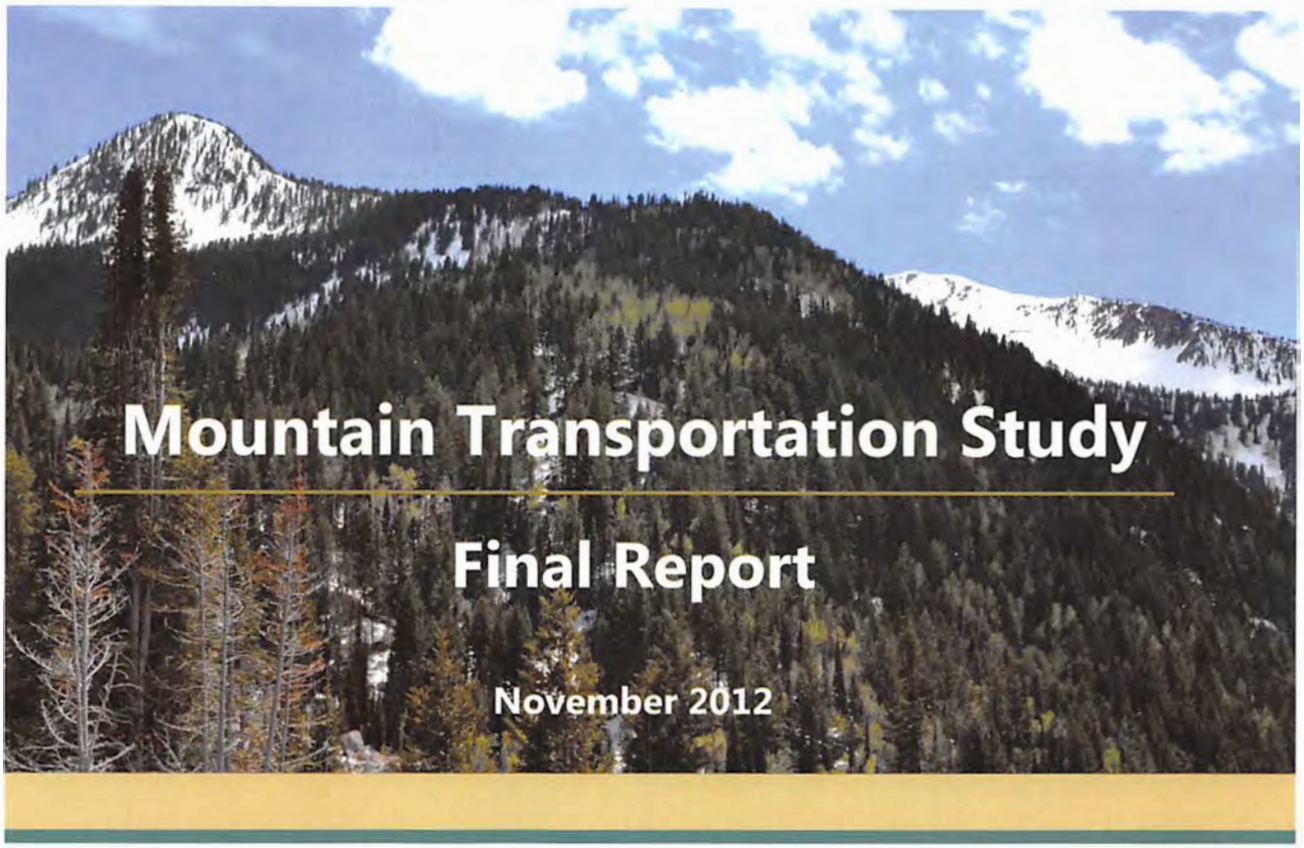
MOUNTAIN
Transportation Study



Mountain Transportation Study

Final Report

November 2012

Prepared for: Salt Lake County
Prepared by: Fehr & Peers | Lochner

SALT LAKE COUNTY

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Appendices

Appendix A: Stakeholder Involvement
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LIST OF ACRONYMS

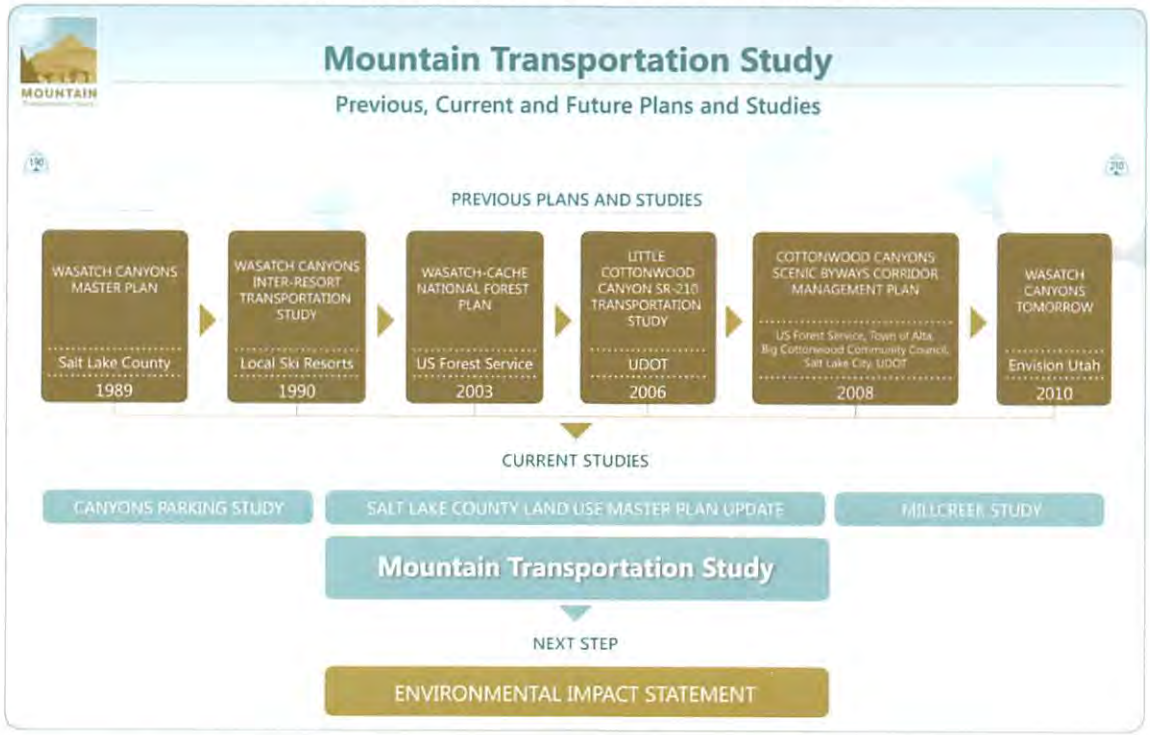
AASHTO	American Association of State Highway and Transportation Officials
BRT	Bus Rapid Transit
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CO_2	Carbon Dioxide
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GOPB	Governor's Office of Planning and Budget
HOV	High-Occupancy Vehicle
ITS	Intelligent Transportation Systems
JTW	Journey to Work
MAP-21	Moving Ahead for Progress in the 21st Century
mph	Miles per hour
NEPA	National Environmental Policy Act
NOI	Notice of Intent
RHCA	Riparian Habitat Conservation Area
ROD	Record of Decision
TMDL	Total Maximum Daily Load
UDOT	Utah Department of Transportation
USDOT	United States Department of Transportation
USFS	United States Forest Service
UTA	Utah Transit Authority
WFRC	Wasatch Front Regional Council

EXECUTIVE SUMMARY

Salt Lake County and its study partners—including the Utah Department of Transportation (UDOT), the Utah Transit Authority (UTA), the United States Forest Service (USFS), Salt Lake City, and the Wasatch Front Regional Council (WFRC)—have completed the Mountain Transportation Study. The Mountain Transportation Study was intended to bring together a diverse stakeholder group; develop consent on key topics, a deeper understanding of transportation to and within the Cottonwood Canyons, and a range of transportation solutions; and provide recommendations for next steps (see Figure ES-1). This study provides the following recommendations:

- **Consider potential short-term transportation projects.**
- **Utilize a tiered Environmental Impact Statement (EIS) process for the next effort.**
- **Consider the Federal Transit Administration (FTA) as the lead agency with UTA, USFS, the Federal Highway Administration (FHWA), and potentially other agencies such as the U.S. Environmental Protection Agency (EPA) as joint leads.**
- **Evaluate regional trips during purpose and need development.**
- **As part of the Tier 1 EIS, include additional analyses of land use, watershed, multiple uses, and economic opportunities.**

Figure ES-1: Previous, Current and Future Studies

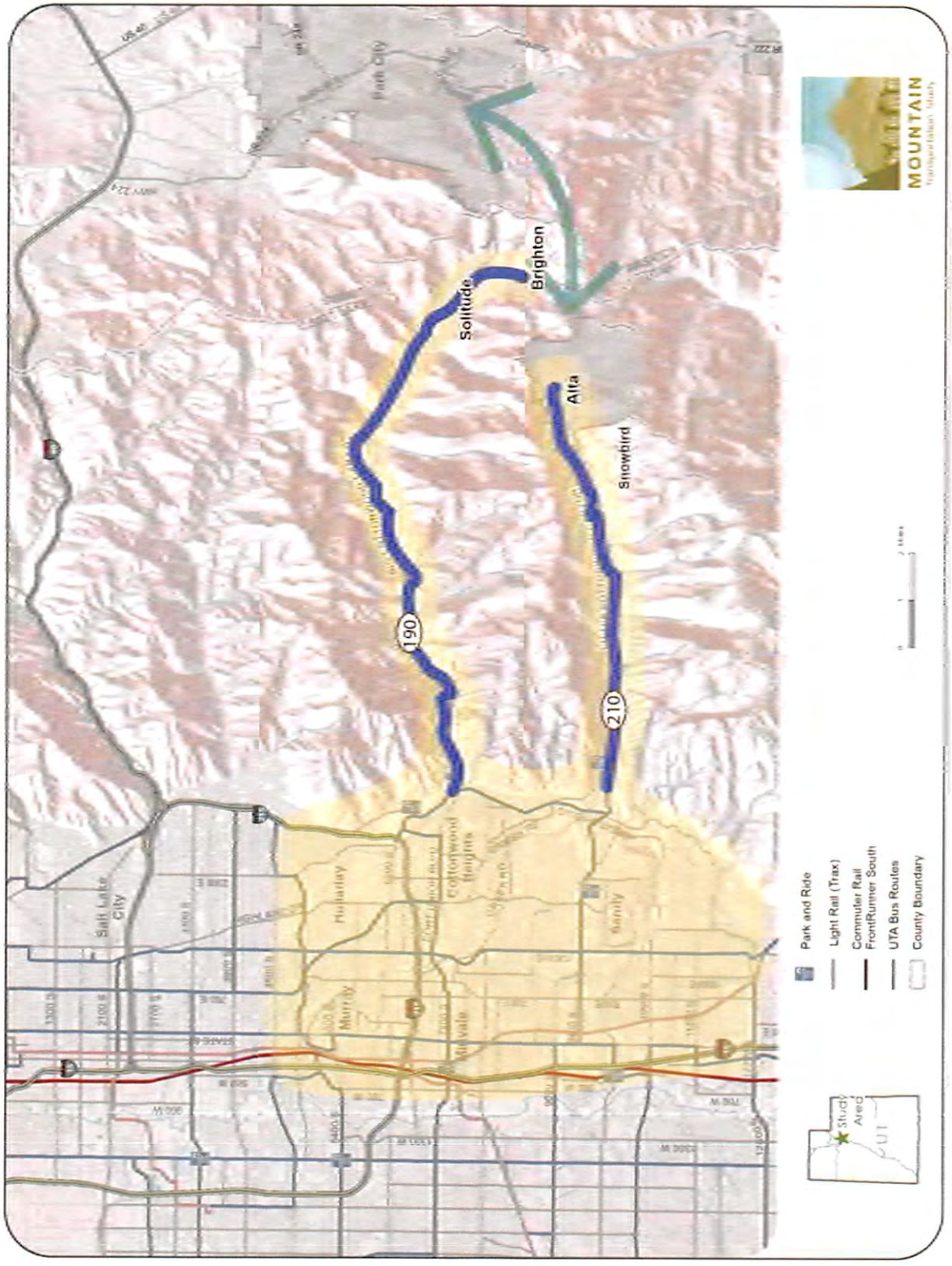


The study area, shown in Figure ES-2, includes both Big and Little Cottonwood Canyons in Utah's Wasatch Mountains, home to world-class winter and summer recreation opportunities, as well as a regionally significant municipal watershed that supplies drinking water to 500,000 people residing in the fast-growing Wasatch Front. The Wasatch Mountains are vital to the Wasatch Front metropolitan area for many reasons—recreation, drinking water supply, watershed, views, and as a respite from urban life to name a few. The mountains' proximity to so many people makes the Wasatch Front unique, yet also makes a project to address transportation complicated and difficult. Such a project must maintain the delicate balance of preserving the mountains' unique characteristics for future generations while also providing current residents and visitors with reasonable access options through which to enjoy the mountains.

The Mountain Transportation Study was designed to transition, or refine, the visioning process completed for the *Wasatch Canyons Tomorrow Study* in 2010 into more concrete recommendations. To that end, the Mountain Transportation Study produced the following results:

1. A successful stakeholder process wherein each party was engaged, positive, and genuinely cared about the future of the Wasatch Mountains
2. A purpose and need framework for transportation, which is a vital step in the larger National Environmental Policy Act (NEPA) context
3. Refined costs, capacities, and travel times of transportation modes that are used in similar settings around the world
4. A list of short-term recommendations
5. Key topics of future analyses, including watershed, land use, an economic analysis, and an enhanced travel model
6. Identification of the need to better understand the relationship between the potential economic benefits of a transportation project and the consequences to the watershed and the natural environment
7. Recommendations on how, by whom, and when the more refined analyses should occur
8. Momentum for change unlike any previous effort

Figure ES-2: Mountain Transportation Study Area



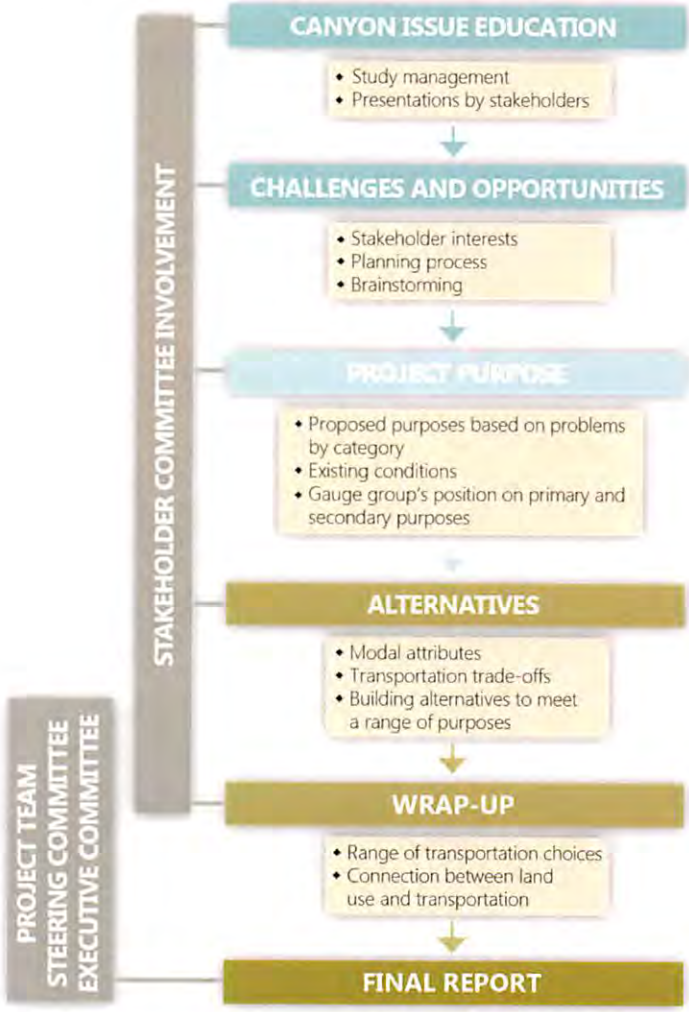
PROCESS

The Mountain Transportation Study process was driven by a series of five stakeholder workshops (see Figure ES-3). Workshop participants ranged from 40 to 70 individuals representing approximately 20 agencies and organizations. The workshops covered the following themes and purposes:

1. Education Workshop
2. Problems and Opportunities
3. Project Purpose
4. Transportation Alternatives
5. Land Use and Wrap-up

In addition to the workshop-driven process, technical analyses were conducted.

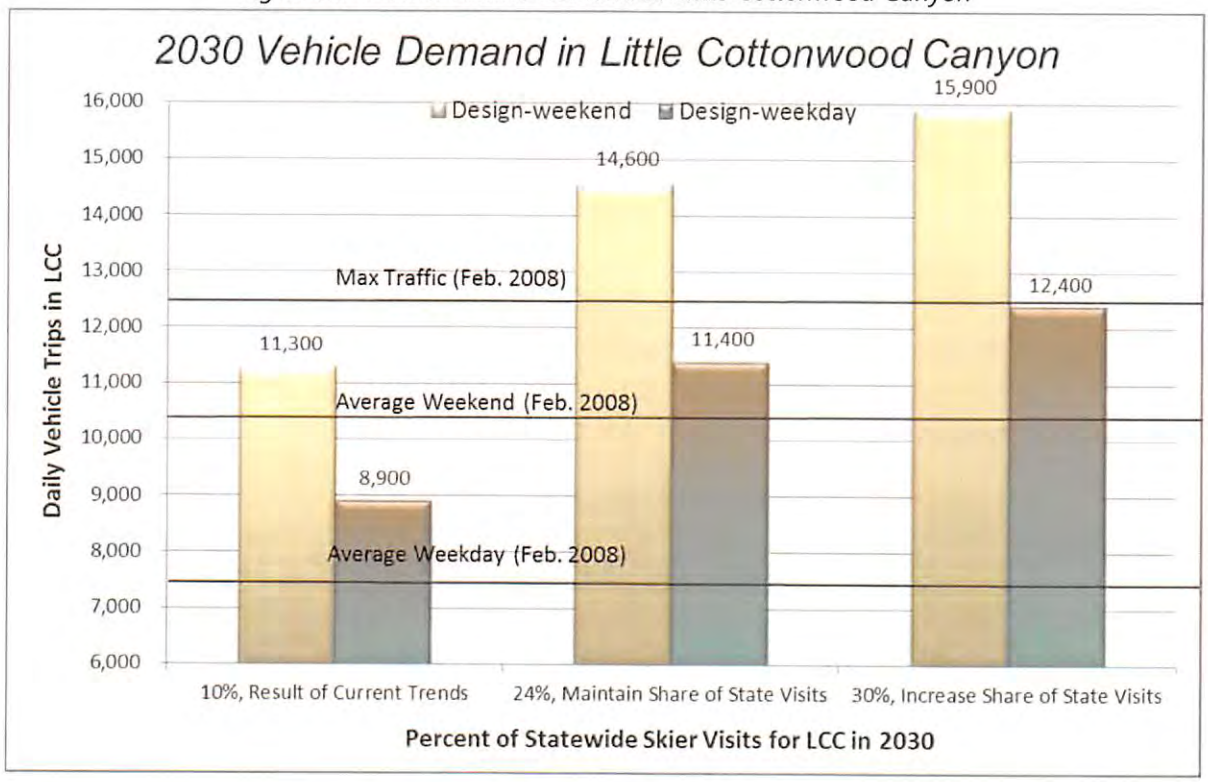
Figure ES-3: Mountain Transportation Study Stakeholder Process



FINDINGS

Data supports the numerous stakeholder comments concerning traffic congestion on peak days during the winter ski season. A model was developed to estimate vehicle trips based largely on skier visits. As skier visits increase, whether due to natural growth or increased share of statewide skier visits, projected traffic is expected to worsen (see Figure ES-4). While modeling was conducted associated with resort skier days, it is also important to recognize that increased vehicle trips might be associated with other year-round recreation uses. For example, there is considerable weekend traffic during the autumn colors.

Figure ES-4: 2030 Vehicle Demand in Little Cottonwood Canyon



A key outcome of the technical and stakeholder processes was a framework for a future purpose and need, stated below.

The purpose of the Mountain Transportation project is to:

- Facilitate safe, convenient, attractive, and reliable year-round access to and within the Cottonwood Canyons.
- Increase transit use and decrease impacts associated with automobile use in the canyons.
- Increase the attractiveness of the region and support the tourism and recreation economies by improving connections between the canyons and the population base, the hospitality infrastructure, and the regional transit network in the Salt Lake Valley.
- Plan for future population growth and add to the quality of life of Salt Lake Valley residents.

Solutions will be ecologically, socially, and economically sustainable, i.e., they will meet present needs without compromising the ability of future generations to meet their needs. Specifically, solutions will:

- Support watershed protection and management objectives, and prevent degradation of watershed health and water quality, especially municipal source water areas.

- Support a diversity of recreation uses and maintain high-quality recreation experiences.
- Minimize noise, viewshed, air quality, and wildlife habitat impacts.
- Integrate land use and recreation objectives of the U.S. Forest Service, Salt Lake County, and Salt Lake City, recognizing that land use, transportation, and recreation are interdependent.
- Consider the diversity of recreation uses in the canyons, including cyclists and pedestrians.

Transportation modes—including auto, bus, bus rapid transit (BRT), rail, and aerial transportation—were evaluated based on multiple characteristics: capacity, costs, and speeds. Table ES-1 shows an example of these characteristics for the segment from the mouth of Little Cottonwood Canyon to Alta.

Table ES-1: Example of Transportation Mode Comparison

Mouth of Little Cottonwood Canyon to Alta					
Characteristic	**Auto**	**Enhanced Bus**	**BRT**	**Rail**	**Aerial**
Capacity (people/hour)	2,000–4,800	60-200	120–600	480–2,400	1,080–3,000
Travel Time (minutes)	14–24	36–63	20–28	13–25	43–54
Capital Cost ($ millions)	30–40	10–20	110–150	510–680	220–280

Each mode has benefits and challenges; the ultimate solution will be the subject of future analyses. This study provides a framework for alternative concepts that can be developed in more detail during a future NEPA process—when the purpose and need and logical termini are better understood.

RECOMMENDATIONS

Numerous ideas for short-term transportation projects have been identified (see Table ES-2). These suggestions have more to do with "tactical" modifications than with any significant improvement. These projects will not be dependent on a future large environmental study and can be planned, designed, and implemented with little impact.

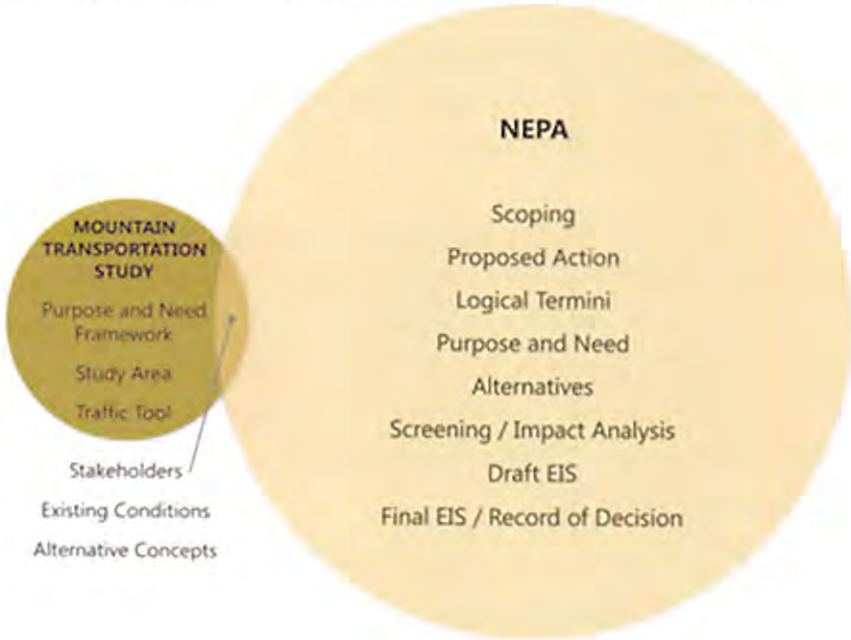
Table ES-2: Recommended Short-Term Improvements

Measure	Responsible
Real-time bus information	UTA
Increase express service to Alta	UTA
Consider express service from University of Utah area	UTA
Permanent parking driveway management metering in Little Cottonwood Canyon	UDOT/Resorts
Consider high-occupancy vehicle (HOV) priority parking at ski areas	Resorts
Parking study recommendations	Salt Lake County
Transit priority at signals/intersections along Wasatch Boulevard	UDOT/UTA
Transit amenities	UTA/Resorts

Begin EIS

In addition to some rudimentary trend analyses of traffic and demand, one of the clear outcomes of the stakeholder process was the determination that a longer-term significant transportation investment should be considered in more detail and with more formality (see Figure ES-5).

Figure ES-5: Mountain Transportation Study and NEPA Process



The Mountain Transportation Study recommends that a tiered EIS be the process for the next effort for the following reasons:

- Good for large-scale projects.
- Allows for a wide range of alternatives to be considered (Tier 1) while also allowing for in-depth consideration of local issues (Tier 2).

- Facilitates consideration of indirect and cumulative impacts on a broad scale.
- Increases opportunities for agency and public involvement.
- Provides a framework for integrating transportation planning with comprehensive land use, natural resource, and multiple-use planning efforts.
- Can support corridor preservation.
- In Tier 2, issues that can delay the progress of one Tier 2 section will not delay the entire project, as progress can still be made on the other Tier 2 sections.
- Different funding sources can be sought for each segment.

Lead Agencies

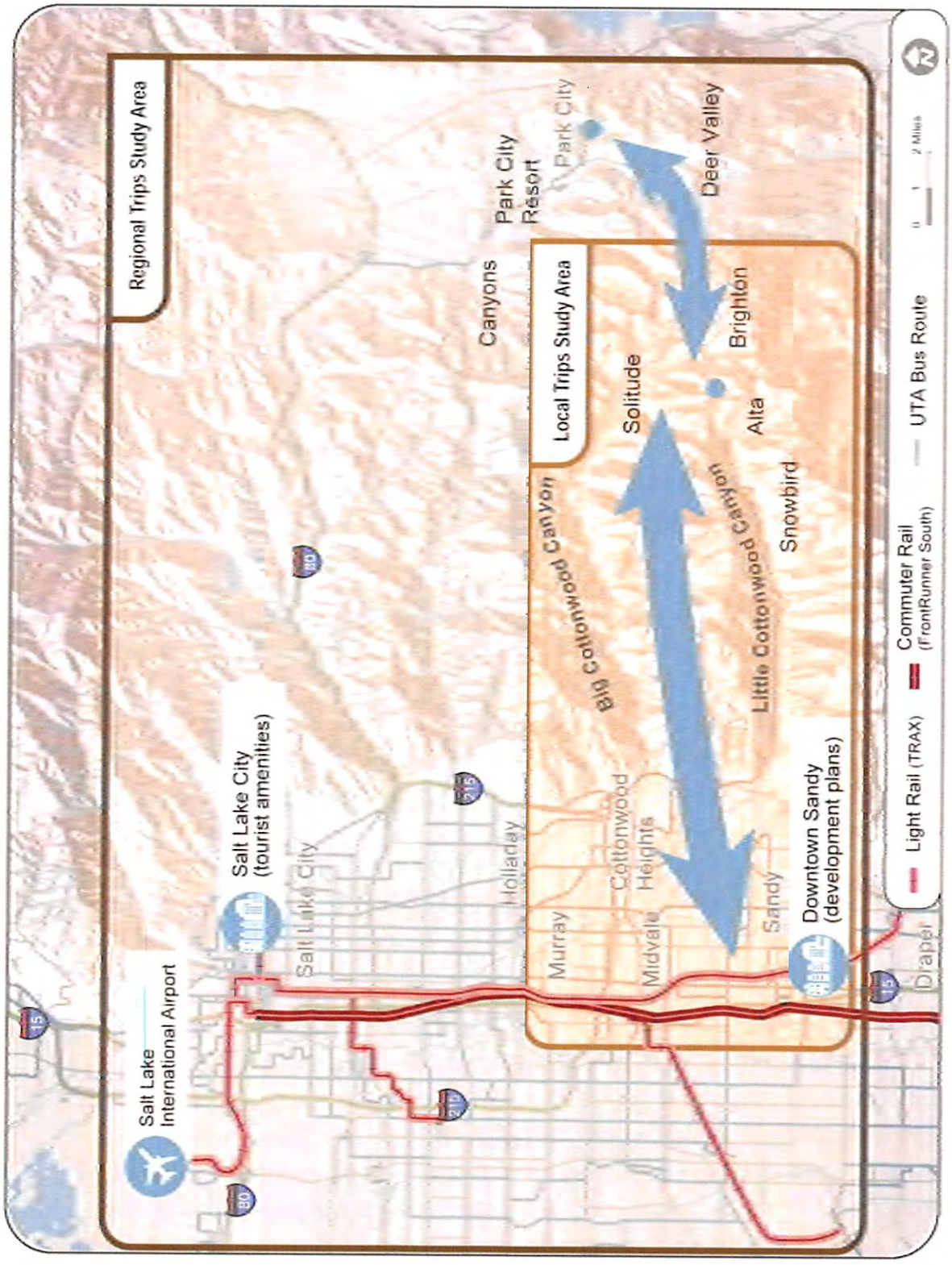
A federal NEPA process will be required for any improvements that impact USFS land or for any projects anticipating federal transportation funding. The U.S. Department of Transportation (USDOT), FHWA or FTA in this case, must be the lead agency if any USDOT approvals are required or if transportation funding will be requested. The direct recipient of federal funds for the project (generally a state DOT or transit authority) must serve as a joint lead agency. Other state and local agencies may also serve as joint leads; however, private entities may not. It should be noted that the new transportation bill, Moving Ahead for Progress in the 21st Century, or MAP-21, provides that if approval from more than one modal administration is required, the U.S. Secretary of Transportation may designate a single modal administration to serve as the federal lead agency for the DOT.

It is recommended that FTA be the lead agency with USFS, FHWA, and potentially other agencies such as the EPA as joint leads. UTA would be required to be a joint lead if funds are anticipated to be requested from FTA. Also, these agencies (FTA, UTA) offer expertise in dealing with the complex transportation problems this project will face. The lead agency and joint lead agencies are free to perform tasks and make decisions jointly, or to allocate the responsibilities and authorities among themselves. The environmental documents prepared must satisfy the requirements of all lead federal agencies.

Study Area

There are two potential study areas that could be evaluated in any future transportation study (see Figure ES-6). The local study area would focus on serving local trips into the canyons. The larger, regional study area would allow for evaluation of both regional and local trips. The regional study area is recommended to allow for an evaluation of regional trips during scoping and development of the purpose and need. The study area may be altered after more information about trip patterns and regional and local trip needs are gathered during the purpose and need effort for the EIS.

Figure ES-6: Potential Study Areas



Scope of EIS

The transportation problems and opportunities in the Wasatch Mountains are interdependent on several other key issues, including watershed and natural resources, land use, economic development, recreation, and travel demand. It is recommended that the scope of the Tier 1 EIS include analysis of land use, watershed, land preservation, recreation demands, and economic opportunities that would extend beyond the evaluation in a traditional EIS.

Desired Tier 1 EIS Outcomes

Desirable outcomes for the Tier 1 EIS decision document include:

- Final purpose and need chapter
- Preferred alternative identified including the mode and a general corridor
- Final affected environment chapter (i.e., chapter describing the existing environmental conditions)
- Level of environmental, or Tier 2, document needed for each subsequent segment including lead agencies, logical termini/independent utility justification, timeframe/phasing, or next steps for corridor preservation

Proposed Action

The Notice of Intent (NOI) is a statement published in the Federal Register that notifies the public and agencies of the official start of the EIS process and solicits scoping input. The NOI includes a brief paragraph that summarizes the proposed action. The NOI also includes general information about the purpose of the project, scoping meetings, and how to comment. Generally for transportation projects that have not been through an FTA Alternatives Analysis process, the proposed action does not state a specific mode or alignment as that could prejudice the alternative evaluation.

The proposed action recommended by the consultant team for the Mountain Transportation Study is below:

> ***The Federal Transit Administration, Utah Transit Authority, U.S. Forest Service, and [list other lead agencies] intend to prepare a Tier 1 Environmental Impact Statement for the Mountain Transportation project. The Mountain Transportation project will facilitate safe, convenient, attractive, and reliable year-round transit access to and within the Cottonwood Canyons. The project may include fixed-guideway improvements (such as bus rapid transit, rail, or aerial gondola) to connect the regional UTA transit system in the Salt Lake Valley to the recreation activities in the Cottonwood Canyons, and potentially to the recreation activities in the Park City and***

Summit County areas. The project will be ecologically, socially, and economically sustainable, i.e., it will meet present needs without compromising the ability of future generations to meet their needs and it will improve, or at minimum, not degrade the Cottonwood Canyons' natural environment and municipal watersheds.

CHAPTER 1. INTRODUCTION

Salt Lake County, in coordination with its community partners, conducted the Mountain Transportation Study for Big and Little Cottonwood Canyons and the surrounding communities. The goal of the study was to gain an understanding of current and future transportation-related problems, opportunities, and possible solutions to, from, and within the canyons.

The Mountain Transportation Study is one of three concurrent studies addressing transportation issues in and along the Wasatch Mountains; the others are the Mill Creek Canyon Transportation Feasibility Study and the Canyons Parking Study. Of the three studies, the Mountain Transportation Study is the largest and most complex in scope. These three studies consider systems that create a more environmentally and economically sustainable transportation system in the canyons and in the communities of southeast Salt Lake County. The studies are a result of Envision Utah's *Wasatch Canyons Tomorrow* process, a large visioning process for the Wasatch Mountains.

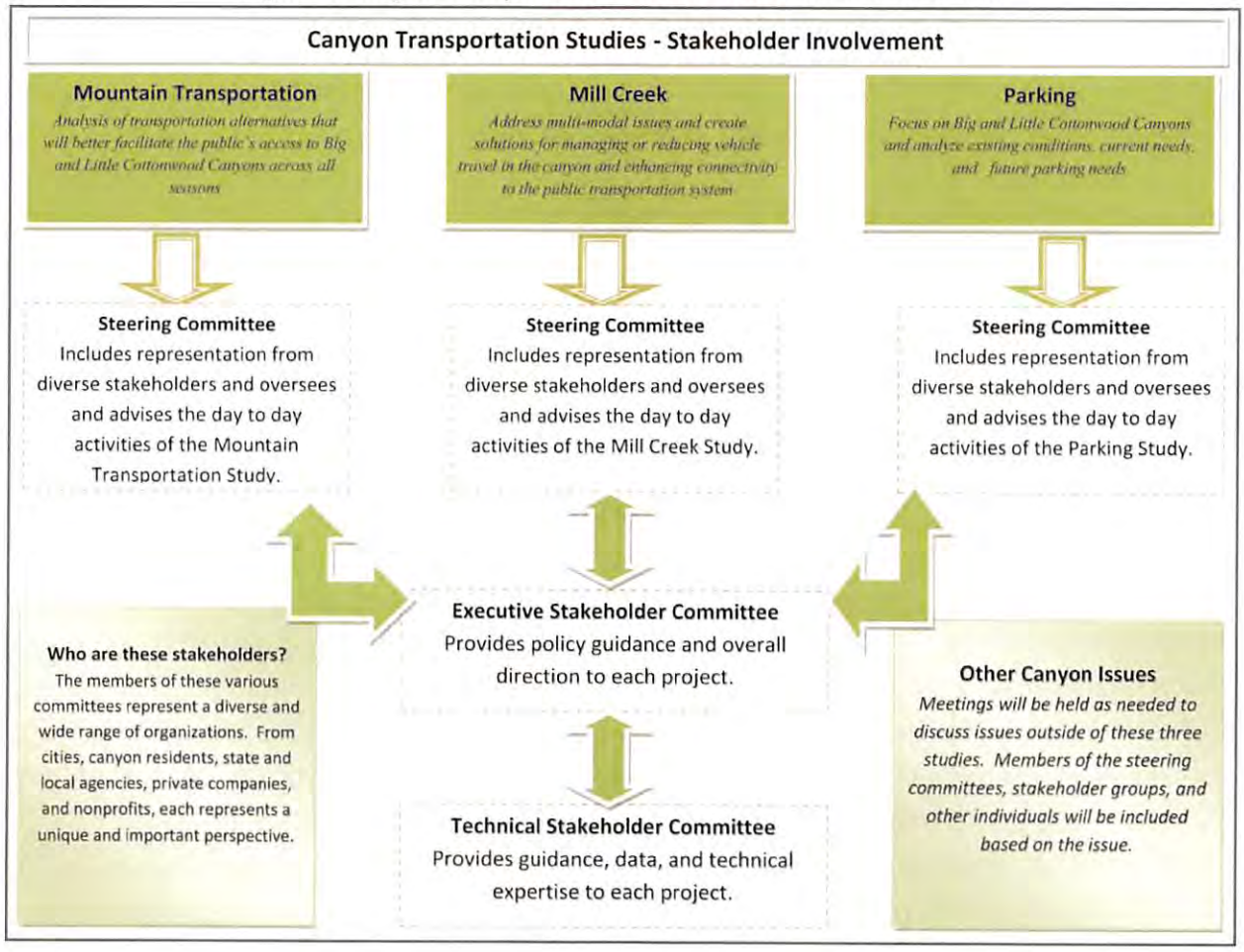
Wasatch Canyons Tomorrow was a major effort to engage public opinion on the wants and needs for the future of the seven major canyons on the eastern side of Salt Lake County as well as their smaller adjoining canyons. These canyons include Little Cottonwood, Big Cottonwood, Mill Creek, Parley's, Emigration, Red Butte, and City Creek, as well as Bell, Neff's, Lambs, and Deaf Smith canyons. The *Wasatch Canyons Tomorrow* study involved the cooperation of the State of Utah, Salt Lake County, Salt Lake City, Envision Utah, and others.

The Mountain Transportation Study began in the fall of 2011 and was completed in the fall of 2012. The Salt Lake County Engineering Division managed the day-to-day aspects of the study and was supported by a small Steering Committee made up of representatives from Salt Lake County Development Services and Mayor's Office, UDOT, UTA, USFS, Salt Lake City Public Utilities, Transportation, and Economic Development, WFRC, and FTA.

The other two study efforts concurrent with the Mountain Transportation Study include the Canyons Parking Study (for Big and Little Cottonwood Canyons) and the Mill Creek Canyon Transportation Feasibility Study. The Canyons Parking Study assessed current parking conditions and prepared recommendations including maps, graphs, and other supportive documentation. The purpose of the Mill Creek Canyon Transportation Feasibility Study was to identify ways to manage transportation demand in Mill Creek Canyon and enhance multimodal (transit, bicycle, and pedestrian) connections. The study included an analysis of travel demand, safety,

environmental concerns, visitation needs and patterns, jurisdictional plans, and other elements. Figure 1 shows the interrelated stakeholder involvement effort for the studies.

Figure 1: Canyon Transportation Studies – Stakeholder Involvement



Study Purpose

The purposes of the Mountain Transportation Study were to: bring diverse stakeholders together to find common ground for transportation improvement needs, develop a summary of transportation choices, and make recommendations that will identify steps to decide on a preferred alternative. The objective of this study was to work collaboratively with stakeholders to promote discussion and understanding of issues and opportunities for transportation. A key result of the stakeholder process is a purpose and need framework that provides the basis for more in-depth analysis in future processes. In addition, a range of transportation concepts, with their associated performance metrics and estimated costs, has been developed for further consideration.

Study Scope

The study area for the Mountain Transportation Study is bounded by the FrontRunner extension to Provo (under construction) on the west, 5300 South on the north, 12300 South on the south, and the Salt Lake County boundary on the east (see Figure 2). The need to consider "inter-county issues" for Wasatch and Summit counties was included. The study area boundaries were thought to be the outer limits of consideration to provide transit connections to the Cottonwood Canyons' communities and recreation activities.

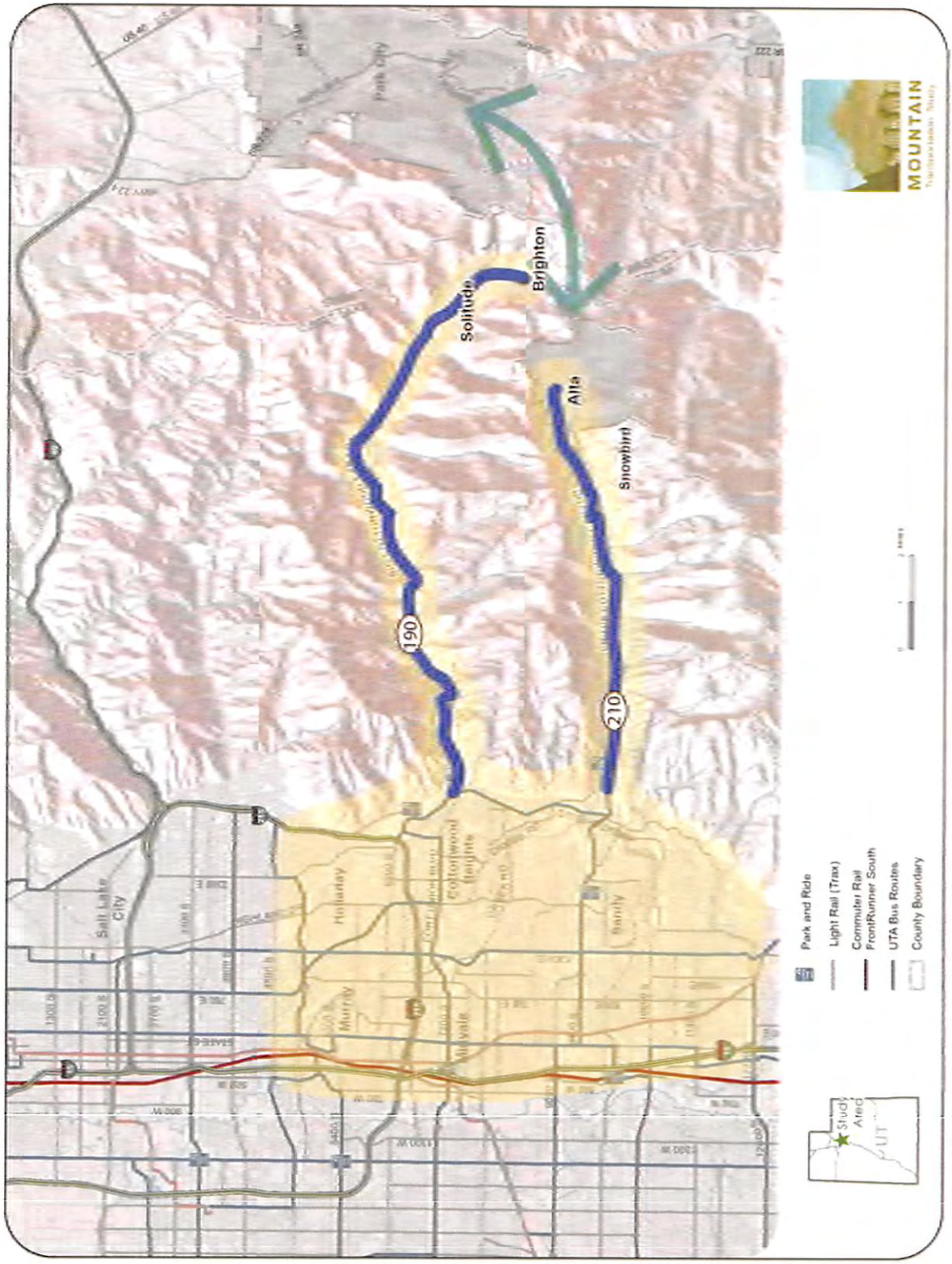
The original scope for the Mountain Transportation Study also stated the following objectives:

- Work collaboratively with stakeholders to promote discussion and understanding of issues and opportunities for transportation in Big and Little Cottonwood Canyons.
- Develop alternatives evaluation criteria to apply to proposed transportation improvements.
- Identify opportunities and constraints for transportation improvements.
- Develop a range of transportation alternatives for consideration.
- Prepare a benefits assessment of transportation alternatives.

As the study progressed, a number of developments resulted in reconsideration of the appropriate effort to be made during this phase. The first change, an increase in the number of interested stakeholders, was evidence of the complexity of determining a purpose and need framework and subsequent evaluation criteria for transportation improvement alternatives. Additionally, the travel demand modeling tools available are not calibrated to forecast recreation or inter-county trips to the accuracy required to include traffic or transit ridership in a benefits assessment. Many of the stakeholders were hesitant to assess alternatives without this critical information. The Steering Committee agreed to present transportation concepts and choices without defining specific alternatives.

This study functioned as a preliminary phase for a potential future environmental analysis under NEPA. Creating criteria and evaluating alternatives would need to be completed during the future, more rigorous phases of the NEPA process.

Figure 2: Mountain Transportation Study Area



In light of the aforementioned challenges, a few of the original objectives were slightly changed:

- Instead of focusing on evaluation criteria, the study team and stakeholders spent more time discussing and defining the challenges and opportunities in the canyons and how they shape a potential purpose and need.
- Rather than defining specific alternatives, this study presents the transportation choices in terms of modes and their characteristics.
- The benefits assessment is replaced by an explanation and comparison of the inherent modal characteristics of the transportation choices, as well as the range or extent of the improvement, rather than a quantified analysis.

Study Process

The study process entailed developing the organization, tasks, and work flow to follow the objectives of the scope. The primary mechanism to track the study's progress was regular meetings with a Steering Committee made up of individuals representing the major stakeholders who committed to participating in the process.

In addition, key Steering Committee members brought together a team of their executives to ensure that the progress and interim findings of the study were vetted at the executive level. The Steering and Executive Committees were instrumental in identifying the subject and content to present to the Stakeholder Committee, which represents a larger, broader audience.

Data collection, research, analysis, and reporting followed the flow of a series of stakeholder workshops held to inform a larger, broader audience of invited community members with a vested interest in what happens in the canyons. In general, the study process entailed a cycle of presenting concepts for a stakeholder meeting to the Steering Committee, performing the work required to prepare for the meeting, holding the meeting, analyzing the results of the meeting, and presenting the results for further direction.

The study process effort is the subject of this report. First, the existing conditions are described, followed by details on the specifics and results of each stakeholder workshop. The purpose and need framework and the transportation concepts were both products of meeting result analyses and were used as presentation materials for subsequent meetings. Finally, this report provides recommendations and next steps for future phases.

CHAPTER 2. EXISTING CONDITIONS

The existing conditions reported in this chapter are for the study area as described in the study scope. The following major aspects of the existing conditions in the Cottonwood Canyons are relevant in defining a problem statement that can assist in developing a project purpose and need to move forward into an environmental analysis. Data supporting each point is provided in more detail throughout this chapter.

- The majority of land in the Cottonwood Canyons is federal land managed by USFS pursuant to its 2003 Wasatch-Cache National Forest Plan. Impacts to USFS lands and expenditure of federal funds on any land types require adherence to NEPA.
- The Wasatch-Cache National Forest Plan disallows parking expansion except if needed for watershed protection or to facilitate mass transit.
- Big and Little Cottonwood Canyons are important municipal watersheds, supplying a large percentage of culinary water to the Salt Lake Valley. Protection of the watershed is a high priority for Salt Lake City, USFS, Salt Lake County, and Sandy City.
- Little Cottonwood Canyon has the highest Avalanche Hazard Index of a major roadway in North America.
- Traffic volumes have remained relatively constant for 15 years, but the afternoon peak is increasing in length of time.
- It is not uncommon for canyon visitors to spend up to three hours in their cars or on a bus to exit Little Cottonwood Canyon on a peak traffic day. Travel is so slow that all vehicles are required to brake for long distances, which creates what some refer to as the "red snake" as seen from those in the line.
- Since 2001, the average number of full SR-210 (Little Cottonwood Canyon) closures (from the mouth of the canyon) is 15 events per season; the average time of closures per month is 15 hours. Some particularly high months raise the average above the median, which is six hours per month. Only those months with any closures were included in the average.
- Skier visits to Summit County resorts have increased at a faster rate since 1995 than visits to Little Cottonwood Canyon. Visits to Big Cottonwood Canyon have remained constant.
- Bus transit service from the Salt Lake Valley to Big and Little Cottonwood Canyons is only provided in winter months to the ski resorts (except two round trips per day in Little Cottonwood Canyon in the summer). Ridership and the number of bus trips provided have declined after peaking during the 2005–2006 season.
- Two recent studies—the *Cottonwood Canyons Scenic Byways Corridor Management Plan* and the final report for *Wasatch Canyons Tomorrow*—recommend additional transit in Big and Little Cottonwood Canyons.

Review of Recent Studies

The Wasatch Front canyons have garnered the attention of a variety of stakeholders for many years and have been the subject of many studies. The following is a discussion of those studies.

SR-210 Transportation Study

The *Little Cottonwood Canyon SR-210 Transportation Study* (2006) contains an extensive description of the existing conditions in Little Cottonwood Canyon in 2006. A summary of the existing conditions (as described in Chapter 2 of that document) is provided in Table 1; the complete chapter can be found at: www.udot.utah.gov/main/f?p=100:pg:0::::V,T:,1720.

Table 1: Summary of Little Cottonwood Canyon Existing Conditions from SR-210 Study (2006)

Subject Condition	Element of Condition	Key Points
Population		• Salt Lake County has the highest total population of just over 1 million, but the lowest forecasted growth in the study area at just over 1.5% over the next 20 years. • The three-county Wasatch Front (Salt Lake, Utah, and Davis counties) is projected to have a 2030 population of more than 2.5 million. • Summit and Wasatch counties will grow the fastest at about 2.8% to reach a total projected population of approximately 100,000 in 2030.
Land Use	Zoning and Regulation	• Town of Alta zoning includes consideration of avalanche and other hazards for new structures. • The Alta General Plan speaks to transportation, emergency response, and connections between Alta and Snowbird resorts. • The Salt Lake County Foothills and Canyons Overlay Zone regulates and guides development on private property within the unincorporated county. The Foothills and Canyons Overlay Zone seeks to protect water resources, aesthetic qualities, soils/slopes, and sensitive lands, while allowing development to occur and maintaining access to the canyons.
	Jurisdiction and Ownership	• Private property ownership includes developed and undeveloped residential areas outside the resorts and lodging/commercial uses at resorts. • The Wasatch-Cache National Forest and two wilderness areas cover a majority of the land mass. Impacts to or acquisition of USFS lands would require NEPA analysis. • UDOT manages the roadway right-of-way.

Table 1: Summary of Little Cottonwood Canyon Existing Conditions from SR-210 Study (2006)

Subject Condition	Element of Condition	Key Points
	Recreation	• Abundant opportunities for many recreation types and in all seasons exist in Little Cottonwood Canyon. • Trails, climbing, camping, picnicking, and winter sports all require access points off of SR-210. • Limited available parking often leads to illegal use of roadway shoulder, which in turn slows traffic and creates safety hazards.
	Resorts	• Proposed action plan elements from the Snowbird Master Plan (1999) and Alta Master Plan (1997) were included in the SR-210 study. Those that have been completed are described in Table 2.
Environ-mental	Watershed	• The watershed is regulated by multiple agencies. • As of 2006, watershed water quality was considered good to excellent with some zinc concentrations from a mining tunnel. • Specific language in Salt Lake City's Watershed Management Plan places water quality over multiple uses of watershed land. • Water quality is affected by soil disturbances, particularly if soil is contaminated.
	Riparian Habitat	• All four Riparian Habitat Conservation Area (RHCA) types exist in Little Cottonwood Canyon. • RHCAs allow a full range of activities but place a priority on riparian management.
	Wetlands	• Most wetlands are high on the slopes of the mountains with the exception of four wetland areas near Little Cottonwood Creek and SR-210. Two of the four are near Snowbird and are considered category four wetlands. The other two are near Alta and are considered category three wetlands.
	Biological Resources	• Fifteen protected species inhabit Little Cottonwood Canyon. • All migratory birds are also protected. • There is a high concentration of rare plants, mostly in high alpine areas, and one listed threatened species that may exist in the canyon.
	Hazardous Materials	• Two CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) sites and four underground storage tanks are known to exist in the canyon. • Many former mining sites may contain hazardous mine tailings. • It is suspected that some contaminated soils were used to construct SR-210.
	Cultural Resources	• Some historic and archaeological sites are suspected to be present in Little Cottonwood Canyon, but no additional investigations have been conducted.

Table 1: Summary of Little Cottonwood Canyon Existing Conditions from SR-210 Study (2006)

Subject Condition	Element of Condition	Key Points
Avalanche	Slide Areas	• A 50-year average of 33 avalanches per year hit SR-210. • SR-210 has the highest highway Avalanche Hazard Index on a major road in North America. • Road closure with subsequent artillery is the typical method of control.
	Avalanche Hazard Index	• The baseline Avalanche Hazard Index on SR-210 with an average winter daily traffic volume of 7,000 is 1045, or Very High. • Diverting traffic around high impact avalanche paths, such as Superior, greatly improves the Avalanche Hazard Index.
Transit	Current Service and Ridership	• UTA has provided bus service in the Cottonwood Canyons since 1976. • The SR-210 study described the transit service and ridership at the time. See Chapter 2 of this report for updated information on current service, fares, and ridership.
Non-winter Issues		• Non-winter road issues were not the focus of the study and no recommendations were made. • Accommodating bicyclists was the one subject that arose with stakeholders at the time of the study.
Roadway Infrastructure	Description	• SR-210 is a two-lane regional rural road with occasional passing lanes, steep grades, tight turns, and often inadequate shoulders. • Traffic varies widely between seasons with a speed limit of 40 mph except in developed areas.
	Deficiencies	• The study points out 6,540 feet of guardrail and three miles of shoulder deficiencies. • No designated turnouts exist, though some, but not enough, shoulders are large enough to function as turnouts.
	Parking	• Snowbird and Alta combined offer 5,168 parking spaces. • Seven park-and-ride lots at the mouths of both Cottonwood Canyons and in the southeast Salt Lake Valley contain an additional 1,179 spaces for transit users and carpoolers.
	Maintenance	• UDOT maintains the road and determines planned closures. • Costs vary due to weather but averaged more than $780,000 per year over a three-year period between 2003 and 2005. • Communication dead zones and notification of closures were a problem at the time of the SR-210 study.
Existing Traffic	Volumes	• Traffic volumes have remained relatively constant for 15 years. • Annual average daily traffic is about 5,500. • Peak months average about 8,000 vehicles daily, 45% higher than annual volumes. • Even the highest hour has remained at 1,100 to 1,200 vehicles per hour.

Table 1: Summary of Little Cottonwood Canyon Existing Conditions from SR-210 Study (2006)

Subject Condition	Element of Condition	Key Points
	Operating Conditions	• Average speeds are affected by roadway geometry at sharp curves, even in the westbound/downhill direction. • These choke points pose an increased risk to travelers in inclement weather or congestion, exposing them to avalanche risks.
	Crashes	• Crashes are not necessarily associated with slippery or winter conditions, though the frequency of crashes is higher in the winter months with the most traffic. • Crashes occur in all areas of the canyon. • The majority of crashes are single car accidents caused by driver error.
	Intelligent Transportation Systems (ITS)	• Communication with the traveling public is accomplished through a variety of means including: variable message signs, CommuterLink cameras, the 511 automated phone message system, websites, and other phone lines.

The SR-210 study concluded with a number of recommendations aimed at improving visitor experience and safety. As shown in Table 2, some of the short-term improvements have been made.

Table 2: SR-210 Study Recommendation Status

Recommendation	Status
Infrasound detection device	Complete
New artillery near White Pine Chutes	Complete
Variable message signs at Alta	Complete
Park-and-ride wayfinding signs design and installation	Complete
ITS project for parking management, canyon communications	Complete
Driveway metering at Snowbird	Ongoing
Gaz-ex above Snowbird Village	Complete
Improvements to China Wall berm	No change
Continue to refine Traveler Information program	Ongoing
Turnouts or turnarounds	No change
Downhill passing lanes	Ongoing/expansion
Additional Gaz-ex	Ongoing
Initiate an EIS for significant improvements	No change
Formal right-of-way delineation	Ongoing

Data on the existing conditions from Big Cottonwood Canyon gathered within the scope of this Mountain Transportation Study is also presented in this chapter. Two more recent studies have been completed since the SR-210 work; a summary of the findings and recommendations is provided. Additional data, which includes skier visits, traffic, road closures, transit, and travel demand, enhances and supplements the data collected in the SR-210 study.

Cottonwood Canyons Scenic Byways Corridor Management Plan

Both Big and Little Cottonwood Canyon Roads are designated state Scenic Byways. The *Cottonwood Canyons Scenic Byway Corridor Management Plan* (2008) was conducted via a stakeholder process pursuant to a federal Scenic Byways grant. The resulting plan includes goals and specific strategies to address congestion, hazards, and population growth impacts in Big and Little Cottonwood Canyons. Three major goals are recommended in the study:

1. Improve travel conditions on the byways.
2. Disseminate important information through a variety of outlets to improve the traveler experience.
3. Protect the watershed and natural resources.

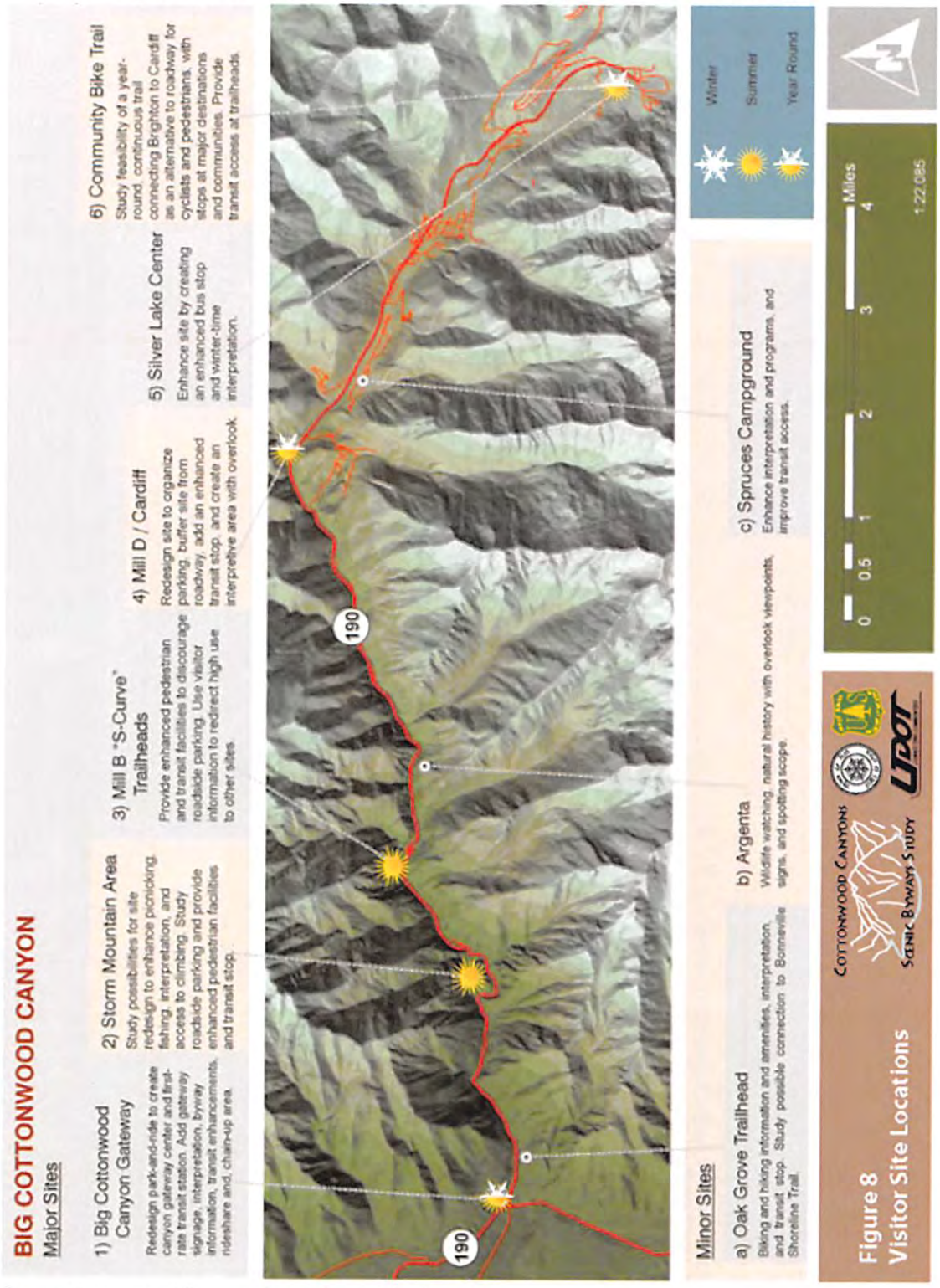
Recommended corridor improvements within the canyons include the following:

- Canyon gateway visitors' centers
- Added pullouts for slower drivers
- Year-round transit
- Refined emergency procedures and simplified road signage

There are also six site-specific improvements and concept designs identified within Big Cottonwood Canyon and four within Little Cottonwood Canyon. These improvements include a canyon gateway and transportation hub at the mouth of the canyons, redesign of several sites to provide transit stops and parking, and redesign of recreation sites. An implementation plan provides a list of additional plans and studies, ongoing byway improvements, and interpretation and communications deemed essential to the success of the Corridor Management Plan.

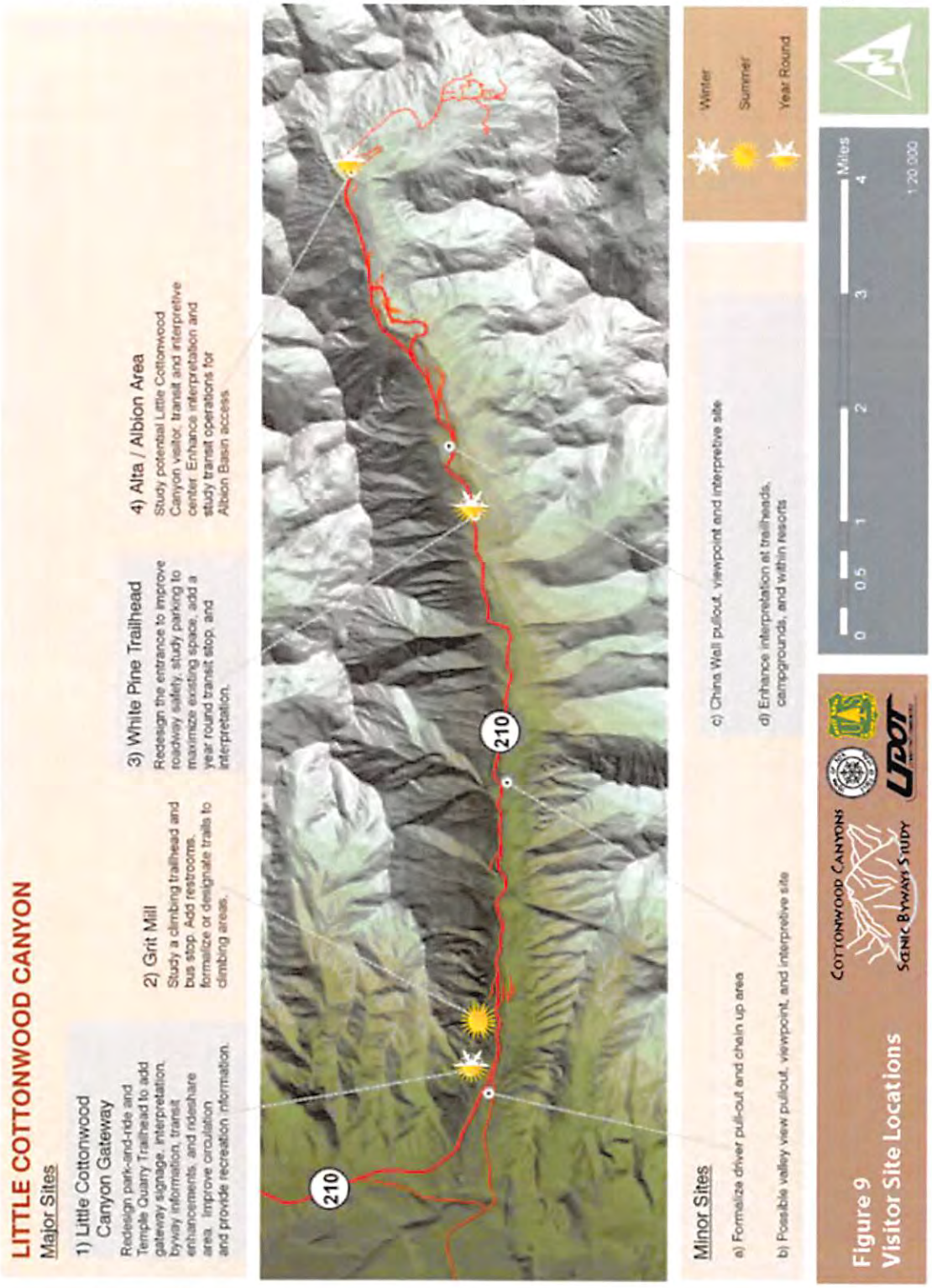
Maps of the recommended site locations and a short description of the improvements in each canyon are provided in Figure 3.

Figure 3: Cottonwood Canyons Corridor Management Plan Site Locations



Source: Cottonwood Canyons Scenic Byways Study

Figure 3: Cottonwood Canyons Corridor Management Plan Site Locations (cont'd)



Source: Cottonwood Canyons Scenic Byways Study

Wasatch Canyons Tomorrow

Wasatch Canyons Tomorrow (2010) was a major effort to engage the public and ascertain public values associated with the seven major Wasatch canyons on the eastern side of Salt Lake County, as well as the smaller adjoining canyons. These canyons include Little Cottonwood, Big Cottonwood, Mill Creek, Parley's, Emigration, Red Butte, and City Creek, as well as Bell, Neff's, Lambs, and Deaf Smith canyons. The *Wasatch Canyons Tomorrow* study involved the cooperation of the State of Utah, Salt Lake County, Salt Lake City, Envision Utah, and others.

The goal of the study was to encourage public communication and contribution with regards to the future of the Salt Lake County canyons. The reason for the study was to inform the revision process of the 1989 Salt Lake County Wasatch Canyons Master Plan for City Creek, Emigration, Red Butte, Parley's, Mill Creek, Big Cottonwood, and Little Cottonwood canyons. The main concepts delineated throughout the study included how policy should adapt to the growing population and utilization of the canyons while also working to preserve and protect water supply and recreation within the canyons. Public involvement spanned 18 months and involved 16 open houses and multiple online surveys with focuses on values, scenarios, and a draft vision. These efforts resulted in the input of thousands of residents, city leaders, and local businesses.

The resulting vision provided goals and recommendations for land use, recreation, and transportation values and visions associated with the canyons, including the following transportation goal:

> *Transportation projects should reduce congestion, improve air quality, and facilitate access and public safety, while maintaining our high-quality recreation experience and protecting natural resources.*

The recommendations from the study and the status of their implementation are provided in Table 3. An executive summary of the final report can be viewed at: www.envisionutah.org/WasatchCanyonsTomorrow_1_Introduction_Scope_ExecSummary.pdf.

Table 3: Wasatch Canyons Tomorrow Recommendations and Status

Recommendation	Status
Enforce Foothills and Canyons Overlay Zone	Updating
Increase funding for sensitive areas	No change
Study feasibility of parking passes to Big and Little Cottonwood Canyons	No change
Capacity study for trails	No change
Regional trails master plan	No change
Maintain and enhance avalanche safety	Ongoing
Climbing management plan	Ongoing
Encourage cooperative process among stakeholders for appropriate year round activities at the resorts	Ongoing
Dispersed recreation	No change
Expand transit from winter only to year-round	Some summer worker service
Improve road-cycling safety	Ongoing – project planned for Little Cottonwood Canyon in summer 2012
Update corridor avalanche control plans	Ongoing
Study feasibility of transit hub along canyons	No change
Express bus service between Salt Lake City central business district and Park City	Complete and in place
Feasibility study of extending rail up Little Cottonwood Canyon	Ongoing
Mill Creek alternative transportation study	Complete
Implement recommendations from the *Cottonwood Canyons Scenic Byways Corridor Management Plan*	No change

Jurisdictions

The Wasatch Front canyons are multi-jurisdictional and are actively managed by a number of agencies pursuant to statutory and regulatory requirements. Table 4 generally summarizes those agencies with some jurisdiction, over what, and their plans, if applicable, within the subject area.

Table 4: Summary of Agency Jurisdiction (Applicable to Cottonwood Canyons)

Agency	Jurisdiction	Applicable Plans
U.S. Forest Service	Federal Lands (Wasatch-Cache National Forest)	2003 Wasatch-Cache National Forest Plan
Utah Department of Transportation	Big Cottonwood and Little Cottonwood Canyon Roads	Big and Little Cottonwood Canyons Scenic Byways Corridor Management Plan; Highway Safety Plan; Avalanche Plan
Utah Department of Environmental Quality	Water quality; drinking water	Total Maximum Daily Load (TMDL) for Little Cottonwood Creek; Drinking Water Source Protection Plan
Utah Department of Natural Resources	Water resources; wildlife resources	Utah Comprehensive Wildlife Conservation Strategy
Salt Lake County	Land Use Authority for private lands in county; water quality (Clean Water Act Section 208)	1989 Wasatch Canyons Master Plan; 2010 Salt Lake Countywide Water Quality Stewardship Plan
Town of Alta	Land Use Authority for private lands in Alta municipal boundaries	2005 Town of Alta General Plan
Summit County	Land Use Authority for private lands in Summit County	Snyderville Basin General Plan
Salt Lake City	Management of municipal watersheds; water rights; landowner	1999 Salt Lake City Watershed Management Plan

Data Collection for Mountain Transportation Study

After review of the recently completed studies, the project team collected readily available, more up-to-date data on canyon characteristics, water resources, skier visits, traffic, road closures, transit, and inter-county travel demand. This data was presented to the Steering Committee and much of it was used to educate stakeholders during the workshops described in Chapter 3 of this report.

Quantitative data is still needed to support the needs identified in Chapter 4, and it is recommended that this data collection be a part of any future study. Some potentially helpful data may include a household survey being conducted by all the Metropolitan Planning Organizations in Utah and UDOT, origin and destination surveys, and airport passenger surveys (more information can be obtained on these datasets from WFRC).

Land Ownership

Land ownership characteristics in Big Cottonwood Canyon differ from those in Little Cottonwood Canyon. Little Cottonwood Canyon has an incorporated town (Alta) and very little privately owned land aside from land owned by the existing resorts. Big Cottonwood Canyon has more privately owned land outside of the existing resorts, some of which has already been developed and some of which has not (see Figure 4). Development on privately owned land in the unincorporated county occurs under the permitting requirements of the Foothills and Canyons Overlay Zone Ordinance governed by Salt Lake County.

Avalanche Paths

As stated in the SR-210 study, Little Cottonwood Canyon has the highest Avalanche Hazard Index of any major North American road. Big Cottonwood Canyon has far fewer avalanche paths that affect the road (see Figure 5).

Figure 4: Cottonwood Canyons Land Ownership

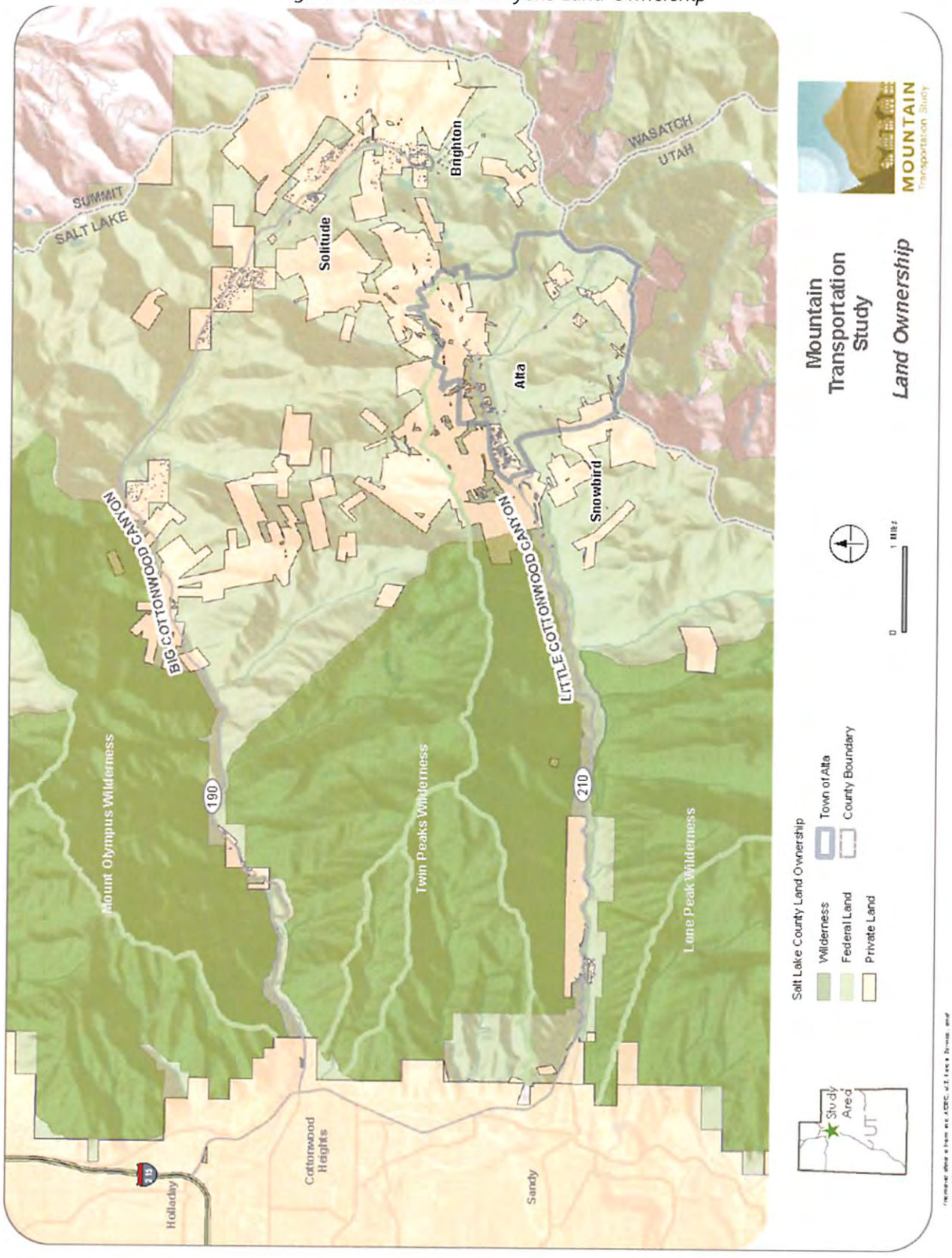
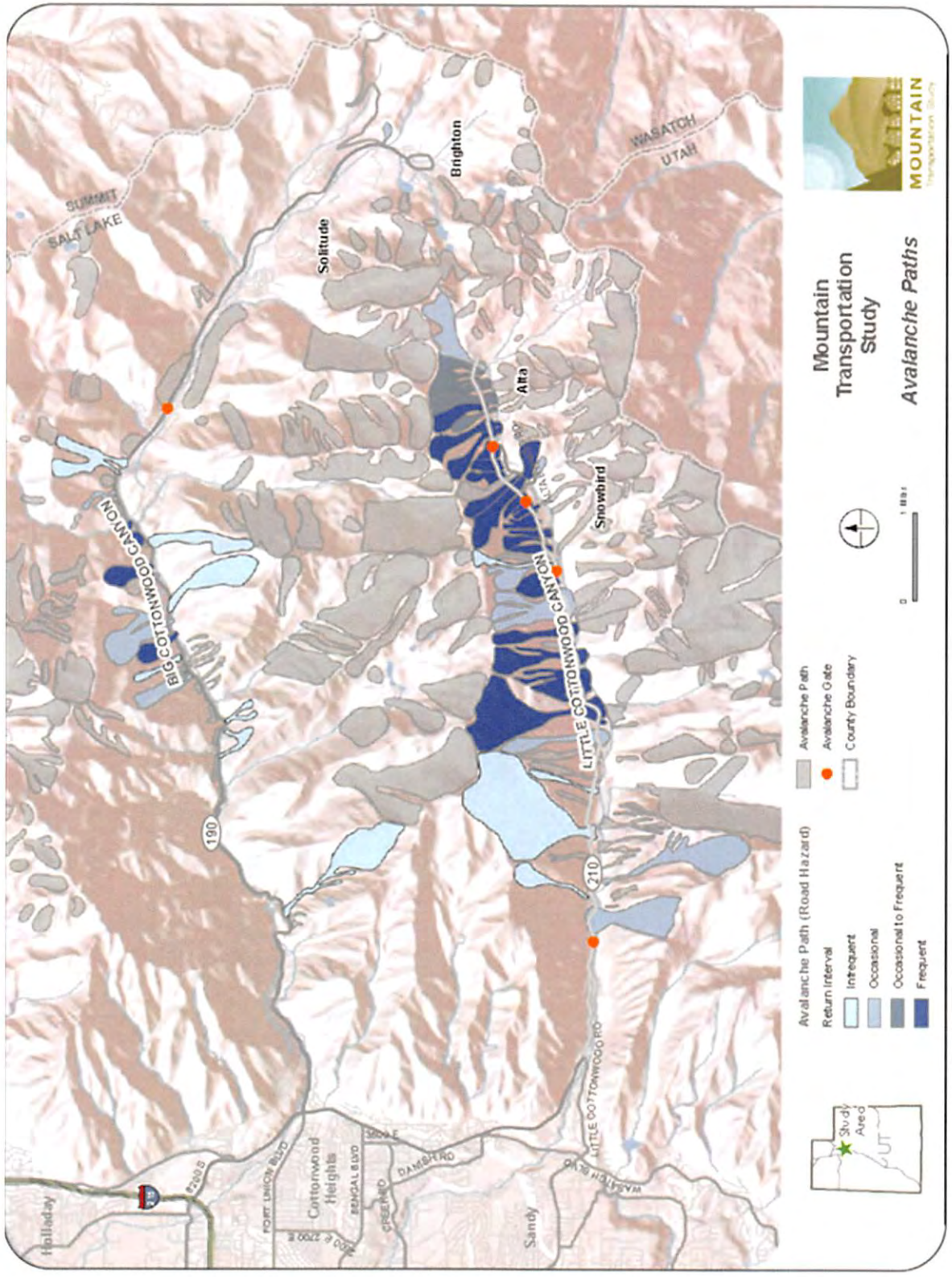


Figure 5: Cottonwood Canyons Avalanche Paths



Watershed

Big and Little Cottonwood Canyons are critical municipal watersheds. The residents of many communities in Salt Lake County—including Salt Lake City, Sandy, and those within the Metropolitan Water District of Salt Lake and Sandy—rely on water from these mountain streams. In total, more than 500,000 people in the Salt Lake Valley are dependent on these watershed systems for their drinking water. These watersheds are managed for source water protection so federal Safe Drinking Water Act requirements can be met by the public water suppliers. In addition, the mountain streams in these canyons have beneficial use designations pursuant to the federal Clean Water Act and Utah Water Quality Act, in which there are associated regulatory requirements. USFS, the Utah Department of Environmental Quality, Salt Lake City, Salt Lake County, and the Salt Lake Valley Health Department each have certain jurisdiction and management authority to implement federal, state, and local requirements pertaining to watershed protection and water quality. Many decades of implementation have resulted in generally good water quality, though Little Cottonwood Creek is impaired due to high zinc concentrations. Figure 6 shows the extent of the watershed within the study area as well as other water resources in the canyons.

Transportation Network

Figure 7 shows the relationship of the Cottonwood Canyons (SR-210 and SR-190) to the greater roadway and transit networks in Salt Lake County. Additionally, the map shows the proximity of the resort areas geographically, and the greater distance that must be traveled by road between the resorts. An element of the canyon transportation challenge mentioned by numerous stakeholders is also evident in this map—how both canyon roads are long dead ends that create a single entry and egress path for all visitors accessing the area.

Recreation

Big and Little Cottonwood Canyons have numerous dispersed and developed recreation opportunities. Big and Little Cottonwood Canyons each have two ski/snowboard resorts—one winter and one year-round resort. Both canyons are used for hiking, biking, hunting, picnicking, camping, fishing, and other activities. Refer to Figure 34 in Chapter 4 for a map of locations of trailheads, campgrounds, picnic areas, climbing areas, and trails in each canyon.

Figure 6: Water Resources

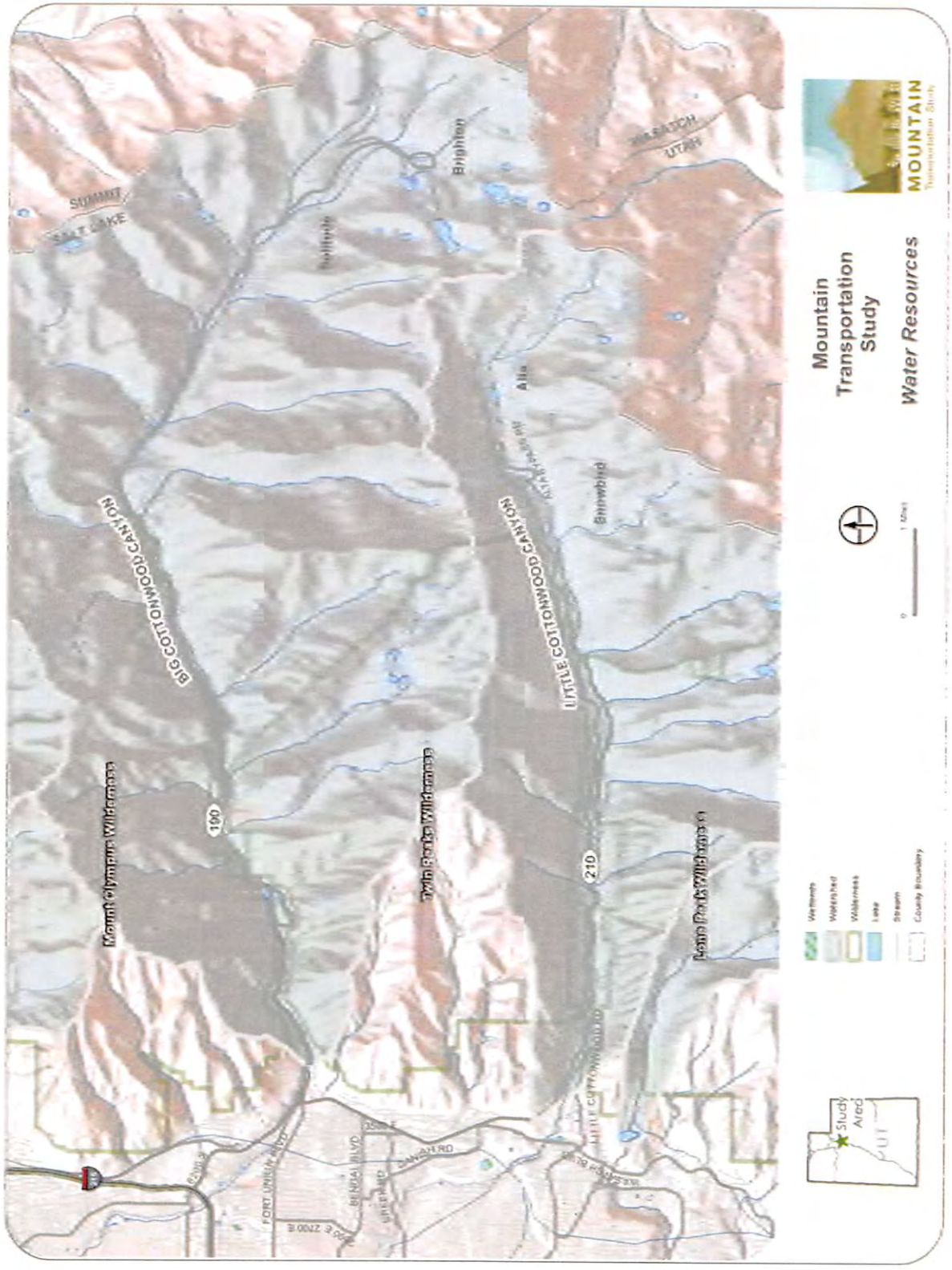
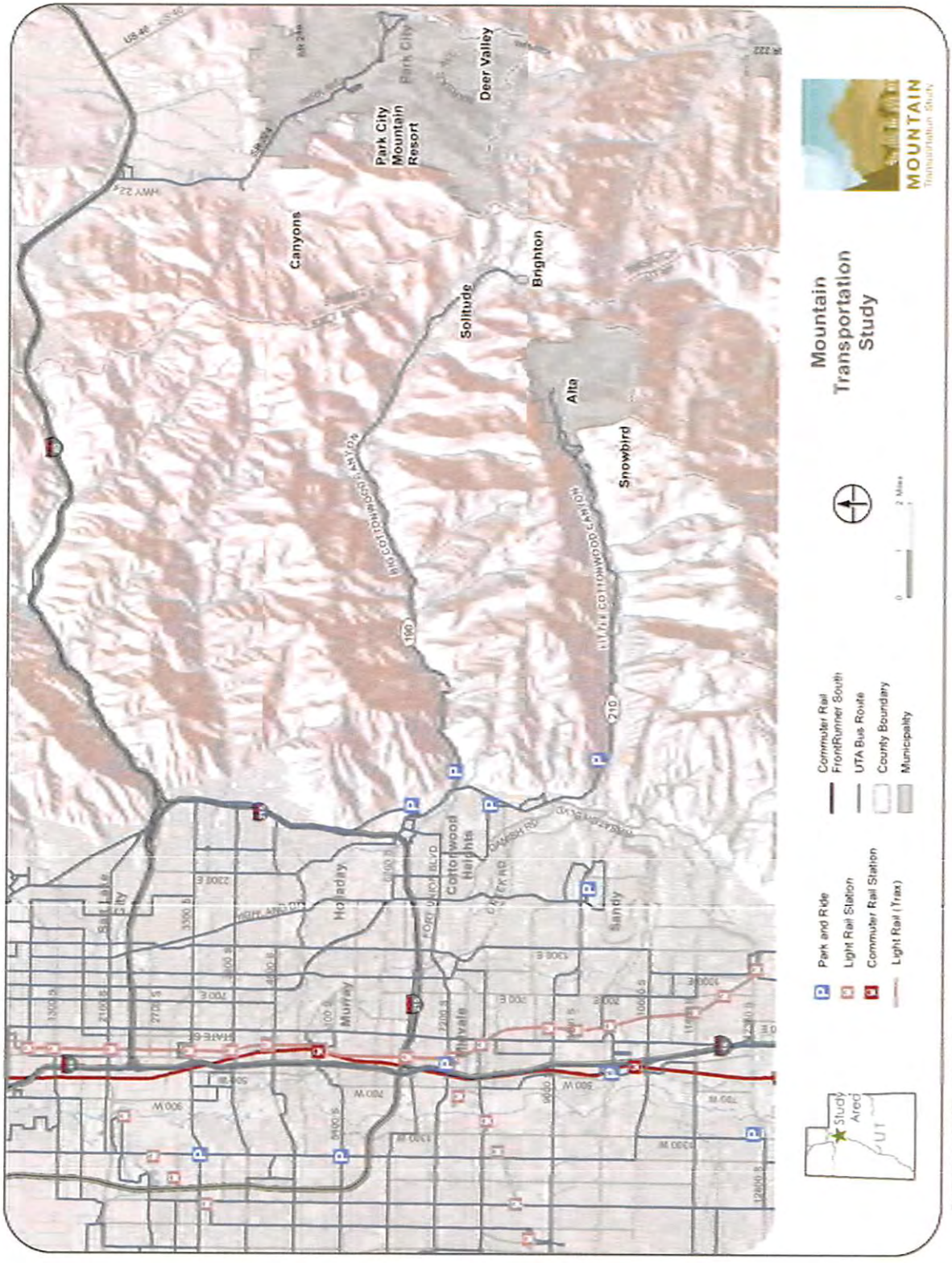


Figure 7: Cottonwood Canyons Transportation



Skier Visits

Historic statewide skier visit data is available starting with the 1957–1958 season, and was obtained from Ski Utah. The last 25 years of data show an increase in statewide skier visits by 69.5 percent, or 2.8 percent annually. The upward trend toward the current number of over 4 million skier visits in the state can be seen in Figure 8, provided by Ski Utah. Some of the ski resorts are also increasing amenities to provide for year-round visits, which may increase the use of the area during the summer season.

Figure 8: Utah Skier Visits

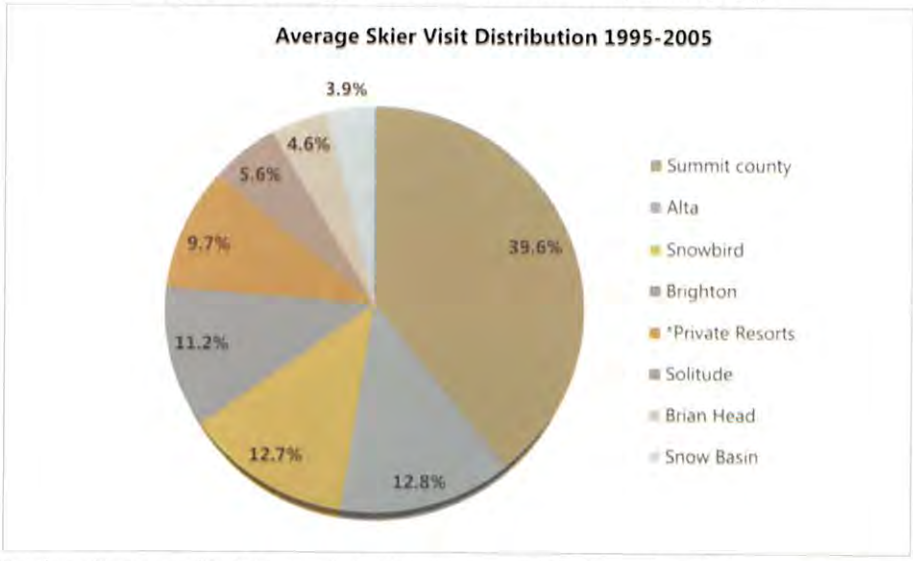
Source: Ski Utah

In 1998, the State of Utah Governor's Office of Planning and Budget (GOPB) released the *Utah Skier Visit Analysis* report. The study reported a total number of skier days for each of the Wasatch Front resorts in 1996, and forecasted visitations for future years. This data indicated the Wasatch Front's percent share of statewide skier days would decline, though actual skier days at each resort were expected to increase.

More recently, in 2006, the GOPB also reported just over 4 million skier visits for the entire state during the 2005–2006 season in its *Utah Ski Database Demographic and Economic Analysis Section*. Additionally, the report included how those visits were divided among the resorts as

reported to the USFS where required, and provided by others if not, for 11 seasons from 1995 to 2005. The distribution is shown in Figure 9.

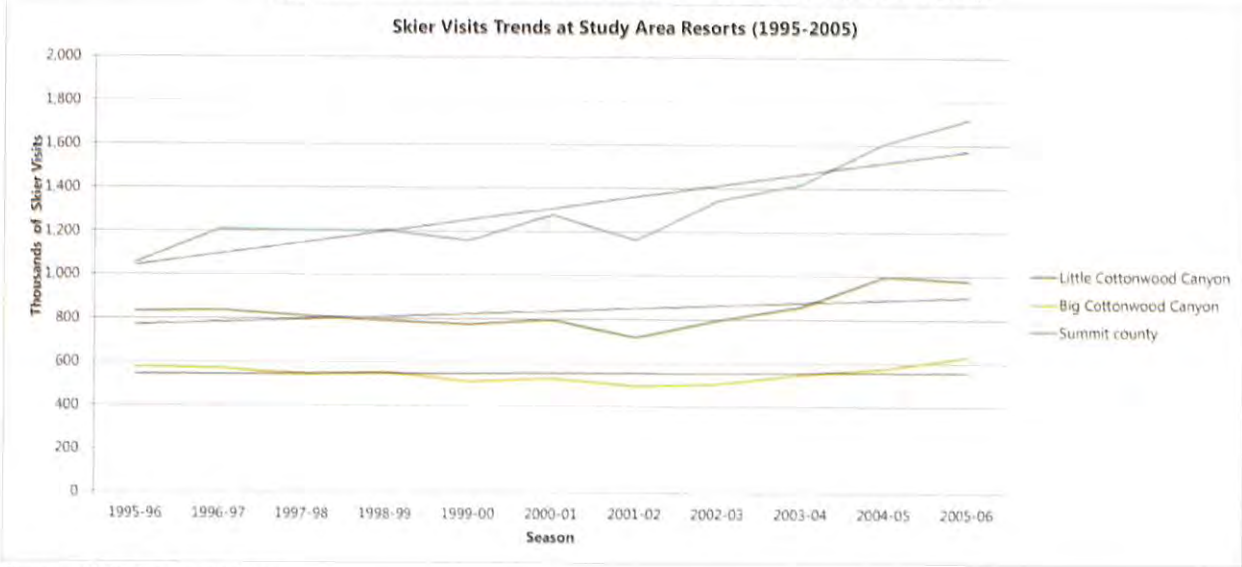
Figure 9: Average Skier Visit Distribution (1995–2005)



Source: Utah Ski Database Demographic & Economic Analysis Section, GOPB, December 2006; summarized by Fehr & Peers, 2012

The same data was analyzed in terms of numbers of skier visits for the study area resorts and aggregated to access routes. Figure 10 shows roadways into Summit County resorts and SR-210 (Little Cottonwood Canyon) have seen increasing demand to accommodate skier visits, while demand on SR-190 (Big Cottonwood Canyon) has remained constant.

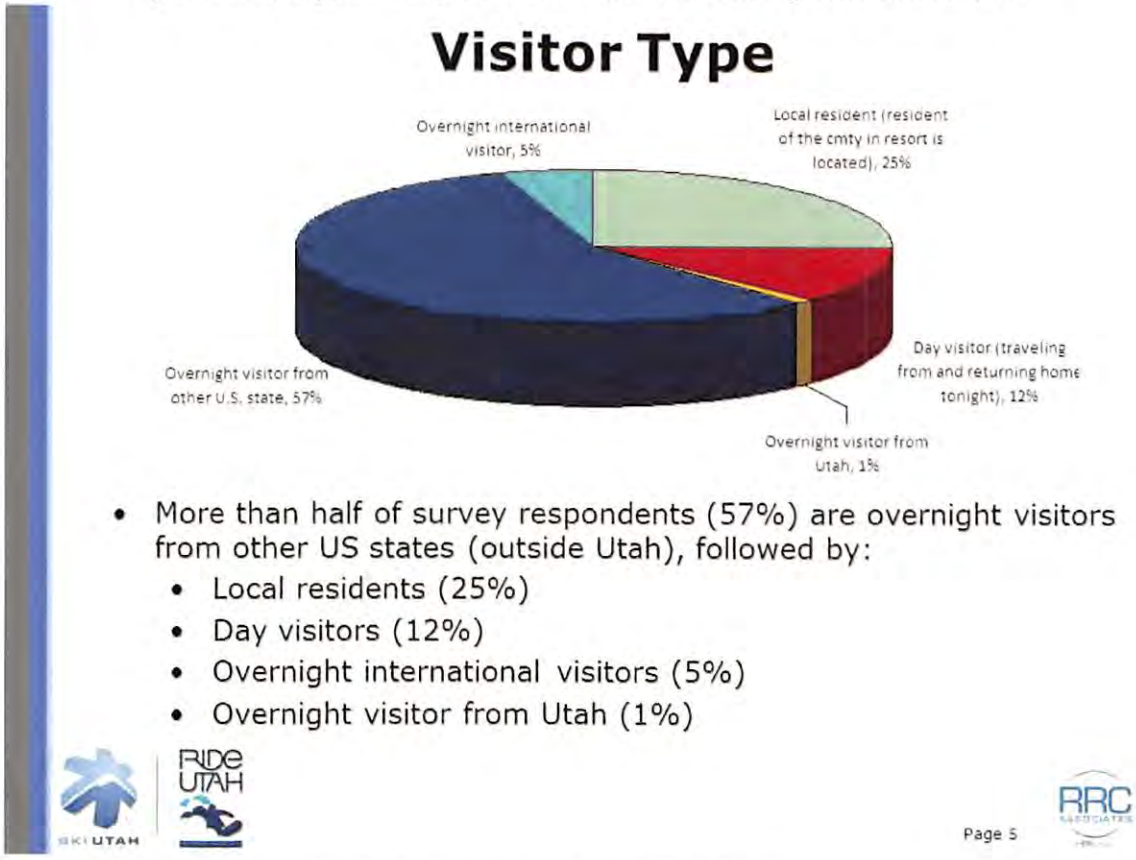
Figure 10: Skier Visit Trends at Study Area Resorts (1995–2005)



Source: GOPB, Fehr & Peers

A survey conducted by Ski Utah of visitors to Utah resorts during the 2010–2011 winter season indicates that more than half of Utah's skier visits are by people from other states who stay overnight (see Figure 11). Another question asked how visitors moved around in Utah, and approximately one-third responded that they rented a car. Assuming that those who rented a car were also out-of-state visitors, and 37 percent of skier visits were local, one can estimate that approximately half of Utah's skier visits used, or potentially could use, the roadway to access the resorts on any given day.

Figure 11: Survey Results of Visitors to Utah Resorts during 2010–2011 Season

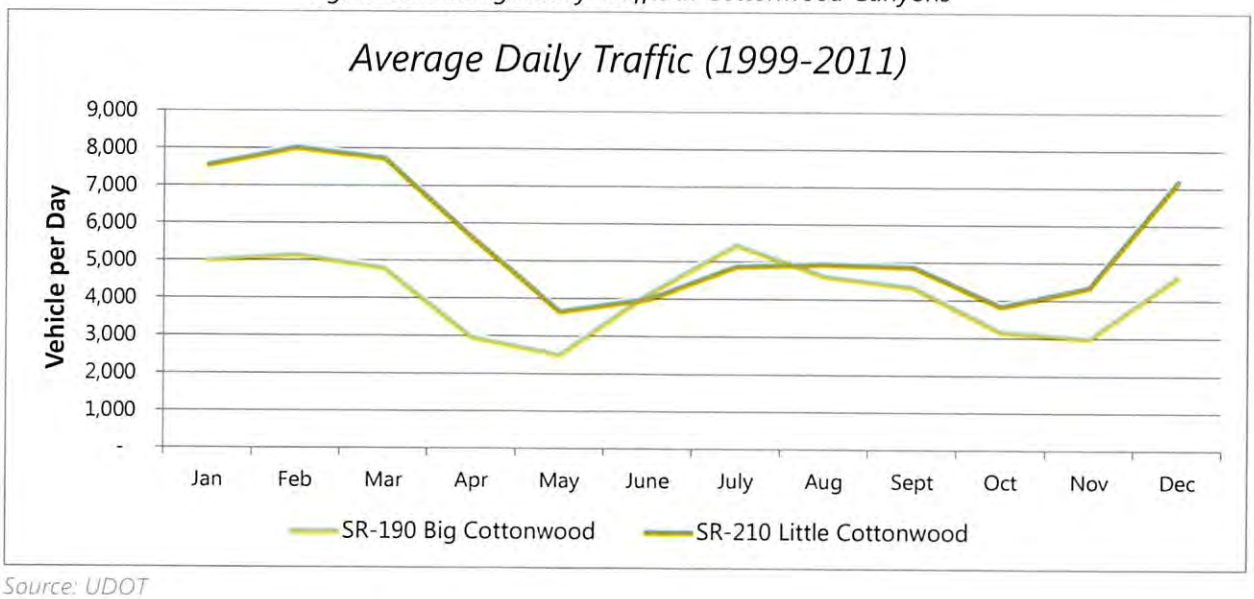


Source: Ski Utah survey of visitors to Utah resorts during the 2010–2011 season

Traffic Volumes

As shown in Figure 12, traffic in the Cottonwood Canyons has seasonal variations. Monthly and hourly traffic data was collected from UDOT for years 1999 through 2011. On SR-190 in Big Cottonwood Canyon, traffic volumes peak between December and March, and again in July. May is typically the month with the lowest traffic volumes. On SR-210 in Little Cottonwood Canyon, traffic volumes also peak between December and March. Traffic volumes sharply decline in April and remain somewhat constant between July and September.

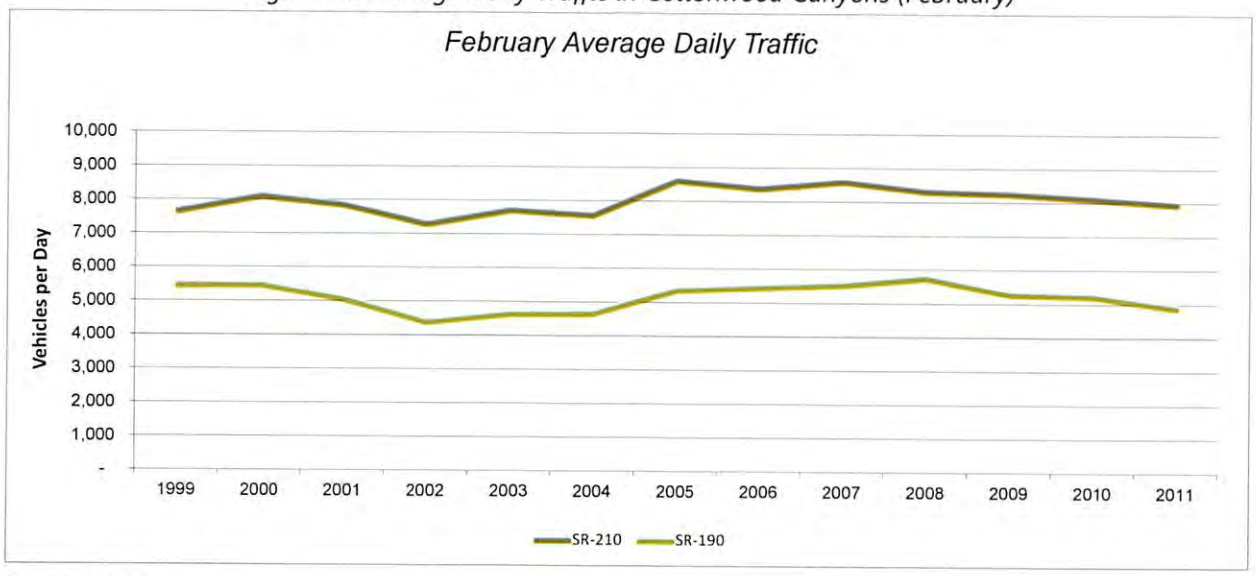
Figure 12: Average Daily Traffic in Cottonwood Canyons



Source: UDOT

Traffic volumes in the Cottonwood Canyons were analyzed for the month of February, which is the month that both canyons experience higher traffic volumes. In a typical February, SR-190 experiences an average daily traffic volume of 5,200 vehicles, while SR-210 experiences an average daily traffic of 8,000 vehicles. Traffic volumes vary from year to year, but generally increased between 2002 and 2007, before declining through 2011 (see Figure 13).

Figure 13: Average Daily Traffic in Cottonwood Canyons (February)



Source: UDOT

UDOT has multiple automatic traffic recorders, which report hourly traffic volumes, throughout the state. Automatic traffic recorders are located on SR-210, 4.16 miles into Little Cottonwood Canyon from the mouth of the canyon, and on SR-190, 2.46 miles into Big Cottonwood Canyon from the mouth of the canyon. On SR-210, hourly traffic counts for February show a number of instances where down-canyon traffic volumes exceed 1,000 vehicles per hour. These instances indicate times when traffic is heavily congested in the canyon. There also appears to be a shift in heavy traffic from Saturday to Sunday. On SR-190, traffic volumes are slightly lower than on SR-210, though down-canyon volumes still reach the 900s and 1,000s.

Example of the "red snake"

Average hourly volumes on SR-210 in February between 1990, 1998, 2005, and 2011 appear to indicate that traffic is dispersing throughout the day. Canyon visitors seem to be leaving earlier in the afternoon. Anecdotal evidence suggests some may want to avoid congestion during the peak traffic time and others are skiing or snowboarding for less time during the day. It is not uncommon for canyon visitors to spend up to three hours in their cars or on a bus to exit Little Cottonwood Canyon on peak day. Travel is so slow that all vehicles are required to brake for long distances, which creates what some refer to as the "red snake" as seen from those in the line.

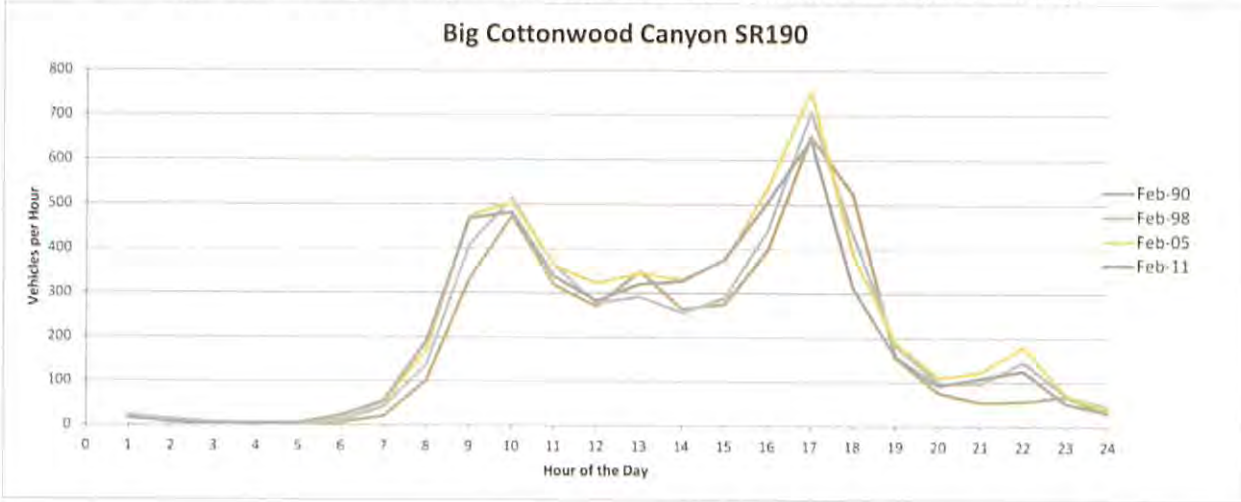
Examining President's Day, which is typically one of the worst days of each February, illustrates this trend best. In February, the peak periods are lasting longer in the existing condition than in the past (see Figure 14). The data also indicates the difference in volumes and peak period length between an average February day and peak days.

Figure 14: Average Hourly Traffic Volumes in Little Cottonwood Canyon (February)

Source: UDOT

The hourly peaks of volume in Big Cottonwood Canyon are similar to those in Little Cottonwood Canyon; however, the afternoon peak is not increasing in length according to data collected for the past 20 years (see Figure 15).

Figure 15: Average Hourly Traffic Volumes in Big Cottonwood Canyon (February)

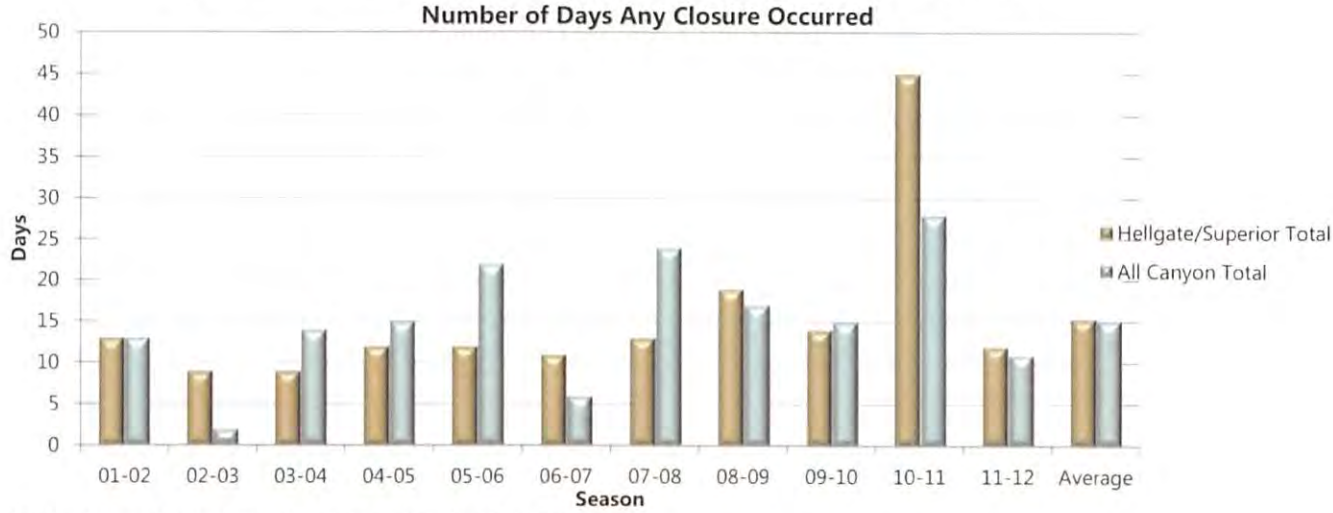


Source: UDOT

Road Closures

Most road closures, if required, occur in Little Cottonwood Canyon. In some cases, only the section of roadway subjected to the Hellgate and Superior avalanche paths needs to be closed. When that occurs, traffic can be routed around the road closure on the bypass road between Alta and Snowbird and continue up or down the canyon. Other times, the canyon is closed at the mouth when no traffic can move in either direction. Closures from the mouth can occur during the day, requiring some visitors who drove up in the morning to have to wait until the road is cleared and opened before they can return. Otherwise, avalanche management and road clearing is provided during the early morning hours before the majority of traffic begins using the canyon. Figures 16 through 18 are based on data collected since the 2001–2002 winter season. The averages are based only on those months including and between the first and last avalanches of a season, i.e., summer months do not bring the average down but winter months that have zero avalanches do.

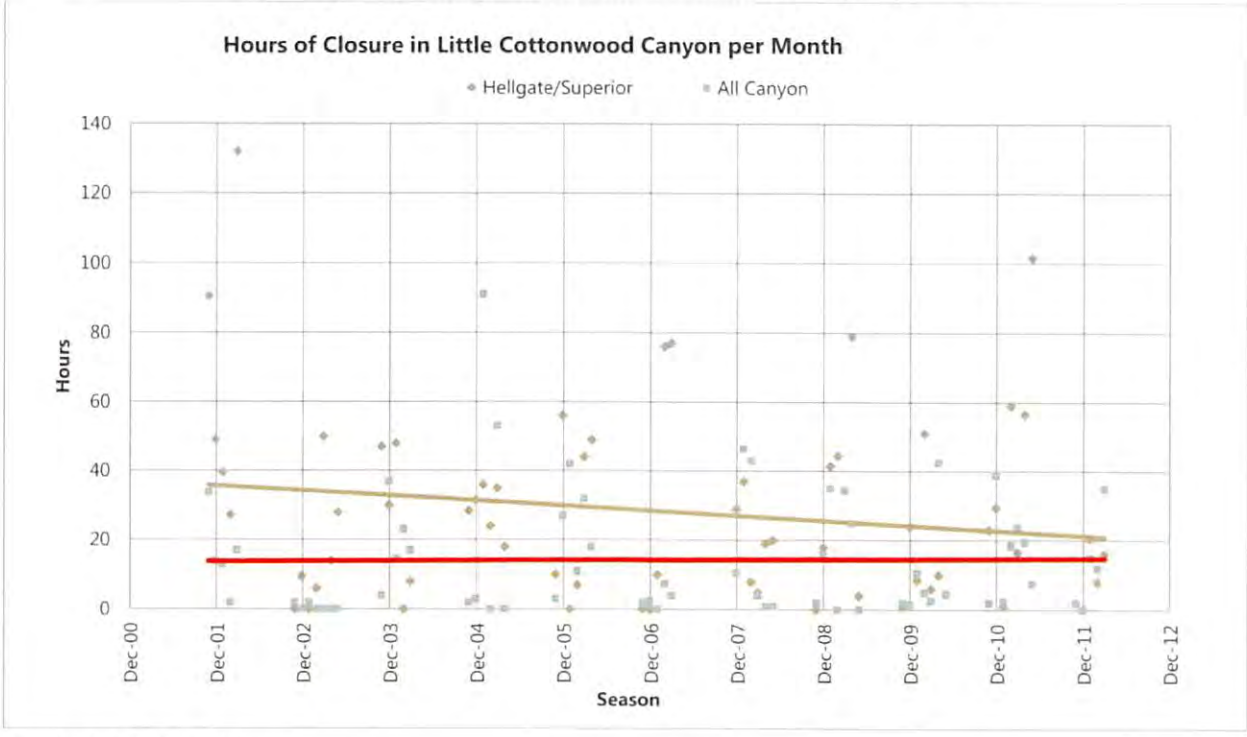
*Figure 16: Number of Days Any Closure Occurred in Little Cottonwood Canyon**



**Data does not distinguish the time or length of closure.*

In terms of hours, the time per month that the Hellgate/Superior section of SR-210 is closed is declining; whereas, closures from the mouth of the canyon have remained fairly constant for a decade.

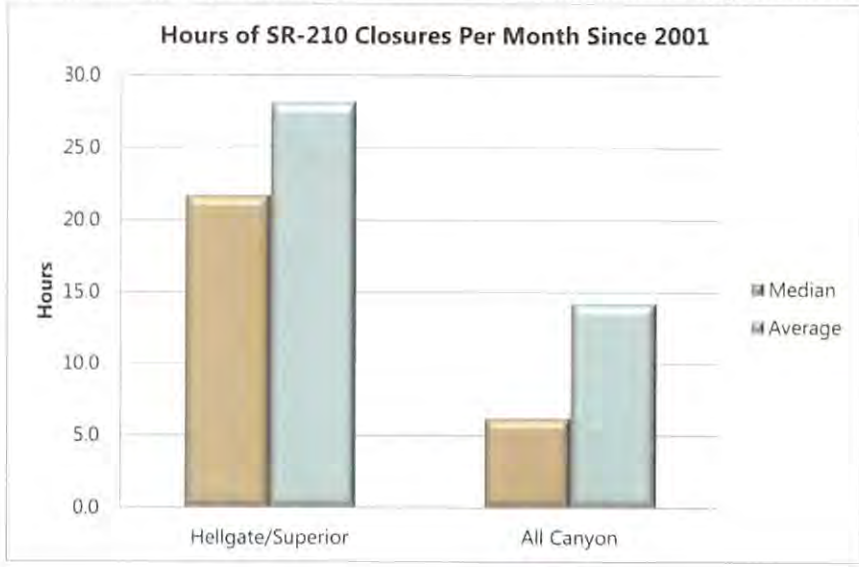
Figure 17: Hours of Closure in Little Cottonwood Canyon per Month



Source: UDOT, Fehr & Peers

The number of months that experience significantly longer road closures is enough to raise the average amount of closure time over the 12-year period to well above the median. The average amount of time that SR-210 is closed is about 14 hours per month. However, the median, which is the value with as many data points above as below, is six hours.

Figure 18: Median and Average Hours per Month of Little Cottonwood Canyon Closures since 2001



Transit

UTA provides bus service to the resorts in Big and Little Cottonwood Canyons usually from mid-December to mid-April. Multiple trips to and from the 7200 South and 10000 South TRAX stations are run each day, as well as one trip to and from downtown Salt Lake City, the University of Utah, and the 4500 South TRAX station. The resorts offer employees and season pass holders a transit pass that is automatically activated for the season. The fare is on a pay-per-trip basis, counted electronically for pass holders or collected in cash. The 2011–2012 one-way fare for ski bus service was $4.25 by the end of the season. UTA has a current operating fleet of 40 ski buses. Additional bus service operates in the summer months to serve work trips in Little Cottonwood Canyon, consisting of one trip in the morning and one in the evening.

Ridership changes from season to season based on the service provided. UTA has tried various strategies including a greater number of shorter trips from the mouths of the canyons that required more passengers to transfer, and fewer longer trips that reduce the number of options passengers have to schedule their trips. Budget restrictions limit the total amount of service UTA is able to offer. The ridership reported in Figure 19 is indicative of some of these changes.

Figure 19: Daily Transit Ridership (Big and Little Cottonwood Canyons)

Source: UTA

Inter-county Travel Demand

Summit County, specifically Snyderville Basin and Park City, represents a significant attraction for local and non-resident tourism. The region offers lodging accommodations, amenities, and relatively short travel time from the urbanized areas of Salt Lake County and Salt Lake City International Airport via Interstate 80 (I-80) and SR-224. In addition, there are a number of employees who commute between the regions. The geographical extent of the study area considering inter-county travel demand encompasses a portion of Summit County bounded by I-80, U.S. 40 and the Utah County line, referred to here as the Park City/Summit County area.

Travel dynamics in the study area are particularly complex. The existing tools, the WFRC Regional Travel Model and UDOT's Statewide Travel Model, have limited ability to represent some key travel characteristics. Specifically, these models do not appropriately represent the geographical scale, range of trip purposes, travel modes, temporal/seasonal variability, or destination dynamics that exist within the study area. Without a comprehensive travel model that represents those travel patterns, a rational approach using various data sources was used to estimate basic person and vehicle flow between Salt Lake County and the Park City/Summit County area. These data sources include UDOT traffic data, U.S. Census Journey to Work (JTW), and travel demand models developed by UDOT, WFRC, and Park City.

The maximum amount of inter-county travel demand is based on annual average daily traffic on I-80, which is the primary transportation link between Summit and Salt Lake counties. UDOT automatic traffic recorders reported 46,000 vehicles per day in 2010 on I-80 in Parley's Canyon. Intuitively, this daily traffic flow is partially composed of trips that do not have both trip ends in Salt Lake and Summit counties, so the total daily inter-county traffic flow must be less than 46,000 vehicles.

JTW data from the U.S. Census Bureau provides information on worker travel. As reported in the "On the Map" database, 4,224 people reported living in Salt Lake County and working in the Park City/Summit County area, while 3,431 people reported living in the Park City/Summit County area and working in Salt Lake County. These worker flows were aggregated into geographic districts, which allow estimation of how work trips are distributed spatially. Work trips represent a portion of overall daily traffic, so the JTW trips represent the lower bound to the estimation and can be logically rescaled to estimate total daily travel. The models mentioned above, as well as a model used by Park City to develop a master transportation plan, provide additional information that frame a range of reasonable estimates.

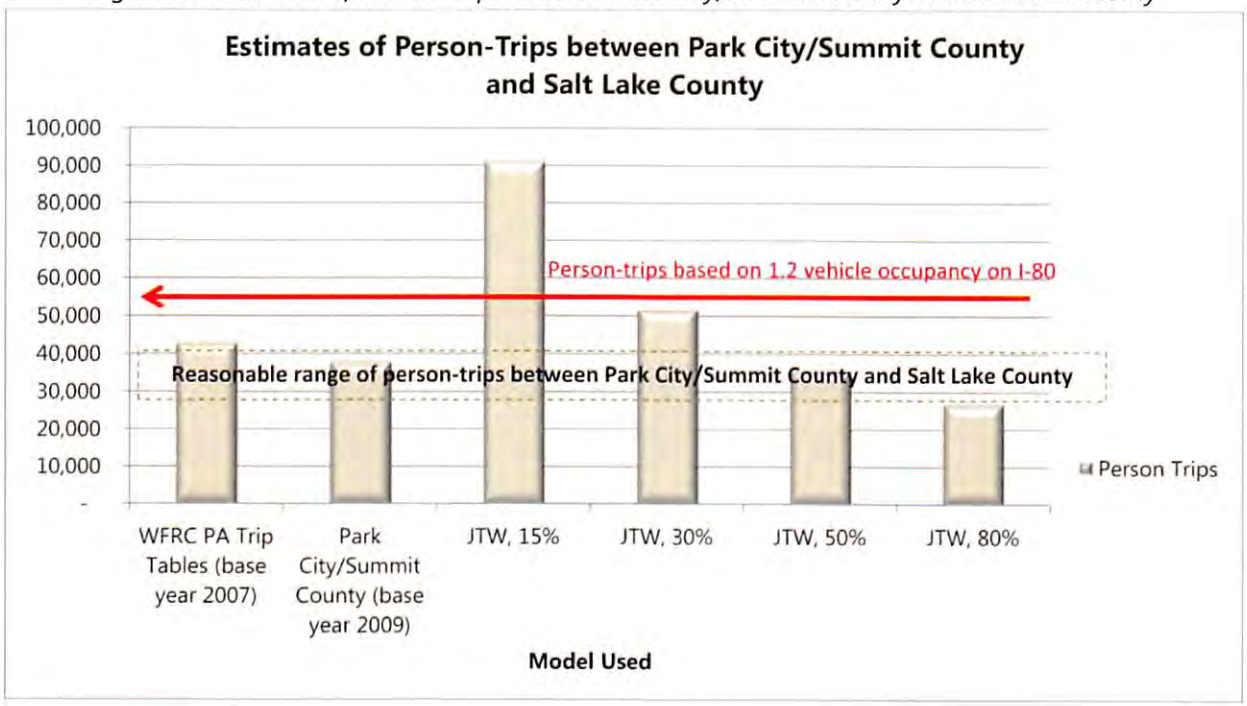
The estimation of the travel demand between Park City/Summit County and Salt Lake County, using the data sources noted above, included the following assumptions:

1. Convert daily worker flows data into daily person-trips using a factor of 1.55. This assumes 1.55 home-based work trips per employee (as opposed to two trips per day), which accounts for common characteristics that influence worker trips, such as flex time, irregular schedules, vacation/sick leave, and so on.
2. Estimate non-worker trips, pivoting off worker trips by considering a range of reasonable work- and non-work trip proportions. Literature suggests home-based work trips comprise 15 percent of total daily travel in a metropolitan area with a population between 1 million and 3 million. In the context of travel between Park City/Summit County and Salt Lake County, in which discretionary travel is minimized by distance and travel time, work trips are likely to comprise a higher percentage of total travel.
3. The composition of work/non-work trips was tested using the I-80 annual average daily traffic as an upper range. Person-trips based on JTW data was converted to vehicle trips assuming vehicle occupancy ranging from 1.2 to 1.5 persons per vehicle, which represents a reasonable average occupancy rate for the corridor. It was determined that between 30 and 80 percent of total travel is work-related.

4. Compare to average daily traffic and Census-based trip estimates to base-year estimates from the three travel models.
5. Apply a best-judgment range of vehicle and person-trips based on the convergence of estimates from the various data sources.

Based on this methodology, a reasonable estimate of the travel demand between the Park City/Summit County area and Salt Lake County is 30,000 to 40,000 person-trips per day (see Figure 20). It is still not possible with existing tools to determine how much of this traffic then proceeds up either of the Cottonwood Canyons or travels to Summit County resorts, yet it offers a scale of the amount of movement between the counties.

Figure 20: Estimates of Person-Trips between Park City/Summit County and Salt Lake County



Note: JTW = Journey to Work

Sources: U.S. Census Bureau, WFRC, Park City, Fehr & Peers

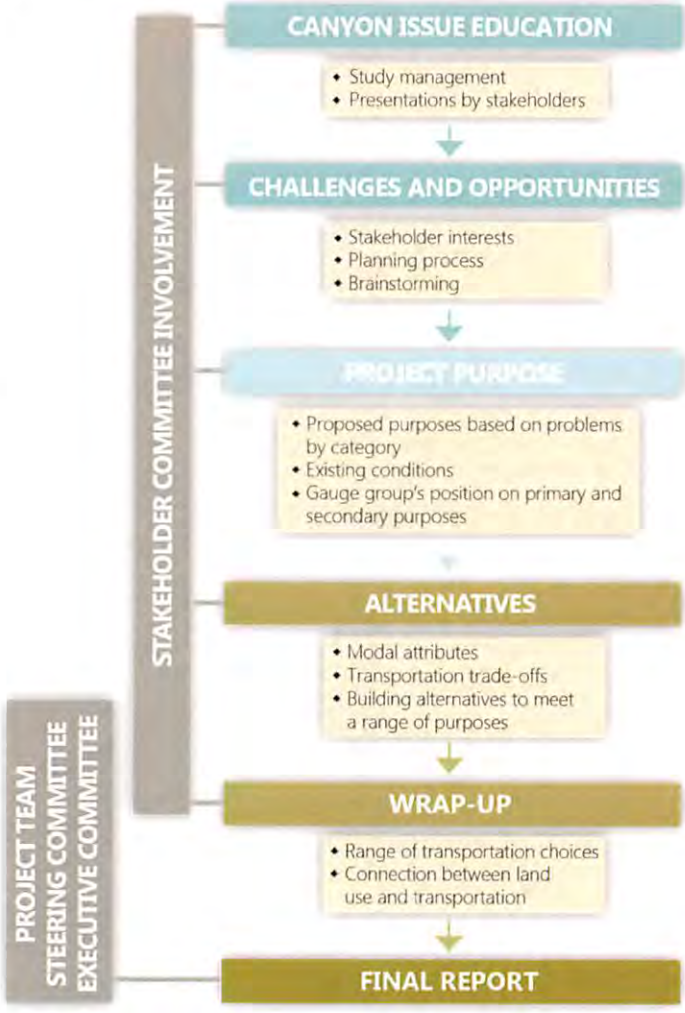
CHAPTER 3. STAKEHOLDER INVOLVEMENT

The process for the Mountain Transportation Study was stakeholder-driven. The consultant team recognized early on that there are many diverse opinions and perceptions of transportation problems and solutions. To proceed directly into a highly technical process without understanding stakeholder perceptions would, in the long run, be counter-productive to the overall project development process.

To better gauge the views and perspectives of key stakeholders, the consultant team conducted a series of one-on-one interviews with approximately a dozen individuals. The intent was to provide an opportunity for stakeholders to express their hopes, concerns, and desires in a private, confidential setting. These interviews set the stage for the larger stakeholder workshop process.

The stakeholder involvement process for the Mountain Transportation Study consisted of five workshops intended to inform as well as gather information from the various interests represented by the group. Figure 21 depicts this process.

Figure 21: Mountain Transportation Study Stakeholder Process



The invitation list to the stakeholder workshops included individuals from the entities shown in Table 5.

Table 5: Stakeholder Workshop Invitation List

Alta Ski Lifts	Salt Lake County - Planning
Alta Ski Resort	Salt Lake County - Sherriff's Office
Big Cottonwood Canyon Association	Sandy City
Brighton Ski Resort	Sandy City Council
Climbers Alliance	Save Our Canyons
Cottonwood Heights	Sierra Club
Cottonwood Heights City Council	Silver Fork Lodge
Draper City	Ski Utah | President & CEO
Envision Utah	Snowbird Ski Resort
Federal Highway Administration	Solitude Ski Resort
Federal Transit Administration	Summit County
Friends of Alta	Town of Alta
Granite Community Council	Unified Police Department
Holladay City Council	United States Forest Service
Mountain Land Development	Utah Department of Transportation
Office of Councilman Bradshaw	Utah Physicians for a Healthy Environment
Park City	Utah Transit Authority - Board of Trustees
Park City Transit	Utah Transit Authority - Bus
Representing Canyon Landowners	Utah Transit Authority - Capital Development
Salt Lake City - Economic Development	Utah Transit Authority - Environmental
Salt Lake City - Public Utilities	Utah Transit Authority - Strategic Planning
Salt Lake City - Transportation	Wasatch Crest Shuttle
Salt Lake County - Bicycle Committee	Wasatch Front Regional Council
Salt Lake County - Engineering	Wasatch Mountain Club
Salt Lake County - Mayor's Office	

The workshops were managed by a professional facilitator who advised the project team on the form and function of each meeting. During the meetings, the facilitator helped ensure that the group understood the agenda, kept the meeting on task, allowed a variety of voices to be heard during question periods, and encouraged the attendees to participate in group discussions. The agendas for each meeting are provided in Appendix A. Most of the material presented at workshops has been uploaded to the project website at: http://cottonwoodcanyonstransportation.com/.

Workshop #1 - Education Workshop

The first workshop was an introductory and education effort where committee members learned about key issues from one another. The stakeholders were introduced to the project team, the study process, and one another. The intention behind the education theme of the workshop was to set the stage for the group regarding the many issues existing in the canyons, particularly outside each participant's particular interest.

Seven members of the committee gave presentations on subjects they represented, with an emphasis on relevance to transportation in the canyons. The issues covered in the presentations included (presenter in parentheses):

- Land Use (Salt Lake County)
- Recreation (USFS)
- Resorts (Ski Utah)
- Watershed (Salt Lake City)
- Avalanche Safety (UDOT)
- Transportation (UTA and UDOT)

Feedback from workshop attendees revealed a desire by participants who did not present to have a chance to voice their positions regarding the canyons, which they were able to do in subsequent workshops.

Workshop #2 - Canyon Challenges and Opportunities Workshop

In response to the feedback from the first workshop, each participant (or a representative if a group had more than one participant) reintroduced themselves and stated their interest in or position on some aspect of the canyon transportation question. Additionally, as a next step in the education process, the consultant team gave a short description of the process a transportation project must follow to become a reality.

The participants played an important role in this meeting as a voice of the attitudes surrounding the current transportation system in the canyons. In small groups, the stakeholders were asked to verbalize the challenges they thought currently existed as well as the opportunities or untapped potential the canyons held.

The small group exercise resulted in a large number of ideas on the problems that visitors experience in the canyons. In an attempt to organize and synthesize these ideas, the project team organized the thoughts into categories and paraphrased the language into bullets. A summary of the results for the identified challenges follows.

Challenges

Access:

- Diversity of visitor groups (with diverse needs and desires)
- Limited parking (trailheads, park-and-ride lots, ski resorts)
- Limited trailhead access information
- Lack of information on available parking
- Informal/illegal parking
- Lack of secondary access/alternate route

Transit:

- Lack of summer transit
- Lack of capacity on buses during peak times
- Lack of real-time information (next bus, etc.)
- Lack of transit options
- Lack of regional connectivity
- Cost (transit fare)

Congestion/Reliability:

- Congestion/delay due to road closures for avalanche control
- Congestion during peak times
- Degradation of air quality from automobiles
- Lack of passing opportunities
- Lack of carpooling (too many single occupant vehicles)

Safety:

- Avalanche hazard
- Canyon conditions (narrow, winding, icy, steep side slopes)
- Lack of continuous bicycle lane
- Pedestrians on road
- Conflicts at driveways

Economic:

- Lack of connections between resorts
- Susceptibility of businesses to road closures and delays
- Funding for major capital improvement
- Cost-effectiveness of transit solution
- Balance level of development with environmental protection

Environmental:

- Watershed protection
- Automobile emissions reduction
- Natural resource protection
- Overuse (what is the carrying capacity of the land?)
- Degrading visitor experience

Miscellaneous:

- Overlap between jurisdictions
- Political integrity
- Accommodating growth
- Private land owner rights

Because transportation projects can also be built to create opportunity, the small groups were also asked to brainstorm ideas on what benefits might be realized by a transportation improvement in the canyon. The opportunities were also summarized and paraphrased, as outlined below.

Opportunities

Access:

- Improve access for all visitors, year-round
- Use/lease existing corporate parking structures at mouth of canyon
- Improve parking management (fees, vouchers, passes)
- Establish/formalize trailheads
- Link Wasatch front and back
- Provide alternate access/alternative route
- Improve real-time information on parking availability/capacity

Transit:

- Provide one-seat trip
- Link to regional transit system
- Improve transit (on time, more frequent, more convenient)
- Implement new technologies
- Obtain last remaining undeveloped parcels at mouth for transit-oriented development hub
- Provide sustainable transit solution

Congestion/Reliability:

- Provide HOV/bus lane
- Reduce automobile trips in canyon
- Alleviate congestion at mouth of canyon
- Improve visitor experience
- Increase capacity to recreation areas

Safety:

- Provide dedicated bike lane
- Eliminate easy access to "party spots"

Economic:

- Increase business revenue with easier access
- Provide ski resort links (interconnect)
- Enhance visitor experience
- Link economic development in valley to canyon transportation
- Promote tourism
- Tap into funding for Olympics
- Phase improvements according to demand and funding

Environmental:

- Decrease automobile emissions
- Improve watershed health: reduce parking, reclaim spider web trails
- Preserve land (as mitigation)
- Address potential overuse (decrease trailhead access in critical areas)

Growth:

- Accommodate population growth

Miscellaneous:

- Improve public awareness/education of watershed and canyon issues
- Improve link between transportation, land use, economic development
- Conduct usage study for trail management
- Create a model of transportation, environmental, and economic balance

The review discussion during the meeting included a stated realization that the opportunities were often a way to address the challenges.

To provide some scale to the thoughts expressed in the challenges and opportunities exercise, we created Figure 22, which sizes words based on the number of times it exists in the input. The input was a file using all of the verbatim comments made by the group during this discussion.

Figure 22: Frequently Used Words in Participants' Comments

Source: wordle.com™, input by Fehr & Peers

Workshop #3 - Project Purpose Workshop

The objectives of the purpose workshop were to take what was heard at the previous workshop and gauge the stakeholders' ideas on what they thought the purpose of a transportation project should be.

Before the group exercise, however, the Steering Committee thought it was important to disclose to the stakeholder group some of the data collected on the existing conditions in the canyons to inform the stakeholders on the current situation. The project team presented some of the statistics on skier visits, traffic, transit, and road closures that are included in Chapter 2 of this report. At the end of the presentation, some example purpose and need statements from other projects were explained to help the group frame their own thoughts before participating in the exercise.

The project team had drafted a number of problem statements based on the problems and opportunities summary of the previous workshop and asked the stakeholders as individuals to weigh in on the purpose choices. Again, the problem statements were presented in categories. Participants were given a limited number of choices, described in the meeting handout as follows:

BLUE DOT – Primary Purpose

Place your blue dots on up to three statements that most closely reflect the main reason(s) for considering a transportation investment (you can place more than one dot on a single statement). Alternatives that do not address the primary purposes (i.e., solve the problem) are eliminated and not considered any further.

What constitutes a primary purpose?

As you read each statement, ask yourself, "Can the existing system continue to function if this specific statement is not addressed?" If you answer "no," you've identified a potential primary purpose statement—a problem exists that *needs* to be addressed. If you answer "yes," you can consider either a green dot (the statement is a valid problem but not the main reason for considering the project) or a red dot (see below).

GREEN DOT – Secondary Purpose

Place your green dots on up to five statements that constitute secondary purposes (you can place more than one dot on a single statement). Secondary purposes stem from valid problems that are not the main reason for considering the project. Alternatives are not required to solve this problem, but alternatives that do solve this problem get extra points.

RED DOT – Causes Concern

The red dot can be placed on one purpose statement, if any, that causes you the most concern. You do not have to use your red dot, but you cannot sell it to your neighbor either.

Each individual was allowed to use one set of dots to complete the exercise. The project team then combined the individual responses on display boards for the group to view and discuss. Figure 23 is a photograph of the one of the boards that had a variety of responses, followed by the complete results in Table 6.

Figure 23: Results of Problem Statement Exercise

As described in Chapter 4 of this report, the results of the purpose workshop suggested that the stakeholders largely agreed on some, though not all, purpose types. Every problem statement elicited some comments, often including contradictory requests or more specificity within the statement.

Many participants suggested changing word choices within particular problem statements, but still decided if they would choose to use their dot.

Table 6: Summary of Workshop #3 Problem Statement Exercise

Dot Color			Potential Purpose Statement	Assigned Category	Majority Priority
Blue	Green	Red			
29.5	12		Facilitate safe, convenient, reliable and sustainable year-round access to and within the Cottonwood Canyons for diverse user groups, including dispersed recreationists (hiking, backcountry skiing, rock climbing, mountain biking), developed recreationists (camp sites, picnic areas), commercial uses (ski/summer resorts), homeowners, and businesses.	Access	Primary
14	11		Protect and maintain watershed health and conditions of the Cottonwood Canyons landscape.	Water/ Natural	Primary
8	12		Enable growth in the tourism and recreation economies of the region by providing alternative canyon access while preserving and enhancing the overall user experience.	Economic	Secondary
8	11.5		Increase transit use and decrease automobile traffic to and within the Cottonwood Canyons.	Transit	Secondary
8	11.5		Improve transit convenience, comfort, frequency, and reliability to and within the Cottonwood Canyons.	Transit	Secondary
8	12.5	2	Accommodate future population and tourism growth by increasing access to resorts in the Cottonwood Canyons, particularly during peak usage times.	Congestion/ Reliability	Secondary
6	11.5		Connect the regional transit network to destinations in the Cottonwood Canyons.	Transit	Secondary
1	20		Improve safety and comfort for cyclists and pedestrians in the Cottonwood Canyons.	Safety	Secondary
7	9	1	Limit degradation of natural resources associated with overuse of the landscape and preserve ecologically valuable land.	Water/ Natural	Secondary
6.5	7		Improve the reliability and convenience of connections from the population base in the Salt Lake Valley to the Cottonwood Canyons.	Access	Secondary
0.5	18		Increase attractiveness of the region by connecting hospitality infrastructure in Salt Lake City and surrounding communities with the ski resorts and other recreation opportunities in the Cottonwood Canyons.	Economic	Secondary

Table 6: Summary of Workshop #3 Problem Statement Exercise

Dot Color			Potential Purpose Statement	Assigned Category	Majority Priority
Blue	Green	Red			
2	11.5		Provide cost-effective alternatives to automobile travel to and within the Cottonwood Canyons.	Transit	Secondary
3.5	7		Reduce the public safety risk from avalanche hazards in the Cottonwood Canyons.	Safety	
6	4	1	Decrease environmental impacts associated with vehicular use in the canyons, such as CO_2 emissions, pollutants in stormwater runoff, and vegetation damage from roadside parking.	Water/ Natural	
1.5	7		Reduce automobile accidents in the Cottonwood Canyons.	Safety	
8.5	5	6	Increase attractiveness of the region for tourism by connecting tourist amenities within the Wasatch Back/Summit County/Park City with ski resorts and other recreation opportunities in the Cottonwood Canyons.	Economic	
	11	1	Reduce unofficial roadside parking and unofficial trail use, which degrade vegetation and watershed health and fragment wildlife habitat.	Water/ Natural	Secondary
1	6		Enhance parking options and availability near recreation access points and/or reduce the demand for parking during peak periods to lessen the impacts of unofficial roadside parking.	Access	
2	3.5		Reduce road closures in the Cottonwood Canyons due to avalanche hazards and accidents.	Congestion/ Reliability	
2	6	2	Decrease congestion in communities at the mouth of the Cottonwood Canyons.	Congestion/ Reliability	
1	4		Provide transit options across all seasons.	Transit	
	5		Improve emergency ingress/egress into the Cottonwood Canyons.	Safety	
3	2	1	Increase access to developed all-season resorts to accommodate more people and concentrate impacts.	Economic	
	2	3	Increase competitiveness in the Intermountain West tourism and recreation economies by gaining market share of skier days.	Economic	

Workshop #4 - Alternatives

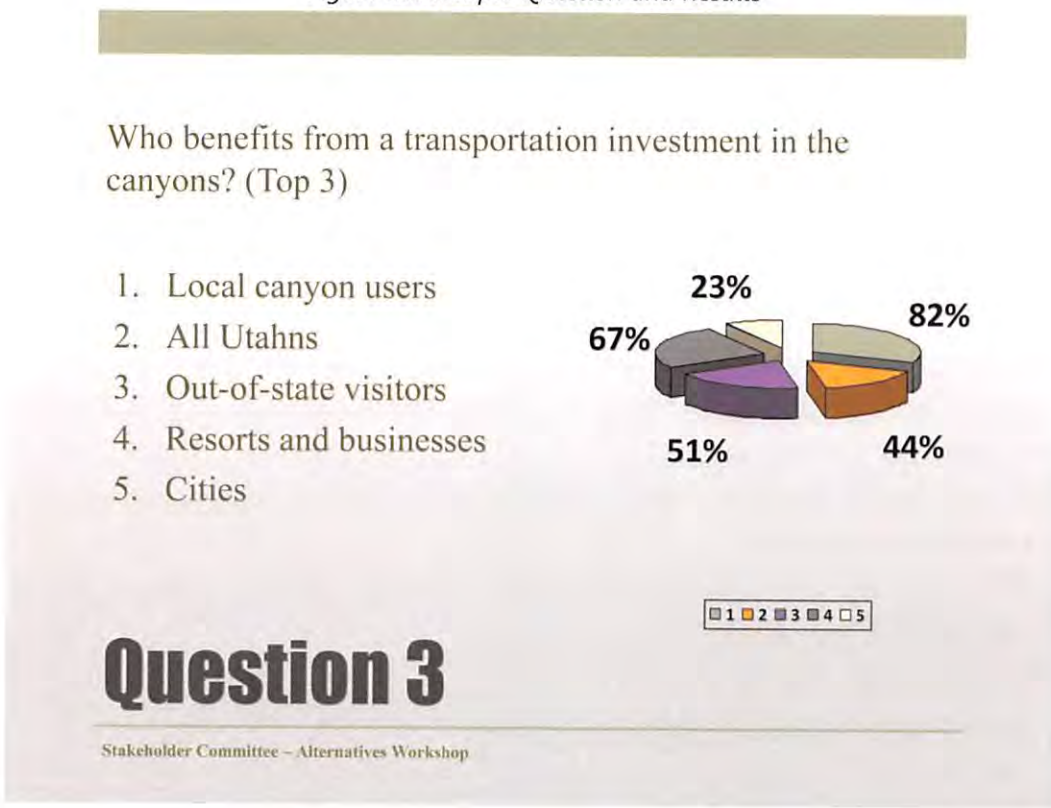
Because no one unifying purpose arose from the previous workshop, the Steering Committee and consultant team devised a meeting agenda that again educated the participants. The audience learned about typical characteristics and uses of a variety of transportation modes, including automobiles, bus and BRT, rail, and aerial systems.

Having been introduced to both project purposes and potential project solutions, the stakeholders took a survey by keypad polling designed to pose a number of questions on the trade-offs faced by the community and decision-makers.

The survey was intended to encourage the participants to think about their answers and not to act as a vote per se. Each question was introduced with a short discussion on the subject with some pictures to spur ideas. Sample introductory and question slides are shown in Figures 24 and 25.

Figure 24: Sample Introductory Slide to Question

Figure 25: Sample Question and Results



Between 37 and 41 attendees took the survey (not all respondents answered all questions or signed in): 16 public employees not associated with a city, nine municipal employees, five private business representatives, three private individuals, and four individuals associated with a non-profit organization. Some points of interest in the survey results include:

- More than two-thirds of respondents agreed that a significant transportation investment is needed to manage growth in the canyons.
- Approximately two-thirds of respondents believe the transportation investment benefit should roughly equal the cost.
- Interestingly, 70 percent of respondents believed that a significant transportation investment will help manage growth, yet 45 percent believed there should be no change in land use.

Following the thoughtful responses provided in the survey, the attendees were asked to apply what they had learned. Stakeholders were asked to sketch an alternative for three different objectives as follows:

- Objective A: Maintain Capacity (i.e., shift modes, optimize roadway efficiency)
- Objective B: Increase Capacity (i.e., increase transportation capacity to top of canyons)
- Objective C: Regional Connectivity (i.e., connect canyons to destinations in the Salt Lake Valley, connect canyons to Summit County)

Stakeholders were provided three blank maps of the Mountain Transportation Study area (one for each objective), and were asked to draw alternatives on the maps using a different color for each mode as follows:

- Roadway (includes improvements such as passing lanes, slow vehicle turnouts, intersection improvements, snow sheds, tolling, etc.; widening for additional through lanes was not considered)
- Bus (uses existing roadway; includes improvements such as improved bus stops, variety of service options, etc.)
- BRT (exclusive lanes, fewer stops, stations with shelters/seating, off-board fare collection, transit signal priority, etc.)
- Rail (light rail or cog rail)
- Aerial (steel cable ropeway system such as gondola, tram, or funitel)

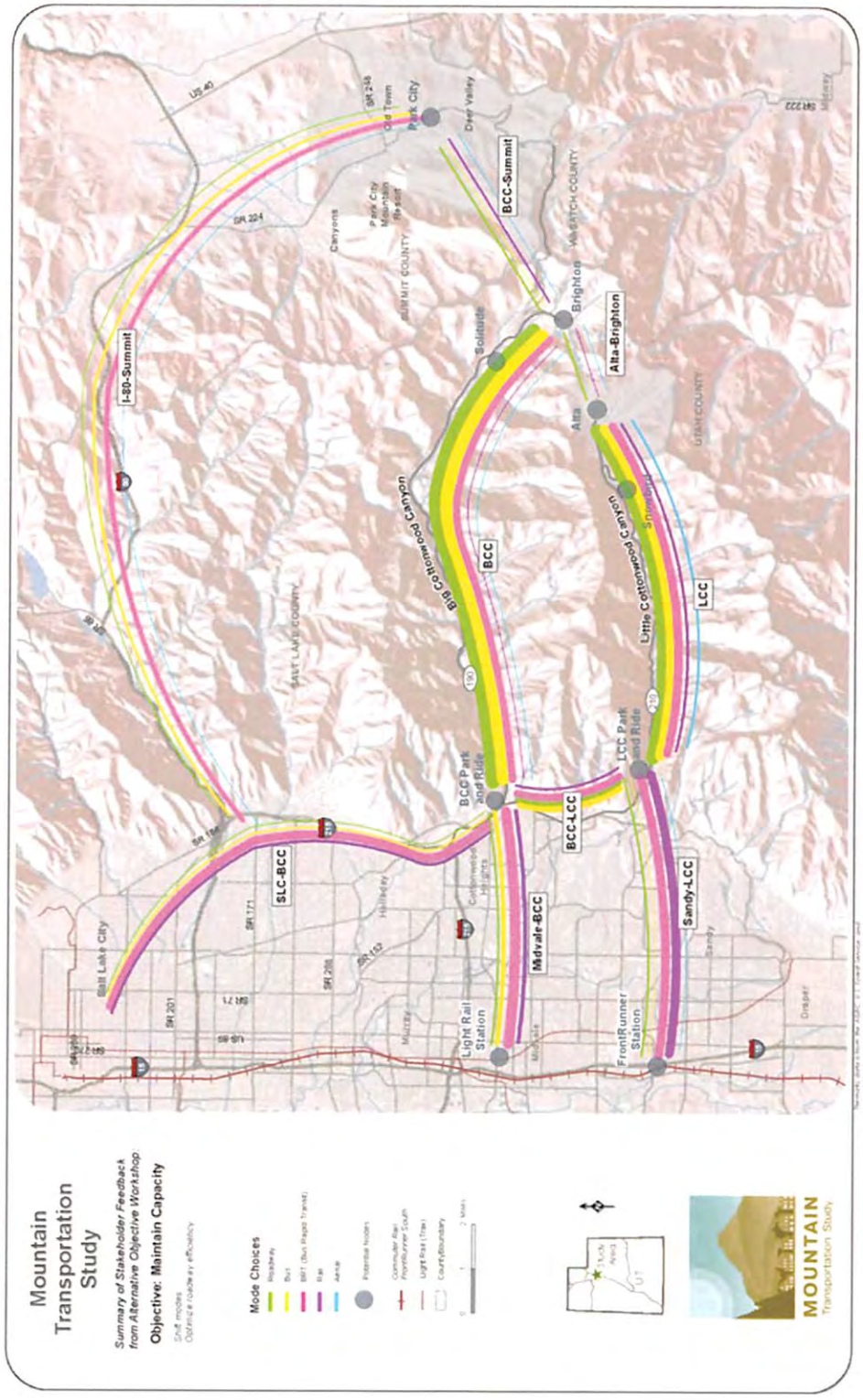
Stakeholders were instructed to sketch an alternative for all three objectives regardless of whether they supported the objective. Each map had a space for the stakeholders to indicate whether they supported the alternative or not. In addition to individual maps, the stakeholders came up with alternatives as small groups.

A total of 35 stakeholders participated in the exercise. To standardize and quantify the results of the open-ended exercise, the results were categorized according to common, recurring segments (most stakeholders divided their alternatives into these common areas on the map). The resulting summary serves as a general snapshot of stakeholders' suggested alternatives for high-level, preliminary purposes; it does not provide details more specific than segment or mode.

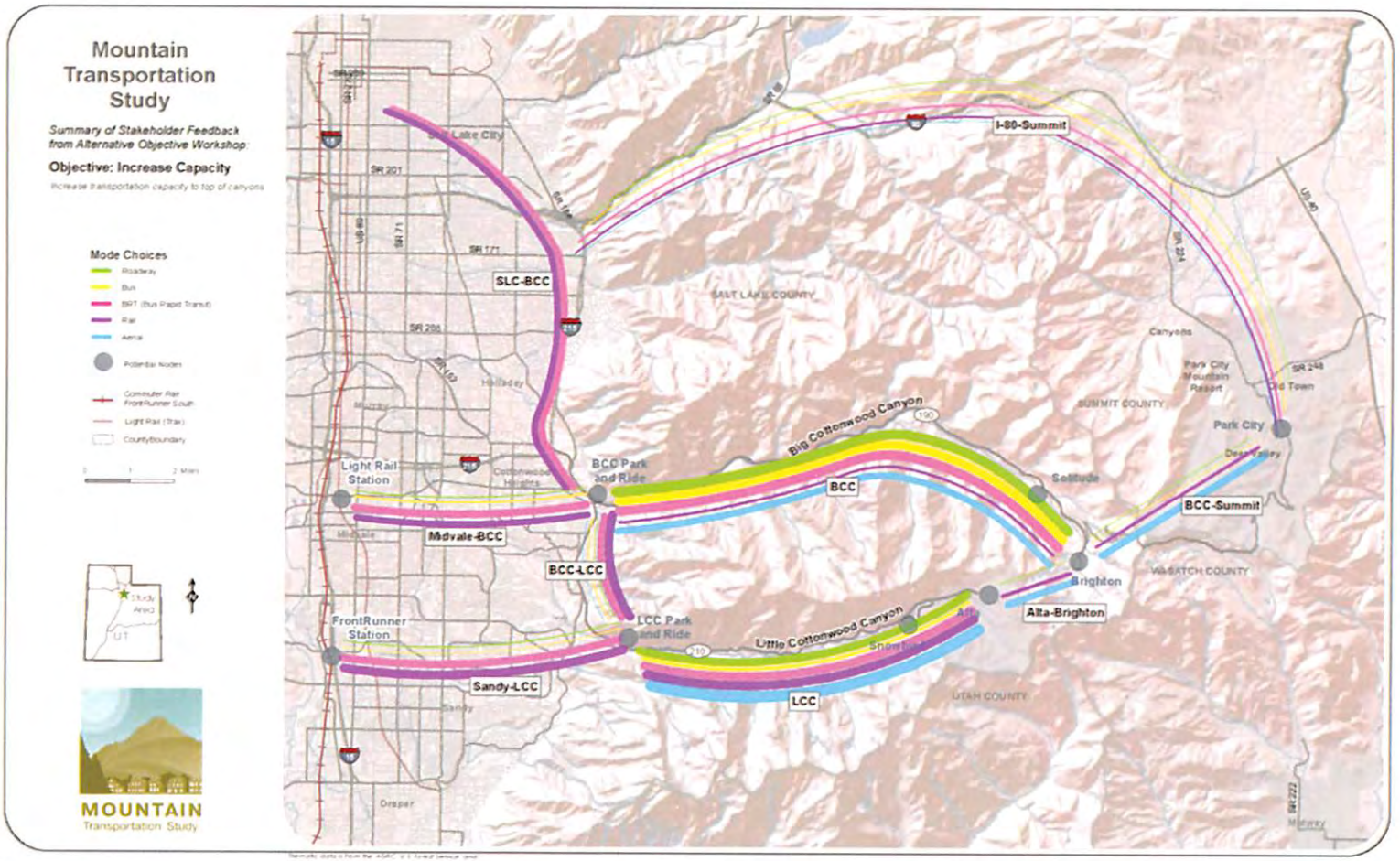
Composites of the group's responses for each purpose are shown in Figures 26 to 28. The thickness of the line indicates the number of same ideas, and specific modes are represented as follows:

- Green – Roadway
- Yellow – Bus
- Pink – BRT
- Purple/magenta – Rail
- Blue – Aerial

Figure 26: Summary of Survey Respondents' Suggested Alternatives for Objective A



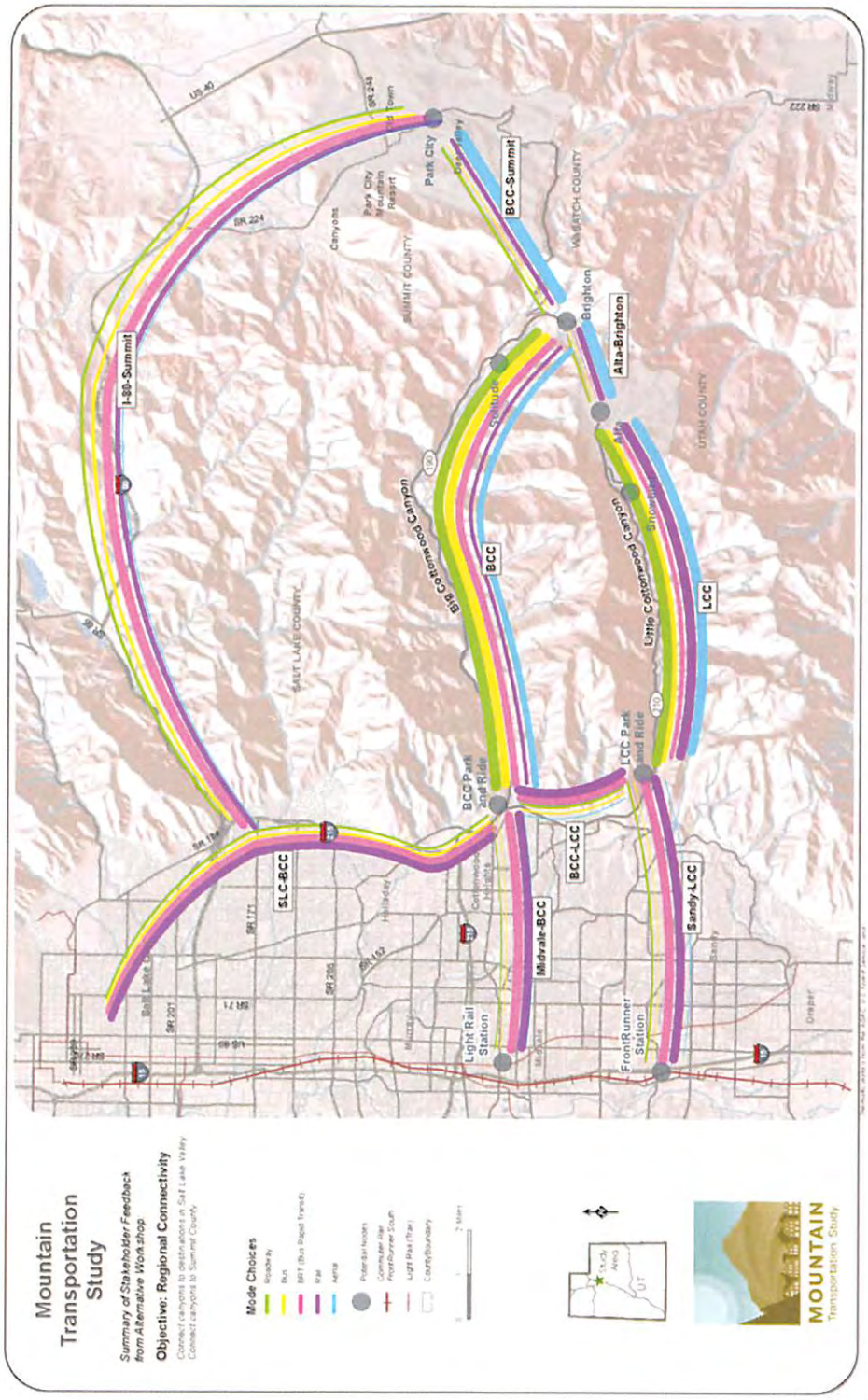
A



B

Figure 27: Summary of Survey Respondents' Suggested Alternatives for Objective B

Figure 28: Summary of Survey Respondents' Suggested Alternatives for Objective C



C

Attendees' comments after the exercise included some confusion regarding the wording of and difference between the objectives; yet, most appreciated the chance to do the exercise. During the educational presentation on modes, attendees were introduced to the concept of an aerial solution. The maps show that most participants used the aerial mode appropriately. The group's familiarity with rail transit seems evident given the use of the rail mode for the Increase Capacity and Regional Connectivity objectives.

Workshop #5 - Wrap-up

The final workshop included review, some new information, and wrap-up exercises that would not require analysis outside the meeting (because it was the final workshop, the project team would not be able to present new results back to the group). The project team used the wrap-up meeting to convey the results from the alternatives workshop. The survey and map exercise summaries previously described were presented to the group.

The observation resulting from the previous workshop's exercise regarding the desire for a transportation project without a change in land use prompted the thought that more attention needed to be paid to educating stakeholders on the connection between transportation and land use. This exercise was used to spark the land use discussion, which will be carried over into future phases.

The consultant team researched a number of mountain towns and the types of land uses seen elsewhere in the United States (and one in Canada). The land uses were categorized largely based on available visitor beds and permanent population. A presentation highlighting three towns for each category—six of which are in Utah—was given to the group. The towns chosen and the category under which they fell are shown in Figure 29. A sample of the information provided for each town is shown on the presentation slide of Alta (Figure 30).

Figure 29: Land Use Choices Categories by City

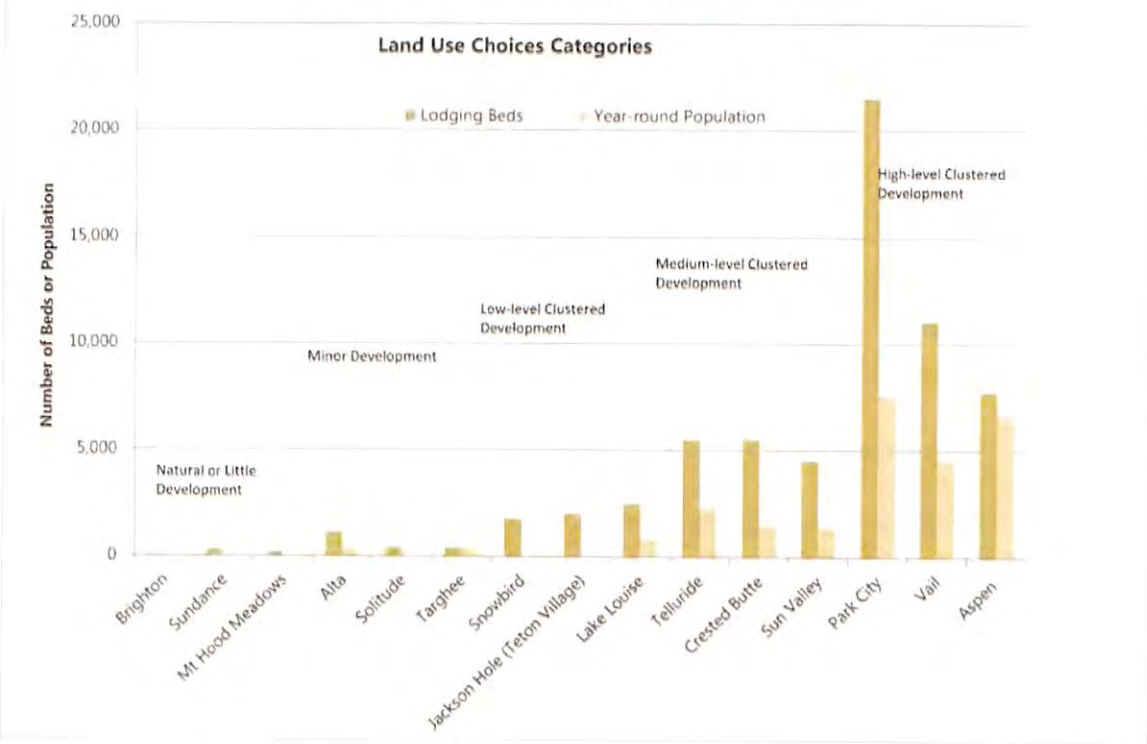


Figure 30: Example of Land Use Presentation Slide – Alta

Distance from Major Metropolitan Area	13.7 Miles
Population	383
Year Founded	1865
Acres of Development	60
Land Use Types	Ski Lodge, Dispersed Commercial, Single-Family Housing, Condos
Hotel Beds	1,136

Minor Development **Alta**

Stakeholder Committee – Wrap-up Workshop

Because keypad polling allows the results to be displayed immediately, the project team chose to again assess the position of the group using a survey. The intent of the survey was to differentiate land use types with respect to geographic location as well as available mode of transportation. Due to time constraints, the survey limited the exercise to the four locations shown on Figure 31.

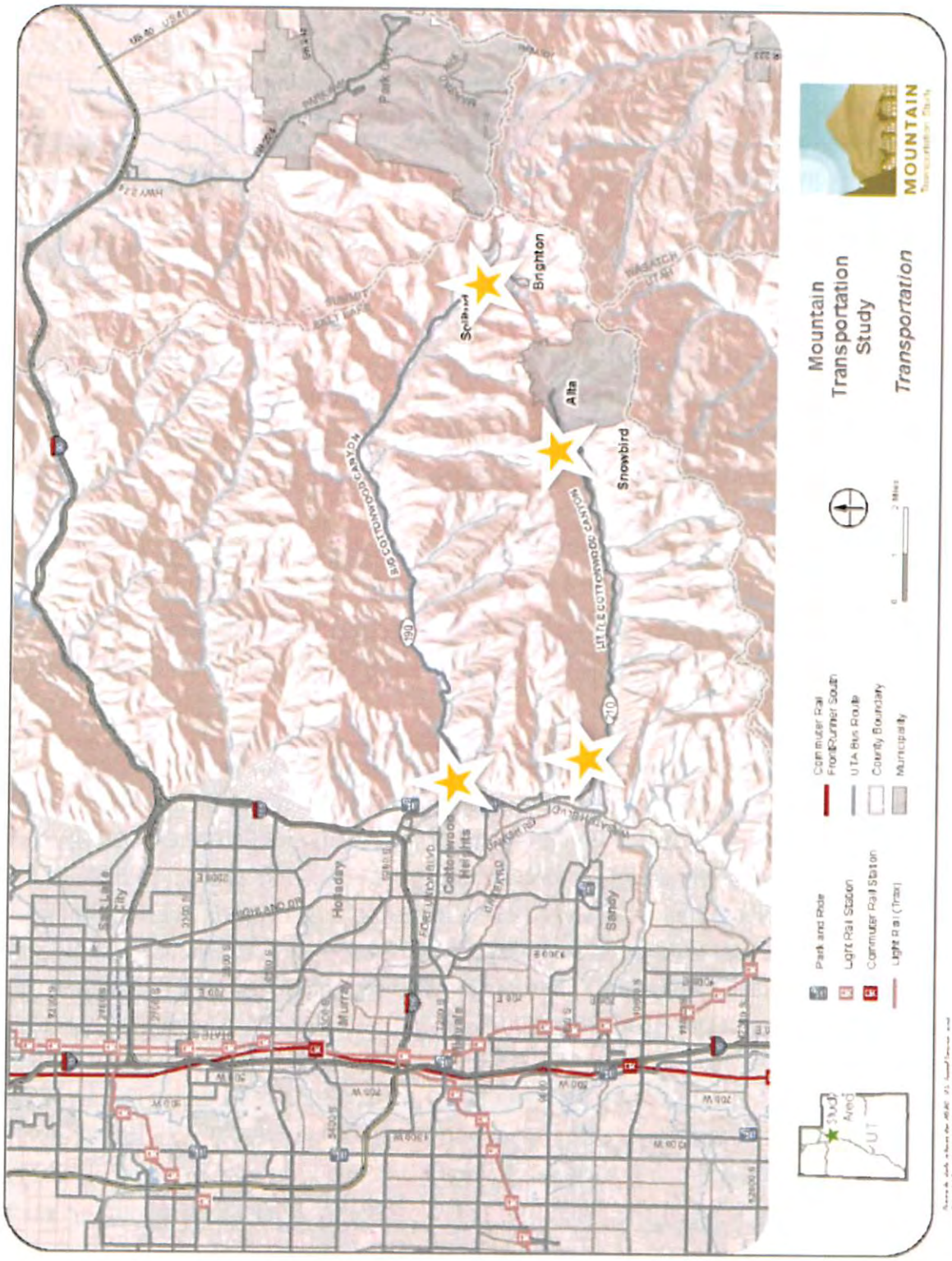
At the wrap-up meeting, 47 to 51 respondents took the survey (again, not everyone answered every question). The sign-in sheet indicates that 16 public employees, 16 municipal elected officials or employees, six individuals representing private business interests, three private individuals, and seven non-profit organization representatives attended the meeting.

The survey consisted of three basic parts:

1. Query the audience's idea of desired land use in the canyons in general: "What type of development would you like to see at the [location]?"
2. Challenge the audience to associate land use with a mode of travel: "What land use do you think is appropriate to sustain [mode] at the [location]?"
3. Discover whether or not the terminus of a transportation project changed anyone's views on land use: "If there were a direct connection to Summit County, what land use do you think is appropriate at the top of [Big/Little] Cottonwood?"

The modes were bus, BRT, rail, or aerial. Based on the results from the alternatives workshop, all four locations were considered for bus and BRT, but only Little Cottonwood Canyon was considered for rail or aerial improvements.

Figure 31: Land Use Survey Locations



spaces are available in most of these areas during the summer. Parking expansion is not allowed on USFS lands in the canyons (except if needed for watershed protection or to facilitate mass transit).

Transit service to the park-and-ride lots at the base of the canyons is limited and the ski buses are generally accessed by driving and parking at the base of the canyons or by drop-offs. There are regular bus routes on 7200 South and 9400 South. During the winter, there are two round trips per day from downtown Salt Lake City, the University of Utah, and the 4500 South TRAX station. Park-and-ride lots in the Salt Lake Valley, at TRAX stations, and downtown Salt Lake City have unused capacity in both seasons.

Parking on the side of the road creates an uncomfortable and/or unsafe environment, impedes bicycle travel and snow removal, and degrades natural resources. Parking on the side of the road is generally legal unless otherwise marked. However, in many areas there is not adequate space to park on the side of the road. On peak winter days some cars are parked partially in the travel lane.

Unofficial summer trails are accessed through roadside parking. Hikers, rock climbers, and other dispersed activity visitors park on the side of the road or in small roadside lots to access unofficial summer trails. Some of the trails form a spider web pattern between the road and the rock climbing route or other recreation area. The multiple unofficial trails can degrade watershed health and fragment wildlife habitat.

Watershed

Watershed health and the natural resources of the canyons are vulnerable to degradation with direct, incremental and cumulative increases in development and use. Results of the USFS's *Watershed Condition Framework* (2011) classify the Little Cottonwood Canyon watershed as not functioning properly (due to zinc impairment to Little Cottonwood Creek and from roads, trails, and other development causing erosion and sedimentation). The Big Cottonwood Canyon watershed is classified as "functioning at risk" for many of the same reasons as Little Cottonwood Canyon. USFS, Salt Lake City, the Utah Department of Environmental Quality, and Salt Lake County each have significant legislative mandates and management responsibilities with regards to watershed health and water quality.

Increased recreation use can also affect the watershed. Increased visitation increases the need to develop more facilities to accommodate more people, potentially affects natural resources and habitat, and stresses the management capacity of the agencies charged with recreational management.

Given their relatively small size and physical and hydrological characteristics, the watersheds are very sensitive to impacts; sedimentation and other contaminants occurring high in the watershed can be transported to the water treatment plants at the mouth of each canyon in a matter of hours.

Watershed for the Salt Lake Valley

Transportation alternatives could either be opportunities to sustain and improve watershed conditions, or could result in additional degradation. Of particular note, transportation alternatives can drive recreation use and land use patterns, which can have significant direct, incremental and cumulative impacts on the overall condition and management of these critical source water areas.

Sensitive canyon environment

Transit

Transit service to the Cottonwood Canyons currently includes ski bus service in the winter. There is no transit service outside the ski season, with the exception of some limited service into Little Cottonwood Canyon. Ski bus routes connect to the TRAX (light rail) system in the Salt Lake Valley, which serves many municipalities. Bus routes have the following headways during peak periods in the winter:

Park-and-ride lots in the Salt Lake Valley

- Route 960, 7200 South in Midvale to Solitude/Brighton: 30-minute headways
- Route 962, 10000 South in Sandy to Solitude/Brighton: 30-minute headways
- Route 990, 7200 South in Midvale to Snowbird/Alta: 30-minute headways
- Route 992, 10000 South in Sandy to Snowbird/Alta: 30-minute headways
- Route 951, downtown Salt Lake City to Snowbird/Alta: 1 route per day a.m., 1 route per day p.m.
- Route 952, University of Utah to Snowbird/Alta: 1 route per day a.m., 1 route per day p.m.
- Route 954, West Valley to Snowbird/Alta: 1 route per day a.m., 1 route per day p.m.

Current transit connections between the population base and tourist amenities in the Salt Lake Valley are limited. Although there is a bus that serves the canyons, bus service directly from

downtown hotels is limited to two round trips per day. The bus trip from downtown Salt Lake City to Alta takes 1.5 hours. The travel time to take TRAX light rail from downtown and connect to a ski bus is similar.

There are currently no convenient transit options between Summit County and the Cottonwood Canyons. For example, for a tourist staying in a hotel near old town Park City, the transit trip for Little Cottonwood Canyon would be about 1.5 hours with one transfer and would only be available on winter weekdays. The transit trip would require two transfers for Big Cottonwood Canyon. The bus route between Salt Lake City and Park City currently does not operate on weekends. The direct distance from Park City to Alta is only nine miles (as the bird flies), but the distance on existing roads (SR-224, I-80, I-215, and Little Cottonwood Canyon Road) is 42 miles (a one-hour drive).

There is currently little incentive to use transit instead of driving because buses get caught in traffic in the canyons on peak days and ample free parking is available on off-peak days. Taking the bus takes longer than taking a personal vehicle because the bus stops to load and unload passengers. Loading and unloading passengers with ski equipment lengthens the time the bus dwells at stops, as well as the overall trip time.

The average reliability for ski bus service for January, February, and March 2011 was 79 percent; in other words, one in five buses was late or early (over 5 minutes). Contributing factors are weather, congestion in the canyons, and transit service characteristics such as loading skis, payment collection, etc. Because there is no "next bus" information for passengers, transit users are left unaware of when the next bus will come or how long they will need to wait.

Bus shelters in the canyons (and in most of the Salt Lake Valley) are not heated, have little to no seating, and do not offer passenger comforts (such as hot beverages). Ski buses tend to be crowded in peak periods and loading ski equipment can be cumbersome.

The cost of the ski bus was $4.25 per one-way trip in 2011–2012. Season and employee pass holders ride free with a season pass from the ski resort (subsidized by the ski resorts). The cost of transit is a factor when competing with automobile travel.

Bus stop amenities at Alta

Safety

Little Cottonwood Canyon road (SR-210) has the highest Avalanche Hazard Index of any major roadway in North America. Vehicles that are traveling slowly or are stationary due to congestion are at increased risk for exposure to avalanches.

Narrow, winding canyon road

The road conditions in the Cottonwood Canyons (steep grades, winding, snowy/icy), combined with driver behavior, can result in crashes—typically vehicles running off the road. UDOT evaluates accident data by comparing the number of crashes on a specific road to the average number of crashes on similar types of roads. The crash rate in both Cottonwood Canyons is higher than expected. The severity is higher than expected in Big Cottonwood Canyon, and lower than expected in Little Cottonwood Canyon. The predominant crash types in Big Cottonwood Canyon are "vehicle ran off road" (due to excessive speed and/or snowy/icy conditions).

Avalanche path above SR-210

There is only one emergency ingress/egress to the Cottonwood Canyons. Emergency response times increase when there is traffic in the canyons. There is no alternative access in Little Cottonwood Canyon, and there is limited/seasonal alternative access in Big Cottonwood Canyon via Guardsman Pass.

Recreation Activities

There are diverse recreation opportunities in the Cottonwood Canyons including hiking, picnicking, camping, rock climbing, mountain biking, road biking, fishing, skiing (resort, back country, cross-country), snowshoeing, and ice climbing. Most of the summer activities are dispersed in nature and accessed by personal vehicles and informal parking areas on the side of the road. There is currently limited transit service in the summer (only two trips per day into Little Cottonwood Canyon). Skiers can access the resorts via personal vehicle or the ski bus. Backcountry skiers and snowshoers generally use personal vehicles and informal parking areas on the side of the road.

Mountainous terrain

Cyclists in Little Cottonwood Canyon

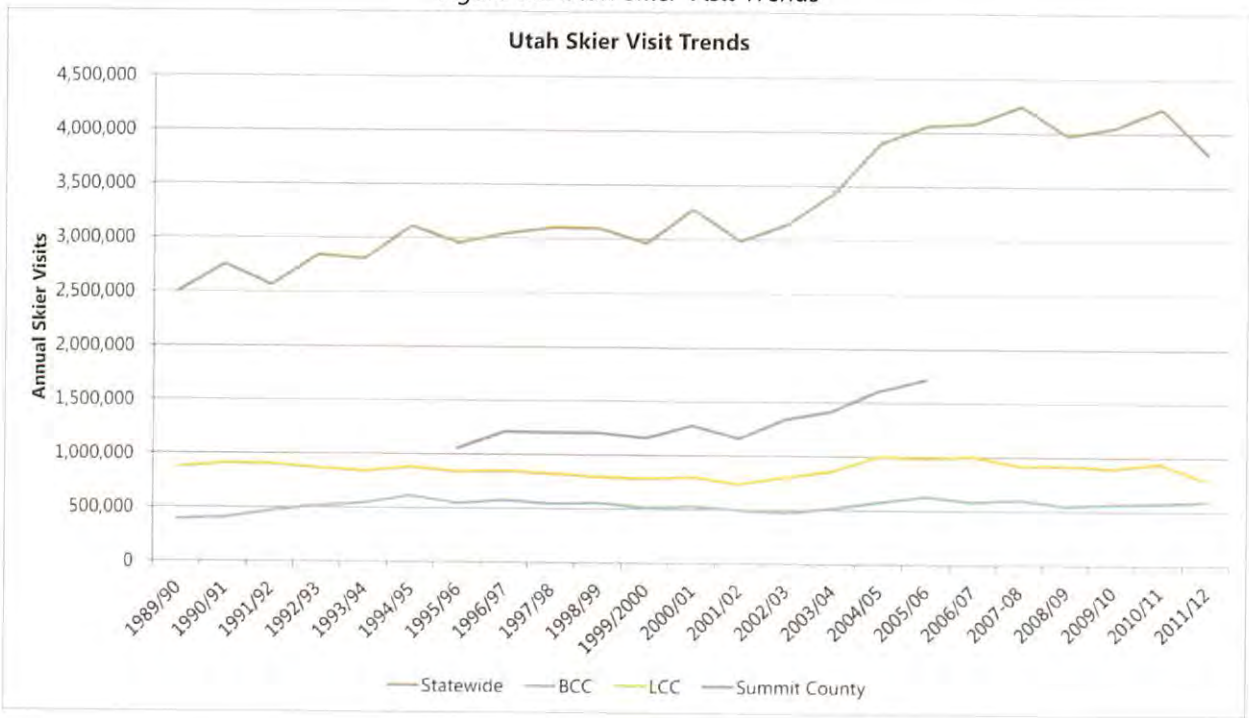
Road cycling in the canyons presents different challenges than other forms of recreation because the activity occurs on the road. Cycling in the canyons is becoming more popular. Road cyclists ride from all parts of the Salt Lake Valley; some park at the base of the canyons. A high speed differential between cyclists and automobiles creates an uncomfortable environment for cyclists and elicits driver frustration. Automobiles get caught behind cyclists in both directions and must drive into the oncoming traffic lane in order to pass. UDOT continues to improve shoulders in both canyons as funding for projects is programmed. As of September 2012, shoulders are generally 2 to 6 feet wide in the up direction in both canyons.

Influence of Ski Trends on Future Canyon Traffic

Future Demand

Figure 32 displays the total annual skier visits from 1989 to 2012 for the entire state of Utah, including Big Cottonwood Canyon (Brighton and Solitude) and Little Cottonwood Canyon (Alta and Snowbird). Annual skier data for Summit County ski areas (The Canyons, Park City Mountain Resort, and Deer Valley) was available from 1995 to 2006. The chart shows that ski areas in the Summit County area are increasing in market share.

Figure 32: Utah Skier Visit Trends

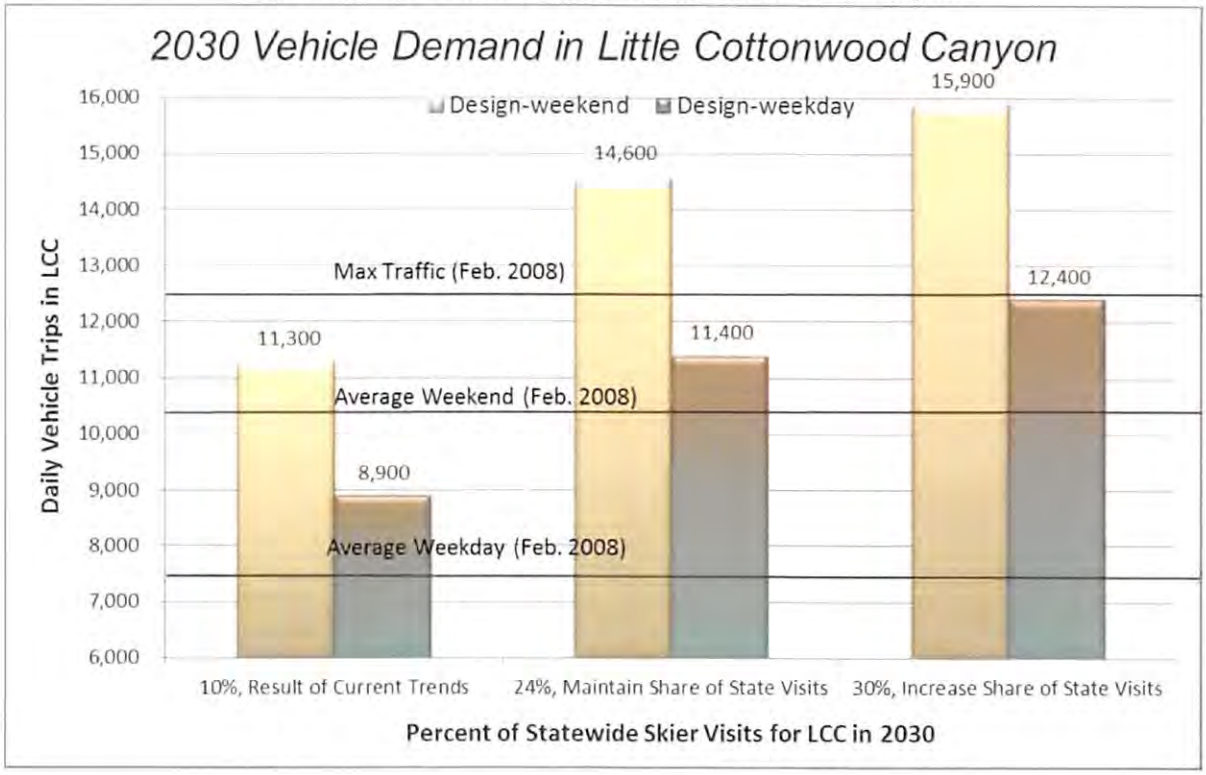


Skier activity is a key indicator of traffic conditions in the Cottonwood Canyons, and long-term skier trends have important implications to future travel demand. In an effort to gain some understanding of future travel in the study area, a demand model was developed to quantify daily travel demand in Big and Little Cottonwood Canyons during the winter season. The "design days" represent conditions on a weekend and weekday during a typical February.

The model was run for 2030 projected statewide skier visits. Figure 33 presents design weekday and weekend two-way traffic volumes for three conditions:

1. Little Cottonwood Canyon with a 10 percent market share, as suggested by historic trends
2. Little Cottonwood Canyon with a 24 percent market share, similar to that in 2005–2006
3. Little Cottonwood Canyon with a 30 percent market share

Figure 33: 2030 Vehicle Demand in Little Cottonwood Canyon



In the first scenario, 2030 traffic levels increase relative to today, but are not dramatically higher. In the second and third scenarios, the ski resorts in Little Cottonwood Canyon maintain or grow their state market share of skier days. Under these scenarios the transportation problems experienced today would worsen.

Models and scenarios were not run for year-round ski resort visits or for dispersed recreation trends; however, these scenarios should also be considered when evaluating transportation alternatives in order to account for the multiple use mandates and management of the USFS.

Economic

The viability and economic health of the recreation tourism and outdoor industries rely in part on visitors to the Cottonwood Canyons. Road closures, congestion, and unpredictable travel can degrade the visitor experience and decrease the attractiveness to visitors.

There may be an opportunity to increase visitor days to Utah with improved transit connections from the area's tourist amenities in the Salt Lake Valley and from the airport to the recreation assets in the canyons. Transit connections between the resorts in Summit County and those in

the Cottonwood Canyons could also increase Utah's economic competitiveness in the Intermountain West and beyond. Increasing tourism could also have economic benefits to local communities.

What areas of purpose and need were not agreed upon?

This section describes the issues identified during the stakeholder workshop on April 27, 2012, and one-on-one discussions.

Growth and Carrying Capacity

At issue is whether the purpose of the project is to increase transportation capacity into the canyons, and if so, by how much. The concern with increased transportation capacity is the impact on the watershed and recreation experience and an increase in development pressure in the canyons. There is general agreement that shifting automobile trips to transit trips is desirable and that increasing traffic into the canyons is undesirable. Additional study on the relationship between different types of access modes and management and impacts to natural resources and cultural aspects of the watershed and National Forest is recommended to better define the purpose and need.

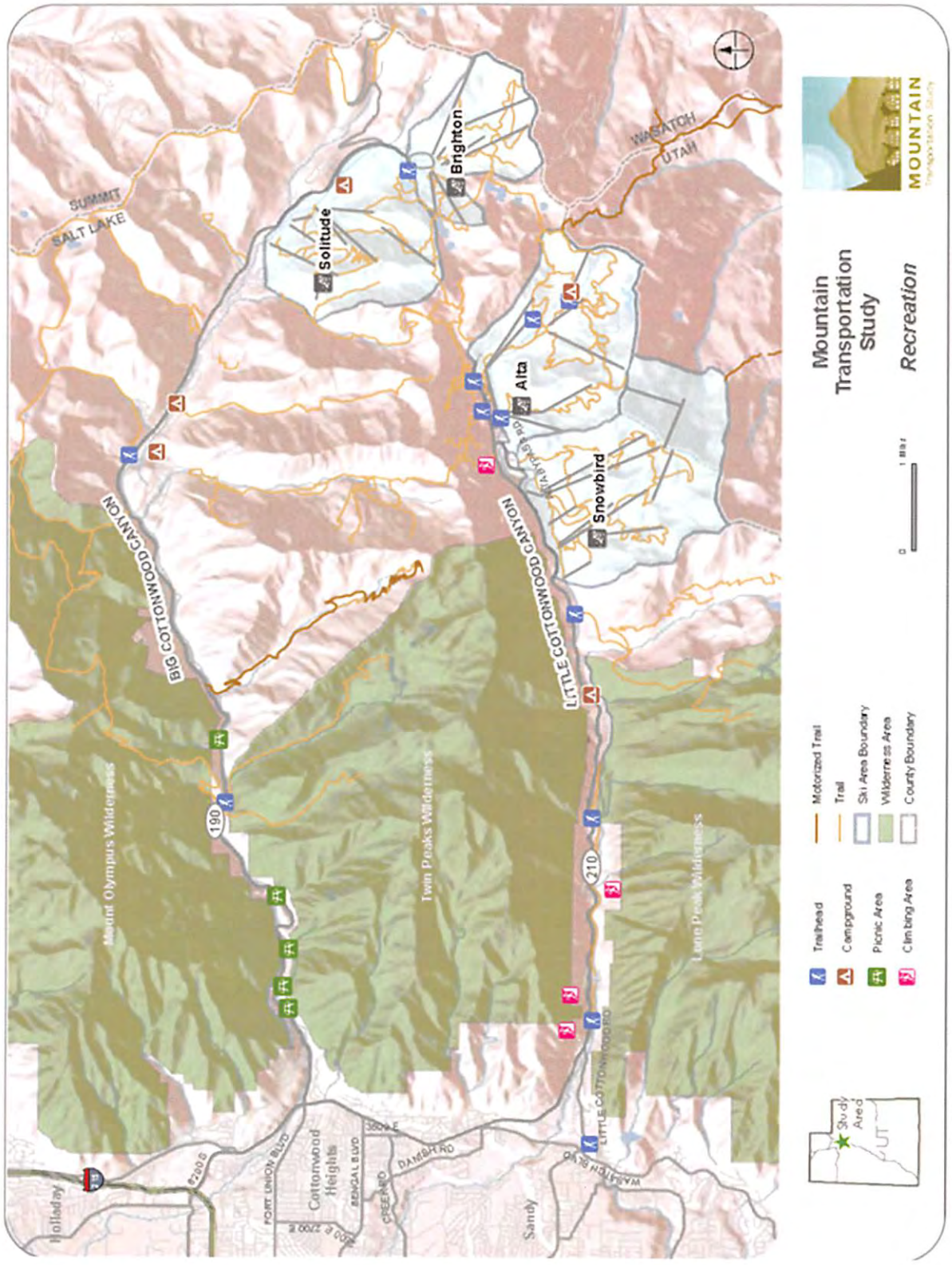
Background

The number of people accessing the Cottonwood Canyons is dependent on the capacity of the transportation infrastructure serving the canyons. There is only one paved road into Little Cottonwood Canyon (SR-210), which ends at the top of the canyon. With the exception of a steep, partially paved/gravel road (Guardsman Pass) that is only open in the summer, the same is true in Big Cottonwood Canyon (SR-190).

During peak periods (weekends, holidays, snow powder days) demand exceeds the capacity of the roads into the canyons. If the capacity of the transportation infrastructure is increased (through transit or roadway improvements), more visitors may access the canyons.

Transportation capacity also affects access to dispersed recreation areas (through parking areas, bus stops, train stations, loading points, etc.). Dispersed recreation activities in the canyons include rock climbing, fishing, hiking, snowshoeing, backcountry skiing, and mountain biking. These dispersed activities are mainly accessed by driving into the canyons and parking on the side of the road or in small roadside lots. See Figure 34.

Figure 34: Recreation Areas



Direct, Indirect, and Cumulative Impacts to the Landscape

The main concerns are summarized in the following questions:

- What are the impacts of increased recreation visitors to the watershed and what is the capacity of the watershed to remain healthy with additional people accessing the forest lands, i.e., what is the carrying capacity of the watershed? Is any degradation allowable?
- How many people can access trailheads and other recreation areas before the experience is degraded by overcrowding?
- What are the impacts of dispersed recreation activities and the associated roadside parking on the watershed? Is it desirable to increase access to dispersed recreation areas, and if so, which ones? Is it desirable to concentrate access in managed areas?

Additional Study

- A study could be conducted to evaluate the carrying capacity of the watershed and forest lands. The study could be conducted in conjunction with or as part of the landscape-scale programmatic EIS or other environmental document. However, the difficulty, complexity, and relative subjectivity in determining carrying capacity in a dynamic natural system are recognized. As such, it may be best to focus on the direct, indirect, and cumulative impacts of proposed actions on the landscape.
- A study to determine the range of ecosystem services provided by the Wasatch canyons and their value could be conducted to better determine how to balance decisions regarding uses of the landscape.

Development Growth

Another issue related to transportation capacity is development and growth. It is important that any transportation study planning for future capacity consider the implications of growth. Improving transportation infrastructure can spur development, and development spurs the need for transportation infrastructure. Although much of the land in the canyons is owned by USFS, there are undeveloped, privately owned lots in Big and Little Cottonwood Canyons, as discussed in Chapter 2. Many of these privately owned parcels have development constraints including slope, access, and water availability so their development potential is severely limited. There are significant development opportunities at the base of the canyons.

Paved/impervious surfaces, vegetation removal, and earth-disturbing activities (cut and fill slopes, excavation) affect the watershed by increasing peak runoff and erosion, and by decreasing storage and infiltration.

The main concerns are:

- How much, where, and what type of development can the watershed absorb and remain healthy?
- Is additional infrastructure needed to accommodate local and regional growth, and if so, where is the best place for the development to occur?

Additional Study

There is an opportunity to preserve land that is ecologically valuable to the watershed (that might otherwise be developed) through land conservation, land trade, open space purchases, or other land use controls. This could be accomplished as a separate project, as a mitigation measure for impacts associated with transportation improvements, or as a joint land use/transportation project.

Ski Resort Expansion, Linking, and Connection to Park City/Summit County

Transit connections between the ski resorts are lacking; however, ski resort linking is controversial and the transportation benefits of linking the ski resorts are not well understood. Concerns with a transit connection to Park City/Summit County include induced travel through the Cottonwood Canyons, backcountry skiing impacts, degradation of water sources (particularly underground water sources), and induced development. The term "induced" refers to an increase spurred by implementation of a project.

Economic opportunities such as increased tourism and/or development opportunities could exist with a connection between the Cottonwood Canyons and Park City/Summit County, though the economic benefits of such a connection are not well understood at this time. NEPA guidance allows "economic benefits" as a purpose for a transportation project. However, economic benefits are harder to quantify and project than transportation problems, and therefore are less commonly used as justification in purpose and need statements. Additional economic study is recommended.

Background

There are seven ski resorts in the Wasatch Canyons that lie within a 45-minute drive from Salt Lake City. The two resorts in Little Cottonwood Canyon (Alta and Snowbird) are affected by slow travel times on SR-210 on peak days. Winter road closures in Little Cottonwood Canyon often result in increased traffic to the resorts in Big Cottonwood Canyon. Improving transportation infrastructure to one ski resort would affect the viability of the other resorts. Alternatives could be designed to improve transportation conditions in the canyon with the most severe problems (Little Cottonwood Canyon) or to all Cottonwood Canyon resorts.

All seven ski resorts are close in proximity; however, they are not directly accessible to one another (i.e., without leaving the resort boundary and/or the canyon), with the exception of Alta and Snowbird. The ski resorts and Ski Utah support the idea of connecting the Big Cottonwood, Little Cottonwood, and Park City/Summit County resorts through ski lifts or transportation infrastructure to increase the attractiveness of tourism to the Wasatch Front. These connections would likely increase the number of people using the canyons (locals and tourists). There is a perception that these connections would also require or lead to ski resort expansion and/or increased development in the canyons. Resort expansion is controversial because it could affect watershed health (for example, construction of access roads, pressure on water and sewer infrastructure, tree removal), and it could reduce backcountry skiing terrain. Ski resorts may be able to increase their market share of skier days by expanding boundaries.

At this time the transportation benefits of ski resort connections are not well understood because traditional models are not designed to project recreation travel demand. The associated economic growth potential is also not understood. A related issue is whether the project objective is to serve destination trips by out-of-state visitors, regional trips, or shorter local trips. Transportation alternatives will vary based on the trip length, and ridership will vary based on the number of mode transfers. Parking needs at the base of the canyons will vary based on mode transfers introduced at the base of the canyons.

Additional Study

- Additional study on the regional travel patterns as they relate to the tourist and resident population base as well as the travel demand between, and economic benefit of connecting, Big Cottonwood Canyon, Little Cottonwood Canyon, the Salt Lake Valley/airport, and Park City/Summit County is needed. The lead agency(ies) for the environmental document would ultimately identify the project termini and target trip length based on this information.
- The travel demand study could be conducted as part of an EIS or other project.
- A joint transportation and land use project that included land preservation or mitigation could be considered, as previously stated.

CHAPTER 5. TRANSPORTATION CONCEPTS

Alternative concepts were developed that could meet the goals and objectives identified by stakeholders. This chapter describes the alternative development process and provides a basic comparison of alternative concepts for the Mountain Transportation Study.

Overview of the Alternatives Development Process for Transportation Projects under NEPA

This section summarizes the alternative development process for transportation projects in general under NEPA.

What is the alternative development process?

The NEPA alternative development process is shown in Figure 35. The first step in a transportation project is to define the problem that needs to be solved—that is, the purpose and need, as discussed in Chapter 4 of this report. Once a purpose and need has been established, different solutions for the problem can be considered—these are the alternatives. It is common to have overlap between these steps. Under NEPA, a reasonable range of alternatives must be rigorously explored and objectively evaluated before decision-makers can select an alternative. Reasonable alternatives include those that are practical or feasible from a technical and economic standpoint and using common sense.[1]

Figure 35: NEPA Alternative Development Process

How are alternatives selected?

A broad range of reasonable alternatives is narrowed down through a screening process to a smaller number of alternatives that are carried forward for detailed evaluation. Screening criteria are developed to evaluate how well an alternative meets the purpose and need. Alternatives that do not meet the purpose and need are not reasonable and are eliminated. Screening criteria may

[1] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 1981

also be developed to compare alternatives according to other factors such as technical feasibility, impacts, costs/benefits, etc. The decisions made during the alternative screening process are often among the most difficult and most intensely disputed among agencies and stakeholders.[2]

Alternatives carried through the screening process are evaluated in detail. Impacts and benefits to the natural and built environment are evaluated and used to compare alternatives, and a preferred alternative is identified. Final approval for the project is given in a Record of Decision (ROD). The lead agency (or agencies), which must be a federal agency, is responsible for determining the range of alternatives evaluated, identifying the preferred alternative, and making the final decision to approve the project. The NEPA process includes the opportunity for public input, and the lead agency (or agencies) must consider the input received from participating agencies and the public in their decision.

Development of Alternative Concepts for this Study

The Mountain Transportation Study is a feasibility study, not a NEPA analysis. The phrase "alternative concept" is used in this report to describe a transportation solution considered at the 30,000-foot level. In other words, the alternatives are considered in a broad or general manner, rather than focusing on the details. An alternative concept can be described in terms of mode (e.g., bus, train, aerial system) or location (e.g., from the mouth of Little Cottonwood Canyon to Alta). Specific alignments were not identified for this study.

Alternative concepts were developed that could meet the following goals and objectives identified by stakeholders:

- Facilitate safe, convenient, attractive, and reliable year-round access to and within the Cottonwood Canyons.
- Increase transit use and decrease impacts associated with automobile use in the canyons.
- Increase the attractiveness of the region and support the tourism and recreation economies by improving connections between the canyons and the population base, the hospitality infrastructure, and the regional transit network in the Salt Lake Valley.
- Plan for future population growth and add to the quality of life of Salt Lake Valley residents.

[2] *AASHTO Practitioner's Handbook, Defining the Purpose and Need and Determining the Range of Alternatives for Transportation Projects*, August 2007

As discussed in the Chapter 4, areas where stakeholders disagreed on goals and objectives include the following:

- Connecting the Cottonwood Canyons to Park City/Summit County
- Increasing transportation capacity into the canyons (if so, by how much)

Alternative concepts were developed for both the areas of agreement and the areas of disagreement, as described below.

How does this study fit with the NEPA process?

This study provides a framework for alternative concepts that can be developed in more detail during a future NEPA process—when the purpose and need and logical termini are better understood. As discussed in Chapter 4, the NEPA purpose and need statement and logical termini for any future transportation project in the canyons will be developed after completion of other formal steps required during the NEPA process. Until a final purpose and need is established and logical termini are identified, it is not appropriate to develop screening criteria or screen alternatives. Therefore, no alternatives have been screened out or eliminated.

Potential Transportation Segments

What is the study area?

The following boundaries were defined for the Mountain Transportation Study:

- FrontRunner commuter rail on the west
- 5300 South on the north
- 12300 South on the south
- Salt Lake County boundary on the east (with inter-county issues to be considered)

During the alternatives workshop, stakeholders expressed interest in evaluating improvements outside the study area (e.g., Foothill Drive, Wasatch/I-215, I-80; see Figures 26 through 28). As discussed in Chapter 6, future NEPA studies may include a larger study area, especially if the purpose of the project is determined to be regional connectivity.

Where are improvements being considered?

Several transportation segments were identified in the study area, as listed in Table 7. The segments represent potential links in a transportation system and were identified based on common sense, stakeholder input, and consistency with the WFRC Regional Transportation Plan. Although there is not agreement on whether a future project should connect to Park City/Summit County through the Cottonwood Canyons, this report provides information on

segments between Alta and Brighton, and between Brighton and Park City. For the purposes of this study, the segments and endpoints are intended to be generic, without a specific alignment. Although 7200 South TRAX and 9400 South TRAX are listed, a final location would be determined as part of future NEPA studies.

Table 7: Potential Transportation Segments

No.	Description
1	7200 South TRAX to mouth of Big Cottonwood Canyon
2	9400 South TRAX to mouth of Little Cottonwood Canyon
3	Mouth of Big Cottonwood Canyon to mouth of Little Cottonwood Canyon
4	Mouth of Big Cottonwood Canyon to Brighton
5	Mouth of Little Cottonwood Canyon to Alta
6	Alta to Brighton
7	Brighton to Park City

Note: These represent general areas where improvements could be made; they do not represent specific alignments.

What is in the Regional Transportation Plan?

A project begins as a need recognized in a long range transportation plan. From the time a project is listed in a long range plan to the time it is constructed, it may change and evolve as it is evaluated in more detail. For example, the outcome of this study or future NEPA processes may result in updates to the long range plan.

WFRC is responsible for maintaining the long range plan for transportation improvements in metropolitan areas along the Wasatch Front. Their 2040 Wasatch Front Regional Transportation Plan includes recommended transit and roadway projects through 2040, including those listed in Table 8.

Table 8: Projects in the Adopted 2011–2040 Wasatch Front Regional Transportation Plan

Transit Type Projects			
Location	**Description**	**Mode**	**Phase**
Fort Union Boulevard Corridor	Mouth Big Cottonwood Canyon – State Street / Fort Union Boulevard	Undetermined	3 (2031–2040)
		Undetermined	Unfunded (2040+)
Big Cottonwood Canyon Corridor	Brighton Ski Resort – Mouth of Big Cottonwood Canyon	Enhanced Bus (BRT 1)	Unfunded (2040+)
Little Cottonwood Canyon Corridor	Alta – Mouth Little Cottonwood Canyon	Bus Rapid Transit (BRT 3)	Unfunded (2040+)
9400 South Corridor	Mouth Little Cottonwood Canyon – State Street	Undetermined	3 (2031–2040)
		Undetermined	Unfunded (2040+)
Highway Type Projects			
Location	**Description**		**Phase**
Little Cottonwood Canyon Road	Avalanche Snow Shed at White Pine Chutes		3 (2031–2040)

The Mountainland Association of Governments is responsible for maintaining the long range plan for urban areas in Summit, Utah, and Wasatch counties. However, their 2040 Metropolitan Transportation Plan does not include any projects in the Mountain Transportation study area, including Park City.

Alternative Concepts

This section provides a general description of alternative concepts for the Mountain Transportation Study. Although there are concepts for all segments listed in Table 7, the main focus of the Mountain Transportation Study was the Cottonwood Canyons, especially Little Cottonwood Canyon. Because traffic congestion and avalanche hazards are worse in Little Cottonwood Canyon than in Big Cottonwood Canyon, more information is provided for alternative concepts in Little Cottonwood Canyon.

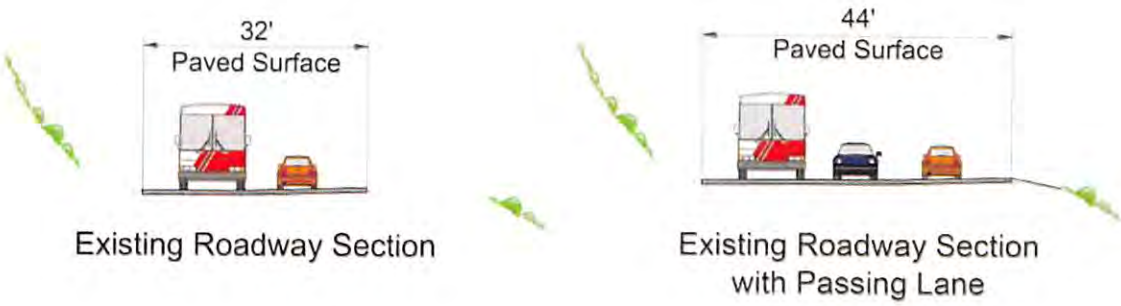
Various transportation modes were considered, including the following:

- Roadway improvements (to increase efficiency of existing infrastructure, not widening for additional lanes)
- Improved bus
- Bus rapid transit (BRT)
- Rail (light rail)
- Aerial systems

Roadway Improvements

Improvements were considered for SR-210 (Little Cottonwood Canyon) to optimize the efficiency and/or safety of the existing road. The goal of this study is to evaluate alternative transportation options in Big and Little Cottonwood Canyons. Widening for additional through lanes was not considered. See Figure 36.

Figure 36: Roadway Improvement Cross Section



Parking Lot Metering

At the end of a busy ski day, operations on SR-210 break down when cars leaving resort parking lots alternate every other with cars traveling down the canyon. This is not the most efficient way to move traffic down the canyon (similar to when a traffic signal is out and is treated like a four-way stop). Metering would improve operations by holding cars back in the parking lots as necessary to keep SR-210 flowing smoothly. Parking lot metering at the parking lot entrances (Snowbird entrances 1, 2, and 4, and Alta Wildcat Base) is one alternative concept that could improve efficiency. Metering could be manual (i.e., people could direct traffic at the parking lot exits) or it could be automated (i.e., with signals).

Traffic backing up on SR-210 at Snowbird exit

Passing Lanes

Passing lanes could improve efficiency by allowing slow vehicles to be passed. Specific locations for passing lanes were not determined.

Snow Sheds and Avalanche Turnarounds

Snow sheds and avalanche turnarounds have been recommended in previous studies[3] and could improve safety as well as efficiency by decreasing the closure time for avalanche control work. Avalanche hazard is inversely proportional to vehicle speed—risk increases as cars sit or travel slowly under avalanche paths. Alternative concepts include snow shed structures at White Pine Chutes #1 to #4, White Pine, and Little Pine. Snow sheds are also included in other transportation concepts (e.g., rail).

Cars below avalanche path on SR-210

Snow shed on Highway 550 (Colorado)

Avalanche turnarounds are bulb-outs located away from avalanche paths that allow for cars to turn around in the event the road needs to be closed for control work or if an avalanche crosses the road while it is open.

Issues and Concerns for Personal Vehicles

Issues and concerns that would have to be evaluated in more detail during future NEPA studies include the following:

- Avalanche risk (for avalanche paths not protected with snow sheds)
- Air quality/emissions
- Limited parking in the canyons

Qualitative Considerations

- Most flexible mode for access (i.e., access is possible anywhere—fishing holes, backcountry areas, trailheads, picnic areas, ski resorts, businesses, residences, etc.—limited only by parking)
- Convenient (can store gear or a lunch, can come and go as desired)
- Comfortable (e.g., personal space, no one standing)

Improved Bus

Improved bus (also called enhanced bus) means improvements to the local bus system without major capital improvements. There are no exclusive lanes for buses—they share the existing roadway with cars (no roadway widening is required).

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[3] *Little Cottonwood Canyon SR-210 Transportation Study Final Report*, August 2006

Potential improvements could include the following:

- Increased bus frequency
- Better/newer vehicles (optional, not required)
- Transit signal priority (bus gets priority over cars at traffic signals)
- Shelters with seating
- Next bus information
- Off-board fare collection
- More doors (allows for quicker boarding)
- Fewer stops (quarter- to half-mile spacing in urban areas)
- Integration with other transit facilities (e.g., timed with connecting rail)

Covered bus shelter with seating

BRT (3500 South MAX)

Issues and Concerns for Improved Bus

Issues and concerns that would have to be evaluated in more detail during future NEPA studies include the following:

- Avalanche risk (for avalanche paths not protected with snow sheds)
- Park-and-ride facilities

Qualitative Considerations

- Can change easily (e.g., route, bus stop locations)
- More flexible than BRT, rail, or aerial for access (bus stops at more locations including minor and major destinations)

BRT

BRT is similar to light rail, except with rubber wheels. In general, BRT stops less frequently compared to bus in order to keep travel time down. BRT systems can include all of the improvements described above for improved bus. For the purpose of this report, BRT assumes the following in addition to improvements listed for improved bus:

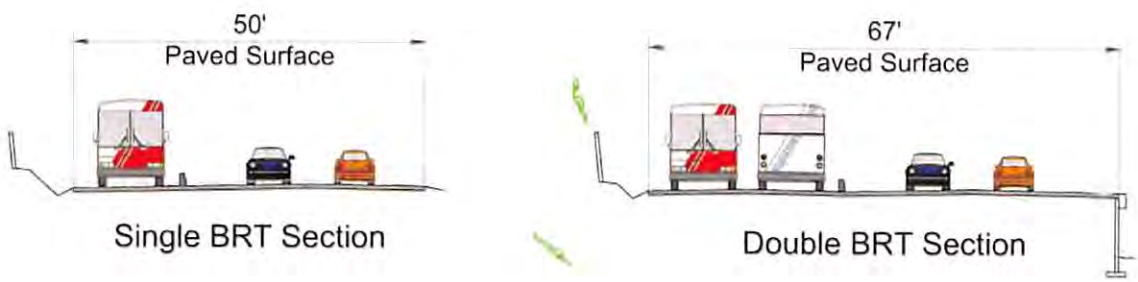
- Exclusive lanes
- Stations (similar to rail)
- Snow sheds at White Pine Chutes #1 to #4, White Pine, and Little Pine

UTA opened the first BRT system in Utah (called MAX) along 3500 South. UTA is planning additional BRT projects along 5600 West and in Provo/Orem.

BRT Concept in Little Cottonwood Canyon

To provide exclusive lanes for BRT in Little Cottonwood Canyon, the existing road would have to be widened (see Figure 37). It could be widened to accommodate one exclusive lane in each direction, or it could be widened for one exclusive lane serving both directions (either with passing areas, or reversible).

Figure 37: BRT Cross Section



Issues and Concerns for BRT

Issues and concerns that would have to be evaluated in more detail during future NEPA studies include the following:

- Impacts to private property, UDOT right-of-way, USFS land, and wilderness
- Visual impacts of earthwork, walls, and stations
- Avalanche risk (for avalanche paths not protected with snow sheds)
- Watershed (potential impacts from construction and increased use/development)
- Park-and-ride facilities

Qualitative Considerations

- Recognizable branding
- Less flexible access compared to automobile or bus, more flexible compared to aerial
- Stations can be similar to rail
- Can be interim step to rail

Rail

UTA currently operates three TRAX light rail lines in Salt Lake County. Extensions to the Salt Lake City International Airport and Draper are expected to open before 2015. The existing TRAX lines operate on a dual track (one in each direction), but it is possible to construct a single track with places for vehicles to pass (passing lanes). Light rail vehicles are powered by overhead electric systems.

Rail Concept in Little Cottonwood Canyon

Table 9 lists the modes that were found to be infeasible (due to terrain or capacity constraints) in previous studies[4] and are not included in this report.

Table 9: Modes Found to be Infeasible in Previous Studies

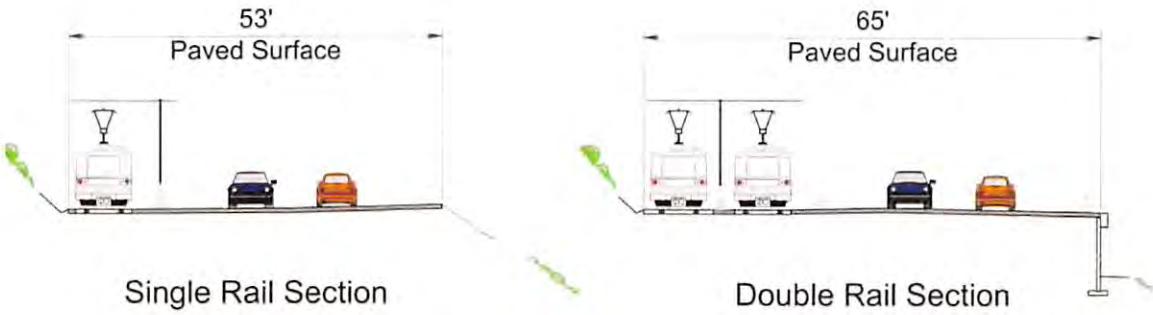
Mode	Reason Infeasible[4]
Maglev	Not appropriate for steep grades and sharp curves in canyon environment; high cost
Heavy rail	Not appropriate for steep grades in canyon environment; high cost
Commuter rail	Not appropriate for steep grades in canyon environment
Monorail	Not appropriate for steep grades in canyon environment
Funicular	Not appropriate for long corridor (can only accommodate single car in each direction)

UTA evaluated a conceptual design for light rail in Little Cottonwood Canyon (see Figure 38). Light rail is feasible in the canyon if vehicles are equipped with pinion wheels for rack trackway (cog rail) on grades steeper than 7 percent. The assumptions for light rail in Little Cottonwood Canyon, based on UTA's concepts, are as follows:

- Single track with passing lanes
- Light rail vehicle equipped with pinion wheels for rack trackway (engage at grades steeper than 7 percent)
- Primary alignment adjacent to SR-210 at grade
- Alternative alignment generally following the existing valley trail, transitioning to SR-210
- Standard light rail four-car stations
- Snow sheds at White Pine Chutes #1 to #4, White Pine, and Little Pine
- Standard overhead contact system for electrical power

[4] *Little Cottonwood Canyon SR-210 Transportation Study Final Report*, August 2006

Figure 38: Rail Cross Section



Rail Concept Connecting to Park City/Summit County with a Tunnel

A concept was considered that would continue the light rail up Little Cottonwood Canyon to Brighton and Park City/Summit County. This concept assumes one tunnel from Alta to Brighton and a second tunnel from Brighton to the east side of the Wasatch Mountains (southeast of Park City). From there, the track would be at grade continuing on to Park City. This alignment is for planning purposes only. The assumptions for the Park City/Summit County connection are as follows:

- Single track
- Light rail with vehicle pinion
- Standard overhead contact system
- Single bore tunnel with vertical concrete partition to create a parallel emergency walkway

Cog Rail – Jungfraujoch (Switzerland)

Issues and Concerns for Rail

Issues and concerns that would have to be evaluated in more detail during future NEPA studies include the following:

- Electrical supply
- Impacts to private property, UDOT right-of-way, USFS land, and wilderness
- Visual impacts of earthwork, walls, stations, and overhead contact system
- Avalanche risk (for avalanche paths not protected with snow sheds)
- Tunnel emergency evacuation
- Hydrology (potential change in hydrology due to tunnel construction)

Cog Rail – Gornergrat Bahn (Switzerland)

- Watershed (potential impacts from construction and increased use/development)
- Park-and-ride facilities

Glacier Express (Switzerland)

Qualitative Considerations

- Less flexible access compared to automobile or bus, more flexible compared to aerial (e.g., stations at major destinations)
- Could connect to light rail system without a transfer (one seat trip)
- Reliable schedule
- Appealing image (perceived as more quiet, spacious, and comfortable, with routes that are more easily understood than bus service)[5]
- Could be a draw for tourism (iconic attraction)

3S Gondola – Peak 2 Peak (Whistler)

Aerial Systems

Aerial systems are fixed or detachable cars on steel cables that travel above ground, including gondolas, trams, and funitels (similar to gondolas with two haul ropes). Ecosign Mountain Resort Planners (Ecosign) evaluated aerial systems for this study (see Appendix C for a comparison of different systems).

3S Gondola

For this report, a 3S gondola system is assumed unless otherwise stated. The 3S (Tri-Cable) gondola has advantages over other aerial systems for the Cottonwood Canyons due its combination of higher speeds and capacities, and because it is better for long distances with longer spans between towers. Characteristics of the 3S gondola system are as follows:

- Two fixed, locked track ropes (steel cables) and a circulating haul rope
- 30 passengers per cabin (up to 18 seats)
- Electrically powered
- Max tower spacing of 9,840 feet
- Maximum tower height of 230 feet
- Tower footing of 3.5 feet by 3.5 feet (4 footings per tower)

[5] http://www.lightrailnow.org/facts/fa_00012.htm

- Access to towers necessary for construction, power, rigging cable, and evacuation
- Stations needed at angle points and for loading/unloading
- Approximate 1.5-minute dwell time at each angle station
- Station footprint of 66 feet by 125 feet
- Evacuation by winch/horizontal rescue
- Attendant in cabins or at stations
- Maximum operation wind speed of 68 mph
- Maximum speed of 17 mph

3S Gondola – Peak 2 Peak (Whistler)

Aerial Concepts

Ecosign evaluated alternative concepts for 3S aerial systems for all of the mountain segments, as summarized in Table 10 (see figure in Appendix C). Specific locations for terminals have not been determined.

Table 10: Aerial Concepts Summary

3S Gondola					
No.[1]	**Description**	**Distance (miles)**	**Loading Stations**	**Number of Towers**	**Number of Angle Stations[2]**
3	Mouth of Big Cottonwood Canyon to mouth of Little Cottonwood Canyon	3.0	Terminals (mouth of canyons)	9–11	1
4	Mouth of Big Cottonwood Canyon to Brighton	12.7	Terminals (mouth of canyon, Brighton), Solitude	25–30	3
5	Mouth of Little Cottonwood Canyon to Alta	9.1	Terminals (mouth of canyon, Alta), Snowbird[3]	20–25	3
6	Alta to Brighton	2.5	Terminals (Alta, Brighton)	4–5	0
7	Brighton to Park City	5.6	Terminals (Brighton, Park City), Summit House	10–12	0
Alternative Option – D8G Gondola[4] Above/Adjacent to Wasatch Boulevard					
3	Mouth of Big Cottonwood Canyon to mouth of Little Cottonwood Canyon	3.2	Terminals (mouth of canyons)		0

1. *No. refers to transportation segment as outlined in Table 7.*
2. *Angle stations are required to change direction and do not allow for loading or unloading.*
3. *It would be possible to add additional loading stations (e.g., White Pine), but it is not assumed.*
4. *D8G is a detachable 8-passenger gondola (only considered for the segment connecting the mouths of the canyons).*

Issues and Concerns for Aerial

Issues and concerns that would have to be evaluated in more detail during future NEPA studies include the following:

- Impacts to private property, USFS land, and wilderness
- Access to towers for construction, power, rigging cable and evacuation
- Visual impacts of towers, cable, and access roads
- Avalanche risk (if towers could be spaced to avoid avalanche paths, if cables would be higher than avalanche blast zone)
- Emergency evacuation (longer time required for longer systems)
- Watershed (potential impacts from construction and increased use/development)
- Park-and-ride facilities

3S Gondola – with seating inside cabin

3S Gondola – with window instead of seating

Qualitative Considerations

- Least flexible mode for access (e.g., terminals for loading and unloading at major destinations only)
- Could be a draw for tourism (iconic attraction)
- Provides a view

Comparison of Concepts

This section provides a comparison of the different modes according to travel time, capacity, capital costs, and qualitative considerations.

Travel Time

Travel time was estimated for each mode as shown in Table 11, using the following assumptions:

- Automobile time based on average speeds between 20 and 35 mph
- Enhanced bus times are based on UTA's 2011–2012 ski bus schedules and a reduction in average speed for the upper range time
- BRT time based on UTA MAX BRT speeds
- Valley light rail times are based on average speeds associated with a 2-minute reliability with respect to scheduled time
- Canyon light rail time based on 30 mph maximum speed and a range of stations and dwell times

- Light rail speed from Brighton to Park City is 15 mph due to assumed at-grade running on winding mountain roads; length of tunnel is unknown at this time
- Aerial time based on maximum speed of 16 mph, 1.5-minute dwell time at angle station, 3.5-minute dwell time at walk-through station (for low end of time range), add 25 percent for high end

Table 11: Travel Time Comparison by Mode

Segment			Travel Time by Mode (minutes)				
No.	**Description**	**Length (miles)**	**Auto**	**Enhanced Bus**	**BRT**	**Rail**	**Aerial**
1	7200 South TRAX to mouth of Big Cottonwood Canyon[1]	7	10–19	21–31	18–23	11–15	N/A
2	9400 South TRAX to mouth of Little Cottonwood Canyon	6.1	10–19	20-30	18–23	11–15	N/A
3	Mouth of Big Cottonwood Canyon to mouth of Little Cottonwood Canyon	4	7–12	10–14	10–14	6–9	15–19 (24–30 for D8G[2])
4	Mouth of Big Cottonwood Canyon to Brighton	14.5	25–43	37–65	37–50	N/A	58–73
5	Mouth of Little Cottonwood Canyon to Alta	8	14–24	36–63	20–28	13–25	43–54
6	Alta to Brighton	2.2	[3]	N/A	N/A	3–5	13–16
7	Brighton to Park City	9	[3]	N/A	N/A	10–30	27–34

Note: N/A means not considered

1. *Route includes a stop at the 6200 South park-and-ride lot for bus alternatives, but not for rail or auto.*
2. *D8G is a detachable 8-passenger gondola (only considered for the segment connecting the mouths of the canyons).*
3. *Auto travel time from Alta to Brighton is about 50 minutes (without a tunnel over 26 miles) and from Brighton to Park City without a tunnel or the use of Guardsman Pass is approximately 60 minutes.*

Auto and rail are the fastest modes, followed by BRT and enhanced bus. Aerial systems are the slowest.

Capacity

Transportation capacity is a measure of the number of people that can be transported in a set time. Capacity was estimated for each mode as shown in Table 12. Capacity is not the same as demand. The demand (or how many riders need to be served) will not be known until a solid purpose and need is established in future NEPA processes. Assumptions for capacity calculations include the following:

- Carrying capacity for mountain setting (not urban)
- Ranges indicate people in vehicles are seated comfortably to very full (includes standees on transit)
- Auto: 2 to 4 people per car; one lane in each direction; 1,000 to 1,200 cars per hour
- Enhanced Bus: 30 to 50 people per bus (30 seats); 30- to 15-minute headways
- BRT: 30 to 50 people per bus (30 seats); 15- to 5-minute headways
- Rail: 60 to 150 people per car (60 seats); four car trains; 30- to 15-minute headways
- Aerial: 18 to 30 people per cabin (18 seats); 60- to 36-second interval between cabins

Table 12: Capacity Comparison by Mode

Capacity (people per hour in one direction)				
Auto	**Enhanced Bus**	**BRT**	**Rail**	**Aerial**
2,000–4,800	60-200	120–600	480–2,400	1,080–3,000

Cost

Capital cost estimates were developed for each segment and for each mode as shown in Table 13. The costs include construction, mobilization, environmental mitigation, and vehicles (in 2012 dollars). For more details and assumptions, see Appendix C.

Table 13: Cost Comparison by Mode

Segment		Capital Cost ($Million)				
No.	**Description**	**Road**	**Enhanced Bus**	**BRT**	**Rail**	**Aerial**
1	7200 South TRAX to mouth of Big Cottonwood Canyon	N/A	13–16	90–110	460–600	N/A
2	9400 South TRAX to mouth of Little Cottonwood Canyon	N/A	11–13	80–90	380–500	N/A
3	Mouth of Big Cottonwood Canyon to mouth of Little Cottonwood Canyon	N/A	7–8	50–60	230–310	70–90
4	Mouth of Big Cottonwood Canyon to Brighton	N/A	25–30	180–220	N/A	310–390
5	Mouth of Little Cottonwood Canyon to Alta	30–40	10–20[1]	110–150	510–680	220–280
6	Alta to Brighton	N/A	N/A	N/A	390–510	60–80
7	Brighton to Park City	N/A	N/A	N/A	730–960	140–170[2]

Note: N/A means not considered

1. *$40M to $60M including avalanche sheds*
2. *Based on a distance of 5.6 miles.*

Snow sheds (at White Pine, Little Pine, and White Pine Chutes #1 to #4 in Little Cottonwood Canyon) were included in the cost estimate for auto, BRT, and rail. They were not included in the enhanced bus estimate shown in Table 13. The estimated cost for these sheds is $30 million to $40 million. Enhanced bus with snow sheds would cost $40 million to $60 million from the mouth of Little Cottonwood Canyon to Alta.

Conclusion

No alternatives have been screened out or eliminated as part of this study. However, the transportation concepts presented here represent proven technologies with successful examples around the world. There are pros and cons for each mode that have to be weighed against costs and impacts.

This study provides a framework for alternative concepts that can be developed in more detail during a future NEPA process—when the purpose and need and logical termini are better understood. Specific modes and alignments will be determined at that time.

CHAPTER 6. RECOMMENDATIONS & NEXT STEPS

This report documents the many elements that need to be considered to move one or more transportation projects forward. The work performed to date, along with the extensive communication with and among stakeholders, suggests that the range of issues and potential solutions vary depending on the scale of the area considered. Therefore, the recommendations and next steps presented in this chapter include some short-term improvements followed by information and considerations to continue the momentum of a larger, long-term project.

Implement Short-Term Improvements

During the course of the study, numerous ideas for short-term transportation projects have surfaced. These have more to do with "tactical" modifications than with any significant improvement. Table 14 is a recommended list of improvements that can be done in the next five years. These will help to either shift more canyon visitors to an alternate mode, namely bus, or better manage the existing traffic. These projects do not depend upon a future large environmental study and can be planned, designed, and implemented with little impact.

Table 14: Recommended Short-Term Improvements

Measure	Responsible
Real-time bus information	UTA
Increase express service to Alta	UTA
Consider express service from University of Utah area	UTA
Permanent parking driveway management metering in Little Cottonwood Canyon	UDOT/Resorts
Consider HOV priority parking at ski areas	Resorts
Parking study recommendations	Salt Lake County
Transit priority at signals/intersections along Wasatch Boulevard	UDOT/UTA
Transit amenities	UTA/Resorts

Begin EIS for Longer-Term Improvements

One of the clear outcomes from the stakeholder process along with some rudimentary trend analyses of traffic and demand is that a longer-term significant transportation investment should be considered in more detail, with more formality, and most importantly within the context of the numerous other land use, conservation, development, and watershed protection projects and initiatives that are in consideration for the central Wasatch Mountains. The Steering Committee showed interest in pursuing a Tiered EIS as soon as practical. A Tiered EIS will allow

for a larger study area that could consider both regional and local transportation needs, as well as their impacts. The decision on which type of EIS to conduct includes related decisions that are informed by the following considerations.

Tiered Versus Traditional EIS

The National Cooperative Highway Research Program's report entitled *Guidance on the Use of Tiered Environmental Impact Statements for Transportation Projects* (Project 25-25) lists the following pros and cons for Tiered EIS documents. Comments are provided as to the applicability to this project.

Pros

- May be the only feasible way to manage the NEPA process for extremely large-scale projects.
    - The Mountain Transportation project is a large-scale project with multiple segments with differing characteristics.
- Allows for a wide range of alternatives to be considered (Tier 1) while also allowing for in-depth consideration of local issues or individual projects (Tier 2).
    - A wide range of modes and alignments need to be considered for the Mountain Transportation project, and consideration of a broader study area would facilitate a wider range of modal alternatives that serve regional trips.
- Facilitates consideration of indirect and cumulative impacts on a broad scale.
    - This additional consideration would benefit the Mountain Transportation project, especially in the areas of the watershed and land use.
- Increases opportunities for agency and public involvement because agencies and the public are engaged in broad decisions in Tier 1 and engaged again regarding detailed siting and mitigation issues in Tier 2.
- Provides a framework for integrating transportation planning with comprehensive land use and/or natural resource planning efforts because a Tier 1 EIS may be more compatible than following a traditional EIS process with the timing and level of detail of land use and resource planning studies.
    - This is also a benefit because integrating transportation planning and natural resource planning will be key to the success of the Mountain Transportation project.
- Can support corridor preservation.
- In Tier 2, issues that could delay the progress of one Tier 2 section will not delay the entire project, as progress can still be made on the other Tier 2 sections.
- Different funding sources can be sought for each segment.

Cons

- Requires customizations because there is no standard "off-the-shelf" process for tiering. Customization takes time and requires attention of agency leadership.
    - A clear understanding of the expectations of the Tier 1 EIS in the agency coordination plan will be key.
- Requires extensive efforts to educate and explain the process.
- May need to conduct more detailed work in Tier 1 than initially planned.
- May have difficulty reaching agreement among agencies with jurisdiction on how to handle non-NEPA requirements in a tiered NEPA process.
- Difficult to achieve complete finality, even after a Tier 1 ROD is issued. Preparing a Tier 1 Reevaluation or Supplemental EIS has the potential to delay or otherwise complicate ongoing Tier 2 studies for individual project sections.

Lead Agencies

A federal NEPA process will be required for any improvements that impact USFS land or for any projects anticipating federal transportation funding. The USDOT, FHWA or FTA in this case, must be the lead agency if any USDOT approvals are required or if transportation funding will be requested. The direct recipient of federal funds for the project (generally a state DOT or transit authority) must also serve as a joint lead agency. Other state and local agencies may also serve as joint leads; however, private entities may not. It should be noted that the new transportation bill, MAP-21, provides that if approval from more than one modal administration is required, the U.S. Secretary of Transportation may designate a single modal administration to serve as the federal lead agency for the DOT.

It is recommended that FTA be the lead agency with USFS, FHWA, and potentially other agencies such as the EPA as joint leads. UTA would be required to be a joint lead if funds are anticipated to be requested from FTA. Also, these agencies (FTA, UTA) offer expertise in dealing with the complex transportation problems this project will face. The lead agency and joint lead agencies are free to perform tasks and make decisions jointly, or to allocate the responsibilities and authorities among themselves. The environmental documents prepared must satisfy the requirements of all lead federal agencies.

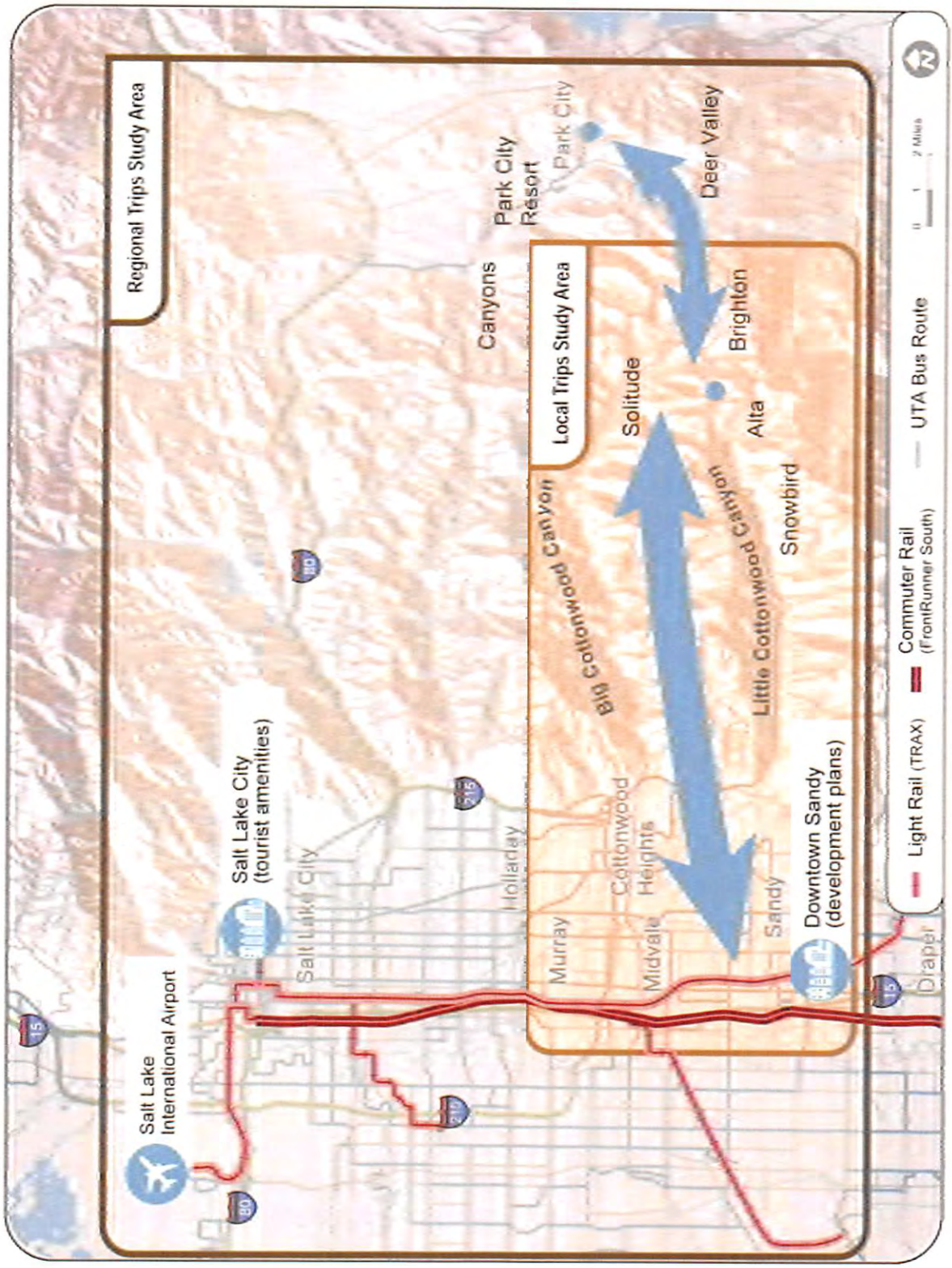
State and local agencies will also participate, particularly where that agency has legal jurisdiction and/or special expertise (see the agency jurisdiction summary in Table 4). More research on potential impacts and federal funding sources can be conducted during the scoping phase of the EIS, which will help determine agency roles. A detailed agency coordination plan is required

at the onset of the EIS to define the lead, cooperating, and participating agencies (federal, state, and local), their roles, and concurrence points on the EIS.

Study Area

There are two potential study areas that could be evaluated in any future transportation study, as shown in Figure 39. The local study area would focus on serving local trips into the canyons. The larger, regional study area would allow for evaluation of both regional and local trips. The regional study area is recommended to allow for an evaluation of regional trips during scoping and development of purpose and need. The study area may be altered after more information about trip patterns and regional and local trip needs are gathered during the purpose and need effort for the EIS.

Figure 39: Potential Study Areas



Scope of EIS

Clearly the transportation problems and opportunities in the Wasatch Mountains are interdependent on several other key issues, including watershed and natural resources, land use, economic development, recreation, and travel demand. It is recommended that the scope of the Tier 1 EIS include analysis of land use, watershed, land preservation, recreation demands, and economic opportunities that would extend beyond the evaluation in a traditional EIS.

Specifically, the scope of the Tier 1 EIS would include the following components.

Watershed and Natural Resources

- Evaluation of the direct, indirect, and cumulative impacts of proposed actions on the landscape and the watershed. This analysis would be included as a part of any NEPA document; however, it is emphasized because of the importance placed on this issue by the project team, Steering Committee, and stakeholders. Additionally, studying the range of ecosystem services provided by the Wasatch canyons and their value would inform how to balance decisions regarding uses of the landscape.
- Evaluation of impacts to the quality of recreation experiences in the canyons, especially with regard to overcrowding.
- Impacts of dispersed recreation activities and the associated roadside parking on the watershed, including an evaluation of the impacts of increasing access to dispersed recreation areas versus concentrating access in managed areas.

Land Use

- Evaluation of type, quantity, and location of development that the watershed can absorb and remain healthy.
- Identification of opportunities to preserve land that is ecologically valuable (that might otherwise be developed) through land conservation, land trade, open space purchases, federal and/or state designation, or other local land use controls.
- Identification of opportunities to trade or acquire land and/or development rights to concentrate development in areas consistent with the Salt Lake City watershed, USFS, and Salt Lake County land management objectives.

Economic

- Analysis of the economic benefit of connecting Big Cottonwood Canyon, Little Cottonwood Canyon, the Salt Lake Valley/airport, and Park City/Summit County.

- Evaluation of the range of economic and other values of the ecosystem services of the landscape.
- Identification of opportunities for beneficial assessment districts that can provide a sustainable source of operational funding for the project.
- Determination of economic benefit needed to justify the capital and operating cost of the project.
- Evaluation of potential funding and governance mechanisms.

Travel Demand Forecasting Tools

- Increase geographic scale to include Summit County with respect to infrastructure as well as socio-economic inputs.
- Trip generation that includes local recreation trips and trips taken by tourists, and if possible, trip sensitivities based on environmental factors or seasons.
- Develop a "special generator" category specific to recreation destinations, such as the Wasatch resorts.
- Develop regional travel demand modeling to include special generators, tourism trips, and key destinations within the study area.

Additional NEPA Opportunities

There are opportunities to expand the project to formally include USFS land management actions as well as transportation actions. This would allow for a broader evaluation of the watershed, natural resources, land use, economic development, and transportation interdependencies, and would facilitate decision-making for land use and watershed issues. An EIS that facilitates decision-making at a policy level or a multi-project level is referred to as a Programmatic EIS.

Because it is not common to include such a broad, multidisciplinary range of actions on a single EIS (even a Programmatic EIS), this could be considered a pilot project. The U.S. Council on Environmental Quality (CEQ) is generally involved on NEPA pilot projects.

Alternatives Analysis

The EIS would include the evaluation of transit alternatives that traditionally would be part of the FTA Alternatives Analysis process. The new transportation bill, MAP-21, eliminated the requirement for an FTA Alternatives Analysis to be performed as a separate process.

Stakeholder and Public Involvement

It is recommended that the Stakeholder Committee initiated for this Mountain Transportation Study continue to be involved throughout subsequent environmental documents. The

membership of the Stakeholder Committee can be re-evaluated or expanded, or additional Stakeholder Committees may be added. A substantial public outreach program should also be conducted.

Desired Tier 1 EIS Outcomes

Desirable outcomes for the Tier 1 EIS decision document include:

- Final purpose and need chapter
- Preferred alternative identified including the mode and a general corridor
- Final affected environment chapter (i.e., chapter describing the existing environmental conditions)
- Level of environmental, or Tier 2, document needed for each subsequent segment including lead agencies, logical termini/independent utility justification, timeframe/phasing, or next steps for corridor preservation

It is recommended that the scope of the Tiered EIS include written concurrence from agencies on the above milestones as they are completed. Subsequent documents (EIS, EA, or Categorical Exclusion) would determine impacts, a preferred alternative for each segment, and mitigation.

Proposed Action

The Notice of Intent (NOI) is a statement published in the Federal Register that notifies the public and agencies of the official start of the EIS process and solicits scoping input. The NOI includes a brief paragraph that summarizes the proposed action. The NOI also includes general information about the purpose of the project, scoping meetings, and how to comment. Generally for transportation projects that have not been through an FTA Alternatives Analysis process, the proposed action does not state a specific mode or alignment as that could prejudice the alternative evaluation.

The proposed action recommended by the consultant team for this study, which could be included in the NOI, is:

> *The Federal Transit Administration, Utah Transit Authority, U.S. Forest Service, and [list other lead agencies] intend to prepare a Tier 1 Environmental Impact Statement for the Mountain Transportation project. The Mountain Transportation project will facilitate safe, convenient, attractive, and reliable year-round transit access to and within the Cottonwood Canyons. The project may include fixed-guideway improvements (such as bus rapid transit, rail, or aerial tram) to connect the regional UTA transit system in the Salt Lake Valley to the recreation activities in the Cottonwood Canyons, and potentially to the recreation activities in the Park*

City and Summit County areas. The project will be ecologically, socially, and economically sustainable, i.e., it will meet present needs without compromising the ability of future generations to meet their needs and it will improve, or at a minimum, not degrade the Cottonwood Canyons' natural environment and municipal watersheds.

The proposed action could also be altered to include proposed USFS actions relating to land management.

MAP-21 Implications

Implications from the new transportation bill, MAP-21, on the EIS could include:

- The USDOT could streamline the process by designating a single agency to lead the EIS, even though the project may include multimodal components.
- There is a process outlined to resolve interagency conflicts to meet a four-year EIS schedule (for projects with national significance).
- There is an opportunity for combining the ROD document and Final EIS, which could reduce paperwork and save time.
- Strong language encourages cooperation among federal agencies.

Schedule

It is recommended that the EIS process begin as soon as practical. It may be helpful to conduct a pre-scoping meeting to determine the role of the federal and state agencies, e.g., joint lead, cooperating, or participating. However, it is possible for the lead agencies to determine the role of agencies during the scoping process.

The funding for a large, complex environmental analysis will need to be addressed, as well as agency staff commitments to participate in a multi-year planning process.

A proposed schedule is as follows:

- Consult with potential lead agencies and other interested parties and find funding – October 2012 to March 2013
- Update Stakeholder and Executive Committees – October 2012 and February/March 2013 (via e-mail or meeting)
- Begin Tier 1 EIS – March 2013
- Decision Document on Tier 1 EIS – March 2015 to October 2015

APPENDIX A: STAKEHOLDER INVOLVEMENT

AGENDA for the EDUCATION WORKSHOP

Mountain Transportation Study

Stakeholder Committee

1:30 – 4:00, Monday, January 23, 2012

Salt Lake County Complex, S 1007

I. Welcome – 1:30 – 1:35

II. Introductions – 1:35 – 2:05
   a. Team
   b. Participants –who they represent and their interest in participating

III. Study Process 2:05 – 2:20
   a. Committees
   b. Study Scope/Schedule
   c. Ground Rules/What we're doing today

IV. Key Topics 2:30 – 4:00
   a. Land Use – David Gellner
   b. Dispersed Recreation/Caring for Land – Carol Majeske

BREAK – 10 MIN

   c. Resorts – Nathan Rafferty
   d. Watershed – Laura Briefer
   e. Terrain/Avalanche – Liam FitzGerald
   f. Transportation – Robert Miles & Tina Bartholomew

V. Next Steps/Meetings

MOUNTAIN Transportation Study

SALT LAKE COUNTY

Mountain Transportation Study – Stakeholder Committee

Workshop #2: Canyon Transportation Challenges and Opportunities
Meeting Agenda

Salt Lake County Complex
2100 South State
4th Floor N4017

Friday, March 16, 2012
9:00 a.m. – 11:30 a.m.

Objectives:

- *Provide an opportunity for participants to share their interests with each other;*
- *Present a brief overview of transportation planning process; and*
- *Identify challenges and opportunities associated with canyon transportation.*

9:00 – 9:05 Welcome and Agenda Review

- Opening comments – *Jon Nepstad, Fehr & Peers, and Andrea Pullos, Salt Lake County*
- Agenda review – *Paul De Morgan, RESOLVE*

9:05 – 9:35 Sharing Interests

- For each stakeholder – briefly describe why you are part of the Committee and what interests you represent?
  - *Based on the expected number of participants, we are requesting brief introductions in this session; however, additional opportunities to convey interests will be available in the Challenges and Opportunities session)*

9:35 – 9:50 Overview of the Transportation Planning Process

- Presentation – *Laynee Jones, Lochner, and Jon Nepstad, Fehr & Peers*
- Questions and discussion

9:50 – 11:20 Canyon Transportation – Challenges and Opportunities

- In small groups, address the following questions:
  - What are the transportation challenges getting to, and within, the canyons?
  - What opportunities could transportation improvements address?
- Share results of small group conversations
- Identify similarities and differences in the ideas shared

11:20 – 11:30 Next Steps

- Confirm action items
- Discuss upcoming meeting schedule

11:30 Adjourn

MOUNTAIN

SALT LAKE COUNTY

Mountain Transportation Study – Technical Stakeholder Committee

Workshop #3: Canyon Transportation Evaluation Criteria
Agenda

Cottonwood Heights City Hall
1265 E. Ft. Union Blvd, Third Floor

Friday, April 27, 2012
8:30 a.m. – 12:00 noon

Objectives:

- *Review challenges and opportunities shared by stakeholders at Workshop #2 and identify any missing items;*
- *Present and discuss possible statements of problem and opportunities; and*
- *Confirm upcoming steps.*

8:30 – 8:40 Welcome, Introductions, and Agenda Review
- Introductions
- Opening comments – *Jon Nepstad, Fehr and Peers, and Andrea Pullos, Salt Lake County*
- Agenda review – *Paul De Morgan, RESOLVE*

8:40 – 9:20 Challenges and Opportunities
- Brief overview of what was heard at Workshop #2
- General reactions from stakeholders; missing items

9:20 – 9:35 Transportation Planning – Moving to the Next Phase
- What do transportation planners do with this information?
- Is there data to back up those issues? Is there really a need?

9:35 – 9:45 Problem/Opportunity Statements
- Overview of possible statements and what they might mean – *TBD*
- Questions and discussion

9:45 – 9:55 **Break and Transition to Small Groups**

9:55 – 10:35 Small Groups – Discussion Problem/Opportunity Statements
- Review categories (each group start with different one and then move through as many as possible) and assess:
  - Which purpose statements are most appropriate? Why?
  - Which purpose statements give you the most concern? Why?
  - Which purpose statements can you live with? Why?

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10:35 – 10:45 **Break and Transition to Plenary**

10:45 – 11:50 Problem/Opportunity Statements

- Plenary discussion of each category with focus on the following:
  - Which purpose statements are most appropriate? Why?
  - Which purpose statements give you the most concern? Why?
  - Which purpose statements can you live with? Why?

11:50 – 12:00 Next Steps

- Discuss upcoming meeting schedule
- Confirm action items?

12:00 Adjourn

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COUNTY

Mountain Transportation Study – Technical Stakeholder Committee

Workshop #4: Canyon Transportation – Alternatives
Agenda

Silver Fork Lodge
Big Cottonwood Canyon

Friday, June 8, 2012
8:30 a.m. – 12:00 noon

Objectives:

- *Review stakeholder discussion at Workshop #3 and how the results are being used;*
- *Introduce stakeholders to the range of transportation modes to be considered in alternatives;*
- *Begin building alternatives to meet different objectives and discuss results; and*
- *Confirm upcoming steps.*

8:30 – 8:40 Welcome, Introductions, and Agenda Review
- Introductions
- Opening comments – *Jon Nepstad, Fehr and Peers, and Andrea Pullos, Salt Lake County*
- Agenda review – *Paul De Morgan, RESOLVE*

8:40 – 9:00 Moving from Project Purposes to Alternatives
- Update on where we are in the process – *Jon Nepstad*
- Brief overview of what was heard at Workshop #3 and how the results are being used? – *Jon Nepstad*
- Questions and discussion

9:00 – 9:45 Attributes and Applicability of Various Transportation Modes
- Overview of range transportation modes and related attributes – *Andrea Clayton, Lochner; Kerry Doane, Fehr and Peers; Laynee Jones, Lochner; Paul Mathews, ecosign*
- Questions and discussion

9:45 – 10:05 Perspectives on Transportation Tradeoffs
- Understanding range of perspectives on tradeoffs (*using keypads*)

10:05 – 10:15 **Break and Transition to Small Groups**

10:15 – 11:10 Small Groups – Building Alternatives to Meet Different Objectives
- Individually, and then in the small groups, develop alternatives to meet three different objectives

11:10 – 11:30 **Break and Transition to Plenary [and "Poster" Session]**
- Participants will be able to review the small group alternatives during the break

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11:30 – 11:50 Discussion of Small Group Alternatives

- Plenary discussion based on review of alternatives during the break

11:50 – 12:00 Next Steps

- Discuss upcoming meeting schedule
- Confirm action items?

12:00 Adjourn

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Mountain Transportation Study – Technical Stakeholder Committee

Workshop #5: Canyon Transportation – Wrap-up Meeting
Agenda

Snowbird Ski & Summer Resort
Snowbird Cliff Lodge Ballroom - Level C
Little Cottonwood Canyon

Thursday, August 16, 2012
8:30 a.m. – 12:00 noon

Objectives:

- *Review stakeholder discussion at Workshop #4 and how the results are being used;*
- *Share summary transportation scenarios based on previous exercises and overview of typical mountain land uses;*
- *Provide reactions and feedback regarding scenarios and land use options;*
- *Provide feedback on process; and*
- *Wrap up process.*

8:30 – 8:50 Welcome, Introductions, and Agenda Review

- Introductions
- Opening comments – *Jon Nepstad, Fehr & Peers, and Andrea Pullos, Salt Lake County*
- Agenda review – *Paul De Morgan, RESOLVE*

8:50 – 9:00 Workshop #4 Review

- Update on where we are in the process – *Jon Nepstad*
- Brief overview of what was heard at Workshop #4 and how that is being used – *Jon Nepstad*
  - Mapping exercise results
  - Keypad polling results
- Questions

9:00 – 9:20 Presentation of Summary Transportation Concepts

- Provide overview (e.g., characteristics, costs) of three Summary Transportation Concepts – *Andrea Clayton, Lochner*
- Questions

9:20 – 10:00 Land Use Characteristics

- Provide pictures and examples of typical mountain land uses – *Jon Nepstad and Kerry Doane, Fehr & Peers*
- Questions

10:00 – 10:15 **Break**

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10:15 – 11:00 Land Use and Transportation Connection – Polling Exercise

11:00 – 11:30 Land Use and Transportation Connection – Discussion of Results

- Review results of keypad polling with respect to each Transportation Concept

11:30 – 12:00 Wrap-up

- Review of what we've done
- Discussion of study process
  - Initial reflections
  - Overview of survey option
- What comes after this study
  - UDOT
  - UTA
  - Salt Lake City
  - Salt Lake County
  - Possibly USFS

12:00 Adjourn

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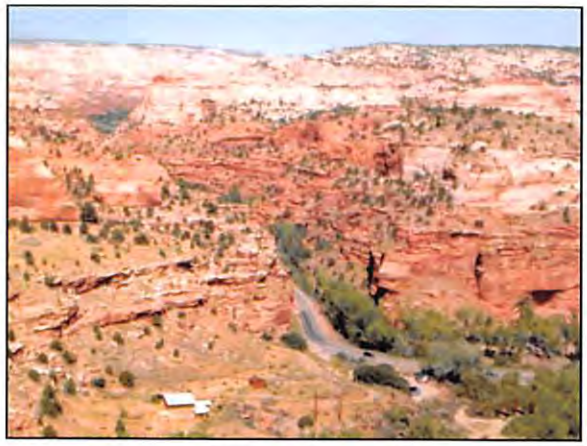
APPENDIX B: PURPOSE AND NEED

SR-12 Escalante to Boulder EA, 2009



The purpose of the SR-12 project is to:

- Provide adequate space for UDOT to perform ongoing maintenance operations on the roadway and supporting infrastructure.
- Improve safety and infrastructure where the roadway facilities are deficient or deteriorating.
- Accommodate the wide range of corridor users.

Cottonwood Street EA, 2012

The purpose of the Cottonwood Street project is to:

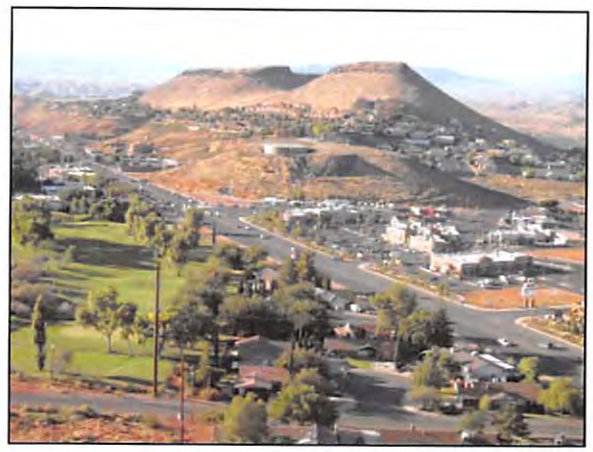
- Improve connectivity and reduce pedestrian and auto travel distances between the planned Murray City Center District, transit stations, neighborhoods, and nearby arterials.
- Support Murray City's plans for economic redevelopment and a more livable, walkable community in the year 2040.

Provo-Orem Bus Rapid Transit EA, 2011

The purpose of the Provo-Orem Bus Rapid Transit project is to increase transportation capacity to include higher-capacity, high-quality, reliable transit service. Specifically, the purpose is to:

- Increase transportation capacity to accommodate growing population, employment, student enrollment, and travel demand in the year 2030.
- Improve transit competitiveness with the automobile by improving transit reliability and reducing transit travel time.
- Improve transit connections to and from FrontRunner commuter rail.
- Improve multi-modal connectivity across I-15 and from I-15 to Orem and Provo.

Bluff Street, St. George Blvd. to Red Hills Parkway EA, 2012



The purpose of the Buff Street project is to accommodate future (2040) travel demand on Buff Street mainline and the St. George Boulevard and Sunset Boulevard intersections.

West Davis Corridor EIS, 2011

The West Davis Corridor is intended to achieve the following primary purposes:

- **Improve Regional Mobility**. Improve regional mobility for automobile, transit, and freight trips by reducing user delay on the road system compared to the No-Action conditions through the consideration of all transportation modes.
- **Enhance Peak-Period Mobility.** Enhance mobility during the AM and PM peak periods for the main travel direction (north-south) to help accommodate the projected travel demand in the study area in 2040.

The project will also evaluate the following secondary purposes:

- Increase the interconnection between transportation modes.
- Support local growth objectives.
- Increase bicycle and pedestrian options.

I-70 Mountain Corridor Programmatic EIS, Colorado, 2011

The purpose for transportation improvements is to increase capacity, improve accessibility and mobility, and decrease congestion for travel demand (projected to occur in 2050) to destinations along the I-70 Mountain Corridor as well as for interstate travel, while providing for and accommodating environmental sensitivity, community values, transportation safety, and ability to implement the proposed solutions for the Corridor.

Draper Transit Corridor EIS, 2010

The purpose of the Draper Transit Corridor project is to:

- Provide high-quality, high-capacity rapid transit service in the highly congested north-south travel corridor between Draper and downtown Salt Lake City.
- Extend fixed-guideway public transportation service and benefits in the study corridor by providing faster, more-reliable transit services that what can be achieved by operating buses in mixed-flow traffic.

The proposed project would:

- Provide more-reliable mobility for transit-dependent people.
- Encourage more pedestrian access to transit and less reliance on park-and-ride access at the existing end-of-the-line station.
- Better serve reverse-peak travel movements for employment and educational access.
- Serve rapidly developing areas.
- Decrease travel times to key urban area destinations.

FrontRunner South EIS, 2007

The purpose of the Proposed Action is to:

- Facilitate the safe and efficient movement of people within the region, specifically the corridor between Provo and Salt Lake City through the year 2030.
- Provide efficient, high-capacity transit service in the project corridor.
- Enhance economic potential in the corridor by improving access to existing and planned activity centers.
- Support regional plans and policies that call for the provision of a balanced transportation system.

FrontRunner North EIS, 2005

The purpose of the proposed commuter rail project is to:

- Facilitate the safe and efficient movement of people and goods within the project corridor for present to the year 2030.
- Provide efficient, high-capacity transit service in the project corridor.
- Enhance economic potential in the corridor by improving access to existing and planned employment and activity centers and by creating Transit-Oriented Development (TOD) opportunities.
- Support regional plans and policies that call for the provision of a balanced transportation system.
- Support regional air quality goals.

Sugarhouse Streetcar EA, 2011

The purpose of the project is to improve connectivity and increase mobility between the newly developing 2100 South area of South Salt Lake, including the Market Station Redevelopment Area, and the Salt Lake City community of Sugar House.

Specifically, the purpose is to:

- Contribute to improved connectivity on 2100 South and between neighborhoods and attractions in the study area and beyond.
- Contribute to increased mobility on 2100 South.
- Provide multimodal travel choices.
- Increase mobility for short-range trips in the study area, especially pedestrian trips.
- Provide connections to the regional transportation network, including the regional transit network.
- Provide a transportation improvement that is pedestrian-friendly, is compatible with surrounding neighborhoods, and supports community and economic redevelopment.

APPENDIX C: ALTERNATIVE CONCEPTS

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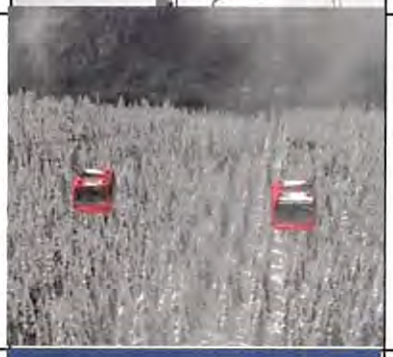
Mountain Resort Planners Ltd.

AERIAL CABLEWAY TRANSRPOTATION SYSTEM - COMPARISON

Existing Example		Aerial Transporation System	Advantage	Disadvantage	Examples
Snowbird Tram		**Aerial Tram**	Good for extreme profile on short (<1 mile) alignments; small stations; high speed (22 mph).	Large towers have high visual impact; low capacity over long distance; high cost per capacity.	Snowbird, Jay Peak
Flight of the Canyons Gondola Canyons, Utah		**Monocable Gondola**	Lowest capital, operating and mainteance cost; capacity up to 3,600 pp/h; small towers and stations have lower visual impact.	Relatively short tower spans; most susceptible to wind; slowest maximum speed (11.2 mph).	Snowbasin, Sun Valley, WhistlerBlackcomb, Northstar
Peak to Peak Gondoala Whistler, BC		**3S Gondola**	Capacity up to 5,000 pp/h; large spans between towers (up to 2 miles); high speed (17 mph)	Towers have high visual impact; large stations (66' x 125')	Whistler, Kitzbulel, Val d/Isere
Funitel Squaw Valley California		**Funitel**	High capacity on normal profile with high speed winds (up to 60 mph); medium speed (13.5 mph); medium stations (48' x 118')	Mechanically complex hence highest capital, operating and mainteance costs; long evacuation time.	Ischgl, Hintertux II, Squaw Valley

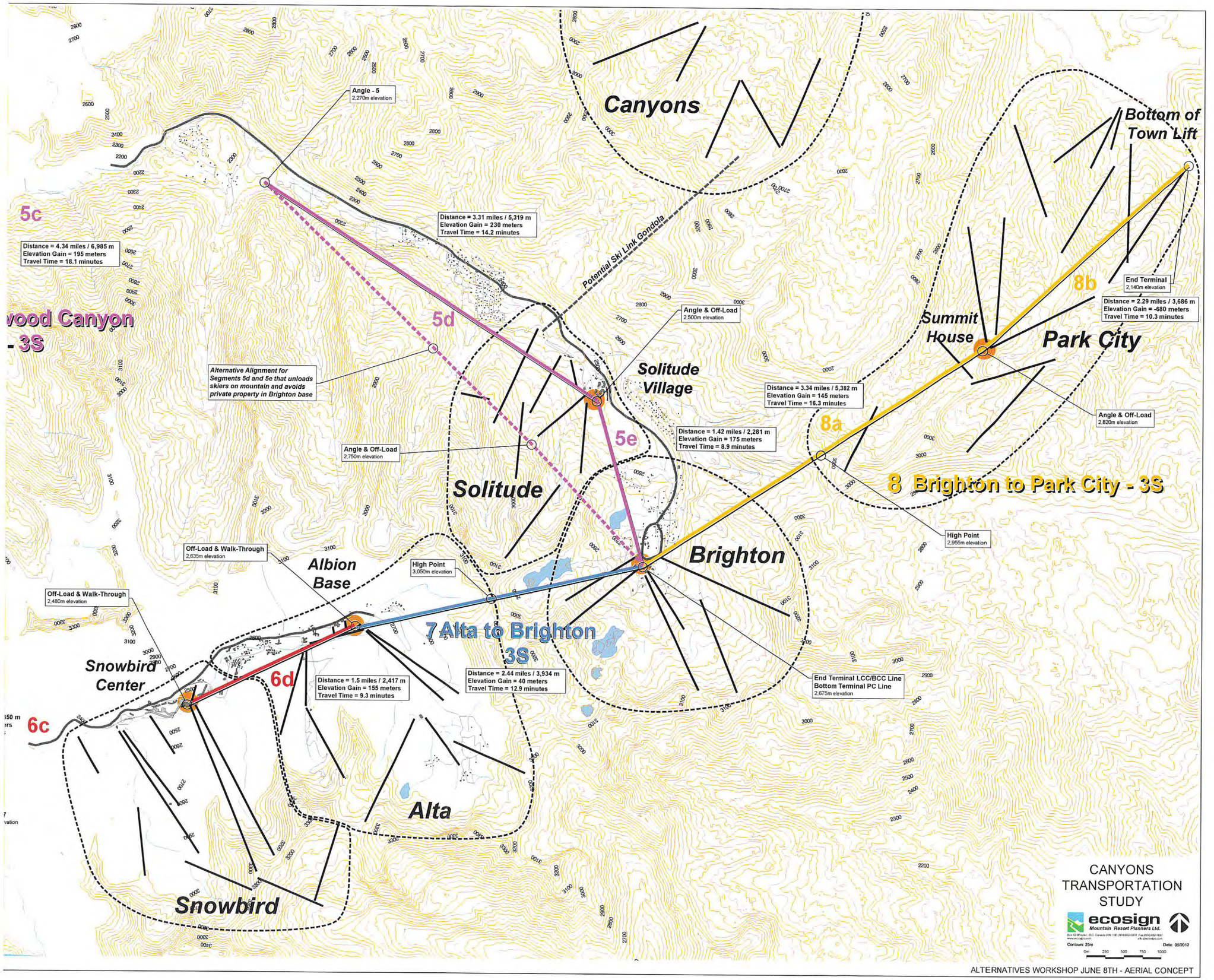
Spatial Segment	Segment Name	Top Terminal Elevation (meters)	Elevation of High Point (meters)	Total Elevation Gain (meters)	Distance (meters)	Distance (miles)	Relative Cost	No. Transfers / Angle Stations	Travel Time (minutes) Includes transfer between stations	Capacity (people per hour)	Parking (60% of capacity require parkir
	AERIAL										
4	**Wasatch Connection (Quarry to LCC) (Bottom Terminal 1,550m)**										
	Option 1 - 3S on foothills										
	4-1a - Quarry to angle (1)	1,620		70	1,187	0.74	$ 19,914,329	1	4.30		
	4-1b - angle to Bottom of Segment 5 (angle 2)	1,675	1,775	55	3,677	2.28	$ 61,689,121	1	10.30		
	Subtotal Option 1			**125**	**4,864**	**3.02**	**$ 81,603,450**	**2**	**14.6**	**3,000**	**2,045**
	Option 2 - D8G in Road ROW										
	4-2a - Quarry to angle	1,550		-	909	0.56	$ 6,817,500	1	4.50		
	4-2b - angle to angle	1,547		(3)	2,031	1.26	$ 15,232,500	1	8.30		
	4-2c - angle to angle to Bottom of Segment 5 (angle)	1,675		128	2,192	1.36	$ 16,440,000	1	10.80		
	Subtotal Option 2			**125**	**5,132**	**3.19**	**$ 38,490,000**	**3**	**23.6**	**2,800**	**1,909**
5	**Mouth of Big Cottonwood Canyon to Brighton (3S Bottom Terminal 1,550)**										
	5a - mouth of canyon to angle (3)	1,620		20	1,355	0.84	$ 22,732,869	1	4.70		
	5b - angle to angle (4)	2,075		455	4,432	2.75	$ 74,355,775	1	12.10		
	5c - angle to angle (5)	2,270	2,425	195	6,985	4.34	$ 117,187,520	1	18.10		
	5d - angle to Solitude	2,500		230	5,319	3.31	$ 89,236,996	1	14.20	3000	
	5e - Solitude to Brighton	2,675		175	2,281	1.42	$ 38,268,394	1	8.90	1500	
	Total Segment 5			**1,075**	**20,372**	**12.66**	**$ 341,781,553**	**5**	**58.0**		**2,045**
6	**Mouth of Little Cottonwood Canyon to Alta (3S Bottom Terminal 1,600m)**										
	6a - mouth of canyon to angle (6)	1,725		125	2,531	1.57	$ 42,462,650	1	7.50		
	6b - angle to angle (7)	2,275		550	6,318	3.93	$ 105,997,244	1	16.50		
	6c - angle to Snowbird	2,480		205	3,350	2.08	$ 56,203,034	1	9.50		
	Subtotal				**12,199**	**7.58**	**$ 204,662,928**	**3**	**33.5**	**3,000**	
	6d - Snowbird to Alta	2,635	2,725	155	2,417	1.50	$ 40,550,069	1	9.30	1,500	
	Total Segment 6			**155**	**14,616**	**9.08**	**$ 245,212,997**	**4**	**42.8**		**2,045**
7	**Alta to Brighton (3S Bottom Terminal 2,635)**										
	7a - Alta to Brighton	**2,675**	**3,050**	**40**	**3,934**	**2.44**	**$ 66,000,816**	**1**	**12.90**	**600**	
8	**Brighton to Park City (3S Bottom Terminal 2,675)**										
	8a - Brighton to Summit House	2,820	2,955	145	5,382	3.34	$ 90,293,949	1	16.30	300	
	8b - Summit Lodge to Park City Town Lift Base	2,140		(680)	3,686	2.29	$ 61,840,114	1	10.30	150	
	Total Segment 8			**(535)**	**9,068**	**5.63**	**$ 152,134,063**	**2**	**26.6**		

Cost per meter 3S		$ 16,777
Cost per meter D8G		$ 7,500
Travel Velocity 3S (m/s)		7
Travel Velocity D8G (m/s)		5
Time through angle station (min.)		1.5
Transfer time walk through (min.)		3.5
Cost per mile 3S		$ 27,000,000
	low cost (-10%)	$ 24,300,000
	high cost (+10%)	$ 29,700,000
Cost per mile D8G		$ 12,070,080
	low cost (-10%)	$10,863,072
	high cost (+10%)	$13,277,088

*note: need two numbers - with and without LR connection to NS line

Cost Estimate Summary

	Segment	Mode									
		Road Cost ($M)		BUS Plus Cost ($M)		BRT Cost ($M)		Rail Cost ($M)		Aerial Cost ($M)	
		Low	High	Low	High	Low	High	Low	High	Low	High
1	7200 S TRAX to mouth of Big Cottonwood Canyon	N/A		$13	$16	$90	$110	$460	$600	N/A	
2	9400 S TRAX to mouth of Little Cottonwood Canyon	N/A		$11	$13	$80	$90	$380	$500	N/A	
3	Mouth of Big Cottonwood to mouth of Little Cottonwood	N/A		$7	$8	$47	$60	$230	$310	$70	$90
4	Mouth of Big Cottonwood Canyon to Brighton	N/A		$25	$30	$180	$220	N/A		$310	$390
5	Mouth of Little Cottonwood Canyon to Alta	$30	$40	$10	$20	$110	$150	$ 510	$ 680	$220	$280
6	Alta to Brighton	N/A		N/A		N/A		$ 390	$ 510	$60	$80
7	Brighton to Park City	N/A		N/A		N/A		$ 730	$ 960	$140	$170


Canyons
Bottom of Town Lift
Angle - 5
2,270m elevation
5c
Distance = 4.34 miles / 6,985 m
Elevation Gain = 195 meters
Travel Time = 18.1 minutes
Distance = 3.31 miles / 5,319 m
Elevation Gain = 230 meters
Travel Time = 14.2 minutes
Potential Ski Link Gondola
5d
Angle & Off-Load
2,500m elevation
Alternative Alignment for Segments 5d and 5e that unloads skiers on mountain and avoids private property in Brighton base
Solitude Village
5e
Distance = 1.42 miles / 2,281 m
Elevation Gain = 175 meters
Travel Time = 8.9 minutes
Angle & Off-Load
2,750m elevation
Solitude
Summit House
Park City
8b
End Terminal
2,140m elevation
Distance = 2.29 miles / 3,686 m
Elevation Gain = -680 meters
Travel Time = 10.3 minutes
Distance = 3.34 miles / 5,382 m
Elevation Gain = 145 meters
Travel Time = 16.3 minutes
8a
Angle & Off-Load
2,820m elevation
8 Brighton to Park City - 3S
High Point
2,955m elevation
Brighton
Off-Load & Walk-Through
2,635m elevation
Albion Base
High Point
3,050m elevation
Off-Load & Walk-Through
2,480m elevation
7 Alta to Brighton 3S
Snowbird Center
6d
Distance = 1.5 miles / 2,417 m
Elevation Gain = 155 meters
Travel Time = 9.3 minutes
Distance = 2.44 miles / 3,934 m
Elevation Gain = 40 meters
Travel Time = 12.9 minutes
End Terminal LCC/BCC Line
Bottom Terminal PC Line
2,675m elevation
6c
Alta
Snowbird
CANYONS TRANSPORTATION STUDY
ecosign
Mountain Resort Planners Ltd.
Contours: 25m
Date: 05/2012
ALTERNATIVES WORKSHOP JUNE 8TH - AERIAL CONCEPT

Road Cost Estimate

Segment 5				
Mouth of Little Cottonwood Canyon to Alta				
Item Description	Quantity	Unit	Low Cost	High Cost
Passing Lane	3,500	Feet	$709,571	$886,964
Intersection Metering	4	Each	$1,200,000	$1,400,000
Snow Shed - White Pine Chutes #1, #2, #3, #4	1	Each	$12,787,808	$15,480,231
Snow Shed - Little Pine Chute	1	Each	$8,283,600	$11,281,140
Snow Shed - White Pine Chute	1	Each	$8,973,900	$12,221,235
Avalanche Turnarounds	1	Each	$406,582	$508,228
Total Segment Costs			$32,361,461	$41,777,797

Assumptions:

Costs do not include operation, maintenance, design and environmental clearance

Passing Lane Assumptions:

- Costs include pavement, retaining walls, roadway excavation and an additional 30% for mobilization, environmental mitigation and contingency
- Assume 16 ft width of pavement (12 ft lane and 4 ft shoulder) with a 30 inch pavement section (7" HMA/ 7" UTBC/ 16" GB)
- Assume 10% of route length will require 10-ft. walls
- Low cost is based on current UDOT average bid price costs
- High cost is based on low cost plus 25%

Intersection Metering Assumptions:

- Locations include: Snowbird 1, Snowbird 2, Snowbird 4 and Alta 1 (Wildcat Base)
- Costs include everything to construct, including mobilization, environmental mitigation and contingency
- Costs from Fehr & Peers
- Low cost are estimated by $300,000/intersection
- High cost are estimated by $350,000/intersection

Snow Shed Assumptions:

- 3 sheds to cover existing lanes:
  1. White Pine Chutes #1, #2, #3, #4 (length = 1235 ft, 2 lanes)
  2. Little Pine Chute (length = 600 ft, 3 lanes)
  3. White Pine Chute (length = 650 ft, 3 lanes)
- Costs include shed structure and an additional 30% for mobilization, environmental mitigation and contingency
- Structure cost estimates based on Dam Chute Shed (designed for Provo Canyon) with updated UDOT bid costs
- Low shed cost are estimated by area at $177/sq ft
- High shed cost are estimated by $4,821 linear foot per traffic lane

Avalanche Turn Around Assumptions:

- Note: turn around areas in safe locations in case of avalanche when the road is open
- Costs include pavement, retaining walls, roadway excavation and an additional 30% for mobilization, environmental mitigation and contingency
- Bulb out area = 11,300 sq ft
- Assume 30% of bulb out length (1200-ft) will require 10-ft. walls
- Low cost is based on current 2012 UDOT average bid price costs for conceptual design
- High cost is based on low cost plus 25%

Bus Plus Cost Estimate

	Segment	Distance (miles)	Cost per Mile	Low Cost	High Cost
1	7200 S TRAX to mouth of Big Cottonwood Canyon	7.4	$1,742,000	$12,890,800	$16,113,500
2	9400 S TRAX to mouth of Little Cottonwood Canyon	6.1	$1,742,000	$10,626,200	$13,282,750
3	Mouth of Big Cottonwood to mouth of Little Cottonwood	3.8	$1,742,000	$6,619,600	$8,274,500
4	Mouth of Big Cottonwood Canyon to Brighton	14.5	$1,742,000	$25,259,000	$31,573,750
5	Mouth of Little Cottonwood Canyon to Alta	8	$1,742,000	$13,936,000	$17,420,000

Assumptions:

Costs include stations, vehicles, transit signal priority/signals, maintenance facility and an additional 30% for mobilization, environmental mitigation and contingency

Costs do not include operation, maintenance, design and environmental clearance

Costs came from 2012 Network Study by Lochner

Low cost are based on distance x cost per mile

High cost is based on low cost plus 25%

Estimates assume 2 buses per 4 miles

BRT w/ Exclusive Lanes Cost Estimate

	Segment	Distance (miles)	Cost per Mile	Low Cost	High Cost
1	7200 S TRAX to mouth of Big Cottonwood Canyon	7.4	$12,376,000	$91,582,400	$114,478,000
2	9400 S TRAX to mouth of Little Cottonwood Canyon	6.1	$12,376,000	$75,493,600	$94,367,000
3	Mouth of Big Cottonwood to mouth of Little Cottonwood	3.8	$12,376,000	$47,028,800	$58,786,000
4	Mouth of Big Cottonwood Canyon to Brighton	14.5	$12,376,000	$179,452,000	$224,315,000
5	Mouth of Little Cottonwood Canyon to Alta	8	$12,376,000	$99,008,000	$123,760,000
	Snow Shed - White Pine Chutes #1, #2, #3, #4	N/A	N/A	$7,740,116	$15,480,231
	Snow Shed - Little Pine Chute	N/A	N/A	$3,760,380	$7,520,760
	Snow Shed - White Pine Chute	N/A	N/A	$4,073,745	$8,147,490
			Subtotals	**$114,582,241**	**$154,908,481**

Assumptions:

Costs include stations, vehicles, transit signal priority/signals, exclusive lanes including R/W costs, maintenance facility and an additional 30% for mobilization, environmental mitigation and contingency

Costs do not include operation, maintenance, design and environmental clearance

Costs came from 2012 Network Study by Lochner

Low cost are based on distance x cost per mile

High cost is based on low cost plus 25%

Estimates assume 2 buses per 4 miles

<u>Snow Shed Assumptions:</u>

3 sheds to cover BRT lanes only:

1. White Pine Chutes #1, #2, #3, #4 (length = 1235 ft)
2. Little Pine Chute (length = 600 ft)
3. White Pine Chute (length = 650 ft)

Costs include shed structure and an additional 30% for mobilization, environmental mitigation and contingency

Structure cost estimates based on Dam Chute Shed (designed for Provo Canyon) with 2012 UDOT bid costs

Low shed cost are estimated by $4,821 per linear foot (single lane)

High shed cost are estimated by $9,642 per linear foot (two lanes)

Rail Cost Estimate

	Segment		Distance (miles)	Cost per Mile	Base Cost	Low Cost	High Cost
1	7200 S TRAX to mouth of Big Cottonwood Canyon	Double track ballasted - at grade	7.4	$56,000,000	$414,400,000	$455,840,000	$600,880,000
2	9400 S TRAX to mouth of Little Cottonwood Canyon	Double track ballasted - at grade	6.1	$56,000,000	$341,600,000	$375,760,000	$495,320,000
3	Mouth of Big Cottonwood to mouth of Little Cottonwood	Double track ballasted - at grade	3.8	$56,000,000	$212,800,000	$234,080,000	$308,560,000
5	Mouth of Little Cottonwood Canyon to Alta	Single track with passing sidings - at grade	8	$56,000,000	$448,000,000	$492,800,000	$649,600,000
	Snow Shed - White Pine Chutes #1, #2, #3, #4		N/A	N/A	N/A	$7,740,116	$15,480,231
	Snow Shed - Little Pine Chute		N/A	N/A	N/A	$3,760,380	$7,520,760
	Snow Shed - White Pine Chute		N/A	N/A	N/A	$4,073,745	$8,147,490
					Subtotals	**$508,374,241**	**$680,748,481**
6	Alta to Brighton	Single track with passing sidings - tunnel	2.2	$160,000,000	$352,000,000	$387,200,000	$510,400,000
7	Brighton to Park City		9	-	-	-	-
	Brighton to Hwy 224	*Single track with passing sidings - tunnel*	*1.5*	*$160,000,000*	*$240,000,000*	*$264,000,000*	*$348,000,000*
	Hwy 224 to Park City	*Single track with passing sidings - at grade*	*7.5*	*$56,000,000*	*$420,000,000*	*$462,000,000*	*$609,000,000*
		Subtotals	**9**	-	**$660,000,000**	**$726,000,000**	**$957,000,000**

Assumptions:

Costs from UTA
Base cost includes construction, mobilization, and vehicles
Costs do not include operation, maintenance, design and environmental clearance
Low costs were estimated based on base cost plus 5% contingency and 5% environmental mitigation
High costs were estimated based on base cost plus 25% contingency and 20% environmental mitigation
Base cost single track with passing sidings (at grade) = $56,000,000/mile
based on average construction cost for UTA's 2015 program (West Valley, Draper, Mid Jordan, Airport LRT)
Base cost single track with passing sidings (single bore tunnel) = $160,000,000/mile
includes DF track, systems, OCS and ventilation:
excavation/liner at $29,000/linear ft (assumptions below)
three drives, 15. to 2 miles each, 5.5 miles total; each drive launched from a portal
23ft ID, single track with vertical concrete partition to create a parallel emergency walkway
assume saturated, fractured quartzite
probe hole drilling and some grouting assumed in the cost per linear foot to control groundwater flows
direct fixation track at $500/linear foot
systems/OCS at $250/linear foot
ventilation at $250/linear foot
TOTAL = 30,000/linear foot ($158.4M/mile - use $160M/mile)

<u>Snow Shed Assumptions:</u>

3 sheds to cover tracks only:
1. White Pine Chutes #1, #2, #3, #4 (length = 1235 ft)
2. Little Pine Chute (length = 600 ft)
3. White Pine Chute (length = 650 ft)

Costs include shed structure and an additional 30% for mobilization, environmental mitigation and contingency
Structure cost estimates based on Dam Chute Shed (designed for Provo Canyon) with 2012 UDOT bid costs
Low shed cost are estimated by $4,821 per linear foot (single track)
High shed cost are estimated by $9,642 per linear foot (double track)

Aerial Cost Estimate

	Segment	Distance (miles)	Low Cost	High Cost
3	Mouth of Big Cottonwood to mouth of Little Cottonwood - 3S on foothills	3	$72,900,000	$91,125,000
3	Mouth of Big Cottonwood to mouth of Little Cottonwood - D8G in road ROW	3.2	$34,880,000	$43,600,000
4	Mouth of Big Cottonwood Canyon to Brighton - 3S	12.7	$308,610,000	$385,762,500
5	Mouth of Little Cottonwood Canyon to Alta - 3S	9.1	$221,130,000	$276,412,500
6	Alta to Brighton - 3S	2.5	$60,750,000	$75,937,500
7	Brighton to Park City - 3S	5.6	$136,080,000	$170,100,000

Assumptions:

Costs include everything to build project including vehicles, towers, cables, mobilization, environmental mitigation and contingency
Costs do not include operation, maintenance, design and environmental clearance
Low Cost per mile 3S = $24,300,000 (from Ecosign)
Low Cost per mile D8G = $10,900,000
High Costs were estimated on low cost plus 25%
Distance for aerial alignment, tower spacing and costs estimated by Ecosign