6.1.3 Elk

Potential residential development on the subject parcel will be of concern for elk for the same reasons described for bighorn sheep (the net loss of winter range, further impaired effectiveness of habitat within the influence of the development, and other potential habitation-related effects [e.g., dispersed recreation originating from residences and free-ranging dogs]). As described for sheep, elk habitat use in this area has adapted to I-70 activity, nearby subdivisions, and dispersed recreational activity,

phase would have the least obtrusive disturbances.

¹³ I.e., on TOV open space to the west, National Forest Service lands to the north, and East Vail parcel open space to the east, some of which are vital to the small bighorn sheep herd.

¹⁴ For what it was developed to consider.

but unlike sheep, the local elk have not habituated at all to human presence.¹⁵ The relatively small (5-acre) potential East Vail development would result in a further, incremental loss of winter range in an overall elk herd whose numbers have declined as a collective result of similar winter range losses and recreational activity effects. The winter range forage losses should be more than offset by reinvigorating forage quality and quantity and facilitating access to 14.6 acres of on-site winter range that are now somewhat impaired by jackstrawed logs and out-of-reach browse. That on-site habitat enhancement could start in 2019, subject to TOV approvals (TR-10). Seventy-nine percent of the parcel would remain available for continued elk use. Additional winter range habitat enhancement being implemented and considered on surrounding TOV and NFS lands would also benefit elk. The subdivision and fencing would also deflect movements from a favored route (the 8-10 ft. wide buried electric line through the parcel) that a small group of elk,¹⁶ wary of human activity and presence, use to move through this portion of their winter range. The project would continue to provide an east-west corridor through the rear portion of the parcel along the north side of the rockfall berm. Elk should also continue to use additional, existing, east-west movement routes buffered to the north of the housing. Other mitigation measures proposed for bighorn sheep would also benefit elk.

4.6.1.4 Black Bear

Residential development on the Workforce Housing parcel will be of concern for black bears because of (1) potential habitation-related effects (e.g., potential garbage-handling issues), (2) the small, but additional net loss of summer forage habitat, and (3) further impaired effectiveness of habitat within the influence of the development. Approximately 79% of the parcel would remain undeveloped and available for continued bear use. Implementation of measures contained in the Wildlife Mitigation Plan (TR-10) should minimize human/bear conflicts to acceptable levels.

4.6.2 Other Wildlife Species and Groups

Implementation of construction and habitation measures contained in the Wildlife Mitigation Plan (TR-10) for the focal wildlife species would also benefit other wildlife species and groups within the project's area of influence. Note that some of the wildlife groups and species considered in the Existing Environment section, above, would not be affected by the proposed development and were not carried forward to this section.

4.6.2.1 Migratory Birds

The Workforce Housing project would remove approximately five acres of habitat used by birds for foraging and nesting. Approximately 2.3 acres of habitat north of the development area that were grade for the rockfall berm would be restored to mountain shrub and aspen habitat. That habitat would be available and used by migratory birds as it develops and matures. Some birds tolerant of close human proximity and those attracted to feeders would inhabit the development area.

4.6.2.2 Fish

Fish and other aquatic life in Gore Creek should not be negatively affected by the project with the implementation of standard Best Management Practices that would prevent sedimentation and impermeable surface runoff from reaching the creek.

4.6.2.3 Mule Deer and Moose

The Workforce Housing project would approximately five acres of deer and moose summer range and deflect east-west movements through the area to the north. Mitigation measures proposed for sheep and elk would also benefit deer and moose.

¹⁵ During the 2017-2018 winter wildlife study (Thompson 2018), elk were present on the parcel and in the surrounding area, but only under cover of darkness.

¹⁶ Composed of 12 cows, 2 calves, and a spike, in winter 2017-2018.

4.6.2.4 Mountain Lion

Mountain lions should be unaffected by the Workforce Housing project. There is likely limited current lion use of the development parcel and the lion prey base (largely ungulates) should not be measurably diminished by the project.

4.7 Noise

The proposed development would generate a short-term increase in noise levels due to heavy equipment use during construction. When construction is complete, the project would generate approximately 460 external vehicle trips over the course of an average weekday, including 29 trips during the morning rush hour and 46 trips during the afternoon/evening peak hour (TR-9), and noise would also be generated by human occupation of the development. Considering the ambient noise generated by the I-70 corridor, the added impact of the noise generated by the proposed development following construction would likely be negligible.

4.8 Odors

The proposed development would not generate any odors.

4.9 Visual Resources

The development would have a mountain contemporary design that honors the fundamentals of the Town of Vail design guidelines and the precedent of other recent Town of Vail's local housing projects such as Lions Ridge and Chamonix Vail. Buildings would be built into the gradually sloping hillside with the walk-out garden level on the lowest floor, and units on the 2nd floor walking out at grade on the north side of each building. Exterior materials will include stucco and cementitious siding that resembles wood siding, with windows and large sliding doors for most units. Primary roofs would be pitched and have asphalt shingles; metal materials would compose the secondary roofing.

Triumph Development has also worked to minimize the height of stepped retaining walls that are required for site access and surface parking that is so important in the economics of a local housing project. The proposed number of parking spaces has been kept to a minimum to keep the footprint of the project as small as possible.

The proposed development would not block any view corridors to the Gore Creek Valley or the north-facing mountain slopes to the south as there are no contiguous neighbors. The project will be visible from the CDOT right of way including I70 and the North Frontage Road. An earthen berm and rockfall protection structure have been provided across the rear of the development to, in part, provide a physical and visual barrier between the human-occupied portion of the development and the USFS and Town of Vail open space behind and to the west of the property.

4.10 Land Use

The 5.4 acres of the project site zoned as Housing (H) would be developed and used as residential space. The 17.9 acres zoned as Natural Area Preservation (NAP) would remain as open space and be enhanced for wildlife use. Thus, the proposed development is consistent with Town Council's October 2017 rezoning to Housing. The potential development of the Housing parcel and enhancement of the NAP parcel is recognized in Action Item #23 of the update to the Town of Vail 2018 Open Lands Plan Update. Thus, the proposed development would change the land use for 5.4 acres of the project site from open space and wildlife habitat to a residential land use.

4.11 Access & Transportation

McDowell Engineering, LLC (2019; TR-9) completed a CDOT Level 2 Study to forecast and analyze the impact of traffic volumes generated by the development on the surrounding roadway network. The traffic analysis was scoped with the Town of Vail and CDOT prior to completion. The analysis determined that:

- **Site Access & Circulation:** The site is proposing to take access directly from the north I-70 Frontage Road. Sight distance meets the minimum spacing sight distance requirement per CDOT's State Highway Access Code.
- **Trip Generation:** The buildout of the site is expected to generate a total of 290 external vehicle trips over the course of an average weekday, including 17 trips during the morning peak hour and 24 trips during the afternoon/evening peak hour. See Table 4.
- **Auxiliary Turn Lane Requirement:** No additional auxiliary turn lane construction is required.
- **State Highway Access Permit:** A State Highway Access Permit will be required for the proposed I-70 North Frontage Road access.
- **Recommendations:** Based on the analysis and recommendations in the McDowell Engineering Report (2019), the project can be successfully incorporated into the Town of Vail's roadway network.

Table 4. Proposed East Vail Residential Trip Generation Analysis Estimated Site-Generated Traffic, East Vail Workforce Housing													
	Units ²	Trip Generation Rates ¹			Average Weekday ³	Morning Peak Hour				Evening Peak Hour			
		Ave. Week day	AM Peak Hour	PM Peak Hour		Trips (VPD)	Inbound		Outbound		Inbound		Outbound
								% Trips	Trips	% Trips	Trips	% Trips	Trips
APT	42 DU	3.29	0.21	0.33	138	32%	3	68%	6	54%	7	46%	6
TH ⁴	31 DU	5.44	0.32	0.41	169	27%	3	73%	7	60%	8	40%	5
MMR	-10%				-17		0		-1		-1		-1
Anticipated Trip Generation					290	5		12		14		10	
¹ Values obtained from field counts at the Timber Ridge and Lions Ridge Apartment Accesses during ski season on December 1, 2018.													
² DU = Dwelling Units													
³ Assumes a dhv of 10% of ADT.													
⁴ Values obtained from <i>Trip Generation, 10th Edition</i> , Institute of Transportation Engineers, 2017.													
APT = Apartments; TH = Townhomes; MMR = Multimodal Reduction													

4.12 Population

As documented by Table 5, the population of the proposed development would range from a low of 113 to a high of 254.

Table 5. Population Projection East Vail Workforce Housing Subdivision					
Unit Type	Number of Units	Persons Per Unit		Total Persons	
		High	Low	High	Low
VR Units	42	4	2	168	84
EHU TH1 2BR	7	4	1	28	7
EHU TH2 3BR	8	5	2	40	16
EHU TH3 2BR	2	4	1	8	2
EHU TH4 3BR	2	5	2	10	4
Market TH1 3BR	6	5	2	30	12

Table 5. Population Projection East Vail Workforce Housing Subdivision					
Unit Type	Number of Units	Persons Per Unit		Total Persons	
		High	Low	High	Low
Market TH2 3BR	6	5	2	30	12
Market TH3	0	5	2	0	0
Market TH4	0	5	2	0	0
Total	61			254	113

5.0 Cumulative & Long-term Effects and Irreversible Environmental Changes

5.1 Hydrology

5.1.1 Surface Water

The proposed development would impact (pipe) a 92-foot long segment of an ephemeral stream in order to create transportation access to the development. This represents a long-term effect and an irreversible environmental change.

5.1.2 Groundwater

There would be no long-term effects or irreversible environmental change to groundwater.

5.2 Atmospheric Condition

The slight increase in hydrocarbon pollutants generated by the development and its traffic represents a cumulative long-term effect and an irreversible environmental change.

5.3 Geology & Hazards

The long-term risk posed by the rockfall hazard potential would be mitigated in a design as developed by Cesare, Inc. The mitigation represents a long-term effect and irreversible environmental change.

5.4 Soils

The proposed development would impact 5.1 acres of native soil. The soil loss represents a cumulative and long-term effect and an irreversible environmental change.

5.5 Vegetation Resources

5.5.1 Vegetation Types

The proposed development would result in the permanent loss of approximately 2.7 acres of an aspen forest. This represents a cumulative and long-term effect and an irreversible environmental change. Approximately 2.3 acres of aspen forest habitat would be restored following construction.

5.5.2 Wetlands

Piping and riprap on and off-site would impact 184 ft² of a 2-foot wide ephemeral stream that is classified as a wetland. This represents a small cumulative effect and a long-term irreversible environmental change.

5.6 Wildlife Resources

The proposed project would have both negative and beneficial effects on the local wildlife community. The project would result in the permanent, irreversible loss of 2.7 acres of relatively young aspen with a mountain shrub understory dominated by chokecherry, as it is converted largely

into an urban wildlife habitat. That area of habitat represents 22% of the 23.3-acre parcel; 78% of the parcel would remain undeveloped. There would also be a temporary loss of 2.3 acres of similar habitat cleared for the rockfall berm, but reclaimed as a similar community. Big game would be restricted from that acreage by the human exclusion fence, but avian and small wildlife species should recolonize that habitat as it matures. There will also be wildlife displacement and reduced habitat effectiveness in habitats surrounding the on-site development and human activity areas and displacement of wildlife around existing, off-site recreation corridors used by housing residents.¹⁷ Wildlife displacement will vary by species and season of habitat occupancy. These direct and indirect project effects have been and would be avoided, minimized, and compensated with (1) the parcel's rezoning, (2) the incorporation of wildlife-oriented design criteria into the development's design, (3) with 14.6 acres of on-site habitat enhancement, (4) with the implementation of wildlife-related construction and operational considerations, and (5) with the implementation and enforcement of the Wildlife Mitigation Plan (TR-10). While the resulting project effects would be relatively small, they would nevertheless be additive to the cumulative wildlife habitat losses that have occurred in the Gore Creek Valley and further down valley in Eagle County since the early 1960's. Collective habitat losses, the effects of increasing recreational activity in wildlife habitats, and other factors have reduced the size of the local elk, mule deer, and bighorn sheep herds (Andree, 2017).

There are no reasonably foreseeable projects that meet criteria warranting consideration in this analysis (CEQ 1997, USEPA 1999). Potential bighorn sheep winter range enhancement on NFS land surrounding the project area is speculative at this time.

5.7 Noise

Noise generated by the proposed development and the traffic it generates would create a slight cumulative and long-term environmental change. However, given the proximity to I-70, this change would be negligible.

5.8 Odors

There would be no odor impacts.

5.9 Visual Resources

Development of the project site would create a cumulative, long-term and irreversible change to the visual resources of the area. Approximately 4.46 acres of native landscape would be replaced with a residential development.

5.10 Land Use

Development of 5.4 acres of the project site which is currently used as open space and wildlife habitat would change the land use to a residential land use. This represents a cumulative, long-term effect and an irreversible environmental change to land use.

5.11 Access & Transportation

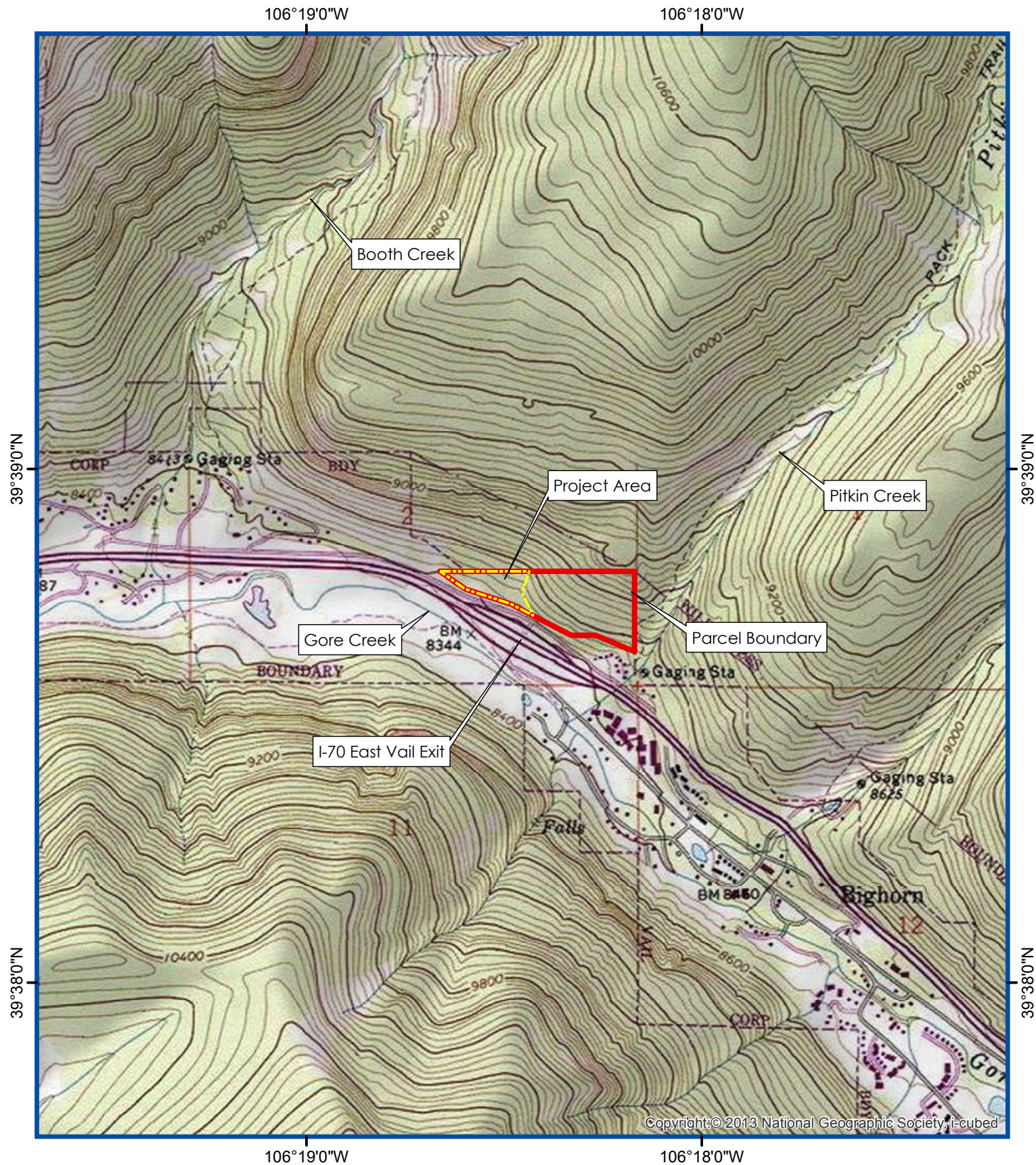
The traffic generated by the proposed development, an estimated 290 vehicle trips per day, represents a cumulative and long-term effect and irreversible change to the existing traffic condition.

5.12 Population

The estimated 113 - 254 residents of the development represent a cumulative long-term increase in the population of the town and an irreversible environmental change.

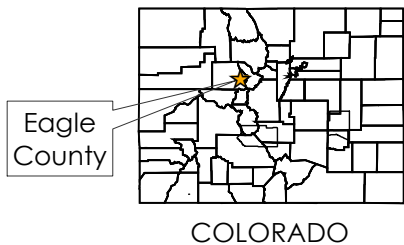
¹⁷ With resident education, fencing, and aggressive fines and enforcement, these recreational impacts will be minimized on lands surrounding the East Vail development area that are important for sheep winter range and other wildlife uses. However, additional recreational impacts will occur along other existing trail corridors in Eagle County that bisect wildlife habitats as a result of increased recreational use of those trails by Workforce Housing residents.

6.0 Figures

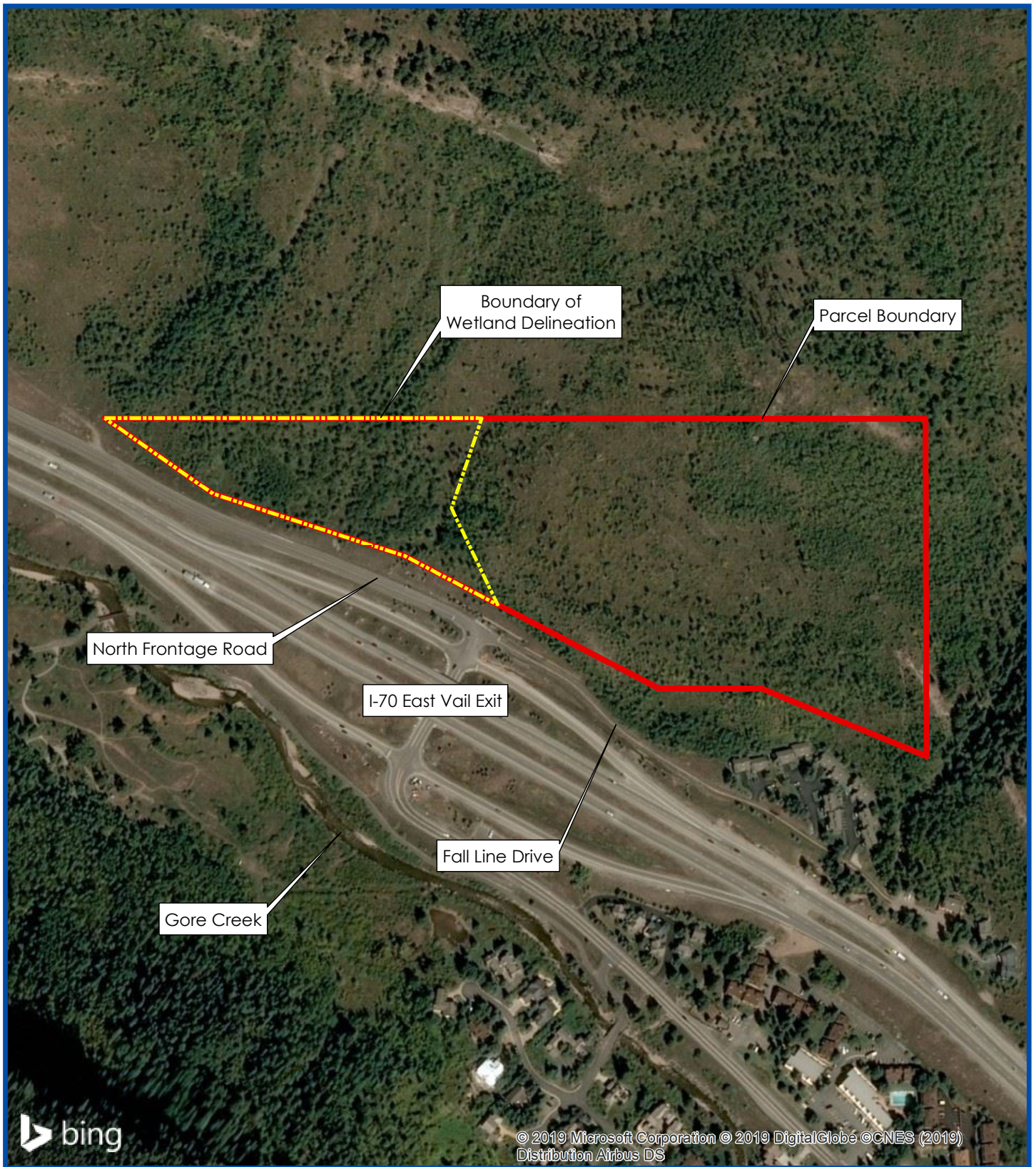


BASE: USGS 7.5' Vail East Quadrangle, Colorado

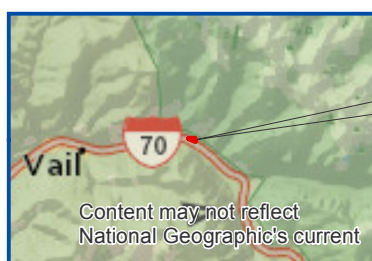
**Figure 1. Project Location Map
East Vail Workforce Subdivision**



Prepared by:
 Birch Ecology LLC
 429 Main Street
 P.O. Box 170
 Lyons, CO 80540
 (720) 350-2530
www.birchecology.com



**Figure 2. Aerial Photograph
East Vail Workforce Housing**



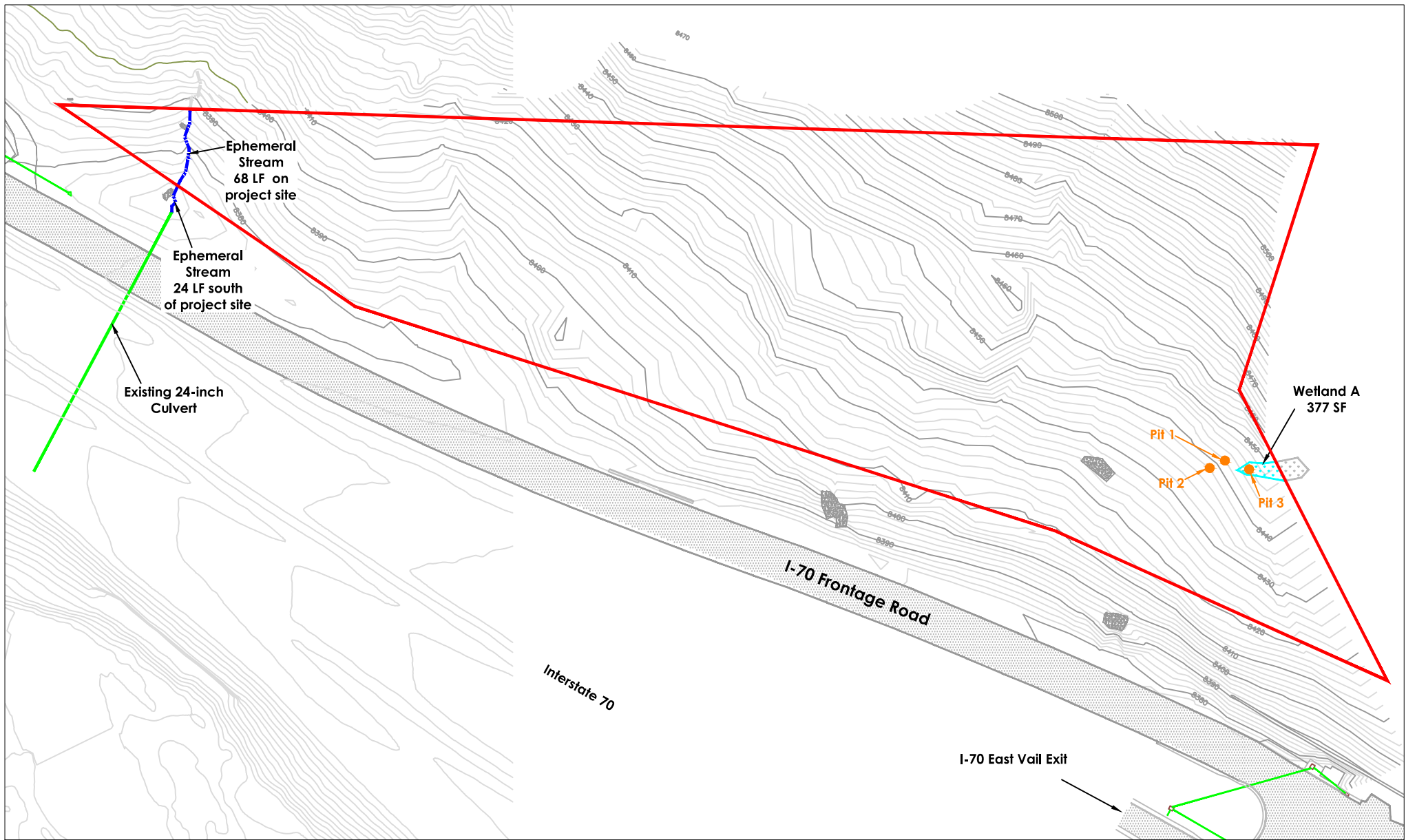
EAGLE COUNTY, CO

Project
Site

N
1:6,000




Prepared by:
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(720) 350-2530
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Legend:

-  Wetlands
-  Pit 1 Soil Pits
-  Ephemeral Stream Channel
-  Culverts
-  Project Boundary

Wetland Flagging
Surveyed by:
Peak Land Surveying Inc.
of Vail, CO

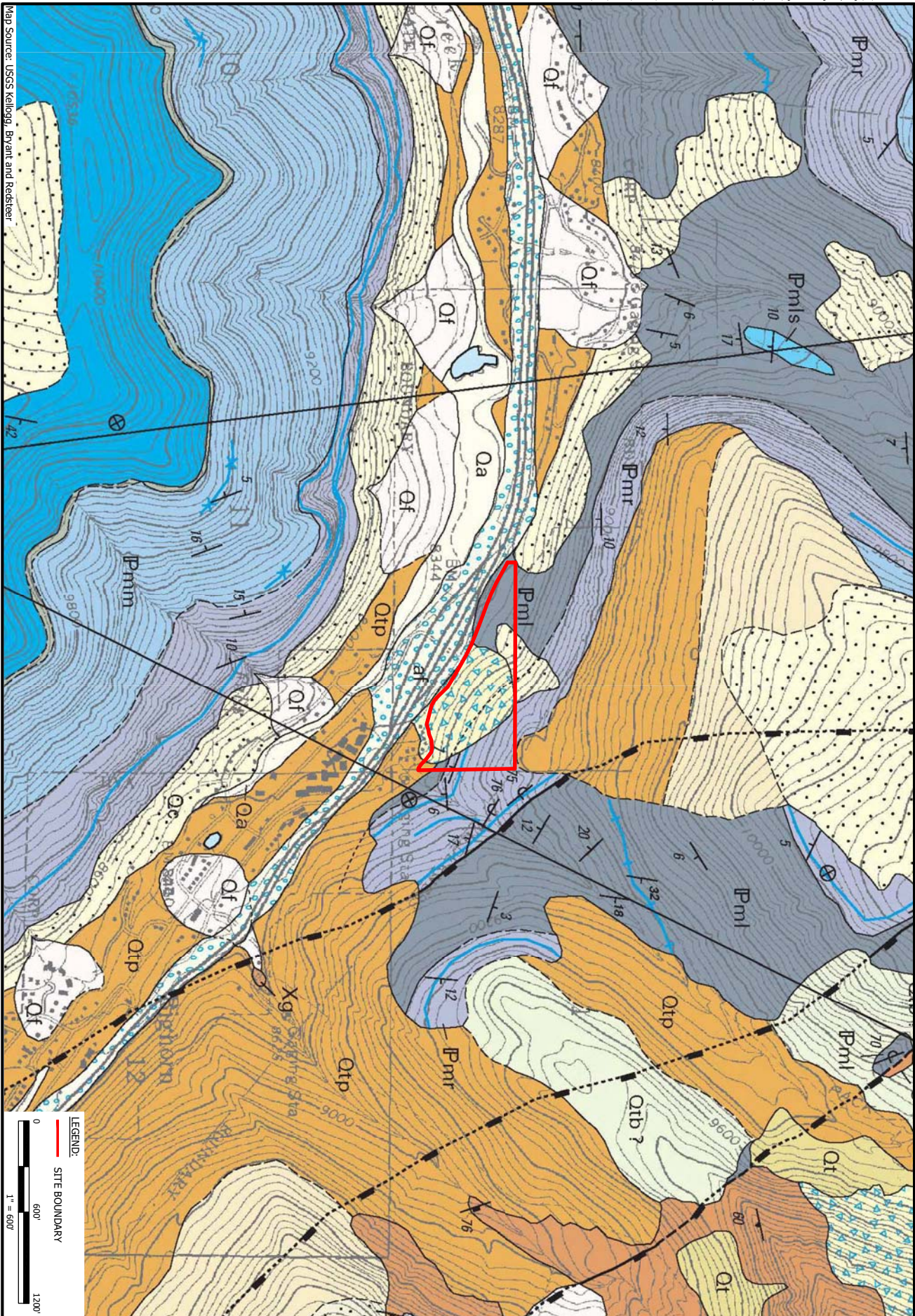

Date: February 2019
Contour Interval = 2 ft
Scale: 1 in = 110 ft

**Figure 3. Wetland Map
East Vail Workforce Housing**

prepared by:



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PROJECT NO:	17.5029		
PROJECT NAME:	Rockfall Hazard Study, East Vail Parcel		
DRAWN BY:	RAB	CHECKED BY:	JMF
DWG DATE:	06.16.17	REV. DATE:	--

FIGURE 4
Sheet 1 of 2
Geologic Map
Page 33



LIST OF MAP UNITS

s	Snowfield (latest Holocene)
af	Artificial fill (latest Holocene)
Qa	Alluvium (Holocene)
Qlsy	Recent landslide deposits (Holocene)
Qf	Fan deposits (Holocene and upper Pleistocene)
Qt	Talus (Holocene and upper Pleistocene)
Qdf	Debris-flow deposits (Holocene and upper Pleistocene)
Qr	Rock-glacier deposits (Holocene and upper Pleistocene)
Qw	Wetland deposits (Holocene and upper Pleistocene)
Qac	Alluvium and colluvium, undivided (Holocene and upper Pleistocene)
Qc	Colluvium (Holocene and upper Pleistocene)
Qls	Landslide deposits (Holocene and upper Pleistocene)
Qfm	Felsenmeer (Holocene and Pleistocene)
Qbf	Boulder field (upper? Pleistocene)
Qtp	Pinedale Till (upper Pleistocene)
Qtb	Bull Lake Till (middle Pleistocene)
Qd	Diamicton (middle to lower Pleistocene)
Ti	Dike rocks of intermediate to felsic composition (Tertiary)
PPm	Maroon Formation (Lower Permian to Middle Pennsylvanian)
IPm	Minturn Formation, undifferentiated (Middle Pennsylvanian)
IPmj	Jacque Mountain Limestone Member
IPmu	Upper sandstone and conglomerate member
IPmwq	White Quail Limestone Member
IPmm	Middle member
IPmkl	Individual limestone bed
IPmr	Robinson Limestone Member
IPmrl	Individual limestone bed
IPml	Lower member
IPmls	Individual limestone bed
IPCu	Pennsylvanian to Cambrian units, undifferentiated—Shown on cross section B-B' only
Pzcd	Clastic dike (lower Paleozoic?)
Dp	Parting Formation (Upper Devonian)
Ep	Peerless Formation (Upper Cambrian)
Es	Sawatch Quartzite (Upper Cambrian)

EARLY PROTEROZOIC ROCKS

Xu	Early Proterozoic rocks, undifferentiated—Shown only in cross sections
Rocks of the Cross Creek batholith (Early Proterozoic)	
Xap	Aplitic granite
Xg	Cross Creek Granite
Xdi	Diorite
Xgb	Gabbro
Xm	Migmatitic biotite gneiss (Early Proterozoic)
Xbg	Biotite gneiss (Early Proterozoic)

60	Contact—Dashed where approximately located; dotted where concealed; showing dip where known
70	Fault or prominent fracture—Dashed where approximately located; dotted where concealed. Showing dip where known. For some faults, no apparent offset interpreted from air photographs

80	Normal fault—Dashed where approximately located; dotted where concealed. Ball and bar on downthrown side. Dip of fault plane shown where known
60	Reverse fault—Dashed where approximately located; dotted where concealed; rectangles on upper plate
60	Thrust fault—Dotted where concealed. Teeth on upper plate. Dip of fault plane shown where known
60	Strike-slip fault—Dashed where approximately located; dotted where concealed; arrows show relative slip direction
60	Mylonitic shear—Generally parallel to Proterozoic Homestake shear zone (Tweto and Sims, 1963)
60	Anticline—Showing trace of axial plane. Dotted where concealed
60	Syncline—Showing trace of axial plane. Dotted where concealed
25	Strike and dip of beds
25	Inclined
25	Vertical
75	Overtured
60	Horizontal
3	Approximate strike and dip of beds
3	Inclined
3	Strike and dip of foliation
3	Inclined
3	Vertical
75	Bearing and plunge of lineation
75	Strike and dip of foliation and bearing and plunge of associated lineation
60	Strike and dip of small fault or fracture
60	Inclined
60	Vertical
A	Letter indicates locality referred to in text

CONVERSION FACTORS

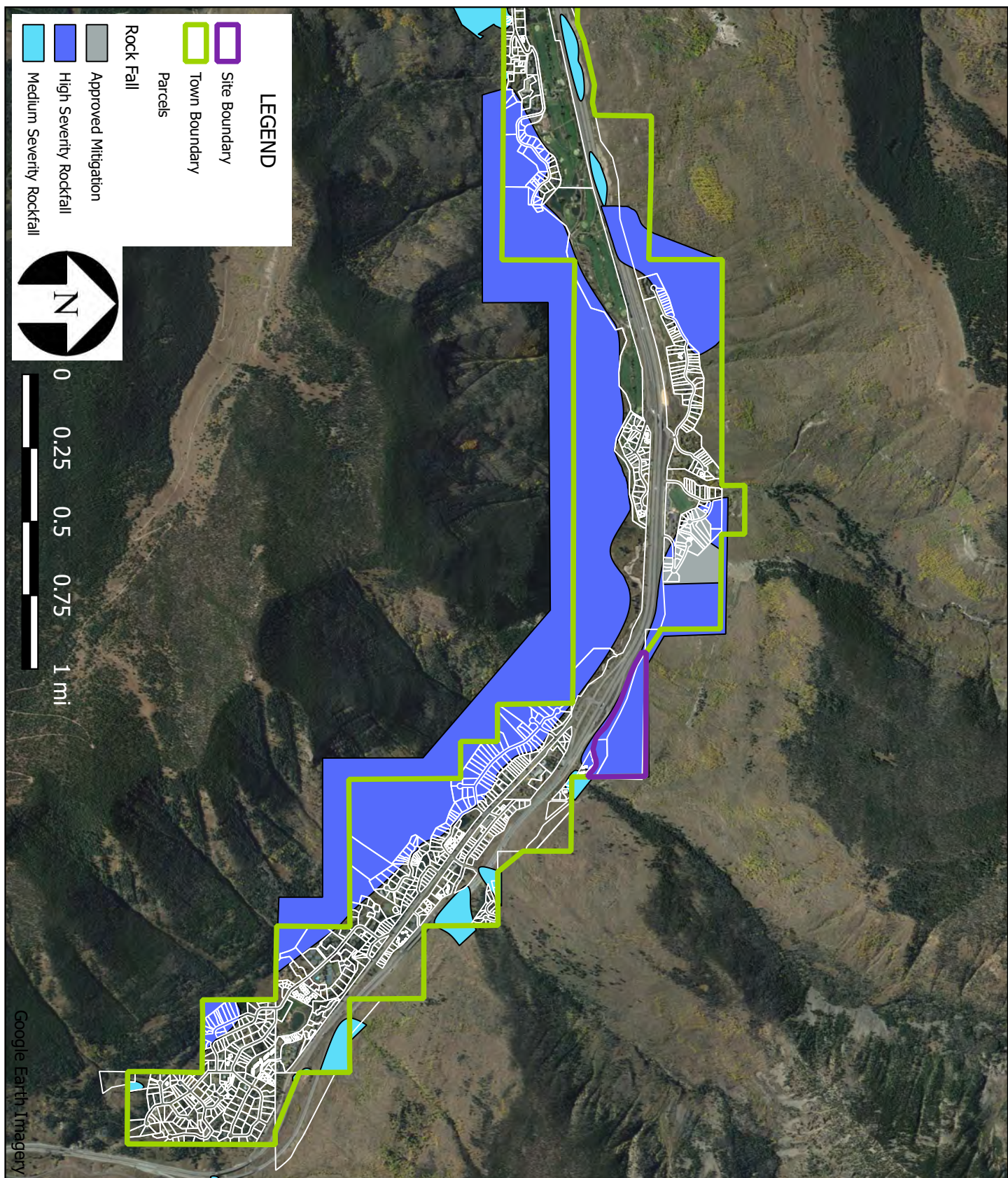
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centimeters (cm)	0.3937	inches (in.)
meters (m)	3.281	feet (ft)
kilometers (km)	0.6214	miles (mi)

Multiply	By	To obtain
inches (in.)	2.54	centimeters (cm)
feet (ft)	0.3048	meters (m)
miles (mi)	1.609	kilometers (km)



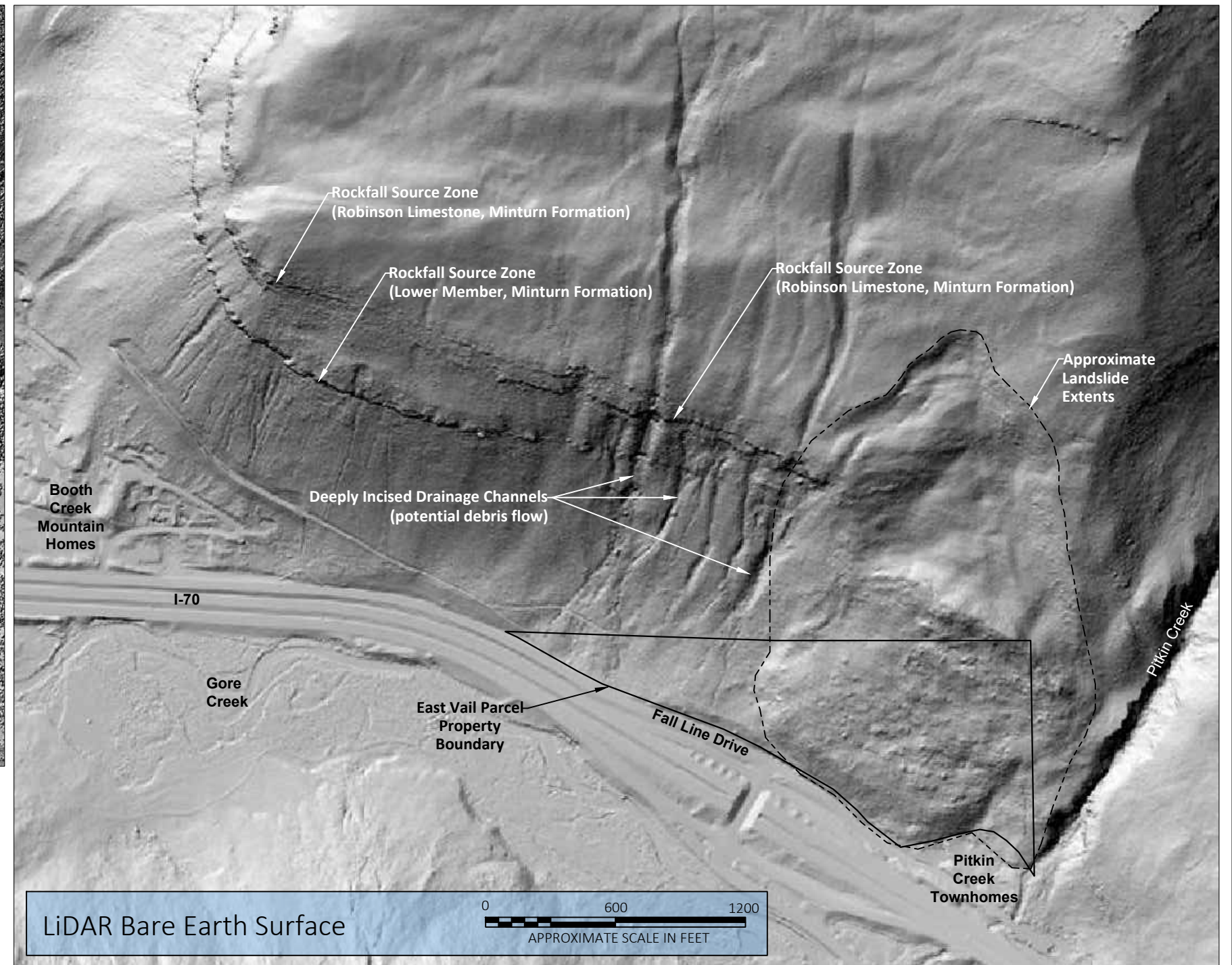
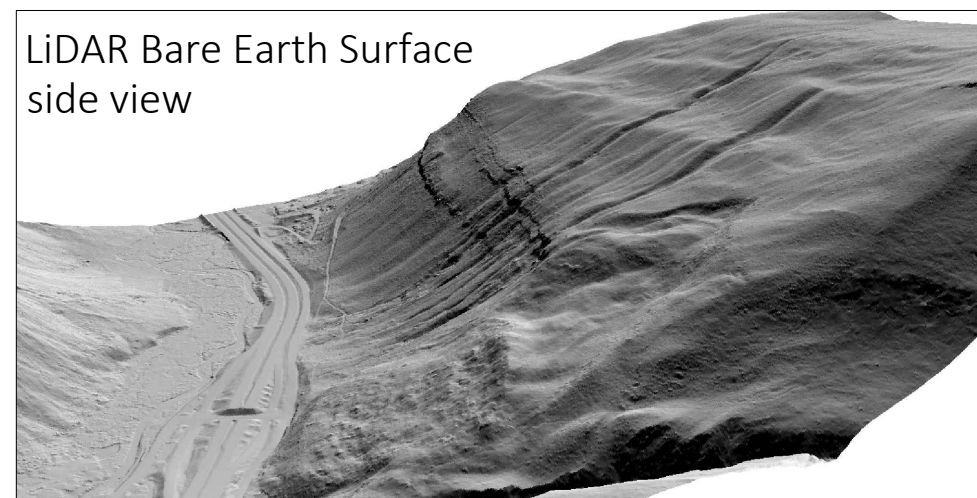
PROJECT NO:	17.5029		
PROJECT NAME:	Rockfall Hazard Study, East Vail Parcel		
DRAWN BY:	RAB	CHECKED BY:	JMF
DWG DATE:	06.16.17	REV. DATE:	--

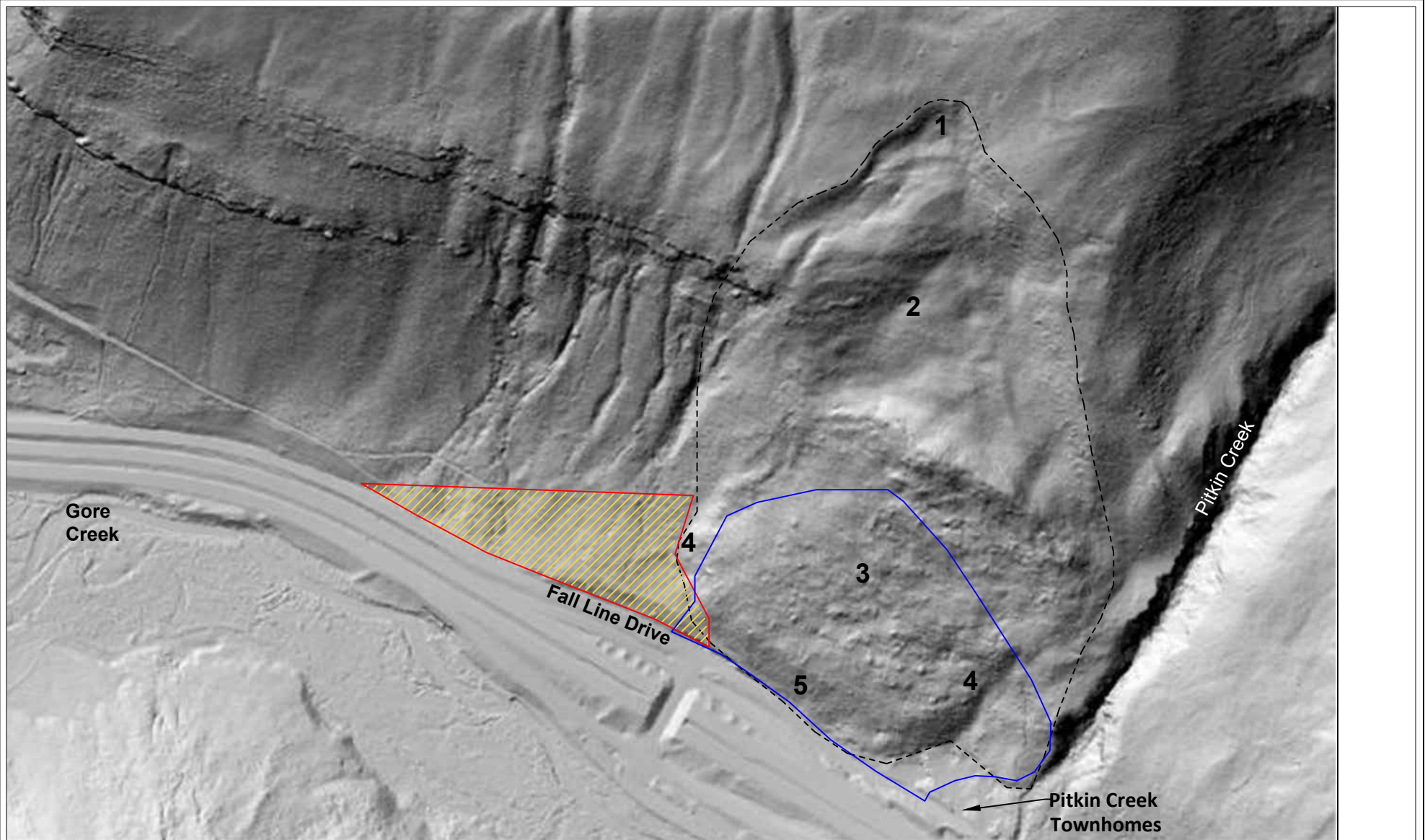
FIGURE 4
Sheet 2 of 2
Geologic Map
Page 34






PROJECT NO:	17.5029		
PROJECT NAME:	Rockfall Hazard Study, East Vail Parcel		
DRAWN BY:	LAG	CHECKED BY:	JMF
DWG DATE:	5/22/17	REV. DATE:	

FIGURE 5
Official Rockfall Hazard Map
Town of Vail, Colorado





Basemap: LIDAR ground surface.

-  East Vail Workforce Housing Parcel - part to be developed (+/- 5.4 acres)
-  Approximate Landslide Extents
-  Approximate Extents, published landslide deposit (Kellogg and others, 2003)

- Area 1 - landslide headscarp, down-dropped, detachment area.
- Area 2 - down-dropped area with irregular topography.
- Area 3 - dislocated, semi-intact block that has moved downslope from the point of origin, hummocky and uneven topography.
- Area 4 - landslide flank, over-steepened slope.
- Area 5 - landslide toe, over-steepened slope.



0 500 1000
APPROXIMATE SCALE IN FEET

Project No: 18105
Project Name: East Vail Parcel

Date: 01.31.2019

FIGURE 7
Landslide Map
Page 37

SKYLINE GEOSCIENCE
GEOLOGICAL CONSULTING

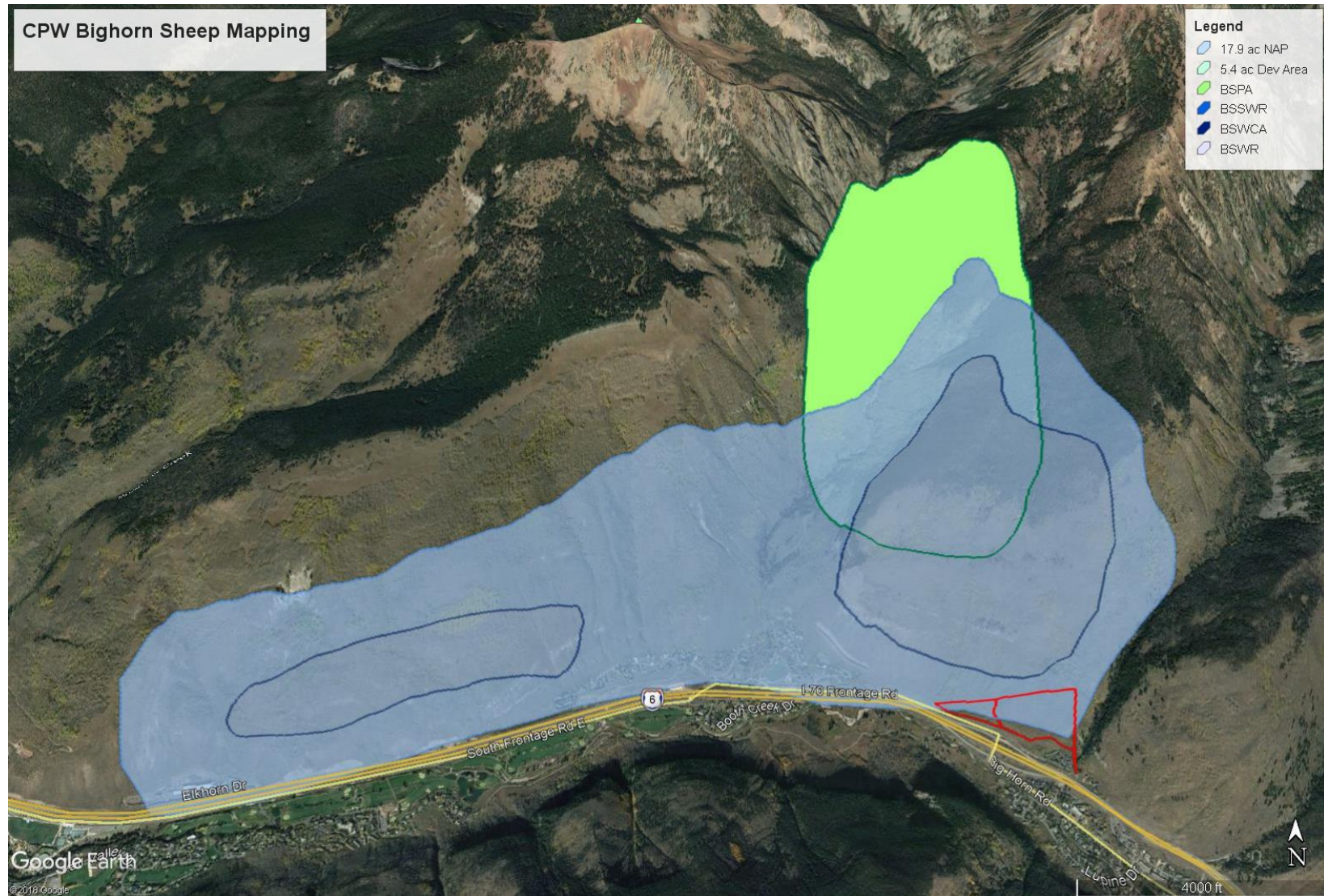


Figure 8. Important bighorn sheep seasonal ranges mapped by CPW in the vicinity of the East Vail parcel (red outline). See text for range definitions. Bighorn sheep winter range and severe winter range cover the same largest area and are shaded light blue. Winter concentration area is shown in the two darker blue polygons. The southern edge of a lambing area above the Booth Creek cliffs is outlined in green.

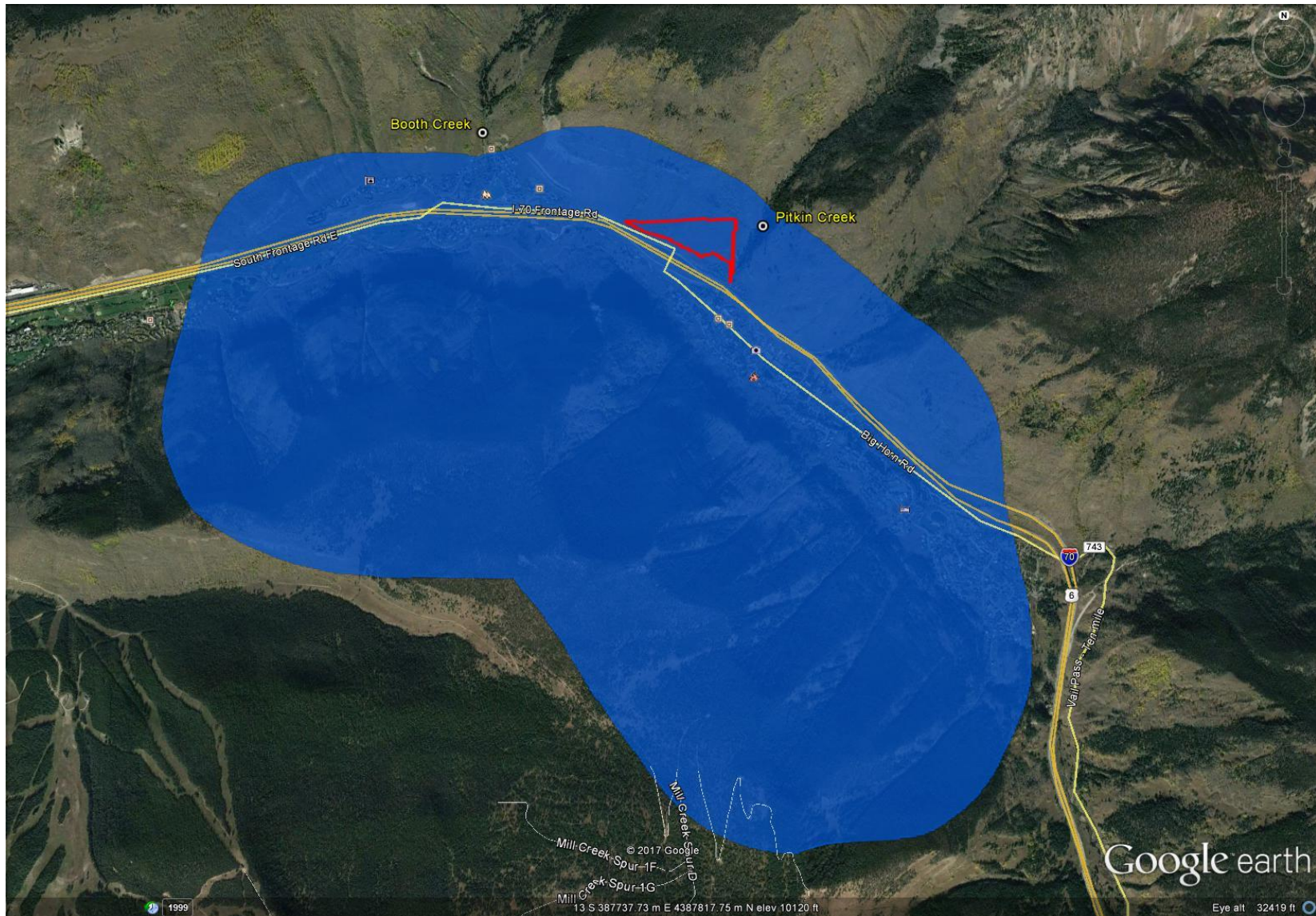


Figure 9. Active peregrine falcon nesting cliff complex and surrounding 0.5-mile buffer (shaded blue) mapped by CPW in the vicinity of the East Vail parcel (red outline).

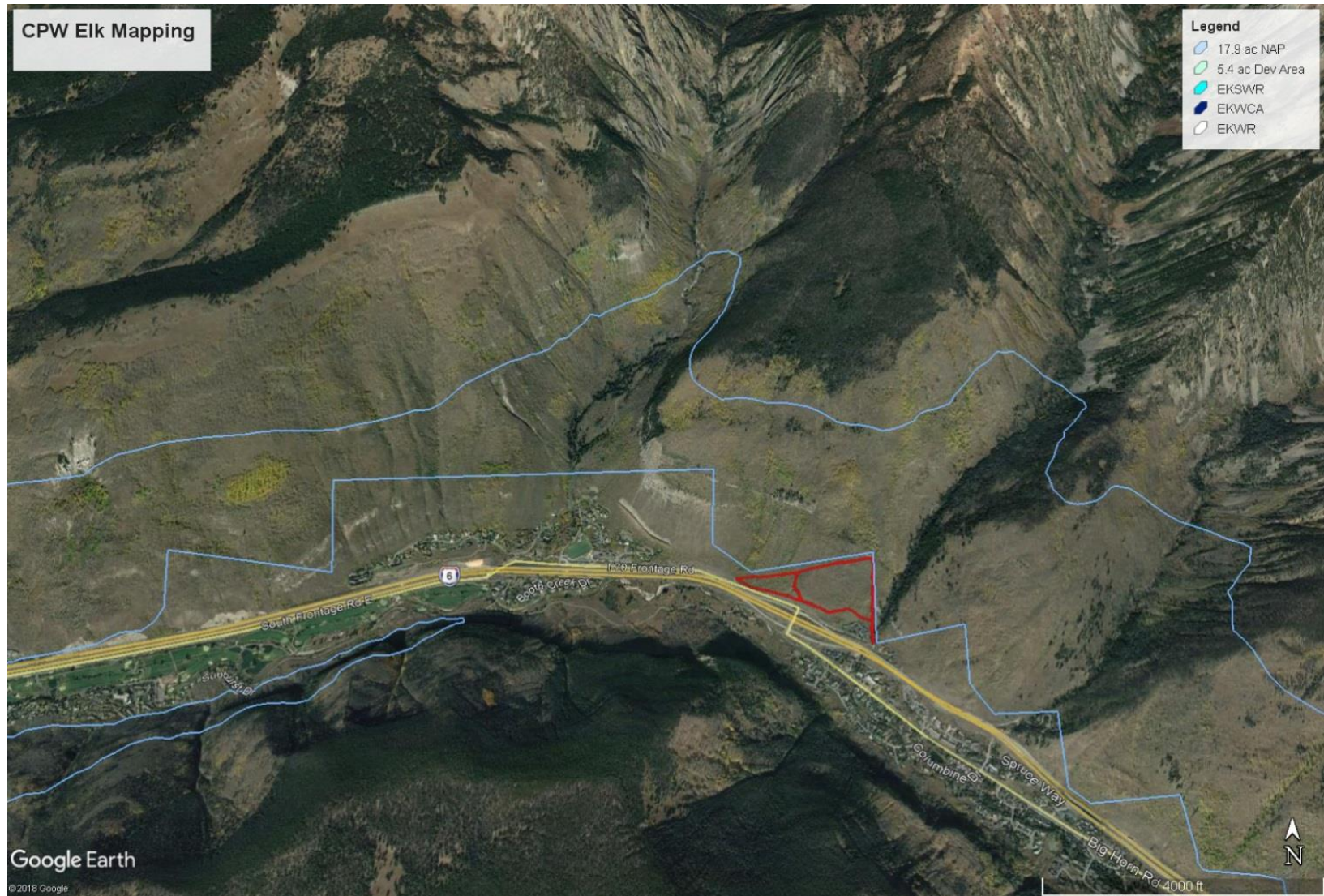


Figure 10. Elk winter range (outlined in light blue) mapped by CPW in the vicinity of the East Vail parcel (red outline). In undeveloped habitats, which include the entire East Vail parcel, the winter range actually comes down to the north shoulder of I-70.

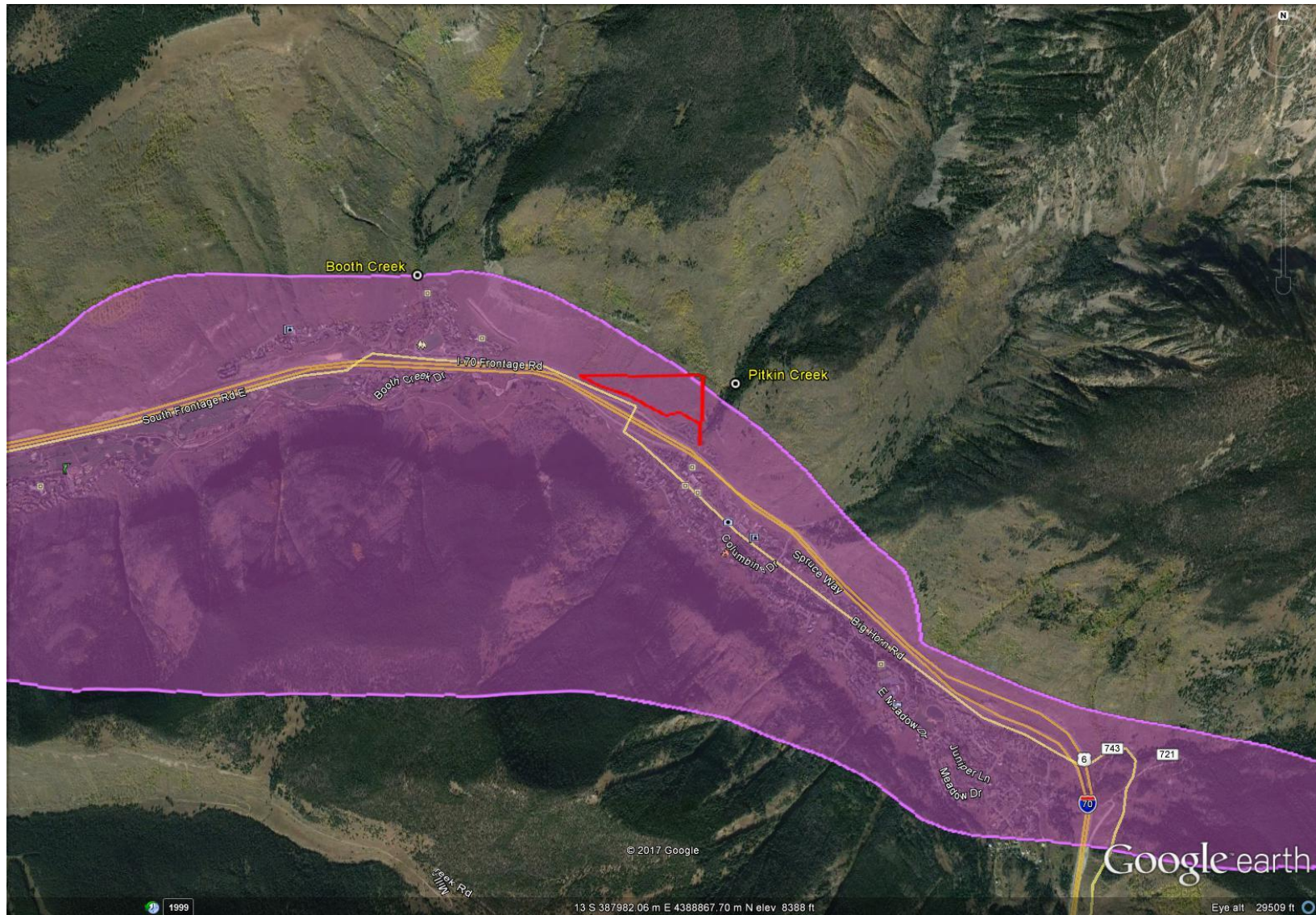
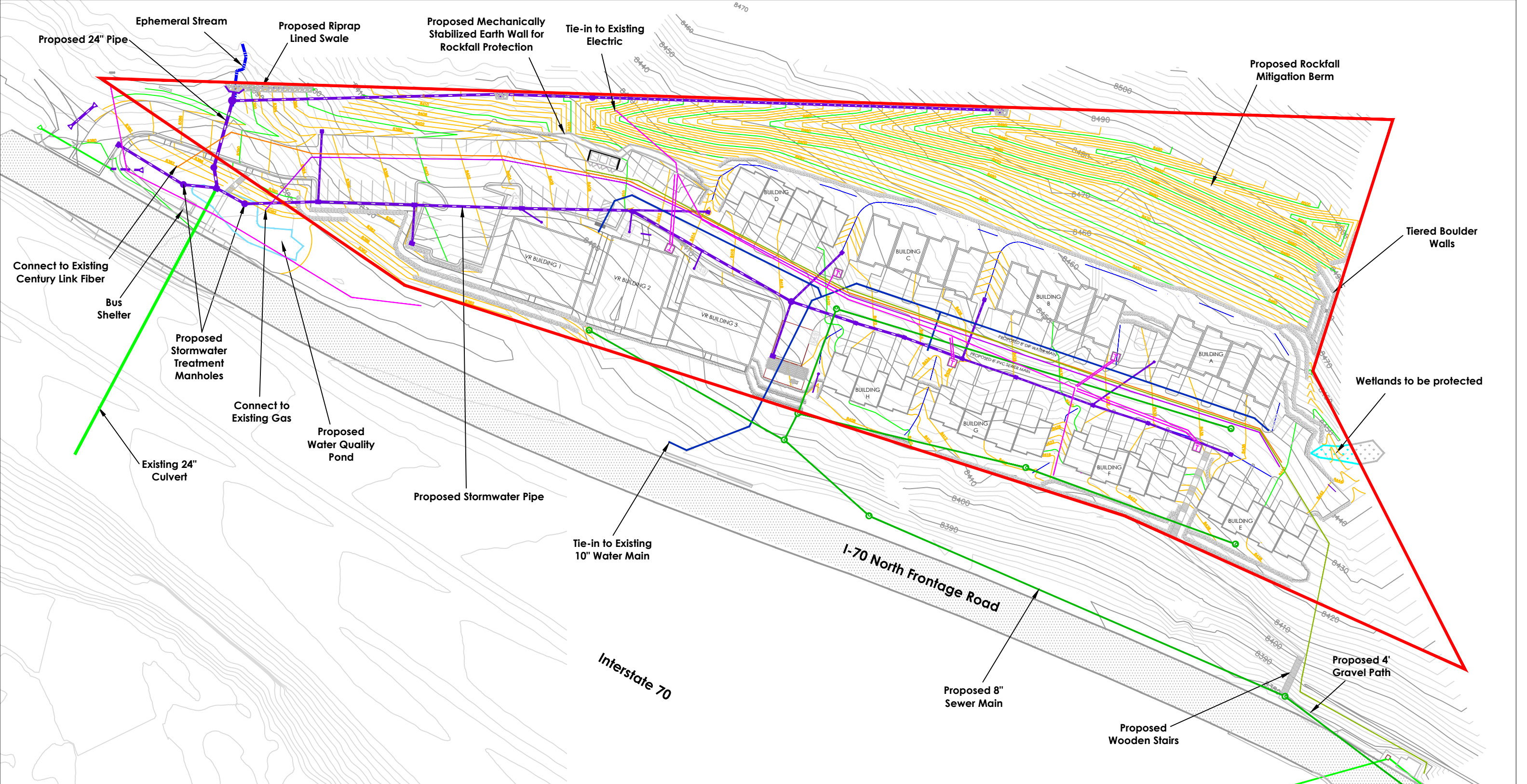


Figure 11. Black bear summer concentration area and human/bear conflict area (a single polygon outlined and shaded purple) mapped by CPW in the vicinity of the East Vail parcel (red outline).



Legend:

- | | | |
|--------------------------|---------------------------|-----------------------|
| Existing Contours | Proposed Stormwater Pipes | Proposed Century Link |
| Proposed Contours | Proposed Water Lines | Proposed Comcast |
| Ephemeral Stream Channel | Proposed Sewer Lines | |
| Wetlands | Proposed Electric | |
| Existing Culverts | Proposed Gas | |



Date: May 2019
 Contour Interval = 2 ft
 Scale: 1 in = 75 ft

Engineering by:
 Alpine Engineering
 Edwards, CO

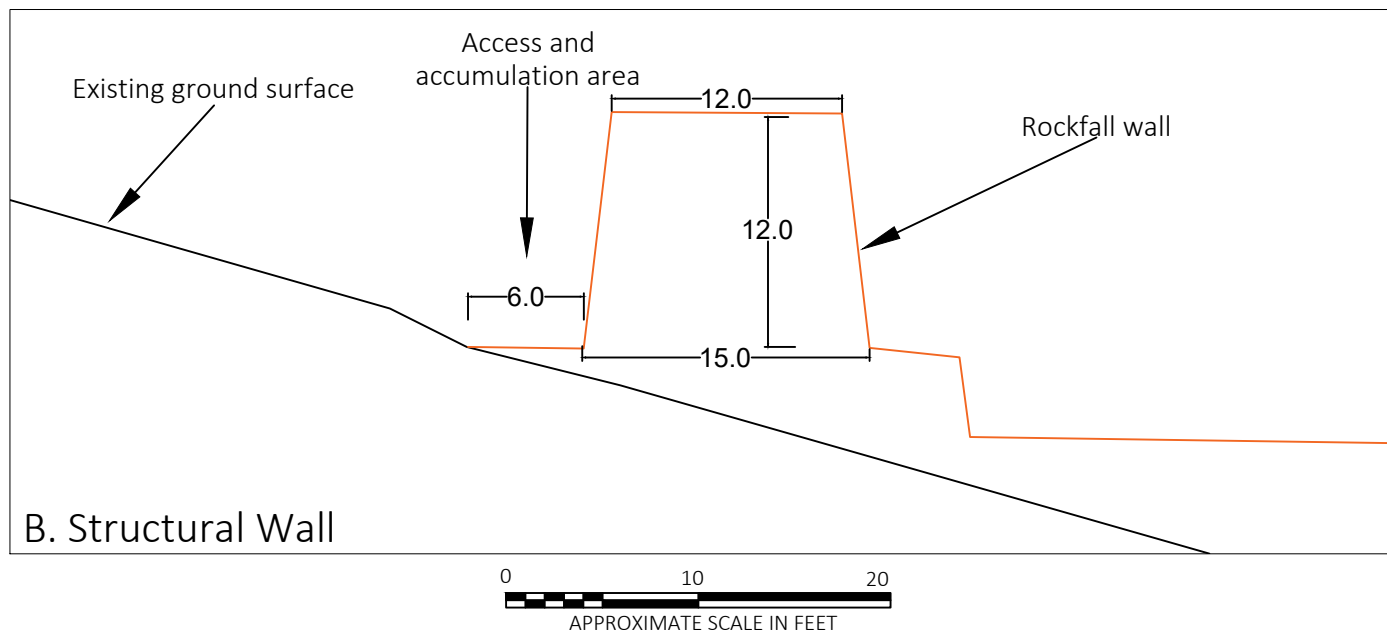
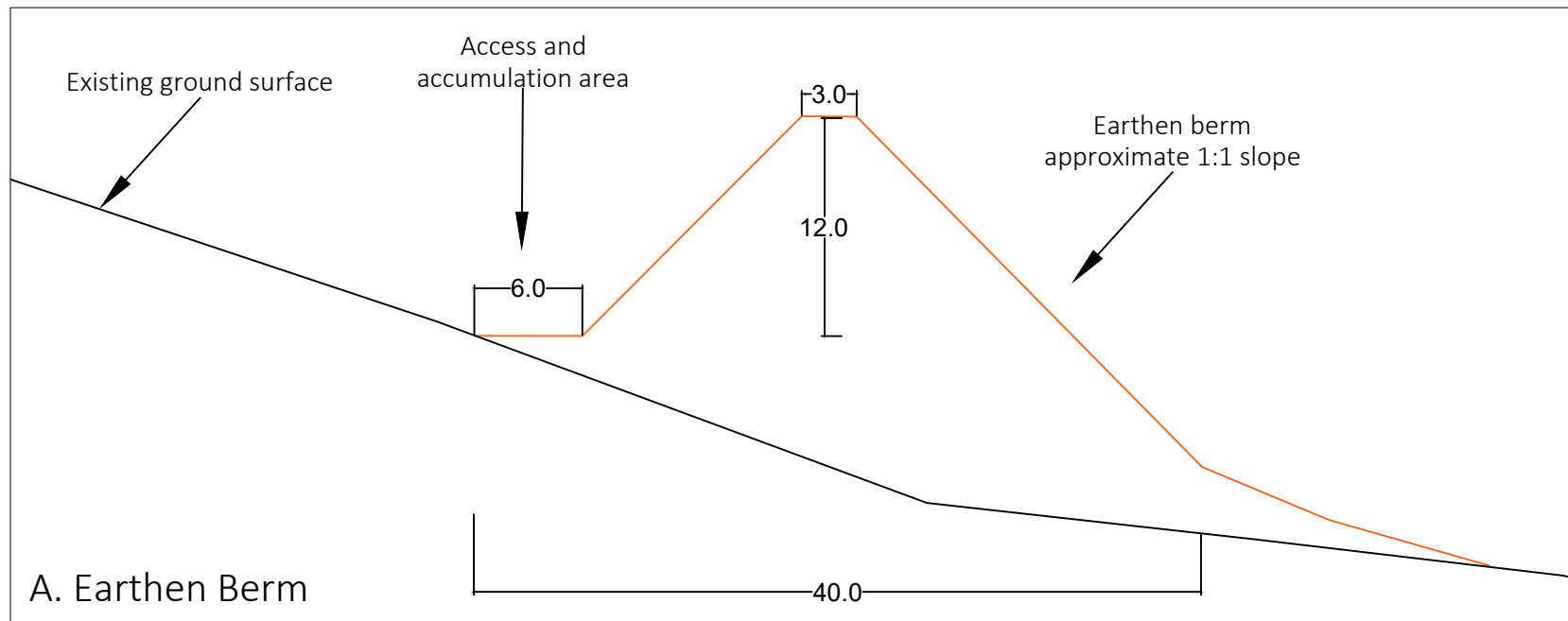
Wetland Flagging
 Surveyed by:
 Peak Land Surveying Inc.
 Vail, CO

**Figure 12. Proposed Development Plan
 East Vail Workforce Housing**

prepared by:



Birch Ecology LLC
 429 Main Street
 P.O. Box 170
 Lyons, CO 80540
 (720) 350-2530
 www.birchecology.com



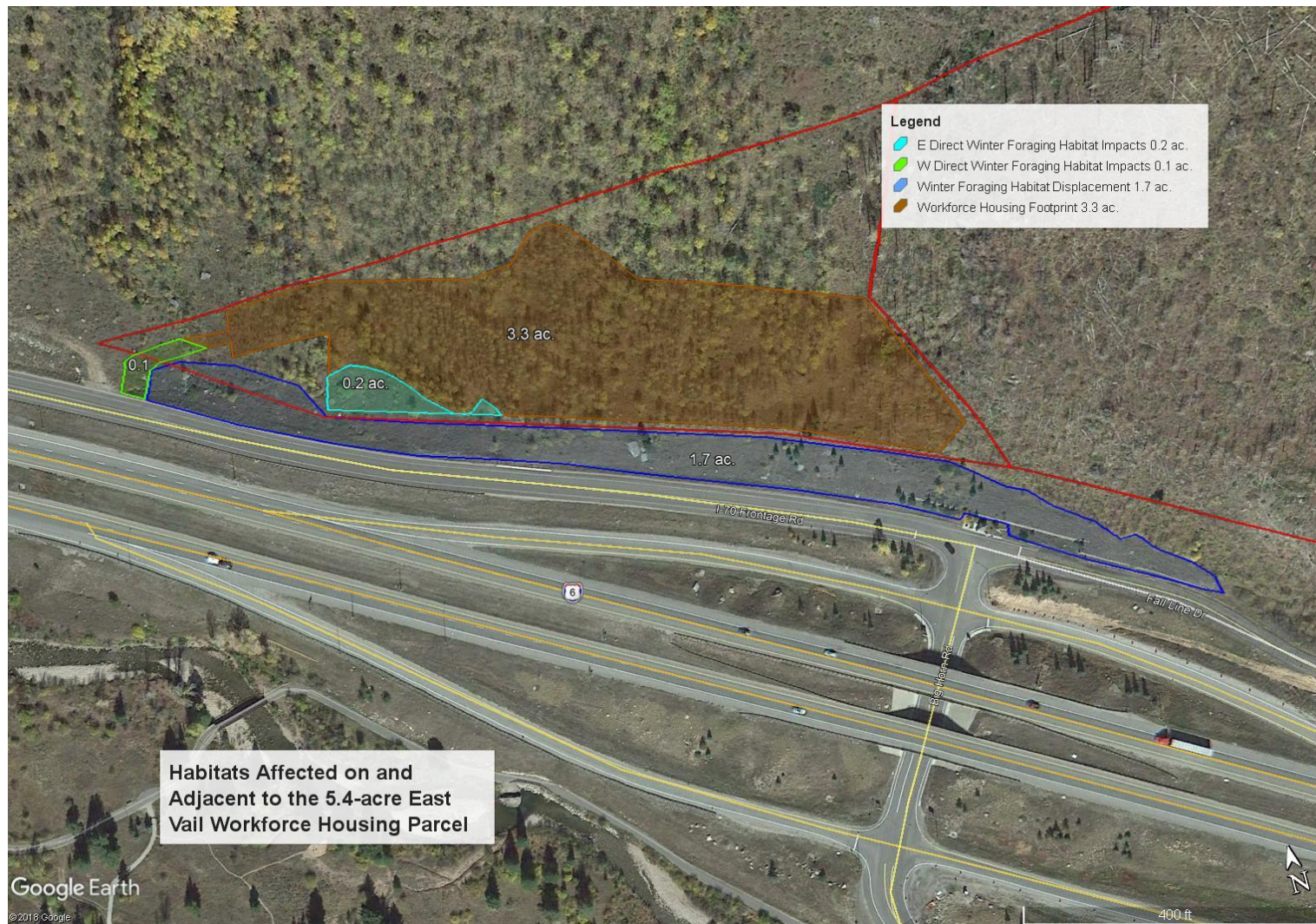


Figure 14. Wildlife habitats affected on and adjacent to the 5.4-acre East Vail Workforce Housing parcel.

The development footprint would affect 3.3 acres of a relatively young aspen stand with a mountain shrub understory dominated by chokecherry. Approximately 0.3 acres of bighorn sheep winter foraging habitat, largely composed of smooth brome, would be permanently lost. Approximately 1.7 acres of sheep winter foraging habitat, also composed of smooth brome and largely off-site, would not be disturbed, but its effectiveness would be reduced by its linear configuration and location between the Frontage Road and the housing. The effectiveness of winter range to the west of the housing's driveway could also be impaired by housing-related traffic, but that area is difficult to quantify. Mitigation is proposed to better maintain that habitat effectiveness.



Figure 15. Bighorn Sheep Winter Range Enhancement

Bighorn sheep winter range enhancement prescriptions proposed on 14.6 acres of the East Vail parcel (red outline) to compensate for winter range lost to, and affected by, development of the Workforce Housing project.

7.0 References

- Ackerfield, J. 2015. The Flora of Colorado. BRIT Press, Ft. Worth, Texas. 818p.
- Andree, B. 2017. Untitled letter re: the sustainability of wildlife populations within the Gore Valley. CPW. Glenwood Springs, CO. Ltr. to P. Wadden, Watershed Community Coordinator, Town of Vail. Mar. 6. 7pp.
- Birch Ecology. 2019. Wetland Delineation Report, East Vail Workforce Subdivision, Eagle County, Colorado. Prepared for Triumph Development & Western Ecological Resource. February 2019.
- Bush, T. 2006. Plant fact sheet: smooth brome, *Bromus inermis*. USDA NRCS Rose Lake Plant Materials Center, East Lansing, Michigan. 2pp. May 25.
- Cesare, Inc. 2018. Preliminary Subsurface Exploration, East Vail Housing Rock Mitigation and Geotechnical Study, Vail Colorado. Prepared for Triumph Development. November 14, 2018.
- Cesare, Inc. 2017. Rockfall Hazard Study, East Vail Parcel, Vail, Colorado. Prepared for Kevin Hopkins, Vail Resorts Development Company. June 19, 2017.
- Chick, Nancy. 2018. Colorado Department of Public Health and Environment Background Estimates for Air Pollution, East Vail Workforce Subdivision. December 27, 2018.
- Colorado Natural Heritage Program. 2017. Biodiversity Tracking and Conservation System. Colorado State University, Fort Collins, Colorado, U.S.A. Tracked Vascular Plant Species. [Online]. Available: <http://www.cnhp.colostate.edu/tracking/vascular.html>
- Colorado Parks and Wildlife. 2008. Recommended buffer zones and seasonal restrictions for Colorado raptors. CPW, Denver, CO.
- Craig, G.R. 1978. American peregrine falcon, *Falco peregrinus anatum*. Pages 40-45 in Essential habitat for threatened or endangered wildlife in Colorado. CDOW, Denver. 84 pp.
- Gunther, K.A., M.J. Biel and H.L. Robison. 1998. Factors influencing the frequency of road-killed wildlife in Yellowstone National Park. pp. 395 to 405 in Proceedings of the International Conference on Wildlife Ecology and Transportation. Fort Myers, FL, Feb. 9 to 12, 1998.
- Jennings, William F. 1990. Final Report. Species studied: *Spiranthes diluvialis*, *Sisyrinchium pallidum*. Report for the Nature Conservancy under the Colorado Natural History Small Grants Program. The Nature Conservancy, Boulder, Colorado.
- Kellogg, K.S., Bryant, B., Redsteer, M.H. 2003. Geologic Map of the Vail East Quadrangle, Eagle County, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-2375, Version 1.1.
- Kellogg, K.S., Shroba, R.R., Premo, W.R., Bryant, B. 2011. Geologic Map of the Eastern Half of Vail 30' x 60' Quadrangle, Eagle, Summit, and Grand Counties, Colorado: U.S. Geological Survey Scientific Investigations Map 3170.
- Skyline Geoscience. 2019. Geologic Hazard Analysis, East Vail Parcel, Vail, Colorado. Prepared for Cesare, Inc. February 12, 2019.

- Spackman, S., et al. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service, and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.
- Thompson, R.W. 2019. Wildlife Mitigation Plan, East Vail Workforce Housing Project, Town of Vail, Colorado. Western Ecosystems, Inc. Boulder, CO. February 2019.
- Thompson, R.W. 2018a. Recommended wildlife design criteria for Vail Resort's East Vail Workforce Housing parcel, Town of Vail. Western Ecosystems, Inc. Boulder, CO. 6 pp., June 15.
- Thompson, R.W. 2018b. East Vail peregrines – 2018 nesting attempt to date. Western Ecosystems, Inc. Boulder, CO. 6 pp., June 18.
- Thompson, R.W. 2018c. Wildlife monitoring report for the East Vail Workforce Housing parcel, Town of Vail, Colorado. Western Ecosystems, Inc. Boulder, CO. 33 pp., Aug. 31.
- Thompson, R.W. 2018d. East Vail Workforce Housing project conceptual bighorn sheep winter range enhancement prescriptions memorandum. Western Ecosystems, Inc. Boulder, CO. 3 pp., Nov. 5.
- Thompson, R.W. 2017. Rezoning wildlife assessment of Vail Resort's East Vail Workforce Housing parcel, Town of Vail. Western Ecosystems, Inc. Boulder, CO. 10 pp., Aug. 10.
- U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. ERDC/EL TR-08-28. U.S. Army Engineer Research and Development Center, Vicksburg, MS.
- U.S. Army Corps of Engineers. 1987. Wetlands Delineation Manual, Technical Report Y-87-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.
- U.S. Council on Environmental Quality. 1997. Considering cumulative effects under the National Environmental Policy Act. Council on Environmental Quality, Executive Office of the President. Wash., D.C. 64 pp.
- U.S. Environmental Protection Agency. 1999. Consideration of cumulative effects in EPA review of NEPA documents. U.S. EPA Off. Fed. Activities. Wash., D.C. 18 pp.
- U. S. Fish and Wildlife Service (USFWS). 1995. Ute Ladies'-tresses (*Spiranthes diluvialis*) recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado.
- U.S. Forest Service. 2015. White River National Forest revised sensitive species list - terrestrial. USDA Forest Service, Glenwood Springs, CO. (updated by J. Austin, USFS, Nov. 7, 2016)
- U.S. Forest Service. 1998. Environmental Assessment, Booth Creek Project Burn Area, Eagle County, Colorado. Holy Cross Ranger District, White River National Forest, Minturn, CO. Feb. 6.

**Appendix A. Colorado Department of Public Health & Environment
Correspondence – Background Estimates for Air Pollution in Project Site**

STATE OF COLORADO

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S. Laboratory Services Division
Denver, Colorado 80246-1530 8100 Lowry Blvd.
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Located in Glendale, Colorado (303) 692-3090

www.colorado.gov/cdphe



Colorado Department
of Public Health
and Environment

David Johnson

By email: david@westerneco.com

December 27, 2018

Dear Mr. Johnson,

You recently requested background estimates for air pollution in the area of the following project:
East Vail Workforce Subdivision

County: Eagle
Latitude: NAD83: 39.645108 AND / OR NAD27
Longitude: -106.304878

The estimates, and their bases, are given below.

Pollutant Standard	Standard	Estimated Concentration	Basis for Estimate
CO requested? Yes			
CO 1 Hour Second Maximum (ppm)	35	2	Grand Junction, 2015 - 2017.
CO 8 Hour Second Maximum (ppm)	9	1	
O3 requested? Yes			
O3 8 Hour Fourth Maximum (ppm)	0.070	0.064	Glenwood Springs, Feb - Dec 2015.
SO2 requested? Yes			
SO2 1 Hour 99th Percentile	0.075	0.012	RM Steel Print Shop, Pueblo, 2013 - 2015.
SO2 3 Hour Second Maximum (ppm) (Secondary Standard)	0.05	0.008	
SO2 24 Hour Second Maximum (ppm)		0.003	
SO2 Annual Mean (ppm)		0.001	
NO2 requested? Yes			
NO2 Annual Mean (ppm)	0.053	0.005	Glenwood Springs, Feb - Dec 2015.
NO2 1 Hour 98th Percentile (ppm)	0.100	0.033	
PM10 requested? Yes			
PM10 24 Hour Second Maximum (ug/m3)	150	40	Glenwood Springs, Feb - Dec 2015.
PM2.5 requested? Yes			
PM2.5 Annual Mean (ug/m3)	12.0	5	Glenwood Springs, Feb - Dec 2015.
PM2.5 24 Hour 98th Percentile (ug/m3)	35	13	
Pb requested? Yes			
Pb Rolling 3-Month Average (ug/m3)	0.15	0.006	Denver Municipal Animal Shelter, 2009.

Any ozone concentrations provided here are for informational purposes only. They are not for use in modeling. Ozone concentrations for use in modeling (AERMOD / OLM) should be requested separately.

Upon request, refinement of a single value background concentration listed above may be conducted by the modeling staff (email: emmett.malone@state.co.us), if applicable, appropriate, and justified.

These estimates are derived from ambient monitored concentrations that are available to the Division to represent background levels (added to the impacts of the project emissions and emissions from other nearby sources) in cumulative ambient air impacts for comparison to the NAAQS. They are not suitable for applications beyond that scope of use. The quantity of data is sometimes limited and may be of uncertain quality. The ambient background concentrations -

1. Do not necessarily substitute for on-site monitoring data; i.e., for permitting actions subject to PSD rules, pre-construction monitoring may be required.
2. Indicate the ambient levels in general geographic areas, not a specific location. This is particularly true for particulate concentration values.
3. Are subject to change without notice as new information is acquired.

Use of these background estimates should be accompanied by an appropriate citation that indicates their source and their limitations. Referencing this letter would be adequate, but an expanded explanation is suggested.

If you have questions, I can be reached at 303-692-3226, or email: nancy.chick@state.co.us.

Sincerely,

A handwritten signature in cursive script that reads "Nancy D. Chick".

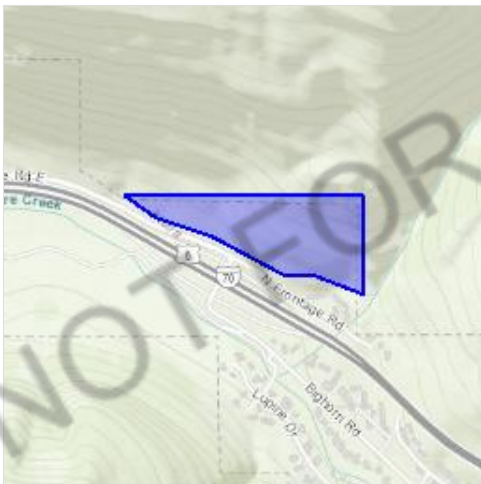
Nancy D. Chick
Environmental Protection Specialist
Air Pollution Control Division

Appendix B. IPaC Resource List

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Eagle County, Colorado



Western Colorado Ecological Services Field Office

☎ (970) 243-2778

 (970) 245-6933

445 West Gunnison Avenue, Suite 240
Grand Junction, CO 81501-5711

<http://www.fws.gov/mountain-prairie/es/Colorado/>
<http://www.fws.gov/platterriver/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME

STATUS

Canada Lynx *Lynx canadensis*

Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/3652>

Birds

NAME

STATUS

Mexican Spotted Owl *Strix occidentalis lucida*

Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/8196>

Yellow-billed Cuckoo *Coccyzus americanus*

Threatened

There is **proposed** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/3911>

Fishes

NAME

STATUS

Bonytail Chub *Gila elegans*

Endangered

This species only needs to be considered if the following condition applies:

- Water depletions in the upper Colorado River basin adversely affect this species and its critical habitat. This species does not need to be considered if the project is outside of its occupied habitat and does not deplete water from the basin.

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/1377>

Colorado Pikeminnow (=squawfish) *Ptychocheilus lucius*

Endangered

This species only needs to be considered if the following condition applies:

- Water depletions in the upper Colorado River basin adversely affect this species and its critical habitat. This species does not need to be considered if the project is outside of its occupied habitat and does not deplete water from the basin.

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/3531>

Greenback Cutthroat Trout *Oncorhynchus clarkii stomias*

Threatened

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/2775>

Humpback Chub *Gila cypha*

Endangered

This species only needs to be considered if the following condition applies:

- Water depletions in the upper Colorado River basin adversely affect this species and its critical habitat. This species does not need to be considered if the project is outside of its occupied habitat and does not deplete water from the basin.

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/3930>

Razorback Sucker *Xyrauchen texanus*

Endangered

This species only needs to be considered if the following condition applies:

- Water depletions in the upper Colorado River basin adversely affect this species and its critical habitat. This species does not need to be considered if the project is outside of its occupied habitat and does not deplete water from the basin.

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/530>

Flowering Plants

NAME

STATUS

Ute Ladies'-tresses *Spiranthes diluvialis*

Threatened

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/2159>

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

- 1. The [Migratory Birds Treaty Act](#) of 1918.
- 2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
------	--

Bald Eagle *Haliaeetus leucocephalus*
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
<https://ecos.fws.gov/ecp/species/1626>

Breeds Dec 1 to Aug 31

Olive-sided Flycatcher *Contopus cooperi*

Breeds May 20 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/3914>

Rufous Hummingbird *selasphorus rufus*

Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/8002>

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (I)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [E-bird Explore Data Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.