APPENDIX J

STRATEGIC ACTION PLAN

Adopted by the Vail Town Council
November 6, 2007

TOWN OF VAIL

ACKNOWLEDGEMENTS

The Town of Vail wishes to thank members of the community who participated in the Vail 20/20 process, as well as the following individuals and organizations:

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Bev Trout, Vail Board of Realtors
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****NOTE: IF APPENDICES ARE NOT INCLUDED,
THEY CAN BE VIEWED AT WWW.VAILGOV.COM/2020**

EXECUTIVE SUMMARY

The Vail 20/20 Focus on the Future process began in 2006 as a way to build upon Vail's successes, keep the resort community competitive and to seek opportunities to improve the community through a strategic plan. Goals of the 20/20 process were adopted as follows:

- Create a plan that identifies commonly shared values in the community.
- Create a clear vision for Vail.
- Integrate a plan to coordinate Vail's strategies for the future.
- Create a plan that transcends the administrations of town staff, Vail Town Council and appointed boards and commissions.

Vail's last community visioning process took place in 1996, which involved the community in the creation of shared values, goals and actions. Now, more than a decade later, that earlier work from Vail Tomorrow has been re-examined as part of the Vail 20/20 process.

The public input process for Vail 20/20 has included two public workshops, a meeting with Vail's stakeholders, a workshop with Vail Mountain School students, and an open house to respond to a first draft of the Strategic Action Plan. Environmental sustainability, workforce housing, I-70 mitigation, wildfire preparedness and management of growth and redevelopment were identified during these meetings as top priorities for the town. In all, more than 300 voices were heard to assist in setting a direction for the future.

The Vail 20/20 Strategic Action Plan begins with a set of values that outline what is truly important to the community. The plan then details land use and development, parks and recreation, environment, housing, transportation, economy, community and public safety topics, including specific vision statements, long-term goals, and actions and strategies over the next 5 years to achieve those goals.

The appendices include the following information: Background information, current practices, current strategies, guiding documents, and public input for each topic (Appendix A), summaries of public input (Appendix B), Vail Tomorrow summaries (Appendix C), 2007 Community Survey (Appendix D).

Vail's Vision is the general vision statement for Vail's future, based on input from the community during the Vail 20/20 process, and is as follows:

We are the "Premier Mountain Resort Community" by providing high quality of life and experiences for both residents and visitors. This is achieved through environmental stewardship, world-class recreational, cultural and educational opportunities, a strong year-round economy, diversity of housing, and superior infrastructure. The town actively seeks input and cooperation from the community and its neighbors to ensure fulfillment of its vision.

The following provides a summary of each topic and general themes expressed by 20/20 participants. For more information, visit www.vailgov.com/2020.

Land Use and Development: The completion of current redevelopment in Vail and preparing for future growth is essential to Vail's ongoing success as a resort community. Through evaluation of and modifications to the town's planning documents, the town has an opportunity to ensure proper guidance of future development. During 20/20, some participants expressed concerns over the scale of development in Vail, while others expressed satisfaction with the town's management of growth and development.

EXECUTIVE SUMMARY

Parks and Recreation: Aging infrastructure, the need for new recreation facilities and programming to meet public demand and a lack of funding have been identified as important challenges to be addressed by Vail's leaders and its partners. During 20/20, participants expressed a desire for new facilities, increased maintenance for existing facilities and additional marketing for recreation programs.

Environment: Vail's reputation as a resort industry leader lends itself to setting exceptional standards for environmental stewardship. During 20/20, participants encouraged the town to become a leader in environmental sustainability, including improvement in town practices and creation of new environmental opportunities for businesses, residents and guests.

Housing: The high cost of housing and a lack of developable land continue to challenge the community in providing adequate workforce housing. Opportunities exist to increase the amount of employee housing through redevelopment of existing housing, the purchase of deed-restricted units and through developer requirements. During 20/20, participants placed workforce housing as a top priority for the community and government leaders to address.

Transportation: Vail strives to operate a seamless transportation system while experiencing an increase in users in every mode of transportation. This increase has caused the town to reevaluate and seek new opportunities for funding sources and solutions to traffic congestion and parking needs. During 20/20, participants expressed concerns regarding I-70 noise and pollution, increased traffic in Vail and the need for additional parking options.

Economy: Increasing capital and operational expenses for the town, a sales tax driven municipal budget, workforce housing needs and a seasonal economy impact the community's long-term financial health. During 20/20, participants expressed interest in creating a year-round economy, funding capital projects and focusing on workforce housing.

Community: Vail's community direction and diversity is impacted by variables such as housing, employment and affordability. These variables have caused a decline in the number of families living in Vail, while representation from other demographic sectors such as retirees and part-time homeowners moving to Vail full-time has increased. During 20/20, participants expressed optimism in addressing the many challenges associated with improving community diversity, which in turn, will contribute to a healthier resort.

Public Safety: The town continues to look for opportunities to improve its public safety divisions including constructing a new fire station in West Vail to improve emergency response times in the neighborhood, as well as renovation to the Main Vail fire station. Additionally, the increase in wildfire danger caused by the ongoing pine beetle outbreak poses a threat to public safety and the town is working with local and regional partners to prepare itself and its residents in the event a wildfire occurs. During 20/20, participants expressed the need for a new fire house in West Vail and ongoing response to the beetle outbreak.

The Vail 20/20 Strategic Action Plan has been developed to guide decisions by key leaders to ensure these decisions are aligned with the community's desired future, as outlined in Vail's Vision above. The plan will also be used to improve effectiveness and efficiency in capital and operational budgeting for the town. As such, Vail's 20/20 values and vision statements, goals and actions should be reviewed as needed to maintain a strategic direction into the future.

VAIL 20/20: COMMUNITY VALUES

Vail's Community Values serve as the foundation for the
Vail 20/20 Strategic Action Plan and are the essence of Vail's identity.

Premier Resort Community: Vail values its role as a premier resort community, which recognizes the interdependent relationship between the resort, community and municipality. Vail's success as a resort depends largely on its success as a community, as the community fosters relationships between locals and visitors. We make plans and take actions that are investments in the experiences and lives of many different generations, today and into the future. It takes work and reinvention to stay No. 1, and Vail is committed to innovation and creativity to achieve our goals.

Diversity: Vail values maintaining a diverse population of residents, workers and visitors, with a broad representation of age, family composition, ethnic background and economic means.

Activities Benefit Individuals and the Community: Vail values a vibrant community life supportive of spiritual and physical well-being and encouraging of intellectual and cultural growth. This value includes providing a wide variety of educational, recreational, entertainment, art and cultural opportunities. These offerings are accessible to all and appeal to residents and guests of all ages, incomes and interests. These activities promote the development of relationships that strengthen the community.

Natural Environment: Vail values the environment as a source of health, beauty, recreation and economic strength that makes Vail a special place to live, work and play. As stewards of the environment, Vail is committed to promoting sustainable environmental practices in every aspect of the community.

Safety and Health: Vail values a sense of personal security for its citizens and their children, as well as for property. Quality healthcare and physical activities support the health of the community.

Participation and Cooperation: Vail values the participation of its citizens in community life, decision making and planning for the future. To foster effective communication, the community subscribes to a Common Code of Ethics for conduct in civic life including honesty, integrity, civility, respect, trust, goodwill, transparency, openness, selflessness and generosity. A sense of ownership and responsibility is achieved through open communication and cooperation between community members, businesses, interest groups and local and regional governments. Cooperation is essential to addressing issues that extend beyond town boundaries.

Leadership: Vail values a transparent, fiscally responsible and ethical municipal government that engages community members, private partnerships, municipalities and other entities throughout the region to make sound decisions that serve all interested parties for the long term.

Healthy Economy: Vail values world-class service and a vibrant, diverse, year-round economy that caters to full and part-time residents, visitors and business owners and operators. A growing employment and revenue base supports the economy, which thrives on environmental sustainability, amenities and events, transportation and other infrastructure.

Sense of Place and Character: Vail values the strong history of the town and its unique character and legacy while acknowledging the importance of reinvention. This is reflected in the high quality of the built environment with design and features that endure over time.

Transportation and Transit Network: Vail values a sustainable, multi-modal transportation system that effectively provides ease of access to residents, visitors and the workforce in an environmentally and technologically forward manner.

TRANSPORTATION

20/20 Vision

Vail is recognized as having a comprehensive transportation system and through continued redevelopment, has reinforced its transit-oriented lifestyle. Transit, walking and biking are the major modes of travel along with extensive, multi-modal connections between major destinations. Those who choose to drive are welcomed with a well-maintained roadway system directing vehicles to Vail's managed parking areas. Goods and service delivery are distributed through the town's dispersed loading and delivery system. Getting to and from Vail is safe and efficient. Connections throughout the intermountain area are seamless and a big factor in Vail's quality of life. Workers enjoy a one-hour commute from the Denver Metro area or Glenwood Springs in a reliable and environmentally friendly method, while residents and guests enjoy the same commute to Denver for work or visits to the many cultural venues and events. Convenient connections to the nearby airports make year-round travel to Vail easy from anywhere in the world.

20/20 Implementation

Based on input from the community during the 20/20 process, town staff developed the following goals and action strategies to support the transportation vision.

Goal #1: Create an integrated Transportation System with high levels of service that caters to the many needs of our residents, guests and employees and embraces the many issues of the surrounding natural and built environment in its design, implementation and operation.

Actions/Strategies

Parking

- Aggressively manage parking to minimize major capital investments to increase supply while encouraging travel modes other than single occupant vehicles.
- Maintain the supply of parking where all demand is met except up to a maximum of 15 days of winter and three days of summer when parking demand exceeds supply.
- On parking overflow days, provide on-street emergency parking and additional bus stops to ensure a maximum waking distance of a quarter mile to a bus stop or half mile to the final destination.
- Parking revenue shall offset all parking costs, including operations and capital, and combined with the ski tax, shall pay for the operational and capital costs of transit.
- Meet future parking needs of approximately 1,000 spaces by developing parking supply that is conveniently located to destinations.

Bikeway

- Integrate Frontage Road plans to include bikeway construction.
- Work with regional trail authorities to implement a comprehensive regional bike trail system to ensure Vail will be the center of a regional bike trail system connecting areas as far as Aspen, Rifle, Breckenridge, Fairplay, Kremmling, Leadville and Salida.
- Create regulations that provide convenient connections between developments and bikeways.
- Work with private developers to ensure all arterials in Vail have bikeways along them and that there are connections between neighborhoods.
- Codify and require developments to provide easements and construct connections.
- Work with the Forest Service, Bureau of Land Management, Greater Outdoors Colorado,

Colorado Trail and other partners to implement the Rocky Mountain trail system that provides regional connections for hiking, mountain biking and other non-motorized modes of transportation, with Vail in the center of the system.

- Increase bicycle parking in commercial core areas.

Pedestrianization

- Ensure that all pedestrians have a maximum of a quarter mile or less to walk from transit stops to major destinations.

- Ensure that walking distances from residential areas to transit stops are one-sixth of a mile in high density areas (5 minute walk), one-third mile in medium density areas (10 minute walk), and a half mile in low density areas (15 minute walk).

- Ensure transit and pedestrian connections are integrated into the design of development projects.

- Evaluate the need for amendments to Zoning Regulations and master plans to incorporate transit oriented development and more mixed use development.

- Analyze current manmade pathways and acquire easements to build legitimate pathways (including streamwalk).

- Improve sidewalks on frontage roads and other necessary places.

Transit

- Annually review transit costs and parking revenue and adjust as necessary in order to maintain balance.

- Provide peak time line haul service of five to eight minutes and max of 15 to 20 minutes on outlying peak service.

- Ensure and plan for all major parking areas to be integrated with significant line haul transit connections.

- Research feasibility of an advanced mass transit system in Vail.

- Provide a max of 30 minutes to one hour off-peak service that is coordinated with expected walk times and people's ability to reach stops during both the winter and summer.

- Coordinate and work with ECO Transit to ensure service can be provided as demand is driven by Vail's aggressive parking management and travel demand management strategies.

- Work with local, regional and state governments to ensure that Vail's mass transit system is interconnected to a county-wide and statewide system, including connections to Summit and Garfield counties.

Roadway

- Maintain the current Levels of Service on roads throughout the town through road improvements (LOS C in clear daytime conditions, LOS D in harsh winter conditions on arterials, LOS D at cross streets during peak times in clear daytime conditions).

- Work with the Community Development Department to ensure land use patterns do not adversely affect travel demand without mitigation or no change in level of service.

- Keep arterial roadway size to four lanes with a center median with a 35 mph speed limit.

- Create a secondary parallel loop route to the frontage roads with two lane 25 mph speed for emergency service.

- Provide alternate routes to detours with proper signage.

TRANSPORTATION

•Seek funding and creation of a Simba Run underpass to allow additional routes across I-70.

I-70

•Work with CDOT to ensure I-70 functions adequately for the movement of people and goods to and from Vail.

•Participate in the I-70 Coalition to assist with solutions for traffic congestion along I-70.

•Convene citizen group to work with staff on a study of I-70 and long-term mitigation of noise and intrusiveness.

•Work with the Colorado Department of Transportation and other organizations to research feasibility and funding for mass transit along I-70 that provides seamless connectivity to Denver Metro System. The measurement of success would be a 60-minute trip from Vail to Denver (C-470).

•Continue to improve the entrances to Vail to ensure a LOS C.

•Work with Eagle County and CDOT to encourage safety improvements on Vail Pass and Dowd Junction.

•Continue to explore options for burying or rerouting I-70.

Air Service

•Encourage year-round air service with adequate year-round connections from around the world to airports in the region.

•Work with ECO Airport, Grand Junction Airport, Denver International Airport and shuttle services to create plan for year-round air service that serves Vail.

•Support local marketing efforts to work with travel package companies to ensure that service to Vail is affordable and accessible.

Goal #2: Minimize the environmental impact of the transportation system on the town and the region.

Actions/Strategies

•Ensure town vehicles minimize their carbon dioxide emissions by upgrading current fleet with energy efficient and low emission vehicles.

•Research methods for reduced energy use in streetscape and other parts of system that have high-energy consumption.

•Continue to mitigate noise pollution issues throughout the town through sand storage berming and other methods; work with community to create new long-term solutions for I-70 noise.

•Monitor effects of air pollution from transportation sources and research potential mitigation.

•Encourage the Colorado Department of Transportation to reduce road sanding yet maintain safety standards.

•Maintain current sand sediment basins and work with CDOT to increase capacity and number of basins.

•Encourage Sediment Control Action Plan (SCAP) for Vail Pass and Vail.

•Reduce point and non-point sources of pollution from transportation.

•Work with Division of Wildlife to ensure that transportation improvements do not affect wildlife.

•Enhance natural environment through initiatives to improve ecosystem health.

TRANSPORTATION

- Respect currently adopted view corridors by encouraging development that enhances view.

APPENDIX K

Lionshead Transit Center
White Paper

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April 10, 2008
FHU Reference Number 05-168

INTRODUCTION

The Town of Vail has been planning for a major transportation center in the Lionshead portal area for many years. This was identified in the Lionshead Master Plan prepared back in 1997. Since 1997, The Town has reviewed numerous sites as potential centers for transit including public services, shuttles, and skier drop activity. The need for a center has only been strengthened due to significant planning in the Lionshead area and given the potential for regional growth along with associated regional transit service. The Vail Transportation Center (VTC) has a finite capacity, and increased service by current providers (Vail and ECO) and the advent of additional providers (I-70 Front Range Service and Summit Stage for example) will overwhelm the practical functionality of VTC facility if it is to serve as the only transit hub within Town.

NEED FOR A LIONSHEAD TRANSPORTATION FACILITY

Lionshead Activity

Lionshead is a major hub today including a gondola and ski lift, a major parking structure, and tourist-oriented commercial space, and condominium units. Recent redevelopment and planned redevelopment, such as Arrabelle, Lionshead Center, Landmark, and the Lionshead Parking Structure redevelopment will establish Lionshead as a near equal rival to the activity in Vail Village. Currently, the Lionshead Village area is anticipated to see approximately 1500 net new units and 290,000 additional square feet of non-residential development given current plans. In 1997, the new development levels anticipated were approximately 586 units and 193,000 square feet of non-residential uses. The residential unit count has nearly tripled since the 1997 plan while the non residential uses have increased by 50 percent.

As this growth comes to fruition, there will be a stronger natural “demand” to travel to/from this hub, and this will require numerous bus routes from several services to stop at Lionshead. Current Vail routes that stop at Lionshead include the In-Town shuttle, and the West Vail routes. In the future, there is the potential to construct a new underpass of I-70 at Simba Run, and this will establish the Lionshead Transportation Center in a much better position than the VTC to serve as the ski-area access hub for western Vail with respect to transit; the synergy that could be developed by a Lionshead transit center and the Simba Run Underpass together will be an extraordinary enhancement to transit service in West Vail. Further, given the potential of a line-haul, Frontage Road bus routing system to make use of the Simba Run underpass, it would be prudent to establish a notable transit facility at a notable hub (Lionshead) along the line-haul route. The Simba Run underpass could also provide for a connection with the Sandstone route as well. Potentially, five bus routes could serve Lionshead in the future as compared to only three today.

In addition to Town service, current regional service to Lionshead includes five routes. The ECO Transit will continue to “want” to serve Lionshead, maybe more so given the growth that is planned at Lionshead. ECO Transit sees a Lionshead Transit Center as a way to improve the efficiency of their current routes by establishing a Vail terminus in Lionshead. Regional ridership has increased 29 percent over the past two years. This regional demand is anticipated to increase much more as growth in Eagle County continues and Vail redevelops and adds jobs. Today, ECO Transit struggles to maintain their bus schedules due in part to the popularity of their service. This challenge prevents too much deviation from their primary routes.

In addition, dwell times have been kept to a minimum by ECO Transit, again in the interest of trying to keep up with their schedules. Future growth will only add more demand to ECO service, thus requiring additional buses along their routes (and the need for additional accommodation in Vail). ECO Transit's revenue has increased by more than 10 percent per year, and they have utilized this increase to add 10 to 15 hours of daily service each year. This year, ECO Transit added the Edwards Express and also established some shadow/piggy back service (when two buses run together as one run).

Besides ECO Transit, other regional services that choose to serve Vail will want to serve the Lionshead hub. Regional bus service connections to Vail are being considered for Summit Stage. This is currently happening on a private basis via Vail Resorts buses. The Roaring Fork Transit Authority (RFTA) is considering connecting to ECO Transit on the west end of Eagle County, potentially introducing new transit market ridership from Pitkin and Garfield Counties into Vail. Also, an I-70 Front Range Service is being discussed. Like ECO, these too would "want" to serve a major hub area like Lionshead due to the natural attractiveness

VTC Capacity

A Lionshead Transportation facility will also provide needed redundancy to VTC. Today, it is not uncommon for the VTC to experience more buses on-site than bus-spaces. Currently, there are six bus bays, and each hold up to two buses. ECO Transit uses two bays, and peak times can see four or five ECO buses at the VTC. The Town uses the remaining four bus bays, and most peak periods see each stall serving two vehicles, in part due to the need to shadow several routes.

Besides accommodating more bus routes, the VTC is also a designated area for bus drivers to take a break. Regulations require drivers to park their vehicle and rest at minimum specified intervals, and the VTC serves in this capacity. Vail is ideal for ECO service driver breaks given that Vail is the terminus of many ECO routes. With the potential of more service, regionally and locally, there will be greater demand for a dedicated driver break area. The VTC will not be able to accommodate all services, all routes, and all driver break activity in the future. Another means is necessary to relieve the VTC; a Lionshead Transportation Center would be able to provide this relief to the VTC.

So, the need for a Lionshead Transportation Center is driven by:

- The need to provide a high level of transit service to a dense area of activity within Vail.

- The intent to leverage the future Simba Run underpass to vastly improve the nature of transit service connecting western Vail to Central Vail.

- The need to relieve the VTC of some of its transit-related demands with respect to regional routes and driver break areas.

- The need to "clean up" significant conflicts which occur at the Lionshead Mall/Lionshead Parking Structure entry area, particularly with pedestrian activity.

- The desire to better accommodate hotel shuttles.

- The desire to better establish an official, organized skier drop off area.

Charter buses currently use the east side of the LH Parking Structure. This area does not provide a good guest experience in which Vail strives to achieve. Further, this is planned to be removed once this lot is developed.

The Town's Transit Plan and Vail's 20/20 vision recognizes the need for multimodal transportation with an emphasis on transit. Employees who work in the Lionshead area (or access the ski area via Lionshead) are expected to avoid commuting via their car. This is a trend that is expected to be encouraged into the future, thus necessitating appropriate transit accommodations for employee users. The Town's estimates for required future parking spaces are heavily reliant on increased transit use. Vail's overall environmental strategies include increased reliance on transit service to reduce green house gas emissions.

For these numerous reason, it is critical to establish a major transit center in the Lionshead area.

LIONSHEAD TRANSPORTATION CENTER NEEDS

The Lionshead area should ultimately be user-friendly for riders. The ideal characteristics for service would include the following:

- An adequate number of spaces (now and in the future) for the various transit providers including:

    - Town routes
    - ECO routes and planned regional services
    - Hotel shuttles
    - Short-term drop-off activity (passenger cars, taxis)
    - Charter Buses

Vail has an excellent reputation as a provider for transit service and allowing guests and residents to leave their car at home. Establishing a robust facility at the Lionshead hub will strengthen this notion and encourage travelers to utilize transit.

The vehicle space needs for the above providers varies during peak season. Each of the users is described in more detail below.

Town of Vail Bus Routes – Given current conditions, three bus routes would likely serve the Lionshead Transit Facility including the two West Vail loop routes and the In-Town shuttle. Expanded local service in the future could instill additional routes stopping at a Lionshead Facility. With the Simba Run underpass of I-70, a Lionshead facility is in an excellent position to serve western Vail, and a hub at Lionshead anchoring these routes would reduce bus mileage (versus traveling all the way to the Vail Village Transportation Center). Potentially, a "line-haul" service could be implemented (given a Simba Run underpass) along the south and north frontage roads providing direct continuity between West Vail, Timber Ridge, Ever Vail, Lionshead, Vail Village, and Ford Park. This continuous service alone could generate 10 to 15 buses into and out of a Lionshead

facility per hour; with potentially three buses from this route on-site at the same time. In addition, outlying bus routes could potentially link to the line-haul at Lionshead creating a peak potential of four to six buses on-site at the same time (2 or 3 line-haul, 1 or 2 outlying, 1 In-Town shuttle).

The 1997 Lionshead Village Transportation Plan had identified 3 vehicles for Town service at the Center. With the advent of the In-Town serving this facility and the increase due to a Frontage Road "line haul" system between West Vail and Ford Park (and the associated reshuffling of outlying service), this estimate has increased to a minimum of four and as many as six vehicles.

ECO Routes (and other Regional Services) – The ECO service has been experiencing more ridership over the years and Vail is one of its prime destinations. Five routes currently serve Vail with stops at Lionshead and at Vail Village. All of the routes terminate at Vail Village. Currently at peak times, four ECO buses stop at the Vail Transportation Center at the same time. Some of this demand could be instead served by a Lionshead Transportation Center, thus providing some badly needed relief to the Vail Village Transportation Center (plus a second driver break area). Given the potential increases described above, the number of buses that Vail would need to accommodate will increase.

The 1997 Lionshead Village Transportation Plan had identified one vehicle for County service. This is clearly too low. With four today at Vail during peak times, and the potential growth described, potentially six to eight spaces for regional buses should be provided. If these are split between The Vail Village Transportation Center and the Lionshead Transportation Center, up to four ECO buses could be at the Lionshead facility at the same time. Part of this demand is the fact that ECO service tends to shadow their routes at peak times.

Hotel Shuttles – There are approximately 20 lodges in Vail and Avon that make use of shuttle services to transport their guests to the ski area. Today, these shuttles park along East Lionshead Circle near the Lionshead Mall (adjacent to the parking structure). During peak times, these shuttles travel continuously between their base lodge and Lionshead creating demand to park and unload guests to the gondola. As Vail reaches build out, more lodges will implement more shuttle services, so this element is anticipated to grow

The 1997 Plan identified the need for four parking stalls to serve lodge shuttles. Build out of Vail is now anticipated to be more aggressive than that thought in 1997, so the expectation of four stalls may be low to accommodate peak demands. An estimate of up to six shuttle parking spaces should ideally be provided to accommodate peak conditions.

Auto Drop off – This use is comprised of private automobiles that temporarily park close to the lifts and drop-off skiers and visitors to the commercial activity centers. Some of these vehicles then park in the structure, but others leave the area entirely only to return in the afternoon and pick up the skiers and shoppers. These users typically attempt to park as close to their destination as possible, often illegally. If this use is not properly accommodated, it will happen anyway, likely at locations not intended to accommodate it which causes problems for others using that area. A significant increase of second homes has occurred down valley, and this use has intensified as a result. Also, a change in the demographics of visitors has increased the ability and desire for groups/families to drop-off/pick-up their members as close as to the skiing and shopping as possible. This trend indicates that larger families and groups who visit Vail usually have at least one member who does not shop or ski and can serve as the designated chauffer. This has added congestion to the "high-desire" locations and increases the need to provide designated drop-off/pick-up areas for autos that is clearly identified.

The 1997 Plan identified the need for a minimum of 5 parking spaces for this type of activity. Again, since Vail's build out is now planned to be denser, the need for more spaces to accommodate peak times would be appropriate. An estimate of 7 to 12 spaces should be provided to accommodate this user in the long term. This would include demand generated by taxis and airport shuttle activity.

Charter Buses – Today, the charter activity occurs just west of the Lionshead Parking Structure. Peak days can see 15 to 20 of these vehicles. The 1997 Plan had identified 3 to 5 loading/unloading spaces to serve charter activity. It is suggested that the upper end of the range be maintained and that 5 bus spaces be established to serve Charter activity that is clearly identified. Besides accommodating their passenger loading/unloading, these buses need to park for the entire day that they are in Town; this is still a critical element without a clear solution.

In summary, the following number of spaces is estimated to be needed for each transit use when considered individually:

- Town Bus Routes – 4-6 spaces
- ECO and Regional Bus Routes – 3-4 spaces
- Hotel Shuttles – 4-6 shuttle spaces
- Auto Drop Off – 7 -12 spaces
- Charter Buses – 5 spaces

It should be noted that combining users into a common facility and allowing for shared parking stops could result in a net reduction. In other words, uses combined into a common area are unlikely to peak at the exact same time, so some reduction to the needed spaces might be appropriate. If each user was accommodated at separate locations, no reduction would be possible. So, there is some advantage to combining users into one facility for total space considerations, subject to keeping certain users separate from each other.

LIONSHEAD TRANSPORTATION CENTER LOCATION CONSIDERATIONS

The ideal location of a facility (or facilities) is driven by numerous operational factors. Different transit services will place different weight on the factors, so no one site is absolutely perfect for all users. The critical considerations for each of the users are discussed below:

Town Bus Routes – Outlying routes, the In-Town Shuttle Route, and future "line-haul" routes could all stop at the facility. The key considerations with respect to location are as follows:

- Connection to other public services (like ECO).
- Provide service to the Parking Structure to serve skiers returning to their cars at the end of ski day
- Have adequate space to include various amenities including shelters, benches, information kiosks, vending services, and possibly restrooms.
- Be located relatively close the Gondola and skier services.
- Be located relatively close to residential, commercial density, and jobs,

Regional Bus Routes – ECO is the only regional service currently serving Vail, but more is possible as mentioned. Key considerations for regional services(s) include:

- Connection to other public services (like Town of Vail).
- Have adequate space to include various amenities including shelters, benches, information kiosks, vending services, and possibly restrooms.
- Be located relatively close the Gondola and skier services.
- Be located relatively close to residential, commercial density, and jobs.
- Be able to return to the Frontage Road easily to maintain schedules. Ideally, the site is very close to the Frontage Road for this reason.

Charter Buses, Auto Drop-off, and Hotel Shuttles – The primary consideration for these three providers is to be located as close to their destination (ski lifts, ski services, and commercial area) as possible. Very few of the passengers using these services are transferring to another transit service; most are heading to/from Lionshead. Auto drop-off and charter buses also consider way-finding as a critical consideration so that these users (pedestrians and drivers) know where to go. Loading/unloading areas should be easy to find for charter services and auto drop-off users.

SITE SELECTION

It is nearly impossible to identify a site that would 100 percent satisfy every characteristic mentioned above. Different sites have different trade-offs with respect to effectiveness and impacts, but the above list gives a good sense of ideal characteristics of a preferred site. The above characteristics also suggest the following:

- Town routes and Regional routes MUST be placed together in a common facility. The provision to transfer from one public service to another is key, and this facility would be one of two major transit hubs in Vail for these types of transfers.

- The ideal location for a combined facility would be along the Frontage Road to assist Vail and ECO Transit in maintaining their schedules.

- Charters, Auto Drop-off, and Hotel shuttles need not be part of the transit facility. While it would be ideal to allow these providers to make use of transit amenities provided by the public services, it is by no means critical for these users to be part of a facility serving the public routes. In fact, these three providers do not even need to be together. Users of these three services are primarily interested in accessing Lionshead, not transferring to another service.

CANDIDATE SITES AND THEIR ASSESSMENT

A total of four sites in Lionshead have been considered for a Transit Center as well as the Ever Vail area. One of the sites, the Lionshead Parking Structure, is considered twice, once as a retrofit of the existing structure and once as a facility integrated into a complete redevelopment of the Parking Structure as a mixed-use facility. The candidate locations are listed below:

- LH Structure – Existing to be Retrofitted
- LH Structure – Element of redevelopment
- E. LH Circle Mall area
- Concert Hall Plaza
- North Day Lot
- Ever Vail Area

In evaluating the sites, the characterization factors listed previously were considered. A summary of the each site' assessment is as follows:

- Ever Vail – This location is too far from the LH core area and gondola and will not serve Lionshead. However, there is enough density being planned in the specific area (including public parking and a new lift) such that it makes sense to establish a bus stop capable of accommodating two or three vehicles as well as hotel shuttles and auto drop-off activity given the mountain portal planned here. Further, this area has been identified as a potential candidate to accommodate charter buses to load and unload riders if the necessary skier services are provided here. Potentially, this site can serve one of the uses like Charters, but it is not a candidate to serve as THE public transit center for Lionshead. **Summary – Not a location for THE public Lionshead Transportation Center, but given a planned ski lift from Ever Vail, this could be an appropriate location for charter buses. Transit service shuttles and auto drop-off also need to serve the planned development. Walk distance to the Lionshead Gondola is approximately 2355 feet (nearly one-half mile).**

- Concert Hall Plaza – This area is not large enough. Significant expansion of the area would be needed to fit the appropriate number of spaces and amenities to establish this area as the Lionshead Transportation Center, even if it is just for the public services. However, there is enough space to possibly serve one of the users such as hotel shuttles or auto drop off. One other consideration is that this area serves delivery activity which can conflict with transit operations. **Summary – Not a good location for THE public Lionshead Transportation Center due**

to its relatively small size, but this area could be appropriate for auto drop-off or hotel shuttles. Walk distance to the Gondola is approximately 910 feet.

- Existing LH Structure (Retrofit) – This option poses numerous design and circulation challenges within the structure and how it interfaces with the Frontage Road. In addition, it also displaces valuable public parking spaces. This site is not recommended for any of the users. **Summary – Not a good solution for any transit users due to need to retrofit and the displacement of parking. Walk distance to the Gondola is approximately 1290 feet.**

- LH Structure Redevelopment – With the redevelopment and reconstruction of the Lionshead Parking Structure to include mixed use development, the opportunity would also exist to incorporate a transit center with many of the ideal characteristics. This would be a bit hidden from the public, but it would be shielded from any nearby residential uses. There are concerns with how real a redevelopment scenario might be given the current deed restrictions on the property. This is a promising scenario if the obstacles of redevelopment can be overcome and the design of the new structure can accommodate the public service program. The close proximity to the Frontage Road is also a plus. **Summary – Very good location for the Transportation Center if appropriate design elements can be incorporated into the redevelopment. Auto drop-off users and hotel shuttles may find it too far away from the Gondola. Walk distance to the Gondola is approximately 1155 feet.**

- North Day Lot – This area is centrally located to serve Lionshead and the walk distance to the Gondola is reasonable compared to the other options. Issues include developing a workable site plan to accommodate the necessary transportation center as well as planned residential uses. In addition, adjacent condominium residents do not support buses utilizing this site, and mitigation will be required. It is close to the Frontage Road which is beneficial to the public services. The pedestrian overpass of I-70 is beneficial, as a facility here would also be able to serve the north side of I-70 (including the Sandstone Elementary School). **Summary – Very good location for the Transit Center. Potentially, this site may only need to serve the public services with auto drop-off users, charter buses, and hotel shuttles being served by another area. If the entire site is used for transit purposes, all of the providers can be accommodated here except for charter buses. Walk Distance from the Gondola is approximately 885 feet.**

- E. LH Circle Mall – This location currently serves as a stop for the In-Town shuttle and hotel shuttles today. The area is congested many times due to pedestrian activity walking between the parking structure and Lionshead Village and its conflict with shuttles, buses, deliveries and other general traffic. This location is away from the Frontage Road which lessens its visibility and negatively impacts the regional routes and Vail's outlying routes. Vehicles that would use this facility would experience delay due to pedestrian activity associated with the parking structure and drop-off in front of Subway. The 1997 study identified 1400 pedestrians per hour crossing East Lionshead Circle at peak time near the Mall. Pedestrian activity will only increase as Lionshead

grows. The Mall could be adequate for hotel shuttles as exists today, but shuttle activity here may be in direct conflict with planned retail along the south side of the parking structure. However, the site is relatively close to the Lionshead core including the Gondola. **Summary – Not a good solution for the public transit elements (other then the In-Town Shuttle which makes routine stops here today), but this area could be adequate for hotel shuttles as used today. Adding auto drop-off to the area as well would not be appropriate as it might create too much congestion. Walk distance to the Gondola is approximately 875 feet.**

RECOMMENDATIONS

There are numerous options to accommodate the five transit providers. Ideally, these five should all be combined onto one site. The availability of an appropriate site in Lionshead may offer too many challenges to accomplish this. At a minimum, the following is recommended:

- Provide public transit service in either the North Day Lot or a redeveloped Lionshead Parking Structure. Either is adjacent to the Frontage Road and large enough to accommodate both providers.

- Barring combining hotel shuttles with the public transit (in either North Day or in the redeveloped parking structure), either Concert Hall Plaza or the Lionshead Mall (current operations) would be appropriate for this provider. The Town has the ability to control the hotel shuttles more-so than the autos and the charters.

- Auto drop-off activity will tend to find the closest location to the gondola regardless what accommodations are provided. The Mall and the North Day Lot has the shortest walk distance to the gondola. However, the congestion that this user would add to the Mall area is problematic. Further, this site is not apparent from the Frontage Road. The North Day Lot would be the best location for these users given a reasonable walking length, good visibility, and no conflicts with existing pedestrian activity. However, it is not critical that the auto drop-off be located with the public transit elements.

- Charter buses can be accommodated at Ever Vail. A planned lift with appropriate skier services in that area will serve these users.

The Town faces a critical decision to construct a transit center on the North Day Lot or wait (and hope) for the redevelopment of the parking structure and incorporate it into its design. If deed restrictions on the structure were removed, this would be an easy decision. But they are not and it is not clear if and when they will be. Relying on the Parking Structure to redevelop becomes a very risky venture because if it does not happen, the North Day Lot is the only other logical location for a public transit center in Lionshead. If both opportunities are lost, the Town will be forced to try and establish a less than adequate facility such as Concert Hall Plaza which would result in no better transit service than exists today. The North Day Lot is the only other reasonable opportunity, especially if the entire site can be used as depicted in the Lionshead Master Plan.

Because of this, Felsburg Holt & Ullevig suggests that the Town not let the North Day Lot slip away from consideration unless there is a guarantee that the Lionshead Parking Structure will redevelop and it will be designed to accommodate the transit facility. One possible course of action for the Town would be to establish the North Day Lot as the Lionshead Transit Center, and plan to relocate the transit center into the Parking Structure once (and if) it redevelops. At that time, auto drop-off and hotel shuttles could make use of the North Day Lot and take advantage of the amenities and access improvements left behind by the public services.

The phasing of transit service provisions ultimately depend on the disposition of the parking structure redevelopment. If the structure redevelops and the appropriate transit elements can be programmed into the plan, North Day Lot may only be needed for auto drop-off and/or shuttles. The North Day Lot is a good location for the drop-offs and shuttles. Even with a redeveloped parking structure facility, the North Day Lot can still play a major role in the Lionshead transit “picture” and provide some relief to other congested areas around the Village.

APPENDIX L

VAIL NOISE MEASUREMENTS 2007

PREPARED FOR: Chad Salli / Town of Vail

PREPARED BY: Jeff Cerjan / Hankard Environmental Inc.

CC: Greg Hall / Town of Vail
Mike Hankard / Hankard Environmental Inc.

PROJECT: Town of Vail Noise Measurements 2007

DATE: June 22, 2007

Noise measurements were conducted along Interstate 70 in Vail for one week in April-May 2007. The purpose of the measurements was to a) provide a comparison to measurements conducted in 2004, and b) to see if construction work on I-70 west of Vail was having any measurable impact on I-70 traffic noise in Vail. Noise levels were measured at the same four locations in 2007 that were used in 2004. The measurement equipment used in both surveys was the same or similar, and the same measurement procedures were followed. Finally, the same data reduction procedures were followed, including the analysis of traffic conditions.

Noise Measurement Locations

Noise measurements were conducted at the four locations shown in Figure 1. A description of each measurement site is provided below. Traffic and weather conditions were monitored northeast of Donovan Park. More detailed information regarding the measurement locations can be found in Hankard Environmental's *Results of Noise and Speed Measurements and Analyses* memorandum dated November 18, 2004.

- **M1 (West Vail):** Located on the north side of I-70, west of the West Vail Interchange, and along Chamonix Lane near the Chamonix Chalets Condominiums. This site was selected to represent the West Vail area. The measurement location is 200 feet from the centerline of Westbound I-70, and the view to the highway is unobstructed.
- **M2 (Donovan Park):** Located on the south side of I-70, east of the West Vail Interchange, along Matterhorn Circle. This site was chosen to represent the residents in the area, and Donovan Park. The measurement location is 400 feet from the centerline of Eastbound I-70, and the view to the highway is obstructed somewhat by tress, residences, and the shoulder of Eastbound I-70.
- **M3 (Sandstone Park):** Located on the north side of I-70, west of the Main Vail Interchange, in Sandstone Park. This site was chosen to represent the residences in the area, and Sandstone Park. The measurement location is 300 feet from the centerline of Westbound I-70, and the view to the highway is obstructed somewhat by trees.
- **M4 (East Vail):** Located on the north side of I-70, east of East Vail Interchange, along Fall Line Drive. This site was chosen to represent the East Vail area, and to capture noise from trucks coming down off of Vail Pass. The measurement location is 200 feet from the centerline of Westbound I-70, and the view to the highway is obstructed by a berm to the east.

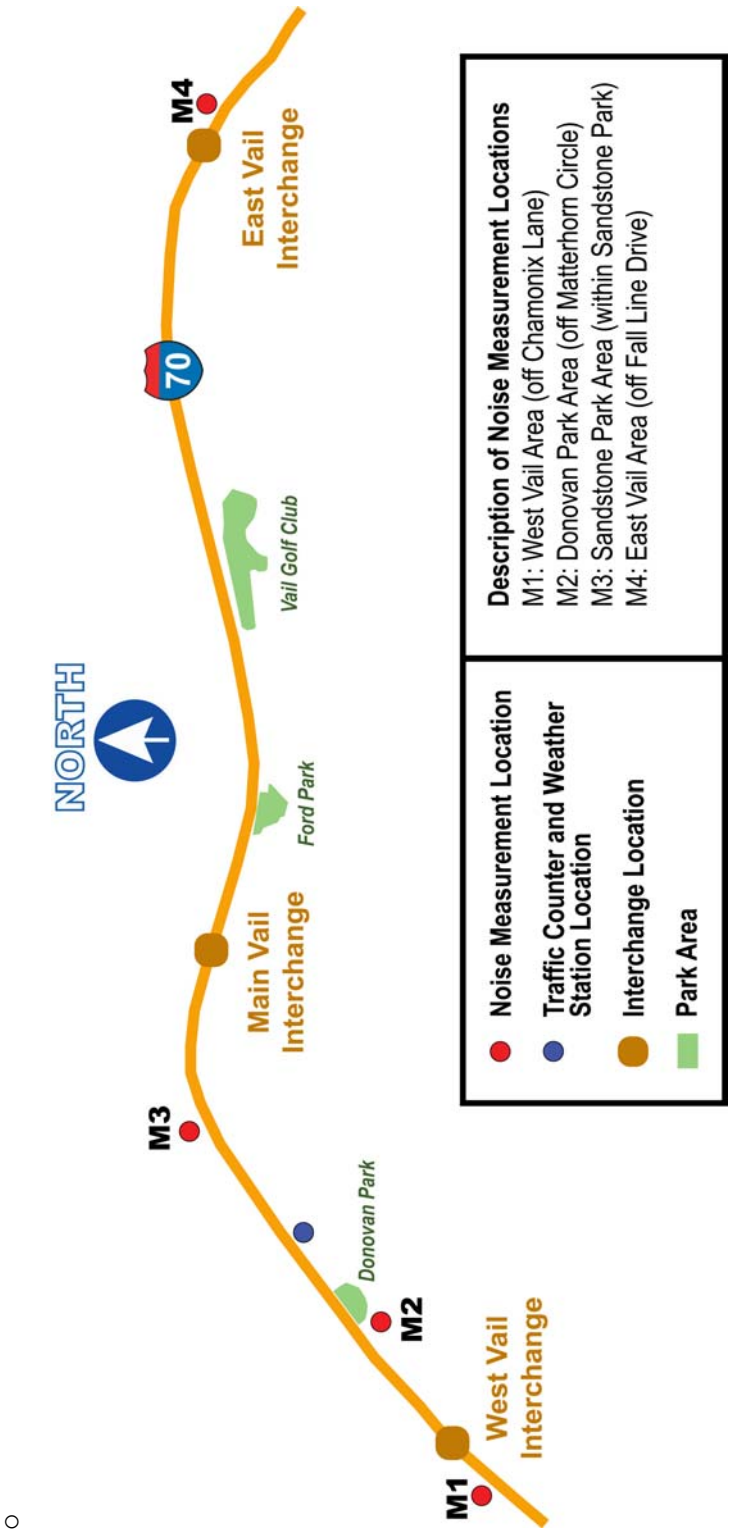

Figure 1: Vail Noise Measurement Sites

Measurement Equipment

A Norsonics Type 114 sound level meter was used at M1, and Larson Davis Model 820 sound level meters were used at M2, M3, and M4. The Larson Davis meters were calibrated by an accredited laboratory within the past one year, and the Norsonics meter was calibrated within the past two years.

Traffic counting was conducted using a Wavetronix SmartSensor Model 105 attached to an instrumentation grade 20-foot tall tripod. This sensor is radar based and monitors the speed and length of each vehicle in up to eight lanes simultaneously.

Weather conditions were monitored using a tripod-mounted system that includes a RM Young wind sensor, a Vaisala relative humidity probe, and a Campbell Scientific CR510 data logger.

Measurement Procedures

All four sound level meters were set to monitor the overall, A-weighted, five-minute, equivalent noise level (L_{eq}, dBA). All microphones were equipped with windscreens and were located five feet above the ground. All sound level meters were time-synchronized with each other. Each sound level meter was field calibrated prior to and re-checked after each measurement. All calibrations were within ±0.2 dBA.

The traffic counter was setup to monitor traffic along I-70 and traffic along the southern frontage road. Monitoring traffic on the north frontage road was not possible due to the distance limitations of the traffic counter. The traffic counter automatically located each lane of traffic and speed and length adjustments to the program as necessary. The traffic counter was time synchronized with the sound level meters and logging was set at five-minute intervals to match the sound level meters.

The weather station was setup to monitor the wind speed, wind direction, and relative humidity. The station was time synchronized with the sound level meters and set to monitor five-minute averages. The orientation of the weather station was situated using a compass.

Noise measurements were started on April 26, 2007 (Thursday). The traffic and weather stations were setup and started on April 27, 2007 (Friday). All meters were checked on May 1, 2007 (Tuesday) and some equipment was downloaded as needed. All equipment was retrieved on May 4, 2007 (Friday). Post checks of the noise meter calibrations showed no error greater than ±0.2 dBA (which is acceptable).

Measured Noise Levels

Figures 2 through 5 show the measured noise levels, and Figures 6 and 7 show the measured wind and relative humidity values. Table 1 lists the average noise levels measured in 2007, those measured in 2004, and the difference between the two surveys. These levels have not been adjusted for differences in traffic conditions. The results of that analysis are provided in the following section. For both 2004 and 2007, the noise levels measured when wind speeds were greater than five miles per hour or when the pavement was wet (based on humidity monitoring) were not included in the averages.

TABLE 1

Average Measured Noise Levels for 2004 and 2007 (dBA) – No traffic adjustments

2007	All Data	Loudest Hours (7:30 to 8:30am, 4:30 to 5:30pm)	Daytime (7am to 10pm)	Nighttime (10pm to 7am)
M1	63	66	65	60
M2	59	60	59	57
M3	57	59	58	54
M4	61	63	63	58
2004	All Data	Loudest Hours (7:30 to 8:30am, 4:30 to 5:30pm)	Daytime (7am to 10pm)	Nighttime (10pm to 7am)
M1	66	68	68	63
M2	60	61	61	57
M3	58	61	60	55
M4	61	64	63	58
Change	All Data	Loudest Hours (7:30 to 8:30am, 4:30 to 5:30pm)	Daytime (7am to 10pm)	Nighttime (10pm to 7am)
M1	-3	-2	-3	-3
M2	-1	-1	-2	0
M3	-1	-2	-2	-1
M4	0	-1	0	0

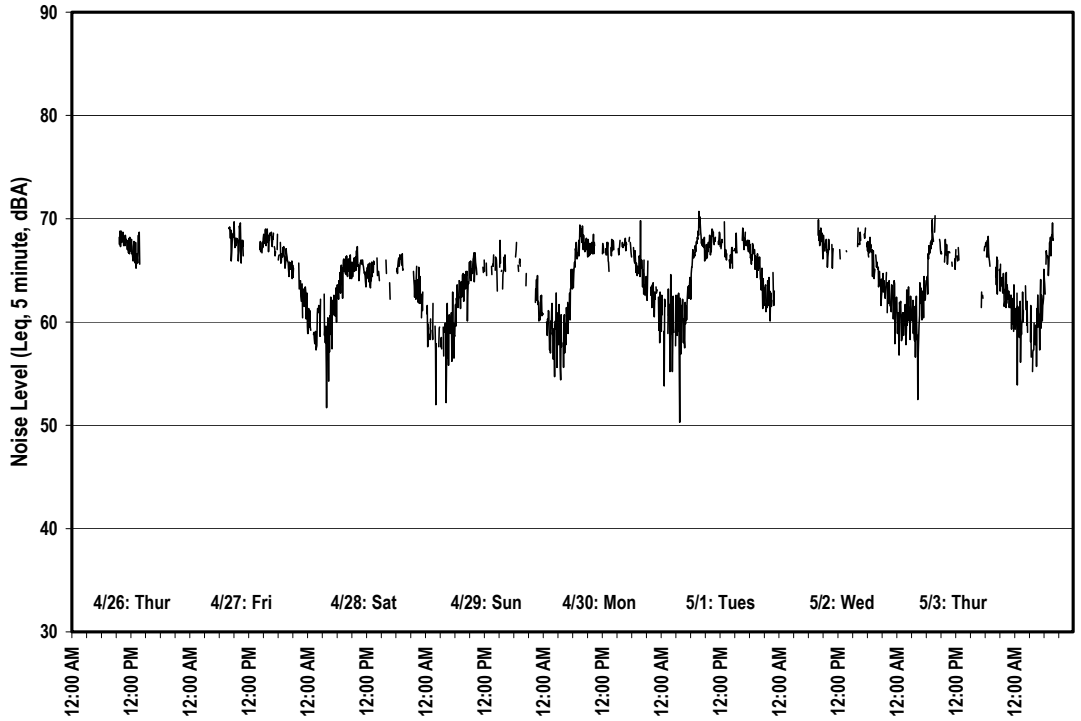

Figure 2: Valid Noise Levels for West Vail Area (M1) in 2007

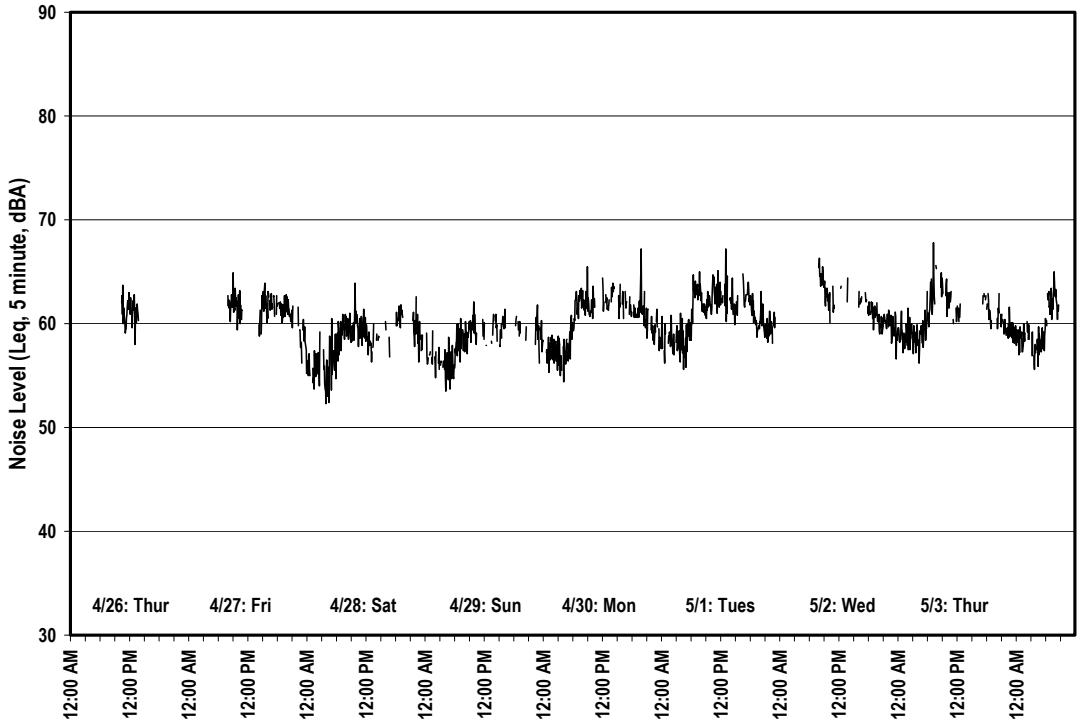

Figure 3: Valid Noise Levels for Donovan Park Area (M2) in 2007

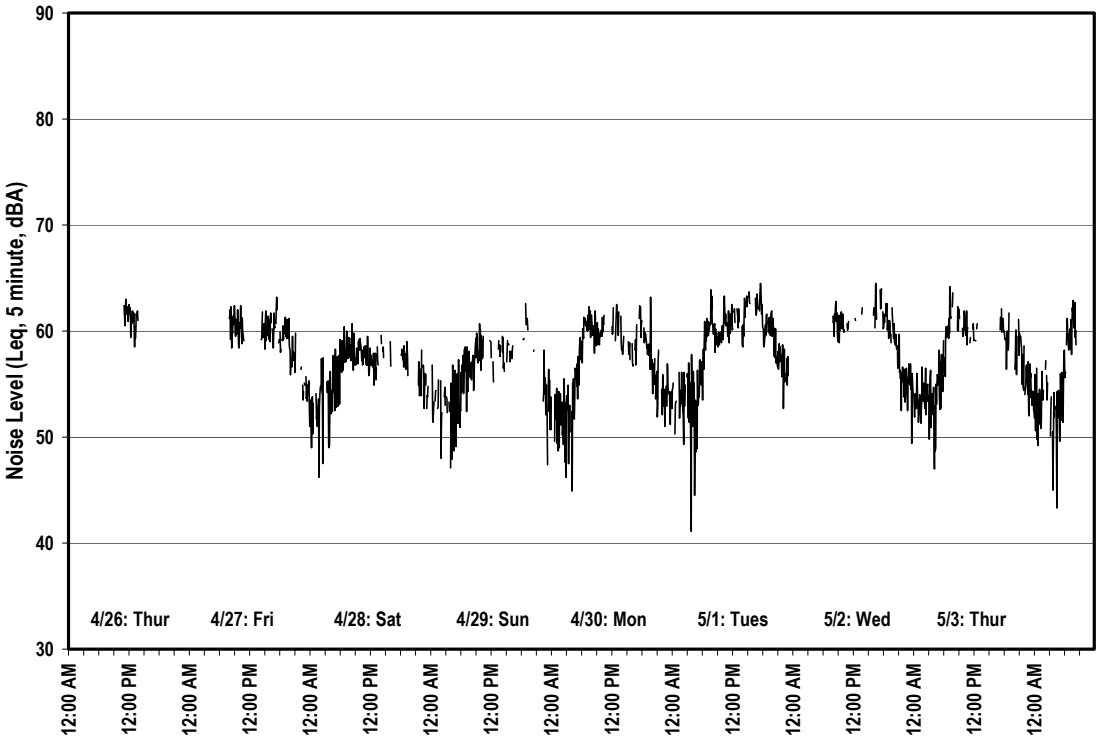

Figure 4: Valid Noise Levels for Sandstone Park Area (M3) in 2007

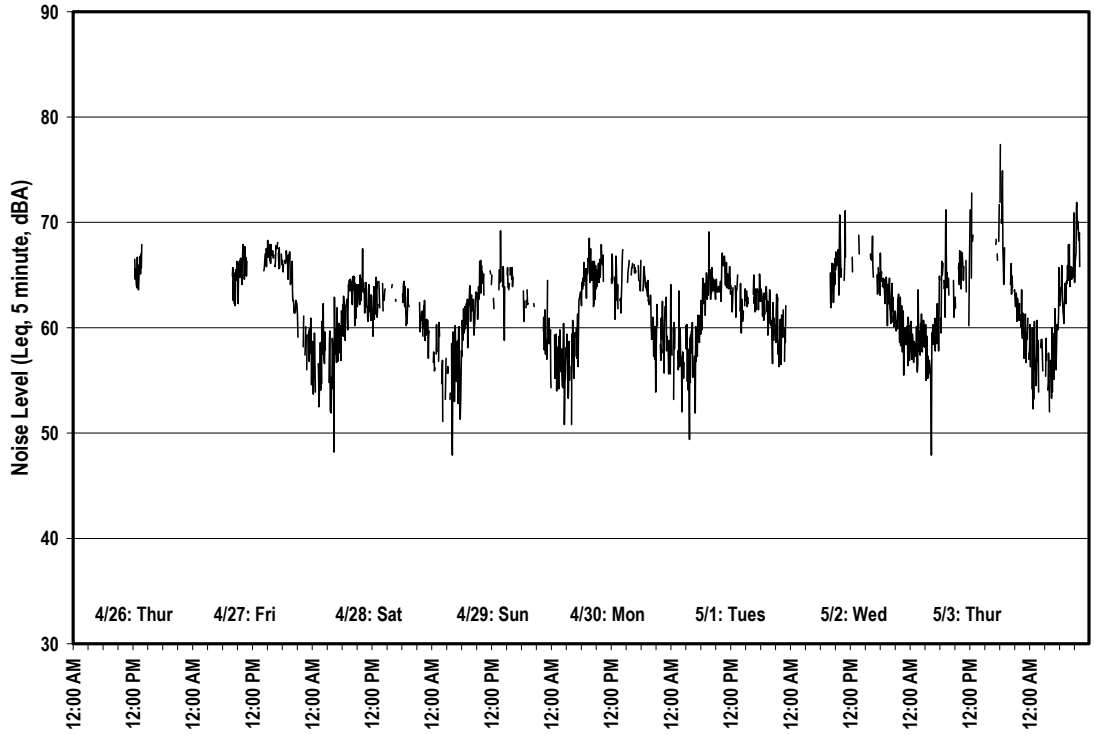

Figure 5: Valid Noise Levels for East Vail Area (M4) in 2007

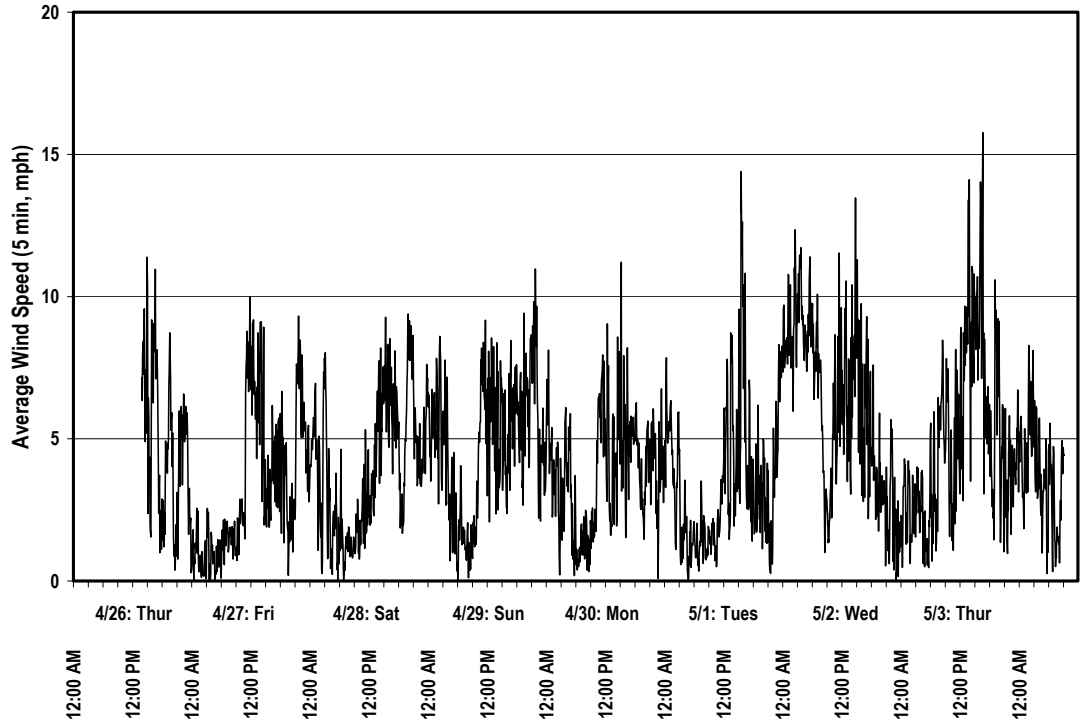

Figure 6: Average Wind Speeds for 2007 Noise Measurements

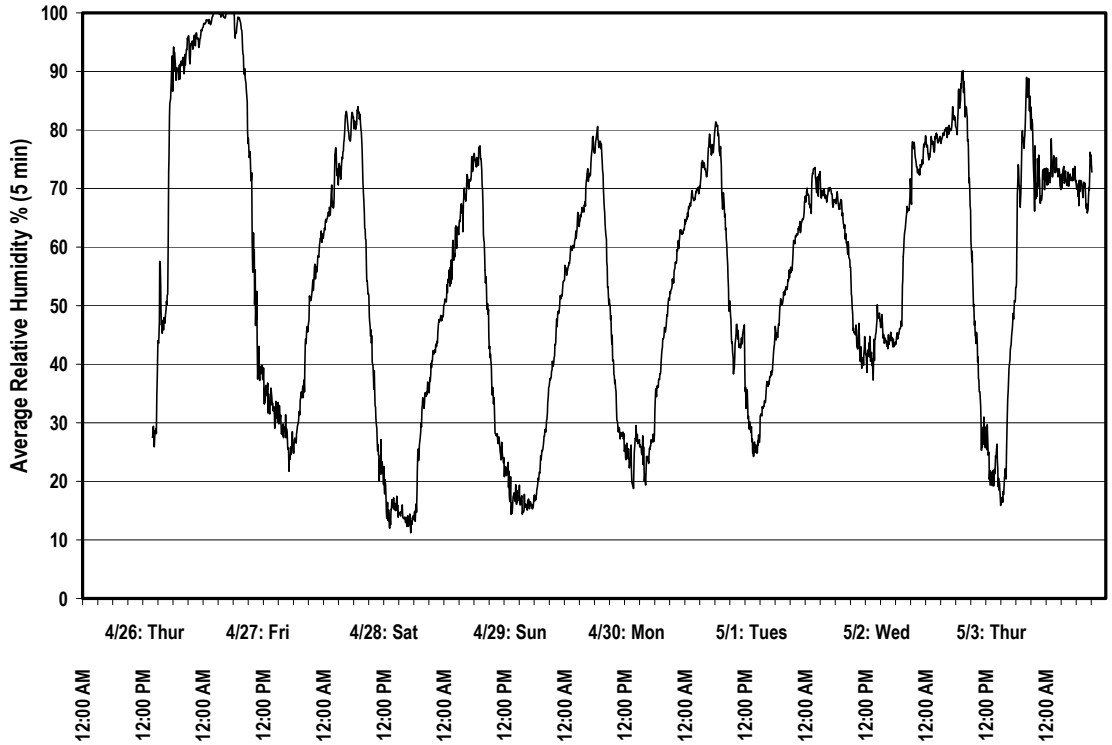

Figure 7: Average Relative Humidity for 2007 Noise Measurements

Accounting For Traffic Conditions

From Table 1, above, the noise levels measured in 2007 were 0 to 3 dBA lower than those measured in 2004. In order to try and determine the cause of this, traffic data was analyzed. The following conclusions can be drawn from the data we have:

- Based on Hankard Environmental's traffic counts, average hourly traffic volumes on I-70 were 1,014 in 2004 and 932 in 2007. This would account for about 0.5 dBA of the measured decrease in noise levels.
- Based on CDOT's permanent traffic counter near West Vail, average hourly vehicle counts during the 2004 survey were 1,296, and during the 2007 survey they were 1,016. This would account for about 1.0 dBA of the measured decrease in noise levels.
- Based on Hankard Environmental's measurements, vehicle speeds decreased from 67 mph to 66 mph for eastbound I-70 between 2004 and 2007, but increased from 65 mph to 69 mph for westbound I-70. A 0.5 dBA increase in noise levels would be expected as a result.

Overall, we feel it is appropriate to add 1 dB to the measured levels in 2007 to account for the lower traffic volumes that occurred during that survey relative to the 2004 survey. We do not recommend making changes to the noise levels based on the speed data, as the accuracy of the radar system we used does not warrant that. Table 2 shows the change in noise levels between 2004 and 2007 when 1 dB is added to the 2007 levels. As can be seen, the levels are quite similar between the two surveys, particularly given the fact that environmental noise levels are known to fluctuate by as much as 5 to 10 dBA from time to time.

TABLE 2

Change in Noise Levels Between 2004 and 2007 (dBA) – Adjusted for traffic volume

	All Data	Loudest Hours (7:30 to 8:30am, 4:30 to 5:30pm)	Daytime (7am to 10pm)	Nighttime (10pm to 7am)
M1	-2	-1	-2	-2
M2	0	0	-1	1
M3	0	-1	-1	0
M4	1	0	1	1

Evaluation of Highway Noise Mitigation Alternatives For Vail Colorado

Final Report

October 2005

Prepared for

TOWN OF VAIL

Vail, Colorado

Prepared by

HANKARD ENVIRONMENTAL

ACOUSTICS AND VIBRATION CONSULTING

Fort Collins, Colorado

1.0 Introduction

This report describes the options available to reduce noise from Interstate 70 through Vail Colorado. This study was commissioned by the Town of Vail, which has been investigating the noise issue for many years. There are a number of complexities involved with the implementation of highway noise mitigation measures, including the length of the study area (8 miles), the extreme topography and weather in Vail, Colorado Department of Transportation (CDOT) and Federal Highway Administration (FHWA) regulations, safety and maintenance concerns, aesthetics, and cost. Understanding of the issue is aided by dividing the list of available mitigation measures into three categories: "source", "path", and "receiver". As illustrated in Figure 1-1, the source is traffic traveling on the highway and frontage roads. The path is the land between the highway and adjacent residences and parks. The residences and parks are the receivers. Table 1-1 lists the available highway noise mitigations measures using this categorization.

As described in Section 2, Source Controls reduce the amount of noise that is generated in the first place. As a result, they benefit almost everyone, regardless of location. For example, reducing speeds and/or putting down quiet pavement reduces noise at ALL homes and businesses in Town, versus a wall that benefits only those located directly behind it or thicker windows that only benefit an individual property. The cons of source controls are that each only provides only a few dB of reduction, they are costly, and they require continued cooperation from the public and/or government agencies.

As described in Section 3, Path Controls benefit a given area, such as a neighborhood. For walls and berms, the extent of the benefited area depends on their height and length and on topography. Barriers typically range in height from 3 to 25 feet, and can be hundreds to thousands of feet long. A 15-foot tall wall typically provides 5 to 10 dBA of noise reduction, depending on topography and distance. The cons of building barriers, particularly walls, are aesthetics, cost, and the rigors of CDOT coordination. The most effective path control is a tunnel, which would virtually eliminate highway noise along adjacent stretches. However, ventilation and portal noise would need to be addressed. Building a tunnel is, obviously, a major undertaking with a host of issues associated with it.

Receiver Controls are described in Section 4. For developed properties, these include the construction of solid fences on private property, the rearrangement of outdoor use areas such as patios, and the installation of better windows. Such measures are effective, but only benefit individual properties and are the responsibility of the property owner. For new (re)developments, recommendations are provided regarding how noise can be considered early in the planning and design process as to minimize conflicts in the first place.

A summary of recommended noise mitigation measures is provided in Section 5. In order to effectively mitigate noise in Vail, a number of measures will need to be pursued simultaneously, including speed reduction, pavement changes, barriers, and improvements to the planning processing for proposed (re)developments.

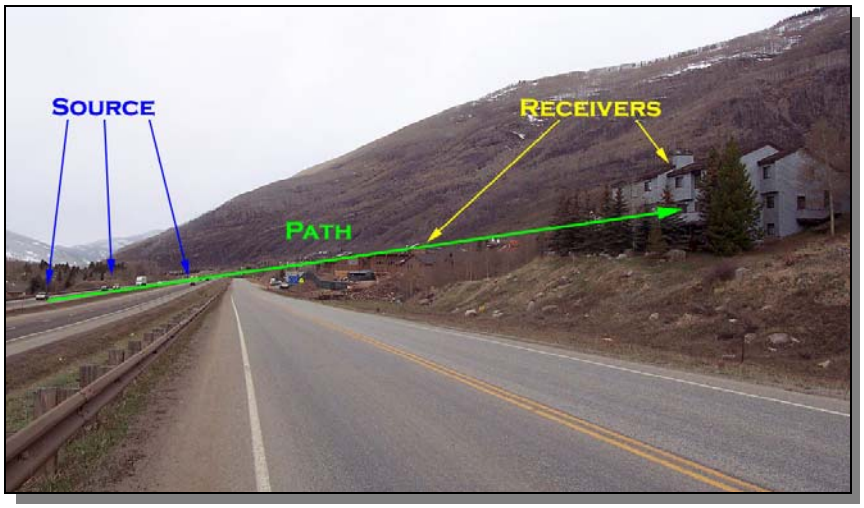

Figure 1-1
Breakdown of Available Highway Noise Mitigation Measures

Table 1-1
Available Highway Noise Mitigation Measures

Source Control Measures	❖ Reduce speeds ❖ Install low-noise pavement ❖ Modify tires, reduce engine/exhaust noise
Path Control Measures	❖ Construct barriers (berms/wall) along highway/frontage roads ❖ Construct tunnel
Receiver Control Measures	❖ Construct barriers (walls, berms) on affected property ❖ Re-arrange existing site use ❖ Acoustically insulate structures ❖ Consider noise in the layout of (re)developments ❖ Consider noise early in the design of buildings within (re)developments

APPENDIX M

LIONSHEAD VILLAGE

TRANSPORTATION PLAN UPDATE

Prepared for:

Town of Vail
75 South Frontage Road
Vail, Colorado 81657

Prepared by:

Felsburg Holt & Ullevig
6300 South Syracuse Way, Suite 600
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303/721-1440

Project Manager: Christopher J. Fasching, PE, Principal

FHU Reference No. 05-168
November 2006

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I. INTRODUCTION

This report serves as an update to the 1998 Lionshead Village Transportation Plan. Development and redevelopment planning within the Lionshead planning area has changed since the 1998 plan, and this report attempts to present these changes, impacts to the transportation system, and provides guidance for future transportation planning activity within Lionshead. Several major changes since 1998 include:

- The advent to redevelop the West Lionshead area including the possibility of a new ski lift and additional public parking in this area,
- The potential to redevelop the Lionshead parking structure to include a mix of uses and possibly additional public parking supply, and
- Changes in the ski industry's pass structure program (which can affect parking demands)

The October 1998 Lionshead Master Transportation Plan included a significant data collection effort in terms of traffic, pedestrian activity, shuttle activity, and transit activity. This level of data collection has not been repeated here. However, this transportation planning effort does leverage the planning that is taking place as part of the Town's Frontage Road plan which did include an extensive peak hour traffic data collection effort. The Frontage Road planning effort is being conducted to determine the traffic impacts of potential development throughout the Town including:

- Development that is under construction
- Development that is already approved
- Development that was recently submitted to the Town for consideration, and
- Potential development that might more efficiently utilize a given parcel of land.

The Lionshead Master Transportation Plan Update makes use of data/projections developed as part of the Frontage Road Plan with refinements being applied specific to the Lionshead area.

LIONSHEAD VILLAGE
TRANSPORTATION ANALYSIS

Prepared for:

Town of Vail
75 South Frontage Road
Vail, Colorado 81657

Prepared by:

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303/721-1440

FHU Reference No. 97-015
October, 1998

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I. INTRODUCTION

This report documents the travel patterns within and around the Lionshead Village area in Vail, Colorado as well as addressing impacts associated with buildout of the Lionshead area. This effort is designed to supplement the information in conjunction with the Lionshead master plan effort prepared, by Design Workshop, Inc. The intent is to gain an understanding of existing access and circulation trends within the Lionshead area and to develop an understanding of projected circulation conditions and identify mitigation, where necessary.

The following section of this report presents an extensive amount of transportation data which were collected over the President's Day weekend in 1997. Data collection included traffic counts, pedestrian counts, bus and shuttle counts including boardings and disembarkments, parking demand information at the Lionshead parking structure, and delivery activity associated with the commercial space in the Village.

The last section of this report presents impacts associated with the proposed Village Master Plan. Traffic projections at the Frontage Road cross streets are presented as is parking demand estimations, delivery vehicle parking needs, and transit demand. Potential mitigation measures are also presented for consideration where necessary.

APPENDIX N

A Report on the Recommendation of a Preferred Site for the Vail Transit Center

Prepared for:

The Town of Vail

Prepared by:

Nate Larson, PE, PTOE
URS Corporation

On Behalf of:

Fentress Bradburn Architects

February 7, 2005

This brief report has been prepared at the request of Town of Vail staff to evaluate four site options for regional transit transfer activities. This report has the following three parts:

1. Evaluation Criteria
2. Pro/Con analysis of the four sites
3. Conclusions

The current transit center is not considered large enough to accommodate the desired functions, which include but are not limited to the following:

- Bays for up to five buses and five hotel shuttle vans at one time
- Warming enclosure for passengers and drivers
- Restroom facilities
- Visual display of system route and schedule information

The consideration of a new location is driven by fact that the existing site is not large enough to accommodate these desired functions, which are considered vital to the future success of multimodal transportation to, from, and within the Town of Vail.

If a new location is selected, all transit center functions currently occurring at the existing site will be transferred to the new transit center when it opens.

CRITERIA FOR EVALUATING TRANSIT OPTIONS

The following criteria were developed by the Vail Civic Center consultant team to facilitate the Pro/Con analysis of each site, and are presented in no particular order:

1. Capacity to meet program targets (5 buses, 5 shuttle vans)
2. Adequate space for vehicle circulation and maneuvering within the center
3. Traffic impacts on Frontage Road
4. Impact on access /egress at Lionshead parking structure
5. Safe pedestrian movement within transit center & from there to Lionshead Mall (proximity to pedestrian destinations)

6. Potential for future expansion of transit center
7. Provides space for waiting area, restrooms, etc. (+/- 600 sf?)
8. Balances pedestrian flow into Lionshead Mall (east vs. west)
9. Possibility of combining with Information Center?
10. Convenient access for buses from Town of Vail and regional bus routes (and I-70)
11. Visibility from highway and Frontage Road
12. Ease of rider transfer to in-town shuttles
13. Safe distance between entry to transit center and any roadway intersection (150'?)
14. Cost
15. Separation from Village Transit Center

These criteria were considered starting points for discussion, and not all of them were eventually used in the Pro/Con analysis.

No scoring or weighting mechanisms were used in this analysis. The Pro/Con analysis for the first three sites was conducted in a workshop setting on September 29, 2004 by consultant team members Mike Winters (Fentress Bradburn), Nathan Kibler-Silengo (Fentress Bradburn), Nate Larson (URS), and Sherry Dorward, Landscape Architect.

OPTION 1: CONCERT HALL PLAZA

The Concert Hall Plaza site is the location of the existing transit transfer facility. It is located on West Lionshead Circle south of Frontage Road (see **Figure 1**).

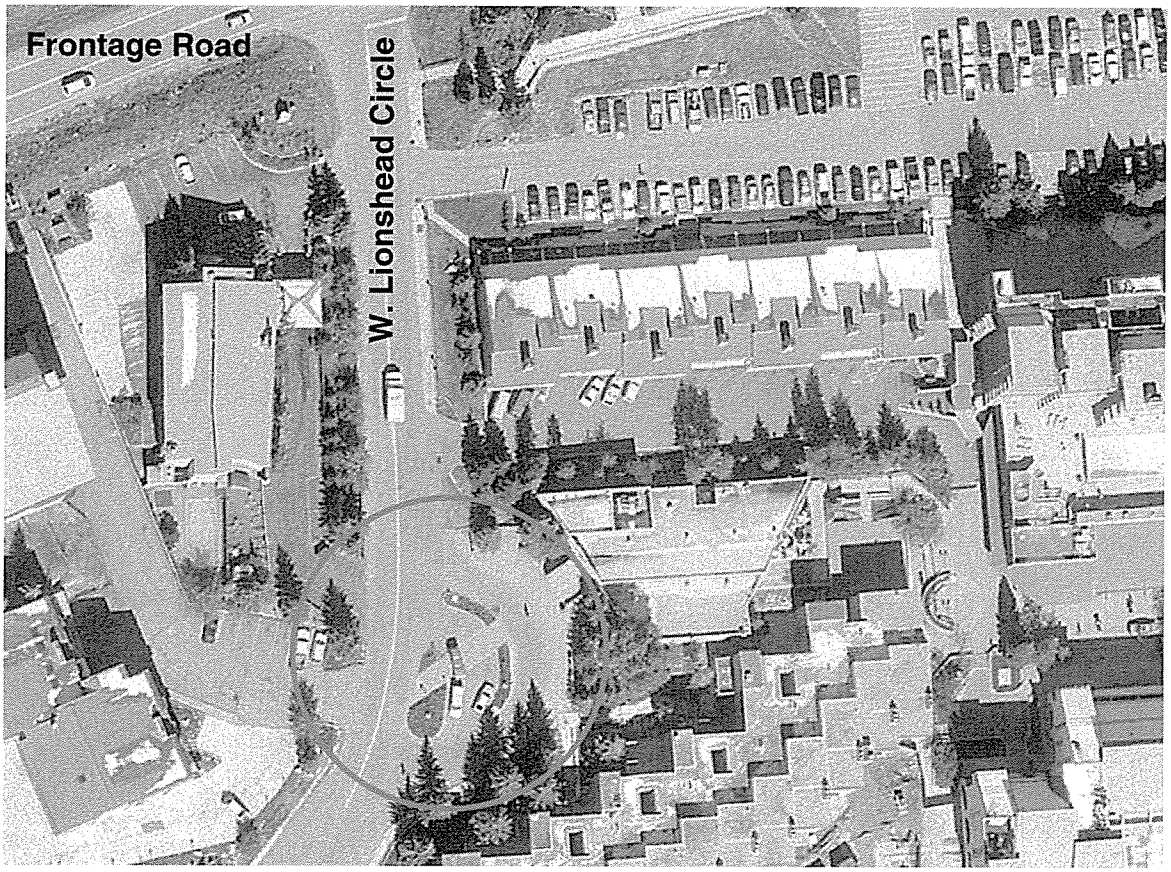


Figure 1. Concert Hall Plaza Site

PROS

- Least cost
- Existing

CONS

- Can't fit full program or any ancillary uses
- Conflicting uses (delivery and service, pedestrians, cars)
- Inefficient, unworkable shape (circle)
- No direct pedestrian route to mountain
- Site doesn't energize retail development, most likely pedestrian route is at mall edge (down the street)
- Brings big buses into Lionshead pedestrian zone
- Limits potential redevelopment of Concert Hall

OPTION 2: NORTH DAY LOT

The North Day Lot site is the located on the southeast corner of the intersection of Frontage Road and West Lionshead Circle (see **Figure 2**).

Figure 2. North Day Lot Site

PROS

- Pedestrian overpass makes this transit location more accessible to people coming from north side of I-70
- Strengthens North-South pedestrian axis into Lionshead core
- Biggest site, allows best potential design (functional, expandable)
- Better vehicle access – no conflicts with parking structure, minimal number of Frontage Road curb cuts
- Closer to mountain than Options 1 or 3

- Pedestrians don't have to cross a vehicular street
- Already part of adopted Lionshead master plan
- Might integrate better with in-town shuttle

CONS

- Have to work around pedestrian overpass (site planning constraint, not obstacle)
- Proximity to residential condos (opposition to traffic and diesel buses, noise)
- Limits use of site for other needed/desired development, increasing development costs
- Not a Town of Vail property (but Town has rights in the Lionshead development agreement)

OPTIONS 3a and 3b: ON TOP OF THE LIONSHEAD PARKING STRUCTURE

The existing Lionshead Parking Structure is located on the southeast corner of the intersection of Frontage Road and East Lionshead Circle. With Option 3a, the new transit center would be located on top of the Lionshead parking structure (see **Figure 3**). With Option 3b, the transit center would be located on the redeveloped Lionshead Parking Structure (see **Figure 4**).

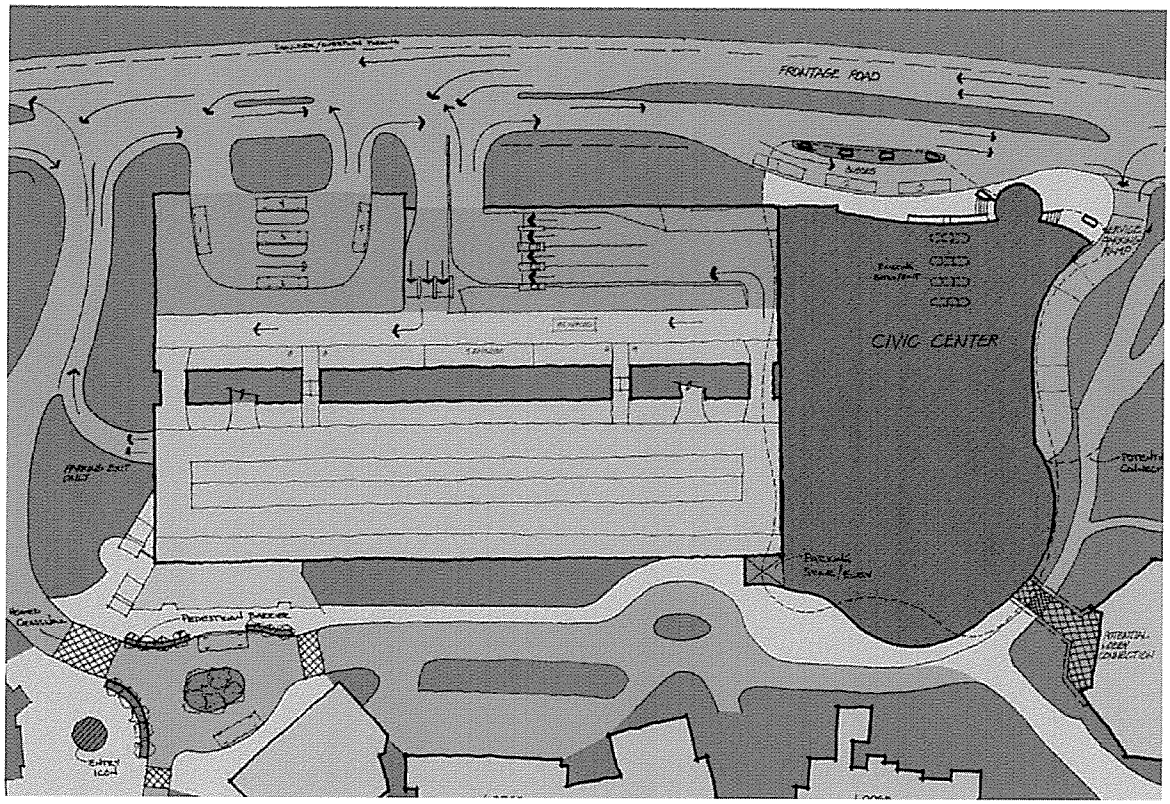


Figure 3. Lionshead Parking Structure Site (Existing)

Option 3a

PROS

- No adjacent residential properties
- Town of Vail property
- Direct access from Frontage Road
- Close to civic/conference center

CONS

- Density of the many curb cuts along Frontage Rd. (potential CDOT concern)
- Displaces parking spaces
- Complicates circulation patterns on Frontage Road – lack of clarity for drivers
- Requires physical improvements to parking structure if placed on existing structure (i.e. Phase 1, option 3)

- Inconvenient pedestrian connection
- Longest distance to mountain
- Unpleasant pedestrian experience (quality concerns)
- Poor visual quality of Frontage Road (no space for landscaping)
- Space available is minimally adequate for program
- No expansion potential
- If transit center is located on existing structure in Phase 1, it will have to be relocated for duration of Phase 2 construction, then rebuilt.

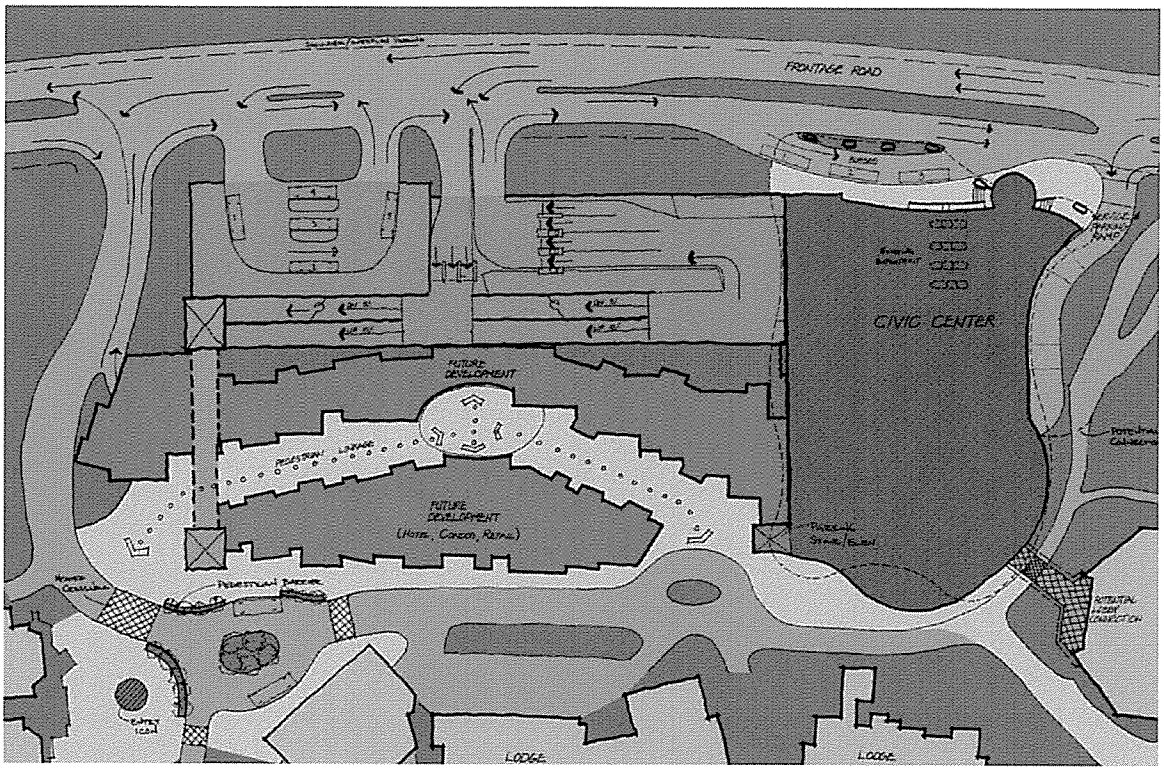


Figure 4. Lionshead Parking Structure Site (Concept Schematic)

Option 3b

PROS

- No adjacent residential properties
- Town of Vail property
- Direct access from Frontage Road

- Pedestrian connection to Lionshead can be designed appropriately
- Close to civic/conference center

CONS

- Density of the many curb cuts along Frontage Rd. (potential CDOT concern)
- Displaces parking spaces
- Complicates circulation patterns on Frontage Road – lack of clarity for drivers
- Longest distance to mountain
- Poor visual quality of Frontage Road (no space for landscaping)
- Timing requires developer involvement
- Would require removal of Vail Resorts International covenants
- Space available is minimally adequate for program

OPTION 4: E. LIONSHEAD CIRCLE TURNAROUND

The E. Lionshead Circle turnaround site is located across E. Lionshead Circle from the southwest corner of the Lionshead parking structure, at the entrance to the Lionshead Mall. This option would include the removal of the Youth Services facility and existing retail space adjacent to the parking structure (currently occupied by Subway) and reconfiguration of the parking structure's pedestrian access (see **Figure 5**).

PROS

- Supports efforts to make East Lionshead Circle a more prominent entry into Lionshead (which could include enhanced signing and/or monuments)
- Shortest distance to mountain minimizes skier/mountain employee walking distance
- Directs pedestrian traffic from parking structure away from bus loading areas
- Displaces current unregulated dropoff and delivery area
- Does not require route modification for in-town shuttle
- Able to accommodate currently-projected transit and hotel shuttle needs easily

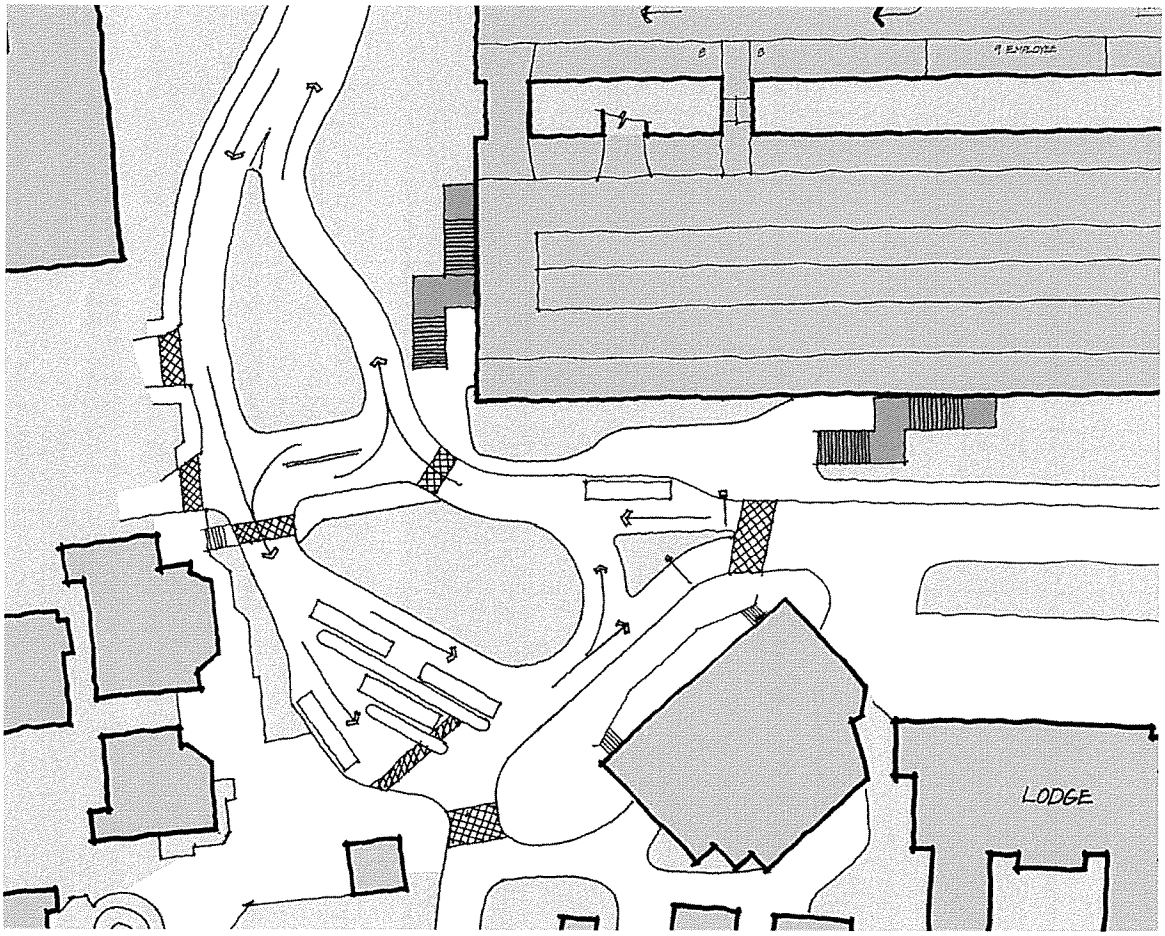


Figure 5. E. Lionshead Circle Turnaround Site

- Does not add new access to Frontage Road (CDOT approval not required)
- Potential for funding synergy between TIF and federal transit sources

CONS

- If full transit operations capacity is realized, uphill bus movement could result in congestion at the Frontage Road/E. Lionshead Circle intersection, especially in concert with a peak-period "relief" exit from the parking structure
- Local traffic inbound on East Lionshead Circle is forced to go through a bus lane
- Increased bus traffic could conflict with E. Lionshead Circle residential traffic
- Slightly longer and less desirable bus routing pattern, given grade and low-speed residential character of E. Lionshead Circle

- Proximity to residential condos could translate to opposition to increased traffic and diesel bus noise and emissions
- Large retaining wall structure would be required in front of the Lionshead Centre commercial building—potential pedestrian/ADA access challenges
- Potentially undesirable entry to Lionshead, with increased pavement and vehicular movement.
- Potential to make parking structure site redevelopment less attractive by occupying what would otherwise be a connection between the parking structure site redevelopment and the entry to Lionshead
- Limited future transit center expansion potential
- Would require the relocation of existing Youth Services facility

CONCLUSIONS

The Pro/Con analysis documented in this report has led to the following preliminary conclusions:

1. Concert Hall Plaza is an inappropriate site unless cost is the only criterion
2. North Day Lot has the most advantages and least disadvantages
3. Lionshead is best Town – controlled property
4. Should not, in any scenario, build transit center on the existing Lionshead structure in Phase 1 (can only be temporary)
5. A Transit Center in the redeveloped Lionshead Parking Structure would be the most cost effective option, but has the least certainty
6. The Lionshead Turnaround site has some merit as a potential site
7. North Day Lot is the best overall transit center location

As a result of the analysis documented in this report, the consulting team recommends the Town consider the North Day Lot site the preferred site for a new transit center. The E. Lionshead Circle turnaround site would also have sufficient advantages to warrant consideration, and the Lionshead parking structure options should be considered viable.

APPENDIX O

Vail Tunnel Options

DRAFT

An Initial Look at
Tunneling Options To Relocate
Interstate 70 in Vail, Colorado

KRACUM RESOURCES LLC

DECEMBER 2005

Executive Summary

Over the past decade several discussions have focused on the impacts Interstate 70 (I-70) places on Vail and its future. Increasing traffic congestion, noise, air pollution, and safety issues from traffic on the interstate have been approached in several ways. Studies have been conducted on traffic, noise, and other issues without a solution that addressed all the issues satisfactorily. In addition, the Interstate bisects the community of Vail, creating connectivity and quality of life issues for its residents and guests.

A cut-and-cover tunnel under I-70 was briefly studied during transportation update planning. Fundamentally, a lid would be placed on the Interstate that would place traffic in a tunnel along the same alignment as the Interstate. With this, many of the I-70 issues could be virtually eliminated. Funding of the cut-and-cover tunnel, it was assumed, could come from transference of air rights above the tunnel, on which both limited commercial and residential development could occur. A boulevard could be created on the lid that would dramatically increase the connectivity in the community. Also, it was discussed that considerable open space could be provided to address the wildlife and recreational issues. The cut-and-cover tunnel under I-70 was tabled largely due to the cost and the impact construction would have on the community.

Currently, the Colorado Department of Transportation (CDOT) is studying options for increasing capacity of I-70 from Denver to Glenwood Springs. The Programmatic Environmental Impact Statement (PEIS) is evaluating options for increasing traffic capacity through Vail which includes widening of the Interstate to three (3) lanes in each direction and providing a corridor for a mass transit system. To address the rockfall and landslide issues associated with Dowd Canyon, CDOT has included an option that would divert the Interstate in Dowd Canyon into a tunnel exiting near Eagle-Vail and connecting back to the Interstate.

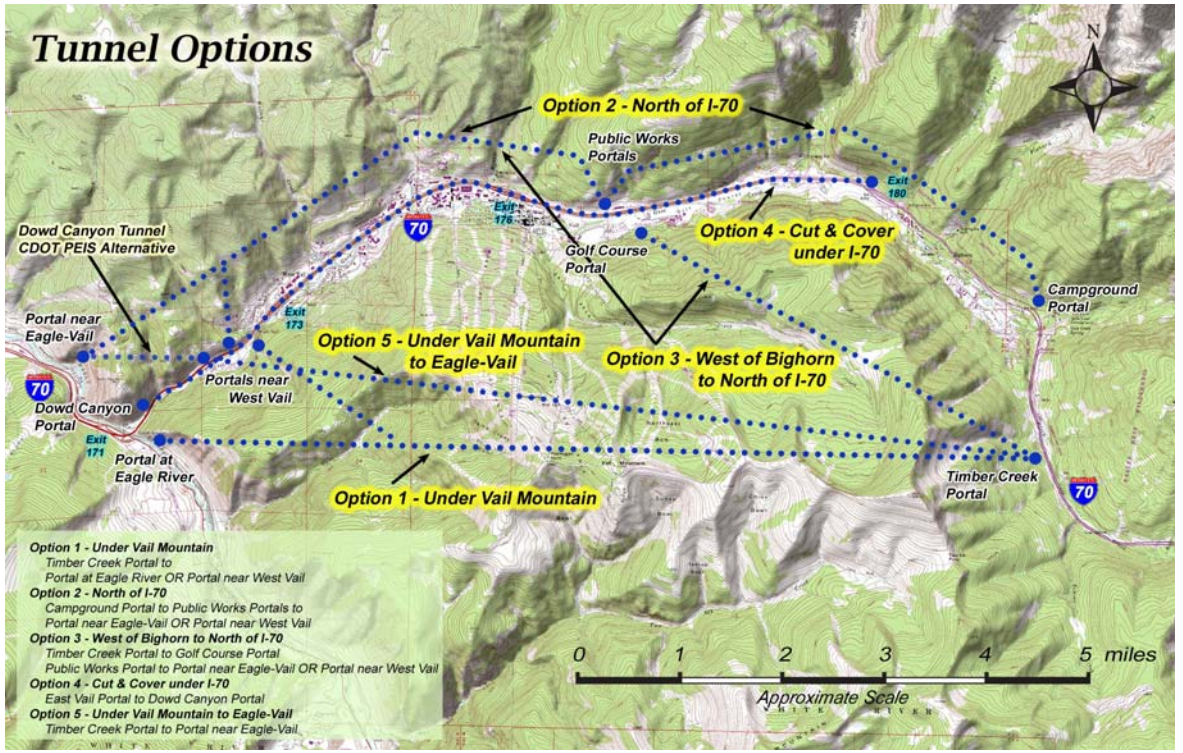
Separate from the PEIS In the past year, the discussions in Vail expanded to relocating I-70 into a tunnel away from Vail, rather than in a cut-and-cover tunnel beneath the existing Interstate. Several ideas brought forward developed into a set of five (5) options with alternative

portal locations. The options, shown below, provided various levels of Interstate relocation with connections to Vail. Options 1 and 5 included bypassing Vail altogether with east portals approximately four (4) miles east of the East Vail Interchange and west portals near the Eagle River. Option 2 circumvents north of I-70 with alternative west portal locations in West Vail and Dowd Junction. Option 3 attempts to provide an interchange connection near the Public Works Facilities while bypassing the Bighorn area. Option 4, the cut-and-cover tunnel under I-70 was also included as one of the options under study (Option 4). This document provides an initial look at the various options for tunneling.

A preliminary evaluation of the options included initial study on the geology, tunnel portal locations, excavation methods, ventilation, facilities, infrastructure, tunnel excavation material disposal, cost, and schedule. Each of the options included two (2) three-lane tunnels for traffic and a separate mass transit and service tunnel. The options were compared in terms of cost, schedule, expandability, construction impacts, and general public benefit.

Preliminary geological study shows that tunneling is possible in each of the options; however, tunneling north of I-70 (Option 2) and west of Bighorn (Option 3) could prove to be the most costly in terms of tunnel excavation and tunnel support. In as well, Option 3 shows a high impact on the Vail Golf Course area with its portal and associated interchange.

Interchange and portal location alternatives were studied to provide various connections to Vail with consideration given to traffic flow, connectivity, and impact to the community. Connectivity near the Public Works Facilities and in West Vail was addressed in each of the options.



No recommendations are made in this study for connectivity as only through intensive long range development and transportation planning can the right choices for interchange and portal locations be made.

Excavation methods, ventilation, facilities, and infrastructure were addressed in each of the options. It was determined that feasible means and methods are available and within tunnel design possibility, even though some of the options represent the longest tunnels in North America. It should be noted here that longer tunnels are in operation in Europe.

A prime consideration in evaluating the tunnel options in Vail includes the haulage, use, and disposal of the rock excavated from the tunnel. Haulage of the excavated material would be very costly and impactive to the community in some options. For instance, as much as 8 million cubic yards of material may need to be hauled from the tunnel sites in Option 2 – North of I-70. If all of the excavated material were hauled in trucks over the existing Interstate, more than 40 trucks per hour could be realized on the Interstate over a few years. Innovative means for tunnel excavation material haulage and disposal may include its use for construction of future water reservoirs and wildlife crossings. In some options, the use of the Union Pacific's Tennessee Pass railroad for haulage could minimize the haulage impact though Vail.

In terms of cost and schedule, the longest tunnels (Options 1 & 5) may actually provide the lowest cost per linear foot of tunnel and shortest schedule using tunnel boring machines for excavation. Tunnel construction could be expected to last from 4 to 5 years. With the right excavation methods and innovative haulage of excavated material, Options 1 and 5 would provide the least impact to Vail during construction. A key issue with these options, however, is that development could not occur on the area recovered from the existing Interstate until the tunnel was complete and in operation. This differs dramatically from Option 4 Cut-and-Cover Under I-70 as the cut-and-cover tunnel can be readily phased to complete short sections of tunnel so that development can occur prior to completion of the entire tunnel, potentially creating a more favorable funding scenario.

From initial study, it appears that Options 1 and 5, where a long tunnel bypasses Vail, may have the greatest public benefit in terms of mitigating the impact of I-70 through Vail and minimizing the impact of construction. Option 4 – Cut-and-Cover Under I-70 has the greatest potential for phasing, but has the highest cost of the options studied. The preliminary order of magnitude costs for 9.4 miles of two (2) three-lane tunnels and a separate transit/ service tunnel for Option 5 is in the range of $2.5 to $3.1 billion. For the same tunnel configuration for the Option 4 - Cut-and Cover Under I-70, costs in the range of $2.8 to $3.5 billion could be expected. Interchanges, right-of-way, and impact mitigation costs are not included in these costs.

Only with additional project definition and extensive geotechnical investigation can these options, costs, schedule, impacts, and benefits be further evaluated.

APPENDIX P

VAIL TRANSPORTATION MASTER PLAN UPDATE

Prepared for:

Town of Vail
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Prepared by:

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402 7TH Street, Atrium Suite 111
Glenwood Springs, CO 81601

WGI Project Number 2284.02
July 2002

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Executive Summary

Vail, Colorado attracts a large number of visitors each year because of its world-class ski area, wide array of recreational opportunities, and thriving economy with numerous restaurants, retail businesses, and services to choose from. With a high volume of visitors comes a need for an efficient transportation system to get visitors to and from Vail and to transport them within the Town as well. In 1990, the Town of Vail undertook a Transportation Master Plan to address all transportation systems and future needs for the area (see *Vail Transportation Master Plan, Felsburg Holt & Ullevig, 1993)*. That document addressed the current transportation system within Vail and also provided recommendations for improvements to the system.

Purpose of the Update to the Transportation Master Plan

The Town of Vail makes great efforts to keep its transportation system as efficient and updated as possible. This is evidenced by the many improvements and additions to the system over the years to accommodate the high volumes of visitors and traffic each year. Because ten years have passed since the production of the original Transportation Master Plan, the Town has deemed it necessary to provide an update for the continued efficiency of the transportation system. The purpose of this Transportation Master Plan Update is to review the existing conditions of the transportation system and to address and/or resolve transportation issues that have arisen since 1990. The following issues were included in the original Transportation Master Plan and will be addressed and updated in this document:

- Vail Village Deliveries
- Town Bus System (specifically, the In-Town Shuttle)

- Outlying Bus System
- Trail System Interface
- Peak Hour Traffic Volumes
- Intersection Level of Service (LOS) Analysis
- Implementation Process
- Plan Monitoring and Updating

One issue addressed in the original document has been resolved since 1990 and is no longer applicable to this update, and that is the Interstate 70 (I-70) Access.

In the original document, parking issues for the Town of Vail were also addressed. The parking issues are also being addressed at the time of publication of this update; however, the study is still underway and will be published as a separate document at a later date.

In addition to the updates in this document, new issues for the Town of Vail transportation system have come to light. These will be addressed in this document and include the following:

- Connecting fixed guideway transit systems
- Noise contour map for I-70 traffic
- I-70 capping review
- Traffic forecasting
- Programmatic Environmental Impact Statement (PEIS) issues resolution

Each of these issues will represent a different chapter in this document. In general, these issues were studied and completed individually but are brought together in this document so that all affected parties and agencies may view them as a whole system. This ensures better coordination by all agencies in making the transportation system efficient for the present as well as for the future.

Summary of Updates, Additions, and Resolved Issues

To provide ease of reference, each update and addition is summarized below with recommendations, if applicable. The issues from the original Transportation Master Plan that are either resolved or no longer applicable are also summarized below.

Updates:

Vail Village Deliveries

The Vail Village Loading and Delivery Study was researched and prepared for the purpose of analyzing and understanding all the factors surrounding people and goods movement in and out of the Vail Village Commercial Core One. The study and this summary provide options and supporting background to help minimize or eliminate motorized vehicles (primarily

delivery trucks) from the Commercial Core for the purpose of enhancing visitor enjoyment and safety. Based on analysis of the present loading and delivery system and the available options for the Commercial Core, short-term and long-term recommendations include the following:

- **Short-term**

1. Use of Variable Message Signs (VMS) at key locations could direct skiers to the parking structures and inform them of appropriate skier drop-off locations. The VMS could also be used to direct loading and delivery traffic to available access routes, loading bays, and dispersed terminals.
2. Consideration should be given to a ticketing structure that penalizes the repeat offender of the loading zones in Vail while not affecting Village guests. First-time offenders pay the maximum hourly rate, and the rate for each subsequent offense is increased significantly.
3. There are several access points into the Village at the present time, only one of which (Checkpoint Charlie) is able to control the entry of delivery traffic. Most delivery vehicles enter the Commercial Core through Checkpoint Charlie, and many other vehicles enter from the other three access points to the Village, frequently against traffic. In reviewing traffic patterns, traffic flow, and entry access points to the Village, it was discovered there might be some opportunity to further limit access to the Village for all types of vehicles. By guiding vehicle entry to enforceable access points throughout the Commercial Core, the overall traffic volume is dispersed over several access routes. Further, the use of on-street loading bays can be better regulated.
4. The following planning and design function should be accomplished.
    - An operational and technology plan should be drawn up to implement a traffic management system based upon an electronic communication system that integrates real time VMS, GPS tracking, smart card, internet computer camera, and dispatch technology with operational and enforcement services.
    - A long-range plan should be developed that when implemented in phases will interconnect buildings with terminal facilities via back-of-house access routes accommodating hand or motorized carts. The plan should be implemented in conjunction with redevelopment of private property and streetscape improvements.
    - Amend loading standard in the zoning code to require enclosed (terminal) loading and delivery bays for a variety of truck types and sizes as part of large development and redevelopment projects. The excess capacity of each terminal should be integrated through developer agreements into the dispersed terminal system.
5. One issue that is a significant contributor to the problem of truck numbers and dwell time in the Commercial Core is the time some deliveries are made. Earlier delivery of goods could remove the majority of larger delivery vehicles from the Commercial Core before “guest hours.” This approach would be most effective if instituted in conjunction with improved signage and some changes in access and traffic flow in the

Village. Stricter limitations could be put on Village access if delivery personnel could complete deliveries to all establishments before 7:00 a.m.

- **Long-term**

1. Addition of several delivery bays as part of a dispersed terminal on the Land Exchange site (the Vail Front Door project at the base of Vista Bahn/the Lodge at Vail). To effectively service at least one-third to one-half of the Commercial Core, six to ten bays for large trucks would be required.
2. Include enclosed dispersed delivery terminals in large development and redevelopment projects. The Town should also seek opportunities to require or acquire additional delivery bays in these facilities.
3. Provide strategically located, heated pedestrian walkways in the Village and adjacent commercial areas, so that push hand carts, pallet jack size pull carts, and small motorized carts can better function in the winter.
4. Where practical, construction or provision for future construction of underground delivery tunnels with street level freight elevators to facilitate loading and deliveries between buildings and dispersed delivery terminals should be done in conjunction with large development and redevelopment projects.
5. Construction of a dispersed delivery terminal with one bay for large trucks or four to eight bays for small cargo vans within an automobile parking structure on the P3&J site on Hanson Ranch Road.
6. Change current zoning code requiring additional on or off-site storage requirements per retail square foot for businesses in the Village.
7. Change current zoning code concerning required delivery space. The current zoning code requires delivery space to be ten feet by 25 feet, which is not adequate. Bars, restaurants, and hotels which require delivery of food and beverages should have one to two or more spaces, twelve feet wide and 35 to 50 feet long. This would accommodate most delivery vehicles. The code should allow for required loading bays to be located in a nearby dispersed delivery tunnel.
8. Design dispersed delivery terminals in appropriate locations so that cargo from a large truck can be transferred to a small cargo van. These would access a dispersed cargo van delivery terminal or bay located closer to the delivery destination.
9. Increase the availability of close-in restricted parking spaces within controlled access private parking structures. These would accommodate the delivery needs of residents, maintenance and construction personnel, business owners, and parcel carriers using small cargo vans and pick-ups. This will contribute to the reduced use of on-street loading bays. Restricted parking spaces could be located in existing and future parking structures built for automobiles.

Parking (summary to be provided by FHU)

To be completed as a separate document at a later date.

In-Town Shuttle Bus System

As a response to space limitations, driver shortages, and higher costs, the Town of Vail is evaluating replacing the In-Town Shuttle buses with an alternative transit system. Such a system would have to be capable of carrying 5,000 people per hour (the current peak demand is approximately 4,000 people per hour) and effectively serve a route approximately 1.5 miles in length. The route would have to be similar to the current bus system route while effectively maximizing both ridership and system operations. This update is to determine the best options, from a range of opportunities, for providing mass transit for the Town of Vail In-Town Shuttle bus route. These options are being presented to address the increased demand and other issues discussed below on the In-Town Shuttle. The bus route is roughly a three-mile loop from Vail Village to Lionshead.

The analysis of all potential options for the In-Town Shuttle system resulted in the following technologies for final consideration:

- Power Unit/Trailer Combination Units
- Low-floor Buses
- Articulated Transit Buses
- Low-floor, Articulated Buses
- Guided Busway
- Automated Guideway Transit (AGT):
  - SK
  - Cableliner DCC
  - Aeromovel

Based on analysis of the remaining technologies and input from two focus group meetings attended by residents and businesses within the Town of Vail, a set of short-term and long-term recommendations for the In-Town Shuttle bus route have been developed and include the following:

- **Short-term**

1. Develop an Express Bus Route from Vail Village to Lionshead – Vail Transit should consider an In-Town Express Bus route between Vail Village and Lionshead. This route would run along the Frontage Road to provide for a quicker, more direct route between the two areas. The express route could also make use of a low-floor, articulated bus. In keeping with the character and space available in the Village Core area, the In-Town Shuttle is better suited for the use of 40-foot buses. However, an express route on the Frontage Road could utilize a low-floor, articulated bus to increase the capacity.

2. Purchase Low-Emissions Vehicles - To address the problem related to smell/air quality, Vail Transit should consider selecting buses that run on compressed natural gas (CNG) and produce lower emissions.

3. Improved Information Technology and Information Displays – Electronic message boards which provide real time information should be placed at the Transportation Center, as well as other key stops along the route. Real time information along the route is extremely valuable to transit riders. Such information requires the deployment of an automatic vehicle location system (AVL) to track buses (Vail Transit already has such a system through NEXTbus). The AVL data can be converted into bus arrival times, which can be transmitted to bus stops.

4. Extend In-Town Shuttle Route to Cascade Village – If demand warrants, the In-Town Shuttle route should be extended west to serve Cascade Village. While discussion at the two focus groups held on September 21st, 2001 indicated that the existing In-Town Shuttle route should be extended to serve Cascade Village, Vail Transit should conduct an on/off survey on its West Vail Green and Red routes to determine the number of riders who currently board and/or deboard at the Cascade Village stop and where they are coming from and going to, to better determine the level of demand for a service extension.

   Extending the In-Town Shuttle route to Cascade Village will add approximately one-half of a mile to each run. This additional mileage would allow vehicles to complete their loops in 50 minutes as opposed to the current 40 minutes, and would not add any substantial cost to the service.

- **Long-term**

1. Develop Guided Busway – If the Town of Vail continues to grow as expected, and capacity on the shuttle needs to be increased to 5,000 pph, Vail Transit should consider the development of a guided busway to run between Lionshead and Main Vail/Cascade Village. The use of a guided busway would allow vehicles to run on shorter headways and therefore carry additional passengers during peak hours.

2. Install Transit-Activated Signal at High Volume Intersections along Frontage Road – At intersections such as East Lionshead Circle and Frontage Road, buses have difficulty making left-hand turns from the minor street (East Lionshead) onto the major street (Frontage). The Town of Vail could look to install a transit-activated signal system that involves detecting the presence of a bus and, depending on the system logic and the traffic situation, then give the transit vehicle special treatment. The system could give a green signal during peak periods for buses waiting to enter onto the Frontage Road. In addition, real time control technologies can consider not only the presence of a bus, but the bus adherence to schedule and the volume of other traffic.

Outlying Bus System

This update includes a West Vail route structure review based on the West Vail Red Loop and the West Vail Green Loop. Ridership, schedules, and route information are provided as

well as short-term and long-term recommendations to streamline the existing route. Also included in this analysis is discussion of a potential undercrossing of I-70 to be constructed in the Simba Run area. In particular, the effects to the West Vail bus route from this undercrossing are determined.

Recommendations for the West Vail bus route include the following:

- **Short-term**

1. Streamline Current West Vail Schedules – Vail Transit should change the current schedules, so that buses operating on the West Vail Green and West Vail Red routes depart at the same time. This would provide more balanced east-west service along the North and South Frontage roads and alleviate safety issues generated by transit users having to cross I-70 at-grade to access bus stops along the opposite frontage road. In the winter, this would mean that buses on each route make their first departure from the Transportation Center at 5:45 a.m. Streamlining these schedules would also make the system easier to understand and utilize, which could generate additional ridership.

2. Improved Route Identification – While each of Vail Transit's routes have names and are color-coded, a number, letter, or number and letter designation should also be used to help lead passengers through a trip. The number, letter, or number and letter designation, along with the route name should be displayed on each bus and any printed maps. In addition, vehicles should have some indication of the direction they are going (e.g. West Vail Green Red – North Frontage) so that the new riders can better understand the system.

3. Elimination of Red Sandstone School Stop on West Vail Green and Lionsridge Loop Routes – To make the routes in the West Vail area run more efficiently, two of the routes, West Vail Green and Lionsridge Loop, should eliminate stopping at Red Sandstone School. This route would continue to be served by the West Vail Red and Sandstone routes. The elimination of this stop would reduce the running time of the West Vail Green route and allow vehicles serving the Lionsridge Loop to reach their primary service area faster.

4. Installation of Trailblazer Signs – Trailblazer signs that direct riders to the nearest stop or stops should be installed on major streets and other key strategic stops throughout West and East Vail. These signs would satisfy the need for approach information, and thus should be compatible with route guidance information with regard to location labels, directions, and route designations.

   Metal trailblazer signs with the appropriate route guidance information can cost anywhere between $500 and $1,000.

- **Long-term**

    1. Purchase of Additional Low-floor, Articulated Buses – If West Vail continues to grow over the next few years as expected, Vail Transit should consider purchasing two additional low-floor, articulated buses to handle the expected increase in demand. These vehicles should be used on the West Vail Green and Red routes. Low-floor, articulated buses have a 33 percent greater capacity than regular low-floor vehicles.

    2. Incorporation of Bus Stops at Simba Run Underpass – While the use of the Simba Run underpass to restructure the West Vail Red and/or West Vail Green routes will not provide any service enhancement or increase in ridership, additional bus stops should be located at each end of the proposed Simba Run underpass along North and South Frontage Roads to improve passenger access to the system and increase safety. These additional stops would serve the West Vail Red and West Vail Green routes, as well as the Lionsridge Loop in the winter.

    3. Incorporation of Stops at Lionshead Intermodal Facility – Following completion of the Lionshead Intermodal Facility, Vail Transit should add this location as a stop on the West Vail Green, West Vail Red, and In-Town Shuttle routes. The facility will include significant parking and should become a key transfer point for transit service, which will increase system ridership.

In addition to the West Vail bus route, a discussion of the Downvalley bus system (the ECO system) is included. A bus service review is provided and includes information on routing, schedules, and ridership as well as short-term and long-term recommendations to provide more efficient routes.

Recommendations for the Downvalley bus system include the following:

- **Short-term**

    1. Variable Lane System and GPS at Transportation Center – The transit plaza could be changed to a variable lane system rather than the current assigned lanes for each route. This would include a variable message system to direct buses into certain decks when they arrive. This would allow for staggered bus arrivals, and therefore add more capacity. The variable message system could be incorporated with a Global Positioning System (GPS), a system that allows a central control system to track the location of all buses at all times. This type of system would allow for greater capacities of buses from downvalley routes rather than the current single lane that is assigned for ECO routes.

2. Express Service on Vail to Edwards Route – To reduce the travel time for commuters and other passengers traveling from downvalley locations to Vail and generate additional ridership, express service should be provided on the Vail to Edwards route. This can be done by making some of the existing runs into an express run with limited stops, or by adding an express run, which may require additional vehicles.

- **Long-term**

1. Impact of the IMC on the Eagle Valley Transportation System – If the IMC rail line is constructed between Vail and the Eagle County Airport, two of the existing Eagle Valley Transportation routes – the Vail to Edwards and Vail to Dotsero routes – would essentially be providing redundant service. To eliminate this service redundancy and make the system function better, these routes should be converted into a feeder service, which would serve new rail stations in Edwards and Dotsero. Feeder routes would be designed to serve residential areas in each town, with runs scheduled to meet arriving and departing trains.

Trail System Interface

In the original Transportation Master Plan, the 1990 trail system is described and mapped. Recommendations are also included for new trails to be constructed that would tie in with the existing trail system and create a better-rounded system. This update provides information on trails that have been built in the Town of Vail since 1990 (from the recommendations made). Each new trail is described in terms of location and physical characteristics, and a map is included to illustrate the locations of the new trails. In addition, the recommendations made in 1990 have been re-prioritized to make a high priority of trail improvements that have not yet been implemented.

In addition to the re-prioritization of the 1990 trail recommendations, the Town has also identified additional trail links that it considers to be of high priority. These include the following:

1. Lionshead Bypass – from the skier bridge in Lionshead, bypassing Lionshead, and connecting to the existing trail system behind Tree Tops Condominiums

2. Vail Village Bypass – from Vail Road near Checkpoint Charlie, to Vista Bahn

3. Sunburst Road Bypass – from the golf course clubhouse to the west end of Katsos Ranch Path

Appendix C1 is a portion of the Eagle County Trails Master Plan. This appendix is included to illustrate how the trail system in the Town of Vail ties in with the Eagle County Trails Master Plan.

For reference, Appendix C2 includes the trail maps from the original Transportation Master Plan.

Peak Hour Traffic Volumes

In 1990, peak hour traffic volumes were collected at 26 intersections along the Frontage Roads in Vail. These counts were taken in March and July during peak weekends. This update includes counts in 2000 at the same intersections in March and July during peak weekends. The counts in 2000 differ because eight of the intersections from the 1990 counts have been reconstructed as four roundabouts; two in West Vail and two in Vail Village, all providing access to and from I-70. The results of the traffic counts are provided as Appendix A1.

Appendix A2 also provides peak hour traffic counts completed by Felzburg Holt & Ullevig in September 2000 for the Vail Village area. These counts were not conducted for the 1990 Transportation Plan but are included here for reference.

Intersection Level of Service (LOS) Analysis

The LOS Analysis update provides LOS for the intersections studied in the original Transportation Master Plan. This update also includes LOS for the newly constructed roundabouts in West Vail and Vail Village.

All intersections along the Frontage Road were found to maintain a LOS of C or better, a standard for the Town of Vail, with the exceptions of Vail Valley Drive West (LOS D), Matterhorn Circle (LOS E), and Westhaven Drive (LOS F). Recommendations for these intersections include the following:

1. Traffic signals. Although the Town of Vail has not used traffic signals in the past to maintain the character of the Town, they are still a feasible solution and could be considered.

2. Traffic directors during peak periods of travel.

3. Roundabouts at these intersections. Although the space requirements at the intersections with poor LOS would indicate that roundabouts are not a feasible solution, this possibility should be further examined, as roundabouts are effective tools in creating adequate flow conditions at an intersection.

4. An all-way stop installed at the intersection (this would bring the LOS to C).

Implementation Process

The implementation process includes a scheduled plan of action for certain elements within the Transportation Master Plan Update. Transportation system elements within the Update should be prioritized as short-term (one to five years), mid-term (six to ten years), and long-term (eleven to 20 years). Recommendations have not been made concerning priorities for

the Town as priorities usually change, depending on what is most appropriate at that time. The Town of Vail should develop a flexible plan for prioritizing the recommendations included in this Update. This prioritization plan should remain open and flexible as any changes in priorities may affect other plan elements. An individual chapter is not included to address this element.

Plan Monitoring and Updating

The original Plan included continuous monitoring and periodic updates of the Transportation Plan to include actions such as periodic traffic counts and a formal plan update every five years. This update to the Transportation Master Plan serves the purpose of updating changes that have taken place in the transportation system for the Town of Vail since 1990. An individual chapter is not included to address this element.

Issue that is resolved and no longer applicable:

I-70 Access

In the original Transportation Master Plan, I-70 access was addressed because of the poor traffic flow at two of the three interchanges (West Vail and Main Vail interchanges). The report outlines the physical and operational characteristics of the interchanges, goals regarding access to I-70, additional crossing capacity of I-70 at these locations, and alternatives to solve the congestion problems at these interchanges. The issue has since been resolved with the construction of roundabouts at these interchanges – two roundabouts to replace the four intersections at West Vail, and two roundabouts to replace the four intersections at Main Vail.

Additions:

Connecting Fixed Guideway Transit Systems

Two rail systems that have been proposed are the Inter-Mountain Connection (IMC) and the Colorado Intermountain Fixed Guideway Authority (CIFGA). The IMC is a commuter rail that would primarily use existing tracks and run from Vail to the Eagle County Airport. The CIFGA system is a fixed guideway system that would run from Denver International Airport (DIA) to Vail and eventually the Eagle County Airport. This addition to the Transportation Master Plan addresses these two systems and how they would affect the transportation system in Vail.

This chapter also includes recommendations for alignments and station locations in the Vail area based on topography and proximity to activity centers. Mapping is provided in Appendix E to show potential alignments for the fixed guideway system. Potential alignments for the CIFGA system include the following:

- **Dowd Junction**

The CIFGA alignment could enter Vail by way of Dowd Canyon on the existing Union Pacific (U.P.) Railroad tracks. Just before the crossing of I-70 over Highway 6 (Dowd Junction), the alignment would curve to the east, paralleling the existing bike path. At the point where the bike path crosses under I-70, the alignment could follow one of two options. Option 1 would be a tunnel cut through the slope of the mountain north of I-70. This option would parallel I-70 until the entrance to West Vail, at which point the median opens up and the alignment would cross over to the median. This option would be most beneficial if I-70 was not capped.

Option 2 would bring the alignment into the median under the proposed capping of I-70 through Dowd Canyon, in between the eastbound and westbound lanes.

Two other options exist for the alignment in the Dowd Canyon area. Option 3 through this area involves the diversion of the alignment before Dowd Canyon. As I-70 curves to the east and back before Dowd Canyon, the alignment could continue south (instead of curving back west and into Dowd Canyon) and tunnel through into Dowd Canyon just west of West Vail. At this point the alignment could cross into the median and continue into West Vail.

Option 4 for the Dowd Junction area includes following the existing rail line into Minturn and then tunneling north back to I-70. This option would be considered because of potential grade problems at Dowd Junction. Options 1 and 2 might face difficulties in creating a rail line that could negotiate the steep grade at the intersection of I-70 and Highway 6.

- **West Vail**

For either option discussed above, the alignment would be in the median as CIFGA enters West Vail. The CIFGA alignment would remain in the median, whether or not the capping was to be constructed. A station location could also be constructed in the median for West Vail access at a location determined to be the most practical. This station would include pedestrian crossings to access areas north and/or south of I-70 and the Frontage Roads in West Vail.

- **Main Vail**

The CIFGA alignment would remain in the median through Main Vail as well, with potential station locations at the proposed North Day Lot Transportation Center in Lionshead and the Vail Transportation Center for pick-up and drop-off of riders. These stations could be constructed in the median of I-70 with pedestrian crossings to access areas north and/or south of I-70 and the Frontage Roads.

- **East Vail**

The CIFGA alignment could also remain in the median through East Vail and continue east outside of the Vail city limits.

As the IMC is proposed as an interim solution until completion of the CIFGA project, all alignment recommendations might be temporary. These sections could be removed as

sections of the CIFGA project are completed. However, the IMC could also remain useful as a local service, providing more frequent stops in Vail for downvalley commuters. Any decisions regarding the temporary or permanent use of the IMC would be decided by the Town of Vail upon further studies and public involvement. Recommendations for potential IMC alignments include the following:

- **Dowd Junction and West Vail**

The IMC alignment would parallel the CIFGA alignment entering Dowd Canyon and traveling through West Vail (using Option 1 or 2). Shortly after passing by the West Vail Roundabouts and the potential station location in West Vail, the IMC alignment would leave the median, crossing over to the area between I-70 eastbound and South Frontage Road. The alignment would continue to parallel the CIFGA alignment.

- **Main Vail**

The alignment would continue to use the space between I-70 eastbound and South Frontage Road, while sharing the potential station locations at Lionshead and the Vail Transportation Center with the CIFGA for pick-up and drop-off. The IMC is proposed to end at the Vail Transportation Center, at which point the line would go back downvalley along the same route.

Noise Contour Map

This addition includes the creation of a noise contour map based on existing and future traffic volumes in the I-70 corridor. Noise measurements were taken at 50 locations throughout the Town of Vail to determine current noise levels produced primarily by I-70. These existing measurements were used for the development of a noise model. The noise model accounts for terrain features and traffic conditions. A future noise model was then developed based on known development plans and traffic forecasts. The noise model includes planning level noise abatement options.

A map of the noise contours with explanatory text will be included as a part of this section in Appendix F2.

I-70 Capping Review

The Town of Vail has expressed the desire to explore other options to reduce noise levels and bring a greater sense of community cohesion to the Town of Vail. Under consideration is the “capping” of I-70. This would involve the tunneling of I-70 under the existing alignment, using the land above for development or open space purposes. This addition to the Transportation Master Plan provides an analysis of other capping projects completed throughout the country, critical issues that the Town of Vail would face in considering such a project, and recommendations for locations and land use in constructing a cap. Appendix E provides mapping for potential capping areas along I-70 through Vail.

Traffic Model

From existing traffic counts, peak hour link volumes were documented and compared with previous 1990 link volumes. Using this information as a base, a spreadsheet-based travel demand model has been prepared for the Frontage Roads and major intersections in the Town of Vail. The model forecasts future traffic based on socio-economic data (housing, population, and employment). Eight traffic analysis zones have been used for the model and these include the following: I-70 East, I-70 West, East Vail, Vail Village, Lionshead, West Vail south of I-70, West Vail north of I-70, and Other Vail north of I-70. The model has been set up for multiple forecast years, and ten and twenty-year forecasts have been conducted. Appendices H1-H5 document the model structure and assumptions made.

Programmatic Environmental Impact Statement (PEIS) Issues Resolution

A PEIS was recently initiated by the Colorado Department of Transportation (CDOT) for I-70 between Denver and Glenwood Springs (see *I-70 Mountain Corridor PEIS, Summary of Issues, J.F. Sato & Associates, June 2000*). To prepare for this PEIS planning effort, issues that could potentially affect transportation in Vail were identified and discussed during a focus group attended by residents representing a wide array of interests and backgrounds. This addition to the Transportation Master Plan identifies these issues and potential solutions to the issues that have been recommended by the Town of Vail. The issues and solutions are also presented in the form of a matrix to indicate how different solutions can potentially address more than one issue.

Recent or Ongoing Studies

In addition to the studies described in this update, other recent or ongoing studies are taking place in the Town of Vail. Some of these are summarized below.

Transportation Center Work in Lionshead

The North Day Lot Transportation Center is proposed in the *Lionshead Redevelopment Master Plan* (Design Workshop, Inc., December 15, 1998). The Transportation Center would serve to create a major new point of entry into the pedestrian and retail core of Lionshead. It would also play a role in providing for a central transit stop in Lionshead.

The Transportation Center would consist of:

- Local/regional shuttles
- Local/regional transit and charter buses
- Short-term skier drop-off area
- Pedestrian portal
- Combination of large central service and delivery facility
- Construction under a structured parking deck
- Access to central Lionshead by freight elevators and a service tunnel
- Accommodation for a peak volume of 15-20 delivery vehicles and storage space

The Redevelopment Master Plan views the Transportation Center as a priority project as it is a prerequisite for other critical projects discussed in the Plan.

Roadway Functional Planning along South Frontage Road for Simba Run Crossing

The scope of work for this project involved conceptual design development for three elements:

1. Improvements to the South Frontage Road between Ford Park and just west of Cascade Village
2. A two-lane I-70 underpass at Simba Run
3. Related North Frontage Road improvements at the intersection of the new Simba Run Underpass

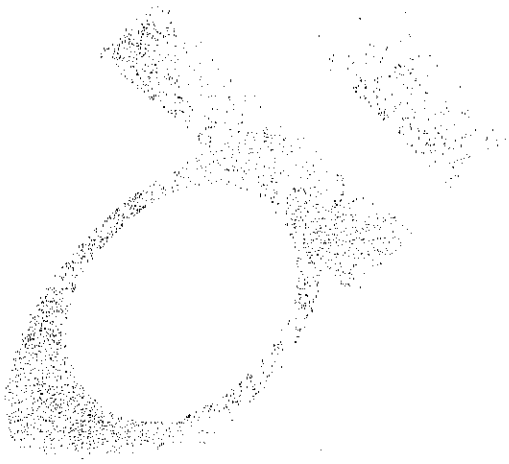
Other elements of this project:

1. Feasibility of the improvements identified in the Lionshead Redevelopment Master Plan
2. Improvements to drainage at Town Hall and access control
3. Feasibility of the South Frontage Road realignment near the VA shops
4. Space and height constraints at the pedestrian overpass

APPENDIX Q

Vail Village Loading & Delivery Study

Preliminary Data Collection, Analysis and Recommendations



Prepared for
Town of Vail

by
MK Centennial

October, 1999

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Vail Village Loading and Delivery Study

Executive Summary

Introduction

The Vail Village Loading and delivery study was researched and prepared between 11/1/97 and 11/1/99 for the purpose of analyzing and understanding all the factors surrounding people and goods movement in an out of the Vail Village commercial core. Ultimately the study and this executive summary give recommendations and supporting background to help minimize or eliminate motorized vehicle (primarily delivery trucks) from the core, for the purpose of enhancing visitor enjoyment and safety. There are several fundamental questions, which the Town of Vail must answer before determining which of these options to proceed with. These questions include:

What is our idea of a pedestrian village and how much are we willing to spend to get there?

Where does the money come from to accomplish the goal of a true pedestrian village?

Who has a voice in what the Town eventually does?

Whose interest takes priority in the process?

What is the time line to accomplish the goal?

Where are new loading facilities built and where are the trucks eventually going to unload?

The following report discusses in detail the entire range of options available to the Town and there potential costs and benefits. This Executive summary lays out two key scenarios that we believe to be feasible and would recommend as cost effective and productive towards the goal of a pedestrian village.

Short Term – Signage, Enforcement, Permitting, Other Factors

The following short-term solutions were presented to the Vail Town council for approval at the November 1998 council meeting.

Variable Message Signs

Use of Variable Message Signs (VMS) at key locations directing skiers to the parking structures, and informing them where appropriate skier drop-offs are located.

Additional - VMS signs, in the vicinity of the roundabout and adjacent to the parking structure, to get the attention of out-of-town guests and direct them clearly to the appropriate parking locations. Operate the signs only during peak periods.

Change in Parking Ticket Structure

Change the parking ticket structure. Have a ticketing structure that will penalize the repeat offender and not affect the guests of the Village.

Start with a warning ticket, then the first three parking tickets a person receives will be the standard $26, the fourth and all subsequent tickets, during that season (Nov. To April) will be $100 or more (Town of Vail Council does have the authority to increase the parking fines in the Village).

Access to the Village Commercial Core

There are several access points into the Village, only one of which is suitable for delivery traffic entry. While we found that most delivery vehicles do enter the Village through CheckPoint Charlie, many other vehicles enter from the other three access points to the Village, frequently against traffic. In reviewing traffic patterns, traffic flow, and entry access points to the Village, we discovered there might be some opportunity to further limit access to the Village for all types of vehicles. By limiting vehicle entry access to one or two enforceable points in the Village, the overall traffic volume could be reduced, thus reducing the impact of delivery vehicles.

Changes are easily instituted and are enforceable. Should reduce traffic in the Village significantly. If instituted in conjunction with improved signage, adjusted delivery hours and better enforcement would have impact on overall sight and noise pollution caused by vehicles in the Village.

Hours of Delivery

One of the issues that we believe could have a significant impact with vehicle density and dwell time in the village that would not require intensive capital investment would be restructuring the way in which the town vendors are allowed to deliver goods to individual businesses. While many of the restaurant owners in town allow delivery personnel unsupervised access to their place of business to make deliveries, or have someone available in the early morning hours to receive goods, some restaurants/bars/hotels do not allow this to happen. This causes some vendors to remain in Vail as late as 11:00AM to 1:00PM to service their customers. This equates to a significant increase in dwell time and cost as well as additional noise and sight pollution.

Earlier delivery of goods could remove the majority of larger delivery vehicles from the village during "guest" hours. This process would require cooperation and coordination between vendors and restaurants. This approach would be most effective if instituted in conjunction with improved signage and some changes in access and traffic flow in the Village. Stricter limitations could be put on Village access if delivery personnel could complete deliveries to all establishments before 7AM.

Other Factors

While delivery trucks do create a sight and noise pollution issue as well as an inconvenience in the Village, the ancillary issues should not be minimized as contributing factors. We believe they warrant further analysis.

Some of these issues include:

- Automobiles in the Village
  - Working people (remodel and remove = construction)
  - Residents
  - Business owners
- Enforcement
- Snowplows
- Small Package Delivery
  - UPS
  - USPS
  - Federal Express
  - Newspapers

Section 5 – Short-Term Analysis and Section 6 - Recommendations detail the entirety of these recommendations. Before any or in conjunction with the consideration of any major capital expenditure, these solutions should be implemented for at least one season. The estimated cost implementing all of these suggestions will range in $250,000 to $1,000,000 and should impact the total traffic in the village during visitor hours by 40-60%.

Longer Term - Construction, Warehousing and Delivery System

Over 250 scenarios were examined (see appendix E) to determine what combination of warehousing and delivery options might be the most feasible and productive in terms of both logistics and cost in removing vehicle traffic from the Village. While many of the scenarios had attractive traits, no one scenario was perfect. It is evident however, that a combination of some of the features of several of the scenarios could reduce the total vehicle volume in the Village by as much as 95%.

These include:

- Addition of several delivery doors and a delivery dock at the Land Exchange building site. To effectively service at least 1/3 to 1/2 of the Village commercial core, 6-10 doors would be required.
- Additionally, some heated sidewalks into the village, which could accommodate pallet jack size pull carts, as well as some traffic management along Vail Road would be required.
- Construction of some underground delivery tunnels with street level freight elevators under Bridge Street and Gore Creek Drive to facilitate loading and delivery at the Land Exchange site.
- Construction of a delivery dock and 4-8 delivery doors at or near the P3&J site

- Consideration of additional storage requirements per retail square foot for businesses in the village
- The consideration of a delivery dock to accommodate large and small trucks at all newly developed and redeveloped sites within the Village.

There are several examples of how and why these options could be done on a cost - effective basis and have a major impact (incremental) on the vehicle traffic in the Village Core in the attached study. There are also discussions on opportunities we believe make less sense from both an economic and vehicle impact.

APPENDIX R

West Vail Interchange

ALTERNATIVES ANALYSIS

Problem Definition and Existing Conditions
Alternative Solutions Analysis

Prepared for:

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List of Figures & Tables

Introduction

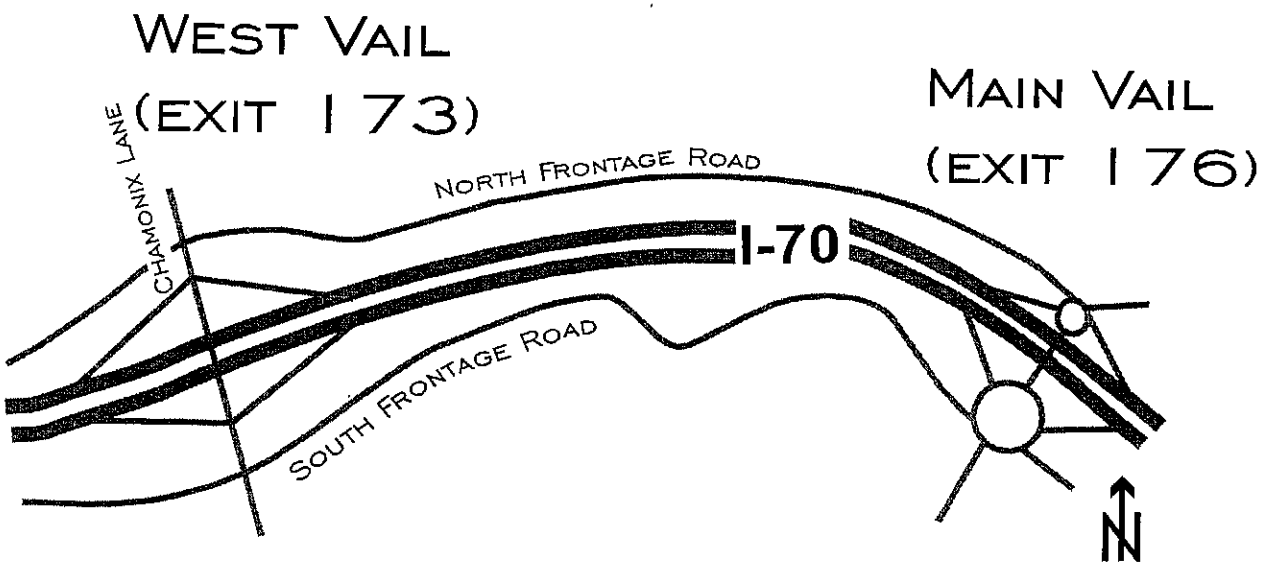
In March of 1996 the Town of Vail conducted a town survey asking citizens to identify and rank existing problems within the Vail Valley. The survey returns indicated that poor traffic conditions at the West Vail Interchange as the number one perceived problem in the Vail Valley.

MK Centennial was hired to work with Town of Vail staff to perform a technical analysis of the alternative interchange solutions and to conduct a public involvement process to achieve informed public consent for proceeding forward with the selected alternative.

Existing Conditions

The West Vail interchange provides access to I-70 from both the north and south frontage roads as well as Chamonix Lane in West Vail, see figure 1. Both the north and south intersections at the interchange are stop sign controlled with single lane entrances from all directions.

Figure 1



The interchange experiences significant congestion and delays throughout the entire day particularly during the height of the winter/summer tourist seasons. The north side of the interchange experiences total entering volumes for both the frontage road and the ramps in excess of 1400 vehicles during the winter AM peak hour and 2300 vehicles during the winter PM peak hour. The south side of the interchange experiences total entering

APPENDIX S

Feasibility Study

I-70/CHAMONIX ROAD

November, 1996

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CONTENTS

Feasibility Study

I-70/CHAMONIX ROAD

SUMMARY

Congestion at the interchange of Interstate Highway 70 and Chamonix Road will be nearly eliminated when a pair of modern roundabouts on both sides of the freeway are built next year. The Town will not need to widen the undercrossing.

The interchange will operate at Level of Service A with present base flows. It will have ample capacity to operate at Levels of Service B and C even if present flows increase by more than fifty percent. Crash frequency and severity are expected to decrease following construction of the project.

ROUNDABOUTS AT WEST VAIL

The Town of Vail built North America's first modern roundabout interchange at Main Vail (I-70/Vail Road) in 1995, thus nearly eliminating traffic congestion at what had been the Vail Valley's most heavily impacted interchange. Following a series of meetings with residents over the summer of 1996, the Town decided to convert West Vail (I-70/Chamonix Road) into a modern roundabout interchange. Construction is expected to be completed in 1997. The design and analysis contained in this report were made available to the Town prior to completion of this report, and the Town's decision to proceed with the project was based partly on this information.

West Vail is now the most heavily impacted interchange in the Vail Valley. With flows approaching capacity much of the time, the interchange is subject to unacceptable delay when ~~special events cause~~ surges in traffic demand. At the closely spaced ramp and frontage road intersections, which are regulated by STOP signs, drivers are sometimes confused as to who should stop and who has the right of way.

PROJECT DESCRIPTION

At West Vail two 150-foot-diameter 6-leg roundabouts will be built (see Appendix A). All entries to both roundabouts will have two lanes, with two exceptions: on both roundabouts the southbound Chamonix Road entries will have only one lane.

The circulatory roadways will be 30 feet wide through both roundabouts, with one exception. In front of the 34-foot-wide westbound South Frontage Road entry to the south roundabout, the circulatory roadway will be 34 feet wide. Both roundabouts are designed to accommodate a 65-foot-long tractor and semitrailer.

Visibility limits to vegetation and signs are given in the drawing of Appendix A titled, "Clear View Areas." Within the central islands the outer 30.5-foot-wide margins will be kept clear of tall objects to provide adequate forward visibility, but a central area 29 feet in diameter may be used for landscaping or public art of any desired height.

Splitter islands will be notched to allow pedestrian refuges. Following modern guidelines, crosswalks will not be marked. Walkways will be designed where necessary as part of the landscape plan to align with the pedestrian refuges in the splitter islands. A six-foot-wide walk will follow the west side of Chamonix Road. Along the east side of Chamonix Road a 10-foot-wide bike road will be provided for cyclists and pedestrians. Behind the row of bridge columns the bike road will widen to 12 feet. It will link a 10-foot-wide bike road to be built along the north side of North Frontage Road with a pair of bike lanes striped along the south side of South Frontage Road. Where the bike lanes of South Frontage Road follow alongside the south roundabout, they will be separated from the roundabout by a six-inch curb. Bicyclists and pedestrians will cross the south leg of Chamonix Road south of the splitter island.

Since there is barely room now for both the ramps and the frontage road between the freeway and Gore Creek, space for a new 150-foot-diameter roundabout must be developed by building large structures. Space for the ramps

to cut into the side slopes of the freeway will be provided by use of retaining walls. A wider bridge will permit the south side of the roundabout to span Gore Creek.

TRAFFIC PERFORMANCE

The performance of the roundabouts was estimated using the computer application RODEL. (See Appendix D for an explanation of RODEL.) RODEL estimates average delay in minutes per vehicle. By use of a spreadsheet, RODEL estimates were converted to average delay in seconds per vehicle and to the corresponding levels of service (see Appendix E). The *Highway Capacity Manual* relates levels of service to average delay for the whole intersection according to the following table .

LEVEL OF SERVICE FROM AVERAGE STOPPED DELAY AT INTERSECTION

Taken from Table 9-1 of the *Highway Capacity Manual*

STOPPED DELAY (SEC/VEH)	LEVEL OF SERVICE
d<=5	A
5<d<=15	B
15<d<=25	C
25<d<=40	D
40<d<=60	E
60<d	F

Both roundabouts will operate at Level of Service A with present traffic. The roundabouts were designed to allow a traffic increase of at least fifty percent because it is thought that some longevity will be necessary to justify the substantial investment required for this project. The improved capacity will

accommodate traffic surges of an unknown amount, perhaps fifty percent or more, which presently occur at various times each year.

The design objective of allowing a fifty percent increase in existing flows will be exceeded. The following percent increases in existing traffic will be possible without exceeding average stopped delay of 30 seconds per vehicle on any leg (a measure of practical capacity), estimated at the 85th percentile.

ROUNDABOUT	A.M.	P.M.
West Vail North	146%	56%
West Vail South	67%	56%

With the percent increases in traffic given above, both roundabouts will operate at Level of Service B in the morning peak hour and at Level of Service C in the evening peak hour. Levels of service are presented in the table below.

	AVERAGE DELAY (Seconds Per Vehicle)				LEVEL OF SERVICE			
	North R.		South R.		North R.		South R.	
TRAFFIC DEMAND	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
100% of Base Flows*	2.5	3.9	3.4	3.8	A	A	A	A
Increased Base Flows**	11.5	23.4	7.6	16.4	B	C	B	C

* "Base Flows" in this report refers to design flows developed by the Town of Vail in the summer of 1995.

** "Increased Base Flows" refers to 100% of base flows plus the percent increases of the first table given above.

SAFETY

Roger D. Gilpin, of the Colorado Department of Transportation, prepared a report of all crashes at both the Main Vail and West Vail interchanges with Interstate Highway 70 over the three-year period of 1991-93. Appendix C contains the portion of his report that pertains to West Vail.

Fifty-six crashes were reported at the west Vail interchange over the three-year period. Of these crashes, 40 were intersectional. The remaining 16 crashes would not be affected by the modern roundabouts proposed to replace the existing ramp and frontage road intersections.

At the two Chamonix Road intersections which will be replaced by the north roundabout 17 crashes were reported in the study period. At the two intersections which will be replaced by the south roundabout 23 crashes were reported during the study period.

Seventy percent of the 40 intersectional crashes (28 crashes) were rear-end crashes, many of them involving vehicles sliding on ice into stopped vehicles. The roundabouts will not do anything to prevent icy conditions, but they will greatly reduce the number of vehicles stopped in queue. The potential for crashes between vehicles which are stopped and vehicles behind them which can not stop will be reduced as the roundabouts reduce queuing.

During the study period there was one pedestrian crash. There were no motorcycle crashes and no bicycle crashes. Only three of the 40 crashes involved injuries. Thirty-seven were property-damage-only crashes.

It is estimated that the safety performance of modern roundabout improvements to West Vail will be similar to the safety performance of Main Vail's modern roundabouts. During the first twelve months of modern roundabout service, from October 1, 1995 to September 30, 1996, total crashes at Main Vail decreased by 19 percent compared to the average number of crashes per year over the three previous 12-month periods. The percentage reduction, 19 percent, is exactly equal to the percentage reduction forecast in the August 1994 feasibility study for that interchange. Injurious crashes have fallen by 75 percent, to only one in the

12 months since construction of the roundabouts from an average of four injurious crashes per year in the previous three years.

CONCLUSION

The modern roundabout interchange to be built at West Vail next year will, more than any possible alternative, impart high capacity, low delay, and safety to the cramped, six-leg stop-sign-regulated intersections on both sides of the freeway. The roundabouts will bring order and beauty to Vail's west entrance. The interchange will become a source of pride over future years to the people of Vail and to all who contribute to the project.

APPENDIX T

Feasibility Study

I-70/VAIL ROAD

August, 1994

Prepared for

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CONTENTS

FEASIBILITY STUDY

I-70/VAIL ROAD

SUMMARY

Congestion at the diamond interchange of Interstate Highway 70 and Vail Road could be corrected by constructing a pair of modern roundabouts at the ramp and frontage road intersections. The project would reduce accidents and enhance the interchange's appearance. The Town would not need to acquire right of way or to widen the undercrossing.

The interchange would have ample capacity to operate at levels of service A and B even if existing flows increase by fifty percent. Accidents would decrease by about 19 percent following construction of the project.

ROUNDABOUTS AT MAIN VAIL

The diamond interchange of Interstate Highway 70 and Vail Road in Vail, Colorado, often called Main Vail, is subject to long delays. During peak traffic demand periods traffic wardens at the intersections north and south of the freeway direct traffic to relieve congestion. A proposal to install traffic signals was rejected by the Town of Vail. Yet the quality of life in the Town is threatened by worsening traffic congestion at this interchange and at the interchange of I-70 and Chamonix Road, known as West Vail.

The Town has commissioned this study of the feasibility of using modern roundabouts to solve the problem. Unlike nonconforming traffic circles, modern roundabouts conform to modern roundabouts guidelines. (See Appendix B for a one-page comparison of the two types of circular intersections.) Since 1990 modern roundabouts have been installed in about a dozen sites in the United States, including many locations in Florida, three in Nevada, two in California, and two in Maryland. All are success stories, reducing delay and accidents.

In the United Kingdom almost all freeway-to-street interchanges are based on the modern roundabout. Australia, Norway, Sweden, and France also have modern roundabout interchanges. Modern roundabout inter-

changes have been proposed in California. In Maryland one has been approved by the Federal Highway Administration.

PROJECT DESCRIPTION

At Main Vail two roundabouts would be built (see Appendix A). The north roundabout would have an inscribed circle diameter (outer diameter) of 120 feet. It would have a raindrop type of central island, which would prevent traffic from turning left onto the off ramp. It would provide high capacity continuous flow for traffic on Vail Road coming from under the bridge, since this traffic would not have to yield the right of way to circulating traffic.

All entries to the north roundabout would have two lanes, with 28 feet between curbs. The circulatory roadway would also be 28 feet wide from the outer curb to an inner nine-foot wide truck apron. The three-inch high concrete truck apron would discourage most vehicles from using it, deflecting and slowing entering vehicles, but the rear wheels of long trucks would easily mount it.

Both roundabouts are designed to accommodate a 65-foot long tractor and semitrailer. Long trucks would be able to make 60-foot radius U-turns from off ramps to frontage roads and from frontage roads to on ramps by beginning their turns in the left lane.

The connection from the north roundabout to Spraddle Creek Road is designed to accommodate a school bus, fire truck, or garbage truck. Right turns from the roundabout to Spraddle Creek Road would have a maximum turning radius of 50 feet. Turns by long vehicles would end next to the road's north curb.

The south roundabout would have a 200-foot inscribed circle diameter. Its central island would be 128 feet in diameter. The outer 39-foot wide margin of the central island would be kept clear of tall objects to provide adequate forward visibility, but a central area 50 feet in diameter could be used for landscaping or public art of any desired height.

To provide ample capacity, all but one entry to the south roundabout would have two lanes. The westbound South Frontage Road entry would have four lanes. The eastbound off ramp would have a right turn bypass lane in addition to its two-lane entry to the roundabout. The circulatory roadway

would be 36 feet wide through most of the roundabout and 48 feet wide in front of the four-lane entry.

Splitter islands would be notched to allow pedestrian refuges 10 feet wide. Following modern guidelines, crosswalks would not be marked. Walkways would be designed where necessary as part of the landscape plan to align with the pedestrian refuges in the splitter islands.

TRAFFIC PERFORMANCE

A number of alternative road improvements were studied by Felsberg Holt & Ullevig and presented in the *Vail Transportation Master Plan* (see Appendix D). The preferred alternative is Alternative 8, given on their page number 78. This would remove the two east ramps at Vail Road and direct traffic needing this connection to ramps east of Vail Road in the Booth Falls area.

The study determined that the present volume/capacity ratio at the intersection of Vail Road and the westbound ramps is 1.16, level of service E. At Vail Road and the eastbound ramps and South Frontage Road the present volume/capacity ratio was determined to be 0.94, also level of service E, if traffic wardens or demand responsive traffic signals are used (see their page number 74).

The performance of modern roundabouts at the ramp and frontage road intersections with Vail Road was estimated using a computer application named Rodel. (See Appendix F for an explanation of Rodel.) Rodel estimates average delay in minutes per vehicle. By use of a little spreadsheet this was translated to average delay in seconds per vehicle and to the corresponding levels of service (see Appendix G). The *Highway Capacity Manual* relates levels of service to average delay for the whole intersection according to the table on the following page.

LEVEL OF SERVICE FROM AVERAGE STOPPED DELAY AT INTERSECTION
Taken from Table 9-1 of the
Highway Capacity Manual

STOPPED DELAY (SEC/VEH)	LEVEL OF SERVICE
d<=5	A
5<d<=15	B
15<d<=25	C
25<d<=40	D
40<d<=60	E
60<d	F

Both roundabouts would operate at level of service A with existing traffic. The roundabouts were designed to allow a traffic increase of at least fifty percent because it is thought that some longevity would be necessary to justify the substantial investment required for this project. Also, traffic surges of an unknown amount, perhaps fifty percent or more, presently occur at various times each year.

With a fifty percent increase in traffic, the north roundabout would continue to operate at level of service A, but the south roundabout would operate at level of service B. Levels of service are presented in the table below.

	AVERAGE DELAY (Seconds Per Vehicle)				LEVEL OF SERVICE			
	North R.		South R.		North R.		South R.	
TRAFFIC DEMAND	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
100% of Existing Traffic*	2.2	1.8	3.4	3.2	A	A	A	A
150% of Existing Traffic	3.0	2.8	11.8	11.5	A	A	B	B

*"Existing traffic" in this report refers to counts made on the twenty-fifth busiest ski day of the year (per Vail Associates), in March of 1990.

The design objective of allowing a fifty percent increase in existing flows will be exceeded. The following percent increases in existing traffic will be possible without exceeding average stopped delay of 30 seconds per

vehicle on any leg (a measure of practical capacity), estimated at the 85th percentile.

ROUNDABOUT	A.M.	P.M.
Main Vail North	117%	65%
Main Vail South	52%	56%

SAFETY

In those countries that have adopted the modern roundabout as a standard type of intersection, the roundabout is generally regarded as the safest type of intersection on earth. Typically, accidents at roundabouts are around 55 percent less than at cross intersections of similar flows regulated by traffic signals. Serious injury and fatal accidents are reduced by more than property damage only accidents according to reports from all countries, typically by 80 to 90 percent when a signalized intersection is converted to a modern roundabout.

But all-way STOP sign regulated intersections, as at Vail's four-way, also have an excellent safety reputation, at least in general. Two-way STOP sign regulated intersections, like the two ramp intersections in this project, generally are not so safe as all-way stops. At Vail Road the reverse is true. The two-way STOP sign regulated intersections experience fewer accidents than the four-way intersection of Vail Road and South Frontage Road, perhaps because of the four-way's heavier flows.

The accident history of modern roundabouts in the United States has been similar to the success stories of roundabouts in foreign countries. Accidents have fallen 44 percent for the first eight months of operation of the Long Beach roundabout in California. This is in contrast to the same eight months of the previous three years, when the circular intersection operated as a nonconforming traffic circle. In Santa Barbara, California, the Five Points roundabout replaced a five-way STOP sign regulated intersection. Accidents previously averaged about four per year. During the first six months of roundabout operation, there were three reported accidents, all at night (the roundabout has poor street lighting). There have not been any accidents reported in the last 14 months. The first modern American roundabouts, built in Las Vegas in 1990, have very low flows. Nevertheless, it is comforting to note that no accidents have been reported at them. As far as this author knows, there has never been a bicycle or pedestrian accident at a modern American roundabout, but there have been two motorcycle accidents.

Roger D. Gilpin, of the Colorado Department of Transportation, prepared a report of all accidents at both the Main Vail and West Vail interchanges with Interstate Highway 70 over the three-year period of 1991-93. Appendix E contains the portion of his report that pertains to Main Vail.

Eighty-seven accidents were reported at this interchange over the three-year period. Of these, 62 were intersectional. The remaining 25 accidents would not be affected by the modern roundabouts proposed to replace the existing ramp and frontage road intersections.

At the intersection of the westbound ramps and Vail Road, which would be replaced by the north roundabout, 14 accidents were reported in the study period. At the two Vail Road intersections to be replaced by the south roundabout, the eastbound ramp and South Frontage Road intersections, 48 accidents were reported during the study period.

A large proportion of the 62 intersectional accidents, 27 accidents, were rear-end accidents, many of them involving vehicles sliding on ice into stopped vehicles. The roundabouts would not do anything to prevent icy conditions, but they would greatly reduce the number of vehicles stopped in queue. The potential for accidents between vehicles which are stopped and vehicles behind them which can not stop would be reduced as the roundabouts reduce queuing.

During the study period there were no pedestrian accidents, no motorcycle accidents, and two bicycle accidents. Modern roundabouts have an excellent reputation for reducing accidents involving most types of road users--trucks, cars, buses, and pedestrians--but not motorcycles and bicycles. Special bypass roads and lanes for bicycles have not been shown to reduce bicycle accidents at roundabouts. Based on British studies of similar roundabouts, it is estimated that the number of bicycle accidents would rise about 50 percent, perhaps by one accident in three years. It is estimated that all other types of accidents would decrease, to a total of around 50 accidents in three years, for a net reduction of about 12 accidents. This would be a 19 percent reduction in accidents following construction of the modern roundabout interchange.

SPECIAL ISSUES

Special issues applicable to modern roundabouts in Vail are considered in Appendix C, "Vail's First Roundabouts." Among other issues discussed in

this appendix are the following: snow and ice, tourists unfamiliar with roundabouts, lighting, signing, maintenance, trucks, buses, bicycles, pedestrians, flow fluctuations, potential traffic growth, landscaping, and emergency vehicles. The roundabouts will give good service with regard to all of these issues.

CONCLUSION

A modern roundabout interchange to replace the diamond interchange of Interstate Highway 70 and Vail Road is feasible. Unlike alternatives previously proposed, it would allow all present traffic movements to continue using the interchange. It would provide an excellent level of service, reduce accidents, and create a beautiful entry to Vail.

APPENDIX U VAIL TRANSPORTATION MASTER PLAN - 1993

VAIL TRANSPORTATION MASTER PLAN

Prepared for:

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In Association with
TDA Colorado, Inc.

FHU Reference No. 89-091
January, 1993

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EXECUTIVE SUMMARY

The purpose of this Executive Summary of the Vail Transportation Master Plan is to consolidate all of the transportation plan recommendations into a single document for easy access and reference. The Transportation Master Plan Final Report documents the entire planning process including data collection, public input, alternatives analysis, and the rationale behind each recommendation. The Transportation Master Plan Final Report should, therefore, be consulted for a full explanation and clarification of the recommendations summarized herein.

The Transportation Master Plan recommendations are summarized into five major categories and include both short-term and long-term actions as listed below. In general, short-term actions should be implemented in a 1 to 5 year time frame while long-term actions may require anywhere from 6 to 20 years to fully implement.

VAIL VILLAGE DELIVERIES

SHORT-TERM RECOMMENDATIONS

1. Modify policies at Checkpoint Charlie.

   - o Eliminate 30% of the traffic (cars) accessing the Core for small deliveries and minor tasks through use of the 1-1/2 hours of free parking in the Vail Parking Structure for this type of need.

     - Designate a desirable area of the Vail Parking Structure for short term parking.

     - Enforcement of this issue would be key to its success. Educate the users that the Town is providing convenient short term spots in the Vail Parking Structure, however, abuse of these spots will result in strict enforcement.

   - o Develop written policies concerning vehicles requiring access to the Village including:

     - Cars without large amounts of goods to be delivered will <u>not</u> be allowed in the Village or in the loading zones. Use of the parking structure would be required for these trips.

     - Trucks and cars that are making deliveries of large quantities of goods will be allowed access to the Village loading zones and will be given priority for these zones. Time will be limited to only what is needed to load or unload these goods. In addition, a permitting process could be established to access these zones.

     - The towing of vehicles for violation of loading zone restrictions will be strictly enforced.

- Construction work requiring parking will need to be planned and approved in advance by the Town of Vail's Community Development, Public Works, Fire, and Police Departments.

- Service vehicles will be allowed limited access to some loading zones for emergency work only. Non-emergency service work should be scheduled for non-peak traffic hours in the Village. All service vehicles will need to contact the Police Department for a parking permit for both the emergency and non-emergency work.

- Loading zone restrictions may be lifted after 6:00 P.M. The loading zones on Gore Creek Drive, however, will be posted as a "No Parking Area" in the non-loading hours.

o Investigate the possibility of locating "drop boxes" in designated places for overnight couriers.

2. Implement the following actions and procedures.

o Eliminate loading zones on Bridge Street and Hanson Ranch Road near Mill Creek only.

o Allow only morning use of the Gore Creek Drive loading area in the vicinity of the Lodge Promenade (winter: 9:00 A.M. to 2:00 P.M. and summer: 8:00 A.M. to 11:00 A.M.).

o Convert the 15 minute parking areas on the north side of the Christiania lot and adjacent to Riva Ridge North to delivery and service vehicles only with no large delivery trucks allowed except for over flow.

o Install "One Way/Do Not Enter" signs further north on Willow Bridge Road.

o Convert the 15 minute parking north of Willow Bridge to truck only.

3. Authorize capital improvements in an attempt to reduce the 33% "lost guest" number and those who enter the Village the wrong way.

o Relocate Checkpoint Charlie south to the vicinity of Willow Road.

o Construct landscaped medians south on Vail Road from the Frontage Road.

o Further evaluate informational and directional signing clarifications and modify as needed.

o Construct entry feature monument signs, at all entry points to pedestrian areas.

o Prior to construction of monument signs provide and install a standard sign which warns motorists with the wording "Pedestrian Zone Automobiles Restricted" at all pedestrian zone entry points.

4. Review the information signs and traffic control procedures at the Main Vail I-70 exit ramps and at the 4-way stop intersection.

   o Install portable, variable message signs at the 4-way stop intersection (Vail Road median) and the I-70 exit ramps providing clear messages to drivers. Messages can be updated based on varying demands throughout the day.

   o Develop action policies for the following groups; (1) CSO's in Village, (2) 4-way traffic controllers, (3) checkpoint personnel, (4) parking structure operations and other Town employees. These action policies should relate to enforcement, who is allowed access to the Village, and vehicle towing procedures. Evaluate disallowing certain traffic movements during peak periods based on traffic circumstances and demands.

5. Work with Vail Associates in designating allowed skier drop-off areas. This would be an attempt to recognize the problem versus banning all skier drop-offs.

LONG-TERM RECOMMENDATIONS

6. Christiania lot.

   o Resolve the land ownership issues.

   o Evaluate in greater detail:

      - Technological options of hand cart deliveries, small vehicles for deliveries and storage lockers.

      - Operational characteristics and regulations for hand carts and small vehicles along with liability issues, storage problems, and financing options.

      - Evaluate options to make the site both aesthetically compatible with the neighborhood and operational for the truck delivery functions.

7. Additional sites to be evaluated:

   o South of Lodge at Vail

      - Resolve land ownership and legal issues.
      - Evaluate compatibility with International Wing development plans.
      - Address Vail Associates concerns
      - Address United States Forest Service concerns.

   o Golden Peak

      - Resolve land ownership issues.
      - Address Vail Associates concerns.

   o Other Location Options

PARKING

SHORT-TERM RECOMMENDATIONS

1. Actively encourage private sector involvement in implementing Travel Demand Management techniques such as:

   - Price discounts for group arrivals by multi-occupant vehicles.
   - Enhanced loading facilities for group arrivals convenient to mountain access points.

2. Retain the existing formal, public parking supply of 2,750 spaces.

3. Annually review and adjust parking fees:

   - Parking structure hourly rates.
   - Premium parking program (Gold Pass) fees.
   - Discount parking program (Blue Pass and coupons) fees.
   - Ford Park hourly rates.

4. Annually review and adjust parking controls and restrictions:

   - Valid time periods for various premium and discount programs.
   - Parking locations reserved for various user groups.
   - Availability of discounts to various user groups.

LONG-TERM RECOMMENDATIONS

5. Evaluate sites and land ownership issues for potential future expansion of the formal, public parking supply including:

   - Ford Park parking lot
   - West Day lot
   - North Day lot
   - Expansion of Lionshead parking structure

6. Evaluate remote, out-lying parking potentials including site availability and transit cost impacts to link remote parking areas with the Town.

7. Evaluate replacement sites for parking over-sized vehicles if the existing parking area adjacent to the Lionshead parking structure is redeveloped. Potential sites include:

   - West Vail (Safeway area)
   - Vail Mountain School parking lot
   - Golf course parking lot
   - Ford Park parking lot
   - Athletic field parking lot
   - Red Sandstone School parking lot

IN-TOWN SHUTTLE

SHORT-TERM RECOMMENDATIONS

1. Develop performance specifications for a high-capacity bus vehicle and submit a Solicitation of Interest to potential manufacturers and bidders.

2. Implement a high-capacity bus vehicle operation along the existing In-Town Shuttle route.

3. Relocate the turnaround at Golden Peak to separate auto/bus conflicts.

4. Further evaluate relocating the west turnaround of the In-Town Shuttle to East Lionshead Circle to remove the special shuttle vehicle from mixed traffic operations on the South Frontage Road.

LONG-TERM RECOMMENDATIONS

5. Conduct a schematic design level technical study of a potential Village to Lionshead people mover to address:

   - New technologies and operating alternatives.
   - Identify alignment location options and station locations.
   - Define right-of-way and guideway envelopes for long-term preservation.

6. Evaluate the potential extension of the In-Town shuttle system into the Lionshead area in conjunction with future major redevelopment.

OUTLYING BUS SYSTEM

SHORT-TERM RECOMMENDATIONS

1. Combine the West Vail routes as opposing loop services utilizing the North and South Frontage Roads operating at 15-minute headways.

2. Continue the Sandstone route at 20 minute headways during the winter season.

3. Reroute the East Vail route along Main Gore Drive to Bighorn Road.

4. Provide separate routes for East Vail (15 minute headways) and the golf course (30 minute headways) throughout the day and combine into one route after the evening peak period operating at 30 minute headways.

5. Provide 15 minute headways between Ford Park and the Transportation Center on Fridays, Saturdays, Sundays, and holidays.

LONG-TERM RECOMMENDATIONS

6. Expand service to Chamonix Lane and Lions Ridge Loop pending future improvements to these roadways to allow safe and efficient bus operations.

7. The Town of Vail should continue to work with other public agencies and private sector beneficiaries to define and operate Down Valley transit services.

I-70 ACCESS/LOCAL CIRCULATION

SHORT-TERM RECOMMENDATIONS

1. Construct an I-70 underpass in the vicinity of Simba Run connecting the North and South Frontage Roads.

2. Upgrade the West Vail interchange and Frontage Road complex by implementing the following improvements:

   - Realign the west leg of the North Frontage Road between Wendy's and the Texaco service station to intersect Chamonix Road north of the existing intersection.

   - Realign the westbound I-70 on-ramp to connect with the east leg of the North Frontage Road.

   - Realign the eastbound I-70 on-ramp such that access to I-70 is via the South Frontage Road.

   - Add exclusive turn lanes for major left and right turning volumes at all intersections.

3. Conduct a controlled test at the Main Vail interchange to evaluate closing the east ramps and the traffic diversion to the East Vail interchange.

LONG-TERM RECOMMENDATIONS

4. Provide a connector roadway between the North Frontage Road and Chamonix Road in conjunction with future development in the vicinity of Vail Das Schone in West Vail.

5. Evaluate improvement alternatives at the Main Vail interchange including:

   - Relocating the east ramps to the Booth Falls underpass.

   - Extending the North Frontage Road east and under I-70 to connect with Vail Valley Drive immediately east of the Transportation Center.

   - Constructing new ramps to I-70 in the vicinity of the VA shops.

6. Monitor high volume intersections and provide demand responsive traffic control. The Town of Vail's preferred control method is to provide manual control with designated traffic control personnel.

7. Depress the South Frontage Road at Vail Valley Drive immediately east of the Transportation Center and provide side-street, stop-sign control on Vail Valley Drive at the South Frontage Road to allow through traffic on the Frontage Road to proceed without stopping.

8. Proceed with the long-term phased implementation of improvements to the Frontage Road system including:

   - Implementation of on-street, 6-foot wide bike lanes along the entire Frontage Road system throughout the Town.

   - Implementation of exclusive left turn lanes at 31 intersections including the provision of a continuous center turn lane along approximately 4.5 miles of the Frontage Road system.

   - Provision of landscaping at major intersections and points of interest.

   - Implementation of special safety improvements (e.g. guardrail, lighting, etc.) at major intersections, along non-residential roadway segments, high pedestrian activity areas, and at the ends of center medians.

9. Evaluate Vail Valley Drive as an eastbound one-way street between the South Frontage Road immediately east of the Transportation Center and a new connection with the South Frontage Road in the vicinity of Ford Park.

TRAIL SYSTEM INTERFACE

1. Proceed with the long-term, phased implementation of the Streetscape Master Plan including the separation of conflicting travel modes including:

   - Vail Valley Drive
   - West Meadow Drive
   - East Lionshead Circle
   - Relocation of Check Point Charlie
   - Willow Bridge Road Improvements

2. Proceed with the long-term, phased implementation of the Recreation Trails Master plan including detailed studies of eight key links throughout the Town:

   - Study Link 1: Stephens Park to 2154 South Frontage Road West
   - Study Link 2: West Gore Creek Circle to Matterhorn Circle/Donovan Park
   - Study Link 3: Lionshead/Vail Library to the Vista Bahn
   - Study Link 4: Vail Village to Kaotos Ranch Trail
   - Study Link 5: Circle K Bridge to Lupine Drive
   - Study Link 6: Nugget Lane to Meadow Drive
   - Study Link 7: Meadow Drive to Bighorn Park
   - Study Link 8: Vail Racquet Club to Main Gore Drive North

APPENDIX V

FEASIBILITY OF A PEOPLE MOVER SYSTEM TO REPLACE THE IN-TOWN SHUTTLE BUS ROUTE

Prepared for

TOWN OF VAIL

DEPARTMENT OF PUBLIC WORKS/TRANSPORTATION

By

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LEA, ELLIOTT, McGEAN & COMPANY

WASHINGTON, D.C.

February 16, 1987

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(Continued)

EXHIBITS

EXHIBITS

(Continued)

1.0 EXECUTIVE SUMMARY

The primary purpose of this study was to examine the feasibility of replacing the Vail In-Town Shuttle bus system by an Automated People Mover System, also referred to in the industry as an Automated Guideway Transit (AGT) System.

Representative People Mover Replacements for the Shuttle

A representative People Mover System for replacing the In-Town Shuttle has been conceptually defined and analyzed and is believed to be both technologically and physically feasible. Competitive commercially available equipment has been identified and a feasible representative alignment defined. The capital cost of such a system has been estimated to be on the order of $20 million.

Recognizing it may be necessary to minimize the capital costs for the initial installation of a people mover, study was made to identify a Starter Line which has the potential to solve the immediate congestion problem and fulfill the need for growing demand. This was done and a Starter Line defined which can carry 78 percent of the In-Town Shuttle demand, connecting the LionsHead area with the Vail Village and Transportation Center. The capital cost of the Starter Line was estimated at $15 million. This Starter Line was defined in a way that can be logically extended to the West towards Cascade Village and to the East through Golden Peak.

Based on the system requirements discussed between the Town of Vail officials and LEM, the feasibility of an AGT system was investigated. The proposed system would be elevated. Its representative alignment follows the In-Town Shuttle bus route. The major restrictions of such an alignment are the small turn radii and the narrowness of the right of way.

While there are possibilities to use portions of Gore Creek as part of the alignment, such was not studied in depth because of problems fitting in stations and the need for pedestrian access. For purposes of this feasibility analysis, the definition of a "feasible representative alignment" was considered of primary importance. Should the Town of Vail then find the project to be feasible, improvements to the alignment should be studied and defined during preliminary design when there is sufficient budget.

Physical constraints limit the number of systems that could be used in Vail. Also, it was found that the average speed of the system will be only slightly better than the bus unless passengers are allowed to carry their skis on-board the trains. Section 7.4 of this report discusses this concern and concludes that the system can be designed where skis can be safely carried on-board a fixed-guideway people mover by passengers. Another constraint on the people mover system is related to the space required to locate the columns and the stations, while maintaining road access to all the buildings alongside the alignment.

After examining these restrictions, LEM identified alternate technologies that would be applicable in Vail. Full descriptions of the systems using these technologies were prepared. A description of an operating plan was also prepared. Based on these descriptions, both capital and operation & maintenance (O&M) costs were developed.

Demand/Ridership Analysis

A detailed analysis of existing population/visitor data and bus ridership was carried out to establish the characteristics of current Shuttle demand and that which can be expected for the future. This demand was analyzed for "peak days" and "design days," terms used by Vail Associates, Inc. for planning and sizing its facilities. The peak day is essentially a factor of 1.26 times higher than a design day. The design capacity is the capacity to which a facility can be filled before crowding begins to take place.

Shuttle demand during the 1985-86 ski season was found to be 17,600 passengers on a peak day and 14,000 passengers on a design day. When Category I and II improvements are completed, ridership demand is expected to increase by 23 percent for the 1995-96 ski season and by 43 percent for the 2003-04 ski season. The 1995-96 time frame was selected for defining a design condition for the people mover system. The people mover systems, upon which feasibility has been studied, were sized to meet the 1995-96 peak period demand for a peak day. Expansion to meet the 2003-04 peak period peak day demand can be easily met by adding only three trains.

The peak period for demand on the Shuttle bus is in the late afternoon (3:30-5:30 p.m.) as skiers come from the slopes when the lifts close. Approximately 24 percent of the entire day's demand occurs then -- 4,259 riders on a peak day and 3,380 on a design day.

The morning peak is much lighter, approximately one-third the rate of the late afternoon peak.

Peak demand was analyzed to determine the following directional line capacity requirements for a peak day.

Season	Directional Line Capacity Required
1985-86	1,065
1995-96	1,310
2003-04	1,523

Review of In-Town Shuttle Operations and Service

A detailed review was made of the existing Shuttle bus operations. Our findings indicate that the system is well operated and that the quality of service on design days during the ski season is generally acceptable. However, on peak days, the service was rated by visitors as "poor" which is confirmed by the following:

- Single direction line capacity is 841 passengers/hour on a design day and 982 passengers/hour on a peak day. Therefore, while the system is capable of meeting the design day peak period demand, its capacity falls 8 percent short of meeting the peak day peak period demand.

- Average speed, a factor in quality of service, falls to 6 mph which is 30 percent slower than the uncongested average speed of 8.5 mph during off-season.

- The major limitations of the bus system were the dwell times and shared use of the road with the pedestrians. This results in low average speed and reduced vehicle productivity. Because of existing physical limitations, increasing the vehicle capacity or the number of vehicles is considered to

be only a short term solution to handling increasing demand. Tight curve radii, limited curb space and general road congestion at peak hours are the major limiting factors in making significant improvements to the In-Town Shuttle bus service.

- o Theoretically, eight additional 35-foot buses would be needed to meet the 1995-96 peak day peak period demand, assuming additional problems that cause further average speed reduction are not encountered.

Alternative Express Links to Handle Peak Demand

The source of the high afternoon peak demand has been identified as cross movements between the Village and LionsHead area. Analyses have identified that 23 percent of this demand are skiers whose first lift of the day is in one of these two areas opposite their origin. This could easily account for the morning peak; therefore, it is surmised that 77 percent of the afternoon peaks could easily be skiers who, on their last ski run of the day, end at an area opposite the area where they are overnighting or where their car is parked, or have chosen to use the Shuttle for commercial and/or eating/entertainment destinations. It is also noted that 45 percent of all Shuttle boardings are at LionsHead and Covered Bridge. All of this suggests that the peak demand, which is causing degradation of Shuttle service, might be carried by an express link connecting the two parking structures.

The possibility of using large capacity buses, operating on the Frontage Road, in express service between the two parking structures has been identified. However, the current congestion at the four-way stop is an impediment to this solution. Signalization of the four-way stop is expected to increase its level of service from condition "F" to condition "C" during the evening peak, and would remove this impediment.

Also, a simplified point-to-point express shuttle type people mover has been defined that could connect the two parking structures, with a capital cost estimated at $6 million. The feasibility of such a system rests upon (1) verification by additional data and analysis that a sufficient portion of the peak demand can be carried by such an express link and (2) that an alignment, either on Colorado DOT I-70 right-of-way or along the south side of the Frontage Road is feasible.

Financial Analyses and Feasibility

Representative People Mover Systems for replacing the In-Town Shuttle bus service are believed to be technologically and physically feasible. There will be some hard problems in fitting the system within the landscape and existing built up real estate. Therefore, feasiblity of the project essentially hinges on financial considerations. The annual cash requirements to meet the capital costs of a people mover system, at either $20 million or $15 million, has been examined and found to be within the range of the Town's ability to raise revenues. Final decision of affordability and feasibility rests with the Town's leaders in considering the availability of such revenues compared with other needs.

Alternative ways of funding such a system were briefly examined. It is LEM's conclusion that concession arrangements based totally on private investment are unlikely. The cost to the private sector would be in the range of $2.00 to $2.55 per annual visitor. It is not likely that implementation of a people mover will substantially increase the spending habits of visitors. Therefore, any benefits provided to the private sector will be judged as those which permit continued expansion of the resort and its economic growth. If the private sector were willing to commit 10 percent of said economic growth to a people mover system, the annual amount of growth in gross revenues would be on the order of $27 to $36 million. Any private concession would, therefore, be expected to require substantial subsidy from the Town of Vail.

The potential for Federal or State grants was briefly considered and discarded as a source of funding. No State grants are available and analyses suggest that the system does not meet current Federal thresholds for justifying fixed guideway transit systems. The current Administration in Washington has been reducing the Federal Budget for transit.

A more traditional approach would be to finance the construction of the system by issuing bonds. Whether this will be feasible or not depends mainly on the Town of Vail indebtedness level. Retirement of the bonds and covering the O&M costs could be done as it is now or by creating a mix of visitor taxes. Installation of a fare collection system was not considered because it impedes boarding performance, increases station size and is an inefficient means to obtain revenue

since it increases both capital and O&M costs. For example, a 25 cent fare is estimated to be required to cover these extra costs.

A financial analysis was carried out examining the potential to derive funds by increasing various local taxes (e.g. sales taxes, property taxes, lift/resort taxes). Four scenarios were postulated, two of which appear reasonable. For example, a one cent additional sales tax was found totally sufficient to fund the capital and additional O&M costs of the $15 million Starter Line People Mover System. Under another scenario a combination of tax increases, additional one cent sales tax and additional 3.88 millage points to the property tax, could completely fund the capital and additional O&M costs of the $20 million Representative People Mover replacement of the Shuttle.

Conclusions and Recommendations

As a result of this study, the following conclusions and recommendations are made.

- The people mover, as a replacement for the In-Town Shuttle is considered technically and physically feasible. Final feasibility is a financial matter which must be determined by the leaders of the Town of Vail.

- The quality of service of the existing In-Town Shuttle bus is falling below an acceptable level, particularly on peak days. Some of this problem may be solved by increasing bus size and adding buses to the route. However, demand is expected to increase to a level at which such measures will probably no longer be effective. It is recommended that the Town investigate this issue to more depth to determine precisely the limit to which service on the Shuttle can be improved.

- It is recommended that additional study of demand be carried out to determine if significant portions might be carried by an express link connecting the two parking structures.

- The four-way stop should be signalized as it would aid in decreasing traffic congestion which would improve the operation of bus services. It would also make possible a test of express bus services between the two parking structures. Previous experiments with such services are believed to have failed primarily because of congestion at the four-way stop.

- Finally and most importantly, the Town should carry out detailed financial analyses of funding the two concepts for people mover replacements of the Shuttle. These analyses should include the following:

  A. Development of a Project Implementation Plan upon which financial analyses can be carried out.

  B. Study of the Town's current level of indebtedness and potential for increasing it without raising taxes.

  C. Study of potential revenues from various tax increases and how such will allow an increase in the Town's indebtedness level.

  D. Examination of other needs of the Town that will require raising additional revenues and a prioritization of these needs versus the people mover project.

  E. Development of a financial plan, including some alternatives for funding the people mover project, assuming that the Town assesses the project to be feasible.