

Technical Land Use Plan Wasatch Canyons

Salt Lake County Council of Governments
208 Water Quality Plan
EDAW inc.

July 14, 1977

Salt Lake County Council of Governments
2033 South State Street
Building 1, Room 214
Salt Lake City, UT 84115

Gentlemen:

In completion of our contract, we are pleased to submit our proposals for the 208 Project Technical Land Use Plan for the Wasatch Canyons.

This report summarizes the results of the joint efforts of EDAW, Inc., the 208 Project Staff, the Land Use Technical Advisory Committee and the Citizens Planning Advisory Committee over the past two years. The plan proposals build on, and should be used in conjunction with, EDAW's previous products for the 208 Project (and for the earlier Wasatch Canyons study).

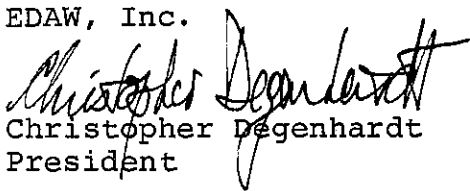
These products are:

- Wasatch Canyons Study Data Report and Maps. June, 1975.
- Salt Lake County Data Report and Maps. December, 1975
- Analysis of Land Use Controls in the Canyons. October, 1975.
- Environmental Suitability Ratings and Composite Maps. January, 1976.
- Development Suitability Map and Alternate Use Level Plan Maps. November, 1976.

We have enjoyed our participation in this stimulating project and trust that our results will prove useful to those charged with monitoring development in the Canyons. We trust also that eventual improvements in water quality data for the canyon streams will soon enable a scientific correlation between land uses and water quality to be determined sufficiently precisely that predictions of future water quality can be made.

Sincerely,

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A Introduction

The 208 Land Use Planning effort in the Wasatch Canyons, which is an integral part of the whole 208 study, has the objectives of providing a rational basis for planning and designing waste water facilities and of devising controls for development and for intensive land uses that will solve existing water pollution problems and prevent future ones. To achieve these objectives, environmental constraints have been examined to reveal the suitability of the land for various uses and the desirable extent and form of future development.

Other 208 Project efforts (not outlined in this report) include Land Use Planning for the Jordan Valley, an assessment of existing water quality and a comparison of the cost and effectiveness of different waste treatment strategies. These, related to land suitability, will enable comprehensive land use solutions to water quality problems to be developed.

The present predominant uses in each of the Canyons (listed in sequence from North to South) can be summarized as follows:

- o City Creek
 - picnicking
 - watershed (culinary water)
- o Red Butte
 - Research Natural Area (entry restricted)
- o Emigration
 - year-round housing
 - cabins
- o Parley's (including Lamb's, Mountain Dell and Mt. Aire Canyons)
 - transportation (I-80)
 - cabins
 - golf
 - watershed (culinary water)
- o Mill Creek
 - picnicking
 - summer cabins
- o Big Cottonwood
 - ski resorts
 - picnicking
 - camping
 - back country recreation
 - summer cabins
 - watershed (culinary water)

- o Little Cottonwood
 - major ski resorts
 - camping
 - back country recreation
 - summer cabins
 - watershed (culinary water)

- o Eastern Traverse Mountains (including Bell's and Corner Canyons)
 - watershed (culinary water)

In March, 1976, a conference was held at which the 208 Project Planning Advisory Committee represented the Counties' population in suggesting priorities, goals and policies for the project. The following direct excerpts from the report of that conference pertain to land use and water quality in the Canyons.

We should maintain water standards at our present level. Presently, water from the Canyons exceeds federal standards both before treatment and after. Present authorities should retain the responsibilities for maintaining this present high level of quality.

Water quality monitoring in sensitive areas, such as the Canyons, should be the responsibility of private developers or developments.

Several canyons should be left in their natural state. Development should be limited in Millcreek, Bell, Red Butte and City Creek Canyons.

Developments in areas threatened by natural hazards such as landslides, snowslides, mudflows, etc., should be designed to accommodate the hazard. This solution is preferable to banning developments in threatened areas. Presently, Salt Lake County is in the process of identifying those areas wherein the dangers exist. When such areas have been mapped out, it should be up to the developer to prove that the danger does not exist before he can win approval for a development which does not accommodate the hazard.

Recreational use and private ownership of land in the Canyons should continue. If various uses conflict, the "scientific facts" should be considered in determining which of these competing needs should be encouraged or discouraged. Mining, reservoirs or intensive resort developments should also be encouraged or discouraged using the same criteria.

Existing resorts should be expanded before other developments for skiing are considered. A publicly-owned ski resort, specifically intended for the day skier, would not be in the best interest of the County's citizens. Nor should the public own more land in the Canyons.

Access to the Canyons should be improved. Mass transit will probably be one of the answers. At the same time, the roads up to the Canyons should be improved by constructing passing lanes to overcome some of the safety problems of the areas.

Large parking lots in the Canyons pose aesthetic problems, yet many developments suffer from inadequate parking. Large parking areas at the mouths of the Canyons should be constructed to make car pooling and mass transit systems more effective. Car pooling should also be encouraged by other means as should mid-week use of the facilities.

Cluster developments should be encouraged because of the economies of such developments and their compatibility with the environment. Cluster developments can be encouraged by educating the public and perhaps assigning a new zoning classification for cluster developments. Maybe later, the amount of zoning for single family residences could be limited while encouraging zoning for cluster developments. Such developments should be located near transportation facilities and open spaces. A certain percentage of the land should be reserved for community facilities and the natural environment should be preserved as much as possible.

Starting from the detailed data inventory that was the principal product of the early stages of the Canyons' land use planning effort and taking into consideration the existing uses and citizens' goals described above, a technical land use plan was evolved using a step-by-step process of determination of land suitability, formulation of alternative use levels and choice of optimum conditional use levels. This plan is described in detail in Section C of this report and can be summarized as follows:

City Creek Canyon

Existing facilities and uses. *No major expansion.*

Red Butte Canyon

Existing facilities and uses. *No major expansion.*

Emigration Canyon

Anticipate

Anticipate

Major residential. Triple the existing level of year-round dwelling units. *^* New sewer. Water from Little Dell Reservoir in adjacent Parleys Canyon, *or permit development of low cells.*

Parleys Canyon

Double the existing small number of cabins. Construct Little Dell Reservoir with associated camping and picnicking

Mill Creek Canyon

Expect

Minimal cabin infill. Minor additional picnicking.

Big Cottonwood Canyon

Increase cabins to 140% of existing. Minor additional ski lift, picnic and campground capacity. No sewer, no construction of Argenta Reservoir.

Little Cottonwood Canyon

Increase dwelling units to 270% of existing (1975), mostly as high density lodge condominium development. Corresponding additional ski lift capacity. Moderate additional camp and picnic facilities. Extend sewer system.

Traverse Mountains

No existing development. Minor new residential and picnic capacity.

B Plan Process

B.1. DATA INVENTORY

The following aspects of the area's environment were studied and mapped:

Physical/Biological Factors

- o Slope and terrain
- o Geologic and avalanche hazards and mineral resources
- o Soils
- o Surface and sub-surface water and flood areas
- o Vegetation and wildlife
- o Climate

Social/Cultural Factors

- o Historic and archaeological sites
- o Existing land uses and major development proposals
- o Land ownership and control
- o Zoning and existing general plans
- o Visual quality and visibility

The data inventory is not intended to provide input merely to the composite maps. It is an ongoing resource (ideally to be updated as more information becomes available) and itself gives direct input to all the steps in the plan process.

The inevitable inadequacies and limitations of any data inventory process and the specific problems with this one are discussed in Sections B.2- Weighting & Compositing of Data - and C.6 - Plan Criteria: Development Suitability.

B.2. WEIGHTING AND COMPOSITING OF DATA

Each environmental condition from each of the data maps was evaluated as to its suitability for development, or the opportunity it presented for other uses. The resulting value decisions were then illustrated in four composite maps. These simplified or generalized summary maps were necessary to act as a "bridge" between the many data maps and the plan map.

The first, most complex and most important of the composite maps (for the purposes of the 208 Plan), is a Development Constraint Map. The data that are actually delineated on it are negative conditions or unsuitabilities, leaving the base information in the suitable areas (where the majority of development will be planned) clear and unobstructed by color or texture.

The remaining three maps are opportunity maps for Agriculture/Extraction, Recreation and Conservation. The data that are mapped on them are positive conditions or suitabilities. This enables each of these three maps to be tested against the Development Constraint Map, and judgments made as to relative values between development opportunity and opportunity for other uses so that a final development suitability map may be evolved.

The composite maps do not replace the data inventory and render it redundant, they are merely a bridge (one of many possible) between the data and the plan map. Their main purpose is to enable lines to be delineated on a map, dividing areas where development (broadly speaking) can generally occur (often subject to conditions) from other areas where development should generally not occur (unless conditions can be shown to be, in fact, suitable).

Note that it is graphically impossible to show all the data from each of the data maps that is relevant to one land use consideration on one composite map. To be readable, the composites must be considerably generalized and, therefore, in the course of plan evaluation, reference must often be made to the original data maps.

Since all four composite maps have the main purpose of enabling formulation of the development suitability map and ultimately of the plan map, it is not generally necessary to repeat data items on the development constraint composite if they appear on one of the other three. In other words, each land use category is considered in isolation on its composite map and is then interrelated on the development suitability map.

- (a) Development Constraint Composite Map - This map illustrates environmental conditions that were judged to be generally unsuitable for development and/or to merit the imposition of special controls on it. The conditions are:
- Steep slopes.
 - Avalanche hazard areas.
 - Geologic hazard areas.
 - Soils unsuitable for development, e.g., unstable soils, erosion hazard soils, etc.
 - Surface water features. A protective buffer strip along all stream, spring, pond and lake banks. The width of this must be resolved on a site specific basis.
- (b) Agricultural/Extraction Opportunity Composite Map - Environmental conditions judged to constitute opportunities for these purposes were mapped:
- Prime or unique agricultural lands - irrigable or non-irrigable.
 - Existing quarries and gravel pits.
 - Valuable mineral extraction areas.
- (c) Recreation and Conservation Opportunity Composite Maps - Environmental conditions considered valuable for these uses were mapped:
- (d)
- Most surface water features.
 - Parks and other developed recreational facilities.
 - Back country recreational use areas.
 - Specially designated undeveloped areas.
 - Historic sites and areas.
 - Outstanding scenic features.
 - Archaeological sites.
 - Critical wildlife habitat.

It is important to keep in mind that, in addition to the limitations of scale inherent in all area-wide resource mapping, there are a number of specific limitations to the data that constitute the composite maps. These are:

- Seismic Shaking

The entire county is a hazard area. The hazard is probably greater on the unconsolidated sediments making up the valley floor; on the other hand, seismic shaking in steep mountainous areas can initiate landslides, rockfalls, etc. This hazard, by its nature, cannot usefully be mapped.

- Geologic Hazards

Detailed studies have been completed for the Sugar House Quadrant, and have revealed many serious hazards. Similar studies do not exist for other, superficially similar areas which presumably contain similar hazards.

Further detailed geologic studies are urgently needed in areas subject to development pressure.

- Avalanche

Unrecorded avalanche paths certainly exist in previously undeveloped areas. Locations on or below slopes beneath possible origin zones are possible hazard areas. It has not been possible to map these within the scope of this Study.

- Cultural Sites

Recorded archaeological and historic sites are thought to constitute only a small fraction of the total sites that exist.

B.3. DEVELOPMENT SUITABILITY ASSESSMENT

The designation of land as "suitable" or "unsuitable" for development is designed to give a general planning overview only. It is intended to be supplemented by later, more detailed, larger scale study pertaining to specific developments. The suitability designations must be used with an understanding of their inevitable limitations.

In the process of development suitability assessment, the composite suitability maps and several data maps were again composited into a single development suitability map using four steps.

- (a) All the areas from the Development Constraint Composite Map that were free of major development constraints or that had at most one major constraint were outlined.
- (b) These areas were checked against the remaining three composite maps to see if they offered any opportunity for uses other than development. The environmental conditions that showed up in these areas and that were judged to merit removal from consideration for development (because of overriding suitability for agriculture, extraction, conservation or recreation) were:
 - Proposed Lone Peak Wilderness Area.
 - Red Butte Research Area.
 - Camp sites, picnic areas, parks, golf course.
 - Snow play areas.
 - Intensive back country recreational use areas.
 - Quarries or gravel pits.
 - Deer winter range (severe winter).

A number of features remain that need protection, but are so small ("spot features") that they can, with care, be successfully integrated into most of the types of development likely in the canyons. Examples are historic or archaeological sites.

- (c) The remaining areas were divided into publicly and privately owned lands.
- (d) Finally, the private development suitable areas were assessed as to their relationship to existing development and existing access, with the thought that development should be consolidated and clustered rather than allowed to sprawl.

In summary, land mapped as suitable for development is:
(1) inherently suitable with, at most, one major mapped constraint, (2) not over-ridingly suitable for some other purpose, (3) generally privately owned and (4) reasonably accessible.

The following table summarizes the amount of land suitable for development in each of the canyons.

B.4. ALTERNATE USE LEVELS

Existing use levels in the eight major canyon watersheds were tabulated and two alternate future use levels that might be reached by 1995 were postulated by 208 Project and Salt Lake County Planning Commission staff. These levels were based on: amount of suitable land, anticipated general effect of development on water quality, and a general concensus as to minimum economic sizes of various major proposed developments.

In general, the alternates express major growth options in Emigration Canyon, Big Cottonwood Canyon, Little Cottonwood Canyon and the Eastern Traverse Mountains, and minor options in the other 4 canyons.

These use levels are somewhat theoretical since no detailed population projections for recreation and tourism were available. However, they do give alternative pictures to facilitate the choice of an appropriate conditional development level for each canyon.

The following table summarizes some of the most important uses for the two hypothetical use levels.

C Selected Plan 1995

C.1 INTRODUCTION

Early water quality data for the Wasatch Front suggested that intensity of human use correlated rather directly with bacterial pollution in the Canyon Streams. Data now available show that this was an over-simplification. Only certain types of use, or certain activities connected with intensive use, appear to have been responsible for recent, and present, high levels of coliform bacteria in some of the Canyon Streams.

The available data are displayed in the report, "Evaluation of Land Use and Bacterial Water Quality in Wasatch Mountain Streams", December, 1976, by Hydrosience, Inc., and are sufficient to permit an evaluation of the relative influence of each of the major existing land uses within a specific watershed upon the existing total coliform levels in the stream draining that watershed.

However, these recent data (including the results of the 208 project sampling program) are still not detailed enough, nor available over long enough time periods to permit water quality predictions to be made on the basis of assumed future land use levels.

Therefore, in the absence of any scientific input that would enable a choice to be made between alternate land use levels on the basis of their predicted water quality, we have been compelled to fall back on rather general planning policies. These permit a full range of appropriate land uses to take place somewhere in the Wasatch Canyons of Salt Lake County. The conditionally suggested 1995 use level was selected from one or other of the 2 previously formulated alternate use levels as seemed most appropriate for each canyon, based on the following:

- The location and acreage of suitable land (as defined in this study).
- The probable general effect of the various land uses on water quality. Crucial to this is the intent of the Citizens Planning Advisory Committee that Canyons water quality should be maintained at its present level (see Section A)
- The general concensus as to the minimum probable economic sizes for sewer service areas and resorts (this being the closest to a demand projection that could be developed).

Possible limiting factors that may act to hold use levels below those tentatively suggested were water supply and transportation. These are not addressed in detail in this study.

The presentation of 1995 use levels is consequently tentative. However, the criteria presented in this section can be used to formulate firmer numbers once more water quality data become available.

C.2. PLAN STRATEGIES

The selected future use level for each Canyon was developed into a plan by locating the development in the vicinity of the most suitable land as revealed on the Development Suitability Map (Section B.3.).

The achievement of the use levels suggested is dependent on a number of criteria (discussed in Section C.6.), the most important of which is that development shall proceed incrementally with continuous water quality monitoring.

The plan is at a regional scale and is intended for general policy decisions. The areas of development shown are diagrammatic, based on the existence of suitable land. They are not intended to be related to specific properties.

Some general strategies were as follows:

- New development should first occur as infilling in vacant areas amongst existing development, then adjacent to existing development and, thirdly, separate from existing development but accessible by existing roads.
- New development should occur on private land rather than public land, even though the latter may have clearer development potential.
- Land with no mapped constraints should be used for development before land with one mapped constraint.
- Higher density single family residential (whether permanent dwelling units or summer cabins) of 2 dwelling units per acre should first be located on the more suitable land with the lower densities (1 dwelling unit per acre) on the less suitable land.

- All development that appears diagrammatically on the plan map is in the vicinity of an equal area of land with, at most, one mapped development constraint.

C.4

SELECTED PLAN: USE LEVELS

LEGEND:

150 - 350
UNITS PERSONS

	CITY CREEK CANYON CANYON			LITTLE COTTONWOOD CANYON		EASTERN TRAVERSE MTNS.	
	Existing Use Level 1975 (1)	Conditional Use Level 1995	Level 1995 (6)	Existing Use Level 1975 (1)	Conditional Use Level 1995 (1)	Existing Use Level 1975 (1)	Conditional Use Level 1995
PERMANENT DWELLING UNITS (3.4 PERSONS/D.U.)	1-3	1-3	102	10-34	50-170	None	100
SUMMER CABINS (5 PERSONS/UNIT)	None	None	1,200	50-250	120-600	None	None
LODGE CONDOMINIUM UNITS (2.3 PERSONS/UNIT - FIGURES INCLUDE RESIDENT EMPLOYEES)	None	None	135	1,044-2,297	2,800-6,440	None	None
TOTAL	1-3	1-3	1,437	1,104-2,581	2,960-7,170	None	100
PARKING SPACES	--	--	Adequate Additional	2,600+	Adequate Additional	None	20
DAY SKIERS (AVERAGE USE OVER SEASON)	None	None	--	2,150	3,500	None	None
SKI LIFT CAPACITY/HR. (THEORETICAL PERSON/TRIPS)	None	None	(5)	9,500	Adequate Additional	None	None
CAMPGROUND CAPACITY (PERSONS)	None	None)	480	700	None	None
PICNIC AREA CAPACITY (PERSONS)	845	845)+	None	200	None	None
AVERAGE ANNUAL DAILY TRAFFIC	Restricted Road	Restricte Road		2,565	--	Dirt Road	750 (7)
BACK COUNTRY RECREATIONAL USE (VISITOR DAYS)	Moderate	Moderate	Adequate Additional	11,000	Moderate Additional	Very Slight	Slight

NOTES:

- (1) Average annual daily traffic data are for 1973. Recreational use data are for 1974.
- (2) According to SLATS, April 26, 1976. Based on 7.5 round trips per d.u. per day.
- (3) Sewer built. Water available from Little Dell Reservoir in Parley's Canyon.

C.5. DESCRIPTION OF PLAN

EXPLANATION

Each of the Wasatch Front Canyons in Salt Lake County is described below (in sequence from North to South) with the 1995 development conditionally proposed for it.

The densities recommended in the descriptions relate to existing county zoning classifications as follows:

<u>Density</u>	<u>Zoning</u>
- 1 dwelling unit per acre	-- FR-1
- 2 dwelling units per acre	-- FR-.5
- 10 condominiums or lodge units per acre	-- -
- 40 condominiums or lodge units per acre	-- FM-20

"Development suitable land" includes terrain with at most one mapped constraint.

CITY CREEK CANYON

Existing Uses - Picnicking, watershed (culinary water), vehicles restricted.

Existing Development - Six acres: Treatment plant, etc.

Land Suitable for Development - 47 acres. Near mouth of canyon.

Conditional Use Level 1995 - No new development.

RED BUTTE CANYON

Existing Uses - Research natural area (entry restricted).

Existing Development - None.

Land Suitable for Development - not measured.

Conditional Use Level 1995 - No development.

EMIGRATION CANYON

Existing Uses - Year-round housing, cabins.

Existing Development - 276 acres, 240 d.u.'s. Many residences located in the narrow valley adjacent to the stream. Sewage disposal by on-site filter field, water supply from wells.

Land Suitable for Development - 203 acres. Most land located north of the stream on a "shelf" on the canyon side. Very little is along the present road in the canyon bottom.

Conditional Use Level 1995 - 370 new year-round dwelling units at 2 d.u./acre and 80 new condominium units at 10 units/acre. 40 new units in areas of existing development. 197 new developed acres. Water supply from future Little Dell Reservoir and new sewer system are essential to this use level but must be shown to be economically feasible.

Comments:

- . Sewer - Comparing the Emigration Canyon sewer proposed here with a 1967 Engineering Study for a then-proposed sewer in Big Cottonwood Canyon, indicates that an Emigration sewer may be economically marginal at the levels of development proposed here, the ratio of its length to supporting residences being less favorable. However, the present situation of on-site sewage disposal and private shallow culinary water wells in the Canyon is unsatisfactory and may lead to public health problems. It is assumed that all new development and, unless totally unfeasible, all existing development would be served by the proposed sewer.
- . Traffic - Developing to the suggested 1995 levels is conditional upon solutions being found for any emerging or projected traffic congestion problems. In normal road conditions, with most of the Canyon dwelling units contributing commuters to the Salt Lake Valley, the capacity of the existing road may approach design limits.

PARLEYS CANYON (includes Lambs, Mountain Dell and Mt. Aire Canyons)

Existing Uses - Transportation (I-80), cabins, golf, watershed (culinary water).

Existing Development - 100 acres, approximately 83 cabins at complexes in Mount Aire and Lamb's Canyons. Sewage disposal by vault. Many more proposed, already permitted, cabins.

Land Suitable for Development - 202 acres. Scattered areas.

Conditional Use Level 1995 - 82 new units at 1 d.u./acre; 82 new developed acres. This excludes the above proposed, permitted cabins.

Comments:

- . Little Dell Reservoir - It is assumed that this will be constructed as being necessary for the proposed development in Emigration Canyon to the North. Major additional camp and picnic facilities are projected near Little Dell Reservoir.

MILL CREEK CANYON

Existing Uses - Picnicking, cabins.

Existing Development - 81 acres, 72+ summer cabins at two main locations near streams. Sewage disposal by on-site filter field.

Land Suitable for Development - 46 acres in small areas along creeks.

Conditional Use Level 1995 - 8 new cabins in areas of existing development.

BIG COTTONWOOD CANYON

Existing Uses - Ski resorts, picnicking, camping, cabins, watershed (culinary water).

Existing Development - 282 acres, 440 cabins, mostly in the upper half of the canyon in both small and (at Silver Fork) large concentrations. Minor commercial, two ski resorts (one inactive). Sewage disposal by vault.

Land Suitable for Development - 693 acres in upper half of canyon, both along stream and on lower slopes around head of canyon.

Conditional Use Level 1995 - 182 new cabins at 1 unit/acre. 33 new units within existing developed areas. 182 new developed acres. Proposed Argenta Reservoir not constructed. Some increase in ski-lift capacity.

Comments:

- . Development Suitable Land - There is more suitable land in this than in any other canyon area (except the Traverse Mountains). Proposed development is located mostly on land with no mapped development constraints.
- . Development to the recommended levels is conditional on solutions being found to any emerging problem of:
 - sewage disposal
 - vehicular circulation
 - water supply
 - water pollution.

LITTLE COTTONWOOD CANYON

Existing Uses - Ski resorts, camping, back country recreation, cabins, watershed (culinary water).

Existing Development - 128 acres (upstream of Temple Granite Quarry). 29 d.u.'s near mouth of Canyon. Two major ski resorts near head of canyon with 1,031 units of accommodation (including resident employees). 32 d.u.'s near head of Canyon. Sewage disposal by sewer.

Land Suitable for Development - 277 acres of which 19 acres are on downhill ski terrain and 183 acres are at or near the Canyon mouth leaving only 75 available acres in the upper Canyon. Of these, 17 acres are publicly owned.

Conditional Use Level 1995 - 60 d.u.'s at 1 unit/acre. 50 d.u.'s at 10 units/acre. 1,738 new lodge/condominium units at 40 d.u./acre (includes employee accommodation). 157 new developed acres (including restaurants, parking, etc.). Additional major parking lots at mouth of Canyon. Sewer system extended as necessary. Appropriate increases in ski lift capacity and ski terrain but this must not pre-empt possible wilderness status for the South and West slopes of White Pine Valley.

Comments:

- . Traffic - Developing to the suggested 1995 level is conditional on solutions being found for any emerging or projected circulation problems. The traffic capacity of the Little Cottonwood Road is discussed in detail in the "Alta/Little Cottonwood Canyon General Plan Report", July, 1973, by EDAW, Inc. and LeBlanc & Company. At the full 1995 development level road capacity, assuming minor road improvements and the use of shuttle buses would be near capacity. This assumes a reasonable percentage of capacity is absorbed by day-skiers.
- . Sewer - It is assumed that the existing sewer would be extended as necessary and that all new development and, unless totally unfeasible, all existing development would be served by this extended system.
- . Avalanche - Developing to the suggested level is conditioned upon detailed study and resolution of the avalanche hazard for each specific site.
- . Development to the recommended level is conditional on solutions being found to any additional emerging problem such as:
 - water supply
 - water pollution.

EASTERN TRAVERSE MOUNTAINS (includes Bell's Canyon and Corner Canyon)

Existing Uses - Watershed (culinary water).

Existing Development - None.

Land Suitable for Development - 1,703 acres.

Conditional Use Level 1995 - 100 new year-round residences at 1 d.u./acre. 100 new developed acres.

Comments:

- . Development Suitable Land - There is a very large area of moderately suitable land at lower altitudes in this area which might be thought of as foothill rather than Canyon land. The proposed development is located on land with no mapped constraints.

- . Development to the recommended level is conditional on solutions being found to any emerging or projected problems such as:

- sewage disposal
- vehicular circulation
- water supply
- water pollution.

EXISTING DEVELOPMENT
& LAND DEVELOPED
UNDER PROPOSED PLAN

WATERSHED	DEVELOPMENT		
	Existing (1975) developed acres (1)	Conditional 1995 new developed acres (2)	1995 new developed acres as a percentage of existing
City Creek Canyon	6	0	-
Red Butte Canyon	0	0	-
Emigration Canyon	276	197	71%
Parleys Canyon	100	82	82%
Mill Creek Canyon	81	0	-
Big Cottonwood Canyon	282	182	65%
Little Cottonwood Canyon	128 (3)	157 (3)	123%
Eastern Traverse Mountains	0	100	-

Notes:

- (1) Acreages of existing development are measured judgementally from aerial photographs.
- (2) Excludes new development within existing developed areas.
- (3) Upstream of Temple Granite Quarry.

CHARACTERISTICS OF LAND
DEVELOPED UNDER
PROPOSED PLAN (1)

WATERSHED		LAND CHARACTERISTICS				
		Adjacent to existing road or development	Private Land	Public Land	No major mapped constraints	One major mapped constraint
CITY CREEK CANYON	acres	0	0	0	0	0
	% of total in the category	-	-	-	-	-
RED BUTTE CANYON	acres	0	0	0	0	0
	% of total in the category	-	-	-	-	-
EMIGRATION CANYON	acres	197	197	0	0	197
	% of total in the category	100%	100%	-	-	100%
PARLEY'S CANYON	acres	82	82	0	20	62
	% of total in the category	100%	100%	-	24%	76%
MILL CREEK CANYON	acres	0	0	0	0	0
	% of total in the category	-	-	-	-	-
BIG COTTONWOOD CANYON	acres	182	182	0	182	0
	% of total in the category	100%	100%	-	100%	-
LITTLE COTTONWOOD CANYON	acres	157	117	40	6	151
	% of total in the category	100%	75%	25%	4%	96%
EASTERN TRAVERSE MOUNTAINS	acres	100	100	0	100	0
	% of total in the category	100%	100%	-	100%	-

Note:

(1) Excludes new development within existing developed areas.

C.6. PLAN CRITERIA

INCREMENTAL DEVELOPMENT AND WATER QUALITY MONITORING

The quantities of the various types of land use included in the 1995 plan are not intended to be achievable in one single period of development activity. Nor are they necessarily final limits. Rather, development must proceed incrementally with continuous ongoing monitoring of water quality and reassessment of development amounts, types, criteria, design standards and development practices, depending on the results of this monitoring and on current social values.

It may prove possible to exceed the suggested 1995 limits; it may on the other hand be necessary to stop development short of them.

DEVELOPMENT SUITABILITY:

Development should be located, to the greatest extent possible on land that is suitable for it, in terms of minimum impact on the environment and minimum hazard to the development.

For discussion of what constitutes "suitable" land, see Sections B.2-Weighting & Compositing of Data - and B.3. - Development Suitability Assessment.

Some of the hazards to development from land characteristics, or impacts on the land from development, may be very difficult or, in some cases, impossible to mitigate. Susceptibility to landslide, hillside slippage, avalanche and flood are examples.

Other impacts and hazards can be mitigated completely or in part. This usually involves direct cost to the developer and may involve cost to society. Thus the social cost of any development may be composed of certain of the financial costs of mitigation plus any hazards and costs (financial or environmental) that cannot be mitigated.

The suitability mapping is an attempt at a scale. Appropriate to a study of the entire Canyons portion of Salt Lake County, to approximate the likely relative social cost of development. However, the specific costs of developing specific land parcels cannot possibly be determined at such a scale. Limitations on the accuracy of almost all the original data categories as well as inevitable inaccuracies in data interpretation, transfer and mapping ensure that some suitable land areas may not be

revealed as such. Similarly, land shown as suitable may very well contain areas that are, in fact, unsuitable. Therefore, before any specific development proposal goes forward, site specific study is essential to reveal the true land characteristics of the site. The suitability designations from the county-wide map must be considered as provisional and suitable only for overall planning.

The intended procedure is that those proposing an action will be required to demonstrate that their plans, designs and construction practices will avoid, or reduce to an acceptable level, any adverse impact or hazard.

The impacts and hazards that result from the relationship of land with proposed developments are strongly affected by the design guidelines and development practices adopted. These are discussed in Section C.7.

POSSIBLE LIMITING FACTORS OTHER THAN WATER QUALITY

In addition to satisfying concerns as to water quality, any proposed new increment of development will have to be assessed with respect to a number of potential problems that the addition of the new increment might initiate. The most important of these are:

Transportation

Problems of congestion may arise in any of the canyons that are subject to considerable increased development.

- Emigration Canyon. Congestion may occur during morning and evening weekday commute hours at the upper limits of development anticipated, especially as numerous driveways lead directly onto the traffic flow.
- Little Cottonwood Canyon. Development approaching the amounts suggested for 1995 will involve increased congestion on winter weekends and will require minor road improvements, increased parking at the ski resorts, use of shuttle buses (with parking at the canyon mouth), and road use restrictions (snow tires, chains, etc.). The hazard from avalanches to the occupants of vehicles stopped on the road by traffic congestion is also a consideration. The traffic circulation question is discussed at some length in the report, "Alta/Little Cottonwood Canyon General Plan", July, 1973 by EDAW, Inc. and LeBlanc & Company (pages 76-97).

- Big Cottonwood Canyon. Some increased congestion may occur on winter weekends. There may be slight increased avalanche hazard to vehicle occupants.
- Traverse Mountains. Access to the areas proposed for development will require considerable new road construction.

Water Supply

The lack of a supply of water sufficient for large numbers of dwelling units may eventually restrict development, especially at high altitude near the heads of some canyons. In the case of compact high density developments, however, water consumption can probably be drastically reduced by recycling of "grey" water for toilet flushing, etc.

Sewage Disposal

Past water pollution problems in several canyons have been attributed to inadequate methods of sewage disposal such as filter fields and poorly constructed and maintained storage vaults.

Wherever a canyon is sewerred, all existing development should be required, unless totally unfeasible, to connect to the sewage system. All new development, without exception, should connect to the system.

In other canyons, disposal should be by the method calculated to be most reliable and to present the least hazard of stream pollution.

Aesthetic Considerations

Recent canyon developments have sometimes been criticized as inappropriate for their location because of their form or exterior materials. This issue is specifically excluded from this technical land use plan study.

C.7. DESIGN GUIDELINES AND BEST DEVELOPMENT PRACTICES

INTRODUCTION

It is clear that the key to clean water in the Canyon streams is management of the design and operation criteria for existing and proposed developments and for intensive human uses within the watershed.

The major developmental and recreational activities that are now known to have contributed in the past to bacterial water pollution in the Canyon streams are:

- construction leading to erosion of exposed soil and its subsequent deposition in streams
- picnicking with attendant stream side human activity and trampling of vegetation
- waste disposal problems such as use of septic tank filter fields and poorly maintained sewage storage vaults.

Specific instances of these and other causes of pollution are detailed in the report "Evaluation of Land Use & Bacterial Water Quality in Wasatch Mountain Streams" by Hydrosience, Inc.

The means by which potential pollution hazard can be reduced may be thought of as, at the design stages of a project, Design Guidelines, and, during and after construction, Best Development Practices.

DESIGN GUIDELINES

- Design all developments to protect, and take advantage of natural settings and to minimize grading. Preserve natural features such as rock outcroppings, vegetation and, especially, stream-side environments.
- Locate roads to fit terrain in order to minimize grading. Make joint use of driveways wherever possible so as to minimize impervious surface and removal of vegetation.
- Locate development and parking in clusters wherever possible. In general, the ratio of disturbed land surface to unit of accommodation must be kept low. The greater the disturbed area, the greater the potential for bacterial water pollution. Similarly, the greater the impervious surface the greater the amount of polluted surface runoff that may find its way into streams.

Clustering of development can achieve significant reductions in impact per accommodation unit because much less ground is disturbed and exposed to removal of vegetation and erosion. If within the confines of a clustered development most of the ground is covered, intricately graded or landscaped, certain development constraints such as slope or soil erosion hazard lose much of their importance. Some of the constraints that are used to define development suitability assume development of the type usual during the past decade, i.e., relatively low density individual structures, each with its own vehicular access. Clustering can radically reduce the length of access road per accommodation unit and can allow similar impact reductions, and economies, in the provision of utilities and the disposal of waste water.

BEST DEVELOPMENT PRACTICES

Surface Water Protection Strips:

Avoid grading, filling or clearing of vegetation within a protective buffer zone adjacent to all surface water features. This buffer strip is designed to intercept and filter pollutants generated by intensive land uses, before they can enter surface waters. Scientific data that enable the width of these buffer strips to be determined on reasonably objective grounds are beginning to become available and must be utilized. Strip width may be influenced by such factors as slope, vegetative cover and soil type (rockiness, permeability, etc.). Unnecessary human traffic within protective buffer zones, even when not associated with any structure (or construction activity), must be avoided. This can only be achieved with the help of a public education program.

The plan assumes a variable buffer strip of width to be determined on a site specific basis.

- Slope. The steeper the slope adjacent to a surface water feature, the wider must be the protective strip to achieve a given reduction in pollutant load reaching the water.
- Soil. The more rocky the soil of a buffer strip, the wider the strip must be. Protective strips composed of very permeable soil may need to be wider, since polluted surface runoff may pass through such soils and into a stream with little opportunity for filtering to take place within the soil. Extremely impermeable soils may also dictate a greater buffer width since in this case most surface water does not enter the soil at all, but flows across the surface and directly into the water body.

- Vegetation. The more sparse the vegetative ground cover of an area, the wider the required buffer strip must be since vegetation acts to trap and filter out many pollutants.

Construction Practices:

From data now available, it seems clear that much recent impact on water quality in some Wasatch Canyon streams, particularly in City Creek and Little Cottonwood Creek, has originated from construction runoff. Probable future levels and rates of development involve major construction efforts often relatively close to streams. Therefore, there must be very careful monitoring of development projects during and after construction in order to minimize erosion/sedimentation from cleared areas, including permanent and temporary roads.

The erosion/sedimentation process operates in three basic steps:

- The existing vegetative cover is stripped deliberately for construction or crushed by movement of vehicles or damaged by human trampling.
- The now-exposed soil is loosened by precipitation or by surface water runoff from upslope.
- The resulting soil material is deposited in streams, becoming sediment, where it may raise the counts of various types of pollution, particularly turbidity, total dissolved solids and total coliform bacteria. Most of the data that show rises in bacterial pollution attributable to construction induced erosion/sedimentation are measurements of total coliforms. It is sometimes claimed that all of such figures actually consist of harmless soil coliforms and that none of them consist of the pathogen-indicating fecal coliforms. However, state and federal standards apply to total (i.e., soil plus fecal) coliform counts. In addition, it is possible that the total coliforms detected actually include some fecal coliforms by reason of the activity responsible for the initial removal of vegetation and erosion.

The following are some specific techniques that should be used, where appropriate, to preserve vegetation and reduce erosion:

- Minimize the amount of vegetation cleared on any construction site and the amount cleared at any one time.
- Minimize the time during which areas of a development site remain unvegetated.

- Allow no grading or heavy equipment within a specified distance of trees or other vegetated areas that are to be preserved. Install protective barriers around these areas during construction.
- Establish revegetation regulations for all exposed areas including cut and filled banks.
- Establish grading regulations for all exposed areas. These specify maximum slopes for various soil and geologic conditions and minimum distances of structures, roads, etc., from the tops of graded slopes.
- Establish regulations to control sedimentation from exposed soil areas, both during construction and subsequently, utilizing sediment catchment devices. Determine maintenance schedules for these.
- Require application of crushed stone/gravel to construction roads.
- Temporarily divert runoff from upslope around stripped areas.