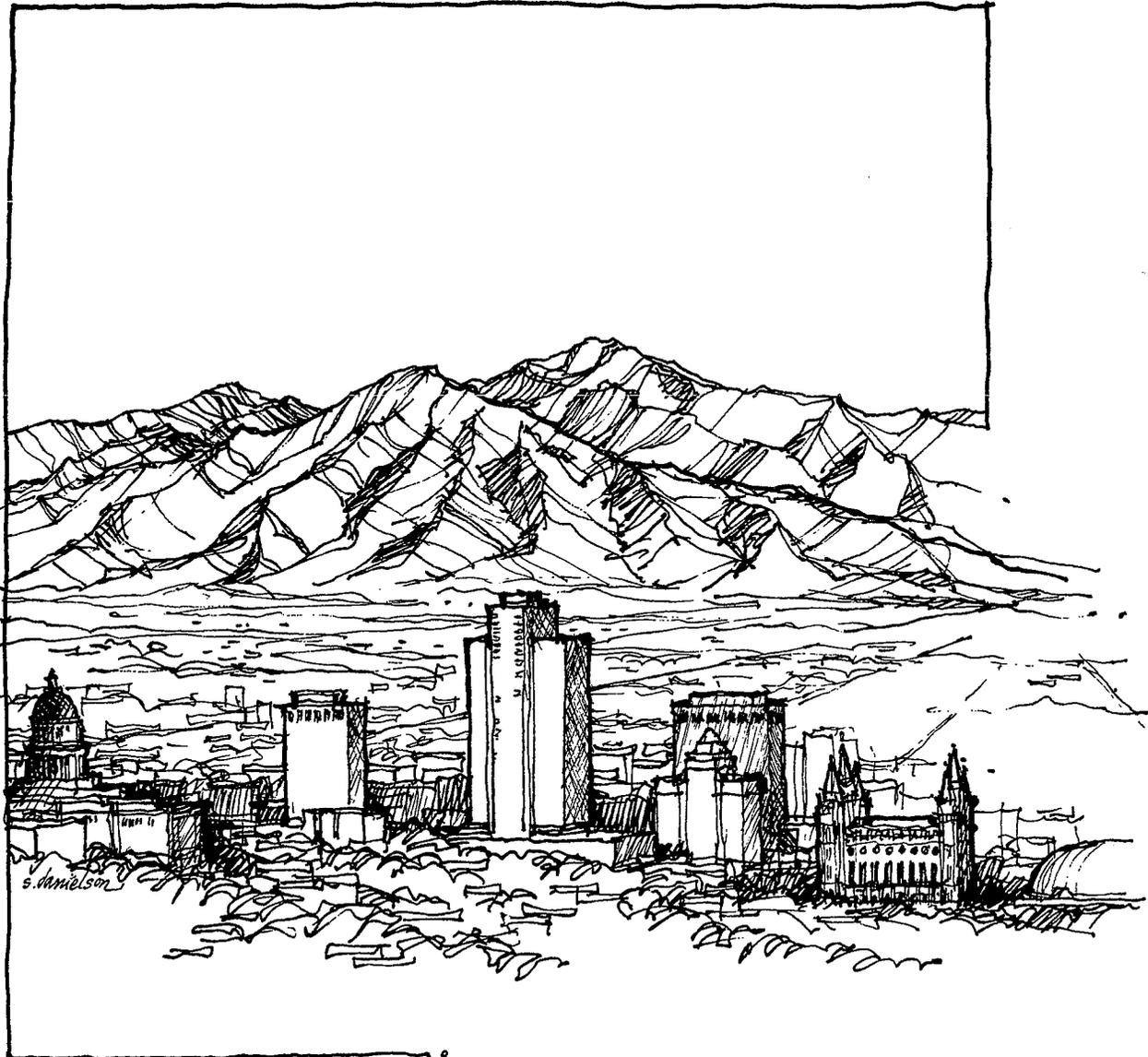


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Wasatch Canyons Transportation Study

Working Paper No. 3

*Adequacy and Sufficiency of
Existing Data Base
for Transportation Planning*

April 1976



Wasatch Front Regional Council

T - Transportation

WASATCH CANYONS TRANSPORTATION STUDY

WORKING PAPER NUMBER 3

ADEQUACY AND SUFFICIENCY OF
EXISTING DATA BASE
FOR TRANSPORTATION PLANNING

Prepared for The
WASATCH FRONT REGIONAL COUNCIL
AND
SALT LAKE COUNTY

Prepared By
P B Q & D, INC.
SANTA ANA, CALIFORNIA

April 1976

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FOREWORD

The Wasatch Canyons Transportation Study is a cooperative effort between the Wasatch Front Regional Council and the County of Salt Lake. The Study is funded in part by the Urban Mass Transportation Administration, U. S. Department of Transportation, with local matching funds and Study coordination provided by Salt Lake County. Cooperating agencies include the Salt Lake County Planning Commission, the Salt Lake County 208 Project, the U. S. Forest Service, the Utah State Department of Transportation, the Town of Alta, and numerous other local, regional, and statewide agencies and organizations. The Study is being coordinated by Salt Lake County as part of the continuing planning process for the Canyons of the Wasatch Front. Project consultant is P B Q & D, Inc., Santa Ana, California.

INTRODUCTION

This is the third in a series of eight Working Papers for the Wasatch Canyons Transportation Study. As a portion of the Salt Lake County effort designed to develop planning guidelines for the Canyons, this Transportation Study is being conducted simultaneously with other programs investigating land use, future growth, and water quality in the Canyons.

The Wasatch Canyons Transportation Study has been structured in three phases:

- Immediate Action Plan
- Short-Range Improvement Program
- Long-Range Development Concept

This is the first of three Working Papers to be developed for the Short-Range Improvement Program. The Immediate Action Plan has been completed and recommendations for immediate improvements in Canyon traffic management and transit service have been forwarded to appropriate agencies for implementation. The Short-Range Improvement Program will build systematically on the recommendations for immediate action in order to develop a staged plan for transportation improvements in the Canyons of the Wasatch Front, based on expected patterns of growth, land use, activity participation, and Canyon development.

This Working Paper has as its objectives (1) the documentation and review of existing data related to transportation planning for the Wasatch Canyons in Salt Lake County, and (2) the identification of planning guidelines for the Short-Range Improvement Program. This report contains a description of assumptions which have been made on such issues as Canyon growth and development, ski industry impacts, and the time frame for planning, as these issues affect the Short-Range Improvement Program. The basic goal of this medium-range

Program is to implement measures which will accommodate trip demands in the Canyons safely and efficiently during a several-year period in which the long-range development plans for each Canyon are conceived, debated, and adopted by the relevant agencies with continuing input from the public in Salt Lake County.

OVERVIEW OF THE EXISTING DATA BASE

This Working Paper contains, as an Appendix, an annotated bibliography of data sources reviewed to date for the Wasatch Canyons Transportation Study. This first section of the Working Paper provides a capsulized overview of the data that are available for use in transportation planning, divided into categories of transportation/traffic data and land use/activity participation data. The following section of the Paper provides an assessment of those areas where data tend to be deficient and where assumptions will need to be employed for short-range transportation planning. Finally, the guidelines, policies, and assumptions which will set the direction for the Short-Range Improvement Program are presented for review and discussion.

Transportation Data

The extent and the depth of transportation planning data available varies considerably for the five Canyons included in the Wasatch Canyons Transportation Study (Emigration, Parley's, Mill Creek, Big Cottonwood, and Little Cottonwood). Due to the primary focus of attention and predominance of previous work conducted in Big and Little Cottonwood Canyons, considerably more data is available for these two Canyons.

Assembly and review of data available and pertaining to the Cottonwood Canyons has revealed that most of it is of a general nature. Much of the information is in the form of reports describing plans and proposals developed for the Canyons (predominantly Little Cottonwood) and various studies pertaining to the use of and access to the Canyons. These plans and studies range from general plans initiated by Salt Lake County, to specific proposals on the behalf

of ski resort developers, to proposals from hardware manufacturers/suppliers for specific transit system development, to academic studies performed by students and/or faculty as university research papers and projects.

The majority of factual data relative to existing transportation conditions in the Canyons is provided by statistics maintained by the Utah Department of Transportation. This statistical information is primarily a result of ongoing traffic counting programs and compilation of accident records for all state highways. Considerable additional data is available for Big and Little Cottonwood Canyons as a result of roadside interviews conducted by the Department of Transportation in 1973. This "Recreation Area Parking Study" also included a survey program which developed directional traffic data and occupancy counts.

The vast majority of other transportation-related data, including university studies and Canyon access proposals, has been directed specifically to Little Cottonwood Canyon and the resorts of Alta and Snowbird. While these studies and transportation system proposals have identified some of the key issues and problems, they have contributed little additional data as they, for the most part, have relied primarily on the available data base. The system development proposals have been largely conceptual in nature and have not included extensive engineering investigations nor detailed cost estimates.

Adequate data have been obtained relative to regional transit operations and existing transit service in the Canyons. Canyon service for the 1975-76 ski season consisted primarily of service provided by the Salt Lake Transportation Company in Little Cottonwood Canyon. Data relative to schedules and estimates of ridership have been obtained from the Company. In the Spring of 1976, the Utah Transit Authority purchased franchise rights from the Salt Lake Transportation Company to operate service in the Cottonwood Canyons and between Downtown and the Salt Lake Airport. This action, as recommended in the Immediate Action

Program, has now set the stage for full public transit service in the Wasatch Canyons, effective immediately. With the basic conflict on service provision resolved, the Short-Range Plan will address itself specifically to the possible ways in which UTA might provide Canyon transit service.

Regional transit service has been and continues to be provided by the Utah Transit Authority. As a public transit system, UTA maintains certain records on existing operations and well-defined expansion plans. These expansion plans have not, to date, included specific service to the Canyons beyond the recommendations contained in the Immediate Action Plan. However, some of UTA's existing equipment and some of that being ordered is suited to Canyon operations, according to the Wasatch Front Regional Council and the UTA Operations Department. While extensive transit operational data is available, there is no definitive data on the nature of potential users of transit services for access to the Canyons. Since the private transit service focused primarily on providing access to Alta and Snowbird from downtown Salt Lake City and the Salt Lake Airport, it was used primarily by non-residents of the Salt Lake area and out-of-state visitors to the ski areas. No surveys have been conducted to identify existing user or potential user characteristics.

Land Use and Activity Participation Data

Considerable factual data relative to land use and environmental conditions in the Canyons have been amassed by the County and its consultants in the development of Master Plans for the Canyons and as part of the ongoing 208 water quality study. Recreational use data for the Canyons consist primarily of that provided by the ski area operators, the lodging facilities operators, and the U. S. Forest Service. Extensive data relative to recreational participation and tourism in the State of Utah is provided by the Institute for the Study of Outdoor Recreation and Tourism at Utah State

University. These data include a variety of information on skiing, but are on a state-wide basis and cannot be applied directly to specific ski areas. However, extensive data are published by the Insitute on an area-by-area basis relative to existing facilities and planned development along with estimates of the skier capacities provided by these facilities.

The most current summary of Canyon area demographics has been issued recently by Williams and Mocine, consultants to Salt Lake County for the "208" Study. This "Demographic Analysis for the Wasatch Mountains" describes the basic factors influencing the amount and distribution of existing and future Canyon development and land use. This compilation of several data sources is the primary reference for assumptions on Canyon growth, development, land use, and recreational participation patterns.

DATA DEFICIENCIES

There are several broad categories of information which are necessary to the development of the Short-Range Transportation Plan. The table on the following page summarizes these areas of relevant data and includes descriptions of how the data will be used; the primary sources of the information; and an assessment of their present adequacy with respect to the existing data base.

The primary data deficiency for the Wasatch Canyons Transportation Study involves the lack of information on the Canyons other than Big Cottonwood and Little Cottonwood. However, with respect to transportation improvement considerations, it is doubtful that Emigration, Parley's, or Mill Creek Canyons experience problems of the severity necessary to develop improvement measures, especially during the period embraced by the Short-Range Improvement Program. As described in the preceding section of this Paper and documented in the Annotated Bibliography, a large volume of information is available on the Cottonwood Canyons. However, much of this information is reliant on the few "hard" sources of data, including the 1973 "Recreation Area Parking Study" and other more current volume counts maintained by the State Department of Transportation.

As is the case with many studies designed to improve access to and circulation within recreation areas, data regarding the travel behavior and characteristics of the users is generally not as extensive as is desirable for transportation planning. Additionally, information on the future development potential in the Canyons is only now being generated; it is expected that this data will facilitate the formulation of assumptions for Canyon transportation planning. (Some preliminary guidelines in this area are presented in the following section of this Working Paper.)

GENERAL DATA REQUIREMENTS AND DEFICIENCIES
 WASATCH CANYONS TRANSPORTATION STUDY
 5-Year Plan for
 Transportation Improvement
 (Emphasis on Big and Little Cottonwood Canyons)

GENERAL DATA REQUIREMENT	DATA USE FOR TRANSPORTATION STUDY	PRIMARY SOURCE(S)	ADEQUACY/DEFICIENCY OF DATA
Origins and travel pattern data on local canyon users, by season	<ul style="list-style-type: none"> -Establishment of local service criteria -Bus routing and scheduling for local service -Locational criteria for major Valley multi-modal transfer facility -Siting of interim and permanent Salt Lake Valley pick-up points/bus stops 	<ul style="list-style-type: none"> -"Recreation Area Parking Study"(1973) -Institute for the Study of Outdoor Recreation and Tourism (USU) 	<ul style="list-style-type: none"> -"Recreation Area Parking Study" deals only with ski season; may be outdated -Institute data available only on state-wide basis only; cannot disaggregate local origins in greater Salt Lake region
Permanent and local origins and travel pattern data on non-local Canyon users, by season	<ul style="list-style-type: none"> -Establishment of service criteria for Airport and Downtown services to Canyons -Relationships between local services and tourist-oriented services 	<ul style="list-style-type: none"> -Institute for the Study of Outdoor Recreation and Tourism (USU) -Resort area operators -Travel and Convention Bureau 	<ul style="list-style-type: none"> -Data is available showing distribution of non-local Canyon users by state of origin. No satisfactory data exists on accommodation other than general breakdown between on-site (resort area) and off-site accommodation
Existing and historical data on public transit use for Canyon trips	<ul style="list-style-type: none"> -Fleet requirements -Coordination of Canyon service with other regional service -Patronage forecasts -Revenue estimates 	<ul style="list-style-type: none"> -Salt Lake Transportation Co. (Gray Line) -Resort area operators -Wasatch Front Regional Council 	<ul style="list-style-type: none"> -Existing data should be adequate for preliminary planning. Historical data, generally, will not serve as an accurate base for estimating Canyon transit service patronage with radically upgraded service
Operational plans and projections for regional bus service	<ul style="list-style-type: none"> -Budget constraints -Fleet size constraints -Fare structure determination -Service day length determination -Plans for park-and-ride/express services 	<ul style="list-style-type: none"> -Utah Transit Authority -Wasatch Front Regional Council 	<ul style="list-style-type: none"> -Planning data furnished by UTA and WFRC will be used as input
Anticipated growth in Canyon use, by season and type of use	<ul style="list-style-type: none"> -Patronage estimation -Development of staging program -Season emphasis for service -Peak versus off-peak service definition 	<ul style="list-style-type: none"> -Salt Lake County -Williams and Mochne -EDAW -Other "208" consultants 	<ul style="list-style-type: none"> -Early results from 208 Study are not definitive regarding future Canyon development plans. Will use data generated to date as a guideline for forecasting
Anticipated growth or change in privately-owned Canyon recreation facilities	<ul style="list-style-type: none"> -Future transportation system requirements -System phasing -Patronage estimation 	<ul style="list-style-type: none"> -Utah Ski Association -Resort operators 	<ul style="list-style-type: none"> -Plans and proposals are presently unresolved; those that are public knowledge will be considered in forecasting process
Existing and projected traffic volumes, roadway conditions and highway improvement plans for relevant areas	<ul style="list-style-type: none"> -Improvements necessary to facilitate increased bus use of Canyons -Private facility improvements required for bus access 	<ul style="list-style-type: none"> -Utah State DOT -Wasatch Front Regional Council -Town of Alta -Recreation area and resort operators 	<ul style="list-style-type: none"> -Data on traffic and on roads and highways are generally good (have been used in the immediate Action Program)

Data deficiencies in travel pattern (origin-destination) information can be overcome through the use of assumptions. While the relative proportions of out-of-state to local skiers have been established with reasonable accuracy, a one-time postcard survey was utilized to assess local origins of skiers destined for the Canyons and resident to the Salt Lake Valley region. This 1973 survey assigned local Canyon trip origins to eleven traffic zones in Salt Lake Valley. Since no other data collection of this nature was undertaken, the trip origin information presented in the "Recreation Area Parking Study" will form the basis for determining direction of approach data, necessary for siting transfer facilities and bus routing. Other data, specifically relating to UTA line patronage and ridership profiles, will be useful and are available on a very limited basis from the Utah Transit Authority and/or the Wasatch Front Regional Council. Procedures for improving the ongoing process of monitoring UTA patronage are now being implemented, but historical data are largely unavailable.

In summary, while a broader set of data would aid in the transportation planning process, there appears to be sufficient data base for use in the Short-Range Improvement Program. Many of the documents available propose schemes for access improvement, and these proposals will serve a useful purpose in developing recommendations. Assumptions which will guide the planning process are presented in the following section.

GUIDELINES FOR SHORT-RANGE TRANSPORTATION PLANNING

Time Frame

The Immediate Action Plan for transportation in the Wasatch Canyons covers the 1975-1976 season. Recommendations for interim measures to improve public transit to Big and Little Cottonwood Canyons during the present season are currently in the process of implementation. It is expected that the improvement measures can be carried over into the 1976-1977 season as well, with service expansion determined by a number of factors including equipment availability and subsidy arrangements. The Short-Range Improvement Program is assumed to cover a five-year period, beginning with the 1976-1977 season and concluding with the 1980-1981 season. Thus, the recommendations for transportation improvements included in the Short-Range Programs will be staged over a five-year period to facilitate incremental implementation. The Program design itself will be included in Working Paper No. 5, "Strategies for Short-Range Access Improvements and Implementation."

This five-year time frame is considered to be an appropriate period for various transportation schemes to be developed, primarily based on low capital-intensive approaches. During the early part of this period, it is expected that long-range plans for the growth and development of the Canyons will be formulated, reviewed, and adopted by private groups, governmental agencies, and the public in Salt Lake County. Long-range transportation system development, which may or may not involve extensive capital-intensive system construction, will depend essentially on the course which is determined for future Canyon development. The Short-Range Program will be designed to lead into the longer-range concept; even if little or no growth or future development is allowed, there are substantial improvements which could be

made--especially in the Cottonwood Canyons--which can help to alleviate some of the transportation-related problems that presently occur in the Canyons. The recommendations which are developed in the Short-Range Program will be aimed at the access requirements associated with assumed levels of Canyon activity during this five-year planning period.

Canyon Development, Land Use, and Activity Patterns

Certain assumptions are necessary in order for the Short-Range Improvement Program and resulting recommendations to most accurately reflect expected land use and activity patterns and general planning constraints in the Wasatch Canyons over the five-year planning period. These planning guidelines fall into the following categories:

- Canyon priorities for transportation planning
- Public transit operation and management
- Development in the Canyons
- Recreational participation patterns and seasonality
- Transportation system investment
- Public agency roles

Preliminary assumptions and policy guidelines, discussed in this Working Paper, which have some effect on the development of the five-year transportation plan are subject to further refinement during the planning process. At this point, however, the guidelines which will be used for planning purposes are as follows:

Canyon priorities for transportation planning. As described in the Immediate Action Plan (Working Paper No. 2), Emigration, Parley's, Mill Creek, and Big and Little Cottonwood Canyons have significant traffic volumes. However, only Little Cottonwood Canyon and, to some extent, Big Cottonwood Canyon have experienced problems related to access and circulation. While the other Canyons may, in the future, experience growth or land use changes which create significant transportation-related problems, it is assumed that no such changes will

occur in the five-year time frame of the Short-Range Improvement Program. Thus, the priority for Canyon transportation planning will be with Big and Little Cottonwood Canyons for the five-year program.

Public transit operation and management. It is assumed that the Utah Transit Authority (UTA) will have ultimate responsibility for planning and implementing public transit systems in Big and Little Cottonwood Canyons. With the recent purchase of Canyon franchise rights by UTA from the existing private operator it will be appropriate to presume that all transit improvements are to be the responsibility of the Utah Transit Authority and that no private franchise holder will be involved.

Private development in the Canyons. Through discussion with various agencies, including the Salt Lake County Planning Department, the U. S. Forest Service, the County "208" Study, and others, it has been determined that little significant development will occur in Big or Little Cottonwood Canyons during the five-year time frame for the Short-Range Improvement Program. This includes major new developments as well as significant additions to or changes in existing developments. This assumption covers both development of recreational facilities and residential/commercial facilities. Although this planning guideline will be revised, of course, should the situation change during the course of the Study, it is presently understood that the Short-Range Improvement Program will be geared to land use and attendant trip generation, based largely on the patterns existing today in the Canyons.

It is important to note, however, that significant changes in the transportation system serving Little Cottonwood Canyon could provide an impetus for increased development of the Canyon. Representatives of the ski areas have indicated that increases in access capacity could spur resort expansion if such plans could be made compatible with acceptable levels of use. That is, there may be a definite distinction in the holding capacity of the Canyons when expressed in terms of human use as opposed to vehicular use. While such correlations are still unproven, it is clear that future development could well be a function of access.

Recreational participation patterns and seasonality. The major variable influencing the type and extent of necessary transportation improvements in the Cottonwood Canyons is the number of recreation-related trips generated by Canyon ski resorts and other seasonal recreational attractions.

Although the data on recreational participation and the actual number of "skier visits" to Utah ski resorts have been somewhat sketchy, the Utah State University Institute for the Study of Outdoor Recreation and Tourism has made some projections of growth over the next decade, based on past performance. These projections are statewide, however, rather than for individual ski resorts, but they are assumed to represent the Cottonwood Canyons. For the period from 1975-1976 to 1980-1981, the Institute projects increases in skier visits ranging from about 55% to over 200%, depending on the method of projection and based on historical use data for the six-year period from 1968-1969 to 1973-1974. The most realistic method is the "least-squares" trend-line regression process, which provides estimates of

skier visits increasing at the more modest end of the range. Realistically, in light of the assumption of limited Canyon development over the five-year period and in view of the state-wide increases in skier visits over the last two seasons (which have averaged about 2% per year), even the 55% growth rate over the period appears inordinately high. With little significant expansion currently planned for the subject period, it is difficult to imagine that skier visits will increase at a rate greater than that exhibited over the past several years. Even if tentative plans for increased uphill capacity in Albion Basin at Alta are realized, the total growth in skier visits is unlikely to reach the 55% figure in Little Cottonwood Canyon unless major increases in off-peak (weekday, late-season) visitation occur.

Data from the Institute for the Study of Outdoor Recreation and Tourism (Utah State University) show that between the 1972-1973 ski season and the 1974-1975 season, the following growth took place:

Utah Ski Areas	Skier Days 1972-1973	Skier Days 1974-1975	Percent Change
"Nonresident" Ski Areas (Alta, Brian Head, Park City, Snowbird)	827,800	899,000	+ 8.6%
"Resident" Ski Areas (Brighton, Nordic Valley, Park West, Powder Mountain, Snow Basin, Sundance)	485,000	433,000	-10.7%
"Rural" Ski Areas (Beaver Mountain, Blue Mountain, Mt. Holly, Snowland)	57,000	70,000	+38.6%
TOTAL STATEWIDE	1,369,800	1,411,000	+ 3.0%

Rather than developing future use projections based on the six-year period ending in 1973-1974, it seems more realistic to use the shorter three-year period from 1972-1973 to 1974-1975, which represents a picture of Utah skiing closer to the probable picture for the coming five years. Thus, the Wasatch Canyons Transportation Study will assume a maximum growth rate in skier days in the Cottonwood Canyons of 4% to 5% per year for the five-year period. This represents an increase of some 20% to 30% for 1980-1981, over the existing use. (Big Cottonwood Canyon will experience greater percentage increases with the expected re-opening of Solitude.)

Other non-skiing use in the Cottonwood Canyons may also be expected to grow over the period of the Short-Range Transportation Program, especially day-use of the Canyons for picnicking, sight-seeing, hiking, and related activities. Typically, however, non-winter activities do not experience the peaking characteristics associated

with skiing and thus the transportation-related problems in the Canyons during spring, summer, and fall are not nearly as severe as during the ski season.

Transportation system investment. Planning guidelines in this category serve to constrain transportation system design in order for such design to be compatible with the assumptions for five-year development and land use in the Canyons. Since no significant growth or alterations to existing land uses are anticipated during the planning period for the Short-Range Improvement Program, it is realistically expected that a capital-intensive, fixed-guideway access system will be a longer-range system candidate for the Cottonwood Canyons. However, during the course of the public input-review process associated with the "208" Study and the Canyon Land Use Plan Alternatives, citizen participation (and concurrence by appropriate public agencies) may alter this a priori planning guideline. In any event, the objective of the Short-Range Program will be to anticipate the probable future consideration of high-technology systems for access-circulation in the Cottonwood Canyons; thus, all planning for bus systems, staging area development, and modal interchange facilities will be accomplished with the provision for future accommodation of at-grade or aerial transit system development. (The objective of the Long-Range Development Plan for transportation in the Canyons will be to conceptualize various alternative systems which can, as conditions dictate, replace reliance on buses and private vehicles for access with fixed-facility transit systems or other high-technology modes.)

Public agency roles. A major consideration in short-range transportation planning for the Canyons is the role various public agencies will assume, especially with respect to the design, implementation, and operation of systems and facilities recommended as part of the Short-Range Improvement Program. As stated earlier, it will be assumed that UTA will have ultimate responsibility for transit operations in the Cottonwood Canyons. It is likely that other responsibilities, including the development of staging areas and/or modal transfer facilities, will be coordinated by the Wasatch Front Regional Council as part of requirements for development of the regional transit improvement program and transportation systems management plans.

Additionally, it is possible that some recommendations may include the assumed participation of private interests in cooperation with public agencies. Until such time as directed otherwise, it will be assumed that the Wasatch Front Regional Council will be in a coordinating role for development of such transfer facilities, with regional planning input provided by Salt Lake County and cooperation by the State or local municipalities where either state-owned or city-owned land may be involved. Coordination of private development interests, where such roles are defined, will be assumed to be the responsibility of the County. (It should be noted that system and facility recommendations for the Short-Range Improvement Program may be made without accompanying recommendations for implementation should the implementing roles of the various agencies remain unclear or be relegated to decisions at a later date.)

WASATCH CANYONS TRANSPORTATION STUDY

ANNOTATED BIBLIOGRAPHY

Alan M. Voorhees & Associates, Inc., Preliminary Transportation Analysis, Little Cottonwood Canyon, Salt Lake County, Utah, for Snowbird Corporation, Snowbird, Utah, December 1973.

A preliminary transportation analysis of access to Little Cottonwood Canyon, intended to set the stage for a more in-depth feasibility study of transportation alternatives. The report describes three mass transportation alternatives: busway, cog-railroad, and aerial bus. Advantages and disadvantages of each alternative are outlined and a comparison of capital and annual costs is presented.

Alan M. Voorhees & Associates, Inc., A Transit Improvement Program for the Utah Transit Authority, prepared for the Salt Lake City Corporation, Salt Lake City, Utah, March 1971.

This report presents guidelines for a program to improve transit service provided by the Utah Transit Authority following its formation in 1970. Extensive use was made of planning data supplied by the Salt Lake Area Transportation Study in the development of this program. The principal elements of the report are: operating characteristics of the existing transit system; analysis of existing travel; examination of the current role of transit; evaluation of alternative courses of action; and a ten-year improvement program.

Both service and capital improvements are recommended. Service improvement recommendations feature a system of express commuter routes, expanded service area, and more east-west service. Recommendations for capital improvements identify a new garage, shop, and office facility in the primary requirement and present a bus acquisition program to reduce the average age of buses to 7.5 years within a three-year period.

Alan M. Voorhees & Associates, Inc., Wasatch Front Regional Transit Development Program, prepared for Wasatch Front Regional Council, March 1973. (Updated in March, 1975, by the Wasatch Front Regional Council.)

A report on a Transit Study for the region, including parts of Box Elder, Weber, Davis, Salt Lake, and Tooele Counties. The purpose of the study was two-fold: (1) "to evaluate present local transit services provided by private bus companies and determine alternatives for improving service, including public acquisition of private companies"; and (2) "to develop a short-range program for improving transit service in the study area to the year 1980, and integrate the improved program with the operations of the Utah Transit Authority." This report documents primarily Phase B of the Transit Study, "Short-Range Transit Improvement Program." Documentation includes review of existing transit service and operations, service improvement alternatives, and their development, recommended transit improvement program including

routes and operating requirements, transit organization and management alternatives, and an implementation program for the recommended plan.

Barnard, Jean et al., Little Cottonwood Canyon: An Interdisciplinary Study, Environmental Problems and the Law Class, University of Utah.

A report of a class project to "make a thorough overview of all facets of Little Cottonwood Canyon, to identify the interests that come into play there and to describe how, when, and where decisions have been and are being made that influence the course of events in the Canyon." The report is divided into two major parts: (1) "Government Regulation of Little Cottonwood Canyon," and (2) "Little Cottonwood Canyon Reconnaissance," with (3) "Interest Groups." The reconnaissance part contains a chapter on transportation, which describes the existing system and presents abstracts of ten transportation alternatives. The information presented in the report consists primarily of extractions from other reports, personal experience, and interviews with officials and individuals involved in the development and use of Little Cottonwood Canyon.

Eckbo, Dean, Austin & Williams, Inc., The Wasatch Front - A Strategy for Planning, prepared for Salt Lake County, July 1973.

This is a study design for development of a comprehensive regional plan for the Wasatch Front within Salt Lake County. The study design points to the critical and unique planning consideration involved in the study area and suggests that the single general goal of the study should be "to maintain a harmonious equilibrium between the region's natural endowments and its man-made environment." The transportation planning elements of this study design constitute the basis for the Wasatch Canyons Transportation Study.

Eckbo, Dean, Austin & Williams and LeBlance & Company, Alta/Little Cottonwood Canyon General Plan, prepared for Salt Lake County and The Town of Alta, July, 1973.

This report presents a proposed General Plan for the upper portion of Little Cottonwood Canyon and documents the planning process involved. The plan addresses land use location and density allocations in conjunction with functional service systems and implementation measures. Included in the report are an assessment of the avalanche hazard and an analysis of circulation capacity in the Canyon.

EDAW inc., Data Report, Tasks 360 and 370 of Salt Lake County Council of Governments 208 Water Quality Plan, January 1976.

A data report which, in conjunction with EDAW's Wasatch Canyons Study Data Report of June 1975, and with an upcoming report by the 208 Project Staff, covering Soils, Flood and Vegetation Data, documents data assembled for the 208 Water Quality Plan for Salt Lake County. These reports supplement a series of 1" = 2000' scale data maps. This particular report documents data assembled in the following categories: slope, geologic hazards and mineral resources, surface water, subsurface

water, wildlife, climatic, historic and archeologic, land ownership and control, land use quantities and development proposals, utilities, zoning, and proposed land use data (composite of general plans).

EDAW inc., Major Issues in the Wasatch Canyons, Task 270 of Salt Lake County Council of Governments 208 Water Quality Plan, December 1975.

The land use planning effort of the 208 Water Quality Planning Program for Salt Lake County has the objective of "devising means to direct future growth and shifts in land use which both avoid new, and solve existing, water pollution problems." This report identifies the issues within the Wasatch Canyons which are pertinent to development of a Water Quality Plan, particularly those issues relative to land use planning. Issues identified are grouped into broad areas of concern including: water quality; visual quality; recreation; circulation; air pollution; avalanche; economic; and land use. A number of conceptual land use alternatives for the Canyons are also presented.

EDAW inc., Data Report, Wasatch Canyons Study, Salt Lake County, Utah, prepared for Salt Lake County Planning Commission, June 1975.

This report describes the mapped data assembled for the Wasatch Canyons Study. The mapped data described includes topographic, slope, avalanche, vegetation, wildlife, climatic, historic, archeologic, special features, land ownership and control, land use, visual quality, and visual exposure data. The descriptions include use of data, map interpretation, and mapping process.

ENTELEKI, Preliminary Report for the Snowbird Project in the Wasatch National Forest.

A verbal description of the development plan for the Snowbird Resort in Little Cottonwood Canyon. The report describes Snowbird as a "full service, destination resort area of the highest quality with an emphasis on skiing in the winter and other types of recreation opportunities in the other three seasons." The development plan calls for overnight accommodations for 5,000 to 6,000 people and lift and trail capacity for 10,000 skiers by 1980. The transportation section of the plan describes the limitation of the existing access road and the need for a mass transit access system for full utilization of planned resort capacity to be possible.

Glenne, Bard et al, Water Pollution and Recreational Use in Little Cottonwood Canyon, UTEC Report 73-123, sponsored by Biomedical Sciences Support Grant Committee, Environmental Engineering Division, College of Engineering, University of Utah, Salt Lake City, Utah.

This report addresses the questions raised whether and how the present developments in Little Cottonwood Canyon are affecting the water quantity and quality in Little Cottonwood Creek. The approach involved historical and spatial examination of the following phenomena: hydrology; water quality; traffic, use and facilities; and correlations between use and pollution. Study methodology included development of predictive models as well as water sampling and interviews with

commercial facility operators. Traffic and trip making data supplied by the Utah State Highway Department and visitor-day data supplied by the U. S. Forest Service are presented in the report.

The report concludes that the physical and bacteriological water quality of Little Cottonwood Creek is definitely influenced by Canyon use. Specific observations include:

- Rapid increase in coliform bacteria levels since 1966, with inordinate origination attributed to the Alta and Snowbird areas;
- Road salt identified as the most probable cause of fairly rapid increase in chloride concentrations in Little Cottonwood Creek, near its mouth;
- A strong correlation shown between traffic volumes and coliform concentrations.

The report predicts from the observed trends that coliform levels in Little Cottonwood Creek will surpass the maximum allowable for a raw water supply within 4 to 6 years.

Hunt, John D. and Perry J. Brown, Utah Resident Outdoor Recreation Participation, Final Report, 1971-1972, report to Department of Natural Resources, Outdoor Recreation Agency by the Institute for the Study of Outdoor Recreation and Tourism, Utah State University, April 1973.

This report describes the outdoor recreation participation of Utah residents from September, 1971 through August 1972, and presents estimates of the amount of participation by activity. These estimates are based on reporting of actual participation by a sample of all ages, twelve years and older, and both sexes. Study methodology is described, including the development and conduct of questionnaire and interview surveys. The report is divided into two major sections: (1) state-wide summaries of outdoor recreation participation, and (2) participation on a multi-county planning district basis.

Institute for the Study of Outdoor Recreation and Tourism, Utah State University, State-of-the-Arts and Problem Analysis of Planning Data for Utah Skiing and Other Winter Sports, Logan, Utah, September 1974, submitted to the U. S. Forest Service.

This is a report to Region IV of the U. S. Forest Service on a study project of the same title conducted through the Institute for the Study of Outdoor Recreation and Tourism. The report is divided into two parts. The first deals with the state-of-the-arts and presents a review and assessment of available data and research methods. It also includes an analysis of skier data from the 1972-73 Utah Winter Sports-Ski Industry Study, historical use and facility inventory data for Utah ski areas, and preliminary projections of skier days for 1978 and 1985. Skier survey data from the 1972-73 study are categorized by resident and non-resident skier and U. S. Forest Service areas versus private ski

areas. The second part of the report describes a study plan for investigating the demand for and supply of winter recreation activity in Utah.

Institute for the Study of Outdoor Recreation and Tourism, Utah State University, Utah Ski Industry Study, 1974-75, Preliminary Report, Logan, Utah, September 1975.

This is a preliminary--not for publication--report of the results of a study of the Utah ski industry, conducted during the 1974-75 season. This study represents a follow-on of the study conducted during the 1972-73 season and involved similar skier interview and questionnaire surveys. Almost 17,000 skier parties were interviewed during the 1974-75 season and 1500 completed questionnaires were returned.

The objectives of both these studies included: collection of data on the number, expenditure patterns, origins, transportation, and length of stay of both resident and non-resident skiers; description of the resort and other winter sports facilities and accommodations; and integration of data from the motor vehicle and commercial air travel studies conducted by Utah State University. As in 1972-73, the survey of skiers constituted the most extensive part of the 1974-75 study. Eleven ski areas were surveyed, including Alta, Brighton, and Snowbird. Utah ski areas reported a total of 1,411,000 skier visits during the 1974-75 season, an increase of only 41,000 skier visits in the two years since the 1972-73 study. This represents a considerable reduction in the growth rate from that of previous years, but may be only a temporary reduction due to the state of the economy. The data also indicated a drop of 25,000 skier visits by out-of-state skiers, perhaps another reflection of the state of the economy.

The results of this study and previous studies have recently been published in a volume entitled, Ski Utah! A Report of the Industry, dated February 1976, and co-authored by John D. Hunt and Christie Anderson.

Institute for the Study of Outdoor Recreation and Tourism, Utah Tourism and Recreation Review, Utah State University, Logan, Utah.

The Utah Tourism and Recreation Review is a quarterly publication established in 1972 by the Institute for the Study of Outdoor Recreation and Tourism to make available to concerned individuals, businesses, agencies, and organizations information produced by the Institute and other programs at Utah State University. Each issue contains a summary of non-resident travel data and resident recreation participation and list of new publications produced by the Institute. Articles on current and ongoing teaching, research, and extension programs also are presented. Articles of particular interest to the Wasatch Canyons Transportation Study and the issues in which they were published are: "Three Years of Non-Resident Motor Vehicle Traveler Study in Utah," Volume 1, Number 3; "Tourism, Interstate 70, and the San Rafael Swell," Volume 2, Number 2; and "The Energy Shortage and Vacation Travel," Volume 3, Number 2.

Myers, Leland and Gary, Little Cottonwood Canyon Transportation Reconnaissance, UTEC Report 74-150, sponsored by A.S.U.U. Environmental Studies Program, Department of Civil Engineering, College of Engineering, University of Utah, Salt Lake City, Utah, October 1974.

This report documents a study of transportation system alternatives for Little Cottonwood Canyon. The major objective of the study was to evaluate and analyze the environmental impact and economic and technical feasibility of alternatives. The report contains summaries of previous transportation studies of Little Cottonwood Canyon and of solutions devised elsewhere to similar problems. A review of governmental and public policies relating to transportation in Little Cottonwood Canyon also is presented. Transportation alternatives evaluated consist of narrow gauge railroad, an aerial bus, improved highway, a bus system, and the existing system. The evaluation indicated a narrow gauge railroad, using the existing roadbed, to be the best alternative. Two basic recommendations are offered: "(1) that specific objectives and constraints for the use of Little Cottonwood Canyon be established; (2) that local, state, and Federal Agencies involved in Little Cottonwood Canyon transportation problems maintain active cooperation in coordinated problem solving."

Recreation Area Parking Study, Phase-1, Data Collection, prepared by Special Studies Unit, Systems Planning Division, Office of Planning and Programming, Utah State Department of Highways, December 1973.

This report describes an effort by the Utah State Department of Highways (now the Utah State Department of Transportation) and other agencies to define needs and identify opportunities for parking facilities at or near the entrances to Big and Little Cottonwood Canyons to promote carpooling and transit use for Canyon access. A postcard survey conducted at roadside interview stations at the mouths of the Canyons on Wednesday and Saturday, February 14 and 17, 1973, is described and the results of the 2,556 returned questionnaires are presented. Directional traffic counts taken in conjunction with the survey also are reported. Potential locations for parking and their capabilities are identified. The report also includes Highway Department estimates of road capacities and road improvement programs for the two canyons.

Reese, Clair, Facilities for a Mass Transit System in Little Cottonwood Canyon, M.S. Thesis, University of Utah, 1972.

A thesis proposing an alternative transportation system for Little Cottonwood Canyon, based on the Transit Expressway (Skybus). The investigation considers historical and projected development within the Canyon, existing transportation problems, and available alternative transportation systems. Four distinct types of facilities are identified as required to implement the Transit Expressway System. The facilities are described as to concept and design requirements.

Salt Lake Area Transportation Study, 1973 Annual Report, published by the Transportation Planning Section of the Utah State Department of Highways.

This report describes the activities of the Salt Lake Area Transportation Study (SLATS) during 1973, and briefly presents planned activities for 1974. In addition to the descriptions of activities, summaries of existing conditions and projections for 1995 are presented. These summaries include color-coded maps of population and employment densities.

Salt Lake Ranger District, Wasatch National Forest, Alternatives for Land Use, Little Cottonwood Canyon Management Area, Tri-Canyon Planning Unit.

A brief summation of objectives, alternatives, and decisions pertaining to the management of the National Forest Lands in Little Cottonwood Canyon, prepared for the purpose of obtaining public opinion as to how these lands shall be managed. The report presents particular Management Objectives for the Tri-Canyon Planning Unit, Management Alternatives for the Little Cottonwood Canyon Management Area, and Management Unit decisions which have resulted from technical studies and consultations with individuals, organized groups, local government agencies, and the academic community. A "Comment Resume" is provided to facilitate written response.

Traffic on Utah Highways, 1973, Utah State Department of Highways, Office of Planning and Programming, Systems Planning Division, Planning Statistics Section, printed April 1974.

This report presents average daily traffic (ADT) volumes on road sections of varying lengths on the Interstate, Primary, Federal-aid Secondary, and State Highways within the State of Utah. The counts presented were collected from 54 continuously operated permanent traffic recording stations, 216 traffic counting machines stationed periodically at various locations, special counts at urban control stations, numerous short-time counts for specific problems, and 96 manual classification counts. In addition to the 1973 ADT volumes by road section, ADT volumes for previous years are given for comparative purposes. An additional section of this publication presents average volumes by month and day of week for the permanent count stations, two of which are located on the highways in Big and Little Cottonwood Canyons.

Utah Traffic Accidents and Accident Rates, 1972, 1973, and 1974, Utah State Department of Highways, Office of Planning and Programming, Systems Planning Division, Planning Statistics Section.

These are the 1972, 1973, and 1974, issues of the annual report of motor vehicle accidents and accident rates on Federal-aid and State Highways in Utah. The number of accidents and accident rate (number of accidents per million vehicle miles) are given for specific highway segments. Accidents are categorized as to severity by whether they involved fatalities, injuries, or property damage only. Rates for previous two years are given for comparative purposes. A summary of accidents and rates by highway classification also is presented.

Utah, Wasatch Front Counties, Traffic Accidents by Type and Accident Rate, 1972, 1973, and 1974, Utah State Department of Highways, Office of Planning and Programming, Systems Planning Division, Planning Statistics Section.

These are the 1972, 1973, and 1974, issues of an annual report presenting information on motor vehicle accidents by type and rate for Federal-aid and State Highways in the Wasatch Front Counties--Weber, Davis, Salt Lake, and Utah. This report supplements the annual report entitled, Utah Traffic Accidents and Accident Rates, and it is intended to provide a reference for locating and analyzing accident trouble spots. The report gives the number, severity, and rate of certain specific types of accidents, such as head-on, rear-end, and sideswipe, for specific highway segments.

von Allmen, Beat, Canyon Transportation Reconnaissance, submitted to the Faculty of Industrial Engineering of the University of Utah, August 1973.

This is an expansion of the transportation reconnaissance presented in Little Cottonwood Canyon: An Interdisciplinary Study. In addition to the description of the existing system and abstracts of alternatives, projections of future canyon use are presented as well as various view-points on Canyon use. Report appendix describes a design contest for a Canyon transportation system and presents the winning proposal, a narrow-gauge railroad.

Wasatch Front Regional Council and Utah Transit Authority, Surveillance of Transit Operational and Demand Characteristics, Technical Report - Volume 1, No. 1, April 1974.

This is the first annual report on the transit surveillance program established by the Wasatch Front Regional Council and the Utah Transit Authority to monitor the operational and demand characteristics of the regional transit system. The report documents the data collection procedure and presents data collected since the surveillance program was initiated in December 1973. Demand characteristics surveyed include inbound and outbound patronage demands for peak and off-peak periods, seasonal variations in demand, and weekday versus weekend demands on a route-by-route basis. Operational characteristics monitored relate to overall financial status, operating cost, revenue generated, etc.

Wilbur Smith and Associates, Salt Lake Area Transportation Study, prepared for Utah State Department of Highways and other participating agencies, June 1965.

- Volume I - "Current Travel Inventory"
- Volume II - "Future Transportation Plan"
- Volume III- "Engineering, Traffic, and Statistical Data"
- Volume IV - "Summary Report"

These reports document the data base procedures, and results of the comprehensive transportation study conducted for the Salt Lake area in 1965. This study was authorized to examine the character of travel within the metropolitan Salt Lake area and to determine the future transportation needs, based on anticipated 1980 travel requirements. The reports describe the conduct and results of the origin-destination surveys which were part of the study. Also documented are forecasts of 1980 travel, examination of transit operations, and a master plan for staged implementation of recommended transportation improvements. The

program (also known as the Salt Lake Area Transportation Study) developed to provide continuous transportation planning for the region is presented as part of the Future Transportation Plan.

Williams and Mocine, Demographic Analysis: The Wasatch Mountains within Salt Lake County, 1976.

This preliminary report describes existing conditions and examines potential for population and recreation growth in the Canyons of the Wasatch Front. Areas studied specifically include existing Canyon population; permanent homes, summer homes, and condominiums; the ski industry impacts; and summer outdoor recreation impacts. The study indicates that the following have a significant impact on the amount and distribution of future development:

- . Population growth in the region
- . Trends in demand for recreation facilities and vacation homes
- . Water supply--for canyon use and protection of supply for Valley
- . Sanitation facilities--practical and safe expansion limits
- . Land suitability and capability
- . Road capacity--total access system
- . Public conservation, land use and transportation policies
- . Private investment decisions