CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

The environmental issues associated with this proposal that were identified through public and agency scoping and through internal, interdisciplinary review are identified and grouped under appropriate resource headings in Chapter 1 (section 1.8). The following sections address each of these resource headings, beginning with a listing of the issues they comprise and a discussion of the methods and assumptions that guided analysis of those issues. A description of the affected environment follows, providing the background information necessary to identify and interpret impacts. The next heading documents the findings of the impact assessment, outlining the direct, indirect, and cumulative impacts of the Proposed Action and alternatives. The chapter concludes with required statements regarding impacts to critical elements of the human environment, unavoidable adverse impacts, the relationship between short-term uses and long-term productivity and the potential for irreversible or irretrievable commitment of public resources.

3.2 WATERSHED RESOURCES

3.2.1 Issues Addressed

The water related issues identified through scoping and internal, interdisciplinary review include the following:

- The adequacy of SOLRC's culinary water supply.
- The adequacy of SOLRC's sanitary facilities and the potential for human waste to contaminate surface water (including Cement Creek and Tiger Gulch) or groundwater.
- The potential for sedimentation and contamination of Cement Creek from SOLRC's parking areas, trails (particularly those used by mountain bikers), footbridges, and residues from avalanche-control explosives.

3.2.2 Analytical Methods and Assumptions

The study area for this assessment of impacts to watershed resources includes the upper portion of the Cement Creek watershed which eventually flows into the main stem of the Animas River immediately upstream of Silverton, Colorado. Potential impacts to watershed resources are primarily related to water quality although some minor concerns have been raised with respect to water quantity used for culinary purposes. The development of water quality standards in Colorado has relied primarily upon federal legislation including the Clean Water Act of 1972 and the Safe Drinking Water Act of 1974 as well as amendments to these acts. Enforcement of these standards has been delegated by the Environmental Protection Agency (EPA) to various Colorado state agencies including the Water Quality Control Division (WQCD) and Water Quality Control Commission (WQCC).

Impacts to water quality could potentially affect both culinary and non-potable water resources due to increased concentrations of coliform bacteria, sediments, and organic chemicals associated

with explosives used during avalanche control activities. Assessment of these impacts relied primarily upon water parameters measured by the WQCD and other local, state, and federal agencies as compared to the applicable water quality standards for the study area. Assessment of impacts to water quantity was guided by a review of water rights regulations as set forth by the Colorado State Engineers Office – Division of Water Resources.

3.2.3 Affected Environment

3.2.3.1 Physical Description

South Fork Cement Creek originates at a cirque lake located within the project area and flows into the main stem of Cement Creek immediately below Gladstone (See Figure 3-1). Cement Creek eventually flows into the Animas River near Silverton, approximately 0.75 miles above the confluence of Mineral Creek and the Animas River. These three riverine segments, including the upper Animas River, Cement Creek, and Mineral Creek, are the primary hydrologic features in the Upper Animas River Basin.

Steep channel gradients are predominant in the Upper Animas River Basin, with most reaches exceeding 4 percent and tributaries to the main stream channels displaying even steeper gradients. High stream velocities associated with these reaches provide little chance for fine sediment deposition. Glacial till located near the confluence of Mineral Creek and the Animas River provides a more shallow channel gradient and unconfined topography, allowing streams to meander and deposit sediment loads (ARSG 2001).

Streamflow within the Upper Animas River Basin, including the Cement Creek watershed, is primarily supported by snowmelt runoff and infiltration to groundwater recharge areas that discharge to streams at lower elevations. Precipitation in the form of snow can occur any day of the year with most of the upper elevations experiencing permanent snow cover in October that can extend into July. Local storm systems produce intense rain events from July through mid-September that transport sediment from steep upslope areas to creeks and streams throughout the watershed (ARSG 2001). Spring runoff events typically begin in late April and peak during the month of June.

Geologic features within the Upper Animas River Basin strongly influence existing water quality conditions. The majority of the basin lies within a collapsed volcanic caldera which is heavily mineralized, providing ample opportunity for mining development during the past 150 years (Church et al. 1997). The process of mineralization created widespread iron-sulfide deposits which continually oxidize into sulfuric acid and iron oxides as the deposits are exposed to oxygen and water. The acid produced during this process continues to remove metals from other mineral deposits within the basin. This decay process is further accelerated by bacteria in low pH environments (ARSG 2001).

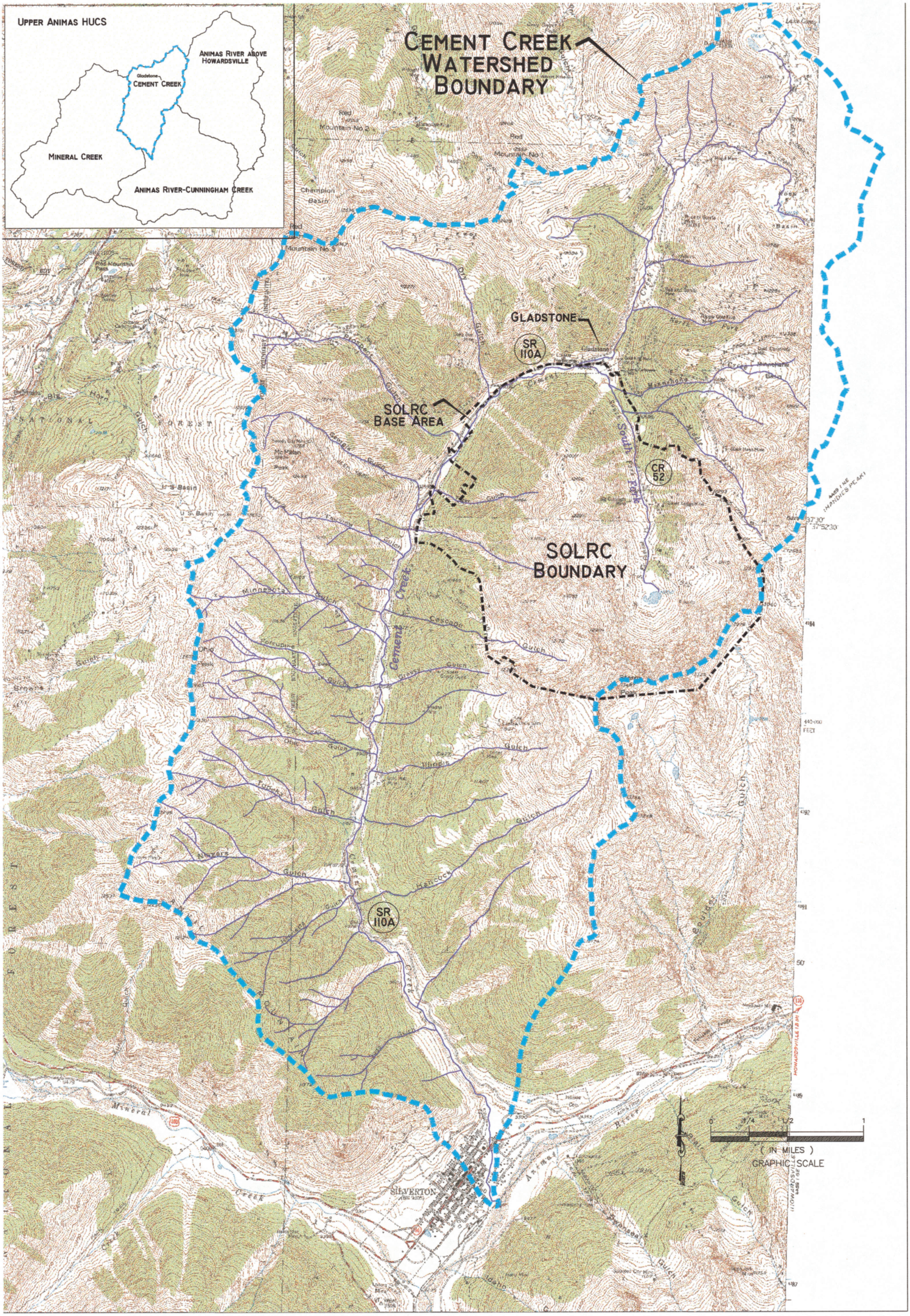


FIGURE 3-1. HYDROLOGIC FEATURES IN CEMENT CREEK WATERSHED.

3.2.3.2 Water Quality

Due in part to the historically poor water quality conditions associated with high metals concentrations found in the Cement Creek and Mineral Creek watersheds, the Upper Animas River Basin continues to be one of the most heavily examined watersheds in Colorado. Initial assessment of water quality conditions in the watershed indicated that heavy metal pollutants were the greatest sources of impairment to stream segments although an exact delineation between natural and human-caused sources could not be determined (ARSG 2001). Additional efforts were extended during the 1990s to assess water quality conditions and identify both natural and human-caused pollutant sources influencing water quality in the Upper Animas River Basin by local stakeholders comprising the Animas River Stakeholders Group (ARSG) acting under the direction of the WQCD. The water quality data collected during these efforts is summarized in several documents including *Exhibit 3, Upper Animas Water Quality Classifications and Standards Proposal* (WQCD 1994a), *Use Attainability Analysis for the Animas River Watershed* (ARSG 2001) and *Total Maximum Daily Load Assessment: A Watershed Based Approach for the Upper Animas River Basin* (CDPHE 2002). These documents assess impairment of water quality from elevated metals concentrations, primarily aluminum, cadmium, copper, iron, lead, and zinc, as well as low pH levels which are typically less than 5.0 on Cement Creek, allowing most metals to stay in their dissolved form. No concerns were raised in these documents regarding violations of water quality standards associated with coliform, sediment, and organic chemicals or potential impacts to water quality from these parameters.

The 1994 assessment by WQCD concluded that Cement Creek, and certain portions of Mineral Creek and the Upper Animas River, could not support aquatic life and had no prospects for achieving aquatic populations in the future (WQCD 1994a). In 1998, the EPA officially accepted a recommendation by WQCD that these stream segments exclude aquatic life use designations (EPA 1998). As stated in 40 CFR 131.10(g)(3) such an exclusion can only occur when "human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place." Prior to reaching this decision, the EPA consulted with the U.S. Fish and Wildlife Service and determined that this action would have no impact to listed or proposed aquatic species found along these stream segments (EPA 1998). Table 3-1 characterizes metals concentrations for various locations along Cement Creek measured during 1997 and 1998.

Existing water quality standards in the Cement Creek watershed and surrounding Upper Animas River Basin are maintained by the WQCD and WQCC. Numeric standards for the basin were established in 1982 as set forth in WQCC Regulation No. 34. Since that time, water quality standards have been amended in 1994 and again in 2000 to reflect the analysis of additional water quality data and assessment of pollutant sources. The health of stream segments, lakes, and reservoirs in this watershed are determined based upon a beneficial use class assigned to a water body that is designed to protect existing or potential levels of water quality. As defined by state legislation, beneficial use classifications protect water-related uses including recreation, agriculture, aquatic life, domestic water supply, and wetlands (Colorado Water Quality Control Act, C.R.S. 25-8-102). Each of these categories may also be appended to indicate potential water quality goals or seasonal conditions that may temporarily prohibit full beneficial use. Classifications may be assigned to any state surface waters except for water contained in ditches or other manmade structures designed to convey surface water volumes (5 CCR 1002-31). After beneficial use classifications have been assigned to a water body, the appropriate water quality standards are applied in order to protect the water body from impairment (5 CCR 1002-31.3). If water quality standards are not subsequently met, the water body is considered impaired and a Total Maximum Daily Load (TMDL) assessment is completed wherein pollutant sources

contributing to impairment are quantified and recommendations to bring the water body into compliance are made.

Table 3-1. Characteristic metals concentrations (mg/l) measured in Cement Creek watershed during 1997 – 1998.

	South Fork Cement Cr.	Cement Cr. above South Fork	Cement Cr. near Animas River
pH			
Avg.	5.49	6.38	4.15
Std. Dev.	.66	2.26	.57
# of Samples	16	34	88
Aluminum			
Avg.	1911.5	1698	9184.05
Std. Dev.	1689.28	1071.97	32911.88
# of Samples	2	2	59
Cadmium			
Avg.	2.10	6.60	1.12
Std. Dev.	3.04	4.10	3.82
# of Samples	4	2	73
Copper			
Avg.	44.13	187	92.49
Std. Dev.	80.60	200.82	253.96
# of Samples	4	2	74
Iron			
Avg.	915.22	3532	26864.34
Std. Dev.	1919.62	4330.32	124776.82
# of Samples	4	2	74
Lead			
Avg.	2.61	15.25	117.84
Std. Dev.	3.37	3.46	769.71
# of Samples	4	2	74
Zinc			
Avg.	754.67	1261.5	693.19
Std. Dev.	1198.84	467.4	559.35
# of Samples	4	2	74

Beneficial use classes and associated water quality standards for certain biological and physical parameters of concern for Cement Creek and adjacent segments of the main stem Animas River are included in Table 3-2. It is assumed that these water quality standards protect the highest potential use of water bodies in the project area and that comparison to the associated standards will indicate their current health and reflect any meaningful trends in water quality that may influence ecological health.

Table 3-2. Beneficial use classes and associated water quality standards for segments of the upper Animas River and Cement Creek.

Segment Description	Use Classification	Coliform Standard	Sediment Standard
Mainstem of Cement Creek, including all tributaries, wetlands, lakes, and reservoirs, from the source to the confluence with the Animas River.	Recreation 1a Agriculture	*F. Coli* = 200 organisms/100 ml *E. Coli* = 126 organisms/100 ml	Narrative[1]
Mainstem of the Animas River, including wetlands, from a point immediately below the confluence with Maggie Gulch to immediately above the confluence with Cement Creek.	Aquatic Life Cold 1 Recreation 1a Agriculture	*F. Coli* = 200 organisms/100 ml *E. Coli* = 126 organisms/100 ml	Narrative[1]
Mainstem of the Animas River, including wetlands, from a point immediately above the confluence with Cement Creek to a point immediately above the confluence with Mineral Creek.	Recreation 2 (Sept. 11 – May 14) Recreation 1a (May 15 – Sept. 10)	*F. Coli* = 2,000 organisms/100 ml *E. Coli* = 630 organisms /100 ml *F. Coli* = 200 organisms /100 ml *E. Coli* = 126 organisms /100 ml	Narrative[1] Narrative[1]

[1] The level of suspended solids in surface waters of the state are to remain at a level that will not form bottom deposits detrimental to beneficial uses.

As mentioned previously, watershed resource concerns in the project area are focused on potential development activities that may increase concentrations of metals, coliform, sedimentation, and explosive residue in both culinary and non-potable water, as well as water quantity demands associated with culinary purposes. The following sections discuss the existing status of these watershed resources in the affected environment with respect to changes that could occur following implementation of the Proposed Action or one of the alternatives.

3.2.3.3 Culinary Water

Allocation of water in Colorado is based upon the doctrine of prior appropriation wherein senior water rights must be satisfied prior to fulfilling any demands junior to that right. Regulation of access to water resources, including well development and permitting, is controlled by the Division of Water Rights through the State Engineers Office. Groundwater resources located in the eastern half of Colorado have been organized according to ground water basins and assigned to management districts. Groundwater resources in the western half of Colorado (west of Denver or range 72 west), including those underlying the Cement Creek and greater Animas River basins have not yet been classified and are assessed under different regulatory requirements than those within designated groundwater basins where over-appropriation is a concern. However, according to Colorado State Law, every well that diverts groundwater must have a permit.

All groundwater wells can be classified as either exempt or non-exempt. Exempt wells are not administered under the priority system, and generally are not permitted if a municipality or a water district can provide water to the property. Non-exempt wells are associated with greater

annual withdrawal volumes and higher pumping rates in comparison with exempt wells. Non-exempt wells are also required to be at least 600 feet from the nearest production well not owned by the applicant. Commercial wells located outside of designated groundwater basins are further classified as either small capacity (less than 1 acre-foot) or large capacity wells depending on the withdrawal volume associated with the well. The assessment of withdrawal volumes for a particular groundwater permit is determined by the State Engineers Office and is based upon the potential for withdrawal to injure existing water rights. Additional criteria regarding the siting and design of culinary wells include avoiding the 100-year floodplain and design approval by the local health department. (WQCD 1997.)

At the present time there is one permitted well in the Cement Creek watershed and no wells within 600 feet of the proposed base area. A search of water rights information maintained by the Division of Water Resources indicated this well is located near the north boundary of section 21, adjacent to the east side of the project area and is likely associated with a seasonal-use cabin (Baxstrom 2003). SOLRC is currently meeting all demands for culinary water purposes with bottled water that is delivered to the existing base area. No water for culinary or other purposes is currently diverted from surface or groundwater resources by SOLRC.

The adequacy of culinary water quality in groundwater wells throughout the state of Colorado is measured with respect to regulations set forth in *The Basic Standards for Ground Water* (5 CCR 1002-41) and *Colorado Primary Drinking Water Regulations* (5 CCR 1003-1) as well as amendments to these acts. Included in these regulations are maximum contaminant level (MCL) standards applicable to drinking water in Colorado, including standards for turbidity, organic and inorganic chemicals, microorganisms, and radionuclides.

The number of people served by a well at SOLRC will determine the water quality standards and associated monitoring criteria applied to the well. Public water systems are defined as serving more than 25 people daily for at least 60 days during a year. There are two types of public water systems including community systems serving cities and towns, and non-community systems serving restaurants, schools, hospitals, or small businesses. Non-community systems are further defined as transient or non-transient. Transient systems include restaurants and other facilities that serve 25 or more different people daily. Non-transient systems such as schools, hospitals, or small businesses serve 25 or more of the same people daily for at least 6 months during the year (5 CCR 1003-1). Post-construction requirements for water quality monitoring of a non-community non-transient water system require analysis of a large suite of water quality parameters including inorganic, organic, nutrient, biological, and radiological constituents. If the well depth is less than 100 feet from the surface a Microscopic Particulate Analysis (MPA) is required to determine the presence or absence of water quality components associated with surface water and the subsequent potential for contamination of groundwater resources. If an MPA test is failed the well owner will need to complete daily testing of water quality and submit monthly reports to the WQCD until the proper mitigation is completed. If the MPA test is passed, a minimum level of quarterly testing for bacteria, nitrate/nitrite, and residual chlorine is required. (Brand 2003, WQCD 1997.)

Protection of groundwater resources drawn from a well are enforced through the Colorado Source Water Assessment and Protection (SWAP) Program Plan. As required by amendments to the 1996 federal Safe Drinking Water Act, Colorado is required to delineate Source Water Assessment Areas (SWAA) for all public water supplies (PWS) including groundwater wells. According to an agreement with the EPA, this assessment will be complete by August 2003 (WQCD 2000). The Colorado Wellhead Protection Program (WQCD 1994b), conservatively defines the SWAA for a well to include all of the recharge area providing water to a particular

well. All Potential Sources of Contamination (PSOC) must be inventoried within the SWAA and a susceptibility analysis completed that ranks the PSOCs by threat, risk, and vulnerability with respect to the source of water (WQCD 2000). Some of the more significant PSOCs identified by the WQCD include those activities known to produce, use, or store regulated contaminants for which MCLs have been established for drinking water. PSOCs located within the South Fork Cement Creek watershed are primarily associated with past and present mining activities including adit discharge and surface runoff from tailings piles, but could also include automotive fluids used during maintenance activities. PSOCs of a lesser concern could include coliform loads from rangeland areas and chemicals used for dust abatement and winter de-icing activities.

Although surface water quality samples collected by the ARSG in the Cement Creek watershed have been found to exceed human health criteria for several metal parameters including arsenic, cadmium, copper, mercury, lead, nickel, and zinc (ARSG 2001), no groundwater quality data has been identified to date. During 1996, a county-wide survey of groundwater wells was completed by the EPA in San Juan County to identify water quality constituents exceeding MCLs in both public and private wells. Results more from the survey confirmed that several wells in the county were exceeding MCLs for one or metal parameters (Simon 2003). Discussions with mining personnel indicate that surface waters in the upper portion of the Cement Creek watershed must be treated to remove metals prior to consumption (Fearn 2003a).

3.2.3.4 Coliform

Numeric water quality standards associated with fecal coliform (*f. coli*) and *escherichia* coliform (*e. coli*) have been established to indicate the potential presence of pathogenic organisms. Assessment of compliance to coliform standards is based upon the geometric mean of representative stream samples. Coliform standards for Cement Creek and segments of the main stem of the Animas River immediately above and below the confluence with Cement Creek are listed in Table 3-2. Numeric criteria for these water bodies are identical with the exception of the Animas River immediately below Cement Creek during the months of September through May. During this time, coliform standards for *e. coli* and *f. coli* are increased to reflect the change in beneficial uses associated with Recreation Class 2. Water bodies under this classification are intended for secondary contact including wading, fishing, and other recreation occurring along streams or lakes (5 CCR 1002-31.13). Assessment of this stream segment by the WQCD determined that recreational uses during September through May were limited to these activities and that Recreation Class 2 was an appropriate beneficial use (Beley 2003).

To date, no measured coliform data has been identified within the Cement Creek watershed. The nearest coliform measurements are routinely collected by the WQCD on the Animas River just above the confluence with Cement Creek (Vann 2003). Coliform tests measured at this site during 2001/02 typically indicated no detection of coliform organisms (WQCD 2003). Existing sources of coliform within and near the project area potentially include human wastes associated with the two individual cabins located near the project area, as well as recreational, grazing, and wildlife use of federal lands located in the watershed.

At the present time, the Gold King mine utilizes vault toilets that are serviced every 3 or 4 months (Fearn 2003a). Existing sanitary facilities at SOLRC consist of vault-type toilets located near the temporary lodge that are periodically serviced and wasteloads disposed of at the appropriate facilities outside of the project area. No existing wastewater facilities (e.g., septic tanks) are currently utilized by SOLRC. SOLRC also has access to a vault toilet located on the north end of CR 52 on leased property that is associated with a private cabin. Although SOLRC customers can occasionally use this toilet, it does not have a large capacity and is not for public use. The nearest permitted discharge of coliform pollutants is associated with the Silverton wastewater

treatment facility that discharges into the Animas River near Silverton. One of the greatest potential sources of coliform pollutant loads to the Cement Creek watershed is likely associated with rangeland grazing of federally managed land by livestock, although grazing allotments have been dramatically reduced within the past several decades (ARSG 2001).

San Juan County and the San Juan Basin Health Department regulate the design and placement of septic systems on private land located within the project area. All building development lots that are not serviced by a public or community sewage system are required to have an on-lot sewage disposal system. These systems may entirely contain waste in a vault structure that requires periodic maintenance or be designed to biologically treat wastes through a soil absorption system receiving effluent from a septic tank. Non-designed systems or "pit privies" are not allowed on private land (Urbonas 2003). The size of a septic system needed to service a particular residence or business is dependent upon the calculated wastewater load. The ability of a septic system to function properly is based upon the physical and biological properties of the surrounding soil. Soil percolation rates at septic system locations must typically range between 1 inch to 12 inches per hour (San Juan Basin Health Department 2003). Septic drain fields must be placed in soils that are a minimum of 8 feet above bedrock with at least 4 feet of soil below the bottom of the proposed absorption system. The soil surface must also be at least eight feet above groundwater (measured during annual high water level) with at least 4 feet of soil between the bottom of the proposed absorption system and groundwater surfaces (San Juan County 2001a, San Juan Basin Health Department 2003). Septic system locations must also be a minimum of 100 feet from water supply wells, 50 feet from streams or other water bodies, and at least 10 feet from property boundaries (San Juan County 2001a). Toilet facilities located on federal land within the project area must be a permanent vault structure designed to agency standards or be a properly maintained, portable system (Shanahan 2003). The location of such facilities on federal land must be outside of floodplain areas and avalanche paths, and sealed vaults must be placed above water tables.

3.2.3.5 Sedimentation

The existing water quality standard regulating the concentration of total suspended solids (TSS, or sediment) in the Cement Creek watershed is defined by a narrative description rather than a numeric criteria. According to a "basic standards" regulation established by the WQCC (5 CCR 1002-31.11):

> Except where authorized by permits, BMPs, 401 certifications, or plans of operation approved by the Division or other applicable agencies, state surface waters shall be free from substances attributable to human-caused point source or nonpoint source discharge in amounts, concentrations or combinations which for all surface waters except wetlands can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludges, mine slurry or tailings, silt, or mud.

Furthermore, although the WQCC recognizes that suspended solids levels can be detrimental to water use classifications, no specific standards have been established or assigned for suspended solids control (5 CCR 1002-31.12). However, the WQCC has included as part of a "table value standards" regulation, defining physical and biological parameters that (5 CCR 1002-31.16):

> Suspended solid levels will be controlled by Effluent Limitation Regulations, Basic Standards, and Best Management Practices (BMPs).

Erosion and sediment loads to streams in the Upper Animas River Basin have reduced dramatically in the past half-century. Early mining developments located throughout the basin were known to dump mine tailings, garbage, and raw sewage into tributaries of the Animas, including Cement Creek, as early as the 1890s (Black et al. 1994). Investigation of sediment deposits below mined areas near Eureka in comparison to undisturbed areas indicated that deposition rates below disturbed areas were as much as 500 times greater from 1880 to 1918 and as much as 4,700 times greater from 1921 to 1930 (Vincent et al. 1999). However, recent investigation of the Cement Creek watershed by USGS scientists determined that no visual evidence of anthropogenic sediment loads currently exist including evidence of loads associated with development of mines, roads, and railroad grades. The initial conclusion from this investigation is that Cement Creek and the adjoining tributaries have been essentially stable during the past 500 years with only small amounts of channel movement typically associated with streams of this size and location (Vincent 2003). Comparison of historical photographs of stream segments within the basin indicate severe loss of riparian vegetation along many stream channels, likely due to historical grazing practices (ARSG 2001). In addition to deposition associated with soil disturbance, precipitation of metal colloids is known to occur immediately below the confluence of Cement Creek and the Animas River due to changes in water chemistry. Water in Cement Creek is typically below pH 5.0, thus allowing metal constituents to remain in a dissolved state. As low pH water from Cement Creek mixes with higher pH water from the Upper Animas, aluminum and iron colloids begin to precipitate and fall from suspension below the confluence (Schemel et al. 1999).

Prior to the commencement of construction activities at SOLRC, a sketch-plan of the proposed development was submitted to the San Juan County Planning Commission as a Planned Unit Development (PUD) for initial review. Any concerns regarding environmental impacts were addressed and recommendations made at that time. The sketch plan was then forwarded to the San Juan County Board of Commissioners for review. Following this review, SOLRC reviewed the comments and incorporated them into a final proposal which was subsequently approved by the Planning Commission and Board of Commissioners (Tookey 2003a).

Previous ground disturbance associated with construction of existing facilities has included excavation during placement of lift towers, lift terminals, patrol shacks, and outbuildings designed for storage of explosives. Footings for lift towers and the upper terminal were constructed with a combination of hand excavation and helicopter support to deliver construction materials and facilitate placement of towers. Shallow excavation and grading of soils were typically associated with parking areas and the temporary lodge facility. A certain amount of indirect disturbance of upslope areas has occurred during clearing of a corridor surrounding the ski lift, equivalent to approximately 4,600 feet by 100 feet, or 10.6 acres. Trees were felled and limbed by chainsaw and primarily left in place along the corridor. A trail currently moves through the lift corridor providing access to the ridgeline. The lower part of the trail has been expanded to allow travel by all terrain vehicle (ATV), but eventually reduces to a footpath along the upper portion. The trail surface of the lower trail is up to 6 feet wide although additional disturbance extends the disturbance beyond this width due to the cut and fill slopes extending beyond the trail. Proper construction and design of water bars would reduce soil erosion levels from the lower ATV trail as well as the upper trail. A more specific coverage of disturbance footprints associated with existing facilities, parking lots, and trails is provided in Table 3-3.

Table 3-3. Impacts to the soil surface associated with SOLRC project elements.	
Element	**Disturbance Area (ft^2)**
Existing Conditions	
Tiger Gulch Chair Lift Alignment	461,900
Tiger Gulch Chair Lift Upper Terminals	36
Tiger Gulch Lift Lower Terminal	540
Base Area Parking Lot	35,000
Lift Trail	50,082
Upper Patrol Shack	200
Lower Patrol Shack	400
Two Explosives Caches	89
Temporary Lodge	1,200
Total ($ft^{2)}$	549,447
Total (acres)	12.6
Proposed Action	
Colorado Basin Hiking Trail	23,199
Total (ft^2)	23,199
Total (acres)	0.5
Alternative A - No Action	
Rope Tow Terminals	800
Permanent Lodge[1]	4,400
One Explosives Cache	64
Yurts/Cabins	11,200
Maintenance/Storage Building	2,400
Total (ft^2)	18,864
Total (acres)	0.4
Alternative B – Guided-only Operation	
No additional surface disturbing elements.	
Alternative C – Integrated Guided and Unguided Operation	
Alternative Lift Trail (Hiking/Biking)	26,320
Total (ft^2)	26,320
Total (acres)	0.6
Mitigation Measures For Other Resources	
Colorado Basin Toilet [2]	600
Access Road	131,599
Total (ft^2)	132,199
Total (acres)	3.0

[1] The permanent lodge would be built on the site of the temporary lodge.
[2] Not yet planned; estimated maximum disturbance footprint.

No suspended sediment data collected from Cement Creek has been found to date. Although the Cement Creek watershed has been intensively sampled by federal, state, and local groups for a large suite of metal constituents, no measurements of TSS or other forms of sediment have been found. The routine monitoring site located on the Animas River near Silverton is typically measured for TSS concentrations which ranged from less than 10 mg/l to 30 mg/l during 2001/02 (WQCD 2003).

3.2.3.6 Explosive residue

The use of explosives in avalanche control activities has been well established since the early 1960s and can utilize hand charges, artillery weapons, and customized equipment specifically designed to safely deliver explosives over large distances (McClung and Schaerer 1993). Existing avalanche control activities at SOLRC utilize a combination of pentilite and cast explosives that are typical of explosives used at other ski resorts throughout the western U.S. for avalanche control purposes. Beginning in the winter of 1999/00 SOLRC began developing snow safety measures, including the use of explosive slope testing on 344 acres of private land and roughly 1,300 acres of BLM land. SOLRC has continued to utilize explosives throughout this area with regular frequency for avalanche control as well to obtain specific knowledge of avalanche behavior at different locations and determine the most effective hazard mitigation procedures possible (Jack Johnson Co. 2001). The specific locations of explosive use are determined by local topography, precipitation, climate, and vegetation that produce areas of avalanche hazard that are found throughout the existing permit area.

Water quality standards regulating the concentration of organic chemicals in surface waters in Colorado, including several that are associated with explosives used during avalanche control activities, are set forth in 5 CCR 1002-31.11. The EPA provides additional technical guidance in the form of two numeric standards that correspond to either an estimated lifetime cancer risk of 1 in 10,000 (10^{-4}) or a lifetime health advisory risk wherein lifetime exposure below the recommended concentration is not expected to cause any adverse noncarcinogenic effects (EPA 2002). Water quality standards for organic chemicals associated with explosive residue are found in Table 3-4. Standards recommended by WQCD in Table 3-4 are associated with stream segments that do not have a water supply classification but do have either a Class 1 or Class 2 aquatic life use classification. Although Cement Creek or the Animas River immediately below Cement Creek are not classified for aquatic life uses, these standards are designed to protect fish consumption that may occur as part of recreational use and will therefore be considered during this analysis.

Table 3-4. Numeric criteria associated with organic chemicals found in explosives typically used during avalanche control activities. All concentrations are in mg/l.

Parameter	EPA		Colorado WQCD[1]
	Lifetime HA	10^{-4} cancer risk	
Nitrobenzene	NA	NA	1.9
1,3-Dinitrobenzene	0.001	NA	NA
2,4-Dinitrotoluene	NA	0.005	.0091
2,6-Dinitrotoluene	NA	0.005	NA
RDX [2]	0.002	0.03	NA
2,4,6-Trinitrotoluene	0.002	0.1	NA

[1] Standards recommended by Colorado WQCD are associated with fish ingestion.

[2] RDX = hexahydro – 1,3,5-trinitro-1,3,5-trazine.

NA - not available

Early studies regarding the use of explosive munitions have found that soils, sediments from lakes and streams, and groundwater aquifers can become contaminated with nitroaromatic compounds (Gerlach et al. 1999, Weissmahr et al. 1999). Recent concerns over the impact of explosive residue on pristine alpine and subalpine watersheds has led to the investigations of

explosive residue compounds in snow. The first study of this kind was conducted to determine the suitability of snow to assist in measuring residue quantities that remained following munitions detonation at military bases, and the subsequent potential for contamination of soil and water (Jenkins et al. 2000). Additional concerns specifically related to explosives used by ski areas and state highway departments led to samples being collected within montane watersheds used by ski resorts in Utah. Samples were collected from "blast craters" associated with avalanche control activities at two ski resorts as well as from an undisturbed watershed located nearby. Analysis of these samples indicated the presence of seven organic compounds associated with explosive residue. None of the residues detected exceeded water quality standards proposed by the EPA. Some questions still remain as to whether these compounds naturally degrade or continue to bioaccumulate over time. (Naftz et al. 2002.)

3.2.4 Environmental Consequences

Potential environmental consequences associated with each of the development alternatives could include impacts to culinary water as well as certain surface water quality constituents including coliform, sediment, and organic chemicals included in explosives used during avalanche control activities. Discussion of these potential impacts is included below as they could occur under each alternative.

3.2.4.1 Proposed Action

The discussion of development activities associated with the Proposed Action addresses impacts that would primarily occur on public land. These impacts would occur in addition to those resulting from developments taking place on private land which are discussed under the No-Action Alternative.

3.2.4.1.1 Culinary Water

The initial demand for culinary water would be supplied using bottled water delivered to the base area. Development of a well to meet the long-term culinary water use at SOLRC would occur on private land and is discussed under the No-Action Alternative.

The SWAA associated with the proposed culinary well could be conservatively defined as the watershed containing all recharge areas contributing to the groundwater aquifer accessed by the well. As mentioned above in section 3.2.3.1, the existing PSOCs within this area include activities associated with mining development, but could also include chemicals involved with road maintenance or coliform loads produced by grazing activities. However, none of the activities associated with the Proposed Action Alternative would create an additional PSOC or substantially contribute to existing PSOCs within the project area.

3.2.4.1.2 Coliform

The initial demand for restroom facilities under the Proposed Action would initially be met with existing vault toilets at the temporary lodge. The existing toilets would meet the daily needs of the projected maximum 475 ticket holders. Eventually, a septic system will be installed on private land to treat waste volumes associated with daily visitors as well as use of the permanent lodge and 10 cabins. Environmental consequences associated with the septic system will be discussed under the No-Action Alternative.

Potential impacts from increased coliform levels under the Proposed Action would include illicit use of backcountry areas where there are no designated restroom facilities. Use of backcountry areas during the winter season would occur at locations determined safe for skiing by SOLRC. Access during the summer (non-skiing) season would occur via the hiking trails located

throughout the project area. Impacts resulting from human sources of coliform under this alternative would be minimal but should nonetheless be addressed. Adequate signs and other appropriate information indicating the location of base area restroom facilities would reduce the potential impacts from human sources of coliform. If deemed necessary by the BLM, a portable toilet located near the base of the Colorado Basin hiking trail (see Mitigation Measure 22) would reduce the potential of coliform impacts from sources such as these particularly during the summer months when overland travel is slower.

The greatest potential source of coliform under the Proposed Action or any other alternative would likely continue to be associated with livestock and large wildlife ungulate species grazing in the Cement Creek watershed.

3.2.4.1.3 Sedimentation

Potential impacts from sediment under the Proposed Action would occur as a result of several development activities occurring on public land. These activities include the following: construction of the 1.5-mile Colorado Basin hiking trail beginning near the top of the existing lift and extending into the basin down to CR 52; use of a 2.6 mile mountaineering route connecting the top of the lift, Storm Peak, and an existing mountaineering route located along Middle Fork Cement Creek; placement of six temporary foot/skier bridges across Cement Creek on public land to facilitate skier travel; and construction of a radio antenna site along a ridgeline peak. Additional development activities will take place on private land located within the permit area and will be discussed below under the No-Action Alternative.

Construction of the Colorado Basin hiking trail would disturb a corridor 1.5 miles long by 3 feet wide, equivalent to roughly 0.5 acres of surface area. The easternmost portion of the trail would run above and parallel to South Fork Cement Creek for about 2,500 feet, although for most of this distance the trail would be several hundred feet away from the stream channel. The proposed trail covers a total of approximately 1,900 vertical feet between the east and west starting locations, with most of the vertical change occurring along the southernmost portion of the proposed route. The majority of slopes over the length of the proposed trail are east-facing and generally maintain steep gradients of more than 60 percent. Topsoil depths in the area are very shallow and consist of a mixture of cobble, gravel, and sand or silt-sized soil particles. Disturbance to the soil surface during construction would include removal of surface vegetation down to bare soil and some localized grading to maintain an appropriate hiking surface. A minimal amount of initial soil erosion may occur immediately following construction, due to the unconsolidated nature of the disturbed surfaces. Hardening of the trail surface from recreational use would reduce detachment of soil particles but could likewise increase surface runoff volumes. Transport of sediments from exposed soil surfaces may occur during the spring season when snowmelt rates exceed surface infiltration rates or during intense thunderstorms that periodically occur in the summer season. Appropriate use of grading and placement of water bars would reduce the amount and velocity of runoff generated by the trail surface and minimize potential sediment impacts to downslope areas including South Fork Cement Creek (see Mitigation Measure 5).

Implementation of the 2.6 mile mountaineering route would not involve construction, due to the extremely rugged terrain and its limited use. A minimal amount of surface soil disturbance would occur during use of the route but would be similar to disturbance produced by use of game trails by wildlife.

Use of six temporary foot/skier bridges on public land would supplement up to 11 footbridges located on private land under the Proposed Action. Placement of these structures would begin immediately before snowcover and end immediately following snow melt. This period could

extend nearly year-round during some years. Footbridges consist of large planks 10-36 inches wide that would be placed by hand across the Cement Creek stream channel. No alteration of the stream channel or deposition of fill material would be involved during placement of the footbridges. It is anticipated this activity would result in no sedimentation impacts to stream channels. Locating temporary bridges in areas with stable channel banks and at locations where planks could span adjacent floodplains and riparian corridors would minimize disturbance impacts with potential to produce sediment loads and unstable channel banks.

Construction of the radio antenna site would disturb an area approximately 10 feet by 10 feet near a ridgeline on public land, within the project area. It is anticipated this activity would result in no sedimentation impacts.

In addition to these elements of the Proposed Action, the safety mitigation measure calling for a potential emergency access road from the base area to the lift top (Mitigation Measure 26) could potentially result in sedimentation of Cement Creek. The proposed road could be constructed along the alignment of the alternative hiking and biking trail described under Alternative C by blading a full-bench cut wide enough to accommodate a snowcat that could groom the road during the winter season. At full width, the road would expose a surface area roughly equivalent to 3 acres with the total disturbed area being somewhat larger.

As this road would traverse the entire slope from the lift top down to the base area, it would create a substantial, potential conduit for delivery of sediment to the creek. To avoid this, effective implementation of standard road construction BMPs would be essential. In particular, construction should be timed to avoid spring runoff and monsoonal periods, water bars should be appropriately sited and constructed, sediment fencing and straw-bale barriers should be placed below the road cut, particularly on lower portions near the creek, and rehabilitation/revegetation efforts should be aggressively implemented. Such measure would preclude any notable sedimentation impact to Cement Creek.

Similarly, the recreation mitigation measure suggesting that a toilet be installed in Colorado Basin (Mitigation Measure 22) could result in surface disturbance and sedimentation risk. If such a facility were installed, it is not certain whether it would be a portable toilet(s) or a constructed vault toilet. To insure that this analysis covers the full range of possible impacts, it is estimated that a maximum of 600 square feet could be disturbed if this measure were implemented. The siting is not certain, but such a facility would undoubtedly be in the Cement Creek corridor, likely beside CR 52. Effective implementation of standard BMPs, such as sediment fencing, straw-bale barriers, and prompt rehabilitation/revegetation efforts should preclude any notable sedimentation of Cement Creek as a result of installing this facility.

3.2.4.1.4 Explosive residue

The potential for contamination of water and soil resources by explosive residue under the Proposed Action would be associated with avalanche control activities on public lands determined to have an existing avalanche hazard by SOLRC. The specific locations of explosive use would be determined by local factors such as topography, precipitation, climate, and vegetation that combine to form avalanche hazards during a particular ski season. Generally, avalanche control activities would begin on those slopes most easily accessed from the existing ski lift and proposed rope tows and extend to outlying areas that continue to maintain avalanche hazards. Under the Proposed Action, ski trails would only be opened when they were determined to be safe for unguided skier access. This policy could periodically result in a smaller geographical area available for skiing as compared to Alternative B or Alternative C which offer guided skiing into areas maintaining a higher avalanche risk. The amount of avalanche control

activity and associated explosive residue under the Proposed Action would be greater than under the No-Action Alternative due to the expanded area generally open to skiing. As noted above (section 3.2.3.6), research to date suggests that use of these standard explosives for avalanche control does not result in exceedances of applicable water quality standards.

3.2.4.2 Alternative A – No Action

The direct environmental consequences of development activities occurring under the No-Action Alternative would take place on private land. As a result, these impacts would also occur under any of the alternatives discussed in this analysis.

3.2.4.2.1 Culinary Water

A projected maximum of 475 skiers per day in addition to approximately 25 SOLRC employees dictate the need for culinary water at SOLRC. Eventually a groundwater well would be developed to obtain water for culinary use. During the development of the master plan, the State Engineer's Office affirmed that groundwater resources in the area surrounding the proposed well were not considered to be "over-appropriated" at the present time (Knox 2000). Construction of the well would occur outside of the floodplain, roughly 150 feet above the east side of Cement Creek, near the proposed permanent lodge facility (Jack Johnson Co. 2001). Access to the proposed site would be via an existing road located on private land.

The SWAA associated with the proposed culinary well could be conservatively defined as the watershed containing all recharge areas contributing to the groundwater aquifer accessed by the well. As mentioned above in section 3.2.3.1, the existing PSOCs within this area include metal-laden adit discharge and surface runoff from tailings piles, automotive fluids, and possible coliform loads from rangelands. Construction of a septic system to treat sewage and wastewater from the proposed lodge and cabins would create a PSOC for the well. Adherence to regulations maintained by the San Juan County and San Juan Basin Health Department would insure that impacts from this source were negligible. Locating the well upgradient (with respect to groundwater flow) from the proposed septic system would likewise minimize the potential risk of coliform contamination.

Use of groundwater for culinary purposes would likely require treatment to remove metals and other constituents known to be harmful to humans. Full compliance with water quality monitoring required by the WQCD and San Juan County would ensure the quality of water produced by the well. The actual monitoring requirements established for the well would depend upon the number of people served, as described above in Section 3.2.3.1.

3.2.4.2.2 Coliform

Impacts from coliform under the No-Action Alternative would be associated with the system used to dispose of sewage and grey water from the permanent lodge and 10 cabins, all of which would be constructed on private land. This system will likely consist of a septic tank, used to separate liquids from solids, and a soil absorption field that receives effluent from the septic tank. San Juan County and the San Juan Basin Health Department regulate the design and siting of septic systems. These regulations are discussed in detail in section 3.2.3.2 above. If soil percolation rates measured at the proposed septic tank location exceed 12 inches per hour, soil replacement in and around the absorption field would ensure the proper treatment of septic tank effluent. The use of grease traps and other appropriate filters to treat grey water volumes would help ensure the proper long-term functioning of the septic system and reduce the potential for failure. If existing regulations enforced by the county and the health department are followed during the design, installation, and maintenance of the septic system, coliform impacts to the project area should be

minimal. Locating the septic system downgradient from the proposed culinary well would also minimize the potential for coliform impacts to culinary water.

3.2.4.2.3 Sedimentation

Potential sedimentation impacts under the No-Action Alternative would occur during construction of several buildings including the lodge, cabins, and storage facilities, installation of two rope tows near the top of the existing lift, and placement of up to six temporary foot/skier bridges on private land. (Note: The reduction of private-land foot/skier bridges from up to 11 mentioned under the Proposed Action is due to the reduced extent of ski terrain under the No-Action Alternative.) A detailed discussion of sedimentation impacts from these developments is provided below. Prior to construction of the facilities located on private land, SOLRC would be required to submit and receive approval of detailed plans for the lodge and other proposed structures located on private land. Review by the San Juan County Planning Commission and the San Juan County Board of Commissioners would address concerns regarding soil disturbance, erosion, and sedimentation to streams and generate recommendations to reduce such impacts.

The largest facility constructed under the No-Action Alternative would be a permanent lodge with a footprint of 2,200 square feet located at the existing temporary lodge. Construction of the lodge facility would have a moderately high potential for sediment impacts due to the total size of the structure and proximity to Cement Creek. The disturbance area associated with the proposed lodge would essentially overlap the area previously disturbed during construction of the existing temporary lodge. Ten cabins or yurts that would accommodate overnight guests would be located immediately west of the lodge. The proposed development area would be accessed by an existing private road. Construction of the proposed lodge and cabins/yurts would occur on shallow alpine soils on a gradual slope located at the toe of a steeper slope maintaining a 45 – 50 degree gradient. A 2,400 square foot maintenance/storage shed would be constructed approximately 1,000 feet south of the existing base area at a previously disturbed site accessed by SH 110A. An additional explosives cache would be constructed on previously undisturbed ground near the base area with a permanent footprint of 64 square feet. Surface disturbance associated with development would occur during the initial construction phase but would be primarily limited to a single season for any particular building.

Sediment produced during construction would be reduced through the use of standard sediment control measures including silt fencing, straw bale dikes, and check dams. Reclamation efforts following construction disturbances would continue to mitigate sediment impacts and could include measures such as reapplication of stockpiled soil, roughening of disturbed slopes to create microsites for moisture conservation and seedling establishment, reseeding, mulching, and covering over-steep slopes with mulch blankets.

A minimal amount of surface disturbance would occur during installation of the two rope tows. Footings for the terminals would be excavated by hand. It is anticipated that sediment impacts from this development would be negligible.

The six temporary foot/skier bridges across Cement Creek would be in place throughout the period of snowcover which could extend nearly year-round during some years. Footbridges consist of large planks 10-36 inches wide that would be placed by hand across the Cement Creek stream channel. No alteration of the stream channel or deposition of fill material would be involved during placement or removal of the footbridges. It is anticipated this activity would result in no sedimentation impacts to stream channels.

3.2.4.2.4 Explosive residue

Potential contamination from explosive residue under the No-Action Alternative would result from avalanche control activities occurring on private land only. As a result, environmental consequences from this activity under the No-Action Alternative would be less than those considered under all other alternatives. Again, as noted above (section 3.2.3.6), research to date suggests that use of these standard explosives for avalanche control does not result in exceedances of applicable water quality standards.

3.2.4.3 Alternative B – Guided-only Operation

3.2.4.3.1 Culinary Water

Potential impacts to culinary water sources under Alternative B would be similar to those discussed under the Proposed Action.

3.2.4.3.2 Coliform

Potential impacts from coliform under Alternative B would be similar to those discussed under the Proposed Action.

3.2.4.3.3 Sedimentation

Potential impacts from sediment under Alternative B would be similar to those described under the Proposed Action.

3.2.4.3.4 Explosive residue

Under Alternative B, skier access to public lands in the permit-area would be limited to guests accompanied by SOLRC guides. Avalanche control activities on public lands would focus more on slope stability evaluation of major avalanche routes and hazard areas as opposed to area-wide avalanche control methods utilized under the Proposed Action. Therefore, the potential for contamination from explosive residue under Alternative B would be somewhat less than the Proposed Action Alternative but greater than the No-Action Alternative. Again, as noted above (section 3.2.3.6), research to date suggests that use of these standard explosives for avalanche control does not result in exceedances of applicable water quality standards.

3.2.4.4 Alternative C – Integrated Guided and Unguided Operation

3.2.4.4.1 Culinary Water

Impacts to culinary water sources under Alternative C would be similar to those discussed under the Proposed Action.

3.2.4.4.2 Coliform

Impacts from coliform under Alternative B would be similar to those discussed under the Proposed Action.

3.2.4.4.3 Sedimentation

Proposed development activities under Alternative C would be similar to those included under the Proposed Action with two exceptions. Approximately 182 acres of upper montane spruce forest located primarily on north-facing slopes would be selected for tree thinning within the SOLRC boundary. Tree-thinning would remove a maximum of 20 percent of tree stems in selected areas but would focus on saplings, hazard trees, and protruding limbs from downed trees, resulting in more skiable terrain while maintaining existing ground cover. It is not anticipated that this activity would result in sedimentation impacts. Trees would be felled with chainsaws and left on

site. No removal of timber would occur. Although a maximum of 20 percent of tree stems could be removed, this would not produce increased surface exposure due to the emphasis on saplings and regenerative growth. Mature trees providing the majority of crown cover would be left in place.

An improved hiking/biking trail would be constructed under Alternative C between the existing base area and the top of the ski lift (see Figure 2-1, Alternative Lift Trail). The trail would be used primarily for recreational purposes, maintaining a width adequate for foot and mountain bike traffic. About 5,220 feet of the length of this trail would be located on public land, while about 3,550 feet would be located on private land. Potential sediment impacts during initial construction of the improved hiking/biking trail would be similar to those described for the Colorado Basin hiking trail under the Proposed Action and would be mitigated in a similar manner, by appropriate grading and installation of water bars.

3.2.4.4.4 Explosive residue

Avalanche control activities under Alternative C would be similar to those discussed under the Proposed Action. Unguided skier access to public lands within the project area would be permitted in areas where risks were sufficiently reduced by avalanche control activities. Guided skier access to public lands would occur where some level of avalanche hazard remained but could be reliably avoided. A limited amount of avalanche control activities would continue to occur in these areas to reduce avalanche hazards that could not be avoided. This effort could result in an incremental decrease in the amount of explosives used as compared to the Proposed Action but would create a negligible change in the environmental consequences. Again, as noted above (section 3.2.3.6) research to date suggests that use of these standard explosives for avalanche control does not result in exceedances of applicable water quality standards.

3.2.4.5 Mitigation

3.2.4.5.1 Culinary Water

1. Locating the proposed culinary well upgradient (with respect to groundwater flow) from the proposed septic system would minimize the potential risk of coliform contamination.

3.2.4.5.2 Coliform

2. Adequate signs and other appropriate information indicating the location of restroom facilities would reduce the potential impacts of human sources of coliform in backcountry areas.

3. If soil textures in and around the septic absorption field were too coarse, soil replacement in these areas would ensure the proper effluent infiltration rates.

4. The use of grease traps and other appropriate filters to treat grey water volumes would help ensure the proper long-term functioning of the septic system and reduce the potential for failure and subsequent coliform contamination of water resources.

3.2.4.5.3 Sedimentation

5. Trail design, use of surface grading, and placement of water bars in accordance with agency guidelines (FSH 2309.18 – Trails Management Handbook) would reduce the amount and velocity of runoff generated by trail surfaces and would minimize potential sediment impacts to downslope areas including South Fork Cement Creek.

6. Locating temporary foot/skier bridges in areas with stable channel banks and at locations where planks could span adjacent floodplains and riparian corridors, would minimize disturbance impacts with potential to produce sediment loads and unstable channel banks.

7. Use of control measures including silt fencing, straw-bale dikes, check dams, and water bars would reduce sediment impacts during construction of buildings and roads. Prompt reclamation efforts following construction would continue to mitigate sediment impacts and could include measures such as reapplication of stockpiled soil, roughening of disturbed slopes to create microsites for moisture conservation and seedling establishment, reseeding, mulching, and covering over-steep slopes with mulch blankets.

3.2.4.6 Cumulative Effects

The cumulative effects area (CEA) addressing watershed resources is defined as the Cement Creek watershed. Under this definition the following cumulative actions, as described in Chapter 2, were not considered:

- Snowmobile use of recreational trails, although located within the analysis area, is not anticipated to influence any of the watershed resource issues discussed above.

- Implementation of the new master plan for the Durango Mountain Resort would not affect watershed resources in the analysis area.

- Completion of the approved master development plan at Telluride Ski Area would not affect watershed resources in the analysis area.

- The jurisdictional change of SH 110A, although located within the analysis area, is not analyzed because it is anticipated that management procedures will remain essentially the same and will not create a cumulative influence to any of the watershed resource issues discussed above.

The remaining cumulative actions listed in Chapter 2 (section 2.4), four-wheel-drive use, mining, and livestock grazing, have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects to watershed resources.

3.2.4.6.1 Four-wheel-drive Use

Use of four-wheel-drive vehicles in the Cement Creek watershed occurs on several well-developed jeep trails as well as narrower ATV routes, primarily in the upper reaches of the watershed. Much of this use occurs on public lands managed by the BLM. Many of these routes utilize older trails that were initially created during the period of active mining. Use of these corridors, particularly during periods when soil surfaces are wet, contributes to surface erosion and sedimentation impacts. Additional sediment impacts occur from off-trail use in areas that were previously undisturbed. Quantitative measures of the cumulative sedimentation impacts for the Cement Creek watershed are not available. As mentioned above, sedimentation impacts from ground disturbance within the project area would likely be limited to a single season during construction of any proposed building structure or trail, and are not anticipated to make meaningful contributions of sediment to loads resulting from current levels of four-wheel-drive use.

3.2.4.6.2 Mining

Extensive mining development has taken place within the Cement Creek watershed during the past century. Impacts of these activities are predominately centered on degraded water quality from metal-laden discharges of water and sediment from mined areas. A substantial level of mitigation has occurred to reduce or eliminate contributions of this nature. However a certain amount of sedimentation continues to occur from exposed tailings piles and other disturbed areas, although no quantitative measure of this load is currently available. It is anticipated that sediment contributions from historic-mining related sources will continue to decrease over time as a result of additional mitigation measures and natural processes.

The Gold King Mine is located adjacent to the permit area and is scheduled to reopen during 2003. The presence of mining-related byproducts including mill tailings could potentially create increased sediment impacts to Cement Creek. However, regulations associated with mining-related byproducts would likely reduce sediment loads to within required limits. Use of SH 110A would increase substantially as a result of employee travel and large trucks transporting ore from the mine to processing facilities. Management of the road during the summer and winter season could potentially become more intensive at times and require an increase in dust abatement or snow removal activities. Chemicals associated with these activities would likely increase somewhat but are not anticipated to create measurable impacts to water quality.

3.2.4.6.3 Livestock Grazing

Impacts to watershed resources from livestock grazing have historically degraded riparian vegetation within the Cement Creek watershed and the rest of the Upper Animas River Basin (ARSG 2001). These impacts have subsequently resulted in delivery of sediment and coliform loads to Cement Creek. Improved management of grazing allotments during the past half-century has enabled riparian vegetation to reestablish in some areas, thus reducing these pollutant loads. Other impacts associated with livestock grazing include soil compaction and some exposure of soil surfaces in areas that may be overgrazed which promotes additional surface runoff and transport of sediment. A quantitative estimate of the impacts associated with grazing is not available. Impacts to watershed resources within the Cement Creek watershed are likely to be more prominent in gently sloping areas that provide easy access to livestock. Although sediment loads associated with grazing impacts would add cumulatively to potential sediment loads associated with development activities at SOLRC, this influence would be limited to the period of construction.

Existing coliform loads produced by grazing cattle and wildlife ungulate species would add cumulatively to potential human coliform loads produced by illicit backcountry use of areas where there are no designated restroom facilities. Potential human coliform loads associated with these activities are not anticipated to create measurable impacts to water quality.

3.3 VEGETATION

3.3.1 Issues Addressed

The vegetation issues identified through scoping and internal, interdisciplinary review include the following:

- Potential impacts to federal and state listed threatened, endangered, and candidate species, and to BLM and Forest Service sensitive species, due to ground disturbance and increased human use.

- Potential impacts to alpine vegetation due to these factors, and particularly to mountain biking above timberline.

- Potential impacts to wetland and riparian vegetation associated with these factors and with installation and removal of the proposed footbridges.

3.3.2 Analytical Methods and Assumptions

The descriptions of the community types that occur in the project area are based on a site visit in August 2001 conducted by Cirrus biologists and by community descriptions found in the literature, as noted below. Threatened, endangered, sensitive, and rare plant species to be addressed in this analysis were determined by conferring with the U.S. Fish and Wildlife Service (FWS) and by referring to the appropriate BLM and Forest Service Region 2 list sensitive species lists, as noted below. The habitat requirements for these species were developed from the literature. Impacts to each community type were estimated by determining the area that would be affected by each element of the Proposed Action and alternatives.

3.3.3 Affected Environment

The SOLRC project area is located in upper Cement Creek in the San Juan Mountains. The elevation ranges from approximately 10,200 feet at the base area to 13,487 feet at the top of Storm Peak. Treeline occurs between 11,400 and 11,600 feet depending on aspect, exposure, and soils. For the purposes of this discussion, the project area is divided into two main vegetation cover types: upper montane spruce-dominated forest occurring below treeline, and alpine communities above treeline. The transition between the upper montane forest and alpine is abrupt, roughly corresponding to the top of the primary slope of Cement Creek Valley. A third minor community type, wetland/riparian, is also present in the project area. Most occurrences of this community type are restricted to a corridor along Cement Creek, with the best example found in Colorado Basin that is the headwaters of the South Fork of Cement Creek.

These community types and some of the dominant species are described in the following paragraphs.

3.3.3.1 Upper Montane Spruce-Dominated Forest

The northwest through northeast-aspect slopes at lower elevations below treeline are characterized by upper montane forest dominated by mature spruce trees. Sub-alpine fir is also present. The understory component of this community is typically sparse due to the closed canopy cover. These stands create a pattern of continuous forest interrupted by the occasional avalanche path. Understory species include blueberry (*Vaccinium myrtillus*), heartleaf arnica (*Arnica cordifolia*), subalpine Jacob's ladder (*Polemonium pulcherrimum* ssp. *delicatum*), parrot's beak (*Pedicularis racemosa* ssp. *alba*), yarrow (*Achillea lanulosa*), and Whipple penstemon (*Penstemon whippleanus*). Within this community type, there are some created openings, referred to as forest clearings, particularly along the powerline corridor at the base of the mountain. These areas are dominated by grass and forb meadow species.

SOLRC has already constructed some of the infrastructure necessary for the operation of the resort. These facilities were built on private land and did not require BLM authorization. These facilities include the chair lift, the lift trail, two patrol shacks, a parking lot, a bridge, a temporary lodge, and two explosives caches. The changes in vegetation due to these elements now comprise part of the existing conditions. They principally affected the upper montane spruce forest or forest clearings.

The chairlift corridor was cut in mature spruce forest on a northwest-facing hillside. It transects the forest from Cement Creek in the valley bottom to the top of the ridge above treeline, fragmenting a forested block on the west-facing slope of the Cement Creek Valley. The lift corridor is approximately 4,619 feet long and up to 100 feet wide, converting approximately 6.6 acres of upper montane spruce forest (Table 3-5) to disturbed land. Within this corridor, the trees have been felled with a chainsaw and bucked up. The mechanical force associated with this process has resulted in surface disturbance. Over time, a meadow-like community will likely become established in this corridor. Regular maintenance would ensure that any woody species that grow in the corridor would remain low to the ground so as not to interfere with skiing or lift operation.

The chairlift has been built in the lift corridor. The lower terminal and most of the lift towers are located in the upper montane spruce forest, while the upper towers and terminal are located in the alpine community (described below). The footprint of the lift footings and the upper and lower terminals will remain unvegetated rather that becoming a meadow. No wetland or riparian impacts occurred during the construction of this element.

The lift trail follows the lift alignment using a series of switchbacks to climb the slope to the top of the lift. Primarily, the trail remains within the lift corridor, although some segments and switchbacks extend into the adjacent forest. The lower segments of the trail consist of a cut-and-fill roadbed to produce a flat surface wide enough to allow ATV passage, while the upper segment is a path. The old path this trail follows is a remnant of a mining trail that was improved for use as the lift trail. The trail is approximately 1.6 miles long with a trail surface up to 6 feet wide. Additional disturbance due to the cut-and-fill slopes extends beyond this width. While much of this trail is within the cleared lift corridor, it represents a more severe level of disturbance due to the grading and the fact that the trail would be maintained as a gravel or earth surface. No wetland impacts occurred due to the construction of this trail.

Additional impacts are associated with the upper and lower ski patrol buildings, a vehicle parking lot, the explosives caches, and the permanent bridge across Cement Creek. The footprint associated with each element is shown in Table 3-5. These structures were primarily located in the forest clearing associated with the powerline corridor.

3.3.3.2 Alpine

Much of the project area falls into the alpine community type. Alpine generally describes the plant communities that occur above treeline, although some treeless portions of the upper subalpine (often maintained as such by avalanche events or extreme wind exposure) intergrade with this type. Alpine vegetation is characterized by low-growing cushion and mat-forming plants which have adapted for growth under extreme environmental conditions (Zwinger and Willard 1972, Bliss 1985). At these elevations, the growing season is short, often less than 75 days, although freezing temperatures may occur at any time during this period. Plant growth occurs slowly under these harsh conditions, which includes extremely low temperatures, high winds, and often low available moisture due to desiccation and freezing temperatures (Walker et al. 1993, Greenland 1989, May and Webber 1982, Komarkova and Webber 1978). These extreme environmental conditions also slow reproductive rates. Sexual reproduction occurs infrequently, sometimes only once in a decade, or not at all among a majority of alpine-adapted plant species. Most reproduction is asexual and consists of fragmentation or rhizomatous root growth (Billings and Mooney 1968). Alpine vegetation that is disturbed can take decades or even centuries to recover naturally (Willard 1996). Revegetation efforts are particularly difficult to manage because of the extreme environmental conditions (Chambers et al. 1990, Willard 1996).

In the alpine zone, variables such as aspect, exposure, and substrate interact to produce different alpine habitat types. Within the project area, three alpine habitat types occur: moist meadow, dry meadow, and talus slope. Descriptions of these habitat types were adapted from Hartman and Rottman (1985) and Rottman and Hartman (1985).

The moist meadow habitat type occurs on more protected sites, such as the lee side of ridges and in bowls where snow accumulations protect the underlying vegetation from harsh winter conditions and provide moisture for a longer period during the growing season. Dominant species in this habitat type includes alpine avens (*Acomostylis rossii* var. *turbinata*), creeping sibbaldia (*Sibbaldia procumbens)*, blackheaded daisy (*Erigeron melanocephalus*), Drummond rush (*Juncus drummondii*), sage (*Artemisia scopulorum*), snow willow (*Salix reticulata* ssp *nivalis*), arctic willow (*Salix arctica*), moss campion (S*ilene acaulis* var. *subacaulescens*), and several sedges.

On drier and less protected exposures, such as ridgelines and windy slopes, conditions are harsher. Strong winds often blow the snow off of these areas, exposing the community to cold and desiccation and providing less moisture from spring snowmelt. These sites are occupied by the dry meadow habitat type. Dominant species include: kobresia sedge (*Carex elynoides*), sheep fescue (*Festuca brachyphylla*), alpine avens, alpine sunflower (*Hymenoxys grandiflora*), and spike trisetem (*Trisetem spicatum*).

Talus slopes are areas of accumulated rock of various sizes that has moved down slope from the source area by means of gravity, runoff, or avalanche. Fine material between the rocks provides substrate for plant growth. Species that occur in this habitat type include Gray's angelica (*Angelica grayi*), Colorado columbine (*Aquilegia coerulea*), alpine spring beauty (*Claytonia megarhiza*), sky pilot (*Polemonium viscosum*), groundsel (*Senecio amplectans* var. *amplectans* and *holmii*) larkspur (*Delphinium barbeyi*), bluebells (*Mertensia ciliata*), king's crown (*Rhodiola integrifolia*), and paintbrush (*Castelleja rhexifolia/haydenii*).

3.3.3.3 Riparian

A recently completed inventory by the Colorado Natural Heritage Program notes the occurrence of iron fens along Cement Creek from Gladstone to near the confluence with the Animas River (CNHP 2003). This is a unique community that is listed as globally imperiled (G2). Currently, there are only 13 known iron fens, four of which occur in San Juan County. These wetlands are fed by groundwater seeping from the eastern and western valley walls, as well as by overflow from Cement Creek. In this system, iron precipitates have been deposited onto organic matter in layers on terraces that have a perched water table and form an extensive network of pools and ponds. These wetland communities are dominated by acid tolerant shrubs, including bog birch (*Betula gladulosa*) and dwarf blueberry (*Vaccinium cespitosum*), with an understory that includes a thick ground cover of mosses (*Spagnum* spp. and other mosses), bluejoint (*Calamagrostis canadensis*), watersedge (*Carex aquatilis*), and alpine spicy wintergreen (*Gaultheria humifusa*). Engelman spruce (*Picea engelmannii*) dominates the overstory.

The headwaters of the South Fork of Cement Creek occur within the project area in Colorado Basin and present an extensive occurrence of wetlands. While the cirque lake in the basin has little vegetation growing around it, a series of wetlands below it support an herbaceous wetland community. Some of the species that characterize this wetland include several species of sedges, groundsel (*Senecio triangularis*), brook cress (*Cardamine cordifolia*), blue bells (*Mertensia ciliata*), elephants head (*Pedicularis groenlandica*), bishop's wort (*Micranthes odontoloma*),

American bistort (*Bistorta bistortoides*), salt and pepper grass (*Deschampsia cespitosa*), alpine phleum (*Phleum alpina*), and lake spike rush (*Eleocharis palustris*).

3.3.3.4 Special Status Plant Species

This section addresses the potential occurrence of Special Status Plant Species, including threatened, endangered, proposed, and sensitive species in the project area. Special Status plants include federally listed threatened, endangered, and proposed species under the Endangered Species Act and BLM listed sensitive species (BLM 2000). In addition, species of concern from the Forest Service sensitive species list are also addressed in this analysis because the elevation and habitats within the project area are more similar to those typically found on National Forest System lands than those typically encountered on BLM lands.

A probability-of-occurrence analysis was completed as part of this analysis and is included in Appendix A. It is based on habitat requirements reported in the literature, whether this habitat type occurs in the project area, and whether the species has been documented as occurring in or near the project area. Species without potential habitat in the project area due to elevation and/or geologic substrate constraints were assigned a probability of occurrence of none and are not addressed further in this analysis. Species whose range of potential habitat includes habitats that occur within the project area were assigned some level of probability of occurrence in the project area and are addressed further in this analysis.

This analysis considered the four federally-listed plant species potentially occurring on the San Juan National Forest (Appendix A) (Garcia 2002b). Based on the probability-of-occurrence analysis, none of the species with federal status are likely to occur in the project area due to habitat constraints imposed by the elevation and geology of the project area. Consequently, federally listed species are not addressed further in this analysis.

The Colorado BLM State Director's Sensitive Species List (BLM 2000) identified six BLM sensitive species potentially occurring in the San Juan Field Office resource area (Table A1). Based on the probability-of-occurrence analysis, none of these species are likely to occur within the project area. Consequently, BLM sensitive species are not addressed further in this analysis.

Eight species of concern were considered in this analysis (Table A1). Based on the probability of occurrence analysis, four of these species could potentially occur within the elevation range and habitat types present in the project area. The habitat requirement for each of these four species is addressed in greater detail below.

The Colorado Natural Heritage Diversity Information Source was reviewed for occurrence information on these species (CNHP 2002d). None of the species addressed in this section were reported as occurring in or near the project area. However, the Colorado Natural Heritage Program recently completed the *San Juan County Biological Survey* (CNHP 2003). This inventory identified a potential conservation area in the upper cirque above the South Fork of Cement Creek to protect showy whitlow-grass (*Draba spectabilis* var. *oxyloba*), globally vulnerable (T3), and kittentails (*Besseya ritteriana*), globally vulnerable (G3). In addition, as noted above, this inventory also reported the occurrence of the Cement Creek iron fens along the creek from Gladstone to near the confluence with the Animas River. Both of these areas occur within and adjacent to the SOLRC project area.

3.3.3.4.1 Reflected Moonwort (Botrychium echo)

Reflected moonwort is a member of the adder's tongue family (a fern) and is endemic to high elevation areas of western North America. This species occurs in the White and San Francisco Mountains of Arizona, the Wasatch Mountains of Northern Utah, and at various locations in Colorado. The type specimen for the species is from Glacier Lake, Boulder County, Colorado, although it is named for Echo Lake, Clear Creek County, Colorado. Reflected moonwort was first described as a separate species in 1983; previously it was considered to be an unusual form of *B. hesperium* (Wagner and Wagner 1983). Individuals of reflected moonwort tend to be found in communities with other members of the genus, but with relatively few other individuals of reflected moonwort. They are distributed between 8,500 and 11,000 feet in elevation on grassy slopes, roadsides, and lake shores, frequently with scattered shrubby vegetation, on rocky soils of decomposed granite (or other rock) origin. The communities where reflected moonwort is found tend to be dominated by young spruce, willow saplings, or other shrubs and weedy herbaceous associates (Wagner and Wagner 1983). Potential habitat for this species in the project area includes forest openings along the bottom of the valley. No individuals of this species are known to occur in the project area.

3.3.3.4.2 Pale Moonwort (Botrychium pallidum)

Pale moonwort is also a member of the adder's tongue family. This species is found in south central Canada, Michigan, and Colorado. Despite its somewhat widespread distribution, it is considered an extremely rare and local plant (Wagner and Wagner 1990). Although pale moonwort is only found in high elevations in Colorado, it may be found in numerous habitat types throughout its distribution. It has been found in sandy dunes, open meadows and fields, sandy road shoulders, and grassy ditches, shrubby second growth fields, and mixed hardwood forests. Potentially suitable habitat includes open areas between 9,800 and 10,600 feet. Potential habitat for this species in the project area also includes forest openings along the bottom of the valley. No individuals of this species are known to occur in the project area.

3.3.3.4.3 Altai Cottongrass (Eriophorum altaicum var. neogaeum)

Altai cottongrass is a member of the sedge family (Cyperaceae). The species is distributed throughout the arctic and alpine regions across much of the northern hemisphere, including the Altai Mountains of Central Asia where it was first described (Colorado Native Plant Society 1989). However, the form that occurs in North America is somewhat different from the plants found in Asia and has been given variety status. In Colorado, Altai cottongrass has been found in high-elevation peat wetland and bog habitats of the San Juan and Elk Mountains of southwestern Colorado. Generally, populations tend to be very local. Potential habitat for this species in the project area includes the wetland areas in Colorado Basin. No individuals of this species are known to occur in the project area.

3.3.3.4.4 Colorado Tansy Aster (Machaeranthera coloradensis)

Colorado tansy aster in known to occur in nine counties in south-central Colorado. Its habitat includes gravelly areas in mountain parks, slopes, and rock outcrops up to dry tundra, at elevation ranging from 8,500 to 12,500 feet. Flowering occurs in July through early August (Spackman et al. 1997). Potential habitat for this species in the project area includes the alpine communities along the ridgelines. No individuals of this species are known to occur in the project area.

3.3.4 Environmental Consequences

3.3.4.1 Proposed Action

This section describes the potential impacts that could occur to vegetation resources under the Proposed Action. These impacts are principally concentrated on public land and would occur in addition to those on private land, as described below under the no-action scenario. The elements that comprise the Proposed Action are described in greater detail in Chapter 2. Their spatial impact is shown in Table 3-5. Briefly, those elements that could affect vegetation resources include the construction of the 1.5-mile Colorado Basin hiking trail from the top of the lift to Colorado Basin and use along the 2.6-mile mountaineering route that would follow the ridgeline southerly from the top of the lift to Storm Peak and then easterly to an existing pack trail. Recreational use off these trails and associated trampling of alpine vegetation would be likely. Other elements that could affect vegetation include the construction of a radio antenna on the ridgeline peak, and the placement of temporary ski bridges across Cement Creek.

Winter recreation would have minimal impact on vegetation, assuming adequate snow cover. However, winter-time human activity on ridge tops or other wind-swept areas with minimal or no snow accumulations would have a similar impact to those described below for summer use.

The impact associated with the recreation trails would be two-fold. First, the Colorado Basin Hiking Trail would result in the establishment of a defined path through the alpine community. This impact would occur when the trail is constructed, involving a combination of route designation and shallow grading of the trail surface, as required. The construction disturbance associated with the trail would be approximately 3 feet wide for the length of the trail, resulting in the impacts to approximately 0.5 acres of alpine community. Use over time would likely widen the trial. The mountaineering route, projected to have a much lower level of use, would not be a constructed trail. Rather, it would be a corridor where use would occur. Over a period of time, use along this route could establish a trail or trails through the alpine community. As noted previously in the description of the alpine vegetation type, this community is sensitive to disturbance. Once the vegetation has been disturbed, especially if thin alpine soils are lost, natural recovery would occur slowly over a long time period. Thus both of these elements would be likely to result in impacts to the alpine community that could be expected to remain for the long term.

Second, these trails, combined with the ease of lift-served access to the ridgeline, would likely facilitate use by SOLRC guests in the alpine environment. Summer use would occur when the alpine zone was snow free and unprotected from foot traffic. Such use would be expected to result in additional trampling impacts to the alpine community beyond the confines of the trail as guests mill around the upper lift terminal area or step off the hiking trail for various reasons. The actual effect of this impact would depend on the amount of off-trail trampling that occurs. Over time, areas that experience repeated use could begin to lose vegetation as plants are damaged.

The placement of a solar-powered radio repeater on the ridge near the existing antenna would have minimal impact on the alpine community. This element would disturb a very small area with its installation, approximately 10 feet square, and the peak where it would be placed is primarily composed of loose boulders. Little, if any, vegetation exists at this location.

Table 3-5. Impacts to vegetation community types by various elements comprising the SOLRC project, grouped by alternative[1].

Element	Upper Montane Spruce-Dominated Forest (ft^2)	Forest Clearing (ft^2)	Alpine (ft^2)
Existing Conditions			
Tiger Gulch Chair Lift Alignment	286,700	20,700	154,500
Tiger Gulch Chair Lift Upper Terminals	0	0	36
Tiger Gulch Lift Lower Terminal	540	0	0
Base Area Parking Lot	0	35,000	0
Lift Trail	33,978	0	16,104
Upper Patrol Shack	0	0	200
Lower Patrol Shack	0	400	0
Two Explosives Caches	0	89	0
Temporary Lodge	0	1,200	0
Total ($ft^{2)}$	321,218	57,389	170,840
Total (acres)	7.4	1.3	3.9
Proposed Action			
Colorado Basin Hiking Trail	0	0	23,199
Total (ft^2)	0	0	23,199
Total (acres)	0	0	0.5
Alternative A - No Action			
Rope Tow Terminals	0	0	800
Permanent Lodge[2]	0	4,400	0
One Explosives Cache	0	64	0
Yurts/Cabins	0	11,200	0
Maintenance/Storage Building	0	2,400	0
Total (ft^2)	0	18,064	800
Total (acres)	0	0.4	0.02
Alternative B – Guided-only Operation			
No additional surface disturbing elements.			
Alternative C – Integrated Guided and Unguided Operation			
Alternative Lift Trail (hiking/biking)	16,056	4,298	5,966
Thinning[3]	see footnote	0	0
Total (ft^2)	16,056	4,298	5,966
Total (acres)	0.4	0.1	0.1
Mitigation Measures			
Colorado Basin Toilet[4]	0	600	0
Access Road	80,281	21,491	29,828
Total (ft^2)	80,281	22,091	29,828
Total (acres)	1.8	0.5	0.7

[1] Note that impacts addressed under the No-Action Alternative also occur under the Proposed Action and other action alternatives.
[2] The permanent lodge would be built on the site of the temporary lodge.
[3] Up to 20 percent tree removal would occur in 182 acres of spruce forest identified for thinning.
[4] Not yet planned; estimated maximum disturbance footprint.

The temporary bridges to facilitate skiers crossing Cement Creek would not require any permanent foundations or changes to the streambed. Because no earthwork would be required and the bridges would be placed late in the season and then removed in the spring, no impacts to iron fen wetlands would be anticipated. Selecting bridge sites where this community is less developed or expansive would further reduce the likelihood of any effect, as suggested in Mitigation Measure 14.

No other wetland or riparian zone impacts are anticipated under the Proposed Action. The trails would be routed to avoid wetland impacts, and the other elements of the Proposed Action would be placed outside of wetlands.

Noxious weeds are a concern due to their potential to out-compete and replace native species. Disturbance and increased human activity would increase the risk of noxious weeds entering and becoming established in the project area. Seeds could be brought in on guests clothing or shoes, or on vehicles. Disturbed areas would provide an opportunity for these species to become established.

Additional impact could occur if a mitigation measure calling for the construction of an access road to the top of the mountain is implemented (Mitigation Measure 26). This road would follow the same route as the alternative hike/biking trail discussed under Alternative C. However, it would be approximately 15 feet wide. The impact of the 15 foot-wide trail is disclosed in Table 3-5. However, the actual impact associated with this trail would be wider than 15 feet to account for the cut and fill slopes necessary to construct a trail of this nature on a steep side hill. The construction of this trail would impact mature spruce forest as well as the meadow-like community that would develop in the lift corridor.

3.3.4.1.1 Special Status Plant Species

As noted in the preceding section, none of the Special Status plants addressed in this analysis, or their habitats, are known to occur in the project area. Therefore, there would be no impact to the Special Status plants. However, potential habitat for four species of concern (reflected moonwort, pale moonwort, Altai cottongrass, and Colorado tansy aster) is present in the project area. Because Altai cottongrass is restricted to wetland fen or bog habitats and the Proposed Action would not impact wetland habitats, there would be no impact to Altai cottongrass.

In the SOLRC project area, both species of moonworts, reflected and pale, are restricted to elevations below treeline. Non-forested openings represent potential habitat. The elements of the Proposed Action would primarily affect the high-elevation alpine habitat (Colorado Basin Hiking Trail and mountaineering route) and would be unlikely to have any impact on these species.

Colorado tansy aster is restricted to alpine habitats. Trampling associated with recreational activities near the Colorado Basin Hiking Trail and the mountaineering route could impact this species. The Proposed Action could result in impacts to individuals but would be unlikely to affect the population.

Under the Proposed Action, there would be no direct impact to the potential conservation area in the upper cirque above the South Fork of Cement Creek where showy whitlow-grass and kittentails occur. Skiing and avalanche control activities would occur over the snow in this area, so minimal impact would be anticipated to the plant community.

3.3.4.2 Alternative A – No Action

Under Alternative A, several elements associated with the infrastructure of the SOLRC operation located on private land would be built. Construction of these elements on private land does not require agency approval. These elements are described in Chapter 2 under the description of the No-Action Alternative. Briefly, no-action elements that could impact vegetation resources include: the construction of two rope tows, a permanent skier lodge, 10 skier cabins/yurts, one additional explosives cache, and general recreational use in the area. The vegetation impact associated with these elements is shown in Table 3-5. With the exception of the two rope tows, the elements would be located in the clearing in the upper montane spruce forest along the powerline corridor. They would convert the meadow-like community of the clearing into a permanently disturbed, nonvegetated surface.

The two rope tow lifts would be built in the alpine community. The impact associated with these elements is also disclosed in Table 3-5. No clearing would be required for the rope tows, and the impact to alpine vegetation would be restricted to the terminals and towers.

Impacts associated with recreational use in the alpine zone on private lands would be similar to those described previously under the Proposed Action. Impacts from recreational use would be reduced in the upper montane spruce forest because the steep nature of the forested areas would discourage use. Most people would travel through this cover type using either the trails or the lift to reach the alpine areas.

The temporary skier bridges across Cement Creek would not have any impacts to vegetation or wetlands, as described previously under the Proposed Action.

While the direct impacts to vegetation associated with these elements are disclosed in Table 3-5, indirect impacts could also occur. Disturbed sites are at risk for noxious weed establishment. Construction equipment and SOLRC guests represent potential vectors to bring these species to the area. In addition, revegetation practices can introduce non-native and even weedy species, either through their inclusion in the seed mix used for revegetation or through straw or other material used to mulch the site while the plants become established. Once established, weeds and non-native species often out-compete native species and spread into adjacent communities.

3.3.4.2.1 Special Status Plant Species

Potential impacts to Special Status plants would be the same as described under the Proposed Action. Potential impacts to the four species of concern that could occur in the project area are as follows. The no-action elements are predominantly located below treeline so there would be greater potential for impacts to the two moonwort species. As noted previously, there are no known occurrences of these species in the project area. However, the cabins, lodge, and temporary skier bridges would be sited in potential habitat for the moonworts. Although these elements could impact individuals, they would be unlikely to affect the populations.

Under the No Action scenario, there would no impact to Altai cottongrass because there would be no impacts to wetlands in Colorado Basin.

Impacts to Colorado tansy aster would be unlikely from the elements of the no-action scenario because these are primarily located below treeline. However, as guests venture along the ridge south of the lift into the alpine habitat, trampling impacts could occur. The No-Action alternative could therefore result in impacts to individuals, but because these impacts would be localized

they would be unlikely to impact the population. The potential for these impacts would be reduced relative to the Proposed Action.

Effects to the potential conservation area in the upper cirque above the South Fork of Cement Creek where showy whitlow-grass and kittentails occur would be the same as described under the Proposed Action.

3.3.4.3 Alternative B – Guided-only Operation

The vegetation and wetland impacts under this alternative would be the same as described for the Proposed Action. This would include both the impacts from those elements described under the no-action scenario as well as those that are unique to the Proposed Action.

3.3.4.4 Alternative C – Integrated Guided and Unguided Operation

The vegetation and wetland impacts under this alternative would be the same as described for the Proposed Action, with two exceptions. First limited tree thinning, limbing, and cleanup on forested, north-facing slopes within the permit area would occur. Five polygons, totaling approximately 182 acres, of upper montane spruce forest have been identified where these activities would take place (see Figure 2-2). Within these thinning areas, up to 20 percent of the trees would be removed. This thinning activity would not result in a cover-type change but would affect the forest structure. The primary emphasis would be on removing limbs near the ground, sapling and pole-sized regeneration, and hazard trees, and bucking up fallen trees so the lay flat on the ground. In addition, sapling and pole-sized trees would be removed from avalanche chutes. Since the thinning activities proposed under this alternative would have minimal affect on the forest canopy and amount of light reaching the understory, the overall effect on the understory would be minimal.

Second, an easier hiking/biking trail would be built from the base area to the top of the mountain (see Figure 2-1, Alternative Lift Trail). This trail is projected to be 3 feet wide and would be cut into the mountain to provide a flat trail surface at a reasonable grade. The construction of this trail would impact mature spruce forest as well as the meadow-like community that would develop in the lift corridor. The impact of this trail is disclosed in Table 3-5.

3.3.4.4.1 Special Status Plant Species

Potential impacts to Special Status plants, species of concern, and the potential conservation area in the upper cirque above the South Fork of Cement Creek would be the same as described for the Proposed Action.

3.3.4.5 Mitigation

8. Educating summer guests about the sensitivity of alpine vegetation to trampling and the slow recovery of damaged communities, and requiring visitors to remain on designated trails and within established use areas would reduce the impact to alpine vegetation due to summer recreation use.

9. Implementation of the BMPs listed in Chapter 5: Reclaiming the Land, as detailed in the publication *Ski Area BMPs* (Forest Service 2001) would reduce the impacts to vegetation resulting from the proposed activities.

10. Development of a vegetation management plan for the ski area would ensure that all vegetation types, both forested and non-forested, were managed to maintain their health and vigor.

11. Developing and implementing an integrated weed management plan for the SOLRC permit area, which would include monitoring of sites disturbed by construction activities for a period of 10 years and aggressively treating any new populations of noxious or invasive species with the most appropriate measures given the size of the population and the nature of the species, would address and reduce the long-term risk of introduction and establishment of weeds.

12. Reseeding disturbed areas with BLM approved seed mixes designed for either alpine or montane settings that emphasize native grasses and forbs and are certified to be weed free would reduce the risk that weedy species would be introduced during the revegetation process.

13. Minimizing surface grading in areas that are cleared would facilitate natural regrowth.

14. Selecting temporary foot/skier bridge placement sites in areas where wetlands adjacent to Cement Creek are less developed/expansive would avoid or minimize wetland impacts.

3.3.4.6 Cumulative Effects

The cumulative effects analysis area for vegetation resources is the Cement Creek watershed. Of the cumulative actions listed in Chapter 2 (section 2.4), the following actions are not considered in this analysis:

- Snowmobile use because it occurs during the winter when snow is present and the underlying vegetation is protected from the impact of the snowmobile. Some damage to vegetation may occur during conditions of low snow if the ground or vegetation is exposed. However, these situations are limited and would not contribute a measurable impact to the cumulative impact situation.

- The expansions at Telluride and DMR because they are outside of the cumulative effect analysis area for vegetation. However, it should be noted that the impacts and changes to vegetation resulting from these resorts and the accompanying commercial and residential development have impacted similar habitats as would be affected by the SOLRC project.

- The change in the jurisdiction over SH 110A because it would not be likely to impact vegetation. Ownership and management of the land adjacent to the road would be unaffected, and travel policies off of designated travel routes would remain unchanged.

The other cumulative actions listed in Chapter 2 (section 2.4), four-wheel-drive use, livestock grazing, and mining have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects to vegetation resources.

3.3.4.6.1 Four-Wheel-Drive Use

Four-wheel-drive use includes a variety of wheeled vehicles, including trucks, jeeps, ATVs, and motorcycles. Recreational use of these vehicles centers on traveling the many old mining trails and roads into backcountry areas. For the purpose of addressing cumulative impacts to

vegetation, four-wheel-drive use is divided between use that remains on the existing roads and trails and use that occurs off-trail. The use that occurs on the roads and trails would have little additional impact on the vegetation. Since most routes were created in the mining era, the impact associated with them is discussed with the mining impacts, below. However, some of the four-wheel-drive use occurs off-trail as enthusiasts seek to test the limits of their machines or merely explore new areas. Off-trail use directly impacts vegetation through trampling. Low-statured plants that may be traversed by these machines, such as those that occur in the meadows or alpine, are particularly susceptible. Plants thus affected may experience reduced vigor or mortality. In addition, when this use occurs on sloping land, it can lead to the formation of ruts that become gullies during subsequent runoff events, extending the impact beyond the area initially impacted by the tire.

This type of impact to vegetation would be cumulative with impacts that could occur along the proposed hiking and mountaineering trails. Quantitative estimates of the magnitude of vegetation impact for four-wheel-drive use are not available for the cumulative impact analysis area. However, in many instances, rough terrain confines user impacts to areas along the travel routes. Within the SOLRC project area, impacts from recreational four-wheel-drive use are essentially absent for this reason.

3.3.4.6.2 Mining

Considerable mining has occurred in the Silverton area. Mining related impacts have resulted from large mines, including the Sunnyside and Gold King mines, as well as small mines and prospects scattered across the landscape. Mining has affected vegetation through the creation of trails and roads to service the mines, surface disturbance associated with mineral extraction and waste rock and tailings disposal, and development of mine infrastructure.

Vegetation disturbance associated with the SOLRC proposal would be cumulative with the past mining disturbance as well as future mining activity. Currently, the permit area is open to mine entry. Planned mining activity in the Gladstone area would be unlikely to affect additional vegetation as it would occur in an area that has already been disturbed. Many sites of early mining disturbance have been abandoned for many years, and natural vegetation recovery has occurred if the site was not excessively disturbed, i.e., buried with waste rock or tailings. Depending on the level of disturbance, the community on the old mine sites may now approximate the undisturbed community, while more disturbed areas have communities characteristic of disturbed sites or may still be bare mineral soil or rock. The area around the larger mines in the Gladstone area that have current workings or recent cleanup activities remain disturbed. Some of the trails and roads from the mining era are still in existence as they continue to be used by wildlife, livestock, and recreational users. Some of these trails would be incorporated in to the SOLRC recreation scenario.

3.3.4.6.3 Livestock Grazing

As noted in the Land Use section (3.5), the project area has been grazed by domestic livestock, primarily sheep, since the early settlement and mining era. The impact associated with grazing depends on the level and season of use. However, heavy grazing can generally be thought of to favor plants that are less palatable and more resistant to grazing, and over time can lead to a shift in community composition and dominance. The vegetation in areas that receive repeated heavy use, such as around areas were sheep are bedded down, may experience trampling impacts. Other changes in soil structure and properties may also occur.

Quantitative estimates of the extent of the area affected by livestock grazing are not available for the cumulative impact analysis area. Grazing use is likely to be more concentrated on more level sites where animal access is easier. Impacts associated with livestock use would add cumulatively to potential trampling impacts that could occur with use along the proposed SOLRC recreation trails. However, evidence of heavy grazing does not appear to characterize the SOLRC project area.

3.4 WILDLIFE

3.4.1 Issues Addressed

The wildlife issues identified through scoping and internal, interdisciplinary review include the following:

- Potential impacts to federal and state listed threatened, endangered, and candidate species, and to BLM sensitive species, due to increased human presence, habitat fragmentation, other habitat impacts, and avalanche control activities. Canada lynx are a key concern.

- Potential impacts to elk, ptarmigan, and grouse habitat and populations due to these factors.

- Potential impacts to aquatic species associated with increased sedimentation and the residues of avalanche-control explosives.

- Potential impacts to subnivian species (e.g., mice and voles) due to avalanche control work.

3.4.2 Analytical Methods and Assumptions

A probability-of-occurrence analysis was conducted to determine what special status species could occur in the project area and should be addressed in this document. This analysis was based on the lists of federally threatened, endangered, and candidate species potentially occurring in San Juan County, of BLM sensitive species occurring in the San Juan Resource Area, and of Colorado State threatened and endangered species. Factors used to determine occurrence in this analysis included habitat requirements reported in the literature, habitat presence in the project area, and documented occurrence of species in or near the project area. Results of this analysis are described in section 3.5.3.1.

Baseline information used in this analysis came from existing information and on-site surveys conducted by consultants and agency specialists over the past few years. Specific resources of note include the following:

- Colorado Division of Wildlife (CDOW) carnivore database.
- Digital coverage of Canada lynx habitats created by the Colorado Natural Heritage Program.
- Annual progress report for the post-release monitoring of lynx reintroduced to Colorado (Shenk 2001).
- *Canada Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000).
- *Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000).
- Field visits and survey reports for the Uncompahgre fritillary butterfly conducted and prepared by Aaron Ellingson, Colorado State University, in 2000 and 2001.
- Field visits and survey reports for the boreal toad conducted and prepared by the BLM, in 2002.

- Field visits by Cirrus resource specialists in August and October 2001 and August 2002.

Analysis of Canada lynx was based on habitat modeled and mapped by the Colorado Natural Heritage Program. The mapped habitat includes acres of winter denning and foraging habitat, and delineates landscape linkages and Lynx Analysis Units (LAUs).

Impacts to wildlife from the proposed elements were assessed by qualitatively determining if the activities would constitute a loss or degradation of habitat, a barrier to movement, or a substantial increase in noise or visual disturbance to wildlife in the area.

This analysis is based on the following assumptions:
- Impacts to wildlife result when a person encounters a species (direct impact) and when wildlife habitat is modified through recreational use or habitat removal (indirect impact).
- Removal of vegetation and the construction of structures constitute habitat modification.
- The presence of people constitutes habitat disturbance and, in some cases, habitat fragmentation.
- Lack of suitable habitat for a species indicates absence of that species in the project area.

3.4.3 Affected Environment

3.4.3.1 Overview

This section addresses background information, habitat requirement, and presence of species that were identified as concerns during scoping. The condition of wildlife habitat and its ability to support these species are also discussed. Groups of species analyzed include the following: (1) federal and state listed species and BLM sensitive species, (2) species of high public interest, (3) aquatic species, and (4) subnivean species.

To determine which species to address in the first group (federal and state listed species and BLM sensitive species), a probability-of-occurrence analysis was conducted. Species without potential habitat present in the project area due to elevation and/or specific habitat attributes were assigned a probability of occurrence of none and are not addressed further in this analysis. Species whose range of potential habitat includes habitats that occur within the project area were assigned some level of probability of occurrence in the project area and are addressed below. Results of this analysis are included in Table A2, Appendix A and are summarized below.

The probability-of-occurrence analysis considered 12 federally listed species of vertebrates and invertebrates that potentially occur in San Juan County. Of these species, 11 are also listed for the state of Colorado as threatened or endangered. Based on this analysis, five of the species with federal status, Canada lynx, bald eagle, southwestern willow flycatcher, boreal toad, and Uncompahgre fritillary butterfly, could potentially occur in the project area (see Table A2, Appendix A). These five species were also identified by the FWS as potentially being impacted by the Proposed Action and will be further analyzed in this document (FWS 2001, Ireland 2003).

The FWS also identified the endangered razorback sucker and Colorado pikeminnow as species that could be potentially impacted by this project (FWS 2001 and Ireland 2003). These species do not occur within the analysis area but occur in the lower San Juan River Basin and lower Colorado River Basin. Activities that deplete water from the San Juan River Basin and/or the Dolores River (Upper Colorado River Basin) have been identified by the FWS as having adverse cumulative effects to the razorback sucker and Colorado pikeminnow. Cement Creek, a 2nd or 3rd order stream, is a tributary to the Animas River, which eventually flows into the San Juan River.

There will be no water withdrawals from Cement Creek associated with this project. However, minor water depletion from the San Juan River Basin would occur through use of the proposed culinary well in the project area. Minor water depletions are addressed by the FWS under the September 21, 1999, programmatic biological opinion (*Intra-Service Section 7 Consultation for Minor Depletions of 100 Acre-feet or Less from the San Juan River Basin*). Since the proposed project would result in minor water depletion from the San Juan River Basin, it has been predetermined as having an adverse effect to these endangered fish species, when added cumulatively to other water depletions in the basin. This impact is being further addressed in a Biological Assessment and through formal consultation with the FWS, and is not further addressed in this document.

Sixteen fish and wildlife species identified on the Colorado BLM State Director's Sensitive Species List (BLM 2000) occur in the San Juan Resource Area and were considered in the probability-of-occurrence analysis. Based on this analysis, two of these species, the northern goshawk and Townsend's big-eared bat could potentially occur within the project area (see Table A2, Appendix A). These species are further addressed in this document.

The Colorado State listing of endangered, threatened, and wildlife species of special concern (CDOW 2002a) includes 21 state listed species in addition to those that are addressed above with the federally listed species. Based on the probability-of-occurrence analysis, one of these species, the wolverine, is likely to occur within the project area (see Table A2, Appendix A). This species is further addressed in this document.

High public interest species are the second group of species identified for further analysis. These are species that the public actively seeks for recreation, or those that receive a higher level of public attention. High public interest species identified during the scoping process as a concern for this proposal include Rocky Mountain elk, grouse, and ptarmigan. These species are known or expected to utilize the project area and are discussed in greater detail below.

The last two groups of species identified as a concern during scoping include aquatic species and subnivean species. No specific species were identified within these categories. Therefore, a general discussion and analysis of these groups is included in this document.

3.4.3.2 Habitat Types

The SOLRC boundary encompasses approximately 1,944 acres and ranges in elevations from 10,200 feet at the base to 13,487 feet at its highest peak. This area contains two dominant vegetation types, upper montane spruce-dominated forest below timberline, and alpine tundra above timberline, with the elevation of timberline ranging between 11,400 and 11,600 feet. Approximately 29 percent of the habitat within the SOLRC boundary (570 acres) is forested. A minor amount of riparian and wetland habitat also occurs in the project area. See section 3.3.3 (Vegetation, Affected Environment) for further description and detail of these vegetation types and their composition.

3.4.3.3 Federal and State Listed Species and BLM Sensitive Species

3.4.3.3.1 Federally Listed Species

Two federally listed threatened species, Canada lynx and bald eagle, and one federally listed endangered species, Uncompahgre fritillary butterfly, could potentially occur in the project area. Also, one candidate species for federal listing, the boreal toad, potentially has habitat in the project area.

Canada Lynx

Mature to late-successional spruce-fir forests have been described as suitable foraging habitat for Canada lynx in the southern portion of their range. These forests can support snowshoe hares, the primary prey species for lynx, as well as red squirrels, an important alternative prey species. Conifer-aspen forests, particularly those with dense regeneration or an extensive shrub and woody debris understory component may also be important for prey species. Mature forest stands are used for denning, cover for kittens, as well as travel corridors. Denning habitat has been described as areas having dense downed trees and root wads, or dense live vegetation (Koehler 1990; Mowat et al. 2000). For denning habitat to be functional, it must be in or adjacent to large areas of quality foraging habitat (Ruediger et al. 2000).

Lynx habitat in the Southern Rocky Mountains is naturally fragmented, a function of elevation, aspect, and local moisture regimes. Primary lynx habitat is likely found within the subalpine and upper montane forest zones, typically between 8,000 and 12,000 feet. High alpine tundra environments and lower, open valleys define the upper and lower elevational boundaries of this habitat. Drier, south and west-facing slopes may also break up the continuity of the cooler, mesic high-elevation forest habitat utilized by lynx. (Ruediger et al. 2000.) Snow-tracking data indicate that Englemann spruce and subalpine fir are the most common forest stands used by lynx in southwestern Colorado. Site-scale habitat data collected for lynx in Colorado indicate that lynx are commonly using forest stands that have Englemann spruce present in the understory from the snow line to at least 3.8 feet above the snow; thus lynx are using areas that provide winter browse for snowshoe hare (Shenk 2001). Additional forest types, high elevation sagebrush and mountain shrub communities found adjacent or intermixed with forest habitats, and riparian and wetland shrub communities also are potentially important habitat in many parts of the Southern Rockies, as they may support alternative prey species.

Density of lynx in an area is highly dependent on prey abundance. Home ranges of lynx are generally larger in southern habitats, where snowshoe hare densities are low. In western Wyoming, home ranges are approximately 42 square miles for males and 35 square miles for females (Squires and Laurion 2000). Lynx appear to remain close to their established home ranges in the winter and exhibit more extensive, exploratory movements in the summer (Squires and Laurion 2000; Shenk 2001).

Until recently, it was assumed that the historic distribution of lynx was sparse in mountainous areas above 9,000 feet in the Park, Gore, San Juan, and La Plata mountains, and the White River Plateau (Fitzgerald et al. 1994). However, recently recovered trapping records indicate that lynx may have been relatively common in Colorado in the early 1900s. Since 1925, less than 10 lynx records have been verified in Colorado (CDOW 1995). Until the recent lynx reintroduction effort, despite large-scale snow-tracking efforts, there were no verified records of lynx in Colorado since 1974, when a pair of lynx was trapped at the Vail ski area (CDOW 1995; McKelvey et al. 2000).

In an effort to establish a viable population of lynx in Colorado, 41 lynx were reintroduced into southwestern Colorado in 1999 and 55 lynx in 2000. Of the lynx introduced in 2000, 45 were released near the Rio Grande Reservoir, over 23 miles southeast of the project area. The remaining lynx were released west of the Continental Divide. As of February 2003, 45 of the original 96 lynx were dead and 51 still possibly alive. Of the 51 lynx, 31 were being tracked, 19 were missing, and one or two had a slipped collar. With the use of VHF and satellite transmitters, numerous travel corridors were identified as being used repeatedly by more than one lynx. One

of these travel corridors used for east-west movements includes the Rio Grand Reservoir, Silverton, and Lizard Head Pass. (Shenk 2001; CDOW 2003.)

The BLM and Forest Service have identified several lynx linkages in the Silverton area. These areas were defined based on the presence of suitable lynx habitat and are considered travel corridors between large blocks of potential lynx habitat in the region. The identified linkages are depicted in Figure B1, Appendix B and include Silverton-Lake City, Red Mountain-South Mineral Pass, Molas-Coal Bank Pass, Lizard Head Pass, Slummgullion-Spring Creek Pass, and the North La Plata Mountains. (CNHP 2002a) Highway 550, which connects Red Mountain and Molas passes and passes through Silverton is within some of these identified linkages and is known to be used by lynx.

In accordance with the Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000), LAUs have been developed for public lands in the Southern Rocky Mountains. An individual BLM LAU in the San Juan BLM Field Office, the Silverton LAU, was recently developed cooperatively by the Colorado Natural Heritage Program, BLM, Forest Service, and Colorado Division of Wildlife (see Figure B1 and B2, Appendix B; CNHP 2002b). The Silverton LAU is approximately 69,305 acres in size and encompasses the project area. Twenty percent of this LAU contains habitat considered suitable for lynx, of which approximately 12,920 acres is classified as potential denning and/or winter foraging habitat, and 1,183 acres as other potential lynx habitat (CNHP 2002c). The remainder of the acreage in the LAU is not considered suitable lynx habitat (see Table 3-6). Denning and winter foraging habitat in the LAU is defined as spruce/fir forest, and other potential habitat is defined as upland aspen or riparian willow stands within 1,640 feet of potential denning or winter habitat. With the exception of 16 acres of winter habitat, no distinction in the LAU is made between the potential denning and winter foraging habitat; it is simply referred to as denning/winter habitat.

Table 3-6. Canada Lynx Habitat in the Silverton Lynx Analysis Unit[1].

Total LAU	Denning/winter foraging habitat	Other habitat	Total suitable habitat	Non-suitable habitat
69,305	12,920 (18.6)	1,183 (1.7)	14,103 (20.3)	55,202 (79.6)

[1] Habitat presented in acres with percent of LAU in parenthesis.

The land inside the SOLRC boundary makes up about 3 percent of the Silverton LAU and contains roughly 570 acres of potential denning and winter foraging lynx habitat, approximating 29 percent of the boundary (Figure B2, Appendix B). About 100 acres of this habitat are located in private inholdings that are not available for SOLRC operations. Therefore, the SOLRC project area (BLM and private land available for SOLRC operations) contains approximately 470 acres of potential denning and winter foraging lynx habitat, comprising 24 percent of the land within the SOLRC boundary and 3.3 percent of the suitable lynx habitat within the Silverton LAU. The spruce-fir habitat within the project area is typical of that used by lynx in Colorado (Wait 2002a). The forested habitat does not have the thick understory common in boreal forests but does contain some shrubs and saplings that emerge above the snowline and are thus available for snowshoe hare browse in the winter. However, because of the high canopy closure in the interior of the forest patches in the project area, the understory component is sparse and is of limited value as winter foraging habitat. Forest edge habitat, such as that along avalanche chutes, roads, and other openings, contains a denser understory component because of the additional light that hits the

forest floor. These areas provide higher value winter foraging habitat than the forest interior. The forest habitat also contains some down logs that could be used for hare cover or lynx denning. The avalanche chutes and forest opening below the lift line are no greater than 100 to 200 feet wide and could be crossed by lynx. Lynx would primarily use the forested hillsides in the project area, as opposed to the alpine meadows and cirques, since the forest contains potential denning and foraging habitat.

The project area contains one existing compacted corridor during the winter months. Since the initiation of skiing in the project area, the trail under the chairlift has been used for access by, skiers, snowshoers, toboggans, and occasionally snowmobiles. Currently, snowmobile access is only partway up this trail, but SOLRC will likely have access to the top of the trail in the future to facilitate emergency needs. This trail is not groomed, but the snow becomes compacted with use. Compaction of this trail potentially creates access to portions of the forested slopes by lynx competitors.

Multiple lynx have been documented year-round in the Silverton area since their initial reintroduction, and some also have been recorded using the area seasonally, in the spring and summer. The seasonal use and movements are possibly associated with breeding activity. Lynx have been reported crossing the project area during travel movements. However, it is unknown if the project area includes home ranges of individuals, as the lynx are still exploring habitats and frequently switch areas of use. Canada lynx are known also to use the upper portion of Cement Creek adjacent to the proposed project area, and a dead collared lynx (cause unknown) was found along SH 110A in summer 2000. (Wait 2002a; Shenk 2003.)

Bald Eagle

Bald eagles are uncommon to locally common winter residents in Colorado at elevations below 8,000 feet and are rare summer residents (Andrews and Righter 1992). Migration of bald eagles from breeding to wintering areas generally takes place during November and December. Winter range usually includes areas of open water such as lakes or major river systems (Spencer 1976). Food availability is probably the most important factor determining wintering distribution and abundance of eagles (Steenhof 1976), with the winter diet consisting of live or dead fish, waterfowl, and mammals (Lish and Lewis 1975, Platt 1976, Beck 1980). In 2001, there were about 51 nesting pairs of bald eagles in Colorado, and the annual midwinter count shows a stable population of up to 800 eagles that winter in the state (CDOW 2002a).

There are no known bald eagle nest or roost sites in the Silverton area. Eagles move into the Silverton area during the fall and spend time along the Animas River perched in adjacent conifers and aspen. Eagles are generally more common in the lower reaches of the Animas River where fish populations are more common. As winter snow depths increase in the Silverton area, eagles generally move to lower elevations, or into adjacent Forest Service lands containing large lakes and reservoirs where they capture fish and remain there until significant ice over occurs. When ice over occurs, eagles move to even lower elevations along major river systems dominated by cottonwood riparian, and adjacent ponderosa pine and pinyon juniper habitats that provide winter range for big game (Garcia 2002a). Consequently, use of the project area by bald eagles is limited to transient use by fall and winter migrants. Given the lack of fish in Cement Creek, and winter snow depths in the area, roosting is highly unlikely.

Southwestern Willow Flycatcher

The southwestern willow flycatcher, a recognized subspecies of the willow flycatcher, is a Neotropical migrant that breeds in North America and winters in Mexico, Central America, and northern South America. It arrives at its breeding territories between mid-May and early June

and migrates south sometime in August. The flycatcher occurs from near sea level to over 8,500 feet, but is primarily found in lower elevation riparian habitats. The flycatcher's historical breeding range included southwestern Colorado, but currently the quantity of suitable habitat within the range is much reduced from historical levels.

The southwestern willow flycatcher usually breeds in patchy to dense riparian habitats along rivers, streams, or wetlands, near surface water or saturated soil, where dense growths of willows, seepwillow, arrowweed, boxelder, or other shrubs and medium-sized trees are present, often with a scattered overstory of cottonwood. They are also known to nest in thickets dominated by tamarisk and Russian olive but prefer native plant communities. Thickets of trees and shrubs used for nesting range in height from 6 to 98 feet, with lower-stature thickets (6-13 foot) occurring at higher elevation sites. (Sogge et al. 1997, FWS 2002.)

Riparian patches used by breeding flycatchers vary in size and shape, from relatively dense, linear, contiguous stands to irregularly-shaped mosaics of dense vegetation with open areas. Southwestern willow flycatchers have been reported as nesting in patches as small as 0.25 acres along the Rio Grande to as large as 175 acres in the upper Gila River in New Mexico. Flycatchers generally do not nest in confined floodplains where only a single narrow strip of riparian vegetation (<33 feet wide) develops, although they may use such vegetation if it extends out from larger patches. In addition to dense riparian thickets, occupied breeding sites are commonly adjacent to quiet, slow-moving, or still water. (FWS 2002).

Potential habitat for southwestern willow flycatchers is limited to two areas within the project area where patches of willow are present. The first area is located on the west side of South Fork Cement Creek near the Gladstone Mine site. The second area is located on the north side of SH 110A on both sides of Cement Creek in Tiger Gulch. A few additional patches of willow are present along Cement Creek in the project area, but patches are small and highly dispersed and do not meet the FWS criteria for suitable southwestern willow flycatcher habitat (FWS 2003). Three additional potentially suitable patches of willow are present outside of and south of the project area from Minnesota Gulch to Illinois Gulch. Southwestern willow flycatchers have not been documented in the project area, but surveys for this species have not yet been conducted. Cement Creek and South Fork Cement Creek are relatively high in gradient, which could preclude flycatchers from occupying the project area. In addition, riparian areas in the project area are over 10,000 feet in elevation, which is likely above the elevation used by breeding members of this subspecies. Furthermore, there are large segments along Cement Creek below the project area, from about two miles south of the project area at Illinois Gulch to about one mile northwest of Silverton, that do not contain willow riparian habitat. Englemann spruce and subalpine fir are the dominant vegetation species along this segment of Cement Creek, which could preclude some willow flycatcher movement up the drainage towards the project area. Large expanses of willow habitat are present along the Animas River, north and south of Silverton, which likely provide more suitable habitat for this flycatcher species.

Boreal Toad

In Colorado, the boreal toad is restricted to the southern part of the Rocky Mountains and occupies montane forest habitats between 7,500 and 12,000 feet. The toad requires breeding ponds, summer range, and winter refugia at various stages of its life history. This toad breeds in high-elevation wetlands and migrates to adjacent moist upland forests, meadows, or riparian habitats (Hammerson 1982). Open water is required for breeding, with typical breeding habitat occurring in beaver ponds and glacial kettle ponds (Verner and Boss 1980; Hammerson 1982). Breeding commences during snowmelt in May or early June (Hammerson 1982), and strings of

eggs are attached to vegetation in shallow pools or along lake margins in still water (Behler and King 1985).

Potentially suitable breeding habitat for boreal toads is present within the proposed project area in Colorado Basin where open water and boggy habitat occurs. However, no emergent vegetation is present in the lake and minimal vegetation is present on the lake perimeter for toads to attach eggs to. Furthermore, an adequate food source may be lacking in this area. The South Fork and main stem of Cement Creek are not considered suitable breeding habitat because of the steep gradient, lack of streamside vegetation, and contamination from mine effluvium.

Surveys for boreal toads were conducted by the BLM in August 2002 in Colorado Basin at the lake, bog, and in the surrounding vegetation. Accessible areas on BLM land along the South Fork and main stem of Cement Creek were also surveyed since the South Fork emerges from the bog below the lake in Colorado Basin. No boreal toads in any developmental stage were seen in Colorado Basin or the South Fork and main stem of Cement Creek. Fish and other aquatic vertebrates also were not detected during the surveys. It was also noted that very few insect larvae were observed (BLM 2002). Even though boreal toads were not observed in 2002, they could still potentially use the lake at Colorado Basin because this species does not breed successfully every year at elevations above 11,000 ft (Hammerson 1982). Toads could also use the forest and meadow habitat in the project area outside of the breeding season.

Uncompahgre Fritillary Butterfly

The Uncompahgre fritillary is endemic to southwestern Colorado having only been found in 10 populations (Ellingson 2002). Populations of the Uncompahgre fritillary are associated with large patches (at least 0.25 acre) of its larval host plant, snow willow (*Salix nivalis*) on north through east aspects above 12,600 feet. The sites where the fritillary butterfly has been found are leeward to alpine ridges, generally associated with areas where snow drifts. These areas have poorly developed soils and are usually covered with rock scree. The snow willow grows downslope from the scree where moisture from the slowly melting snow dirt is deposited. (FWS 1993.)

There are no known populations of the Uncompahgre fritillary butterfly in San Juan County. Surveys for the Uncompahgre fritillary have been conducted south and southwest of the project area in portions of San Juan County (south side of Storm Peak, Grand Turk, and Blair Lake). Few snow willow patches and no butterflies were observed in these areas (Ellingson 2002). The closest verified population to the project area is located approximately 13 miles away.

Several locations within the project area are above 12,600 feet and contain north through east-facing aspects, thereby consisting of topographically suitable habitat for the Uncompahgre fritillary butterfly. Portions of the project area that would be potentially disturbed by the proposed mountaineering and hiking routes were surveyed for the presence of snow willow in August 2001 and October 2002 (Cirrus 2001 and 2002). Less than a dozen patches of snow willow were identified along the mountaineering route, on northerly aspects in small flat areas below steep scree slopes. Only one patch of snow willow was identified along the proposed hiking trail, on a northeast-facing slope. In all instances, patch size was small, and less than the minimum size required by the butterfly. Because of the marginal quality of the snow willow habitat, and the lack of documented occurrences of this species in the vicinity, surveys for the Uncompahgre fritillary were not considered necessary by the FWS and were therefore not conducted in the project area (Ireland 2002).

3.4.3.3.2 BLM Sensitive Species

Two species occurring on the BLM State Director's sensitive species list, northern goshawk and Townsend's big-eared bat, could potentially occur within the project area.

Townsend's Big-Eared Bat

Townsend's big-eared bats utilize semidesert and desert shrublands, pinyon-juniper woodlands, ponderosa pine forests, mixed coniferous forests, mountain brush, and open montane forests from sea level to 10,000 feet. During the winter, they typically roost in deep mine shafts or caves, where microclimates are more stable. They remain at these sites, called hibernacula, from early fall to early spring. In summer, they roost in mines and caves, and occasionally in buildings. Big-eared bats are very sensitive to human disturbance and will abandon roost sites if disturbed. (Fitzgerald et al. 1994; Oliver 2000.)

Townsend's big-eared bats occur over most of the western two-thirds of Colorado and extreme southeastern Colorado to elevations of about 9,500 feet (Fitzgerald et al. 1994). One of the largest known Townsend's hibernacula is located in the La Plata Mountains, west of Durango. Surveys for bats were conducted in mines on private, Forest Service, and BLM land in the Cement Creek, Mineral Creek, and La Plata River drainages, northwest of the Durango Mountain Resort, and between the towns of Silverton and Ouray. Evaluations of mine sites indicated that most sites were too high and shallow to provide much potential for bat habitat. No mines were surveyed inside of the project area boundary, but four mines surveyed were less than 2 miles from the boundary, and an additional two were surveyed less than 3 miles away. No bats were observed in any of these six mines. Of all the mines surveyed, Townsend's big-eared bats were found only at four sites. Three were in the La Plata Mountains, over 32 miles away, and the fourth was near the town of Rockwood, about 22 miles southwest of the project area. The only other bat species observed during the survey effort was one long-legged Myotis (*Myotis volans*), about 4 miles north of the project area. All locations of Townsend's big-eared bats were at elevations below 7,600 feet, indicating that the project area is likely too high to support this species. (Forest Service 2000.)

Two abandoned mines are known within the project area, the Big Colorado and Silver Ledge mines. These mines do not provide habitat for bats because of the high elevation and lack of suitable openings. The Big Colorado mine is not thought to have above-ground openings large enough to support potential hibernacula, and the opening to the Silver Lodge mine has been closed with a grated culvert that does not allow access to bats. Additional mine adits and shafts could be present in the project area, but no above-ground openings have been identified during cultural resource surveys in the area or are known at this time. A few test holes have been identified, but they are too shallow to be used as hibernacula and are not accessible to people. The likelihood of Townsend's big-eared bats utilizing the project area for hibernating is extremely low since the project area is above the elevation utilized as hibernacula, and because of lack of suitable winter roosting habitat. It is possible that individuals could occasionally pass through the area while foraging and use rocky outcrops for overnight roosting.

Northern Goshawk

Northern goshawks are forest habitat generalists that use a wide variety of forest ages, structural conditions, and successional stages. Nest areas are typically located on northerly aspects in drainages or canyons, often near streams, and foraging areas contain a mosaic of forest types and conditions. Specific habitat attributes used include snags, downed logs, woody debris, large trees, herbaceous and shrubby understories, and a mixture of various forest vegetative structural stages

(Reynolds et. al. 1992). Selected goshawk prey includes squirrels, chipmunks, woodpeckers, jays, rabbits, and grouse.

The northern goshawk is a rare to uncommon resident in the foothills and mountains of Colorado, having been reported at elevations up to about 11,300 feet. Some individuals wander to above timberline, especially in fall. They occasionally migrate through or winter in the lowlands. (Andrews and Righter 1992.)

Goshawks are found across the San Juan National Forest, with the closest known nesting territory over 10 miles southwest of the project area, near Lime Creek. Goshawk nests in the Forest have been described as occurring in ponderosa pine trees within mature and late successional ponderosa pine forests and in aspen trees within mature and late successional ponderosa pine and mixed conifer stands. Surveys for goshawks have not been conducted in the San Juan Resource Area, and no known goshawk territories have been identified in the vicinity of the project area. Habitat in part of the project area is limited because it is above treeline and above 12,000 feet in elevation, and therefore not available for nesting. Forested portions of the project area provide suitable foraging habitat. Although goshawk nests on adjacent Forest Service lands occur primarily in mature ponderosa pine or aspen intermixed with mixed conifer, the spruce-fir habitat in the project area could also provide some potential nesting habitat, along with the aspen mixed conifer habitat just outside the project area (Garcia 2002b).

3.4.3.3.3 State Listed Species

One species on the State of Colorado list of threatened and endangered species, the wolverine, could potentially occur in the project area.

Wolverine

Wolverines utilize several habitat types and have been located from low-elevation, forested drainage bottoms to high-elevation, sparsely timbered cirque basins. In general, this species inhabits tundra and coniferous forest zones at higher altitudes during summer and mid to lower elevations during winter. Natal den sites have been located in Idaho in remote alpine cirques, with rock talus substrata, on north-to-northeast-facing slopes, suggesting that this type of habitat may be important to denning wolverines (Copeland 1996).

Wolverines are primarily scavengers and forage on carcasses of ungulates. They also hunt for snowshoe hares, marmots, mice, voles, ground squirrels, and grouse and will eat fruits, berries, and insects when other prey is unavailable (Hash 1987). Wolverines reportedly prefer to hunt around small meadows, timbered thickets, cliffs, riparian, and ecotonal areas. They are mainly active at night, but will occasionally hunt during the day.

Foraging habitat for wolverines is likely present throughout the project area, with the majority occurring in timbered habitat. Suitable denning habitat for wolverine is present in the project area, but is limited to areas above timberline that have concave slopes and contain rocky substrata. Aerial surveys were conducted for wolverine in the San Juan Mountains by CDOW with a fixed-wing aircraft on March 6, 1997. The survey area included portions of the SOLRC project area. Although no wolverine tracks were observed in the project area, the surveyors determined that the survey area contained good potential wolverine habitat (Byrne and Copeland1997).

There were several reports of wolverine in Colorado in the 19th century, although populations apparently were never high (Fitzgerald et al. 1994). The distribution of wolverine between 1961 and 1982, interpreted from a combination of confirmed, highly probable, and probably reports,

covered the majority of the Rocky Mountain ecoprovince in Colorado. The distribution of wolverine between 1983 and 1993 was greatly reduced, with fewer sightings reported and locations more dispersed throughout this ecoprovince (Maj and Garton 1994). During the period between 1982 and 1993, there were no confirmed reports of wolverine on any National Forest System lands in the state (Macfarlane 1994).

There were 32 verified wolverine reports in Colorado between 1878 and 1995, with the majority of these records from the 19th century. None of these records were from San Juan County. (Nead et al. 1985; CDOW 1995.) There have, however, been eight unverified reports of wolverine sightings in the County since 1975, of varying reliability (CDOW 2002b). The closest report to the project area was about 3.5 miles away and the furthest, about 18 miles away. The lack of confirmed wolverine reports in the County does not preclude their presence, as this species, with its secretive nature and tendency to inhabit remote areas, is difficult to detect. Because suitable habitat exists in the project area and vicinity, it is possible that wolverines, if present in the County, would utilize the project area.

3.4.3.4 Species of High Public Interest

Rocky Mountain Elk

Habitat utilized by elk varies by location and season. Generally, elk prefer mountainous country with mixed open, grassy meadows, marshy meadows, river flats, and aspen forest, as well as coniferous forests, brushy opening, forest edges, and shrub steppe habitat. During the summer elk spend the majority of their time in alpine and subalpine mountain meadows or in stream habitats. During the winter, elk congregate at lower elevations in valley bottoms and forage on south-facing slopes where snowpack is low. Thermal and security cover is required year-round by elk and generally consists of forests with large amounts of edge along grasslands or meadows. Calving grounds are used from mid-May through June in areas characterized by aspen, lodgepole pine, grassland/meadow, and mountain brush habitats. (Fitzgerald et al. 1994.)

Elk are herbivores, and are considered generalist feeders. In the Rocky Mountains, grasses and shrubs comprise most of the winter diet, with the former becoming of primary importance in the spring and summer months. Forbs become increasingly important in late spring and summer, and grasses again dominate the elk diet in the fall. (Kufeld 1973; Fitzgerald et al. 1994.)

Rocky mountain elk from Game Management Unit 74, which includes the project area, are seasonally present in suitable habitat within and surrounding the proposed project area. This area has been identified as elk summer range, with forage available in the alpine meadows and cover in the adjacent forest stands. Calving occurs at lower elevations and in different habitats than those present in the project area. Over 2,000 elk use the Silverton area in the summer and fall (Wait 2002b). Numerous elk move through the project area and surrounding land during this period, but this area is not considered a migration corridor. They usually leave for their winter grounds in mid-October.

No winter range has been identified in the Silverton area, as only limited numbers of elk winter there. A few elk are known to winter near Silverton, and about 50 along the south-facing slopes of the Animas River near Eureka and Middleton. There have been reports from residents of elk individuals in the Colorado Basin in the winter, but these animals were reportedly trapped in the basin by early snowfall. Additional elk wintering grounds, based on a limited number of radio-collared animals, are located south of the project area towards Durango, on Missionary Ridge and at Canyon, Tank, Coon, and Carson Creeks (Wait 2002b)

Grouse

Only one species of grouse, the blue grouse, potentially inhabits the project area. Blue grouse breed in open coniferous and aspen forests with a shrub understory or adjacent to shrublands. They spend the winter at higher elevations than summer habitat, primarily in Douglas fir and lodgepole pine forests of various age classes and tree densities (Andrews and Righter 1992). They have also been known to winter in spruce forests in southwest Colorado. Grouse roost in large conifers with dense foliage. Grouse feed primarily on needles and buds of conifers in the winter (Douglas-fir often important) and berries, insects, flowers, and leaves in the summer.

Potential brood-rearing habitat could occur within the forested portions of the project area. However, this habitat is not typical of that used by grouse in the region, and the scant shrub component in the spruce-fir stands likely renders this habitat unsuitable. The forested portions of the project area are likely more suitable as summer habitat and potentially winter habitat. However, grouse generally prefer to winter in forests with a Douglas-fir component.

White-tailed ptarmigan

White-tailed ptarmigan are a common summer resident in Colorado above timberline (Andrews and Righter 1992). Alpine habitat at or above timberline is used during the spring as breeding grounds, predominantly in rocky areas, krummholz, moist vegetation near snowfields and streams, and willow-dominated plant communities. During summer, ptarmigan use high elevation, sedge meadow habitat near receding snowfields. (Braun et al. 1993.) Ptarmigan commonly winter above timberline, but in western Colorado, where snowfall is heavy, they winter below timberline in stream bottoms or along avalanche chutes dominated by willow, spruce, and birch (Braun et al. 1976). Ptarmigan feed primarily on willow buds in the winter and forbs and willow in the spring. Summer diet includes more forbs than the other seasons and broods may also feed on insects.

Ptarmigan have been sighted in the project area during the summer. Spring and summer habitat is present above timberline, primarily in Colorado Basin, along South Fork Cement Creek, and in scattered rocky areas containing a willow component. Suitable winter habitat is present below timberline, primarily along the main stem of Cement Creek where willow is present. The location for up to four temporary foot/skier bridges proposed on SOLRC land occurs within this habitat. Potentially suitable habitat could also occur adjacent to the lower portion of South Fork Cement Creek. However, this land is privately owned and not available for SOLRC operations. The stretch of stream between Dry Gulch and Gladstone was a known wintering area in the 1970s and is presumably still used by this species. Habitat in the project area has likely become less suitable for ptarmigan due to sheep grazing of willow patches.

Recent research has found that cadmium poisoning exists among ptarmigan throughout central and southwestern Colorado, including the Animas River watershed in which the project area lies. Cadmium becomes concentrated in willow, the primary winter food, and consequently accumulates in the kidneys of ptarmigans. This has been shown to affect calcium balance and skeletal integrity of ptarmigan, and poisoned birds tend to have brittle bones and lay fewer eggs. Cadmium poisoning has resulted in reduced survivorship of adults, changes in population structure, and reduced breeding densities of ptarmigan. (Larison 2001 and Larison et al. [undated].)

3.4.3.5 Aquatic Species

The proposed project area contains a few streams and wetlands that have the potential to support aquatic species (see Figure 3-1). Colorado Basin contains a lake, surrounding wetlands, and the headwaters of South Fork Cement Creek. The South Fork runs north almost to SH 110A where it

joins the main stem of Cement Creek. Cement Creek runs southwest adjacent to the project area and SH 110A. The confluence of Minnehana Creek and Middle Fork Cement Creek with South Fork Cement Creek are within the northeast portion of the SOLRC boundary, but only a small portion of each stream is located within this area.

The entire Cement Creek watershed has been deemed incapable of supporting higher aquatic life due to water quality conditions arising from both natural and anthropogenic (drain adits and hard rock mine waste) causes (Anderson 2000). Cement Creek has a very low pH (~4.0) and very high loads of metals, in the form of aluminum, iron, zinc, and other precipitates. These conditions minimize, if not preclude aquatic life throughout the drainage (Simon et al. 2000). See section 3.2.3.2, Water Resources, for further information regarding water quality of Cement Creek.

Fisheries

Fish surveys were conducted in Cement Creek in 1984 and 2002. Results of these surveys found this tributary entirely devoid of fish. Absence of fish is likely due to a combination of poor water quality, limited food base, and the heavy coating of substrates with metal precipitates (Simon et al. 2000; Anderson 2000).

Fish stocking has not occurred in the Cement Creek Drainage since 1973. There has been one unconfirmed report of fish stocking in the lake in Colorado Basin at the headwaters of the South Fork Cement Creek. This lake, which occurs on privately owned land, was reportedly stocked about 5 years ago by a private trout grower with rainbow trout and rainbow trout/cutthroat hybrids. No additional fish have been stocked, and it is not known whether the stocked fish survived the severe winters in the basin. Because of the size of this lake, there is a small possibility that the fish survived the winters and are still present (Japhet 2003). However, during a recent survey of this lake for amphibians, no fish were observed (BLM 2002). If fish are still present in the lake, there is a remote possibility that they could be present in the South Fork Cement Creek. However, given the water quality conditions, especially in upstream reaches, it is considered highly unlikely (Japhet 2003).

Amphibians

As discussed in regard to boreal toads in section 3.4.3.3.1, the habitat for amphibians in the project area is poor in quality due to lack of emergent vegetation around the lake and near the streambed, the steep gradient of Cement Creek and its tributaries, and the reportedly low numbers of insect larvae. In addition, the high mineral concentrations and low pH in the main stem of Cement Creek preclude its use by amphibians. No amphibians were seen during site visits in 2001 and toad surveys in 2002. The presence of amphibians in the project area cannot be entirely discounted. There is still a low likelihood that amphibians could use the headwaters of South Fork Cement Creek and the lake and wetlands at Colorado Basin, as well as the forest habitat. However, the pH of the water in these areas (6.0) is slightly below that considered acceptable for aquatic life.

Aquatic Insects

Macroinvertebrates were sampled in Cement Creek in 1996 and 1997. Results of these surveys indicate that few taxa and low densities of aquatic insects exist in this drainage. Data analysis found the low taxa richness to be related to the large amount of orange precipitate occurring in Cement Creek. The precipitate was defined as a non-organic material coating the surface of the rocks and was comprised of metals in precipitate form. It is thought that the precipitate impacts macroinvertebrates by coating the substrate surfaces and filling interstitial space required by these insects. (Anderson 2000.)

3.4.3.6 Subnivean Species

The project area contains habitat for numerous small mammal species that live in the open space between the snow and the ground (subnivean space) during the winter months. Mammals inhabiting subnivean space include primarily shrews, voles, and mice. However, tree squirrels can inhabit this zone when temperatures are extremely cold (<-20C), and pika reportedly utilize this zone, as well as snow tunnels, for foraging. In addition, predators such as weasel and wolverine can burrow into this space while hunting. No special status-species in the project area live in the subnivean space.

3.4.4 Environmental Consequences

This section discloses potential impacts to the terrestrial and aquatic wildlife species discussed above that could occur under each alternative. Because most wildlife species tend to be highly mobile, the analysis of impacts to wildlife is closely linked to habitat impacts. Disturbance acres by habitat type are described in section 3.3.4, Vegetation.

Potential impacts to wildlife species associated with the SOLRC project include a relatively short period of disturbance during construction of trails and facilities, and disturbance associated with increased winter and summer use.

3.4.4.1 Proposed Action

3.4.4.1.1 Federal and State Listed Species and BLM Sensitive Species

Lynx

The SOLRC project area is within the Silverton LAU, contains approximately 470 acres of potential denning and winter lynx habitat, and is adjacent to three identified linkages (Silverton Lake City, Red Mountain South Mineral, and Molas/Coal Bank Pass; Figure B1, Appendix B). In assessing the effect of the Proposed Action on lynx, three sources of disturbance were considered: the impact of human presence, use of explosives, and habitat modification. Habitat modification was considered in terms of habitat loss, habitat linkages and snow compaction.

The level of human use of the project area would increase under the Proposed Action and could potentially disrupt lynx behavior. In the summer, recreational use would be confined primarily to designated trails and routes, thus limiting the potential for human-lynx encounters to specific areas. The only forested trail would occur underneath the ski lift (the Lift Trail). Lynx would likely avoid this trail during the summer because of the presence of hikers and bikers on the trail, and the operation and use of the chair lift. There would be an increase in use of County Road 52 (CR 52) during the summer, as it is connected to the mountaineering route. However, use would be by small groups and probably wouldn't be as disruptive to lynx behavior as the chairlift. In the winter, the majority of skiing would take place above timberline, or in non-forested openings or sparsely forested glades. Most of the forested areas within the project area would not be utilized because of tree density. However, the chair lift would be running throughout the day within the forested habitat and the Lift Trail would be used for access between the base area and the top of the lift. In addition, skiers would use CR 52 en route to a shuttle stop. Recreational use of the forested areas could effectively fragment lynx habitat and reduce the amount of security, travel, and winter foraging habitat available to lynx. See Table 3-7 for a depiction of acres of lynx denning/winter habitat that could potentially be disturbed by summer and winter recreation use of these areas.

Table 3-7. Canada Lynx Denning/Winter Foraging Habitat Potentially Disturbed by Summer and Winter Recreation.[1]

Disturbance	Chairlift	Lift Trail (existing)	Access Road[2] (potential mitigation)	CR 52 (existing county road)	Alternative Lift Trail[3] (Alt C only)
Summer Recreation (scenic lift rides, hiking, biking)	6.6 (0.5)	0.8 (1.1)	1.8 (1.0)	0.7 (0.5)	0.4 (1.0)
Winter Recreation (skiing[4], snowmobiling[5])	6.6 (0.5)	0.8 (1.1)	1.8 (1.0)	0.7 (0.5)	0.4 (1.0)

[1] Habitat presented as acres of trail, road, or lift alignment within forested habitat. Length (miles) of feature within forest habitat noted in parenthesis.

[2] If this mitigation measure is implemented, use of the proposed access road would replace winter use of the existing Lift Trail (habitat figures are not additive). Both could be used in summer for hiking and biking.

[3] This trail applies to Alternative C only. Use of this proposed trail would replace winter use of the existing Lift Trail. Both trails could be used in summer for hiking and biking.

[4] Limited skiing would also occur in non-developed portions of forest but would be confined to avalanche chutes and other natural openings. Since acreage available for tree skiing depends on tree density and skier ability, this figure is not reported.

[5] Snowmobile use associated with the proposed project would be limited to operational and emergency use of the Lift Trail or Access Road. Snowmobile use on CR 52 is an existing condition that would continue.

Lynx are known to utilize the project area, therefore an encounter with a recreationist is possible. However, because lynx are most active from dusk to dawn, and SOLRC has not proposed and would not conduct nighttime operations (see Mitigation Measure 15), natural temporal separation would occur between the lynx's period of activity and winter and summer recreation, reducing the probability of encounters. The result of an encounter could range from temporary disruption of foraging behavior, to avoidance of the project area during the periods of high recreation activity, to displacement of individuals during the ski period. It is also possible that lynx would become habituated to or tolerant of human presence as has been reported by many authors (Roe et al. 2000). SOLRC guests would be educated about the potential presence of forest carnivores in the ski area, and sightings of wildlife would be requested (see Mitigation Measures 17 and 18). Thus, in the event of lynx presence in the project area, the BLM and other pertinent agencies could implement appropriate measures.

With the implementation of the Proposed Action, use of SH 110A would increase. Lynx use has been documented on this road, thus an increase in vehicle use could potentially result in lynx-vehicle mortalities. However, given the low speed limit, the wide size, and the good condition of the road, and the fact that the majority of vehicle travel would occur during daylight hours, the likelihood of road mortalities occurring is very low.

The potential impact of the use of explosives on lynx is difficult to predict, as no studies examining the impacts of noise on lynx are known. Existing literature on the impact of noise on general wildlife is primarily focused on aircraft noise and sonic booms, and the effects are primarily related to the distance of low aircraft overflights from animals. Very little information exists on the impact of noise alone, without the visual stimulus of its source. However, simulated studies of the impacts of sonic booms on farm animals and mink have been conducted, and limited observations of wild animals have been made. Behavioral reactions of domestic animals

included occasional jumping, galloping, bellowing, and random movements. Reactions of mink consisted of occasional temporary alertness directly after the sound, and were reportedly similar to their responses to traffic, snowplows, barking dogs, and mine blasting. Reactions of wild animals to sonic booms ranged from none, to momentary reaction, such as raising the head, pricking the ears, and scenting the air. (Bell 1972.) Sonic booms are less localized, and can be louder and of longer duration than the sound created by explosives. In addition, noise from explosives is not associated with a visual stimulus. Probable impacts of the use of explosives on lynx could range from no response to a temporary startle response. It is also possible that lynx could become habituated to this disturbance. Use of explosives would occur for short periods throughout the day, primarily in the late morning before skiing commences, and would not occur at night. Therefore, the disturbance would be short-term and confined to the period of lowest lynx activity. This disturbance would be minimized by implementing several mitigation measures related to the timing of explosive use, and the initial scanning of slopes for lynx prior to avalanche testing (see Mitigation Measures 16 and 17).

Noise disturbance related to construction activities could also occur, but these disturbances would be localized and would only occur during daylight hours and snow-free months. Therefore, associated impacts to lynx would be short-term and confined to the period of lowest lynx activity.

Very little development is associated with the Proposed Action. With the exception of the rope-tow terminals above timberline, construction is limited to the lodge and yurts/cabins at the base of the chair lift, and an off-site explosives cache and maintenance/ storage building. The base area is located within an existing power right-of-way. Vegetation has been reestablished in this previously disturbed area through re-seeding efforts, and dispersed conifers are also present. A maximum of 20 trees would be removed from less than 0.2 acres in the base area for the construction of these structures. No trees would be removed for the construction of the off-site structures. To facilitate emergency exit, a few mature trees could be removed from the existing trail that switches back underneath and adjacent to the chair lift. See Table 3-5 and Table 3-3 for a description of impacts to vegetation community types, and disturbance acreages under the Proposed Action, respectively. The only other modification of vegetation in the project area would be the periodic pruning of the shrubs and seedlings under the lift alignment to a height of about two feet. The quantity of habitat removed or modified would be very small and limited to areas that have been previously disturbed, and the removal would not create a large gap in the forest canopy. Therefore this modification is not anticipated to negatively impact lynx movement or prey. It is possible that the future shrub and seedling layer below the lift could potentially increase foraging opportunities for lynx during the summer, as it could provide a patch of early successional vegetation that is limited within the adjacent spruce forest. However, because the area in the lift alignment is small, and because the shrub species that occur in the project area do not provide much structure or cover for lynx prey species, the potential habitat would not likely be significant to lynx and lynx habitat.

In addition to these elements of the Proposed Action, the safety mitigation measure calling for a potential emergency access road from the base area to the lift top (Mitigation Measure 26) would result in the removal of additional trees. The proposed road could be constructed along the alignment of the alternative hiking and biking trail described under Alternative C by blading a full-bench cut wide enough to accommodate a snowcat that could groom the road during the winter season. At full width (15 feet), the road would expose a surface area roughly equivalent to 3 acres with the total disturbed area being somewhat larger. The total area of access road that crosses through lynx denning/winter foraging habitat is approximately 1.8 acres (see table 3-7). If deemed necessary by the BLM, a mitigation measure calling for a portable toilet located near the base of the Colorado Basin hiking trail would be implemented (see Mitigation Measure 22).

The toilet would be above timberline, and no surface disturbance would be associated with its placement, thus habitat modification would not result.

The Proposed Action would not notably impact the existing habitat linkages surrounding the project area or the movement of lynx through these corridors. The presence of the lift and recreationists would not create a barrier to lynx movement, and the amount of habitat removed to construct base facilities would not be large enough to impact cover habitat or travel corridors. Although there could potentially be human-lynx encounters, the probability of encounter during travel would be reduced by the crepuscular nature of the lynx. Additionally, some of the forested habitat in the project area would remain unused by humans, thus providing lynx with secure areas for foraging, resting, and travel. With the exception of the lift alignment, the duration and intensity of other forested habitat impacts would be short-term and low. Furthermore, if lynx were to avoid the lift alignment and other forested terrain in the project area while traveling, there would still be undisturbed, forested habitat across SH110A that would be available for lynx use and would not impede their movement towards the adjacent habitat linkages.

Two roads, SH 110A and CR 52, are adjacent to and within the project area, respectively. These roads are plowed and groomed, respectively, during the winter and represent existing compacted corridors. Grooming of ski terrain would not occur under the Proposed Action. However, the trail under the ski lift would be used by snowmobiles, skiers, snowshoers, and toboggans and would become a compacted corridor during the ski season, as it has during the past seasons. Continued compaction of this trail would create access to forested habitat previously not available to lynx competitors because of snow depth. Opportunities for resource competition (hares) could increase between lynx and other predators such as coyotes because predators would be able to hunt on the forest edges adjacent to the trail. Ski compaction could occur in avalanche chutes but compacted corridors are not anticipated because skiing will be dispersed. No new trails would be created or additional compaction accrued in the forest interior, so access to areas adjacent to the lift trail would still be unavailable to lynx competitors. If Mitigation Measure 26 were implemented and an emergency access road were constructed and groomed from the base area to the lift top, this road would replace the existing compacted corridor (lift trail). However, opportunities for resource competition could be slightly greater than from the lift trail, because additional forested habitat would become available to lynx competitors from the access road (see Table 3-7).

As stated in Effected Environment (section 3.4.3.3.1), the SOLRC boundary contains roughly 570 acres of potential denning and winter foraging lynx habitat. Of this habitat, approximately 100 acres are located in private inholdings that are not available for SOLRC operations. Therefore, potential impacts to lynx described above could occur on up to 470 acres of forested habitat (3.3 percent of the suitable habitat of the Silverton LAU). However, SOLRC operations would be limited to small portions of the forested habitat associated with the chairlift, lift trail, avalanche chutes, and naturally occurring tree runs. The acreage associated with these features would be less than 10 acres.

The Biological Assessment prepared for this project determined that the Proposed Action may effect, but is not likely to adversely affect lynx or its habitat. This determination was based on the following factors, as described in detail above. Although there could be impacts from occasional human-lynx encounters and explosive noise, these disturbances would be short-term and minimized by the temporal and some spatial separation that would occur between recreation activities and lynx use of the project area. The majority of habitat removal would occur in previously disturbed areas and would not occur in a large enough area to impact habitat quality for lynx or hares or habitat linkages for lynx.

Bald Eagle
The Proposed Action would not affect bald eagles. Eagles are not known or expected to nest or roost in the project area because of lack of an adequate food source and because the elevation of the project area is above that generally used by this species. There is a remote possibility of incidental use of the project area by transient fall and winter migrants, and subsequently a short-term encounter with a skier. However, no impacts to eagle populations would result.

Uncompahgre Fritillary Butterfly
No impacts to the Uncompahgre fritillary butterfly are anticipated from the Proposed Action because populations of this species are not known or expected to occur in the project area, and because habitat would not be disturbed or removed. Existing patches of snow willow would be covered during winter and would therefore not be impacted by skiers. No large contiguous patches of willow were identified on the hiking trail or mountaineering route, so potential butterfly habitat would not be damaged during trail and route use. Snow willow habitat observed during trail construction would be avoided to the extent possible. Small isolated patches of snow willow on the mountaineering route could be walked on by hikers, but these patches do not constitute suitable habitat for the fritillary butterfly, so the butterfly would not be impacted.

Southwestern Willow Flycatcher
No impacts to the southwestern willow flycatcher habitat are anticipated from the Proposed Action because riparian habitat would not be removed. Impacts to individuals could potentially result from recreational disturbance if this species were in the project area. However, under normal weather conditions there would be temporal separation between the ski season and the flycatcher breeding season, as the birds would not arrive on their breeding grounds at elevations over 10,000 feet until at least mid-June, when the snowpack has generally receded. Furthermore, with the exception of the base area, where willow habitat is lacking, proposed summer recreation would generally not take place in riparian areas. Disturbance to flycatchers could also potentially occur from maintenance and construction activities. However, construction disturbances would only occur for the first few years of the project and maintenance disturbances would be short in duration. Furthermore, although these activities would be near riparian areas and willow thickets, they would not occur directly in flycatcher habitat.

The majority of the potentially suitable flycatcher habitat along South Fork Cement Creek near Gladstone is on private property and is not available for use by SOLRC. No footbridges are proposed, and limited, if any, recreational use would occur in this area. One of the proposed temporary foot/skier bridges would span Cement Creek within the willow patch in Tiger Gulch. This bridge would be in place during the ski season and would consist of large planks placed by hand across the stream channel. No habitat would be altered during bridge placement and removal. Crossings on this bridge by late-season skiers could potentially cause disturbance to flycatchers during their breeding season. With the exception of limited footbridge crossings on this bridge, skiers would not enter potential flycatcher habitat in the project area.

Boreal Toad
The Proposed Action would not affect boreal toads directly, and potential impact to habitat would be negligible. No toads were observed during survey efforts in the project area, but this species could potentially utilize the lake at Colorado Basin and the surrounding wetland habitat. No alterations to boreal toad habitat would result from the Proposed Action. No removal of wetland habitat would occur, and since no surface disturbance would occur in the vicinity of the lake, no input of sediment to the lake is anticipated. Potential nitrate residues from explosives would be extremely low and would be further diluted by snowmelt. Therefore, the impact to toad habitat

would be minimal or non-existent. See section 3.2.3.6, Water Resources, for further discussion on explosive residue and associated water quality standards regulating the concentration of organic chemicals in surface waters in Colorado.

Northern Goshawk
Nesting goshawks should not be impacted by the Proposed Action because no goshawk nests or territories have been identified within or adjacent to the project area. In the event that a goshawk nest were identified, it would be protected by a seasonal buffer (see Mitigation Measure 19). Goshawks would not be disturbed by winter recreation activities because the project area is too high in elevation for winter use. Forest and forest edge within the project area could potentially be used by foraging goshawks concurrent with summer activities. Summer recreation would be confined largely to designated trails with the majority of activities occurring on and adjacent to the chairlift, on CR 52, and above timberline. Construction activities would be confined to the trails, the rope tow alignments, and the base area, and would be completed within the first 5 to 10 years of the permit. Goshawk foraging behavior could be disrupted by summer recreation and construction activities, but the disturbances would be short-term in nature and would be limited to a small portion of the project area. If goshawks were foraging in the project area, they would likely avoid the lift alignment and forage in areas with less human presence. Therefore, there the majority of habitat potentially used for foraging by goshawks would be undisturbed.

Townsend's Big-eared Bat
No impacts to Townsend's big-eared bats are anticipated from the Proposed Action. Use of the project area by this species is likely limited to foraging and potential overnight roosting. Summer recreation and construction activities would be temporally separated from foraging and roosting activities and therefore would not impact big-eared bats. Winter recreation would not impact this species because bats would be hibernating during the winter, winter roosting habitat is lacking, and hibernacula are not known or expected to occur in the project area.

Wolverine
There have been no confirmed reports of wolverine in San Juan County and no reports of any type in the project area. However, the project area contains suitable foraging habitat for wolverines, and potential denning habitat exists in subalpine cirques on north-facing slopes. If wolverine were to forage or den in the project area, they would be potentially disturbed by skiers. Disturbance of denning females could result in abandonment of den sites, but this disturbance would be limited to areas above timberline that have concave slopes and contain rocky substrata. This disturbance would be further reduced since steep terrain and difficult access limit skiing in this area.

Disturbances could also result from avalanche control activities if wolverine were present in the project area. However, this potential disturbance would be minimized by implementing several mitigation measures related to the timing of explosive use, and the initial scanning of slopes for wolverine prior to avalanche testing (see Mitigation Measures 16 and 17).

Wolverines are mainly active at night, so there would be some degree of temporal separation of summer recreation and construction activities from wolverines. Impacts likely would be limited to avoidance of the lift alignment and base area during summer use. SOLRC guests would be educated about the potential presence of forest carnivores in the ski area (see Mitigation Measure 18). If wolverines were sighted in the project area by SOLRC guests or employees, the BLM would be contacted to confirm identification, and possible management action would be determined (see Mitigation Measure 17).

3.4.4.1.2 Species of High Public Interest

Grouse and Ptarmigan

Winter activities could potentially impact individual grouse and ptarmigan. Skiers could encounter these species while using the timbered north-facing slopes and avalanche chutes, and while crossing Cement Creek. Skier-bird encounters could disrupt foraging or roosting behavior, but disturbances would be short in duration and would be unlikely to cause long-term displacement of individuals. Since ptarmigan winter below timberline in areas of high snowfall, and winter habitat in the project area is primarily along the main stem of Cement Creek where willow is present, encounters with skiers above timberline are unlikely. Furthermore, encounters with grouse would be infrequent because the majority of skiing would take place above timberline or in naturally open or gladed areas. Likewise, since ptarmigan would likely utilize the riparian areas during winter, as opposed to the open areas used by skiers, encounters with this species would be infrequent. With the exception of temporary bridge crossings in select locations, skier activity is not expected to occur in riparian areas. However, there is the potential for wintering ptarmigan to be disturbed if their location were to coincide with that of one of the proposed temporary bridges.

Summer activities have the potential to impact grouse and ptarmigan since recreationists would utilize the hiking and biking trails within the forested and non-forested (above timberline) portions of the project area. If birds were foraging, roosting, or nesting near these trails, recreationists could disturb them and possibly cause a nesting bird to leave her chicks unattended. Noise and associated human presence during construction activities could also disturb grouse and ptarmigan. The disturbances would be short-lived, and it is expected that the displacement of birds would be temporary. There is a high likelihood that blue grouse would be using habitat containing more deciduous trees and shrubs, and at lower elevations than the project area during the summer, thus ameliorating this impact. Although individuals may be impacted by summer recreation, impacts to grouse populations are likely low. Given the current condition of ptarmigan populations and survivorship due to cadmium poisoning, disturbances that cause abandonment of nests could have more serious consequences to local populations.

Rocky Mountain Elk

Wintering, calving, or migrating elk would not be impacted by the Proposed Action because the project area does not contain wintering or calving habitat and is not in a migration corridor. Because elk winter at elevations below that of the project area, winter activities, including skiing and avalanche control, would generally be spatially separated from elk. However, if elk individuals were trapped in Colorado Basin because of an early snowfall, they would be subject to even greater stress from skiers and noise from avalanche control activities.

Elk use portions of the project area during the summer and fall and could potentially be disturbed by summer recreationists and construction activities. Since elk activity often occurs during the night and at dusk and dawn, there would be some degree of temporal separation between elk and human activity. However, elk are also known to forage during the day in high alpine valleys, especially when limited human use is present. The increase of summer recreation in the project area would present a new disturbance to elk, and could lead to short-term disruption in foraging activities, and potentially displacement of individuals or herds.

No large facilities or structures would be erected in the project area. Therefore, barriers and disruption to elk movement from structures would be minimal. Furthermore, since the project area is not used as a migration corridor, no disruption of elk migration to wintering grounds would occur.

The Proposed Action would not substantially modify habitat for elk. The vegetation removed would be minimal and would not constitute a large loss of forage or cover for elk. Human waste would be managed according to applicable county, state, and BLM regulations, and would not pose a risk to elk forage or water. See section 3.2.4.1.2, Water Resources, for a discussion of potential coliform contamination. Potential nitrate residues from explosives would be extremely low and would be further diluted by snowmelt, thus the impact to elk from explosive residue is considered negligible.

3.4.4.1.3 Aquatic Species

Fishes would not be directly or indirectly impacted by the Proposed Action because fish species are not present and cannot survive in Cement Creek due to the poor water quality of the stream.

Some sedimentation of Cement Creek could result from construction activities and use of roads and trails (see section 3.2.4.1.3, Water Resources). However, the quantity of sediment input is anticipated to be small, and the steep stream gradient would preclude sediment buildup, so no impact to aquatic species is anticipated.

There is the potential that explosive residue could affect aquatic habitat. However, the concentrations are anticipated to be very small and would be further diluted when they entered the water. The small concentrations of residues, combined with the poor quality of the Cement Creek Watershed, lack of fish and amphibians, and few species of macroinvertebrates, indicates that impacts to aquatic life would be negligible. See section 3.2.3.6, Water Resources, for further discussion on explosive residue and associated water quality standards regulating the concentration of organic chemicals in surface waters in Colorado.

3.4.4.1.4 Subnivean Species

The proposed permit area is within an avalanche prone region, and has historically experienced high intensity avalanches (CDOT 1996). More intensive avalanche control activities would take place under the Proposed Action, intended to result in more frequent, less intense avalanches. Because subnivean mammals, by definition, live underneath the snow, there is the potential for individuals to be impacted if avalanche control results in extensive compaction of subnivean space. However, three factors limit these potential impacts. First, avalanche control tends to reduce the size of avalanches and thus the snow load they place in the run-out zone. This tends to reduce compaction of subnivean space relative to naturally occurring avalanches. Second, avalanche control tends to reduce the frequency of avalanches that run to the ground and completely remove snow cover down to the ground. Thus the potential for complete removal of subnivean habitat due to complete snow removal is reduced. Third, more than half of the permit area lies outside controlled avalanche paths and thus would be unaffected by control activities. In addition, because small mammals have high rates of reproduction, and avalanches naturally occur in the project area, impacts would not cause a loss of viability to subnivean populations or species, or to their predators.

No impacts to subnivean species are anticipated as a result of skiing. Areas where skiing would occur are dispersed, would be used short-term and would not receive continued compaction, and would become snow covered after each snowfall. Furthermore, the weight of and resulting compaction from skiers would not be enough to eliminate the subnivean space between the snow and bare ground.

3.4.4.2 Alternative A – No Action

The No-Action Alternative would differ from the Proposed Action in that facilities and recreation would not occur on public land but would be restricted to the 344 acres of private land that SOLRC owns or has rights to use.

3.4.4.2.1 Federal and State Listed Species and BLM Sensitive Species

The same general types of impacts to lynx discussed under the Proposed Action would occur under the No-Action Alternative, but at a smaller spatial scale and higher level of intensity. Winter and summer recreation would be confined to SOLRC land and thus be more concentrated (see habitat associated with chairlift and lift trail in Table 3-7). The area where lynx could encounter people would be smaller, but the concentration of people in areas of potential encounter would be greater. The reduction in overall use of the forested habitat on public land, as compared to the action alternatives, would provide more security habitat for lynx, but the increased presence of people on SOLRC land would likely result in the avoidance of this area. This impact would be limited somewhat by the degree of temporal separation between lynx and recreation activities described above under the Proposed Action. The risk of vehicle-caused mortalities, although highly unlikely, would also increase under the No-Action Alternative but could be potentially less in the winter because of the low likelihood that SOLRC would receive 475 guests per day with limited available ski terrain (see section 3.7.4.2, Recreation). There would be less use of SH 110A and no use of CR 52 by guests under the permit. Likewise, the potential reaction to the noise created by explosives would occur under this alternative, but it would be less frequent because fewer explosives would be required to manage the limited ski terrain.

Modification and removal of lynx habitat would be the same as under the Proposed Action because construction activities are restricted primarily to SOLRC land. Likewise, impacts to linkages are not expected under the No-Action Alternative. Less forested area would be utilized under this alternative thus providing lynx with secure areas for foraging, resting, and travel on the southeast side of SH 110A. In addition, undisturbed forest habitat on the other side of SH 110A would be available for lynx use and would not impede lynx movement towards the adjacent habitat linkages.

Snow compaction would occur on the trail underneath the chair lift as under the Proposed Action, which could create exploitation competition for resources required by lynx. Since the available ski terrain would be limited under the No-Action Alternative, snow compaction could also result in other portions of land that were heavily skied. Skiing below timberline would occur primarily under the lift line, in existing avalanche chutes, and to a lesser extent in forested terrain where tree density does not preclude it. Snow compaction could likely occur to some degree on the skied chutes and could allow further access to forest prey by lynx competitors.

As under the Proposed Action, bald eagles, Uncompahgre fritillary butterflies, and Townsend's big-eared bats would not be affected by the No-Action Alternative. Southwestern willow flycatchers would not be impacted, as the two potentially suitable habitat patches identified under the Proposed Action are outside of the area available for use under the No-Action Alternative and would not be disturbed. As under the Proposed Action, there is still the potential for short-term disturbance to flycatchers from construction and maintenance activities. Boreal toads would not be impacted because construction and use of trails, routes, or toilet facilities on public land would not be authorized, and explosive residue would not concentrate in Colorado Basin.

Goshawk foraging behavior could be affected under the No-Action Alternative. Summer recreation would be more concentrated in the forested portions of the project area than under the Proposed Action since BLM land would not be used. Therefore the potential for recreation to disturb goshawks on SOLRC land would increase if the birds were utilizing the area and could cause goshawks to forage elsewhere. However, since the mountaineering route would not be available, CR 52 would receive less use under this alternative thus providing additional undisturbed forest habitat for goshawks.

The majority of terrain available for use under the No-Action Alternative does not provide suitable denning habitat, so the likelihood of winter recreation impacting denning wolverines is very low. If wolverine were in the project area, potential impacts from avalanche control activities would be minimized by implementing several mitigation measures related to the timing of explosive use, and the initial scanning of slopes for wolverine prior to avalanche testing (see Mitigation Measures 16 and 17). The potential impacts of summer recreation on wolverines would be the same as under the Proposed Action.

3.4.4.2.2 Species of High Public Interest

Rocky Mountain elk would not be impacted by winter recreation because they generally do not winter and would not be present in the project area. As under the Proposed Action, most of the summer recreation would be temporally separated from elk. Impacts would be minimal, consisting of temporary disturbances. There would also be some spatial separation between elk and people since restricting recreation activity to SOLRC land would leave ample room for elk to separate from human activity in the project area. The likelihood and frequency of elk-human encounters and associated disturbances would be less under the No-Action alternative.

The impacts of winter and summer recreation on grouse and ptarmigan would be the same as under the Proposed Action with the following exceptions. Impacts would be limited to those potentially created by use of the chair lift, ski terrain, and hiking/biking trail on forested habitat on SOLRC land. Encounters of recreationists with birds on SOLRC land could potentially occur more frequently in the summer than under the Proposed Action because use would be more concentrated. However, forested habitat on adjacent public land would not be impacted.

3.4.4.2.3 Aquatic Species

There would be less potential for impacts to aquatic habitat from sedimentation and contamination than under the Proposed Action since no facilities would be built and no trails constructed or used on public land. Likewise, there would be less potential for trace elements from explosive residue to concentrate in aquatic habitat because there would be less use of explosives than under the Proposed Action. Potential impacts of using the hiking/biking trail and foot bridges on SOLRC land would be similar to the Proposed Action but could potentially increase because recreational use would be concentrated on SOLRC land. In any case, given the poor quality of habitat in Cement Creek, impacts to aquatic species would be negligible.

3.4.4.2.4 Subnivean Species

The potential impacts to subnivean species would be similar to those under the Proposed Action but would be restricted to SOLRC land. No impacts to subnivean species are anticipated as a result of skiing. Since public land would not be utilized under this alternative, less explosives would be used for avalanche control and slope stability testing than under the Proposed Action, and less induced avalanches would result. Therefore, the potential impact to subnivean species would still exist, but at a much smaller scale than under the Proposed Action.

3.4.4.3 Alternative B – Guided-only Operation

Alternative B would differ from the Proposed Action by limiting winter use of public land to guests accompanied by guides, and by potentially utilizing a helicopter to access terrain. The guided-only option would make the most public land terrain available for use by the fewest skiers relative to the other alternatives. The result would be dispersed skiing throughout the permit area where safety permits.

3.4.4.3.1 Federal and State Listed Species and BLM Sensitive Species

The majority of skiing under Alternative B would occur above timberline, or in natural openings or glades, so the frequency of encounters with lynx on public land would be less than the Proposed Action or other alternatives. Since unguided skiing would occur on SOLRC land under this alternative and all alternatives, the frequency of lynx encounters on SOLRC land is expected to be similar (see habitat associated with chairlift and lift trail in Table 3-7). Potential road-kill of lynx could occur, but the likelihood is low, as described under the Proposed Action, and would be less than under the other alternatives because of the lower anticipated skier numbers per day and season (see section 3.7.4.3, Recreation). Potential impacts of explosive use discussed under the Proposed Action could occur, but since the guided-only approach to skiing emphasizes hazard avoidance as opposed to hazard reduction, the amount of explosives used under this alternative and associated impacts to lynx would be less than under the Proposed Action. The use of a helicopter during the ski season under Alternative B would cause both an aural and visual disturbance to lynx, and could potentially cause substantial modification of behavior.

Modification and removal of lynx habitat would be the same as under the Proposed Action, as construction would take place largely on SOLRC land. Likewise, impacts to lynx habitat linkages are not expected under the guided-only alternative. Winter recreation would be dispersed on public lands under this alternative and would probably result in fewer encounters with lynx than the Proposed Action, providing lynx with relatively secure areas for foraging, resting, and travel on the southeast side of SH 110A. In addition, undisturbed forest habitat on the other side of SH 110A would be available for lynx use, providing unimpeded lynx movement towards the adjacent habitat linkages. Snow compaction would occur on the trail underneath the chairlift as under the Proposed Action, which could create exploitation competition for resources required by lynx. Since winter recreation would be dispersed on public land under this alternative, compaction of other terrain is not expected. However, unguided use of forested terrain on SOLRC land could still occur, resulting in potentially compacted corridors in heavily skied areas.

Potential impacts to bald eagles under Alternative B would differ from the Proposed Action because of use of a helicopter to access terrain. Bald eagles are known to be sensitive to disturbance by aircraft, and noise and visual disturbance of a helicopter could preclude use of the project area by this species. However, since use of the project area would only be incidental, impacts to this species would be negligible.

As under the Proposed Action, Uncompahgre fritillary butterflies and Townsend's big-eared bats would not be affected by Alternative B. Potential impacts of recreation, construction, and maintenance on the southwestern willow flycatcher would be the same as under the Proposed Action. Potential impacts of summer recreation on boreal toads and goshawks would be the same as described under the Proposed Action. Potential impacts of explosive use associated with winter recreation on boreal toads would be less than under the Proposed Action since avalanche control explosive use would be less frequent under the guided-only alternative.

The potential impacts of winter recreation on wolverine under Alternative B would be similar to those described under the Proposed Action. However, use of a helicopter to access terrain would create an additional disturbance. If wolverines were foraging in the project area, the noise and visual disturbance of the helicopter could result in disruption of behavior and potential displacement from the project area. Likewise, if wolverines were denning in the project area, helicopter disturbance could cause them to abandon their den site. The potential impacts of summer recreation on wolverines would be the same as under the Proposed Action.

3.4.4.3.2 Species of High Public Interest

Potential impacts of winter recreation under Alternative B to grouse and ptarmigan would be the same as those described under the Proposed Action with the following exceptions. It is possible that more skiing would take place on SOLRC land than under the Proposed Action because of the reduced area open to unguided skiing. This could lead to a greater likelihood of encountering individuals of one of the bird species, if they were utilizing the project area. It is also possible that noise from the proposed helicopter would impact behavior of these birds. Potential impacts of summer recreation are the same as those described under the Proposed Action.

Potential impacts of winter recreation to elk under Alternative B are similar to those described under the Proposed Action. Since no winter range is present, no impacts are projected. However, if elk become trapped in Colorado Basin, they would incur additional impacts and stress from the noise of the helicopter. Potential impacts of summer recreation are the same as those described under the Proposed Action.

3.4.4.3.3 Aquatic Species

Potential impacts to aquatic species would be the same as those described under the Proposed Action and would be negligible.

3.4.4.3.4 Subnivean Species

The potential impacts to subnivean species would be similar to those under the Proposed Action. No impacts to subnivean species are anticipated as a result of skiing. Since fewer explosives would be used for avalanche control under the guided-only alternative than under the Proposed Action, fewer induced avalanches would result. Therefore, the potential impact to subnivean species would still exist but would be less frequent than under the Proposed Action.

3.4.4.4 Alternative C – Integrated Guided and Unguided Operation

Alternative C would differ from the Proposed Action by providing both guided and unguided skiing on public lands and facilitating tree skiing by selectively pruning limbs and thinning trees on north-facing slopes in the project area. In addition, an alternative hiking/biking trail would be constructed underneath the chair lift. This alternative would result in the greatest amount of available terrain and highest number of skiers relative to the other alternatives.

3.4.4.4.1 Federal and State Listed Species and BLM Sensitive Species

The potential impacts of Alternative C on Canada lynx would be the same as those described under the Proposed Action, with the following exceptions. The available ski terrain would be greatest under this alternative because of the integration of guided and unguided skiing options and the thinning of forested slopes. Saplings, seedlings, and pole-size trees would be thinned and limbed to facilitate tree skiing, primarily in avalanche chutes. Up to 20 percent of the stems within 182 acres of forest identified in the project area for thinning would be removed. See vegetation section 3.3.4.4 and the thinning polygons depicted in Figure 2-2 for further description of tree thinning. Thinning would provide areas for skiing currently unavailable in forested habitat

on both public and private land. As there are limited forested areas in and adjacent to the project area, thinning could potentially result in increased human-lynx encounters that could effectively fragment the habitat and reduce the amount of security and travel habitat and winter foraging habitat available to lynx. Projected impacts of encounters are addressed under the Proposed Action and would be the same. However, the likelihood of human-lynx encounters would be greatest under this alternative because of the increased terrain available to skiers and the greater number of skiers likely to be present (see section 3.7.4.4, Recreation). Forest thinning would also reduce habitat features utilized by prey species, such as the cover provided by lower limbs of trees. This would effectively reduce the value of winter foraging habitat for lynx, especially in and adjacent to avalanche chutes, where better quality foraging habitat is present. This impact would be lessened to some degree since no cut materials would be removed. Forest thinning could also increase habitat for prey species by the addition of woody debris (cut limbs and trees) on the forest floor, but cumulatively, there would be an overall loss in habitat quality. There is also the potential for shrub species and seedlings to develop in the thinned areas. However, since the thinning activities proposed under this alternative would have minimal affect on the forest canopy and the amount of light reaching the ground, the overall effect on the forest understory would be minimal and the potential beneficial effect on foraging habitat negligible.

The 1.7-mile alternative lift trail proposed under Alternative C would facilitate skier access between the base area and top of the lift. Construction of the trail would provide winter access to areas in forested habitat on both public and private land that currently, with the exception of the portion of trail that crosses the existing lift trail and alignment, are generally not accessible due to tree density. Approximately 1 mile of this trail would run through potential lynx denning and winter foraging habitat and the area of trail within forested habitat would be approximately 0.4 acres. This trail would be narrower overall than the existing lift trail because it would not contain as many switchbacks (see Table 3-7). As discussed for tree thinning, skiing and other winter use of the alternative lift trail could potentially result in increased human-lynx encounters that could effectively fragment the habitat and reduce the amount of security and travel habitat and winter foraging habitat available to lynx. In addition, snow on this trail would become compacted with use by skiers, snowmobiles (operational and emergency use only), snowshoers, and toboggans.

As this trail is proposed to replace winter use of the existing lift trail, it would not increase the number of compacted corridors in the project area. However, although the proposed alternative trail would be narrower than the existing lift trail, the alternative trail would increase the amount of forested habitat that could be entered by lynx competitors, as the trail alignment traverses a larger area of forest habitat than the existing trail (see Figure 2-1).

Construction of the alternative trail beneath the chair lift under Alternative C would also increase the amount of forested land that would be available for hiking and biking, as both the alternative lift trail and existing lift trail would be available for use (see Table 3-7). This could increase the potential for lynx-human encounters in the project area during the summer. As under the Proposed Action, lynx would likely avoid this trail during the summer because of the presence of recreationists on the trail, and the operation and use of the chair lift.

As under the Proposed Action, bald eagles, Uncompahgre fritillary butterflies and Townsend's big-eared bats would not be affected by Alternative C. Limited acreage of the thinning polygons overlap with riparian habitat. To ensure that potential southwestern willow flycatcher habitat would not be removed, Mitigation Measure 20 would restrict tree thinning to areas outside of riparian habitat and to species other than willow. With the implementation of this measure, potential impacts of recreation, construction, and maintenance on the flycatcher would be the same as under the Proposed Action. Potential impacts of summer recreation on boreal toads and

goshawks would be the same under Alternative C as under the Proposed Action. Potential impacts of winter and summer recreation on wolverine would also be the same, although the potential for an encounter would be slightly higher during the winter under this alternative because of the increased terrain available to skiers and the greater number of skiers likely to be present (see section 3.7, Recreation).

3.4.4.4.2 Species of High Public Interest

Potential impacts of winter recreation to grouse and ptarmigan under Alternative C would be the same as those described under the Proposed Action. However, the probability of encountering these species in the winter would be somewhat greater under this alternative since more terrain would be available and used, and a greater number of skiers would potentially be present. Potential impacts of summer recreation are the same as those described under the Proposed Action.

Potential impacts of winter and summer recreation to elk under Alternative C are the same as those described under the Proposed Action. Elk could potentially be disturbed by summer recreationists and construction activities and by winter recreationists if they were trapped in Colorado Basin. Although some thinning of the north-facing forested slopes would occur under this alternative, it would not substantially alter thermal or cover habitat for elk.

3.4.4.4.3 Aquatic Species

Potential impacts to aquatic species would be the same as those described under the Proposed Action and would be negligible.

3.4.4.4.4 Subnivean Species

The potential impacts to subnivean species would be the same as under the Proposed Action. No impacts to subnivean species are anticipated as a result of skiing. Use of explosives for avalanche control and slope stability may vary slightly from the Proposed Action, but the difference projected in terms of resulting avalanches would be minor and speculative.

3.4.4.5 Mitigation

The following suggested measures have been identified to mitigate potential impacts to wildlife resources:

15. Restricting nighttime activities to those associated with the overnight base-area facilities would decrease potential impacts to Canada lynx.

16. Restricting avalanche control activities to the period between 1 hour after sunrise and 1 hour before sunset, scanning the surrounding terrain for animals before using explosives, and not using explosives for 4 hours after an animal is spotted would minimize potential impacts to lynx and wolverine due to avalanche control.

17. If lynx or wolverine individuals, tracks, or dens were sighted within the project area, notifying the Columbine Field Office recreation planner and/or wildlife biologist and coordinating with CDOW biologists would assist agency monitoring of lynx and wolverine use of the area and devising appropriate management practices.

18. Posting information at the base area explaining the potential presence of forest carnivores in the area, describing what to do in the event of a wildlife encounter, and requesting that

wildlife sightings be reported would increase the guest awareness and assist the BLM in managing these species.

19. Establishing a 1/4-mile no-mechanized-activity buffer around known or detected active goshawk nests from March 1 to August 15 would protect nesting birds from disturbance. Establishing a 30-acre no-habitat-alteration buffer around known or detected active or suitable inactive goshawk nests year-round would maintain stand structure and would not reduce habitat suitability around the nest. Suitability of inactive nest sites would be determined by a wildlife biologist.

20. Restricting tree thinning to areas outside of the riparian zones and to species other than willow would protect habitat for snowshoe hare, ptarmigan, and southwestern willow flycatcher. (Note that this measure is only applicable to Alternative C, as forest thinning is not proposed under the other alternatives.)

3.4.4.6 Cumulative Effects

The cumulative effect area (CEA) delineated for the analysis of wildlife impacts encompasses over 107,000 acres, and includes the entire BLM San Juan Resource Area and Silverton LAU plus the Red Mountain-South Mineral and Molas-Coal Bank Pass lynx linkages along Highway 550, as defined in section 3.4.3.3.1. This area was chosen because it represents a forested and non-forested landscape surrounding the project area where past, present, and future management actions have and will occur, and it should provide enough potential habitat to support the home range of a lynx or wolverine, the two species in this analysis requiring the largest home ranges.

Of the cumulative actions listed in Chapter 2 (section 2.4), the following actions are not considered in this analysis:

- Expansions associated with the Telluride ski area and Durango Mountain Resort are not considered because these resorts are outside the CEA for wildlife.

- The shift in jurisdiction over SH 110A is not addressed in the wildlife cumulative effects analysis because management activities (i.e. maintenance, access agreements, etc.) are not expected to change. Cumulative impacts of use of SH 110A are addressed in relation to use of this road associated with snowmobile, four-wheel drive, and mining activities.

The remaining cumulative actions listed in Chapter 2 (section 2.4), snowmobile use, four-wheel-drive use, mining activity, and grazing have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects to wildlife resources.

3.4.4.6.1 Snowmobile Use

Snowmobiling has historically been the most popular winter activity in the CEA, occurring for over 20 years. Snowmobile use would continue in the CEA, including forested and non-forested portions along CR 52, and is expected to increase in the future. SH 110A does not currently receive use by snowmobiles, and no future use of the road for this purpose is projected. Snowmobiles create noise disturbance and increase human presence in remote areas. They also can provide a means for backcountry skiers to reach areas not accessible by vehicle. Disturbances to wildlife associated with snowmobile use could include increased movement, heart rate, and energy expenditure; result in avoidance of areas; and lead to displacement. Potential disturbances to wildlife from increased noise and human presence under the Proposed

Action would add cumulatively to that created by existing and increasing snowmobile use in the area.

3.4.4.6.2 Four-Wheel-Drive Use

Four-wheel-drive use is the most popular summer activity in the CEA. Vehicle use, particularly by ATVs, has been increasing over the last 10 years and is expected to increase in the future. Roads used frequently by four-wheel drives adjacent to the project area include SH 110A and a jeep road through Corkscrew Gulch. This form of recreation creates noise disturbance and an increase in human presence in remote areas. Disturbances to wildlife associated with recreational vehicle use could include increased movement, heart rate, and energy expenditure; result in avoidance of areas; and lead to displacement. Wildlife mortality from vehicle collisions, although unlikely, could also result.

Potential disturbances to wildlife from increased noise and human presence under the Proposed Action would add cumulatively to that created by four-wheel-drive vehicle use in the area. Since the majority of the areas used for summer recreation under the proposed project would not overlap with those used by ATVs, the cumulative effects are projected to be minor. However, areas where recreation use would overlap, such as portions of CR 52, could lead to displacement of species and potential abandonment of habitat. Increased noise and human presence in general could also reduce the habitat effectiveness of the CEA for some species. The potential for vehicle-caused wildlife mortality under the Proposed Action could also add cumulatively to potential mortality from recreational vehicles on jeep roads and known mortality from vehicles on Highway 550. However, as discussed in section 3.4.4.1.1, the likelihood of vehicle mortality on SH 110A is anticipated to be very low.

3.4.4.6.3 Mining

Mining activities have occurred historically at various intensities in the vicinity of the project area. Mining operations and associated traffic on SH 110A were high in the 1980s and have been small since the early 1990s when the Sunnyside Mine closed. Activities at the Sunnyside mine in the last decade has been limited to reclamation, resulting in few people using the road on a regular basis, and have had minimal impacts on wildlife. Reclamation efforts have increased the water quality of Cement Creek, but the creek is still considered uninhabitable by higher aquatic life.

Future operation of Gold King Mine, adjacent to the project area, would add cumulatively to wildlife impacts. Operation of Gold King Mine will increase the number of people in the Cement Creek watershed with the majority of the people concentrating at the mine site.

Use of SH 110A and 110B is anticipated to increase greatly when Gold King Mine is in full operation. Increases in traffic cause increases in noise and potential vehicle-wildlife collisions. Lynx have reportedly been killed on Highway 550 by moving vehicles. The increase in traffic projected on SH 110A and SH 110B from mining operations would add cumulatively to those projected from SOLRC's operations. Associated risks to wildlife would add cumulatively to those existing in the CEA.

Noise levels would increase in the vicinity of the project area from future mining activities at Gold King Mine. Noise level increases from mining have the potential to disrupt wildlife and could lead to avoidance or displacement of individuals. Potential disturbances to wildlife from increased noise and human presence under the Proposed Action would add cumulatively to that created by mining operations in the area.

Localized disturbance and habitat removal would result from mining development and could potentially disrupt bat habitat and degrade foraging habitat for raptors and carnivores. However, since the impacts of habitat removal under the Proposed Action were determined to be negligible, they would not add cumulatively to those impacts potentially resulting from mining activities.

Water quality in Cement Creek would likely be degraded during mining operations, but would be mitigated to some degree by water treatment. Given the current degradation of Cement Creek, and since the Proposed Action would result in negligible or nonexistent impacts to water quality and fisheries habitat, the impacts of the Proposed Action would not add cumulatively to those from mining activities.

There are no current or reasonably foreseeable future mining activities within the project area. Therefore, no activities associated with mining in the project area would add cumulatively to impacts to wildlife.

3.4.4.6.4 Grazing

The project area has been grazed seasonally by domestic sheep since the 1940s and is part of the Gladstone sheep allotment. Grazing occurs primarily during July and August when grasses and forbs are abundant. Quantitative estimates of the extent of the area affected by livestock grazing are not available for the CEA, but it is likely that the sheep graze most frequently in riparian bottoms where willow is present and other more level sites where animal access is relatively easy and other browse species are present. Grazing by domestic livestock reduces the forage available for ptarmigan, grouse, elk, and other wildlife species. Forage utilization by livestock in conjunction with other natural forage users, such as elk, could also represent a competetive situation between these animals and lynx prey. Additionally, grazing can alter snowshoe hare habitat through alterations of native plant communities such as high elevation willow (Ruediger et al. 2000).

Impacts associated with livestock use would add cumulatively to the impacts to wildlife associated with the proposed construction and winter and summer recreation activities. Given the poor condition of ptarmigan in the area due to cadmium toxicity, additional cumulative impacts could potentially affect their survivorship.

3.4.4.6.5 Summary

SOLRC's proposed permit would add cumulatively to additional human disturbances and the influence of human presence on wildlife populations. These include potential impacts to wildlife from increases in noise, recreation, and traffic resulting from past, present, and future snowmobile use, four-wheel-drive use, mining, and livestock grazing in the CEA. Impacts to wildlife could include increased movement, heart rate, energy expenditure, and potential wildlife-vehicle collisions; result in avoidance of specific areas; and lead to displacement. Indirect and direct impacts to wildlife from the proposed project would likely increase incrementally over time and add cumulatively to the impacts from other disturbances to wildlife populations in the CEA.

3.5 LAND USE

3.5.1 Issues Addressed

The land use issues identified through scoping and internal, interdisciplinary review include the following:

- The potential for restricted public access to the requested permit area, particularly for backcountry recreationists who are not guests of SOLRC.

- Potential effects on private property, access to private property, private property rights, and private property development potential, given the existence of private inholdings within and adjacent to the project area.

- The impact on other, ongoing commercial land uses in the area, specifically mining, livestock grazing, and helicopter skiing.

- The potential for expanded SOLRC operations in the future.

Note: While potential impacts on public recreational opportunities are discussed under the Land Use heading, the identified recreational issues associated with the SOLRC operation itself are addressed under Recreation, section 3.7. The impacts of avalanches and avalanche control efforts are discussed under Safety, section 3.8 and Transportation, section 3.9.

3.5.2 Analytical Methods and Assumptions

Data collected about current land uses in the project area consisted of interviews with San Juan County, CDOT, Gold King Mines Corporation, Sunnyside Mine, and BLM personnel.

Land ownership in the project area is complex and not thoroughly documented. The best available land ownership maps were used in this analysis and in SOLRC's operating plan. Numerous entities and agencies have surveyed property within the SOLRC boundary. Powers Elevation Land Surveyors surveyed the lift line, base area, and adjacent land claims. The BLM surveyed the Natalie Placer, Comstock, and Orleans mining claims (Jack Johnson Co. 2001). Salem Minerals surveyed the leased parking areas and John Stockton, a former county surveyor, surveyed the Elkton claim (Brill 2003a). All property where construction has or will occur has been surveyed (Jack Johnson Co. 2001).

3.5.3 Affected Environment

Private land within the project area is part of San Juan County's Mountain Zoning District. The intent of mountain zoning is to preserve the natural environment while allowing activities normally occurring in the mountains of the county. Within the mountain zone, only mining and milling, and activities which do not involve any construction or development of any sort (such as grazing, camping, picnicking, hiking, and outdoor recreation) are permitted as uses by right. All other uses within this zone are subject to county review and permitting processes. (San Juan County 2001b.) To allow for mixed use on SOLRC land, SOLRC applied for and has been granted a Planned Unit Development (PUD) permit by the county. SOLRC also has additional county permits for the development of the existing chairlift, base area, and temporary lodge.

Three primary forms of permitted land use occur within the permit area: recreation, mining, and grazing. In addition, there are several parcels of privately owned land within the permit area.

Land uses and associated regulations, where applicable, are described in this section. Impacts of the proposed permit on these forms of land use are analyzed in section 3.5.4.

3.5.3.1 Recreation on Public Lands

Public lands within and adjacent to the project area are used for a variety of recreation activities. Snowmobiling is the most dominant wintertime activity, although backcountry and Nordic skiing and snowshoeing also occur in the winter and early spring. Hiking, mountain biking, sightseeing, hunting, and four-wheel-drive use, are common summer and fall activities, with the latter being the most popular recreational activity in the Cement Creek drainage.

3.5.3.1.1 Summer Recreation

The project area contains portions of three pack/hiking trails that are used occasionally. One is located on the southwest side of the permit area in Zone 6, and crosses Cascade Gulch. Another is a short trail that parallels an unnamed stream on the west side of the permit area in Zone 3. The third is located on the east side of the permit area within Zone 4. Part of this trail runs along South Fork Cement Creek and eventually ties into CR 52.

There are also approximately 2.4 miles of old mining roads in Zones 1 and 2 of the SOLRC boundary in addition to the 1.6-mile trail underneath the chair lift. The trail under the lift receives use associated with current SOLRC operations (hiking and biking). Use of the other unimproved roads is limited and consists of hiking and biking. With the exception of the lift trail, these roads are accessed from CR 52 or SH 110A.

CR 52 runs south through the SOLRC boundary between Zones 2 and 4. This road accesses a seasonal residence, a weather station, and the lake in Colorado Basin, so it receives periodic use during the summer. CR 52 receives some use by mountain bikers, but use is limited because of motor vehicle presence on the road. This road is heavily used during the summer months by four-wheel-drives and also used by hunters in the fall to access public land.

An extensive road network covers the Cement Creek drainage, and the greater Silverton area, due largely to historic mining activities. This road network has facilitated significant use by four-wheel-drive vehicles, ATVs, motorcycles, and two-wheel-drive vehicles, where accessible. Adjacent to the SOLRC project area, SH 110A and a jeep road through Corkscrew Gulch provide opportunities for OHV recreation and access to US 550. Approximately a dozen tour operators from the surrounding region utilize SH 110A and account for 15 to 20 percent of vehicular traffic on this road (Speegle 2003). Hunters also use SH 110A in the fall to access public land.

Summer scenic chairlift rides are offered by SOLRC. Summer lift operations began in summer 2002 and consist of rides from the base area to the top of the lift, where the visitors take in the views, take photographs, take short walks, and engage in other such activities on SOLRC land.

3.5.3.1.2 Winter Recreation

Snowmobile activity is one of the most popular winter activities in the Cement Creek drainage, with the Silverton Snowmobile Club grooming over 100 miles of trails for use. Groomed trails are located along CR 52, above Gladstone, in the Minnehaha and Ross Basins, over to Eureka via Eureka Gulch, and down 110B to Silverton, and also up through Prospect Gulch towards Red Mountain (Huffman 2003). Within the project area, Colorado Basin and CR 52 are used on average, by about 15 snowmobiles per day, with most use occurring on weekends.

The Silverton Snowmobile Club hosts an annual snowmobile event within the SOLRC project area, on CR 52 and in Colorado Basin. The event consists of racing and hill climbs and has been held annually in April under a BLM Special Event Permit (Huffman 2003; Speegle 2003). The event attracted about 360 people in 2002.

An event called the Camel International Speed Skiing Championship was held intermittently from 1982 to 1991 in Colorado Basin on (informally named) Velocity Peak, just east of Storm Peak. Access up the mountain was provided by 4-wheel-drive vehicles and helicopter shuttles. The course ran down a couloir with the run-out into Colorado Basin. The 1991 event made use of a rope tow to move racers up the hill. Several world records were set on the site, until it was moved to Les Arcs, France, in 1992. (Hogan 2003a.)

Winter recreation in the SOLRC boundary also includes Nordic and backcountry skiing. CR 52 is used by about three to five Nordic skiers per day. This use is limited, presumably because of snowmobile traffic on the road. Until 2002, backcountry skiers accessed public land near the junction of SH 110A and CR 52, from which they hiked up to suitable ski terrain. The areas used for backcountry skiing from this access point included two prominent avalanche chutes, the Cabin Slide and Big Colorado Slide. These areas were used primarily on the weekends by up to ten people per day. A few smaller chutes on the west portion of the permit area have also been used in the past but are not used regularly because of their short length.

In February 2002, access to public lands within the SOLRC boundary was closed by the BLM for safety reasons, to protect backcountry recreationists from avalanches triggered by SOLRC's avalanche control efforts. Currently, a temporary boundary management plan is in place that provides backcountry access to public land from a gate at the end of CR 52 (see Figure C1. Appendix C). Public land available for skiing from this access point includes the southern portion of the SOLRC boundary (including portions of Zones 4, 5, and 6). Backcountry skiers have not been seen using this area during the 2002/03 ski season. No other backcountry access points exist, and public use of the remaining BLM lands within the SOLRC boundary is not permitted.

See section 3.7.3.3, Recreation, for further description of winter recreation within and adjacent to the project area.

3.5.3.2 Private Property

There are numerous parcels of private land within the SOLRC boundary. These parcels are patented mining claims granting owners with both surface and mineral rights. Of the 344 acres of private land used for SOLRC operations, SOLRC owns approximately 150 acres, and approximately 194 additional acres are available for use under individual leases and easements. Additional parcels of private land (approximately 300 acres) are present within the SOLRC boundary and are not available for SOLRC operations. Current structures occur solely on land owned or managed by SOLRC. Private in-holdings are only used by SOLRC under agreements made with landowners and identified in their operating plan. The chairlift, hiking/biking trail (Lift Trail), lift terminals, temporary lodge, explosives caches, and patrol shacks, are located entirely on SOLRC land.

Some private property within the permit area not owned or managed by SOLRC is closed to recreational use at the request of the landowners. Property closure boundaries are designated with signs in accordance with the Colorado Ski Safety Act of 1979, section 33-44-107 (4, 6). Under law, this requirement does not apply in heavily wooded areas or other non-skiable terrain. Skiers are informed about boundary markings and policies at the time of ticket purchase. Skier

responsibilities under the Ski Safety Act are designed to prevent skiers from skiing on a slope or trail that has been posted as closed, or knowingly entering public or private lands from an adjoining ski area that has been posted as closed (section 33-44-109 [3, 11]). SOLRC employees patrol closure boundaries and are directed to notify the county sheriff of violations.

There are two part-time residences located just outside of the SOLRC boundary. One is adjacent to SH 110A below Tiger Gulch and is considered an established winter residence. At the request of the landowner, SOLRC signed a boundary line adjacent to this residence in a manner that directs the skiers to the north where they can cross Cement Creek on BLM land, away from the private property. The other residence is located off of CR 52, uphill from lift-served skiing, and is infrequently inhabited. Because skiers are not directed towards this residence, property boundary signs are limited to those required under the Ski Safety Act, as previously described.

There are three additional private parcels adjacent to the project area that are permitted for single family home development. Access to these claims is via SH 110A. No dwellings have been built to date.

- Portions of SH 110A and CR 52 are periodically and temporarily closed during avalanche control work. Temporary signs and barriers can be used to denote road closures at five locations on SH 110A, and at one location (mile marker 0.1) on CR 52. Closure of SH 110A has occurred only three times since avalanche studies and SOLRC operations began in 1999. The county road has been closed frequently during SOLRC operations since a large amount of control work occurs on the east portion of the permit area. Closure of SH 110A is usually above access to the established winter residence described above, and closure of CR 52 limits access to the infrequently inhabited residence. Road closures associated with avalanche control activities are reported to the San Juan County sheriff, the road supervisor, and inhabitants of private residences. See section 3.9.3.3, Transportation, for further discussion of closures to SH 110A.

3.5.3.3 Commercial Land Use

Three primary categories of commercial land use exist in the vicinity of the project area: mining, grazing, and recreation, specifically helicopter skiing. These land uses are addressed below.

3.5.3.3.1 Mining

There are numerous abandoned mines and patented and unpatented mining claims within the SOLRC boundary, but none have current or pending permits for mineral exploration or extraction, and no mining activity is planned. Since 1994, congress has placed a moratorium on the issuance of mineral patents, and BLM is no longer accepting mineral patent applications.

There are two mines currently permitted just northeast of the project area, the Gold King and the Minnehaha mines. Both mines are operated by Gold King Mines Corporation and accessed via SH 110A. Gold King Mine (also known as American Tunnel) is located at the old town of Gladstone and Minnehaha Mine is located southeast of Gladstone in the Minnehaha Gulch. Gold King Mines Corporation will begin commercial operations in 2003. The mining operation is anticipated to employ 40 to 50 people working there year-round, with approximately 15 to 25 loads of ore trucked from the mine site to Howardsville Mill each day on SH 110A (Fearn 2003b).

There is also a current operating permit for the Sunnyside Mine, also at Gladstone. Production at Sunnyside Mine was terminated in 1991, and all portals have been sealed. Sunnyside Gold

Corporation is currently completing reclamation efforts specified under their Mining Permit. Reclamation activities are conducted by three employees year-round, and will be completed and terminated by the end of 2003.

3.5.3.3.2 Grazing

The Gladstone allotment is the only grazing allotment within the permit area. This allotment has been grazed seasonally by 900 to 1,200 sheep since the 1940s. No other livestock species have been permitted to graze in this area. The allotment contains 3,468 public-land acres, and encompasses the permit area. It is currently permitted to the Etchart Sheep Ranch for 924 sheep. Grazing is permitted from July 5 to September 5, with some yearly fluctuations of these dates.

3.5.3.3.3 Helicopter Skiing

Telluride Helitrax is the only helicopter skiing operation in Colorado. They have been in business since 1996, and operate under annual Forest Service and BLM special use permits. The Helitrax permit area covers over 25 square miles of mountainous terrain, from Telluride south to Durango Mountain Resort, east to Silverton, and north to Ouray. (Telluride Helitrax 2003.) This area includes the SOLRC permit area, but to date, Helitrax has conducted limited commercial operations there.

3.5.3.4 SOLRC Expansion and Development

There are no plans for SOLRC to expand operations beyond those described in this analysis (Jack Johnson Co. 2001). Any future proposal involving public land would be subject to NEPA review. Therefore this issue will not be further addressed in this analysis.

3.5.4 Environmental Consequences

This section discloses potential direct, indirect, and cumulative impacts to the land uses and private property discussed above that could occur under each alternative. Potential impacts to land associated with the SOLRC project include restricted access to public lands within the project area, temporary access restrictions due to road closures during avalanche control activities, and impacts associated with SOLRC visitation and operations.

3.5.4.1 Proposed Action

3.5.4.1.1 Recreation on Public Lands

Summer Recreation

The Proposed Action would not negatively impact summer recreation on public lands. Public access to BLM land in the permit area would continue. Access to SH 110A and CR 52 for four-wheel-drive use and other recreational uses would not be restricted, as road closures would not be associated with SOLRC summer operations.

Winter Recreation

The Proposed Action would restrict winter access to public lands within the SOLRC boundary. The winter boundary management plan currently in place would be applied during future ski seasons (see Mitigation Measure 21). Under this plan, backcountry access to public lands in the project area would continue to be provided from the end of CR 52 (see Figure C1, Appendix C). Public land available for skiing from this access point would include the southern portion of the SOLRC boundary (parts of Zones 4, 5, and 6). CR 52 would also be available for skiing and travel. No other backcountry access points would be provided, and public use of the remaining BLM lands within the SOLRC boundary would not be permitted. Closures would be signed in

accordance with the Colorado Ski Safety Act, section 33-44-107 (4, 6) and violators of closure boundaries would be subject to prosecution.

Information about public backcountry access, including a map and descriptive text, would be posted at the entrance to CR 52 and at the SOLRC base area. Access would be prohibited if CR 52 were closed for avalanche control activities or avalanche safety reasons. Road closure information would be available by contacting SOLRC or the county sheriff.

The following entities would be exempt from the public lands access restrictions, once safety conditions were assessed: (1) San Juan County officers, (2) San Juan County Search and Rescue personnel, (3) private property owners in the act of accessing their land, (4) CDOT, and (5) other entities with authorization under BLM special-use permits.

The number of backcountry skiers that would be affected by the closure of CR 52 and restricted access to public lands in the project area would be relatively small, as regular use in this area in the past has been limited to a few local and Durango residents. Snowmobile users would be affected to a larger extent by closures and access restrictions, as many local snowmobilers use CR 52 and portions of adjacent BLM land on a regular basis. When the road was not closed, snowmobile use, like backcountry skier use, would be restricted to CR 52 within the northern portion of the project area, including a portion of Colorado Basin, which has been heavily used by snowmobiles in the past (see Figure C1, Appendix C). Snowmobile use would be unrestricted in the southern portion of the project area, from just above the basin lake, thus there would still be some gentle terrain available for use. Closure of CR 52 would limit the days in a season that people could use snowmobiles in this region and could result in the utilization of different areas.

Special recreation events such as the snowmobile hill climb would not likely be impacted by the Proposed Action because these events would take place under BLM special use permits in late spring, when closure of CR 52 was unlikely because of reduced avalanche danger.

Although public access would be restricted within the SOLRC boundary under the Proposed Action, the number of people that use this area on a regular basis and would be affected is relatively small compared to the number of people that would potentially use the proposed ski area.

3.5.4.1.2 Private Property

The Proposed Action could impact access to private property. However, this impact would be limited to the periods when SH 110A or CR 52 was closed for avalanche control activities. Closures would be temporary, occurring only during winter months when occupancy of part-time residences was intermittent, and access to private claims was generally not necessary. Closures of SH 110A have been rare since SOLRC began their operations and are anticipated to be rare in the future because avalanche occurrence is infrequent on the north and west side of the project area and consequently, this area requires less avalanche work (CDOT 1996; Brill 2003d). In addition, the chances of avalanches running to the road are rare due to the long avalanche paths and flat run-outs (CDOT 1996). In the few instances that SH 110A has been closed in the past, the road was closed above Tiger Gulch and so did not impact the established winter residence along this road. Closures below this residence are anticipated to be rare in the future because of the low-likelihood of avalanches running to the road, thus impacts to access to this residence would be minimal. Closures of CR 52 have been frequent since SOLRC began their operations and are anticipated to continue at this rate in the future because of high avalanche frequency in this area. Currently, this road accesses only one residence, and the residence is occasionally used in the winter. If the property owner desired to access this land in the winter, access would be

impacted by the Proposed Action during periods of road closure. In general, access to private property along CR 52 would be limited by road closures associated with avalanche control. Owners of residences would be notified in advance of avalanche control efforts and associated road closures, and road closures would be signed.

Private property rights would not be impacted by the Proposed Action. Proposed developments and management and commercial activities would occur solely on land owned or managed by SOLRC or used under BLM permit. The proposed lodge, cabins/yurts, rope tows, and explosives cache would be located entirely on SOLRC land. The proposed mountaineering route, hiking trail, and foot bridges would be located on both SOLRC and BLM land, and the parking areas would be located on SOLRC land, permitted private land, and road right-of-ways (see Figure 2-1). Furthermore, the shuttle bus system would be designed to avoid private property by funneling skiers to specific pickup locations on SH 110A adjacent to SOLRC and BLM lands.

Private property boundary management would continue as under the current SOLRC permit. Private property within the project area not owned or managed by SOLRC would be closed to recreational use at the request of landowners. Property closure boundaries would be designated with signs in accordance with the Colorado Ski Safety Act of 1979, section 33-44-107 (4, 6). Skiers would be informed of boundary markings and policies at the time of ticket purchase. All skiers would be held accountable to the applicable rules under the Ski Safety Act regarding private boundary closures and other land closures (Ski Safety Act section 33-44-109 [3, 11]). SOLRC employees would patrol closure boundaries, and the county sheriff would deal with violators of closure boundaries accordingly.

If damage to private property resulted from SOLRC avalanche control activities or other operations, SOLRC insurance would cover damages in accordance with applicable Colorado civil statutes related to private property damage.

Private property development potential would not be impacted by the Proposed Action. Currently, the land use zoning within the permit area is Mountain Zoning District (San Juan County 2001b). Any proposed property development would have to go through applicable county processes, and a PUD permit would need be approved and granted by the county before development was allowed to commence. Currently, no such permits have been applied for, thus no impacts to planned development would result from the Proposed Action.

3.5.4.1.3 Commercial Land Use

Mining

There are no current or pending permits for mineral exploration or extraction, and no mining activity is planned within the SOLRC boundary. Thus the Proposed Action would not impact mining operations in the project area.

Access to Gold King Mine could be impacted occasionally if SH 110A were closed due to avalanche control activities. However, as discussed above (section 3.5.4.1.2), closures would be temporary and would occur infrequently.

Grazing

Grazing in the project area would not be impacted by the Proposed Action. Sheep grazing would continue within the Gladstone allotment under a BLM grazing permit.

Helicopter Skiing
Use of the project area by Telluride Helitrax could potentially be impacted by the Proposed Action. The Helitrax permit area overlaps the SOLRC permit area, as described in section 3.5.3.3.3. While Helitrax has conducted limited commercial operations in this area, current permitting would allow joint use. Such joint use might or might not be compatible, depending on the level of coordination between Helitrax and SOLRC. Coordination would be complicated by the fact that SOLRC use of the area of overlap would involve unguided skiing. This would make it difficult to control patterns and timing of ski use. At this point, the potential impact on Helitrax operation cannot be assessed because of their lack of use of the SOLRC permit area. Should conflicts occur in the future, the BLM would address them through the terms of their respective permits.

3.5.4.2 Alternative A – No Action

3.5.4.2.1 Recreation on Public Lands

Summer Recreation
The No-Action Alternative would not impact summer recreation on public lands, as the project area would only include lands owned or managed by SOLRC. Surrounding BLM lands would continue to be available for public use.

Winter Recreation
The No-Action Alternative would not restrict winter recreation on public lands, as the project area would only include lands owned or managed by SOLRC. Surrounding BLM lands would continue to be available for public use. Access to these lands could be disrupted periodically due to temporary closures of SH 110A and CR 52, as described under the Proposed Action. Since past access of BLM lands within the SOLRC boundary by backcountry skiers were primarily from SH 110A, disruptions to access because of closures to this road would be extremely infrequent. Disruption of access to the popular snowmobile trail on CR 52 would be greater, as this road would be closed more frequently. However, closures of CR 52 are anticipated to be less frequent than under the Proposed Action.

3.5.4.2.2 Private Property

Potential impacts to private property access would be the same as under the Proposed Action. Access to property would be impacted when SH 110A or CR 52 was closed for avalanche control activities. However, avalanche control activities would be confined to SOLRC land, as opposed to public land, so road closures would be less frequent.

The potential for indirect impacts to private property due to SOLRC operations would be less under this alternative because of the restricted scope of these operations. Fewer private parcels would be in a position to be affected by SOLRC management or recreation activities.

Private property rights and development potential would not be impacted by the No-Action Alternative. Proposed developments and operations would occur solely on land owned or managed by SOLRC. Private property within the project area not owned by SOLRC would be posted as closed to recreational use at the request of adjacent landowners in accordance with the Colorado Ski Safety Act of 1979. Colorado civil statutes related to private property damage would apply, as under the Proposed Action.

3.5.4.2.3 Commercial Land Use

Impacts to mining, grazing, and recreation would be the same as those described under the Proposed Action in section 3.5.4.1.3.

Potential use of the project area by Telluride Helitrax would not be affected under Alternative A. SOLRC operations would occur solely on their private land and would not affect Helitrax use of adjacent public land.

3.5.4.3 Alternative B – Guided-only Operation

3.5.4.3.1 Recreation on Public Lands

Summer Recreation
Access to BLM land in the permit area would continue to be available for public use, as described under the Proposed Action in section 3.5.4.1.1.

Winter Recreation
Winter access to BLM land in the project area would be restricted, as described under the Proposed Action in section 3.5.4.1.1.

3.5.4.3.2 Private Property

Impacts to private property access, rights, and development potential would the same as described under the Proposed Action in section 3.5.4.1.2. However, since all skiers would be led into terrain by a guide, the likelihood of potential boundary closure violations would be less than under the Proposed Action.

3.5.4.3.3 Commercial Land Use

Impacts to mining and grazing would be the same as those described under the Proposed Action in section 3.5.4.1.3.

Use of the project area by Telluride Helitrax could potentially be affected under Alternative B, as under the Proposed Action. However, SOLRC's use of the area of overlap between the two permits would be restricted to guided operations involving a maximum of 100 skiers. This would facilitate coordination of joint use. Furthermore, the helicopter skiing option under Alternative B would provide the potential for SOLRC collaboration with Helitrax in the future.

3.5.4.4 Alternative C – Integrated Guided and Unguided Operation

3.5.4.4.1 Recreation on Public Lands

Summer Recreation
Access to BLM land in the permit area would continue to be available during the summer for public use, as described under the Proposed Action in section 3.5.4.1.1.

Winter Recreation
Winter access to BLM land in the project area would be restricted, as described under the Proposed Action in section 3.5.4.1.1.

3.5.4.4.2 Private Property

Impacts to private property access, rights, and development potential would the same as described under the Proposed Action in section 3.5.4.1.2. However, since some skiers would be led into

terrain by a guide, the likelihood of potential boundary closure violations would be somewhat less than under the Proposed Action.

3.5.4.4.3 Commercial Land Use

Impacts to mining and grazing would be the same as those described under the Proposed Action in section 3.5.4.1.3.

Use of the project area by Telluride Helitrax could potentially be impacted by Alternative C, as described under the Proposed Action in section 3.5.4.1.3.

3.5.4.5 Mitigation

The following mitigation measure is suggested, and has been analyzed above, to reduce potential impacts to land uses within the project area:

21. Maintaining the boundary management plan implemented during the 2001/2002 season would provide for winter access to public lands and private inholdings within and adjacent to the permit boundary while affording protection from avalanches triggered by SOLRC's avalanche control, stability testing, and commercial skiing activities. This boundary management plan is described in Appendix C.

3.5.4.6 Cumulative Effects

The cumulative effect area (CEA) delineated for the analysis of land use impacts includes the Cement Creek watershed. This area was chosen because it contains existing land uses adjacent to the proposed project area and accessed by SH 110A and CR 52.

Of the cumulative actions listed in Chapter 2 (section 2.4), the following actions are not considered in this analysis:

- Snowmobile use is not considered because, although there would be direct impacts to snowmobile use from the closure of CR 52, no cumulative impacts due to increased snowmobile use in the CEA would result.

- Four-wheel-drive vehicle use is not considered because no land use issues were directly associated with four-wheel-drive use, and four-wheel-drive use does not impact the land uses discussed in this analysis.

- Expansions associated with the Telluride ski area and Durango Mountain Resort are not considered because these resorts are outside the CEA for land use.

- The shift in jurisdiction over SH 110A is not addressed because management activities (i.e. maintenance, access agreements, avalanche road closure agreements, etc.) are not expected to change.

- Grazing is not considered because direct and indirect impacts to grazing are assessed in this section, and grazing does not affect the other land uses discussed.

- Mining is not considered because, although access to mines would be impacted during temporary closures of SH 110A, no cumulative impacts due to mining activities in the CEA would result, and mining would not affect the other land uses discussed.

No cumulative actions listed in Chapter 2 (section 2.4) have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects to land use.

3.6 SOCIOECONOMICS

3.6.1 Issues Addressed

The socioeconomic issues identified through scoping and internal, interdisciplinary review include the following:

- SOLRC's impact on the local socioeconomic setting through increased recreational visitation and spending, job creation, growth in student enrollment, and other spin-off effects, particularly during the depressed winter season.

- Potential increases in property values, taxes, and the cost of providing utilities and services.

- The potentially added burden for search and rescue services and use of the Colorado "rescue card" by SOLRC guests.

- The availability of adequate emergency medical services, given SOLRC's remote location, the hazardous activities undertaken there (including construction), and the possibility of multiple injuries.

3.6.2 Analytical Methods and Assumptions

The study area for the socioeconomic environment includes surrounding towns (term also includes cities) that could be affected by the Proposed Action or an alternative to that action. Potential impacts of the Proposed Action or alternatives would come from increased visitation to the area, increased labor requirements, and the distance employees have to travel for work. Other impacts may include indirect influences on the local economies or populations as a result of economic success of the area (i.e., increased taxes, increased property values, increased development, etc.).

To focus this analysis, the following variables were investigated: population, employment, housing, community services, and local economy. The study area includes Silverton, Ouray, Ridgway, Loghill Village CDP, Montrose, and Durango which are in San Juan, Ouray, Montrose, and La Plata counties. While data exists for other towns within the four counties, only those most likely to be impacted by the proposed project were selected for in-depth analysis. Due to its proximity to the proposed project, the town of Silverton and closely surrounding areas in San Juan County would likely experience the greatest impact.

Analysis of the socioeconomic impacts of the proposed project focuses primarily on the geographic area where potential impacts would be concentrated (i.e., the town of Silverton and other towns along the north/south transportation corridor). Data used to determine potential impacts included results of the 2000 U.S. Census, communications with local authorities, reports detailing the economic condition of the study area, and data assembled on the internet. Information pertaining to the current operations of the SOLRC and future projected needs were gathered from SOLRC representatives.

3.6.3 Affected Environment

The historic socioeconomic environment in the study area was primarily focused around the mining industry. Mining was at its peak from the late 1800s through the early 1900s. During this period, the population of Silverton was as high as 4,500 persons. Silver was the main mineral extracted during the early years, but gold, lead, zinc, copper, and tungsten became important minerals to the area and carried the mining industry until its demise. During the early 1900s, most of Silverton's public buildings were constructed. Mining prosperity declined as the narrow gauge railroad lines declined, reaching a low point in 1952 when the Shenandoah-Dives Mine and mill shut down. The re-opened Sunnyside Mine and mill was a major employer in Silverton until 1991. (Town of Silverton 2003.)

While the mining industry is still functioning to some extent in the local area, the tourist industry has increased over the recent decades due to the region's scenic beauty and opportunities associated with the surrounding mountains. Summer and winter tourism opportunities exist throughout the study area as discussed in the recreation section. Today, Silverton's economy is primarily based on summer and fall tourism with about 220,000 passengers riding the rails of the narrow gauge rail road each year from Durango to Silverton and 230,000 annual visitors to the town (Reigh 2003a). On average, this converts to about 1,600 visitors arriving by train each day plus those arriving by other methods.

The social well being of the Silverton area is reflected in the comments received during scoping. While concerns are reflected those comments as stated in Section 3.6.1, the majority of the comments received focused on the needed economic boost the area would receive from the proposed project. With the closure of local mines and the lack of winter tourism, the economic well being of the area has been strained. The socioeconomic trends over the past decade have made it difficult for the economic well being of the area to be improved. Many commentors feel that San Juan County needs an economic boost, especially during the winter season, to strengthen the existing economic environment. Other comments noted concerns regarding impacts to property values and taxes, impacts to search and rescue services, availability of adequate emergency services, concerns about economic overload to residents forcing them out of the area due to increased tax burdens and increased public service costs, and the possibility of the areas over development.

The fundamental shift in the socioeconomic environment from a mining to a recreation tourism base has resulted in costs and benefits. Most of the changes have been associated with population, employment, housing, community services, and the local economy. These issues are of concern to elected officials, government administrators, and citizens in close proximity to the study area. The following sections discuss the existing environment in relation to potential socioeconomic changes that could result from the implementation of the Proposed Action or one of the alternatives.

3.6.3.1 Population

Population growth within the study area has varied over the past decade, primarily in relation to the mining and recreation industries. The latest available comprehensive population data was gathered by the 2000 Census effort. Portions of the study area have more than doubled the rate of growth of the State of Colorado over the past 10 years while other portions of the study area have declined (Table 3-8). The highest increase in growth rate has occurred in the Ridgway and Ouray areas with percentage growth rates in the mid to high 60s. The greatest declines have been in the portion of the study area closest to the proposed project, where population has declined approximately 25 percent over the past 10 years. This decline is primarily attributed to the

closing of mining operations in the Silverton area. In the recent past, 300 underground miners have been laid off due to closures (Skinner 2003b) which resulted in a dramatic decrease in the local population.

Table 3-8. Study area and state population change from 1990 to 2000.

Town/County/State	1990 Population[1]	2000 Population[2]	Percent Change 1990-2000
Silverton	716	531	-25.8
San Juan County	745	558	-25.1
Ouray	644	813	26.2
Ridgway	423	713	68.6
Loghill Village	No Data	311	-
Ouray County	2,295	3,742	63.1
Montrose	8,854	12,344	39.4
Montrose County	24,423	33,432	36.9
Durango	12,430	13,922	12.0
La Plata County	32,284	43,941	36.1
Colorado	3,294,394	4,301,261	30.1

[1] U.S. Census Bureau (1990).
[2] U.S. Census Bureau (2000a).

3.6.3.2 Employment

Like population, employment rates in the study area vary. Unemployment ranges from 0.8 percent in the town Ouray to 5.0 percent in Durango (Table 3-9). In the year 2000, the average unemployment for the State of Colorado was 3.0 percent (U.S. Census Bureau 2000b). The number of unemployed workers in towns most directly associated with the proposed project (i.e. Silverton, Ouray, Ridgway, Loghill Village, Montrose, and Durango) was 928 workers (Table 3-9). Table 3-9 also displays the major industries that occur in the study area. The primary occupations associated with the major industries in the study area include primarily management, professional, and related occupations as well as service, sales, office, and construction occupations. In the town of Silverton, recent mine closures have resulted in a shift from mining-related jobs to tourism-related jobs.

Employment at SOLRC consists of both winter and summer jobs. Current SOLRC employment consists of 11 full-time employees and three part-time employees during the winter, and five full-time employees and one part-time employee in the summer (Core Mountain Enterprises 2003).

3.6.3.3 Housing

The total number of housing units in the study area as of the year 2000 is shown in Table 3-10, which also identifies the number of occupied and vacant housing units. Vacant housing units in the study area vary from 20 units in Ridgway to 329 in Montrose. Vacant housing units in San Juan County total 363, which could be explained by the sharp decrease in population over the last 10 years as discussed above.

The distribution of vacant housing units is shown in Table 3-11. Vacant housing units are broken down into rental and owned units. The numbers of rental units vary throughout the study area. The town of Silverton had a rental vacancy rate of 23.1 percent, while Ridgway and Durango were around four percent (Table 3-11). Vacant housing units for seasonal, recreational, or

occasional use was also greatest for the town of Silverton when compared to other towns/cities in the study area.

Table 3-9. Study area employment and unemployment.[1]

Town/County	Civilian Labor Force	Number Unemployed	Percent Unemployed	Major Industry
Silverton	316	8	1.8	Arts, entertainment, recreation, accommodation, and food services.
San Juan County	329	10	2.1	Arts, entertainment, recreation, accommodation, and food services.
Ouray	402	5	0.8	Arts, entertainment, recreation, accommodation, and food services.
Ridgway	407	14	2.6	Construction.
Loghill Village	136	4	1.6	Construction.
Ouray County	1,885	67	2.2	Construction.
Montrose	5,623	304	3.1	Educational, health, and social services.
Montrose County	15,975	805	3.2	Educational, health, and social services.
Durango	7,975	597	5.0	Educational, health, and social services.
La Plata County	24,386	1,396	4	Educational, health, and social services.

[1] U.S. Census Bureau (2000b).

Table 3-10. Study area housing.[1]

Town/County	Total Housing Units	Occupied Housing Units	Vacant Housing Units
Silverton	432	260	172
San Juan County	632	269	363
Ouray	580	356	224
Ridgway	314	286	28
Loghill Village	182	132	50
Ouray County	2,146	1,576	570
Montrose	5,557	5,228	329
Montrose County	14,202	13,043	1,159
Durango	5,813	5,489	324
La Plata County	20,765	17,342	3,423

[1] U.S. Census Bureau (2000c).

Short-term accommodations exist throughout the study area and include hotels, motels, bed and breakfasts, and weekly cabin rentals. The short-term accommodations most impacted by the proposed project would be those in Silverton and elsewhere in San Juan County. The total capacity of short-term accommodations available for winter use is approximately 455 people (Silverton Area Chamber of Commerce 2001, Silverton 2003), with other private dwellings

available to some visiting guests. Short-term accommodations increase during the summer season with the availability of campgrounds and RV parks.

Current short-term visitation attributed to the SOLRC consists of 40 skiers per day allowed on public lands for the 2002/03 ski season. This level was recently increased from the previous level of 20 skiers per day. To date, SOLRC has operated Thursday through Sunday.

Table 3-11. Vacant housing units in the study area.

Town/County	For Rent[1]	Rental Vacancy Rate (%)[2]	For Sale Only[1]	Rented or Sold, Not Occupied[1]	For Seasonal, Recreational, or Occasional Use[1]	Other Vacant[1]
Silverton	25	23.1	14	2	129	2
San Juan County	25	22.3	17	2	315	4
Ouray	29	19.1	19	23	121	32
Ridgway	2	4.3	6	10	5	5
Loghill Village	1	10.5	7	3	21	32
Ouray County	37	8.3	57	54	327	95
Montrose	87	6.3	91	9	107	35
Montrose County	250	7.7	223	87	362	227
Durango	131	4.1	32	32	97	32
La Plata County	324	5.5	207	142	2,491	256

[1] U.S. Census Bureau (2000d).
[2] U.S. Census Bureau (2000a).

3.6.3.4 Community Services

Community services in the study area are shown in Table 3-12. Police/sheriff and fire protection services cover the study area. The towns of Ridgway and Loghill Village receive protection from the Ouray County Sheriff's Department and the Ouray Fire Department headquartered in Ouray. Law enforcement in San Juan County is responsible for the local population and visiting tourists throughout the year. The county receives on average 1,600 persons per day during the summer plus tourists travelling through the county (Skinner 2003b). Medical facilities are also distributed throughout the study area with smaller clinics in Silverton, Ridgway, and Ouray, and larger and more abundant facilities in Montrose and Durango. Emergency services are provided through the local sheriff's department for search and rescue. Local county sheriff's departments and search and rescue organizations can apply for the reimbursement of funds through the Colorado Search and Rescue Fund.

The Colorado Search and Rescue Fund is financed through surcharges on hunting and fishing licenses, registration of boats, off-highway vehicles, and snowmobiles, and through the sale of Colorado Outdoor Recreation Search and Rescue (CORSAR) cards (Colorado Department of Local Affairs 2002). The Colorado Search and Rescue Fund is administered by the state and operates pursuant to C.R.S. 33-1-112.5. The fund was initiated in 1987 for the purpose of reimbursing political subdivisions and search and rescue organizations for the costs incurred during search and rescue operations throughout the state and to provide funding for the purchase of search and rescue related training and equipment (Colorado Department of Local Affairs 2002).

Eight school districts occur in the four counties within the study area, with five school districts occurring in the six primary towns. Table 3-12 shows the number of students within the six primary towns associated with the study area. As expected, the Silverton School District is the smallest district in the study area with 77 total students. The number of students in the Silverton School District varied from two to 12 students per grade level in 2001 (Colorado Department of Education (2002).

Table 3-12. Community services in the study area.

Town/County	Police/Sheriff Departments (number)[1]	Fire Stations (number)[2]	Medical Facility Type (number)[3]	Students K-6 (number)[4]	Students 7-12 (number)[4]
Silverton	1	1	Clinics (2)	38	39
Ouray	2	1	Clinics (2)	127	106
Ridgway	-	-	Clinics (3)	173	133
Loghill Village	-	-	-	-	-
Montrose	2	1	Hospital (1) and Multiple Clinics	2,919	2,469
Durango	2	3	Medical Centers (2) and Multiple Clinics	2,366	2,381

[1] Capitolimpact.com. (2003).
[2] Yahoo! Inc. (2003a).
[3] Yahoo! Inc. (2003b).
[4] Colorado Department of Education (2002).

3.6.3.5 Local Economy

Local economies in the study area vary by municipality and county. The median household income, per capita income, and the percentage of persons below the poverty line are shown in Table 3-13. Data gathered in 1999 in the study area shows that the median household income and per capita income is lowest in the town of Silverton, while the percentage of persons below the poverty line is the greatest (Table 3-13). The same data shows that Loghill Village has the highest median household income and per capita income, while the town of Ridgeway has the lowest percentage of persons below the poverty line.

On a county-wide basis, San Juan County shows the lowest median household income and Ouray County shows the highest (Table 3-13). However, per capita income is lowest for Montrose County and highest for Ouray County. The percentage of persons below the poverty line is highest in San Juan County and lowest in Ouray County. When compared with state averages, the median household income for the state is greater than all towns/cities in the study area with the exception of Loghill Village (Table 3-13). The same is true for per capita income in that the state is greater than all areas except for Loghill Village and Ouray County (most likely due to such a high figure for Loghill Village). With the exception of towns/cities in Ouray County and the county as a whole, the remainder of the study area has a larger percentage of persons below the poverty line than the state average (Table 3-13).

Gross and retail sales can also be used to describe the local economy in the study area. Historic retail sales for counties in the study area from 1996 through 2000 are shown in Table 3-14. In the late 1990s, retail sales in San Juan County declined, while retail sales in other study area counties

increased, likely due to the changes in mining operations in the Silverton area. Table 3-15 gives a comparison of the 2001 gross and retail sales for towns/cities and counties in the study area.

Table 3-13. Economic indicators in the study area (1999).

Town/ County/ State	Median Household Income ($)	Per Capita Income ($)	Persons Below Poverty Line (%)
Silverton	30,486	16,839	21.6
San Juan County	30,764	17,584	20.9
Ouray	36,094	23,127	8.1
Ridgway	40,903	20,084	4.3
Loghill Village	68,958	30,034	6.6
Ouray County	42,019	24,335	7.2
Montrose	33,750	18,097	14.7
Montrose County	35,234	17,158	12.6
Durango	34,892	19,352	17.2
La Plata County	40,159	21,534	11.7
Colorado	47,203	24,049	9.3

Source: U.S. Census Bureau (2000b).

Table 3-14. Retail sales by county within the study area (thousands of dollars).

County	1996	1997	1998	1999	2000
San Juan	15,804	14,218	14,508	13,387	15,617
Ouray	34,828	38,224	41,099	42,683	44,294
Montrose	459,820	477,134	517,365	545,183	605,661
La Plata	758,798	769,613	831,822	883,846	975,301

Source: Colorado Department of Revenue (2002).

Table 3-15. Gross sales and retail sales in the study area (thousands of dollars).

Town/County	Gross Sales ($)	Retail Sales ($)
Silverton	13,523	13,227
San Juan County	16,869	16,578
Ouray	26,721	24,350
Ridgway	21,220	17,537
Loghill Village	-	-
Ouray County	52,715	46,409
Montrose	606,946	533,580
Montrose County	747,087	641,356
Durango	945,351	7,66,978
La Plata County	1,228,742	1,011,492

Source: Colorado Department of Revenue (2002).

Silverton's economy has suffered due to mine closures and continues to suffer during the winter season due to the lack of tourism opportunities. During the 2001/02 ski season, approximately 700 visitors came to SOLRC. As a result, the town's economy was boosted by about $34,200 in retail sales (about 15 percent). Increases in retail sales were reported for January through March

from restaurants, hotels, bars, and auto service businesses (Sluis 2002). This boost in retail sales came in spite of below average snowfall during the winter.

The level of skier visitation affects the local economy primarily through skier spending. Skier spending levels for Colorado resorts were last recorded for the 1996/97 ski season (Colorado Ski Country 1997). During the 1996/97 ski season, sales per skier visit averaged $146 with destination visitor spending averaging $189, and day skier spending averaging $49. During that same year, 69 percent of the skiers were destination and 31 percent were day skiers (Colorado Ski Country 1997).

Based on visitation discussed in the Recreation section, the installation of the chairlift for the 2001/02 season added 700 guests with 99 percent being destination skiers. Considering inflation of the 1996/97 skier spending (inflation rate determined using the Consumer Price Index [Sahr 2003]), the total amount in skier spending for the 2001/02 season was $149,100. The number of skiers recorded during the 2002/03 season was 2,700. Therefore, using inflated 1996/97 figures, the total skier spending for the 2002/03 season was projected to be $585,900. Skier spending includes all spending skiers would incur (i.e., travel, lodging, food, entertainment, recreation, etc.), not simply monies paid to SOLRC. Skier spending associated with the SOLRC has demonstrably improved the economic status of the Silverton area in the past 2 years.

3.6.4 Environmental Consequences

Potential impacts to the socioeconomic environment consist of direct, indirect, and cumulative effects. The Proposed Action and action alternatives could have both positive and negative impacts on the socioeconomic environment of the study area. Impacts could result from increased employees and increased visitors resulting in increased requirements for housing and community services and increased spending in the study area. The background environment against which the potential impacts of this project are assessed is described in the Affected Environment (section 3.6.3) above.

The scoping analysis identified a number of issues that describe the overall community sentiments regarding the proposed development. While these could be described for each alternative, the comments and concerns focused on either allowing development to occur in order to benefit the local economy or on prohibiting the use of public lands, and therefore the proposed development. Commentors that support the idea that more development should occur in San Juan County feel that (1) the economy would receive a much needed boost, (2) the winter economy is in need of improvement, (3) jobs would be added to the local area, (4) businesses that close down during the winter could remain open for much of the year, (5) opportunities for additional recreation would be increased, (6) the area could become a viable year-round community and destination, and (7) education opportunities with respect to avalanche control could be enhanced. Those that are against the use of public lands by a private enterprise feel that (1) use should be left to the public as a whole and not to an individual entity, (2) backcountry skiing experiences should not be changed, (3) costs of controlling avalanche terrain would be too great, (4) impacts would occur to surrounding landowners, (5) impacts could occur to other activities in the area, and (6) the length of the permit should be shortened to review impacts and adjust mitigation.

The concerns described point out the positive and negative aspects of increasing opportunities in the study area. Many of these effects could impact groups of people both inside and outside the local communities. These groups include extreme skiers, backcountry skiers, avalanche professionals, and other recreationists as well as citizens with no strong feelings about the

recreational aspects of the project but ideas about its costs and benefits to the community and region.

The following analysis for each of the alternatives is based primarily on the potential impacts of changes in employee or visitor numbers in the Silverton area. The projected number of employees is described below for each alternative. While the maximum number of skiers per day projected under each of the action alternatives would be 475, the actual number of visitors to the area would most likely differ for each of the alternatives as discussed below.

3.6.4.1 Proposed Action

3.6.4.1.1 Population

Under the Proposed Action, population changes in the study area would occur due to increased employees and increased visitors. Employment is discussed under section 3.6.4.1.2. During the winter season, the maximum number of visiting guests at SOLRC is projected to be 475 per day. The number of total skier visits on an annual basis would vary depending on weather conditions, avalanche closures, the number of days of operation, economic factors, etc. As discussed in the Recreation section, the annual visitation under the Proposed Action would likely range from 15,000 to 25,000 skier visits. When compared to the No-Action Alternative, the Proposed Action would be more likely to achieve this range in visitation.

Indirect impacts to population in the study area would occur as a result of the increased demand for goods and services by visiting guests. Goods and services would include groceries, food services, lodging, transportation, entertainment, auto repairs, etc. Increased demand for goods and services would require additional employees in the local community in the event that the current infrastructure and employment levels were not adequate, as appears likely in the winter.

As discussed below, employment would increase under the Proposed Action, which would result in an increase in the current population levels. Increases in employment would result from employees directly associated with the proposed project as well as indirectly through the increased demand for goods and services.

With the exception of San Juan County, the trend in population growth would be unchanged throughout much of the study area as a result of the Proposed Action. Within San Juan County, population growth due to direct and indirect impacts would increase gradually over a 5 to 10 year period until development was complete and the client base stabilized. After that period, population growth would no longer increase but would remain stable throughout the life of the permit with fluctuations possibly occurring due to external forces (e.g., weather patterns, national economy, overall skier markets, etc.).

3.6.4.1.2 Employment

Winter employment by SOLRC under the Proposed Action would increase above the current levels (see Table 3-16). Implementation of all elements of the Proposed Action would require an estimated 28 full-time employees and five part-time employees during the winter season (Core Mountain Enterprises 2003). This would be an increase of 22 full-time employees and one part-time employee above the No-Action Alternative discussed below. Winter employees under the Proposed Action would be required for administration, base area management, mountain operations, ski patrol, snow safety, ski guides, education programs, and other skier services.

Additional summer employment would also be required under the Proposed Action (see Table 3-16). Total summer employment would include an estimated 14 full-time employees and one part-time employee (Core Mountain Enterprises 2003). This would be an increase of four full-time employees and a decrease in one part-time employee when compared to the No-Action Alternative discussed below. Summer employment would be required for administration, base area management, mountain operations, education programs, and other center services.

Table 3-16. Projected SOLRC employment. [1]

	Current (2002/03)	Proposed Action	Alt A - No Action	Alt B - Guided Only	Alt C - Integrated
WINTER (FT/PT)					
Center Administration	1/-	2/-	1/-	2/-	2/-
Base Area Management/ Customer Service	1/-	3/-	-/1	2/-	3/-
Mountain Operations	2/-	5/1	2/-	2/1	5/1
Ski Patrol/Snow Safety	2/3	10/4	3/volunteer	8/2	8/4
Guides	5/-	2/-		6/6	6/6
Education Program		2/-	-/1	-/2	2/-
Rental Unit Management and Maintenance		2/-	-/2	1/1	2/-
Shuttle Bus Driver		2/-	No shuttle	Guides would drive	2/-
Total Winter FT/PT	**11/3**	**28/5**	**6/4**	**21/12**	**30/11**
SUMMER (FT/PT)					
Center Administration	2/-	2/-	2/-	2/-	2/-
Base Area Management/ Customer Service	1/-	3/-	3/-	3/-	3/-
Mountain Operations	2/-	4/1	2/-	4/1	4/1
Education Program	-/1	2/-	-/2	2/-	2/-
Rental Unit Management and Maintenance		2/-	2/-	2/-	2/-
Shuttle Bus Driver		1/-	1/-	1/-	1/-
Total Summer FT/PT	**5/1**	**14/1**	**10/2**	**14/1**	**14/1**

[1] Estimated employment 5 years into life of project.

Due to the nature of the work for some positions, specialized expertise would be required from outside the study area. However, many of the new positions would be filled by workers within the study area and would therefore reduce the level of unemployment referred to in the Employment section above. Many SOLRC employees would work both winter and summer seasons, so a number of positions would be considered year round. Adequate labor pools exist within the study area to fill the non-specialized positions that would be associated with the Proposed Action. As discussed in the previous section, indirect impacts to employment levels would occur in response to the increased demand for goods and services by visiting guests.

Employment would trend upward through the 5-to-10-year implementation period of the Proposed Action. Increased employment would primarily occur during the winter season due to direct and indirect employment needs. Limited increases would occur during the summer months through the life of the project.

3.6.4.1.3 Housing

Implementation of the Proposed Action would increase the need for short-term and long-term housing primarily in the Silverton area as well as in other portions of the study area. Short-term accommodations would be required for visiting guests in the winter and summer. During the winter season, a projected maximum of 475 skiing guests and those accompanying them could require short-term accommodations. However, it is likely that some of those skiing would be residents or day-use guests. As mentioned in the Recreation section, it is projected that a number of skiers staying in Telluride and Durango Mountain Resort would visit the project area for a day as part of their visit to other resorts. It is projected that the current short-term accommodation capacity of 455 persons would meet the needs of the Proposed Action, with few visitors being required to travel to other portions of the study area, and then only during the peak use seasons.

Long-term accommodations would be necessary for additional winter and summer employees required under the Proposed Action. The estimated employee requirement during the winter season would be 33, 23 above the No-Action Alternative and 19 above current employment levels. The estimated summer employee requirement would be 15, three above the No-Action Alternative and nine above current conditions (Core Mountain Enterprises 2003). As discussed above, there were 25 housing units for rent in the Silverton area in 2000 (U.S. Census Bureau 2000d). This level of housing availability is still considered to be accurate (Reigh 2003b). It is therefore projected that sufficient housing exists in the area to accommodate the additional employees required under the Proposed Action. Considering weekly rentals and the Hostel, it is also projected that sufficient housing would be available to accommodate employees required to meet increased needs for retail and service personnel in the community due indirectly to the Proposed Action.

In response to increases in employment and population, trends in short-term and long-term housing would also increase over a 5-to-10 year period.

3.6.4.1.4 Community Services

As discussed above, implementation of the Proposed Action would result in increased numbers of visiting guests and employees. The maximum increase in persons potentially requiring community services on a daily basis would be 494 (475 skiing guests and 19 employees), with average potential demand being less. The primary impact on law enforcement, fire protection, medical professionals, and schools would occur in the town of Silverton and San Juan County. However, serious medical emergencies would continue to be transported to larger facilities in Durango and Montrose. The San Juan County Sheriff's Department is staffed for the year-round county population as well as the peak summer visitation of 1,600 plus persons. The sheriff's department staff remains employed throughout the year (Skinner 2003b). The current staffing is projected to be adequate for the maximum increase in visitors and employees. The same is true for fire protection. The need for fire protection would not increase above the current capacity under the Proposed Action.

Medical services throughout the study area are provided on a year-round basis. Clinics in the closely surrounding area would likely see an increased level of activity due to the expanded recreational opportunities under the Proposed Action. Larger medical facilities in Montrose and

Durango would only have a slight potential increase in demand for services. Overall, it is projected that additional medical services would be required but would be within the capacity of the current medical system.

Under the Proposed Action, search and rescue efforts within the proposed project area would be provided primarily by SOLRC's ski patrol. Areas where safety is a concern due to avalanche danger would be closed to the public. Guided skiing opportunities would also be available. Therefore, the requirements of the sheriff's department for search and rescue efforts could be slightly less than under the No-Action Alternative due to the increased amount of terrain that would be covered by the ski patrol. While the local sheriff's department would still be involved, the level of effort could be reduced. Impacts to the Colorado Search and Rescue Fund would essentially be unaffected. With such a large donating base, the fund would see minimal impact in the event that an emergency occurred at SOLRC. San Juan County contains an extensive amount of extreme terrain, which currently requires search and rescue efforts on an occasional basis. The implementation of the Proposed Action is not projected to change demands on the Colorado Search and Rescue Fund.

Under the Proposed Action, it is assumed that the same ratio of school children to the total population would occur. Therefore, it is estimated that two additional students would be added to the local school district in Silverton due to direct SOLRC employment. This level of increase in the public school would primarily go unnoticed and would not result in any negative impact.

3.6.4.1.5 Local Economy

Under the Proposed Action, the local economy would grow due to the increase in skier spending, employment, tax revenues, etc. As discussed above, annual skier visitation would be projected to range from 15,000 to 25,000 persons. It is assumed that the percentage of destination skiers would be greater than the state average due to the type of experience offered but lower than what has been experienced in the first two seasons. Therefore, it is projected that about 80 percent of the visiting skiers would be destination visitors and about 20 percent would be day skiers. The Proposed Action would therefore result in annual skier spending ranging from about $2.8 million to $4.6 million, based on the estimates of daily skier spending presented in section 3.6.3.5.

The local economy would also benefit from SOLRC's summer operation, especially the scenic lift rides. Summer annual visitation is projected to be roughly the same as winter, though per visitor spending would likely be somewhat less. It should also be mentioned that some tourists who ride the train and purchase a scenic lift pass would include an overnight stay, which would increase summer revenue in the local area from the sale of lodging and food.

Employment levels would also slightly increase under the Proposed Action which would help to strengthen the local economy. Median household income and per capita income levels would not be affected to any appreciable degree. Tax revenues would also increase with additional visitation as more money was brought into SOLRC and the local visitor services. Increased tax revenues would also increase the level of support for community services.

Overall, implementation of the Proposed Action would strengthen the local economy, particularly during the winter season when it is needed most. As with any strengthened economy, property values would likely increase due to the additional opportunities available. The extent of the increase would be determined by a number of factors. The strengthened economy could also result in changes in the tax structure. Tax revenues would increase to the town/county due to increased skier and resident spending which would allow improvement to the services offered.

3.6.4.2 Alternative A – No-Action

3.6.4.2.1 Population

Under the No-Action Alternative, population levels would remain similar to current conditions. Visiting guests to the SOLRC would still be limited to 475 persons per day by the county, but total skier visits on an annual basis would be lower than under the action alternatives. As discussed in the Recreation analysis (section 3.7), annual visitation levels would vary due to weather conditions, skier crowding, economic conditions, etc., and is not projected to achieve the range described for the Proposed Action. Direct impacts to the population levels in the study area would be minimal. The only expected change would occur in the summer with slightly increased employment levels as discussed below.

Indirect impacts to population levels in the study area are also projected to be minimal. Without increased demand for goods and services, population levels are projected to remain fairly constant. Trends in population levels would be projected overall to remain fairly constant over time in the absence of other projects or mine closures occurring in the area.

3.6.4.2.2 Employment

Winter employment requirements under the No-Action Alternative would decrease from current levels due to skiing activities being restricted to private lands (see Table 3-16). Implementation of the No-Action Alternative would require an estimated six full-time employees and four part-time employees during the winter season (Core Mountain Enterprises 2003). Winter employees would be required for administration, base area management, mountain operations, ski patrol, snow safety, education programs, and other skier services.

Summer employment requirements under the No-Action Alternative would increase from current levels due to the addition of educational programs (see Table 3-16). Summer employment levels would include an estimated 10 full-time employees and two part-time employees (Core Mountain Enterprises 2003). Summer employees would be required for administration, base area management, mountain operations, education programs, and other center services.

Overall, winter SOLRC employment levels would decrease and summer SOLRC employment levels would increase from current conditions. Through the life of the project, the No-Action Alternative would not notably affect the unemployment rate in the study area.

3.6.4.2.3 Housing

Under the No-Action Alternative, the need for housing in the Silverton area would increase much less than under the action alternatives. Short-term and long-term housing would be required in the study area. Short-term accommodations would be required for visiting guests in the winter and summer. As with the action alternatives, the projected daily maximum of 475 skiing guests and those accompanying them could require short-term accommodations. As discussed in the Recreation section, it is unlikely that the 475-skier figure would often be reached due to the likelihood of overcrowding and the limited skiing opportunities available. It is likely that some of the visiting skiers would be residents or day-use guests. It is less likely under the No-Action Alternative that skiers staying in Telluride and Durango Mountain Resort would be attracted to the project area as part of their visit to other resorts. It is projected that the current short-term accommodation of 455 persons would meet needs under the No-Action Alternative.

Long-term housing accommodations would be necessary for additional summer employees required under the No-Action Alternative. The estimated employee requirement during the

winter season would be 10, four less than current employment levels whereas the summer requirement would be 12, six more than current conditions (Core Mountain Enterprises 2003). Some of the summer employment would consist of employees used in the winter and who would therefore be year-round employees.

As discussed above, there were 25 housing units for rent in the Silverton area in 2000 (U.S. Census Bureau 2000d). This level of housing availability is still considered to be accurate (Reigh 2003b). It is therefore projected that sufficient housing exists in the area to accommodate the housing requirements of the additional employees required under the No-Action Alternative. Considering weekly rentals and the Hostel, it is also projected that sufficient housing would be available to accommodate employees required for additional retail and service demand resulting from SOLRCs operation.

Under the No-Action Alternative, the trend in housing is projected to increase over the next few years with the current infrastructure in place due to the potential for increased visiting guests. Most of the increase in housing trends would occur in the short-term market with minimal changes occurring in the long-term market.

3.6.4.2.4 Community Services

Under the No-Action Alternative, the number of visiting guests and employees would increase somewhat. The maximum increase in persons potentially requiring community services would be 481 (475 skiing guests and six employees). The primary impact on law enforcement, fire protection, medical professionals, and schools would occur in the town of Silverton and San Juan County. However, serious medical emergencies would continue to be transported to larger facilities in Durango and Montrose. The current staffing of the local sheriff and fire departments is projected to be adequate for the maximum increase in visitors and employees.

Medical services throughout the study area are provided on a year-round basis. Clinics in the closely surrounding area would likely see an increased level of activity. Larger medical facilities in Montrose and Durango would only have a slight potential increase in demand for services. It is projected that additional medical services could be required but would be within the capacity of the current medical system.

Under the No-Action Alternative, search and rescue efforts on private lands within the ski area would be provided by SOLRC's ski patrol. Ski area boundaries would be marked, but public land areas beyond would not be patrolled. As a result, demands on the sheriff's department for search and rescue efforts could increase relative to current conditions (see section 3.8.4.2.1). Local sheriff involvement would continue as needed. Impacts to the Colorado Search and Rescue Fund could likewise increase from current conditions.

Under the No Action Alternative, it is estimated that the number of students in the area schools would not change as a result of SOLRC employment.

3.6.4.2.5 Local Economy

Under the No-Action Alternative, the local economy would grow due to the increase in skier spending, employment, tax revenues, etc. However, growth would be constrained when compared to the Proposed Action due to the decreased likelihood that skier visitation levels would actually reach the level described for the Proposed Action. It is likely that the level of skier spending would be less than the bottom of the range projected under the Proposed Action.

Employment levels would slightly increase during the summer under the No-Action Alternative which would help the local economy. Median household income and per capita income levels would not be affected. Tax revenues would also increase with additional visitation as more money was brought into SOLRC and local visitor services. Increased tax revenues would increase the level of support for community services.

Overall, the No-Action Alternative could strengthen the local economy, particularly during the winter season, but to a lesser degree than the action alternatives. Therefore, benefits described under the Proposed Action would occur, but to a lesser extent.

3.6.4.3 Alternative B – Guided-only Operation

3.6.4.3.1 Population

Under Alternative B, population growth in the study area would increase above that described for the No-Action Alternative due to additional skiers and an increased number of employees. Daily skier visitation would not be expected to exceed 475 persons. Annual skier visitation levels would exceed that of the No-Action Alternative but would be less than the Proposed Action (see Recreation analysis). Annual skier visitation levels could range from 15,000 to 25,000 but would be less likely to reach the high end of the range.

While it is recognized that indirect impacts would be less than those described under the Proposed Action, the types of impacts would be similar. Therefore, an increase in employees would be likely to supply additional goods and services to visiting guests. As with the Proposed Action, direct and indirect increases in employment would result in higher population levels.

The primary additional employment requirement for the winter season would be skier guides. Therefore, many of the new winter positions would likely be filled from persons outside the study area which could slightly increase the population levels within the study area.

3.6.4.3.2 Employment

SOLRC employment requirements under Alternative B would increase from current levels due to increased use of public lands (See Table 3-16). Implementation of Alternative B would require an estimated 21 winter full-time employees and 12 part-time employees during the winter season (Core Mountain Enterprises 2003). This would be an increase of 15 full-time employees and eight part-time employees above the No-Action Alternative. Employees would be required for administration, base area management, mountain operations, ski patrol, snow safety, ski guides, education programs, and other skier services.

Summer employment levels under Alternative B would be the same as under the Proposed Action and would include an estimated 14 full-time employees and one part-time employee (Core Mountain Enterprises 2003; See Table 3-16). This would be an increase of four full-time employees and a decrease of one part-time employee when compared to the No-Action Alternative. Summer employees would be required for administration, base area management, mountain operations, education programs, and other center services.

Overall, winter and summer employment levels would increase from current conditions. Similar to the Proposed Action, some specialized positions would be filled by workers outside the study area while some would be from within. Therefore, the level of unemployment in the study area could potentially be reduced. Adequate labor pools exist within the study area to fill non-specialized positions that would be associated with Alternative B.

3.6.4.3.3 Housing

As with the Proposed Action, implementation of Alternative B would increase the need for short-term and long-term housing primarily in the Silverton area as well as in other portions of the study area. Short-term accommodations would be required for visiting guests in the winter and summer. During the winter season, a projected daily maximum of 475 skiing guests and those accompanying them could require short-term accommodations. As discussed in the Recreation section, it is projected that fewer visiting guests would realistically come to the SOLRC than under the Proposed Action due to the limitations of guided-only operations on public lands. It is also likely that some of those skiing would be residents or day-use guests. As with the Proposed Action, it is projected that a number of skiers staying in Telluride and Durango Mountain Resort would visit the project area for a day as part of their visit to other resorts. It is projected that the current short-term accommodation of 455 persons would meet the needs of Alternative B with few visitors being required to travel to other portions of the study area during peak periods.

Long-term accommodations would be necessary for additional winter and summer employees required under Alternative B. The estimated employee requirement during the winter season would be 33, 23 above the No-Action Alternative and 19 above current employment levels (Core Mountain Enterprises 2003). Summer employment would primarily consist of employees used in the winter and would therefore, in most cases, be year-round employees. As discussed above, there were 25 housing units for rent in the Silverton area in 2000 (U.S. Census Bureau 2000d). This level of housing availability is still considered to be accurate (Reigh 2003b). It is therefore projected that sufficient housing exists in the area to accommodate the additional SOLRC employees required under Alternative B. Considering weekly rentals and the Hostel, it is also projected that sufficient housing would be available to accommodate the additional employees required to meet increased demand for retail and service personnel due indirectly to Alternative B.

3.6.4.3.4 Community Services

As with the Proposed Action, implementation of Alternative B would result in increased visiting guests and increased employees. The maximum increase in persons potentially requiring community services would be 494 (475 skiing guests and 19 employees). Potential impacts to law enforcement, fire protection, medical professionals, and schools would be slightly less but not noticeably different than those disclosed under the Proposed Action.

3.6.4.3.5 Local Economy

Under Alternative B, the local economy would grow due to the increase in skier spending, employment, tax revenues, etc. Annual skier visitation would be projected to be above the No-Action Alternative but would be at the lower range of the Proposed Action. Therefore skier spending would also be on the lower range of that projected for the Proposed Action.

Employment levels would slightly increase with Alternative B which would help to strengthen the local economy. Median household income and per capita income levels would not be affected to any appreciable degree. Tax revenues would also increase with additional visitation as more money was brought into SOLRC and local visitor services. Increased tax revenues would also increase the level of support for community services.

Overall, implementation of Alternative B would strengthen the local economy, particularly during the winter season. The level of economic impact would be greater than the No-Action Alternative but less than the Proposed Action.

3.6.4.4 Alternative C – Integrated Guided and Unguided Operation

3.6.4.4.1 Population

Alternative C would result in the greatest population growth in the study area of all the alternatives due to additional skiers and increased employment. As with the other alternatives, daily skier visitation is not projected to exceed 475 persons. Annual skier visitation levels would exceed all alternatives due to the availability of both guided and unguided skiing on the greatest extent of terrain (see Recreation analysis). Projected annual skier visitation levels would range from 15,000 to 25,000. When compared to the Proposed Action, Alternative C would be more likely to achieve this range.

Indirect impacts would be similar to those described for the Proposed Action. Employment levels would increase similarly to the Proposed Action with the exception of a greater demand for part-time ski patrollers. The additional employment levels could increase the level of growth in the population. Winter positions would likely be filled from persons both inside and outside the study area, which would slightly increase the population levels within the study area.

3.6.4.4.2 Employment

SOLRC winter employment requirements under Alternative C would increase the most from current levels due to the two types of skiing programs offered and to maximized use of public lands (see Table 3-16). Implementation of Alternative C would require an estimated 30 full-time employees and 11 part-time employees during the winter season (Core Mountain Enterprises 2003). This would be an increase of 24 full-time employees and seven part-time employees above the No-Action Alternative. Employees would be required for administration, base area management, mountain operations, ski patrol, snow safety, ski guides, education programs, and other skier services.

Summer employment levels under Alternative C would be the same as under the Proposed Action and would include an estimated 14 full-time employees and one part-time employee (Core Mountain Enterprises 2003; see Table 3-16). This would be an increase of four full-time employees and a decrease of one part-time employee when compared to the No-Action Alternative. Employees would be required for administration, base area management, mountain operations, education programs, and other center services.

Overall, winter and summer employment levels would increase from current conditions, with winter levels increasing more than under the Proposed Action and other alternatives. As with the Proposed Action, specialized expertise would be required for some positions, while workers within the study area could fill others. The increased worker requirement would aid in potentially reducing the unemployment rate within the study area. Adequate labor pools exist within the study area to fill the non-specialized positions that would be associated with Alternative C.

3.6.4.4.3 Housing

As with the other action alternatives, implementation of Alternative C would increase the need for short-term and long-term housing primarily in the Silverton area as well as in other portions of the study area. Short-term accommodations would be required for visiting guests in the winter and summer. During the winter season, a projected daily maximum of 475 skiing guests and those accompanying them could require short-term accommodations. Under Alternative C, it would be likely that use levels would be slightly higher than the Proposed Action and would therefore have the potential to reach the maximum of 475 skiers more frequently. As with the Proposed Action, it is likely that some of those skiing would be residents or day-use guests.

As mentioned in the Recreation section, it is projected that a number of skiers staying in Telluride and Durango Mountain Resort would visit the project area for a day as part of their visit to other resorts. It is projected that the current short-term accommodation of 455 persons would meet the needs of Alternative C with few visitors being required to travel to other portions of the study area under peak conditions.

Long-term accommodations would be necessary for additional winter and summer employees required under Alternative C. The estimated employee requirement during the winter season would be 41, 31 above the No-Action Alternative and 27 above current employment levels (Core Mountain Enterprises 2003). Summer employment would consist primarily of employees used in the winter who would therefore be year-round employees. As discussed above, there were 25 housing units for rent in the Silverton area in 2000 (U.S. Census Bureau 2000d). This level of housing availability is still considered to be accurate (Reigh 2003b).

When compared to the Proposed Action, the additional employees would mainly be part-time employees to provide for additional snow safety responsibilities. Since each housing unit would house multiple persons it is projected that sufficient housing exists in the area to accommodate the housing requirements of the additional employees required under Alternative C. Considering weekly rentals and the Hostel, it is also projected that sufficient housing would be available to accommodate additional retail and service employees required as an indirect impact of Alternative C.

3.6.4.4.4 Community Services

As discussed above, implementation of Alternative C would result in increased guests and employees. The maximum increase in persons potentially requiring community services would be 502 (475 skiing guests and 27 employees). Impacts to law enforcement, fire protection, medical professionals, and schools would not be distinguishable from those described for the Proposed Action.

3.6.4.4.5 Local Economy

Impacts to the local economy during the winter and summer would be similar to those described for the Proposed Action. The only difference would be the opportunity for increased skier visitation and spending due to the additional opportunities available with guided skiing and additional open terrain.

3.6.4.5 Mitigation

No impacts requiring mitigation were identified.

3.6.4.6 Cumulative Effects

The cumulative effect analysis area consists of the study area for the socioeconomic analysis described above. This area matches the probable extent of any impacts to socioeconomic resources associated with the SOLRC project.

The following cumulative actions, as outlined in Chapter 2, were not considered:

- The transfer of jurisdiction over SH 110A to San Juan County would not affect the socioeconomic environment of the study area since it is not likely to affect population, employment, housing, community services, or the local economy.

- Likewise, the grazing of livestock in the project area would not cumulatively affect the socioeconomic environment.

The remaining cumulative actions listed in Chapter 2 (section 2.4) have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects in the socioeconomic environment, as discussed below.

3.6.4.6.1 Snowmobile Use

Cumulative impacts to the study area would occur in the winter due to snowmobile use. The primary impact would occur with short-term housing requirements. Snowmobile visitors would be sharing the local short-term accommodations in the Silverton area which could result in the need for visiting guests, skiers and/or snowmobilers, to travel beyond San Juan County for accommodations. This level of impact would most likely only occur during the busiest seasons.

3.6.4.6.2 Four-Wheel Drive Use

OHV use is one of the prominent uses of the area during the summer season. On a cumulative basis, operation of the lift and associated facilities may result in visitors staying in the area for a slightly longer period of time. However, this impact is not projected to result in negative socioeconomic impacts in the study area.

3.6.4.6.3 Durango Mountain Resort Development

The Durango Mountain Resort development would add cumulatively to socioeconomic effects within the study area. As discussed above, the cumulative impact of this project with the Durango Mountain Resort project would likely result in visiting guests at Durango Mountain Resort potentially staying longer to visit the Silverton area for a day to experience the terrain offered. It is not projected that the proposed project would detract from the Durango Mountain Resort development and vice versa due to the difference in the experiences offered. On a cumulative basis, the resorts may be somewhat competitive but, due to the experiences offered, would likely compliment one another.

3.6.4.6.4 Telluride Expansion

Logistically, the Telluride Ski Area expansion is further away from the project area. However, much of the same cumulative impact could occur. The primary impact could be that visiting guests at Telluride may take a day and visit the Silverton area to experience that terrain. This level of impact was discussed above. On a cumulative basis, the resorts may be somewhat competitive but, due to the experience offered, would likely compliment one another.

3.6.4.6.5 Mining

Mining in the project area has played a major role in the shaping of the community. Mining operations in the recent past involved about 300 underground miners with additional management and support staff (Skinner 2003b). The Gold King Mine is scheduled to open for commercial operation and will require 40-50 persons on a year-round basis. With the reduction of mining activity, a void has been left in the local economy that is being filled with tourism, both winter and summer. As a result, many of the potential socioeconomic impacts in the study area are positive because the proposed project would replace the economic stability that is being lost with decreased mining activity. Therefore, impacts to population, employment, housing community services, and the local economy are viewed as positive and are helping to revitalize the area, particularly during the winter season.

3.7 RECREATION

3.7.1 Issues Addressed

The recreation issues identified through scoping and internal, interdisciplinary review include the following:

- Whether there is adequate demand for SOLRC's recreational opportunities to justify the proposed allocation of public resources.

- The balance between the on-mountain and base-area capacities of the proposed ski operation.

(Note: Potential impacts on public access to recreational opportunities in the project area are discussed under Land Use, section 3.5, and snow safety issues are discussed under Safety, section 3.8.)

3.7.2 Analytical Methods and Assumptions

Data collected on current recreational trends in the project area consisted of review of current BLM management plans and interviews with BLM personnel and others knowledgeable on the subject area.

Information on the state of the ski resort industry came from the National Ski Areas Association (NSAA) and Colorado Ski Country (CSC) publications and websites, and from interviews with ski area personnel.

Information on the state of the backcountry ski industry came from interviews with equipment manufacturers, associated journals and magazine editors, federal land managers, and outfitter and guide services.

The issue of whether demand for the proposed SOLRC recreational opportunities justifies the allocation of public resources centers primarily on winter recreation, based on the lack of growth in the ski industry over the past decade. While it is recognized that SOLRC proposes a new and unique approach to commercial skiing, industry trends at the national, state, and regional level still provide part of the picture regarding demand for SOLRC's ski product. This is due in part to the fact that a substantial part of SOLRC's visitation is likely to come from skiers opting to take a day out of a ski vacation at one of the regional destination resorts to ski at SOLRC. In this analysis, the demand picture is rounded out by examining demand for alternative forms of skiing similar to SOLRC's, but information in this regard is much less comprehensive. Anticipated demand for summer recreational opportunities is less of an issue and is dealt with in more general terms.

Analysis of the balance between on-mountain and base area capacities used accepted ski industry standards.

3.7.3 Affected Environment

3.7.3.1 Demand for Alpine and Backcountry Skiing

The background information necessary to assess the demand for SOLRC's unique skiing product starts with trends in the national, regional, and local ski industry, then shifts to trends in the demand for backcountry skiing and other alternatives to traditional resort skiing.

3.7.3.1.1 National Ski Market

The NSAA, the ski resort industry trade group, tracks national skier visits along with other demographic and market information relating to the industry. Their website provided much of the information cited in this section.

Resort skiing enjoyed significant growth during the 1960s through the 1970s. After 1980, however, growth in skier visits slowed and was generally stable up to the 1993/94 season when skier visits totaled 54.6 million. Since that season, national skier visits have varied between 52 and 54 million, jumping to a record 57.3 million in the 2000/01 season. The 2001/02 season saw skier visits drop to 54.2 million, the third-best season since statistics were first kept. (NSAA 2002). The 54.2 million skier visits of the 2001/02 season represented a 5.2 percent increase over the long-term national average (1978/79-2001/02) of 51.2 million visits and a 3.9 percent increase over the long-term median of 52.1 million skier visits. However, the 54.2 million skier visits also represented a 5.5 percent drop from the 2001/02 season.

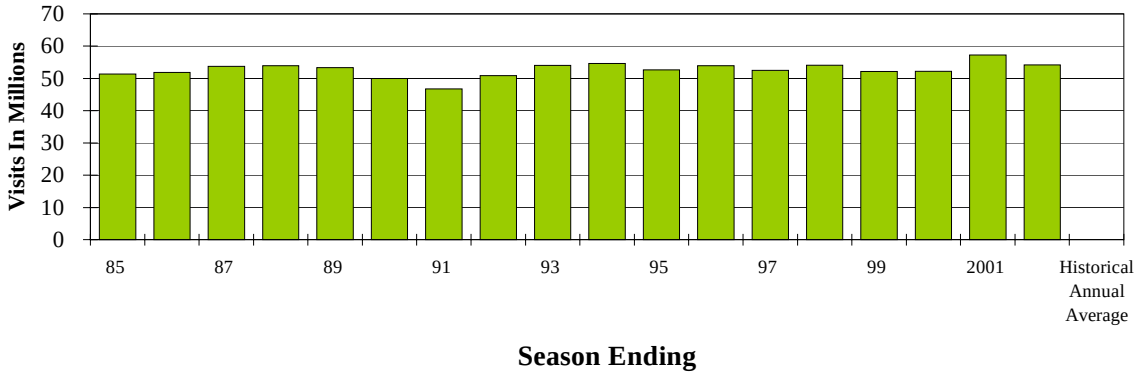
Recent national and international events and the current economic climate have had a negative impact on overall travel activity. Additionally, inconsistent winter weather patterns with poor snowfall and warm temperatures throughout most of the country, particularly in the early and latter parts of the season, have had an effect on the length of the operating season and skier visits for most resorts.

In summary, while the ski industry achieved it's third best season on record last year, average annual growth over the past decade has declined about 0.17 percent (1993/94 to 2001/02), and the industry acknowledges a flat long-term participation level. This is generally attributed to a maturing of the industry, demographic and lifestyle shifts associated with an aging population, prohibitive cost of entry, loss of available leisure time, competition from alternative leisure-time pursuits, and inconsistent winter weather patterns.

Figure 3-2 illustrates the fluctuation of skier visits nationally since 1985. Though skier visits have not significantly increased over the past two decades, the number of ski areas operating in the U.S. has declined from 735 during the 1982/83 season to 490 in the 2000/01 season. (NSAA 2001.) While there has been in a decrease in the overall number of resorts, the existing ones have witnessed substantial growth in Vertical Transport Feet (VTF) capacity and investment in other improvements such as learning centers, day lodges, snowmaking, terrain parks, real estate development, etc. (NSAA 1998.) The result has been that resorts are competing for a larger market share from an ever-diminishing population base.

During the 2001/02 season, NSAA indicates that about 7.7 million people participated in downhill skiing, roughly 3 percent of the U.S. population. They skied an average of 8.3 days per season, and their median age was 27.7 years, with 57.6 percent 25 or older. Males and females accounted for 60.2 and 39.8 percent of the skier population respectively. Of these skiers, 58.2 percent were from households with children under the age of 18.

During the same period, NSAA estimates a total of 5.3 million people participated in snowboarding, about 2.1 percent of the U.S. population. They skied an average of 7.2 days per season, with a median age of 17.3 years. Of the total, 75.1 percent were 24 years old and younger. Males and females accounted for 72.4 and 13.6 percent respectively. Approximately 21.9 percent of snowboarders also alpine skiing.



Source: NSAA 2002. Kottke National End of Season Survey 2001/02, Preliminary Report

Figure 3-2. Historical United States Skier Visits – 1985-2002.

NSAA indicates that snowboarding currently represents 29.2 percent of total ski area visits, up from 27.7 percent last season. In spite of overall flat growth industrywide, the compounded annual rate of snowboarding growth since 1998/99 is 6.8 percent and constitutes a significant segment of industry. Much of this growth is coming from traditional alpine skiers who cross over and participate full-time or part-time in snowboarding.

3.7.3.1.2 Colorado Ski Market

Statewide Skier Visitation Trends

Colorado skier trends relative to the U.S. market for the last decade are shown in Table 3-17. Growth at the national level has been relatively static, and Colorado reflects the national trend.

Table 3-17. National, Rocky Mountain Region, and Colorado skier visit trends (millions).

Season	National Visits	Colorado Skier Visits	Rocky Mtn. Region Visits	Colorado Share (% of National Market)	Colorado Share (% of Rocky Mtn. Region Visits)
1993/94	54.6	11.2	17.5	20.51%	64.00%
1994/95	52.7	11.1	18.4	21.06%	60.33%
1995/96	54	11.8	18.1	21.85%	65.19%
1996/97	52.5	11.8	18.9	22.48%	62.43%
1997/98	54.1	12	19.2	22.18%	62.50%
1998/99	52.1	11.4	18.3	21.88%	62.30%
1999/00	52.2	10.8	18.2	20.69%	59.34%
2000/01	57.3	11.7	18.2	20.42%	64.29%
2001/02	54.2	11.1	18.2	20.48%	60.99%
AAGR[1]	-0.17%	-0.20%	0.4%	-0.05%	-0.66%

Source: National Ski Areas Association, Colorado Ski Country.
[1] Average annual growth rate

CSC reports 11,145,181 skier visit's to Colorado resorts during the 2001/02 season (CSC 2002). This represents a 4 percent decrease from last season's total of 11,666,672, and slightly less than the decline in visits seen nationally. Colorado skier visits are tracked under three groupings: Destination Resorts (including Telluride, Aspen, Crested Butte, Durango Mountain Resort), Front Range Destination Resorts (including Vail, Breckenridge, Copper Mountain), and Front Range Resorts (Eldora, Ski Cooper, Loveland). The destination resorts saw a 5.08 percent decease in visits, the Front Range Destination Resorts a 4.31 percent decrease, and the Front Range resorts a 2.12 percent decrease.

Colorado's market has witnessed weather-related peaks and valleys, with generally flat growth over the past decade. However, it continues to retain its prominence in the ski industry with over 20 percent of the total national market, although the numbers indicate some loss of market share to other Rocky Mountain states.

Regional Analysis

Twenty-three ski areas are presently operating in Colorado, ranging from small local facilities with few lifts and support facilities to larger destination resorts with national recognition. Of these resorts, SOLRC will interact primarily with the three ski areas located in southwest Colorado, as outlined in Table 3-18 below.

Table 3-18. Regional resort facts and figures.

Ski Area	SV[1] Rank of Group	Skiable Terrain	Terrain Beg/Int/Adv	Uphill Capacity (pph)	Vertical Drop	Base Elevation
SOLRC	4	1,644[2]	0/25/75	550	3,100	10,400
Wolf Creek	3	1,600	20/35/25	8,280	1,604	10,300
Durango Mtn. Resort	2	1,200	23/51/26	15,050	2,029	8,793
Telluride	1	1,750	15/50/35	21,186	3,535	8,725

Source: SOLRC Master Plan (Jack Johnson Co. 2001), resort operators and web pages.
[1] SV = Skier visit.
[2] This reflects the entire ski area acreage at SOLRC, while the figures for other resorts are for terrain generally accessible by the general public.

The facilities associated with the other regional ski areas are full-service with complete amenity packages. All have developed base area facilities and skier services. Of the three, Telluride is a nationally renowned destination mountain resort, with Durango Mountain Resort also considered a destination resort, although it has a stronger orientation towards a regional and local level. Wolf Creek is considered more of a regional and local resort and competes more with Durango Mountain Resort for skier visits than it does with Telluride. However, one thing all of the resorts share in common is a need to draw visits from outside of Southwest Colorado region.

Telluride opened in 1972. Their market is 80 percent national destination and 20 percent regional and local visits. Their biggest market segment is couples without children. Until recently the resort was oriented towards experts due to the nature of the terrain, but the recent opening of Prospect Bowl has allowed development of intermediate terrain and more balanced offerings. Telluride can comfortably accommodate about 6,900 skiers per day. (Kuhles 2003.)

Durango Mountain Resort opened in 1965. Their market consists of approximately one-third national destination visitors, one-third regional visitors, and one-third local visitors. About one half of their total national and regional destination visits stay at the resort. Most visitors are classified as intermediate in ability level (Skinner 2003a). Their business is predominately families, ski clubs, tour operators, and college students (Barry 2001). Durango Mountain Resort can comfortably accommodate about 5,000 skiers per day. The resort is embarking on a major development plan, which includes an improvement of mountain facilities and a large real estate component. This proposed new development will increase daily skier capacity to 9,800.

Wolf Creek Ski Area opened in 1939 with the installation of a tope tow on Wolf Creek Pass by the San Juan Valley Farm Association (Haidorafter-Pitcher 2003). Wolf Creek's market is approximately 60 percent destination, with the remaining 40 percent comprising a regional and local market. The resort gets much of its business from Texas and New Mexico. Texans, who visit on a year-round basis, own many second homes in the area. Visits to Wolf Creek often track snowfall patterns. Wolf Creek Ski Area tends to get significant snowfalls that miss many other Colorado resorts, allowing them to draw visitors from the Front Range and throught the surrounding region.

Wolf Creek characterizes their market as mostly families, church-groups, and clubs. Many are intermediates and beginners that choose Wolf Creek because of their ski school. The area is also popular with people who like to hike out of bounds in the Knife Ridge area. The daily skier capacity is about 2,500 people per day. (Haidorafter-Pitcher 2003.)

While not a direct competitor, Kendall Mountain in Silverton should also be noted. The area provides of a 200-vertical-foot T-bar and is used mostly by local families.

A comparison of historic skier visit trends, regional market shares, and overall share of the Colorado market for the three ski resorts in Southwest Colorado is shown in Table 3-19.

Comparing visitation performance of ski resorts in SOLRC's competitive area, both Telluride and Wolf Creek have witnessed nominal growth and have gained a small amount of market share relative to the regional market, while Durango Mountain Resort has seen an overall drop in both skier visits and market share, as shown in Table 3-19. All of the areas have seen a decline in visits relative to historic highs of three to four seasons ago. The lack of natural snowfall has been a strong factor in the decline of annual skier visits in the past several years (Skinner 2003a).

Table 3-19. Skier visitation trends for SOLRC regional area.

Season	Wolf Creek	Market Share	Telluride	Market Share	Durango Mtn. Resort	Market Share	Total	% of Colo. Total
1993/94	140,456	19%	300,388	40%	302,103	41%	742,947	6.63%
1994/95	157,995	19%	301,748	36%	382,839	45%	842,582	7.59%
1995/96	124,478	18%	270,916	39%	307,442	44%	702,836	6.39%
1996/97	152,971	19%	306,507	38%	341,643	43%	801,121	7.35%
1997/98	158,235	18%	375,027	44%	328,705	38%	861,967	7.98%
1998/99	202,053	23%	382,467	43%	304,735	34%	889,255	8.31%
1999/00	114,802	17%	309,737	47%	235,000	36%	659,539	6.22%
2000/01	187,116	22%	334,506	40%	321,600	38%	843,222	8.03%
2001/02	170,847	22%	341,370	45%	250,500	33%	762,717	7.33%
AAGR[1]	**-4.54%**		**0.85%**		**-4.54%**		**-1.16%**	

[1] Average Annual Growth Rate.

While growth may be viewed as flat for this segment of the Colorado market, it may also be viewed as a somewhat positive phenomenon because all three resorts are geographically isolated when compared to their competition. The major Front Range Colorado resorts in the Summit and Eagle county areas benefit from their proximity to the major metropolitan populations, an international airport, and direct, local airport access from other major airports around the country. All of the southwest Colorado resorts are far removed from major metropolitan areas, and their airports do not have the same deplanement capacities. In spite of these problems, skiers are still coming to these resorts in reasonable numbers. This is evidenced by the resort utilization rates, which at all three resorts are relatively high. Utilization is expressed as a percentage and reflects the number of skier visits each resort accommodates in a given year compared to what they could accommodate if they operated at 100 percent of their daily skier capacity. All of the resorts are operating at well over 40 percent. Comparing the utilization rates with the 1995/96 averages for the U.S. (32.1 percent), Rocky Mountains (45.7 percent), Pacific West (24.5 percent), and Rocky Mountain ski areas of a similar size (32.9 percent), all three ski areas are generating use levels greater than industry averages (NSAA 1996). In spite of their geographic isolation Wolf Creek, Durango Mountain Resort, and Telluride all offer a unique experience that draws people to their individual locations.

3.7.3.1.3 Growth in Alternative Ski and Winter Activities

National Level

Skiing has changed dramatically in the past 10 years. One of the most dramatic changes has been the introduction of new equipment technologies including “fat skis” and shaped skis. These new ski designs have greatly eased the learning curve associated with skiing and allowed individuals to ski in more challenging, non-groomed conditions. Powder and “crud” skiing is much more accessible to a broader range of ability levels than in the past. In turn, this has fostered a greater interest in experiencing powder conditions at alternative venues, including helicopter and cat skiing, and in other less-developed mountain environments.

Telemark skiing enjoyed a resurgence at ski resorts in the 1970s. This lead to increased visitation in the mountain backcountry, which previously was only visited in the winter by climbers and alpine touring skiers. For many years, the telemark ski community consisted of small groups of hearty individuals due largely to the challenge of learning a new ski technique and limited equipment quality. That pattern changed in the early 1990s with the introduction of plastic telemark boots, which allowed for much greater control in skiing. Technological advances and use of new high-tech materials in skis and bindings further enhanced the ski experience, making it more appealing to a much broader market. As a result, what was once a unique ski activity has now become a common sight at ski resorts and in the backcountry.

In the mid-90s, alpine touring (AT) skiing benefited from the same advances in technology that benefited telemark skiing and has enjoyed a similar increase in popularity. AT ski equipment consists of boots with “rockered”soles for ease in walking, bindings that allow for freeing the heel during uphill travel and heel locking for descent, and light-weight mountaineering skis. Like telemark skiers, AT skiers use climbing skins to hike uphill.

Once considered a fad in the early 1980s, snowboarding has become mainstream in the industry. Equipment has undergone a transformation in which companies are producing snowboards that facilitate backcountry travel. This includes boards that may be split in half and affixed to each foot for uphill travel, with specialized bindings and climbing skins.

In contrast to the flat skier visitation picture discussed above (section 3.7.3.1.1 and 3.7.3.1.2), there has been significant growth over the past decade in alternatives to resort alpine skiing, including backcountry skiing and boarding, hut/yurt skiing, cat skiing, and helicopter and other forms of guided skiing. However, in contrast to the ski resort industry, there is limited data and only anecdotal information as to the size of this alternative ski market and its characteristics. There is no survey information as to the number of people who actively participate in backcountry skiing, the type of skiing they participate in (i.e., telemark, AT, boarding), how often they ski, if they cross-participate in resort skiing and backcountry skiing, their ages, genders, income levels, regional visitation patterns, and so forth. However, it is assumed that this group will comprise a major component of the market that SOLRC hopes to serve, thus some consideration must be given to their influence on the potential demand for the product SOLRC will offer. In order to provide some context as to the size of this alternative ski market, information was sought from equipment manufacturers, related outdoor magazines, and outfitter and guide services.

Black Diamond is the largest manufacturer of backcountry and telemark equipment in the U.S. Black Diamond has seen significant growth in the sales of backcountry products over the past decade. For products that are used exclusively in the backcountry (climbing skins, shovels, probes), growth has been in the high single digits (7 to 9 percent) per annum over the last decade (Metcalf 2002). Black Diamond's sales of AT gear have reportedly been increasing by 20 percent a year for the past 5 years (Kerasote 2003).

Garmont is one of three plastic telemark boot manufacturers. Sales of telemark boots have been stable for the last 10 years. Total annual sales for of telemark boots are approximately 25,000 per annum. Garmont estimates the market size at 100,000 to 150,000 people who telemark either in the backcountry or at ski resorts. They estimate sales for alpine touring boots at 7,000 to 10,000 pairs per year. Boots are typically replaced every 4 to 5 years, so this number of pairs suggests an AT population of from 28,000 to 50,000. This indicates the total market for backcountry skiing (exclusive of snowboards) at up to 200,000 people (Schwietzer 2002).

Ortovox is the largest manufacturer and seller of avalanche beacons in the world. Ortovox indicated that there has been significant growth in sales of transceivers over the course of the last decade. In 1990, there were about 15,000 Ortovox's sold in the U.S. In 2001 there were about 45,000 sold. Over this time period growth was 200 percent or an average of 18 percent per annum. During the last quarter of 2001, sales grew 27 percent (Petersen 2002).

Couloir Magazine is a California-based monthly dedicated to backcountry skiing, mountaineering, and related activities. Ten years ago, the circulation of Couloir Magazine was 2,000 but has grown to about 20,000 today. The typical magazine subscriber is 37, white, male, and ski 42 days a year, with about 25 days in the backcountry.

The magazine has been tracking backcountry user trends and feels there has been steady growth in backcountry skiing during the life of the magazine. Based upon their internal research, Couloir believes there are between 300,000 and 500,000 people who backcountry ski today. This includes telemark, AT, and snowboarders. They have observed a change in the demographics in the profile of backcountry users. Up until 2 to 3 years ago, most backcountry skiers could be characterized as "hardcore," highly athletic skiers who ski a minimum of 20 to 25 days in the backcountry. Today there is a broader component to the profile of backcountry skiers that could be characterized as less aggressive, and not as strong or technically proficient as backcountry skiers of the past. More individuals who profess to be backcountry skiers are skiing more

frequently in resorts, enter the backcountry through resort accesses, and make use of guide services (Dostie 2002).

John Litz is the past editor of Backcountry magazine and the author several books on backcountry and hut-to-hut skiing. He has followed trends in telemark skiing for two decades and reports growth in telemark skiing in Colorado, mostly at established resorts, particularly in the Front Range. Resorts such as Loveland Pass and Eldora see 10 to 15 percent of annual skier visits by telemark skiers. Litz has also seen steady, but not necessarily dramatic, growth in backcountry skiing over the past 10 years. He has observed that numbers increase in the spring when nicer weather and safer conditions prevail. He estimates current growth at 2 to 5 percent per annum. Ten to fifteen years ago very little activity was observed in the backcountry. Mr. Litz believes the growth in AT skiing is the result of an aging telemark population who are no longer able to telemark ski. (Litz 2002.)

The Colorado Avalanche Information Center provides avalanche forcasting the state of Colorado. They indicate that no one to their knowledge is monitoring the numbers of backcountry users. Their estimate is a 5 to10 percent increase per year in backcountry skier visits during the 1990s (Toepfer 2002).

The North American Telemark Association (NATO), based in Vermont, is a 20-year old educational organization. In the course of its existence, the organization has taught about 40,000 telemark students and 1,000 instructors. NATO currently instructs an average of 3,000 to 4,000 people per year. Growth rates when the group first commenced operation were 6 to 8 percent per annum. In the early 1990s it increased to 13 to 15 percent per annum and in recent years is 20 percent per annum. From discussions with manufacturers, NATO estimates the number of telemark skiers to be between 300,000 to 400,000 in the US, based upon equipment sales. They estimate that growth has been about a 176 percent since 1985. (Hall 2002.)

The *British Columbia 1999-2000 End-Of-Ski Season Review* indicates that skier visits at helicopter and snowcat skiing operations grew from 60,611 skier visits in 1990/91 to 90,354 visits in 1999/00. Seventy-nine percent of total visits come from the U.S. and other countries. In spite of the difficult travel issues associated with accessing these ski venues, British Columbia remains the location for most of the world's helicopter, wilderness lodge, and snowcat skiing operations. According to a survey by the British Columbia Heli and Snowcat Skiing Operators Association, 28,000 people took a backcountry trip in 2000/01, most of them from the U.S. and Europe (Kerasote 2003). Alpine skiing in general is growing in British Columbia. Skier visits in 1990/91 were 3,391,792 and grew by 67 percent to 5,656,871 in 1999/00. Over one million of those visits came from the U.S. (British Columbia 2000.)

Local and Regional Level

Shifting to a local focus, backcountry skiing has been slowly but steadily growing in southwest Colorado for the past decade. However, there are no reliable estimates as to the level of past or current use other than qualitative observations by area managers and backcountry enthusiasts which indicate a perceived growth at trailhead parking and other back country access points (Speegle 2002).

Discussions with local ski shops in Durango indicate that there are several hundred local, backcountry skiers that get out routinely, mostly on weekends (Keller 2001). Backcountry use by snowboarders has grown quite a bit faster, and these users tend to access areas that are close to parking areas. In Ouray, there are smaller numbers of local, backcountry skiers, but local sports

shops indicate a growth in backcountry skiers from the surrounding region (Telluride, Ridgway, Montrose) skiing in the area (Leo 2001).

Interestingly, backcountry use patterns are somewhat segmented in the mountains between Durango and Ouray. Skiers from Durango tend to use the Molas and Coal Banks Pass areas, while skiers from Ouray tend to use the Red Mountain Pass area, leaving the mountains around Silverton only occasionally visited. Most backcountry skier use in the Silverton area comes from local residents. These skiers access backcountry areas from the intersection of SH 110A and CR 52, where forested terrain allows for safe uphill routes. The area received an average of six to 10 people per day, mostly on weekends. However, since the February 2002 closure of public lands in the SOLRC boundary to public use, the area has received little or no use by backcountry skiers.

Nordic skiing occurs mostly along CR 52 due to the fact that the Silverton Snowmobile Club grooms it. Typically, about three to five nordic skiers per day use the road to access skiing prior to the closure.

Ice climbing has been available in Ouray for many years. Water from old, leaking pipes along rock faces creates the ice for climbing. The area available for climbing was historically small, and primarily used by local climbers. Several years ago, volunteers added pipe and sprinklers on a series of rock faces, which increased the amount and consistency of the ice. As a result, ice-climbing has grown dramatically. Up to 10,000 ice climbers from around the national and world come to Ouray each season. People come from around the nation and internationally just for Ouray ice. (Leo 2001).

The 10th Mountain Dividison Huts, based in Breckenridge,Colorado takes reservations for the 10th Mountain Division Huts, Friends Huts, and Alfred Braun Huts. Since 1994 they have seen reservations increase from 29,945 to 47,651 in 2001, an average annual growth rateof 6.6 percent (10th Mountain 2002).

Two cat skiing businesses operate in the region, the San Juan Ski Company and El Diablo. The San Juan Ski Company has been in business for 5 years. Business has grown by about 200 percent since it's inception. They are based at Durango Mounatin Resort and have about 35,000 acres in the Cascade and Hermosa drainages (Rule 2002). El Diablo has also been in operation for 5 years They ski the Molas Pass area and use two cats. Business has been growing, doubling in the past 3 years. The 2001/02 season a 10 to 20 percent increase in reservations from last year. These operators indicate that there is not a significant local market for cat skiing, due to the small regional population and the reltively isolated location. Most of their market comes from out-of-state guests who are seeking an alternative ski experience, combined with visits to Durango Mountain Resort (Kuss 2002).

Summary of Demand for Alternative Skiing

In spite of the variation in the estimated size of the alternative skier market, all of those interviewed expect to see continued growth within this subset of the ski industry. Following is a summary of reasons why the alternative skier market is growing:

- Improvements in the quality of ski equipment.

- Demographic shift of the nation's population from large, coastal cities to the Rocky Mountain states, allowing for faster and easier access to the mountains.

- As more people participate and go into the backcountry, it introduces others to the sport and establishes it as a popular activity.

- Outdoor magazines expose many people to backcountry skiing. Unrelated manufacturers, such as the major automobile companies, are also facilitating national exposure to the backcountry. With large advertising budgets and market research capability, the advertisements created to promote SUV purchases make use of exciting and dynamic outdoor activities that help to promote vehicle sales.

- Diversification of ski resort terrain and relaxation of backcountry boundary management policies offers relatively safe opportunities to hike to terrain that is not lift served, thereby introducing people to a pseudo-backcountry experiences.

- Increased interest in skiing powder snow. Skiing powder has become very desirable and often skiers become disappointed in the lift-served resort experience, as there is little opportunity to actually ski powder due to crowding. As a result, on stormy days, resorts tend to be full of people while the backcountry is relatively untouched. Once the powder is gone in the resorts, people move into the backcountry either on their own or through use of established services including heli-skiing, cat-skiing, and other guided services.

- People are looking for alternatives to conventional ski areas, as the resort experience, to many skiers, has become sterile and homogenous. For people first getting into backcountry, the motivation is often to go powder-skiing. Over time, the exercise, the pristine environment, the time spent with friends, and getting away from the resort crowds become primary motivation.

- The high cost of resort skiing has caused some skiers to leave resorts. Many industry people noted that telemark and AT skiers have come from an alpine ski background and have transitioned to backcountry skiing. This may be a reason for some attrition in resort skier numbers.

In summary, the discussion above indicates that in spite of flat growth of the national resort skiing market, growth in alternative ski activities and venues has been brisk for many years. Indeed, this growth may be occurring, in part, at the expense of skier visits to lift-served resorts. Skiers are actively seeking new ways to experience skiing and leaving the "traditional" resort experience to find these new opportunities. Geographic location has become less of an obstacle in attaining that ski experience as long as the venue responds with the type of product the market wants.

3.7.3.1.4 SOLRC as an Alternative Ski Venue

SOLRC currently offers a unique ski experience in Colorado and in the ski industry as a whole. While it shares the same dramatic and beautiful mountain terrain typical of Colorado ski resorts, it offers unique attributes when compared to these other venues.

The element of the SOLRC concept that makes the ski area most unique is its objective to bridge the gap between a pure, self-supported backcountry ski experience and the type of skiing one would experience at a conventional downhill ski resort. Like a conventional downhill ski resort, it offers lift access to ski terrain, a snow safety program, ski patrol, food services, and other amenities. Unlike a conventional downhill ski resort, it assumes many guests will be hiking to access much of the ski terrain in a manner similar to backcountry skiers. All of the terrain is steep

and challenging, the snow conditions are ungroomed, and the market focus is on advanced and expert skiers with the ability to ski such terrain rather than on the full range of skier abilities. All of these factors are a marked departure from conventional ski resorts that seek to offer terrain to serve a broad range of skier abilities and with easy- to- ski, groomed snow conditions.

SOLRC's ski experience most closely approximates helicopter, cat, and guided backcountry ski operations. However, it differs from these recreational operations in important ways as well. First, it is less expensive than heli-skiing and cat-skiing operations which cost from several hundred to nearly a thousand dollars per day. Second, SOLRC's very basic infrastructure, particularly the lift but also the drive-in access, the lodge, guides, and rental equipment, simply make the experience easier to access.

In summary, it is the blending of a variety of elements from a range of other skiing types and locales that makes SOLRC a unique experience in and of itself. The one-of-a-kind experience that SOLRC provides is the single greatest factor in determining demand.

3.7.3.2 Demand for Summer Recreation in the Project Area

Currently there are no developed-site recreation facilities, such as campgrounds, in the area. At this writing there are no plans to develop such facilities by the BLM.

Dispersed summer recreation activities in the project area include ORV and ATV use, hiking, mountain biking, hunting, and sightseeing. An extensive road network covers the entire region, due largely to historic mining activities. This road network has facilitated significant ORV and ATV use. This is the most popular recreation use in the project area and overall growth in vehicle use has been consistent over the past 10 years, in particular the growth in ATV use (Speegle 2002). SH 110A and a jeep road through Corkscrew Gulch provide ORV access to Highway 550 and receive use by these vehicles. Approximately a dozen tour operators from the surrounding region utilize SH 110A and account for 15 to 20 percent of vehicular traffic on this highway.

In the Cement Creek drainage, several hiking trails are found within the project area. One trail traverses the South Fork of Cement Creek drainage, in Zone 4, and over the Storm Peak ridgeline to Eureka or down Boulder Creek towards Silverton. Another trail is located in Cascade Gulch, in Zone 6, dropping back into Illinois Gulch. Additional trails, outside of the SOLRC operating area, are located around Hurricane Mountain just north of the project area.

Mountain biking has been one of the fastest growing recreational pursuits in the nation in recent years, and the San Juan Mountains are no exception to this trend. The large number of jeep roads and trails provide relatively easy access for mountain biking in the region. In the project area, the steep terrain limits mountain biking, and people tend to make use of existing jeep roads. Mountain bike use, along with other typical trail users, in the Cement Creek drainage is relatively low due to the large amount of motorized vehicle use, which tends to direct mountain bikers to other, less used areas (Speegle 2003).

Driving for pleasure and sightseeing occurs to a limited degree in the project area. The fact that SH 110A is not a through-road precludes significant use for this activity. Average annual daily traffic (AADT) counts from CDOT are about 201 cars (CDOT 2003). Most driving for pleasure and sightseeing occurs closer to Highway 550.

In the project area hunting opportunities exist for various big game, small game, and furbearers, including, but not limited to, deer, elk, blue grouse, snowshoe hare, and coyotes. A single hunting outfitter operates occasionally in the project area.

3.7.3.3 SOLRC Current Operations

SOLRC was established in 1999 as a guided ski tour operation. To date, activities have occurred on about 344 acres of private land that SOLRC owns or controls and on approximately 1,300 acres of BLM administered land used under an annual Special Recreation Permit. Snow safety studies and avalanche control have been conducted for 3 years (through the 2001/02 season), under a BLM Snow and Avalanche Study Permit on the public land portion. These 1-year permits were reissued for the 2002/03 season.

Currently SOLRC offers guided skiing on private and public land (under the BLM Special Recreation Permit cited above). Initially the permit allowed 10 guided guests at one time to access the permit area during the 2000/01 season. In 2001/02, the permit was expanded to allow 20 guided guests at one time, and in the 2002/03 season the permit was expanded to allow 40 guided guests per day.

Educational programs on private and public land include field sessions on avalanche safety, backcountry ski travel, mountaineering, mountain rescue, environmental studies, adventure writing, backcountry medicine, steep skiing, and nature photography. Thus far, the programs have been fully booked through the 2002/03 season (Brill 2003b).

In December of 2001 SOLRC completed the installation of a fixed-grip double chairlift on private land from the base area to a ridge below the summit of Storm Peak. The lift is currently used to transport guided parties to the ridgeline where they are able to depart onto open high-elevation public lands or more forested private lands below the upper lift terminal.

SOLRC maintains a temporary 1,200 square-foot base lodge with basic services and a parking area on private land, accessed via SH 110A. The lodge is used for staging of SOLRC activities.

With the installation of the chairlift for the 2001/02 season, SOLRC saw a total of about 700 guests. About 99 percent of these guests came as destination visitors. About 50 percent originated from locations in Colorado. Many of the guests from Colorado locations came from other ski resort communities such as Aspen, Telluride, and Vail. SOLRC has noted very few visits from the Durango area thus far. During the current 2002/03 season, SOLRC projects about 2,500 guests with a similar breakdown in guest origination points.

The typical guest profile consists of male professionals in their late 30s. About 75 percent of the guests are repeat customers. Many guests have spent a day at SOLRC while vacationing at other ski resorts (Durango Mountain Resort and Telluride). SOLRC indicates that after their first visit these guests often come back to Silverton as their primary Colorado ski destination. The type of user consists of conventional alpine and alpine touring skiers (60 percent), telemark skiers (20 percent), and snowboarders (20 percent). (Brill 2003b.)

SOLRC controls access within its permit boundary. They enforce road closures during avalanche control activities by closing CR 52 at the intersection with SH 110A or at other locations down canyon on SH 110A (see Land Use analysis, section 3.5.3.2). Public access into the SOLRC permit area is precluded unless attended by SOLRC guides. Non-SOLRC backcountry skiers can use terrain in the southern portion of the SOLRC boundary under the current boundary

management scheme (see Land Use analysis, section 3.5.3.1.2). Snowmobiles also encroach into the SOLRC permit boundary in the area immediately surrounding CR 52.

SOLRC's summer recreational offerings to date have consisted primarily of summer scenic lift rides since the chairlift was installed in 2001. Most visitors who take advantage of this opportunity are passengers on the popular narrow-gauge railway that makes several trips daily during the summer from Durango to Silverton and back. People driving in the area, particularly four-wheel-drive enthusiasts using designated routes in the SRMA, have also taken the opportunity to ride the chairlift.

SOLRC has also hosted hikers and mountain bike riders and organized several special events for these groups. No summer educational programs have been offered to date, but the educational aspect of SOLRC's operation is slated to increase during the 2003/04 season.

3.7.4 Environmental Consequences

3.7.4.1 Proposed Action

3.7.4.1.1 Demand for SOLRC's Recreational Product

Assessment of SOLRC's ability to attract sufficient winter visitation to justify the proposed allocation of public resources is a complex issue. The discussion of lift-served, resort style skiing indicates flat growth, but there is evident growth in alternative forms of skiing and alternative venues, whether they are purely backcountry, backcountry/resort, or guide services. There is no data directly applicable to the SOLRC operation, so qualitative assessment based largely on inference is the only way to address the question.

This discussion assumes that SOLRC will draw its market primarily from two sources. The first source will be skiers coming from established resorts in the region, including Durango Mountain Resort, Telluride, and to a lesser degree Wolf Creek. A number of skiers of more advanced ability levels visiting these resorts will likely add a day at SOLRC to their vacation plans in much the same way that resort skiers choose to go helicopter or cat skiing, snowmobiling, or engage in other activities. This will take some skier days from these resorts. SOLRC may also draw skier visits away from other types of operations, such as snowcat skiing, although these businesses represent a relatively small number of visitors.

The second source of skiers will be those coming specifically for the SOLRC experience. There will also be a blending of these markets due to a growing "critical mass" of recreation opportunities in the area, which will include cat and helicopter skiing, snowmobiling, and other activities. Expansions at Telluride and Durango Mountain Resort will also draw more guests. Visitors will be more inclined to visit the area as a result of a broader array of vacation options.

Under the Proposed Action, maximum daily skier visits are projected to be 475. Assuming a 150-day operating season and a utilization pattern somewhat lower than lift-served resorts (20 to 35 percent), SOLRC could expect between 15,000 to 25,000 skier visits per season. The number of annual visits to the Southwest Colorado lift-served resorts is about 760,000 skiers. 15,000 to 25,000 skier visits to SOLRC would represent about 1.8 to 3.3 percent of the region-wide total skier visits. It would seem reasonable to assume that under the Proposed Action the SOLRC concept could capture this percentage of the region's skier visits. That trend has already established itself with the current operations.

SOLRC can also anticipate receiving skiers from other markets who will instead come to Silverton for the sole purpose of skiing at SOLRC, thus increasing overall skier visits in Southwestern Colorado. No reasonable prediction of visitation from this source can be made.

Some percentage of the backcountry-oriented market discussed above (section 3.7.3.1.3) will likely also visit SOLRC. These users are pre-disposed to seeking out alternative ski experiences, and the 1,644 acres of high-quality terrain in a dramatic setting is consistent with the other similar backcountry-style resort venues. Based upon the discussions with industry experts, the total market for backcountry skiers are conservatively estimated at 200,000. It is probably also reasonable to conclude that SOLRC would capture some small percentage from this source, as well. If only 1 percent of the backcountry market were to ski at SOLRC for 1 day per season, that would equate to 2,000 skier visits.

There is no market data to support whether or not skiers will come to SOLRC in the numbers projected under the Proposed Action. However, it seems evident that what is being proposed is consistent with other existing, alternative ski venues throughout North America that have received favorable market responses.

In terms of demand for SOLRC's summer recreational and educational offerings, chairlift rides would likely to continue to be the biggest draw. However, the addition of extensive BLM-administered land, the Colorado Basin hiking trail, and the mountaineering route would provide summer visitors with substantial new recreational opportunities. These additions would also expand the resource base available for summer educational programs. Cumulatively, these additions to SOLRC's geographic scale and infrastructure would increase the center's attraction for summer visitors. Visitation would likely grow beyond tourists arriving on the Durango-Silverton train with time only for a scenic lift ride at SOLRC. More people would likely make the center a summer recreational destination rather than just taking a lift ride as a recreational target of opportunity.

3.7.4.1.2 Balance of Facilities

Successful ski area development is planned and coordinated to maintain a balance between skier demand, ski area capacity (lifts and trails), and the supporting equipment and facilities (lodges and skier service facilities, utility infrastructure, access, and parking).

From the standpoint of the mountain lifts and trails, the proposed facilities would be adequate to accommodate 475 people at one time under the SOLRC concept. The 550 person-per-hour (pph) chairlift, with the proposed vertical and horizontal profile, would be able to accommodate the daily skier capacity, because the vertical demand per skier would be reduced as skiers at SOLRC would be spending more time hiking, skiing, and returning to the base area, rather than pure "yo-yo" skiing. As currently configured, the chairlift has about 6 million vertical transport feet per day (hourly capacity X vertical feet of lift X hours of operation) capability. Vertical demand expected by the average SOLRC skier would likely be between 15,000 to 20,000 feet per day, when hiking is factored in. Capacities in the range of 400 to 500 skiers per day could be readily accommodated. The two rope tows would serve primarily an access rather than a round-trip function, so their respective capacities are not factored into the daily skier capacity.

Out-of-base capacity is the ability to move the daily skier capacity onto the mountain in a reasonable period. Industry standards call for this movement to occur within a 1.5 to 2 hour time frame. With a 550-pph capacity, the chairlift would provide access onto the mountain for 475 skiers within an acceptable time frame, even with some skiers round-trip skiing the lift during that period.

With regard to the base area facilities, industry standards for conventional downhill ski areas recommend facility sizing and scope of services that would support the mountain capacity. The recommendations are based upon meeting the comfort needs of visitors, complying with pertinent local regulations, and generating additional revenue streams.

Typically service functions of a base area lodge at a downhill ski resort include: restaurant seating, kitchen/scramble area, bar/lounge, restrooms, ski school, daycare, rentals/repair, retail, ticket sales/guest services, lockers, ski patrol/first aid, administration, mechanical space, and storage. The same industry standards recommend a three-seat turnover per day for food service. This means that only about one-third of the total skier capacity would occupy the base area food service facilities at one time. The dedicated space for all of the above functions is calculated to be about 35 to 40 square feet of base lodge space per person.

Industry standards also recommend that base area support services be tailored to the market the resort is serving. Given the market SOLRC anticipates serving, some of the uses found in a conventional resort would not be required. These would include day care and perhaps, public lockers. Other uses may be combined such as food and bar/lounge services. The base area facilities would also need to comply with San Juan County public health regulations regarding public health, safety, and welfare.

Under the Proposed Action, it is assumed that a portion of the 475 skiers at SOLRC would be out in zones that are too distant to make use of the base area skier services, with the bulk of the skier population likely skiing in zones closer to SOLRC facilities. Assuming that up to 20 percent of the skiers would be using zones that preclude, or reduce, use of the base lodge during the course of the day, then the lodge would need to serve about 375 people during the course of a ski day. Using the space use standards typically employed by the ski industry, a base lodge should be about 4,375 to 5,000 square feet with 125 available seats. The Proposed Action is proposing a 4,400 square foot base lodge, which is within acceptable industry standards. However, there could be some crowding of the base lodge in the morning if most of the skier population arrives in a short time period.

Proposed sanitary facilities at the base area would be adequate. However, no facilities are planned elsewhere in the SOLRC boundary. It may be desirable to provide restroom – portable units or agency approved vault toilets – in Colorado Basin where skiers and summer users dropped down to CR 52 to leave the basin and return to the base area.

Parking is proposed to accommodate 262 vehicles. Industry standards typically estimate a range of between 1.8 to 2.3 people per car. Parking at SOLRC would therefore accommodate between 472 to 603 people, an acceptable capacity for the 475 skier-per-day projection. (See Transportation analysis, section 3.9.4.1.2.)

Maintenance facilities at ski resorts are often sized based upon the number of tracked (snow cats, excavation equipment, and snow mobiles) and tired vehicles (trucks) to be serviced. In the case of SOLRC, there are no snow cats or other heavy equipment, so applying industry standards would not represent the actual need for the resort. The proposed 2,400-square-foot maintenance and storage building would appear to be a reasonably sized facility for servicing the limited number of vehicles used by the resort meeting their storage needs.

In short, the on-mountain and base-area facilities proposed at SOLRC under the Proposed Action would be in balance and would be adequate to meet the basic needs of up to 475 visitors per day.

The services would not match those provided by conventional ski resorts, but that is not SOLRC's objective.

3.7.4.2 Alternative A – No Action

Under this alternative, no BLM permit would be issued, and SOLRC's operations would be confined to private land they own or have made arrangements to use. Currently, that comprises 344 acres. The projected maximum of 475 on total daily visitation would remain in force.

3.7.4.2.1 Demand for SOLRC's Recreational Product

Two factors would serve to limit the desirability of SOLRC's skiing opportunity under this alternative and thus the likelihood that demand would reach the visitation levels projected under the Proposed Action. First, the acreage of SOLRC's private terrain is 344 acres, of which a smaller amount would actually be skiable. With 475 skiers at one time, skier densities would approach those at conventional downhill ski resorts, resulting in packed or even moguled ski runs. Second, the relatively low uphill capacity of the chairlift would result in longer lift lines than under the Proposed Action because most skiers would be round-trip skiing and expecting to achieve a greater number of vertical feet. Collectively, these two factors would preclude SOLRC from offering the unique backcountry ski experience they are trying to provide. This would make it unlikely that visitation levels would reach the 15,000 – 25,000 range projected for the Proposed Action.

Demand for summer recreational and educational programs would also be less under this alternative. While scenic lift rides would likely remain popular, SOLRC could offer little else to attract summer visitors. The hiking/biking trail connecting the base area to the top of the lift would be the only other recreational amenity, and it is steep and full of switchbacks. The limited amount of private land available would not provide a strong base for educational programs. All in all, summer recreation would likely involve little more than scenic lift rides attracting primarily tourists arriving for day visits on the Durango-Silverton train.

3.7.4.2.2 Balance of Facilities

In terms of facilities balance, the time it takes to move skiers out of the base area and onto the mountain would change somewhat with this alternative. This is due to the amount of round-trip skiing that would take place. One round trip (i.e., time in the lift line, time on the lift, and time skiing down) would take about 25 minutes. Within that time frame, returning skiers would be back at the base of the chairlift as other skiers were heading up for their first run. However, even under the round-trip scenario, skiers should be able to distribute around the mountain within a 2-hour period.

The size of the lodge would likely be less than adequate on peak days under this alternative. The Proposed Action assessment above assumes fewer people would make use of the lodge's services, as they would be skiing areas far from these services. Under Alternative A, skiers would seek support services in a fashion similar to a conventional downhill ski resort. In this case, base area facilities would need to be sized to accommodate the full 475 skiers. Using accepted industry standards, the base lodge would need to be sized to approximately 5,600 square feet. Assuming a three-seat turnover, 158 seats would be required. The proposed Lodge would not meet this need.

3.7.4.3 Alternative B – Guided-only Operation

The guided-only operation would involve unguided skiing on private lands and guided skiing on public lands for up to 100 people. The projected maximum of 475 on total daily visitation would

remain in force. Use of a helicopter to transport skiers and to conduct snow safety operations would be authorized under this alternative.

3.7.4.3.1 Demand for SOLRC's Recreational Product

With respect to the unguided skiing on private lands, this alternative would be similar to Alternative A in that large numbers of skiers would be skiing on relatively few acres of skiable terrain. The difference would be that up to 375 skiers at one time would be on private land as compared to 475 under the No-Action Alternative. With this incremental reduction in skiers on private land, skier densities would be similar to conventional downhill ski resorts, and the ability to meet the proponent's objective of providing a unique ski resort experience would be compromised, although not to the degree of the No-Action Alternative. It is unlikely that the levels of visitation projected under the Proposed Action (i.e., 15,000 – 25,000 skier visits annually) would be achieved but visitation would likely exceed the No-Action Alternative.

The greater potential to generate demand lies with the guided operation on public land. The current limited operation, with a 40-person cap, has attracted strong levels of visitation, indicating that guided service for up to about 100 people is achievable. The guided component of this alternative in itself would expand the recreational opportunities at SOLRC. Adding a helicopter to create a heli-skiing option would add another recreational opportunity as well as a means of dispersing skiers over a wider area. This would further enhance the recreational opportunity as well as allowing more extensive skier compaction, potentially extending the limits of skiable terrain.

The combination of unguided, guided, and heli-skiing options, combined with the increased amount of skiable terrain likely to be available, would increase the likelihood of achieving annual visitation in the 15,000 – 25,000 range predicted under the Proposed Action. However, this alternative would restrict SOLRC's unique backcountry experience on public land to the 100 people on guided tours.

From an operations standpoint, the guided service would likely need to be staged in a manner that avoided crowding in the backcountry, to maintain the backcountry experience and to avert safety hazards in avalanche-prone terrain.

The use of the helicopter may also serve to turn away some visitors due to the noise and visual impacts of the helicopter, which would be inconsistent with the backcountry experience some people would likely be seeking.

In terms of demand for summer recreational and educational programs at SOLRC, this alternative would have the same effect as the Proposed Action (see section 3.7.4.1.1).

3.7.4.3.2 Balance of Facilities

Balance of facilities would be the same as described under the Proposed Action, as up to about 100 skiers would be in the backcountry with guides and too distant to make much use of skier services at the base area.

3.7.4.4 Alternative C – Integrated Guided and Unguided Operation

This alternative would combine guided and unguided skiing options. The terrain open to each option would be determined by snow stability assessments. Thinning would be authorized to facilitate tree skiing in forested areas. The projected maximum of 475 on total daily visitation would remain in force.

3.7.4.4.1 Demand for SOLRC's Recreational Product

By offering both guided and unguided skiing within the entire ski area boundary, with terrain restrictions determined on the basis of snow stability, this alternative would appeal to a broad range of skiers in SOLRC's target markets. This alternative would also result in the most terrain being open at any given time. Unguided skiing on terrain where avalanche hazard was adequately reduced would result in relatively high levels of skier compaction, serving to make the snowpack in such areas more stable and more reliably skiable. The guided operation would extend into terrain beyond these limits, where the guides' expertise would allow hazards to be avoided. This would increase the extent of open terrain at any specific point in time, and it would also provide skier compaction in a progressively wider area, increasing long-term stability and setting the stage for expanded unguided skiing. Thus, through the course of a season, the amount of open terrain could generally be expected to increase.

With this expanded base of open terrain, both guided and unguided skiers could find a unique experience, different from standard resort skiing. Under most conditions, more terrain would be open to unguided skiing than under other alternative except perhaps the Proposed Action, so unguided skiers would be less crowded. Guided skiers would generally be pushing into new terrain following storm cycles and as stability increased late in the season. Therefore, they could anticipate a consistent, quality, backcountry experience.

In short, this alternative would provide SOLRC with the greatest opportunity to serve their perceived market and achieve maximum levels of visitation. Visitation would likely fall within or exceed the range of 15,000 – 25,000 visitors per year range projected under the Proposed Action. By providing more open terrain and less crowding, this alternative would allow SOLRC to maintain the backcountry experience that is central to its market appeal.

In terms of demand for summer recreational and educational programs at SOLRC, this alternative would have the same effect as the Proposed Action (see section 3.7.4.1.1). The single difference would be the addition of the alternative hiking and biking trail between the base area and the top of the lift. This trail would be less steep and have fewer switchbacks, making it a more attractive option to most people considering taking the lift up and walking down, or *vice versa*.

3.7.4.4.2 Balance of Facilities

Balance of facilities would be the same as described under the Proposed Action.

3.7.4.5 Mitigation

22. Providing restroom facilities at the bottom of Colorado Basin would result in a more comfortable recreational experience for SOLRC visitors, as well as reducing potential water quality impacts. No vault-type restroom facilities should be authorized within floodplains or in areas with high water tables.

3.7.4.6 Cumulative Effects

The cumulative effects analysis area for recreational impacts is defined as the southwestern Colorado region, as this is the extent of one major component of SOLRC's potential market. The other component is national or even international, making any meaningful assessment of cumulative effects impractical.

Of the cumulative actions listed in Chapter 2 (section 2.4), the following actions are not considered in this analysis:

- Snowmobile use is not considered because it would not affect SOLRC's market appeal of facilities balance.

- Four-wheel-drive vehicle use is not considered because it would not affect SOLRC's market appeal of facilities balance.

- The shift in jurisdiction over SH 110A is not addressed because management activities (i.e. maintenance, access agreements, avalanche road closure agreements, etc.) are not expected to change.

- Grazing is not considered because it would not affect SOLRC's market appeal of facilities balance.

The remaining cumulative actions listed in Chapter 2 (section 2.4), development at Durango Mountain Resort and expansion at Telluride ski area, have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects to recreation. As discussed above (see sections 3.7.3.3 and 3.7.4.1.1) the proposed and actual expansions at these two major destination resorts have the potential to increase the region's drawing power in the national and international destination skier market. Any resulting growth in regional visitation would have positive implications for increased visitation at SOLRC.

3.8 SAFETY

3.8.1 Issues Addressed

The safety issues identified through scoping and internal, interdisciplinary review include the following:

- The ability of SOLRC to effectively manage avalanche hazard in the project area, given the magnitude of the problem (i.e., steep, high elevation terrain, continental snowpack, and local climatic conditions), the levels of expertise and effort needed maintain a major snow safety program, and SOLRC's ability to bear the costs of such a program.

- Whether adequate, early season skier compaction to stabilize the snowpack could be achieved.

- Liability for avalanche injuries and damage. (Note: liability for avalanche damage to private property is addressed in the Land Use analysis, section 3.5.4.1.2.)

- The potential hazard to SOLRC visitors posed by abandoned mines.

- Potential for collisions between snowmobilers and SOLRC visitors on CR 52.

- The potential for heightened wildfire hazard due to increased visitation.

An issue was raised during scoping regarding the potential for the noise of avalanche control explosives to trigger avalanches at other locations. While simultaneous releases and larger-than-anticipated areas of avalanche propagation do occur as a result of explosive control work, these are typically triggered by the charge itself and not by its noise. Sound energy in itself is not

considered an important factor. While loud noise could theoretically trigger an avalanche under extremely unstable conditions, other triggers (e.g., additional wind loading, cornice breaks, rock fall, or wildlife movement) would more likely come into play. As a result, this issue is not assessed further.

Note: Potential impacts of SOLRC's snow safety program on public land access and on roads and parking are discussed under Land Use, section 3.5, and Transportation, section 3.9, respectively.

3.8.2 Analytical Methods and Assumptions

Assessment of the snow safety issues, particularly whether SOLRC can effectively manage avalanche hazard in the project area, was based primarily on review of SOLRC's operating and snow safety plans (see section 2.2 of this EIS) and the physical setting where they would be applied. This review provided the basis for contrasting the snow safety impacts of the Proposed Action and alternatives using key variables such as the amount of skiable terrain, the projected number of skiers, the type of operation (i.e., guided v. unguided skiing), and the cost of snow safety program relative to ski area revenue. An assumption underlying the range of alternatives addressed in this analysis is that an adequate level of public safety could be provided under the Proposed Action or any alternative. The question addressed here is the likelihood that this level would be achieved and maintained.

The snow safety review was conducted by several recognized avalanche professionals included on the ID team specifically for this purpose. As described in Chapter 4 (List of Preparers), the snow safety reviewers' qualifications and experience make them eminently qualified to conduct this assessment.

The issue of risks associated with abandoned mines was addressed by reviewing the results of the cultural resources inventory and assessment completed for this project (DAC 2003), then determining whether the Proposed Action or alternatives would result in more people recreating in the vicinity of hazardous mines.

The potential for collisions with snowmobiles on CR 52 was assessed by reviewing patterns of snowmobile use coupled with projected patterns of skier use of the road. San Juan County officials were consulted regarding current management and management options for the road.

Assessment of the risk of collisions between SOLRC skiers and snowmobilers on CR 52 was based on review of information on use of the road by these two user groups documented in the Land Use (section 3.5) and Recreation (section 3.7) analyses in this EIS.

The issue of wildfire hazard was addressed through discussions with BLM fire management and control personnel.

3.8.3 Affected Environment

The background information that provided the basis for assessment of impacts in the areas of snow safety, abandoned mine risks, and wildfire hazard is summarized below.

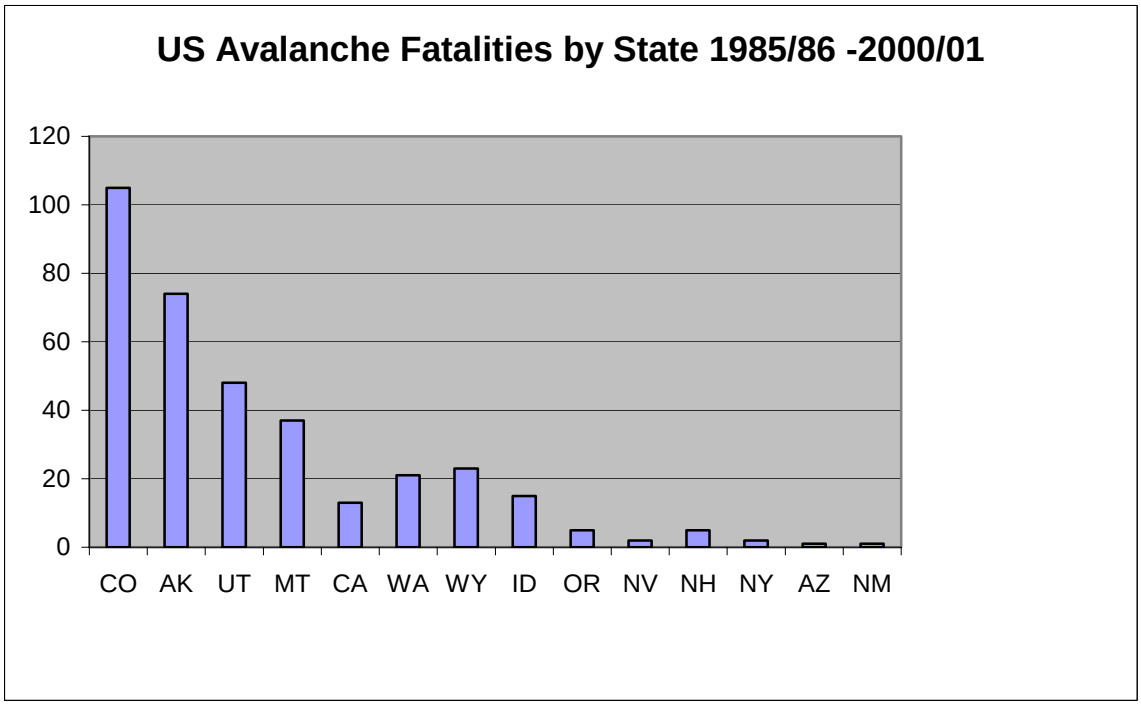
3.8.3.1 Snow Safety

SOLRC is located in Colorado's San Juan Mountains, a range known for its high avalanche hazard. This is due to the San Juan's steep topography, prevalent climatic conditions, and resulting snowpack characteristics. Unstable snowpack conditions often develop early in the season and remain for long periods. As a result, snow safety, particularly in terms of avalanche

hazard, is a key aspect of this analysis. To set the stage for assessment of snow safety issues associated with the Proposed Action and alternatives, this section will provide an overview of safety issues related to avalanches, particularly in Colorado and the project area, then review SOLRC's snow safety program as it has functioned to date.

3.8.3.1.1 Avalanche Hazard and Backcountry Skiing

Avalanche hazard is a fact of life in all mountainous areas with heavy snow accumulations. As indicated in Figure 3-3, 14 states have registered avalanche fatalities since 1985, with Colorado leading the list. The continental snowpack that prevails most years in Colorado and the San Juan Mountains is characterized by cold temperatures, low density snow, and shallow snow cover. The snowpack is generally weak and unstable, and avalanche activity frequently involves the entire snowpack rather than just surface layers. Timing of avalanche activity is much more difficult to predict because of this persistent deep slab instability. This is believed to partially account for the higher number of avalanche fatalities in Colorado versus other states.



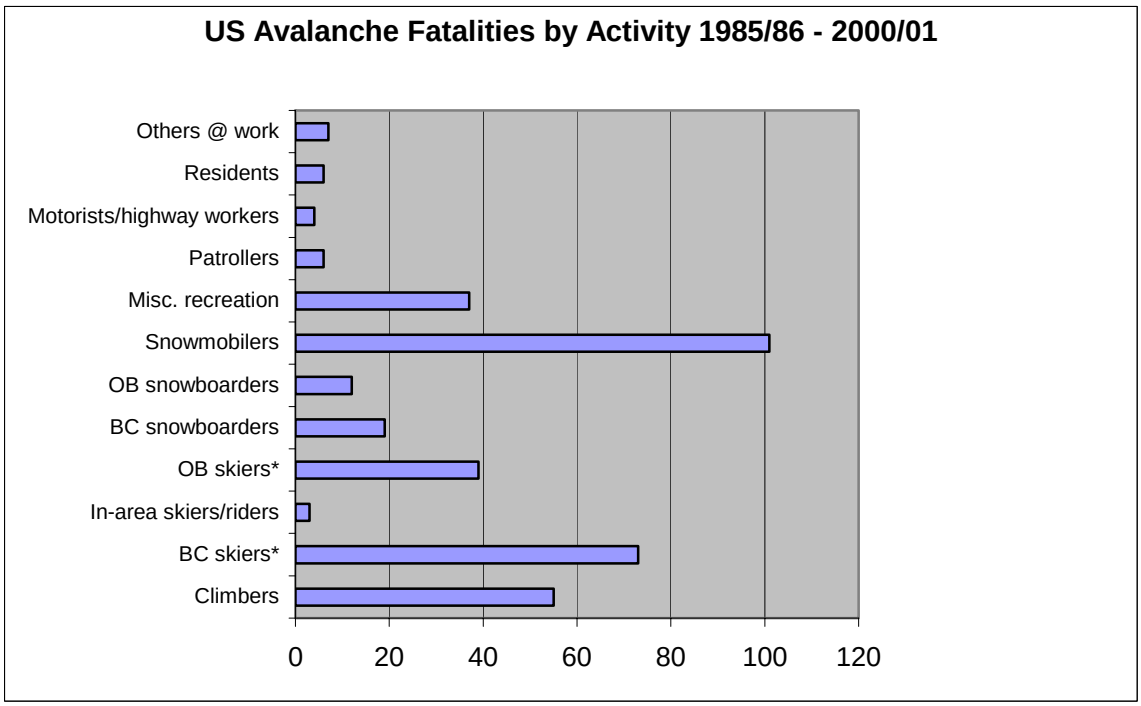
Colorado Avalanche Information Center (CAIC), 2002.

Figure 3-3. US Avalanche Fatalities by State.

A discussion of the snowpack metamorphosis process involved in the continental snowpack is available in the *Avalanche Handbook* (Armstrong and Williams 1992, pp. 51-53) and the *Avalanche Book* (McClung and Schaerer 1993, pp. 45-54).

Figure 3-4 breaks down avalanche fatalities by activity groups. Most avalanche victims were pursuing some form of recreation. Snowmobilers, backcountry skiers, and climbers head the list. A distinction between out-of-bounds (OB) skiers and backcountry (BC) skiers is noted in the *Avalanche Handbook* (1992). BC skiers include ski mountaineers, heli-skiers, ski-tourers,

snowcat skiers, and snowshoers who use the backcountry, far from developed areas. OB skiers are lift skiers that venture beyond ski area boundaries.



Colorado Avalanche Information Center (CAIC), 2002

Figure 3-4. US Avalanche Fatalities by Activity.

Armstrong and Williams (1992) note that, "Fatal avalanche accidents within ski-area boundaries have become extremely rare because of the effectual use of avalanche control and the stabilizing effect of snow compaction from thousands of skiers. Once lift skiers cross the area boundary, however, they enter the more hostile domain of an uncontrolled, uncompacted snow cover."

Supporting this general observation, the American Avalanche Association (AAA 2003) reports two avalanche fatalities at U.S. ski areas in the past 5 years, both at Jackson Hole, and one in a permanently closed area within the ski area boundary. In the backcountry, 10 skiers were killed in avalanches during the 200/01 and 2001/02 seasons in the U.S. During the 6 previous years, avalanche deaths among backcountry skiers averaged only one per year. In terms of guided backcountry operations, of 28,000 people who participated in helicopter and snowcat skiing operations in British Columbia in 2000/01, three died in avalanches. Among heli-ski operations, until January 2003 nobody had been killed in 17 years. (Kerasote 2003.) The conclusion this evidence suggests is that backcountry skiing is considerably more dangerous than resort skiing, and that guided operations reduce the hazard substantially.

Armstrong and Williams (1992) also provide a discussion on post control release in relation to snow compaction:

> Explosives (hand charges, artillery and avalauncher) do the job as intended more than 99.9 percent of the time; that is, the explosive either sets off an avalanche or it blows a crater in the snow and gives a good indication of stable snow. Still, 99.9 percent is not 100 percent. This means there are those few times when explosives do not get the job done. The result is a *post-control avalanche,* which we will define as an avalanche that releases minutes to hours following explosive control. Data show that there are about 20 to 25 post-control avalanches per winter. Some of these have been killers.
>
> The prospect of a post-control release poses an ever-present problem. Suppose you are in charge of the snow safety program at a ski area; you have sent out your control teams in the morning and they have come back with typical results-a few slides release, but most of the bombs went off in the snow without shaking anything loose. You give the all-clear, the lifts start running and soon skiers are all over the mountain. An hour or so later, a skier enters a steep slope, skis past a bomb crater and releases an avalanche that tumbles him down the hill. He-and you-have just been victimized by a post-control avalanche.
>
> The causes of these unkind events are not fully understood, but we do have some strong speculations. First, they are more likely to happen on slopes that have not had the benefit of compaction by skier traffic, or on slopes with significant depth hoar at the bottom of the snowpack. A program of continued explosive control, followed by as much ski compaction as possible, has been a good solution at many areas . . .

3.8.3.1.2 SOLRC Snow Safety Program

The area that SOLRC has proposed for public skiing operations has been reviewed by several consultants and avalanche experts. According to FitzGerald (2001), "The terrain under consideration for development and winter use by SOLRC could be categorized in general as steep and subject to a considerable threat by avalanches. Numerous large, well defined avalanche paths, as well as many smaller less obvious areas, will pose a significant challenge to a safe and efficient operation . . . In comparison to most other ski resorts in this country, the area SOLRC is suggesting for its operation has an unusually high percentage of avalanche prone terrain. This fact requires that a considerable amount of time be devoted to studying each of the designated Zones prior to their being considered a part of the normal operation." See Figures 3-5 and 3-6 for a depiction of avalanche terrain within the project area.

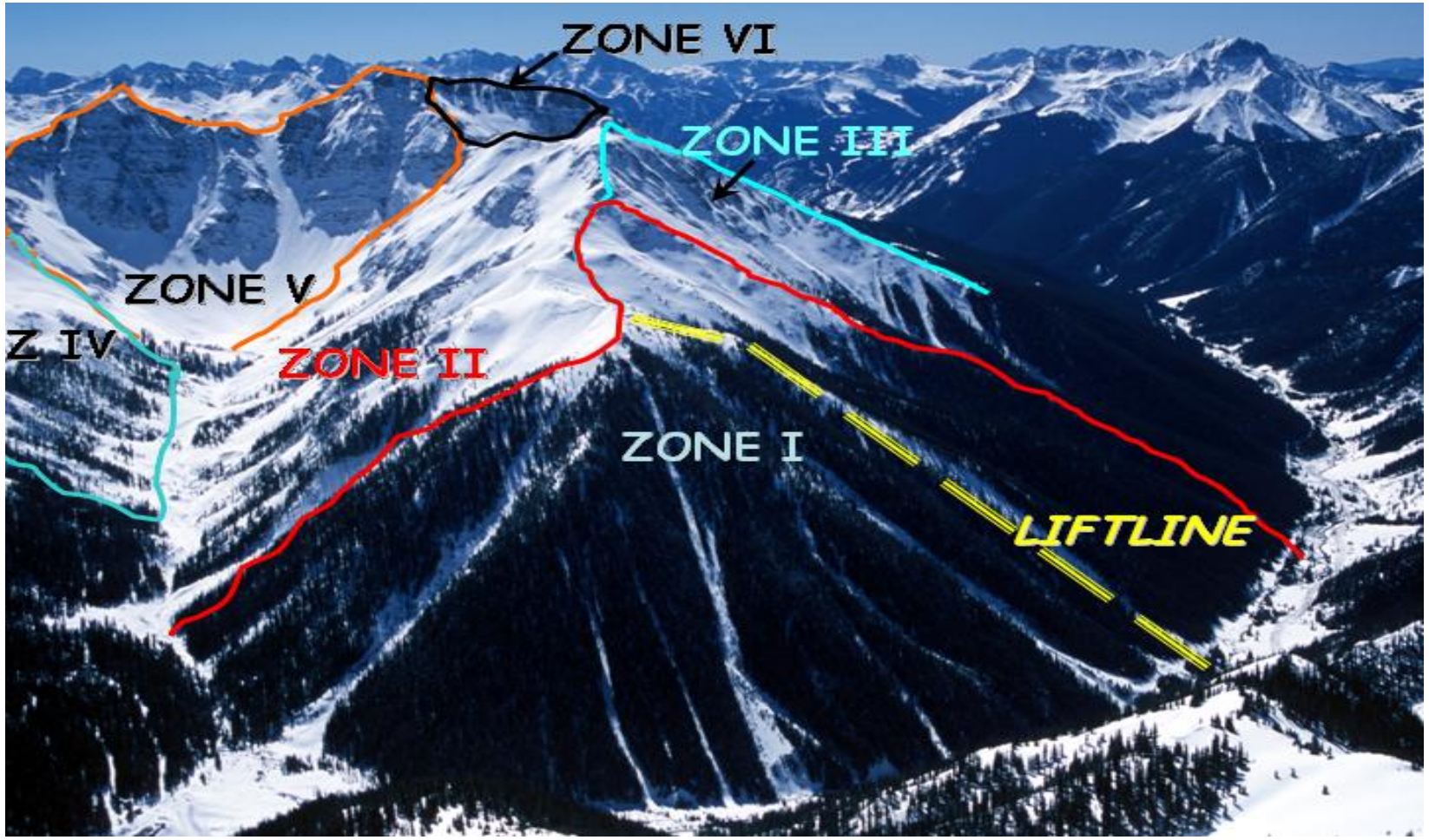


Photo by Scott Smith.

Figure 3-5. SOLRC Operational Zones and Ski Terrain.

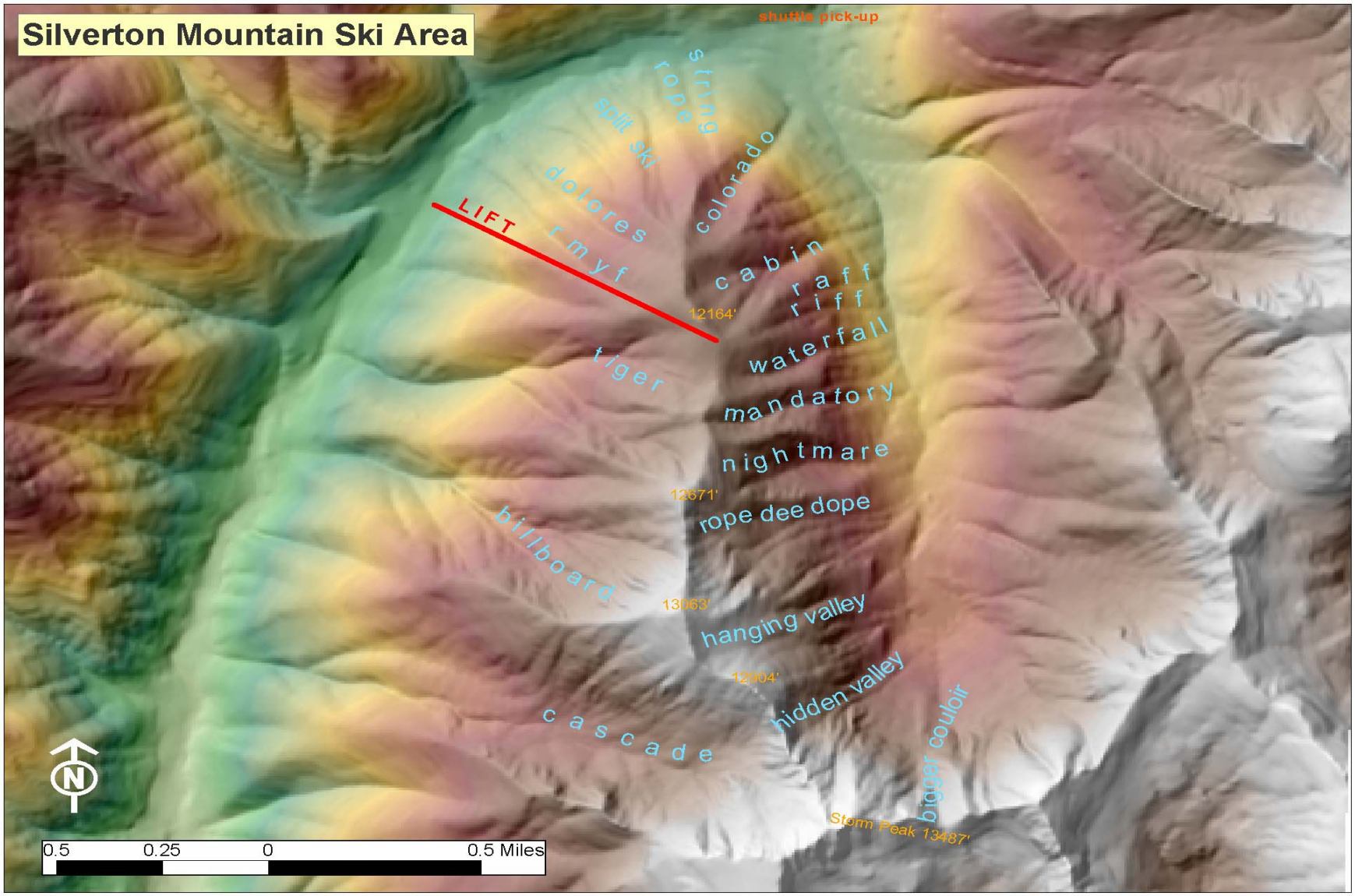


Figure 3-6. SOLRC Ski Runs.

To address this challenge, snow safety study and planning at SOLRC has been underway since 1999 under BLM permit (see section 1.3, Background). The results of this ongoing effort can be discussed under three headings: (1) snow and avalanche data and information coupled with responsive snow safety plans and programs, documented in a Snow Safety Document prepared by SOLRC; (2) avalanche hazard evaluation and forecasting procedures utilized by SOLRC; and (3) the avalanche control work completed to date and documented by SOLRC personnel.

Snow Safety Document

The Snow Safety Document prepared by SOLRC as part of their Operating Plan includes the following components:

- Snow Safety Plan: This plan includes avalanche control and snowpack stability evaluation procedures. Many of the avalanche control procedures are standard for the ski industry and a more detailed discussion is available in the *Avalanche Book* (McClung and Schaerer 1993, pp. 207-233).

- Avalanche Rescue Plan: This is a standard rescue plan tailored to SOLRC. The A*valanche Book* (McClung and Schaerer 1993, pp. 182-195) provides a more detailed overview of rescue planning.

- Avalanche Atlas: This includes a detailed inventory of avalanche slide paths with maps and photos of each slide path. A "route book" describing control routes is currently being revised.

- Ski Patrol Manual: This is an industry standard patrol manual with procedures specific to SOLRC.

- ISSC Operations Plan 1983: International Speed Skiing Competition operation plan including avalanche control procedures for the event from 1983, conducted in Colorado Basin within the proposed SOLRC boundary.

- Colorado Department of Transportation (CDOT) Avalanche Atlas: This includes a detailed inventory with maps and photos of slide paths along SH 110A accessing SOLRC. Currently CDOT is responsible for conducting avalanche control work along State Highway 110A while the San Juan County Road Department conducts routine maintenance such as grading and snowplowing. Roles and responsibilities for management of SH 110A are scheduled to change when road jurisdiction is transferred to the county in October 2003 (see section 3.9, Transportation). The atlas lists 49 avalanche tracks along SH 110A, 24 of which can cross the roadway (see Appendix D). During large avalanche cycles the roadway can be buried by avalanche debris. (Bachman 2002.)

- Discussion of private inholding (cabin): The June 1998 issue of the Avalanche Review documents a cabin located about 1.4 miles southeast of the Sunnyside Mine off CR 52. On March 29, 1998, during a storm, an avalanche struck the cabin destroying the south and east sides of the cabin. A person was in the cabin at the time and survived. The cabin has since been rebuilt. The Cabin chute lies within Zone 2 of the proposed SOLRC operational boundary and avalanche control work may threaten the rebuilt cabin. SOLRC must clear this residence prior to initiating control work on the effecting paths and be adequately insured to cover repair or replacement cost to the structure. SOLRC has been diligent in this respect and

maintains a liability policy, which covers such property damage up to $600,000 (Sturbenz 2002).

- The Snow Safety Document has been reviewed by several snow safety experts as part of this analysis and found to meet industry standards. It includes the appropriate elements, is based on appropriate data, and provides an adequate planning foundation for SOLRC's snow safety program.

Avalanche Hazard Evaluation/Forecasting

Stability evaluation is the process of determining whether avalanches can start given the current snow conditions. It is an essential element of avalanche prediction. Avalanche forecasting is defined as supplying estimates of both current and future snow stability. McClung and Schaerer (1993) provide a detailed discussion on avalanche prediction in Chapters 6 and 7 of the *Avalanche Handbook*. SOLRC employs the following data sources for avalanche forecasting:

- The twice-daily forecasts from the Colorado Avalanche Information Center (CAIC) based in Boulder, Colorado. The CAIC is a state agency under the Colorado Geological Survey. These forecasts include a weather forecast for different areas of the state of Colorado, avalanche hazard forecasts, avalanche observations, and snowpack analysis. Notes on accidents and hazard warnings are also included periodically in these forecasts.

- The Silverton Avalanche Forecast Office (SAFO) is part of CAIC. They currently employ three forecasters that work closely with CDOT on U.S. Highway 550 from Coal Bank Pass to Ouray, SR 145 over Lizard Head Pass, and SH 110A from Silverton to Gladstone. SAFO prepares daily avalanche evaluations for CDOT highway maintenance and avalanche control crews. SAFO blends weather forecasts with snowpack data, avalanche observations, and real-time weather data gathered from sensors along US 550 and on Lizard Head Pass.

- Telluride is the closest ski area to SOLRC and generally has similar snowpack and avalanche hazard conditions. The Telluride Ski Patrol staff provides regular weather and avalanche observations to SOLRC and other avalanche professionals via the internet.

- On-site weather data consists of daily new snow fall in inches and temperature (daily high and low). A permanent snowstake was not established for the 2001/02 season although one was established for the 2002/03 season. A weather station for measuring winds was installed for the 2002/03 season.

These information sources provide a comprehensive database available to SOLRC for ongoing snow stability assessments and avalanche forecasting. In conjunction with the Snow Safety Document, this database appears to set the stage for an effective snow safety program.

Implementation of Avalanche Control Activities

2001/02 Ski Season: The test of any avalanche control program is its implementation and outcome. The 2001/02 season was the first season SOLRC provided lift-served skiing. Public operations began on January 19, 2002, and were limited to 20 guided clients per day. Operations were conducted four days per week, and about 700 skier visits were logged for the season. The BLM requires SOLRC to provide detailed reporting on their snow safety activities, and this reporting for their initial season of lift-served operation provides an indication of the success of their avalanche control efforts. Note that the SOLRC permit area is broken down into six operational zones, as identified in Figures 2-2 and 3-5. The existing chairlift lies in Zone 1.

The goal of any avalanche control program is to reduce hazard by decreasing the size and frequency of large, unpredictable avalanches while creating more small, predictable, and relatively harmless avalanches (Sturbenz, 2002). Avalanche Control Shot Sheets from SOLRC indicate that control work with explosives was conducted on 48 days during the 2001/02 ski season.

Work began on December 5, 2001, initially focusing on Zone 1. In addition to the use of explosives, control skiing, ski packing, and boot packing were also documented as part of the control effort. The results noted were a lot of settling and cracking of the snowpack as well as some surface sluff avalanches. On December 14, control work was initiated in Zone 2 with some surface sluff avalanches noted. On December 20, control work included Zone 3 with no results noted. The bomb tram (a cable device allowing charges to be safely delivered to central locations in large avalanche starting zones) was first used on December 29 (Zone 2) with no results noted.

January was a relatively dry month with 30 – 60 percent of normal snowfall reported by the CAIC. Control efforts on January 3 produced two slides with the bomb tram, and efforts were focused on Zone 2. The avalauncher (a gas-powered gun used to launch explosive charges into distant starting zones) was used on January 10 in Zones 2, 4, and 5 with minimal results noted. In late January, as control work progressed in Zone 2, some larger avalanches were observed as a result of control work. January 22 efforts produced a HS-AE-4-OG avalanche in the Cabin Chute (HS = hardslab, AE = artificial trigger – explosive, 4 = large size, OG = running surface combination of old snow bed and ground).

February was also a relatively dry month with 26 – 71 percent of normal snowfall reported by the CAIC for southern Colorado. Control efforts were focused on Zones 1 and 2 with minimal results reported in Zone 1. Control efforts in Zone 2 produced two size-class 3 avalanches and a couple of size-class 2 avalanches.

March snowfall was between 48 and 72 percent of normal. The storm of March 8 – 9 brought 12 to 20 inches of snow to the San Juans, and several backcountry avalanche accidents occurred between the March 13 and 17. Control work at SOLRC produced three size-class 3 avalanches between March 13 and 22 and several smaller avalanches as well. Control work was conducted on two days in April with no results recorded.

2002/03 Ski Season: The 2002/03 season was the second season SOLRC provided lift-served skiing. Guided operations began on November 2, 2002, and were limited to 40 guided clients per day. Operations were conducted four days per week, and approximately 2,700 skier visit days were logged for the season. Reports detailing SOLRC snow safety activities indicate a successful avalanche mitigation program for the second season of lift-served skiing.

Avalanche control report forms from SOLRC indicate that control work with explosives was conducted on 74 days during the 2002/03 ski season. During this time, approximately 6,000 pounds of explosives were used and included both hand charges and avalauncher rounds.

Work began on November 2, 2002, initially focusing on Zones 1 and 2. Explosive testing, boot packing, ski cutting, and directed skiing with the guided groups were documented as part of the early season control effort. Approximately 150 volunteers boot packed many of the starting zones in Zone 1 and part of the Zone 2 (Riff & Raff). This helped provide for a core area of heavy compaction for the guided skiing operation during periods of storm and/or avalanche cycles for the remainder of the season.

The control work resulted in one slide of interest in November, occurring in the Cabin Chute. The slide was categorized as a SS-AE-3-0 slide (soft slab, artificial explosive, moderate size, old snow bed surface), occurred on a northerly aspect, had a 3-foot fracture line, was 900 feet wide, and ran 1,500 vertical feet. Avalanche debris covered the creek at the valley floor. This avalanche path also ran in January 2002 in an artificial event triggered by explosives, and in March 1998 in a natural event that destroyed the cabin situated at the bottom of the path across the creek. November 2003 was a wet month with 49 inches of new snow containing 4.9 inches of water recorded at the lower weather site.

In December, the snowpack became weakened by the faceting process. Storm events during this month brought 37 inches of new snow with 2.0 inches of water. However, the new snow did not bond well to the old snow and a persistent weak layer developed in the snowpack. By the end of the month, the snowpack was 87 percent of average for Red Mountain Pass.

January was a relatively dry month, with only 17 inches of new snow with 1.5 inches water content reported at Silverton Mountain. The snowpack remained weak but with little new snow load and few avalanches recorded. The snowpack average dropped to 71 percent of the yearly average and to 65 percent of normal for much of the San Juan Mountains.

During February, the weak continental snowpack was finally overloaded by a wind event followed by a snow event, with 35 inches of new snow containing 3 inches of water recorded. The wind brought in a red dirt layer from the Utah canyons, and weak snow crystals developed both above and below this layer. This provided a failure plane for the majority of activity recorded from both natural and artificial avalanche cycles. No incidents or injuries were reported. The precipitation, combined with strong storm winds resulted in several extended avalanche cycles. By the end of the month, the snowpack was at 76 percent of average.

Snow and winds continued into early March which produced another extensive avalanche cycle. New snow measurements were recorded at 26.5 inches with 2.4 inches of water, bringing the snowpack to 70 percent of average. Control work at SOLRC produced numerous releases of hard slabs that ran to the ground in weak depth hoar layers. Runs with heavy skier compaction did not produce large, full-depth avalanches at this time. Warm periods in the middle of the month and again at the end of the month produced a small wet avalanche cycle in the new snow layers most afternoons.

No control work was reported during the first 2 weeks in April, and SOLRC guided operations ended April 13. The snowpack reading on April 12 was 66 percent of average for Red Mountain Pass.

One avalanche incident unrelated to SOLRC control work was reported as occurring on March 2 in Zone 1. A client triggered a small slab in the steep trees in an area know as 100-acre woods. This area has many steep, narrow, but small starting zones off of the ridge as you drop into the run. No injuries were reported. The slide was categorized as SS-AS-2-0, had a 2-foot fracture line, ran 250 vertical feet in the trees down a 38 degree slope, and was only 15 feet wide. This incident indicates that pockets of unstable and hazardous snow can persist in the steep treed areas, even in Zone 1, which is the most heavily skied zone at this area.

CAIC requests commercial ski operations to report any avalanche incidents that result in injury to skiers. In the course of the 2001/02 and 2002/03 seasons, no such incidents were reported by

SOLRC. In addition, no post-control avalanches have been reported at SOLRC to date. This indicates that SOLRC's snow safety program was effective for two seasons of limited operation.

Liability

The issue of liability for injuries associated with avalanches or other aspects of commercial ski operations is comprehensively dealt with by the Colorado Ski Safety Act of 1979 (Title 33, Article 5, Part 7; Ski Safety Act). This law was promulgated specifically to: "further define the legal responsibilities of ski area operators and their agents and employees; to define the responsibilities of skiers using such ski areas; and to define the rights and liabilities existing between the skier and the ski area operator and between skiers" (33-44-102).

The Ski Safety Act recognizes the inherent risks of skiing, describes in detail the responsibilities of skiers and ski area operators, and specifies the limits on damages if injuries occur as a result of breaches of these responsibilities. SOLRC, like other commercial ski areas, carries liability insurance which would presumably cover damages under this scenario. As liability would be addressed in this manner regardless of the outcome of this analysis, this issue is not addressed further.

3.8.3.1.3 Assessment of SOLRC Snow Safety Situation Based on Experience to Date

Site visits, coupled with review of the Snow Safety Document, avalanche forecast procedures, and reports on implementation of the snow safety program during the 2001/02 season allowed the snow safety experts who conducted this analysis to reach several conclusions regarding the feasibility of safe, expanded, commercial skiing operations at SOLRC. According to FitzGerald (2001):

> Of all the area under consideration for SOLRC operations, Zone 1 represents the most manageable situation [see Figure 2-2]. A distinct difference exists between Zone 1 and Zones 2 through 6. Although Zone 1 presents numerous avalanche related challenges, it should prove to be much easier to manage than other areas . . . The amount of time required to deal with each avalanche area in Zone 1, and the number of staff likely to be available on a daily basis, would suggest that opening all of Zone 1 at one time during hazardous periods may not be a realistic goal. Most of the area in Zone 1 could be effectively controlled with hand charges and ski cutting . . . These methods, combined with regular and thorough compaction will provide a reasonable approach in dealing with the avalanche hazard found in Zone 1.

Sturbenz (2002) stated:

> Most of this zone (Zone 2) is generally east facing with complex leeward starting zones originating in mostly alpine terrain. Much of this terrain is subject to wind loading from prevailing west & southwest storm winds. Eastern aspects typically have complex snowpacks with multiple layers overlying depth hoar. Hazard mitigation in this zone will be much more demanding than in Zone 1 . . . The size and complexity of the area will preclude reliance on compaction. Closures, hand charge routes and avalauncher control will be required to supplement an active, state-of-the-art, forecasting program . . . For many years ski areas avoided expansion into terrain such as this because of high operational expenses, exposure to potential liability and lack of demand. However, in recent years public demand has prompted many ski areas to develop this type of natural

> avalanche terrain. In 1976, when Perla and Martinelli wrote *The Avalanche Handbook*, they made the following recommendation with regards to development of natural avalanche terrain: "Three to five years of continual observation are desirable before the area is opened to the public."

FitzGerald (2001) continued:

> Zones 3 – 6 represent as great an avalanche potential as found in Zone 2, but have the additional problem of inaccessibility. Whereas many of the avalanche starting zones in Zone 2 can be accessed from the top with a moderate amount of uphill travel from the chairlift, most of the starting zones in Zones 3 – 6 are much more difficult to reach due either to the steep, rugged ridgeline that ascends towards Storm Peak, or their considerable distance from the chairlift. This inaccessibility will severely limit ski compaction in the upper portions of the avalanche starting zones, and in most cases make the use of hand thrown explosives (unless deployed from a helicopter) impractical.
>
> Most of the terrain in zones 3 – 6 could be characterized as extremely rugged and difficult to reach. Portions of Zone 4 however appear to be a little less extreme. Whereas these more moderate areas are still capable of producing large and destructive avalanches, certain areas with lower slope angles or sufficient tree cover may offer some opportunity for guided skiing. This could be considered after explosive tests have been carried out, and during periods when snowpack conditions are considered to be generally stable.
>
> In general, Zones 3 – 6 should be regarded as separate from Zone 1, and certain sections of Zone 2. Any skiing operations carried out in Zones 3 – 6 and in most of Zone 2, would most likely take place during springtime conditions (when the snowpack is naturally more stable). Winter use may be possible under the supervision of a qualified guide, but would be advisable only during the most stable snowpack conditions. As with Zone 2, allowing SOLRC to conduct explosives control work in these areas would increase their understanding of the avalanche potential and how to manage it. It is also likely to contribute to the safety of operations in Zone 2 as well as any access by the public into Zones 3 – 6 that might take place during springtime conditions.

The agency Snow Ranger assigned to assist with on-site administration of SOLRC's permit during the 2002/03 season noted several operational issues with implementation of the snow safety plan. Most pressing was the level of snow safety staffing, particularly the number of people available to complete control routes and the need to free the snow safety director up to supervise work. Other issues identified include incorporating more of the available weather and snowpack data into the avalanche forecasting effort and employing a second Avalauncher along CR 52. These issues are being addressed through agency permit-administration activities and will be reflected in operating and safety plan modifications as appropriate. (Hogan 2003b.)

In summary, based on site visits, review of pertinent SOLRC plans and information, and experience gained through the 2001/02 and 2002/03 operating seasons and the 2000 through 2003 snow safety studies, the conclusions drawn regarding the potential for safe, expanded, commercial skiing operations in the SOLRC permit area can be summarized as follows:

- The difficulty of implementing effective snow safety efforts generally increases from Zone 1, to Zone 2, to Zone 4, to Zones 3, 5, and 6, with access being an important factor limiting control efforts in Zones 3 – 6.

- Zone 1 may be the only zone that can routinely be opened during periods of high avalanche hazard, once standard control measures have been implemented (e.g., hand charges, ski cutting, and skier compaction).

- Zone 2 is large and complex, and more aggressive control measures and explosive delivery systems will be required to effectively control avalanches (e.g., bomb tram and avalaunchers in addition to hand charges, closures, and less reliance of skier compaction).

- Zones 3, 5, and 6 pose a greater control problem than the others because they combine the rugged terrain and numerous avalanche paths of various sizes characteristic of Zone 2 with more limited access. As a result, they may be opened only during periods of high stability during early and mid-winter, and then perhaps only with qualified guides. Helicopter use would allow more effective explosives use. Because of limited access and use, skier compaction will probably not be an important factor. More extensive use will be possible once the snowpack stabilizes in spring.

- Because it includes areas that are less steep and more forested, Zone 4 may provide more skiing options under generally stable conditions, once standard stability testing has been done.

- Within the zones, specific ski runs may be more readily made safe than the zone as a whole (e.g., Riff and Raff in Zone 2, Tiger in Zone 3, and several runs in Zone 4; see Figures 3-5 and 3-6).

3.8.3.2 Abandoned Mine Risks

The project area's mining history is described in detail in the Cultural Resources section of this EIS (section 3.11). Mining operations have been ongoing in the area since the late 1800s, and a cultural resources survey, inventory, and impact assessment was completed to identify potential impacts of this project on historic mining resources. That effort identified 11 historic mining related sites and 15 mining-related isolated finds. Each of these sites and isolated finds was examined, and none were found to contain open tunnels or shafts that would pose a safety hazard. However, the report noted that there are standing or partially standing buildings, structures, and large machinery parts present at sites including the Big Colorado Mine, Silver Ledge Mine, Fairview Settlement, and Yale Mill Site that pose potential hazards to skiers or hikers. (DAC 2003.) Note: Maps of these sites are not included in this analysis in order to protect the historic resources they comprise.

As noted in the Cultural Resources section (3.11), the pedestrian survey for historic mining sites did not cover 100 percent of the terrain within the SOLRC boundary, so the possibility remains that open tunnels or shafts could exist. However, the Colorado Division of Minerals and Geology, Inactive Mine Program, will be visiting the project area this summer to survey for openings. If any are found, appropriate measures will be taken to eliminate any hazards posed (e.g., openings would be sealed). (Krabacher 2003.)

3.8.3.3 Collision Potential on CR 52

As discussed in the Land Use analysis, CR 52 is groomed in the winter by the Silverton Snowmobile Club for snowmobile use. In addition to normal use involving an average of 15 snowmobiles per day, the club stages a special event each spring that brings several hundred people and many snow machines to the Colorado Basin site. CR 52 is also the egress route for SOLRC skiers using any portion of the ski area terrain that drops into the South Fork of Cement Creek. Given SOLRC's limited level of operation to date, and the extent of road closure associated with their avalanche control efforts, this joint winter use of the road has posed no problem. (See Land Use, section 3.5.3.1.2, for detailed discussion of snowmobile use and road closure.)

3.8.3.4 Fire Hazard

While most terrain in the SOLRC boundary does not support forest vegetation because it is above timber line, too steep and rocky, or too dry, there are substantial forest stands on north and west facing slopes in the northern portion of the area. These comprise both public and private lands. As demonstrated by the catastrophic fires in the region during the summer of 2002, wildfire hazard can be severe, placing risks on people, property, and natural resources. While levels of human activity in the area during summer are relatively high (see section 3.5, Land Use), no wildfires have been recorded in the project area during the past decade.

3.8.4 Environmental Consequences

This section outlines projected direct, indirect, and cumulative impacts in the areas of snow safety, abandoned mine risks, and wildfire hazard, respectively, under the Proposed Action and alternatives.

3.8.4.1 Proposed Action

3.8.4.1.1 Snow Safety

As stated above under Analytical Methods and Assumptions (section 3.8.2), it is assumed that an adequate level of public safety could be provided under the Proposed Action or any alternative, and the question addressed here is the likelihood that this level would be achieved and maintained. That is a complex question involving a number of variables, most of which can be addressed at this point only in qualitative terms. Table 3-20 presents the key variables and the assessment of each under the Proposed Action and the alternatives. The key variables and their relevance to this issue are as follows:

Level of Skier Use. While the maximum number of skiers projected on a given day is the same under all alternatives (475), the Proposed Action and alternatives would vary in their likelihood of actually attracting this number. It is not possible or necessary to project hard numbers for the purposes of this analysis, but we can make generalizations about skier numbers. Skier numbers also factor into skier compaction and revenue generation, discussed below.

Extent of Skiable Terrain. Given their different approaches to snow safety, the unguided and guided scenarios would make different amounts of terrain useable. This in turn factors into skier compaction and the cost of the snow safety program, discussed below.

Table 3-20. Comparison of key snow safety aspects of the Proposed Action and alternatives.

Alternative/ Variable	Proposed Action	Alt A – No Action	Alt B – Guided-Only Operation	Alt C – Integrated Guided and Unguided Operation
Level of Skier Use	Projected to reach 15,000 – 25,000 skier visits per year.	Unlikely to reach visitation projected under the Proposed Action because of limited terrain.	Unlikely to reach visitation projected under the Proposed Action because of higher price for guided skiing and skier:guide ratio (up to 8:1), which effectively limits guided skiing to about 100 visitors per day. Projected visitation higher than No-Action Alternative.	Most likely to reach visitation projected under the Proposed Action because of guided and unguided options and greater skiable terrain.
Extent of Skiable Terrain	Limited terrain open under unguided-only scenario because "hazard reduction" approach to snow safety can only open so much.	Least of all alternatives; skiable portion of 344 acres of private land only.	Guided operation would make the most terrain available because "hazard avoidance" approach to snow safety allows selective use of more expansive terrain.	Would make the most terrain available because guided and unguided skiing are options.
Skier Compaction	Potentially high degree of skier compaction on public and private land because of high skier numbers; extent of compaction limited by amount of terrain that can be opened.	High degree of skier compaction on private land because of high skier numbers on least terrain. No compaction on public land.	Lowest degree of skier compaction on public land because of lowest skier numbers on most expansive terrain. High degree on private land.	Highest potential degree of compaction on public land because guided operation would likely result in more terrain open to unguided skiing than under the Proposed Action. High degree on private land.
Revenue Generation	Moderate revenues due to high skier numbers at low pass prices, further limited by amount of terrain that can be opened and lack of higher priced guided option.	Lower revenues because available terrain limits skier numbers, as does lack of guided option.	Revenues limited by low skier numbers, mitigated to some degree by higher price for guided skiing.	Highest potential revenues due to high numbers of unguided skiers and higher price of guided skiing.

Table 3-20 (cont'd). Comparison of key snow safety aspects of the Proposed Action and alternatives.				
Alternative/ Variable	**Proposed Action**	**Alt A – No Action**	**Alt B – Guided-Only Operation**	**Alt C – Integrated Guided and Unguided Operation**
Cost of Snow Safety Program	Highest cost because hazard reduction (avalanche control, boundary management, etc.) requires highest levels of snow safety staffing and materials, and because the entire permit area would potentially be subject to this approach. Potentially offset by high levels of skier compaction, depending on amount of terrain that can be opened.	Least cost because of limited terrain, reduced snow safety staffing and high levels of skier compaction.	Somewhat lower cost because hazard avoidance costs less than hazard reduction, but the main slide paths would still have to be controlled. Fewer full-time snow safety staff than Proposed Action. Not notably offset by skier compaction.	Higher cost, between the Proposed Action and Alt B, because it entails costs of hazard reduction on a portion of the permit area (Proposed Action involves all) and hazard avoidance on the remainder. Lower snow safety saffing than Proposed Action but higher than Alt. B. Cost offset by potentially highest levels and greatest extent of skier compaction.
Internal Boundary Management	Most difficult because all skiers unguided and open terrain potentially extensive; most reliance on barriers and signage.	Difficult because all skiers unguided, but less terrain open; most reliance on barriers and signage.	Easiest because all skiers guided, and thus controlled, on public land. Same difficulties on private land as other alternatives.	Difficult because some skiers unguided and open area large, and because of differing boundary for unguided and guided skiers. Facilitated relative to Proposed Action by having guides as monitors. Same difficulties on private land.

Skier Compaction. This is a key snow safety factor, as compaction can eliminate unstable layers from the snow profile and substantially reduce avalanche risk. This factor is assessed by looking at projected use levels relative to the projected extent of skiable terrain, and it factors into the cost of the snow safety program, discussed below.

Revenue Generation. This is a very general, qualified look at relative numbers of visitors anticipated under each alternative and the price they would pay. The objective is to assess SOLRC revenues versus the relative costs of the different snow-safety approaches (see below).

Cost of Snow Safety Program. As discussed in Chapter 2, unguided operations entail a "hazard reduction" approach to snow safety (section 2.2), while guided operations focus on "hazard avoidance" (section 2.3.3), though hazard reduction is a part of any snow safety program where slopes are steep and snowpacks weak. Attaching dollar values to the two approaches is not possible or necessary, but the relative costs can be characterized for the purposes of this analysis. A second important factor in the cost of an effective snow safety program is the staffing required, including dedicated snow safety personnel, ski patrollers, and guides. Snow safety expertise requires sophisticated training and extensive practical experience, so the number of qualified people is limited. Table 3-16 in the Socioeconomics section of this EIS indicates the numbers of snow safety personnel, ski patrollers, and guides projected under the Proposed Action and alternatives.

Boundary Management. This term has two aspects, management of (1) SOLRC visitors' access to terrain within the permit area and (2) other visitors' access to the permit area. While both of these have safety implications, our focus here is on the first (i.e., management of internal and perimeter boundaries or closures for SOLRC visitors). Internal boundary management is an important safety issue in itself and also factors into the cost of the snow safety program. Note: External boundary management is discussed under Land Use (section 3.5).

As stated in Chapter 2 and the Analytical Methods and Assumptions section above, the Proposed Action and the alternatives are assumed to provide adequately for public safety. The question to be addressed in this analysis is the likelihood that this adequate level of safety would be achieved and maintained under the Proposed Action and alternatives. Answering this question requires integrating several of the variables outlined above and assessing them on the basis of professional experience and judgement. An overall public risk assessment for the Proposed Action follows the table and is included in the discussion of each alternative in subsequent sections.

An overall assessment of public risk associated with the Proposed Action relative to other alternatives was derived by integrating and assessing the preceding key factors. The conclusion is that under the Proposed Action it may be somewhat more difficult for SOLRC to maintain an adequate level of public safety, relative to some other alternatives, as discussed below. This is primarily because the cost of the snow safety program, focused on provision of unguided skiing through hazard reduction over the entire ski area, would be more costly than under the alternatives. On the other side of the equation, revenue generation would be moderate, limited by SOLRC's stated intention to keep pass prices low (i.e., between $25 and $35 per day, initially), by the amount of terrain they were actually able to open on a regular basis, and thus by their ability to maintain high levels of utilization. Internal boundary management is also projected to be more difficult and costly than under the other alternatives.

Moving beyond these general conclusions regarding the overall public risk associated with snow safety under the Proposed Action, a number of operational details regarding SOLRC's snow safety program and its implementation warrant mention. As discussed above (section 3.8.3.1), this safety analysis involved site visits, review of SOLRC's snow safety plan, and assessment of the ski area's efforts to date to implement the plan. While the plan itself and its implementation to date were determined to be generally sound, neither has been tested under the operating conditions that would be authorized under the Proposed Action. While the current snow safety plan and program have been developed as appropriate to the current operation, they must continue to evolve if an adequate level of safety is to be maintained as the operation expands.

Determining what terrain will be opened to unguided skiing is a key issue under the Proposed Action. As discussed above (section 3.8.3.1.2), the SOLRC area has been divided into six zones,

and these zones have been the focus of snow studies, risk assessments, and snow safety planning to date. However, that discussion also notes that different runs within zones may differ from the zone's norm in terms of avalanche hazard, control options, and skiing opportunity under various conditions. SOLRC has undertaken efforts to capitalize on these differences, focusing boot-packing efforts and guided skiing to stabilize key runs and develop an expanded base of reliably safe ski terrain. Knowledge has also been gained regarding safer ski routes in the forested portion of the area and on evacuation routes when injuries occur.

The snow safety program must continue to evolve to effectively address these developments. Adequate staffing is key. While these are operational details beyond the scope of NEPA analysis, it is recommended that active steps are implemented to insure that this evolution takes place if the Proposed Action is selected.

First, the snow safety study that has been implemented under annual permits since 1999 should be continued (see section 1.3 and 3.8.3.1.2). Increased, detailed understanding of snowpack and avalanche dynamics within the SOLRC boundary will provide a basis for more detailed snow safety planning and reduce the inherent risks of the operation. This study should continue for at least the next several seasons. (See Mitigation Measure 24.)

Second, improvements to the snow safety program should be documented and formalized in the snow safety plan. Once in place, snow safety plans often remain unchanged as actual programs grow beyond them. This can create a number of problems, including making agency review more difficult, risking the loss of key details when snow safety staff changes, and generally making the plan less binding. SOLRC snow safety personnel and BLM permit administrators should meet at the end of each season to review snow study results, assess snow safety program implementation and results, and document appropriate changes to the snow safety plan. (See Mitigation Measure 25.)

A final safety issue is emergency access between the base area and the top of the lift. To date, SOLRC has maintained the trail that roughly parallels the lift alignment, on private land, to provide skiers an easier way down, ski patrollers with an evacuation route down, and mountain operations staff with a route to the top in the event of a lift breakdown or other emergency. This trail is narrow and includes numerous switchbacks, and it has not been regularly maintained since the lift began operating. Further, it has not been cleared above timberline to date for passage of a tracked vehicle.

While this limited surface access between the base area and the lift top has proven adequate to date, and SOLRC has proposed no upgrades, need for an improved access route could increase with the level of winter activity at the ski area. An access route passable by tracked vehicles in the winter and wheeled vehicles in the summer would facilitate emergency access and should be considered based on experience and perceived need in the future. (See Mitigation Measure 26.)

3.8.4.1.2 Abandoned Mine Risks

As noted above (section 3.8.3.2), standing or partially standing buildings, structures, and large machinery parts present at sites including the Big Colorado Mine, Silver Ledge Mine, Fairview Settlement, and Yale Mill Site pose potential hazards to skiers or hikers within or adjacent to the SOLRC boundary. Under the Proposed Action, up to 475 skiers or summer visitors per day could be exposed to these risks.

In the case of summer visitors, the risk associated with these features would be low, much less than would be the case if open tunnels or shafts were present. The buildings and structures are

small, which reduces the hazard of collapse. The machinery is generally lying on the ground, posing no danger of falling. In short, the existence of these mining artifacts pose little risk beyond the inherent risk of recreating in rugged, mountainous terrain.

Winter visitors could face slightly more risk due to these artifacts. Skiers in untracked snow could conceivably collide with partially collapsed buildings, structures, or machinery that lay just under the snow surface. In that these sites are known, any such hazards could be identified on resort signage and flagged like other, naturally occurring hazards. This mitigation would reduce the risk to negligible levels. (See Mitigation Measure 27.)

3.8.4.1.3 Collision Potential on CR 52

As noted above (section 3.8.3.3), there is currently joint use of CR 52 by SOLRC skiers and snowmobilers, setting the stage for potential collisions. While no problems have occurred to date, the increase in SOLRC skiers projected under the Proposed Action – up to 475 per day v. the currently permitted 40 per day – would increase the potential for a collisions. Since the skiers would be unguided under this alternative, they would likely be dispersed along the road and potentially unaware of the possible hazard. This would be, in a sense, the worst case scenario in terms of collision potential.

Mitigation of this hazard would be most effective if it involved all parties, the BLM, San Juan County, the Silverton Snowmobile Club, and SOLRC. Working together, representatives of these entities should be able to devise operational procedures, or perhaps a management plan for winter use of the road, that provided for the safety of all users. (See Mitigation Measure 28.)

3.8.4.1.4 Fire Hazard

As discussed in the Land Use analysis (section 3.5) the project area supports a relatively high level of human activity, including recreation, residential use, mining, and grazing (section 3.5.3). The Recreation analysis also notes that public recreational use could increase marginally under the Proposed Action (section 3.5.4.1). Coupled with SOLRC's summer use involving up to 475 additional visitors per day, a notable increase in human activity in the project area could result from implementation of the Proposed Action. More human activity could translate to more opportunity for people to be careless with fire and increase the risk of wildfire.

However, as noted above (section 3.8.3.4), the extent of forested terrain capable of carrying a wildfire is limited in the SOLRC boundary, and historically wildfire has not been a problem in the upper reaches of the Cement Creek drainage. Furthermore, most SOLRC summer visitors are anticipated to do little more than take advantage of the scenic lift ride opportunity and thus would not be dispersed through the area. Many other SOLRC visitors would be involved in educational programs, under the supervision of trained staff. In short, dispersed, unsupervised recreation in the area is not projected to increase substantially, and wildfire risk should match this trend.

The BLM responds to increasing fire hazard by imposing a staged series of restrictions, ranging from bans on open fires to full area closure. These standard measures should prevent any notable increase in wildfire hazard due to marginally increased summer use of the project area under the Proposed Action.

3.8.4.2 Alternative A – No Action

3.8.4.2.1 Snow Safety

The assessment of public risk under this alternative, based on the key factors assessed in Table 3-20 above, is that the No-Action Alternative would potentially be the safest in terms of SOLRC's operation within their private land boundary. This is primarily because the cost of the snow safety program would be low, addressing only 344 acres of private land and offset by high levels of skier compaction. Even the lower projected levels of visitation should be adequate to support this snow safety program. However, the hazard created by SOLRC skiers leaving the private land boundary to ski on the surrounding, unmanaged public lands would potentially be extreme. The lift would greatly facilitate access to the surrounding area, and SOLRC's snow safety program would end at their property line. If skiers were able to ride the lift then leave SOLRC, many would likely do so, creating a substantial new safety risk in the project area.

If this alternative were selected, it would be necessary to close public lands surrounding SOLRC to winter use by SOLRC visitors. While this would be inconsistent with a general agency policy of providing public access to public lands (see section 2.2), it would be warranted given the potentially extreme avalanche hazard in the surrounding area and the easy access provided by SOLRC's chairlift. (See Mitigation Measure 23.)

3.8.4.2.2 Abandoned Mine Risks

Generally the same conclusions drawn above for the Proposed Action would hold under this alternative. However, the already marginal risk would be reduced because only two of the sites lie on the private land on which SOLRC would operate under this alternative (i.e., the Big Colorado and Silver Ledge mine sites), and because fewer visitors are anticipated under this alternative.

3.8.4.2.3 Collision Potential on CR 52

The general situation outlined above under the Proposed Action would hold under this alternative, but the hazard would be reduced somewhat by the reduced terrain available for SOLRC's operation and the likely lower number of skiers involved.

3.8.4.2.4 Fire Hazard

Generally the same conclusions drawn above for the Proposed Action would hold under this alternative. If there were a difference, it would be reduced risk due to restriction of SOLRC's summer programs to their private lands.

3.8.4.3 Alternative B – Guided-only Operation

3.8.4.3.1 Snow Safety

In regard to snow safety, this alternative would differ from the Proposed Action primarily because use levels would likely be lower and because more terrain could potentially be opened under the "hazard avoidance" approach to snow safety that characterizes guided operations. The potential use of a helicopter is another important difference.

In terms of use levels, it is assumed that SOLRC's private land, which would be open to unguided skiing under this alternative, would receive the same level of use as under the Proposed Action. The lower projection of overall use would result from the lower skier numbers the permit area could accommodate under the guided-only limitation. With a maximum skier:guide ratio of 8:1,

SOLRC estimates that about 100 guided skiers per day would be the maximum on public lands. This would result in a reasonable number of guides (i.e., 12 or 13) and would not result in crowding that would detract from the guided experience. The higher price of guided skiing could also limit demand.

In general, the guided operation could safely access more terrain under most conditions than the Proposed Action's unguided operation, and it might also provide additional understanding of the terrain and snow stability situation to allow opening more private land to unguided skiing than the unguided operation would alone. Use of a helicopter to transport snow safety personnel and perhaps skiers to more distant parts of the permit area would not only allow more thorough stability testing and data collection, but would also disperse skiers and skier compaction more broadly.

Decreased skier numbers and potentially increased terrain would impact the overall public safety risk associated with this alternative in several ways. First, it would result in less skier compaction, a key factor in snow stability. Guides would likely be instructed to focus use in key areas, using compaction to maintain stability of the most important slopes and runs, but the overall level and extent of compaction would be less than under the Proposed Action or action alternatives. As noted above, helicopter use would allow more dispersion of skiers and skier compaction.

Revenue generation would also be affected. Again, the private-land operation would likely not be affected, so the question would be whether up to 100 guided skiers on public land would generate more revenue for SOLRC than would an undetermined number (up to 475 per day) of unguided skiers. The experts involved in this analysis concluded that they likely would not, that even at lower per skier prices the unguided option would likely attract enough additional skiers to make up the difference.

In terms of the cost of the snow safety program, a number of factors would come into play. While hazard avoidance generally costs less than hazard reduction, the situation at SOLRC demands that the major avalanche paths be controlled for either guided or unguided skiing. The difference between the two approaches would occur once the major control work was done and the associated costs incurred. At that point, the remaining hazards could be avoided by guiding. Helicopter use would change this scenario, allowing more effective stability testing and control efforts. However, given the high cost of helicopter hire, this option would substantially increase the outlay for snow safety efforts if it occurred very frequently. As noted above, skier compaction would be less under this alternative, so it would not reduce the cost of the snow safety effort appreciably. Using a helicopter to disperse skiers would offset this limit, but at high cost. All in all, snow safety program costs would likely to be less than under the Proposed Action, but the difference might not be appreciable.

The final variable considered is internal boundary management. Under this alternative, all skiers on public land would be under the supervision of a guide, which would make boundary management a simple matter. A helicopter would also allow easy identification of closure violations. On private land, the same boundary management problems discussed under the Proposed Action would hold, but at a reduced scale because of the smaller area open to unguided skiing.

The overall assessment of public risk suggested by these factors is that Alternative B would likely fall between the Proposed Action and the No-Action Alternative. The basic issue is that the cost of the snow safety program could be nearly as high as under the Proposed Action, while revenue

generation would likely be less. The lessened expense for effective boundary management expense could offset the difference. In short, SOLRC would be more likely to successfully maintain an adequate level of public safety under Alternative B than under the Proposed Action, though not by a wide margin, because of the inherent safety aspects of guided operations, if all other factors are equal, and the higher likelihood of effective boundary management. Maintaining the snow study effort and continuing to develop the snow safety plan, as discussed under the Proposed Action, would also be important under this alternative.

3.8.4.3.2 Abandoned Mine Risks

Generally the same conclusions drawn for the Proposed Action would hold under this alternative. However, flagging of hazards of mine sites on public lands would not be necessary, as guides could be made aware of and avoid them.

3.8.4.3.3 Collision Potential on CR 52

The general situation outlined above under the Proposed Action would hold under this alternative, but the fact that all SOLRC skiers descending from public lands would be accompanied by a guide would reduce the risk. Guided skiers would be in groups, and the guides would be aware of the potential hazard and supervise the groups accordingly.

3.8.4.3.4 Fire Hazard

Generally the same conclusions drawn for the Proposed Action would hold under this alternative.

3.8.4.4 Alternative C – Integrated Guided and Unguided Operation

3.8.4.4.1 Snow Safety

In terms of snow safety, this alternative was devised to capitalize on the advantages of both the Proposed Action and Alternative B – Guided Operation Only. First of all, it would likely attract higher levels of use than any other alternative because it would include both the guided and unguided options. Second, it would make the most skiable terrain available by offering both options and by providing for forest thinning to increase tree skiing options below timberline, a particularly important improvement during storms. The guided option would serve to open more terrain to unguided skiing over time by establishing known routes and by providing more exact, up-to-date information on snow stability and avalanche dynamics. Tree thinning would open tree routes available to both guided and unguided skiers, as appropriate. As a result of these aspects of the alternative, more net terrain would be open on public land than under the Proposed Action, and its use would not be restricted by the skier:guide ratio as under Alternative B. These two factors would translate to higher revenue generation than the Proposed Action and Alternative B.

On the cost side, this alternative would probably fall between the Proposed Action and Alternative B as a result of some savings associated with the hazard avoidance approach under the guided option and because skier compaction would be the most widespread. Tree thinning would not add notably to program cost, as it would be done incrementally by people already on staff, using hand tools and leaving thinned material on the ground. Management of internal boundaries would be facilitated by having guides out on the permit area monitoring illicit use by unguided skiers. The Alternative Lift Trail included under this alternative would facilitate emergency snowmobile access between the base area and the top of the lift. Such access is limited by the current lift trail.

In terms of overall public hazard, this alternative would provide the greatest likelihood of SOLRC maintaining an effective snow safety program. It would provide SOLRC the most operational

flexibility to adjust to changing snowpack conditions, client demand, and other operational factors on an hourly, daily, and seasonal basis. This flexibility is vital to an effective snow safety program and also to maintaining the unique type of recreational experience SOLRC is endeavoring to offer. While program costs would be at the high end of the range, revenue-generating potential to fund the program would be highest. Success will depend on the operational discipline and expertise to implement a well articulated snow safety plan that includes clear criteria for shifting from guided to unguided operations in a given area. Again, efforts discussed under the Proposed Action to continue the snow study and to facilitate evolution of the snow safety plan should continue.

3.8.4.4.2 Abandoned Mine Risks

Generally the same conclusions drawn for the Proposed Action would hold under this alternative. However, flagging of hazards of mine sites on public lands open to guided use only would not be necessary, as guides could be made aware of and avoid them.

3.8.4.4.3 Collision Potential on CR 52

The general situation outlined above under the Proposed Action would hold under this alternative, but the advantages of having at least some of the SOLRC skiers accompanied by guides (see section 3.8.4.3.3 above) would also serve to reduce the risk somewhat under this alternative.

3.8.4.4.4 Fire Hazard

Generally the same conclusions drawn for the Proposed Action would hold under this alternative.

3.8.4.5 Mitigation

3.8.4.5.1 Snow Safety

23. If the No-Action Alternative were selected, closing public lands adjoining SOLRC's private lands to winter access by SOLRC visitors would eliminate the possibility of their being harmed by avalanches in the surrounding, unmanaged terrain.

24. Continuing the ongoing snow safety study for at least the next several seasons would insure that expanded, up-to-date information on the area's snowpack and avalanche dynamics was available to aid in effective snow safety planning.

25. Regular updating of the snow safety plans, through end-of-season meetings of SOLRC snow safety personnel and BLM permit administrators would insure that the snow safety plan remained an effective tool for management of public risk. Documented criteria for determining when operations in a given area can be shifted from closed, to guided, to unguided will be essential.

26. An access road between the base area and the top of the chairlift, passable by tracked vehicles in the winter and wheeled vehicles in the summer, would improve emergency access and egress if the agency deemed it was necessary in the future. This road could be constructed along the alignment of the alternative hiking and biking trail proposed under Alternative C by blading a full-bench cut wide enough to accommodate a snowcat to groom the road in winter.

3.8.4.5.2 Abandoned Mine Risks

27. Standard flagging of hazards at mine sites, or avoidance of such sites by guided groups, would minimize any risk skier collisions with buildings, structures, or machinery remaining at these sites.

3.8.4.5.3 Collision Potential on CR 52

28. Collaboration by the BLM, San Juan County, the Silverton Snowmobile Club, and SOLRC on a plan for management of CR 52 would reduce the risk of collisions between skiers and snowmobiles on CR 52.

3.8.4.5.4 Fire Hazard

No impacts requiring mitigation were identified.

3.8.4.6 Cumulative Effects

The cumulative effect analysis area for safety impacts is the SOLRC boundary. Of the cumulative actions listed in Chapter 2 (section 2.4), the following were not included in this analysis:

- The Durango Mountain Resort and Telluride expansions were not considered because they will not affect safety in the project area.

- The jurisdictional change of State Highway 110A was not addressed because, as discussed in the cumulative actions description (section 2.4.5), management of the road in terms of clearing and avalanche control is not expected to change.

- Mining operations at Sunnyside and Gold King mines were not considered because these mines are outside of the SOLRC boundary and therefore would not affect safety in the project area.

The remaining cumulative actions have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects in the realm of safety, as discussed below.

3.8.4.6.1 Snow Safety

None of the cumulative actions have the potential to impact snow safety within the SOLRC boundary.

3.8.4.6.2 Abandoned Mine Risks

None of the cumulative actions have the potential to affect the risk posed by abandoned mines. However, as discussed in section 3.8.3.2 above, the state agency responsible for closure of abandoned mines will survey the project area for abandoned mine hazards and mitigate any such risks as appropriate.

3.8.4.6.3 Collision Potential on CR 52

As discussed in section 2.4.1, snowmobiling is the major winter use of CR 52, and this use could increase. Since this road would also constitute the main route for SOLRC skier leaving Colorado Basin (see section 3.8.3), increased use by snowmobiles would increase the potential for a collision. This in turn would hasten the need for development of a road management plan to deal with this issue, as discussed in sections 3.8.4.1.3 and 3.8.4.5.3. To date, this has not been a major

issue, largely because both snowmobile and skier use have been limited due to closure of CR 52 and, effectively, the terrain lying above it when SOLRC avalanche control activities are underway.

3.8.4.6.4 Fire Hazard

Four-wheel-drive use, mining, and grazing all involve potential ignition sources for wildfire and thus should be considered cumulatively with the Proposed Action and alternatives in assessing overall wildfire hazard in the project area. However, the same protective measures noted above (section 3.8.4.1.4) would be implemented by the BLM during high-hazard periods. This should preclude any major increase in the cumulative risk.

3.9 TRANSPORTATION

3.9.1 Issues Addressed

The transportation issues identified through scoping and internal, interdisciplinary review include the following:

- Adequacy of SH 110A capacity, and the potential for traffic circulation.
- Availability of adequate parking areas, including capacity and use rights.
- How will closure of SH 110A be managed during avalanche control activities and what are the potential avalanche impacts to roads and parking areas used or otherwise impacted by SOLRC.
- The need to maintain road access for emergency medical purposes, and so that emergency repairs can be made to the powerline that traverses the project area.

Note: The only issues raised through scoping and internal, interdisciplinary review regarding CR 52, another road corridor within the project area, involved limitations on its use due to SOLRC's avalanche control efforts, and the potential for collisions involving snowmobilers and SOLRC skiers. These issues are addressed under Land Use, section 3.5, and Safety, section 3.8 respectively. As a result, CR 52 is not discussed in this analysis.

3.9.2 Analytical Methods and Assumptions

Data and information on the use and management of SH 110A was collected through interviews with San Juan County, Colorado Division of Transportation (CDOT), and BLM personnel, and traffic statistics from the CDOT website.

Information regarding road access and closure permits, and road closure associated with avalanches, came from interviews with San Juan County, CDOT, and SOLRC personnel, and associated county permits.

Data used to describe avalanche pathways, and the frequency of avalanches affecting SH 110A came from documents referenced in this section, including reports by the Silverton Avalanche Forecast Office (SAFO), the CDOT Avalanche Atlas, and the CDOT Avalanche Hazard Index.

This information was used to complete a generally qualitative assessment of the transportation issues identified above.

3.9.3 Affected Environment

3.9.3.1 Road Capacity and Traffic Circulation

SOLRC is accessed from Silverton via SH 110A. Silverton, and SH 110A are accessed from the south and north via US 550. SH 110A has been used for over 125 years, providing access to the mines and mining communities in the Cement Creek watershed. CDOT took the road over in the 1960s, widening and improving it to accommodate large volumes of mining traffic and heavy vehicles. The highest traffic volumes on the road occurred when activity peaked at the Gold King and Sunnyside mines from 1960 to 1991, with daily use by 300 to 500 vehicles, including high-capacity ore trucks. (King 2003.)

SH 110A includes four lanes at its point of origin at the junction of US 550, narrowing to two lanes just north of Silverton. The majority of the road is unpaved, with the exception of the 2-mile paved portion from US 550 through town. The road is a minimum of 24 feet wide, and the speed limit is generally 25 mph. The average annual daily traffic estimate in 2001, for the 6.5-mile segment from the junction with SH 110B was 201 vehicles. Only 5 percent of this use was from truck traffic. Peak-hour volume on this portion of road was estimated at 32 cars. (CDOT 2002.) Use of this road varies considerably by season, with the majority of use occurring from June through September and very little use occurring between November and April (Speegle 2003). It is estimated that the road is used daily by several hundred vehicles during the summer and by 25 to 40 during the winter (Jack Johnson Co. 2001, Bachman 2002, Speegle 2003).

Currently, San Juan County is contracted by the State of Colorado to maintain SH 110A year-round. Maintenance includes snowplowing during the winter and general upkeep, including gravel grading, as needed, during the snow-free months. The state maintenance contract will terminate at the end of June 2003. An agreement has been signed between CDOT and San Juan County for the county to take jurisdiction over SH 110A in October 2003. As part of that agreement, CDOT will complete a number of improvements, including culvert replacement and re-paving of certain road portions (King 2003). After the shift in jurisdiction, the road will be maintained by the county as it has been in the past (Norman 2003).

In 2001 and 2002, SOLRC constructed an access lane and turnout to the ski area in the highway right-of-way on the east side of the road, just above mile-point 6.0, under a CDOT State Highway Access Permit (CDOT 2000). Access will continue to be granted when the management of this road shifts to the county (Norman 2003).

3.9.3.2 Parking

Two main parking lots, containing a total of 185 parking spaces, are available for SOLRC use. The largest lot is located at the SOLRC base area and contains 100 parking spaces. The second lot, an overflow lot, contains 85 spaces and is located 1.0 mile up SH 110A on land owned by Salem Minerals. This lot is available for use by SOLRC under an agreement with Salem Minerals. There are 77 additional spaces in four pullouts off of SH 110A, in the right-of-way. These pullouts are not currently available for use by SOLRC under the CDOT Access Permit but will become available under authorization by San Juan County, once the county has taken jurisdiction over the road. With the addition of the road pullouts, there will be a total of 262 parking spaces available for SOLRC use. This parking configuration, with the exception of the overflow lot on land owned by Salem Minerals, was described in the SOLRC Final Plan, and was

approved by the county as part of the PUD process (Norman 2000a). An amendment to the original parking plan was later submitted to the county and approved (Norman 2000b).

The base area parking lot is located under two small avalanche paths, Dump North and Dump South. Since 1971, there have been two reported avalanches from each chute that have hit SH 110A (see Appendix D). This lot is also at the base of the recently constructed lift alignment, which could act as an avalanche path. Two of the four road pullouts available for parking are located at the base of the Dry Gulch South avalanche path. However, there has only been one report of avalanches from this path hitting the road since 1971. The overflow lot is located near the base of two avalanche chutes, String and Florence. However, there are no reports of avalanches from these paths hitting SH 110A. (CDOT 1996, Ozawa 2003.)

3.9.3.3 Road Closures

Under the terms and conditions of a CDOT issued special use permit and an associated CDOT approved traffic control plan, SOLRC currently has the authority to close SH 110A while conducting avalanche control work to prevent risks to people travelling on the road. Closures are authorized at mile points 0.1, 4.1, 5.0, 6.2, and 7.7 during daylight hours when avalanche control activities are underway. CDOT, SAFO, and other state and county entities are notified in advance of avalanche control work or road closures, and temporary signs and barriers are posted/erected during control work to inform the public.

The CAIC/SAFO monitors and forecasts avalanches for more than 100 slide paths along the US 550 corridor from Coal Bank Pass to the south to Ouray to the north. Avalanche control work and associated closures of US 550 are managed by CDOT and based on information provided by CAIC and SAFO.

There are 49 avalanche paths in the SH 110A corridor, 10 of which originate inside the SOLRC boundary, and 24 directly across SH 110A from the project area (see Figure D1 and Table D1 in Appendix D). CDOT has assigned an avalanche hazard index (AHI) of 49 to SH 110A. The AHI is a quantitative measure of the avalanche hazard to traffic and is based on a combination of the size and type of each avalanche path, the historical frequency of avalanche occurrences, the number or avalanche tracks, the length of highway exposed, the volume of traffic on the road, the traffic peak characteristics, the speed of traffic, and the consequences of an avalanche encounter with a vehicle. The AHI for SH 110A was based on a daily traffic average of 100 vehicles. The hazard designation for SH 110A is moderate (with AHI values of 30-49 considered moderate and 50-99 considered high). In comparison, the AHI values for Molas/Coal Bank Pass to the south and Red Mountain Pass to the north on US 550 are 108 and 335, respectively. (CDOT 1995.)

Closure of SH 110A has occurred only three times since avalanche studies and SOLRC operations began in 1999 (Brill 2003d). Although periods of high avalanche activity routinely occur in the SH 110A corridor, the frequency of avalanches running to the highway is generally low. Avalanche occurrence is infrequent on the north and west sides of the project area, and avalanches rarely run to the road. Of the 56 avalanches along SH 110A reported to SAFO between 1996 and 2002, only six hit the road. None of these originated from the project area, and only one originated on the west side of SH 110A, across from the project area. During a similar period (1992 – 2002) CAIC has recorded only four avalanches hitting the road. CDOT data indicates that 19 avalanches hit SH 110A between 1971 and 1993. Four of these originated from the project area, and 13 originated on the west side of SH 110A, across from the project area (see Appendix D). (CDOT 1996; Ozawa 2003.)

In contrast to SH 110A, avalanches have frequently hit US Highway 550. For example, during the winter of 2000/01, a year of average snowfall, 225 natural and artificially triggered avalanches out of 1,018 total hit Red Mountain Pass on US 550, and 30 out of 285 total hit Molas/Coal Bank Pass. These avalanches resulted in full gate closures for 83 and 30 hours on Red Mountain Pass and Molas/Coal Bank Pass, respectively, and spot closures on both passes for 19 days during the season. (CAIC 2001.) During the winter of 2001/02, a year of very low snowfall and lower than average snowpack, 89 natural and artificially triggered avalanches out of 195 total hit Red Mountain Pass on US 550, and zero out of 40 total hit Molas/Coal Bank Pass. These avalanches resulted in full gate closures on Red Mountain Pass for a total of 38 hours and spot closures on both passes for 13 days during the season. (CAIC 2002.) Because of the low frequency of avalanches hitting SH 110A relative to Molas/Coal Bank Pass and Red Mountain Pass, road closures requirements of this highway have been minimal (CDOT 1996; Brill 2003d).

Although historic avalanche frequency adjacent to the project area along SH 110A has been low, and subsequent road closures have been rare, portions of this roadway have been buried by avalanche debris during major avalanche cycles. CDOT is currently responsible for avalanche control mitigation in the SH 110A corridor. They monitor snow stability in the area and avalanche paths on the highway, and they are in charge of control activities. The CAIC/SAFO provides daily avalanche forecasts and guidance for these control activities. Closure is determined through consultation with CAIC and the San Juan County Road Department and sheriff's office. When avalanches do hit the road, CDOT is responsible for the cleanup, which is contracted out to the county.

As previously discussed, jurisdiction over SH 110A will shift to San Juan County in October 2003. After the shift, CDOT will no longer permit avalanche control and associated road closures by SOLRC. However, it is anticipated that SOLRC will enter into an agreement with San Juan County, and the terms and procedures are anticipated to be similar to those outlined under the state permit. Prior to the winter of 2003/04, CDOT and San Juan County will develop a mutually acceptable avalanche program for SH 110A. Under this program and agreement, it is anticipated that CDOT would continue to monitor the road for avalanches and would still regulate avalanche control mitigations and cleanup, while the county would pay for the cost of explosives. The county would be ultimately responsible for road closure decisions, and the county sheriff and road supervisor would be kept informed of all avalanche control activities and closures. (Norman 2003.)

3.9.3.4 Emergency Road Access

As discussed in section 3.9.3.3, Road Closures, the infrequent closure of SH 110A is determined through consultation with CAIC/SAFO and the San Juan County Road Department and sheriff's office, and cleanup is conducted by the county. SAFO primarily monitors and forecasts avalanches on US 550 from Coal Bank Pass/Molas Pass south, through Red Mountain Pass, north to Ouray, and on SH 145 (Lizard Head Pass). Priority is given to keeping US 550 open to the south over Molas Pass and Coal Bank Pass, as this route provides Silverton residents access to the closest hospital in Durango. The majority of the avalanche control work has been done on Red Mountain Pass, and work on SH 110A has been minimal. (Bachman 2002.) In the rare instances where both passes on US 550 are closed because of avalanche danger, SH 110 is also closed, and forecasting, control, and cleanup efforts are focused on the US 550 corridor (King 2003). However, medical services in Silverton are still available when the passes are closed. See section 3.6.3.4, Socioeconomics, for a description of regional medical facilities.

During the period of peak mining activity in Gladstone, SH 110A provided access to mine employees. When road closures occurred because of avalanche danger, employees were either

held at the mine, or shifts were cancelled until the danger was mitigated (Bachman 2002). This would likely be the case with the reopening of the Gold King Mine.

When SH 110A is closed, access for emergency purposes, including medical emergencies and utility repair, is allowed by the state and county as needed and as safety permits. If emergency egress is required for medical reasons and the road cannot be safely traveled, access to the road corridor is available by helicopter, weather permitting. In addition, basic first-aid supplies and expertise are available at SOLRC.

3.9.4 Environmental Consequences

3.9.4.1 Proposed Action

3.9.4.1.1 Road Capacity and Traffic Circulation

The capacity of SH 110A would accommodate the increase in traffic anticipated under the Proposed Action. The number of passengers arriving per vehicle at ski areas typically ranges from 1.8 to 2.3. Therefore, under peak SOLRC use by 475 people per day, 207 to 264 vehicles are anticipated to use SH 110A to access the ski area. As this road was designed for use during peak mining activity by up to 500 vehicles per day, including ore trucks, no impacts to traffic circulation are anticipated. Continued, routine snow plowing and maintenance would facilitate safe travel on this road.

3.9.4.1.2 Parking

The SOLRC parking configuration would accommodate the number of visitors anticipated under the Proposed Action. There are 262 parking spaces available for SOLRC guests. Based on the number of vehicles anticipated during peak use of the ski area (207 to 264), there is enough parking to accommodate guests. If fewer than 1.8 guests, on average, arrived per vehicle, the parking capacity could be exceeded. If the demand for parking exceeded the number of available spaces, SOLRC could offer a shuttle bus service between Silverton and SOLRC (see Mitigation Measure 29). In the summer, the majority of visitors would arrive at SOLRC via shuttle bus, after coming to Silverton on the train. Therefore, the parking lots are not anticipated to fill during this period.

3.9.4.1.3 Road Closures

Under the Proposed Action, road closures would continue to be managed in a similar fashion to that described in section 3.9.3.3, Affected Environment. Avalanches and associated road closures have been historically low on SH 110A, but under the Proposed Action the potential for road closures would increase somewhat due to increased avalanche control activities at SOLRC. However, the result of avalanche control would be more frequent but less intense avalanches, so, the chances of avalanches running to the road would be less than has historically occurred. Road closures would impact people traveling on SH 110A for various purposes, as described in section 3.5.4, Land Use. However, the public would be informed of closures, and the closures would be short-term.

Traffic increases anticipated under the Proposed Action would slightly raise the CDOT AHI for SH 110A, likely moving it into the lower portion of the high hazard designation. However, relative to Molas/Coal Bank Pass and Red Mountain Pass on US 550, the hazard to moving traffic and parked vehicles on SH 110A would remain low.

The main SOLRC parking lot is located under two infrequently active avalanche paths and below the lift alignment. Avalanches could potentially hit the lot from the existing chutes. However, since only four avalanches have run to the road in this location since 1971, this risk is anticipated to be low. The lift alignment could act as an avalanche pathway during periods of high instability. However, there have been no avalanches in this alignment since it was created in 2000, and projected avalanche frequency is low because high levels of skier use would compact the snow and increase its stability. Avalanches could potentially run into the pullouts on SH 110A that are used as parking areas. However, since only one avalanche has run to the road in this location since 1971, this risk is considered to be very low.

The overflow parking lot is below two avalanche chutes, one on the north side of SH 110A, and one on the south side. In the last 30 years, there have been no records of avalanches from these chutes hitting the road. However, CDOT (1996) projects that the average avalanche activity on the road per year from the northern chute (Florence) is 0.04, or once every 100 years (see Appendix D). No avalanche activity projections exist for the other chute (String), but it has been used by skiers during the last two SOLRC permits, thus would likely be stabilized to some degree by skier compaction. Although avalanche frequency is generally low above the parking lots, there is a chance that they would run to the road during years of high avalanche frequency. However, avalanche control activities conducted by SOLRC in the corridor would reduce the risk of high intensity avalanches, and should maintain relatively safe parking conditions.

One scoping comment suggested that a corridor management plan for the SH 110A corridor be developed to address increased development and use of a roadway subject to high avalanche hazard. However, such plans are typically required when high traffic volumes or extensive development are anticipated along a roadway. In this case projected traffic volumes are well below the design capacity of SH 110A, as described in section 3.9.4.1.1, and only limited development is foreseen. That leaves avalanche hazard as the primary concern and, as indicated by this analysis, adequate, CDOT approved plans are currently in place to manage that hazard. If that conclusion changed, the entity responsible for management of the highway, most likely San Juan County, could implement a management plan for the corridor.

3.9.4.1.4 Emergency Road Access

Emergency road access could potentially be impacted by the Proposed Action. As discussed in section 3.9.3.4, when SH 110A is closed, the county determines emergency access to this road on the basis of urgency and safety. Emergency access would continue to be managed in this manner under the Proposed Action. Although road closures are anticipated to be rare, because of the low frequency of avalanches running to the road, SH 110A would likely be closed more frequently than it has been in the past because of increased avalanche control activities. Overall, this would make the road safer for travel but could create more temporary barriers to access. It could also create a temporary inconvenience to Silverton residents during power outages, if emergency repairs could not immediately be made to the powerline along SH 110A.

If there were a medical emergency requiring evacuation from the SH 110A corridor when the road was closed and ground access was not possible, a helicopter would be the next option. If the emergency did not require immediate action, SOLRC would have first aid supplies and trained personnel on-hand. In addition, the base facility would be heated, and food and water would be available, so any injured or stranded visitors would be comfortable if they were required to spend the night. Alternative wood-burning stoves would also be available, so heat would still be provided in case of a power outage.

3.9.4.2 Alternative A – No Action

3.9.4.2.1 Road Capacity and Traffic Circulation

As under the Proposed Action, the capacity of SH 110A would accommodate the increase in traffic anticipated under Alternative A, and traffic circulation would not be compromised. The projected maximum of 475 visitors per day would remain if force.

3.9.4.2.2 Parking

As under the Proposed Action, parking at SOLRC would remain adequate.

3.9.4.2.3 Road Closures

Avalanche control activities and road closures would be managed the same as under the Proposed Action. However, since less terrain would be available for skiing, avalanche control activities would be reduced to a smaller area and would likely be less frequent. Therefore, the frequency of road closures and potential risk to parked cars would likely be less.

3.9.4.2.4 Emergency Road Access

Road access for emergency purposes would be managed the same as under the Proposed Action. However, road closures would likely be less frequent than under the Proposed Action, as avalanche control activities would be less widespread and intensive.

3.9.4.3 Alternative B – Guided-only Operation

3.9.4.3.1 Road Capacity and Traffic Circulation

As under the Proposed Action, the capacity of SH 110A would accommodate the increase in traffic anticipated under Alternative B, and traffic circulation would not be compromised. The projected maximum of 475 visitors per day would remain if force.

3.9.4.3.2 Parking

The adequacy of parking at SOLRC is the same as described under the Proposed Action.

3.9.4.3.3 Road Closures

Avalanche control activities and road closures would be managed the same as under the Proposed Action. However, since there could be less avalanche control activity under this alternative due to the "hazard avoidance" approach to snow safety under the guided operation, road closures associated with control work could be less frequent.

3.9.4.3.4 Emergency Road Access

Road access for emergency purposes would be managed the same as under the Proposed Action.

3.9.4.4 Alternative C – Integrated Guided and Unguided Operation

3.9.4.4.1 Road Capacity and Traffic Circulation

As under the Proposed Action, the capacity of SH 110A would accommodate the increase in traffic anticipated under Alternative A, and traffic circulation would not be compromised. The projected maximum of 475 visitors per day would remain if force.

3.9.4.4.2 Parking

As under the Proposed Action, parking at SOLRC would remain adequate.

3.9.4.4.3 Road Closures

Avalanche control activities and road closures would be managed the same as under the Proposed Action.

3.9.4.4.4 Emergency Road Access

Road access for emergency purposes would be managed the same as under the Proposed Action.

3.9.4.5 Mitigation

29. If peak-day parking proved to be inadequate due to lower than anticipated vehicle occupancy rates, instituting a shuttle service between Silverton and SOLRC would reduce parking requirements at the ski area.

3.9.4.6 Cumulative Effects

The CEA delineated for the analysis of transportation impacts includes the Cement Creek Drainage and the SH 110A corridor, from its origin at US 550 to its end at Gladstone. This area was chosen because it includes the road used to access the ski area and the avalanche pathways that could potentially reach the road.

Of the cumulative actions listed in Chapter 2 (section 2.4), the following actions are not considered in this analysis:

- Expansions associated with the Telluride ski area and Durango Mountain Resort are not considered because these resorts are outside the CEA for transportation.

- Grazing is not considered because it occurs during the snow-free months when SOLRC traffic and parking demands would be reduced, and because it has limited impact on traffic and parking itself.

- The shift in jurisdiction over SH 110A is not addressed because management activities (i.e. maintenance, access, and avalanche control agreements, etc.) are not expected to change.

The remaining cumulative actions listed in Chapter 2 (section 2.4), snowmobile use, four-wheel-drive use, and mining activity, have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects to traffic flow, circulation, and parking.

3.9.4.6.1 Snowmobile Use

Snowmobiling has historically been the most popular winter activity in the Cement Creek watershed and greater Silverton area, occurring for over 20 years. An annual snowmobile event, "the hill climb," has historically taken place in Colorado Basin in late April, with approximately 360 people participating in this event in 2002. This event will likely continue to take place in the future, under a BLM special use permit. If SOLRC were to have the maximum number of guests at the time of this event, there could be a shortage of available parking spaces in the area for those participating in or watching the snowmobile activities.

3.9.4.6.2 Four-wheel drive Use

Four-wheel-drive recreation is the dominant summertime recreational activity in the Silverton area and is projected to increase in the future. Four-wheel-drive vehicles, ATVs, and motorcycles use SH 110A heavily in the summer. Since the capacity of SH 110A would accommodate SOLRC guests at peak capacity, and since many of summer visitors to SOLRC would come by shuttle bus rather than personal vehicles, no notable cumulative effects are anticipated.

3.9.4.6.3 Mining

Limited mining activities are currently occurring, and future mining operations are planned for the immediate future at Gladstone. The mines are accessed via SH 110A, and mining traffic is anticipated to increase once operations begin at Gold King Mine. At peak operation of Gold King Mine, as many as 50 employees could travel this road daily in personal vehicles, and up to 25 ore trucks could shuttle daily between the mine and the Howardsville Mill. Since up to 500 vehicles per day used this road during peak mining years, SH 110A would be able to accommodate mining traffic and SOLRC traffic on peak days (207-264 guests). Therefore, no adverse cumulative effects are anticipated.

3.10 AESTHETIC RESOURCES

3.10.1 Issues Addressed

The issues regarding aesthetic resources identified through scoping and internal, interdisciplinary review include the following:

- The visual impact of SOLRC facilities on residents and visitors to the project area.
- The noise impact of avalanche-control explosives on residents and visitors to the project area. (Note: the potential for noise impacts for wildlife and safety are discussed under those headings.)
- The air quality impact of the proposed development, particularly the visual impact of construction dust.

3.10.2 Analytical Methods and Assumptions

Analysis of impacts to visual resources utilized the BLM Visual Resource Management (VRM) System (BLM 1984) for project compliance with area management objectives.

Noise impacts were assessed through communication with SOLRC regarding the size and scope of avalanche control program and interpretation of this information in the context of the project's setting.

Air quality impacts were assessed through review of the SOLRC proposal for facilities construction, and review of applicable federal and state air quality regulations.

3.10.3 Affected Environment

3.10.3.1Visual Resources

The project area is located in the Silverton Special Recreation Management Area (SRMA). Significant importance is attached to the scenic quality of the SRMA. BLM lands offer visitors a

rich and varied visual landscape, and the agency goes to great lengths to protect the scenic quality of the lands under its management. In the SRMA, a combination of mountainous topography, rock outcrops, diverse vegetation, numerous historically significant sites and picturesque mine-related structures, along with open vistas help attract thousands of visitors annually.

Portions of the proposed SOLRC development are located on BLM lands and portions are on private land. The BLM developed its VRM system to provide standards for managing the visual resources on BLM lands. For privately owned lands, San Juan County has responsibility for decisions regarding visual quality.

3.10.3.1.1 BLM Visual Resource Management System

The VRM assists BLM personnel in setting objectives for management activities that protect the scenic quality of BLM lands.

The VRM system assumes the visual quality of the landscape has a variety of visual values and that these different values mandate different levels of management. The appropriate level of management is determined through a systematic approach to identify landscape visual values. Visual values are identified through a VRM inventory and are considered with other resource values (e.g., timber, grazing, and mining) in the Resource Management Planning (RMP) process. The inventory process classifies visual quality based upon three factors: scenic quality evaluation, sensitivity analysis, and delineation of distance zones. Lands are classified as either Inventory Class I, II, III, or IV. Class I and II are considered the most valued, Class III represents moderate value, and Class IV lands are considered of least value visually.

Visual management objectives are established in RMPs consistent with land use allocations. The management objectives are area specific and form the basis for evaluating future management projects. Following are descriptions of the VRM Class Objectives, taken from the *Visual Resource Contrast Rating manual* (BLM 1986a).

Class I Objective: The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II Objective: The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III Objective: The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objective: The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the

impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Due to the high scenic value of the Colorado Basin area and the number of visitors it receives, it has a Management Objective of Class II.

When a project is proposed, VRM employs the Contrast Rating System which provides a systematic means to evaluate the proposal and determine if it conforms to the approved VRM objectives. The Contrast Rating System also provides a means to identify appropriate mitigation measures that can be taken, as needed, to minimize adverse visual impacts.

3.10.3.1.2 Private Land Standards

Currently, there are no standards for maintaining scenic quality on private lands within the project area. However, San Juan County has developed a Scenic Preservation Overlay District which falls within corridors bordering Highway 550 and the Durango and Silverton Narrow Gauge Railroad alignments.

3.10.3.1.3 Project Area Scenic Quality

The SOLRC area is generally viewed from the road that provides access to it. Travelling north up SH 110A, the project area first appears as a deep, V-shaped canyon, with steep, rugged mountainsides climbing to high mountain ridges rising over 3,000 feet from the valley floor. Above Gladstone, where SH 110A ends and CR 52 begins, the topography opens to a broad glacial basin rimmed by the area's highest peaks with cliffs, scree fields, and steep, sparsely vegetated slopes on their flanks. A cirque lake and surrounding wetlands lie at the bottom of the basin, where CR 52 ends.

The landscape character throughout the area is typical of the dramatic Southern Rocky Mountains. High alpine terrain consisting of rugged mountain peaks rise above the angular valley floor. Above treeline, broad, open meadows are visible, capped by rocky outcrops, while below treeline, views reveal a diversity of vegetation, predominantly conifer and aspen, interspersed with wildflower meadows that create a variety of texture, size, and color. The spring-to-fall landscape consists of a mosaic of various shades of green to the brilliant gold of the fall aspens contrasted against the dark green of conifers. A perennial stream runs along the valley floor, springing from the cirque lake in Colorado Basin.

Remnants of past mining activity are scattered throughout the area, consisting of timber structures, mine tailings, and wooden cabins. The Sunnyside Mine was the largest mine in the basin and its facilities, and the abandoned mining community of Gladstone, are visually evident along SH 110A.

The project site itself was relatively undisturbed prior to initial development at SOLRC, with SH 110A passing the base area, where an overhead power line paralleled Cement Creek and old mining roads traversed the steep, timbered slopes above. On-site development began in 2001, and since then the base area parking lot has been cleared, the overhead power line buried, the top and bottom patrol shack and temporary lodge constructed, the explosives caches and Avalauncher platform built, the lift alignment cleared, the hiking/biking trail cut, and the lift installed. All of these facilities are on private land.

Of the development to date at SOLRC, the base area facilities, the cleared, lower portion of the lift alignment, and the lift itself are visible to people visiting or residing in the area, and then only

as a passing scene viewed from SH 110A. The parking lot, patrol shack, and temporary lodge are rustic and visually consistent with the mining and limited residential development in the area. The lift cleared alignment was cut with slightly irregular borders and is similar in appearance to the many natural avalanche chutes that score the area's forested slopes. The lift itself has more visual impact than any other element of the existing development, due in large part to its sudden appearance close to the road as vehicles round the curve and pass the base area. Recognizing that the VRM system is not applicable to private lands, the SOLRC base area may not meet the Class II objective assigned by the BLM to the surrounding public lands, but it easily achieves the Class III objective.

3.10.3.2 Noise

In addition to the air pollutants described in the Air Quality section, noise is also an air-transferred pollutant. Noise has been defined as unwanted sound. San Juan County has not instituted noise standards or regulations.

In the past, noise has been treated merely as a nuisance or an unimportant factor because of the rural environment in the project area. During the winter, noise impacts arise from ski area avalanche control operations and snowmobile activity. In non-winter seasons, noise impacts arise from vehicles using SH 110A, CR 52, and surrounding jeep roads.

Avalanche control methods can be a potential area of concern because of the associated noise. Areas of avalanche activity occur throughout the project area. Methods of control employed to date at SOLRC involve the use of hand-held explosives, called hand charges, and a compressed-gas launching device known as an Avalauncher. Sound waves from these control devices significantly increase the noise level in the area on an intermittent basis during avalanche control operations.

Hand charges typically weigh about 1 kilogram and are carried by control personnel and tossed into selected avalanche starting zones. Occasionally, hand-placed charges of up to 45 kilograms are employed for special avalanche control circumstances.

Charges deployed by an avalauncher are typically 2 kilograms in weight. The avalauncher is a pneumatic cannon that employs compressed gas to project the explosive charge to a selected site and is virtually noise-free.

Explosive control of avalanches results in extremely loud but very brief noise impacts. When a charge is laid at or just above the snow surface, the full level of sound is projected throughout the basin. When a hand charge sinks below the snow surface, the sound is attenuated due to the insulating effects of the snow pack. Because of the steepness of the terrain and lack of tree cover, sound can be distributed throughout the project area. As with most noise sources, noise from an explosive charge is loudest the closer a person is to the explosion. As one moves further from the point of explosion, the sound level decreases.

SOLRC indicates that to date they have employed up to 9,000 pounds of explosives in a given year. The amount of control work needed in an operating season is largely a function of snow conditions and how much terrain is opened within a given time frame. During the previous two seasons and the current season, avalanche control activities using explosives have taken place most days of the season. The control work typically consists of two routes per day. The first control route takes place in the morning and lasts for one-half to 1 hour, employing 10 to 12 charges. After completion of this route, control personnel hike to the next route (about an hour)

and commence with the second control route, which has similar duration and explosives use to the morning route.

Noise impacts associated with avalanche control are most strongly felt by the people whom reside within the Colorado Basin and with a direct line of sight to SOLRC avalanche control activities. The closest residence to SOLRC is about 3,000 lineal feet, and 1,500 vertical feet from the nearest point where control activities will be occurring in Zone 2 (see Figure 2-2).

Other major noise sources in the project area include snowmobiles, which are an extremely popular activity (see section 3.7.3.3, Recreation, for a complete discussion). Snowmobiles generate high noise levels due the use of two-stroke engines, which exhibit a loud and high-pitched sound. Unlike an explosion from a hand charge, snowmobiles are heard the entire time they are operating in the project area. The geographic extent of the area that the newer, and more powerful machines can cover mean noise impacts occurs over an extensive area and the sound levels vary as the distances change between these machines and the listener. Snowmobile activity occurs throughout the project area and can commonly be heard by area residents and winter visitors.

3.10.3.3 Air Quality

The air quality impact of the proposed development, particularly the visual impact of construction dust, is the issue identified through scoping of the SOLRC project. Other air quality impacts arise from combustion of wood and coal for home heating, use of cars and trucks, and from snowmobile use.

Air quality in the project area, as throughout the U. S., is regulated by federal and state agencies through a variety of regulations. National Ambient Air Quality Standards (NAAQS) were established by the Clean Air Act (CAA) of 1963 and subsequently amended, the principal amendment being the 1990 Clean Air Act Amendments (CAAA). Primary standards established under the act are to protect public health, and secondary standards were established to protect public welfare from any known or anticipated adverse effects associated with the presence of ambient air pollutants. The CAA and CAAA also establish air pollution emission standards for a variety of stationary sources. Enforcement of the CAA is delegated by the U. S. Environmental Protection Agency (EPA) to the states, and in Colorado enforcement is the responsibility of the Colorado Department of Public Health and Environment, Air Pollution Control Division (CDPHE/APCD). All state programs regarding the provisions and enforcement of the CAA, including State Implementation Plans (SIP), are subject to oversight and approval by the EPA. State programs may be more, but not less, stringent than the standards imposed as NAAQS.

NAAQS have been established for six criteria air pollutants. These are sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), lead (Pb), nitrogen dioxide (NO_2), and fine particulate with an aerodynamic diameter of 10 microns or less (PM_{10}). Typical sources of these pollutants are:

- SO_2 - fuel burning such as coal-fired power plants, coke ovens, and smelters.
- CO - incomplete combustion such as that associated with poorly adjusted motor vehicle engines or incomplete wood burning.
- O_3 - photochemical reactions in smog, large electrical equipment, and fireplaces.
- NO_2 - (and other oxides of nitrogen, NOx), fuel burning such as power plants, industrial processes, and vehicle emissions.

- Pb - nonferrous smelters and "leaded" gasoline vehicle emissions.

- PM_{10} - fireplaces, woodstoves, road sanding for safety, re-entrained dust from silt and mud loading on public streets, construction, vehicle tailpipe emissions, industrial sources, and natural sources.

There currently is no air quality monitoring in the project area, so there is no quantitative data that would allow for quantitative analysis of issues related to air quality. There are no significant sources for emissions including SO_2, O_3, CO, NO_2, and Pb. However, in Silverton there may be occasional air quality issues associated with high PM_{10} levels and low visibility during the winter.

Air quality in the Silverton area is impacted by the fact that most home heating involves wood and coal-burning stoves. There are no natural gas supply lines serving Silverton. Further, due to long spells of very cold weather, residents tend to keep vehicles, including diesel trucks, running for long periods of time. The topography in Silverton favors temperature inversions that trap wood smoke and other combustion-related pollutants in the valley during the winter. PM_{10} levels are potentially high and a concern during some periods of the winter. During the non-winter seasons, these issues are less a problem as home heating is negligible and weather patterns move air through the valley routinely. Most of these air quality issues are generally restricted to the valley in which Silverton lies and do not affect adjacent wilderness areas (Graw 2003a). The SOLRC base area facilities are located approximately 1,000 vertical feet above Silverton and are not susceptible to the inversion conditions that affect the town.

Visibility is the degree to which the atmosphere is transparent to visible light. It is an important air quality value in the western U.S., particularly in scenic and recreational areas. Scenic vistas in most U.S. parklands can be diminished by haze that reduces contrast, washes out colors, and renders distant landscape features indistinct or invisible. Haze degrades visibility primarily through the scattering or absorption of light by fine atmospheric particles. Visibility degradation in national parks, forests, and resource areas can be a consequence of broader, regional-scale visibility impairment.

During the summer, air-entrained dust from automobiles, trucks, and ORVs/ATVs creates some short-term impacts on air quality. Short-term impacts may also occur as a result of tailpipe emissions, particularly two-stroke engine emissions from ATVs. All forms of vehicular traffic on SH 110A are highest from June through September and lowest between November and April (Speegle 2003). According to the Colorado Department of Transportation (CDOT 2003) website, SH 110A, at 1.22 miles from its intersection with US 550, receives an average annual daily traffic count of 201 vehicles per day.

During the winter use of the project area by snowmobiles is an extremely popular activity (see section 3.7.3.3, Recreation, for a complete discussion). According to the EPA, snowmobiles are sources of hydrocarbons, carbon monoxide, particulate matter, and nitrogen oxides. Widespread snowmobile use of the project area can result in widely dispersed and occasionally heavy concentrations of emissions.

Because no monitoring currently occurs in the immediate project area, there is no way to determine if any indicators in the project area are in exceedance of applicable air quality standards. An air quality monitoring station located in the Molas Pass area is operated under the Interagency Monitoring of Protected Visual Environments (IMPROVE) program by the San Juan National Forest. The station gathers data on particulates and aerosols in the atmosphere to

monitor impacts on visibility. The air quality, as it relates to visibility, is considered to be extremely good and meets the applicable federal and state guidelines regarding air quality for that area (Graw 2003b).

3.10.4 Environmental Consequences

3.10.4.1 Proposed Action

3.10.4.1.1 Visual Resources

Facilities on BLM lands that would be authorized under the Proposed Action and would be visible to the public include the hiking trail from near the top lift terminal into Colorado Basin, the solar powered radio repeater, the additional explosives cache, and the flagging, rope lines, and signage associated with boundary management. Two mitigation measures suggested in other sections of this analysis also would have visual impacts. These include the Colorado Basin toilet facilities suggested under Recreation (Mitigation Measure 22) and the access road from the base area to the top of the chairlift under Safety (Mitigation Measure 26). Of these collective elements, the most sensitive is the toilet facilities. The project area falls within the BLM's Class II Objective. Under this objective, the existing character of the landscape is to be retained. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. A small toilet facility (permanent or portable) could draw from and be constructed of materials that repeat the characteristic form, line, color and texture in this setting and so be consistent with the Class II visual quality objective of the project area (see Mitigation Measure 30).

The access road would not be highly visible from the SH 110A/CR 52 travel corridor because its lower portion would lie primarily in forest that would screen it while its upper portion, though in more open terrain, would lie over the brow of the slope at an angle not visible from below. However, the road would be highly visible to the less numerous travelers on roads at higher elevations in the area, particularly across Cement Creek. With visual impact consideration factored into design of the road and rehabilitation following construction, the road should be consistent with the Class II VRM objective.

The hiking trail would be marginally visible but within the expectations of most people visiting the project area. With appropriate construction techniques a hiking trail is consistent with the Class II objective rating.

With regard to the proposed radio repeater, its location on a peak at 13,053 feet in elevation would place it at a site with very low public sensitivity. Few people would ever see the facility due to this location. Further, its small size and ability to be screened through use of color would allow it to be consistent with the Class II objective.

Similarly, the additional explosives cache would, in accordance with applicable regulations, be isolated from areas of public use and therefore not readily visible. The cache would be at least 200 feet from SH 110A, in a forested site, and not visible to passersby.

Flagging, rope lines, and signage for boundary management would be dispersed on public and private land. While these materials are by design highly visible, most would be placed to be visible to skiers, not to others. However, signage would occur along roadways to warn winter

visitors of avalanche hazard associated with SOLRC's operation, constituting an unavoidable visual impact.

3.10.4.1.2 Noise

Under the Proposed Action, noise impacts associated with avalanche control activities would be similar to levels currently occurring on the project site. Currently the avalanche control program has made use of explosive testing and control almost every day of the operating season. The duration of control work can span an entire day in order to cover the terrain in the permit area. This season SOLRC is anticipating use of approximately 9,000 pounds of explosives (Brill 2003c). The amount of explosives used is a function of conditions that vary from one season to the next but this figure remains the best indicator of future explosives use.

3.10.4.1.3 Air Quality

Air quality impacts associated with the Proposed Action would include construction of the Colorado Basin hiking trail, the additional private-land explosives cache, and the Colorado Basin toilet facilities called for under Mitigation Measure 22), in addition to the construction activities occurring under the No-Action Alternative (see section 3.10.4.2.3 below). Given the small amounts of surface disturbance associated with these projects at any given time, they would have no notable, incremental effect on air quality. Any temporary, minor dust problems could be mitigated through standard dust abatement practices (see Mitigation Measure 31).

Additional traffic on SH 110A and CR 52 due to potentially higher levels of visitation could result in more entrained dust in the air. However, the majority of the traffic volume associated with SOLRC would occur during the winter months, so air-entrained dust from vehicular use of area roads would be minimal. Vehicle use of SH 110A during the summer is significantly higher due to 4-wheel-drive and ORV use by individuals and tour operators. This activity would create more air quality impact to the project area than SOLRC. San Juan County conducts dust abatement efforts on SH 110A when conditions warrant.

3.10.4.2 Alternative A – No Action

3.10.4.2.1 Visual Resources

As discussed above under Affected Environment (section 3.10.3.1.2), there are no standards in place by which to evaluate visual impacts on private lands. Proposed private-land facilities under this alternative include a 4,400-square-foot, two-story base lodge, overnight cabins/yurts, two rope tows near the upper chairlift terminal, maintenance/storage shed, and six foot/skier bridges across Cement Creek. With the exception of the two rope tows, these facilities would impact visual resources at and around the base area on SH 110A, adding to the base area development to date. Some people would disapprove of the more developed appearance of the SOLRC facilities while others, particularly skiers, would likely find the same facilities visually acceptable. The rope tows would not likely be visible to anyone but SOLRC patrons.

3.10.4.2.2 Noise

The No-Action Alternative would result in noise levels lower than the current operation and the Proposed Action. Explosives use would be much more restricted under this alternative, as avalanche control work would take place only on private lands. Additional short-term noise disturbances would occur as a result of construction of base area facilities.

3.10.4.2.3 Air Quality

Air quality impacts under this alternative would be associated with construction of facilities, with heating, and with additional traffic on area highways and roads. Construction activities would involve the base lodge, the overnight cabins/yurts, the two rope tows, and the maintenance/storage shed. These activities would have very little effect on air quality as they would generate relatively small amounts of dust individually and collectively, and once the buildings are framed in, impacts diminish quickly. Any impacts would be very short term. According to the CDPHE/APCD the small size of the proposed construction activities would not require any air quality permitting (Swing 2003).

Heating of SOLRC base area facilities will involve propane gas heaters and EPA-approved emission controlled wood burning stoves, neither of which would generate notable air quality effects (see Mitigation Measure 32).

Traffic volumes on SH 110A and CR 52 could increase somewhat beyond current levels, resulting in more entrained dust in the air. However, as noted above under Proposed Action, the majority of the traffic volume associated with SOLRC would occur during the winter months, so air-entrained dust from vehicular use of area roads would be minimal. Vehicle use of SH 110A during the summer is significantly higher due to 4-wheel-drive and ORV use by individuals and tour operators. This activity would create more air quality impact to the project area than SOLRC.

3.10.4.3 Alternative B – Guided-only Operation

3.10.4.3.1 Visual Resources

This alternative would have the same impacts to visual resources as described in section 3.10.4.1.1, Proposed Action, and section 3.10.4.2.1, No-Action Alternative. The possible exception would be less flagging, rope lines, and signage associated with internal boundary management.

3.10.4.3.2 Noise

Noise impacts associated with avalanche control explosives would be somewhat less then the Proposed Action. Control work would occur on private lands in a similar fashion to the No-Action Alternative. The guided-only operation would employ a stability testing and hazard avoidance program, which would use slightly fewer explosives on public lands then the Proposed Action.

This alternative also includes the potential use by SOLRC of a helicopter for heli-skiing or avalanche control work. Helicopters can generate sound levels in excess of 85 decibels (dBA), which can cause physical discomfort to people in the immediate vicinity and be perceived as a nuisance by people farther away. Recreationists seeking a backcountry-type experience can be particularly disturbed. Factors mitigating this impact in the project area include the mountainous topography, with intervening ridges to attenuate the sound, and the existence of other engine noise, from traffic on the roads, snowmobiles, and the chairlift. Further, a helicopter would be used on an as-needed basis only, and need is anticipated to be limited.

3.10.4.3.3 Air Quality

Air quality impacts associated with the Alternative B would be the same as described in section 3.10.4.1.3, Proposed Action, and section 3.10.4.2.3, No-Action Alternative.

3.10.4.4 Alternative C – Integrated Guided and Unguided Operation

3.10.4.4.1 Visual Resources

This alternative would have similar impacts to visual resources as described in section 3.10.4.1.1, Proposed Action, and section 3.10.4.2.1, No-Action Alternative. The primary differences would be in the proposed thinning of the forested, north-facing slopes in Zones 1 and 3 and the alternative hiking/biking trail from the lift top to the base area.

The thinning proposed in avalanche chutes would result in the removal of vegetation that has re-established itself after a climax avalanche event. Removal of this regenerated vegetation would create a similar appearance as other avalanche chutes, which run more frequently, preventing regeneration from becoming established. In this regard, the thinned avalanche chutes would appear as naturally-occurring phenomena. The proposed thinning within the coniferous forest cover would involve a small percentage of the total number of stems per acre and would not be visually apparent to the casual observer.

The alternative hiking/biking trail would not be highly visible from the SH 110A/CR 52 travel corridor because its lower portion would lie primarily in forest that would screen it, while its upper portion, though in more open terrain, would lie over the brow of the slope at an angle not visible from below. However, the trail would be visible to the less numerous travelers on roads at higher elevations in the area, particularly across Cement Creek. With visual impact consideration factored into design of the trail, it would be consistent with the Class II VRM objective.

3.10.4.4.2 Noise

Noise impacts associated with avalanche control would be essentially the same as described in section 3.10.4.1.2, Proposed Action, and section 3.10.4.2.2, No-Action Alternative. This alternative may result in a slight reduction in the number of explosive charges for avalanche hazard control work in fewer zones. However, noise from explosive charges will likely continue throughout any given operating day as the result of the use of explosives for avalanche testing associated with the guided operations.

3.10.4.4.3 Air Quality

Air quality impacts associated with Alternative C would be the same as described in section 3.10.4.1.3, Proposed Action, and section 3.10.4.2.3, No-Action Alternative.

3.10.4.5 Mitigation

3.10.4.5.1 Visual Resources

30. Utilizing Best Management Practices (BMPs) and designing facilities to blend with the natural background to insure facilities meet Class II VRM objectives would minimize the visual impact of restrooms on BLM lands.

3.10.4.5.2 Noise

There are no feasible mitigation measures to reduce the level of noise associated with avalanche control, and no mitigation is suggested for the limited impact of potential helicopter noise.

3.10.4.5.3 Air Quality

31. Implementing a dust suppression program, including careful scheduling of equipment use, wetting of exposed soil, and use of magnesium chloride, would mitigate any short-term impacts on air quality associated with construction activities. Note that no water from Cement Creek would be withdrawn for this purpose.

32. Using EPA approved wood-burning devices would mitigate long-term impacts from wood-burning stoves.

3.10.4.6 Cumulative Effects

The cumulative effect analysis area consists of the Cement Creek watershed as far north as the cirque lake at the head of the South Fork. This area matches the probable extent of any impacts to visual resources, noise, or air quality associated with the SOLRC project.

The following cumulative actions, as outlined in Chapter 2, were not considered:

- Expansion plans for Durango Mountain Resort and Telluride, as these actions are too geographically distant so as to contribute to cumulative effects for visual resources, noise, and air quality.

- The transfer of jurisdiction over SH 110A to San Juan County will, likely, not affect actual use of the road by current user groups.

The remaining cumulative actions listed in Chapter 2 (section 2.4) have the potential to interact with the Proposed Action's direct and indirect effects and generate cumulative effects in the areas of visual resources, noise, or air quality, as discussed below.

3.10.4.6.1 Visual Resources

Resumption of mining operations at the Gold King Mine has little potential for visual impacts as most of the needed infrastructure is already in place. However, the mine closure and remediation work at Elk Tunnel and in Prospect Gulch will add to the visual impact of mining in the watershed and thus the cumulative impact of the SOLRC project on visual resources. The cumulative impact should remain minor, given the widespread and, in the view of many visitors, interesting visual impact of mining in the watershed. The other identified cumulative actions should have little impact on visual resources.

3.10.4.6.2 Noise

Ambient noise levels in the project area will fluctuate depending on the time of the year. Cumulative impacts in the winter will occur primarily from the use of snowmobiles. Snowmobile use in the project area increases noise levels and is anticipated to increase consistent with historic use patterns. In the summer, on-site construction combined with summer sponsored SOLRC activities and off-site traffic noise, including ORV use, would add to the cumulative effect of noise in the project area. Start up construction activities at the Gold King Mine would temporarily increase noise levels in the watershed, and the noise of 25 ore trucks per day on SH 110A would be an ongoing impact.

Late spring and fall are the quietest times of the year in the project area. Most cumulative effects on noise levels would be intermittent and localized. Some days, particularly on weekends, noise levels may be high, while weekdays will have fewer impacts. Overall, no major cumulative

impact on ambient noise levels is anticipated, given the number of ongoing activities and associated ambient noise in the watershed.

3.10.4.6.3 Air Quality

Like noise impacts, air quality impacts may vary depending on the time of the year. During the winter, snowmobiles in the project area produces wide-ranging but short-term impacts because of their ability to cover a very wide area. Impacts are exacerbated by the fact that virtually all snowmobiles employ two-stroke engines that create proportionally higher emissions then four-stroke engines.

In summer, short-term and intermittent air quality impacts will occur as a result of vehicular use, including ORVs, on SH 110A and CR 52. Two-stroke ATVs will create proportionally higher emissions then their four-stroke engine counterparts. Dust impacts at times will exceed tailpipe emissions.

Resumption of mining activities at the Gold King Mine at Gladstone will add a projected 25 ore trucks per day, winter and summer, to the Howardsville Mill. This traffic will potentially increase the vehicle entrained dust in the SH 110A corridor, increasing the net impact of traffic associated with SOLRC's summer operation. This will not be a factor in winter.

Grazing by sheep can generate dust, particularly late in the season when the ground is dry. However, such impacts typically occur only infrequently, mostly when bands are being brought in for working and shipping. This occurs in the fall, when impacts associated with other activities, including SOLRC operation, would be lowest.

Overall, cumulative air quality impacts are anticipated to be minor and temporary. The high quality of the airshed should not be notably impacted.

3.11 CULTURAL RESOURCES

3.11.1 Issues Addressed

The cultural resource issue identified through scoping and internal interdisciplinary review is the following:

- Potential impacts to historic mining sites that may qualify for listing in the National Register of Historic Places.

3.11.2 Analytical Methods and Assumptions

A cultural resources assessment of the project area was completed by Durango Archaeological Consultants (DAC). This assessment consisted of a Class I and Class III archaeological survey (DAC 2003). Prior to conducting the field studies, DAC conducted a Class I review of the records of all known archaeological and historical properties within the study area by consulting existing literature and site file records at the San Juan Resource Area Office in Durango. The sites identified from these records were evaluated to determine what effect the project could have on them. Areas within the project area that had not been previously inventoried and evaluated and that could sustain direct or indirect impacts from the proposed project were also identified.

The Class III survey included both public and private lands, and was limited to slopes less than 30 degrees for safety and accessibility reasons. However, mining resources observed on steeper

slopes were also inventoried if access was facilitated by a trail or road. Of the approximately 1,644 acres of public and private land present in the project area (1,300 acres BLM; 344 acres SOLRC private), approximately 180 acres meet this criteria and were surveyed using 15-meters transects. Those portions of the project area currently lacking survey for proposed facilities and constructed trails (approximately 5 acres) will be 100 percent intensively inventoried during the summer of 2003.

The fieldwork and reporting were done to the standards of the Colorado Historical Society Office of Archaeology and Historic Preservation and the standards of the Colorado BLM State Office. Recording procedures were in accordance with the Colorado State Cultural Resources Survey Form. This included filling out a Management Data Form, a Historic Archaeology Component Form, a Historic Architectural Component Form (where appropriate), and photographing and mapping the site. The Section 106 process is still in progress and will be completed before finalizing the EIS.

The following section summarizes the cultural resource report prepared by DAC for this project (DAC 2003). This report has been filed as part of the project record. Results of the summer of 2003 inventory will be documented in an addendum to the DAC report.

3.11.3 Affected Environment

The cultural resources of the project area center around the region's extensive early mining history. This section provides an overview of that history and the cultural resources that occur in the project area.

3.11.3.1 Early Mining History

The early settlement of the Silverton area is closely linked with the discovery of gold and the subsequent boom-bust cycles of the mining industry. The area's mining history follows the general pattern of mining development in the San Juan Mountains. Exploration began in the early 1860s, soon after the discovery of gold in Colorado. However, the boom era did not begin until the 1870s with the implementation of labor intensive techniques for lode mining and the removal of the Ute Indians from the San Juan Mountains. Silverton became established as one of the early mining centers of the region.

The SOLRC project area falls within the Eureka Mining District of San Juan County. Mining began in the 1870s with prospectors locating claims throughout the area. Mining settlements followed, and by 1878 there was a post office and mill at the small settlement of Gladstone. Early transportation in and out of the Cement Creek drainage was via wagon roads. Mining properties continued to be located and worked in and around the Gladstone area through the 1880s. Small-scale mining continued, but some mining operations began to consolidate smaller claims and invested in on-site facilities such as steam driven compressors, boardinghouses, etc. The Big Colorado Mine, located along the South Fork of Cement Creek, was an example of a moderate-to-large-size mining operation of this era.

Mining activities in the district continued to increase in the early 1890s. However, the silver crash of 1893 impacted mining in Cement Creek and many mines were abandoned. After the price of silver fell, mines with gold and other precious metals became the focus of subsequent mining efforts. The Gold King Mine in Gladstone was developed during this period to capitalize on the value of gold. With the discovery of the Bonanza Lode in 1896, this was one of the richest gold mines in the Cement Creek drainage. The mill that had been developed by the Gold King Mining and Milling Company in Gladstone a few years earlier was enlarged to accommodate

increased production at the mine, and a tram system was constructed to transport the ore to the mill. In 1899 the Silverton-Gladstone and Northerly Railroad was completed, providing for more economical transportation of ore from the area.

The scale of mining began to change in the late 1890s and early 1900s as technology improved and mining corporations began to invest large amounts of capital in mills, tram systems, and steam or hydroelectric power plants. These improvements made it possible to exploit lower grade ores and allowed for more profitable mining of silver, lead, zinc, and copper. Ore dumps from earlier operations could also be reworked. During this period, there were large mill complexes in Gladstone and many new mines were opened. The mining activity in the area was a stimulus for growth in Gladstone and the town flourished. Some of the major mines operating in Cement Creek in the early 1900s were the Big Colorado, Gold King, Henrietta, Mogul, Silver Ledge, and Gold Hub.

Mining continued through the 1910s and into the 1920s in the Cement Creek drainage, but at a diminished rate as many of the ores bodies began to play out. A small resurgence in mining occurred in the late 1910s following the outbreak of World War I, spurred on by the war-time demand for the metals. The 1920s and 1930s following the war was a slow time for mining in the San Juan Mountains. Large mining operations such as the Gold King Mine, as well as the railroad, shut down during this period (1924) and the town of Gladstone was almost abandoned. However, a number of small mining operations continued.

Mining again increased during the 1940s, in part due to the increased demand for metals created by World War II. A few mines continued operation into the 1950s, the largest of which was the American Tunnel at Gladstone, developed as part of the Sunnyside properties. Mining continued in the Cement Creek drainage on a small scale through the 1960s, 1970s, and 1980s. Several mines, including the American Tunnel continued to be mined until the 1980s, but by 2001, there was little active mining in the area.

There are two mines currently permitted just northeast of the project area, the Gold King and the Minnehaha mines. Both mines are operated by Gold King Mines Corporation. Gold King Mine (also known as American Tunnel) is located at the old town of Gladstone and Minnehaha Mine is located southeast of Gladstone in the Minnehaha Gulch. Gold King Mines Corporation will begin commercial operations in 2003. (Fearn 2003b.)

There is also a current operating permit for the Sunnyside Mine, also at Gladstone. Production at Sunnyside Mine was terminated in 1991, and all portals have been sealed. Sunnyside Gold Corporation is currently completing reclamation efforts specified under their Mining Permit. Reclamation activities are conducted by three employees year-round, and will be completed and terminated by the end of 2003.

3.11.3.2 Existing Cultural Resources

Within the SOLRC project area, there are 11 historic mining related sites (eight previously recorded, three newly recorded) and 15 mining-related isolated finds (12 previously recorded and three newly recorded) (DAC 2003). Of the 11 historic mining related sites, five are located on BLM land, three are located on private land, and three are located on both BLM and private land. Table 3-21 summarizes these resources. Seven of the 11 historic sites have been recommended as eligible for inclusion in the National Register of Historic Places. The Colorado State Historic Preservation Office (SHPO) is being consulted to officially determine the eligibility of these sites for the National Register of Historic Places. These sites represent mining related cultural resources, dating to around the turn of the century and earlier, are comprised of the remains of

mining era development, including structures, power houses, mills, tramways, mine railroads, adits, tunnels, mine dumps, tools, refuse dumps, and other artifacts of this period. These sites provide information on mining technology, history, and lives of miners from the early mining era. The isolated finds identified in the project area are by definition not significant cultural resources and therefore are not eligible for inclusion in the National Register of Historic Places. The isolated finds include prospect pits, shallow adits, scattered timbers, and other scattered artifacts of the mining era. No prehistoric cultural resources are known to exist within the project area. (Note: Maps of these sites are not included in this analysis in order to protect the historic resources as authorized by Section 304 of the National Historic Preservation Act).

Table 3-21. List of historic sites and isolated finds in the project area and their recommended eligibility for inclusion in the National Register of Historic Places.

Archaeological Sites		
Site Number	**Site Name**	**National Register Eligible**
5SA16	Gladstone Townsite	Yes
5SA638	Belladonna Claim	Yes
5SA643	Ariadne Mine	Yes
5SA644	Big Colorado Mine	Yes
5SA646	Fairview Settlement	Yes
5SA647	Unknown Mine	No
5SA662	Silver Ledge	Yes
5SA663	Standard Mine	No
5SA952	Miner's camp	No
5SA953	Herbert Lode	Yes
5SA954	Yale Mill Site	No
Isolated Finds		
5SA755	Prospect hole	No
5SA756	Test trench	No
5SA766	Adit and waste rock	No
5SA767	Prospect and waste rock	No
5SA768	Two adits	No
5SA769	Adit and waste rock	No
5SA771	Nine prospect pits	No
5SA772	Adit	No
5SA773	Adit	No
5SA774	Adit	No
5SA775	Prospect pit	No
5SA776	Prospect pit and adit	No
5SA955	Prospect hole	No
5SA956	Pile of mine timbers	No
5SA957	Adit and waste rock	No

3.11.4 Environmental Consequences

3.11.4.1 Proposed Action

Under the Proposed Action, there would be no direct impacts to known archaeological sites in the project area. None of surveyed physical elements associated with the Proposed Action would be

located in areas with known archaeological sites. Further archaeological survey will be conducted during the summer of 2003 to complete a 100 percent intensive inventory of the portions of the project area where facilities and constructed trails are proposed. If additional archaeological sites were identified during this survey, trails would be rerouted and facilities would be relocated, as needed, to avoid them (see section 3.11.4.5, Mitigation). In addition, avalanche control activities would be unlikely to damage any historic sites because several of these sites lie in naturally occurring avalanche paths and because SOLRC's avalanche control program would increase the frequency and decrease the magnitude of avalanches relative to natural cycles. Therefore, it is anticipated that these control efforts would decrease rather than increase the risk of avalanche damage to historical structures.

Indirect impacts to historical mining sites could occur with increased winter and summer visitation to the project area. There are several mining sites in the SOLRC boundary that could receive increased visitation, especially in summer. These sites contain structural remains and artifacts that constitute important information on the history of mining in the area that could be damaged or removed by visitors. Such impacts are common at mining sites in the San Juan Mountains. Mitigation measures have been suggested to protect sites on both public and private lands (section 3.11.4.5).

3.11.4.2 Alternative A – No Action

Under the No-Action Alternative, direct impacts to cultural resources would be the same as described under the Proposed Action—none of the surveyed physical elements associated with the No-Action Alternative would be located in areas with known archaeological sites. Further, the avalanche control program that was identified as a potential source of impacts to cultural resources would occur only on private land, which would avoid impacts to most of the identified sites.

The potential for indirect impacts would be reduced relative to the Proposed Action for several reasons. First, the SOLRC operation would focus on private land and guests would be less likely to encounter cultural resources on public lands. Second, under this alternative, there would likely be fewer guests. Because fewer visitors would be exploring the area, risk that cultural artifacts would be damaged or removed would be reduced.

3.11.4.3 Alternative B – Guided-only Operation

Under Alternative B, potential direct and indirect impacts to cultural resources would be similar to those described under the Proposed Action.

3.11.4.4 Alternative C – Integrated Guided and Unguided Operation

Under Alternative C, potential direct impacts to cultural resources would be similar to those described under the Proposed Action with one exception. Proposed thinning could potentially degrade historic sites in the forested portions of the project area. However, thinning would be done by hand, thus minimizing surface disturbance and potential damage to sites. Furthermore, buffering select sites during thinning operations would reduce the likelihood of direct impacts (see Mitigation Measure 34).

The likelihood of indirect impacts could increase under this alternative if tree thinning facilitated access to historical sites. Heavy forest cover provides a measure of protection to some sites in the project area by limiting visibility and ease of access, thereby decreasing the likelihood of visitation. If tree thinning increased visibility of and access to these sites, it could increase the risk that artifacts could be damaged or removed. Conducting tree thinning in a

manner that does not facilitate access to historical sites would mitigate this impact (Mitigation Measure 34).

3.11.4.5 Mitigation

33. Rerouting proposed trails and relocating proposed facilities to avoid historic sites that could be identified during future archaeological surveys would reduce potential impacts to these sites.

34. Restricting tree thinning under Alternative C around known historic sites would reduce potential direct impacts to these sites. Buffer size would be determined on a site-by-site basis, as appropriate to limit visibility of selected sites.

35. Insuring that tree thinning under Alternative C would not facilitate access to select historical sites would help protect these sites from vandalism and souvenir collection.

36. Design and implementation of an archaeological site management plan that includes an annual site monitoring program, a Historic American Buildings Survey and Historic American Engineering Record (HABS/HAER) documentation schedule, and an in-field artifact analysis of prioritized eligible sites, in consultation with the BLM, would protect the historic value of the project area.

37. Design and implementation of a public education plan for on-site interpretation of prioritized eligible sites, in consultation with the BLM, would educate the public about the historic value of the project area and enhance the summer programs offered by SOLRC.

38. Providing information to guests regarding the importance of historical sites, the public's responsibility to avoid disturbing such sites, the laws protecting cultural resources would help minimize impacts and further educate the public about the historic value of the project area.

3.11.4.6 Cumulative Effects

The cumulative effects area for cultural resources is defined as the Cement Creek Drainage. This area was selected for the cumulative effects discussion because it encompasses the on-site historical resources as well as adjacent and related off-site historical resources. It is also the geographical area in which potential impacts of the SOLRC operation could occur.

Of the cumulative actions listed in Chapter 2 (section 2.4), the following actions are not considered in this analysis:

- The expansions at Durango and Telluride because they are outside of the cumulative effect analysis area for cultural resources for this project.

- The change in jurisdiction over State Highway 110A because it would have no effect on cultural resources.

The other cumulative actions listed in Chapter 2 (section 2.4), four-wheel-drive use and mining, have the potential to interact with the Proposed Action's direct and indirect effects and could generate cumulative effects to cultural resources.

3.11.4.6.1 Snowmobile Use

This form of recreation is a very popular winter activity in the cumulative effects area and is expected to increase in the future. Snowmobile use has the potential to impact cultural resources directly if a cultural site is driven over or disturbed by snow machines. In addition, increases in snowmobile recreation could result in increased visitation to historic mining sites. Indirect impacts could occur as recreationists explore cultural sites and either vandalize them or remove artifacts. As most historic sites would be covered with snow during the snowmobile season, minimal direct or indirect impacts to historic sites are anticipated to occur. However, if historic sites extend above the snowline, there is the potential for impact from this form of recreation. Any indirect impacts that did occur would be cumulative with indirect impacts associated with the SOLRC project and would adversely affect the historical values present in the area.

3.11.4.6.2 Four-Wheel-Drive Use

This type of recreation is a very popular summer activity in the cumulative effects area and has been increasing with the growing popularity of the Silverton area. Four-wheel-drive use has the potential to impact cultural resources directly if a cultural site is driven over or disturbed by vehicles or roads. In addition, increases in four-wheel-drive recreation could result in increased visitation to historic mining sites. Indirect impacts can occur as participants explore cultural sites and either vandalize them or remove artifacts. Vandalism and souvenir hunting has already affected many historical sites in the area, particularly those with easy access. Any indirect impacts would be cumulative with indirect impacts associated with the SOLRC project and would adversely affect the historical values present in the area.

3.11.4.6.3 Mining

This category of impacts includes both mineral extraction and site reclamation. Most of the historical mining sites are associated with old mining claims. If these mines were reactivated, the historical context and value of the site could be adversely affected or lost to make way for the current production. Mine site reclamation, while important to protect other resource values, can also result in the loss of historical resources and context. As many of these sites are on private land, there is limited legal protection for them. While the SOLRC project would not directly impact any cultural resources, any loss in historical value from indirect impacts would be cumulative with losses due to mining activities.

3.11.4.6.4 Livestock Grazing

Livestock grazing occurs in the cumulative effects area for cultural resources, in the Gladstone sheep allotment. In areas with high livestock concentration, potential direct impacts to historic sites could occur in the form of trampling and possibly chewing. While the SOLRC project would not directly impact any cultural resources, direct impacts from livestock grazing would be cumulative with indirect impacts associated with the SOLRC project and would adversely affect the historical values present in the area.

3.12 IMPACTS TO CRITICAL ELEMENTS OF THE HUMAN ENVIRONMENT

This disclosure is required by the BLM NEPA Handbook, Appendix 5, as amended, which lists elements of the human environment that are subject to requirements specified in statute, regulation, or executive order and must be considered in EAs and EISs. Of the 14 elements listed, eight are addressed in the context of the analysis documented in Chapter 3 of this EIS. These include air quality (section 3.10), cultural resources (section 3.11), floodplains (section 3.2), threatened or endangered species (sections 3.3 and 3.4), hazardous or solid waste (section 3.2), drinking and groundwater quality (section 3.2), wetlands and riparian zones (sections 3.2

and 3.3), and invasive non-native species (section 3.3). The remaining six, including areas of critical environmental concern, prime or unique farmlands, Native American religious concerns, wild and scenic rivers, wilderness, and environmental justice are addressed below.

3.12.1 Areas of Critical Environmental Concern

There are no areas of critical environmental concern in the project area, so no impacts to these resource values will occur.

3.12.2 Prime or Unique Farmlands

There are no prime or unique farmlands in the project area, so no impacts to these resources will occur.

3.12.3 Native American Religious Concerns

The three relevant Native American tribes, the Southern Ute Indian Tribe, Northern Ute Tribe, and Ute Mountain Ute Tribe, were consulted and identified no cultural or religious concerns. Therefore, no impacts in this regard will occur.

3.12.4 Wild and Scenic Rivers

There are no wild and scenic rivers in the project area, so no impacts to these resources will occur.

3.12.5 Environmental Justice

There are no minority or low-income populations in or near the project area. Therefore, the Proposed Action and alternatives will not have a disproportionately high and adverse human health or environmental effect any such population.

3.13 UNAVOIDABLE ADVERSE IMPACTS

This disclosure is required under NEPA and the CEQ regulations regarding its implementation. This analysis identified several unavoidable, adverse, environmental impacts, the most notable of which include:

- Wildlife (section 3.4): short-term impacts to the threatened Canada lynx (i.e., finding of "may affect but not likely to adversely affect"); short-term disturbance and possible displacement of species of high public interest, including elk, grouse, and ptarmigan.

- Land Use (section 3.5): reduced access to the project area by winter recreationists not visiting SOLRC; occasionally reduced access to adjacent private property and private inholdings.

- Safety (section 3.8): more people exposed to the inherent risk of backcountry-type skiing.

- Transportation (section 3.9): more people exposed to the inherent avalanche risk of driving on SH 110A; periodic closure of SH 110A when SOLRC conducts control work on slopes above the highway.

- Aesthetic Resources (section 3.10): change to the visual character of the base area due to construction of lift, buildings, and associated infrastructure.

3.14 SHORT-TERM USES V. LONG-TERM PRODUCTIVITY

This disclosure, required under NEPA, identifies the costs, in terms of natural resource productivity in the long-term (i.e., over decades or centuries), that are projected to result from the short-term use comprised by a proposed action. In this case, authorization of SOLRC's proposed use of public lands in the permit area would involve no such impacts. All impacts on air, water, soil, vegetation, and wildlife identified in this analysis would be temporary and/or mitigable, and thus would have no affect on the long-term productivity of the natural resource base.

3.15 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

This required disclosure identifies commitments of resources that, in practical terms, cannot be regained. Irreversible commitment of a resource means that, once committed, the resource is lost to other uses. This type of commitment generally applies to non-renewable resources (e.g., minerals, geologic features, or cultural resources) or to resources that are only renewable over a very long period of time (e.g., soil productivity or perhaps old-growth forest). Most of the impacts identified through this analysis do not fall in this category. If BLM authorization of SOLRC's use was issued and subsequently revoked, the site could be easily reclaimed and returned to its previous ecological function. The single possible exception is cultural resources. As discussed in this EIS (section 3.11), increased recreational visitation associated with SOLRC could increase the risk of vandalism or souvenir collecting at historic mining sites potentially eligible for listing in the National Register of Historic Places. Mitigation is proposed to reduce this risk.

Irretrievable commitments of resources involve lost use or productivity of resources. Any such loss resulting from authorization of SOLRC's proposed recreational and educational use of the permit area would fall in this category. As discussed in the Land Use section of this EIS (section 3.5), several human uses of the permit area could be limited during the term of the authorization. These include dispersed, public, winter recreation in the portion of the permit area proposed to be closed for safety reasons, and public use of SH 110A and CR 52 when they are closed for avalanche control activities. While all of these uses could be restored at a later date and are therefore not irreversible, they would be lost during the term of SOLRC's authorization.