The bull elk harvest in DAU E-12 has remained stable while the bull:cow ratio has slightly increased over the past 10 years. Neither of these data points are cause for MIS concern at this time (Giezentanner 2008).

The calf:cow ratio in DAU E-12 is low and has declined over the past five years and is a concern to the CDOW and the Forest Service (Giezentanner 2008). It is possible that at least some of this decline is a result of a stress response of the population being over the DAU population objective for the herd. The decline may also be reflective of the drought conditions over the past 5-7 years coupled with the increasing development of private lands on winter ranges throughout the DAU. It may also be a response to the increasingly heavy recreation use of public lands in the DAU. There have been no significant increases in the number of open roads or trails on NFS lands within the DAU over this time period, but all open roads and trails continue to experience increasing use by recreationists during the summer and fall. The continued development of large portions of the winter ranges on private lands may also be placing additional stresses on the population and may contribute to reduced calf production and survival. All of these factors likely play a part in the downward trend in reproduction of this herd. The drought, winter range development, overall population, and some other causal agents of the reduced capabilities are almost entirely beyond the capabilities of the Forest to control.

6.1.3 PROJECT-LEVEL INFORMATION

Elk are a common, widespread species that inhabit a wide variety of montane through alpine habitats in Eagle County. They are seasonally present along the road access corridors and on the private parcel from late fall into summer (i.e., fall transitional range, winter range, spring transitional range, calving, and calf-rearing). Current (Feb. 3, 2009) Natural Diversity Information Source (NDIS, funded by the CDOW) seasonal elk habitat mapping in the vicinity of the project area is consistent with the CDOW Wildlife Resource Information System (WRIS) 2006 data files available in the Forest Service GIS library, as shown in Phinney (2008). WRIS mapping, which evolved into NDIS mapping, was developed over many years of annual surveys. However, while seasonal ranges were delineated by the CDOW as accurately as possible at a 1:50,000 scale, even accurately plotted boundaries may fluctuate widely between years. The CDOW provides the following disclaimer with their WRIS maps:

> *"The activity areas portrayed here are graphic representations of phenomena that are difficult to reduce to two dimensions. Animal distribution is fluid, animal populations are dynamic, and either may vary considerably from what is shown here."*

Three important elk seasonal ranges/activity areas are identified by NDIS mapping in the vicinity of the project area.

Elk winter range covers the entire project area, including all access road segments on NFS land and the entire private parcel (Fig. 5). This winter range polygon has increased in size (elevation) in recent years (i.e., compared to Alan Richman Planning Services and Design Studios West 1996), probably as a result of refined definitions. Elk winter range is defined as "that part of the overall range of a species where 90% of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each DAU"

(CDOW 1993a). Elk winter range occupancy dates in DAU E-12 were defined by CDOW personnel to be from January 15 to May 1 (CDOW 1993b).

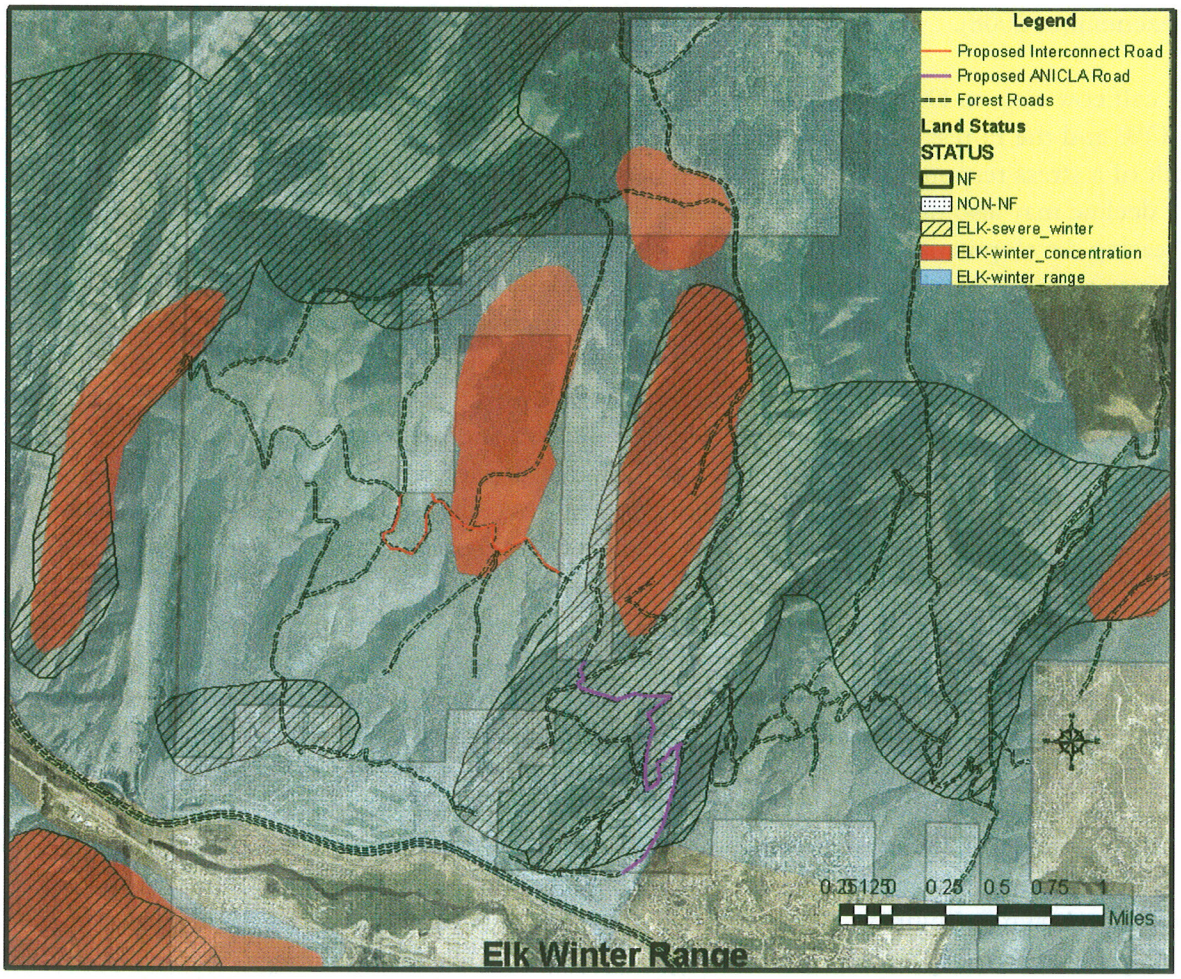

Figure 5. Elk winter ranges in the vicinity of the Berlaimont project area from Phinney (2008). The private Berlaimont parcel is shaded. The "proposed interconnect road" shown reflects a prior, outdated road proposal.

Elk winter concentration area (EWCA) is defined as "that part of the winter range of a species where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten" (CDOW 1993a). Three EWCA polygons occur in the vicinity of the project area (Fig. 5). Two polygons overlap portions of the private parcel and a portion of the upper FSR 780 road segment in upper Thames, Beard, and Berry Creeks. The third polygon is located just northeast of the private parcel's northeast tip in upper Berry Creek.

Elk severe winter range (ESWR) is defined as "that part of the winter range of a species where 90% of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of 10. The winter of 1983/84 is a good example of a severe winter" (CDOW 1993a). Polygons of ESWR in the vicinity of the project area occur in lower to mid-elevations of Beard and Berry Creeks, overlapping almost the entire lower FSR 780 corridor and a

portion of the private parcel's eastern "leg", and a second polygon overlapping the private parcel's northwestern tip in upper Spring Creek and the East Fork of Red Canyon Creek (Fig. 5).
The importance of elk winter range north of I-70 in the Eagle Valley has increased in recent years as a result of cumulative and ongoing development of winter range. South-facing slopes are particularly valuable because of enhanced snow-shedding characteristics. The relatively mesic conditions on side slopes of most project area ridges support more vigorous mountain shrub communities with a greater abundance of serviceberry and mountain mahogany, two important winter browse species. Habitat effectiveness of this block of winter range is relatively high because of motorized road closures, including the closure of Berry Creek Road (FSR 780) to all motorized use, except snowmobiles, from two days after the last big game hunting season (early to mid-November) to May 1. Because of this motorized closure, there is current no road mortality along project area roads. Low to moderate levels of dispersed recreational activity (i.e., mountain biking, hiking, and snowmobiling), generally confined to the network of USFS and volunteer roads through the area, displace animals from diurnal bedding areas with inadequate security. Winter use of this habitat block by big game has probably increased in recent years with the loss of adjacent winter range.

No other seasonal habitats are identified on WRIS/ NDIS maps for the project area. The CDOW (B. Andree, pers. comm., 2001) has indicated that the aspen stand on the private parcel is used by low numbers of elk during the calving season. Elk were detected in this stand during June 19, 2001, June 6, 2006, and June 5, 2008 calving surveys. No evidence of calving was detected. However, most of the interior, mature aspen stands with dense shrubby understories were considered to be excellent calving habitat, with the only limitation being the lack of nearby open water. It is likely that little elk use occurs along the road corridors or on the private parcel after calf rearing (July 1), when animals have moved to higher elevations in the Gore Range to summer.

Access road segments under consideration are located in Management Area (MA) 5.41, Deer and Elk Winter Range, and MA 8.32, Utility Corridors. The access road to the private parcel would be entirely within MA 5.41. The objective of MA 5.41 is to provide habitat and winter forage for deer and elk along with cover and solitude. Human activities are managed so that deer and elk can effectively use the area. The continuation of the access road on NFS lands between the private parcel's two "legs" would occur in MA 8.32.

Project area roads are unplowed in winter and receive some use by over the snow vehicles for recreational use and occasional power line maintenance. Other motorized vehicle access to this area is currently restricted by a gate at the beginning of Berry Creek Road that is closed to protect big game winter range and damage to roads from two days after the end of the last big game rifle season to May 1.

6.1.4 PROJECT EFFECTS

The effects of the proposed action are analyzed below as they relate to the Applicant's Application before the County and the decision at hand. While it may seem contrived to separate road construction vs. road use effects, this approach is appropriate for the Applicant's request and the County's decision. Regardless, all impacts associated with the proposed action and potential future residential development are presented.

6.1.4.1 Road Construction Effects

The proposed upgrading and construction of the access road from current conditions would result in the loss of elk winter range, EWCA, and ESWR, and locally impair daily winter range and migratory movements on the south-facing slopes north of I-70. Each of these impacts is described below.

Habitat Impacts

The engineered access road would result in the net loss of approximately 30.9 acres of habitat, mostly on NFS lands, between the current entrance to Berry Creek Road and the cul-de-sac in the crotch of the private parcel. This acreage[4] includes (1) habitat permanently lost to the road surface[5], shoulders, and cut and fill slopes (whether or not they may be revegetated), (2) locally reduced habitat effectiveness associated with retaining walls, guard rails, and snow deposition areas, and (3) the acreage of the existing FS roads that are within the proposed road alignment[6]. Cut and fill slopes will affect a broader corridor along portions of the road alignment, which will eliminate much more habitat than a flat 26-foot-wide road. Elk winter range, EWCA, and ESWR, permanently lost from direct access road impacts would total approximately 30.9 acres. Based on volunteer revegetation that has occurred along this road corridor and reclamation efforts that will be required, is will be assumed that graded habitat within the ROW at < 1:1 slopes can be effectively reclaimed. However, as a worst case scenario, it will be assumed that such revegetated area would not be effective as equal value winter foraging habitat, at least in the moderate term (i.e., until full size shrubs could regrow).

It is unknown to what extent road upgrading activities would overlap winter range occupancy and migration, resulting potentially in construction activities displacing elk from the road corridor and adjacent habitats. Such potential construction activity displacement effects could last for years and while full recovery can not be assumed (Morrison et al. 1995), it is likely that elk would eventually fully habituate to the unused (other than by snowmobiles) road (road use effects addressed below) bisecting winter range and the migration corridor.

Restricted Movements

Much of the proposed access road would be on slopes ≥ 30%, resulting in additional and steeper cut and fill slopes (i.e., over those now present). Upgrading road sections crossing steeper slopes would further affect the ability of animals to (1) move across and up and down local hillsides and (2) access winter forage. Cut and fill slopes greater than 1:1 (45°) can make the slopes too steep for animals to negotiate, especially in winter (Phinney 2008). Even laying the slope back to a reasonably stable 1:2 slope (30° angle), the slope may be too steep for big game to negotiate in deep snow on both the cut and fill slopes. Replacing or reducing cut and fill slopes with retaining walls along either the cut slope or fill slope would reduce the area of habitat loss, but would create a complete barrier to local animal movements.

[4] The proposed access disturbance limits would cover 42.5 ac.
[5] The proposed access road surface would cover 14.6 ac.
[6] The acreage of existing FS roads that are within the proposed road alignment totals 11.61 acres.

Adding guard rails to road sections on steep slopes would also create additional barriers to wildlife movements, even in very light snow cover (Phinney 2008). Animals that are on the slope below the guard rail may not be able to jump the guard rail depending on the relative height of the rail relative to the terrain below. A guard rail that is placed on the slope break at the top of the fill slope creates a barrier to movements. On a 2:1 fill slope, an animal that is 1½ feet horizontally from the guard rail is three feet below the top of the fill slope, and a two-foot-tall guard rail would require an animal to jump five vertical feet to get over the guard rail. On a steep slope with any snow, the footing would be precarious and many animals could not or would not attempt to jump the guard rail. A flat surface of about five horizontal feet between the guard rail and slope break is needed to allow animals to successfully jump the rails, particularly animals that may be in a weakened condition late in the winter. Of course, adding additional road width to facilitate movements would increase the amount of winter range lost to road construction.

Additional lengths of barriers and restrictions imposed by road upgrading would affect migratory movements and local movements when elk are resident on winter range. Impaired movements during migration could result in increased energetic costs, which would be more significant in spring (vs. fall) when animals are in poor condition and moving uphill through consolidated snow. Most migratory elk movements per se occur above the access road. Impaired movements on winter range could also result in increased energetic costs and reduced availability of winter range if animals are unable to effectively access habitat patches. The area of reduced transitional and winter range effectiveness resulting from access restrictions could equal or exceed the acreage of direct winter range losses.

6.1.4.2 Road Design Variance Effects

Proposed road design variances would have small, uncertain, somewhat offsetting effects on elk, depending on (1) whether proposed emergency turn-arounds would affect more or less winter range than regularly-spaced turn-arounds and (2) whether shorter cut and fill slopes resulting in longer retaining walls would affect slightly less winter range, but pose slightly longer restrictions to migratory and winter range movements. The requested 30 mph vs. 20 mph local speed limit variance could increase road-kill probabilities and injury to big game, but only in unusual circumstances.

6.1.4.3 Road Use and Private Residential Development Effects

Year-round motorized use of the access road and residential development of the private parcel (the development and use of roads, driveways, building envelopes, and septic systems) would result in the vast majority of impacts to elk associated with this overall project. Impacts would include loss of winter range, transitional range, and calving habitat, reduce habitat effectiveness affecting these same habitats, restricted migratory and local movements, and increased injury and road-kill probabilities on access roads and regional highways. Each of these impacts is described below.

Habitat Impacts

Residential development would result in the loss of winter range, transitional range, and calving habitat from the development of roads, driveways, building envelopes, and septic systems on the private parcel. Although there is currently no conceptual development plan, direct habitat losses/ modifications would

likely total approximately 42.51 acres7 on the 682-acre parcel. Habitat loss could be considerably larger if horses are permitted on the property.

Reduced Habitat Effectiveness

Year-round motorized use of the access road and developments on the private parcel would reduce the effectiveness of habitats beyond areas of direct habitat losses/ modifications. Reduced habitat effectiveness would be the largest impact associated with the overall project. Sources of reduced habitat effectiveness are addressed below.

Motorized use of the upgraded access road, including winter use by residents, guests, and others associated the proposed Berlaimont Estates Subdivision (but not the public), would affect a considerably larger area of elk winter range, EWCA, ESWR than that directly impacted by road upgrading. Phinney (2008) considered a 400 meter buffer on each side of the access road as an approach to quantify the amount of habitat that could be affected to some extent by road use. Assuming that road use effects are not attenuated before that distance or extend beyond that distance, that all elk (and deer) within that zone are displaced from that zone by anticipated traffic levels and patterns, and that there is no habituation to traffic patterns, then about 617 acres of winter habitat on NFS lands would be affected to some extent by road use from the start of the Berry Creek Road up to the private parcel. This affected acreage is not the same as lost habitat, since animals will return to forage in this zone of influence under cover of darkness when traffic ebbs for the day. To a certain extent, this acreage is not currently 100% effective because of snowmobile use along existing roads and pedestrian recreational use along the Berry Creek Valley. However, this acreage is an approximation of habitat that would be further affected by vehicular traffic. This affected acreage amounts to approximately 20% of the ESWR block that extends from Beard Creek, east, to above Wildridge Subdivision, Fig. 5). Phinney (2008) also considered habitat effectiveness adjacent to a one mile section of road between the private parcel's legs (Fig. 5). Phinney's (2008) analysis was for a prior road proposal, but his approach was applied to the current section of road between the private parcel's legs that is on NFS land (Fig. 2). The lower one-half of this road section overlooks a large area of the basin formed by Tames Creek, Deadhorse Gulch, and Beard Creek. The upper one-half of this road section is contained within the valley enclosed by ridges along the private parcel's legs. The 400 meter buffer adjacent to this road would affect about 473 acres of elk winter range, including about 138 acres of EWCA (approx. 35% of this block of EWCA). In summary, the proposed access road could reduce the effectiveness of approximately 1,090 acres of elk winter range, including approximately 138 acres of EWCA and 555 acres of ESWR.

Habitat effectiveness would also be reduced on and adjacent to the private parcel. The extent of this cannot be quantified at the present time without a development proposal and without considering the overlapping effects associated with the access road on NFS lands. Clustering would occur, to a certain extent, however, it is likely that all areas of the private parcel, composed entirely of elk winter range, EWCA, and ESWR (Fig. 5) would be influenced by residential development.

[7] Assuming 5.4 miles of roads averaging 26 feet wide, 19 homesites with 1 acre building envelopes, 19 driveways averaging 200 feet long and 20 feet wide, and 19, 0.25 acre septic fields.

Additional lengths of barriers and restrictions imposed by road upgrading on NFS and private lands would affect migratory movements and local movements and further impair habitat effectiveness. This is described in greater detail above in Section 6.1.4.1, Road Construction Effects, Restricted Movements.

Road plowing and snow handling may also impair winter range movements, both on steep and flat slopes (Phinney 2008). Snow plowing creates piles of snow along the road way or fills the road side ditches. Snow plowing changes the snow characteristics as well as doubles the snow depth on the edge of the road. Not considering snow compaction, plowing 10 inches of snow off a 26-foot-wide road creates 21.7 cubic feet of snow per linear foot of road. Plowing increases the density of plowed piles and ditches, but may not pack the snow dense enough to support a deer or elk, resulting in deeper, consolidated snow along roadways that animals need to negotiate during crossing attempts. Deeper denser snow piles would make it more difficult for animals to exit the road surface, increasing the stress on animals that encounter traffic on the road way. In some cases, animals may not be able to get off the road to avoid traffic. As winters progress, snow piles become deeper and weakened animals will expend additional energy to cross roads.

Plowing snow along the steeper slopes will cause additional issues (Phinney 2008). On cut and fill slopes, the snow on the entire road is usually side cast to the downhill side of the road, increasing the snow depth and building a berm on the downhill side of the road. The increased amount of snow and the steepness of the slope will create a steep snow slope that could extend a long way down the slope (beyond the toe of the fill slope), thus increasing the snow depth and reducing the availability of otherwise unaffected winter forage.

It is uncertain how altered patterns of public use of NFS roads and land north of Edwards would change with the paved access road. It is possible that hiking and mountain biking along the paved road, unpaved spur roads, and volunteer trails might increase, while snowshoeing, Nordic skiing, and snowmobile use along those same roads and trails might decrease. Increased human intrusion into the area would exacerbate wildlife disturbances. Biking would have the most wide ranging effects, although bike use would largely occur outside the winter range occupancy period.

In summary, reduced habitat effectiveness and habitat losses would displace wintering elk to other already occupied winter range (where resident animals in those areas would also be affected) and to unoccupied lower quality habitat that is not currently used as winter range. Overuse of winter range already at carrying capacity could have adverse, long-term impacts, further impairing the habitat's ability to support the existing number of animals. New human disturbances and increased barriers and restrictions to movements in a large area of elk winter range would force animals to move more frequently and move longer distances, requiring greater energy expenditures, and likely resulting in additional winter kill losses in this herd. It is uncertain what mitigation measures might be implemented to avoid, minimize, and compensate for the above, worst case big game winter range impacts as part of the USFS's NEPA decision, which would include additional CDOW and County input.

The proposed action would continue the trend of winter range loss and fragmentation north of I-70 associated with subdivisions extending from the valley bottom to the upper elevations of winter range

presently represented by Wildwood and Mountain Star, possibly joined by the approved, but unbuilt, Village at Avon. Other substantial subdivisions extending partway through this winter range block also include Singletree and Cordillera Valley Club.

Road Mortality

Year-round paved road use, where no such use presently occurs, would increase big game road-kill probabilities. Big game road mortality would inevitably occur along the upgraded access road. Elk mortality would most likely to occur during migration and winter range occupancy (approx. Dec. 15 to May 15) when most elk use occurs along the access road and roads on the private parcel. Although the proposed action would likely incorporate measures that would be implemented specifically to minimize road-kill (e.g., maximized sight-distances, low speed limits, resident education, etc.), such measures are not 100% effective. Elk mortality will likely be relatively low (i.e., < 1 animal per year). That estimate is based on a nearly identical situation at Mountain Star, a largely built-out, 684-acre, 88-homesite subdivision at 8,600-9,200 feet, located three miles east (up valley) of the project area. The development includes over seven miles of private road and 2.14 miles of access road posted at 25 miles per hour that crosses otherwise undeveloped deer and elk winter range, ESWR, and mule deer migration corridor. Based on the 17 years over which that project has developed, there has been one documented elk road-kill and approximately 3-4 road-killed deer (J. Clark, Mountain Star Caretaker, pers. comm., Feb. 9, 2009). This does not consider animals that may have been struck by vehicles and struggled off to die undetected. At full buildout, Berlaimont would generate 192 vehicles per day (ADT) compared to 889 vehicles per day at Mountain Star. Similar levels of big game road mortality are associated with other larger residential developments accessed by Metcalf Road, Beaver Creek Boulevard, Squaw Creek Road, and Bellyache Ridge Road. Big game road mortality would be minimized by closing (and enforcing) the road to the public in winter.

Project-related traffic on I-70 and regional highways would result in discountable increases in road-kill probabilities. Additional fencing recently installed along unfenced portions of I-70 in the project area should reduce existing levels of elk highway mortality (although elk will continue to attempt crossings).

Further Secondary Development

The proposed action is not expected to generate any further secondary development from contractors and temporary and permanent employees (i.e., those that would design, build, and maintain the Berlaimont Estates Subdivision and its ancillary facilities) that would have discernable effects on elk. Temporary employees and contractors that would implement the project components would be mostly locals or commuters that would exploit existing vacancies in the local housing market (as opposed to building new homes or contributing meaningful demand for additional subdivision development). These workers would make discountable, incremental contributions to elk highway mortality and the fragmenting effects of highways within the range of the GMU 36 elk herd.

6.2 MULE DEER

6.2.1 MULE DEER LIFE HISTORY INFORMATION

Mule deer are widely distributed in western North America. They inhabit every major vegetation type in western North America and every climatic zone except the arctic and tropic. Rocky Mountain mule deer is the subspecies found in Colorado and they occur throughout the state in all ecosystems (Fitzgerald et al. 1994). Mule deer range over most of the WRNF and use essentially all habitats. Like elk, mule deer inhabit higher elevations during spring and summer and migrate to lower elevations for winter range. Winter range availability and habitat effectiveness may be the most critical seasonal range for deer survival.

In Colorado, mule deer breed in November and December. A variety of factors stimulate the complex endocrine system that manipulates the physiological processes involved in the timing of reproduction. In males these factors cause growth of antlers and neck swelling prior the rut. At the time of ovulation, the peak of estrus, females are receptive for breeding for only a few hours to less than a day. If not bred, however, they recycle until fertilized (Wallmo 1980). A Colorado study (Anderson and Medin 1967) documented that 70% of the breeding occurred in a 20-day period. The mean length of gestation is 203 days, with individual variance of up to 30 days (Anderson and Medin 1967, Robinette et al. 1973). In spring, pregnant does drift off by themselves a week or two before she drops her fawn. Most fawns are born from early to mid-morning. Fawns are precocious and weigh 8 to 10 pounds at birth. In Colorado, fawns are normally born from June 15 to July 15 (Einarson 1969). Yearling females typically produce a single fawn, while older females in good condition normally produce twins (Fitzgerald et al. 1994). Family groups are usually made up of mature and young does, young bucks, and yearling fawns (Einarson 1969). When not in rut, adult males often form pairs or small groups of three to five individuals (Fitzgerald et al. 1994). The males shed their antlers from late December to late February (Einarson 1969).

Mule deer eat a wide variety of plants (Bison M 2001). The seasonal use of foods may change quickly and within a few weeks a highly palatable plant may fall into complete disuse. During the spring months, grasses may make up a high percentage of the diet in some areas. This early growth is high in protein. During the summer, when the variety of plants available reach their maximum abundance, grasses may drop as a percent of the total diet. Forb use and new growth of shrubs is high during this period (Einarson 1969). Autumn frosts bring great changes to mule deer diets. A high portion of the diet is comprised of grasses, leaves and forbs, but this period marks the transition to shrubby vegetation. In winter, succulent vegetation is at a minimum and in many areas snow covers herbaceous plants and many shrubs, leaving only taller browse (Einarson 1969).

Cover may be a key factor that determines the amount of use deer will make of foraging areas. In optimal deer range 40% of an area will be in cover type habitats. Ideally, cover habitat is comprised of 50% hiding cover and 50% thermal cover. Hiding cover generally is any vegetation that will hide 90% of a deer at 200 feet or less. Optimal hiding cover will be in patches at least 800-1,600 feet wide. Optimal winter range contains thermal cover consisting of evergreen trees with 75% or greater canopy closure. Spring and summer thermal cover may be as important as winter thermal cover for protection from high temperatures. Spring and summer thermal cover may be provided by coniferous or

deciduous trees, which provide at least 75% canopy closure. Escape cover used by deer may include thermal or hiding cover. Broken terrain or topographic features are also used as escape cover (Hoover and Wills 1984, Thomas et al. 1979). Loft et al. (1991) documented that deer prefer meadow-riparian habitats in the absence of domestic livestock grazing.

Fawning may occur in any habitat type found on the forest. However, fawns are most often found on sites with slopes of less than 15% that have good ground cover in the form of herbaceous vegetation mixed with low shrubs or small trees 2 to 6 feet in height. Normally these areas are within 600 yards of a water source and in areas that have quality forage for the doe that assures adequate milk production. Fawning areas are normally 1 to 5 acres in size if located on sites with characteristics different from the surrounding habitats (Hoover and Wills 1984). Fawns are relatively inactive during the first few days of their lives, but gradually become more active and begin to explore their surroundings. They begin to consume solid foods at 15 to 20 days of age (Einarson 1969). In a Colorado study, Geduling (1981) reported that of 11 fawns he studied from early June through August, the average home range was 321 acres and the average home range expanded throughout the summer. Riley and Dood (1984) reported an average summer home range of 456 acres for fawns in a Montana study. They found that fawns selected habitat types with dense vegetative cover and typically used the mid- and lower one-third of slopes, possibly to minimize encounters with coyotes.

Deer are thought to experience less reduced habitat effectiveness compared to elk with respect to road effects, however, they are still adversely influenced by the presence of roads that are open to vehicular traffic. Some level of reduced use of areas adjacent to roads extended for distances ranging from ¼ to ½ mile (Thomas et al. 1979). Road type, its location, and its degree of use influenced mule deer habitat effectiveness (Rost and Bailey 1979). Roads also provide access for hunters and poachers alike, leading to increased deer mortality.

Mule deer are sympatric with elk across large areas of western North America, where populations of mule deer have declined while elk populations have increased (Johnson et al. 2000). While more study is needed to specifically determine if elk population increases are the direct cause of mule deer population declines, Johnson et al. (2000) documented mule deer avoidance of areas used by elk. Consequently increasing elk populations are suspected to be a causative factor in the decline of mule deer populations in some areas.

Winter range conditions are most critical for mule deer survival. Pressures are increasing on most winter range from human developments such as reservoirs, housing developments, access roads, highways and cultivated fields. Overgrazing of mule deer winter range by domestic livestock can have significant impacts on deer populations. The communal life of the deer in mid-winter concentrations brings a critical period in the life of the young deer. In habitats with adequate forage, and during mild weather, no crisis occurs, but where growing conditions are poor and where overpopulations of domestic livestock and deer both use the range, the winter months of excessive cold and deep snow often become critical for the younger deer. Yearlings and fawns may have been in excellent condition as winter approaches, but larger and more mature animals press forage back, often standing up on hind legs to reach the remaining browse, the smaller deer fail to secure adequate nourishment. Immature deer make up from 60 to 80 percent of the mortality in critical winter conditions (Einarson 1969). In a

study in northwest Colorado, White and Bartmann (1998) documented significant increases in fawn survival rates after wintering densities of mule deer were lowered.
Chronic wasting disease is a potential threat to mule deer populations and recreational hunting on local areas of the WRNF. This disease has been found in wild deer and elk in northeastern Colorado and southeastern Wyoming for more than 30 years and in captive elk for more than a decade (CDOW 2002, Gross and Miller 2001).

6.2.2 PROJECT-LEVEL INFORMATION

Mule deer are a common, widespread species that inhabit a wide variety of montane through alpine habitats in Eagle County. Deer are present year-round in the project area, although different animals are present during summer and winter. The CDOW maps deer seasonal ranges. Current (Feb. 3, 2009) Natural Diversity Information Source (NDIS, funded by the CDOW) seasonal mule deer range mapping in the vicinity of the project area is consistent with the CDOW Wildlife Resource Information System (WRIS) 2006 data files available in the Forest Service GIS library, as shown in Phinney (2008). WRIS mapping, which evolved into NDIS mapping, was developed over many years of annual surveys. However, while they were delineated by the CDOW at a 1:50,000 scale as accurately as possible, even accurately plotted boundaries may fluctuate widely between years. See the Project-Level elk discussion, above, for the CDOW disclaimer associated with the WRIS and NDIS maps.

Five important mule deer seasonal ranges/activity areas are identified by NDIS mapping in the vicinity of the project area. Mule deer winter range (MDWR) extends up the Eagle River Valley to Dowds Junction. At these highest winter ranges in the valley, it is best developed and most extensive on the south-facing, sagebrush and mountain shrub-dominated slopes on the north side of the valley. This winter range block is the only mule deer winter range for animals in central eastern Eagle County. This largest winter range polygon covers the entire project area, including all access road segments on NFS land and the entire private parcel (Fig. 6). This polygon has increased in size (elevation) in recent years (e.g., Alan Richman Planning Services and Design Studios West 1996), probably as a result of refined definitions. Mule deer winter range is defined as "that part of the range of a species where 90% of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each DAU" (CDOW 1993c). Mule deer winter range occupancy dates in this portion of Game Management Unit (GMU) 36, in Data Analysis Unit (DAU) 8, are generally considered to extend between November 15 and April 30 (dates inclusive), which includes most fall and spring mule deer migration and all winter range use. This period differs somewhat from the mule deer migration periods (October 15 to December 14 [fall] and April 16 to June 1 [spring], dates inclusive) and winter range occupancy period (December 15 to April 15, dates inclusive) that the CDOW applies to the broader Eagle Valley, between approximately Vail and Eagle, resulting in a longer, October 15 through June 1 (dates inclusive) migration and winter range interval in that larger area.

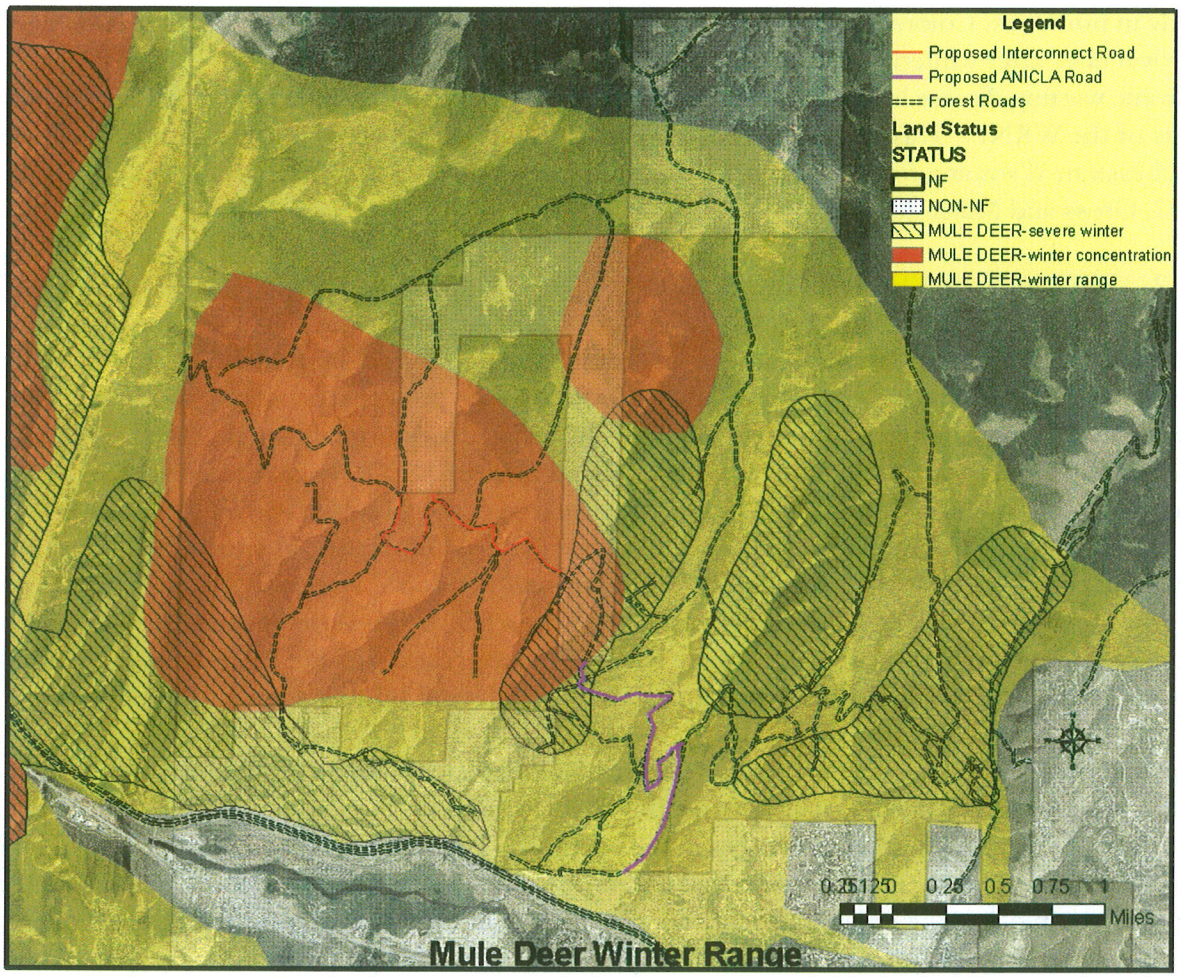

Figure 6. Mule deer winter ranges in the vicinity of the Berlaimont project area from Phinney (2008). The private Berlaimont parcel is shaded. The "proposed interconnect road" shown reflects a prior, outdated road proposal.

Mule deer winter concentration area (MDWCA) is defined as "that part of the winter range of a species where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten" (CDOW 1993c). Two MDWCA polygons occur in the vicinity of the project area (Fig. 6). The largest polygon overlaps the lower "legs" of the private parcel and that section of FSR 780 connecting the two "legs", between Beard Creek on the east and Red Canyon Creek on the west The other overlaps the upper, northeast corner of the private parcel in the Beard Creek drainage.

Mule deer severe winter range (MDSWR) is defined as "that part of the winter range of a species where 90% of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum during the two worst winters out of 10. The winter of 1983/84 is a good example of a severe winter" (CDOW 1993c). Polygons of MDSWR in the vicinity of the project area occur in lower to mid-elevations of Beard, Berry and June Creeks, with a large polygon beginning on private lands at the mouth of Beard Creek and extending down valley through Cordillera Valley Club to Squaw Creek, then along both sides of the valley bottom past Gypsum (Fig. 6). The three former polygons are

the highest blocks of MDSWR in the Eagle Valley. The Beard Creek polygon overlaps the distal end of the lower access road segment and most of the private parcel's eastern "leg."

NDIS maps classify the entire project area below the approximate 8,800 to 9,000-foot elevation contour as mule deer migration corridor. Migration corridors are defined as "a specific mapable site through which large numbers of animals migrate and loss of which would change migration routes" (CDOW 1993c). This delineation covers both access road sections (under Alts. 2 and 3) and the lower "legs" of the private parcel. Deer migration occurs through this general area twice a year following general elevational contours (i.e., east-west). Fall and spring mule deer migration in the vicinity of the project area occurs from approximately November 15-December 15 and March 30-April 30 (dates inclusive). Most deer that winter in the project area summer on the south side of the Gore Range and south of I-70 along the ridge line from Shrine Pass to Chicago Ridge. Deer summering south of I-70 cross the highway through the Mud Springs Gulch underpass east of Dowds Junction (Reed et al. 1975).

Lastly, NDIS maps classify the length of I-70, from Red Canyon Creek on the west to Metcalf Creek on the east, excluding the Edwards Interchange area, as a mule deer highway crossing. This activity area may be eliminated when maps are next updated as a result of a new deer fence recently installed to minimize big game highway mortality (although some deer will continue attempting crossings). No other seasonal deer habitats are identified on NDIS maps for the project area.

6.2.3 PROJECT EFFECTS

Deer issues (e.g., habitat impacts, restricted movements, reduced habitat effectiveness, road and highway mortality, and further secondary development), road construction effects, road design variance effects, and road use and private residential development effects associated with the proposed action are virtually identical to those described above for elk, with four exceptions. First, as a result of an expanded elk population (and resulting competition and displacement) since the 1970s and the I-70 deer fence, deer are being forced to migrate further west down the Eagle Valley to winter. Deer populations have been affected to a much greater degree by cumulative winter range losses in the Eagle Valley than have elk.

Second, while the acreage of impacts to the three winter range types (i.e., WR, WCA, SWR) differ between deer and elk, The entire Berlaimont access road corridor, adjacent habitat, and the private parcel is composed of MDWR, MDWCA, and MDSWR. In addition, while deer are thought to experience less reduced habitat effectiveness compared to elk with respect to road effects, however, deer are still adversely influenced by the presence of roads that are open to vehicular traffic, and the same acreages of reduced habitat effectiveness quantified above for elk can also be applied to deer.

Third, deer are more susceptible to road-kill, which will result in higher mortality along the access road than is expected for elk. The CDOW (B. Andree, pers. comm., July 13, 2001) has estimated that annual road-kill mortality could reach 30-35 animals along the access road. That estimate may be excessive considering the lower levels of road mortality along higher speed, higher volume roads accessing larger, similarly isolated subdivisions located in big game winter range, such as Mountain Star and Wildridge (see Road Mortality section under Elk, above).

Fourth, deer would be more susceptible to restrictions and barriers imposed by excessive cut and fill slopes, retaining walls, and snow deposits created by plowing.

It is uncertain what mitigation measures might be implemented to avoid, minimize, and compensate for the above, worst case big game winter range impacts as part of the USFS's NEPA decision, which would include additional CDOW and County input.

6.3 OTHER WILDLIFE

A number of other wildlife species not specifically addressed herein occur along the access road and on the private parcel that warrant consideration during project planning, installation, and habitation. While some minimization measures have been incorporated into the road design that is part of the Application, additional measures may be a required part of the USFS's NEPA decision. Furthermore, development of a wildlife mitigation plan for the private parcel, to ensure that development follows a design minimizing habitat losses and facilitating continued wildlife movements through, and use of, the property will be a consideration (i.e., addressing issues including, but not limited to avoiding high value wildlife habitats, home and road siting to attenuate disturbances and retain high value habitat values, clustering, dog and pet controls, seasonal use restrictions and designated and volunteer trails [on- and off-site], bears and trash disposal, fencing, horses, landscaping, wildlife mortality on local roads, mountain lions, feeding wildlife, weed management, education, enforcement, etc.). Such a plan, developed with additional USFS, CDOW, and County input, could include the same types of minimization and compensation measures contained in other wildlife mitigation plans that have been developed for properties containing similar wildlife issues in the County.

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APPENDIX C

ECONOMIC IMPACT STATEMENT

Economic Impact Assessment:

for the proposed: 'Berlaimont Estates'

Eagle County, Colorado

Prepared for: Berlaimont Estates, LLC

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March 18, 2013

v. 1.1

Job 1308

Executive Summary

The economic impact study of the proposed Berlaimont Estates indicates the following:

- Over the nine year phase-in (construction) period – the project's cumulative input to the local/regional economy will be $213.8 million, including $203.6 million from project construction and $10.2 million from ongoing community occupancy and maintenance activities.

- On an ongoing basis following the nine year phase-in, Berlaimont Estates' operations will generate $2.1 million for the local/regional economy – on an ***annual*** basis.

- Over the nine year phase-in (construction) period – the cumulative number of Full-Time Equivalent (FTE) jobs generated in the local/regional area will be 1,467, including 1,367 from project construction and 100 from ongoing community occupancy and maintenance activity.[1]

- On an ongoing ***annual*** basis following the nine year phase-in, Berlaimont Estates' occupancy and maintenance activity will generate 21 FTEs and $2.1 million in dollar flows for the local/regional economy.

- The project will also generate significant public revenues to Eagle County. The major sources of revenue will be property taxes and sales taxes.

[1] Employment impacts are quoted in terms of 'Full-Time Equivalents (FTE)' – sufficient employment to keep one worker employed on a full-time basis for one year.

Introduction

Study Purpose - Doug Kennedy Advisors was asked to project the potential economic impact of the proposed Berlaimont Estates residential community – with a focus on the project's potential to generate jobs and dollar flows in the private sector. This report summarizes the critical data and findings resulting from our analysis. Doug Kennedy Associates is a consulting firm with over 30 years of experience in assessing residential markets and economics throughout North America.

The Project - Berlaimont Estates is a proposed, low density, residential community located on a 680 acre inholding in the White River National Forest in Eagle County, Colorado. The proposed community will consist of 19 single family acre lots, each to include 35 acres. Additional acreage will be used for a commonly held equestrian facility and a caretaker's cottage.

- The single family homes are expected to be 'high-end' – individual homes are expected to average 10,000 square feet of living space. It has been assumed that lot sales will occur at an average rate of three per year and that home construction will commence in the year of sale and take an average of 18 months to complete. It is expected that all lot buyers/homeowners will use the units on a vacation/seasonal basis.
- Access to the inholding requires the construction of an 8.8 mile access road. This road will be constructed during the first year of the project.
- Access to individual lots will require the construction of a 3.7 mile interior road. It is assumed that this road will be phased-in over a five year period.
- It has been assumed that the equestrian facility and caretaker cottage will be constructed during the third and fourth years of the project. [2]

Economic Impact Theory – a significant body of prior research makes it clear that the construction and occupancy of residential developments generates new economic activity in the form of private sector jobs and dollar flows. These benefits accrue to both the businesses directly involved in construction and businesses that provide goods and services for residents. Perhaps just as importantly, the *direct* dollars expended at local businesses have a *secondary* (multiplier) impact, creating more dollar flows/jobs in the local and regional economy.

[2] Source: Berlaimont Estates, LLC.

Methodology – The *direct* and *secondary* impacts of Berlaimont Estates were projected using a powerful computer-based model – IMPLAN. IMPLAN is a broadly accepted model used for making projections regarding employment and economic impacts and is commonly used by the Forest Service in Environmental Impact Statements prepared as part of the NEPA process.

The IMPLAN model was used to measure the project's economic impact in two ways: 1) The impacts of project construction – short term (estimated at nine years) and; 2) The impacts of ongoing occupancy and ongoing maintenance of the community – long term. It is expected that the project's impacts will be primarily felt locally in the Eagle County area. However, the project's secondary impacts will extend through a broader region.

Definitions – In this analysis, new jobs are defined in terms of 'Full-Time-Equivalents' (FTEs) – sufficient work to keep one person employed full-time for one year. In seasonal communities one FTE may represent several employment positions.

Project Construction Impact – Short Term

Project construction costs were estimated as follows:

- Road construction costs at $1,780,229 per mile;[3]
- Equestrian facility cost ~ 16,500 sq. ft. at $150 per square foot.
- Caretaker cottage cost ~ 1,800 sq. ft. at $300 per square foot.
- Purchases/Caretaker & Equestrian – capital expenditures such as vehicles.
- Furniture/Home Furnishings – seven percent of construction value in single family units and five percent of construction value in caretaker cottage.
- Engineering/Architecture Fees – seven percent of construction value for structures and five percent of construction value for roads.

Berlaimont Estate's planned project construction schedule and construction values are summarized in the table below.

[3] Road cost estimate source: Berlaimont Estates, LLC.

Berlaimont Estates – Project Construction Schedule

	Expenditures									*Cumulative*
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Totals***
Access Road	$15,666,015									$15,666,015
Internal Road	$1,317,369	$1,317,369	$1,317,369	$1,317,369	$1,317,369					$6,586,847
Equestrian Center				$2,475,000						$2,475,000
Caretaker Cottage			$540,000							$540,000
Equipment Purchases-Equestrian/Caretaker			$50,000	$100,000	$50,000					$200,000
Single Family Structures		$10,500,000	$15,750,000	$15,750,000	$15,750,000	$15,750,000	$15,750,000	$8,750,000	$1,750,000	$99,750,000
Furniture/Home Furnishings		$744,330	$1,144,503	$1,116,494	$1,116,494	$1,116,494	$1,116,494	$620,275	$124,055	$7,099,139
Engineering/ Architecture	$849,169	$800,868	$1,206,168	$1,341,618	$1,168,368	$1,102,500	$1,102,500	$612,500	$122,500	$8,306,193
Totals	$17,832,554	$13,362,567	$20,008,041	$22,100,482	$19,402,232	$17,968,994	$17,968,994	$9,982,775	$1,996,555	$140,623,195

Project construction will result in over $140 million in direct spending.

The construction values were input to the IMPLAN model to provide estimates of direct and secondary jobs and dollar flows to be generated by the construction component of the project. The results of the analysis are shown in the table below. The table shows direct and secondary jobs (in FTEs) and dollar flows produced by construction activity – throughout the construction period of nine years.

Berlaimont Estates Construction – Jobs and Dollar Flow Impacts

	Construction Year									*Cumulative*
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Totals***
Jobs (in FTEs)										
Direct Impact	82	65	94	106	85	76	74	40	8	628
Secondary Impact	103	77	111	117	100	90	86	46	9	739
Total Impact	185	141	205	223	185	166	160	86	17	1,367
Dollar Flows										
Direct Impact	$15,991,571	$11,584,868	$16,742,296	$17,840,169	$15,119,815	$13,515,662	$13,043,466	$6,993,270	$1,349,813	$112,180,930
Secondary Impact	$12,604,491	$9,475,110	$13,709,553	$14,638,539	$12,372,790	$11,094,307	$10,705,178	$5,738,768	$1,107,513	$91,446,249
Total Impact	$28,596,062	$21,059,978	$30,451,849	$32,478,708	$27,492,605	$24,609,969	$23,748,644	$12,732,038	$2,457,326	$203,627,179

Over the nine year construction period, the cumulative impact will be to create 1,367 FTE jobs and over $203.6 million in total dollar flows. The *multiplier* impact of construction activity (the amount by which direct impacts are reinvested in the area economy) is 1.82.

Berlaimont Estates Occupancy & Maintenance – Long Term

While construction activity will have a *significant* impact over the first nine years of the project, it is the ongoing occupation and maintenance of the community that will have a longer term impact on the Eagle County economy. Direct employment will be created both inside and outside the community, as owners and their guests make expenditures at area businesses. Secondary employment will be dispersed over a broader geographic area. Effectively then, ongoing occupation and maintenance of Berlaimont Estates will generate employment and dollar flows in three major ways:[4]

1. Caretaker Operations – a private community of this size, scope and value will likely hire a full-time caretaker, with primary responsibility for maintenance and repair of the community's common facilities. Further, it is reasonable to expect that the caretaker would contract with outside firms for major repair/maintenance jobs;

2. Property Management Operations – high value homeowners typically contract with a professional property manager for ongoing security, maintenance, etc. for their home. Further the management firm will contract with outside firms for significant home maintenance or repair jobs;

3. Homeowner expenditures – homeowners will make expenditures at area businesses during the periods when they – or their guests – occupy the homes. This might include: Retail; Food & Beverage (Restaurant); Recreation, etc. For purposes of estimation, we assumed that the each home would only be occupied four weeks out of each year. A number of studies provide data on typical Colorado visitor expenditures.[5]

[4] This is a conservative estimate of ongoing community costs. Additional expenditures, such as heating and utilities have not been included.

[5] Sources include:

- Colorado Ski Country
- Colorado State University
- Utah Bureau of Economic & Business Research
- Vermont Tourism Data Center
- Alberta Economic Development

The greatest weight was applied to estimates of Colorado skier activity. Per capita expenditure figures have been factored up to account for CPI increases since the dates of publication.

Estimates of *direct* expenditures in each of the three areas noted above are shown in the table below. Note that occupancy is not expected to begin until the third year – when three of the homes are completed.

Berlaimont Estates – Occupancy/Maintenance Expenditures Projections

	Expenditures										*Nine-Year*
Year	1	2	3	4	5	6	7	8	9	Contin-uing>	*Cumulative Totals*
Caretaker Salary & Expenditures			$142,500	$197,475	$352,518	$410,381	$468,392	$526,554	$549,871	$549,871	$3,197,562
Property Mgmt. & Expenditures			$89,400	$178,800	$268,200	$357,600	$447,000	$536,400	$566,200	$566,200	$3,009,800
Home User Expenditures			$97,689	$195,379	$293,068	$390,757	$488,447	$586,136	$618,699	$618,699	$3,288,874
Totals	$0	$0	$329,589	$571,654	$913,786	$1,158,738	$1,403,838	$1,649,089	$1,734,770	$1,734,770	$9,496,236

During the nine year phase-in period, it is projected that occupancy and maintenance of the community will result in $9.496 million in direct spending in the area of the project. Further, it is expected that the community will continue to spend approximately $1.735 million in the county *in each subsequent year.*

The direct expenditures were then input to the IMPLAN model in order to estimate the net impact of the occupancy and maintenance of the community on local/regional dollar flows and employment. The annualized results of these analyses are shown in the table below – for the project phase-in period.

Berlaimont Estates Occupancy & Maintenance – Jobs and Dollar Flow Impacts

	Construction Year									*Cumulative*
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Totals***
Jobs (in FTEs)										
Direct Impact	0	0	3	6	8	10	12	14	14	67
Secondary Impact	0	0	2	3	4	5	6	7	7	33
Total Impact	0	0	5	8	12	15	18	21	21	100
Dollar Flows										
Direct Impact	$0	$0	$281,126	$473,805	$732,311	$901,317	$1,059,639	$1,207,788	$1,232,100	$5,888,086
Secondary Impact	$0	$0	$200,783	$341,071	$533,474	$656,426	$771,574	$879,289	$896,811	$4,279,428
Total Impact	$0	$0	$481,909	$814,876	$1,265,785	$1,557,743	$1,831,213	$2,087,077	$2,128,911	$10,167,514

Over the nine year phase-in period, Berlaimont Estate's *occupancy and maintenance* will generate a cumulative total of 100 FTEs and $10.2 million in dollar flows. In the long run, the community's maintenance will continue to generate 21 FTEs and $2.1 million in dollar flows in the local/regional economy (as shown for Year 9) – ***on an annual basis.*** The *multiplier* impact of operations activity (the amount by which direct impacts are reinvested in the area economy) is 1.73.

Berlaimont Estates - Total Impact

The table below summarizes the total private sector impact of the Berlaimont project, in terms of FTEs and dollar flows – during the nine year phase-in period.

Berlaimont Estates – Economic Impact During Phase-In

	Construction Year									*Cumulative*
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Totals***
Jobs (in FTEs)										
Direct Impact	82	65	97	111	93	86	86	53	22	695
Secondary Impact	103	77	112	120	104	95	92	53	16	772
Total Impact	185	141	209	231	198	181	178	107	38	1,467
Dollar Flows										
Direct Impact	$15,991,571	$11,584,868	$17,023,422	$18,313,974	$15,852,126	$14,416,979	$14,103,105	$8,201,058	$2,581,913	$118,069,016
Secondary Impact	$12,604,491	$9,475,110	$13,910,336	$14,979,610	$12,906,264	$11,750,733	$11,476,752	$6,618,057	$2,004,324	$95,725,677
Total Impact	$28,596,062	$21,059,978	$30,933,758	$33,293,584	$28,758,390	$26,167,712	$25,579,857	$14,819,115	$4,586,237	$213,794,693

During the nine year phase-in period Berlaimont Estates will cumulatively generate 1,467 FTE jobs and $213.8 million in dollar flows in the area economy.

Fiscal Implications

Berlaimont Estates will also generate significant public (Eagle County) revenue on an ongoing basis, both during the phase-in/construction period and on an ongoing basis. While the county will benefit from a range of permits, fees, etc. that will be generated by the project's construction and occupancy, the major two sources of revenue will be as follows:

- ***Property Taxes*** – Eagle County taxes real property based on assessed value. FY 2012 data indicates that the county's total assessed valuation was $3,017,601,680. Further, the total mill levy (Tax Rate per $1,000 of Assessed Value) was $8.499. This generated $23,583,391 in property tax revenues in FY2012.[6]

  Property taxes generated by Berlaimont Estates will increase throughout the phase-in period as the single family houses and other improvements are completed. At the point of completion (19 Single Family Houses) the project will generate property taxes into the foreseeable future based on its assessed valuation.

- ***Sales Tax –*** Eagle County assesses a 1.5 percent sales tax on sales transactions within the county. 0.5 percent of this is allocated to Trails & Transit operations, while the remainder (1.0 Percent) is allocated to the General Fund. Sales taxes generated approximately $17.2 million for the county in 2012.[7]

  During the phase-in/construction period, the project will generate sales tax revenue based on construction-related purchases as well as purchases relating to occupancy and maintenance of the project. Sales tax revenue will continue to be generated following project completion based on occupant purchases and purchases relating to community maintenance.

[6] Source: Eagle County, Colorado.

[7] Source: *Abstract of Assessments and Levies for the Tax Year 2012*, Eagle County Assessor's Office.