Area-Wide
Water Quality Management Plan
October, 1978

Financed Under Section 208 of the
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Salt Lake County Water Quality & Water Pollution Control

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Preface

Over the past three years Salt Lake County has undertaken perhaps the most comprehensive and far-reaching program in its 130 year history. The Water Quality Management program, funded by the federal government, has been designed, managed, administered, and operated by local people - the citizens and elected officials of Salt Lake County and its incorporated municipalities. The 208 Water Quality Management Plan is one of the first Federal programs to be planned and carried out by local government with local control.

The long-term goals of the program try to achieve a critical balance between growth and careful environmental management in Salt Lake County. The participation of countless citizens and interest groups in the planning process resulted in a decision that growth should take place in Salt Lake County with provision of a quality environment. Growth by itself is not enough: It must preserve the values of careful planning and resource management imparted by the pioneers who settled Salt Lake Valley and it must maintain qualitites that enable our children to enjoy the same economic, social, and environmental advantages that we all presently enjoy. Achieving this goal requires thoughtful, careful management of our canyons and our water resources.

The Salt Lake County Council of Governments was originally designated as the area-wide water quality planning agency with receipt of a $1 million grant from the Environmental Protection Agency in 1975. The purpose of this grant was to provide for basic research and analysis which would result in a county-wide water quality management plan. This plan was completed as a draft in October, 1977. Over the past year extensive review and public hearings have been conducted by all appropriate federal, state, and local agencies in order to obtain consensus on the components of the plan and to comply with federal regulations. During this year-review period the Council of Governments and the Salt Lake County Commission met to create a permanent, on-going water quality planning agency with county-wide jurisdiction - thus the creation of the Salt Lake County Department of Water Quality and Water Pollution Control.

On February 6, 1978, Governor Scott M. Matheson officially de-designated the Council of Governments, and re-designated the new Water Quality Department as the area-wide water quality planning agency. Completion of the final water quality plan was the work of the Salt Lake County Water Quality and Water Pollution Control Department: Gerald H. Kinghorn, Director; Steven F. Jensen, Assistant Director and Chief Planner; Terry G. Way, Water Quality Specialist and Environmental Engineer; and Nancy T. Bartel, Administrative Assistant.

Two important notes regarding the content of the plan are necessary. First, this plan is heavily supported by technical data in the form of 208 Technical Reports. These reports are available to the public from the County Department of Water Quality, and are required to be up-dated and re-printed annually - together with the Water Quality Management Plan. The Water Quality Plan itself is a summation of all its supporting data. Secondly, at printing time the management agency group for the Northern regional sewage treatment plant had not selected a final name for the agency. The terms, "North Plant," "Jordan Valley" plant, and "Central Valley" plant, have all been used somewhat interchangeably throughout the plan to depict the management agency to manage the North Jordan planning area regional facility.

The Water Quality staff would like to recognize two individuals whose patience and consideration are to date unsurmounted: Mr. Chet Hutchings, Salt Lake County Printing Department and Mr. Loren Mansfield of Graphic Reproductions,

Inc., were bestowed the task of printing the text and maps contained in the plan. Special thanks to these gentlemen and their respective staff.

This Water Quality Management Plan is intended to be the starting point for a continuous planning process directed toward achieving the policy of restoring and maintaining the chemical, physical and biological integrity of the waters of Salt Lake County.

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I. Introduction

I. INTRODUCTION

Background

Comprehensive area-wide water quality management planning in the State of Utah is a relatively new concept which has recently been introduced by Federal Law. Amendments to the Federal Water Pollution Control Act passed in October, 1972 (PL 92-500) require that studies recommending specific solutions to water pollution problems be conducted before Federal monies are released for funding construction and management programs toward the improvement of water quality. These studies, known as the 303 (e), the 208, and the 201 plans, maintain an interdependent set of both congressional and local objectives in the development of an overall water quality management plan. The overall objective is to provide a planning, construction and management process which will "restore and maintain" the quality of the nation's waters.

The Section 303 (e) plan developed a river basin plan that serves as the framework for later, more specific plans (i.e., the 208 plan).

The 208 plan, as defined in Section 208 of PL 92-500, is required to propose implementable solutions to area-wide water quality and pollution problems, both from point and non-point sources.

Part of the plan to be developed, according to standards set forth in Section 201 of the Act, will describe specifics of facilities that are needed to attain the goal of substantially reduced pollution in the nations waterways.

This document is the second of three studies designed to define the problems and describe solutions to abate pollution and restore and maintain water quality on a local level. The goals and objectives of Salt Lake County are consistent with those of Congress.

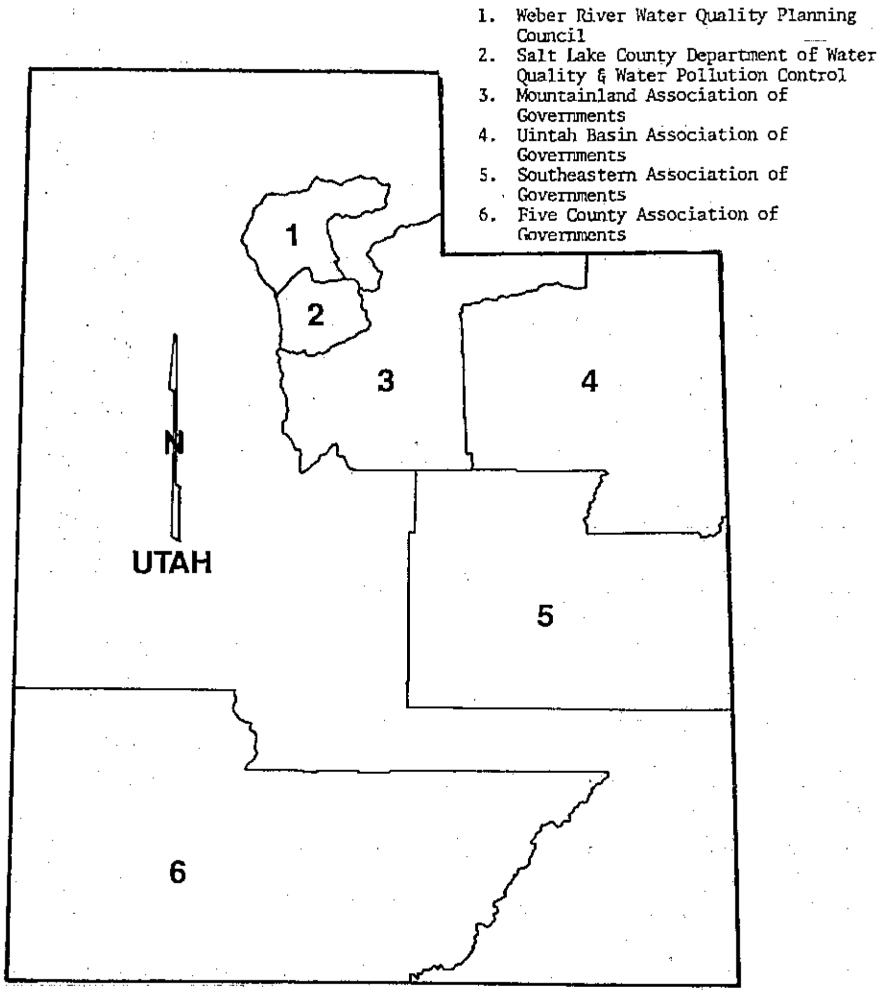


Figure I-1. Designated Area-wide Water Quality Planning Organizations in Utah

Congressional Objectives

The intent of Congress in enacting the Federal Water Pollution Control Act Amendments was to provide a process to identify the nature and extent of pollutants entering the surface waters, with emphasis on impairment of beneficial uses resulting from such pollution. Interpretation of beneficial use as applied to the Jordan River would mean conditions that impair the economic, social, and environmental productivity of the river's resources. Presently, the River is extremely low in productivity. Such low productivity in turn affects the productivity of economic and social uses, such as fishing, boating, swimming, picnicking, bicycling, and other open-space oriented activity that produces local multiplier effects in the generation of related goods and services.

In order to increase the beneficial use of the nation's waterways, the pollutants that reduce their natural - likewise economic - productivity must be eliminated or drastically reduced. This is not a simple task. Pollution sources are diverse. Federal law requires the identification of the nature and extent of pollution originating not only from municipal sewage plants or industries, but agricultural and silvicultural activities (tree harvesting), mining, construction, groundwater seepage, and hydrologic modifications.

This Congressional goal has far-reaching implications for regulation of development and dredge/fill operations adjacent to waterways. The convenience of grading and excavation practices must change into a careful process of staged development followed by reclamation of disturbed land. The law will establish real limits to the development of public watershed and produce new incentives for developers to monitor and economize land-disturbing activity. Such a far-reaching goal promises to produce new challenges between public and private sectors as well as within divisions of the public sector itself.

It is for this reason that local citizen goals and policies play a critical role in water quality planning and implementation. Because the 1977 Clean Water Act administers this planning and implementation at the local level (one of the first federal programs to do so), it was necessary that the residents of Salt Lake County provide a framework of goals and policies that could mold a water quality plan consistent with Congressional goals but representing the needs of the local population.

Local Citizen Objectives

Citizen participation in the county-wide water quality plan consisted of a five step process:

1. To survey public opinion about water use and quality in Salt Lake County.
2. To formulate an initial workshop for a Citizen's Planning Advisory Committee which would articulate the goals and policies which would be reflected in the plan.
3. To provide a secondary citizen input phase based on the final progress and outcome of the planning process.
4. To hold public hearings - county-wide - on the water quality plan.
5. To provide the machinery for on-going citizen participation in the plan update and implementation.

1. Surveying Local Public Opinion

The Salt Lake County Council of Governments (COG) initiated a public opinion poll conducted in cooperation with the University of Utah. It is recognized that polls may not be the most accurate method of discerning public attitudes, but some method of locating common concerns is necessary in order to avoid extensive mistakes and oversights in the formulation of research work programs. The poll involved 260 individual interviews which for a population of 500,000 (as in Salt Lake Valley) produces a 95% confidence level with a tolerated error of 5.5 to 6.0%. The format of the poll was to identify problems-particularly those relating to water. It consisted of five sections:

1. Perceived Problems
2. Water Supply System
3. Improving and Maintaining the Water Supply System
4. Waste Disposal System
5. Natural Waterways
6. Growth and Development

The major attitude profile for each of these sections is summarized below:

1. Perceived Problems. Three major problems surfaced from the majority of the respondents -

   o The problems of unplanned and unlimited growth
   o Inflation and rising costs
   o Environmental problems and pollution

   When asked to rank eleven possible problems that could be facing the county, respondents clearly rated providing additional employment, controlling development in the canyons, and reducing air pollution as the top three. Providing an adequate water supply followed close behind.

2. Attitudes toward the Water Supply System. Prominent in this section was the feeling that restricted use in the canyons is necessary to protect the quality of county drinking water.

3. Attitudes on Improving or Maintaining the Water Supply System. Local government has the responsibility and need to improve canyon water supplies through adequate restrictions and that government should establish standards to ensure good water quality.

   "It is evident that a positive program of zoning, land use planning, and a restrictive system of development are far more acceptable means for maintaining or improving water quality in Salt Lake County than would increasing taxes or decreasing services . . .", but "increasing taxes if necessary" is the next choice after other controls have been tried.

4. Attitudes towards the Waste Disposal System. There is a definite void in public awareness concerning the advantages and disadvantages of the various types of sewage treatment systems available. There appears to be an even division of opinion regarding centralized treatment works:

   30.8% favor centralization
   37.8% favor a local system
   31.4% have no opinion

5. Attitudes toward the Natural Waterways. Respondents desire to see natural waterways enhanced and kept uncovered. An overwhelming majority of the respondents feel that the Jordan River should provide swimming, bicycling, fishing, horseback riding, picnicking, and boating.

6. Attitudes toward Problems of Growth and Development.

   o Over 80% of the respondents feel that future canyon development should be regulated and/or limited.

   o "The single dwelling approach to housing is still by far the most preferred."

   o "65% of the respondents indicate their opposition to any further development on the upper areas of the East Bench."

   o The final question analyzed deals with the perceptions of the residents in Salt Lake County of the extent to which they feel local government has the legitimate responsibility to impose restrictions on the extent, the type, and the areas where development can or cannot take place. It is crucial to the whole emphasis of this questionnaire that nearly 60 percent (58.1%) of the respondents "strongly agree" that this type government intervention is appropriate and some 92.5 percent would not openly disagree with this claim. The significant point of this question is closely related to several earlier questions. Public acceptance of government regulation and control, at least in the Salt Lake County area, is much more likely to be viewed as appropriate and legitimate to the extent that local governmental units, as opposed to state and federal units of government, have the responsibility and control of these activities.

2. Citizen's Advisory Committee Goals

Figure I-2 represents the 208 Project organization structure and shows how the Citizen's Advisory Committee interfaced with the on-going planning process. The need to obtain citizen input for definition of legitimate goals and objectives to be addressed in the Water Quality Plan was critical to the planning process.

The Bureau of Community Development at the University of Utah was contracted to provide a meaningful process for involving the Citizen's Advisory Committee in the initial plan approach. A workshop/conference was initiated on March 12th and 13th, 1976. The format of the combination workshop/conference was to provide the members of the Citizen's Committee with a study guide which would acquaint the participants with the nature of local water pollution and the many alternative methods of dealing with it.

The Study Guide addressed the three major technical areas into which water-quality management falls:

1. Land Use
2. Water Quality
3. Facilities

Questions were asked of the committee members in the Study Guide in order to prepare them for the kinds of dialogue and group interaction that would ultimately produce a list of articulated goals. These goals would then provide a framework for the study of water pollution problems and solutions in the county.

The following narrative summarizes the goals and policies recommended by the 208 Citizen's Advisory Committee in each category. The three committees were not asked to suggest technical solution to problems plaguing the county's water quality. Rather, they represented the county's population in suggesting

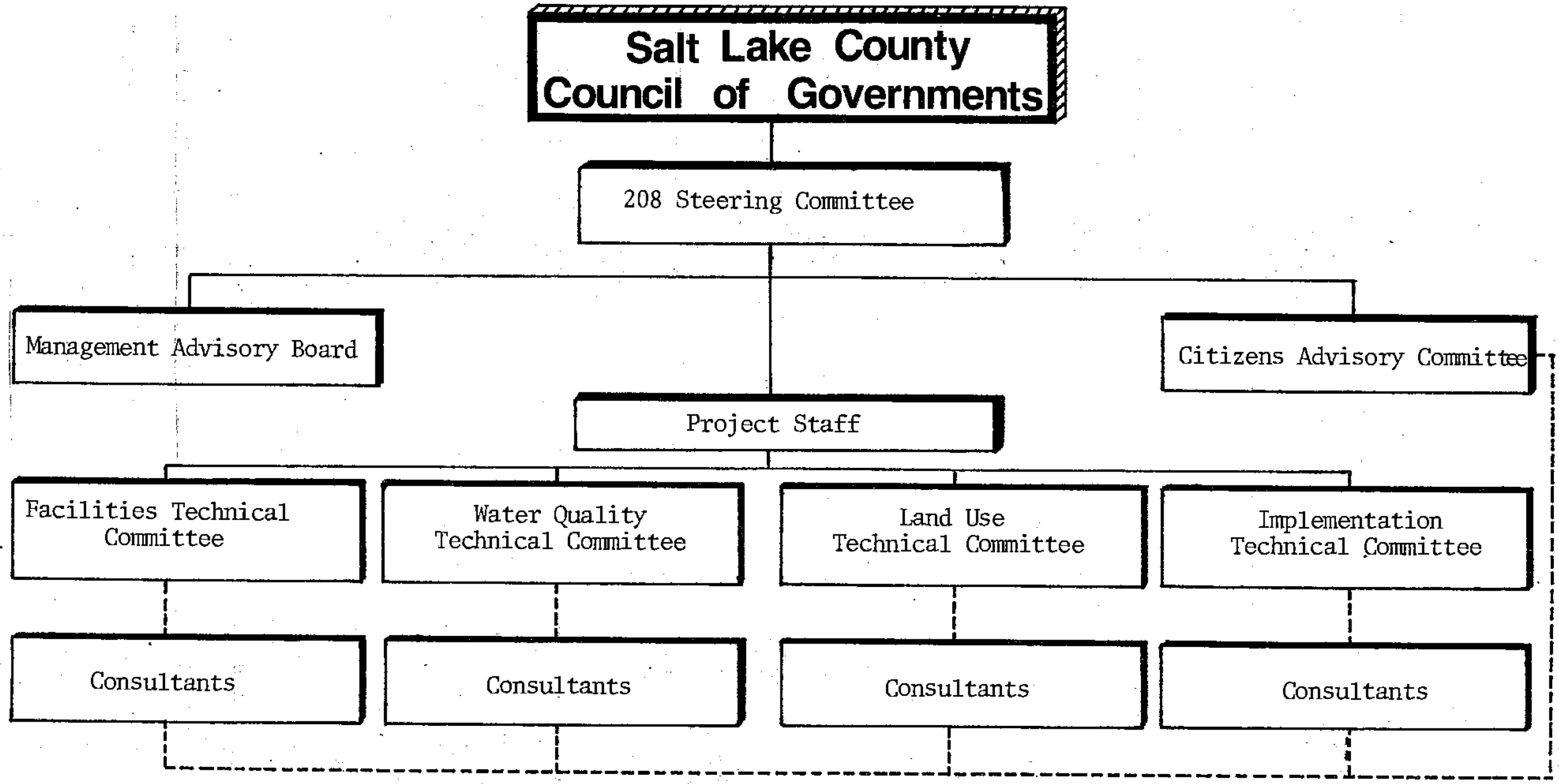


Figure I-2. 208 Project Organization

priorities, goals, and policies. The committees met separately in several sessions during the two-day conference. Twice, all the participants met together to review and correlate the recommendations of all committees

Land Use

Jeff Anderson
Frank Fitzgerald
Raymond Hixson
M.J. Matsumori
Dorothy Miles
David Myers
Gina Rieke
Keith Romney
Beverly Saathoff
Dan Simons
Vay Simper
James W. Smith, Jr.
Velma Steele
Ernest Snyder
Randolph Taylor
Bill Viavant
Kevin Watts

- Preserving Agricultural Land

  1. Agricultural land should be preserved - in large block - wherever possible.

  2. Urban limit lines should be used discriminately to accomplish agricultural land preservation, along with transferable development rights and purchase by municipalities and the county.

- Irrigation Water

  1. Farmers should receive subsidies to help finance costs of pollutant removal, construction of holding ponds, etc.

  2. Recharge areas for groundwater should also be protected from development that might adversely affect groundwater quality.

  3. All Salt Lake Valley subdivisions should be provided with sewers and water lines to prevent groundwater contamination.

- Compact Cities & Facility Location

  1. Some types of industries should be discouraged because of the pollution they may contribute.

  2. Industrial locations should be bunched in areas where employment centers are needed.

- Transportation

  1. Access to the canyons, utilizing passing lanes and mass transit, should be improved.

2. Large parking lots in the canyons should be discouraged; parking lots at the canyon mouths should be constructed.

3. Devote funding for the improvement of the Jordan River as a central valley scenic and recreation area.

4. The recreational aspects of the Great Salt Lake should also be improved.

5. Mass transit systems should be expanded and the use of cars discouraged.

o <u>Pollution</u>

1. Canyon water standards should be maintained at their present levels. Presently, water from the canyons exceeds federal standards and authorities should retain the responsibility for maintaining this high level of quality.

o <u>Natural Constraints</u>

1. Development in areas threatened by hazards such as landslides, mudflows, etc. should be designed to mitigate the hazard.

2. It should be the responsibility of the developer to prove that no hazards exist before approval for a development which does not mitigate the hazard.

o <u>Determining Priorities for Use</u>

1. Recreational use and private ownership in the canyons should continue, but where uses conflict, "scientific facts" should be considered in determining which needs should be encouraged or discouraged.

2. Existing resorts should be expanded before other developments for skiing are considered.

3. Several canyons should be left in their natural state. Development should be limited in -

   a. Millcreek Canyon
   b. City Creek Canyon
   c. Red Butte Canyon
   d. Bell Canyon

4. Wherever development occurs in the canyons, water quality monitoring of the development site should be the responsibility of the developer.

Water Quality

James Ash
Genevieve Atwood
Keith Bergstrom
Lloyd Bliss
Orlando Cuellar
Jan Johnson
Elwood Jones
Harold Lamb
Gary Lloyd
Clark Ostergaard
Clark Partridge
Susan Pratt
Burdett Ringlesbach
Tom Sessions
E. G. Valdez

- Water Quality in the Jordan River

  1. The Jordan River should be cleaned up so that it conforms to Class C standards as a minimum and upgraded even more if possible.

  2. The county should consider the possible use of the Jordan River for water contact sports.

- Recreational Use

  1. The highest priorities for recreational use of the Jordan River are enhancement for aesthetic quality, boating, rafting, and water contact sports.

  2. Fish should be planted or bred in the area if necessary to encourage this recreational use of the Jordan River.

- Irrigation Canals

  1. Canals near development (residential) should be covered. Requirements for approval of development near open canals should include that the canals in the immediate area be covered.

- Stormwater

  1. No more storm drains should be allowed to empty into canals or streams in the future.

  2. Catchment basins or holding ponds should be constructed to allow pollutants in stormwater to settle out as an alternative to treating the stormwater.

  3. Property owners or developers should be required to revegetate areas stripped bare by development to improve the quality of the water.

  4. Development should also be controlled in areas where high runoff occurs.

Facilities & Facilities Management

Ed Blaney
Sands Brook
Vee Call
Barbara Denton
Joy Dunyon
John R. Evans
Bob Glascock
William Guillory
J. K. Holdsworth
Moroni Jensen
Glen A. Lloyd
Jan Miller
Stanley Mulaik
Casper A. Nelson
Richard Taggart
John Winder

- Regional Sewage Treatment

  1. To maintain high water quality, the county should construct a regional sewage treatment system.

- Water Re-use and Recharge

  1. No use is presently made of water discharged from the sewage treatment plants. However, water reuse for some purposes will be imperative in the future.

- Water Conservation

  1. Since 50% of Salt Lake County's water is used on lawns, gardens, public parks, etc., a campaign to educate the public about water conservancy is needed.
  2. Regulation of water use by law or by economic or mechanical means should be investigated.

- Disposal Practices

  1. The county should continue to dispose of effluent to surface waters, but this should not exclude future examination or implementation of other methods of wastewater reclamation.
  2. If the disposal of sludge becomes a problem as the population grows, some commercial enterprise for converting it to a marketable product should be considered. Another alternative . . . is to dispose of it in a landfill.

- Stormwater

  1. Pollution problems caused by stormwater should be investigated. It should be determined how serious the problem from this source is and how expensive it would be to remedy.

- Location of Treatment Plants

    1. Sewage treatment plants should not be located where they would adversely affect areas of historical or archeological importance. Areas which have ecological value - fisheries, cemeteries, etc. - should also be considered in selecting a site for a sewage treatment plant.

- Who Pays and How

    1. Costs of new facilities should be distributed on the basis of general usage.

3. Citizen's Advisory Committee Progress Report

Just before the end of the initial planning and research phase of the 208 Project, a progress report was prepared by the 208 staff and Bureau of Community Development for the Citizen's Advisory Committee. In May, 1977 a second conference was held that mainly provided feedback to the committee on the progress made during the last year.

The main conclusions of the water quality, facilities, and land use consultants were referred to the committee for their reaction. Most of the conclusions are consistent with the goals and policies initially formulated by the committee.

Water Quality

The canyon tributaries, the valley tributaries, and the Jordan River received the majority of consultant attention. Final conclusions were that:

Canyon Tributaries—

- Construction, picnicking, camping, and leaking septic tanks (or holding vaults) are the main causes of pollution to pristine canyon waters.

- A potential source that needs further study is the influence of salts used to clear roads of ice.

Valley Tributaries—

- Stormwater runoff is a major source of non-point pollution. This runoff is a potentially severe problem which will affect Jordan River Parkway facilities.

- If the maximum use of the tributaries for recreation or other uses is to be achieved, stormwater control is necessary.

Jordan River—

- The major sources of pollution to the Jordan River are stormwater runoff, dry-weather pollutants pumped into the storm drains, and irrigation returns.

Facilities

- Local officials had determined that three regional wastewater treatment plants be constructed. (However, following this progress report, this figure had changed to five plants. The Environmental Protection Agency recently decided to provide funding for only two plants).

Land Use

Valley Element—

- Medium Density clustered development offers the greatest advantages for improving water quality because it increases the amount of permeable, open land thus allowing for less surface runoff and greater absorption.

- As development becomes more scattered, it becomes less efficient and potentially more polluting.

Canyon Element—

- The data for water quality in the canyons is not yet sufficiently precise to determine how certain levels of use will affect the canyons.

- However, it was determined that construction, picnicking, camping, and septic tank seepage do affect canyon water quality. These impacts can be kept to a minimum through the following practices for best water quality management:

1. Phased Development and Monitoring

   A contractor should develop in phases (as as to keep disturbed land at a minimum) and provide for continuous water quality monitoring to determine how his development affects the stream.

2. Planned Suitability

   Development should be planned on land with the best suitability.

3. Avoid Adverse Impacts

The developer should demonstrate that the proposed construction will either eliminate adverse impacts and hazards or reduce them to some acceptable level.

4. Maintain Stream Buffer

Construction and other human activities should be kept back from stream beds or other surface water features.

- Erosion control is needed to minimize the degradation of water caused by construction, road cuts, and areas of high use.

4. Public Hearings

County-wide hearings were held in December, 1977 on the Draft Water Quality Management Plan:

1. November 28, 1977 Salt Lake City	7:00 to 9:00 p.m. City-County Building Room 300 City Commission Chambers
2. November 30, 1977 Holladay	7:00 to 9:00 p.m. Auditorium - Holladay Library 2150 East 4800 South
3. December 1, 1977 Midvale	7:00 to 9:00 p.m. Auditorium Midvale City Hall 80 East Center
4. December 5, 1977 Granger-Hunter	7:00 to 9:00 p.m. Auditorium Granger Library 2880 West 3650 South
5. December 7, 1977 Cottonwood	7:00 to 9:00 p.m. Classroom, Whitmore Library 2197 East 7000 South
6. December 8, 1977 West Jordan	7:00 to 9:00 p.m. City Office Council Room 1850 West 7800 South
7. December 12, 1977 Sandy/Draper	7:00 to 9:00 p.m. Sandy Police Department 800 East 100 North
8. December 14, 1977 South Jordan/Riverton	7:00 to 9:00 p.m. Bingham High School Copper Pit - 2160 West 10400 South

A total of 83 persons attended these hearings exlcuding the 208 staff. Among the heaviest turnouts were the Whitmore and Granger Library hearings where local residents appeared to vigorously protest the expansion of the Cottonwood and Granger-Hunter Treatment Plants as presented in the facilities plan.

Due to the controversy surrounding the approval of the Central Regional Plant at the Cottonwood site and maintenance of the Granger Plant in the North Regional Facilities, the Environmental Protection Agency (EPA) mandated that the 208 staff conduct additional public hearings on the proposed North and Central Facilities. These hearings were held June 7th and 8th, 1978. The outcome of these hearings produced a decision by EPA to reject the Draft plans and provide funding for only two of the original three regional plants.

Conclusion

The Water Quality Management Plan for Salt Lake County was produced on a foundation of local citizen goals that are consistent with the goals of Congress in establishing national water pollution control laws.

The local population was scientifically surveyed for their opinions about water quality related issues and a Citizen's Advisory Committee participated in laying a framework in which water quality planning and management be carried out.

Many opportunities for the public to respond to the plan were provided in the form of extensive public hearings. As detailed in Chapter VII, Implementation, an on-going process has been set up to insure adequate citizen involvement as programs for pollution control get under way.

The Water Quality Management Plan presents the details of how water pollution control will be implemented. Chapter III describes the Salt Lake

County study area — as it is now — and how it is projected to be in the future; Chapter IV discusses the water quality conditions in the Salt Lake Basin; Chapter V presents the plan for new industrial and municipal wastewater facilities; Chapter VI discusses the need for implementing new and far-reaching programs for non-point or diffuse water pollution; Chapter VII describes how these plans will be implemented; and Chapter VIII is an assessment of the environmental impact of plan recommendations.

In order to understand the general elements of the plan without extensive detail, refer to Chapter II - Plan Summary.

II. Summary

II. SUMMARY

introduction

Amendments to the Federal Water Pollution Control Act passed in 1972 (PL 92-500) require that studies recommending specific solutions to water pollution problems be conducted before Federal monies are released for funding of construction and management programs directed toward the improvement of water quality. These studies maintain an interdependent set of both congressional and local objectives in the development of an overall water quality management plan.

The first study, the 303(e) plan, developed a river basin plan that serves as the framework for later, more specific plans (i.e., the 208 plan).

The 208 plan, as defined in Section 208 of PL 92-500, is required to develop implementable solutions to area-wide water quality and pollution problems, from both point and non-point sources.

Part of the plan to be developed, according to stipulations set forth in Section 201 of the Act, describes specifics of municipal wastewater treatment facilities that are needed to attain the goal of substantially reduced pollution in the nations waterways.

The intent of Congress in enacting the Federal Water Pollution Control Act Amendments was to provide a process to identify the nature and extent of pollutants entering the surface waters with emphasis on impairment of beneficial uses resulting from such pollution.

In order to increase the beneficial use of the nation's waterways, the pollutants that reduce natural, therefore economic, - productivity must be eliminated or drastically reduced.

The far-reaching goals of PL 92-500 promise to produce new challenges between public and private sectors as well as within divisions of the public sector itself.

It is for this reason that local citizen goals and policies play a critical role in water quality planning and implementation.

Citizen participation in the Salt Lake County planning process consisted of a five step program:

1. Survey public opinion about water quality and use in Salt Lake County.
2. Formulate an initial workshop for the Citizen's Planning Advisory Committee which would articulate the goals and policies that would be reflected in the plan.
3. Provide a secondary citizen input phase based on the final progress and outcome of the planning process.
4. Hold county-wide public hearings on the water quality plan.
5. Provide the machinery for on-going citizen participation in the plan update and implementation.

The local population was scientifically surveyed for their opinions about water quality related issues and the Citizen's Advisory Committee participated in laying a framework by which water quality management would planning be carried out.

Many opportunities for the public to respond to the plan were provided. Nineteen public hearings and meetings were conducted and an on-going process was set up to insure adequate citizen involvement as programs for pollution control get under way.

The Water Quality Management Plan presents the details of how water pollution control will be implemented. Section III describes the Salt Lake

County study area, present and future. Section IV discusses water quality conditions in the Salt Lake Basin, present and future. Section V presents the plan for industrial and municipal wastewater facilities. Section VI discusses the implementing of programs for non-point water pollution abatement. Section VII describes how these plans will be implemented. Section VIII is an assessment of the environmental impact of plan recommendations.

present and future conditions

Salt Lake County is located in the northern portion of Utah flanked by the Wasatch Mountains to the east and the Oquirrh Range to the west. The Traverse Mountains join the Oquirrh and the Wasatch Mountains so as to close the southern end of the county except for the narrow gorge carved by the Jordan River entering the county. The northwestern end of the county opens out to the Great Salt Lake, a remnant of the ancient sea known as Bonneville.

The sub-setting of Salt Lake County is a product of the work of Lake Bonneville with both Wasatch and Oquirrh Mountains bearing the terraced scars of the ancient sea. Alluvium from the eroding mountains spreads out below the foot of Rose, Butterfield, Coon, Big and Little Cottonwood, Mill, Parleys, Emigration, City Creek and Red Butte Canyons forming plateaus overlooking the Jordan River.

A small party of Mormon pioneers led by Brigham Young entered the Salt Lake Valley on July 24, 1847, to establish a permanent settlement. In spite of the lateness of the season, crops were planted, gravity-flow irrigation systems established, and crops harvested that fall. Within two years, Salt Lake City had a population of 5,000 and became one of the fastest growing communities in the West.

As the valley was settled, new pressures were placed on the canyon water supply. Extensive growth experienced in the early half of the 20th century necessitated storage, treatment, and preservation of the water supply suddenly in high demand. As a result of continual urban growth, the Jordan River soon became the disposal line for the valley, receiving more and more sewage (both treated and untreated) and other pollution from urban and agricultural areas.

TOPOGRAPHY AND CLIMATE

The elevation of the Great Salt Lake is about 4200 feet above sea level. The Wasatch Front reaches elevations of over 11,000 feet and the Oquirrh Mountains reach altitudes of over 9200 feet. The land surface between these ranges of mountains consists of a series of benches, each of which slopes gradually away from the mountains and drops sharply to the next bench.

Salt Lake ~~County~~ VALLEY has a maximum length of 31 miles and an approximate width of 23 miles. Roughly 65 percent of the 764-square mile County lies within the valley itself with the remaining 35 percent in the surrounding mountainous areas.

The Great Salt Lake and the surrounding mountain ranges greatly influence the climatic conditions of Salt Lake County. The transitional climate of the area can best be described as semi-continental and semi-arid.

Approximately 60 percent of the annual precipitation falls in the winter and spring. Average annual precipitation varies from 12 to 15 inches at the Salt Lake Airport to 35 and 40 inches in the Wasatch Mountains.

Wind patterns in the County are highly variable depending upon location. The normal winds are determined by topography with essential up canyon winds during the warm part of the day and down canyon during the cool part.

Generally, the climate of the valley can be described as variable but not extreme with major factors affecting weather conditions being the topographic conditions of the valley.

EXISTING POPULATION AND LAND USE

Salt Lake Valley accomodates over half a million people living in approximately 168,000 homes. These homes occupy a total area of about 31,000 acres.

Since 1847, the County has steadily grown until it now serves the intermountain region as the center of commerce, industry, communication, medicine, education and finance.

Past and present figures concerning population and land use are shown below.

	1960	1970	1976
Population	383,035	458,607	521,500
Household Size	3.5	3.4	3.1
Occupied Dwelling Units	108,007	134,926	168,100
% Population Increase		19.73	13.71

The present land use conditions of Salt Lake County can be summarized in terms of past inefficient patterns of development. The present development pattern has generally resulted in:

1. loss of irreplaceable natural and recreational resources;
2. loss of the productive use of prime irrigated agricultural areas by the intermingling of subdivisions;
3. diversion of public and private investment to newly developing areas rather than upgrading of older areas;
4. existing service facilities being under-used while new facilities are being extended into new areas;
5. intense competition between jurisdictions for developments which generate revenues to pay for the needed urban services;
6. heavier reliance on the automobile for transportation at the expense of more efficient transit service (air pollution impacts).

ECOSYSTEMS

Terrestrial ecosystems in Salt Lake County range from subalpine systems in the eastern Wasatch Mountains to the Great Salt Lake desert in the northern portion of the country.

The Subalpine ecosystem in Salt Lake County is extremely limited. It can be characterized as having a very rugged terrain due to soils, topography, heavy snow accumulations and historic glacial action.

Englemann Spruce - Subalpine Fir form the dominant vegetation associations in the Upper Montane ecosystem. This spruce-fir association is limited to higher elevations and covers only very small portions of the County.

The Lower Montane ecosystem is characterized by a climax community of Ponderosa pine (yellow pine) - Douglas Fir - White Fir. Intermixed throughout this community are subclimax stands of quaking aspen and lodgepole pine. These montane regions range in elevation from 6000 to 9000 feet.

The Grass-Sagebrush ecosystem ranges in altitude from about 4300 to 6000 ft. Various communities within the Grass-Sagebrush ecosystem are grass-sagebrush, wet meadow-stream side willow, mountain brush and marsh. The various habitat communities adjacent to the Jordan River are predominantly agricultural lands. Through distrubance, the indigenous plant communities have been replaced by exotic types.

The Great Salt Lake Desert ecosystem is limited to the area surrounding the Great Salt Lake in the Study Area. Altitudinal limits of this ecosystem ranges below 4300 feet. The climate of this area can be described as desert but much of the land is marshland, a strip of land about seventy miles long and two to eighteen miles wide (total) on the southeastern shore of the Great Salt Lake.

The major aquatic ecosystems in the county consist of City Creek, Red Butte Creek, Emigration Creek, Parley's Creek, Mill Creek, Big Cottonwood Creek, Little Cottonwood Creek, and the Jordan River.

Upstream from the Salt Lake City Water Treatment Plant, City Creek runs over limestone substrate in a steep canyon. Streamside vegetation is primarily fir, maple, birch, dogwood, chokecherry, and currant.

Below the plant, the gradient decreases and slight meandering begins. Streamside vegetation includes cottonwood, elm, maple, birch and boxelder. The fish population is small and dominated by brown trout.

The watershed on Red Butte Creek above the reservoir is at low elevation with moderate side slopes vegetated with scrub oak and grasses. Streamside vegetation is birch, dogwood, elm, horsetail, wheatgrass, and thistle.

Red Butte Creek below Red Butte Reservoir is a foothill-type watershed vegetated by oaks and willows. Bank cover composition is elm, scrub oak, wheatgrass, rose, and June grass.

Emigration Creek flows entirely through private property. Above the Mount Olivet diversion ditch near the mouth of the canyon, the watershed is of moderate gradient. Bank vegetation is boxelder, cottonwood, mustard, clover, and June grass.

Below the diversion, Emigration Creek flows through foothills and residential areas, including Hogle Zoo and a golf course. Streamside vegetation is typically boxelder, scrub oak, and June grass.

From the reservoir upstream to Lamb's Canyon Creek, Parley's Creek lies in a mid-altitude watershed. Streamside vegetation is primarily birch, willow, hawhtorne, and grasses. Below the reservoir, the creek is piped beneath the Freeway (I-80) to the canyon mouth.

From 1300 East upstream to the canyon mouth, Parley's Creek is a valley stream suffering from the extensive physical encroachment by development, espcially golf courses, parks, and freeways. Bank vegetation is cottonwood, hawthorne, Russian olive, and grasses.

These four creeks are diverted into storm drain systems in Salt Lake City and conveyed to the Jordan River. City Creek is diverted to the North

Temple storm drain while Red Butte, Emigration, and Parley's Creeks are diverted to the 1300 South storm drain system.

The valley segment of Mill Creek flows through heavily urbanized areas of Salt Lake City and County. The result is extensive encroachment on the stream habitat by man's influence. The natural stream channel has been altered greatly, being replaced by concrete in many instances.

The canyon segment of Mill Creek flows down a moderate gradient in a mid-elevation watershed vegetated with oak, aspen and conifers. Streamside vegetation is boxelder, birch, dogwood, maple, willow, grasses, white and Douglas fir, and cow parsnip.

There are moderate populations of rainbow and cutthroat trout sustained by natural reproduction and supplemental annual plants of catchable rainbow trout.

Most of the lower Big and Little Cottonwood Creek drainages, from the Jordan River upstream to the canyon mouths, are surrounded by Salt Lake County and other municipal residential areas. The ecosystems have been degraded by channelization, diffuse source pollution, dewatering, and litter.

The segment of Big Cottonwood Creek from the canyon mouth upstream to the Cardiff Flat Bridge is of steep gradient. Bank vegetation consists of birch, alder, cottonwood, dogwood, and grasses. The entire section has adequate flow year-round. The wild fish population, dominated by brown trout, is moderate and augmented with annual plants of catchable rainbow trout.

The segment extending from the bridge upstream to the stream termination at Mary's Lake is in a canyon of moderate gradient. Bank stabilization is provided by alder, willow, birch, and grasses. Mayflies and caddis flies are very abundant and are a major food source for rainbow, brown, and brook trout existing in this section.

Upstream from the mouth of Little Cottonwood Canyon, Little Cottonwood Creek flows through a steep, glaciated canyon. Streamside vegetation consists of aspen, fir, dogwood, cottonwood, and grasses. Because of the steep gradient and large boulder substrate, production of fish and other aquatic life is low. The existing populations of rainbow and cutthroat trout are very small and average fish size is small. Stream flow is good.

In the northern portion of the Jordan River, stream velocity and volume are suitable for a warm fishery. Water temperatures are suitable for warm water fish species, although present water pollution prevents establishment of game fish population.

The mid-section of the Jordan River is an area of moderate human development and poor aesthetics. Stream velocity, volume and percent of bottom covered during low flow is suitable for fishery maintenance. Channelization has destroyed much fish habitat.

In the upper reaches of the river in Salt Lake County, stream velocity is adequate for a fishery, but volume is often inadequate because of excessive diversions. The stream bottom type is good benthic invertebrate substrate and water temperatures are suitable for a warm or cold water fishery. However, water pollution slightly limits aquatic productivity.

GROUNDWATER AND WATER USE

The groundwater system in Salt Lake County consists primarily of confined aquifers recharged in areas along the east bench area of the valley. Groundwater withdrawals have been increasing at a rate of about 1.5% per annum and presently constitute 125,000 acre-feet per year. Total water diverted for use in Salt Lake County amounts to approximately 632,700 ac-ft per year.

SOLID WASTE

Presently Salt Lake County and Salt Lake City are operating separate landfills. Both landfills are located in areas of high groundwater (0.4 ft.)

and the leachate from these landfills is suspected to cause health and water quality problems. Surface water runoff from the landfills is also suspect. Additionally, two smaller landfills are operating in Salt Lake County. None of the existing landfills in Salt Lake County are operated according to standards specified by the City-County Health Department.

The total solid waste generation in the Salt Lake Valley is presently 1360 ton/working day (4.80 lbs. per capita per day). Future solid waste loadings in 1995 were based on applying a per capita waste generation multiplier of 1.56.

COUNTY GOVERNMENT

At the present time, there are 10 incorporated cities in Salt Lake County. These are: Salt Lake, South Salt Lake, Murray, Midvale, Sandy, Draper, Bluffdale, Riverton, South Jordan, West Jordan and the Town of Alta. The Salt Lake County Council of Governments, a voluntary membership organization, was formed to help work out problems created by this fragmentation of government. These problems center around the provision of services for residents within the County boundaries.

The initial 208 grant to finance this study was to the Council of Governments.

FUTURE POPULATION AND LAND USE

The population of Salt Lake ~~County~~ Valley is expected to increase 52% in the next 20 years at an annual average rate of about 5%. In two decades an additional 270,000 people will have to be housed. The impact of this growth on water quality will be increases in wastewater, stormwater, and decreased agricultural return flows.

Common statistical areas (drainage basins combined with sewer district boundaries) were used in initial population projections. Subsequent allocations were made by municipality and common sewage treatment areas. Although the total county projection is relatively stable since it is based on employment factors, the direction and intensity of growth in any one specific location is most difficult to assess.

Table II-1 indicates the required amount of land that will have to be developed as residential useage to house expected population increases.

In order to assess the impact of growth on water quality, the plan has been developed utilizing the most land consuming alternative providing a realistic effect of growth on local economy and water quality. The description of growth is divided into two elements; the Salt Lake Valley and the Wasatch Canyons.

Salt Lake Valley

The term "developed" refers to urbanization and includes all land use components except agricultural, open, and vacant land.

Development will have basically three impacts on future water quality:

1) Increased wastewater flows.

2) Increased urban and storm runoff.

3) Decreased agricultural return flows.

The causes for these impacts are summarized as follows:

	New Construction (116,000 new dwelling units)	Additional Impervious Areas (Homes, Roads, etc. -- 22,000 acres)	Added Waste Flows (31 million gallons/day)	Consumption of Irrigated Agriculture (12,928 acres)
1. Increased sewage flows	X		X	
2. Increased urban and storm runoff	X	X		X
3. Decreased agricultural return flows	X	X		X

TABLE II-1: ACREAGE ABSORPTION
BY STATISTICAL AREA

Salt Lake County Statistical Areas	ACRES				
	Total Available	Committed by 1995		Available after 1995	
		Residential	Non-Res.	Residential	Non-Res.
1					
2					
3					
4					
5	300			300	
6	90			90	
7					
8	1,960	1,510		150	
9	20,810	373	296	16,013	4,033
10					
11					
12	3,337	52	3,285		
13					
14	320		320		
15	205	89		116	
16	3,954	1,681	1,110	1,327	336
17	670	270	400		
18	6,435	1,656	990	3,024	
19	13,677	4,788	700	6,526	1,653
20	14,183	958	160	10,329	2,641
21	16,802	5,379	1,700	7,758	1,965
22	6,780	558	470	4,589	1,163
TOTAL	89,523	17,314	9,431	50,222	12,556

Wasatch Mountains

The planning process for the Wasatch Canyons began with an exhaustive inventory of natural constraints, assessing the relative suitability for development of large canyon sites, and proposing hypothetical levels of use in each canyon. Typical development densities were used where appropriate.

Table II-2 summarizes the land suitable for development in the Wasatch Front Canyons in Salt Lake County.

TABLE II-2
LAND SUITABLE FOR DEVELOPMENT (ACRES)

WATERSHED / LAND SUITABILITY	• Adjacent to existing development or road with Private ownership and No mapped constraints	• Adjacent to existing development or road with Private ownership and 1 mapped constraint	• TOTAL
City Creek Canyon	12	35	47
Red Butte Canyon	-- Not Measured --		
Emigration Canyon	2	201	203
Parley's Canyon	21	181	202
Mill Creek Canyon	0	46	46
Big Cottonwood Canyon	292	401	693
Little Cottonwood Canyon	6	254	260
Eastern Traverse Mountains	106	1,597	1,703

The population projections developed in the plan, therefore, are a composite of employment projections and land suitability as a base, then applying a density/specific use factor which, when carried through the projection process, arrives at figures for future population that are very reasonable and widely accepted.

AIR QUALITY

At this time, there exist no comprehensive air quality projections for Salt Lake County nor a State Implementation Plan (SIP) for the State. However, the State is required to produce an SIP by January 1, 1979. This discussion is limited to area sources of air pollution (analogous to non-point sources of water pollution).

Emissions growth due to population growth is at the discretion of the State. Traffic growth rates used in the Preliminary State Transportation Plan by the Wasatch Front Regional Council are 1% and 4% per year for the Salt Lake central and urbanized areas respectively.

Using this growth rate, it appears that standards for Sulphur dioxide (SO_2), nitrogen oxides (NO_x), Particulates, and carbon monoxide (CO) will be attained by 1982 in Salt Lake County. Salt Lake City will not attain 1982 CO standards and the entire county will not attain the 1982 photochemical oxidant (OX) standard. It is anticipated that the State will apply for and receive an extension to 1987 for these non-attainable standards.

Ninety (90) percent of all CO emissions and 58% of Hydrocarbon (HC) emissions in Salt Lake County are due to transportation. (Hydrocarbons are the primary precursors of oxidant concentrations). To attain the CO standard, transportation emissions will need to be reduced by 40%. Based upon FMVCP, an inspection and maintenance program, and reasonable traffic control measures, the standard will be attained. To attain the photochemical oxidant standard, an estimation of the impact on oxidants through reduction of HC is necessary. It appears as though a 55% reduction in all HC emissions is necessary.

A reduction of approximately 25% in total HC emissions can be achieved through a transportation control program while a 30% reduction in total HC emissions is necessary from point sources.

The only control of air pollution sources that sewage treatment districts could impose, other than emissions from treatment plants themselves, is a limitation on sewer hook-ups. The result of this type action would be a change-over to septic and holding tanks, illegal hook-ups or illegal discharges (untreated) to surface waters of the county. The building of additional sewage treatment capacity is not a material contributor to growth, but provides a response to other pressures as long as growth subsidy is avoided in rate schedules and connection fees.

FUTURE WASTEWATER FLOWS

Increases in wastewater flows in Salt Lake County will result from increases in population and be decreased by sewer system rehabilitation. Coupled with increasing population will be an increase in industrial wastewater flows.

Projected domestic wastewater loading were calculated using the following factors:

1. Wastewater flow: 100 gallons per capita per day
2. BOD_5 load: 0.167 lbs. per capita per day
3. SS load: 0.167 lbs. per capita per day

It was assumed that increases in industrial employment will be approximately the same as increases in total employment. Industrial wastewater flow and load projections were made by increasing present flows and loads by the same proportion that total employment is projected to increase in the county.

Projected future flows generated in facilities planning areas is shown in Table II-3.

Table II-3. Projected Average Daily Flows

Planning Area		Year		
		1980	1990	2000
Salt Lake City	Flow (mgd)	36.0	36.6	37.1
	BOD_5 (lb/day)	37,000	37,800	39,500
Magna	Flow	1.2	1.5	1.7
	BOD_5	1,700	2,200	2,500
Upper Jordan	Flow	16.0	24.0	32.0
	BOD_5	23,500	35,300	47,000
Lower Jordan	Flow	40.0	45.0	51.0
	BOD_5	55,700	63,000	71,300

water quality conditions

PRESENT WATER QUALITY

Present water quality in Salt Lake County ranges from excellent in the upper Wasatch Mountains to poor in the lower reaches of the Jordan River, surplus irrigation and sewage canals, and Kersey Creek/C-7 Ditch. Primary reasons for the degradation of the waterways are storm drainage, urban runoff, agricultural returns and impacts, municipal and industrial discharges and others (not listed in order of magnitude of impact).

Wasatch Mountain Streams

City Creek is a high mountain stream in its upper reaches used primarily as culinary water supply for Salt Lake City. Below the water treatment plant the stream runs through a park and is then diverted to the city storm drain system (North Temple storm drain) and conveyed to the Jordan River. The water quality of the stream in the upper canyon is excellent because of restricted access to the canyon.

Red Butte Canyon has been closed to the public for over 70 years, first by the Fort Douglas Military Reservation and more recently by the U.S. Forest Service. The Forest Service now maintains the canyons as a natural research area.

The water in Red Butte Creek above the reservoir is of excellent quality. Below the reservoir (located approximately at the canyon mouth), the stream is dewatered a portion of the year and the majority of flow is groundwater seepage. The natural channel is used for storm runoff and is diverted to the 1300 South storm drain system near 1300 East in Salt Lake City.

The Emigration Creek drainage area is the most heavily developed of all the canyon stream areas in Salt Lake County. The stream follows the road for the greater part of the canyon length. Located at the mouth of the canyon is a small park, a zoo, and a golf course. The creek is dewatered during the summer months from near the golf course to where the natural channel is diverted to the 1300 South storm drain system near 1300 East. During summer months, the lower channel is used primarily for storm runoff.

Pollution from stream-side construction, sanitary wastes from improperly operated holding and septic tanks, and debris and litter in the channel have degraded the stream quality significantly.

Parley's Creek starts near the Salt Lake County line in the east portion of the county. The stream has two major tributary streams, Lamb's Creek and Little Dell Creek, which join in Mountain Dell Reservoir. The developments in this water system include Interstate 80 East and West through the length of the canyon, some summer cabin sites located in upper Lamb's Canyon, and a golf course and park located upstream from the reservoir.

Below the reservoir the stream is diverted to a conduit that runs beneath the freeway to the mouth of the canyon. From the canyon mouth to the diversion of the stream into the 1300 South storm drain system near 1300 East, the stream runs parallel to the freeway through another golf course and another park. The channel is used primarily for storm drainage. There is a detention pond on the stream located in the lower park.

Mill Creek Canyon is used extensively for summer recreation and less intensively for winter recreation. There are many U.S. Forest Service picnic grounds located adjacent to the stream throughout the length of the canyon, two commercial developments, and some summer cabins in the upper reaches of the stream. From the mouth of the canyon to the Jordan River, the stream has been channelized extensively and receives numerous discharges from storm drains and canal return flows. Recreational usage in the canyon is one cause of high bacterial counts in the valley portion of the stream. Additional water quality impact is created by the discharge into the stream of unused canal water to serve exchange agreements and urban and storm runoff.

Big Cottonwood Creek is the longest tributary stream of the Jordan River. The canyon is used extensively for winter and summer recreation in addition to year-round housing. Two U.S. Forest Service campgrounds in addition to other picnic areas are located in the canyon adjacent to the stream. Winter recreation activities include two ski resorts, snowmobile and cross country skiing trails, and some commercial establishments. The stream is culinary water supply for Salt Lake Valley and therefore water quality is monitored closely.

Below the WTP at the canyon mouth, the stream is dewatered for the summer low flow months. The stream channel passes through a moderately urbanized area of Salt Lake County for the rest of the way to its confluence with the Jordan River. Stream flow is augmented by urban and storm runoff, groundwater seepage, and canal waters (through existing exchange water rights). Urban and storm runoff and unused canal waters originating in Utah Lake pumped by Salt Lake City to serve exchange agreements are partially responsible for the lower quality of water in the valley portion of the stream.

Of all the Wasatch Mountain streams, the water quality of Little Cottonwood Creek has been studied the most intensively. This canyon has seen recent development of Snowbird, a major ski resort, just below the town of Alta, located at the head of the canyon. A wilderness area has been designated in the lower portion of the canyon (the only designated wilderness area in Utah). The stream is the southernmost continuously flowing stream in Salt Lake County and flows through the least amount of urbanized area. The canyon water is used as culinary water supply for Salt Lake Valley, causing the stream to be completely dewatered at the canyon mouth during the low flow high culinary demand period of the year. Below the canyon mouth, stream flow is augmented by groundwater seepage, urban runoff, and irrigation flows and canal inflows. Urban runoff, canal water pumped by Salt Lake City from Utah Lake to serve exchange agreements and irrigation flows create lower water quality in the valley portion of the stream.

Intermittent Streams

Intermittent streams in Salt Lake County usually flow during spring snowmelt runoff and storm runoff. These streams, sometimes convey emergency high flows from irrigation canal systems during storm events.

Water quality of these streams has not been intensively monitored in the past and will probably not be in the future. Because of very low flow volumes, the impact on the Jordan River caused by these intermittent streams is very small.

Jordan River

The Jordan River is the only natural outlet from Utah Lake in Utah County. After leaving Utah Lake, the river flows northward approximately 15 miles before entering Salt Lake County through what is known as the Jordan Narrows. The river then continues northward through Salt Lake County approximately 41 miles before entering a marshland at the inlet to Great Salt Lake. Seven sewage treatment plants, five major tributaries, numerous agricultural return flows and storm drainage augment the flow, but major irrigation diversions substantially deplete the flow. About 16 miles upstream from the Great Salt Lake a major portion of the river flow is diverted into the surplus canal which conveys high flow waters directly to the Great Salt Lake in order to alleviate flooding problems on the lower Jordan River.

Between Utah Lake and the Jordan Narrows (approximately the Utah-Salt Lake County line), the water is very turbid. Proceeding farther north, to approximately 12400 South (Salt Lake County), turbidity lessens. Reduction of turbidity results from the high proportion of groundwater in the flow. During the heavy irrigation diversion season, the entire flow in this portion is groundwater seepage. From this point downstream to the Great Salt Lake, water quality generally deteriorates and the natural channel has been substantially altered.

Canals

The water quality of the major Salt Lake Valley irrigation canal systems has only been lightly investigated. Available data indicates that the quality of canal water is close to that of Utah Lake. This is expected because most of the major irrigation canals divert water directly from the upper Jordan River.

The major east-side canals terminate in smaller canals and in the valley portions of the Wasatch Mountain streams to satisfy water rights exchanges.

Storm/Urban Runoff

Quality of urban storm and urban runoff has been investigated in the heavily urbanized portions of Salt Lake County. The results of a summer monitoring program conducted by the 208 Project staff showed that in some instances, pollution in storm runoff was greater than that of raw sewage.

Groundwater

Groundwater occurs in subsurface materials throughout Salt Lake County but only the water in the valley fill is a major source for wells.

In the northern and central parts of the Jordan Valley, a segment of the valley fill 40 to 100 feet thick and 50 to 150 feet beneath the land surface confine water in the aquifer beneath it and is designated the confining bed. Several distinct aquifers within the reservoir are recognized.

Near the mountains at the edges of Jordan Valley (except at the north end of the Oquirrh Mountains), there is no effective confining bed and the top of the saturated zone (generally known as the water table) is a few hundred feet below the land surface. Near the center of the valley, all the valley fill beneath the confining bed is saturated.

The quality of groundwater varies widely and depends on the sources of recharge and the nature of the materials through which it has percolated. Water in the shallow aquifer in Jordan Valley generally contains more dissolved solids and is more subject to contamination by wastes than water in the principle aquifer. Groundwater seepage from this aquifer into surface streams has a significant effect on water quality.

Representative water quality in the major waterways in the county is shown in Table II- 4 .

STREAM SEGMENTATION/CLASSIFICATION

Stream classification for water quality management purposes is a task required of the State by EPA. The process for stream classification seems fairly simple from the outside but is, in reality, very complex. Federal regulations require that existing beneficial uses of a stream be, at a minimum, maintained. All other uses that can be achieved, as per the goals of the Act (and amendments), must also be included as beneficial uses.

The beneficial uses (multiple) of a particular stream segment determine the quality of water necessary to achieve that use (expressed numerically - referred to as "water quality criteria"). The process usually progresses from use to criteria but in many instances, the criteria determines, or limits, uses.

Note that waters must be protected for downstream uses. If there exists a higher downstream use (i.e., coldwater fishery downstream of a warmwater fishery), then the management scheme would be to manage for the downstream use.

Table II- 4. General Water Quality in Salt Lake County Streams and Canals[1]

Water	Temp (°C)	Total Coliforms (MPN/100 ml)	Fecal Coliforms (MPN/100 ml)	BOD_5 (mg/1)	DO (mg/1)
Jordan River Tributaries					
City Creek[2]		15-200			
Red Butte Creek[2]	7-12	68-227	14-67	<1.0	6.4-8.6
Red Butte Creek[3]	11-14	13-45	2-5	1.0	7.5
Emigration Creek[2]	10-17	1300-2300	600-800	1.0-2.3	8.0
Emigration Creek[3]	11-18	7000-25500	1500	1.2-2.0	8.0
Parley's Creek[2]		1-60			
Mill Creek[2]	8-12	140-380	35-105	<1.0-1.5	8.4
Mill Creek[3]	17-19	930-9300	23-430	<1.0-2.3	7.9-8.8
Big Cottonwood Crk[2]	9-12	43-1250	2-40	<1.0-1.6	7.9-8.5
Big Cottonwood Crk[3]	17-20	90-9300	3-230	2.5-4.2	6.5-7.8
Little Cottonwood Creek[2]	9-10	3-162	2-23	<1.0-1.7	7.6-8.1
Little Cottonwood Creek[3]	18-22	90-14000	3-230	1.1-6.4	7.3-8.1
Jordan River					
Narrows (Utah-Salt Lake County Line)	22	230	43	5.0	7.1
9000 South Street	20	1970-23000	430-2300	4.1-4.5	6.9-7.5
2100 South Street	19	8000-18700	800-3150	6.2-8.8	5.5-6.2
Canals					
Utah and Salt Lake		730-13600	100-230	5.2-5.8	5.5-6.7
South Jordan		1060-10600	90	4.5-8.3	5.5-6.6
North Jordan		3150-20000	500	1.1-10.6	5.9-7.4
East Jordan		4300		1.7	7.5

[1]Monthly averages for low flow conditions, 1976-1977.
[2]Canyon portion of stream.
[3]Valley portion of stream.

At the time of this writing, the committee is in the process of developing new water quality standards. This plan is based upon these new standards as it appears that they will be adopted as written (perhaps with minor modifications).

Specific stream classifications as per draft state water quality standards are listed below.

Class 1 - protected for use as a raw water source for domestic water systems
- Class 1A - protected for domestic purposes without treatment
- Class 1B - protected for domestic purposes with prior disinfection
- Class 1C - protected for domestic purposes with prior treatment by standard complete treatment processes as required by the Utah State Division of Health

Class 2 - protected for in-stream recreational use and aesthetics
- Class 2A - protected for recreational bathing (swimming)
- Class 2B - protected for boating, water skiing and similar uses, excluding recreational bathing.

Class 3 - protected for in-stream use by beneficial aquatic wildlife
- Class 3A - protected for coldwater species of game fish and other coldwater aquatic life, including the necessary aquatic organisms in their food chain
- Class 3B - protected for warmwater species of game fish and other warmwater aquatic life, including the necessary aquatic organisms in their food chain
- Class 3C - protected for non-game fish and other aquatic life, including the necessary aquatic organisms in their food chain. Standards for this class will be determined on a case-by-case basis
- Class 3D - protected for waterfowl, shorebirds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain

Class 4 - protected for agricultural uses, including irrigation of crops and stock watering

Class 5 - protected for industrial uses, including cooling, boiler makeup, and other with potential for human contact or exposure. Standards for this class will be determined on a case-by-case basis

Class 6 - protected for uses of waters not generally suitable for the uses identified in Classes 1 through 5 above. Standards for this class will be determined on a case-by-case basis

The drainage basin in Salt Lake County is somewhat unique in that the entire Jordan River drainage basin (downstream from Utah Lake) coincides with the county boundaries except for unconfined drainage in the northeast portion of the county.

Stream segmentation and classification is listed in Table II-5. Criteria for these classifications can be found in the Appendix.

FUTURE WATER QUALITY

Water quality impacts from various activities have been projected for the Wasatch Mountain streams and the Jordan River. When considered in conjunction with projected land usage and associated activities in the canyons and valleys, first estimates of future water quality can be made.

Correlation analyses were made on certain canyon uses to define relative influences of use. Correlation analyses do not show cause and effect, rather they indicate a parameter that can be used to relate an observable factor to whatever actual factors are the cause of the effect being investigated.

Results of correlation anaylses for the Wasatch Front streams is shown in Table II-6.

Future water quality of intermittent drainages has not been projected. Lack of data and small impact (due to small amount of flow) are the reasons for this lack of projection.

Future water quality of the Jordan River has been projected more rigorously than that of the Jordan River tributaries. Factors that affect future water quality that have been investigated are consolidation of sewage treatment facilities, sewage treatment plant effluent quality, improvement of irrigation efficiency, east-side urbanization, low flow conditions, and response to storm runoff. Projections were made for a range of regional STP configurations.

Table II-5. Stream Segmentation and Classification for Waters of Salt Lake County

Subbasin Drainage Area	Segment I. D.	Segment Description[1]	Classification[2]
CC	CC-1	City Creek, from WTP to headwaters	1C, 2B, 3A
	CC-2	City Creek, from No. Temple Storm Drain (SLC) Diversion to City Creek Water Treatment Plant (WTP)	2B, 3A
RB	RB-1	Red Butte Creek from reservoir to headwaters	1C, 2B, 3A
	RB-2	Red Butte Creek, from 1300 E. Storm Drain Diversion (SLC) to Reservoir	2B, 3A
EC	EC-1	Emigration Creek, from Rotary Glen to headwaters	2B, 3A
	EC-2	Emigration Creek, from 1300 E. Storm Drain Diversion (SLC) to Rotary Glen	2B, 3A
PL	PL-1	Parley's Creek, from Mountain Dell Reservoir to headwaters	1C, 2B, 3A
	PL-2	Parley's Creek, from 1300 E. Storm Drain Diversion (SLC) to Mountain Dell Reservoir	2B, 3A
MC	MC-1	Mill Creek, from canyon mouth (SLC Water Department gaging station) to headwaters	2B, 3A
	MC-2	Mill Creek, from confluence with Jordan River to canyon mouth (SLC Water Department gaging station)	2B, 3A, 4
BC	BC-1	Big Cottonwood Creek, from Big Cottonwood WTP to headwaters	1C, 2B, 3A
	BC-2	Big Cottonwood Creek, from confluence with Jordan River to Big Cottonwood WTP	2B, 3A, 4
LC	LC-1	Little Cottonwood Creek from Little Cottonwood WTP to headwaters	1C, 2B, 3A
	LC-2	Little Cottonwood Creek, from confluence with Jordan River to Little Cottonwood WTP	2B, 3A, 4
SE	SP-1	South Fork of Dry Creek, from Draper Diversion to headwaters	1C, 2B, 3A
	SP-2	Bell Canyon Creek, from Reservoir to headwaters	1C, 2B, 3A
	SP-3	Little Willow Creek, from U.S. Forest Service Boundary to headwaters	1C, 2B, 3A
NW, KC, BW, MB, WA, SW	SP-4 thru SP-9	All Permanent Creeks on east slope of Oquirrh Mountains	2B, 3A, 4
S.L.Co.	JR-1	Jordan River, from confluence with Little Cottonwood Creek to Narrows Diversion	2B, 3A, 4
	JR-2	Jordan River, from 400 N Street, SLC to confluence with Little Cottonwood Creek	2B, 3B, 4
	JR-3	Jordan River, from Farmington Bay to 400 N St. Salt Lake City (SLC)	2B, 3C, 3D, 4
S.L.Co.	PR-1	Provo Reservoir Canal	4
	UL-1	Utah Lake Distributing Canal	4
	SJ-1	South Jordan Canal	4
	DI-1	Draper/Sandy Irrigation Canals	4
	US-1	Utah and Salt Lake Canal	4, 5
	NJ-1	North Jordan/Ritter Canal	4, 5
	EJ-1	East Jordan Canal	2B, 3A, 4
	JS-1	Jordan and Salt Lake City Canal	2B, 3A, 4
	UC-1	Upper Canal	2B, 3A, 4
S.L.Co.	JR-4	Surplus Canal	4, 6
	SC-1	Sewage Canal	6
	KC-1	Kersey Creek/C-7 Ditch	6
BC	ML-1	Mary's Lake (>20 ac.)	1C, 2B, 3A
PL	MD-1	Mountain Dell Reservoir (>20 ac.)	1C, 2B
S.L.Co.	SL-1	Great Salt Lake	6, 2B
	FB-1	Farmington Bay Waterfowl Management Area	3C, 3D, 2B

[1]Stream segment includes the segment described and all tributaries to that segment.
[2]As per Proposed State Water Quality Standards

Table II-6. Results of Correlation Analyses for Wasatch Front Streams

Segment	Present Usage[1]	Projected Usage	Correlation[2]	Projected Quality[3]	Remarks
City Creek	Culinary watershed Recreation	Same Slight increase	17 MPN[4]/100 ml/1000 picnickers/year/stream mile	30-150 MPN/100 ml	High quality - canyon patrolled regular[illegible]
Red Butte Creek	Culinary watershed Natural research area	Same Same		Very small change from present	High quality - restricted access
Emigration Creek	Residential	Increased residential		Some degradation from present	Could be sewered - high erosion hazard area, NPS problems
Parley's Creek	Culinary watershed Recreation Residential	Same Slight increase Slight increase	2-7 MPN/100 ml/cabin/mile creek frontage	Slight increase in bacteria	Only in upper canyon
Mill Creek	Recreation Residential	Slight increase Slight increase	7 MPN/100 ml/cabin/mile creek frontage 17/100 ml/picnickers/year/stream mile	100-200 MPN/100 ml	Based on USFS plan
Big Cottonwood Creek	Culinary watershed Recreation Residential	Same Increase Increase	9 MPN/100 ml/1000 visitors/year/stream mile 2 MPN/100 ml/cabin/mile creek frontage	30-150 MPN/100 ml (range) 50 MPN/100 ml (average)	Heaviest recreational usage of all Wasatch Mtn. streams
Little Cottonwood Creek	Culinary watershed Recreation Residential	Same Slight increase Increase	Bacteria 10X Aug. during construction times	50 MPN/100 ml Aug.	High quality - heavy recreational usage

[1]Usage listed in order of importance

[2]Correlation of bacteria numbers to present usage

[3]Quality in upper reaches unless otherwise noted in remarks

[4]MPN = Most Probable Number of bacteria organisms per 100 milliliters

Minimum dissolved oxygen (DO) projections range from a 0.0 mg/l during storm events to 6.3 mg/l when projected with a 50% reduction in agricultural diversons from the Jordan Narrows. When projected with various decay coefficients, DO concentrations differed by approximately 1. mg/l to 4. mg/l when all other conditions were held constant.

For the case of polished secondary level of treatment centralized at one regional treatment plant with the removal of coliform and BOD loads from dry weather storm drain discharges, ammonia concentrations are expected to exceed 6.0 mg/l in the lower river which is about four times the toxic concentration for aquatic life at Jordan River temperature and pH.

Ammonia projections are in the range of 6. mg/l to 7. mg/l without ammonia removal during low flow periods of the year. Projections for the case of 90% ammonia removal resulted in total ammonia concentrations of less than 1. mg/l. A 50% reduction in agricultural water diversion resulted in projected ammonia concentrations of about 4. mg/l. Low flow conditions with one regional treatment plant resulted in the highest total ammonia concentrations of all projections (greater than 9. mg/l).

Chlorine concentrations in the Jordan River were projected on a first estimate basis. Projections resulted in toxic total chlorine concentrations except for the case of chlorine removal.

Coliform bacteria projections generally fall in the vicinity of acceptability (5000 organisms/100 ml). Storm events are projected to increase levels about 40 to 60 times, to levels that are totally unacceptable (360,000 organisms/100 ml). Control of storm runoff discharge could most effectively reduce this excessively high concentration.

Storm events are expected to increase suspended solids concentrations to over 800 mg/l. Stormwater treatment is also indicated here. Control of storm runoff is discussed in the Non-Point Plan section.

Future water quality in the irrigation canal systems in Salt Lake County is very closely linked to that in the Jordan River at the Narrows (Utah-Salt Lake County line). Mountainland Association of Government's 208 Project (MAG 208) is projecting a 15% decrease in coliform and BOD levels by the year 2000 at this point (to 7.0 mg/1 BOD_5 and 1400 MPN/100 ml coliforms). Future water quality in canals will approximate what it is now, but will be affected by future developments in Utah County.

Without any further improvement of the conditions leading to the low quality of water in the sewage canal, it can be expected that water quality will change slightly, if any. Oil and grease problems plague the sewage canal.

Kersey Creek, the receiving water for the Magna STP, and the C-7 Ditch join and flow to the Great Salt Lake in the northwestern portion of the county. Man-induced background conditions in this system degrades the quality of the water greatly. The situation here is different from that of the sewage canal in that the system discharges to the Lake very near the developing Great Salt Lake swimming beaches. The benefits to be derived from abatement of the pollution generated in this system outweigh the costs greatly, especially in public health and safety aspects.

WASTE LOADS

All of the Wasatch Mountain streams can be classified as effluent limited streams (EL) in the mountain segments. An effluent limited stream is defined as one which is presently meeting water quality standards or one which could meet standards if effluent quality limitations were imposed and adhered to.

The valley segments of Emigration, Mill, Big Cottonwood and Little Cottonwood Creeks are classified as water quality limited (WQL). A water quality limited stream is one which is not presently meeting water quality standards or will not meet water quality standards even with imposition of stringent effluent limitations. Additionally, the valley segments of City Creek, Red Butte Creek, South Fork of Dry Creek, Bell Creek, Little Willow Creek, and all permanent creeks on the east slope of the Oquirrh's could be WQL segments but data necessary for this determination is incomplete.

The Jordan River is a water quality limited stream (WQL) for the entire length of Salt Lake County.

It was determined that polished secondary levels of sewage treatment (BOD_5=10 mg/1, SS=10 mg/1) and nitrification (90% N reduction to 5.0 mg/1) at sewage treatment plants discharging to the Jordan River is necessary to maintain instream ammonia and dissolved oxygen concentrations at acceptable levels. With these effluent requirements and an emphasis put on control of urban runoffs through stormwater detention and best management practices, pollutant levels in the Jordan River could be lessened to where the river may be classified as EL.

Future waste load contributions from industrial discharges have been projected for the increase in loads to future sewage treatment facilities but have not been projected for those industries that are and will be discharging directly to surface waters (especially the Jordan River) in Salt Lake Valley. Discharges to surface waters are termed "discrete discharges".

Of those discrete industrial dischargers that are not projected to go to total containment or a sewer discharge to meet "10/10" standards, the increase in quantity of discharges was linked to employment increases in the manufacturing industry. An overall increase of about 38% in the manufacturing industry employment is expected by 1995. Therefore, increases in flows from industrial point sources discharging to surface waters (especially the Jordan River system) are expected to be in this range.

The major irrigation canals in Salt Lake County can be grouped into two major categories, those that are used for irrigation and industrial purposes (the west-side canals) and those that are used for irrigation and flow augmentation in the valley portions of the Wasatch Mountain streams (the east-side canals).

The major west-side and one east-side canal are classified as EL. These are the Provo Reservoir Canal, the Utah Lake Distributing Canal, the South Jordan Canal, the Draper Irrigation Canal, the Utah and Salt Lake Canal, and the North Jordan Canal.

The major east-side canals except the Draper Irrigation Canal are classified WQL. The cause of a water quality limited classification is for the protection of downstream water uses. These canals carry flows for the purpose of meeting water rights exchange requirements on the valley portions of some Wasatch Mountain streams.

The sewage canal is classified as a WQL segment. The canal, over the years, has been the conveyor of great amounts of raw wastes from industrial and urbanized areas in Salt Lake City. This canal was constructed for the purpose of waste disposal.

The Kersey Creek/C-7 Ditch system is classified WQL now but that situation needs to be changed. The system must be upgraded for public health and safety reasons.

The surplus canal is classified as WQL. However a major problem encountered in stream segmentation is the fact that there are no quality criteria set as standards for Class 3C, 5 or 6 waters. Without numerical criteria to compare an exisitng quality, a meaningful classification cannot be developed.

point sources

The point source plan discusses abatement of pollution from municipal and industrial wastewater. Control and abatement of impacts from storm drainage (urban and storm runoff) is discussed as non-point source pollution even though a recent court decision has required that storm drainage discharges be considered point sources of pollution.

PRESENT MUNICIPAL WASTEWATER MANAGEMENT

Entities involved with wastewater management in Salt Lake County are of two distinct types; multipurpose governments (incorporated cities) and single-purpose governments (sewage collection districts). Virtually all developed land in the county is serviced by one or the other. However, some developed land is not serviced by either. Wastewater management in unserviced areas primarily consists of septic and/or holding tanks.

Planning for sewage treatment needs has been left to individual collection districts and cities until P.L. 92-500 mandated that planning be integrated, first on a river basin basis (Section 303(e)) and then on a local area-wide basis (Section 208).

At the present time there are 19 sewage collection districts in Salt Lake County. Of these 19 districts, five are incorporated cities, one is privately owned and operated (to be phased out), and 13 are special purpose districts, one of which is not presently operating. These 19 collection districts are serviced by 10 treatment plants, nine of which discharge to surface waters of the county.

FUTURE MUNICIPAL WASTEWATER MANAGEMENT

The ~~208~~ plan for future sewage treatment in Salt Lake ~~County~~ Valley will consolidate nine treatment plants into four, two of which will discharge to the

Jordan River. A summary description is given below.

a) Phase out existing plants at Midvale and Sandy by approximately 1980.

b) Construct a regional plant at or near present site of Midvale plant to handle wastes from Midvale and Sandy areas by approximately 1980.

c) Phase out existing plants at Murray, Cottonwood, South Salt Lake, Granger-Hunter, and SLCSSD #1 by approximately 1990.

d) Construct a regional plant at or near the present site of SLCSSD #1 plant to handle wastes from Murray, Cottonwood, South Salt Lake, SLCSSD #1, and Granger-Hunter areas by approximately 1990.

e) Upgrade existing plant at Salt Lake City to handle future wastes.

f) Upgrade existing plant at Magna to handle future wastes.

g) Phase out Lark lagoon system as town is phased out.

h) Continue present arrangement at Copperton (convey wastes to Kennecott Copper Corporation waste stream for treatment).

Estimated 20 year costs for municipal sewage treatment management is on the order of $105 million.

Two distinctly different sets of receiving water conditions and requirements exist in the county: those of the Jordan River and its anticipated high levels of recreation use, and those of the Salt Lake City Sewage Canal and Kersey Creek which are principally degraded by extensive quantities of background pollution.

Effluent requirements for the Upper and Lower Jordan Planning Areas are consistent with, but not limited to, the State's definition of polished secondary effluent, including implementation by the State's proposed target date of June 30, 1985. Effluent requirements for the Salt Lake City Planning Area and the Magna Planning Area are based on recommendations by the 208 Project to implement the Utah State effluent requirement of polished secondary treatment for all municipal wastewater. However, the 208 Project recommends delaying polished secondary treatment, while achieving consistent standard secondary treatment at the Salt Lake City and Magna facilities, until such time as comprehensive pollution abatement programs can be established for the Salt Lake City Sewage Canal and Kersey Creek.

Analysis of alternatives resulted in the conclusion that the ultimate method of sludge disposal should be the same for all proposed treatment plants: A stabilized, sterile sludge cake will be made available for use to the private sector as a soil conditioner. Any sludge cake in excess of demand will be disposed of in sanitary landfill on other solid waste disposal system.

REGIONALIZATION ALTERNATIVES

In preliminary analyses, and consistent with the 303(e) plan, Salt Lake City facilities were not included in a valley-wide regionalization concept.

Magna facilities were also not included in the regionalization concept. Three alternatives selected for further study for treatment of Magna wastes were as follows:

1. Upgrade and expand existing facilities.
2. Phase out existing plant, convey Magna wastes to the Kennecott Copper Company.
3. Phase out existing plant, convey Magna wastes to the Lower Jordan planning area.

Regionalization in the Upper and Lower Jordan Planning Areas offered many alternatives for waste treatment. Five primary alternatives were selected for further investigation. They are as follows:

1. Upgrade and expand present plants.
2. Phase out existing plants and provide treatment at single regional plant at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant.
3. Phase out existing plants and provide treatment at two subregional plants; one at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant, one at or near the present site of the Midvale plant.
4. Phase out existing plants and provide treatment at three subregional plants; one at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant, one at or near the present site of the Cottonwood plant, one at or near the present site of the Midvale plant.
5. Phase out existing plants and provide treatment at five subregional treatment plants; one at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant, one at or near the present site of the Granger-Hunter plant, one at or near the present site of the South Salt Lake City plant, one at or near the Cottonwood plant, and one at or near the present site of the Midvale plant.

EFFLUENT DISPOSAL

There are three major possibilities for disposal of municipal wastewaters; they are treatment and discharge to surface waters, land application, treatment and reuse. Each of these alternatives was analyzed for disposal of wastes from each of the planning areas.

Treatment and Discharge to Surface Waters

Secondary plants discharging to surface waters in Salt Lake County will have to meet Federal and particularly State effluent requirements, which are more stringent then Federal requirements. This was the selected alternative based upon land availability and costs.

Land Application

All three major types of land application systems, irrigation, overland flow, and infiltration-percolation, were considered and apparently, a minimum of secondary treatment and a relaxation of State policy would be required prior to efficient land disposal of effluent.

Storage during nongrowing season would be required for irrigation and overland flow. Infiltration-percolation can be carried out all year, but would have freezing problems in winter.

Area required for land disposal would be quite large. Basic requirements are:

1. Outside urbanizing area.
2. Down stream of potable groundwater use.
3. At least 5 feet to groundwater.

The closest land fulfilling these requirements for the Upper and Lower Jordan Planning Areas is west of Municipal Airport No. 2. The closest suitable land for Magna and Salt Lake City planning areas is west of the International Airport.

Treatment and Reuse

Possible wastewater reuses are:

1. Potable municipal reuse
2. Nonpotable municipal reuse
3. Industrial use
4. Agricultural use
5. Recreational use
6. Ecological use
7. Recreation use

These seven reuse possibilities were considered. Each, if feasible, would have its own water quality requirements. However, the minimum treatment would be the State effluent reuse requirements which have been set on general public health grounds.

Conclusion

There are no major acceptable reuse opportunities in Salt Lake County which does not involve treatment and discharge to surface waters.

SPECIFIC PLANS

Salt Lake City Planning Area

Wastewater flows from the present contributory population of incorporated Salt Lake City of 180,000 are collected and treated in a two-stage trickling filtration plant prior to discharge to the Salt Lake City Sewage Canal. Population projections are as follows:

Year	Resident Population
1975	180,953
1985	183,294
1995	186,471
2005	188,310

Average daily flows are summarized below

Year	Flow (mgd)
1980	36.0
1990	36.6
2000	37.1

An analysis of Best Practicable Treatment (BPT) led to the conclusion that upgrading and expanding the existing Salt Lake City facility with discharge to the Salt Lake City Sewage Canal is the most cost-effective method of treating wastewater in the Salt Lake City Planning Area over the planning period.

Magna Planning Area

Wastewater flows from the present population of 8,000 served by the Magna Sewer Improvement District are collected and treated in a standard rate trickling filtration plant prior to discharge to Kersey Creek. Population projections are as follows:

Year	Population
1975	7,532
1977	8,000
1985	11,476
1995	14,328
2005	15,020

Average daily flows are set out below:

Year	Flow (mgd)
1980	1.2
1985	1.4
1990	1.5
1995	1.6
2000	1.7

An analysis of BPT led to the conclusion that upgrading and expanding the existing Magna facility with discharge to surface waters is the most cost-effective method of treating wastewater in the Magna Planning area over the planning period.

Upper Jordan Planning Area

Within the Upper Jordan Planning Area there exists three treatment plants (Lark, Sandy, Midvale) and a collection system that collects wastewater and conveys it out of the planning area (Copperton). The future plan for each of these situations is summarized below.

Lark: The detail of future wastewater arrangements at Lark are moot in that the town, on "Lease" from Kennecott Copper Corporation, is being phased out. There will be no town of Lark (presently unincorporated) after approximately summer 1979.

Copperton: The existing arrangement at Copperton is conveyance of wastewater to Kennecott Copper Corporation for treatment in their waste stream. This arrangement is adequate for treatment of Copperton wastewater throughout the planning period.

South Valley Water Reclamation Facility: The Sandy and Midvale wastewater treatment plants will be regionalized to form the South Valley Water Reclamation Facility located at or near the site of the present Midvale facility. Projected daily flows are shown below:

Item	1990	2000
Residential	17-20	22-29
Industrial	1.2	1.5
Infiltration	1.2	1.2
	22-23	25-32

Reviewing the range of projections, the 208 staff concluded that the following values should be used:

Item	1990	2000
Average Daily Flow (mgd)	24	32

Effluent from the Midvale regional plant will be discharged to the Jordan River.

Lower Jordan Planning Area

Within the Lower Jordan Planning Area there are five sewage treatment plants (Murray, Cottonwood, Salt Lake City Suburban Sanitary District No. 1, South Salt Lake and Granger-Hunter) served by 8 collection districts.

These five treatment plants will be regionalized to form the Jordan Valley Water Reclamation Facility located at or near the present site of the District No.1 Plant.

Population projections for the Lower Jordan Planning Area by contributory plant are shown below:

Plant Contributory To:	1980	1990	2000
Cottonwood	67,500	79,900	89,100
Murray	25,200	28,100	31,200
South Salt Lake	11,800	14,000	15,300
SLCSSD#1	121,300	138,300	155,200
Granger-Hunter	82,300	97,100	109,400
Total	308,100	357,400	400,200

Reviewing a range of flow projections, the 208 staff concluded that the following values should be used:

Item	1990	2000
Average Daily Flow (mgd)	45	51

Effluent from the Jordan Valley Water Reclamation Facility will be discharged to the Jordan River.

INDUSTRIAL POINT SOURCES

Point source pollution from industrial dischargers in Salt Lake County has not been addressed in much detail. The principal reason for this is the fact that of the present (1975) 20 industries that have permits to discharge directly to surface waters of the county, it is projected that 7 will go to total containment to meet "10/10" standards and the quantity of discharge will remain constant for another 10. The increase in quantity of discharge for the remaining three discharges is projected to be about 38% each.

It is projected that by enforcement of NPDES discharge permit conditions, pollution impacts on the Jordan River and the Great Salt Lake from industrial discharges will be minimal.

Estimated costs to industry to meet future standards are on the order of $18,605,000.

non-point sources

Point discharges impact the Jordan River at a higher level of magnitude over non-point discharges. The extent of non-point pollution in Salt Lake County is widely distributed. The 208 Project was not able to specifically qualify or quantify the exact impact of mine tailings leaching or over-irrigation on groundwater quality; of total cabin construction impact on streams in the Wasatch Canyons; or of total animal concentration influence on irrigation waterways. It has, however, been able to assign relative influences of land use to water quality and has prioritized the most important non-point impacts in Salt Lake County.

Urban runoff, forest recreation/watershed runoff, and agricultural runoff are the three highest priority problems for non-point water quality management in Salt Lake County.

Non-point Source categories that must be identified or assessed are summarized in Table II- 7 . For each of these categories, there are one of three definitions of problem identification:

1. Certification that no water quality problem exists or is likely to develop within 20 years.
2. Identification of the nature and extent of the NPS water quality problem.
3. A statement that no evidence exists that a water quality problem is present or is likely to develop within 20 years.

Table II- 7 . Identification of Non-Point Sources Within Salt Lake County

SALT LAKE COUNTY NON-POINT SOURCE CATEGORY	A. No Water Quality Problem Exists	B. Identified Water Quality Problem	C. Unidentified Water Quality Problem	D. Regulatory Program Needed	E. Non-Regulatory Program Needed
Urban Storm Runoff		X		X	
Construction Runoff		X		X	
Recreation Use		X		X	
Home Disposal (septic tanks)		X		X	
Hazardous Materials			X	X	
Irrigated Agriculture			X		X
Livestock Grazing			X		X
Feedlots			X		X
Mining - Non-coal			X	X	
Groundwater			X	X	
Solid Wastes-Residuals			X	X	
Hydrologic Modification			X	X	
Non-Irrigated Agriculture	X				
Mining - Coal	X				
Silviculture	X				

A. A determination of no problem implys that resources or conditions necessary for the problem to develop are not present in the County.
B. An identified problem is that which is supported by historical water quality monitoring and analysis.
C. An unidentified problem has no supporting water quality data or analysis, but manifests resources, conditions, or characteristics which make a problem likely or probable.
D. A regulatory program involves requirements for performance standards, monitor and inspection, enforcement against compliance, management agency designation, technical assistance, educational programming/reporting.
E. A non-regulatory program includes the above elements excluding those associated with requirements and enforcement.

Table II-7 also indicates whether or not a regulatory or non-regulatory program is necessary. The difference between the two being whether or not requirements and enforcement are necessary. Unidentified problems will entail additional monitoring and research in further assessing their impact before implementation of a management problem takes place.

URBAN RUNOFF

Urban storm runoff in Salt Lake County is characterized by three subelements:

1. Dry-weather discharges
2. Wet-weather or stormwater discharge
3. Stormwater discharge from construction sites

Although limited data has been compiled regarding urban runoff impact, the data available justify the stormwater problem as one to be considered seriously.

Dry-weather Discharge

The storm sewer system in Salt Lake County is responsible for the discharge of diffuse non-point source pollutants to surface waters.

The implications surrounding this dry-weather discharge condition are compounded when a consideration of wet-weather or stormwater discharges are included.

Stormwater Discharge

The addition of stormwater loadings in the lower Jordan River have been projected to violate minimum stream standards. Projected water quality indicates that stormwater impacts will be most severe in the stream segment north of 2100 South, while high but less severe impacts occur in the southern stream segment.

The implications of both dry- and wet-weather impact of urban runoff are that:

1. The application of methods to reduce quantity and increase quality on a site specific basis is justified for drainage sectors, both north and south of 2100 South.

2. Application of these methods alone will not ensure reduction of stormwater pollutants in areas already densely urbanized. Therefore, the need for stormwater detention facilities in capturing flows prior to discharge to the Jordan River is important if the goals for improvement and enhancement of the Jordan are to be met. This need is obviously demonstrated, particularly in light of the danger of volatile materials entering the Jordan through storm systems, and the unavailability of sites for intermediately located facilities in the urban core area.

Construction Runoff

The impact of excessive sediment on water quality during storm events on foothill construction sites in Salt Lake County was documented by the 208 Project during the summer of 1977. Impacts from canyon or foothill construction have summoned the drafting of local ordinances that set performance standards for more effective management practices on development of hillsides. Specific performance standards for slope stabilization and erosion/ sediment control are necessary not only for the reduction of water pollution loadings, but for the protection of public health, safety, and welfare.

Both high erosion and runoff potential factors are directly related to stormwater generation and pollution, particularly due to the soil structure and slope influence. Almost every major stream segment in Salt Lake County is impacted by urban runoff either directy or indirectly or confine runoff to their site.

Where storm drains do exist, most discharge directly into the Jordan without any detention time. Detention facilities currently in place merely slow runoff, allowing temporary detention, but without the utilization of riser pipes, straining barriers, or other sediment settling features.

CANYON WATERSHED/RECREATION

The protection of pristine conditions for ecologic and watershed resource values in the canyons of the Wasatch Mountains is a recognized goal of most Salt Lake County residents. It was shown that increased use and development in the canyons produce increases in canyon stream pollution. Intensive summer recreation use and construction are the non-point pollution sources needing additional management for the reduction of pollutants or maintenance of the pristine water quality conditions.

One stream segment, the canyon segment of Emigration Creek, exceeds the pollution levels of other canyon segments with similar ecologic and biotic characteristics. The reason is the presence of approximately 250-300 year-round residences without a sewage system. Emigration canyon is unique in this respect since residential use in other canyons is mainly seasonal and/or and comparatively small in numbers.

Antidegradation

The proposed anti-degradation policy for the State of Utah specifies that no new point sources of wastewater treatment or otherwise will be allowed to discharge into anti-degradation stream segments. This policy ignores non-point sources that enter the streams in a diffuse manner. Because of the potential non-point source impact on canyon watershed, the mandatory institution of best management practices for the control of diffuse non-point sources is necessary. Best Management Practices (BMPs) essentially involve precautions or improvements that reduce both quantity and quality of surface runoff.

Recreation/Construction Sites and Anti-Degradation

A significant impact on water quality in the Wasatch Front Canyons originates from construction of public and private recreationally oriented facilities (cabins, lodges, campgrounds, etc.) and overuse of public recreational areas.

Any new recreational development should assess its impact on water quality, and that impact will be influenced by factors relating to total pervious and impervious coverage and destruction or maintenance of ecologic relationships; particularly with regard to vegetative coverage and its influence on water absorption, soil stabilization, floral and faunal succession. Wherever any construction takes place, the developer should be required to monitor the effects of the operation on the stream, regardless of what procedures or safeguards are.

Septic Groundwater Seepage and Anti-Degradation

The 208 Project found that the quality of all canyon streams is high enough to merit pristine quality preservation with the exception of one: Emigration Creek. Emigration Canyon with the largest permanent dwelling concentration in all canyons, many of which utilize septic tanks with filter fields for sanitary disposal has extradordinarily high coliform concentrations.

The alternatives for abatement of this condition are limited to:

1. Installation of sealed sanitary vaults to replace

existing drainage vaults (i.e., holding tanks) and proper operation of such.

2. Installation of a sanitary sewer along the length of Emigration Canyon.

The installation of sewer facilities will undoubtedly produce an expansion of residential growth potential in the canyon, with accompanying storm runoff increases. A tradeoff exists between the effect of sewer facilities on water quality and the long term effect of a sewer on growth in this watershed.

AGRICULTURAL RUNOFF

Agriculture is on the rapid decline in Salt Lake County due to heavy trends toward full urbanization. Most of the present irrigated farmland will be absorbed by urbanization within twenty years: either through new construction, replacement or fragmentation of access and irrigation systems.

Any impacts from irrigation return flows will lessen due to total reduction of agricultural chemicals, herbicides, and animal wastes. However, new stormwater runoff will replace these pollutants with equal or more severe impacts.

Irrigated Agricultural Effects

The primary souce of irrigation water in Salt Lake County is water from Utah Lake. Utah Lake has high concentrations of total dissolved solids, algae, and coliform bacteria. Most of the water pumped into the Salt Lake County irrigation system is polluted as a result of these conditions in Utah Lake. Much of this water is unused and flows through the system either to dissipate as perched aquifer recharge or to discharge directly into the Jordan River or Great Salt Lake.

Non-Irrigated Agricultural Effects

No identification has been made of the nature and extent of non-irrigated agriculture on water quality.

Animal Concentrations/Feedlot Effects

Animal concentrations, with the exception of Hogle Zoo, have not been directly monitored so as to determine the impact on receiving streams.

MINING

Kennecott

Significantly large mining impacts on water quality are possible due to the size of the Kennecott Copper operation. Non-point sources from the Kennecott mine would originate mainly from two sources:

1. Surface runoff into intermittent streams flowing seasonally into the Jordan River and the Great Salt Lake and its marshes.
2. Subsurface leaching of trace materials from tailings dumps and leaching operations into underground wells and perched acquifer.

It is emphasized that non-point loads due to mining operations probably go unnoticed and have been in the past.

Sand and Gravel

Mining operations in Salt Lake County include extensive sand and gravel extraction along ancient lake shore deposits on the east and west sides of Salt Lake Valley. The nature and extent of water pollution from these sources is not known.

South Hecla - Zinc

There are countless old mining claims in Little and Big Cottonwood Canyons especially in the vicinity of the Town of Alta. These claims are generally inoperable but some serious mining activity has taken place within the last year. The South Hecla Mining Company has commenced a small operation close to the main ski lift area in Alta, where small quantities of zinc are extracted. The Salt Lake City-County Health Department conducted an investigation of the water quality of natural springwater discharges from the mine and has found no degradation of quality. (Since the writing of the Non-point Section, the mining operations at the South Hecla mine have ceased.)

Vitro Tailings

The radioactive Vitro tailings adjacent to the Salt Lake Suburban Sanitary District No. 1 sewage treatment plant remain as potential hazardous material in the form of an excavation. A number of studies regarding the level of radioactivity have been performed but no comprehensive reports on water quality have been completed. Surface water quality monitoring has been carried out in the vicinity as the Vitro Ditch is the receiving water for the District #1 plant.

GROUNDWATER

Groundwater conditions are the poorest in the southwestern part of the Jordan Valley principal acquifer. The principle reasons are:

1. Lesser amounts of bedrock recharge from the Oquirrh Mountains.

2. Poorer quality of recharge water from surface intermittent streams.
3. Recharge from poor quality Utah Lake water.
4. Contamination from mining operations.

SOILD WASTE

Little data has appeared that specifically document the impact of landfill operations to either shallow or deep acquifers.

The results of a recent report indicate that the quality of shallow groundwater in the landfill vicinity of the Salt Lake City landfill has been degraded. The reason for this condition is twofold:

1. "Previous disposal practices of placing wastes in contact with the water."
2. "The limited horizontal migration of leachate from the disposal site."

Since consolidation of county landfill operations with Salt Lake City appears likely only two solid waste sites will remain in the County. These are the Salt Lake County sites adjacent to the east of the Kennecott tailings and the Trans-Jordan site west of Copperton.

HYDROLOGIC MODIFICATIONS

There are two areas where hydrologic modifications may impact water quality in Salt Lake County. The first is in the construction of storm drains, the second from the importation of additional culinary water and the potential for resultant decrease of Utah Lake irrigation water.

The construction of additional storm drains to facilitate increasing urbanization would increase the volume of storm runoff to the Jordan River. The catchment and transportation of storm-water from more impermeable urban development adversely effects water table levels and recharge into the acquifers of Salt Lake Valley.

The transportation of new culinary water resources into Salt Lake Valley is estimated at 70,000 acre feet annually. Most of this water will be used to satisfy municipal and industrial needs.

As agricultural acreage is urbanized water rights presently allocated can be forfeited, traded or otherwise acquired. The potential that re-arrangement of water use has on the quality of return flows into the Jordan River is unknown.

SILVICULTURE

No water quality problem exists or is likely to develop in Salt Lake County within the next twenty years as a result of silvicultural activity.

COAL MINING

It is anticipated that due to the lack of coal resources, no water quality problem relating to coal mining exists or is likely to ever exist.

NON-POINT MANAGEMENT ALTERNATIVES

There is a broad range of solutions non-point water quality problems in Salt Lake County, from non-regulatory programs with educational emphasis to others critical enough to merit regulatory programs with emphasis on control and enforcement. Most water quality problems will require regulatory approaches in the long run.

Greater population places pressure on recreational areas. The U.S. Forest Service and the municipalities interpret this condition in the form of increasing costs for the treatment of culinary water supply that may become more polluted with increasing use of the watershed. Pristine water quality has been a standard for most Wasatch Canyon streams and should remain that way.

As urbanization increases, the agricultural resources in the county can be expected to decrasse. Agricultural runoff will be replaced with urban runoff. The long-term effects of pollution from irrigated land, pasture, and feedlots are anticipated to be minor if not non-existent. Agricultural use currently predominates approximately 50,000 acres of land on the valley floor.

These non-point sources represent the highest priorities for pollution control:

1. Urban Runoff (including construction sites)
2. Recreation impact on canyon watershed (including abatement of septic tank seepage)
3. Agricultural runoff

The first two sources (urban runoff and recreation impact) can best be controlled through regulatory programs while the third source (agricultural runoff) can best be controlled through non-regulatory programs.

The impacts of non-coal mining, hazardous materials (Vitro tailings), solid waste, hydrologic modifications, and other groundwater pollutants are long term. Table II- 8 summarizes both primary and secondary non-point management needs.

Table II- 8 . Non-Point Management Needs

Sources	Implementation		Planning		
	Regulatory	Non-regulatory	Initial	Additional	On-going
Urban Runoff	X			X	X
Recreation	X			X	X
Septic Tanks	X			X	X
Irrigated Ag.		X	X		X
Grazing		X	X		X
Feedlots		X	X		X
Non-irrigated Ag.		X	X		X
Non-coal Mining	X			X	X
Hazardous Waste	X		X		X
Solid Waste	X			X	X
Groundwater	X			X	X
Hydrologic Mod.	X		X		X

Urban Runoff Management

There are two approaches that may be taken in solving non-point pollution problems generated by urban runoff:

1. The "End of the Pipe" treatment which utilizes detention ponds or basins for the settling of suspended solids.
2. The implementation of on-site methods (Best Management Practices) to reduce runoff quantity and quality.

The need for retention of stormwater runoff within the main acquifer recharge areas of the county can be initially satisfied by the utilization of both "End of the Pipe" and site-specific control measures.

Stormwater Facilities

County stormwater quality improvement is limited to the installation of detention basins that can enable treatment of both dry and wet-weather discharges. Where stormwater pollution is most critical, north of 2100 South, the greatest opportunity that exists for location of stormwater detention facilities is at the "end of the pipe," just before the stormwater flows into the Jordan River. Where foothill development in Salt Lake City occurs, such facilities are both recommended and in place. The southern portion of the County affords wider opportunities, where intermediately located detention facilities can be constructed as part of, and in conjunction with, community and neighborhood recreational facilities.

Several detention basin locations have been proposed. Based upon a detention time of 2.5 minutes, approximately 60 to 80 percent of the silt material would be settled out at a flow-through velocity of 1.0 fps. However, only coarse sand and larger particles could be removed. The 208 Project recommended doubling the detention time to remove particles of silt size and larger.

The concept of stormwater detention and water quality impacts includes the construction of two reservoirs on the Jordan River in the southern portion of the county. These reservoirs, the Lampton and Riverton Reservoirs, would act as large detention facilities located directly on the River.

Cost estimates include a total cost of constructing the proposed flood protection plan and a cost per acre which would be required to construct the regional detention basins within these areas.

The cost per acre for detention basins north of 2100 South Street is approximated at $2,000 while it is approximately $1,000 south of 2100 South Street. Costs for detension basins in both areas totals at about $95 million. Added to the costs for the lower Jordan River development, for the Lampton and Riverton dams, for the Dry Creek flood control project and for the Jordan River Parkway Development, the total cost runs about $147 million. The 208 Plan costs excludes the $52 million extra for Jordan River Parkway and dams development.

Dry-Weather Discharges

There are basically two structural alternatives available to control this situation: (1) collection system controls, and (2) storage and treatment. Collection system controls involve a survey to determine the source and some action to eliminate it. Storage and treatment would involve either on-site treatment at each storm drain or intercepting the flow to be treated at a treatment plant (combined sewers). Individual treatment at each drain would not be cost-effective. Elimination would be less costly because the violators, as they are identified, would be responsible for correcting the situation. The second alternative (interception) is unattractive from the treatment plant standpoint.

Federal funding may not be available for either alternative. The 208 Project recommendation is to survey the drains to locate the sources. If this is unsuccessful, interception and treatment may have to be implemented.

Permits

In the 1974 case of the U.S. EPA vs. Natural Resources Defense Council, a legal determination was made that permits issued under the National Pollutant Discharge Elimination System (NPDES) apply to stormwater discharges.

Due to the number of outfall lines to the Jordan, it would be more administratively efficient to allow issuance of a general permit for the specific types of discharge and location that distinguishes the degree of the problem. Separate permits should apply to dry-weather discharges, and two permits issued to govern discharges north of 2100 South, and south of 2100 South.

Best Management Practices

The approach that should be taken in implementation of best management practices involves mainly erosion/sediment control which entails coordination with implementing agencies and public and private developers. Slope stabilization in areas of 10% - 30% slopes can be carried out at a cost of $1500 per acre. Slopes of 30% and steeper require extra stabilization. Structures for steep slopes add an increased average cost of about $5000 per acre.

It is doubtful that coordination alone will achieve the goal of effective erosion and sediment control. Many public agencies do not administer effectively programs dealing with problems not clearly perceived. Agencies in Salt Lake County are faced with shortages of staff that do not enable adequate administration.

The private section has its share of problems. Subdivisions established in sensitive foothill and canyon areas are often left for years with barren, unstabilized cuts and fills with the hope that private owners will incur the cost for problem correction. Public developers in Salt Lake County can be cited in several areas for this condition where grading and excavation of roads has taken place.

Strong guidelines are needed in Salt Lake County that will insure that attention is paid to this important area. Enforcement provisions can be attained through a requirement of performance bonding ("front end" bonding) for erosion and slope stabilizing improvements.

The long term improvement of our surface waters by BMPs can best be served by:

(1) Adoption of a revegetation and slope stabilization program for all public and private development. Requiring implementation of Chapter 70, Uniform Building Code.

(2) Emphasize application of these measures in areas of A) the Wasatch Canyon, B) the Valley Foothills, and C) other soil deposits with extreme erosion and high runoff potential.

(3) Bonding public or private developers for the cost of on-site erosion and slope stabilization improvements together with improvements for flood runoff control.

<u>Forest Recreation/Watershed Management</u>

Implementation of water quality management in the watersheds of the Wasatch Canyons can take place mainly through coordination of management agencies. Major areas that will be requiring coordination for maintenance of an anti-degradation policy include:

1. Obtaining agreements with designated management agencies with jurisdiction in watershed management.
2. Review of grading (cut/fill) and slope stabilization plans by these agencies.
3. Provision of performance bonds.

4. Deposition of a specified dollar amount for water quality monitoring (before, during and after construction) into an escrow account.

Septic Tank Discharges: There are two alternatives to abate the pollution in Emigration Creek:

1. Removal and/or renovation of faulty septic tank conditions from those sites identified as pollution sources.

2. Provision of sewer utilities for all housing in the canyon for the removal of faulty septic tank conditions.

However, a closer definition of pollution sources seems apparent before an abatement program is designed. It is probable that the high resident population of people, dogs, and other home disposal practices are combining to produce high pollutant levels.

Tradeoffs in environmental quality will occur with sewering Emigration Canyon. Some of these appear below as outlined by canyon residents, most of whom are opposed to sewering the canyon.

1. A dramatic increase in traffic generation.

2. Possible road widening to accommodate traffic volume.

3. More problems relating to construction-cut, fill, etc.

4. A general depletion of the aesthetic values of canyon living due to over-crowding.

5. The replacement of septic tank pollution with pollution from urban storm runoff.

The substitution of one pollution problem for another is a legitimate argument that deserves the attention of additional study.

Agricultural Runoff Management

The implementation of water quality management in Salt Lake County for agricultural activities rests with the local Soil Conservation District (SCD).

The local SCD can assume responsibility for the implementation of the 208 Program by:

1. Recommending water quality standards and water pollution control policies to appropriate federal, state, and local agencies.

2. Recommend, adopt and enforce limited land use regulations.

3. Recommend, adopt and enforce Best Management Practices for agricultural activities.

4. Finance water resource, conservation and pollution control activities related to agriculture as funds are available.

5. Provide technical assistance for agricultural related activities.

6. Coordinate water quality control projects in agricultural areas.

7. Aid in the inventory, assessment, monitoring, correction and abatement of non-point sources of water pollution.

8. Aid in soil surveys and interpretative information for land disposal of wastes, suitability of soils to absorb and treat wastes and practices for erosion and sediment control treatment.

9. Review construction and conservation plans for agriculture activities that affect soil and water conservation and water pollution control.

10. Provide periodic follow-up checks and inspections on all applied practices and implementation of conservation plans.

Other NPS Management

Implementation of water pollution abatement programs for other areas such as forestry, mining, construction, recreation, and flood control activities on privately owned lands can be handled in ways similar to those outlined above. Another method would be by initiation of a memorandum of understanding between land administering agencies for state and federally owned lands.

implementation

A unique facet of 208 water quality planning is that the plan developed must be implementable. By developing a plan with implementation as an overriding requirement, implementation can be realized.

To insure implementation of the plan, The Salt Lake County Commission established, through ordinance, the Salt Lake County Department of Water Quality and Water Pollution Control. The responsibilities of the Department include implementing, updating and recertifying the 208 plan. Implementation of specific facets of the plan is to be accomplished by designated management agencies. Most of these agencies already exist in local, State, and Federal government and regulatory/advisory agencies.

Department policy is established by the Water Quality Council consisting of one representative from each of nine Program Evaluation and Policy Development Committees. The committees, listed below, were chosen so as to include all sectors in the county, both public and private.

Program Evaluation and Policy Development Committees

- Wastewater Treatment
- Real Estate/ Construction
- Agriculture
- Watershed and Supply
- Flood Control/Stormwater
- Industrial Discharges
- General Public Interest
- Planning
- Recreational Development

NON-POINT SOURCE IMPLEMENTATION

Implementation of non-point source pollution abatement programs is to be accomplished through existing structures. Agencies, to be designated by the Governor, will sign contractual agreements with the department which will spell out specifics of plan implementation.

POINT SOURCE IMPLEMENTATION

Implementation of point source pollution abatement programs (municipal sewage treatment) will be handled by methods analogous to those outlined above. However, due to regionalization of some facilities, new management agencies have been created. These management agencies are actually a consolidation of existing agencies that are presently involved in wastewater treatment. Other than this twist, implementation of the point source plan will be handled as the non-point source plan is: by contractual agreement and designation by the Governor.

environmental assessment

The following information provides an assessment of the possible impacts resulting from implementation and construction of the water quality plan components. The components addressed by the assessment include only those involving structures or facilities and where sufficient data exists to support need for the facilities. Figure II -1 summarizes in which assessment category positive and negative impacts are likely. Negative impacts may require further analysis to determine their severity or whether or not they can be overcome. Positive impacts indicate a relative enhancement or improvement over existing conditions.

The assessment was prepared in accordance with guidance provided by the U.S. Environmental Protection Agency in the publication, Environmental Assessment of Water Quality Management Plans (October, 1976). The impact categories of economic, land use, social, physical, and ecologic provide a useful framework for addressing a broad spectrum of impacts and issues that components of a water quality plan may raise. The assessment hopes to provide a rational method of weighing trade-offs and benefits resulting from the implementation of the water quality plan.

Plan Components	Impact Category	ECONOMIC					LAND USE							PHYSICAL			SOCIAL				ECOLOGIC					
																					Non-Living				Living	
		EMPLOYMENT	POPULATION	INCOME	PUBLIC REVENUES	PUBLIC EXPENDITURES	RESIDENTIAL	INDUSTRIAL	COMMERCIAL	INSTITUTIONAL	PARKS	AGRICULTURAL	TRANSPORTATION	VISUAL	TOPOGRAPHIC	FLOODWAYS	RECREATION	EDUCATION	HEALTH	SAFETY	SOILS	GEOLOGY	AIR QUALITY	WATER QUALITY	WILDLIFE	VEGETATION
Point Facilities	SOUTH VALLEY	+	+	+	-	+	-	+	+	+	-	+	+	+	+	-	-	+	-	-	-	-	+	+	-	-
	CENTRAL VALLEY	+	+	+	-	+	+	+	+	+	-	+	+	+	+	-	-	+	-	-	-	-	+	+	-	-
	SALT LAKE CITY	+	+	+	-	+	-	+	+	+	+	+	+	+	+	-	+	+	-	-	-	-	+	+	+	+
	MAGNA	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+
Non-Point Facilities	DETENTION FACILITIES	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+
	EROSION CONTROL	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

FIGURE II-1. SUMMARY OF ENVIRONMENTAL IMPACTS RESULTING FROM IMPLEMENTING THE WATER QUALITY PLAN.

III. Existing and Future Environment

SALT LAKE COUNTY: PRESENT & FUTURE

Present Conditions

PLANNING BOUNDARIES - A DEFINITION OF THE STUDY AREA

Salt Lake County is located in the northern portion of Utah flanked by the Wasatch Mountains to the east and the Oquirrh Range to the west. The Traverse Mountains join the Oquirrh and the Wasatch Mountains so as to close the southern end of the county except for the narrow gorge carved by the Jordan River entering the county. The northwestern end of the County opens out to the Great Salt Lake, a remnant of the ancient sea known as Bonneville.

The sub-setting of Salt Lake County is a product of the work of Lake Bonneville with both Wasatch and Oquirrh Mountains bearing the terraced scars of the ancient sea. Alluvium from the eroding mountains spreads out below the foot of Rose, Butterfield, Coon, Cottonwood, Mill, Parleys, Emigration, City Creek and Red Butte Canyons forming plateaus overlooking the Jordan River.

When the valley was first settled in the late 1840's, new pressures were placed on the canyon water supply. As mining and agricultural industries expanded, the waters of the Wasatch Mountains provided an ample supply of clean, potable water. But the extensive growth experienced in the early half of the 20th century necessitated storage, treatment, and preservation of the water suddenly in high demand. As a result of continual urban growth, the Jordan River soon became the disposal line for the valley, receiving more and more sewage (both treated and untreated) and other pollution from urban and agricultural areas.

The Salt Lake County hydrologic basin is truly a textbook example of the age old battle of man with his environment - the conquest of its mountain riches, wildlife, and finally, its water.

HISTORY

During the early nineteenth century, English and American trappers explored the Utah and Salt Lake Valleys. Among these early explorers were William H. Ashley and Entienne Provost sent by the Rocky Mountain Fur Company to explore and trap mink and beaver. John C. Fremont passed through the Valley in 1843.

A small party of Mormon pioneers led by Brigham Young entered the Salt Lake Valley on July 24, 1847, to establish a permanent settlement. In spite of the lateness of the season, crops were planted, gravity-flow irrigation systems established, and crops harvested that fall. Within two years, Salt Lake City had a population of 5,000 and became one of the fastest growing communities in the West. The town was laid out in square 10-acre blocks that were oriented in north-south and east-west direction. Wide streets were provided between the blocks and areas were set aside for parks, churches, businesses, and similar uses at the time the city was laid out. Most of the roads in the area are still square with the compass.

The valley continued to grow with Mormon settlement. Additional growth occurred when the Union Pacific Railroad was completed in 1873 and the Denver and Rio Grande Western Railway was completed in 1889.

Members of the Church of Jesus Christ of Latter-Day Saints (Mormon Church) were leaders in the settlement of the Study Area. However, with the discovery of gold in California came an influx of miners, soldiers, and settlers. This developed into many years of conflict, both philosophical and physical, involving marital law, anti-Mormon legislation, court expropriation of Church property, and delay of statehood.

CULTURE

Early Mormon struggles and persecution resulted in a unique cultural and political heritage manifested today in the Study Area. There is strong group and family solidarity. People in the Study Area say they prefer to "take care of themselves." The historic cultural background has been translated into an anti-Federal government outlook. Over the past ten years a rapid in-migration of people with mixed religious and cultural backgrounds has produced the existing population. The Study Area is characterized by large families oriented toward single family residential preferences. A generalized desire to provide employment and housing has been translated into strong pro-development attitudes which are reflected in the local media and governmental institutions. New growth has produced typical, relatively unstable communities in the south half of the county with attendant issues of school crowding, criminal justice problems and general service delivery strains on local government. The formation of social groups to enhance community social values is beginning to produce dialogue on community issues as the population mix changes.

As is the case with many other parts of the United States, religious ties may be weakening in the Study Area, particularly in the cities. However, the Mormon Church remains a strong force in shaping the culture of the Salt Lake area. Within Salt Lake County is Salt Lake City which is the capital city of the State of Utah. The University of Utah is also located in Salt Lake City and with Westminster College provide some academic values for the Study Area.

It appears that the usual liberal-conservative issues and divisions do not fully apply in Salt Lake County. There is a strong element of conservatism within the county. Conservative factions, together with some land developers and realtors, were considered responsible for defeating a land use bill passed by the legislature in 1973 by public referandum. The culture of the Salt Lake County population is changing rapidly as the population increases with all the attendant social and institutional confusion rapid change brings.

PRESENT WATER QUALITY MANAGEMENT

Many Federal, State and local government agencies are involved in the management of water resources. At the federal level, the U.S. Environmental Protection Agency is charged with the responsibility for implementing the provisions of both the Federal Water Pollution Control Act as amended in 1977 and the National Environmental Policy Act of 1969 and for administering the federal construction grant program for wastewater facilities.

Within the State of Utah, the Utah State Division of Health and the Utah Water Pollution Committee have primary responsibility and authority to prevent waste disposal practices from becoming a hazard to health or a detriment to water quality.

Local agencies, industries and individuals are obligated to finance, build, and operate wastewater facilities that will provide acceptable means of waste disposal and meet all applicable water quality standards.

Federal regulations are based on the Federal Water Pollution Control Act as amended in 1977. The 1972 and the 1977 Amendments establish as a national goal the discharge of pollutants into the waters of the United States be eliminated by 1985, that the quality of the nation's waters be restored and maintained, and that as an interim goal, wherever attainable, there be achieved, by 1 July 1983, water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water.

It is recognized by EPA that while the 1983 objective carries with it defined, specific, enforcement mechanisms, the 1985 goal is an ideal toward which Congress intended the country to strive. To reach this goal, the Act requires that waste discharges must be of a specified, improved quality before release to receiving waters. To assure that improved quality is attained, new authority was given to federal and state governments to fully develop a national permit system to regulate the quality of discharged wastes (initiated in 1972).

Present control tactics for the County, designed to meet the water quality requirements, include the establishment of water quality planning criteria, classification of stream segments, allocation of waste loads and regulation of waste discharge through the discharge permit program (National Pollutant Discharge Elimination System).

TOPOGRAPHY

Salt Lake County is bounded on the east by the Wasatch Mountains, on the west by the Oquirrh Mountains and on the south by the Traverse range. The Great Salt Lake is the eventual recepient of water in the north-flowing Jordan River. Streams originating from the Wasatch Front flow westward into the Jordan River, the only outlet from Utah Lake in Utah County to the south. No major streams originate from the western side of the valley. The three mountain ranges along with the Great Salt Lake create a virtually enclosed hydrologic basin in the County.

The elevation of the Great Salt Lake is about 4200 feet above sea level. The Wasatch Front reaches elevations of over 11,000 feet above sea level. The Oquirrh Mountains, to the west, reach altitudes of over 9200 feet. The land surface between these ranges of mountains consists of a series of benches, each of which slopes gradually away from the mountains and drops sharply to the next bench. Hence, an east-west profile across the valley would show a series of steps leading from the mountains on each side down to the Jordan River and the flat valley floor. The land for a number of miles southeast of the shore of the Great Salt Lake is monotonous, flat, and covered with alkali soil that supports little vegetation.

The Salt Lake Valley has a maximum length of 31 miles and an approximate width of 23 miles. Roughly 65 percent of the 764-square mile County lies within the valley itself with the remaining 35 percent in the surrounding mountainous areas.

Figure III-1 indicates the main topographic factors affecting the study area.

CLIMATE

The Great Salt Lake and the surrounding mountain ranges greatly influence the climatic conditions of Salt Lake County. The transitional climate of the area can best be described as semi-continental and semi-arid.

Approximately 60 percent of the annual precipitation falls in the winter and spring. These storms are of orographic origin - storms caused by moist Pacific air forced over a topographic barrier resulting in condensation of water vapor into droplets and ice crystals. Summer precipitation is associated with thunderstorms developed from moist air from the Gulf of California. Figure III-2 shows the most frequent thunderstorm paths in Salt Lake County. Average precipitation varies from 12 to 15 inches per year at the Salt Lake Airport to 35 and 40 inches in the Wasatch Mountains. Average annual precipitation at selected stations in the County is illustrated in Figure III-3.

Due to the surrounding mountains, there exists a tendency for cold air to pool at the bottom of the valley and form strong inversions during the

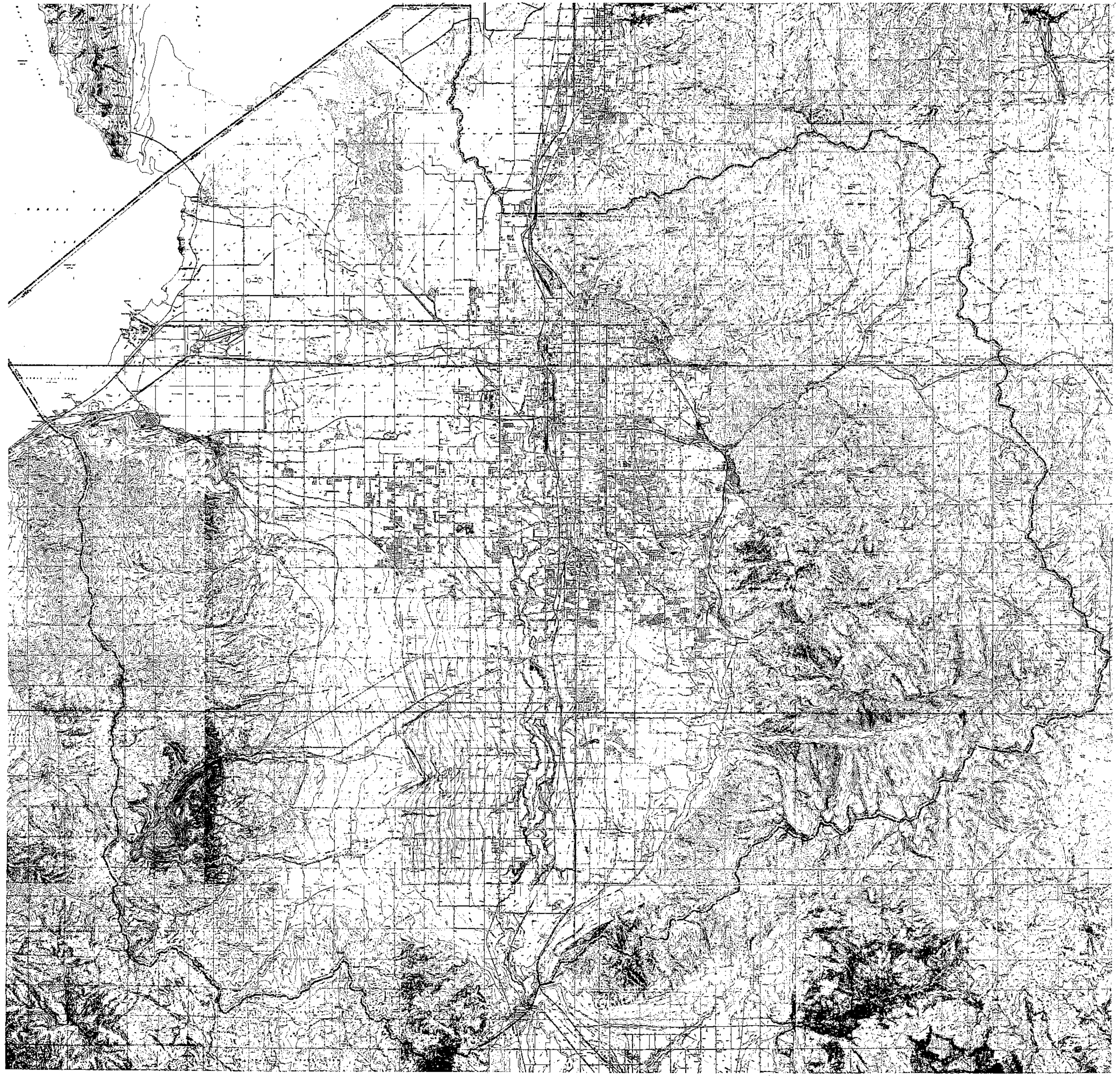


FIGURE III-1
TOPOGRAPHIC MAP
SALT LAKE COUNTY
UTAH

Salt Lake County Water Quality & Pollution Control
208 Water Quality Plan

NORTH

Sq. Miles 9 1

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

miles 0 1 2 3 4 5

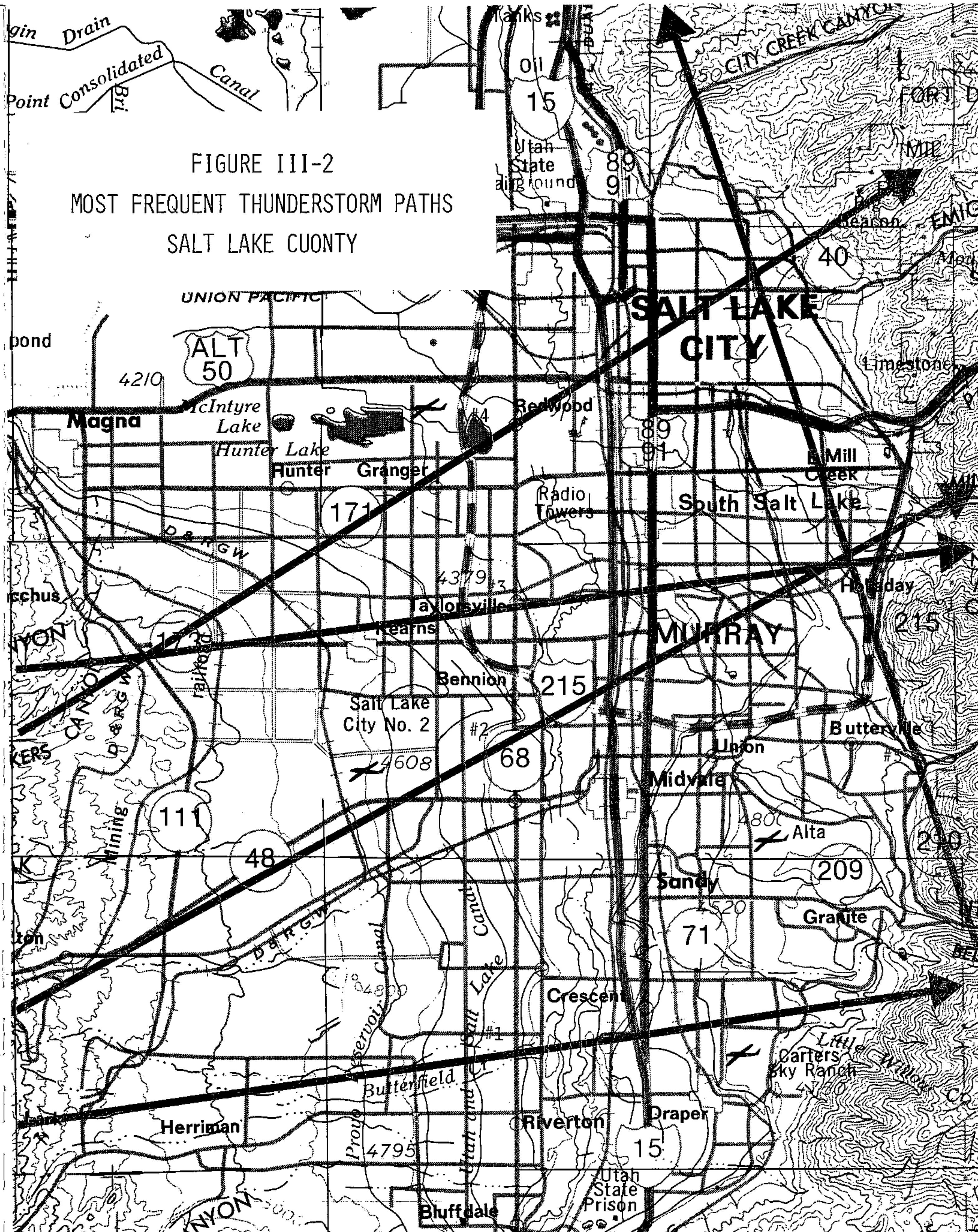


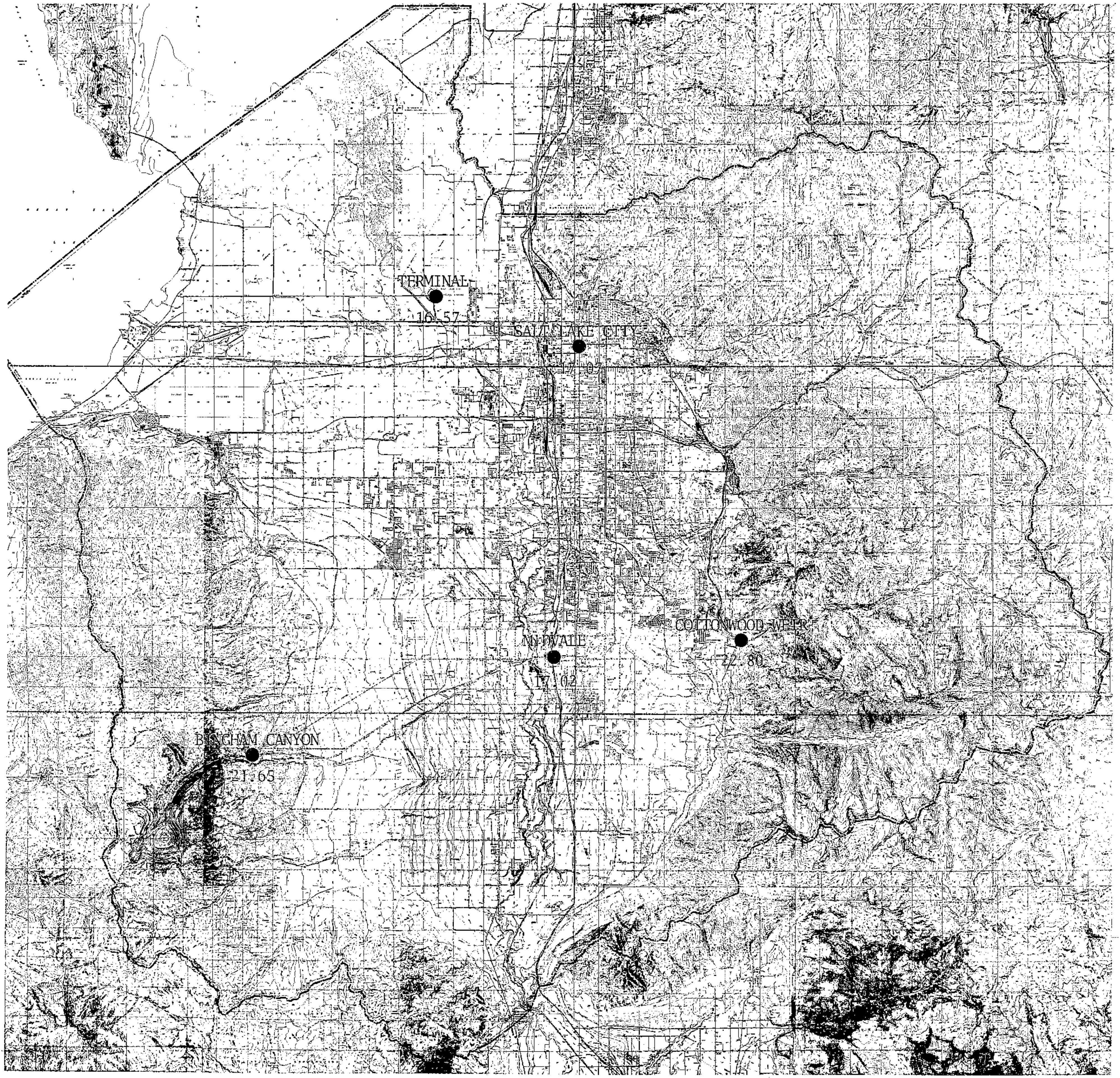
FIGURE III-2
MOST FREQUENT THUNDERSTORM PATHS
SALT LAKE CUONTY

FIGURE III-3

AVERAGE ANNUAL PRECIPITATION

1970-1976

(IN INCHES)



Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

Sq. Miles 9 1

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

miles 0 1 2 3 4 5

colder parts of the year. These inversion periods create air pollution problems and drastic temperature gradients. Notwithstanding the cold air pools, temperatures decrease with increasing altitudes.

Wind patterns in the study area are highly variable depending upon location. The normal winds are determined by topography with essential up canyon winds during the warm part of the day and down canyon during the cool part. Storm activities can produce extremely strong, gusty winds. A wind rose depicting the general wind patterns at the Salt Lake Airport weather station during normal and storm conditions is shown in Figure III-4. During fair weather conditions, winds typically blow from the south, southeast or northwest. During inclement weather conditions, winds originate in the north and northwest.

A wind rose depicts the percentage of time that wind blows in a specified direction at various speeds. For example, in Figure III-4, the Fair Weather Wind Rose shows that approximately 9.7% of the time, winds are less than 5 mph at the Salt Lake Municipal Airport and that winds greater than 30 mph blow from the South approximately 0.2% of the time. (Note that the direction of wind is read going into the center of the rose).

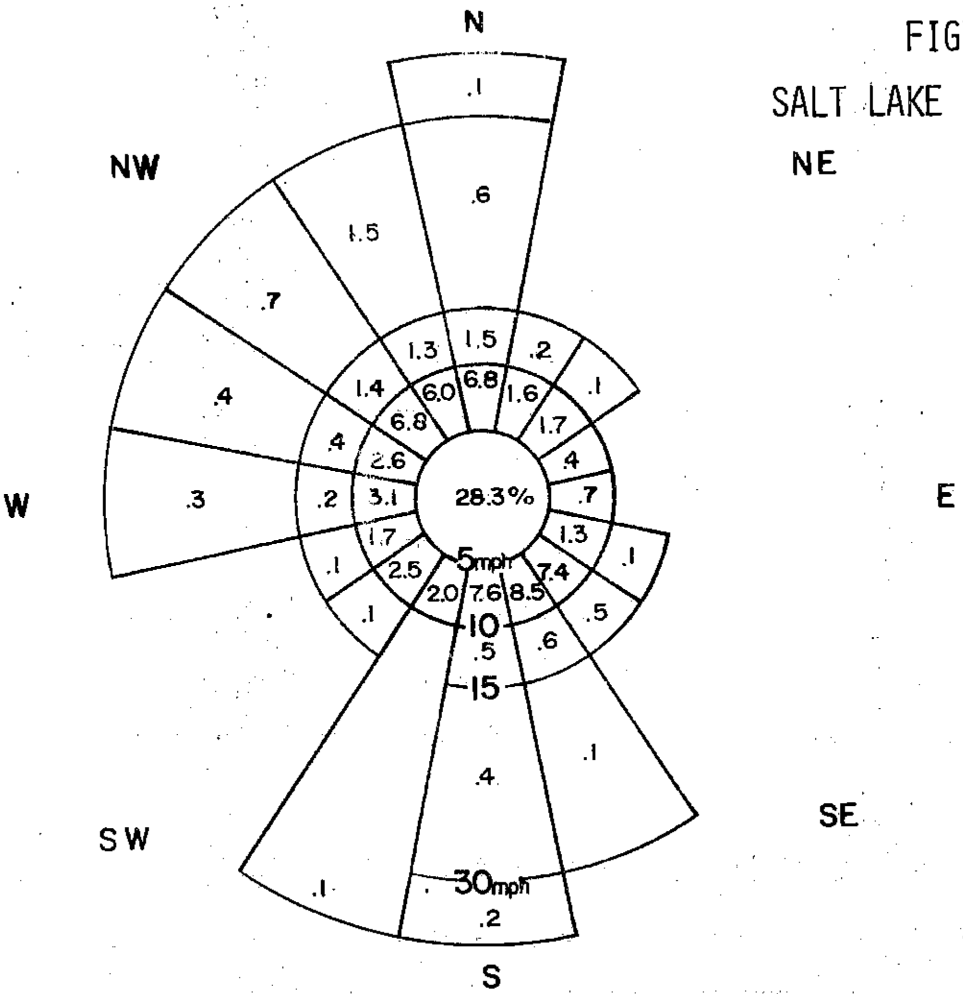
Generally, the climate of the valley can be described as variable but not extreme with major factors affecting weather conditions being the topographic conditions of the valley.

AIR QUALITY

With the major environmental awakening of the late 1960's came governmental actions to protect the quality of the nation's air. The combination of goals established by the EPA and Congress have become the framework for the air quality programs established in individual states across the nation.

FIGURE III-4

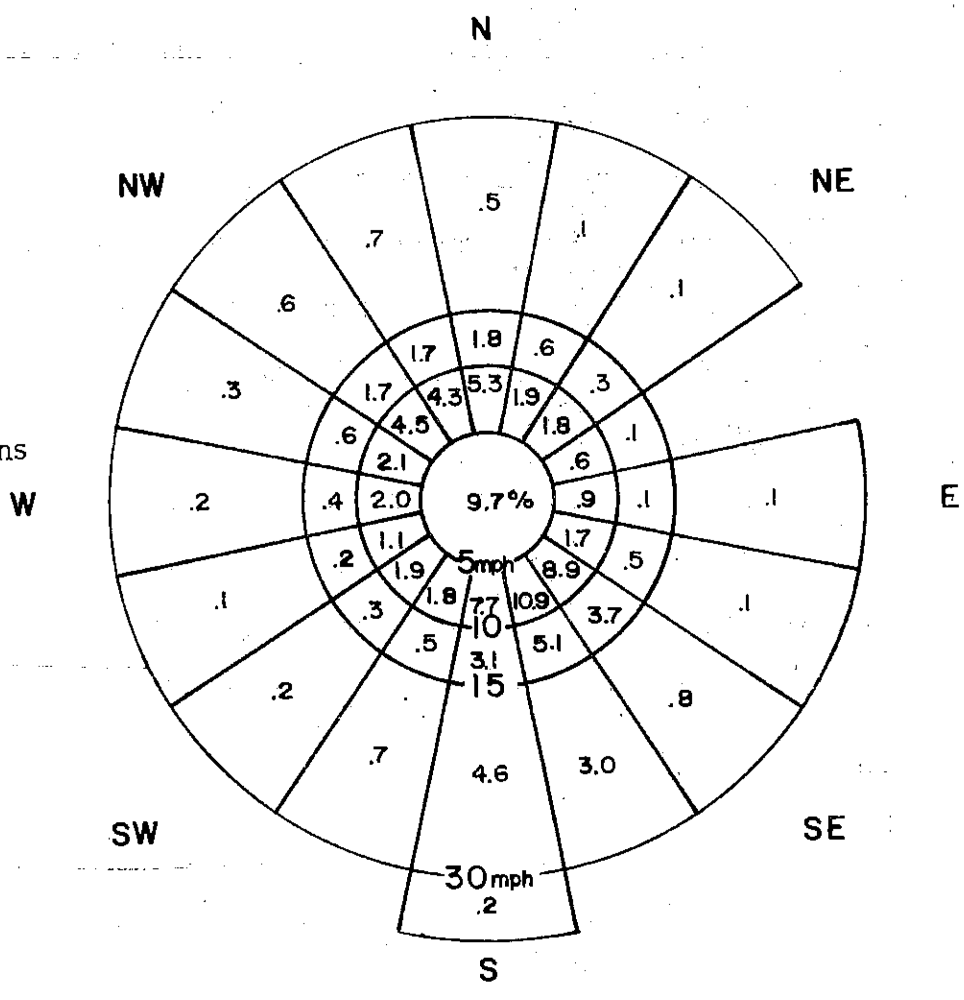
SALT LAKE COUNTY WIND ROSE



INCLEMENT WEATHER
WIND ROSE*
Salt Lake Municipal
Airport
Inclement weather
conditions occur
approximately 5.2%
of the time.
Source: U.S. Weather
Service, 1967 wind
data period:
1955-1964

Figure 7.

FAIR WEATHER
WIND ROSE*
Salt Lake Municipal
Airport
Fair weather conditions
occur approximately
94.8% of the time.
Source: U.S. Weather
Service, 1967 wind
data period:
1955-1964



Standards

Under the Clean Air Act (amended 1977), the EPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants. These criteria pollutants are carbon monoxide, sulphur dioxide, particulates, photochemical oxidants, hydrocarbons, and nitrogen dioxide. The values for these pollutants are shown in Table III-1.

Air quality standards are divided into two major categories; "non-attainment" standards and "attainment" standards. "Non-attainment" standards apply to areas where air quality violates the values set forth in Table III-1. These standards are further broken down into primary and secondary standards. Primary standards are set for protection of human health while secondary standards are set for protection of human welfare.

"Attainment" standards are set for areas where air quality is better than the standards set in Table III-1. In this case, only incremental pollution is allowed in three subclassifications (Classes I, II, and III). A schematic representation of the applicability of air quality standards is shown in Figure III-5.

It should be noted that the standards in Table III-1 are maximum values that are allowed. Any concentration less those shown is more desirable.

The State has the option to set more stringent air quality standards than Federal standards (as in water quality standards) but at the present time they have not. Therefore, the national standards apply in Utah.

The following discussion of the six criteria pollutants is abstracted from Urban Environmental Management, Berry and Horton, 1974.

1. Hydrocarbons (HC). Major polluting hydrocarbons are those which result from the incomplete combustion of fuels and the evaporation of fuels

Table III-1. National Ambient Air Quality Standards

POLLUTANT	AVERAGING PERIOD	STANDARDS Primary	STANDARDS Secondary	REMARKS
SO_2	Annual	0.03 ppm (80 ug/M^3)	None	Arithmetic mean
	24 hours	0.14 ppm (365 ug/M^3)	None	Not to be exceeded more than once per year
	3 hours	None	0.5 ppm (1300 ug/M^3)	Not to be exceeded more than once per year
PARTICULATE	Annual	75 ug/M^3	60 ug/M^3	Geometric mean
	24 hours	260 ug/M^3	150 ug/M^3	Not to be exceeded more than once per year
CO	8-hour	9 ppm (10,000 ug/M^3)	Same as Primary	Not to be exceeded more than once per year
	1-hour	35 ppm (40,000 ug/M^3)	Same as Primary	Not to be exceeded more than once per year
PHOTOCHEMICAL OXIDANTS	1-hour	0.08 ppm (160 ug/M^3)	Same as Primary	Measured as Ozone. Corrected for NO_x and SO_2. Not to be exceeded more than once per year
HYDROCARBONS	3-hour	0.24 ppm (160 ug/M^3)	Same as Primary	Corrected for Methane. Not to be exceeded more than once per year
NO_2	Annual	0.05 ppm (100 ug/M^3)	Same as Primary	Arithmetic mean

Note: ppm = parts per million
ug/M^3 = micrograms/cubic meter

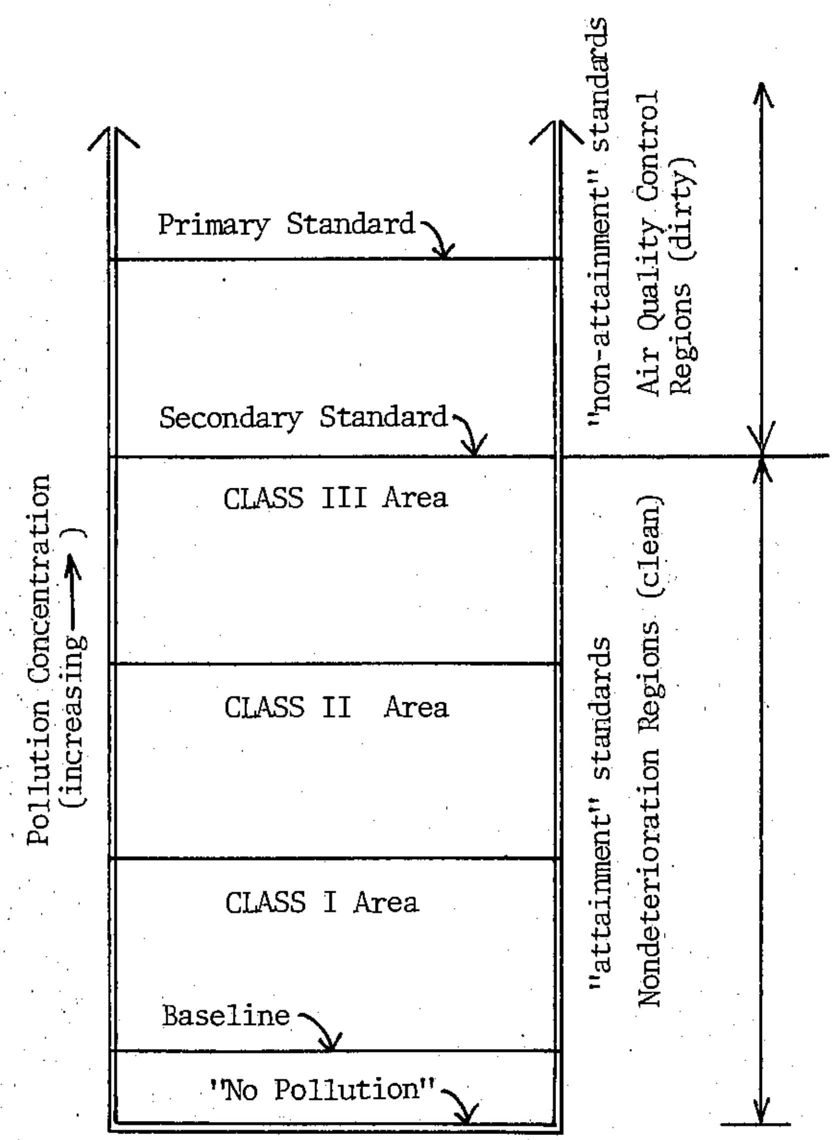


Figure III-5. Schematic Diagram of Air Quality Standards

and industrial solvents. Polluting hydrocarbons exist in the air primarily as gases (including methane, ethylene and acetylene); others, including cancer-inducing agents such as benzo-a-pyrene, are solid particulates.

2. Carbon Monoxide (CO). Carbon monoxide is a colorless, odorless, tasteless gas. The major source of CO is gasoline powered motor vehicles.

When CO enters the bloodstream, it interferes with the ability of the blood to transport oxygen, thus impairing the functioning of the central nervous system. It can cause dizziness, unconsciousness, or death.

3. Nitrogen Dioxide (NO_2). When nitrogen and oxygen react at high temperatures, nitrogen oxides are produced, usually in the form of nitric oxide (NO) and nitrogen dioxide (NO_2). Most nitrogen oxides are the result of fuel combustion.

4. Sulfur Dioxide (SO_2). The most significant sulfur oxide pollutants are sulfur dioxide, an invisible gas with a pungent odor, and sulfur trioxide, a gas which combines with water in the atmosphere to form sulfuric acid. Sulfur dioxide results from burning sulfur-bearing fuels in the production of electric power and space heating and, in Salt Lake Valley, from the smelting process in the production of copper. Sulfur dioxide can aggravate lung and heart disease, asthma, and the lung functions in children.

5. Particulates. Particulate air pollutants are any dispersed matter, solid or liquid, in which the individual aggregates are larger than single small molecules but smaller than about 500 um (um-micrometer). Particulates can cause respiratory ailments, visual pollution, and will increase the deterioration of some materials. Particulates can act as nucleation sites for the formation of sulfuric acid mist and can increase respiratory problems associated with SO_2. They can cause temporary or permanent injury to the linings of the lungs and throat. Such injury may weaken human resistance to infection. Particulates may also transport chemicals into the respiratory system which could cause such illnesses as cancer or lead poisoning. Salt Lake fugitive dust inventory is shown in Table III-2.

6. Photochemical Oxidants. Photochemical oxidants are chemical compounds which are the major components of smog. They are formed when hydrocarbons

and nitrogen oxides are exposed to sunlight. Most significant oxidants are ozone and peroxyacyl nitrates (PAN). Sources of photochemical oxidants are the same as those of hydrocarbons and nitrogen oxides. The most common effects of ozone and PAN are eye irritation and difficulty in breathing. They can cause irritation of mucous membranes in nose and throat, and at higher levels, impair lung functions.

Table III-2. Fugitive Dust Emissions Inventory, Salt Lake County

Source Category	Tons/Year (1974)
Agriculture	
Wind blown	74
Tilling	16
Unpaved roads	2190
Tailings	2781
Aggregate storage	1576
Industrial storage	Neg.
Road Construction	1625
Residential/commercial/industrial construction	10593
Sanding (ice & snow control)	2694
County Total	21549

Source: PED Co. - Environmental Specialist Inc., Fugitive Dust Emissions Inventory; Wasatch Front, Utah, Cincinnatti, Ohio, July 1975.

Current Air Quality

Currently there are three active air quality monitoring stations in Salt Lake County. A fourth station, located in Kearns, was abandoned by EPA and the State in 1977. As shown in Table III-3, the Salt Lake City station monitors particulates, SO_2, CO, NO_2, and Ozone. The airport station only monitors particulates while the Magna station monitors particulates and SO_2.

Table III-3. State Air Quality
Monitoring Network in Salt Lake County

Station	Location	Pollutants Monitored				
		Part.	SO_2	CO	NO_2	O
Salt Lake City	610 South 200 E. Salt Lake City	X	X	X	X	X
Salt Lake Airport	175 North 2400 W. Salt Lake City	X				
Magna	2935 South 8560 W. Magna	X	X			

Source: Utah State Bureau of Air Quality

Table III-4 shows particulate data for three Salt Lake County stations for the years 1970 through 1977. Data for the Kearns station is shown for 1971 through 1976. The 1977 county-wide distribution of particulates and SO_2 are shown in Figure III-6 and III-7. It should be noted that these inventories for particulates and SO_2 are the only coutny-wide distributions available at the time of this writing (September 1978).

GEOLOGY AND SOILS

Both geology and soils have a critical influence on surface and subsurface hydrology. Surface runoff characteristics have been described in detail in the 208 Technical Report Best Management Practices (LU-14).

Table III-4. Particulate Data for Salt Lake County

PARTICULATE μg/M³	SLC	MAGNA	SL AIRPORT	KEARNS
1970 Annual Geometric Mean	84	70	75	
1970 Annual Geo. Standard Deviation	1.65	2.02	1.78	
1970 # Of Observations	361	354	329	
1970 # > Nat'l Secondary Standard	41	52	34	
1970 # > Nat'l Primary Standard	8	10	4	
1970 Max. 24-Hour Average	353	1029	489	
1970 2nd High 24-Hour Average	351	788	417	
1971 Annual Geometric Mean	94	71	78	51
1971 Annual Geo Standard Deviation	1.63	1.94	1.80	1.73
1971 # of Observations	348	345	336	328
1971 # > Nat'l Secondary Standard	56	28	37	8
1971 # > Nat'l Primary Standard	8	12	3	4
1971 Max. 24-Hour Average	469	2031	350	474
1971 2nd High 24-Hour Average	452	1257	302	285
1972 Annual Geometric Mean	94	70	77	54
1972 Annual Geo Standard Deviation	1.58	1.87	1.73	1.66
1972 # of Observations	349	334	330	352
1972 # > Nat'l Secondary Standard	57	31	31	11
1972 # > Nat'l Primary Standard	9	12	2	0
1972 Max. 24-Hour Average	355	1465	278	221
1972 2nd High 24-Hour Average	331	898	261	220
1973 Annual Geometric Mean	89	75	73	54
1973 Annual Geo Standard Deviation	1.69	1.94	1.85	1.78
1973 # of Observations	342	333	314	330
1973 # > Nat'l Secondary Standard	49	47	29	13
1973 # > Nat'l Primary Standard	9	16	2	0
1973 Max. 24-Hour Average	340	991	294	259
1973 2nd High 24-Hour Average	330	865	294	233
1974 Annual Geometric Mean	93	84	85	58
1974 Annual Geo Standard Deviation	1.59	1.81	1.86	1.76
1974 # of Observations	343	342	285	342
1974 # > Nat'l Secondary Standard	42	47	43	14
1974 # > Nat'l Primary Standard	6	10	6	3
1974 Max. 24-Hour Average	704	3080	827	507
1974 2nd High 24-Hour Average	634	612	508	473
1975 Annual Geometric Mean	82	73	66	51
1975 Annual Geo Standard Deviation	1.76	2.16	1.93	1.82
1975 # of Observations	352	339	340	344
1975 # > Nat'l Secondary Standard	46	56	34	14
1975 # > Nat'l Primary Standard	8	24	4	2
1975 Max. 24-Hour Average	691	1456	637	392
1975 2nd High 24-Hour Average	349	850	622	273
1976 Annual Geometric Mean	96	100	79	76
1976 Annual Geo Standard Deviation	1.70	2.00	1.97	1.77
1976 # of Observations	354	343	314	339
1976 # > Nat'l Secondary Standard	70	97	49	42
1976 # > Nat'l Primary Standard	21	37	6	3
1976 Max. 24-Hour Average	352	2105	313	318
1976 2nd High 24-Hour Average	352	489	286	306
1977 Annual Geometric Mean	107	80	85	
1977 Annual Geo Standard Deviation	1.66	1.88	1.70	
1977 # of Observations	349	345	313	
1977 # > Nat'l Secondary Standard	91	53	40	
1977 # > Nat'l Primary Standard	18	19	8	
1977 Max. 24 Hour Average	473	576	414	
1977 2nd High 24 Hour Average	398	402	336	

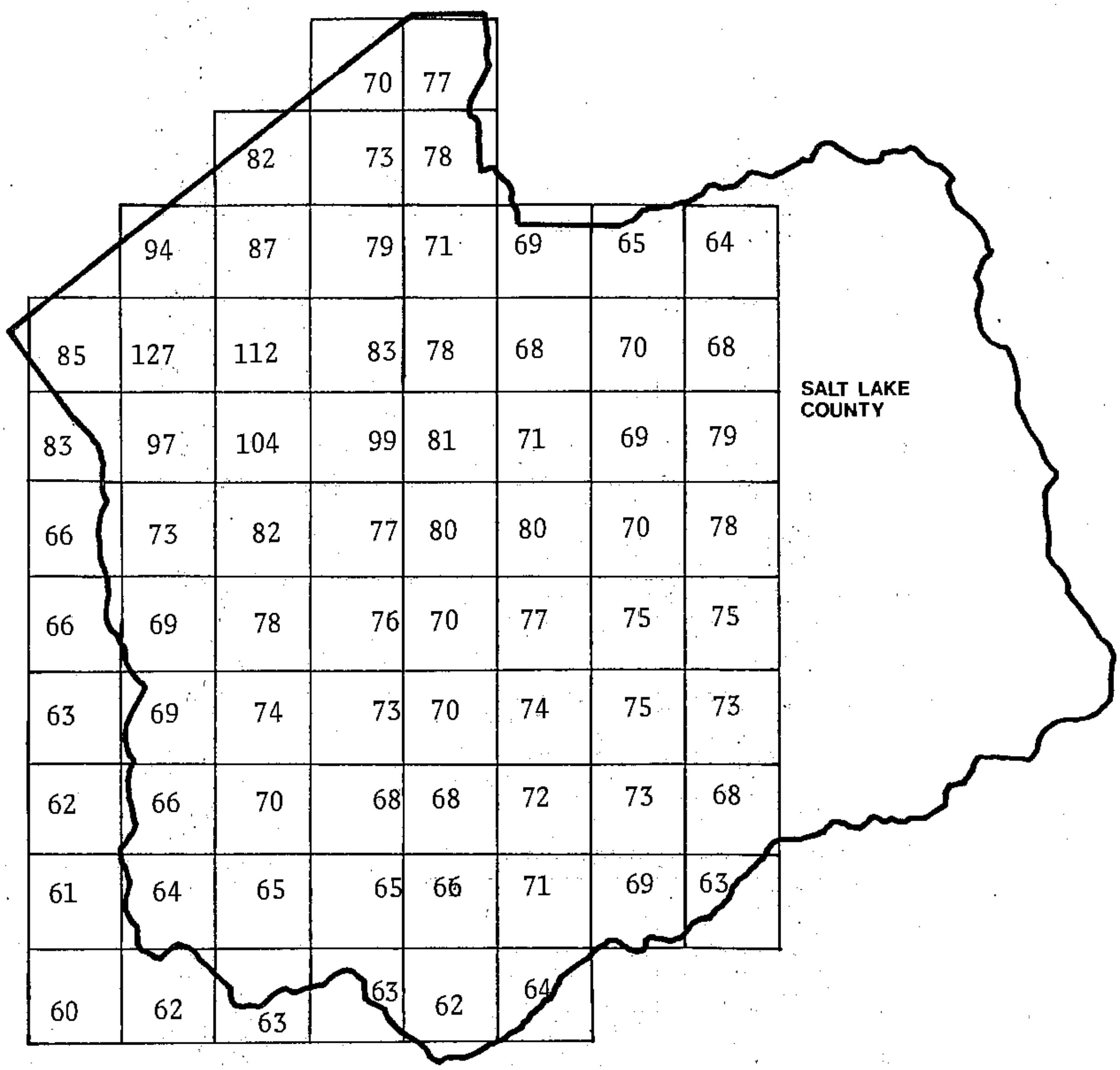


Figure III-6. 1977 Total Suspended Particulates (TSP) Inventory for Salt Lake County. (ug/m^3; calibrated using CDM - includes background of 24 ug/m^3).

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

5 km^2	6250 ac.

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

meters (thousands) 0 5 10 15

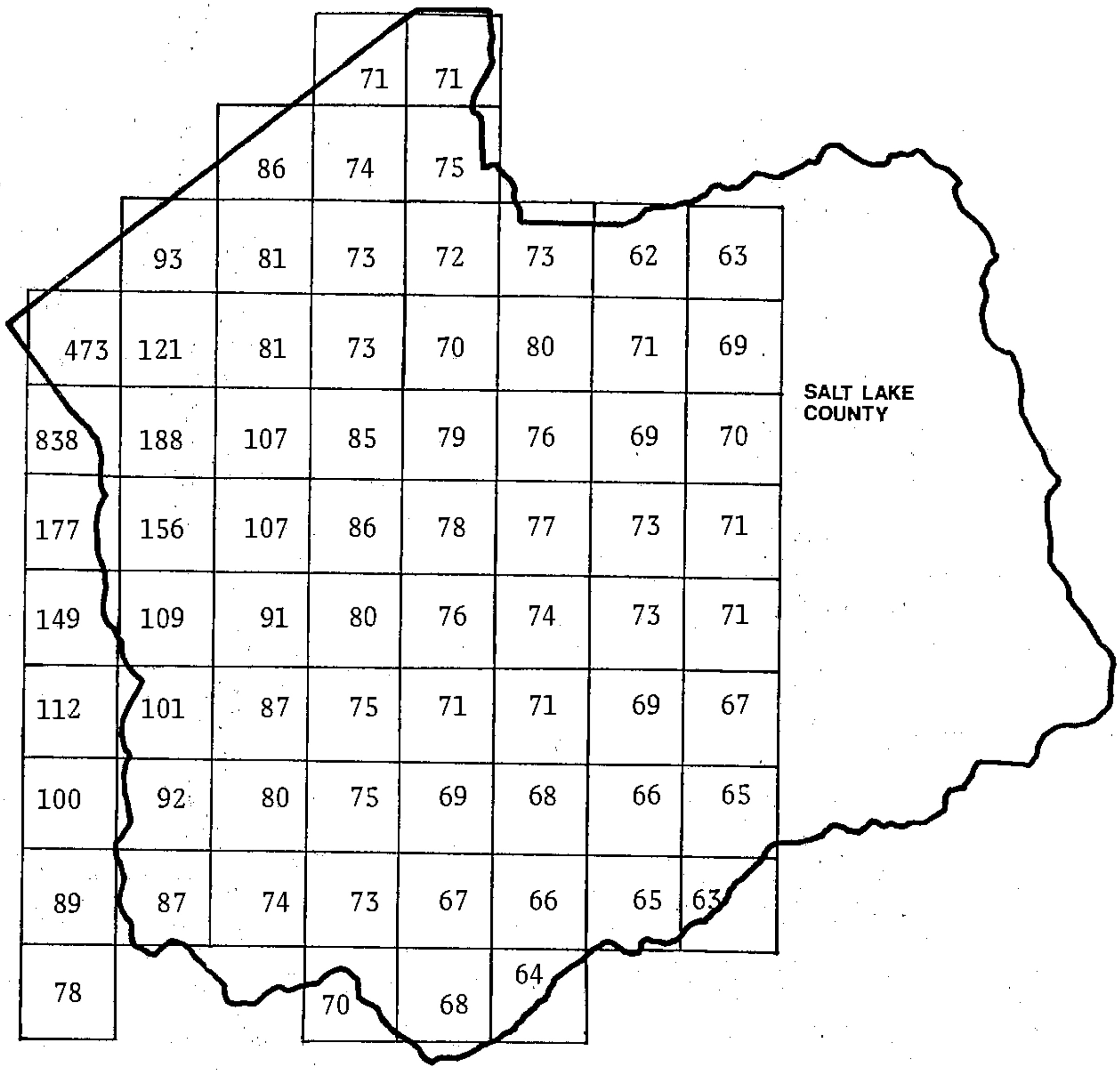


Figure III-7. 1977 Sulphur Dioxide (SO_2) Inventory for Salt Lake County. (ug/m^3; calibrated using CDM - includes background of 15 ug/m^3).

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

5 km^2	6250 ac.

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

meters (thousands)

0 5 10 15

Since the most critical analysis of surface runoff relates to soils data, only issues of secondary importance relate specifically to geology. For example, structural alternatives relating to acquifer recharge by water injection would require more detailed mapping of geologic conditions than the data presently available. Detailed mapping has been carried out for most quadrants located in the Wasatch Canyons, but the only data available in any detail for Salt Lake Valley is in the Sugarhouse Quadrant, which covers primarily the foothills of Olympus Cove.

General geologic features of the County are shown in Figure III-8.

POPULATION AND LAND USE

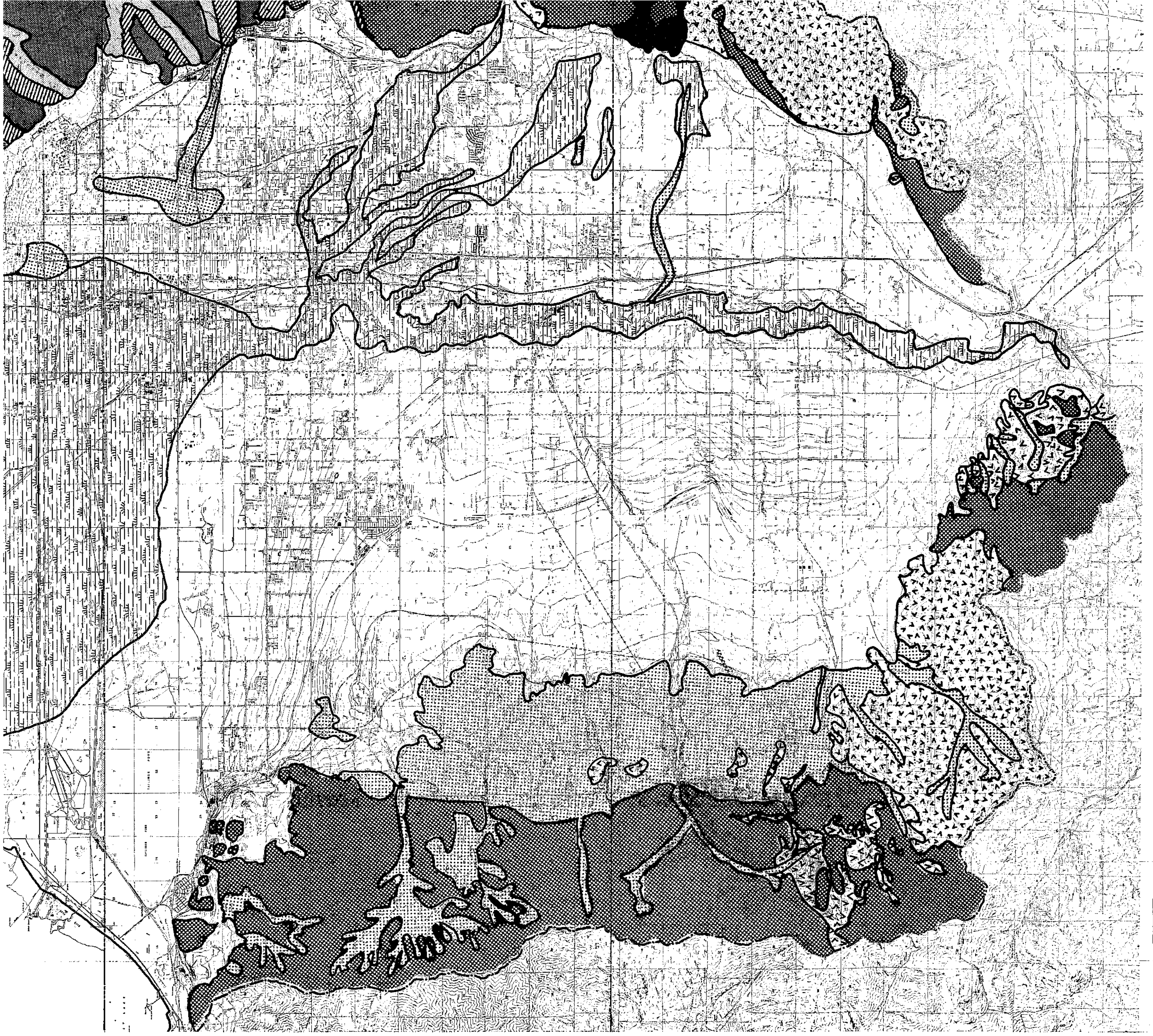
Presently, Salt Lake Valley accomodates over half a million people, living in approximately 168,000 homes. These homes occupy a total area of about 31,000 acres.

Since 1847, the County has steadily grown until it now serves the inter-mountain region as the center of commerce, industry, communication, medicine, education and finance. Attendant with a rapidly accelerating growth rate, problems have developed. In an effort to effectively meet those problems, Salt Lake County developed a master plan which was adopted by the County Commission in 1965. Since then, dramatic increases in population and shifts in land use patterns have occurred, necessitating an update of that plan. The 208 Project has provided significant input into this update which is in progress at the present time.

The past and present figures concerning population and land use are shown below (abstracted from Technical Report LU-11).

FIGURE III-8

GEOLOGY



VOLCANIC PLUTONIC

QUARTZITE

LIMESTONE

SANDSTONE

CONGLOMERATE

SHALE

ALLUVIAL DEPOSIT

FLOOD PLAIN DEPOSIT

LACUSTRINE DEPOSIT

TALUS AND GLACIAL TILL

COMPILED FROM UTH GEOLOGICAL SURVEY DATA FROM 1960 TO 1964.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

40 160 640 ACRES 10

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

MILES

0 1 2 3 4

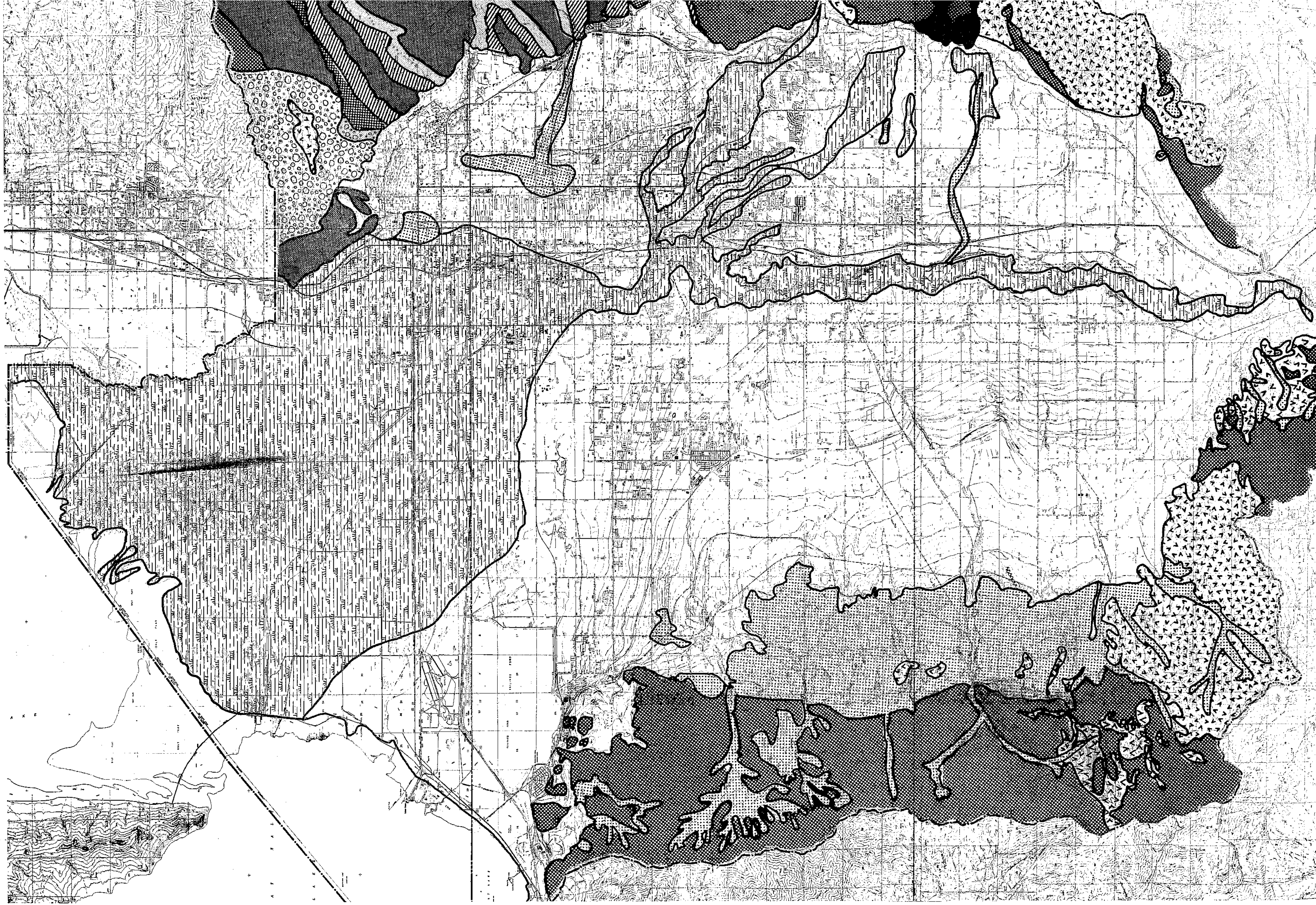
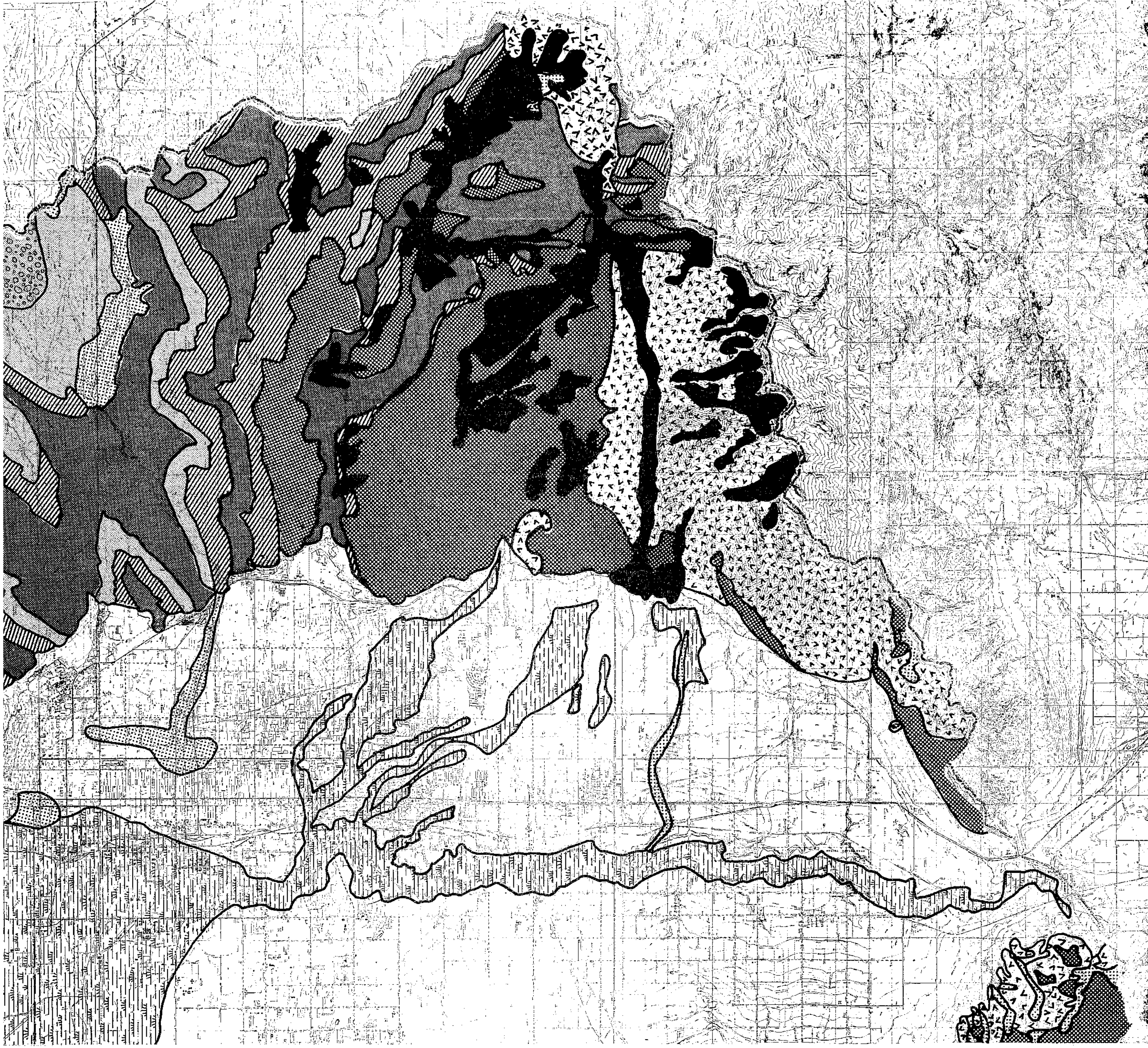


FIGURE III-8

GEOLOGY



VOLCANIC
PLUTONIC
QUARTZITE
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Salt Lake County Water Quality & Pollution Control

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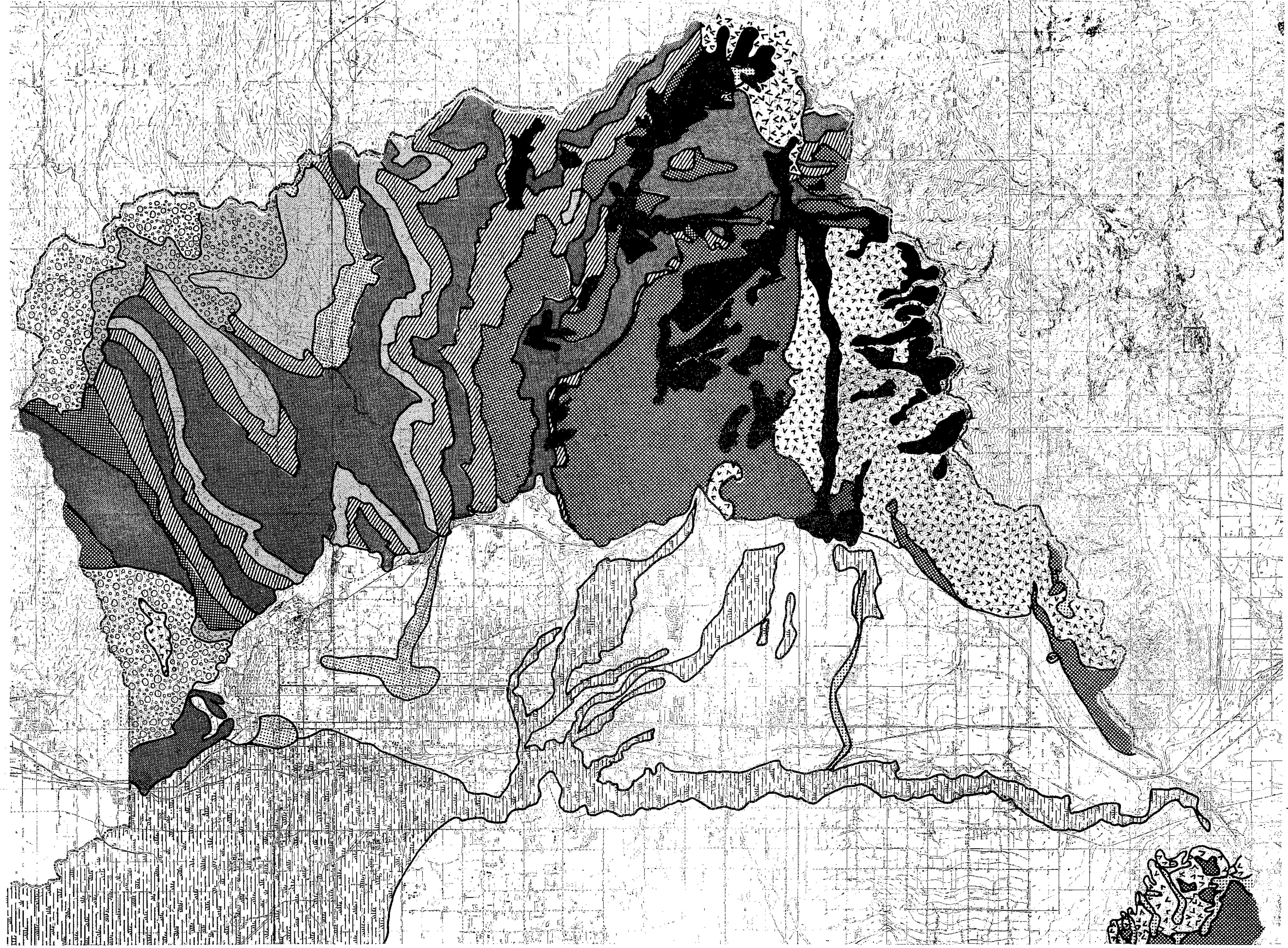
0 1 2 3 4



	1960	1970	1976
Population	383,035	458,607	521,500
Household Size	3.5	3.4	3.1
Occupied Dwelling Units	108,007	134,926	168,100
% Population Increase		19.73	13.71

The present land use conditions of Salt Lake County can be summarized in terms of past inefficient patterns of development. The present development pattern has generally resulted in:

1) loss of irreplaceable natural and recreational resources;
2) loss of the productive use of prime irrigated agricultural areas by the intermingling of subdivisions;
3) diversion of public and private investment to newly developing areas rather than upgrading of older areas;
4) existing service facilities being under-used while new facilities are being extended into new areas;
5) intense competition between jurisdictions for developments which generate revenues to pay for the needed urban services;
6) heavier reliance on the automobile for transportation at the expense of more efficient transit service (air pollution impacts).

The following description of the existing structure is taken from the Salt Lake County Master Plan summary which appeared in the Salt Lake Tribune in July, 1977. (Structural form of the County is shown in Figure III-9.)

> Salt Lake County consists of an unincorporated area which contains approximately half of the county population and nine incorporated cities* which contain the other half of the county population. How-

*Since the printing of the summary in July 1977, the southeastern community of Draper voted for incorporation. Draper becomes the tenth city in Salt Lake County.

ever, when viewed from the air these political subdivisions are not obvious. No physical features are readily identified as city or county boundaries. The most noticeable features are the railroads and highways, commercial and industrial districts, residential areas, the Jordan River, farm lands and mountains, the location of which combine to create the urban form and setting.

The area of greatest activity consists of the one to one and one-half mile wide section located on either side of I-15 which stretches the full length of the County. This "central corridor" is anchored on the north by the Salt Lake City central business district and on the south by a proposed regional shopping center and employment area. Between the two anchors lie industrial land, scattered single family homes, a regional shopping center, and strip commercial uses along State Street. Paralleling the central corridor on either side are the major residential areas of the valley. Our history and culture place high value on the single family home which accounts for the majority of our dwelling structures. However, due to many factors such as housing costs and family size, an increasing percent of families are living in condominiums or apartments. As a result, it is necessary to accommodate an increasing number of multiple family dwellings within the residential area. It is proposed that they be located on the periphery of rather than within single family neighborhoods.

As the population continues to increase, the single family area will spread out from the central corridor. The higher density developments will fill in the more centrally located sites where services are more conveniently available. These sites will generally be located on major thoroughfares where more convenient transit service is planned.

Mountains and Agriculture

The next land use area outbound from the cental corridor consists of the mountains and/or agricultural areas. The mountains are not suitable for development except recreation. Their role as culinary watersheds requires close supervision of any use or development.

Agricultural land traditionally receives the major thrust of urban expansion. It is proposed in the plan that methods be devised to permanently preserve the most valuable agricultural land.

Other Major Features

Numberous major facilities dot the valley flood and add emphasis to the more uniform pattern of commercial-residential-agricultural land uses. Some have located next to raw materials, others near markets to be served, others because of access to transportation systems and still others simply because of available land. Included in this category are the regional shopping centers, Kennecott Copper, Hercules, salt processing, the International Airport, the University of Utah, sand and gravel operations and others.

Transportation System

All of these components of the valley land use pattern are linked together and served by a network of freeways, railroads, air facilities, major streets and communication systems. Improvements to the system of major streets and freeways are planned as they become necessary to support the orderly, incremental growth of urban land uses. At the same time, the structure of these land uses is to be planned to support an expansion of the mass transit system and to make riding transit more convenient and attractive.

TERRESTRIAL AND AQUATIC ECOSYSTEMS

Terrestrial ecosystems in Salt Lake County range from subalpine systems in the eastern Wasatch Mountains to the Great Salt Lake desert in the northern portion of the country.

The Subalpine region of Salt Lake County is extremely limited. It can be characterized as having a very rugged terrain due to soils, topography, heavy snow accumulations and historic glacial action. Wet meadows are common. The Englemann Spruce-Subalpine Fir Association occurs in this ecosystem as well as large areas of exposed rock. Plant and animal life is restricted due to the harsh environment and lack of habitat area. This region is limited to elevations greater than 9000 feet.

Englemann Spruce - Subalpine Fir form the dominant vegetation associations in the Upper Montane ecosystem. This spruce-fir association is limited to higher elevations and covers only very small portions of the County.

The Lower Montane ecosystem is characterized by a climax community of Ponderosa pine (yellow pine) - Douglas Fir - White Fir. Intermixed throughout this community are subclimax stands of quaking aspen and lodgepole pine. These montane regions range in elevation from 6000 to 9000 feet.

The Lower and Upper Montane ecosystems provide diverse habitats of cover and living space, and food and water requirements for an abundant and varied wildlife. Animals are likely to migrate between the Lower and Upper Montane. Therefore, an inventory of organisms produces a list of species that could be considered common to both. Animals shy of encroachment into their habitat may tend to exist at the high elevations. Dominant species include Rocky Mountain Mule Deer, yellow-haired porcupine, and snowshoe rabbit. Small mammals are dominated by various species of squirrels, chipmunks, and shrews. Skunk, pika, and various rodents are also associated with this ecosystem. The more common smaller birds include woodpeckers and flycatchers, the rock wren, Western robin, mountain bluebird, and the gray-headed Junco.

The Grass-Sagebrush ecosystem ranges in altitude from about 4300 to 6000 ft. Various communities within the Grass-Sagebrush ecosystem are grass-sagebrush, wet meadow-stream side willow, mountain brush and marsh. Man's activities in the Grass-Sagebrush ecosystem have displaced many of the indigenous animals of the area. The niche these native organisms occupied has been filled by introduced and domestic species. Upland game such as pheasant and mourning dove abide in large number and compete with smaller populations of chukar partridge, sage and forest grouse, and quail.

The various habitat communities adjacent to the Jordan River are predominantly agricultural lands. Through disturbance, the indigenous plant communities have been replaced by exotic types. A limited area of grass-sagebrush exists in the vicinity of the Jordan Narrows.

The Great Salt Lake Desert ecosystem is limited to the area surrounding the Great Salt Lake in the Study Area. Major biotic communities include marsh, juniper, mixed brush, greasewood, shadscale, and vegetated dune. The altitudinal limits of this ecosystem ranges below 4300 feet in Salt Lake County.

The desert habitat types are dominated by small mammals and birds. Typical of the desert communities are the black-tailed jack rabbit, several species of ground squirrels, and the kangaroo rat. Only the red-shouldered hawk and the burrowing owl are confined to the Salt Desert.

While the climate of this area can be described as desert, much of the land is marshland. This marshland is a strip of land about seventy miles long and two to eighteen miles wide (total) on the southeastern shore of the Great Salt Lake. Much of the marshland has been developed by diking and impounding waters that formerly drained into Great Salt Lake. Development has been by private, state, and federal agencies. A consequence of this development is the production of great numbers of mosquitoes and other insect pests and vectors.

The major aquatic habitat in the county consist of City Creek, Red Butte Creek, Emigration Creek, Parley's Creek, Mill Creek, Big Cottonwood Creek, Little Cottonwood Creek, and the Jordan River. The following discussion is derived from the Utah State Division of Wildlife Resources' report SR-1.

City Creek

Upstream from the Salt Lake City Water Treatment Plant the stream runs over limestone substrate in a steep canyon vegetated with pine, oak, and grasses. Streamside vegetation is primarily fir, maple, birch, dogwood, chokecherry, and currant. Aquatic insects are sparse because of the lack of suitable stream habitat.

Below the Salt Lake City Water Treatment Plant the gradient decreases and slight meandering begins. Slope vegetation is mainly oak and June grasses; streamside vegetation includes cottonwood, elm, maple, birch, boxelder, and grasses. The fish population is small and dominated by brown trout.

Red Butte Creek

The watershed above Red Butte Reservoir is at low elevation with moderate side slopes vegetated with scrub oak and grasses. Streamside vegetation is birch, dogwood, elm, horsetail, wheatgrass, and thistle. Banks are well stabilized and fairly well shaded. The stream bottom is heavily silted due to excessive beaver dams. Aquatic insects are common and dominated by mayflies. Cutthroat and brook trout dominate the substantial trout populations.

Red Butte Creek below Red Butte Reservoir is a foothill-type watershed vegetated by oaks and willows. Bank cover composition is elm, scrub oak, wheatgrass, rose, and June grass. Bank stabilization and shading is poor. Mayflies are the common bottom fauna. A diversion above Fort Douglas dewaters the stream during most of the year.

Emigration Creek

Emigration Creek is 12.6 miles in length and flows entirely through private property. Above the Mount Olivet diversion ditch near the mouth of the canyon, the watershed is of moderate gradient vegetated with scrub oak on the south-facing slopes and oak and maple on the north-facing slopes. Bank vegetation is boxelder, cottonwood, mustard, clover, and June grass. Bank stabilization and shading are adequate for aquatic wildlife.

Below the Mount Olivet diversion Emigration Creek flows through foothills and residential areas, including Hogle Zoo and a golf course in Salt Lake City. Brush oaks comprise the hillside vegetation. Streamside vegetation is typically boxelder, scrub oak, and June grass. Bank stabilization is poor but shading is adequate.

Parley's Creek

From Mountain Dell Reservoir upstream to Lamb's Canyon Creek, Parley's Creek lies in a mid-altitude watershed with scrub oak, elm, and grasses on the side hills. The watershed is in good condition because of protection by the Salt Lake City Water Department. This section of stream is 2.6 miles in length and runs through land mostly owned by Salt Lake City. There is some private land and very little State land.

Above Mountain Dell reservoir streamside vegetation is primarily birch, willow, hawthorne, and grasses. Bank stabilization and shading are excellent. Stream bottom composition is suitable for aquatic insect production and natural reproduction of trout. Stream flow is variable but is seldom, if ever, less than 5 cfs.

From 1300 East, Salt Lake City, upstream to the piped source at the canyon mouth, Parley's Creek is a valley stream suffering from the extensive physical enchroachment by development, especially golf courses, parks, and freeways.

Within the section below the canyon mouth bank vegetation is cottonwood, hawthorne, Russian olive, and grasses. Bank stablization is fair. Stream shading is adequate. Stream substrate is good insect habitat but this section of Parley's Creek is devoid of organisms, including trout. The pool-to-riffle ratio is excellent.

Mill Creek

Upstream from the confluence of Mill Creek and the Jordan River to the Scott Avenue Hatchery, 880 Scott Avenue, Salt Lake County (3.4 miles), Mill Creek runs through Salt Lake County urban areas and is bordered primarily by exotic plants. Bank stabilization and stream shading are very poor.

Stream flow is variable but adequate for a fishery. The stream bottom is excessively silted and limits aquatic insect production.

From the hatchery (not presently in operation) upstream to 2300 East, Salt Lake County, (2.6 miles), the stream is occasionally dewatered for very short periods of time during the summer from about 2000 East to 2150 East. From 2300 East, Salt Lake County, upstream to the Elbow Fork diversion, 4.7 miles are on private land and 4.1 miles are on U. S. Forest Service land. The entire section flows down a moderate gradient in a mid-elevation watershed vegetated with oak and aspen. Streamside vegetation is boxelder, birch, dogwood, maple, willow, and grasses. Stream banks are badly denuded as a result of overuse by campers and picnikers. Stream shading and stream flow are adequate for fishery requirements. Aquatic insects (mayflies and caddis flies) are common in the stream. There are moderate populations of rainbow and cutthroat trout sustained by natural reproduction and supplemental annual plants of catchable rainbow trout. The fishery in this section is suffering mainly from overuse by recreators.

From the Elbow Fork diversion upstream to the headwaters (3.6 miles), the area is a high elevation watershed with moderate stream gradient. Conifers and aspen dominate the slope vegetation. Streamside vegetation consists of white and Douglas fir, dogwood, cow parsnip, and grasses. Bank stabilization and stream shading is excellent. Overall, this watershed is in excellent condition. Aquatic insects are abundant. Stream flow is adequate for the existing fishery. Because of the moderate gradient, the stream has few resting pools for fish. A modest population of rainbow trout exists as a result of limited natural reproduction and supplemental annual plants of catchable rainbows.

Big Cottonwood Creek

Most of the lower Big Cottonwood Creek drainage, from the Jordan River upstream to the State Highway 148 crossing at Knudsen's Corner (Holladay Blvd. and 6200 S. streets; 7 miles), is surrounded by Salt Lake County and other municipal residential areas and the ecosystems have been degraded significantly. Diversions dewater the stream near the canyon mouth.

The section of watershed from the Highway 148 crossing upstream to the Utah Power and Light Company's Stairs power plant is at low elevation and flows through the east Salt Lake County residential district. Vegetation includes willow, cottonwood, scrub oak, grasses, and exotic planrs. Bank cover composition is oak, birch, cottonwood, dogwood, rose, and grasses. Bank stabilization is fair and stream shading is adequate for fish protection. Stream flow is generally adequate for the existing fishery, although subject to extreme daily fluctuations due to upstream water treatment and power plant operation. Aquatic insects, dominated by mayflies and caddis flies, are abundant. Existing populations of rainbow and brown trout are moderate.

The section extending from the Stairs Power Plant upstream to the Storm Mountain reservoir (0.8 miles), is occassionally dewatered by the diversion located there.

From that diversion upstream to the Cardiff Flat Bridge (6 miles), the drainage is of steep gradient and vegetated with conifers, aspen, and oak. Bank vegetation consists of birch, alder, cottonwood, dogwood, and grasses. Stream shading is slightly inadequate for fish protection, but bank stabilization is very good. The entire section has adequate water flow year-round. Although the aquatic insect resource (primarily mayflies and caddis flies) is substantial, high stream velocity and lack of suitable fish resting pools (occasioned by steep stream gradient) preclude high natural trout production.

The wild fish population, dominated by brown trout, is moderate and augmented with annual plants of catchable rainbow trout.

The section extending from Cardiff Flat Bridge upstream to the stream termination at Mary's Lake (6.8 miles), is in a canyon of moderate gradient vegetated with conifer and aspen. Bank stabilization is excellent and provided by alder, willow, birch, and grasses. Stream shading is good. The stream bottom type is good for natural reproduction of fishes and this section is the most productive portion of Big Cottonwood Creek. Mayflies and caddis flies are very abundant and are a major food source for the excellent populations of rainbow, brown, and brook trout existing in this section.

Little Cottonwood Creek

The lower reach of Little Cottonwood Creek, from the Jordan River upstream to the water treatment plant, represents a fishery (and associated biota) almost totally degraded by channelization, diffuse source pollution, dewatering, and litter. The stream flows through a somewhat urbanized area near the canyon mouth and then through a more heavily urbanized area near the Jordan River. The resident fish population consists of brown trout. There is no planting of fish in this section.

Upstream from the treatment plant at the mouth of Little Cottonwood Canyon, Little Cottonwood Creek flows through a steep, glaciated canyon vegetated with conifers and aspen. Streamside vegetation consists of aspen, fir, dogwood, cottonwood, and grasses. Bank stabilization is good, but stream shading is inadequate for a fishery. Because of the steep gradient and large boulder substrate, production of fish and other aquatic life is low. The existing populations of rainbow and cutthroat trout are very small and average fish size is small. Stream flow is good.

Jordan River

In the northern portion of the Jordan River, stream velocity and volume are suitable for a warm fishery. The percent of stream bottom covered during low flow is adequate. A low pool-to-riffle ratio, resulting from extensive channelization, and high turbidity limit aquatic flora and fauna production. The stream bottom type is of poor quality and unsuitable as benthic insect or fish spawning habitat. Water temperatures are suitable for warm water fish species, although present water pollution prevents establishment of game fish population. Resident fish species are limited to carp (Cyprinua carpio), the Utah chub (Gila atraria), and the Utah sucker (Catostomus ardens). Natural fish propagation is poor.

The mid-section of the Jordan River is an area of moderate human development and poor aesthetics. Stream velocity, volume and percent of bottom covered during low flow is suitable for fishery maintenance. Channelization has destroyed much fish habitat and reduced the pool-to-riffle ratio. Although the length of the growing season is good, turbidity and pollution limit aquatic plant production. Stream bottom type is of fair quality and of suitable substrate for substantial benthic invertebrate populations. Bank cover and stream shading is poor, but water temperatures are sometimes suitable for trout. Predominant resident fish species are rainbow trout (Salmo gairdneri), brown trout (S. trutta), carp, black bullheads (Ictalurus melas), longnose dace (Rhynichthys cataractae), mountain suckers (Pantosteus platyrhynchus), and Utah suckers. Fish populations are small because of poor natural reproduction and heavy fishing pressure.

In the upper reaches of the river in Salt Lake County, stream velocity is adequate for a fishery, but volume is often inadequate because of excessive diversion. The percent of streambed covered during low flow is poor. Stream bank cover, shading and the pool-to-riffle ratio are good but turbidity limits aquatic production. The stream bottom type is good benthic invertebrate substrate. Water temperatures are suitable for a warm or cold water fishery. Natural fish propagation is fair and sustains populations of black bullheads, bluegill (Lepomis macrochirus), carp, channel catfish (Ictalurus punctatus), fathead minnows (Pimephales promelas), and white bass (Roccus chrysops). Water pollution slightly limits aquatic production.

HYDROLOGIC OVERVIEW

The major hydrologic features in Salt Lake County consist of surface water and groundwater systems.

From Utah Lake, the Jordan River meanders approximately 55 river miles northward to the Great Salt Lake. The river gradient is slight, averaging only 5.2 feet per mile. The river flow is supplemented by many tributaries entering the river from the east and depleted during the summer by diversions into irrigation canals. The major tributaries and their drainage basins are illustrated in Figures IV-1 and IV-11.

At the Jordan Narrows, ten miles north of Utah Lake, the bulk of the river flow is diverted into irrigation canals during the irrigation season (May-September). Flow immediately below the diversion varies from 1400 cfs during spring runoff to no flow during summer months. North of the diversions, the river meanders through a broad flood plain, gaining flow from groundwater, irrigation returns, and several small area wastewater treatment plants. The 20-mile reach of the river that passes through the Salt Lake City Metropolitan area is the recipient of many municipal and industrial waste discharges. The river also receives urban and storm runoff from these areas. At 2100 South Street, much of the river flow is diverted into what is called the Surplus

TABLE III-6

WATER USES IN SALT LAKE COUNTY

Use	Amount (Ac-Ft/Yr)	%
Irrigation	296,600	47
Industrial	160,100	26
Residential & Municipal	135,300	22
Stock (cattle, horses, etc.)	33,500	5

From SR-5

SOLID WASTES MANAGEMENT

Presently Salt Lake County and Salt Lake City are operating separate landfills. Salt Lake City's landfill is located at approximately 7200 West North Temple while Salt Lake County's facility is located at approximately 8000 West 2100 South. Both landfills are located in areas of high groundwater (0.4 ft.). The leachate from these landfills can cause serious health and water quality problems. Surface water runoff from the landfills can also pose added difficulities. Salt Lake County used to operate a trash dump near 3200 West and 6200 South where yard, garden, and other landscaping wastes were disposed This dump is now closed but remains a problem area for County officials. The dump is burning underground and is a source of cockroaches which have been infesting the houses of nearby residents. Four south county municipalities have also established and presently use a small landfill approximately six miles west of South Jordan called the "Trans-Jordan Pit." The locations of the existing landfills are shown in Figure III-10. None of the existing landfills in Salt Lake County are operated according to standards specified by the City-County Health Department. Therefore, the health authorities have demanded

Canal. This canal was designed to provide for a direct access to the Great Salt Lake for flood control purposes protecting downstream areas on the Jordan River. North of Salt Lake City, the river flows into marshland areas that feed the Great Salt Lake.

The groundwater system in Salt Lake County consists primarily of confined aquifers recharged in areas along the east bench area of the valley. Groundwater withdrawals have been increasing at a rate of about 1.5% per annum and presently constitute 125,000 acre-feet per year (SR-5). Much of the remaining recharge to the aquifer is naturally discharged into the Jordan River, its tributaries, and to the groundwater table by upward leakage.

Table III-5 provides a breakdown of the sources of the 632,700 acre-feet per year of water diverted between 1970-1975 in Salt Lake County. Additional water other than the previously described sources are diverted and piped into Salt Lake County from the Provo River in Utah County and from Tooele County for industrial and irrigation uses. Table III-6 indicates the various uses for the water diverted in the County.

TABLE III-5

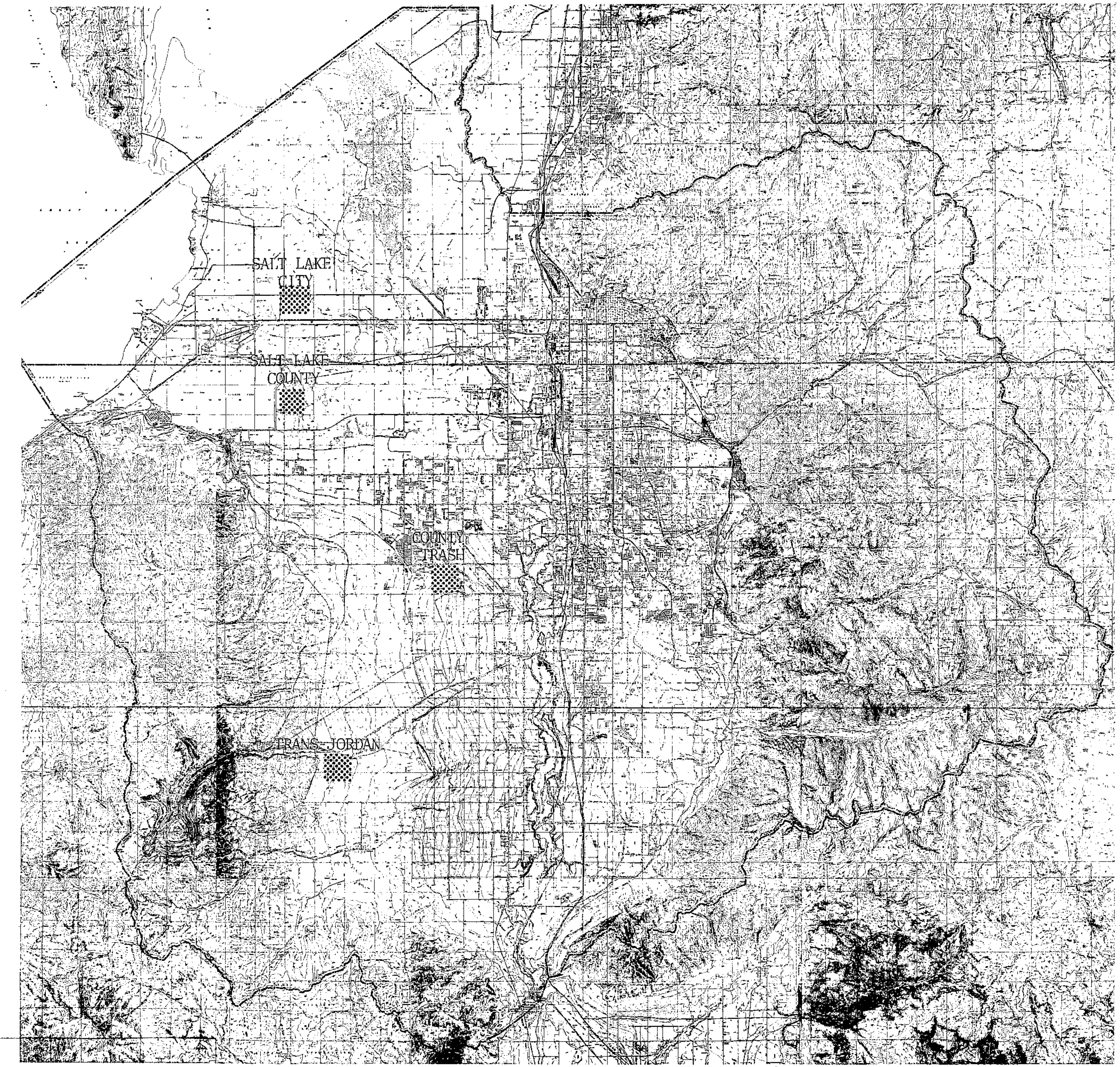
WATER SOURCES IN SALT LAKE COUNTY

Source	Amount (Ac-Ft/Yr)	%
Jordan River	323,000	51
Wells and Springs	142,000	22
Wasatch Front Streams	108,000	17
Provo River	50,200	8
Tooele County	9,500	2

From SR-5

FIGURE III -10

EXISTING LANDFILL SITES



Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

Sq. Miles
9
1

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

miles
0 1 2 3 4 5

that both the major landfills discontinue operation at their present locations and transfer all solid waste to a more environmentally suitable area.

Collection services are provided by each municipality or contracted out to various private, commercial collection firms in the Valley.

The present solid waste generation is tabulated in Table III-7 according to source of wastes.

TABLE III-7

LANDFILL LOADINGS- TONS/DAY*

Category	County Landfill	City Landfill	Trans-Jordan Landfill
Residential	290	178	74
Commercial	202	197	70
Industrial	104	134	76
Private	20	8	10
Totals	616	517	230

*Working-day loadings
From SR-6

The total solid waste generation in the Salt Lake Valley is presently 1360 ton/working day. This yields a per capita waste generation of 4.80 lbs. per capita per day.

Future solid waste loadings in 1995 are based on applying a per capita waste generation multiplier of 1.56 (SR-4). Table III-8 tabulates the future loadings in Salt Lake County.

TABLE III-8

FUTURE LANDFILL LOADING CALCULATION

Category	Present per capita wastes generation	1995 Population	Multiplier	Loading (Tons/Day)
Residential	2.54	791,000	1.56	1570
Commercial	1.31	791,000	1.56	810
Industrial	1.06	791,000	1.56	650
				Total = 3030

Salt Lake City and County are undertaking an investigative study into the use of solid waste in a direct fuel recovery system. Pilot plant studies are just beginning. The conversion to resource recovery systems and the utilization of separated solid waste as a supplemental fuel source is quite realistic.

FINANICAL STATUS

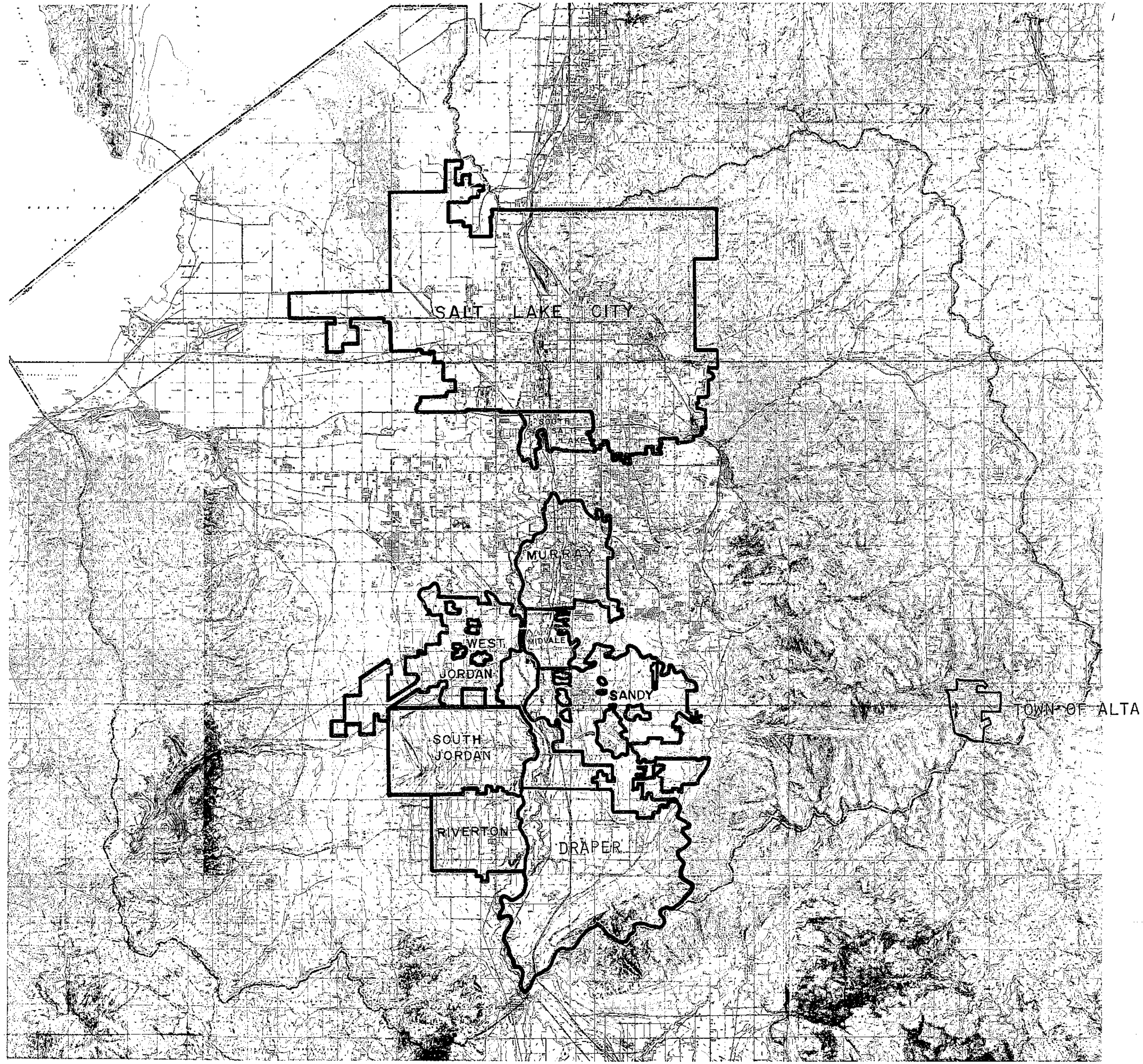
The fragmentization of governmental units in Salt Lake County, as shown in Figure III-11, has created problems in the past and will continue to do so in the future. The Salt Lake County Council of Governments, a voluntary membership organization, was formed to help work out problems created by this fragmentation of government. These problems center around the provision of services for residents within the County boundaries. Some services are provided on a county-wide basis (flood control, health department, and others) but these are only a few of many. Other services, such as wastewater treatment, are provided for by special service districts. These districts charge only those who receive the services rendered.

A recent Utah Supreme Court decision involving taxing within an incorporated areas has created a furor concerning county garbage collection services. The decision was based upon the issue of double taxation where residents of

FIGURE III- 11

GOVERNMENTAL AND JURISDICTION FRAGMENTATION

SALT LAKE COUNTY



Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

Sq. Miles 9 1

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

miles 0 1 2 3 4 5

incorporated areas were being taxed to pay for county services outside of corporate boundaries.

Economies of scale can be achieved through consolidation of certain services, as has been demonstrated by combining city and county health departments, but municipalities are often reluctant to give up services that identify their own spheres of influence or power base.

The effect of this on-going struggle with reference to future water quality needs has, to a large extent, been overcome. The Salt Lake County Council of Governments has agreed to finance on-going water quality management from the County-wide Flood Control mil levy. Under this arrangement, the service being proposed under this area-wide water quality plan has been agreed upon by both cities and county to be shared.

Future Conditions

PROJECTED LAND USE

As reported early in the 208 Project, the population of Salt Lake County is expected to increase 52% in the next two decades, at an annual average rate of about 5%. This implies that an additional 270,000 people will have to be housed. The impact of this growth on water quality will be increases in wastewater, stormwater, and decreased agricultural return flows. Section IV discusses these specific impacts in more detail.

During the course of the 208 study period, the Project Management has had the benefit of three studies in Land Use: 1) Williams & Mocine, 208 Project Consultants for the Valley portion of the County, made initial estimates of projected population, holding capacity, and allocation of housing units by 208 Statistical Area. 2) EDAW, Inc., 208 Project Consultants for the Canyon portion of the County, were contracted by the Salt Lake County Planning Commission to provide a comprehensive update of the 1965 Master Plan. 3) The Salt Lake County Planning and 208 Project Staff conducted additional studies and drafted alternatives to the work of both consulting firms. Therefore, the Land Use patterns, assumptions, allocations, and maps are a composite of these joint efforts.

Technical Report LU-9, Economic and Demographic Futures, 1975-1995, provides the initial source of population and dwelling unit projections. Although common "Statistical Areas" were used in the first projection (drainage basins combined with Sewer District boundaries), subsequent allocations were made by municipality and common sewage treatment area. Figures III-12, III-13, III-14, and III-15 indicate the statistical areas and the population allocations made for each area. It is stressed that the assumptions made concerning these allocations are dynamic rather than static. They will change as economic forces shift, and predicting the complex shifting of a regional economy is most difficult, if not impossible.

The need for up-dating and re-adjusting the projections will be necessary as conditions change, because of unexpected expansions in the employment base at any one point in the county. Although the total county projection is relatively stable since it is based on employment factors, the direction and intensity of growth in any one specific location is most difficult to assess. More detailed description of this process can be reviewed in Economic Demographic Futures.

Table III-9 is a summary of the number of acres available for development and the number of acres estimated to be developed as a result of population

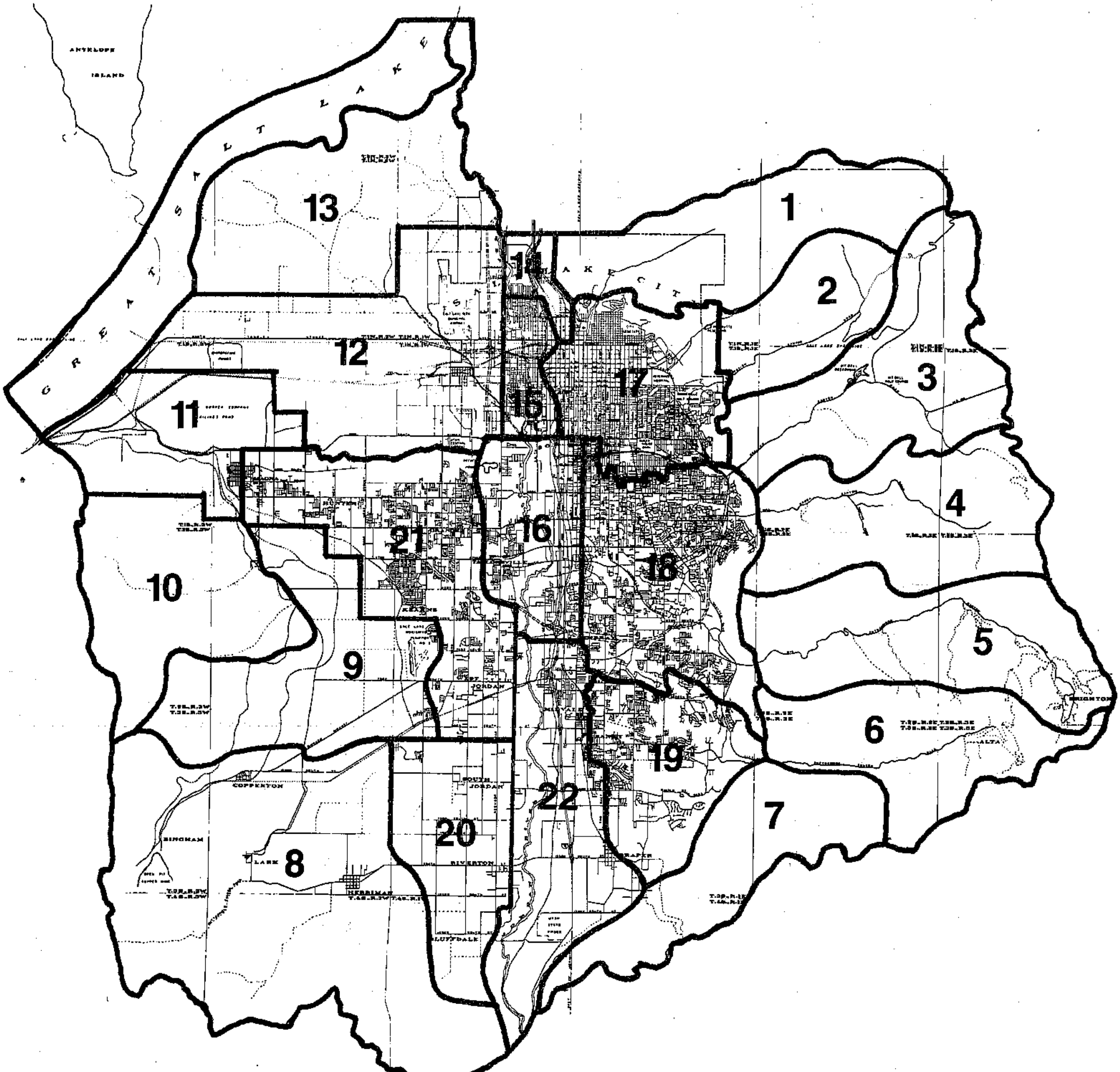


FIGURE III-12. WATER QUALITY
PROJECT STATISTICAL AREAS

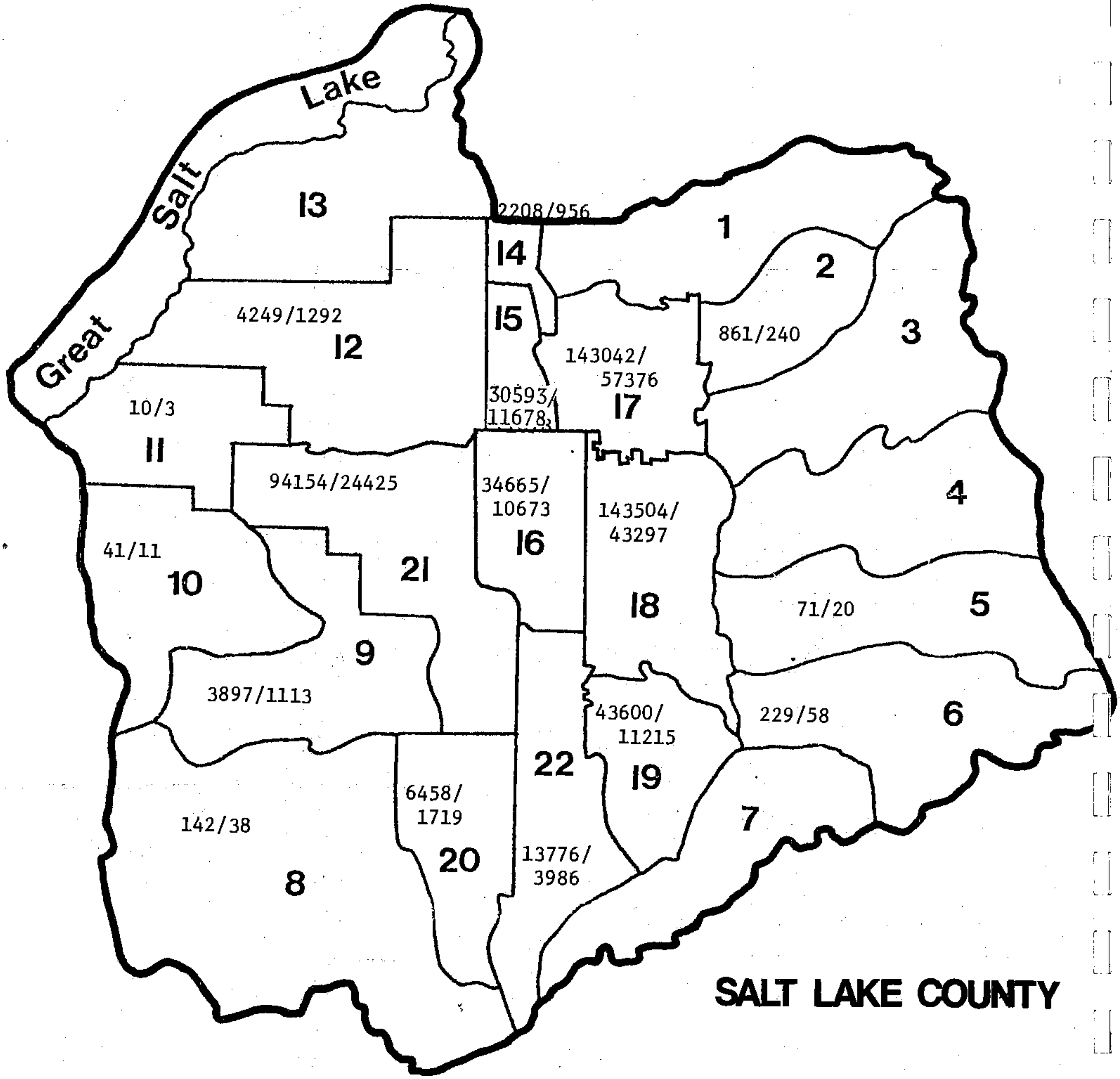


FIGURE III-13. 1975 POPULATION/DWELLING UNITS

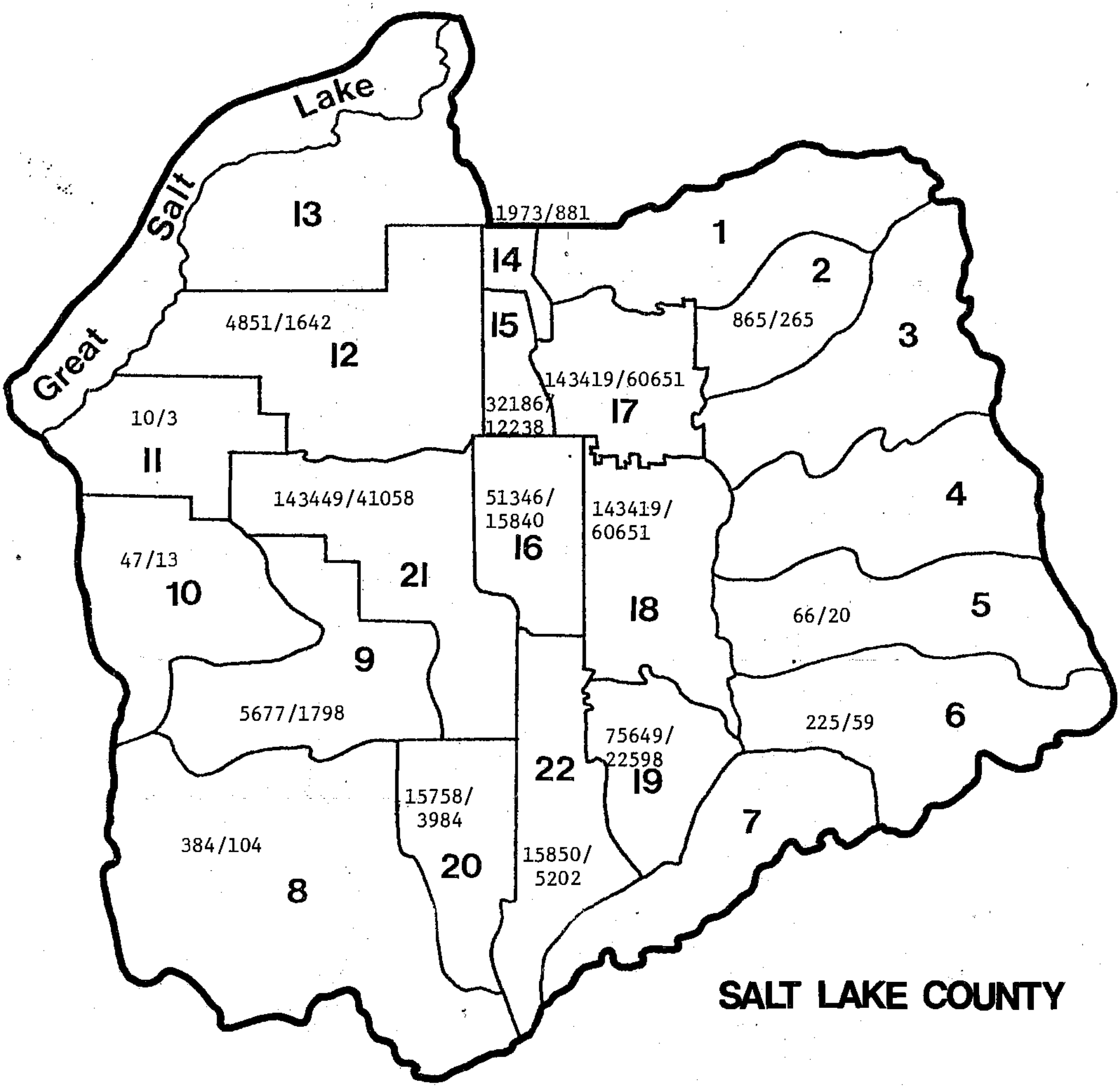


FIGURE III-14. PROJECTED 1985 POPULATION/DWELLING UNITS

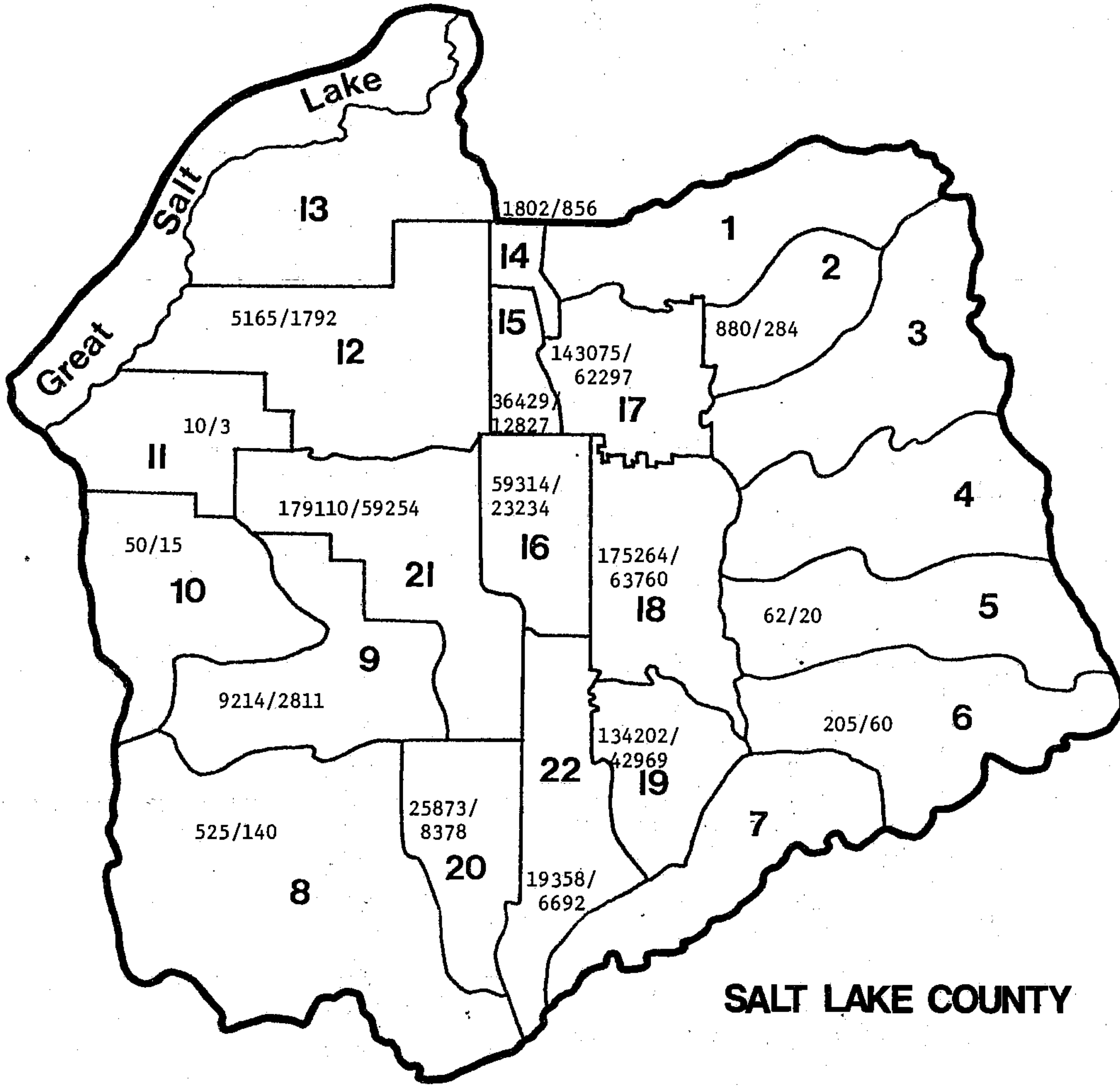


FIGURE III-15. PROJECTED (HIGH) 1995 POPULATION/DWELLING UNITS

TABLE III-9. ACREAGE ABSORPTION
BY STATISTICAL AREA

Salt Lake County Statistical Areas	ACRES				
	Total Available	Committed by 1995		Available after 1995	
		Residential	Non-Res.	Residential	Non-Res.
1					
2					
3					
4					
5	300			300	
6	90			90	
7					
8	1,960	1,510		150	
9	20,810	373	296	16,013	4,033
10					
11					
12	3,337	52	3,285		
13					
14	320		320		
15	205	89		116	
16	3,954	1,681	1,110	1,327	336
17	670	270	400		
18	6,435	1,656	990	3,024	
19	13,677	4,788	700	6,526	1,653
20	14,183	958	160	10,329	2,641
21	16,802	5,379	1,700	7,758	1,965
22	6,780	558	470	4,589	1,163
TOTAL	89,523	17,314	9,431	50,222	12,556

increase in respective statistical areas. The impact of these increases in residential and non-residential (commercial, industrial, institutional) growth are evident in Figures III-16 and III-17. These figures indicate the increase in acreage and where the increases are most likely. Note that one figure shows the next 20 years of expansion under low density, the other at medium density: (low density = 2-4 units per acre; medium density = 4-8 units per acre). Therefore, if residential units were clustered rather than developed in typical subdivisions, there would be almost 10,000 acres left open.

The differences in these growth alternatives are outlined on Table III-10 However, in order to most accurately assess the impact of growth on water quality, the Project Staff has represented the most land consuming alternative in its description. This approach provides the most realistic effects of growth on the local economy and water quality. The description of growth is divided into two elements - the Salt Lake Valley and the Wasatch Canyons.

Salt Lake Valley - 1995

Figure III-18 indicates the general development pattern expected in Salt Lake Valley over the next 20 years. This pattern is a composite of the efforts made to date in land use planning programs in Salt Lake County, and mainly outlines areas expected to be developed (urbanized) and areas expected to remain undeveloped.

The term "developed" refers to urbanization and includes all land use components except agricultural, open, and vacant land in general.

Development will have basically three impacts on future water quality:

1) Increased wastewater flows to the sewer treatment plants.

FIGURE III-16

URBAN EXPANSION 1975-1995
LOW DENSITY ALTERNATIVE

Salt Lake County Water Quality & Water Pollution Control

208 Water Quality Plan

Valley Land Use Williams & Mocine

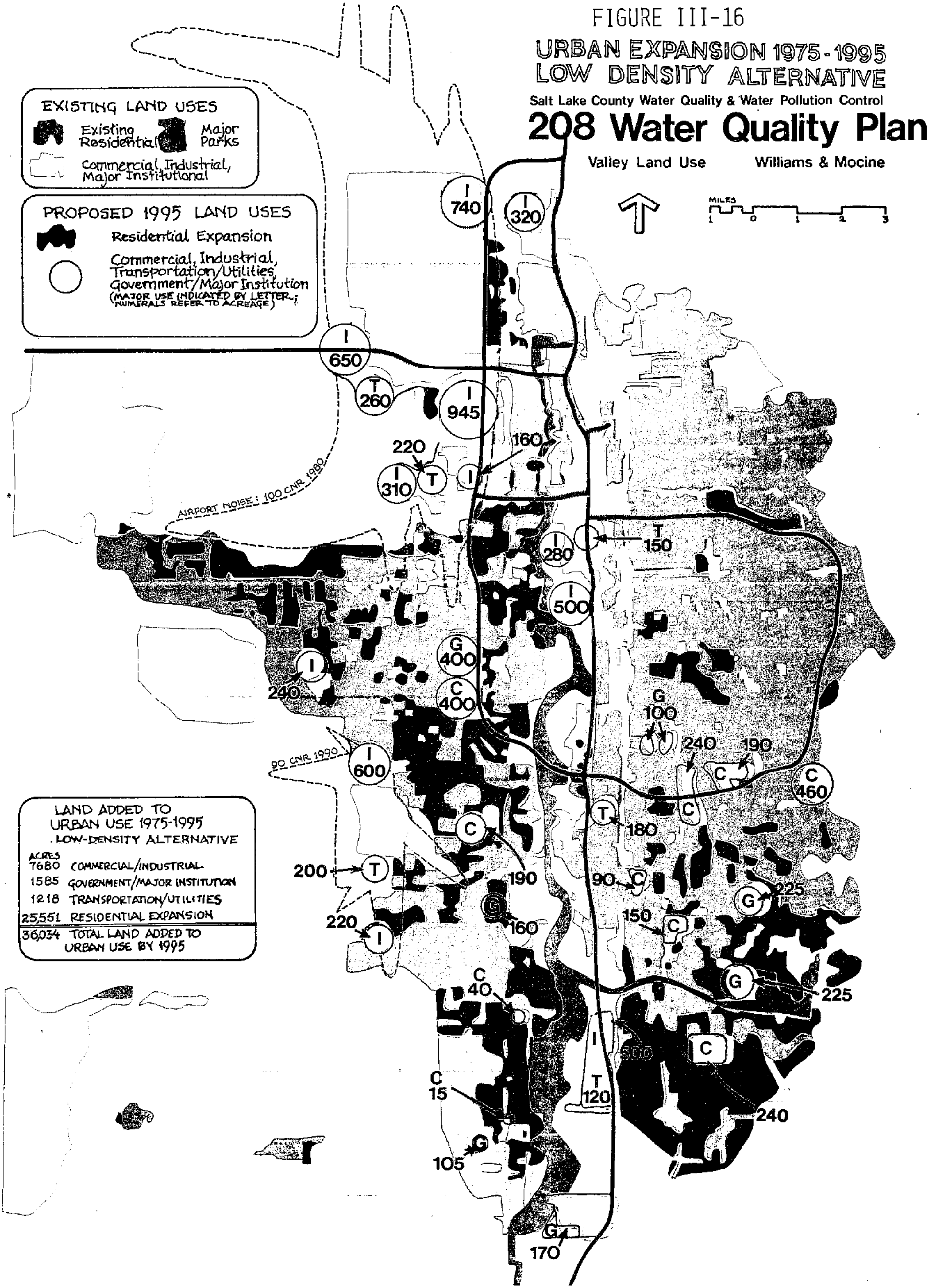


FIGURE III-17

URBAN EXPANSION 1975-1995
MEDIUM DENSITY ALTERNATIVE

Salt Lake County Water Quality & Water Pollution Control

208 Water Quality Plan

Valley Land Use   Williams & Mocine

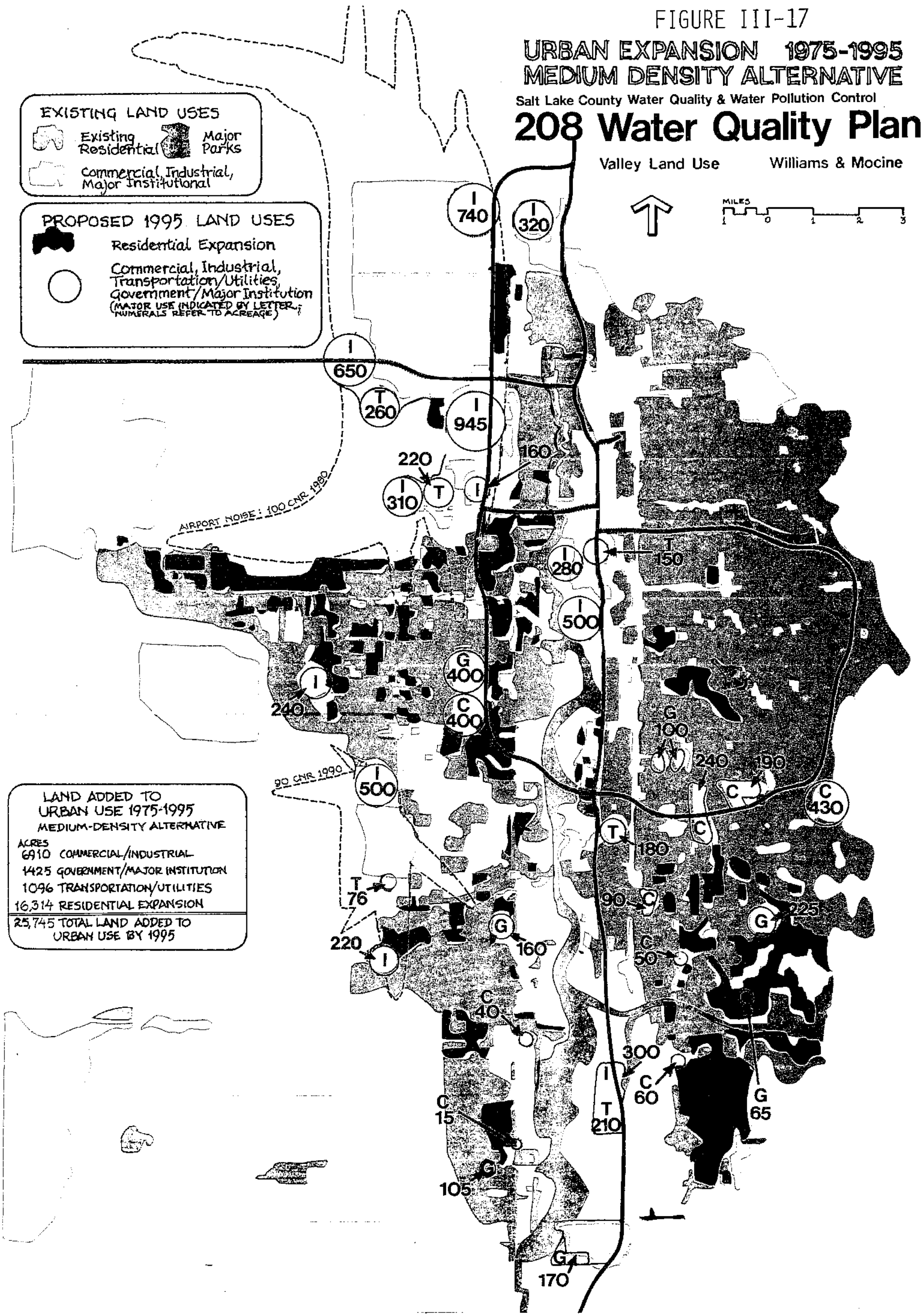


TABLE III-10

LOW AND MEDIUM DENSITY ALTERNATIVES

TOTAL RESIDENTIAL LAND USE AND DENSITY

SALT LAKE VALLEY

Statistical Areas	Existing 1975 Residential Acres	Existing 1975 Occupied Dwell. Units	Existing 1975 D.U. Acres	With Low Density Alternative 1995[a] Residential Acres	With Low Density Alternative 1995[a] Occupied Dwell. Units	With Low Density Alternative 1995[a] D.U. Acres	With Medium Density Alternative 1995[b] Residential Acres	With Medium Density Alternative 1995[b] Occupied Dwell. Units	With Medium Density Alternative 1995[b] D.U. Acres
9	332	1,113	3.4	725	2,811	3.9	705	2,811	4.0
12	417	1,292	3.1	486	1,792	3.7	469	1,792	3.8
14	81	956	11.8	81	856	10.6	81	856	10.6
15	1,723	11,678	6.8	1,855	12,827	6.9	1,812	12,827	7.1
16	2,388	10,673	4.5	4,779	23,234	4.9	4,069	23,234	5.7
17	5,470	57,376	10.5	5,740	62,297	10.9	5,740	62,297	10.9
18	9,360	43,297	4.6	13,227	63,760	4.8	11,051	63,760	5.8
19	3,628	11,215	3.1	11,875	42,969	3.6	8,416	42,969	5.1
20	630	1,719	2.7	2,071	8,378	4.0	1,588	8,378	5.3
21	5,077	24,425	4.8	12,632	59,254	4.7	10,450	59,254	5.7
22	1,089	3,986	3.7	1,759	6,692	3.8	1,647	6,692	4.1
8	370	38	0.2	720	140	0.2	720	140	0.2
Valley TOTAL	30,565	167,768	5.5	55,950	285,010	5.1	46,748	285,010	6.1

a. 1974, 1975 slats land use update and Salt Lake Co. Planning Dept. Land Use Map, 1975.

b. Based upon Williams & Mocine Predictions.

2) Increased urban and storm runoff to the Jordan River.

3) Decreased Agricultural Return Flows.

Detailed projections of various wasteloads allocations can be reviewed in Sections IV, V, and the end of Section III.

The causes for these impacts are summarized as follows:

CAUSE → / ↓ EFFECT	New Construction (116,000 new dwelling units)[a]	Additional Impervious Areas (Homes, Roads, etc. -- 22,000 acres)[b]	Added Waste Flows (31 million gallons/day)[c]	Consumption of Irrigated Agriculture (12,928 acres)[d]
1. Increased sewage flows	X		X	
2. Increased urban and storm runoff	X	X		X
3. Decreased Agricultural Return flows	X	X		X

Sources: a. ECONOMIC DEMOGRAPHIC FUTURES (LU-9)

b. BEST MANAGEMENT PRACTICES (LU-14)

c. FACILITIES & FACILITIES MANAGEMENT INTERIM (FM-5)

d. AGRICULTURAL FUTURE? (LU-12)

Each item under the "cause" column deserves some explanation:

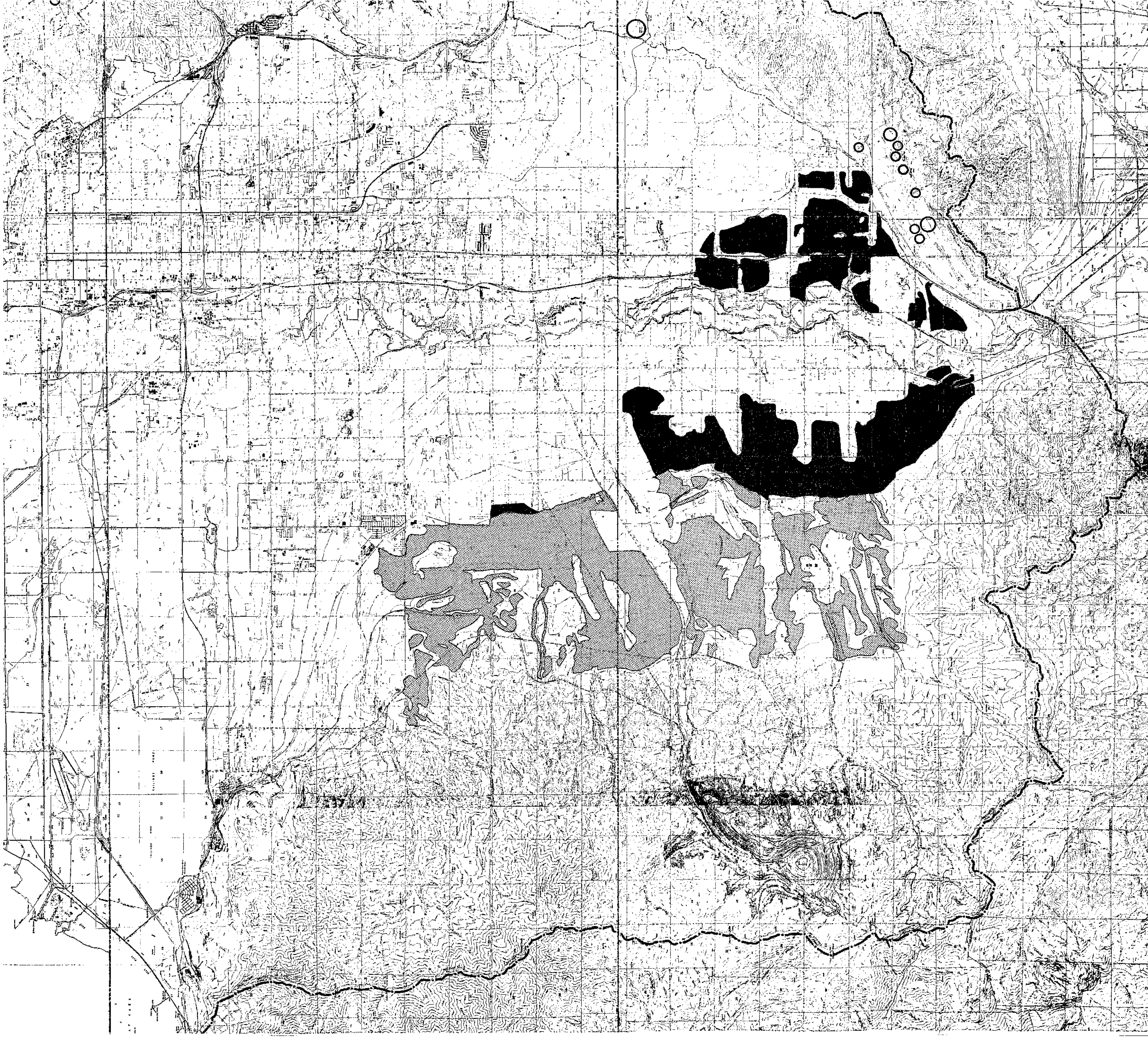
A. New Construction - Results of the 1977 208 Summer Stormwater Monitoring Program (unpublished) indicate dramatic pollutant increases in runoff from construction sites on upper bench areas of Salt Lake City.

FIGURE III-18

PROJECTED DEVELOPMENT

1995

SALT LAKE COUNTY



INDUSTRIAL
COMMERCIAL
RESIDENTIAL

AGRICULTURAL
PRIME LAND

PROPOSED NEW
AGRICULTURAL
PRIME LAND

CANYON
DEVELOPMENT

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

40 160 640 ACRES 10

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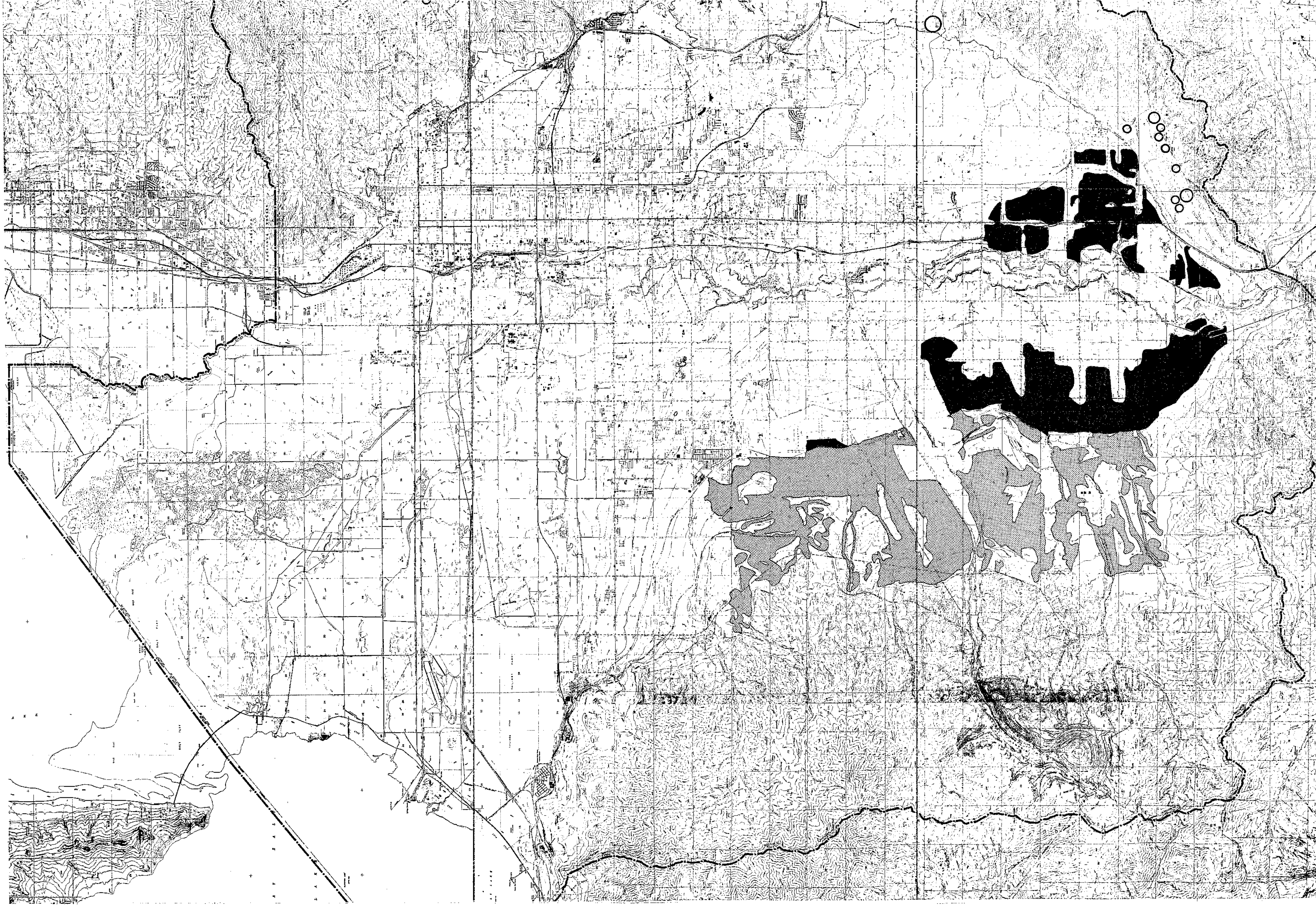
MILES

0 1 2 3 4



B. Additional Impervious Area- This applies to urban street runoff and the debris which it carries (wastes, nutrients, oil and grease, salts, etc.) Projections of storm runoff in Section IV indicate that the most highly urbanized section of Salt Lake Valley (North of 2100 South) produces the highest stormwater impacts.

C. Added Waste Flows- The generation of sewage from the increases in population will require extensive Treatment Facility improvement (see Section V).

D. Consumption of Irrigated Agricultural Land- The expansion of residential areas in the south portion of Salt Lake Valley will "consume" - at a minimum - about one-half of the irrigated agricultural land in the County. However, this consumption could be much higher than 12,000-13,000 acres if a sprawl growth pattern is permitted to continue (see Agricultural Future? LU-12). The reasons for this are the extensive fragmentation of large farming parcels and irrigation systems, the invasion of croplands by unauthorized tresspass and continuous vandalism, and the inflation of agricultural land values due to real estate speculation.

More specific locations, where impact can be expected from non-point pollution, are discussed in Section VI and VII.

Wasatch Canyons - 1995

Technical Report LU-13, (Technical Land Use Plan - Wasatch Canyons) presents a somewhat different approach than that taken in the Salt Lake Valley. The planning process began with a more exhaustive inventory of natural constraints, assessing the relative suitability for development of large canyon sites, and proposing hypothetical levels of use in each canyon. Typical development densities were used where appropriate (as in Brighton, where one cabin unit per acre was most often assumed) in order to "fill up" the acreage available that is most suitable for development. "Most suitable" refers to land that does not possess more than one limiting natural constraint (steep slope, avalanche hazard, susceptibility to slippage, etc). Therefore, the assumption made in this approach is that economics will guide development to where development expense can be held to a minimum. Table III-11 summarizes the respective canyons where new intensive development is most likely to occur. The assumptions made that give form to anticipated canyon growth include:

City Creek Canyon

Existing facilities and uses. No major expansion.

Red Butte Canyon

Existing facilities and uses. No major expansion.

Emigration Canyon

Anticipate moderate residential. Possibility of tripling the existing level of year-round dwelling units.

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 dewlling 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.

TABLE III-11.

LAND SUITABLE FOR DEVELOPMENT (ACRES) (1) WATERSHED \ LAND SUITABILITY	Adjacent to existing development or road with Private ownership and No mapped constraints	Adjacent to existing development or road with Private ownership and 1 mapped constraint	TOTAL
City Creek Canyon	12 (2)	35 (2)	47
Red Butte Canyon	-- Not Measured --		
Emigration Canyon	2	201	203
Parley's Canyon	21	181 (3)	202
Mill Creek Canyon	0	46	46
Big Cottonwood Canyon	292 (4)	401 (5) (6)	693
Little Cottonwood Canyon	6 (7)	254 (7) (8) (9) (10)	260
Eastern Traverse Mountains	106	1,597	1,703

Notes:

(1) Excludes land already developed.

(2) All at canyon mouth.

(3) Some adjacent to I-80.

(4) 10 acres on site of proposed Argenta Reservoir.

(5) 94 acres on site of or downstream of proposed Argenta Reservoir.

(6) 58 acres of existing downhill ski terrain.

(7) An additional 9 acres with no constraints but public ownership and 8 acres with 1 constraint and public ownership were identified in Alta Village.

(8) 183 acres at or near canyon mouth.

(9) 19 acres on ski terrain in Albion Basin.

(10) Only 58 acres of suitable private land identified in the upper canyon.

Traverse Mountains

No existing development. Minor new residential and picnic capacity.

Table III-12 summarizes some of the most important uses for the two alternative levels of use. Figure III-19 shows the general location of the most suitable land for development in each canyon. It is within these locations that either the high or low use levels could be expected.

Whether low or high development levels take place in the canyons, it is clear (based on historical water quality data, WQ-1) that at least two impacts on water qualtiy can be expected. These impacts are mainly septic tank leakage and stormwater runoff:

1) Septic Tank leaching/Holding Vault leakage- The possibility of up to 490 new residential units in Emigration Canyon implies that additional leakage from sanitary holding vaults (now required by the City-County Health Department) can be expected unless sanitary sewer facilities are installed or proper operation of new holding tanks is required and monitored and old septic tanks are replaced by no-discharge holding tanks. Constant high pollution levels from existing septic tank drain fields will also persist unless removed and/or not operated. Additional waste disposal methods unless sanitarily operated can be expected to add to the high pollutant levels in Emigration Creek. This is expected in any canyon development.

2) Stormwater Runoff- The result of either use level in the canyons will be an increase in construction activity and an increase in impervious area. Both these increases can be expected to raise pollutant and stormwater discharge levels.

TABLE III-12 ALTERNATE USE LEVELS

WATERSHED	DEVELOPMENT	PRESENT (1975)	ALT. "A" 1995 HYPOTHETICAL LOW LEVEL OF DEVELOPMENT (total: existing plus proposed)	ALT. "B" 1995 HYPOTHETICAL HIGH LEVEL OF DEVELOPMENT (total: existing plus proposed)
City Creek Canyon	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	1 0 845	1 0 845	1 0 1,100
Red Butte Canyon	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	0 0 0	0 0 0	0 0 0
Emigration Canyon	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	240 0 0	260 0 0	730 0 0
Parleys Canyon	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	83 0 80	165 0 80	440 300-600 1,000
Mill Creek Canyon	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	73 0 1,842	81 0 2,000	100 0 2,600
Big Cotton-wood Canyon	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	514 685 1,530	729 800 1,700	1,460 1,000 2,000
Little Cotton-wood Canyon	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	1,104 480 0	2,154 550 100	2,960 700 200
Eastern Traverse Mountains	Total dwelling units Campground capacity (persons) Picnic area capacity (persons)	0 0 0	100 0 100	800 0 200

"Hypothetical Levels of Development" as described on Table III-12 are not projections. They do not represent what is expected to happen in the Canyons. These use levels merely present what is possible given the development of the most suitable land under existing zoning in the Canyons. They do not indicate what the probable levels of development could be.

If is difficult, if not impossible, to project the level of growth in each canyon based on suitability alone. There are too many variables that influence the level of development of any one point in any one canyon.

Therefore, the reasoning used in presenting hypothetical use levels for the canyons is simply to call attention to what may happen in the canyons given the availability of most suitable land. These possilities cannot be ignored when important canyon watershed safeguards and policies are to be debated and implemented. In summary, the Hypothetical Use Levels represent the highest and most critical levels that could result - assuming no zoning changes are allowed, and construction is undertaken using present technology.

FUTURE AIR QUALITY

The Clean Air Act amendments of 1977 require that each State shall demonstrate, through the State Implementation Plan (SIP), attainment of national primary and secondary standards as rapidly as possible. Primary standards, set for protection of public health, are to be attained no later than December 31, 1982. However, if the State can demonstrate that attainment is not possible for carbon monoxide (CO) and/or photochemical oxidants (Ox) with stationary sources and transportation emissions controls, then the State shall be eligible for a five year extension of the 1982 deadline (to December 31, 1987).

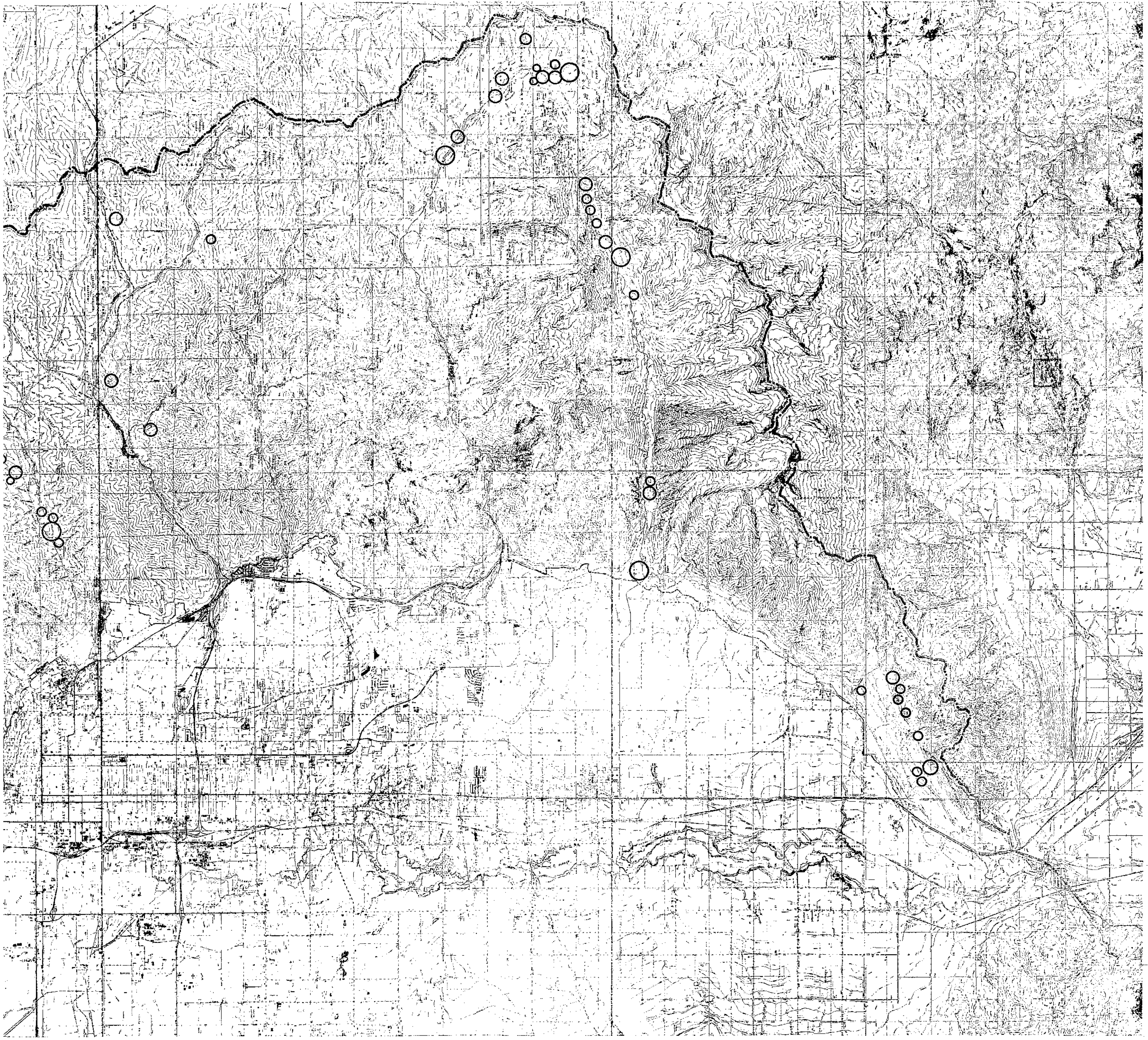


FIGURE- III-19

WASATCH CANYON DEVELOPMENT,

SUITABILITY, ANTICIPATED LOCATIONS

INDUSTRIAL
COMMERCIAL
RESIDENTIAL

MOST SUITABLE CANYON DEVELOPMENT LOCATIONS

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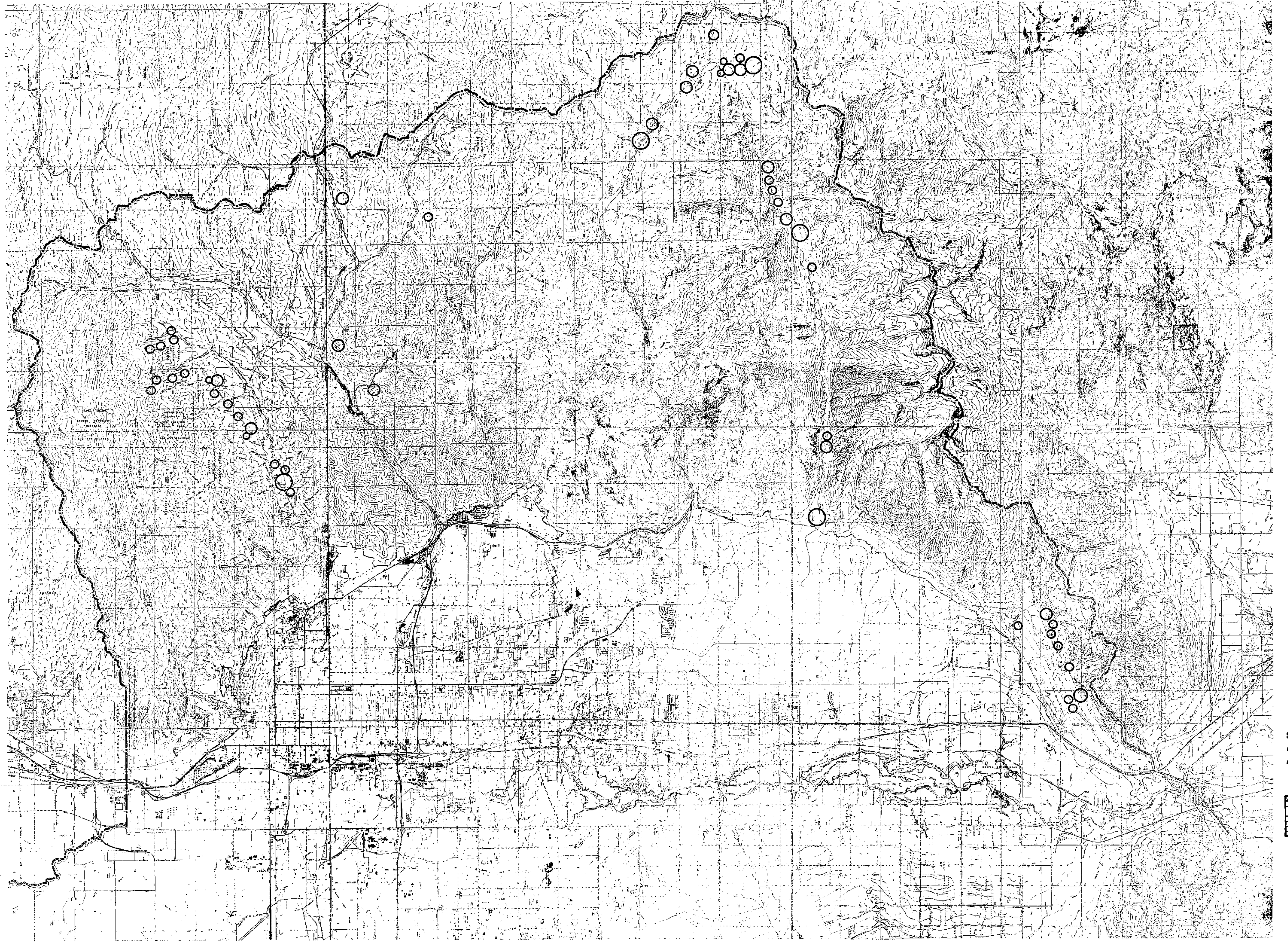


At this time, there exist no comprehensive air quality projections for Salt Lake County nor a SIP for the State. The discussion is taken from the Preliminary Transportation Control Plan for the Wasatch Front Region prepared by the Wasatch Front Regional Council. It is anticipated that there will exist an SIP on January 1, 1978.

Emissions growth due to population growth is at the discretion of the State if other measures are taken to meet the statutory deadlines of 1982 or 1987. However, these growth rate predictions must be consistent with other Federal planning programs (FWPCA 208, 201; HUD 701; FHWA 134; etc.). Traffic growth rates used in the Preliminary State Transportation Plan are 1% per year and 4% per year for the Salt Lake central and urbanized areas respectively.

Discussions with the State and the Wasatch Front Regional Council (WFRC) indicate that standards for SO_2, NO_x, Particulates, and CO will be attained in Salt Lake County. Salt Lake City will not attain December '82 CO standards and the entire county will not attain the December '82 photochemical oxidant standard.

Ninety (90) percent of all CO emissions and 58% of Hydrocarbon (HC) emissions in Salt Lake County are due to transportation. (Hydrocarbons are the primary precursors of oxidant concentrations). Twenty-four (24) percent of NO_x emissions result from this source. In 1977, the eight-hour standard for CO (9.0 ppm) was violated 24 days while the one-hour standard for photochemical oxidants (9.98 ppm) was violated 23 days at the Salt Lake City monitoring station.

To attain the CO standard, transportation emissions will need to be reduced by 40%. Based upon FMVCP, an inspection and maintenance program, and reasonable traffic control measures, the standard will be attained.

To attain the photochemical oxidant standard, an estimation of the impact on Ox through reduction of HC is necessary. It appears as though a 55% reduction in all HC emissions is necessary.

A reduction of approximately 25% in total HC emissions can be achieved through a transportation control program while a 30% reduction in total HC emissions is necessary from point sources. The 30% HC reduction required from other than transportation sources is equivalent to a 71% reduction in total process emissions. It is anticipated that the State will have to apply for a five-year extension from the December 31, 1982 to December 31, 1987.

The only control of air pollution sources that sewage treatment districts could impose, other than emissions from treatment plants themselves, is a limitation on sewer hook-ups. The result of this type action would be a change-over to septic and holding tanks, illegal hook-ups or illegal discharges (untreated) to surface waters of the county. These measures have been observed in Salt Lake County in the past. The HC problem cannot be totally solved by the implementation of a transportation control plan but rather needs the implementation of a point source emission reduction program. This aspect is not specifically related to growth itself.

Because of the limited authority of the special purpose districts which contain the largest land areas for future growth and because of observed past enforcement problems related to sewer hook-ups, the building of additional sewage treatment capacity is not a material contributor to growth, but provides a response to other pressures as long as growth subsidy is avoided in rate schedules and connection fees. The strongest need is for an overall SIP which addresses point source emissions and automobile caused pollutants.

ANTICIPATED WASTEWATER FLOWS

Increases in wastewater flows in Salt Lake County will result from increases in population and be decreased by sewer system rehabilitation. Coupled with increasing population will be an increase in industrial wastewater flows.

Projected domestic wastewater loading have been calculated by using the following factors:

1. Wastewater flow: 100 gallons per capita per day
2. BOD_5 load: 0.167 lbs. per capita per day
3. SS load: 0.167 lbs. per capita per day

As discussed later, it is expected that for industries discharging to municipal sewers, water use for employees will not change significantly over the next 25 years, and therefore, increases in industrial flow to municipal wastewater treatment plants will be proportional to increases in industrial employment.

Since the industrial flow to most municipal plants is minor, it was not considered necessary to accurately estimate employed industrial personnel increases over the planning period; it has been assumed that increases in industrial employment will be approximately the same as increases in total employment. Therefore, industrial wastewater flow and load projections have been made by increasing present flows and loads by the same proportion that total employment is projected to increase in the county.

Summer infiltration at most plants in higher than the average infiltration developed in the reconstruction of present flows. Final results of all county infiltration/inflow analyses are not available. Until they are, it is assumed that system rehabilitations will lower summer inflows and infiltration. Rehabilitation will affect average annual infiltration to some degree.

Projected future flows generated in facilities planning areas is shown in Table III-13.

Table III-13. Projected Average Daily Flows And Loads by Facilities Planning Areas

Planning Area		Year		
		1980	1990	2000
Salt Lake City	Flow (mgd)	36.0	36.6	37.1
	BOD_5 (lb/day)	37,000	37,800	39,500
Magna	Flow	1.2	1.5	1.7
	BOD_5	1,700	2,200	2,500
Upper Jordan	Flow	16.0	24.0	32.0
	BOD_5	23,500	35,300	47,000
Lower Jordan	Flow	40.0	45.0	51.0
	BOD_5	55,700	63,000	71,300

Maximum flows and loads for the Salt Lake Valley STP's can be adequately provided for by application of multiplication factors shown in Table III-14.

Table III-14. Multiplication Factors for Extreme Conditions

Item	Factor
Minimum Flow	0.4
Maximum Daily Flow	1.4
Peak Flow	
Plant Flow <10 mgd	2.5
Plant Flow >10 mgd	2.0

Source: FM-5

IV. Water Quality Conditions

IV. WATER QUALITY CONDITIONS

PRESENT WATER QUALITY

Present water quality in Salt Lake County ranges from excellent in the upper Wasatch Mountains to poor in the lower reaches of the Jordan River. Primary reasons for the degradation of the waterways are storm drainage, urban runoff, agricultural returns and impacts, municipal and industrial discharges and others. These factors are not listed in order of magnitude of impact. The first section will present the most current water quality available for continuously flowing streams, rivers and canals in Salt Lake County with a short description of the quality and characteristics of each of these waterways. Intermittent streams and storm drainages are discussed in the second section.

Streams, rivers and canals and their associated drainage areas, are shown in Figure IV-1. The format for discussion and presentation of data will be to describe representative water quality and habitat conditions of streams from the north portion of the county, upstream to downstream, to the south portion of the county, then the Jordan River from south to north (the direction of the flow), and finally the major irrigation canals from south to north (the direction of flow). Locations for quality of County streams discussed in the following text are shown in Figure IV-2.

City Creek

City Creek is a high mountain stream in its upper reaches used primarily as culinary water supply for Salt Lake City. Below the water treatment plant, located approximately three miles from the canyon mouth, the stream runs through a park and is then diverted to the city storm drain system (North Temple storm drain) and conveyed to the Jordan River. The water quality of the stream in the upper canyon is excellent because of restricted access to the canyon.

Representative quality data (coliform MPN) for City Creek at the water treatment plant for low flow conditions is shown in Table IV-1.

Table IV-1 Total Coliform Numbers at City Creek Water Treatment Plant*
(MPN/100 ml)

Year	Month		
	July	August	September
1973	258.0	222.0	91.0
1974	41.0	40.0	14.0
1975	21.0	21.0	15.0

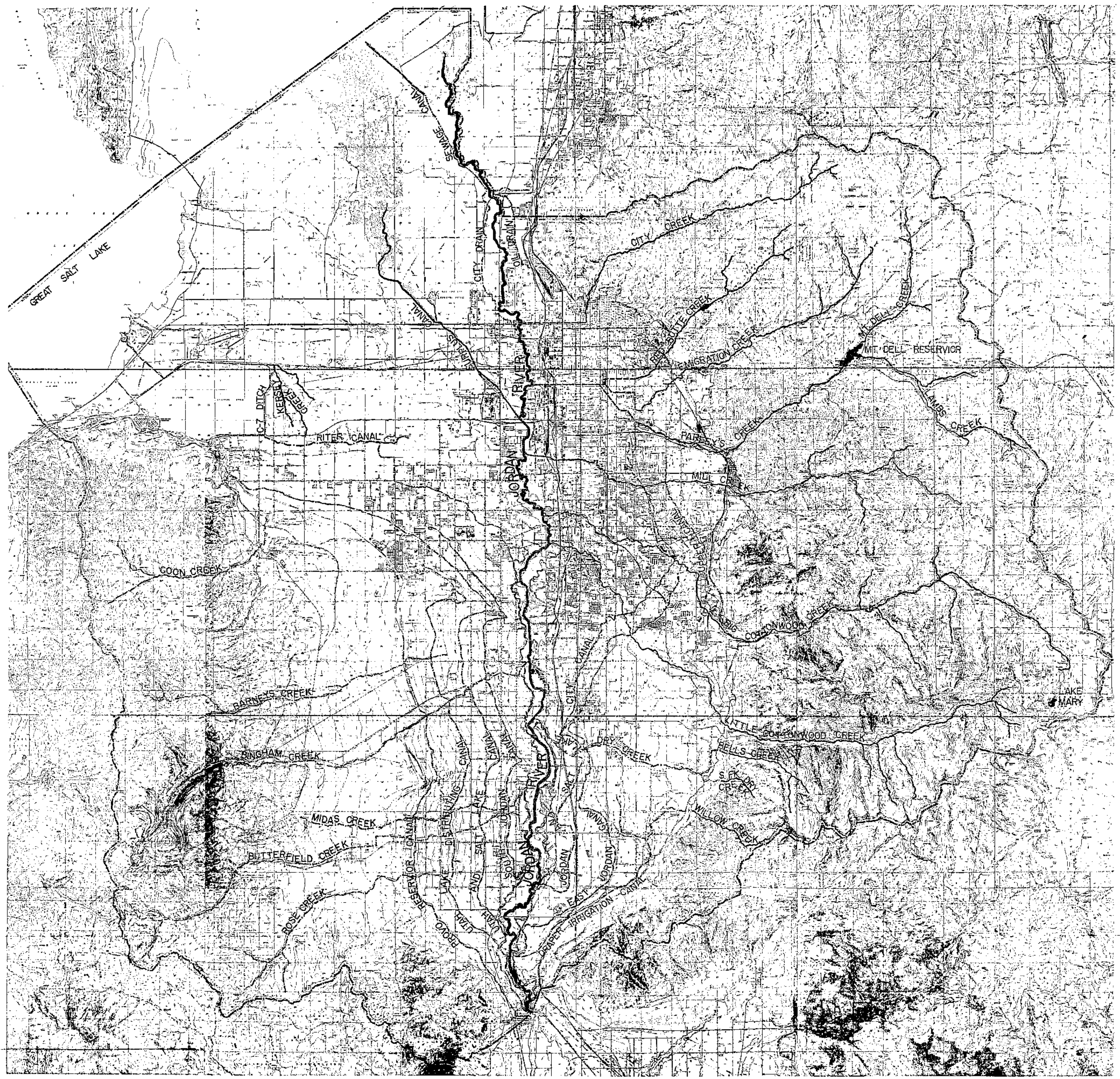
*Monthly average for low flow conditions.

Red Butte Creek

Red Butte Canyon has been closed to the public for over 70 years, first by the Fort Douglas Military Reservation and more recently by the U.S. Forest Service. The Forest Service now maintains the canyon as a natural research area. Public access is controlled to the point where the only access is for research of the area, limited fishing for patients from the Veterans Administration Hospital at Salt Lake City, and limited deer hunting in the fall for herd control purposes. The restricted access provided the opportunity for a comparative evaluation of canyon stream uses and the impact upon water quality in Salt Lake County by the 208 staff.

The water in Red Butte Creek above the reservoir is of excellent quality and is the culinary water supply for Fort Douglas, located near the

FIGURE IV-1
MAJOR SALT LAKE VALLEY STREAMS
AND CANALS



PERENNIAL
INTERMITTENT AND CANALS
STORM DRAIN

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FIGURE IV-2

SAMPLE STATION LOCATIONS FOR GENERAL WATER QUALITY DISCUSSION

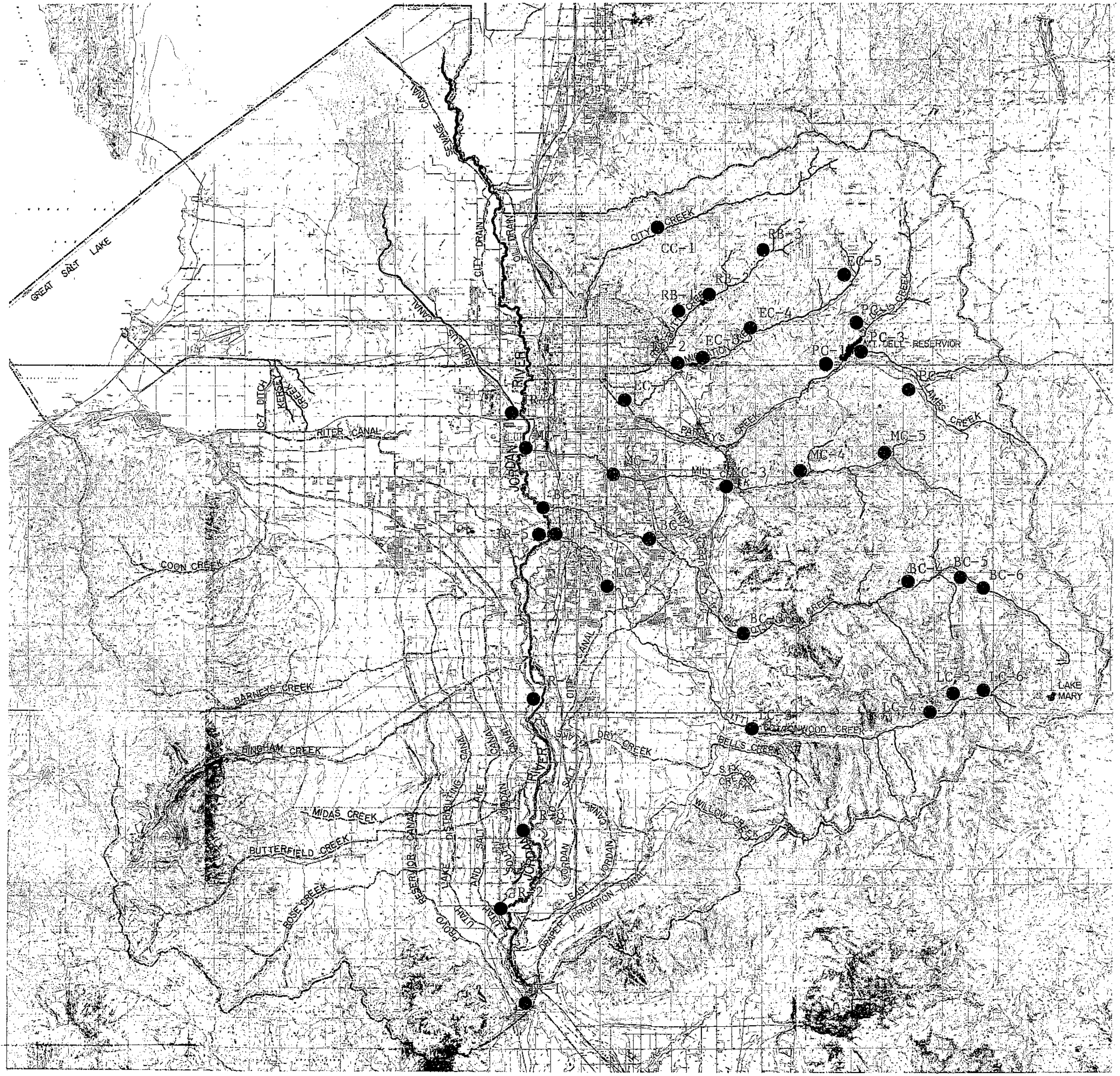

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Table IV-3. Water Quality in Emigration Creek*

Sample Station Date	Temp (^oC)	Total Coliform (MPN/100)	Fecal Coliform (MPN/100	BOD_5 (mg/1	DO (mg/1)
EC-5 July 1976	11°-15°	3,316	763	1.0	8.0
Sept. 1976	9°-12°	1,778	717	1.3	8.2
EC-4 July 1976	13°-17°	2,303	813	<1.0	7.8
Sept. 1976	10°-13°	1,302	608	2.3	8.1
EC-3 July 1976	14°-18°	1,937	570	1.0	7.8
Sept. 1976	11°-14°	4,377	760	1.2	8.2
July 1977		2,300	430		6.9
EC-2 July 1976	15°-18°	7,264	1,493	1.2	7.8
Sept. 1976	11°-14°	25,411	1,517	2.0	8.1
EC-1 July 1976		9,300		<1.0	7.6
Sept. 1976		9,300		1.0	8.5
June 1977	No	Flow			

*Monthly averages for low flow conditions.

TABLE IV-4 COLIFORM (TOTAL) NUMBERS IN PARLEY'S CANYON STREAMS*

Sample Station	Date	Coliform (total) (MPN/100 ml)
Upper Lambs Canyon (PC-4)	7/74	53
	8/74	48
	9/74	39
	7/75	38
	8/75	33
	9/75	16
Lower Lambs Canyon (PC-3)	7/74	32
	8/74	33
	9/24	43
	7/75	61
	8/75	31
	9/75	24
Little Dell (PC-2)	7/74	55
	8/74	39
	9/74	60
	7/75	39
	8/75	32
	9/25	12
Parley's at WTP (PC-1)	7/74	8
	8/74	1
	9/74	1
	7/75	1
	8/75	1
	9/75	1

*Monthly averages for low flow conditions

Mill Creek

Mill Creek Canyon is used extensively for summer recreation and less intensively for winter recreation. There are many U.S. Forest Service picnic grounds located adjacent to the stream throughout the length of the canyon, two commercial developments, and some summer cabins in the upper reaches of the stream. From the mouth of the canyon to the Jordan River, the stream has been channelized extensively and receives numerous discharges from storm drains and canal return flows. Recreational usage in the canyon causes most of the bacterial counts in the valley portion of the stream. Additional reduced water quality impact is created by discharge of unused canal water originating in Utah Lake pumped by Salt Lake City to serve exchange agreements and urban and storm runoff.

Representative water quality data for this stream is shown in Table IV-5. This stream continuously flows year round throughout the entire length except for some isolated reaches where irrigation water rights deplete the flow. The depletion in this stream is not the rule but rather the exception.

Big Cottonwood Creek

Big Cottonwood Creek is the longest tributary stream of the Jordan River. The canyon is used extensively for winter and summer recreation in addition to year-round housing. Two U.S. Forest Service campgrounds in addition to other picnic areas are located in the canyon adjacent to the stream. Other summer activities include many hiking trails, camping, and the largest concentration of summer homes of all the Jordan River tributary streams. Winter recreation activities include two ski resorts, snowmobile and cross country skiing trails, and some commercial establishments. The stream is culinary water supply for Salt Lake Valley and therefore water quality is monitored closely.

Table IV-5. Water Quality of Mill Creek*

Sample Station	Date	Temp (^{0}C)	Total Coliform (MPN/100ml)	Fecal Coliform (MPN/100ml)	BOD_5 (mg/1)	DO (mg/1)
MC-5	7/76	9-13	63	13	<1.0	8.1
	9/76	8-9	199	46	1.3	8.5
MC-4	7/76	10-12	138	34	<1.0	8.1
	9/76	8-10	379	105	1.5	8.7
MC-3	7/74		67			
	8/74		67			
	9/74		18			
	7/75		56			
	8/75		86			
	9/75		33			
	7/76	11-15	193	63	<1.0	8.0
	8/76	9-12	94	14	<1.0	7.7
	9/76	9-10	673	196	1.4	8.3
MC-3	6/77	15	2,300**	430**	5.5	7.8
	7/77	13	2,300**	20**		7.5
MC-2	7/76		2,500**		2.0	7.9
	9/76		4,300**		4.5	7.8
	6/77	23	1,500**	230**	9.9	6.8
	7/77	22	2,300**	230**		8.0
MC-1	7/76		930**		<1.0	7.9
	9/76		9,300**		2.3	8.1
	6/77		9,300**	430**	2.2	8.8
	7/77		1,500**	23**		7.8

*Monthly mean for low flow conditions.

**Multiple Tube dilution method of analysis; all other coliform data is membrane filter.

Representative water quality data for Big Cottonwood Creek is shown in Table IV-6. The stream flows year round from the headwaters to the canyon mouth. Diversion of the stream for culinary purposes at the water treatment plant depletes the flow, usually taking all the flow during the low flow peak culinary demand times of the year (July to September).

Below the WTP at the canyon mouth, the stream is dewatered for the summer low flow months. The stream channel passes through a moderately urbanized area of Salt Lake County for the rest of the way to its confluence with the Jordan River. Stream flow is augmented by urban and storm runoff, groundwater seepage, and canal waters (through existing exchange water rights). Urban and storm runoff and unused canal waters originating in Utah Lake pumped by Salt Lake City to serve exchange agreements are responsible for the lower quality of water in the valley portion of the stream.

Little Cottonwood Creek

Of all the Wasatch Mountain streams, the water quality of Little Cottonwood Creek has been studied the most intensively. This canyon has seen recent development of Snowbird, a major ski resort, just below the town of Alta, located at the head of the canyon. Two U.S. Forest Service camp grounds are located in the canyon portion of the stream, numerous hiking trails traverse the canyon, and a wilderness area has been designated in the lower portion of the canyon (the only designated wilderness area in Utah). The stream is the southernmost continuously flowing stream in Salt Lake County and flows through the least amount of urbanized area. The canyon water is used as culinary water supply for Salt Lake Valley, causing the stream to be completely

Table IV-6. Water Quality in Big Cottonwood Creek*

Sample Station	Date	Temp (°C)	Total Coliform (MPN/100ml)	Fecal Coliform (MPN/100ml)	BOD_5 (mg/l)	DO (mg/l)
BC-6	7/75		55			
	8/75		82			
	9/75		23			
	7/76	13	240	240	<1.0	7.6
	8/76	9-13	59	6	1.2	7.8
	9/76	9	43	23	1.5	8.6
BC-5	7/75		1247	39		
	7/76	10	39	14	<1.0	8.0
	8/76	9-12	17	2	1.4	7.9
	9/76	9	43	4	1.6	8.5
BC-4	7/76	10	43	43	<1.0	7.8
	8/76	9-11	28	7	1.1	7.9
	9/76	9	23	4	1.4	8.6
BC-3	7/75		1187			
	7/76	12-13	25	6	<1.0	7.8
	8/76	11-12	29	<3	<1.0	7.7
	9/76	9-11	118	7	<1.0	8.2
	6/77	14	23	<3	1.2	7.9
	7/77	13	210	<3		7.3
BC-2	7/76	20	2400		<1.0	7.9
	8/76	19	4300		5.1	7.8
	9/76	17	7500		3.3	7.6
	6/77		230	23	2.0	7.5
	7/77		43	<3		7.9
BC-1	7/76	20	93		<1.0	7.8
	8/76	17	4300		4.2	7.8
	9/76	17	7500		2.6	8.2
	6/77		9300	230	2.5	6.9
	7/77		230	3		6.5

*Monthly averages for low flow conditions.

dewatered at the canyon mouth during the low flow high culinary demand period of the year. Below the canyon mouth, stream flow is augmented by groundwater seepage, urban runoff, and irrigation flows and canal inflows. Urban runoff, canal water pumped by Salt Lake City from Utah Lake to serve exchange agreements and irrigation flows create lower water quality in the valley portion of the stream. The valley portion of the stream has been somewhat channelized, especially in the lower reaches just above the confluence with the Jordan River at approximately 4800 South. Representative water quality of Little Cottonwood Creek is shown in Table IV-7.

The valley portion of Little Cottonwood Creek is dewatered and is impacted by point and non-point pollution. Institution of best management practices in the valley portion of this stream could reduce non-point pollutant loadings.

Intermittent Streams

Intermittent streams in Salt Lake County usually flow during spring snowmelt runoff and storm runoff. These streams, which are shown in Figure IV-1 sometimes convey emergency high flows from irrigation canal systems during storm events. This phenomena is brought about by the irrigation companies allowing storm drainage from new subdivisions to be diverted to the canal systems. This process has been developed by the Salt Lake County Flood Control Department.

Water quality of these streams has not been intensively monitored in the past and will probably not be in the future. Because of very low flow volumes, the impact on the Jordan River caused by these intermittent streams is very small, if any except for storm runoff. It is expected that these streams will remain very small in magnitude of impact on Jordan River water quality. Determination of impacts from intermittent streams will be an ongoing effort to be handled by the Department.

Table IV-7. Water Quality of Little Cottonwood Creek*

Sample Station	Date	Total Coliform (MPN/100 ml)	Fecal Coliform (MPN/100 ml)	Temp. (°C)	BOD_5 (mg/l)	DO (mg/l)
LC-6	7/75	162				
	7/76	43	15	13	1.0	7.7
	8/76	<5	2	12	1.0	8.0
	9/76	23	1	6	1.3	8.5
LC-5	7/75	162				
	8/75	93				
	7/76	110	23	10	<1.0	7.6
	8/76	15	2	9-10	<1.0	7.9
	9/76	3	3	9-10	1.7	8.1
LC-4	7/76	7	7	10	<1	7.7
	8/76	8	<1	7	1.2	7.8
	9/76	4	<1	10	1.5	8.4
LC-3	7/75	68				
	8/75	93				
	7/76	15	2		<1.0	7.7
	8/76**	22	3		<1.0	7.6
	9/76**	29	10		1.3	8.3
	6/77	430	93		1.3	7.7
LC-2	8/76	4300		16	4.6	7.9
	9/76	24		18	7.6	7.7
LC-2	6/77	92	<3		2.0	7.6
	7/77	93	<3			7.2
LC-1	7/76	14000		22	1.1	7.5
	8/76	4300		17	4.1	8.2
	9/76	1500		18	6.4	7.3
	6/77	2300	230		2.9	6.4
	7/77	93	3			8.1

*Monthly averages for low flow conditions

**No flow at sample point (bridge at Wasatch Resort). Sample taken approximately 100 meters upstream at Metropolitan Water District WTP Diversion.

Jordan River

The Jordan River, the major waterway in Salt Lake County, is the only natural outlet from Utah Lake in Utah County. After leaving Utah Lake, the river flows northward approximately 15 miles before entering Salt Lake County through what is known as the Jordan Narrows. The river then continues northward through Salt Lake County approximately 41 miles, before entering a marshland at the inlet to Great Salt Lake. Along the 41 miles through Salt Lake County, seven sewage treatment plants, five major tributaries, numerous agricultural return flows and storm drainage augment the flow, but major irrigation diversions substantially deplete the flow. The locations of the present seven sewage treatment plants are shown in Figure IV-3. About 16 miles upstream from the Great Salt Lake, a major portion of the river flow is diverted into the surplus canal, which conveys high flow waters directly to the Great Salt Lake in order to alleviate flooding problems on the lower Jordan River.

Between Utah Lake and the Jordan Narrows (approximately the Utah-Salt Lake County line), the water is very turbid. Proceeding farther north, to approximately 12400 South (Salt Lake County), turbidity lessens. Reduction of turbidity results from the high proportion of groundwater in the flow. During the heavy irrigation diversion season, the entire flow is groundwater seepage. From this point downstream to the Great Salt Lake, water quality generally deteriorates and the natural channel has been substantially altered.

Representative quality data for the Jordan River is shown in Table IV-8. (See Figure IV-2, for sample station locations.)

Canals

The water quality of the major Salt Lake Valley irrigation canal systems has only been lightly investigated. Available data indicates that the quality of canal water is closest to that of Utah Lake. This is expected because most of the major irrigation canals divert water directly from the upper Jordan River. Figure IV-1 shows the major valley irrigation canals and ditches. Figure IV-4 shows a more detailed illustration of the canal systems including beginning and terminus points.

Table IV-8. Water Quality of the Jordan River*

Sample Station	Date	Parameter				
		Temp (°C)	Total Coliform (MPN/100 ml)	Fecal Coliform (MPN/100 ml)	BOD_5 (mg/1)	DO (mg/1)
JR-1	8/77	22	230	43	5.0	7.1
JR-2	8/72		406	279		9.2
	8/77	19	930	230	5.5	10.5
JR-3	6/77		150,000	2,300	4.2	6.3
	7/77		15,493	1,315	3.6	6.9
	8/77	17	4,300	930	4.3	7.8
JR-4	8/72		1,967	1,026		7.4
	6/77		23,000	430	4.5	7.5
	7/77		6,104	450	4.1	6.9
	8/77	20	7,500	2,300	4.5	7.5
JR-5	8/72		3,326	1,266		7.3
	6/77		93,000	2,300	4.6	6.1
	7/77		11,444	908	3.6	6.5
	8/77	19	4,300	930	5.1	8.1
JR-6	8/72		18,700	3,146		5.8
	6/77		2,300	430	8.8	6.2
	7/77		7,894	789	6.2	5.5

*Monthly averages for low flow conditions

Representative water quality data for selected canals is shown in Table IV-9. Sample station locations are shown in Figure IV-5.

As can be seen in Figure IV-4, the major east side canals terminate in smaller canals and in the valley portion of the Wasatch Mountain streams. The reason for flow from the canals to the stream channels is to satisfy water

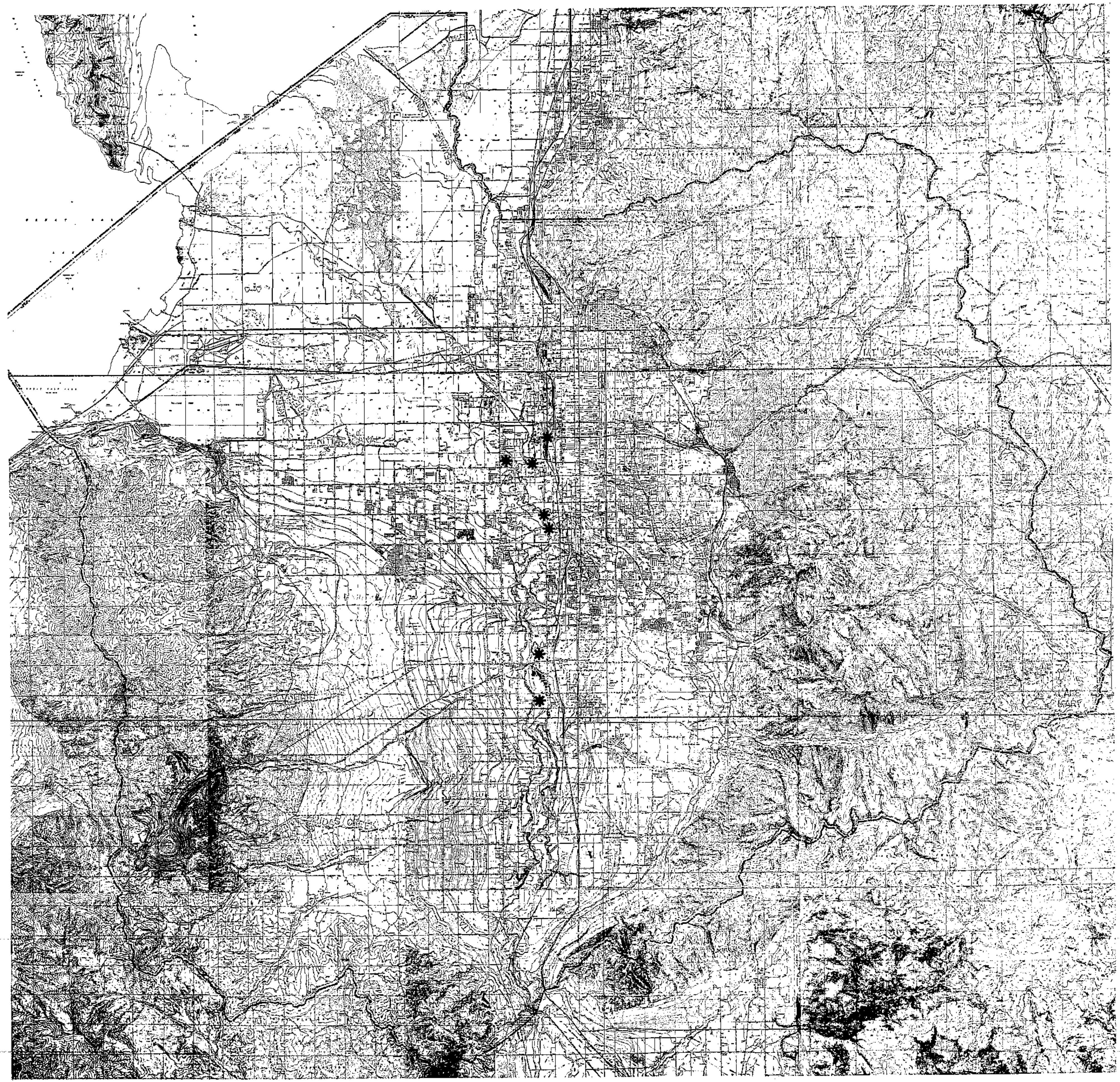

FIGURE IV-3. LOCATION OF SEWAGE TREATMENT PLANTS DISCHARGING TO THE JORDAN RIVER

* DESIGNATES LOCATION OF EXISTING TREATMENT PLANTS

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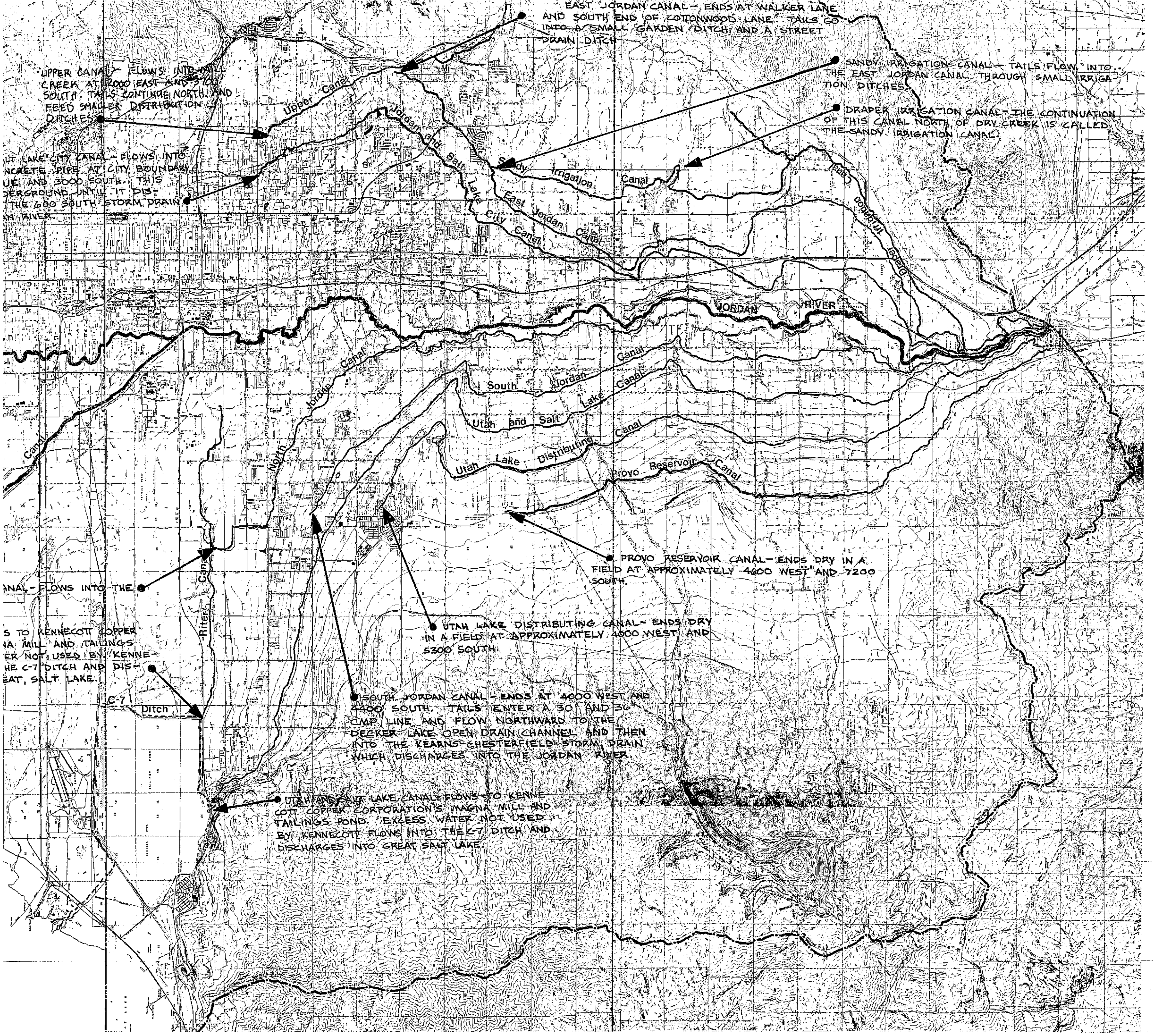
FIGURE IV-4.

SALT LAKE COUNTY MAIN CANALS AND THEIR TERMINUS POINTS



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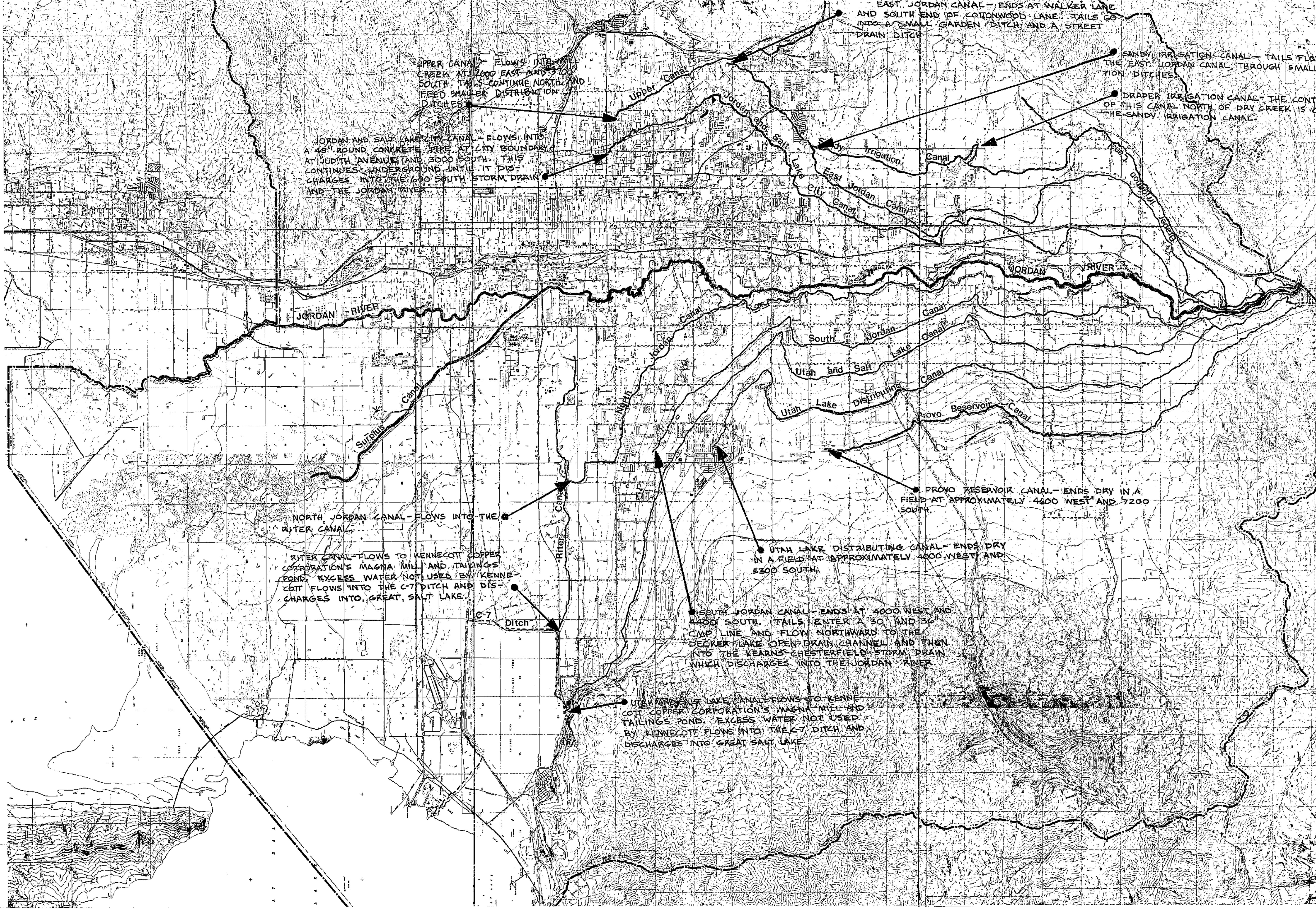


EAST JORDAN CANAL - ENDS AT WALKER LANE AND SOUTH END OF COTTONWOOD LANE. TAILS GO INTO A SMALL GARDEN DITCH AND A STREET DRAIN DITCH
SANDY IRRIGATION CANAL - TAILS FLO
THE EAST JORDAN CANAL THROUGH SMALL
TION DITCHES.
DRAPER IRRIGATION CANAL - THE CONT
OF THIS CANAL NORTH OF DRY CREEK IS
THE SANDY IRRIGATION CANAL.
UPPER CANAL - FLOWS INTO MILL CREEK AT 2000 EAST AND 3900 SOUTH. TAILS CONTINUE NORTH AND FEED SMALLER DISTRIBUTION DITCHES
JORDAN AND SALT LAKE CITY CANAL - FLOWS INTO A 48" ROUND CONCRETE PIPE AT CITY BOUNDARY AT JUDITH AVENUE AND 3000 SOUTH. THIS CONTINUES UNDERGROUND UNTIL IT DISCHARGES INTO THE 600 SOUTH STORM DRAIN AND THE JORDAN RIVER.
Upper Canal
Jordan and Salt Lake City Canal
Sandy Irrigation Canal
East Jordan Canal
Draper Irrigation Canal
JORDAN RIVER
JORDAN RIVER
North Jordan Canal
South Jordan Canal
Utah and Salt Lake Canal
Utah Lake Distributing Canal
Provo Reservoir Canal
Surplus Canal
Riter Canal
C-7 Ditch
PROVO RESERVOIR CANAL - ENDS DRY IN A FIELD AT APPROXIMATELY 4600 WEST AND 7200 SOUTH.
NORTH JORDAN CANAL - FLOWS INTO THE RITER CANAL.
UTAH LAKE DISTRIBUTING CANAL - ENDS DRY IN A FIELD AT APPROXIMATELY 4000 WEST AND 5300 SOUTH.
RITER CANAL - FLOWS TO KENNECOTT COPPER CORPORATION'S MAGNA MILL AND TAILINGS POND. EXCESS WATER NOT USED BY KENNECOTT FLOWS INTO THE C-7 DITCH AND DISCHARGES INTO GREAT SALT LAKE.
SOUTH JORDAN CANAL - ENDS AT 4000 WEST AND 4400 SOUTH. TAILS ENTER A 30" AND 36" CMP LINE AND FLOW NORTHWARD TO THE DECKER LAKE OPEN DRAIN CHANNEL AND THEN INTO THE KEARNS-CHESTERFIELD STORM DRAIN WHICH DISCHARGES INTO THE JORDAN RIVER.
UTAH AND SALT LAKE CANAL - FLOWS TO KENNECOTT COPPER CORPORATION'S MAGNA MILL AND TAILINGS POND. EXCESS WATER NOT USED BY KENNECOTT FLOWS INTO THE C-7 DITCH AND DISCHARGES INTO GREAT SALT LAKE.

rights that exist on the lower portions of the streams. Water from the upper canyons is of such quality that it is used for culinary purposes in Salt Lake Valley. To fulfill water rights on the valley portions of the streams, water is diverted from the Jordan River, conveyed to these streams via some east side canals, and released to the stream channels to augment the flows.

Table IV-9 Water Quality in Major Salt Lake Valley Irrigation Canal Systems*

Canal System	Sample Station	Date	Parameter: Total Coliform (MPN/100 ml)	Fecal Coliform (MPN/100 ml)	BOD_5 (mg/1)	DO (mg/1)
Utah & Salt Lake	U-1	7/76	13,598		5.4	6.7
		8/76	930		5.8	5.5
		9/76	735	109	5.2	6.6
	U-2	8/76	9,300		7.1	6.8
	U-3	7/76	900	230	1.4	6.9
South Jordan	S-1	7/76	10,606		5.5	6.6
		8/76	1,857		7.0	5.5
		9/76	1,059	89	4.5	5.5
	S-2	8/76	43,000		8.3	6.3
North Jordan	N-1	7/76	19,998		7.8	6.7
		8/76	3,145		10.6	5.9
		9/76	5,212	494	3.9	7.4
	N-2	8/76	11,000	2,500	1.1	6.9
East Jordan	E-1	7/76	4,300		1.7	7.5

*Monthly averages for irrigation season

As more agricultural land is developed into urban land on both the east and west side of the Jordan River, less water is required to maintain water quantities that have historically been applied to irrigate parcels of land. Appropriate storage and continued diversions to urbanized areas, chiefly planned subdivisions, to be used as home irrigation water is a concept endorsed by the 208 Project. However, continued diversions of historic quantities of water to irrigate smaller amounts of agricultural land is a phenomena that needs more study. This is an area of major concern to the Department.

Storm/Urban Runoff

Quality of urban storm and urban runoff has been investigated in the heavily urbanized portions of Salt Lake County. The results of a summer monitoring program conducted by the 208 Project staff showed that in some instances, pollution in storm runoff was greater than that of raw sewage. Table IV-10 shows quality of urban runoff for both dry-and wet- weather flows for the locations shown in Figure IV-6.

Table IV-10. Water Quality of Storm/Urban Runoff[1]

Parameter - Units	Averages				High	
	Dry Weather Flows		Wet Weather Flows		Dry Weather Flows	Wet Weather Flows
	Value	No. of Samples	Value	No. of Samples		
DO (mg/l)	6.0	12	5.9	17	7.1	6.9
BOD_5 (mg/l)	16.8	15	46.5	17	53.0	271.0
Total Coliform Bacteria (MPN/100 ml)	>44,000	16	>152,000	17	>230,000	>230,000
Fecal Coliform Bacteria (MPN/100 ml)	> 850	16	> 11,600	17	23,000	93,000
TSS (mg/l)	50.0	15	1390.0	17	210.0	7886.0
NH_3-N (mg/l)	0.37	16	0.43	17	1.20	1.25

[1]From 208 Water Quality Sampling Program-Summer 1976.

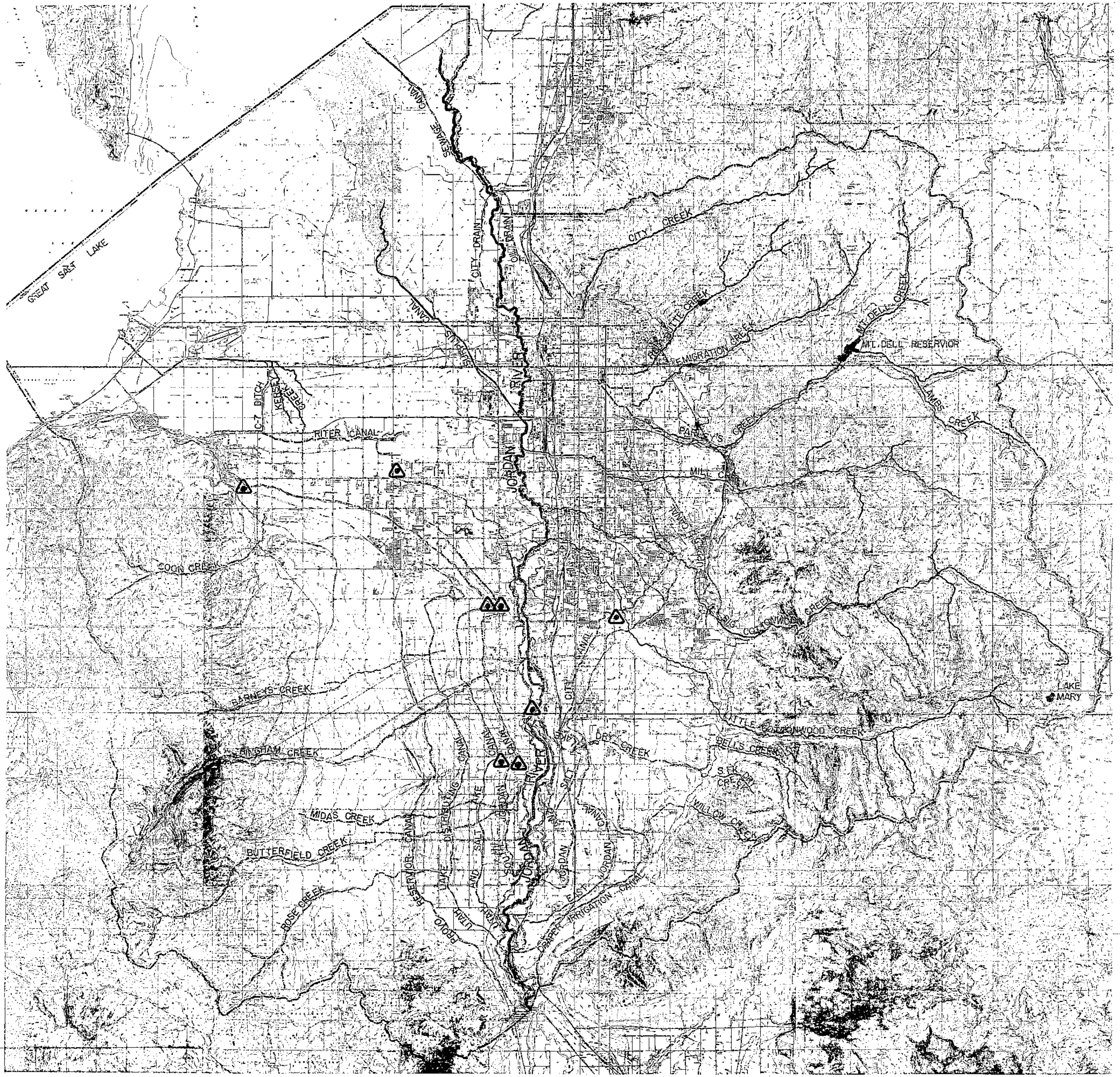
Groundwater

Ground water occurs in subsurface materials throughout Salt Lake County, but only the water in the valley fill is a major source for wells.

In mountainous areas some of the ground water escapes to the atmosphere by evapotranspiration; some seeps into stream channels and flows to Jordan

FIGURE IV-5

LOCATION OF SAMPLE STATIONS ON MAJOR SALT LAKE VALLEY IRRIGATION CANALS AND DITCHES



Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

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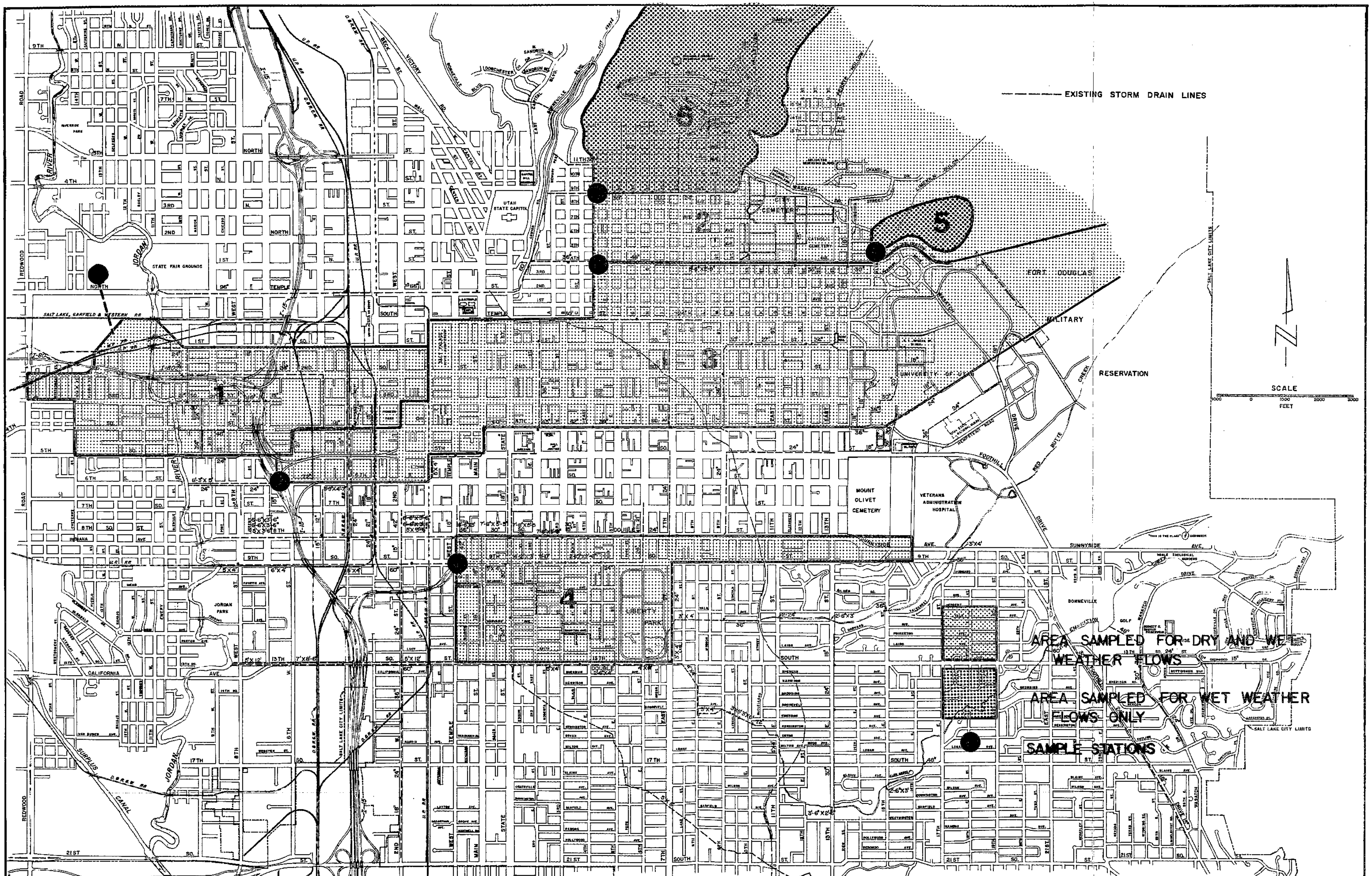


FIGURE IV-6. LOCATION OF SAMPLE STATIONS FOR URBAN/STORM RUNOFF

Valley; and the rest moves downward and laterally through openings in the bedrock into the valley fill. Thus, like surface water, most of the ground water eventually reaches the valley.

In the valley portion of the County, the unconsolidated deposits, ranging from coarse sand and gravel to fine silt and clay, rest on a bed of semiconsolidated deposits or solid rock. All the unconsolidated valley fill that is saturated is included in the ground water reservoir of the Jordan Valley.

In the northern and central parts of the Jordan Valley, a segment of the valley fill 40 to 100 feet thick and 50 to 150 feet beneath the land surface contains many beds of low permeability that act collectively as a single bed and retard the vertical movement of water. The segment tends to confine water in the aquifer beneath it and is designated the confining bed. Because this bed divides the more permeable fill into segments, each of which is characterized by a different pattern of water movement, several distinct aquifers within the reservoir are recognized.

The approximate real extent of the aquifers is shown in Figure IV-7. The confining bed occurs in the areas designated as confined and shallow unconfined aquifers and also in the area designated as perched aquifer.

Near the mountains at the edges of Jordan Valley (except at the north end of the Oquirrh Mountains), there is no effective confining bed and the top of the saturated zone (generally known as the water table) is a few hundred feet below the land surface. Near the center of the valley, all the valley fill beneath the confining bed is saturated. Although this segment of the fill consists of many beds with differences in permeability, the beds act collectively as a single aquifer.

The quality of ground water varies widely and depends on the sources of recharge and the nature of the materials through which it has percolated.

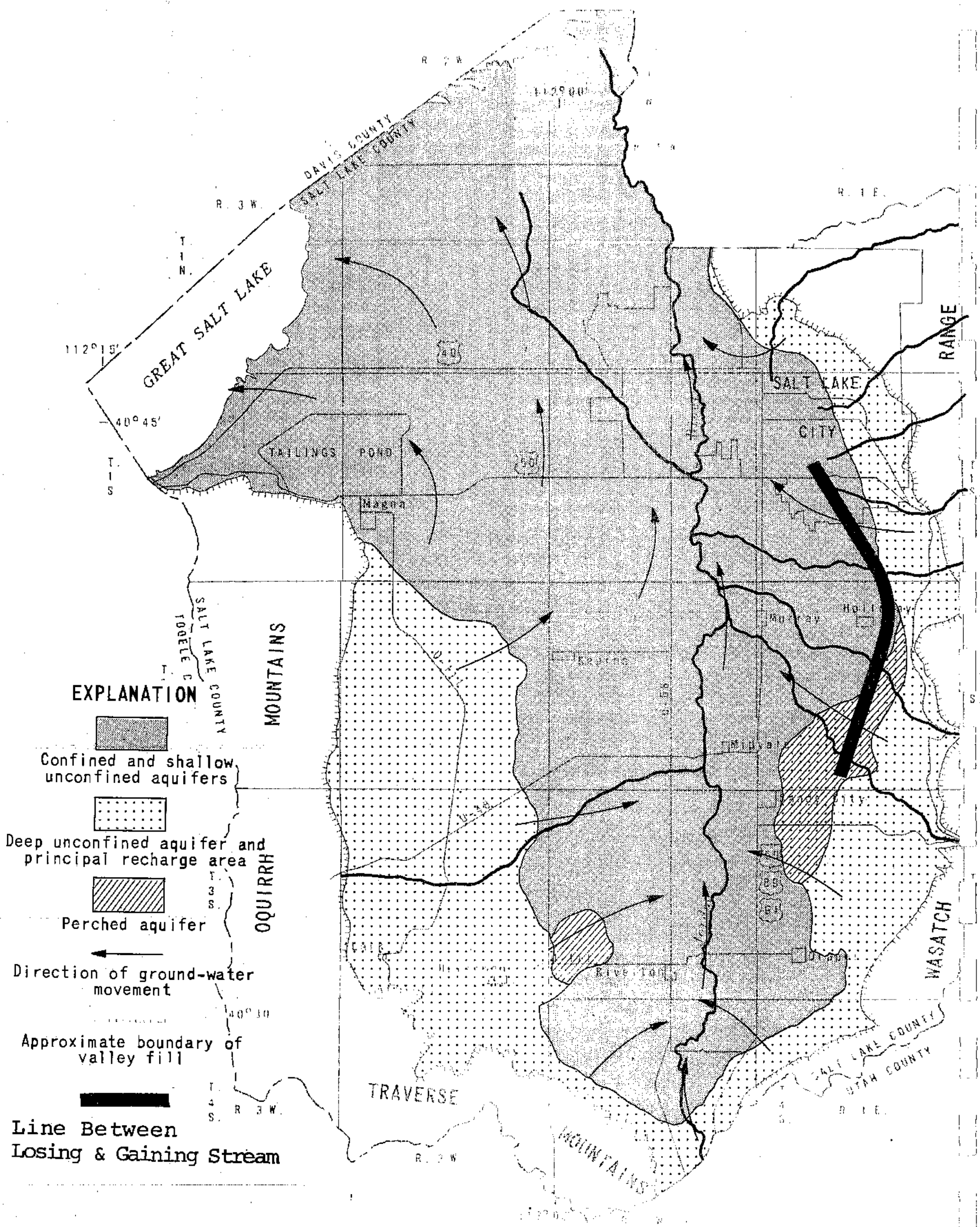


Figure IV-7. Approximate Extent of Various Aquifers in Salt Lake County.

From: Hely, et.al., 1971.

Water in the shallow aquifer in Jordan Valley generally contains more dissolved solids and is more subject to contamination by wastes than water in the principle aquifer. Ground water seepage from this aquifer into surface streams, especially the Jordan River, has a significant effect on water quality.

Limited water quality data is available for gound water in Salt Lake County. Figures IV-8 and IV-9 show a real distribution of total dissolved solids and temperatures, respectively, in the ground water in the principal aquifer.

Total dissolved solids concentrations for specific locations is given in Table IV-11 for wells shown in Figure IV-10.

Table IV-11. TDS in Shallow Aquifer (mg/l)

Well	TDS (calc.)
A	725
B	2583
C	1871
D	1469
E	827
F	1408
G	552
H	906
I	11010
J	1313
K	1462
L	1496

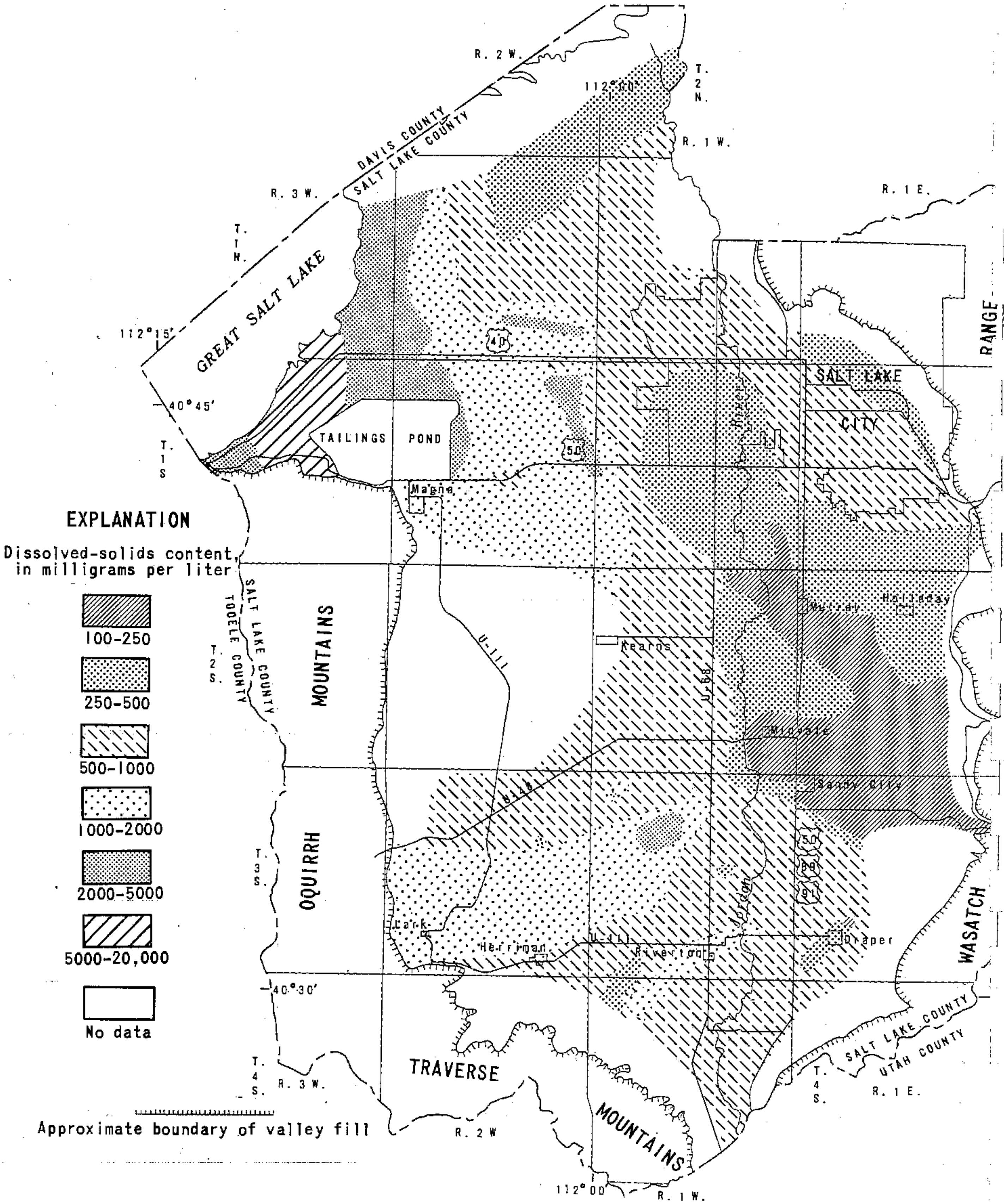


Figure IV- 8. Total Dissolved Solids in Water From the Principle Aquifer in Salt Lake County.

From: Hely, et.al., 1971.

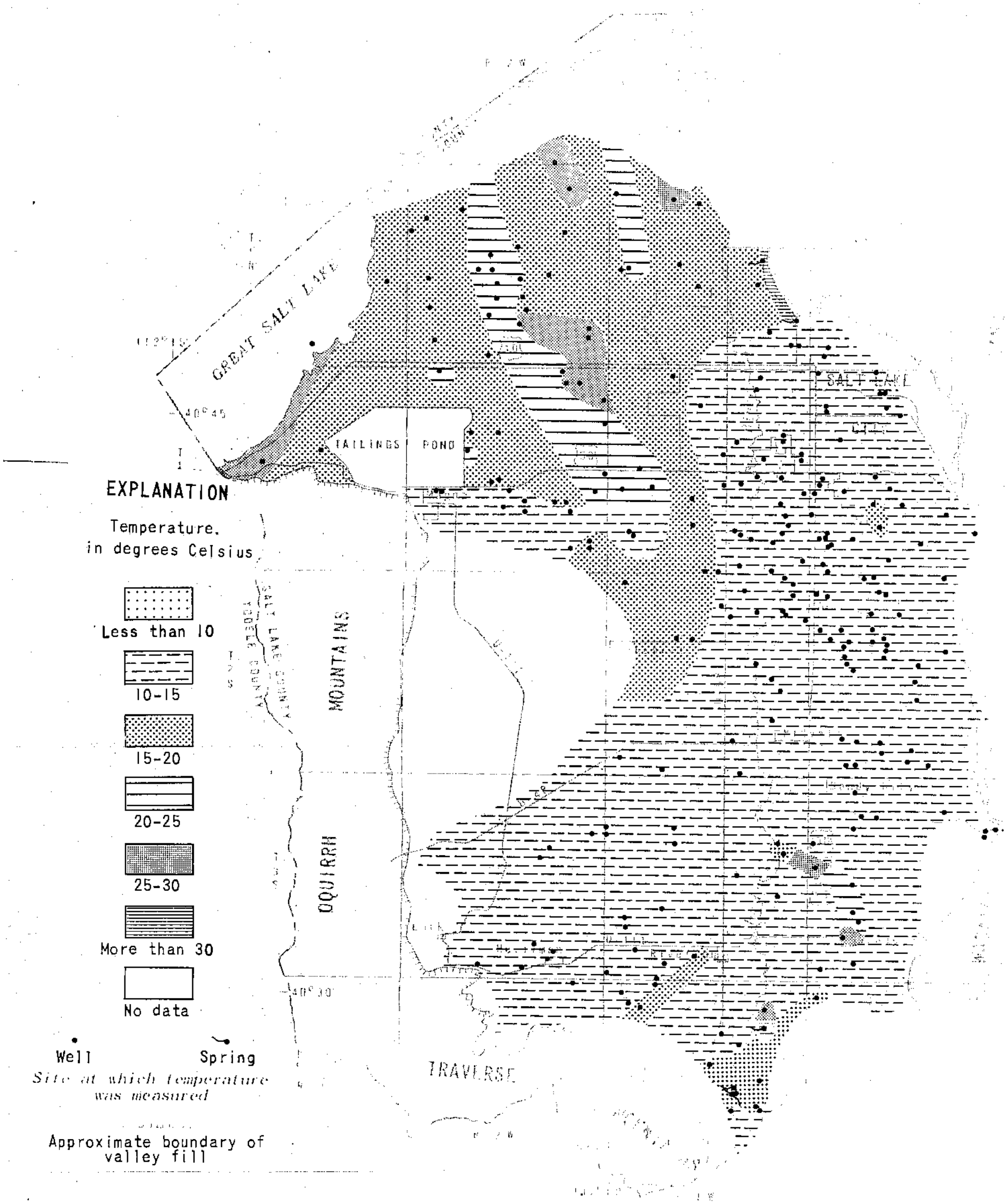


Figure IV- 9. Water Temperature in the Principle Aquifer in Salt Lake County.

From: Hely, et.al., 1971.

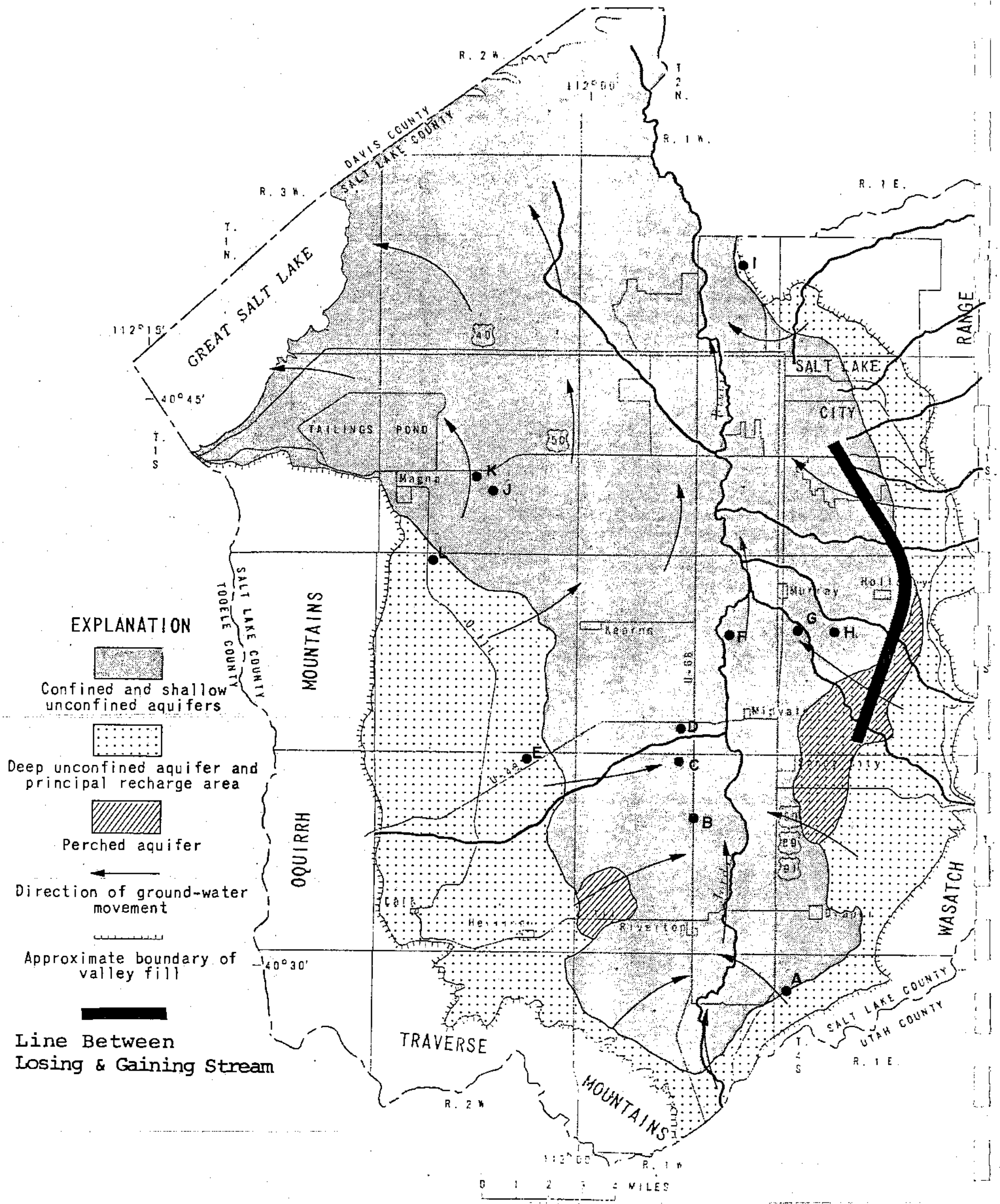


Figure IV-10. Well Locations for TDS Concentrations in Table IV-11.

From: Hely, et.al., 1971.

WATER QUALITY STANDARDS

Existing State water quality standards are worded to essentially protect all waters of the State for drinking water supplies. Protection of quality for other beneficial uses (e.g., aesthetics, recreation) is a secondary concern. To conform with Federal regulations, the State is currently in the process of developing new standards. The new standards set policy for protection of water quality for six beneficial use categories. Since it is apparent that the existing standards will be replaced by a version of the proposed standards, the existing standards and stream segmentation will not be discussed. This section will deal with the proposed standards.

Existing water quality standards and stream segmentation for Salt Lake County are shown in Appendices A-2-1 and A-2-2.

Proposed Water Quality Standards

The proposed water quality standards (dated 12 April 1978) are a giant step in the direction of a workable set of standards. The entire water quality management planning process is dependent upon the standards. It is imperative that a set of standards be adopted that will enable all entities involved with water quality to conform with the policy of the State.

Proposed State policy is to conserve water and to maintain and improve quality for public water supplies, wildlife, recreation, agriculture, and other legitimate beneficial uses.

The proposed scheme is to first determine the applicability of the anti-degradation policy (discussed below) then determine the beneficial use of a segment, and then assign a classification to the segment (also discussed below). The classification carries with it the numerical criteria that will apply to the segment.

The following is a short discussion of the "parts" of the standards (i.e., the anti-degradation policy, beneficial uses and classifications and general provisions). The draft standards (Part II) are shown in Appendix A-2-3. State proposed segmentation is shown in Appendix A-2-4 and Department comments on the draft standards are shown in Appendix A-2-5. Department proposed segmentation and classifications are shown in Table IV-12 and Figure IV-11 (discussed later).

Anti-degradation Policy

The intitial step in classifying waters of the county so that numerical criteria can be applied is to determine which segments are "anti-degradation segments". These are to be segments where there is allowed minimal, if any, degradation of water quality. Consideration for this classification should be given to National and State parks, monuments, recreation areas, etc. and other outstanding natural resource waters.

The proposed standards attaches this classification primarily to waters used for domestic supply. The policy allows for control of new point sources of discharge only. In Salt Lake County, the affected proposed segments (see Appendix A-2-4) are not presently greatly affected by point sources, except for storm drainage, but rather, are greatly impacted by non-point sources. The Department made a comment to the State in this regard (see Appendix A-2-5).

Use Designations

Beneficial uses of the waters of the State are broken down into six major categories. These are:

Class 1 - Raw water sources for domestic water supplies

Class 2 - In-stream recreational uses and aesthetics

Class 3 - In-stream uses by aquatic wildlife

Class 4 - Agricultural uses

Class 5 - Industrial uses

Class 6 - Special uses

The specific classifications are listed below.

<u>Class 1</u> - protected for use as a raw water source for domestic water systems
- Class 1A - protected for domestic purposes without treatment
- Class 1B - protected for domestic purposes with prior disinfection
- Class 1C - protected for domestic purposes with prior treatment by standard complete treatment processes as required by the Utah State Division of Health

<u>Class 2</u> - protected for in-stream recreational use and aesthetics
- Class 2A - protected for recreational bathing (swimming)
- Class 2B - protected for boating, water skiing and similar uses, excluding recreational bathing (swimming)

<u>Class 3</u> - protected for in-stream use by beneficial aquatic wildlife
- Class 3A - protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain
- Class 3B - protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain
- Class 3C - protected for non-game fish and other aquatic life, including the necessary aquatic organisms in their food chain. Standards for this class will be determined on a case-by-case basis
- Class 3D - protected for waterfowl, shorebirds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain

<u>Class 4</u> - protected for agricultural uses, including irrigation of crops and stock watering

<u>Class 5</u> - protected for industrial uses, including cooling, boiler makeup, and other with potential for human contact or exposure. Standards for this class will be determined on a case-by-case basis.

<u>Class 6</u> - protected for uses of waters not generally suitable for the uses identified in Classes 1 through 5 above. Standards for this class will be determined on a case-by-case basis

<u>General Provisions</u>

Among the general provisions of the standards, the ones with the greatest impacts are:

- The classifications and numerical criteria (see Appendix A-2-3) shall apply to all waters of the State so designated and classified.

- Modifications of the standards are allowed to protect downstream designated uses.

- Intermittent waters are protected as per use designation.

- Public hearings will be held to review all changes, modifications, use classifications, etc.

- Public meetings will be held to determine the criteria for "case-by case" situations.

- A mixing zone definition has been included to more precisely delineate water quality sampling, etc.

STREAM SEGMENTATION

As a necessary part of the 208 plan and for management purposes, the major streams, rivers, and canals in Salt Lake County have been segmented as per the draft state water quality standards. The drainage basin in Salt Lake County is somewhat unique in that the entire Jordan River drainage basin (downstream from Utah Lake) coincides with the county boundaries except for unconfined drainage in the northeast portion of the county. The river flows approximately 11 miles from the pumping station at Utah Lake before entering Salt Lake County through the Jordan Narrows.

Factors used to segment the waterways in Salt Lake County were:

1. Subbasin drainage areas: A stream segment includes the stream and the associated drainage area. Subbasin drainage areas are shown in Figure IV-11.
2. Land use within drainage area: Any significant change in the overall land use in the drainage area affects the stream segmentation. Major land usage (present and projected) is shown in Figure III-17.
3. Physical stream characteristics: Any significant change in the velocity, depth, amount of channelization, etc., affects the stream segmentation.
4. Discharges from point sources: Major discharges from WTP, STP, industrial discharge points, etc., affects the stream segmentation.
5. Present and proposed waterway usage: Usage of a waterway for water supply, recreation, etc., affects the stream

segmentation ("Beneficial uses" as in proposed State classification system).

Based on the above described factors, all waterways in Salt Lake County have been classified by (State Water Quality Standards definitions) and segmented.

Table IV-12 lists the stream segments in Salt Lake County. The segmentation is shown in Figure IV-12 The discussion of the stream segmentation analysis by subbasin drainage area and canal system follows.

City Creek

CC-1: City Creek from the headwaters downstream to the water treatment plant (about three miles above the canyon mouth) is primarily used for culinary water supply and recreation.

CC-2: City Creek from the water treatment plant downstream to the diversion to the North Temple storm drain is used primarily for recreation, primarily picnicking and fishing.

Red Butte Creek

RB-1: Red Butte Creek from the headwaters downstream to the reservoir (above canyon mouth) is used for culinary water supply and a natural study area.

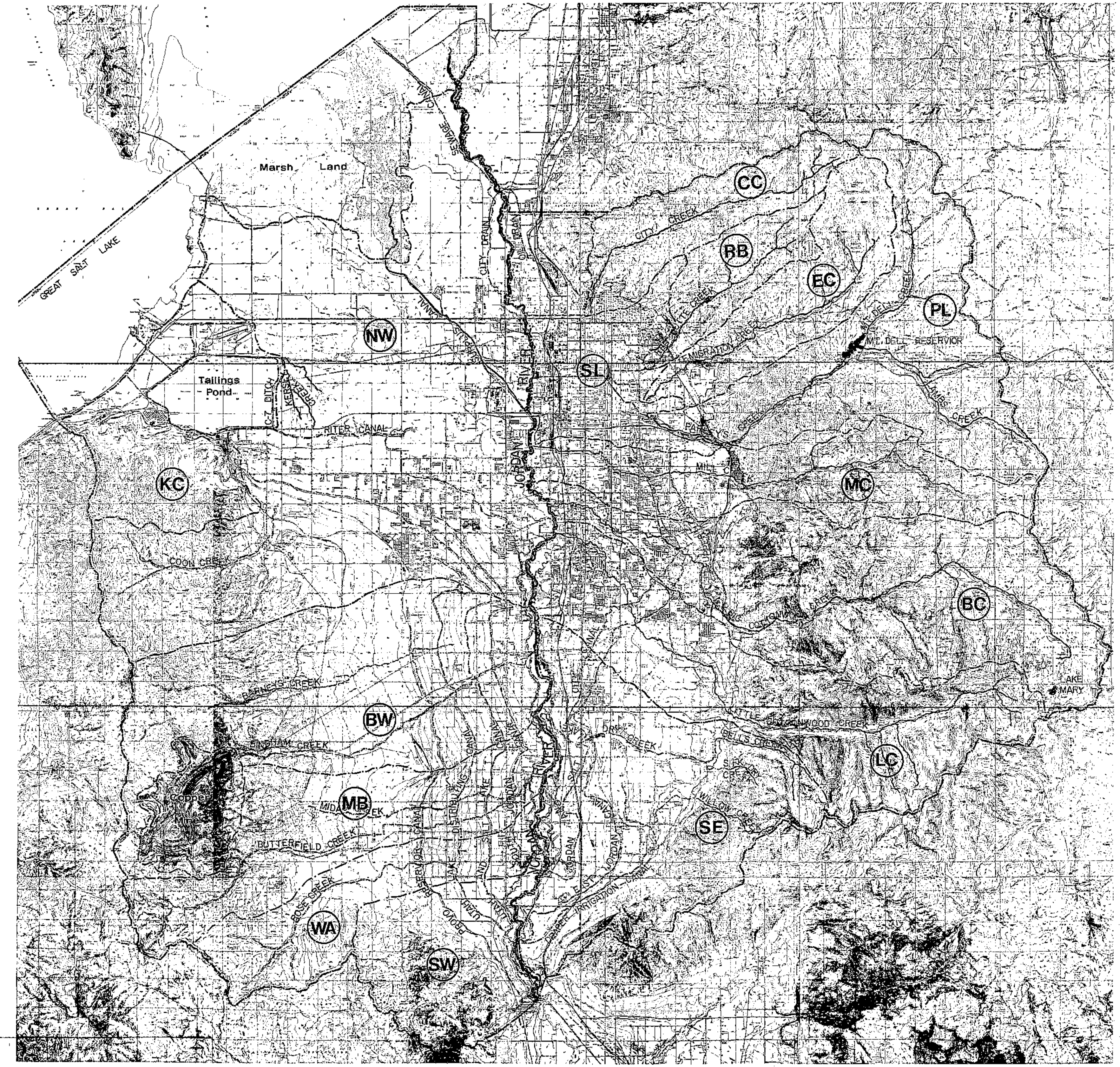
RB-2: Red Butte Creek from the reservoir downstream to the 1300 So. storm drain diversion is used primarily for storm runoff.

Emigration Creek

EC-1: Emigration Creek from the headwaters downstream to the mouth (Rotary Glen) is used primarily for recreation, picnicking and esthetic enjoyment on private land (no improved recreation areas).

EC-2: Emigration Creek from the canyon mouth downstream to the 1300 So. storm drain diversion is used primarily for storm runoff.

FIGURE IV-11
SUBBASIN DRAINAGE AREAS
IN SALT LAKE COUNTY



Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

Sq. Miles 9

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Table IV-12. Stream Segmentation and Classification for Waters of Salt Lake County

Subbasin Drainage Area	Segment I. D.	Segment Description[1]	Classification[2]
CC	CC-1	City Creek, from WTP to headwaters	1C, 2B, 3A
	CC-2	City Creek, from No. Temple Storm Drain (SLC) Diversion to City Creek Water Treatment Plant (WTP)	2B, 3A
RB	RB-1	Red Butte Creek from reservoir to headwaters	1C, 2B, 3A
	RB-2	Red Butte Creek, from 1300 E. Storm Drain Diversion (SLC) to Reservoir	2B, 3A
EC	EC-1	Emigration Creek, from Rotary Glen to headwaters	2B, 3A
	EC-2	Emigration Creek, from 1300 E. Storm Drain Diversion (SLC) to Rotary Glen	2B, 3A
PL	PL-1	Parley's Creek, from Mountain Dell Reservoir to headwaters	1C, 2B, 3A
	PL-2	Parley's Creek, from 1300 E. Storm Drain Diversion (SLC) to Mountain Dell Reservoir	2B, 3A
MC	MC-1	Mill Creek, from canyon mouth (SLC Water Department gaging station) to headwaters	2B, 3A
	MC-2	Mill Creek, from confluence with Jordan River to canyon mouth (SLC Water Department gaging station)	2B, 3A, 4
BC	BC-1	Big Cottonwood Creek, from Big Cottonwood WTP to headwaters	1C, 2B, 3A
	BC-2	Big Cottonwood Creek, from confluence with Jordan River to Big Cottonwood WTP	2B, 3A, 4
LC	LC-1	Little Cottonwood Creek from Little Cottonwood WTP to headwaters	1C, 2B, 3A
	LC-2	Little Cottonwood Creek, from confluence with Jordan River to Little Cottonwood WTP	2B, 3A, 4
SE	SP-1	South Fork of Dry Creek, from Draper Diversion to headwaters	1C, 2B, 3A
	SP-2	Bell Canyon Creek, from Reservoir to headwaters	1C, 2B, 3A
	SP-3	Little Willow Creek, from U.S. Forest Service Boundary to headwaters	1C, 2B, 3A
NW, KC, BW, MB, WA, SW	SP-4 thru SP-9	All Permanent Creeks on east slope of Oquirrh Mountains	2B, 3A, 4
S.L.Co.	JR-1	Jordan River, from confluence with Little Cottonwood Creek to Narrows Diversion	2B, 3A, 4
	JR-2	Jordan River, from 400 N Street, SLC to confluence with Little Cottonwood Creek	2B, 3B, 4
	JR-3	Jordan River, from Farmington Bay to 400 N St. Salt Lake City (SLC)	2B, 3C, 3D, 4
S.L.Co.	PR-1	Provo Reservoir Canal	4
	UL-1	Utah Lake Distributing Canal	4
	SJ-1	South Jordan Canal	4
	DI-1	Draper/Sandy Irrigation Canals	4
	US-1	Utah and Salt Lake Canal	4, 5
	NJ-1	North Jordan/Ritter Canal	4, 5
	EJ-1	East Jordan Canal	2B, 3A, 4
	JS-1	Jordan and Salt Lake City Canal	2B, 3A, 4
	UC-1	Upper Canal	2B, 3A, 4
S.L.Co.	JR-4	Surplus Canal	4, 6
	SC-1	Sewage Canal	6
	KC-1	Kersey Creek/C-7 Ditch	6
BC	ML-1	Mary's Lake (>20 ac.)	1C, 2B, 3A
PL	MD-1	Mountain Dell Reservoir (>20 ac.)	1C, 2B
S.L.Co.	SL-1	Great Salt Lake	6, 2B
	FB-1	Farmington Bay Waterfowl Management Area	3C, 3D, 2B

[1]Stream segment includes the segment described and all tributaries to that segment.
[2]As per Proposed State Water Quality Standards

Parley's Creek

PL-1: Parley's Creek (and tributaries) from the headwaters downstream to Mountain Dell Reservoir is used primarily for culinary water supply and recreation.

PL-2: Parley's Creek from the canyon mouth downstream to the 1300 So. storm drain diversion is used primarily for recreation.

Mill Creek

MC-1: Mill Creek from the headwaters downstream to the canyon mouth (S.L.C. Water Department gaging station) is used extensively for recreation and aesthetics.

MC-2: Mill Creek from the canyon mouth (S.L.C. Water Department gaging station) downstream to the Jordan River is used primarily for recreation.

Big Cottonwood Creek

BC-1: Big Cottonwood Creek from the headwaters downstream to the canyon mouth (water treatment plant) is used primarily for culinary water supply and recreation.

BC-2: Big Cottonwood Creek from the canyon mouth downstream to the Jordan River is used primarily for recreation and aesthetic enjoyment.

Little Cottonwood Creek

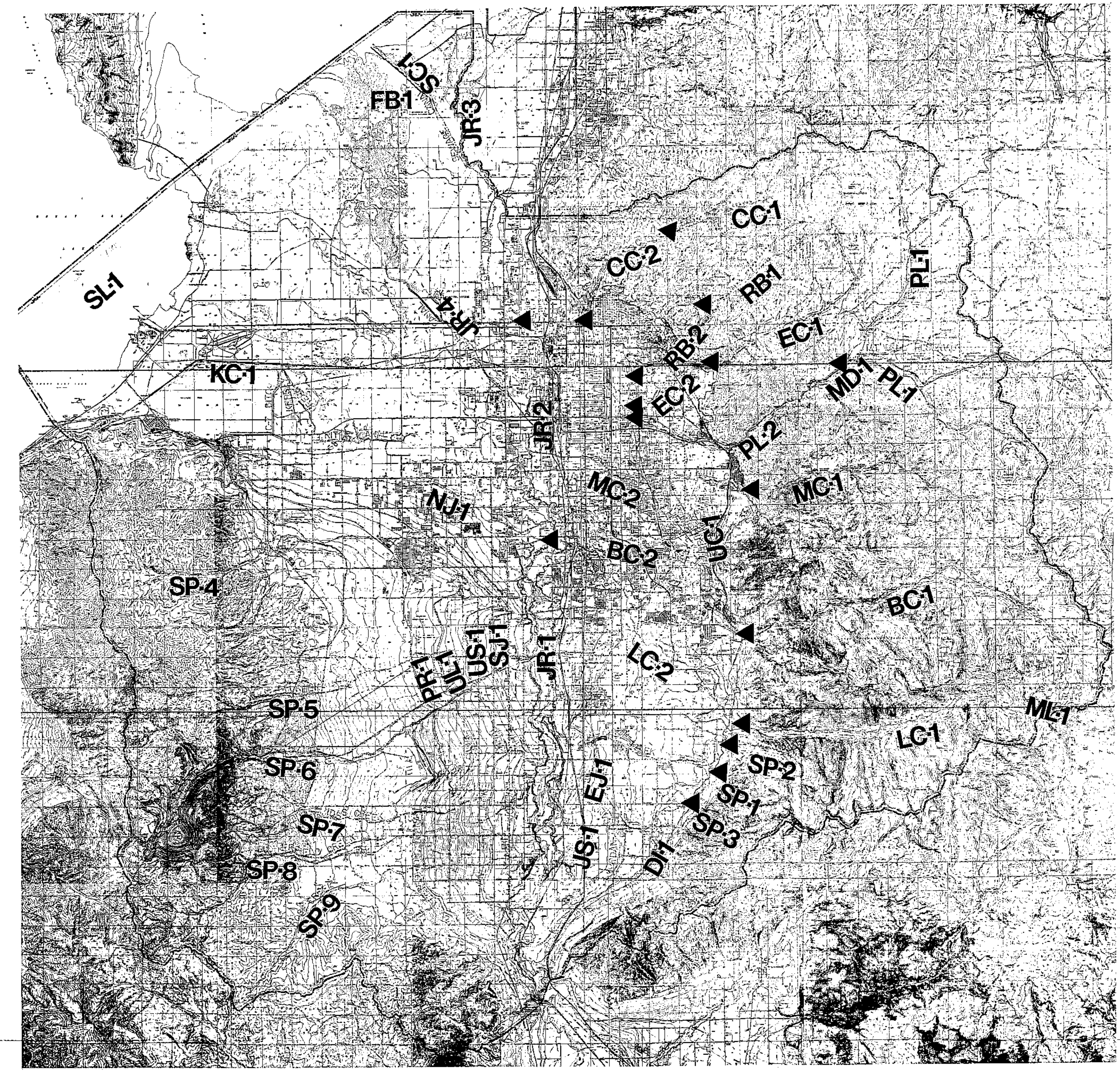
LC-1: Little Cottonwood Creek from the headwaters downstream to the canyon mouth (water treatment plant diversion) is used primarily for culinary water supply and recreation.

LC-2: Little Cottonwood Creek from the canyon mouth downstream to the Jordan River is used primarily for recreation and aesthetic enjoyment.

Southeast

SP-1: South Fork of Dry Creek from the headwaters downstream to the Draper

FIGURE IV-12
STREAM SEGMENTATION
FOR SALT LAKE COUNTY



TRIANGLE SIGNIFIES CHANGE IN SEGMENTATION ALONG A WATERWAY

Salt Lake County Water Quality & Pollution Control

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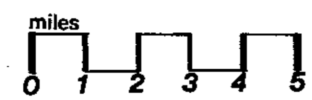


Division is intermittent - uses are culinary water supply, agricultural, and conveyance of storm runoff.

SP-2: Bell Canyon Creek from the headwaters downstream to the reservoir is intermittent - uses are culinary water supply, agricultural, and conveyance of storm runoff.

SP-3: Little Willow Creek from the headwaters downstream to the USFS boundary is intermittent - uses are culinary water supply, agricultural, conveyance of storm runoff.

Northwest

SP-4: Coon Creek from the headwaters downstream to the terminus near Magna is intermittent - some agricultural usage and conveyance of storm runoff.

Kennecott

No major waterways except Kersey Creek/C-7 Ditch (discussed later).

Barney's - Bingham

SP-5: Barney's Creek from the headwaters downstream to the Jordan River is intermittent - some agricultural usage and conveyance of storm runoff.

SP-6: Bingham Creek from the headwaters downstream to the Jordan River is intermittent - some agricultural usage and conveyance of storm runoff.

Midas - Butterfield

SP-7: Midas Creek from the headwaters downstream to the Jordan River is intermittent - some agricultural usage and conveyance of storm runoff.

SP-8: Butterfield Creek from the headwaters downstream to the Jordan River is intermittent - some agricultural usage and conveyance of storm runoff.

West - Ag

SP-9: Rose Creek from the headwaters downstream to the Jordan River is intermittent - some agricultural usage and conveyance of storm runoff.

Southwest

SP-4: Coon Creek;	from the headwaters
SP-5: Barney's Creek;	downstream to the
SP-6: Bingham Creek;	Jordan River are
SP-7: Midas Creek;	intermittent - uses are
SP-8: Butterfield Creek;	agricultural and
SP-9: Rose Creek;	conveyance of storm runoff

Jordan River

JR-1: The Jordan River from the Narrows (where it enters the county) downstream to the confluence with Little Cottonwood Creek is used for agriculture, conveyance of storm runoff, STP effluent receiving water, and recreation.

JR-2: The Jordan River from the confluence with Little Cottonwood Creek downstream to 400 North Street (Salt Lake City) is used for agriculture, conveyance of storm runoff, STP effluent receiving water, and recreation.

JR-3: The Jordan River from 400 North Street (SLC) downstream to the Great Salt Lake is used for agriculture, conveyance of storm runoff, and recreation.

Irrigation Canal Systems

These irrigation canals have somewhat limited access but they are not patrolled and many children from the surrounding areas play in them. The usual time for flow in the canals is from May or June through September or October. There is very limited usage of canal water for home irrigation.

PR-1: UL-1: SJ-1: DI-1: These canals are used almost exclusively for irrigation purposes.

US-1: NJ-1: These canals are used for irrigation and for industrial purposes

EJ-1: JS-1: UC-1: These canals were originally used for irrigation and now augment flow in the valley portions of Mill, Big Cottonwood and Little Cottonwood Creeks.

<u>Drainage Canal Systems</u>

JR-4: The Surplus Canal from the diversion from the Jordan River downstream to the Great Salt Lake marshes is used for conveyance of high flow waters around the heavily urbanized portion of Salt Lake County (Salt Lake City) - some agricultural usage.

SC-1: The sewage canal tributaries (the city drain and the oil drain) and the sewage canal itself are waste canals that convey wastes, both municipal and industrial, directly to the Great Salt Lake without any discharge into the Great Salt Lake marshes or the Jordan River.

KC-1: Kersey Creek and the C-7 waste ditch (Kennecott Copper Corp.) from the headwaters to the Great Salt Lake is used for conveyance of waste water.

<u>Lakes</u> (>20 acres)

ML-1: Mary's Lake is used for culinary water supply and recreation.

MD-1: Mountain Dell Reservoir is used for culinary water supply.

SL-1: Great Salt Lake is used for recreation and industrial purposes (mineral extraction).

FB-1: Farmington Bay Waterfowl Management area is used for recreation and wildlife management.

PROJECTED WATER QUALITY

Water quality impacts from various activities have been projected for the Wasatch Mountain streams and the Jordan River. When considered in conjunction with projected land usage and associated activities in the canyons and valleys, first estimates of future water quality can be made. In order to develop a management plan to abate pollution problems in the county, projections have been made concerning future water quality.

In order to continually refine projections of water quality, a comprehensive on-going monitoring program must be implemented. Current monitoring programs and sample points are shown in Figure IV-13. Specific sampling points are listed in Table IV-13. Discussions with the SLC Water Department, the Salt Lake City-County Health Department, the U.S. Forest Service, and the State Bureau of Water Quality have indicated that they are in favor of some consolidation of monitoring programs. The effects of a consolidation of many sampling programs into one comprehensive program would reduce costs, expand the scope of the programs, and make information more readily available to all interested parties. This action is being addressed by the Department.

Correlation analyses were made on certain canyon uses to define relative influences of use. Correlation analyses do not show cause and effect, rather they indicate a parameter that can be used to relate an observable factor to whatever actual factors are the cause of the effect being investigated. Analyses of this sort are presented below on a stream by stream basis.

Projections for the future water quality in Salt Lake County are presented here, on a stream by stream basis, and are used to develop the management plan.

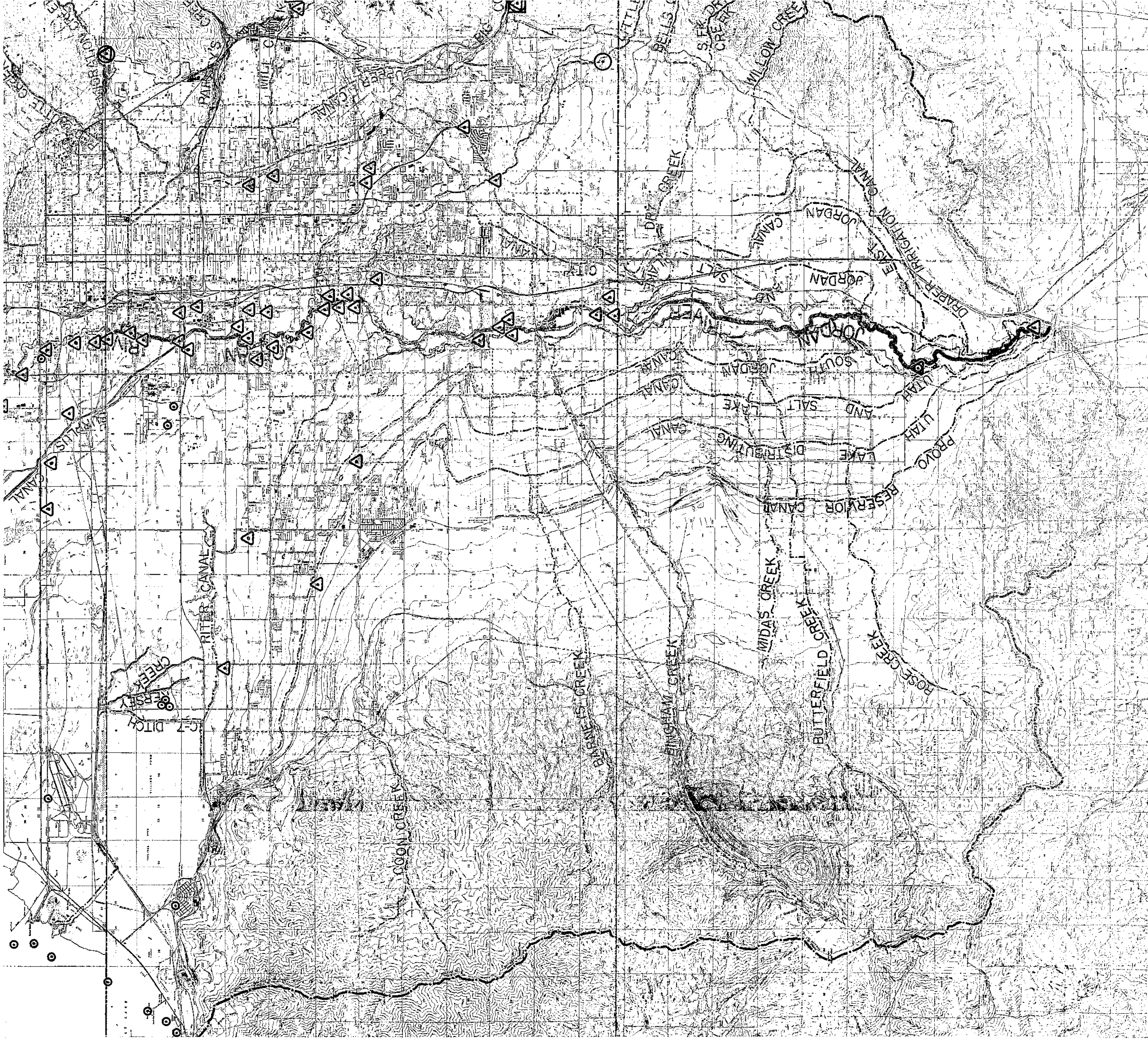


FIGURE IV-13
SAMPLE STATION LOCATIONS IN SALT
LAKE COUNTY FOR VARIOUS
MONITORING PROGRAMS

⊙ State Bureau of Water Quality
△ City / County Health Department
◯ Salt Lake City Water
⊡ Wasatch National Forest

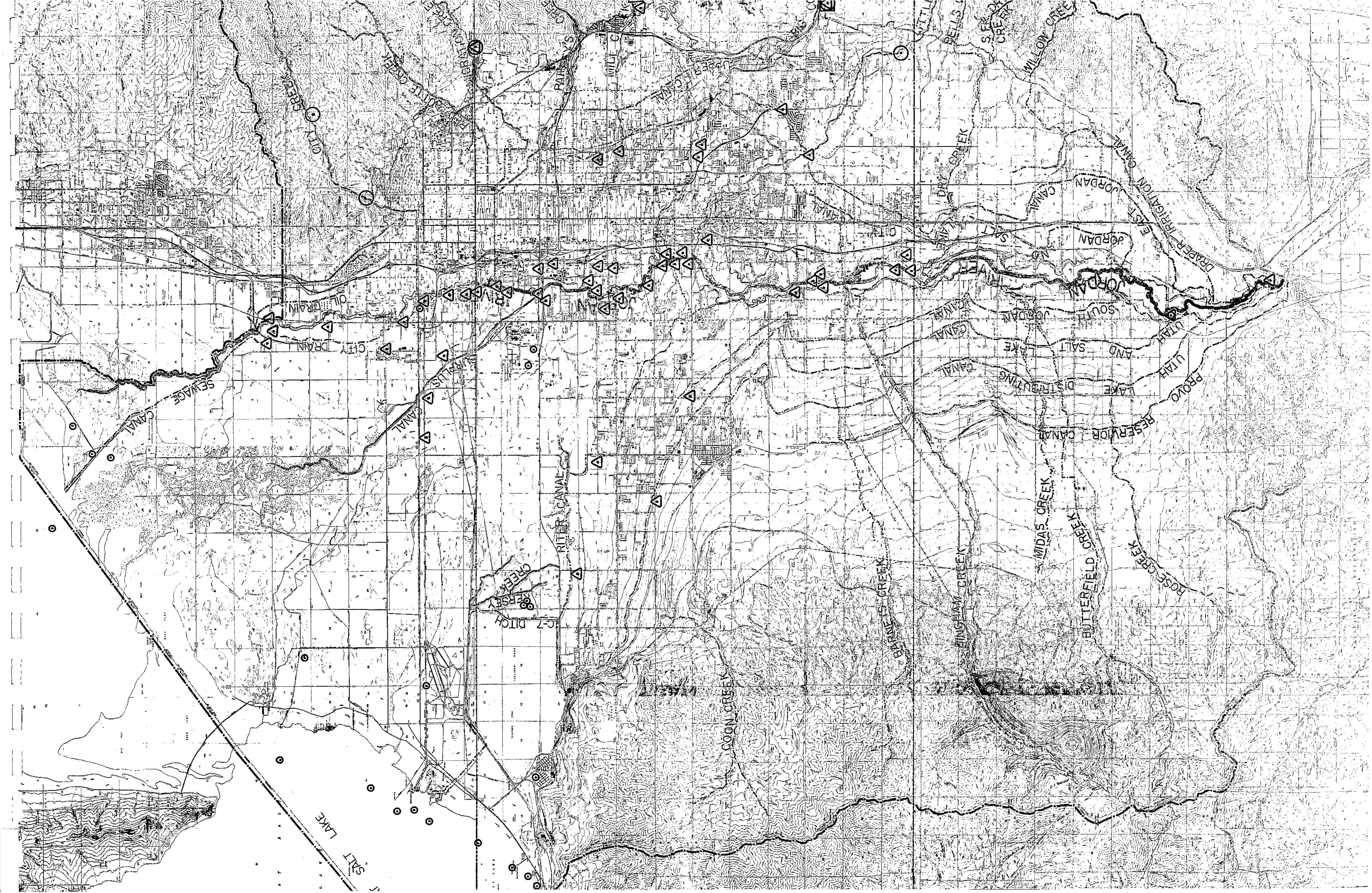
Salt Lake County Water Quality & Pollution Control
208 Water Quality Plan

NORTH

40 | 160 | 640 ACRES | 10

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

MILES
0 1 2 3 4



JORDAN RIVER
CITY CREEK
BIG COTTONWOOD CREEK
LITTLE COTTONWOOD CREEK
BELLS CANYON CREEK
DRY CREEK
WILLOW CREEK
EAST JORDAN CANAL
DRAPER IRRIGATION CANAL
JORDAN AND SALT LAKE CITY CANAL
SOUTH JORDAN CANAL
UTAH AND SALT LAKE CANAL
UTAH LAKE DISTRIBUTING CANAL
PROVO RESERVOIR CANAL
OIL DRAIN
CITY DRAIN
SEWAGE CANAL
RITER CANAL
KERSEY CREEK
C-7 DITCH
COON CREEK
BARNEY'S CREEK
BINGHAM CREEK
MIDAS CREEK
BUTTERFIELD CREEK
ROSE CREEK
SALT LAKE

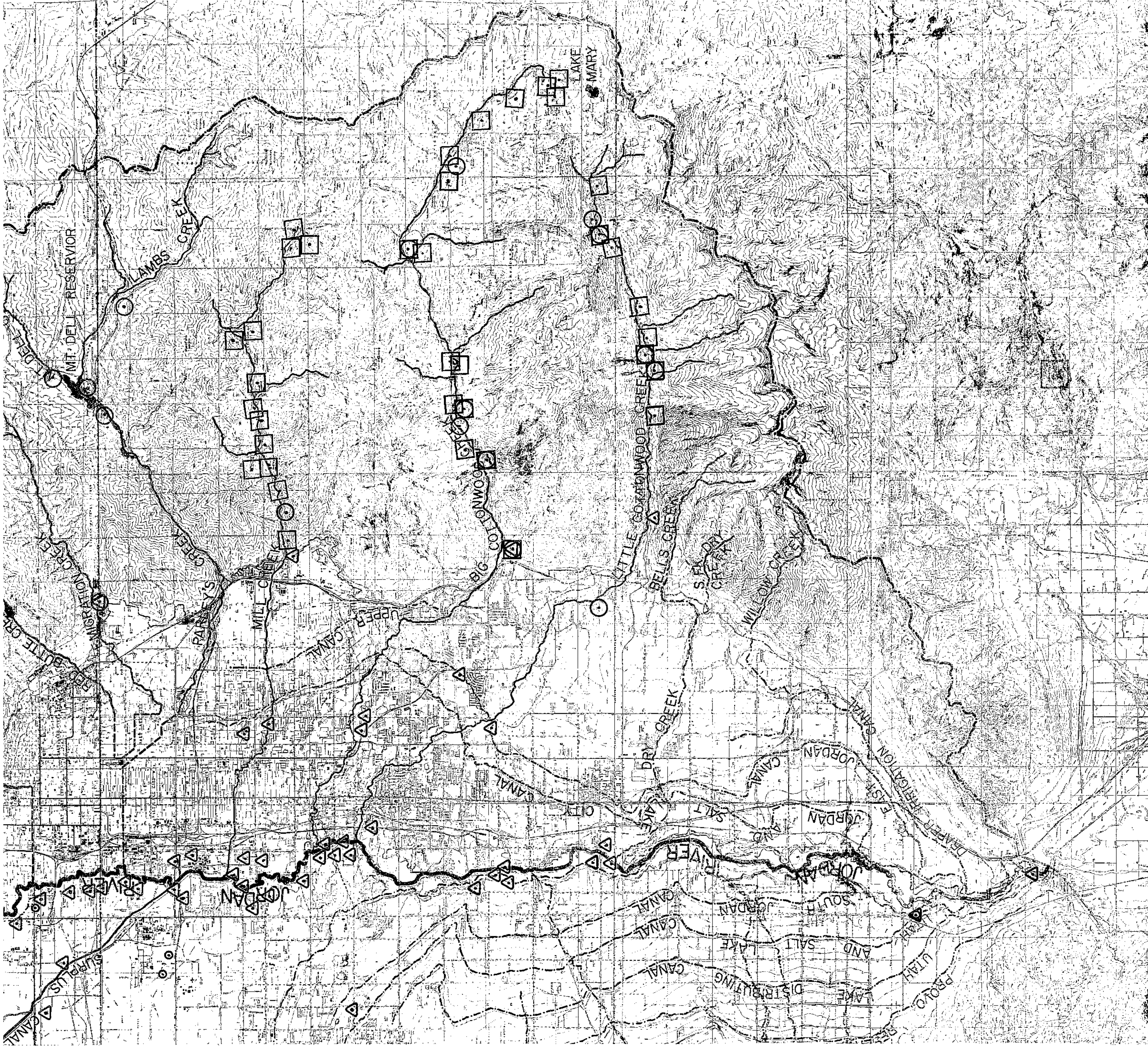


FIGURE IV-13

SAMPLE STATION LOCATIONS IN SALT LAKE COUNTY FOR VARIOUS MONITORING PROGRAMS

- ⊙ State Bureau of Water Quality
- △ City / County Health Department
- ◯ Salt Lake City Water
- ⊡ Wasatch National Forest

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

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MILES

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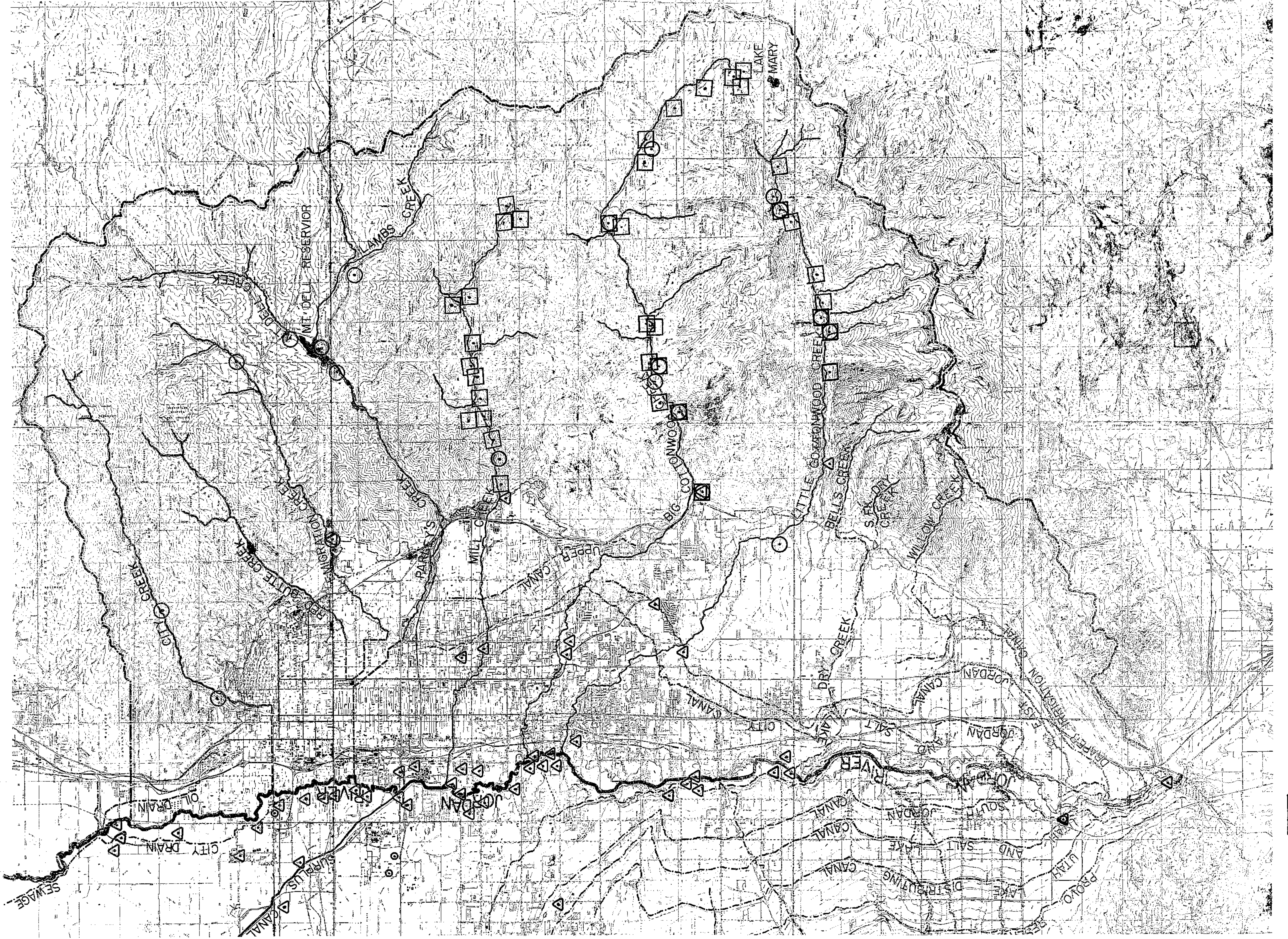


LAKE MARY
LAMBS CREEK
MT. DELL RESERVOIR
DELL CREEK
MILL CREEK
BIG COTTONWOOD CREEK
LITTLE COTTONWOOD CREEK
BELL'S CREEK
S. FK. DRY CREEK
WILLOW CREEK
CITY CREEK
RED BUTTE CREEK
EMIGRATION CREEK
PARLEY'S CREEK
UPPER CANAL
DRY CREEK
EAST JORDAN CANAL
DRAPER IRRIGATION CANAL
CITY CANAL
JORDAN RIVER
SOUTH JORDAN CANAL
UTAH AND SALT LAKE CANAL
UTAH LAKE DISTRIBUTING CANAL
OIL DRAIN
CITY DRAIN
SEWAGE
SURPLUS CANAL

TABLE IV-13. SAMPLE STATIONS FOR MONITORING PROGRAMS IN SALT LAKE COUNTY*

A. Salt Lake City Water Department

Identification	Description
Old 20th Ward	Opposite canyon station house at entrance to City Creek Canyon
City Creek	Intake to City Creek Treatment Plant
Lower Emigration	Taken from stream at Emigration Tunnel Springs box, just up canyon at historical marker
Upper Emigration	Taken from stream at 6201 Emigration Canyon just up turnoff to Pinecrest
Little Dell	Bridge at Sheep Trail near Camp Grant Monument
Lower Lambs	Weir below golf course at Dell Reservoir
Upper Lambs	Golf course intake structure at Interstate turnoff to Lambs Canyon
Parley's	Intake to Parley's Treatment Plant
Millcreek	Taken from stream at Upper Boundary Springs in Millcreek Canyon
Big Cottonwood	Intake to Big Cottonwood Treatment Plant
Storm Mt.	Taken from stream at bridge in front of Mule Hollow
Mill B	Taken from tributary from Lake Blanche
Mill D	Taken from stream at bridge on road to Jordan Pines picnic area
Silver Fork	Off lower bridge below Silver Fork Lodge
Brighton	Entrance to loop road
Little Cottonwood	Intake to Metropolitan Treatment Plant
Red Pine	Taken from main stream just below intersection of Red Pine Stream in Tanner Flat Campground
White Pine	Taken from main stream below intersection of White Pine Stream in Tanner Flat Campground

Table IV-13 (cont'd)

Identification	Description
Snowbird	Taken from stream near Gad Ski Lift
Alta	Taken from stream at bypass road bridge

B. Utah Bureau of Water Quality

Identification (Storet No.)	Description
491-502	Bluffdale (Jordan River)
491-820	Goggin Drain at N. Temple St.
491-819	Lee Creek
491-815	C-7 Ditch
491-251	Sewage canal on bridge in Farmington Bay
491-781	Turpin Dike on Farmington Bay
491-782	Turpin Dike on Farmington Bay
491-800	Varian Eimac, 1678 Pioneer Road
491-799	Metal Processing, 1822 Industrial Road
	Kersey Creek
491-801	50 ft. above Magna Imp. Dist.
491-802	At outfall
491-803	Below outfall
	UP&L Gadsby Plant
491-321	Abatement canal above outfall
491-322	Abatement canal below outfall
491-323	Jordan River above outfall
491-324	Cooling Tower to Jordan River
491-325	Jordan River below UP&L at N. Temple

Table IV-13 (cont'd)

C. Salt Lake City/County Health Department

Identification	Description
506	Jordan River at Bridge on 9000 So. above Sandy STP
507	Sandy STP effluent at point of discharge from chlorination contact tank
508	Jordan River approximately 50 ft. above fur breeder's plant below Sandy STP plant effluent
510	Jordan River approximately 50 ft. above Midvale STP outfall
512	Midvale STP effluent at discharge end of outfall line.
872	4900 South 200 West - Little Cottonwood Creek 516A
518	Jordan River 50 ft. above Murray STP outfall
519	Murray STP effluent approximately 20 ft. above confluence with Jordan River.
520	Bridge on 4500 South below Murray STP further downstream to assure mixing
521	Big Cottonwood Creek at 4200 South 500 West approximately 100 ft. above Salt Lake County Cottonwood Sanitary District STP outfall
522	Salt Lake County Cottonwood Sanitary District STP effluent of discharge from secondary settling tanks
562	Jordan River at bridge on 3900 South Street
866	Bridge at Wasatch Blvd. - Little Cottonwood Creek
361	Old Mill Bridge - Big Cottonwood Creek
876	3550 Wasatch Blvd. - Mill Creek
864	At Monument Park above zoo at approximately Rotary Glen Park - Emigration Creek
530	Salt Lake County Suburban Sanitary District #1 STP effluent at chlorination pond discharge
532	South Branch Vitro waste ditch above confluence with main ditch

Table IV-13 (cont'd)

Identification	Description
524	Jordan River near 3300 South, at loop in river approximately 1300 ft. above 3300 South bridge, above Jordan Meat Company plant and feed yards
533	Vitro waste ditch at bridge approximately 300 ft. north of gate at end of pavement on 1100 West St. approximately 300 ft. south and approximately 50 ft. above confluence with Jordan River
526	Granger-Hunter Improvement District STP effluent at point of discharge from secondary settling tanks
535	Mill Creek at 900 West approximately 2900 South
537	South Salt Lake STP effluent at outfall of chlorinator tank
538	Jordan River at bridge on California Avenue (approximately 1350 ft.) below South Salt Lake City STP
411	Salt Lake City Treatment Plant; effluent 540A
541	Surplus canal at railroad bridge 1 block south of Highway 40 (North Temple Street at approximately 3500 West) below Utah Woolen Mills
544	Bridge over Jordan River at Redwood Road near 17th North
410	Sewage canal 50 ft. above Salt Lake City STP effluent outfall
412	Sewage canal 100 ft. below Salt Lake City STP effluent outfall

(Storet No.)	
331046	City Creek at storm drain outlet to Jordan River
331175	Jordan River at 400 North
331194	City Drain at 6th North & 1800 West
331173	Goggin drain at North Temple
331078	City drain 2nd South - South of airport
331174	Jordan River at 300 South

Table IV-13 (cont'd)

(Storet No.)	Description
331047	Sixth South Storm Sewer
331048	Eight South Storm Sewer
331049	Thirteenth South Storm Sewer
331079	City Drain at 21st South 6th West
331050	Twenty-First South Storm Sewer
331034	Ritter Canal at 2400 South 8300 West
331017	North Jordan Canal at 3100 South
331041	Utah and Salt Lake Canal at 4100 South
331038	South Jordan Canal at 4700 South
331042	East Jordan Canal at 6200 South 20th East 6400 South
331051	Holladay Storm Sewer Outlet Northwest of Cottonwood Mall
331028	Jordan & Salt Lake Canal at Elgin Avenue approximately 29th South 1150 East

D. Wasatch National Forest

Identification	Description
LC1	Little Cottonwood Creek at Forest Boundary
LC2	Little Cottonwood Creek above Lisa Falls
LC3	Little Cottonwood Creek above confluence with Red Pine Creek
LC4	Little Cottonwood Creek below confluence with White Pine Creek
LC5	White Pine Creek above confluence with Little Cotton-wood Creek
LC6	Little Cottonwood Creek below Snowbird Recreation Area
LC7	Little Cottonwood Creek below Hellgate Spring
LC8	Little Cottonwood below Alta
LC9	Little Cottonwood above Alta and directly under crossing of Sunnyside Ski Lift

Table IV-13 (cont'd)

Identification	Description
BC1	Big Cottonwood Creek at Forest Boundary
BC2	Big Cottonwood Creek at Storm Mountain Pond inlet below bridge
BC3	Big Cottonwood Creek above Maxfield Lodge
BC4	Mill B South Fork above confluence with Big Cottonwood
BC5	Big Cottonwood Creek above confluence with Mill B South Fork
BC6	Mineral Fork Creek above confluence with Big Cottonwood Creek
BC7	Big Cottonwood Creek above confluence with Mineral Fork
BC8	Mill D South Fork above confluence with Big Cottonwood Creek
BC9	Big Cottonwood Creek above confluence with Mill D South Fork
BC10	Big Cottonwood Creek ½ mile below Silver Fork Lodge
BC11	Big Cottonwood Creek below confluence with Willow Creek at road
BC12	Big Cottonwood Creek ½ mile below Solitude
BC13	Big Cottonwood Creek at Guardsman Pass
BC14	Big Cottonwood Creek below Silver Lake outlet at old gaging
BC15	Unnamed Tributary (that runs through Brighton) above confluence with Big Cottonwood
BC16	Big Cottonwood above inlet to Silver Lake by LDS Church
MC1	Mill Creek at Forest Boundary
MC2	Mill Creek directly below Tracy Wigwam Camp
MC3	Church Fork above Church Fork Campground

Table IV- 13 (cont'd)

Identification	Description
MC4	Mill Creek above Church Fork Campground
MC5	Mill Creek above Mill Creek Inn
MC6	Mill Creek below Log Haven Restaurant by bridge
MC7	Mill Creek above Log Haven's Restaurant Pond inlet
MC8	Mill Creek below Maple Cove Campground
MC9	Mill Creek below confluence of Elbow Fork and Mill Creek
MC10	Mill Creek below Clover Spring Picnic Area
MC11	Mill Creek below Soldier Fork confluence with Mill Creek
MC12	Mill Creek above confluence of Big Water Gulch with Mill Creek
MC13	Big Water Gulch - above confluence with Mill Creek

*Does not include sampling stations that were monitored by the 208 Project Staff. For those locations, see WQ-1.

City Creek. Present summer picnic usage in City Creek Canyon correlates to an increase in coliform bacteria organisms of about 17/100 ml/1000 picnickers/ year/stream mile. Present coliform numbers in the canyon portion of City Creek range from 30 to 150/100 ml.

Projected canyon usage indicates a slight increase in the number of picnickers in the canyon but the increase is estimated to be slight. Therefore, projected coliform numbers in the stream should remain in this range.

Red Butte Creek. Due to the essentially non-existant day use of this canyon, no projections of future water quality have been made. However, it is expected that the present canyon usage, a natural study area, will not change in the future. Therefore, the water quality in the canyon should not show any appreciable change in the future.

Emigration Creek. Infiltration from septic tanks into Emigration Creek are a major cause of high bacterial numbers (coliform) in the Creek. However, at present there is a movement underway for annexation to Salt Lake City and the construction of a sanitary sewer to convey wastes to the Salt Lake City STP. Any construction in the canyon can be expected to result in degraded water quality, even the construction of a sewer system. After the primary impact of sewer construction lessens, a secondary impact (and probably a greater impact) caused by increased development potential (more people) will degrade water quality even more. This tradeoff, between construction of a sewer to abate septic seepage problems and accommodation of more human usage of the canyon, is being considered by the Department at the present time.

Parley's Creek. At present, there is no problem with the water quality in this canyon. A 30,000 acre-foot capacity reservoir is proposed to be constructed above the present 3,000 acre-foot capacity Mountain Dell Reservoir by the year 2000. Water related recreation is planned for this new reservoir (there is none at Mountain Dell) and based on past recreation and management practices would probably cause a lower quality of water in it and in Mountain Dell Reservoir. Increases in coliform levels in canyons for summer cabins correlate to an increase in coliform bacteria range of 2 to 7/100 ml./cabin/mile creek frontage. For construction activities, the increase is about ten fold. With the small number of cabins present and expected and the construction of the reservoir, coliform levels in this canyon can be expected to increase but by a small number.

Mill Creek. Mill Creek coliform bacteria numbers correlation to a range of 7/100 ml./cabin/mile creek frontage to 17/100 ml./1000 picnickers/year/stream mile. Future usage of the canyon is projected to be some minor cabin infilling and a slight increase in the number of picnickers per year (USFS development plan). Based upon this data, coliform numbers in Mill Creek are projected to increase but at a small scale. Expected values will range about 100-200 bacteria/100 ml. in the upper reaches.

Big Cottonwood Creek. Recreational usage of Big Cottonwood Canyon is the heaviest of all Wasatch Mountain Canyons in Salt Lake County. Coliform numbers are among the lowest, however. Correlation of increases in coliform bacteria from recreators is on the order of 9/100 ml./1000 visitors/year/stream mile. Contributions from cabins (some are year-round residents) correlates to only 2 bacteria/100 ml./cabin/mile creek frontage. There could be approximately 40% more cabins in existence in Big Cottonwood Creek by the year 2000. The construction of a new ski development has recently taken place. Expected coliform numbers in the future is estimated to range about 30 to 150/100 ml. with the average slightly more than 50/100 ml.

Little Cottonwood Creek. During past construction times, it has been found that coliform numbers increase ten fold due to construction activities. Other analyses have shown that winter sport activities contribute only a very small portion of total coliform numbers. Present coliform bacteria numbers range from about 27 to 70/100 ml. during construction activities and drop off slowly when construction is completed. Future steady state concentrations will probably average about 50/100 ml.

Intermittent Creeks. Future water quality of intermittent drainages has not been projected. Lack of data and small impact (due to small amount of flow) are the reasons for this lack of projection. However, some future monitoring will be carried out on these drainages and if the impacts are shown to be great enough, study of abatement procedures will be directed into this area.

Jordan River and Surplus Canal. Future water quality of the Jordan River has been projected more rigorously than that of the Jordan River tributaries. Factors that affect future water quality that have been investigated are consolidation of sewage treatment facilities, sewage treatment plant effluent quality, improvement of irrigation efficiency, east-side urbanization, low flow conditions, and response to storm runoff. Projections have been made for a range of regional STP configurations. A summary of Jordan River water quality projections is shown in Tables IV-14 through Table IV-17.

Minimum dissolved oxygen projections range from a 0.0 mg/l during storm events to 6.3 mg/l when projected with a 50% reduction in agricultural diversions from the Jordan Narrows. When projected with K_d values of 0.2/day and 1.0/day, DO concentrations differed by approximately 1 mg/l to 4 mg/l respectively when all other conditions were held constant.

For comparison purposes, minimum DO concentrations resulting from different levels of treatment are shown in Table IV-14 .

For the case of polished secondary level of treatment centralized at one regional treatment plant with the removal of coliform and BOD loads from dry weather storm drain discharges, ammonia concentrations are expected to exceed 6.0 mg/l in the lower river which is about four times the toxic concentration for aquatic life at Jordan River temperature and pH.

Ammonia projections are in the range of 6 mg/l to 7 mg/l without ammonia removal during low flow periods of the year. Projections for the case of 90% ammonia removal resulted in total ammonia concentrations of less than 1 mg/l. A 50% reduction in agricultural water diversion resulted in projected ammonia concentrations of about 4 mg/l. Low flow conditions with one regional treatment plant resulted in the highest total ammonia concentrations of all projections (greater than 9 mg/l).

Table IV-14. Projected Dissolved Oxygen Concentrations in the Jordan River

Effluent Conditions (mg/1) DO	CBOD	NBOD	Minimum Instream DO (mg/1) Present Locations	One Plant	Two Plant	Three Plant	Four Plant	Five Plant	Remarks
5.0[1]	25	90	3.8	4.1	4.1				Summer conditions, includes SDS STP, NBOD of 90 mg/1 corresponds to STP NH_3 effluent of 22 mg/1, NBOD of 90 mg/1 corresponds to STP NH_3 effluent of 2.5 mg/1.
		9	4.7	4.8	4.9				
	10	90	4.9	5.0	5.0				
		9	5.8	5.8	5.8				
	5	90	5.3	5.4	5.3				
		9	6.1	6.2	6.1				
4.9[2]	27	91			3.0	3.1	3.0	3.0	Summer conditions, does not include SDS STP, CBOD and NBOD are utlimate values. STP effluents: NBOD 91 = NH_3 20.5; NBOD 46 = NH_3 10.3; NBOD 23 = NH_3 5.2; NBOD 12 = NH_3 2.5; T = 20°C
		46			3.3	3.4	3.3	3.3	
		23			3.4	3.6	3.4	3.4	
		12			3.5	3.6	3.5	3.5	
6.5[2]	27	91			6.0	6.0	5.9	6.0	Winter conditions, does not include SDS STP, CBOD and NBOD are ultimate values. T=7°C
		46			6.1	6.2	6.0	5.9	
3.9[3]	27	110	2.9 1.8 0.8						Summer conditions, does not include SDS STP, NBOD 110 = $NH_3$30, T=16°, 20°, & 24°C respectively. CBOD and NBOD are ultimate values.
		12		4.1		4.3			Summer conditions, does not include SDS STP, T=16°C, CBOD and NBOD are ultimate values, NH_3 = 2.5 and 5.0 mg/1 respectively.
		23		4.1		4.2			
		12		3.2		3.4			Summer conditions, does not include SDS STP, T=20°C, CBOD and NBOD are ultimate values, NH_3 = 2.5 and 5.0 mg/1 respectively.
		23		3.2		3.3			
		12		2.4	2.5	2.5			Summer conditions, does not include SDS STP, T=24°C, CBOD and NBOD are ultimate values, NH_3 = 2.5, 5.0, and 30 mg/1 respectively.
		23		2.3	2.4	2.5			
		110		1.7	1.9	1.9			
5.0[4]	10			5.5					Baseline, TKN=22 mg/1, Pol. Sec. at both regional and SDS STP
				6.2					Baseline, TKN=2 mg/1, Pol. Sec. at both regional and SDS STP
				5.4					37% more urbanization on east side of Jordan, TKN=22 mg/1
				6.3					Irrigation efficiency increased by 50%, TKN=22 mg/1
				4.9					Low flow conditions, TKN=22 mg/1
				0.0 3.8					Response to storm areal distribution #1, Kd=1.0/day and 0.2/day respectively
				2.7 5.7					Response to storm areal distribution #2, Kd=1.0/day and 0.2/day respectively.

[1] From: WQ-5.

[2] From: Way, T., The Jordan River: Ammonia/Chlorine Projections, Salt Lake County Department of Water Quality and Water Pollution Control, 101 pp., April 1978.

[3] From: Contant, C., Stream Response Simulation to Pollution Loadings for the Jordan River, University of Utah, Department of Civil Engineering, 68 pp., December 1977.

[4] From: WQ-12.

Table IV-15. Projected Ammonia Concentrations in the Jordan River

Effluent Conditions (mg/1) DO	CBOD	NBOD	Maximum Instream NH_3 (mg/1) Present Locations	One Plant	Two Plant	Three Plant	Four Plant	Five Plant	Remarks
3.9[1]	27	110	3.22 3.21 3.20						Summer conditions, doesn't include SDS STP, NBOD 110=NH_3 30 mg/1, T=16°, 20°, and 24°C respectively. CBOD & NBOD are ultimate values.
		12 23		(1.25)* 0.80 1.39		(1.25)* 0.90 1.37			Summer conditions, does not include SDS STP, T=16°C, CBOD and NBOD are ultimate values, NH_3 =2.5 and 5.0 mg/1 respectively.
		12 23		(1.25)* 0.80 1.39		(1.25)* 0.90 1.45			Summer conditions, does not include SDS STP, T=20°C, CBOD & NBOD are ultimate values, NH_3 =2.5 and 5.0 mg/1 respectively.
		12 23 110		(1.25)* 0.79 1.34 7.62	(1.25)* 0.90 1.45 7.49	(1.25)* 0.90 1.45 7.45			Summer conditions does not include SDS STP, T=24°C, CBOD and NBOD are ultimate values, NH_3 =2.5, 5.0, and 30.0 mg/1 respectively
4.9[2]	27	91 46 23 12			6.64 3.33 1.78 (1.17)* 0.97	6.51 3.33 1.74 (1.17)* 0.96	6.18 3.29 1.71 (1.17)* 0.96	6.17 3.17 1.71 (1.17)* 0.96	Summer conditions, does not include SDS STP, CBOD and NBOD are ultimate values, T=20°C NBOD 91=NH_3 20.5 46=NH_3 10.3 23=NH_3 5.2 12=NH_3 2.5
6.5[2]	27	91 46			5.66 3.11	5.57 3.07	5.48 2.94	5.48 2.94	Winter conditions, does not include SDS STP, CBOD and NBOD are ultimate values. T=7°C
5.0[3]	10			6.0					Summer conditions, TKN=22 mg/1, Pol. Sec. at both regional and SDS STP
				0.8					Summer conditions, TKN=2 mg/1, Pol. Sec. at both regional and SDS STP
				6.8					37% more urbanization on east side of Jordan, TKN=22 mg/1
				3.8					Irrigation efficiency increased by 50%, TKN=22 mg/1
				9.5					Low flow conditions, TKN=22 mg/1
5.0[4]	10		6.70 0.86		6.60 0.68				Summer conditions, TKN=22 and 2 mg/1 respectively, does not include SDS STP, T=21°C

*Numbers in parentheses indicate that projected maximum concentrations (in brackets) occur above first STP effluent outfall.

[1]From: Contant, C., Stream Response Simulation to Pollution Loadings for the Jordan River, University of Utah, Department of Civil Engineering, 68 pp., December 1977.

[2]From: Way, T., The Jordan River: Ammonia/Chlorine Projections, Salt Lake County Department of Water Quality & Water Pollution Control, 101 pp., April 1978.

[3]From: WQ-12.

[4]From: WQ-14.

Table IV-16. Projected Chlorine Concentrations in the Jordan River

Effluent Concentration CL_2 (mg/l)	Decay Coefficient (/day)	Maximum Instream CL_2 (mg/l) Present Locations	One Plant	Two Plant	Three Plant	Four Plant	Five Plant	Remarks
1.00[1]	0.0			0.310	0.310	0.313	0.313	Summer Conditions
	1.0			0.266	0.258	0.240	0.240	
	5.0			0.187	0.205	0.205	0.205	
0.40[1]	0.0			0.124	0.124	0.125	0.125	
	1.0			0.106	0.103	0.096	0.096	
	5.0			0.082	0.082	0.082	0.082	
0.04[1]	0.0			0.012	0.012	0.013	0.013	
	1.0			0.011	0.010	0.010	0.010	
	5.0			0.008	0.008	0.008	0.008	
1.00[1]	0.0			0.252	0.252	0.255	0.255	Winter Conditions
	1.0			0.213	0.207	0.192	0.192	
	5.0			0.144	0.128	0.128	0.128	
0.40[1]	0.0			0.101	0.101	0.102	0.102	
	1.0			0.085	0.083	0.077	0.077	
	5.0			0.058	0.051	0.051	0.051	
0.04[1]	0.0			0.010	0.010	0.010	0.010	
	1.0			0.009	0.008	0.008	0.008	
	5.0			0.006	0.005	0.005	0.005	
0.40[2]	0.0	0.16	0.12	0.13				Summer Conditions
	1.0	0.11	0.12	0.11				

[1]From: Way, T., The Jordan River: Ammonia/Chlorine Projections, Salt Lake County Department of Water Quality and Water Pollution Control, 101 pp., April 1978.

[2]From: WQ-14.

Table IV-17. Summary of Bacteria And Solids Projections for the Jordan River*

Ref.	Total Coliform Bacteria Max. No./100 ml	Total Dissolved Solids Max. Conc. (mg/1)	Total Suspended Solids Max. Conc. (mg/1)	Remarks
1	5200	1490		Baseline projection TKN=20 mg/1
2	4300	1440		37% more urbanization on east side of Jordan
	2230	1160		50% irrigation efficiency increase
	6640	1660		Low flow conditions
	360,000		880	Response to storm areal distribution #1, see WQ-12
	230,000		810	Response to storm areal distribution #2, see WQ-12

*Effluent BOD_5=10 mg/1 and TKN=22 mg/1 unless otherwise noted in "remarks" column.

Ref 1: WQ-5
Ref 2: WQ-12

Chlorine concentrations in the Jordan River were projected on a first estimate basis using decay coefficients of 0.0/day, 1.0/day and 5.0/day. Decay coefficients were used to account for the reduction of free chlorine to other non-toxic forms when it oxidizes organic matter. Most projections resulted in toxic total chlorine concentrations except for the case of chlorine removal.

Coliform bacteria projections generally fall in the vicinity of acceptability (5000 organisms/100 ml). Storm events are projected to increase levels about 40 to 60 times, to levels that are totally unacceptable (360,000 organisms/100 ml). Control of storm runoff discharge could most effectively reduce this excessively high concentration.

Storm events are expected to increase suspended solids concentrations to over 800 mg/1. Storm water treatment is also indicated here. Control of storm runoff is discussed in the Non-Point Plan section. Additionally, discussions with the Corps of Engineers has indicated that they will incorporate water quality consideration into their development plans for the lower Jordan River. (See Appendix A-4 and Jordan River Parkway: An Alternative, UTA, 1971).

More detailed information on water quality projections can be found in WQ-10, WQ-11, WQ-12, WQ-13, and WQ-14.

Irrigation Canals. Future water quality in the irrigation canal systems in Salt Lake County is very closely linked to that in the Jordan River at the Narrows (Utah-Salt Lake County line). Mountainland Association of Government's 208 Project (MAG 208) is projecting a 15% decrease in coliform and BOD levels by the year 2000 at this point (to 7.0 mg/1 BOD_5 and 1400 MPN/ 100 ml Coliforms). Future water quality in canals will approximate what it is now, but will be affected by future developments in Utah County and by the practice of allowing new subdivisions to discharge storm runoff directly to the canals. This practice warrants future study by the Department. Projection of future water quality in the canal systems at this point in time would be misleading.

Sewage Canal. Without any further improvement of the conditions leading to the low quality of water in the sewage canal, it can be expected that water quality will change slightly, if any. Oil and grease problems plague the sewage canal. It has been estimated that since the benefits derived from the improvement of the canal are far outweighed by the costs that would be incurred, improvement of the water quality will be a distant project, if it ever is.

Kersey Creek/C-7 Ditch. Kersey Creek, the receiving water for the Magna STP, and the C-7 Ditch join and flow to the Great Salt Lake in the northwestern portion of the county. Man-induced background conditions in this system degrades the quality of the water greatly. The situation here is different from that of the sewage canal. The system discharges to the Lake very near the developing Great Salt Lake swimming beaches. The benefits to be derived from abatement of the pollution generated in this system outweigh the costs greatly, especially in public health and safety aspects. Therefore, abatement of the pollution problems in this system is high on the priority list of the new Department.

WASTE LOAD ANALYSIS

All of the Wasatch Mountain streams can be classified as effluent limited streams (EL) in the mountain segments. An effluent limited stream is defined as one which is presently meeting water quality standards or one which could meet standards if effluent quality limitations were imposed and adhered to. Non-point source pollution is minimal in the canyon portions of the streams except for Emigration Creek. Otherwise, point source contribution is negligible.

The waste loads presently generated from septic seepage and non-point sources in Emigration Canyon are severe enough to merit abatement. Any new construction in the canyon will produce an increase in pollution. The trade-off between installation of a sanitary sewer and the upgrading of septic tanks is being considered by the Department.

The valley segments of the Wasatch Mountain streams receive diffuse pollution loadings, principally from storm and urban runoff and water transfers from canals. The valley segments of Emigration, Mill, Big Cottonwood and Little Cottonwood Creeks are therefore classified as water quality limited (WQL). A water quality limited stream is one which is not presently meeting water quality standards or will not meet water quality standards even with imposition of stringent effluent limitations. Additionally, the valley segments of City Creek, Red Butte Creek, South Fork of Dry Creek, Bell Creek, Little Willow Creek, and all permanent creeks on the east slope of the Oquirrh's could be WQL segments but data necessary for this determination is incomplete.

The Jordan River is a water quality limited stream (WQL) for the entire length of Salt Lake County. Pollutant loadings from point and non-point sources degrades the water quality to below proposed standards in many instances.

In many reports for the 208 Project, it was determined that polished secondary levels of sewage treatment (BOD_5=10 mg/1, SS=10 mg/1) and nitrification (90% N reduction) at sewage treatment plants are necessary to maintain ammonia and dissolved oxygen concentrations at acceptable levels in the Jordan River (WQ-6, FM-5, WQ-14, and others).

Wastewater CBOD and assimilation curves for the Jordan River are shown in Figure IV-14. Advanced nitrification (90% N reduction) increased DO concentrations by about 0.5 to 0.2 mg/1 in all cases.

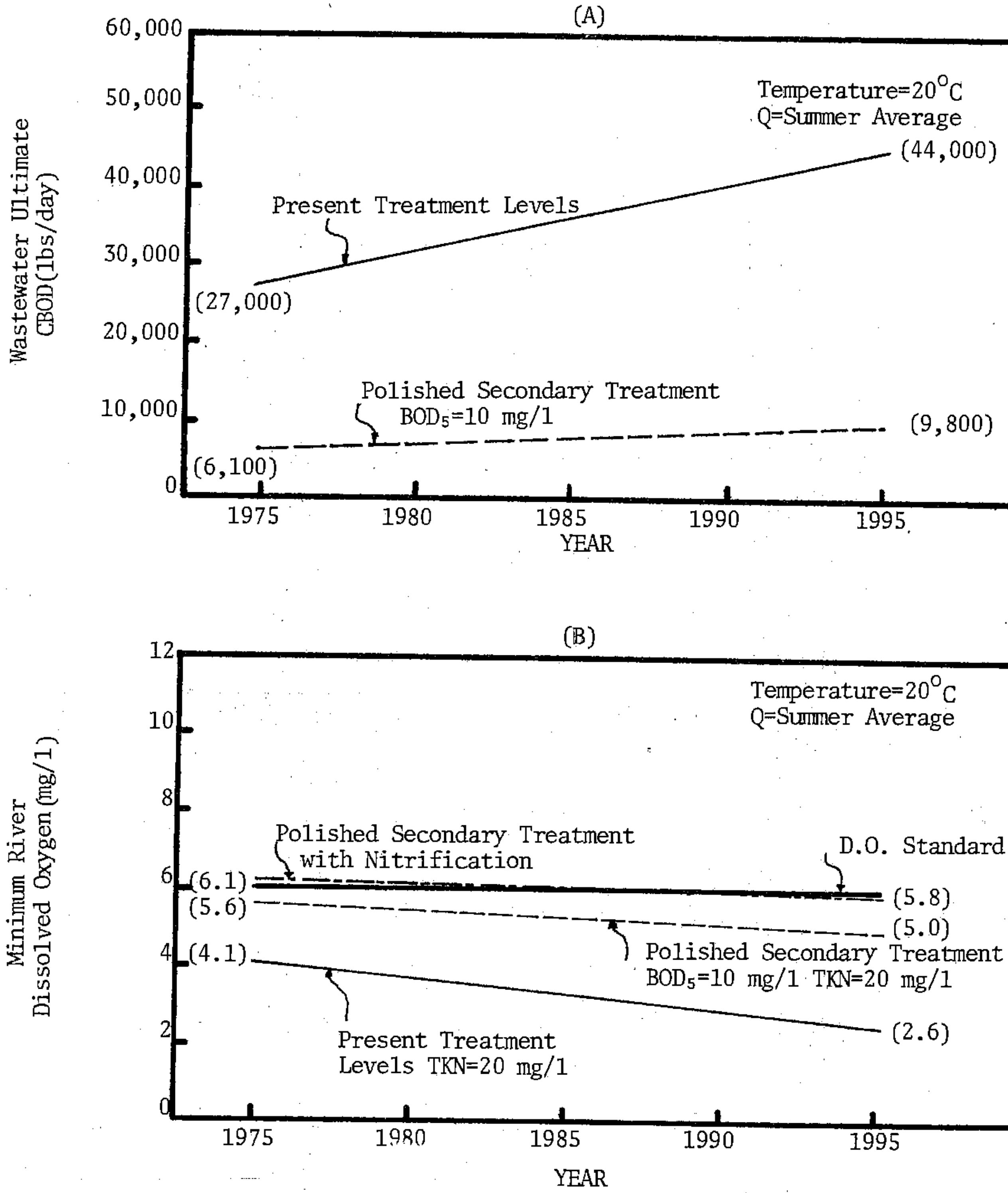


Figure IV-14. Wastewater CBOD and Jordan River Assimilation Curves

Future municipal point discharges (STP effluents) will not degrade the water quality of the river to the extent that they do now. Polished secondary treatment will enable the STP's to meet future discharge requirements of 10 mg/1 BOD_5 and 10 mg/1 suspended solids and better. With an emphasis put on control of urban runoffs through stormwater detention and best management practices, pollutant levels in the Jordan River could be lessened to where the river may be classified as EL. Control of point discharges will keep the quality high enough to attain desired in-stream concentrations. Just now much NPS reduction is needed to meet future stream standards should not be expressed as an overall percentage or other non-meaningful measure but should be evaluated on a section by section basis. The proposed plan for reducing NPS pollution, particularly from urban and storm runoff, is discussed in the Non-Point Plan section (Section VI).

Future waste load contributions from industrial discharges have been projected for the increase in loads to future sewage treatment facilities but have not been projected for those industries that are and will be discharging directly to surface waters (especially the Jordan River) in Salt Lake Valley. Future loads to sewage treatment facilities are discussed in Section V and will not be discussed here. Future loads to surface waters have not been projected in detail due to inherent difficulties in projecting this impact. However, based upon present industrial patterns and present discharges from these industries, preliminary projections of the amounts of waste loads from present dischargers have been compiled.

An inventory of present industrial dischargers was undertaken and permit data compiled for those dischargers who have NPDES permits. Locations of existing NPDES dischargers that discharge to surface waters (discrete discharges) are shown in Figure IV-15 and are listed in Table IV-18. These dischargers have been evaluated as to the proposed "10/10" state standards (FM-1) that are to be enforced in the near future. The evaluation for present dischargers is listed in Table IV-19. (Note that the State now proposes to change the "10/10" standards to "15/10" standards - see Appendix A-2-3).

Of those discrete industrial dischargers that are not projected to go to total containment or a sewer discharge to meet "10/10" standards, the increase in quantity of discharges has been linked to employment increases in the manufacturing industry. Table IV-20 lists projected increases in this category by statistical areas.

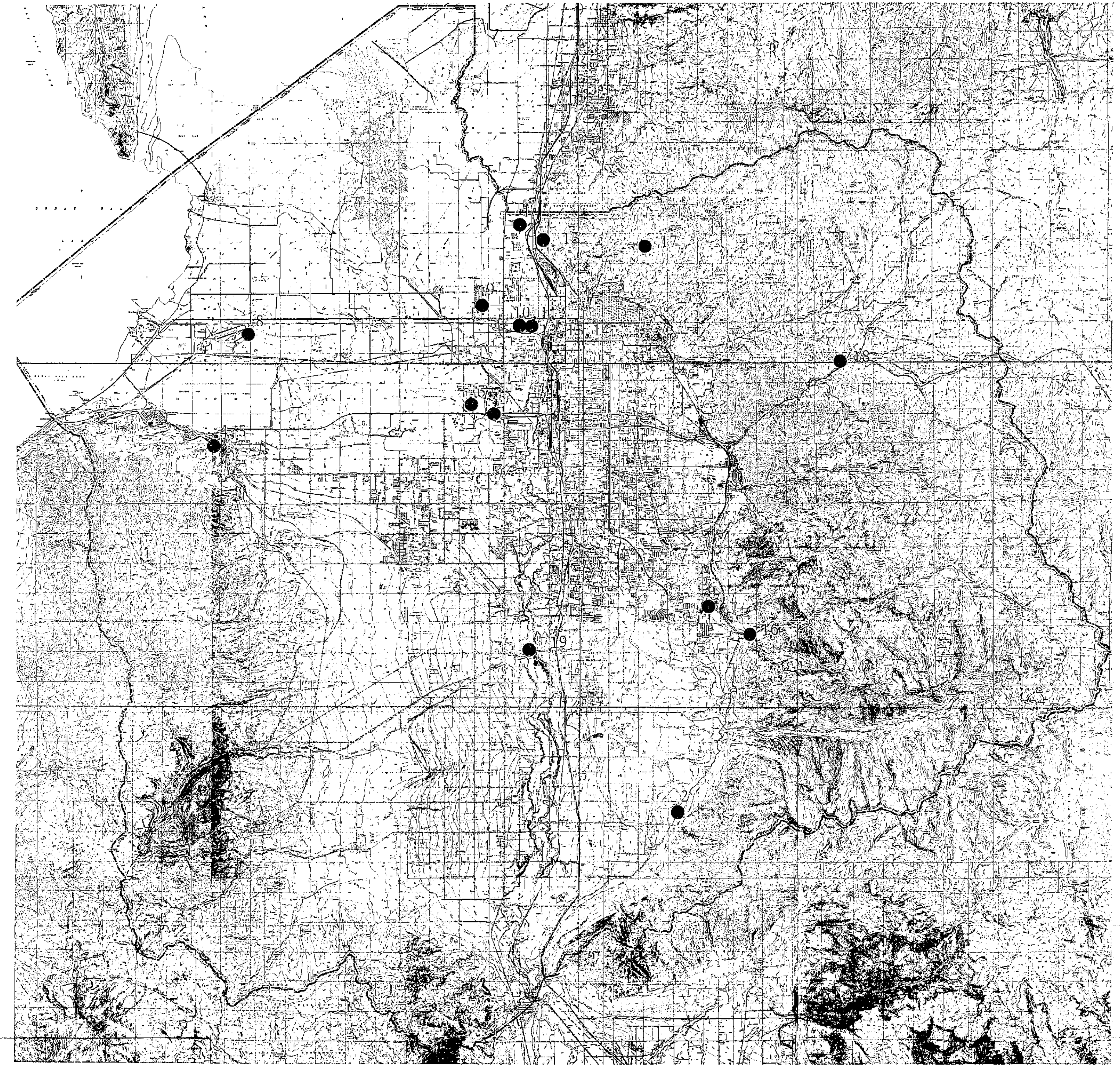
As can be seen, an overall increase of about 38% in the manufacturing industry employment is expected by 1995. Therefore, increases in flows from industrial point sources discharging to surface waters (especially the Jordan River system) are expected to be in this range. It is also projected that no new large water intensive industry will locate in Salt Lake County by 1995.

The major irrigation canals in Salt Lake County can be grouped into two major categories; those that are used for irrigation and industrial purposes (the west-side canals) and those that are used for irrigation and flow augmentation in the valley portions of the Wasatch Mountain streams (the east-side canals). This flow augmentation/exchange situation has been discussed earlier in this section.

The major west-side and one east-side canal are classified as EL. These are the Provo Reservoir Canal, the Utah Lake Distributing Canal, the South Jordan Canal, the Draper Irrigation Canal, the Utah and Salt Lake Canal, and the North Jordan Canal. These canals receive numerous storm/urban runoff discharges from the many new subdivisions that are being constructed in that

FIGURE IV-15

LOCATION OF EXISIING DISCRETE INDUSTRIAL NPDES DISCHARGES



1 CONCRETE PRODUCTS
2 DRAPER IRRIGATION CO.
3 EIMAC, DIV. OF VARIAN
4 KENNECOTT COPPER
5 KENNECOTT COPPER
6 KEY INDUSTRIES SE SAND & GRAVEL
7 METALS PROCESSING
8 MORTON SALT CO.
9 SPERRY UNIVAC
10 UTAH POWER & LIGHT
11 UTAH POWER & LIGHT
12 UTAH POWER & LIGHT
13 UTAH POWER & LIGHT
14 UTAH POWER & LIGHT
15 MONROC
16 BIG COTTONWOOD WATER PURIFICATION PLANT
17 CITY CREEK WATER PURIFICATION PLANT
18 PARLEY'S CANYON WATEI PURIFICATION PLANT
19 MICHAEL'S FOOD MART

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

Sq. Miles 9 1

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

miles 0 1 2 3 4 5

Table IV-18. Salt Lake County Industrial NPDES Permit Inventory

Name of Discharger	Location	SIC No	Activity	Receiving Water	Permit No / Exp'n Date	USO No	Source of Wastewater / Type of Current Treatment	Discharge Immediate / Future	Average Discharge (MGD)	Effective Date	BOD	Coliform Fecal	Coliform Total	COD	Sulfide	Chloride	Sulfate	pH	Temp °C	Phosphorus	Nitrogen	TSS	TDS	Chlorine Residual	Oil & Grease	Miscellaneous	Remarks
AMERICAN OIL CO	SALT LAKE CITY	2911	MFG OF GASOLINES & OILS	S.L.C STP	UT000006 6-30-81	001	PROCESS WATER	IMMEDIATE	0.0	6-28-76																	4-6-74 ALL DISCHARGE NOW DIVERTED TO S.L.C STP
CLARK TANK LINES	1450 BECK ST SALT LAKE CITY	7538	TRUCKING TERMINAL MAINT & CLEAN	S.L.C STP	UT0022390 12-31-80	001	PROCESS WATER SETTLING TANKS	IMMEDIATE FUTURE		1-1-76 7-1-80	25 10							6.5-9.0 6.5-9.0				25 10			10 10		ALL DISCHARGE NOW DIVERTED TO S.L.C SEWAGE TREATMENT PLANT
CONCRETE PRODUCTS	2200 NO 1200 W SALT LAKE CITY	1442	WASHING & CLARIFYING SAND & GRAVEL	S.L.C SEWAGE CANAL TO GREAT S L	UT000066 6-30-81	001	PROCESS WATER SETTLING POND	DISCHARGE IMMEDIATE FUTURE	0.4	7-8-76 7-1-77 7-1-80		200 20	2000 200					7.5 6.5-9.0 6.5-9.0	21°			30 25 10			10		
DRAPER IRRIGATION CO	12590 SO 950 E DRAPER		CULINARY WATER PURIFICATION	BIG WILLOW CREEK	UT0022179 6-30-78	001	BACKWASH & INLET OVERFLOW SETTLING POND	IMMEDIATE FUTURE		(NOTE 1) 12-1-75 7-1-77								6.5-9.0				30 25		0.5		(Al=1.0mg/l) (Al=1.0mg/l)	APPLYING FOR RENEWAL
EIMAC DIVISION OF VARIAN	1678 PIONEER ROAD SALT LAKE CITY		ELECTRONICS	C7 DITCH TO GREAT SALT LAKE	UT000070 12-31-81		PROCESS & STORMWATER PHYSICAL - CHEMICAL PLANT FOR PROCESS	DISCHARGE IMMEDIATE FUTURE	0.35	(NOTE 2) 6-30-80								6.5-9.0 6.5-9.0				20 10			10 10	(Cu=2.0mg/l)(Fe=0.25) (CN=0.50mg/l)	PERMIT OUT FOR PUBLIC COMMENT
KENNECOTT COPPER	MAGNA	1021	PRODUCTION OF COPPER ORE	C7 DITCH TO GREAT SALT LAKE	UT000005 12-31-81	002	PROCESS WATER SETTLING POND	IMMEDIATE FUTURE		7-1-77 7-1-80	20 10	200 20	2000 200	30				6.5-9.0				20 10			10	(Cu=.15mg/l)(Fe=.3mg/l) (CN=.03mg/l)(Pb=.2mg/l) (Mn=.15mg/l)(Hg=.001mg/l)	(Phenols=.1mg/l) (Zn=.3mg/l)
"	"	"	"	"	" "	006	PROCESS & SANITARY WASTEWATER PHYSICAL-CHEMICAL PLANT	IMMEDIATE FUTURE		7-1-77 7-1-80	10 10	200 20	2000 200		1.0			6.5-9.0				20 10			10	(Cu=.15mg/l)(Fe=3mg/l) (Ag=.05mg/l)(CN=.03mg/l) (Pb=.2mg/l)(Phenols=1mg/l)	(Mn=3mg/l) (Zn=3mg/l)
KEY INDUSTRIES SO. E. SAND & GRAVEL	6500 HOLIDAY BLVD HOLIDAY	1442	WASHING & CLARIFYING SAND & GRAVEL	BIG COTTONWOOD CREEK	UT000055 9-30-81	001	PROCESS WATER SETTLING PONDS	IMMEDIATE FUTURE	0.28 0.0	10-1-76 7-1-77								7.8 6.5-9.0				25 30			4 10		NO DISCHARGE ALLOWED
CHRISTENSEN DIAMONDS	SALT LAKE CITY		INDUSTRIAL DIAMONDS & ELECTRO-PLATING	CITY STORM DRAIN	UT0000531 6-30-81	001	PROCESS WATER HOLDING TANK	IMMEDIATE FUTURE	0.02 0.02	7-1-76 7-1-81	25							6.5-9.0 6.5-9.0				25 10				(Cu=0.5)(Cr6+=.05)(Cd=.05) (Fe=1.0)(Cr=.1)(Pb=0.1) (Zn=1)(Ba=1.0)(Phenols=.1)	ALL FIGURES GIVEN IN MISCELLANEOUS COLUMN ARE IN (mg/l)
MORTON SALT CO	SALTAIR		SALT BY SOLAR EVAPORATION	RITTER CANAL	UT000038 11-1-81	001 THRU 008	PROCESS WATER		2.64									6.5-9.0									
WERNELI REFRIGERATION CO.	264 GLENDALE SALT LAKE CITY	7538	SOFT DRINKS PROCESSING	JORDAN RIVER	UT0000752 9-30-81	001	VEHICLE CLEANING WASTEWATER GREASE TRAP	DISCHARGE IMMEDIATE FUTURE	10 GAL/DAY	10-1-76 7-1-80	38.5 25 10							6.93 6.5-9.0 6.5-9.0				4.5 10 10			2.3 10 10		ALL DISCHARGE NOW DIVERTED TO SALT LAKE CITY SEWAGE TREATMENT PLANT
SPERRY UNIVAC	322 NO 2200 W SALT LAKE CITY	3823	COMPUTER MFG.	BRIGHTON CANAL	UT0020397 6-30-79		STORMWATER RUNOFF & AIR CONDITIONER BLOW-DN.	IMMEDIATE										6.5-9.0									
STAUFFER CHEMICAL	MAGNA	281	FERTILIZER MFG.	C7 DITCH TO GREAT SALT LAKE	UT0000477 7-1-83	001 002	WATER SOFTENER REGENERANT SETTLING POND	DISCHARGE IMMEDIATE FUTURE	0.005	(NOTE 2) 7-1-80								6.5-9.0 6.5-9.0				25 10					PERMITOUT FOR PUBLIC COMMENT
UTAH POWER & LIGHT (GADSBY PLANT)	SALT LAKE CITY	4911	PRODUCTION OF ELECTRIC POWER	JORDAN RIVER	UT000016 12-31-80	001	WATER TREATMENT	IMMEDIATE FUTURE	1.8 1.8	1-1-76 7-1-80								6.5-9.0 6.5-9.0	32.2 32.2			25 10		0.2 0.2	10 10	(Fe=1.0mg/l)(Cu=1.0mg/l)	
"	"	"	"	ABATEMENT CANAL	" "	004 005 006	NON-CONTACT BEARING COOLING WATER SETTLING POND	IMMEDIATE FUTURE		1-1-76 7-1-80								6.5-9.0 6.5-9.0	35 35			25 10		0.2 0.2	10 10	(Fe=1.0mg/l)(Cu=1.0mg/l)	
UTAH POWER & LIGHT (JORDAN PLANT)	SALT LAKE CITY	4911	PRODUCING ELECTRICAL POWER	JORDAN RIVER	UT000010 12-31-80	001	CONDENSOR CLG. WATER	IMMEDIATE	27 55 (MAX)	1-1-76								6.5-9.0	32.2					0.2	10	(Cu=1.0mg/l) (Fe=1.0mg/l)	NORMALLY ON STANDBY—USED ONLY OCCASIONALLY
"	"	"	"	"	"	002	NON-CONTACT BEARING COOLING WATER	IMMEDIATE	0.005	1-1-76								6.5-9.0	32.2								
MONROC	1730 BECK ST. SALT LAKE CITY	1442	WASHED SAND & GRAVEL	"	UT000058 6-30-81	001	PROCESS WATER SETTLING POND	IMMEDIATE		7-1-77 7-1-80								6.5-9.0 6.5-9.0				25 10			10		NO DISCHARGE
HUNTSMAN OIL & CHEMICAL CO.	1979 SO 600 W. SALT LAKE CITY	281	COMPOUND & MIXED CHEMICALS		UT000020 9-30-78	001		(NOTE 3)	0	10-5-73																	ZERO DISCHARGE
BIG COTTONWOOD WATER PURIFICATION PL.	BIG COTTONWOOD CANYON		CULINARY WATER TREATMENT	BIG COTTONWOOD CREEK	UT0000680 6-30-82	001	CLARIFIER OVERFLOW NONE	IMMEDIATE		10-22-77 7-1-80								6.5-9.0				25 10		0.5		(Al=1.5mg/l)	
"	"		"	"	" "	[illegible]	SLUDGE BED OVERFLOW NONE	IMMEDIATE	0.15	10-22-77 7-1-80												25 10		0.5		(Al=1.5mg/l)	
CITY CREEK WATER PURIFICATION PL.	CITY CREEK CANYON		CULINARY WATER TREATMENT	CITY CREEK	UT0000671 6-30-82	002	CLARIFIER & INLET OVERFLOW NONE	IMMEDIATE										6.5-9.0				25 10				(AL=1.5mg/l)	
"	"		"	"	" "	003	SLUDGE PUMPWELL DRAIN NONE	IMMEDIATE										6.5-9.0				25 10				(Al=1.5mg/l)	
PARLEYS CANYON WATER PURIFICATION PL.	PARLEYS CANYON		CULINARY WATER TREATMENT	PARLEYS CREEK	UT000069 6-30-82	004 005	EFFLUENT & PLANT OVERFLOW NONE	IMMEDIATE										6.5-9.0				25 10				(Al=1.5mg/l)	
"	"		"	MOUNTAIN DELL RESERVOIR	" "	005	SLUDGE BED DISCHARGE NONE	IMMEDIATE	0.15									6.5-9.0				25 10				(Al=1.5mg/l)	
MICHEAL'S FOOD MART	1550 W 7800 SO.		FOOD MARKET	IRRIGATION DITCH JORDAN RIVER	UT0022900 12-31-80	001	AIR CONDITIONING COOLANT NONE	IMMEDIATE	.001									6.5-9.0	32								NOTHING OTHER THAN HEAT TO BE ADDED TO THE DISCHARGE

UPDATED 7-21-78 by T.W.
NOTE 1: IN PROCESS OF REAPPLYING TO EPA a/o 7-21-78.
NOTE 2: EFFECTIVE DATE 30 DAYS FOLLOWING RECEIPT OF APPROVED PERMIT.
NOTE 3: FORMALLY WASATCH CHEMICAL CO. - MAY CHANGE NATURE OF FACILITY AND NOT REAPPLY FOR NEW PERMIT.

Table IV-19. Evaluation of Present Industrial Dischargers as to Processes Necessary to Meet Proposed "10/10" Standards and Increases in Loads Where "10/10" Standards are Expected to be Satisfied (Discrete Dischargers)

Discharge Number	Name of Discharger	Receiving Water	Processes or Loads
1	Concrete Products	SLC Sewage Canal	Total confinement to meet 10/10 standards
2	Draper Irrigation Company	Big Willow Creek	Total confinement to meet 10/10 standards
3	EIMAC	C7 Ditch	Quantity increases at rate of employment in manufacturing industry
4,5	Kennecott	C7 Ditch	Quantity will remain constant or decline somewhat
6	Key Industries	Big Cottonwood Cr.	Total confinement to meet 10/10 standards
7	Christensen Diamonds	City Storm Drain	Quantity increases at rate of employment in manufacturing industry
8	Morton Salt Co.	Ritter Canal	Quantity increases at rate of employment in manufacturing industry
9	Sperry UNIVAC	Brighton Canal	Quantity will remain same
10,11	Utah Power & Light Co. (Gadsby Plant)	Jordan River	Quantity will remain the same-filters and/or other treatment will be necessary to meet 10 mg/1 TDS
12,13,14	Utah Power & Light Co. (Jordan Plant)	Jordan River	Quantity will remain the same (Plant not presently in operation)
15	Monroc	SLC Sewage Canal	Total confinement to meet 10/10 standards (at present)
16	Big Cottonwood Water Purification Plant	Big Cottonwood Creek	Total confinement to meet 10/10 standards
17	City Creek Water Purificat. Plant	City Creek	Total confinement to meet 10/10 standards
18	Parley's Water Purificat. Plant	Mt. Dell Reservoir	Total confinement to meet 10/10 standards
19	Michael's Food Mart	Irrigation Ditch-Jordan River	Quantity will remain the same

See Figure IV-14.

Table IV-20. 1975-1985-1995 Located Employment in Manufacturing Industry by Statistical Area Group

Statistical Area	Year	Employment	Percent Change
TOTAL CENTRAL AREA	1975	14,010	-5
	1985	13,342	4
Central Salt Lake City	1995	13,874	
TOTAL INNER FRINGE	1975	14,433	33
	1985	19,232	38
Salt Lake Airport, Big Cottonwood, Murray, So. Salt Lake	1995	26,627	
TOTAL SUBURBAN FRINGE	1975	4,050	3
Little Cottonwood,	1985	4,167	36
Hunter-Granger, Kearns, Midvale, Draper, W. Jordan, S. Jordan, Riverton	1995	5,662	
TOTAL WEST MOUNTAINS	1975	3,735	-11
Oquirrh Mount. W. Salt	1985	3,326	46
Lake Smaller Airport, Coppermine Refining Tailings Pond	1995	4,846	
TOTAL WASATCH MOUNTAINS	1975	0	0
Wasatch Mountains, Alta,	1985	0	0
Traverse Mountains	1995	0	
COUNTY TOTALS	1975	36,228	11
	1985	40,067	27
	1995	51,009	

area. This practice is discouraged by the Department. These canals also receive numerous agricultural returns. The extent of these returns is not precisely known.

The major east-side canals except the Draper Irrigation Canal are classified WQL. The cause of a water quality limited classification is for the protection of downstream water uses. These canals carry flows for the purpose of meeting water rights exchange requirements on the valley portions of some Wasatch Mountain streams.

The sewage canal is classified as a WQL segment. The canal, over the years, has been the conveyor of great amounts of raw wastes from industrial and urbanized areas in Salt Lake City. This segment will probably retain a WQL classification for quite some time as the economics of the situation do not favor the "cleaning up" of the canal. This canal was constructed for the purpose of waste disposal. However, the canal cannot remain an "open sewer".

As before, the situation in the Kersey Creek/C-7 Ditch system is different. The system is classified WQL now but that situation needs to be changed. The system must be upgraded for public health and safety reasons.

The surplus canal is classified as WQL. However, a major problem encountered in stream segmentation is the fact that there are no quality criteria set as standards for Class 3C, 5 or 6 waters. Without numerical criteria to compare an existing quality, a meaningful classification cannot be developed.

Proposed State water quality standards are not stringent enough in the anti-degradation policy area. Only new point discharges of wastewater are disallowed. Consistent with the antidegradation policy, the quality of designated streams should not be degraded. However, without some release from this policy, it would become, in essence, a no development policy. Costs of protecting designated streams would be less than the increased costs of water treatment that would be incurred. The requirement of developers to institute best management practices and to carry out water quality monitoring attendent with construction should enable the State Water Pollution Control Committee and the Department Council to review conditions of degradation and make any variances or requirements necessary for abatement of non-point pollution. Culinary water supply in Salt Lake County is now at a premium and should not be wasted or destroyed.

V. Point Source Management Plan

V. POINT SOURCES

INTRODUCTION

The point source plan is divided into two sections: municipal sewage treatment and industrial waste treatment. This part of the point source plan concentrates on the future of sewage treatment in Salt Lake County because the majority of industrial point dischargers are projected either to go to total containment to meet future effluent requirements, or they are of such small impact that they are not relatively significant. Industrial considerations are discussed in this section as well as in Section IV.

In this document, control and abatement of impacts from storm drainage (urban and storm runoff) is discussed as non-point source pollution (Section VI) even though a recent court decision has required that storm drainage discharges be considered point sources of pollution.

Present Wastewater Management

Entities involved with wastewater management in Salt Lake County are of two distinct types; multipurpose governments (incorporated cities) and single-purpose governments (sewage collection districts). Virtually all developed land in the county is serviced by one or the other. However, some developed land is not serviced by either. Wastewater management in unserviced areas primarily consists of septic and/or holding tanks. Two ways an area can obtain sewer service are; 1) be annexed to an incorporated city with a collection service or 2) petition a sewage collection district for annexation to that district.

Planning for future sewage treatment needs has been left to individual collection districts and cities until P.L. 92-500 mandated that planning be integrated, first on a river basin basis (Section 303(e)) and then on a local area-wide basis (Section 208). The third step in this planning process is planning, designing and construction of individual treatment facilities.

At the present time there are 19 sewage collection districts in Salt Lake County. Of these 19 districts, five are incorporated cities, one is privately owned and operated (to be phased out), and 13 are special purpose districts, one of which is not presently operating. These are shown in Figure V-1. These 19 collection districts are serviced by 10 treatment plants, nine of which discharge to surface waters of the county. The location of these 10 treatment plants is shown in Figure V-2. Table V-1 lists the plants and their contributory districts.

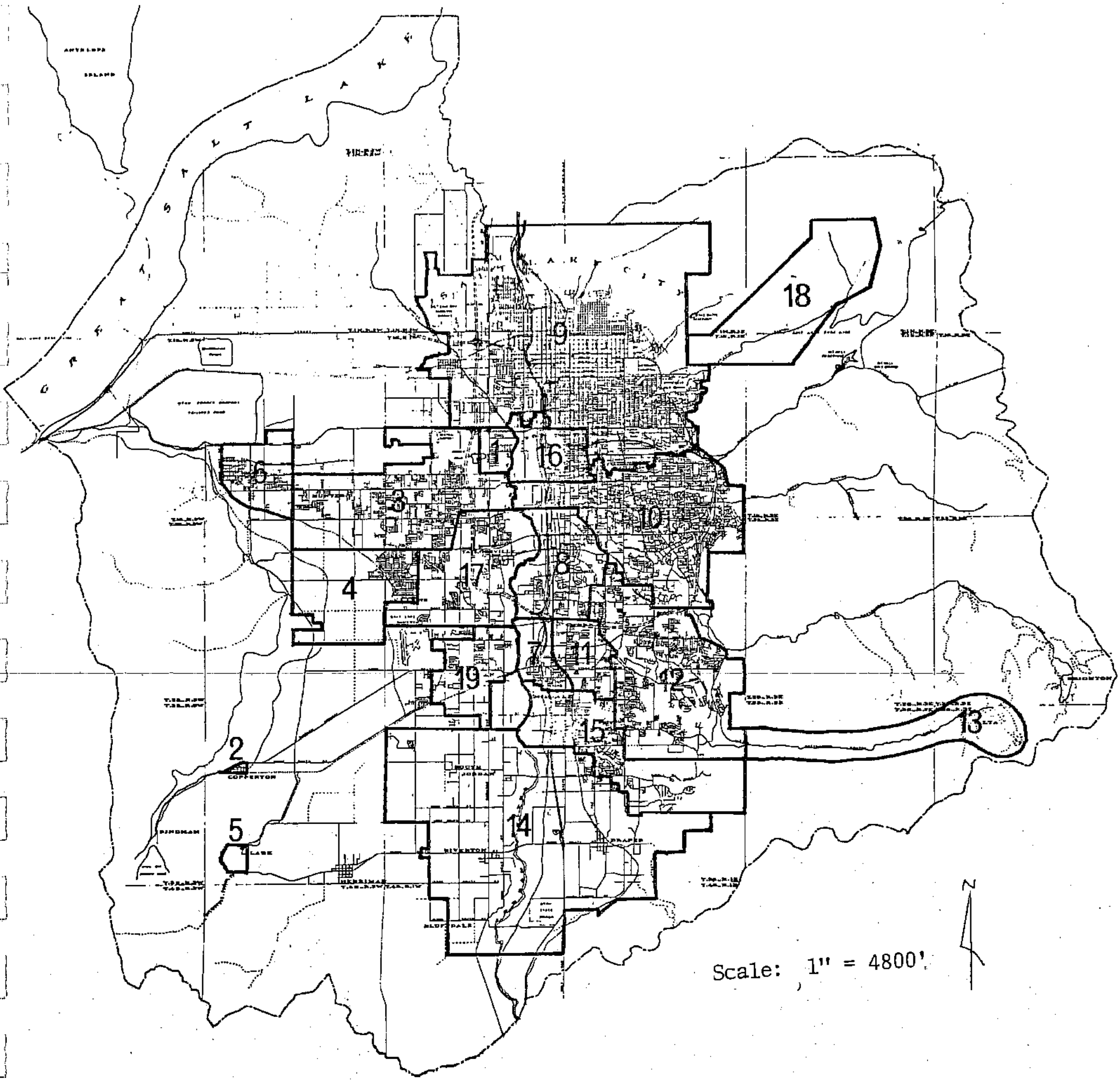
Facilities Planning Areas

Initially, facilities planning areas included the Salt Lake City Planning Area, the Magna Planning Area, and the Jordan Planning Area. After many boundary changes and exclusions/inclusions, the planning areas as shown in Figure V-3 were adopted. These planning areas are outlined in Table V-2.

SEWAGE TREATMENT PLAN SUMMARY

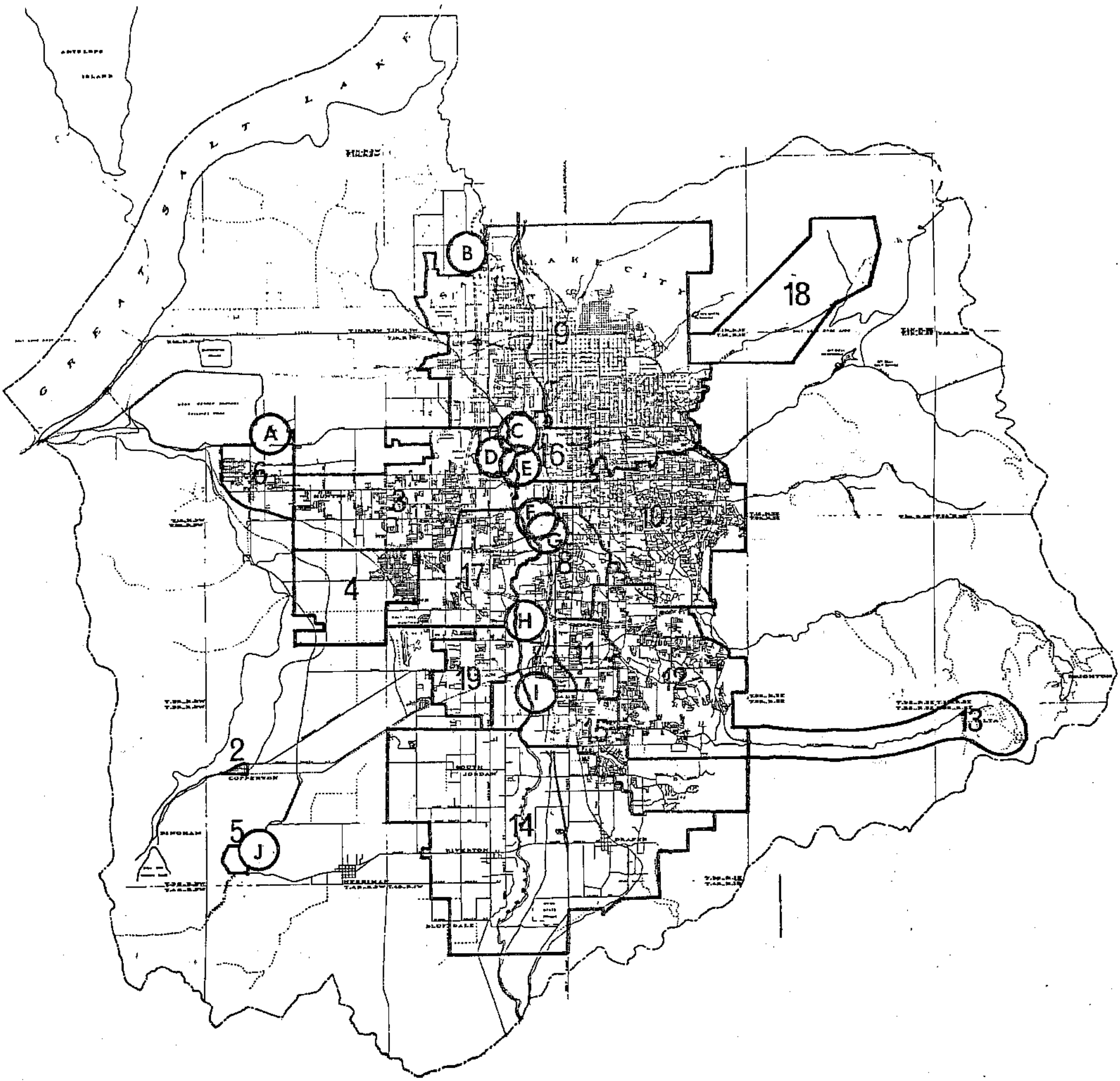
At the present time, there are nine sewage treatment plants in Salt Lake County discharging to surface waters (Figure V-21). The Magna STP discharges to Kersey Creek and the Salt Lake City STP discharges to the sewage canal while the other sewer discharge to the Jordan River.

In summary, the 208 plan for future sewage treatment in Salt Lake County will consolidate these nine treatment plants into four, two of which will discharge to the Jordan River. A summary description is given below.



1. Chesterfield Improvement District
2. Copperton Improvement District
3. Granger-Hunter Improvement District
4. Kearns Improvement District
5. Lark U. S. Mines
6. Magna Improvement District
7. Midvale City
8. Murray City
9. Salt Lake City
10. SLC Suburban #1
11. SLC Suburban #2
12. SL County Cottonwood District
13. SL County Service Area #3
14. SL County Sewer Improvement #1
15. Sandy Suburban Improvement District
16. South Salt Lake
17. Taylorsville-Bennion Improvement District
18. Emigration Canyon Improvement District
19. West Jordan

Figure V-1. Sewage Collection Districts.



Legend:

A. Magna
B. Salt Lake City
C. South Salt Lake City
D. Granger-Hunter
E. Salt Lake Suburban Sanitary District No. 1
F. Cottonwood
G. Murray
H. Midvale
I. Sandy
J. Lark

N

Scale: 1" = 4800'

Figure V-2. Location of Salt Lake County Sewage Treatment Facilities.

Table V-1. Existing Treatment Plants And Contributory Areas

Plant	Location (Address)	Contributory Districts
Magna	7650 W. 2100 So. Magna, Ut	Magna Water and Sewer Improvement District
Salt Lake City	1850 N. Redwood Rd. SLC, Ut	Salt Lake City Chesterfield Improvement District
South Salt Lake City	2200 S. 500 W. So. SLC, Ut	South Salt Lake City
Granger-Hunter	1500 W. 3100 So. SLC, Ut	Granger-Hunter Improvement District Kearns Improvement District
Salt Lake City Suburban Sanitary District No. 1	650 W. 3300 So. SLC, Ut	Salt Lake City Suburban Sanitary District No. 1 Taylorsville-Bennion Improvement District
Salt Lake County Cottonwood	4100 So. 500 W. Murray, Ut	Salt Lake County Cottonwood Sewer District Salt Lake County Service Area No. 3
Murray City	4500 S. 500 W. Murray, Ut	Murray City
Midvale (Tri-Community)	985 W. 7030 S. Midvale, Ut	Midvale City West Jordan City Salt Lake City Suburban Sanitary District No. 2 Salt Lake County Sewer Improvement District No. 1
Sandy	8735 S. 700 W. Sandy, Ut	Sandy Suburban Sanitary District
Lark	8600 W. 12500 So. Lark, Ut	Lark U.S. Mines

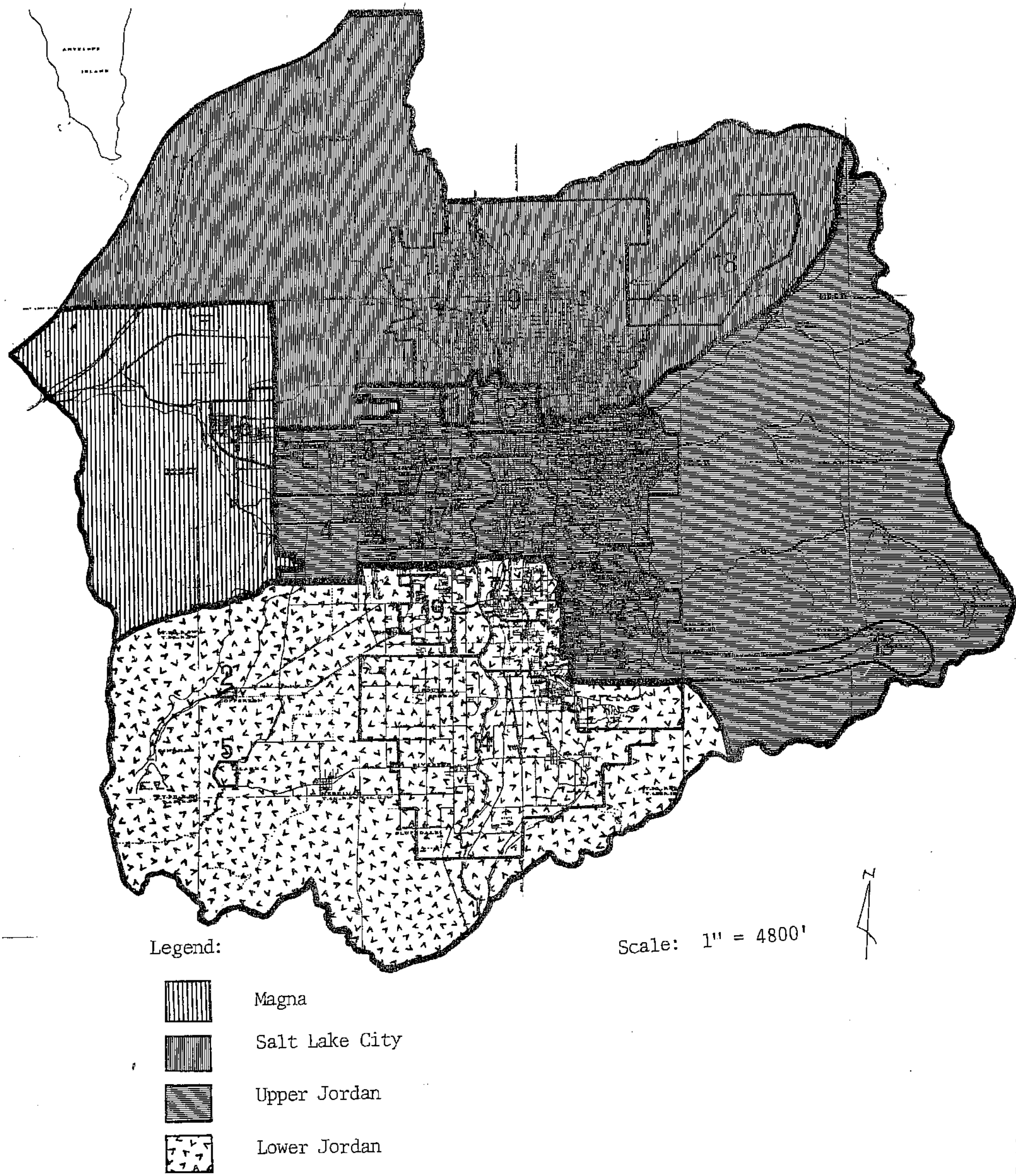


Figure V-3. Facilities Planning Areas.

Table V-2. Description of Facilities Planning Areas - Salt Lake County

Planning Area	Description
Magna	Serviced Area: Magna Water and Sewer Improvement District Unserviced Area: Bounded by southern ridge of Marker's Canyon on south Bounded by County line on west Bounded by North Temple Street on north Bounded by Granger-Hunter and Kearns Improvement Districts and line running north to North Temple Street from NE corner of Magna Water and Sewer Improvement District on the east
Salt Lake City	Serviced Area: Salt Lake City Chesterfield Improvement District Emigration Canyon Improvement District (inactive) Unserviced Area: Bounded by SE ridge of Emigration on the east Bounded by Granger-Hunter Improvement District, Salt Lake City Suburban Sanitary District No. 1, and South Salt Lake City on the south Bounded by County line on the north Bounded by Magna Planning Area on the west
Lower Jordan	Serviced Area: South Salt Lake City Granger-Hunter Improvement District Kearns Improvement District Salt Lake City Suburban Sanitary District No. 1 Murray City Taylorsville-Bennion Improvement District Salt Lake County Cottonwood Sewer District Salt Lake County Service Area No. 3 Unserviced Area: Bounded by County line and east ridge of Bell's Canyon on east Bounded by Salt Lake City Planning Area on north Bounded by Magna Planning Area on west Bounded by southern boundary of Kearns and Taylorsville-Bennion Improvement Districts, southern boundary of Salt Lake County

Table V-2. (Continued)

Planning Area	Description
Lower Jordan (cont'd)	Service Area No. 3, and northern boundaries of West Jordan and Midvale cities, Salt Lake City Suburban Sanitary District No. 2, and Sandy Suburban Improvement District on the south.
Upper Jordan	Serviced Area: Copperton Improvement District Lark U.S. Mines Midvale City West Jordan City Salt Lake City Suburban Sanitary District No. 2 Sandy Suburban Improvement District Salt Lake County Sewer Improvement District No. 1 Unserviced Area: Bounded by east ridge of Bell's Canyon on the east Bounded by County line on south Bounded by County line on west Bounded by Lower Jordan Planning Area on north

MUNICIPAL POINT SOURCE MANAGEMENT PLAN SUMMARY:

a) Phase out existing plants at Midvale and Sandy by approximately 1980.

b) Construct a regional plant at or near present site of Midvale plant to handle wastes from Midvale and Sandy areas by approximately 1980.

c) Phase out existing plants at Murray, Cottonwood, South Salt Lake, Granger-Hunter, and SLCSSD #1 by approximately 1995.

d) Construct a regional plant at or near the present site of SLCSSD #1 plant to handle wastes from Murray, Cottonwood, South Salt Lake, SLCSSD#1, and Granger-Hunter areas by approximately 1990.

e) Upgrade existing plant at Salt Lake City to handle future wastes.

f) Upgrade existing plant at Magna to handle future wastes.

g) Phase out Lark lagoon system as town is phased out.

h) Continue present arrangement at Copperton (convey wastes to Kennecott Copper Corporation waste stream for treatment).

EFFLUENT QUALITY

Two distinctly different sets of receiving water conditions and requirements exist in the county: those of the Jordan River and its anticipated high levels of recreation use, and those of the Salt Lake City Sewage Canal and Kersey Creek which are principally degraded by extensive quantities of background pollution. The 208 Project recommendations for discharge to the Jordan River include effluent quality requirements consistent with, but not limited to, the State's definition of polished secondary effluent, including implementation by the State's target date of June 30, 1980. (Note: New draft water quality standards proposed by the State change the target date to either June 30, 1983 or June 30, 1985 depending upon the receiving water's stream classification.)

On the other hand, effluent requirements for the Salt Lake City Planning Area and the Magna Planning Area are based on recommendations by the 208 Project to implement the Utah State effluent requirement of polished secondary treatment for all municipal wastewater. However, the 208 Project recommends delaying polished secondary treatment, while achieving consistent standard secondary treatment at the Salt Lake City and Magna facilities, until such time as comprehensive pollution abatement programs can be established for the Salt Lake City Sewage Canal and Kersey Creek.

Characteristics of polished secondary and standard secondary effluents are shown in Table V-3. Effluent requirements for the two subregional plants discharging to the Jordan River are shown in Table V-4. These effluent requirements are based on beneficial use classifications as discussed in Section IV.

Table V-3. Utah State Definition of Polished Secondary and Standard Secondary Effluents

Parameter	Standard Secondary	Polished Secondary
BOD_5 (mg/l)[1]	25	10 [2]
SS (mg/l)[1]	25	10
Total Coliforms (MPN/100ml)[3]	2000	200
Fecal Coliforms (MPN/100ml)[3]	200	20
pH [4]	6.5-9.0	6.5-9.0

[1] Maximum monthly arithmetic mean.
[2] Subject to change - see Draft Standards in Appendix.
[3] Maximum monthly geometric mean.
[4] Range.

Table V-4. Effluent Requirements for Treatment Plants Discharging to the Jordan River.

Parameter	Criteria
BOD_5 (mg/l)	10[1]
SS (mg/l)	10[1]
NH_3-N (mg/l)	5.0 Summer[1] 10.0 Winter[1]
P	No Requirement
Inorganic N	No Requirement
Coliforms (MPN/100 ml)	200[1]
Fecal Coliforms (MPN/100 ml)	20[1]
DO (mg/l)	4.0[2]
Chlorine Residual (mg/l)	0.0[3]
pH (units)	6.5 to 9.0[4]

[1] Maximum allowable monthly mean.

[2] Minimum allowable monthly mean.

[3] Maximum allowable monthly mean. The State Division of Health does not require a minimum chlorine residual concentration. However, they recommend a residual of 1.0 mg/l for disinfection (Paragraph III-82e, Code of Waste Disposal Regulations, adopted 5/19/65).

[4] Range.

The State has indicated that, although it is unlikely that polished secondary effluent values could be consistently attained where the method of secondary treatment is trickling filtration, the definition of polished secondary is intended to cover plants employing two-stage or single-stage low rate trickling filters followed by granular media filters, and that effluent from such plants is acceptable as a polished secondary effluent. (A plant employing single-stage low rate or two-stage trickling filters followed by granular media filters can be expected to consistently produce an effluent of 15 mg/1 BOD_5, 15 mg/1 SS. However, ammonia-nitrogen concentrations in this effluent would be greater than the recommended summer and winter effluent concentrations of 5.0 and 10.0 mg/1.) This is apparent in that the Draft Standards (Appendix A-2-3) proposed to change the polished secondary definition of BOD_5 limits from 10 mg/1 to 15 mg/1.

Analysis of alternatives resulted in the conclusion that the ultimate method of sludge disposal should be the same for all proposed treatment plants: A stabilized, sterile sludge cake will be made available for use to the private sector as a soil conditioner. Any sludge cake in excess of demand will be disposed of in sanitary landfill on other solid waste disposal system (FM-5, FM-9).

In a recent development, personnel from the State Bureau of Water Quality, City-County Board of Health, Kennecott Copper Corporation and the Department have engaged in a pilot study program for sludge disposal in the county. The concept is to mix sludge with tailings (to provide organics) and revegetate a small parcel of land located adjacent to the existing tailings pond near Magna. If successful, the program could be expanded into a revegetation program for the side slopes of the tailings pond. (See Figure III-1, northwest Salt Lake County). This could prove to be an effective alternative for sludge disposal for all county sewage treatment plants.

Following a discussion of alternative screening and selection, a short discussion of the proposed sewage treatment facilities will be presented. Greater detail can be found in Technical Reports FM-5 through FM-12.

ALTERNATIVE WASTEWATER TREATMENT SYSTEMS

To develop a comprehensive wastewater treatment plan, several alternative treatment processes were investigated to provide for the best practical treatment of wastewater in Salt Lake County. The evaluation (from FM-5) was carried out by 208 Project consultants in the following manner:

1. On the basis of data and analyses published in the Utah Lake - Jordan River 303e Basin Study, it was concluded that sewage treatment regionalization opportunities in Salt Lake County do not include Salt Lake City and Magna facilities and that the present arrangements at Lark and Copperton will be adequate through the planning period (hydraulics and distance).
2. Regional and subregional possibilities were screened and treatment plant siting alternatives were developed.
3. Further screening was carried out to determine best practicable treatment in a general manner. This led to the conclusion that treatment and discharge to surface waters is the best practicable treatment in all four planning areas (discussed later).
4. Preliminary present worth analyses were made of treatment plant siting alternatives in the Jordan area. This led to the conclusion that treatment of all municipal wastes from the Jordan planning area in

a single regional plant is the alternative with the least present value cost.

5. Socio-economic factors were assessed and applied to the conclusions above. The resultant recommendation of this plan reflects the most cost-effective, socio-economic and politically acceptable alternative.

TREATMENT PLANT SITING ALTERNATIVES

Salt Lake City Planning Area

In the preliminary analyses, and consistent with the 303(e) plan, Salt Lake City facilities were not included in the regionalization concept. Therefore, the alternative selected for further investigation was upgrading and expanding of existing plant.

Magna Planning Area

Magna facilities were also not included in the regionalization concept. Three alternatives selected for further study for treatment of Magna wastes were as follows:

1. Upgrade and expand existing facilities.
2. Phase out existing plant, convey Magna wastes to the Kennecott Copper Company combined sanitary-industrial plant for treatment.
3. Phase out existing plant, convey Magna wastes to the Jordan planning area for treatment.

Upper and Lower Jordan Planning Area

Regionalization in the Upper and Lower Jordan Planning Areas offered many alternatives for waste treatment. Five primary alternatives were selected for further investigation. They are as follows:

1. Upgrade and expand present plants.
2. Phase out existing plants and provide treatment at single regional plant at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant. Three major interceptors are required:
   a. Interceptor from present Midvale plant to the regional plant site,
   b. Interceptor from present Granger-Hunter plant to regional plant site,
   c. Interceptor from present South Salt Lake plant to regional plant site.
3. Phase out existing plants and provide treatment at two subregional plants; one at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant, one at or near the present site of the Midvale plant. Three major interceptors are required:
   a. Interceptor from present Murray plant to the present site of the SLC Suburban Sanitary District No. 1 plant,
   b. Interceptor from present Granger-Hunter plant to the present site of the SLC Suburban Sanitary District No. 1 plant,
   c. Interceptor from present South Salt Lake plant to the present site of the SLC Suburban Sanitary District No. 1 plant.
4. Phase out existing plants and provide treatment at three subregional plants; one at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant, one at or near the present site of the Cottonwood (Tri-community) plant, one at or near the present site of the Midvale plant. Interceptors required for this alternative are as follows:

a. Interceptor from present Murray plant to the site of the Cottonwood plant,

b. Interceptors from the present Granger-Hunter plant and the present South Salt Lake plant to the site of the SLC Suburban Sanitary District No. 1 plant.

5. Phase out existing plants and provide treatment at five subregional treatment plants; one at or near the present site of the Salt Lake City Suburban Sanitary District No. 1 plant, one at or near the present site of the Granger-Hunter plant, one at or near the present site of the South Salt Lake City plant, one at or near the Cottonwood (tri-community) plant, and one at or near the present site of the Midvale plant. The interceptor required for this alternative is as follows:

   a. Interceptor from present Murray Plant to the site of the Cottonwood plant.

Screening to Determine Best Practicable Treatment

There are three major possibilities for disposal of municipal wastewaters. They are treatment and discharge to surface waters, land application, treatment and reuse. Each of these alternatives was analyzed for disposal of wastes from each of the planning areas (FM-5). Analyses are summarized below.

Treatment and Discharge to Surface Waters

Secondary plants discharging to surface waters in Salt Lake County will have to meet the federal and particularly the state effluent requirements which are discussed above. Preliminary costs for the alternatives outlined above were developed for the three levels of treatment outlined below.

1. Secondary Treatment: Average effluent characteristics are:

BOD_5	25 mg/l
SS	25 mg/l
Total N	20 mg/l
Total P	12 mg/l
Coliforms	2,000 MPN/100 ml
Fecal Coliforms	200 MPN/100 ml

2. Polished Secondary Treatment (filtered secondary): Average effluent characteristics are:

BOD_5	10 mg/l
SS	10 mg/l
Total N	20 mg/l
Total P	12 mg/l
Coliforms	200 MPN/100 ml
Fecal Coliforms	20 MPN/100 ml

(*Subject to change to 15 mg/l BOD_5)

3. Advanced Tertiary Treatment (filtered secondary with carbon adsorption and P and N removal). Average effluent characteristics are:

BOD_5	2 mg/l
SS	2 mg/l
Total N	2 mg/l
Total P	2 mg/l
Coliforms	200 MPN/100 ml
Fecal Coliforms	20 MPN/100 ml

Treatment plant cost estimates were based on various curves developed by Smith, Monti & Silberman and Black & Veatch and adjusted to an Engineering News Record Index of 2200 (approximate 1975 index in Salt Lake County). Also, since these curves were based on data which is several years old, a national telephone survey was made of recently constructed treatment plants. This survey showed that even after adjustment to current cost indexes, these curves under-estimate present plant capital costs by about half. Therefore, curve values for capital costs were doubled in this study to ensure estimates accurately reflect current costs. Interceptor costs were based on applying unit costs to quantities taken from preliminary layouts and sizes, at an ENR index of 2200.

Preliminary cost estimates for the three, four and five subregional plant alternatives were not included in the first cut cost estimates as the alternatives were not proposed until a later date. Tables V-5 and V-6 present initial cost estimates of total and local costs that were used in the alternative screening process.

Land Application

There are three major types of land application systems: irrigation, overland flow, infiltration-percolation. Alltypes were considered and apparently, a minimum of secondary treatment and a relaxation of State policy would be required prior to efficient land disposal of effluent.

Typical removal efficiencies are set out in Table V-7. Specific site analyses would be needed to refine these if land disposal is considered a likely alternative.

Storage during nongrowing season would be required for irrigation and overland flow. Infiltration-percolation can be carried out all year, but would have freezing problems in winter.

Area required for land disposal would be quite large. Basic requirements are:

1. Outside urbanizing area.
2. Down stream of potable groundwater use.
3. At least 5 feet to groundwater.

The closest land fulfilling these requirements for the Upper and Lower Jordan Planning Areas is west of Municipal Airport No. 2. The closest suitable land for Magna and Salt Lake City planning areas is west of the International Airport. Land requirements are indicated in Table V-8.

Cost estimates, which were based on the EPA publication "Costs of Land

Table V-5. Preliminary Estimated Costs for Treatment and Discharge - Total Costs*

Item	Treatment Level	Capital Cost $10^6	Annual O&M Cost at Design Flow $10^6	Total Annual** Cost at Design Flow $10^6
Salt Lake City Planning Area (Upgrade Existing Plant)	Secondary	15.0	0.8	2.1
	Pol. Secondary	21.4	1.2	3.0
	Tertiary	78.4	3.8	10.7
Jordan Planning Area*** Alternative I (Upgrade All Existing Plants)	Secondary	46.6	2.0	6.1
	Pol. Secondary	64.0	3.0	8.6
	Tertiary	180.8	7.3	23.3
Alternative II (Single Regional Plant)	Secondary	70.0	1.2	7.4
	Pol. Secondary	79.2	1.8	8.8
	Tertiary	150.2	4.9	18.1
Alternative III (Two Regional Plants)	Secondary	71.0	1.5	7.7
	Pol. Secondary	82.2	2.1	9.3
	Tertiary	160.6	5.6	19.7
Magna Planning Area Alternative I (Upgrade Existing Plant)	Secondary	0	0.2	0.2
	Pol. Secondary	0.7	0.2	0.3
	Tertiary	2.4	0.3	0.5
Alternative II (Joint Treatment with Jordan Plant)	Secondary	5.0	0.1	0.5
	Pol. Secondary	5.2	0.1	0.5
	Tertiary	6.7	0.1	0.7
Alternative III (Joint Treatment with Kennecott)	-	2.6	0.1	0.3

*Revised final cost estimates are presented later

**Capital cost amortized over 20 years at 6 1/8 percent interest rate.

***Does not include costs of a three plant or more regionalization scheme in the Jordan Planning Area.

Note: This is a preliminary estimate of costs to determine best practicable treatment in a general manner. It does not include replacement, salvage values, O & M changes through planning period or interest during construction.

Table V-6. Preliminary Estimated Costs for Treatment and Discharge - Local Costs*

Item	Treatment Level	Capital Cost** $10^6	Annual O&M Cost at Design Flow $10^6	Total*** Annual Cost at Design Flow $10^6
Salt Lake City Planning Area (Upgrade Existing Plant)	Secondary	3.8	0.8	1.1
	Pol. Secondary	5.4	1.2	1.7
	Tertiary	19.6	3.8	5.5
Jordan Planning Area****				
Alternative I (Upgrade All Existing Plants)	Secondary	11.6	2.0	3.0
	Pol. Secondary	16.0	3.0	4.4
	Tertiary	45.4	7.3	11.3
Alternative II (Single Regional Plant)	Secondary	17.6	1.2	2.8
	Pol. Secondary	20.0	1.8	3.6
	Tertiary	37.8	4.9	8.2
Alternative III (Two Regional Plants)	Secondary	19.8	1.5	3.2
	Pol. Secondary	22.6	2.1	4.1
	Tertiary	42.2	5.6	9.3
Magna Planning Area				
Alternative I (Upgrade Existing Plant)	Secondary	0	0.2	0.2
	Pol. Secondary	0.2	0.2	0.2
	Tertiary	0.7	0.3	0.4
Alternative II (Joint Treatment with Jordan Plant)	Secondary	1.2	0.1	0.2
	Pol. Secondary	1.3	0.1	0.2
	Tertiary	1.7	0.1	0.3
Alternative III (Joint Treatment with Kennecott)	-	0.7	0.1	0.2

*Revised final cost estimates are presented later.
**After 75 percent federal grant.
***Capital costs amortized over 20 years at 6 1/8 percent interest rate.
****Does not include costs of a three plant or more regionalization scheme in the Jordan Planning Area.

Note: This is a preliminary estimate of costs to determine best practicable treatment in a general manner. It does not include replacement, salvage values, O&M changes through planning period or interest during construction. Final cost estimates are shown on Tables V-7 and V-8.

Table V-7. Land Application Systems - Removal Efficiencies for Major Constituents

Constituent	Removal Efficiency Irrigation	Overland Flow	Infiltration-Percolation
BOD	98+	92+	85-99
COD	95+	80+	50+
SS	98+	92+	98+
Total N	85+	70-90	0-50
Total P	80-99	40-80	60-95
Metals	95+	50+	50-95
Microorganisms	98+	98+	98+

Table V-8. Land Requirements for Land Application Alternatives

Planning Area	Year 2000 Flow (mgd)	Type of System	Land Requirement Acres
Salt Lake City	45	Spray Irrigation	20,000
		Overland Flow	11,000
		Infiltration-Percolation*	2,000
Jordan	75	Spray Irrigation	31,000
		Overland Flow	19,000
		Infiltration-Percolation*	3,400
Magna	1.5	Spray Irrigation	650
		Overland Flow	400
		Infiltration-Percolation*	70

*Does not include winter storage. If freezing problems cannot be overcome, more land would be necessary.

Application Systems" and assume secondary treatment prior to disposal, are summarized in Tables V-9 and V-10. Table V-9 shows total costs, while Table V-10 shows local costs after 75 percent federal aid on capital costs.

However, with the development of the interest in sludge application to the Kennecott Copper tailings pile to provide organic content for revegatation (discussed above), the issue of land application of sludge is a viable alternative. Land application of effluent, however is not considered a viable alternative.

Treatment and Reuse

Wastewater Reuse Opportunities

Possible wastewater reuses are:

1. Potable municipal reuse
2. Nonpotable municipal reuse
3. Industrial use
4. Agricultural use
5. Recreational use
6. Ecological use
7. Recreation use

These reuse possibilities are considered below. Each, if feasible, would have its own water quality requirements. However, the minimum treatment would be the State effluent reuse requirements which have been set on general public health grounds. (See Sppendix A-2-3).

1. Potable Municipal Reuse

   This can be carried out in either of the following three ways:

   a. Return to surface supply reservoir.

   b. Recharge supply aquifer, upstream of municipal wells, by injection or surface spreading.

   c. Direct return to potable users.

   Wastewater is not presently reused for municipal potable purposes anywhere in the U.S. Chief problems are:

Table V-9. Preliminary Estimated Costs for Land Application - Total Costs

Item	Land Disposal Type	Capital Cost $\$10^6$	Annual O&M Cost $\$10^6$	Total Annual Cost $\$10^6$
Salt Lake City Planning	Spray	78.6	2.3	9.7
Area	Overland	70.6	2.0	9.2
(Upgrade Exisiting Plant	Infil-Percol	35.4	1.6	4.7
Jordan Planning Area*				
Alternative II	Spray	181.0	3.2	19.3
(Single Regional Plant)	Overland	166.0	2.5	17.1
	Infil-Percol	100.4	2.6	11.5
Alternative III	Spray	181.5	3.5	19.5
(Two Regional Plants)	Overland	171.0	2.9	18.0
	Infil-Percol	102.4	2.9	11.9
Magna Planning Area				
Alternative I	Spray	4.9	0.2	0.7
(Upgrade Existing	Overland	4.4	0.2	0.6
Plant)	Infil-Percol	2.0	0.2	0.4

*Costs not developed for Alternative I (upgrade existing plants) since it is clear that this would be more expensive than land disposal from regional plant.

Table V-10. Preliminary Estimated Costs for Land Application - Local Costs

Item	Land Disposal Type	Capital Cost $\$10^6$	Annual O&M Cost $\$10^6$	Total Annual Cost $\$10^6$
Salt Lake City Planning Area (Upgrade Existing Plant)	Spray	19.7	2.8	4.4
	Overland	17.7	2.0	3.5
	Infil-Percol	8.9	1.6	2.3
Jordan Planning Area*				
Alternative II (Single Regional Plant)	Spray	45.3	3.2	7.2
	Overland	41.5	2.5	6.2
	Infil-Percol	25.2	2.6	4.9
Alternative III (Two Regional Plants)	Spray	45.4	3.5	7.5
	Overland	42.8	2.9	6.7
	Infil-Percol	27.5	2.9	5.3
Magna Planning Area Alternative I (Upgrade Existing Plant)	Spray	1.3	0.2	0.3
	Overland	1.1	0.2	0.3
	Infil-Percol	0.5	0.2	0.3

*Costs not developed for Alternative I (upgrade existing plants) since it is clear that this would be more expensive than land disposal from regional plant.

1. Viruses - A high level of virus removal is not attained by standard wastewater disinfection.
2. Dissolved Solids - Salt Lake County already has high dissolved solids concentration in waters. Reuse would only tend to increase the problem.
3. Stable Organics - Some of these may be carcinogenic.
4. Freezing - Problems with surface spreading, the cheapest method of aquifer recharge, during the winter months.
5. Public Opinion.

2. Nonpotable Municipal Reuse

Wastewater could be used to conserve present water use by substituting it for:

a. Nonpotable household uses, such as toilet flushing or clothes washing.

Use of wastewater for nonpotable household uses is probably not publicly acceptable at present. Health hazards are involved since it would be available for unauthorized potable uses, and would involve duplication of present distribution facilities.

b. Lawn sprinkling, etc.

Use of wastewater for lawn sprinkling for private homes would also involve duplication of present water distribution facilities and is not considered feasible at present. However, a great part of water use in Salt Lake County is used for lawn sprinkling, and this constitutes a potential summer use for wastewater. Duplication of facilities would be minimized if wastewater sprinkling were limited to large point users, such as public parks, institutional grounds, golf courses. This is considered below under Recreation.

3. Industrial Use

Most industries in Salt Lake County are fairly small water users and need water of high quality. General industrial use of municipal treatment plant effluent is not feasible.

There are two large users of low quality water - Kennecott Copper near Magna and Utah Power and Light in Salt Lake City. Use of reclaimed wastewater by either of these companies depends on their needs - they have both indicated that it would probably not be economical for them (they would have to pay for all treatment above that required for treatment and discharge, plus the cost of transmission). Industrial use does not appear to be a viable alternative at present.

4. Agricultural Use

There are two types of farming in Salt Lake County - dry land farming and irrigated land farming.

a. Irrigated Land Farming

There are two situations in which use of wastewater is feasible:

(a) increased need for low quality water or (b) substitution of low quality water for present use of high quality water (i.e. groundwater in eastern county) that can be switched to municipal use.

(b) The 303e and the 208 Studies indicate that irrigated land is expected to decrease, hence the first case is unlikely.

b. Dry Land Farming

Yield on agricultural land without water rights could be increased by irrigation. The present average irrigated land water allotment is about 4 acre ft/acre/year, therefore it is possible to irrigate 140 acres or more per mgd.

3. Industrial Use

Most industries in Salt Lake County are fairly small water users and need water of high quality. General industrial use of municipal treatment plant effluent is not feasible.

There are two large users of low quality water - Kennecott Copper near Magna and Utah Power and Light in Salt Lake City. Use of reclaimed wastewater by either of these companies depends on their needs - they have both indicated that it would probably not be economical for them (they would have to pay for all treatment above that required for treatment and discharge, plus the cost of transmission). Industrial use does not appear to be a viable alternative at present.

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Jordan 201 area.

b. Water requirements of Farmington Bird Refuge or other marshes on lower Jordan. This need applies to Jordan and Salt Lake City 201 areas.

Both of these may affect effluent quality, but are essentially treatment and discharge.

7. Recreational Use

Possible needs are:

a. Maintaining minimum flow for uses of South Jordan River Parkway. This is essentially treatment and discharge.

b. Irrigation of park lands and golf courses.

This would be associated with treatment and discharge during winter and probably during summer too, since demand for this purpose would be less that total wastewater flows in the County. Specific demands are required before this alternative can be further evaluated.

Conclusion

There appears to be no major acceptable reuse opportunities in Salt Lake County which does not involve treatment and discharge. If reuse does become a viable alternative in the future, two key issues need to be addressed. They are:

1. The legality of diverting wastewater from present receiving streams must be determined.

2. If diversions legal, discussions with Kennecott Copper and Utah Power and Light (major non-potable reuse opportunities) needs to take place to determine quality of reclaimed water they need, and price they are prepared to pay for it.

FINAL COST ESTIMATES

The selected plan for municipal point source pollution abatement in Salt Lake County is to upgrade existing plants at Salt Lake City and Magna, continue present arrangement at Copperton, phase out Lark system as Lark is phased out, and regionalize seven small area treatment plants along to the Jordan River into two subregional treatment plants.

A summary of present worth estimates for the Upper and Lower Jordan Planning Areas alternatives are shown in Table V-11. Table V-12 shows construction and O & M cost estimates for the upgrading of the Salt Lake City and Magna treatment plants. (See FM-5 through FM-12 for additional information).

SPECIFIC PLANS

Salt Lake City Planning Area

Wastewater flows from the present contributory population of incorporated Salt Lake City of 180,000 are collected and treated in a two-stage trickling filtration plant prior to discharge to the Salt Lake City Sewage Canal.

Existing average annual flows and loads are as follows:

Flow:	36 mgd
BOD_5:	123 mg/1
	37,000 lbs/day
SS:	120 mg/1
	36,000 lbs/day

TABLE V-11. UPPER AND LOWER JORDAN PLANNING AREAS - SUMMARY OF WASTEWATER TREATMENT COST - EFFECTIVENESS ANALYSIS (Millions of $)

REPORT - DATE

(See Notes Below)

ALTERNATIVE	A. 6/75	B. 10/76		C. 3/77		D. 8/77		E. 12/77		F. 12/77		G.	
	TEAC[1]	TEAC	LEAC[2]	TEAC	LEAC	TEAC	LEAC	TEAC	LEAC	TEAC	LEAC	TEAC	LEAC
1 Plant	(6.72)[3]	(8.6)	(3.2)	(7.5)	(2.2)	(9.8)	(3.5)	3.1	(3.7)	6.3	(3.5)		
2 Plant	6.4[4]	5.8	15.6	(7.5)	4.5	3.1	5.7	(9.8)	8.1	10.2	7.2		
3 Plant	11.0			6.7	13.6	10.2	14.3	1.0	8.1	(9.2)	15.3	2.7	(3.3)
5 Plant												(8.6)	1.8
7 Plant	16.1	4.7	50.0										

[1] Total Equivalent Annual Cost
[2] Local Equivalent Annual Cost
[3] Numbers in parentheses indicate least cost alternative in millions of $.
[4] Numbers not in parentheses indicate cost as percentage above least cost alternative.

NOTES:

A. Includes costs for S.L. City - not included in other cost estimates - projected flows very low in South, somewhat high in Central.

B. "Polished Secondary" treatment - Interim report - projected flows very low in South, high in Central.

C. Population projection errors - staffing and staff salaries unrealistically low - inadequate design criteria - preliminary report - some costs not included - projected flows very low in South, somewhat high in Central.

D. Revision of Report "C" - some errors - some costs not included - EPA rejected "3 Plant" based on this report - flows consistent with 208 projections.

E. Revision of Report "D" but by another firm - several errors - alternatives not compared on common basis - some costs not included - staffing unrealistically low - some costs unrealistic - economies of scale not achieved - land costs not reported accurately - flows consistent with 208 projections.

F. Some errors - based on combination of facilities reports and PW analyses, 1 and 2 Plant alternatives from PW analysis (Report D) while 3 Plant alternative based on facility report - inconsistent comparison - projected 208 flows.

G. North & Central costs from facilities reports, South costs from PW analysis - flows from North area lower than projected flows - Central costs using STR basis costs - inconsistent comparisons - several errors - economies of scale not achieved. Some costs are not included.

Table V-12. Salt Lake City and Magna Construction and Operating and Maintenance Cost Estimates

	Construction Costs*		O&M Costs*		Total*	
	Total	Local**	Total	Local**	Total	Local**
Salt Lake City	16.0	4.0	27.2	27.2	43.2	10.8
Magna	3.5	0.9	4.4	4.4	7.9	4.4

*1977 Dollars

**75% Federal construction grant

Existing flows are made up of the following components:

Component	Avg. Daily Flow mgd	Avg. Daily BOD_5 lbs/day
Domestic	18.0	30,000
Wet Industrial	3.0	6,000
Institutional	2.0	1,000
Infiltration	13.0	
	36.0	37,000

Population projections are as follows:

Year	Resident Population	Employment
1975	180,953	135,839
1985	183,294	151,499
1995	186,471	182,622
2005	188,310	

Average daily flows are summarized below

Year	Flow (mgd)	BOD_5 & SS (lbs/day)
1980	36.0	37,000
1990	36.6	37,800
2000	37.1	39,500

A review of monthly summaries and infiltration/inflow studies now in progress indicate that extreme situations will be adequately provided for by applying the following multiplication factors to average flow and load projections:

Item	Factor
Minimum Flow and Load	0.40
Maximum Daily Flow and Peak Load	1.40
Peak Flow	1.75

As discussed earlier, an analysis of Best Practicable Treatment (BPT) led to the conclusion that upgrading and expanding the existing Salt Lake City facility with discharge to the Salt Lake City Sewage Canal is the most cost-effective method of treating wastewater in the Salt Lake City Planning Area over the planning period.

Magna Planning Area

Wastewater flows from the present population of 8,000 served by the Magna Sewer Improvement District are collected and treated in a standard rate trickling filtration plant prior to discharge to Kersey Creek.

Existing average annual flows and loads are as follows:

Flow:	1.0 mgd
BOD5:	155 mg/l
	1,300 lbs/day
SS:	155 mg/l
	1,300 lbs/day

There are no major industrial or institutional flows in Magna. Existing flow of 1 mgd is 80 percent domestic (including associated minor commercial and institutional flows) and 20 percent infiltration.

Population projections are as follows:

Year	Population
1975	7,532
1977	8,000
1985	11,476
1995	14,328
2005	15,020

Average daily flows are set out below:

Year	Flow (mdg)	BOD_5 & SS (lbs/day)
1980	1.2	1,700
1985	1.4	2,000
1990	1.5	2,200
1995	1.6	2,300
2000	1.7	2,500

A review of monthly summaries indicate that extreme situations will be adequately provided for by applying the following multiplication factors to average flow and load projections.

Item	Factor
Minimum flow and load	0.4
Maximum daily flow and peak load	1.4
Peak flow	2.5

As discussed earlier, an analysis of BPT led to the conclusion that upgrading and expanding the existing Magna facility with discharge to surface waters is the most cost-effective method of treating wastewater in the Magna Planning area over the planning period.

Upper Jordan Planning Area

Within the Upper Jordan Planning Area there exist three treatment plants (Lark, Sandy, Midvale) and a collection system that collects wastewater and conveys it out of the planning area (Copperton). The future plan for each of these situations is discussed below.

Lark

The detail of future wastewater arrangements at Lark are moot in that the town, on "lease" from Kennecott Copper Corporation, is being phased out. There will be no town of Lark (presently unincorporated) after approximately summer 1979.

Therefore, wastewater treatment facilities at Lark will be abandoned by approximately August 1979.

Copperton

The existing arrangement at Copperton is conveyance of wastewater to Kennecott Copper Corporation for treatment in their waste stream. This arrangement is adequate for treatment of Copperton wastewater throughout the planning period.

South Valley Water Reclamation Facility

The Sandy and Midvale wastewater treatment plants will be regionalized to form the South Valley Water Reclamination Facility located at or near the site of the present Midvale facility. For short, this plant is referred to as the "South Plant."

Contributory collection districts to the South Plant are listed below.

Midvale City
Salt Lake County Sewer Improvement District No. 1
Salt Lake City Suburban Sanitary District No. 2
West Jordan
Sandy Suburban Improvement District *

* Includes area previously served by Sandy City.

Population projections for the Upper and Lower Jordan Planning Areas on which early reports were based were revised by the 208 staff. Revised flows for the Upper Jordan Planning Area, based on the revised populations, are as follows:

Item	Projected Average Daily Flow (mgd) 1990	2000
Residential	17-20	22-29
Industrial	1.2	1.5
Infiltration	1.2	1.2
	22-23	25-32

Reviewing the range of projections, the 208 staff concluded that the following values should be used:

Item	1990	2000
Average Daily Flow (mgd)	24	32

Review of exisiting flows in Salt Lake County indicates that extreme situations will be adequately provided for by applying the following multiplication factors to average flow projections.

Item	Factor
Minimum Daily Flow	0.4
Maximum Daily Flow	1.4
Peak Flow	2.0

Wastes are typically domestic. Projected strengths of average annual and maximum daily flows are as follows:

Item	Concentration
BOD_5	200 mg/1
SS	200 mg/1
TKN	32 mg/1

Effluent from the Midvale regional plant will be discharged to the Jordan River.

LOWER JORDAN PLANNING AREA

Within the Lower Jordan Planning Area there are five sewage treatment plants (Murray, Cottonwood, Salt Lake City Suburban Sanitary District No.1, South Salt Lake and Granger-Hunter) served by 8 collection districts. The plants and contributory collection districts which are listed below are to be regionalized to form the Jordan Valley Wastewater Reclamation Facility (or for short, the "North Plant") at or near the present site of the District No. 1 plant.

Plant	Contributory Collection District
Murray	Murray City
Cottonwood	Salt Lake County Cottonwood Sewer District
	Salt Lake County Service Area No.3
Granger-Hunter	Granger-Hunter Improvement District
	Kearns Improvement District
South Salt Lake	South Salt Lake City
SLCSSD#1	Salt Lake City Suburban District No. 1
	Taylorsville-Bennion Improvement District

Revised population projections for the Lower Jordan Planning Area by contributory plant are shown below:

Plant Contributory To:	1980	1990	2000
Cottonwood	67,500	79,900	89,100
Murray	25,200	28,100	31,200
South Salt Lake	11,800	14,000	15,300
SLCSSD#1	121,300	138,300	155,200
Granger-Hunter	82,300	97,100	109,400
Total	308,100	357,400	400,200

Based upon revised population figures presented above and industrial and infiltration flow projections, plant sizing will be based upon the following flow projections:

Plant Contributory To	Flow (mgd) 1980	1990	2000
Cottonwood	8.0	9.5	11.0
Murray	3.0	3.5	4.0
South Salt Lake	4.3	5.0	5.7
SLCSSD#1	15.7	17.5	19.0
Granger-Hunter	8.7	10.0	11.5
Total	39.7	45.5	51.2

Reviewing the range of projections, the 208 staff concluded that the following values should be used:

Item	1990	2000
Average Daily Flow (mgd)	45	51

Review of existing flows in Salt Lake County indicates that extreme situations will be adequately provided for by applying the following multiplication factors to average flow projections:

Item	Factor
Minimum Daily Flow	0.4
Maximum Daily Flow	1.4
Peak Flow	2.0

Wastes are typically domestic (except those contributory to the present South Salt Lake Plant). Projected strengths of average annual and maximum daily flows are as follows:

Item	Concentration
BOD_5	200 mg/l
SS	200 mg/l
TKN	32 mg/l

Effluent from the Jordan Valley Water Reclamation Facility will be discharged to the Jordan River.

INDUSTRIAL POINT SOURCES

As was discussed earlier in this section and in the preceding section (Section IV), point source pollution from industrial dischargers in Salt Lake County has not been addressed in much detail. The principal reason for this is the fact that of the present 20 industries that have permits to discharge directly to surface waters of the county, it is projected that 7 will go to total containment to meet "10/10" standards and the quantity of discharge will remain constant for another 10. The increase in quantity of discharge for the remaining three discharges is projected to be about 38% each. (See Tables IV-14, IV-15, and IV-16.)

It is projected that by enforcement of NPDES discharge permit conditions, a function that could possibly be delegated to the State Division of Health when and if enabling legislation is passed by the State legislature, pollution impact on the Jordan River and the Great Salt Lake will be minimal.

Estimated costs to industry to meet future standards are on the order of $18,605,000 as shown in Table V-13.

Table V-13. Cost Estimate:

Industrial Upgrading for BAT

Permit Holder	Process or Equipment Needed	Total Cost
Concrete Products	Pipeline, pump station, and enlarging ponds. Based on NMW estimate.	$ 150,000
Draper Irrigation Company	Pipeline to head of plant for backwash, pump station. Based on NMW estimate	35,000
Kennecott Copper Corporation	Total recycle on tailing ponds and treatment and discharge for balance of wastewater. Based on information from their engineers.	17,000,000
Key Industries	Pipeline, pump station, and enlarging ponds. Based on NMW estimate.	80,000
Utah Power & Light Company, Gadsby Plant	Treatment and discharge to Abatement Canal until 1980 after that date discharge to the Jordan River. Ash water recirculation. Based on information from their engineers.	
	Total	$18,605,000

From: Nielsen, Maxwell & Wangsgard - 208 Project Consultants

VI. Non–Point Source Management Plan

VI. NON-POINT SOURCES

INTRODUCTION

Point discharges undoubtedly impact the Jordan River at a higher level of magnitude over non-point discharges. This is true particularly in typical low flow conditions. However, in view of projected changes in beneficial use of both the Jordan River and Great Salt Lake, it is important that the ecological processes responsible for integrity of water quality be more closely scrutinized, and negative effects abated to the greatest extent possible.

For years, both the Great Salt Lake and Jordan River have been relegated to the "status" of common sewage interceptor facilities. However, the provisions of Public Law 92-500 apply equally to Utah as well as other states, and this "status" is due for a common sewer change. It is a desirable change as well. For if the taxpayers of Utah and Salt Lake County are truly committed to the goal of maximizing our resources for tourism, then those resources must be improved and cautiously preserved.

Aside from the value in tourism, Salt Lake County residents are all concerned about abatement of pollution and improvement of the Jordan River, so that the River can become a local recreational resource. The Public Opinion Survey conducted by the University of Utah at the outset of the project indicated that a consensus appeared among respondents that the Jordan River should be developed as a Parkway:

> "Nearly three-fourths of the respondents want bicycle trails developed, as well as picnic areas and fishing areas. A majority want horseback riding trails and places to swim in the river. Nearly 50 percent want to develop the stream for boating." (University of Utah's Bureau of Community Development report on Salt Lake County Water Quality Public Opinion Survey Summary, January 1976).

The 208 Citizen Planning Advisory Committee also strongly advocated the Parkway goal in its policy statements on future water quality:

> "The Jordan River should be cleaned up so that it conforms to Class C Standards as a minimum. In the future, if the quality of water could be upgraded even more, it should be. The 208 Program should also consider the possible use of the Jordan River for water contact sports." (University of Utah's Bureau of Community Development report on Salt Lake County 208 Water Quality Program Public Participation, May 1976).

The Citizen's Committee went on to prioritize future recreational use with aesthetic value first, boating and rafting second, and body contact sports third. A strong desirability existed that the Jordan be further improved to enable its potential as a sport fishery.

The fact remains, then, that if the Jordan River is to reach these goals, it must be improved beyond the minimum effluent levels to be discharged by improved sewage treatment facilities. This improvement can take place through identification, management and reduction of the non-point pollutants.

The extent of non-point pollution in Salt Lake County is widely distributed. The 208 Project in its two-year span has not been able to specifically qualify or quantify the exact impact of mine tailings leaching or over-irrigation on groundwater quality; of total cabin construction impact on streams in the Wasatch Canyons; or of total animal concentration influence on irrigation waterways. It has, however, been able to assign relative influences of land use to water quality, and has prioritized the most important non-point impacts in Salt Lake County.

Urban runoff, forest recreation/watershed runoff, and agricultural runoff are the three highest priority problems for non-point water quality management. The reason for this order of priority rests with the conclusions of the monitoring and projection analysis by Hydroscience in "Evaluation of Water Quality," and results of the 1977 208 Stormwater Monitoring Program conducted in Salt Lake City. Stormwater flushing presents immediate hazards to significant Jordan River Parkway development success--particularly in terms of warm or cold water fishery establishment. Protection of pristine ecologies--and therefore valuable municipal watershed--is most important in maintaining culinary water supply and economic treatment costs. Agriculture, while on rapid decline in Salt Lake County, seems responsible at first look, for some pollution in irrigation return flows and groundwater total dissolved solids. Groundwater quality and effects of mine tailings and landfills are also potential problem items but need development of specific data before significant conclusions can be made. Each of these major priorities can be divided into subcategories (e.g., urban runoff; dry and wet weather flows). The following discusses the assessment of each non-point problem and the alternative management proposals designed to quantify information and solve each problem.

Non-Point Source Assessment

Table VI-1 summarizes the Non-point Source (NPS) categories that must be identified or assessed. For each of these categories, there are one of three definitions of problem identification:

1. Certification that no water quality problem exists or is likely to develop within 20 years.
2. Identification of the nature and extent of the NPS water quality problem.
3. A statement that no evidence exists that a water quality problem is present or is likely to develop within 20 years.

The Table also indicates whether or not a regulatory or non-regulatory program is necessary. The difference between the two is generally whether or not requirements and enforcement are necessary. It is added that those identified problems will be the object of immediate or short-range implementation measures.

SALT LAKE COUNTY NON-POINT SOURCE CATEGORY	A. No Water Quality Problem Exists	B. Identified Water Quality Problem	C. Unidentified Water Quality Problem	D. Regulatory Program Needed	E. Non-Regulatory Program Needed
Urban Storm Runoff		X		X	
Construction Runoff		X		X	
Recreation Use		X		X	
Home Disposal (septic tanks)		X		X	
Hazardous Materials			X	X	
Irrigated Agriculture			X		X
Livestock Grazing			X		X
Feedlots			X		X
Mining - Non-coal			X	X	
Groundwater			X	X	
Solid Wastes-Residuals			X	X	
Hydrologic Modification			X	X	
Non-Irrigated Agriculture	X				
Mining - Coal	X				
Silviculture	X				

A. A determination of no problem implys that resources or conditions necessary for the problem to develop are not present in the County.
B. An identified problem is that which is supported by historical water quality monitoring and analysis.
C. An unidentified problem has no supporting water quality data or analysis, but manifests resources, conditions, or characteristics which make a problem likely or probable.
D. A regulatory program involves requirements for performance standards, monitor and inspection, enforcement against compliance, management agency designation, technical assistance, educational programming/reporting.
E. A non-regulatory program includes the above elements excluding those associated with requirements and enforcement.

Table VI-1. Identification of Non-Point Sources Within Salt Lake County

Unidentified problems will entail additional monitoring and research in further assessing their impact before implementation of a management problem takes place.

URBAN STORM RUNOFF

Urban storm runoff in Salt Lake County is characterized by three sub-elements:

1. Dry-weather discharges
2. Wet-weather or stormwater discharge
3. Stormwater discharge from construction sites

Impacts resulting from all three sub-elements have been described in the new (Figure VI-1), projections conducted by Hydroscience, and the Summer Stormwater Monitoring Program of 1977. Although limited data have been compiled regarding urban runoff impact, the data available justify the stormwater problem as one to be considered seriously. Additional stormwater impacts will be documented and reported during continual research and monitoring programs to be conducted or supervised by the local 208 Planning Agency.

Dry-weather Discharge

The storm sewer system in Salt Lake County is responsible for the discharge of diffuse non-point source pollutants. For example, the 1300 South storm drain in Salt Lake City carries the flow of Emigration, Parley's and Red Butte Creeks in addition to other urban runoff (See Figure IV-1). Emigration Creek carries the largest volume of coliform bacteria of any stream in Salt Lake County, with the exception of the Jordan River itself. In addition, storm drains in Salt Lake City have been responsible for delivering hundreds of gallons of disposed gasoline into the Jordan. (See Figure VI-1). Other storm drainage facilities collect and discharge Utah Lake irrigation water into the Jordan. (See Figure IV-4).

The implications surrounding this dry-weather discharge condition are compounded when a consideration of wet-weather or stormwater discharges are included.

Gas Source Remains A Mystery

By Jon Ure
Tribune Staff Writer

Fire fighters and petroleum engineers Thursday remained baffled in their attempts to pinpoint the source of leaking gasoline which spread to the Jordan River, causing a spectacular blaze on the water.

Salt Lake City Fire Marshal Ben Andrus ordered crews to check all service stations in the area of the Metropolitan Hall of Justice, 450-3rd East, believed to be the secondary source of the gasoline.

The crews began measuring the quantity of the fuel in the underground tanks of the service stations to compare the quantity of loss with the quantity pumped to customers.

He said the process would probably be complete within a week.

Meanwhile, fire fighters patrolled the area around the Jordan River between 3rd and 6th South streets, checking for fumes.

Fumes Drift

Wednesday evening the fumes drifted from the Hall of Justice through storm drains to the river, where they ignited, creating a fire on the water that was finally put out at 12:30 a.m. Thursday.

At one point, flames shot from a manhole near Jordan Junior High School, 1040 W. 6th South, causing near panic in the area. The fire on the water ignited a second time.

Crews stationed themselves on bridges from 6th to 3rd South and kept the flames from spreading into industrial areas.

Fire Marshal Andrus said Utah Power & Light Co. was forced to quickly switch to an alternate cooling source when it was learned that the gasoline had spread to the water.

He said electrical engines at the plant would have ignited the fumes.

Smell Gasoline

Residents smelled gasoline near 4th South and State Street about 6:45 p.m. Hydrants were turned on to flush the drainage system but not before fumes channeled through the system which

See Page B-4, Column 1

City Officials Still Baffled By Source of Gas Leak

Continued From Page B-1

runs along 4th South, then turns south on Main Street to 6th South where it flows west to the river, about 1040 West.

At 9:30 p.m., foam was pumped into the storm drains. Within an hour, the foam was running low and 1,000 gallons more was obtained from the American Oil Co. refinery.

The fire ebbed and flowed from the drainage culvert into the river as fire fighters fought to prevent the flames from spreading downstream.

Battalion Chief Ken Curtis said he believed the fumes were probably ignited by someone who smelled the gas.

Both police and fire fighters had their hands full in controlling throngs gathered to view the spectacle.

Chief Andrus said the gasoline might be old. "Some of that floating on the river looked like oil," he said.

The fuel was believed to have formed in a sump in the underground parking area of the hall of justice Tuesday, forcing a three-hour evacuation of the building. Wednesday, the sump was pumped but some gasoline remained.

Chief Andrus met with petroleum engineers Thursday to form a plan to rid the sump of the volatile fumes. He said the operation would begin Friday morning.

Attempts to analyze the fuel have not been completed, the fire marshal said, but preliminary findings showed that fuel from the two nearest service stations were identical.

Also, he said, the fuel kept in an unused tank that was formerly used for police squad cars was so old that he felt there was little chance of its being the source.

He said he received phone calls all day Thursday. "Everyone smells gas now," he said.

The fire marshal said the river was cleared Thursday and there seemed to be no more vapors in the drainage system. The last of it remains in the sump, he said.

He urged people who smell gas in their homes to run water in their floor drains. If the odor persists, they should call the fire department.

Figure VI-1. Example of Dry Weather Flows in Salt Lake County

Stormwater Discharge

The addition of stormwater loadings in the lower Jordan River have been projected by Hydroscience to violate minimum State Standards. Projected water quality indicates that stormwater impacts will be most severe in the stream segment north of 2100 South, while high but less severe impacts occur in the southern stream segment. These projections of stormwater impact have been supported by recent stormwater samples obtained during the 1977 Summer Monitoring Program.

The implications of both dry- and wet-weather impact of urban runoff are that:

1. The application of methods to reduce quantity and increase quality on a site specific basis is justified for drainage sectors, both north and south of 2100 South.

2. Application of these methods alone will not ensure reduction of stormwater pollutants in areas already densely urbanized. Therefore, the need for stormwater detention facilities in capturing flows prior to discharge to the Jordan River is important if the goals for improvement and enhancement of the Jordan are to be met. This need is obviously demonstrated, particularly in light of the danger of volatile materials entering the Jordan through storm systems, and the unavailability of sites for intermediately located facilities in the urban core area.

Location and design criteria for these proposed facilities is discussed under the subtitle, "Proposed Non-Point Management Alternatives."

CONSTRUCTION RUNOFF

The impact of excessive sediment on water quality during storm events on foothill construction sites in Salt Lake County was documented by the 208 Project during the summer of 1977. In addition, countless storm events documented by local news media and public agencies verify the need for preventing damage from foothill-generated floodwaters. (See 208 Report, Best Management Practices.)

Such impacts from canyon or foothill construction have summoned the drafting of local ordinances that set performance standards for more effective management practices on development of hillsides. Such ordinances were drafted and approved in 1976-77 by Salt Lake City planning officials, who coordinated closely with the 208 planning staff. The same kinds of measures were drafted by Salt Lake County planners, but have yet to be implemented due to the political sensitivity of such measures. Nevertheless, specific performance standards for slope stabilization and erosion/sediment control are necessary not only for the reduction of water pollution loadings, but for the protection of public health, safety, and welfare.

Figure VI-2 indicates the location of soils which have characteristics of high erosion and runoff potential. Both these factors are directly related to stormwater generation and pollution, particularly due to the soil structure and slope influence. Detailed descriptions of these factors can be reviewed in the 208 Report Best Management Practices. Figure VI-3 indicates projected areas of development expansion to occur within these areas of erosion and runoff potential. Without adequate standards regarding site rehabilitation and restabilization, areas such as these can be expected to contribute significant loadings of both suspended sediment and coliform bacteria, as well as create adverse affects on downstream warm or cold water fishery success due to chemicals, biological contaminants, and extreme water temperature changes.

Almost every major stream segment in Salt Lake County is impacted by urban runoff either directly or indirectly. The Salt Lake County Flood Control Department maintains agreements with various irrigation canal companies for the allowance of stormwater discharge into irrigation waterways; where storm drain facilities are not available, developers are directed to design drainage disposal into natural waterways such as Big and Little Cottonwood

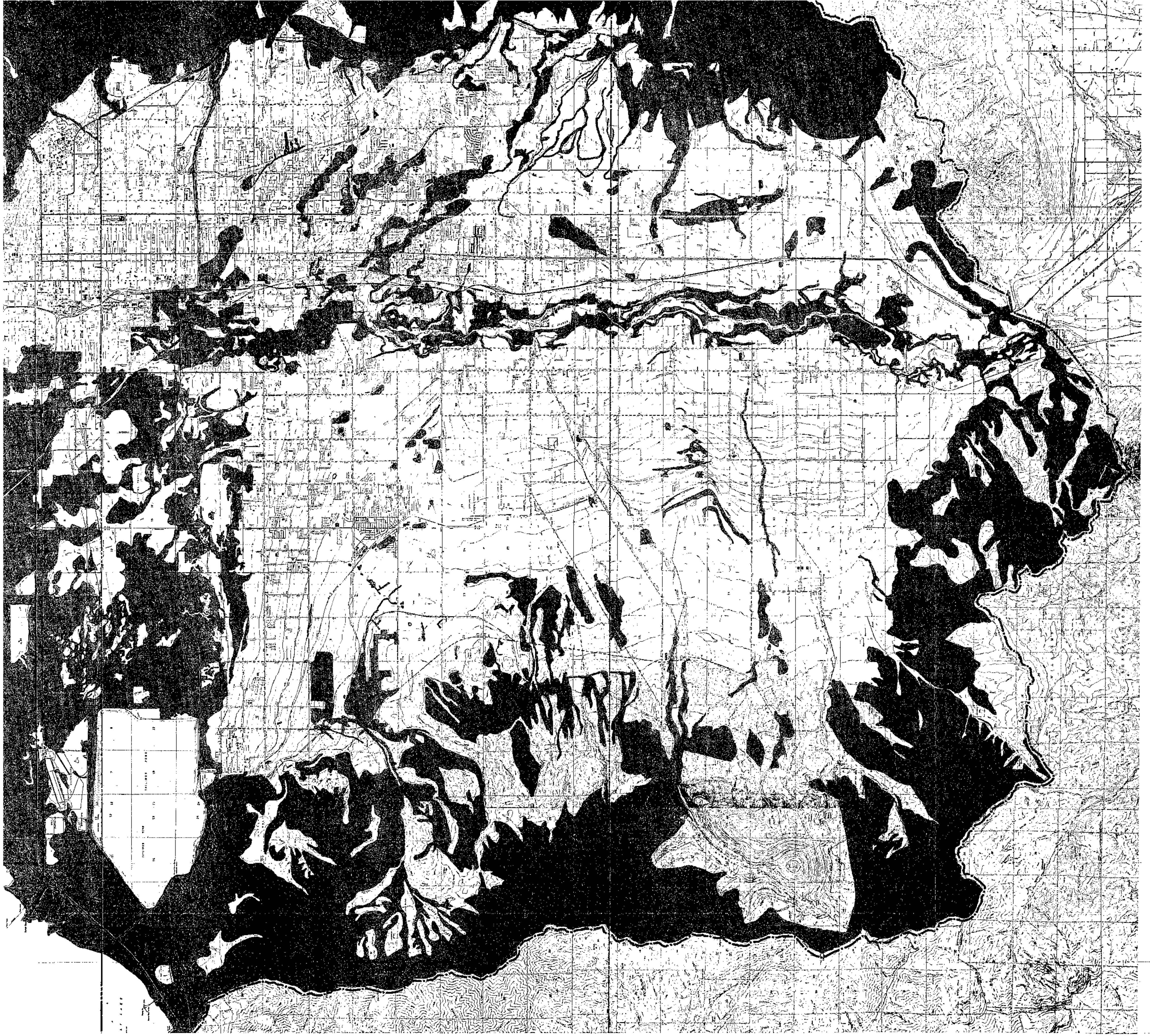

FIGURE VI-2

HIGH EROSION AND RUNOFF POTENTIAL SOILS

AREAS WITH HIGH EROSION OR RUNOFF

HIGH RUNOFF AND EROSION POTENTIAL RELATE TO SEVERE SOIL CONDITIONS WHICH ACCOMMODATE THE EFFICIENT TRANSPORT OF POLLUTANTS BY SURFACE WATER OR WIND.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

40 160 640 ACRES 10

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

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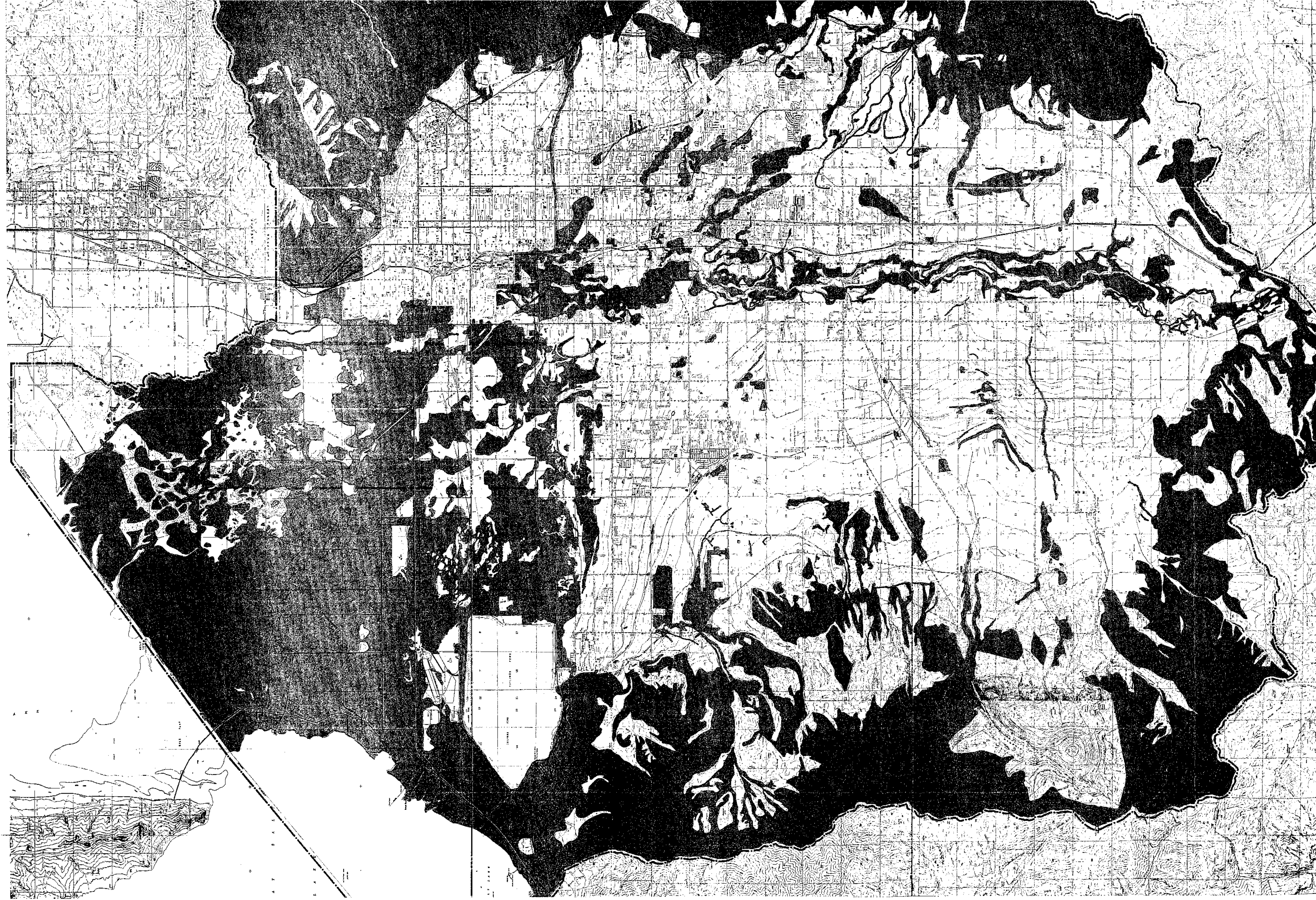
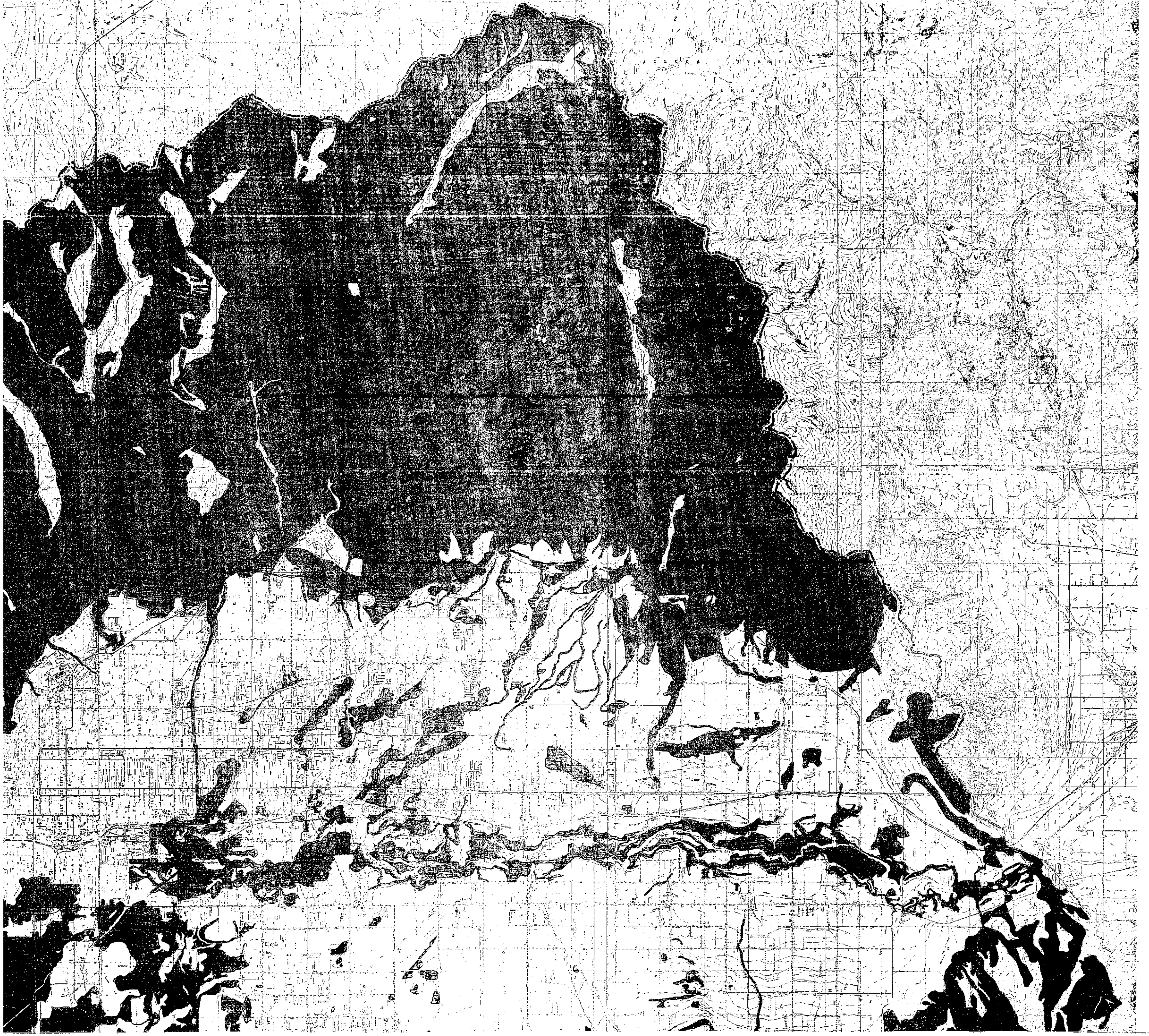


FIGURE VI-2

HIGH EROSION AND RUNOFF

POTENTIAL SOILS



AREAS WITH HIGH EROSION OR RUNOFF

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

40 160 640 ACRES 10

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

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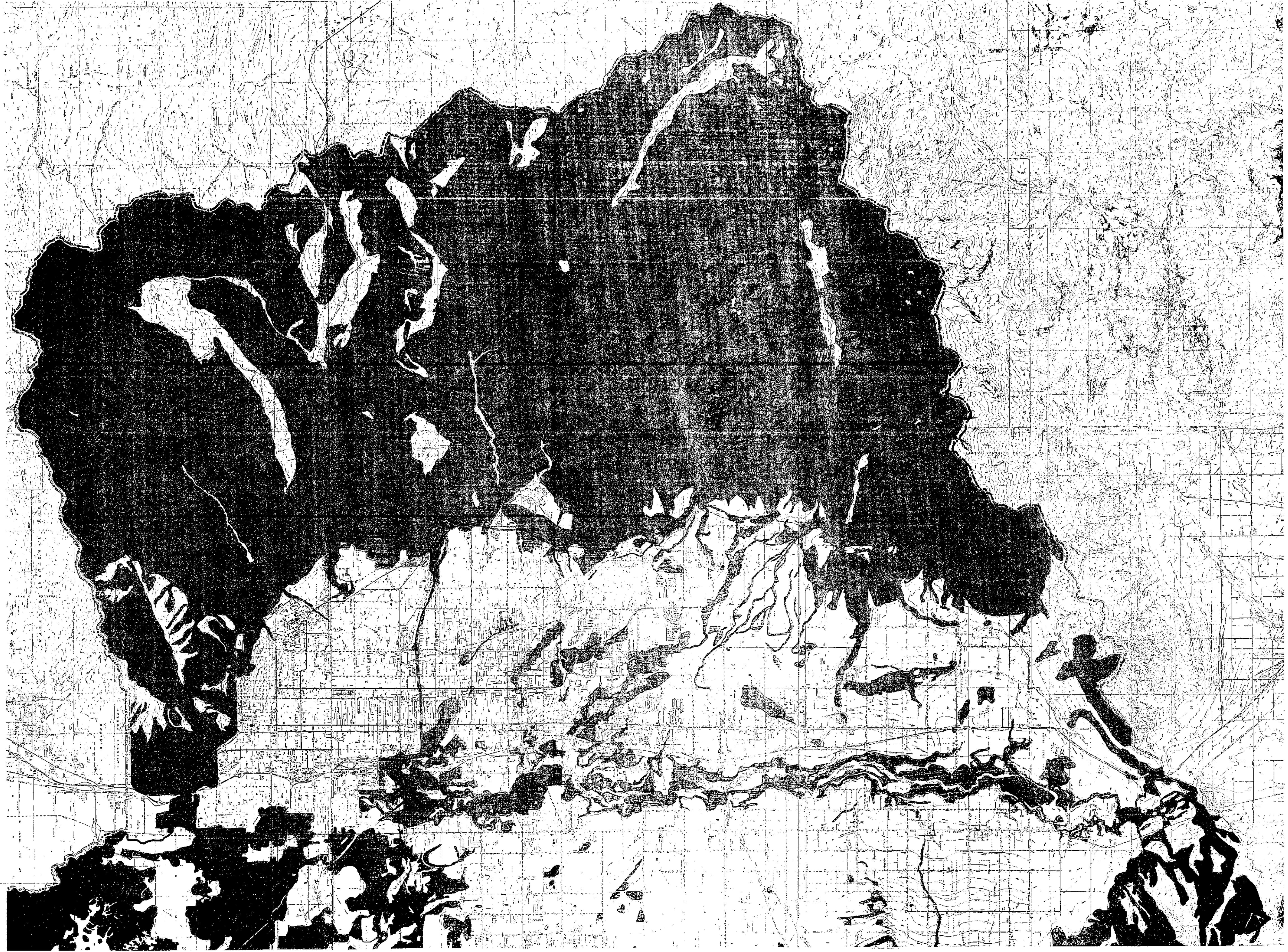
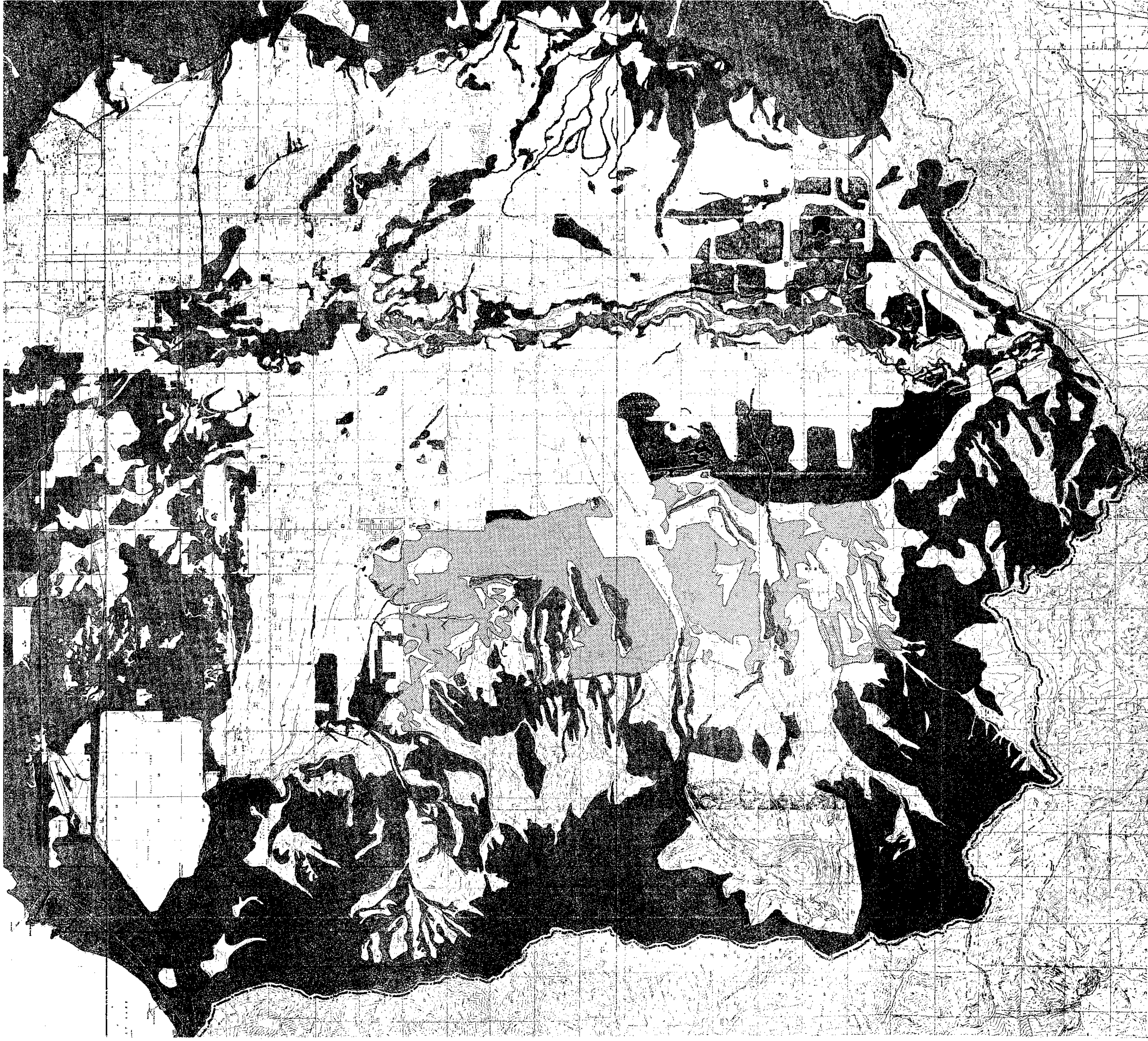
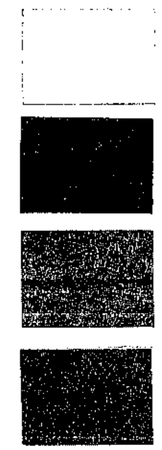


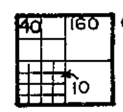




Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH



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ACRES

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

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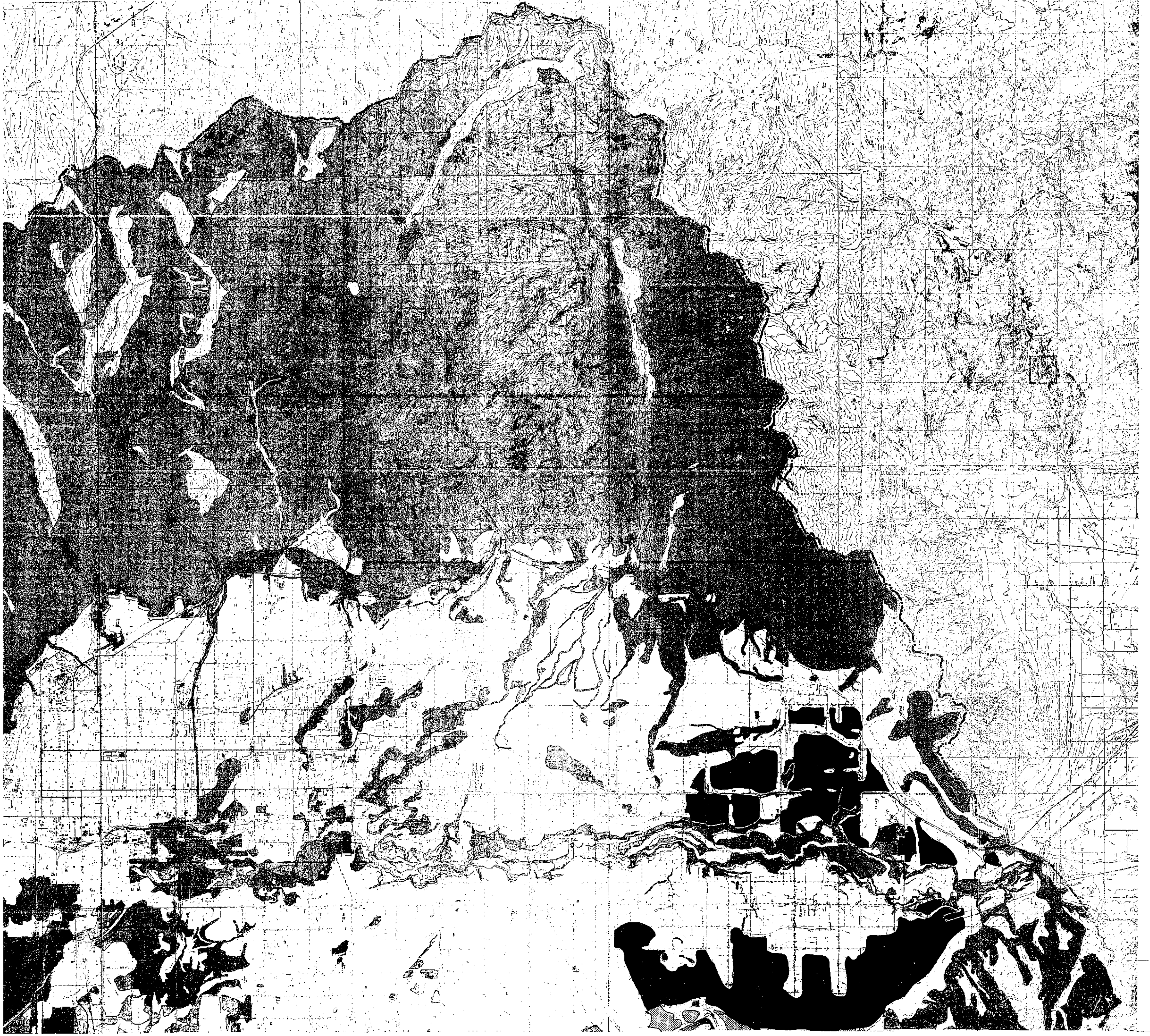
FIGURE VI-3

AREAS OF PROJECTED DEVELOPMENT WITH HIGH EROSION AND RUNOFF POTENTIAL



1995 PROJECTIONS

URBAN AREAS

AGRICULTURAL AREAS

AREAS WITH HIGH EROSION OR RUNOFF

PROJECTED DEVELOPMENT IN HIGH EROSION AND RUNOFF AREAS

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

40 160 640 ACRES 10

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

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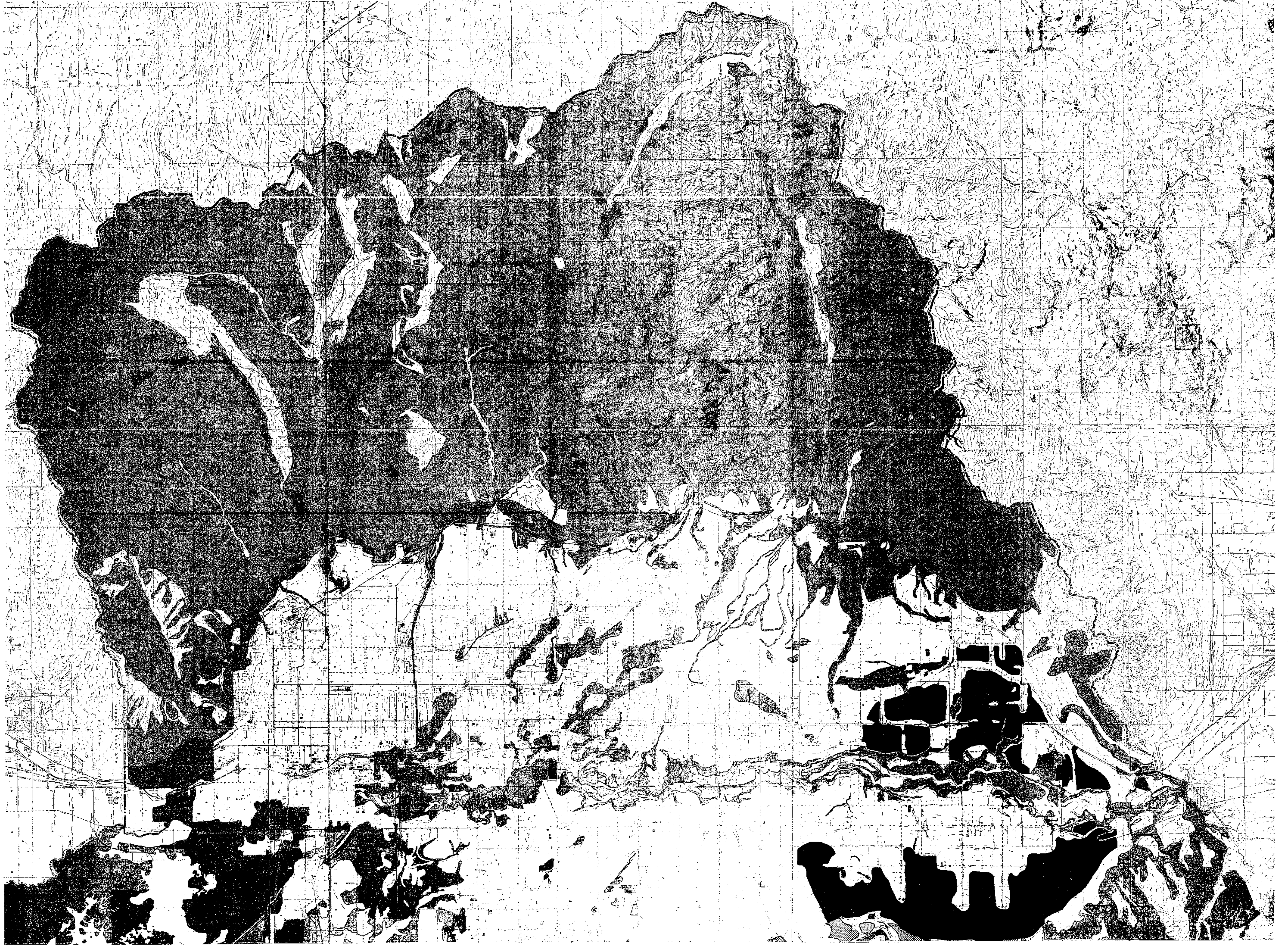

Creeks or confine runoff to their site; where storm drains do exist, most, if not all, discharge directly into the Jordan without any detention time. Detention facilities currently in place merely stow the water runoff allowing temporary detention, but without the utilization of riser pipes, straining barriers, or other sediment settling facilities.

Because the assessment of stormwater impact relates to sediment loadings from storm events, and since a determination of existing as well as projected impact is needed, the Area-wide Water Quality Planning Agency for Salt Lake County will complete a comprehensive erosion inventory of the County during FY78. This study will serve to pinpoint the location of major non-point stormwater pollution sources, and provide a basis for prioritizing implementation efforts.

CANYON WATERSHED/RECREATION

The protection of pristine conditions for ecologic and watershed resource values in the canyons of the Wasatch Mountains is a recognized goal of most Salt Lake County residents. The recent success of the wilderness designation legislation for the Lone Peak-White Pine area attests to this, as well as strong sentiment of the Citizen Planning Advisory Committee to establish a non-degradation policy for the Wasatch Canyon streams.

Such sentiment for non-degradation policies is based on the impact of construction and recreation on the watershed lands of the Wasatch Canyons. Hydroscience (Technical Report WQ-13) and Glenne (Simulation Method for Predicting Water Pollution in Wasatch Canyons, December, 1977) both essentially conclude that increased use and development in the canyons produce increases in canyon stream pollution. Data is thus available indicating primarily that intensive summer recreation use and construction are the non-point sources needing additional management for the reduction of pollutants or maintenance of the pristine water quality conditions.

Furthermore, one canyon stream segment - Emigration Creek - largely exceeds the pollution levels of other canyon segments with similar ecologic and biotic characteristics. The reason behind these relatively high Emigration pollution levels is the presence of approximately 250-300 year-round residences. Emigration canyon is unique in this respect, since other canyon residences are seasonal and comparatively small in numbers.

Non-degradation: Local Public Policy

The maintenance of pristine water quality conditions in the canyons involves the adoption of policies that effectively regulate and monitor activities that have been identified as problems. The policy of non-degradation best meets this need.

The proposed non-degradation policy for the State of Utah (June, 1978) specifies that no new point sources will be allowed to discharge into non-degradation stream segments. This policy ignores non-point sources that enter the streams in a diffuse manner rather than through defined, enclosed drainage structures. Because of the potential non-point source impact on canyon watershed, the mandatory institution of best management practices for the control of diffuse non-point sources is necessary. Best Management Practices (BMP) essentially involve precautions or improvements that reduce both quantity of surface runoff from the site, and pollutants that accompany such runoff.

Perhaps the most effective, supplemental measure for administration of a non-degradation policy is water quality monitoring of all new development sites, prior to, during, and after construction. Such a measure satisfies several needs:

1. It places the burden of proof on the developer to show that adverse water quality impact does not occur.
2. Where adverse impact does occur, the extent and seriousness is documented and measured.

3. It initiates a process to immediately correct problems causing the pollution.
4. Such monitoring will improve the technology for BMP application, effectiveness, and advance knowledge and data bases for further water quality planning.

Where application of non-degradation measures apply to recreation and construction use in water quality maintenance, so too should they apply where severely polluted waters can be restored. Such a condition exists in Emigration canyon.

Recreation/Construction Sites and Non-Degradation

A significant impact on water quality in the Wasatch Front Canyons originates from construction of public and private recreationally oriented facilities (cabins, lodges, campgrounds, etc.) and overuse of public recreational areas. Several conclusive publications support this claim: Hydroscience's Evaluation of Land Use and Bacterial Water Quality in Wasatch Mountain Streams; U.S. Forest Service Proposed Land Management Plan; 208 Staff Report on Best Management Practices.

The foresight of the Citizen's Planning Advisory Committee in March 1976 provided useful guidance for the 208 Project in dealing with canyon conditions. Quoted from EDAW's "Technical Land Use Plan - Wasatch Canyons," the citizen sentiments established consensus that:

1. "Water quality monitoring in sensitive areas, such as the canyons, should be the responsibility of private developers or developments" . . . as well as public developers and developments.
2. "Developments in areas threatened by natural hazards . . . should be designed to accommodate the hazard."

3. "Access to the canyons should be improved. Mass transit will probably be one of the answers."
4. "Large parking lots in the canyons pose aesthetic prolems," (and water quality problems as well; see Hydroscience - Land Use and Bacterial Water Quality in Wasatch Mountain Streams). "Large Parking areas at the mouths of the canyons should be constructed to make car pooling and mass transit systems more effective."
5. "Cluster developments should be encouraged because of the economics of such developments and their compatibility with the environment." (Also see Salt Lake County 208 Project - Best Management Practices).

Each of these key recommendations comprise the basis of selected best management practices for the Wasatch Canyons. The assessment of land suitability (See Figure VI-5) indicates generally where most significant canyon development is likely to occur. However, any new recreational development should assess its impact on water quality, and that impact on water quality will be influenced by factors relating to: 1) total pervious and impervious coverage (clustering economizes greatly), and 2) destruction or maintenance of ecologic relationships-particularly with regard to vegetative coverage and its influence on water absorption, soil stabilization, floral and faunal succession (vegetative preservation and re-establishment through proper grading and erosion control). Reducing large parking facilities and promoting transit systems can minimize large-scale grading operations. Finally, wherever any construction takes place, the developer should be monitoring the effects of his operation on the stream, regardless of what procedures or safeguards are are taken.

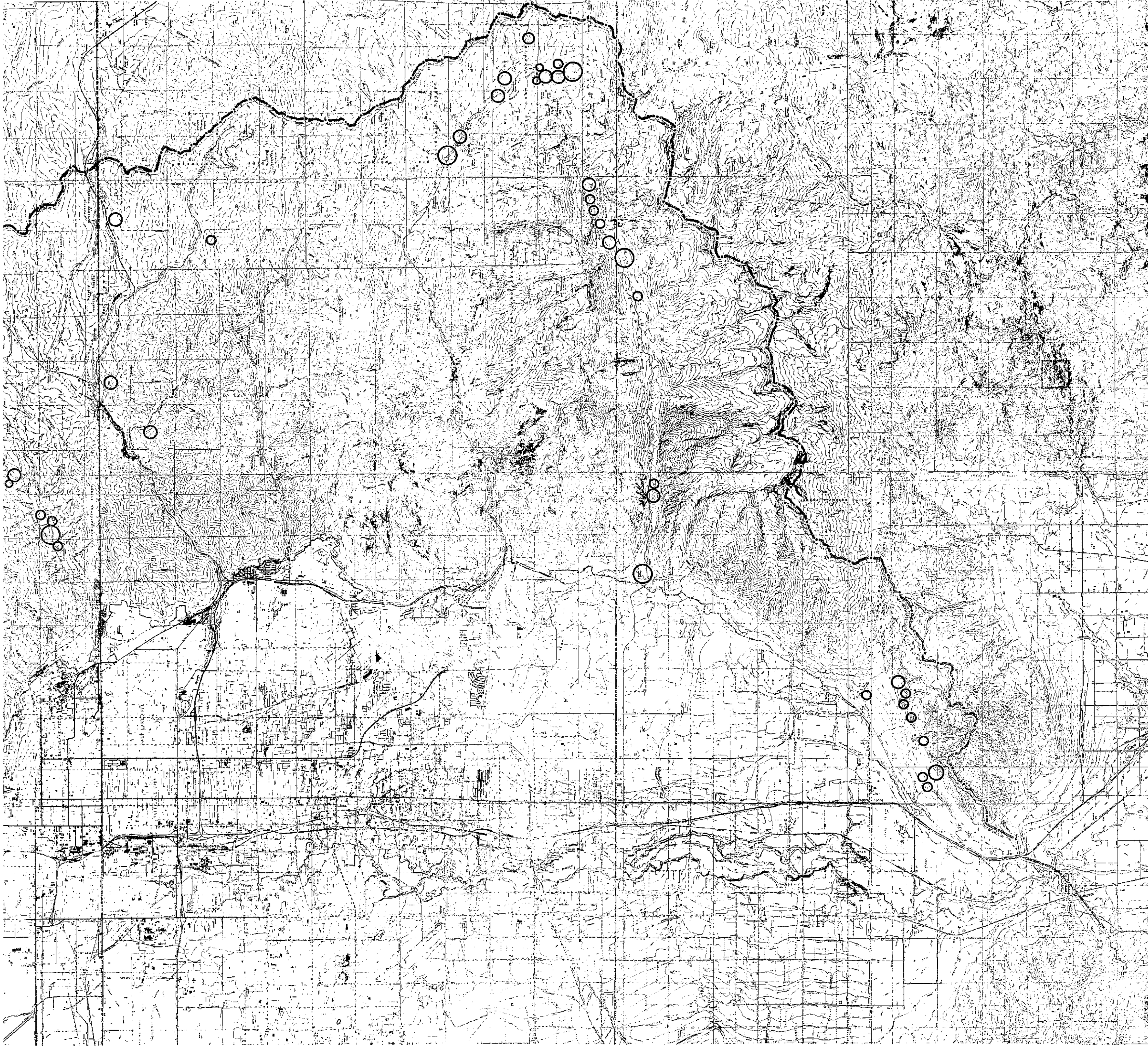

FIGURE VI-5
AREAS OF EXISTING AND ANTICIPATED CANYON DEVELOPMENT

EXISTING COMMERCIAL & RESIDENTIAL

ANTICIPATED CANYON DEVELOPMENT

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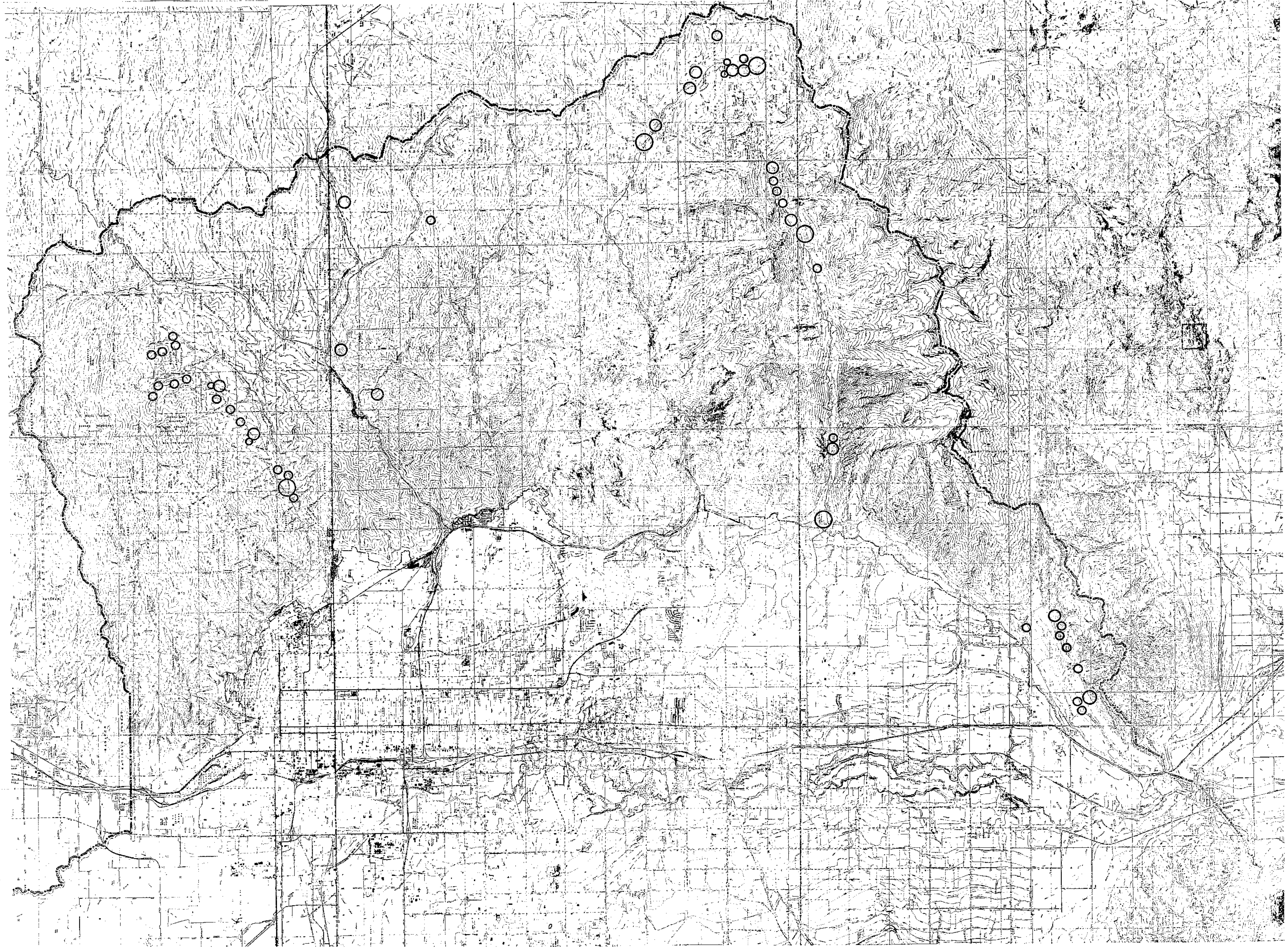


Septic Groundwater Seepage and Non-Degradation

The 208 Project has found the quality of all canyon streams high enough to merit pristine quality preservation with the exception of one: Emigration Creek. Figure VI-4 indicates that with close to 300 permanent single family dwellings in Emigration Canyon (the largest permanent dwelling concentration in all canyons), and with many of these dwellings utilizing septic tanks with filter fields for sanitary disposal, extraordinarily high coliform concentrations are present almost the full length of the canyon stream segment. (See Table IV-3, Present Water Quality).

The alternatives for abatement of this condition are limited to;

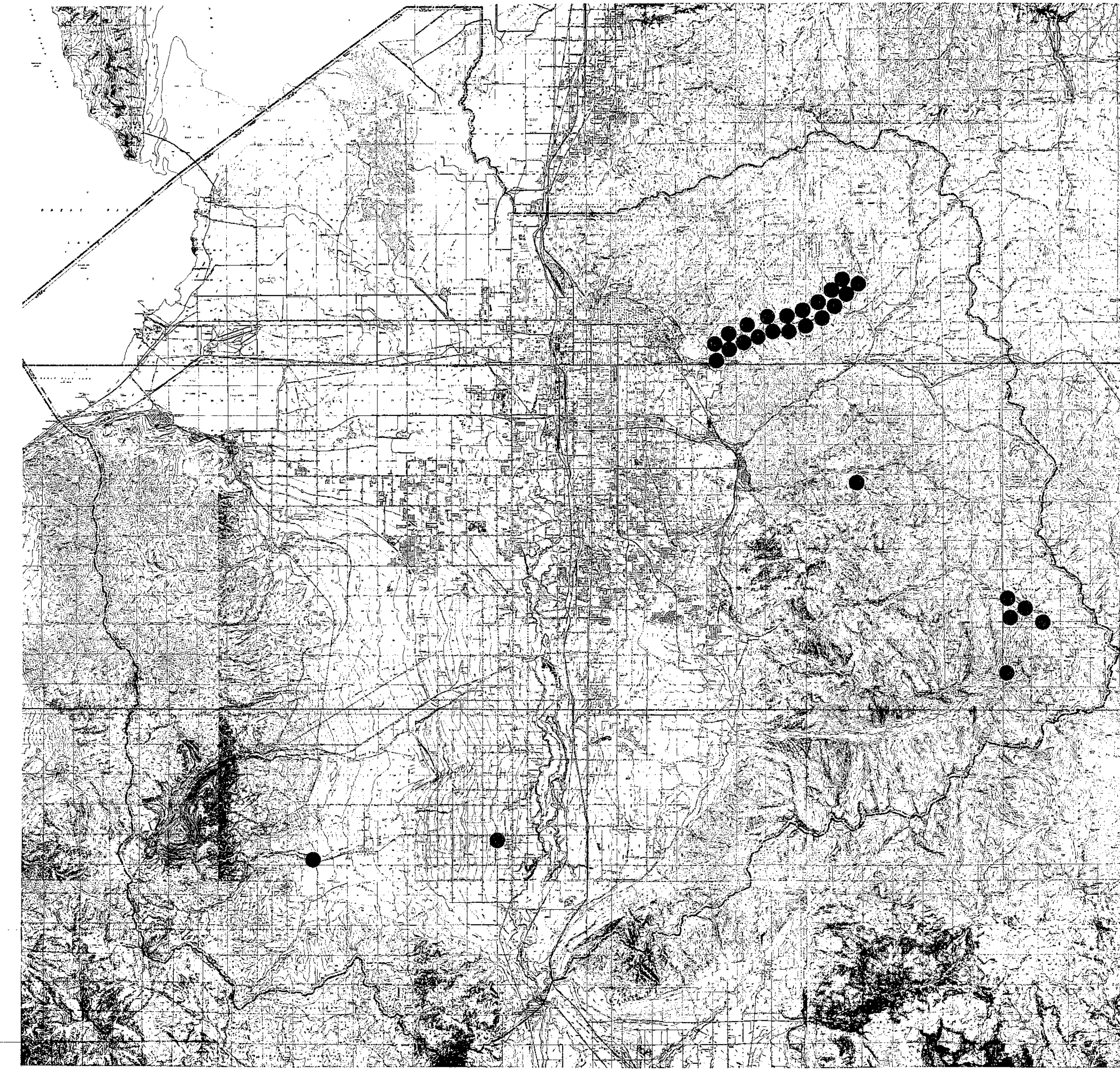
1. Installation of sealed sanitary vaults to replace existing drainage vaults (i.e., holding tanks).
2. Installation of sanitary sewer facilities along the length of the Emigration Canyon stream segment.

Although water treatment at mouth of Emigration Canyon could substantially improve the quality of the stream for possible culinary use, the preponderance of permanent single family residences, along with other institutional/ recreation use, will not alleviate potential public health problems relating to culinary well contamination and inability of the water to maintain healthy aquatic life-- much less for cold-water fishery sustainment. It may be desirable at some future date to consider water treatment, but the integrity of Emigration Creek should be restored.

The economic and environmental impacts of implementation of these alternatives will be discussed further under environmental assessment and non-point implementation. A sewer improvement district does exist for Emigration, and some preliminary facility planning has already been completed,

FIGURE VI-4

AREAS WITH SERIOUS SEPTIC TANK INFILTRATION



EACH DOT REPRESENTS TEN SEPTIC TANKS

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(See Appendix A-1, Bibliography). The installation of sewer facilities will undoubtedly produce an expansion of residential growth potential in the canyon, with accompanying storm runoff increases. A tradeoff appears evident between the effect of sewer facilities on growth, and the long term effect of such growth on this particular canyon watershed. Additional analysis and planning is needed to fully weigh the costs and benefits of such a tradeoff.

AGRICULTURAL RUNOFF

The conditions affecting the economic health of Salt Lake County agriculture have been described in detail in the Salt Lake County 208 publication, The Agricultural Future? In summary, agriculture is on the rapid decline in Salt Lake County due to heavy trends toward full urbanization. Most of the present irrigated farmland will be absorbed by urbanization within the twenty-year planning period, either through new construction, replacement or fragmentation of access and irrigation systems. (See Figure VI-6.)

Within this context, any impacts from irrigation return flows will lessen due to total reduction of agricultural chemicals, herbicides, and animal wastes. However, new stormwater runoff will replace these pollutants with equal or more severe impacts. The 208 Technical Report, Jordan River Water Quality Projections, indicates similar impacts in the upper Jordan from storm loadings as it does in the lower Jordan, (e.g., coliform concentrations of 230,000 MPN/100ml), and suspended sediment concentrations of 810 mg/1.

Irrigated Agricultural Effects

Current impact from irrigated agricultural use was estimated primarily from Water Quality of Agricultural Return Flows to the Jordan River by Sperling and Glenne, 1974. The estimates reflect data taken from three drain discharges into the Jordan at 10600 South, 12400 South, and 12600 South. Although the observed coliform levels were extremely high (200-500,000; 3000-100,000; and 300-10,000

MPN/100 ml respectively), extraneous influences such as septic tank leakage prior to installation of sanitary sewer facilities could have masked the real impact from agricultural use.

The primary source of pollutant delivered by the irrigation system is water from Utah Lake. Utah Lake maintains high concentrations of total dissolved solids, algae, and coliform bacteria. Most of the water pumped into the Salt Lake County irrigation system is polluted - or of low quality - as a result of these conditions in Utah Lake. Much of this water is unused, and flows through the system either to dissipate as shallow groundwater recharge or discharge flows through the system either to dissipate as groundwater recharge or discharge directly into the Jordan River or Great Salt Lake. The U.S. Geological Survey acknowledges that such recharge adversely affects the quality of groundwater.

Aside from these limited data sources, no identification has been made of the nature and extent of irrigated agricultural impact. Future planning and problem assessment will be carried out with the local Soil Conservation District (SCD).

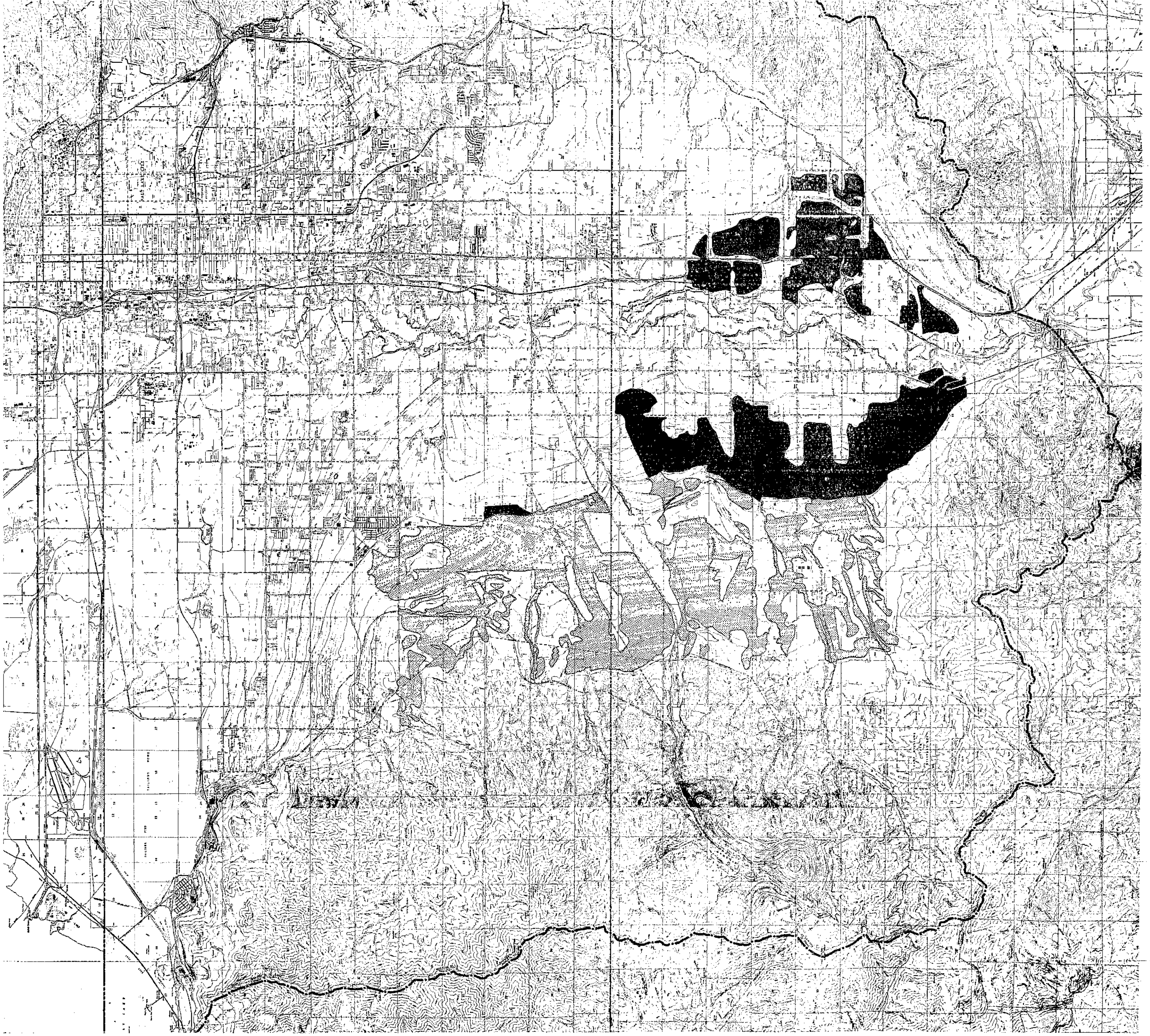
Non-Irrigated Agricultural Effects

No identification has been made of the nature and extent of non-irrigated agriculture on water quality. This area will be the subject of further planning and study.

Animal Concentrations/Feedlot Effects

Animal concentrations - with the exception of Hogle Zoo - have not been directly monitored so as to determine the impact on receiving streams. A detailed assessment is to be prepared in cooperation with the local SCD for such problem identification, in addition to a refinement of animal concentration data that appears on Figure VI-7.

FIGURE VI-6
REMAINING AGRICULTURAL LAND IN
SALT LAKE COUNTY, 1995



PRIME/IRRIGATED CROPLAND

NON-PRIME/UNIRRIGATED CROPLAND

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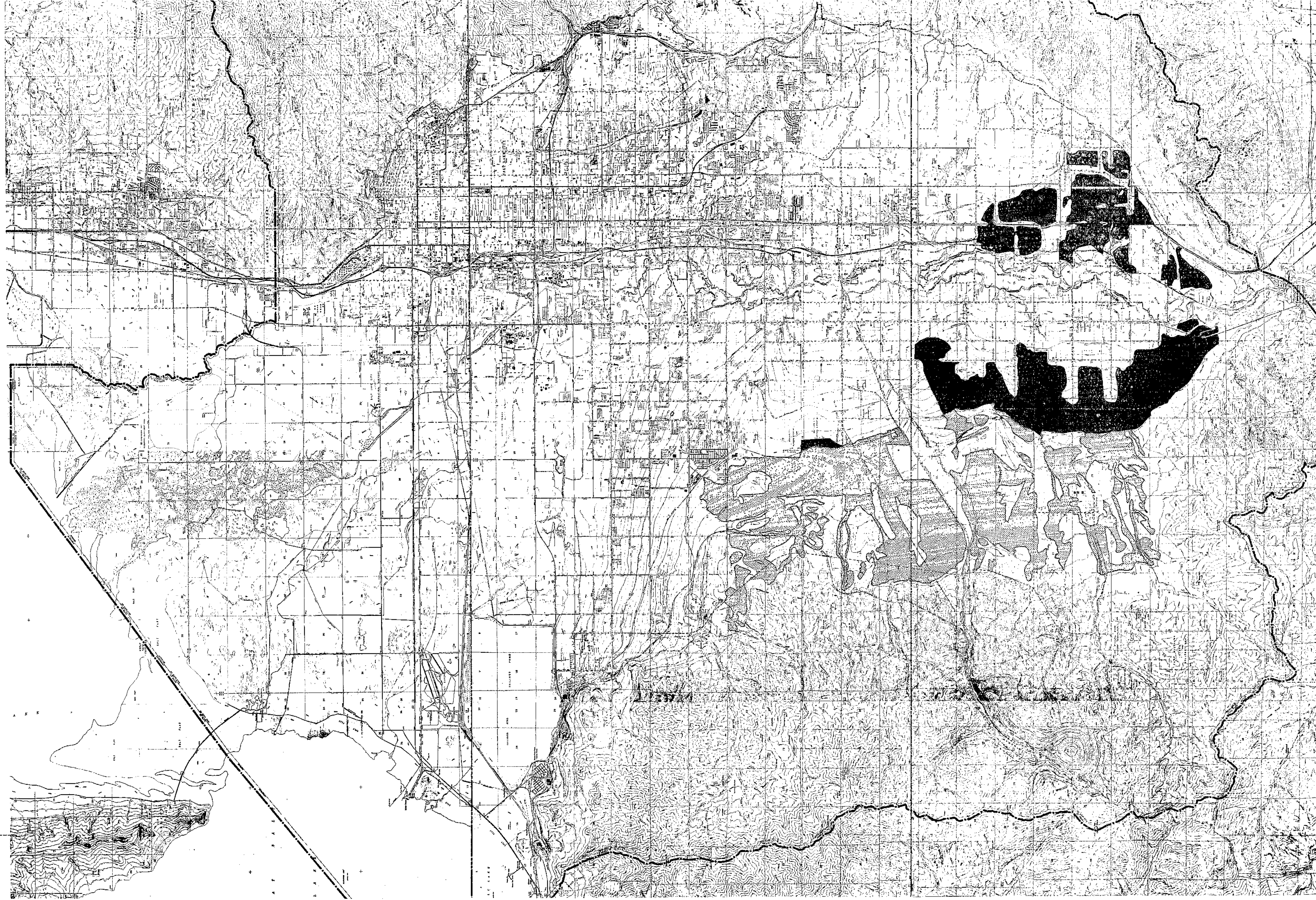

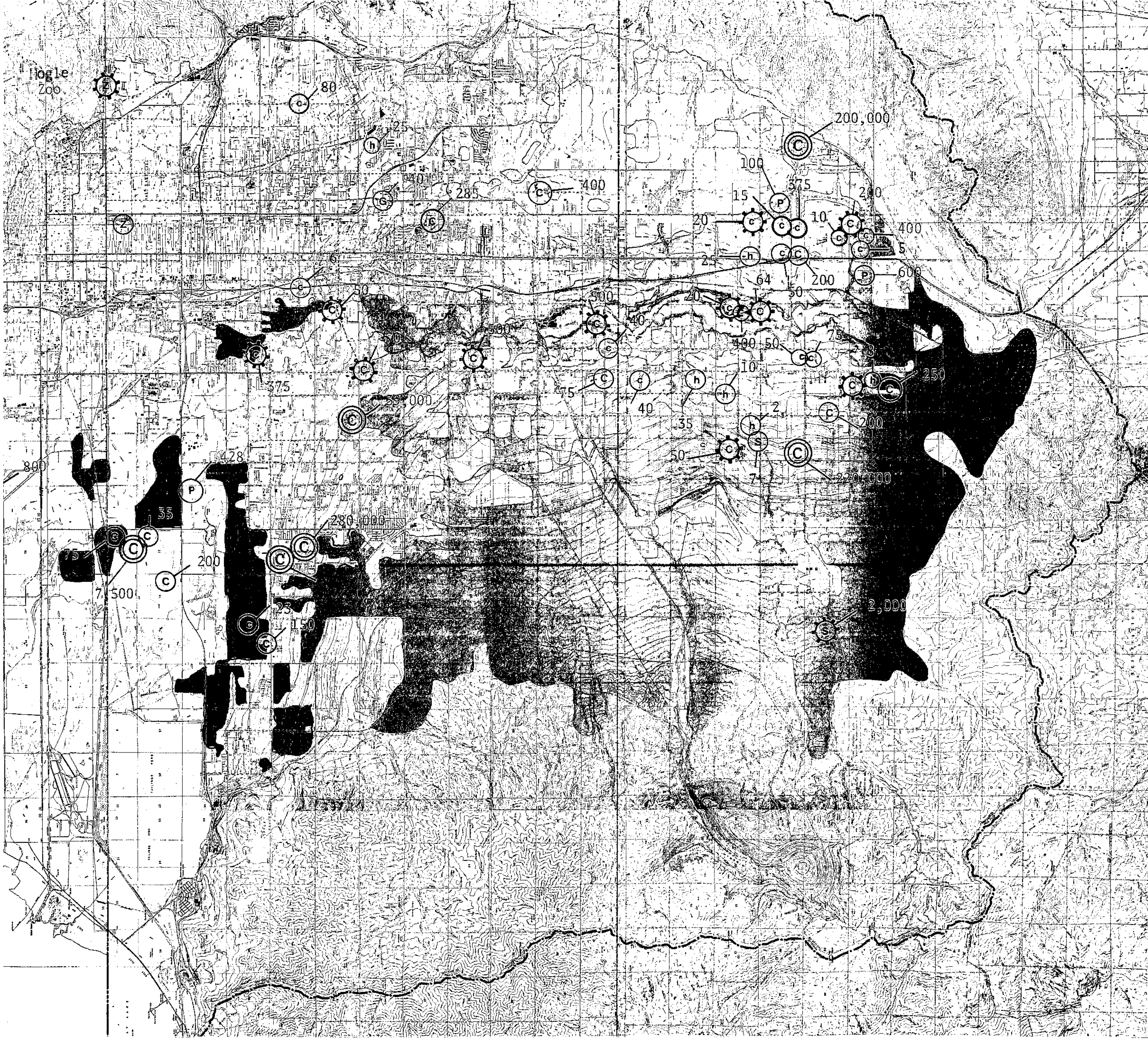

FIGURE VI-7
EXISTING CROPLAND
AND ANIMAL CONCENTRATIONS

AGRICULTURAL LAND

- DISCHARGE DIRECTLY INTO A CANAL OR STREAM
- (G) GOATS
- (S) SHEEP
- (P) PIGS
- (h) HORSES
- (c) CATTLE: BEEF OR DAIRY
- (©) CHICKENS

SOURCES: U.S. SOIL CONSERVATION SERVICE, S.L. COUNTY SOIL CONSERVATION DISTRICT, "ANIMAL CONCENTRATIONS INVENTORY," SEPTEMBER, 1978. UTAH STATE DEPT. OF ENVIRONMENTAL HEALTH, "ANIMAL CONCENTRATION COMPUTER DATA," JUNE, 1977.

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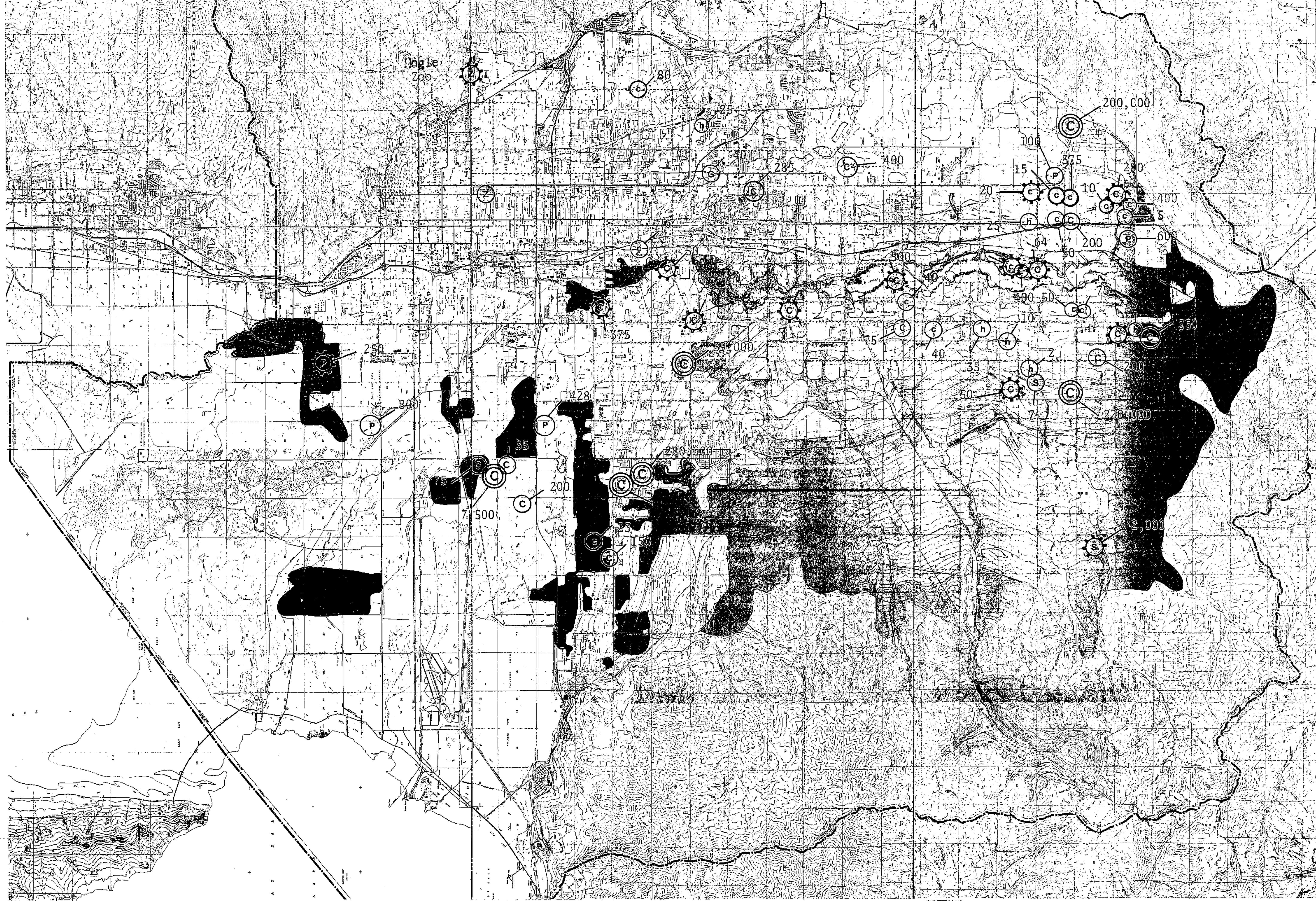


Zoo
80
25
200,000
100
375
400
40
285
15
200
20
10
400
5
25
600
64
200
50
6
50
300
20
40
500
400
50
75
375
10
75
40
250
55,000
35
2
250
200
50
7
220,000
800
428
35
280,000
200
75
7,500
23
150
2,000

MINING

Kennecott

Significantly large mining impacts on water quality are possible due to the size of the Kennecott Copper operation. Point discharges are documented and permitted at the Northern end of the mining area where refining and waste disposal is prevalent. At this point, wastes are discharged into the C-7 canal which flows into the Great Salt Lake. Non-point sources from the Kennecott mine would originate mainly from two sources:

1. Surface runoff into intermittent streams flowing seasonally into the Jordan River. Large benches of extensive excavation are characteristic of this mining operation. In addition, almost total denuding of Oquirrh Mountain hillsides has taken place at the Northern end of the operation. Although surface runoff velocity and quantity have most likely increased as a result, the water quality impacts have not been assessed.
2. Subsurface leaching of trace materials from tailings dumps into the underground wells and unconfined acquifer is a subject for intensive survey and analysis. Very little public monitoring and analysis has been carried out in this respect. Additional studies by the Area-wide Planning Agency appear necessary for an adequate assessment, although some assessment of trace chemicals from mine tailings contamination was made by U.S.G.S. between 1964-68.

It is emphasized that non-point loads due to mining operations probably go unnoticed and have been so in the past. However, extended or sprawl of residential growth into these runoff impact areas will present future assessment and management problems within 20 years. It is recommended that the Area-wide Water Quality Planning Agency coordinate closely with any efforts by Kennecott to identify, quantify, or analyze water quality impacts resulting from their mining operation. To date, data obtained by Kennecott on subsurface water conditions has not been made available.

Sand and Gravel

Mining operations in Salt Lake County include extensive sand and gravel extraction along ancient lake shore deposits on the east and west sides of Salt Lake Valley. The nature and extent of water pollution from these sources is not known. The monitoring of surface runoff from these sites is necessary in order to determine water quality impact.

South Hecla - Zinc

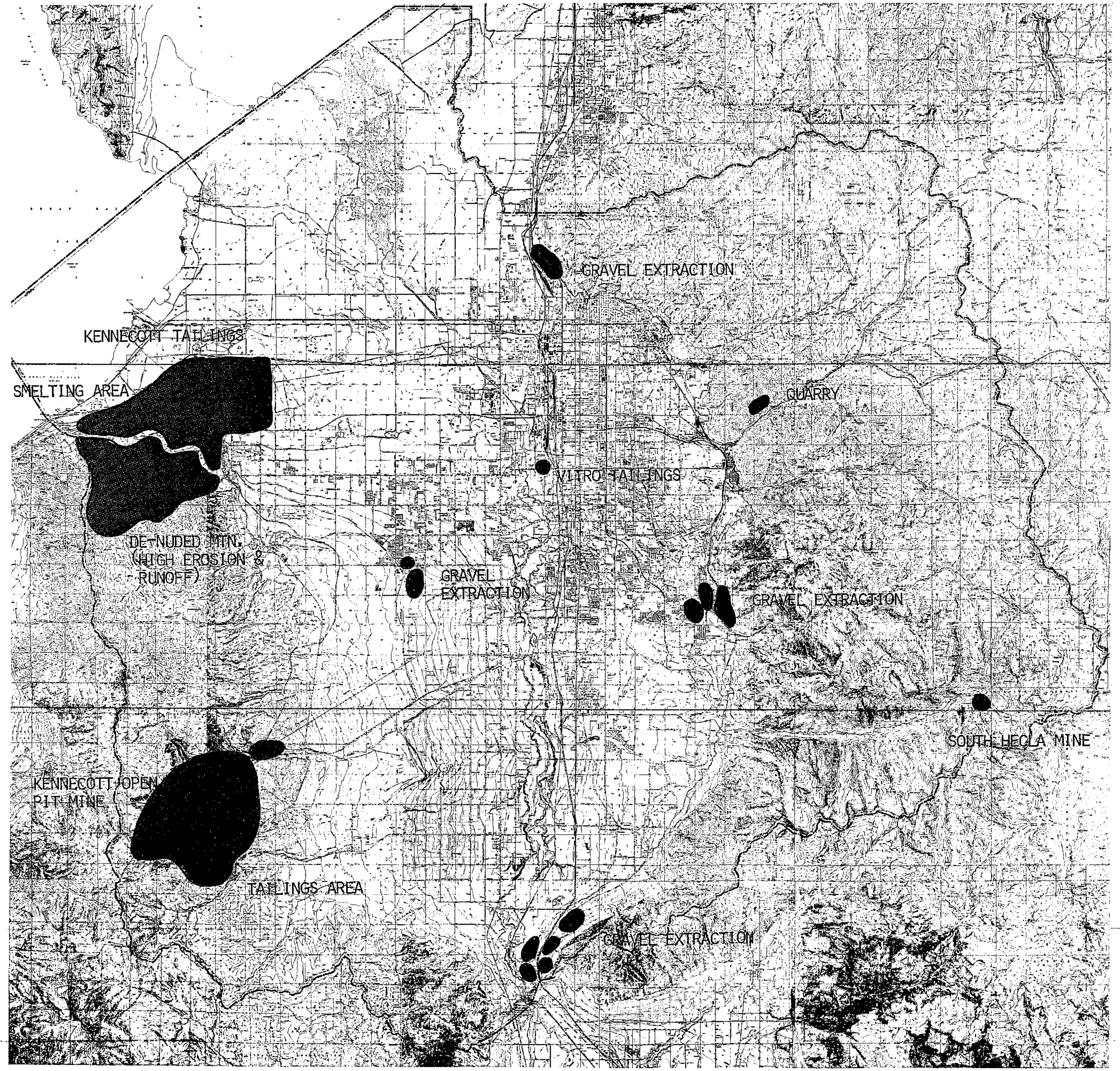
There are countless older mining claims in Little Cottonwood Canyon, in the vicinity of the Town of Alta. These claims are generally inoperable, but some serious mining activity has taken place within the last year. The South Hecla Mining Company has commenced a small operation close to the main ski lift area in Alta, where small quantities of zinc are extracted. The Salt Lake City-County Health Department has conducted an investigation of the water quality of natural spring-water discharges from the mine, and has found no degradation of quality. However, the subsurface effects of the operation is not known. Continuous monitoring of canyon streams should identify any subsurface influences over time.

Vitro Tailings

The radioactive Vitro tailings adjacent to the Salt Lake Suburban #1 Sanitary facilities remain as potential hazardous material in the form of an excavation. A number of studies regarding the level of radioactivity have been performed by the State Division of Health, but no surveys of water quality have been completed.

FIGURE VI - 7a

LOCATION OF SIGNIFICANT MINING AND EXTRACTION OPERATIONS



SOURCE: SALT LAKE COUNTY WATER QUALITY, 1" = 200' RECTIFIED AERIAL PHOTOGRAPHY, 1975.

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Because of the emphasis on urban runoff by the Environmental Protection Agency at a national scale, it would seem that the interaction of urban runoff and hazardous wastes would be of a priority concern. Monitoring stations for any urban stormwater assessment should include analysis of water from the Vitro tailings.

GROUNDWATER

The most comprehensive and recent identification of groundwater conditions appears in the State Department of Natural Resources publication 31, Water Resources of Salt Lake County. Although this publication appeared seven years ago, additional data have been gathered since by the U.S. Geological Survey, but have not been incorporated into an updated report.

The conclusions of this most recent effort are that groundwater conditions are poorest in the Southwestern part of the Jordan Valley principal acquifer (see Figures IV-6 and IV-7). The main reasons involve:

1. Lesser amounts of bedrock recharge from the Oquirrh Mountains.
2. Poorer quality of recharge water from surface intermittent streams.
3. Recharge from poor quality Utah Lake irrigation water.
4. Contamination from mining operations.

In order to more accurately assess the nature and extent of groundwater pollution sources, it is recommended that additional data collected since initial publication of Water Resources of Salt Lake County be compiled in cooperation with U.S.G.S. and evaluated regarding adequacy of problem identification. It is anticipated that additional more specific information regarding mining, irrigation, and stormwater impacts can be obtained through coordination resulting from agreements between the U. S. Environmental Protection Agency, U.S.G.S., and the local Water Quality Planning Agency.

SOLID WASTE

Aside from the suspected non-point pollution sources of groundwater described in Water Resources of Salt Lake County, little data have appeared that specifically document the impact of landfill operations to either shallow or deep acquifers.

Salt Lake City Corporation, in May of 1977, commissioned a special study on the effect of the West North Temple Street landfill located approximately three miles North of the Kennecott Copper Tailings Pond. The results of this report, Geotechnical Investigation and Evaluation of the West North Temple Street Landfill (EMCON Associates, May, 1977), indicate that the quality of shallow groundwater in the landfill vicinity (Northwest) had been degraded. The reason for this condition is due to two factors:

1. "Previous disposal practices of placing wastes in contact with the water."
2. "The limited horizontal migration of leachate from the disposal site."

This report recommends that the West North Temple site is adequate for locating a landfill operation, but with stipulations that leachate control facilities be constructed, that impermeable soil barriers halt surface water intrusion, and that slope is built up to efficiently conduct surface runoff. The report also recommends monitoring of the leachate system.

Since consolidation of county landfill operations appears likely with Salt Lake City, only two solid waste sites will remain in the County. These are the Salt Lake County sites adjacent to the east of the Kennecott tailings and the Trans-Jordan site west of Copperton (see Figure III-9). Both sites have had limited water quality surveillance, but only the Trans-Jordan site possesses characteristics that make potential seepage of leachate into groundwater possible.

The County site possesses similar characteristics as the West North Temple area, where artesian pressure produces an upward groundwater movement, making horizontal leachate seepage the only consideration. (See Table VI-2.)

The Trans-Jordan site, however, is located along geologic depositions of a more permeable nature, that serve as recharge to the Jordan Valley Aquifer. However, recent water sample drillings to the east of the Trans-Jordan site were dry. The Kennecott Corporation reportedly samples a deeper drilling east of the landfill, but Trans-Jordan consultants have been told that water quality data from this station is unavailable.

Additional monitoring and analysis is necessary to determine the nature and extent to which solid waste disposal affects groundwater resources.

HYDROLOGIC MODIFICATIONS

There are two areas where hydrologic modifications may impact the water quality in Salt Lake County. The first is in the construction of storm drains, the second from the importation of additional culinary water and the potential for resultant decrease of Utah Lake irrigation water.

The construction of additional storm drains normally would increase the volume of flood waters into the Jordan River, as well as increasing pollution loads. Also, the catchment and transportation of stormwater from more impermeable urban development can adversely effect changes in water table levels and recharge into the acquifers of Salt Lake Valley. However, the improvements recommended later in this chapter (Proposed Non-point Management Alternatives) should maintain stormwater volume, velocity, quality, and recharge to within acceptable levels.

The transportation of new culinary water resources into Salt Lake Valley as a result of constructing the Jordanelle Reservoir (Bonneville Unit of the Central Utah Project) is estimated at 70,000 acre feet annually. Most of this water will

TABLE VI-2.

CHEMICAL ANALYSIS OF GROUNDWATER IN VICINITY OF SALT LAKE COUNTY LANDFILL

mg/l

Sample No.	Ca	Mg	Na	SO4	Cl	Fe	TDS	BOD
A-1	1160	700	8000	1390	14600	0.21	29210	35
A-2	490	80	4050	420	5700	1.59	10160	37
B-1	40	10	1390	120	2100	2.03	4750	36
B-2	370	70	620	110	640	0.24	3950	40
B-4	270	80	2200	270	1990	0.84	20280	37
B-4A	700	80	1560	160	2400	1.29	9950	35
B-5	3200	1220	5670	710	9500	17.3	36860	86
B-6	30	13	600	290	700	0.05	24040	43
Flowing Well	20	20	350	140	450	0.1	1190	

NOTES:
Borings A-1 and A-2 are upgradient from the landfill.
Boring B-1 is finished in sand at a depth of 16 feet and is about 200 feet downgradient from the old landfill. Borings B-2, B-3, and B-4 are finished in sand downgradient from the landfill. Boring B-5 is finished in clay and silt downgradient from the landfill. Wate in Boring B-5 is definitely influenced by landfill leachate. Boring B-5 has water higher in calcium, magnesium, sodium, sulfate, chloride, and iron than the surrounding wells. The other borings finished in the sand do not show leachate influence. This substantiates that the clay layer and the upward hydraulic gradient are preventing mixing of leachate and groundwater. Ambient chloride and sodium are high because of Salt Lake influence on groundwater making these ions poor leachate indicators.

None of the water sampled from surface streams or groundwater meets drinking water standards.

be used to satisfy municipal and industrial needs. The water will impact both treatment operations carried out by industrial and municipal authorities. All impacted flows, wasteload allocations and recommended effluent limitations have been described in Chapter V.

As Salt Lake Valley expands in population, and more agricultural acreage moves aside for ubanization, Utah Lake water rights presently allocated can be expected to be forfeited, traded or otherwise acquired. Whether trades result between public or private corporations and water users, or whether they remain intact with the users, is a question for detailed consideration. The potential that re-arrangement of water use has on the quality of return flows into the Jordan River is unknown. Too many alternatives and options are open. It is recommended that additional study be made of these options to determine which are most probable, and what their probable effects will be on water quality.

SILVICULTURE

No water quality problem exists or is likely to develop in Salt Lake County within the next twenty years, as a result of silvicultural activity.

Substantial tree harvesting operations impacted primarily the Big Cottonwood and Mill Creek sub-basins of the Wasatch Mountains early in the history of Utah settlement. Conifers were cleared in these areas for use in Salt Lake Valley construction. In fact, several sawmills were located along both canyon streams, and several stream forks and side-canyons still bear either an alphabetical or numerical Mill designation.

Since the U.S. Forest Service maintains the majority of the Wasatch Canyon-lands for public watershed and recreational use, it is anticipated that Silviculture will be neither a possible or probable future use. A basic assumption in the proposed land management plan of the U.S. Forest Service is that "there will be no commercial harvest of sawtimber from the Planning Unit."

COAL MINING

Coal resources in Salt Lake County are, for all intensive purposes, non-existent. Most mining in the county is limited to the extraction of hard metal ore and sand and gravel.

It is anticipated that due to the lack of these resources, no water quality problem relating to coal mining exists or is likely to ever exist.

Non-Point Management Alternatives

There is a broad range of solutions to water quality problems in Salt Lake County. Some solutions lend themselves to non-regulatory programs with educational emphasis, while others are critical enough to merit regulatory programs with emphases on control and enforcement. Due to the institutional organization of the polluters in each category, and the level of seriousness the pollution caused, most water quality problems will require regulatory approaches in the long run.

In fact, all non-point source categories necessitate new control measures for the protection of public health, safety, and welfare. However, non-point source impacts are closely related to the dynamics of growth within a hydrologic system. For example: Salt Lake Valley is rapidly urbanizing, producing a dwindling of agricultural resources. Urbanization also increases pressure for recreational opportunities, and demands a higher performance standard for changes made in the system that produce indirect side effects on a growing population. Pollution problems change as do the activities of man. Solutions to these problems must address those factors that predominate the present and future as well.

Predominant Non-Point Source Factors

If there is one word that describes the condition of Salt Lake County, it must be "Growth." Salt Lake Valley accommodates well over one-half million people now and is expected to almost double within twenty years. A marked factor that predominates here is construction of new industrial, residential, commercial, and institutional facilities. Permeable land is being surfaced by impermeable roads, buildings and other improvements. Water gathers in greater amounts, travels faster, and is polluted by the new urban landscape.

Greater population places pressure on recreational areas. The Wasatch Canyons are the playground for an ever-increasing populous with more time and money to spend. Demand for recreation on public watershed is already exceeding the supply and the response by man to his watershed resources should be one of preservation - not exploitation. The U.S. Forest Service interprets this condition in the form of increasing costs for the treatment of culinary water supply that may become more polluted with increasing use of the watershed.

Pristine water quality has been a standard for most Wasatch Canyon streams. The exception to this is Emigration Canyon, an early settlement site and year-round residential community. Due to the predominance of septic tank seepage at this location, the restoration of Emigration Canyon becomes of critical concern in the overall improvement and maintenance of canyon water quality.

As urbanization increases, the agricultural resources in the county can be expected to decrease. Agricultural runoff will be replaced with urban runoff. The short-terms effects of pollution from irrigated land, pasture, and feedlots have not been identified as to their nature and extent, and the long-term effects are anticipated to be minor if not non-existent. Agricultural use, however, still predominates approximately 50,000 acres of land on the valley floor.

These non-point sources represent the highest priorities for pollution control:

1. Urban Runoff (including construction sites)
2. Recreation impact on canyon watershed (including abatement of septic tank seepage)
3. Agricultural runoff

The first two sources (urban runoff and recreation impact) can best be controlled through a regulatory program that provides incentives for long-term solutions. The third source (agricultural runoff) can best be controlled through non-regulatory programs designed for short-term implementation.

<u>Secondary Non-point Source Factors</u>

The impacts of non-coal mining, hazardous materials (Vitro tailings), solid waste, hydrologic modifications, and other groundwater pollutants are long term. They all have a close relationship to the maintenance of the quality of life that develops in Salt Lake Valley as it grows.

These impacts have not been identified to the extent and nature that urban, recreational, and agricultural sources have. However, the institutional fabric and organizational aspects of pollution from mining, solid waste, hazardous materials, and hydrologic modifications all require the need for incorporating adequate performance standards (a regulatory program) for the solution to their problems. However, until specific problems surface as a result of on-going water quality planning and monitoring neither non-regulatory or regulatory programs can be implemented. Table VI-3 summarizes both primary and secondary non-point management needs.

Table VI-3. Non-Point Management Needs

Sources	Implementation		Planning		
	Regulatory	Non-regulatory	Initial	Additional	On-going
Urban Runoff	X			X	X
Recreation	X			X	X
Septic Tanks	X			X	X
Irrigated Ag.		X	X		X
Grazing		X	X		X
Feedlots		X	X		X
Non-irrigated Ag.		X	X		X
Non-coal Mining	X			X	X
Hazardous Waste	X		X		X
Solid Waste	X			X	X
Groundwater	X			X	X
Hydrologic Mod.	X		X		X

Urban Runoff Management

There are two approaches that may be taken in solving non-point pollution problems generated by urban runoff:

1. The "End of the Pipe" treatment which utilizes detention ponds or basins for the settling of suspended solids. This method may necessitate the addition of skimming devices for the removal of oil and grease in highly urbanized areas.
2. The implementation of on-site methods (Best Management Practices) to reduce runoff quantity and quality. These mthods also involve community-wide street cleaning programs to reduce residual sediment in highly urban areas.

The need for artificial retention of stormwater runoff within the main acquifer recharge areas of the county can be initially satisfied by the utilization of both "End of the Pipe" and site-specific control measures. A detailed description of these non-point source control measures follows.

Stormwater Facilities

On the whole, County stormwater quality improvement is limited to the installation of detention basins that can enable treatment of both dry and wet-weather discharges. Where stormwater pollution is most critical, north of 2100 South, the most opportunity that exists for location of stormwater detention facilities is at the "end of the pipe," just before the stormwater flows into the Jordan River. Where foothill development in Salt Lake City occurs, such facilities are both recommended and in place, such as at the 11th Avenue Park. The southern portion of the County affords wider opportunities, where intermediately located detention facilities can be constructed as part of, and in conjunction with, community and neighborhood recreational facilities.

In the northern or lower Jordan area, improvements proposed by the U.S. Corps of Engineers on the River will include installation of detention basins. The 208 Project Staff has already recommended to the Corps certain specifications that should be included in the design of these basins (see Appendix A-4). In addition to these specifications, the Corps should take care in incorporating the basins attractively into a parkway setting, rather than merely construct functional detention ponds. Preliminary plans for construction should be provided the 208 Staff or water quality management agency for review and distribution to various county and state implementing agencies. The following recommendations provide treatment alternatives for both dry and wet-weather discharges.

WET WEATHER DISCHARGERS

The Salt Lake County metropolitan area was divided into two general areas for purposes of evaluating the alternatives for handling stormwater runoff. Priority Area No. 1 includes that portion of the City which lies north of 21st South Street and east of the Jordan River.

Priority Area No. 2 includes that portion of the City and County south of 21st South Street. This area includes the Millcreek, Little and Big Cottonwood Creek, and Dry Creek areas; Murray; Midvale; Sandy; Granger; Taylorsville; Bennion; Kearns; Hunter; Magna; Riverton; and West Jordan.

Priority Area No. 1 (Lower Jordan)

Flooding Considerations

It appears that the plan which will be implemented for overall flood control in this area is the Lower Jordan River Plan completed by the Army Corps of Engineers. This plan incorporates Nielsen & Maxwell's Flood Control Plan Using Detention Basins in total and Urban Technology Associates' Jordan River Parkway - An Alternative in part. Major features of this plan will include the following:

- Improvement of 8.5 miles of Jordan River and adjacent land into a floodway from near 21st South Street to the Interstate 215 crossing north of Salt Lake City.
- Construction of a 200-acre, 800 acre-foot detention basin above Interstate 215 to regulate downstream releases.
- Preservation of the low water channel to retain fish and wildlife values and to provide sufficient water depth for boating.
- Development of a parkway in conjunction with the floodway to provide open space, recreation opportunities, and restoration of natural aesthetics to the river and adjacent lands.
- Construction of desilting basins near the discharge point of major storm drains to Jordan River to reduce silt and turbidity from urban runoff.
- Construction of pumping plants on storm drains discharging at 9th South, 6th South, 6th North, and 10th North Streets to insure proper functioning of storm drains during high river stages.
- Modification of street bridges to increase the flow area and to provide underpasses for recreation trails.
- Construction of recreation facilities consisting of hiking, horse-back riding, and bicycle trails and formal and informal parks equipped with pavilions, picnic facilities, electrical service, and parking areas. Provisions for public access from adjacent streets and public property.

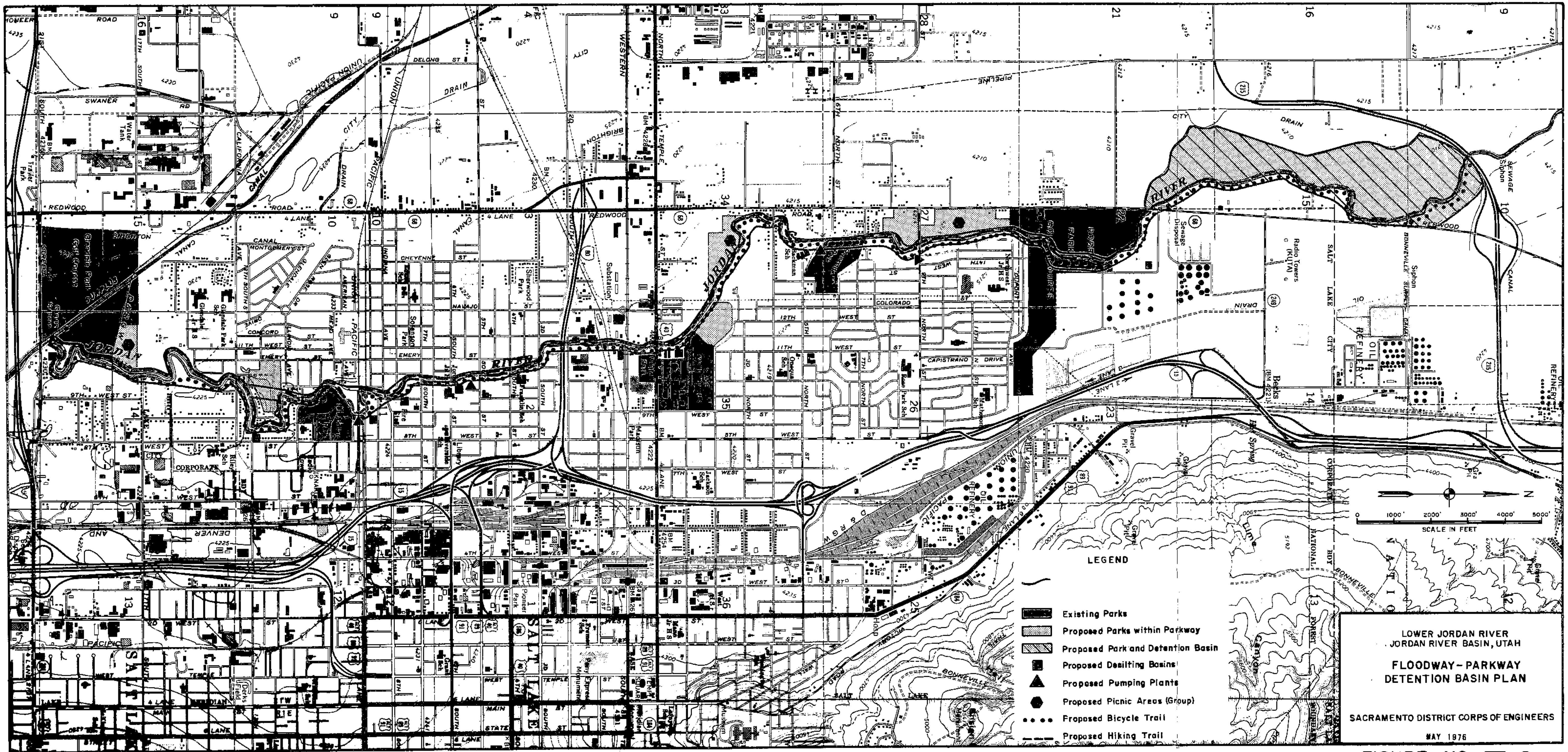
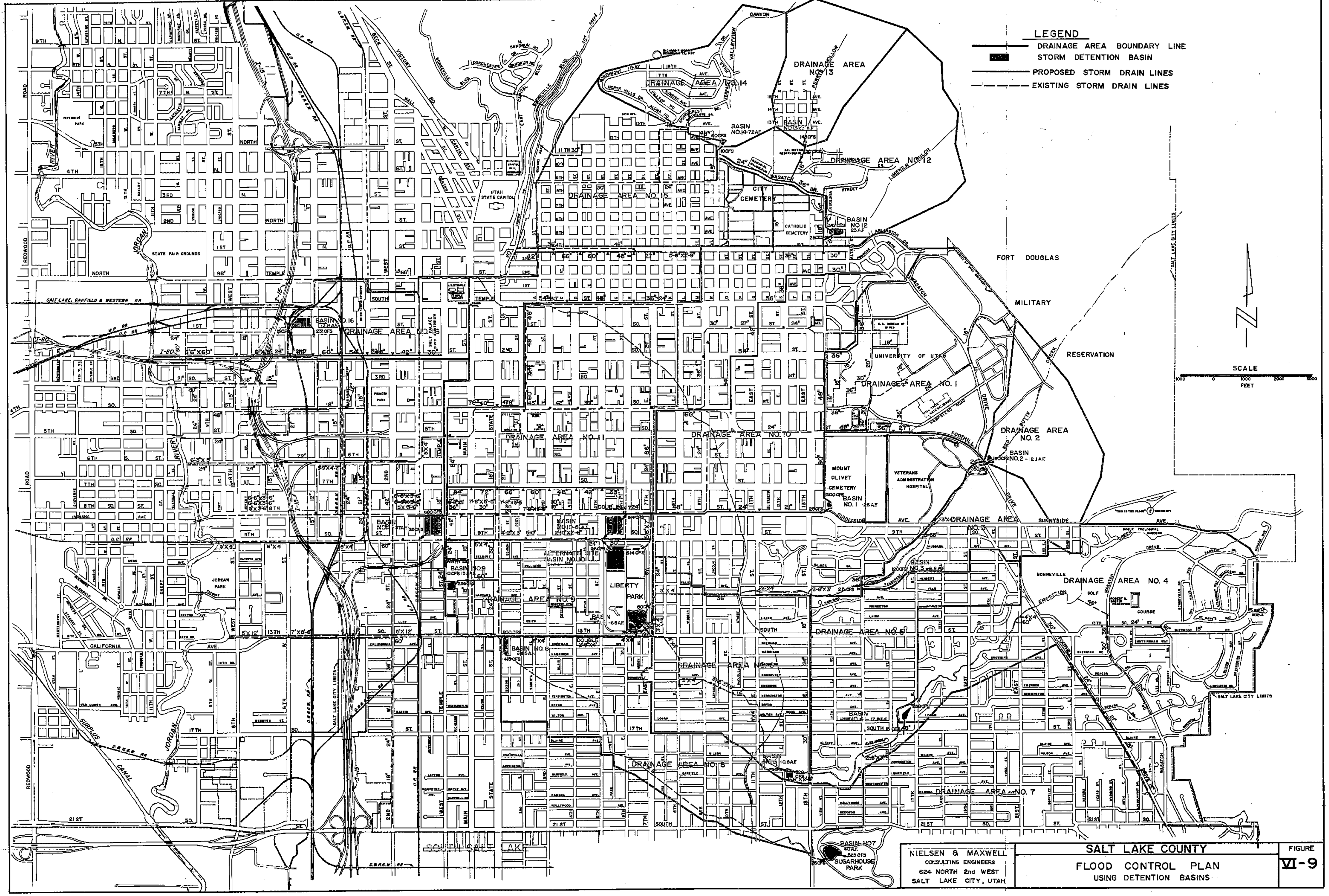
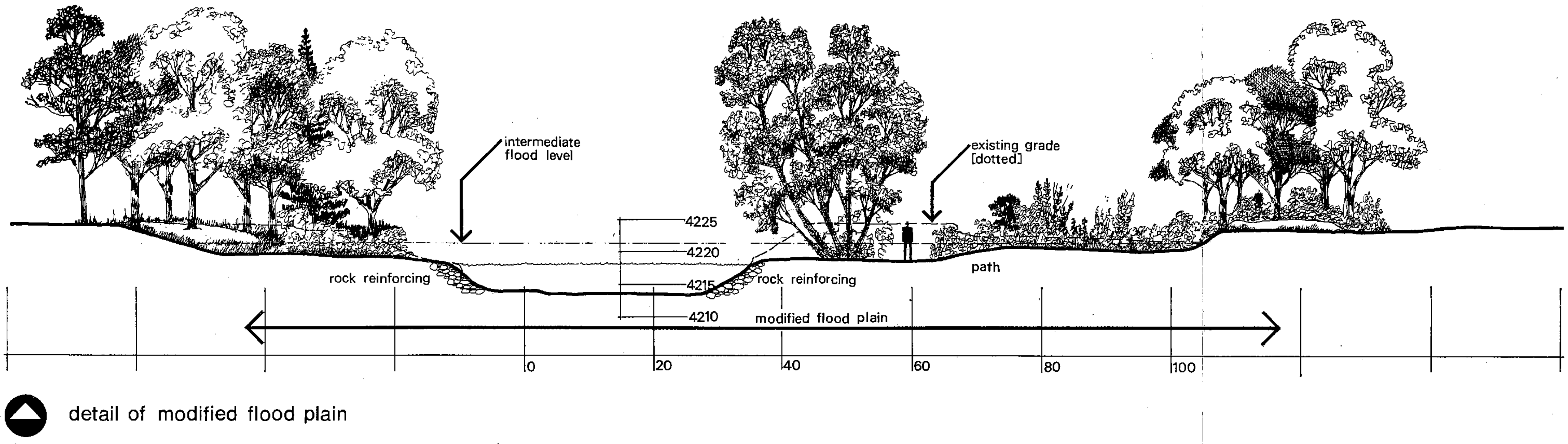


FIGURE NO. VI-8


LEGEND
DRAINAGE AREA BOUNDARY LINE
STORM DETENTION BASIN
PROPOSED STORM DRAIN LINES
EXISTING STORM DRAIN LINES
SCALE
1000 0 1000 2000 3000
FEET
DRAINAGE AREA NO. 13
DRAINAGE AREA NO. 14
DRAINAGE AREA NO. 12
DRAINAGE AREA NO. 15
UTAH STATE CAPITOL
CITY CEMETERY
CATHOLIC CEMETERY
FORT DOUGLAS
MILITARY
RESERVATION
STATE FAIR GROUNDS
DRAINAGE AREA NO. 1
UNIVERSITY OF UTAH
DRAINAGE AREA NO. 2
DRAINAGE AREA NO. 11
DRAINAGE AREA NO. 10
MOUNT OLIVET CEMETERY
VETERANS ADMINISTRATION HOSPITAL
DRAINAGE AREA NO. 3
DRAINAGE AREA NO. 4
LIBERTY PARK
JORDAN PARK
DRAINAGE AREA NO. 9
DRAINAGE AREA NO. 5
DRAINAGE AREA NO. 8
DRAINAGE AREA NO. 6
DRAINAGE AREA NO. 7
SOUTH SALT LAKE
SUGARHOUSE PARK
NIELSEN & MAXWELL
CONSULTING ENGINEERS
624 NORTH 2nd WEST
SALT LAKE CITY, UTAH
SALT LAKE COUNTY
FLOOD CONTROL PLAN
USING DETENTION BASINS
FIGURE
VI-9



TYPICAL CROSS-SECTION OF THE
JORDAN RIVER PARKWAY
(AFTER UTA)

FIGURE NO.
VI-10

- Construction of the 15 detention basins recommended in the NMW plan for Salt Lake City.

The various aspects of the plan are shown in Figures VI-8, VI-9, and VI-10. Figure VI-8 shows the proposed Floodway-Parkway Detention Basin Plan developed by the Army Corps of Engineers. Figure VI-9 is the incorporated Nielsen & Maxwell Flood Control Plan Using Detention Basins. Figure VI-10 shows a typical cross section of the Jordan River Parkway.

Water Quality Considerations

As outlined previously, the Corps report incorporated UTA's recommendation for installing desilting basins on the major storm drains prior to discharge to the river. UTA's original recommendation was to provide settling time sufficient to remove 60 to 80% of the silt material. The following locations and surface area requirements were outlined:

Little Cottonwood Creek	0.70 acres
Big Cottonwood Creek	0.90 acres
Mill Creek	0.65 acres
13th South Storm Darin	0.40 acres
9th South Storm Drain	0.40 acres
8th South Storm Drain	0.60 acres
6th South Storm Drain	0.40 acres
North Temple Storm Drain	0.50 acres

The Corps recommended that these facilities be designed to retain water for 2.5 minutes and reduce velocities to approximately one foot per second under maximum design flows. Provisions for 30-day silt storage and provisions to permit periodic cleaning were recommended.

A more comprehensive investigation concerning urban runoff related to water quality in the area north of 21st South was completed by Jou in 1974 ("An Engineering Evaluation of Stormwater Pollution and Control"). He concluded basically that the quality of the wet weather flows observed was low enough to warrant concern over the effect on the receiving stream. He also concurred that, in addition to implementation of BMP's, the desilting basins recommended by UTA would be appropriate. However, the desilting basins were not recommended for water quality reasons but for preventing the problems associated with siltation in the river. Jou, therefore, investigated the settling times that would be required for varying percentages of suspended solids and BOD removal. His results are shown graphically as Figure VI-11.

Elsewhere in his thesis he indicated that no matter how high the concentration of suspended solids in stormwater, the majority of the solids will settle out in an hour, which has great significance in the design of facilities.

Work completed more recently by Hydroscience pointed out the complexity of projecting stormwater wasteloads and assessing the stream impacts in the study area (Jordan River Water Quality Projections for Salt Lake County 208, February 1977.) By using a "mean annual" storm, they determined that the wasteloads would cause occasional but significant violations of the dissolved oxygen and total coliform standard. They recommended that both structural and non-structural methods to control urban runoff be implemented.

The conclusions and recommendations of the above-listed reports coincide reasonably well. However, some clarification is needed regarding the "desilting" structures recommended for installation along the Jordan. Given the 2.5 minute detention time specified by the Corps, nothing smaller than coarse sand would be removed. A listing of particle classifications by size is listed in Table VI-1.

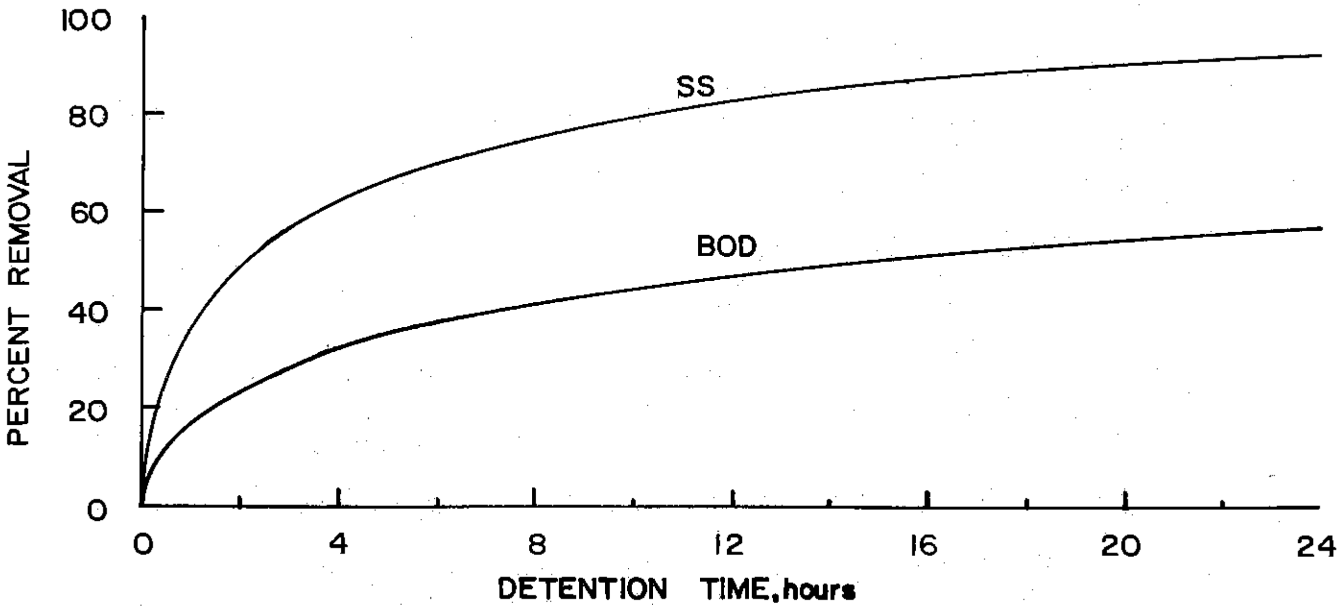


FIGURE VI-11
REDUCTION OF SS AND BOD BY SETTLING
IN 14-INCH HIGH GRADUATED CYLINDERS
after Jou

Even at Hydroscience's "mean annual" storm, which would have a detention time in the basins equal to approximately 10 times that of the design storm (10-year), or 25 minutes, no particles classified as silt would be removed

Table VI-1. Particle
Settling Velocities

Classification	Particle Diameter (mm)	Settling Velocity* (mm/sec)
Gravel	10.0 - 0.6	1000 - 63.0
Coarse Sand	0.4 - 0.06	42.0 - 4.0
Fine Sand	0.04 - 0.01	2.0 - 0.15
Silt	0.004	0.025

*At a temperature 10° C.

in the "desilting" basins. Detention times on the order of 20 hours would be required to remove silt.

The basins would be more aptly named desanding or degritting basins at their recommended size. It appears more investigation is needed to determine what percentage of each classification of material is actually of concern in the "siltation" problem.

In addition, it is recommended that a modification be made to standard design criteria for detention basins included in the 1971 NMW PLAN. Conventional design allows little opportunity for removal of suspended solids for the average storm. The basin is essentially a peaking reservoir which is used infrequently. Modification to a flow-through type design which incorporates a desanding or degritting chamber would do much to enhance the usefulness of detention basins by "controlling" the solids. The conventional and modified designs are shown as Figures VI-12 and VI-13.

Priority Area No. 2

Flooding Considerations

Portions of the Caldwell, Richards & Sorenson Master Storm Drainage Plan have been updated by Nielsen, Maxwell & Wangsgard during the 208 Project. The portions completed are the Magna, Riverton, and West Jordan areas. Salt Lake County has also updated selected areas within the County in order to meet development demands. The revised plan is much the same as the NMW plan for Priority Area No. 1. Detention basins, which have been proven to be the most cost effective approach to urban runoff control, were incorporated. Again it is recommended the modified detention basin design be utilized.

Figure VI-14 shows the existing and proposed facilities for urban runoff control. It should be noted that these facilities do not represent the final county urban runoff plan. With development occurring continuously within the County, it is recommended that this plan be reviewed and updated periodically.

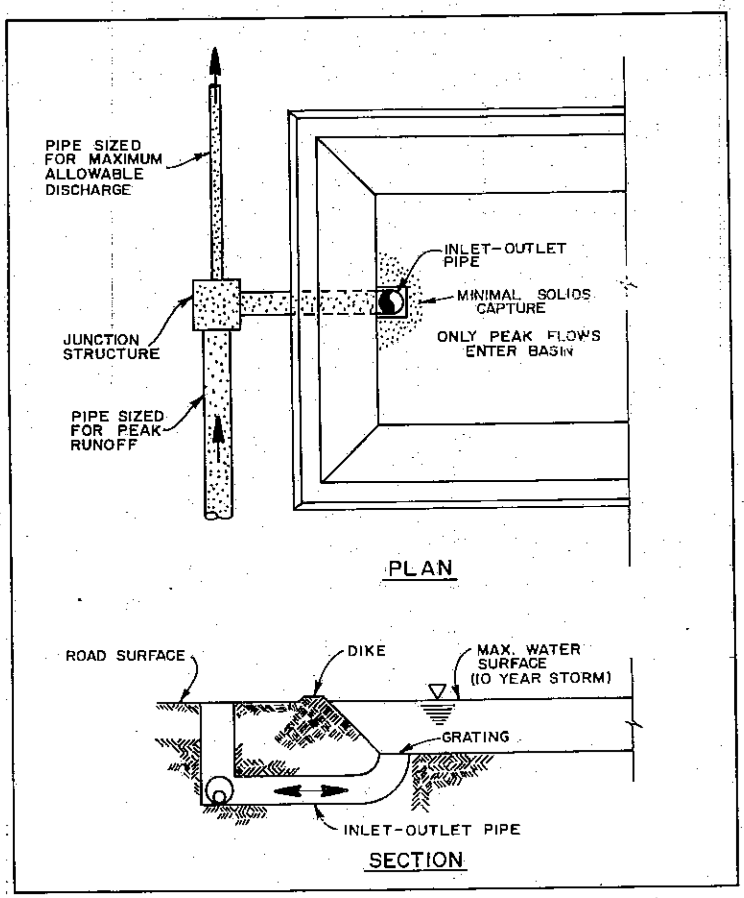


FIGURE VI-12
CONVENTIONAL DETENTION BASIN DESIGN

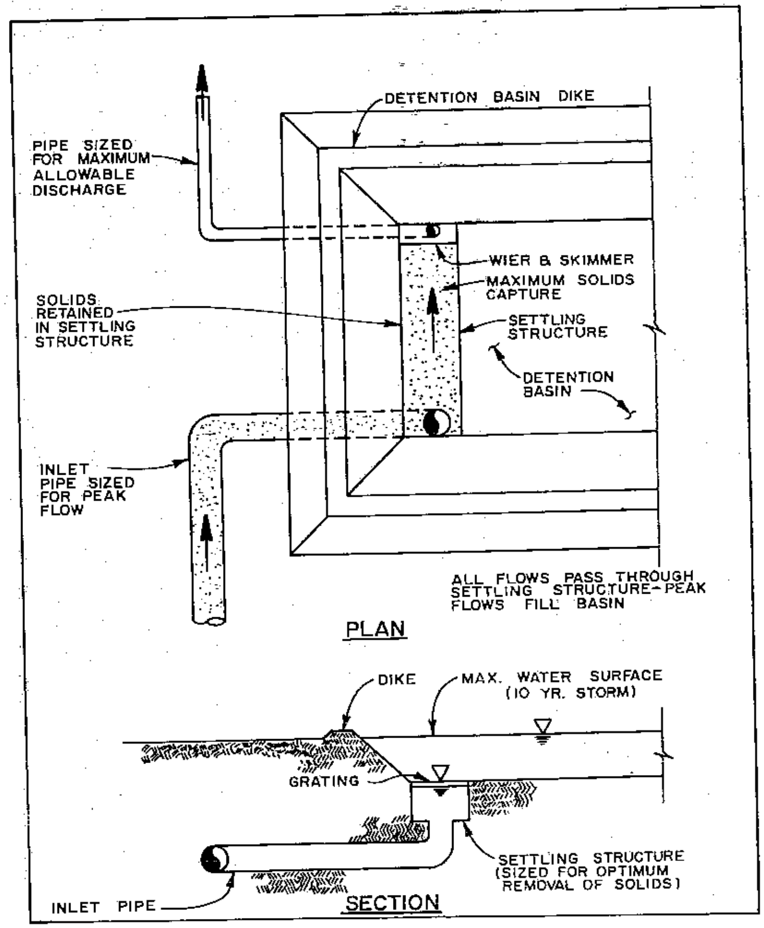


FIGURE VI-13
MODIFIED DETENTION BASIN DESIGN

In addition, the Lampton and Riverton Reservoirs are to be constructed. These facilities will be multi-purpose in that they will serve to meet the needs of agriculture, industry, and recreation, as well as flood control. Maps 8 and 11 of Figure VI-14 show the locations of these reservoirs.

Water Quality Considerations

The implementation of the detention concept along with the BMP's recommended by the 208 staff will insure that water quality is maintained at the highest level practical.

Cost Estimate for Implementation

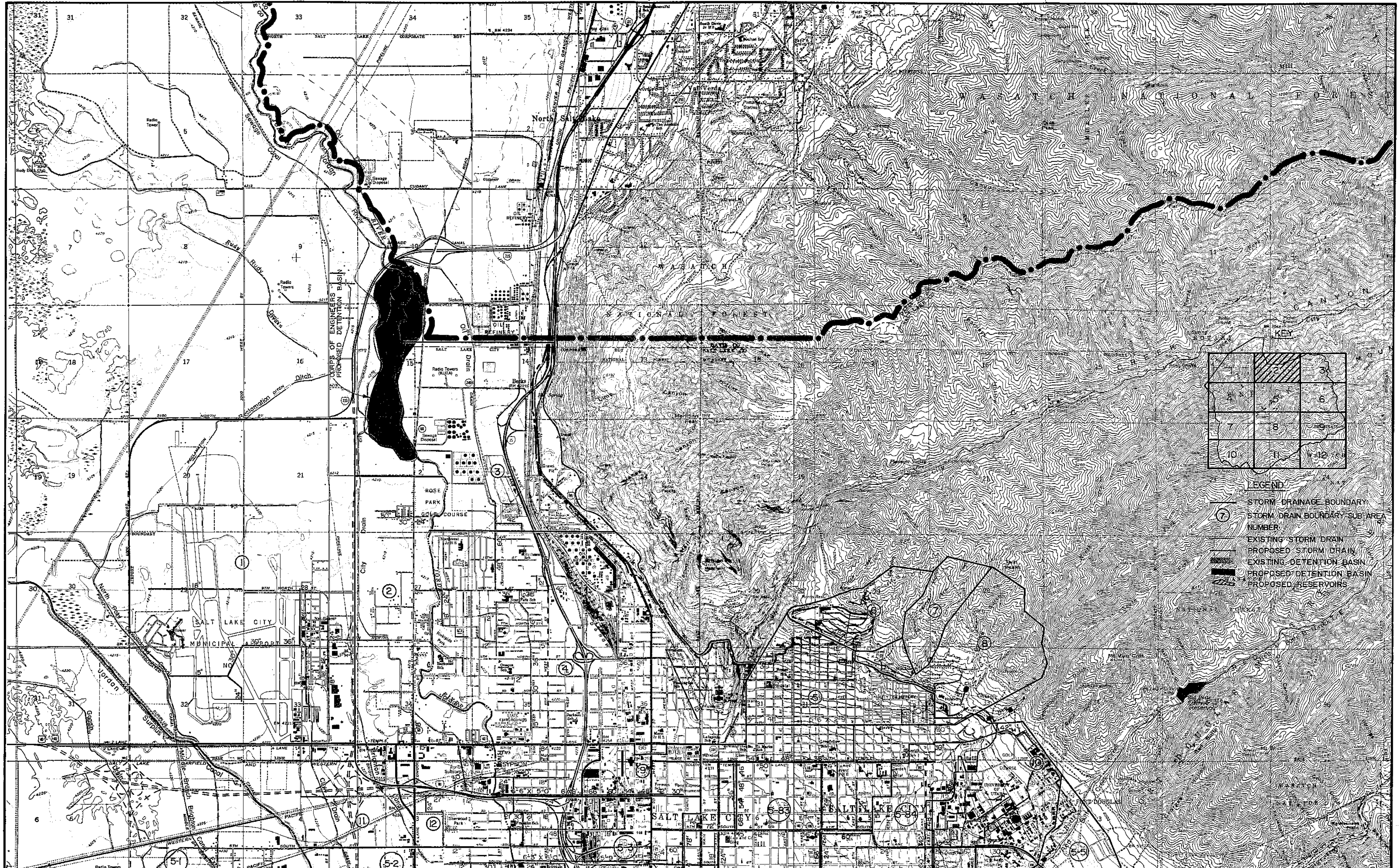
The cost estimates shown for both priority areas include a total cost of constructing the proposed flood protection plan and a cost per acre which would be required to construct the regional detention basins within these areas. All cost estimates obtained from references were updated as of Deptember 1977 by using the Engineering News Record Construction Cost Index.

Priority Area No. 1

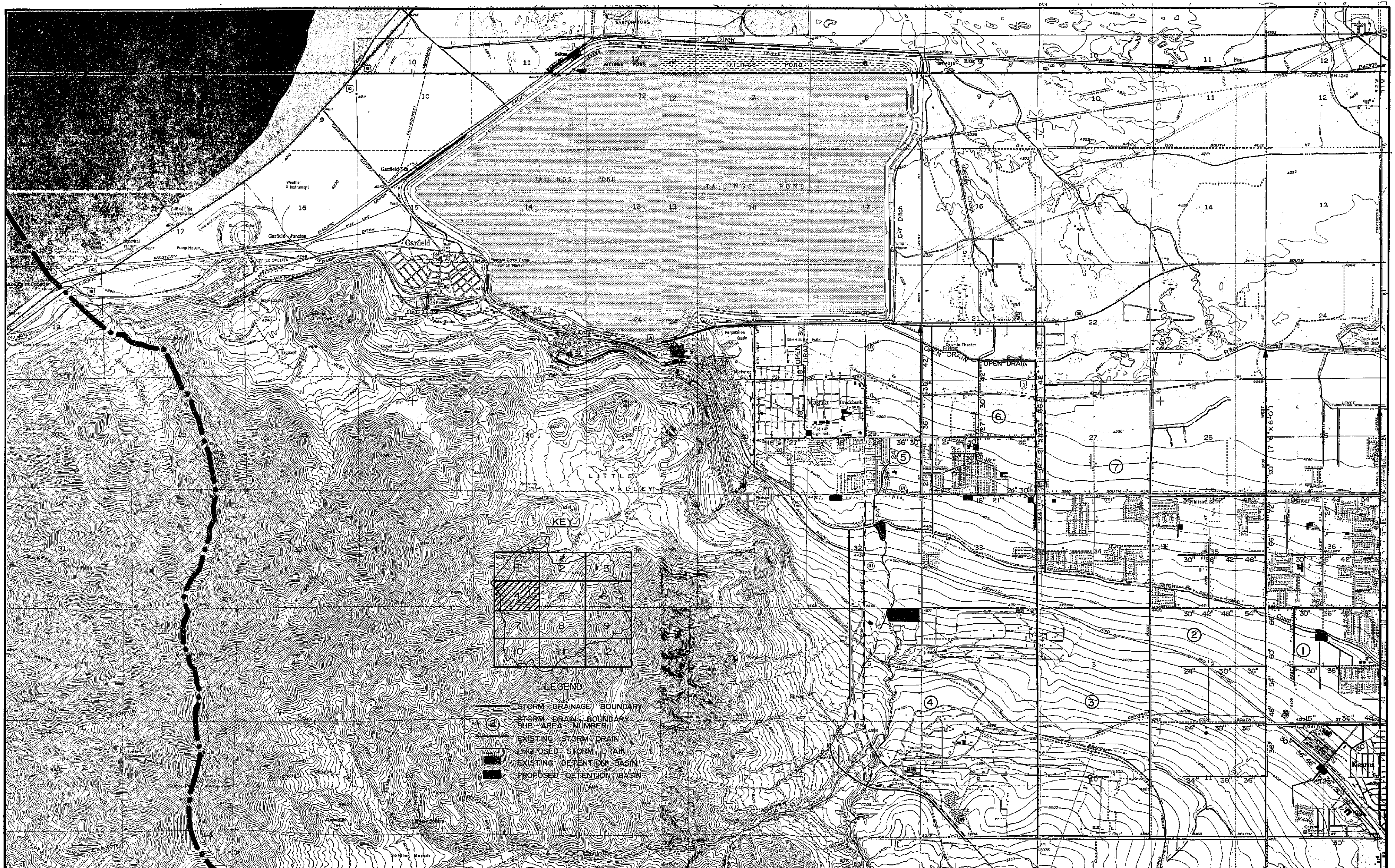
The cost estimate for the wet weather discharge facilities in Priority Area No. 1 is shown in Table VI-2. The acreage was determined from the sixteen drainage areas established in the report "Flood Control Plan, Using Detention Basin for Salt Lake County," NMW, 1971. Using the cost estimates from this report, a cost per acre was determined for each drainage area served and then divided by the number of acres. The cost per acre of $2,000 was obtained by averaging the cost per acre of the sixteen drainage basins.

To account for the projects presently under construction or recently completed, $3,000,000 was subtracted from the basin estimate.

In addition to the detention basins, the cost estimate includes the cost to develop the lower Jordan River. This cost estimate was taken from



Facilities and Facilities Management Stevens, Thompson & Runyan - Nielsen, Maxwell & Wangsgard Consulting Engineers	0 4500' 9000' 13500' 18000' 22500'	North	Prepared for the Salt Lake County Council of Governments Under Section 208 of the Federal Water Pollution Control Act of 1972, as Amended.	Salt Lake County Water Quality & Water Pollution Control **208 Water Quality Plan**	URBAN STORM RUNOFF EXISTING & PROPOSED FACILITIES	FIGURE VI - 14 MAP NO. 2



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Salt Lake County Water Quality & Water Pollution Control

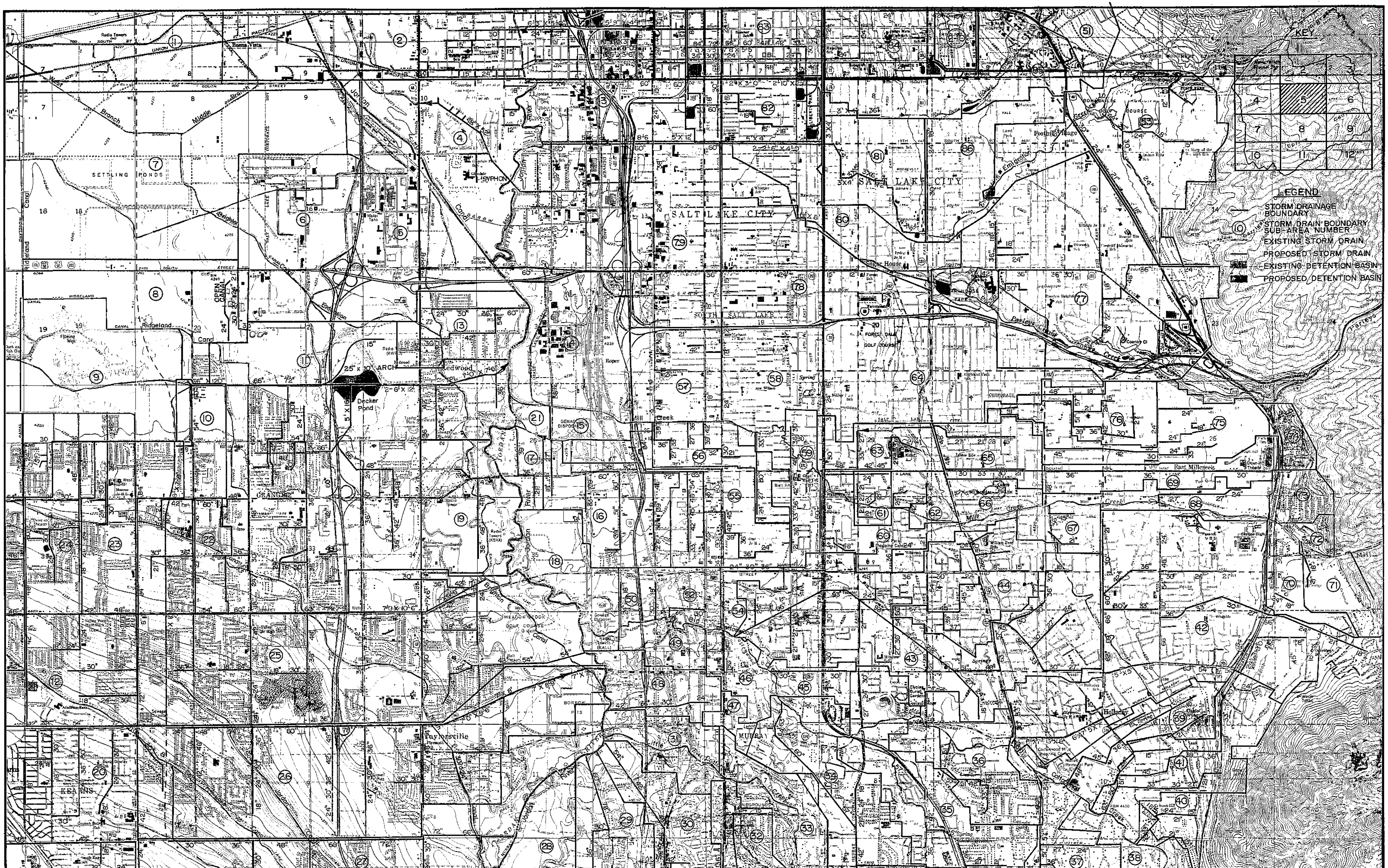
208 Water Quality Plan

URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI-14

MAP NO. 4



Facilities and Facilities Management
Stevens, Thompson & Runyan - Nielsen, Maxwell & Wangsgard
Consulting Engineers

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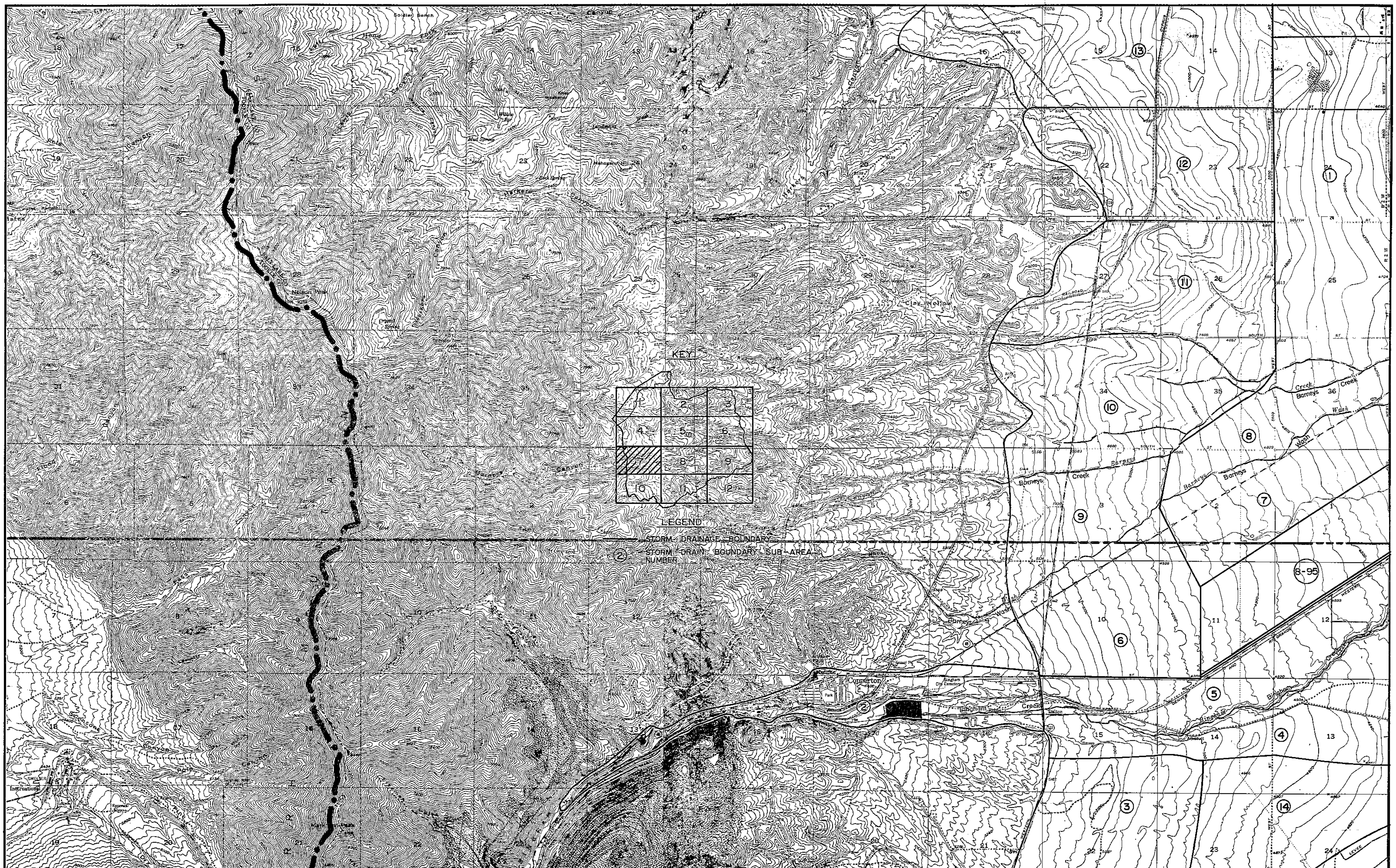
Salt Lake County Water Quality & Water Pollution Control
208 Water Quality Plan

URBAN STORM RUNOFF
EXISTING & PROPOSED FACILITIES

FIGURE VI - 14
MAP NO. 5



Facilities and Facilities Management Stevens, Thompson & Runyan - Nielsen, Maxwell & Wangsgard Consulting Engineers	0 4500' 9000' 13500' 18000' 22500'	North	Financed for the Salt Lake County Council of Governments Under Section 208 of the Federal Water Pollution Control Act of 1972, as Amended.	Salt Lake County Water Quality & Water Pollution Control **208 Water Quality Plan**	URBAN STORM RUNOFF EXISTING & PROPOSED FACILITIES	FIGURE VI - 14 MAP NO. 7

Facilities and Facilities Management

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Salt Lake County Water Quality & Water Pollution Control

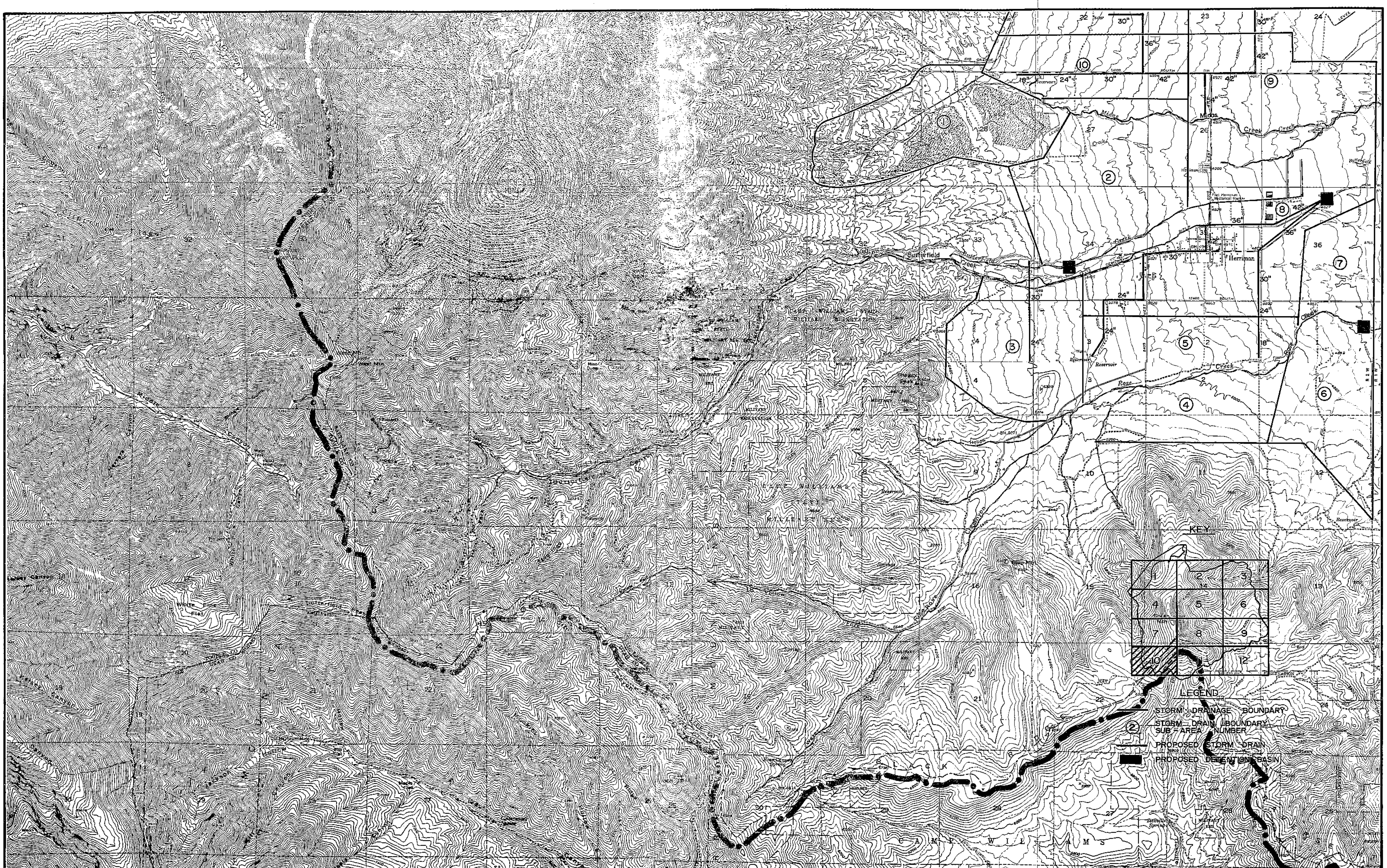
208 Water Quality Plan

URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI-14

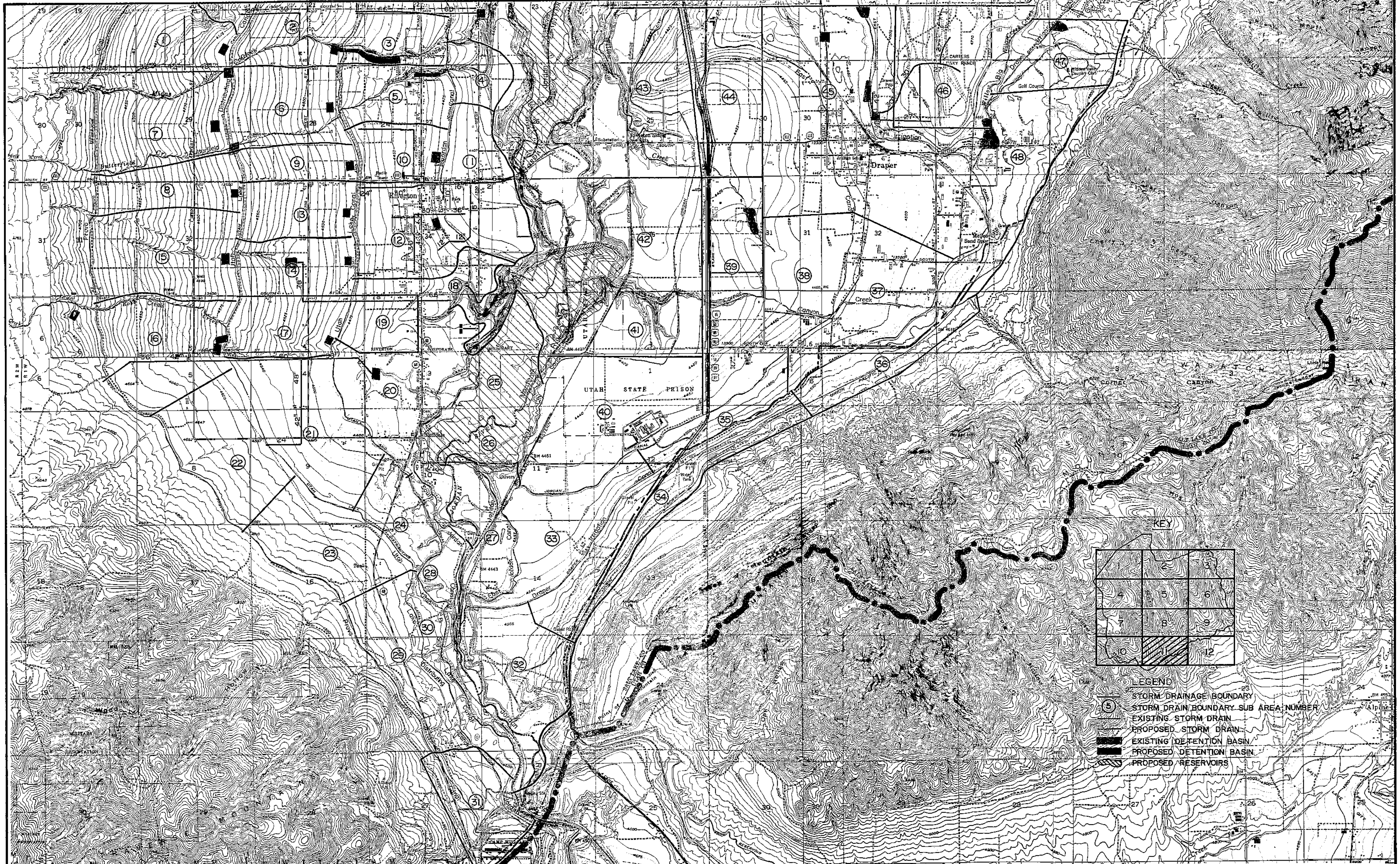
MAP NO. 8



Facilities and Facilities Management **Stevens, Thompson & Runyan - Nielsen, Maxwell & Wangsgard** Consulting Engineers	0 4500' 9000' 13500' 18000' 22500'	North	Financed for the Salt Lake County Council of Governments Under Section 208 of the Federal Water Pollution Control Act of 1972, as Amended.	Salt Lake County Water Quality & Water Pollution Control **208 Water Quality Plan**	URBAN STORM RUNOFF EXISTING & PROPOSED FACILITIES

FIGURE VI - 14

MAP NO. 10



Facilities and Facilities Management

Stevens, Thompson & Runyan - Nielsen, Maxwell & Wangsgard

Consulting Engineers

Salt Lake County Water Quality & Water Pollution Control

208 Water Quality Plan

URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI - 14

MAP NO. 11

"Lower Jordan River, Utah - Feasibility Report for Water Resources Development," Corps, 1976.

Priority Area No. 2

The cost estimate for the Priority Area No. 2 facilities is also shown in Table VI-2. The acreage was determined from the following sources: the "Master Storm Drainage Study for Salt Lake County," Phases I, II, and III, CRS, 1964-and 1966; the "Master Storm Drainage Plan for the Town of West Jordan, Utah," NMW, 1974; the "Master Storm Drainage Plan for the Town of Riverton, Utah," NMW 1975; and the "Coon Canyon Storm Drainage Project," NMW, 1975. The cost per acre was based on the average cost per acre established in the West Jordan and Riverton Master Storm Drainage Plans. This cost was updated from $600 to $840. It was felt that $840 may be low and would not represent the majority of the area located east of I-15. Because of the difference in land costs and location, $1,000 per acre was used.

Although not a specific part of the stormwater quality management plan, there are the additional costs related to the Jordan River development projects. These additional costs are for the Lampton and Riverton Dams and reservoirs, including the Dry Creek flood control project. The costs used for these came from the "Upper Jordan River Development Plan for Salt Lake County," NMW, 1972.

Also included in the cost estimate is the cost for the portion of the Jordan River Parkway Plan between 21st South Street and 48th South Street. This cost came from the report "Jordan River Parkway an Alternative," UTA, 1971.

All cost estimates are not currently realistic because of construction and land cost inflation. The 1978 plan update by the Salt Lake County Water Quality and Water Pollution Control Department will contain current cost data.

Table VI-2.

Cost Estimate for

Wet Weather Discharge Facilities*

Priority Area No. 1

Acreage benefitted by detention basins = 10,500 acres	
Cost per acre for detention basins = $2,000.00	$21,000,000.00
Minus construction jobs completed	3,000,000.00
Total costs for detention basins	$18,000,000.00
Lower Jordan River Development	34,864,000.00
TOTAL	$52,864,000.00

Priority Area No. 2

Acreage benefitted by detention basins = 71,000 acres	
Cost per acre for detention basins = $1,000.00	
Cost for detention basins	$71,000,000.00
Lampton & Riverton Dams	17,306,000.00
Dry Creek Flood Control	1,672,000.00
Jordan River Parkway	8,223,000.00
TOTAL	$98,201,000.00
COMBINED TOTALS	$151,065,000.00

*Estimated as of September 1977 by using the Engineering News Record Construction Cost Index (Denver).

Dry Weather Discharges

Hydroscience in "Recommended Wastewater Load Allocations for Salt Lake County 208" indicated that "interception and treatment of BOD loads associated with dry weather storm drain flows between river mile points 15 and 12 could raise the minimum river dissolved oxygen about 0.3 mg/l." This problem occurs because of some old cross-connections between the sanitary and storm systems and also because of some illegal industrial connections. The problem is critical, as was evidenced recently when a storm drain actually caught on fire and was burning from the center of Salt Lake City to the Jordan River. Gasoline dumped from a service station was the apparent cause.

In a later report, "Jordan River Water Quality Projections for Salt Lake County 208," Hydroscience indicated that these dry weather flows "account for about 15,000 org/100 ml of the total coliforms observed in the Lower Jordan and more than 2 mg/l of the total CBOD concentrations observed."

There are basically two alternatives available to control this situation: (1) collection system controls, and (2) storage and treatment. Collection system controls involve a survey to determine the source and some action to eliminate it. Similar corrective action was recently taken by the City of Ogden on the 21st Street Storm Drain in a typical collection system control activity.

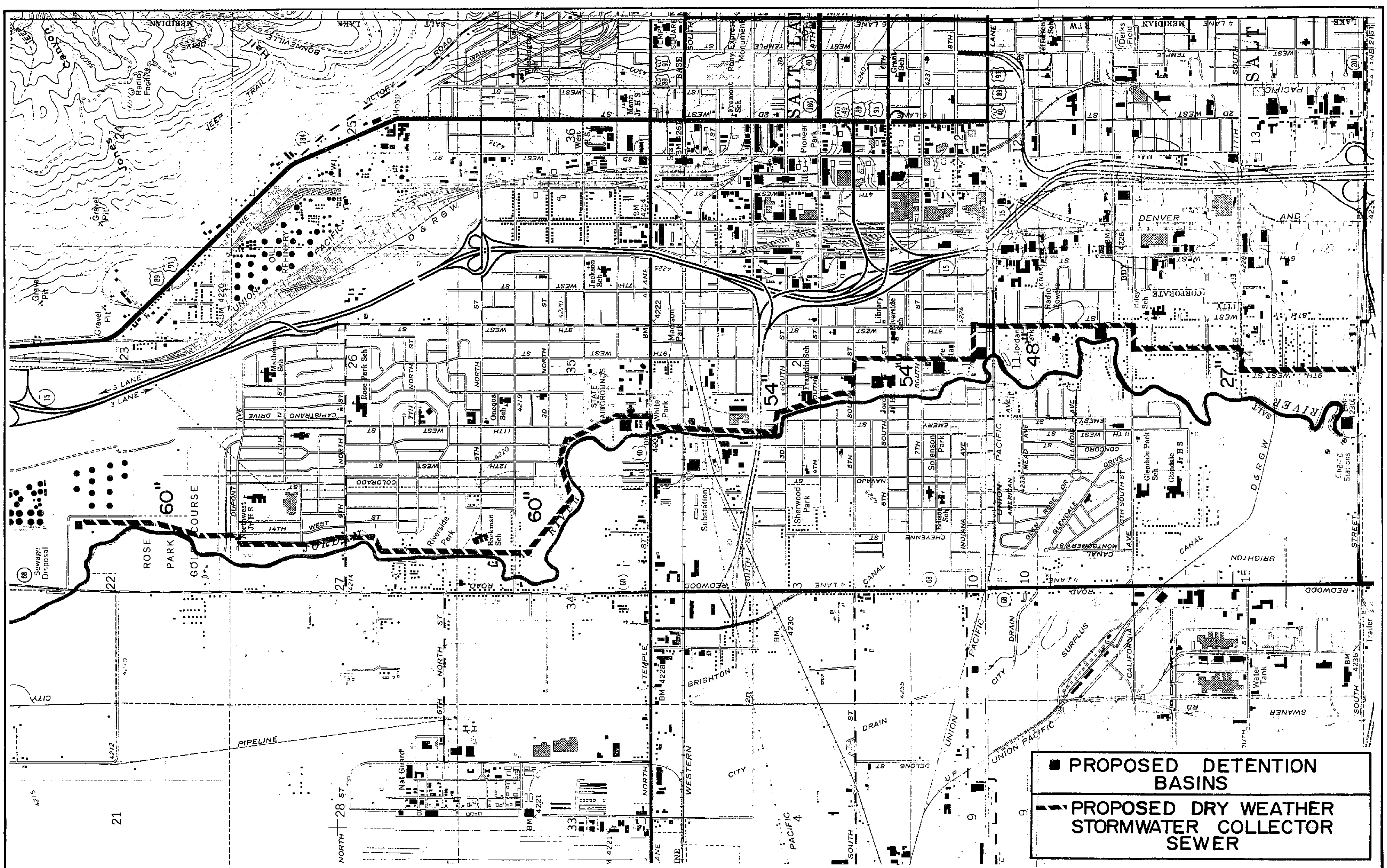
Storage and treatment would involve either on-site treatment at each storm drain or intercepting the flow to be treated at the Salt Lake Water Reclamation Plant or a separate facility. Individual treatment at each drain would not be cost effective.

The choice is then elimination or interception and treatment. The first approach would be less costly because the violators, as they were identified, would be responsible for correcting the situation. The second alternative looks unattractive from the standpoint of discharging it to the municipal plant because Salt Lake City is now undertaking an extensive project to eliminate infiltration/inflow from the sanitary system. The dry weather flows from the storm drain contain much extraneous water from infiltration and from springs and cooling water discharges. A preliminary layout for an interceptor sewer to implement this alternative is shown as Figure VI-15.

Federal funding may not be available for either alternative. The initial recommendation is therefore to survey the drains to locate the sources. If this is unsuccessful, interception and treatment would have to be implemented. Such a survey should be carried out by the Water Quality Planning Agency in conjunction with Salt Lake City and City-County Health Department.

The cost estimate for the dry weather interceptor and pretreatment facilities is shown in Table VI-3. The cost for the pretreatment facilities includes aeration basins, diffused air system, final clarifiers, sludge pumps, and skimmers. The cost of treatment facilities for secondary treatment is not included. Expansion of the Reclamation Plant or new treatment facilities would be in addition to these costs. The interceptor sewer was sized to handle the flows shown in Table VI-4. As indicated, these flows were based on measurements taken during the Salt Lake City infiltration/inflow study.

The estimated cost of the survey to locate the illegal connections to the storm sewers is on the order of $200,000. As explained earlier, the cost of correction would be borne by the violators.



Facilities and Facilities Management Stevens, Thompson & Runyan - Nielsen, Maxwell & Wangsgard Consulting Engineers	0 4500' 9000' 13500' 18000' 22500'	North	Financed for the Salt Lake County Council of Governments Under Section 208 of the Federal Water Pollution Control Act of 1972, as Amended.	Salt Lake County Water Quality & Water Pollution Control **208 Water Quality Plan**	DRY WEATHER DISCHARGER INTERCEPTOR SEWER ALTERNATIVE	FIGURE VI-15

Table VI-3. Cost Estimate for Dry Weather Discharge Facilities

Interceptor		
27-inch	6800 ft	$ 150,000
48-inch	4600 ft.	253,000
54-inch	8400 ft.	
60-inch	16,400 ft.	1,148,000
	TOTAL	$ 2,055,000
Regulators & Diversons		120,000
Pretreatment Facilities		4,000,000
* TOTAL COST	on the order of	$ 6,000,000

*Expansion of Reclamation Plant not included.

Table VI-4. Dry Weather Interceptor Design Flows

Location		Dry Weather Flow (cfs)	Dry Weather Flow (mgd)
10th North		3.82	2.47
7th North		2.55	1.65
North Temple	(measured)	6.37	4.12
3rd South		0.19	0.12
4th South		1.27	0.82
5th South		0.25	0.16
6th South	(measured)	5.11	3.30
8th South		10.19	6.59
9th South	(measured)	0.90	0.58
13th South (N)	(measured)	5.81	3.75
13th South (S)	(measured)	17.03	11.00
21st South	(measured)	7.78	5.03
	TOTAL	61.27	39.59

SUMMARY

Stormwater has been shown to be a significant problem in the study area. First priority was assinged to the Lower Jordan (north of 21st South). In this area the following recommendations are made:

1. Implement the Corps plan with possible modification in desilting structure sizing based on further study.
2. Implement the NMW detention plan with modified basin design.
3. Implement parkway concept.
4. Implement BMP's outlined by the 208 staff.
5. Implement a survey to locate dry-weather sources and then initiate a program to eliminate them.

Second priority was given to the remainder of the County, with the following recommendations:

1. Implement updated master storm drain plan utilizing modified detention basin design.
2. Implement parkway.
3. Implement BMP's outlined by 208 staff.
4. Construct Riverton and Lampton Reservoirs.

The above-outlined approach for the 208 Study Area will ensure that flooding problems will be minimized and water quality will be upgraded to the level which is cost effective and acceptable to the public.

PERMITS

In view of litigation incurred during 1974 in U.S. EPA vs. Natural Resources Defense Council, a legal determination was made that permits issued under the National Pollutant Discharge Elimination System (N.P.D.E.S.) apply to stormwater discharges. Each stormwater outfall to the Jordan River should be closely monitored for compliance with effluent limitations recommended by the Environmental Protection Agency, the Utah State Division of Health, and the Salt Lake County Area-wide Water Quality Planning Authority.

However, due to the number of outfall lines to the Jordan, it is perhaps more administratively efficient to allow issuance for a general permit for the specific types of discharge and location that distinguishes the degree of the problem. Separate permits should apply to dry-weather discharges, and two permits issued to govern discharges north of 2100 South, and south of 2100 South.

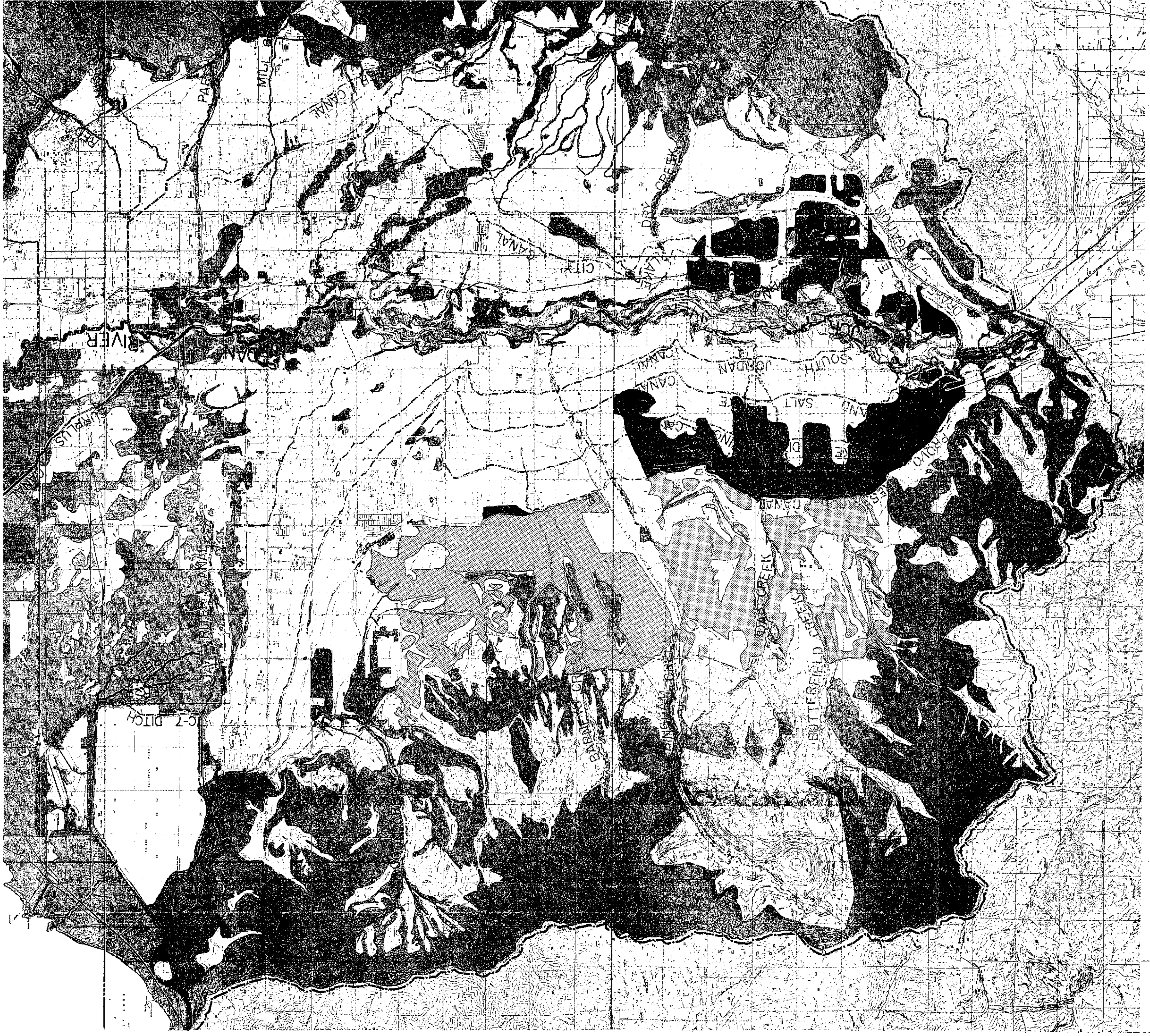
BEST MANAGEMENT PRACTICES

The approach that should be taken in implementation of best management practices involves mainly erosion/sediment control which entails coordination with Water Quality Implementing Agencies and both public and private developers. Slope stabilization in areas of 10% - 30% slopes can be carried out at a cost of $1500 per acre. These methods involve mostly revegetation through planting of native or domestic grasses, and are fairly effective as evidenced by the work done on Salt Lake City's 11th Avenue Park (see 208 Technical Report on Best Management Practices -LU-14). Slopes of 30% and steeper require extra stabilization, through the use of rip-rap retaining, terracing or contour ditching with planted material, flumes, diversions, and check dams that slow down surface runoff velocity or transport the water to points of absorption or dissipation. These structures add an increased average cost of about $5000 per acre.

Not all areas of the County require equal stabilization or runoff control. Figure VI-16 indicates areas of priority where attention to these practices should be emphasized. Generally these areas occur along steeper foothills, alluvial deposits, and within the canyons of the Wasatch (where watershed management is a priority concern). In addition, these areas can be identified

FIGURE VI-16

PRIORITY AREAS OF STABILIZATION AND RUNOFF CONTROL



URBAN AREAS

AGRICULTURAL AREAS

AREAS WITH HIGH EROSION OR RUNOFF

PRIORITY AREAS FOR STABILIZATION AND RUNOFF CONTROL

UNIMPACTED STREAM SEGMENT

HIGH EROSION AND RUNOFF IMPACTED STREAM SEGMENT

AGRICULTURAL OR URBAN IMPACTED STREAM SEGMENT

HIGH EROSION RUNOFF & AGRICULTURE OR URBAN INPACTED STREAM SEGMENT

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

40 160 640 ACRES 10

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

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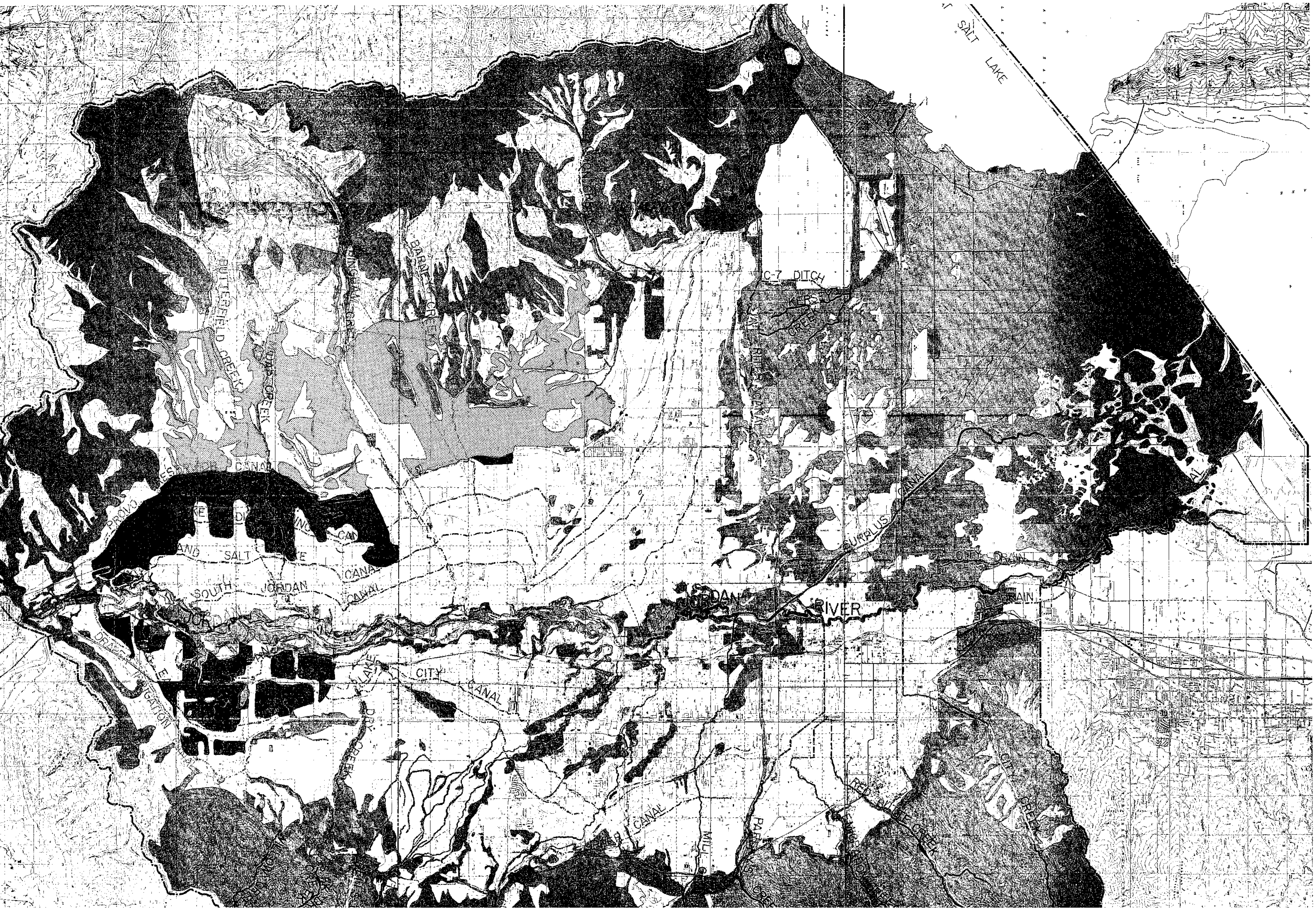
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KERSEY CREEK
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BUTTERFIELD CREEK
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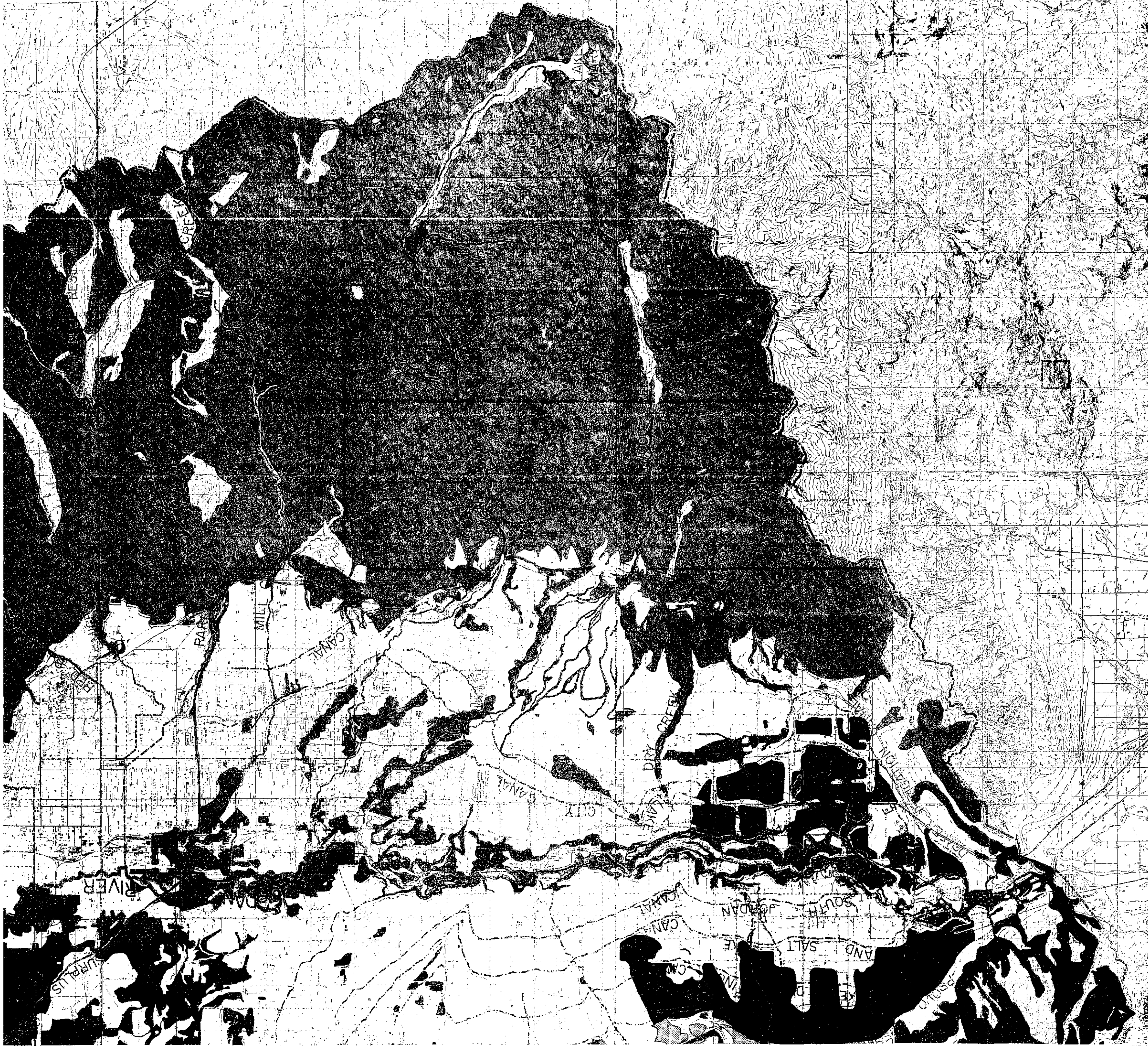

FIGURE VI-16
PRIORITY AREAS OF STABILIZATION AND RUNOFF CONTROL

URBAN AREAS

AGRICULTURAL AREAS

AREAS WITH HIGH EROSION OR RUNOFF

PRIORITY AREAS FOR STABILIZATION AND RUNOFF CONTROL

UNIMPACTED STREAM SEGMENT

HIGH EROSION AND RUNOFF IMPACTED STREAM SEGMENT

AGRICULTURAL OR URBAN IMPACTED STREAM SEGMENT

HIGH EROSION RUNOFF & AGRICULTURE OR URBAN INPACTED STREAM SEGMENT

Salt Lake County Water Quality & Pollution Control
208 Water Quality Plan

NORTH

40 160 640 ACRES 10

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

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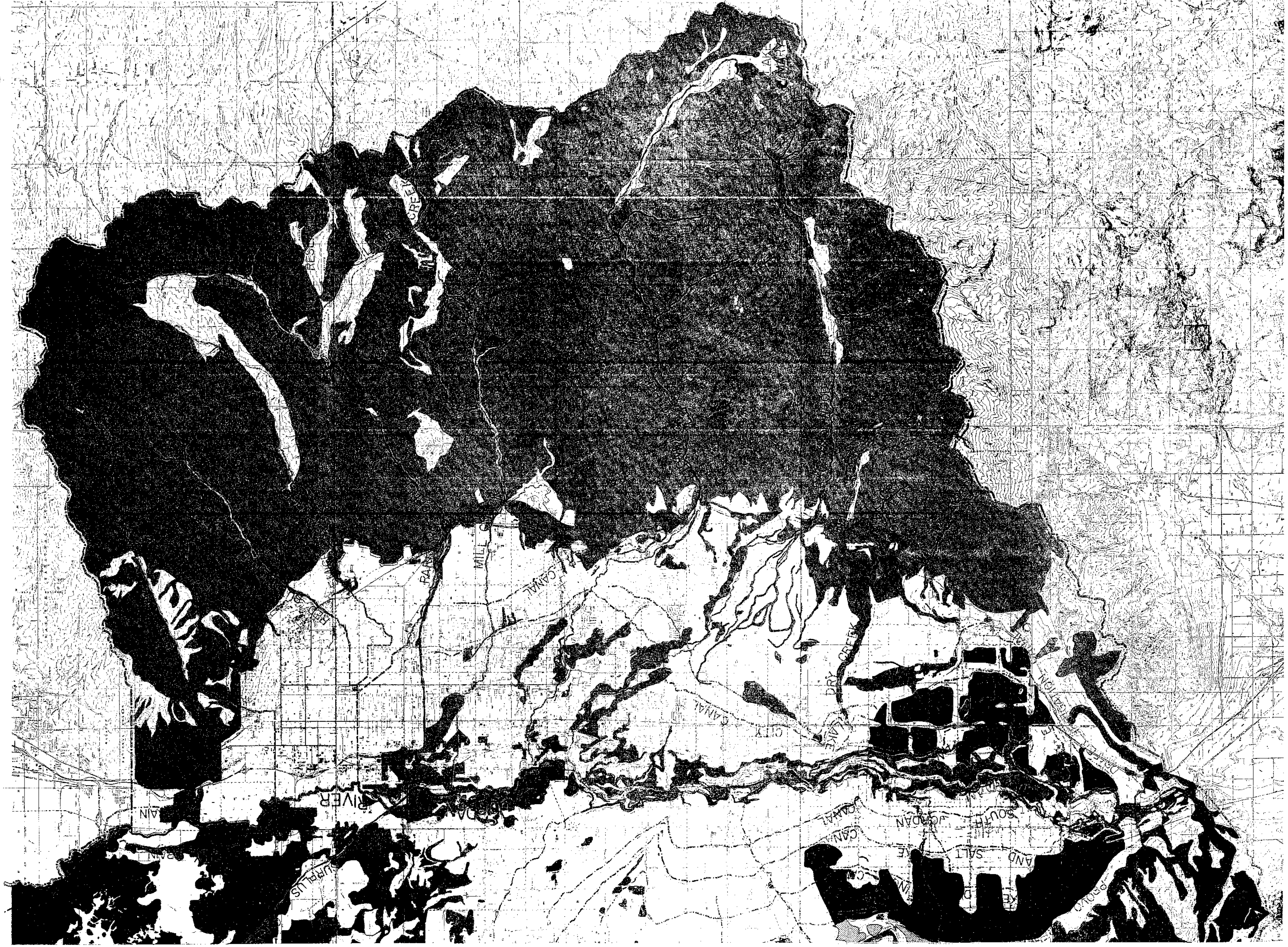
CREEK
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as requiring more or less advanced measures of erosion control and slope stabilization.

It is doubtful that coordination alone will achieve the goal of effective erosion and sediment control. The reason for this is the fact that many public agencies do not administer effectively programs dealing with problems not clearly perceived. Agencies in Salt Lake County are also faced with shortages of staff that do not enable adequate administration. This situation is the condition in Salt Lake County where effective grading, excavation, and slope stabilization provisions are absent - due mainly to reasons outlined above.
The private sector shares this neglect. Subdivisions established in sensitive foothill and canyon areas are often left for years with barren, unstabilized cuts and fills with the hope that private owners will incur the cost for problem correction. This expectation, particularly where extremely steep and long fill structures are concerned, is largely disappointing. Public developers in Salt Lake County can be cited in several areas for this condition where grading and excavation of roads has taken place. The inventory of sheet and rill erosion now being completed will detail their extent and location.

Strong guidelines are needed in Salt Lake County that will insure that attention is paid to this important area. Proper revegetation and slope stabilization, if it is to occur in the canyons and valley foothills as a matter of policy, should be developed into a program with enforcement.

Such enforcement provisions can be attained through a requirement of performance bonding for erosion and slope stabilizing improvements. The Salt Lake County Flood Control and Surveyor Departments presently require "Front-end" bonding for drainage control improvements such as curb and gutter, catch basins, drainage sumps, piping, and culverting. In line with legislation governing the activities of these departments in the area of water quality, mainly flood control, bonding for additional improvements related to water quality is entirely in line with its delegated authority and the needs of the county.

The 208 Project Staff or the staff of the proposed Area-Wide Water Quality Coordination Agency will provide specific quidelines such as those contained in Best Management Practices, (LU-14), and Chapter 70 of the Uniform Building Code (grading and excavation). However, the long term needs in accomplishing improvement of our surface waters can best be served by::

(1) Adoption of a revegetation and slope stabilization program for all public and private development. Requiring implementation of Chapter 70, Uniform Building Code would be a first step.

(2) Emphasize application of these measures in areas of A) the Wasatch Canyons, B) the Valley Foothills, and C) other soil deposits with extreme erosion and high runoff potential.

(3) Bonding public or private developers for the cost of on-site erosion and slope stabilization improvements together with improvements for flood runoff control. It should be noted that flood runoff may be reduced by the installation of flow reducing improvements for erosion control. Therefore an economic trade-off or benefit is likely to result from erosion/slope management.

The framework for such an implementation effort is in place. Additional coordination would be necessary, and consolidation of performance bond administration likely. Such consolidation is now being considered by the Salt Lake County Attorney.

Forest Recreation/Watershed Management

Implementation of water quality management in the watersheds of the Wasatch Canyons should and can take place largely through coordination of management agencies by the County Water Quality Area-wide Planning Agency.

Major areas that will be requiring coordination for maintenance of an anti-degradation policy include:

1. Obtaining agreements with the U. S. Forest Service, Soil Conservation District, Salt Lake City Water Department, Salt Lake City-County Health Department, Salt Lake County Planning Commission, Salt Lake City Planning Commission, Salt Lake County Flood Control Department, or other designated management agencies with jurisdiction in watershed management, in order to insure consistency in implementation of the water quality maintenance program.

2. Review of grading (cut/fill) and slope stabilization plans by these agencies, with recommended application of standard criteria for slope stabilization as outlined in Best Management Practices.

3. Provision of performance bonds to be posted covering the cost of erosion control or grade improvements to be installed.

4. Deposition of a specified dollar amount for water quality monitoring (before, during, and after construction) into an escrow account to insure compliance with uniform sampling procedures and obtain standard results.

Septic Tank Discharges

There are two alternatives to accomplishing the abatement of high pollution levels in Emigration Canyon:

1. Removal of faulty septic tank conditions from those sites identified as pollution sources.

2. Provision of sewer utilities for all housing in the canyon for the removal of faulty septic tank conditions.

The Salt Lake City-County Health Department has conducted monitoring programs in the canyon for years. Although there is not a significant lack of data identifying the problem, the source of the pollution problem is still under question. Recent monitoring results of canyon investigation, using the "membrane filter" method of laboratory analysis of coliform bacteria, indicate lower levels than reported in previous years. Much of this is undoubtedly due to the use of the membrane filter approach as opposed to the 'Most Probable Number" method.

A closer definition of pollution sources seems apparent before an abatement program is designed. There is a possibility that the high resident population of people, dogs, and other home disposal practices are combining to produce the high pollutant levels. Because of the high population and number of residences in the canyon, it may be desirable to individually inventory homes regarding their disposal practices, frequency of holding vault pumping, nature of their disposal facilities (septic tank or holding vault), and other non-point source generators such as construction activity. The provision of such an up-dated inventory together with improved monitoring and analysis by the Health Department should do much to shed light on realistic solutions that benefit the greatest number of canyon residents.

Canyon Growth and Water Pollution

Shortly after the release of the Draft Water Quality Management Plan, in which the canyon was recommended to be sewered, speculation of large land holdings in the canyon began. Developers of these holdings began to use the sewer recommendation as a lever to persuade Salt Lake City to annex portions of the canyon to build the sewer. Public hearings were held on the matter, and most of the canyon residents voiced strong opposition to the proposal. The initial 208 recommendation became a political football.

Canyon residents argue that provision of sewer facilities will produce more severe results than pollution abatement. They maintain that the following negative impacts will accompany the sewer:

1. A dramatic increase in traffic generation.
2. Possible road widening to accommodate traffic volume.
3. More problems relating to construction-cut, fill, etc.
4. A general depletion of the aesthetic values of canyon living due to over-crowding.
5. The replacement of septic tank pollution with pollution from urban storm runoff.

Other factors were mentioned, but the thrust of the hearings by Salt Lake City was that the majority of canyon residents are opposed to extension of sewer facilities into the canyon. The substitution of one pollution problem for another is a legitimate argument that deserves the attention of additional study. Such a study should be the object of the Water Quality Planning Work Program, and has been identified as a priority task output to be included in the 1979 Plan update.

Agricultural Runoff Management

The implementation of water quality management in Salt Lake County for agricultural activities should rest with the local Soil Conservation District (S.C.D.). The Salt Lake Soil Conservation District was established under the Utah Soil Conservation Districts Law, Utah Code Annoted 1953, Title 62, Chapter 1, Section 1 to 17. The local S.C.D. receives guidance and direction from the Utah Soil Conservation Commission as well as being a member in good standing of the Utah Association of Soil Conservation Districts and the National Association of Conservation Districts. These associations stress policies and procedures.

The local S.C.D. can assume responsibility for the implementation of the 208 program by:

1. Recommending water quality standards and water pollution control policies to appropriate federal, state, and local agencies.

2. Recommend, adopt and enforce limited land use regulations.

3. Recommend, adopt and enforce Best Management Practices for agricultural activities.

4. Finance water resource, conservation and pollution control activities related to agriculture as funds are available.

5. Provide technical assistance for agricultural related activities.

6. Coordinate water quality control projects in agricultural areas.

7. Aid in the inventory, assessment, monitoring, correction and abatement of non-point sources of water pollution.

8. Aid in soil surveys and interpretative information for land disposal of wastes, suitability of soils to absorb and treat wastes and practices for erosion and sediment control treatment.

9. Review construction and conservation plans for agriculture activities that affect soil and water conservation and water pollution control.

10. Provide periodic follow-up checks and inspections on all applied practices and implementation of conservation plans.

Similar implementation of water quality can be handled in other areas such as forestry, mining, construction, recreation, and flood control activities on privately owned lands and also by initiation of a memorandum of understanding between land administering agencies for state and federally owned lands.

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VII. Implementation

VII. IMPLEMENTATION

The factor that distinguishes water quality planning from most local planning is the requirement for implementation. Planners have long recognized the fact that the planning process is not an independent function of implementation. Planning is a dynamic process that requires continuous up-dating with advents in technological development. The best available alternative solutions can be realized only as far as the necessary implements can achieve them.

Therefore, implementation is often changed or overlapped by technology recognized by the planning process. This plan has attempted to identify the most realistic and implementable of solutions to identified water quality problems. These solutions represent the best range of alternatives open to Salt Lake County residents in meeting the letter and spirit of Public Law 92-500.

The purpose of this chapter is to describe the framework in which the water quality programs presented will be implemented. It consists of two parts:

1. The description of local achievements in implementing an on-going county-wide water quality planning process.
2. A description of the management agencies to be designated in implementing the water quality plan, and their organization, tasks, and responsibilities in achieving effective management of both point and non-point pollutants.

Water Quality Planning - A Success Story

Much of the implementation of 208 goals and objectives has taken place in tangent with the planning process, particularly in the area of municipal treatment facilities. This is due in part to extensive studies on wastewater treatment already undertaken during the 303e and 201 projects.

However, the primary organizational unit for carrying out implementation elements was not identified until July of 1977, when the 208 Project Steering Committee met in Alta to consider initiating some form of on-going area-wide water quality management. The 208 Project staff presented two organizational alternatives: The Special Service District, and the creation of an area-wide agency using existing flood control legislation.

After four months of debate and dialogue with the Steering Committee, the Area-wide Agency concept surfaced as the most desirable alternative. On Halloween of 1977, the Salt Lake County Commission unanimously voted "Aye" on an enabling ordinance that created the "Salt Lake County Department of Water Quality and Water Pollution Control."

The framework for continuing area-wide planning and management of water quality in Salt Lake County is thus established. Integration and coordination will be accomplished as a function of the Board of County Commissioners. Management of specific water quality treatment works, monitoring and regulatory activities, development and implementation of best management practices, etc., will be carried out on a decentralized basis by existing agencies. These include the following which have participated in the development of this plan:

Salt Lake County Council of Governments
Utah Water Pollution Committee
Wasatch Front Regional Council
Salt Lake County Public Works Department
Salt Lake County Planning Commission
Municipalities (Public Works & Planning Departments)
Salt Lake City-County Health Department
Soil Conservation District
Salt Lake City Water Department
Sanitary Sewer Districts in the County
Salt Lake County Water Conservancy District
Board of Canal Company Presidents
Jordan River Parkway Authority
Utah Transit Authority
Utah Department of Transportation

Central Utah Water Conservancy District
U.S. Forest Service - Wasatch National Forest
U.S. Army Corps of Engineers
U.S. Geological Service

Each such agency will have representation in the work of the coordinating body, through the policy development and program evaluation committees and the Water Quality and Water Pollution Control Council. The specific roles of the decentralized management entities will be equitably defined and strengthened as a result of the coordination provided in the enabling ordinance, but the role of the Water Quality Coordinating Agency itself will include:

1. Continuing planning, including annual update and recertification of the 208 plan through required channels.

2. Ongoing definition and clarification of roles and responsibilities, through regular meetings and continuing discussions with all agencies involved, to formulate, review, and adopt or modify goals or objectives.

3. Administrative staff assistance and professional consultant studies where needed, to help attain water quality goals.

4. Ongoing evaluation of the program, including review of monitoring and testing activities, and facilities planning and approval procedures.

5. Public education programs to obtain broad understanding, support, and cooperation in efforts to improve water quality.

6. Recommendations to cognizant agencies for appropriate changes in policies, standards, or legislation, to meet changing conditions or requirements with respect to water quality.

7. Coordination of planning and implementation efforts with neighboring 208 organizations.

8. Adequate financing for the activities listed above.

The characteristics and authority orientation of the comprehensive management agency were identified, consistent with the functions and relationships outlined above. It was agreed that the organization's governing body (Council) should be representative of Salt Lake County, both geographically and in terms of specific functional interests. Members of the governing body should have a broad range of expertise in the various special aspects of water quality mangement, and be elected to serve their position as a representative of one of the following Program Evaluation Committees:

1. Wastewater Treatment
2. Real Estate/Construction
3. Agriculture
4. Watershed & Supply
5. Flood Control/Stormwater
6. Industrial Dischargers
7. General Public Interest
8. Planning
9. Recreational Development

Figure VII-1 summarizes the organization of the new Water Quality Planning Agency, while Figure VII-2 shows the process by which citizen and implementation agency participation is accomplished. Finally, the adopted enabling legislation creating the new water quality management process is included in order to further clarify the functioning of the Council, Committees, or Department.

The various elements of the Water Quality Management Plan must be organized into an implementation schedule. For example, the new wastewater treatment facilities plan, after gaining approval and certification from both the State of Utah and Environmental Protection Agency, will be broken down into the phases that include financial, design, and construction arrangements. Such arrangements will be forthcoming from the Wastewater Program Evaluation Committee, now in the process of finalizing agreements as to the nature, location, and financing of the proposed facilities.

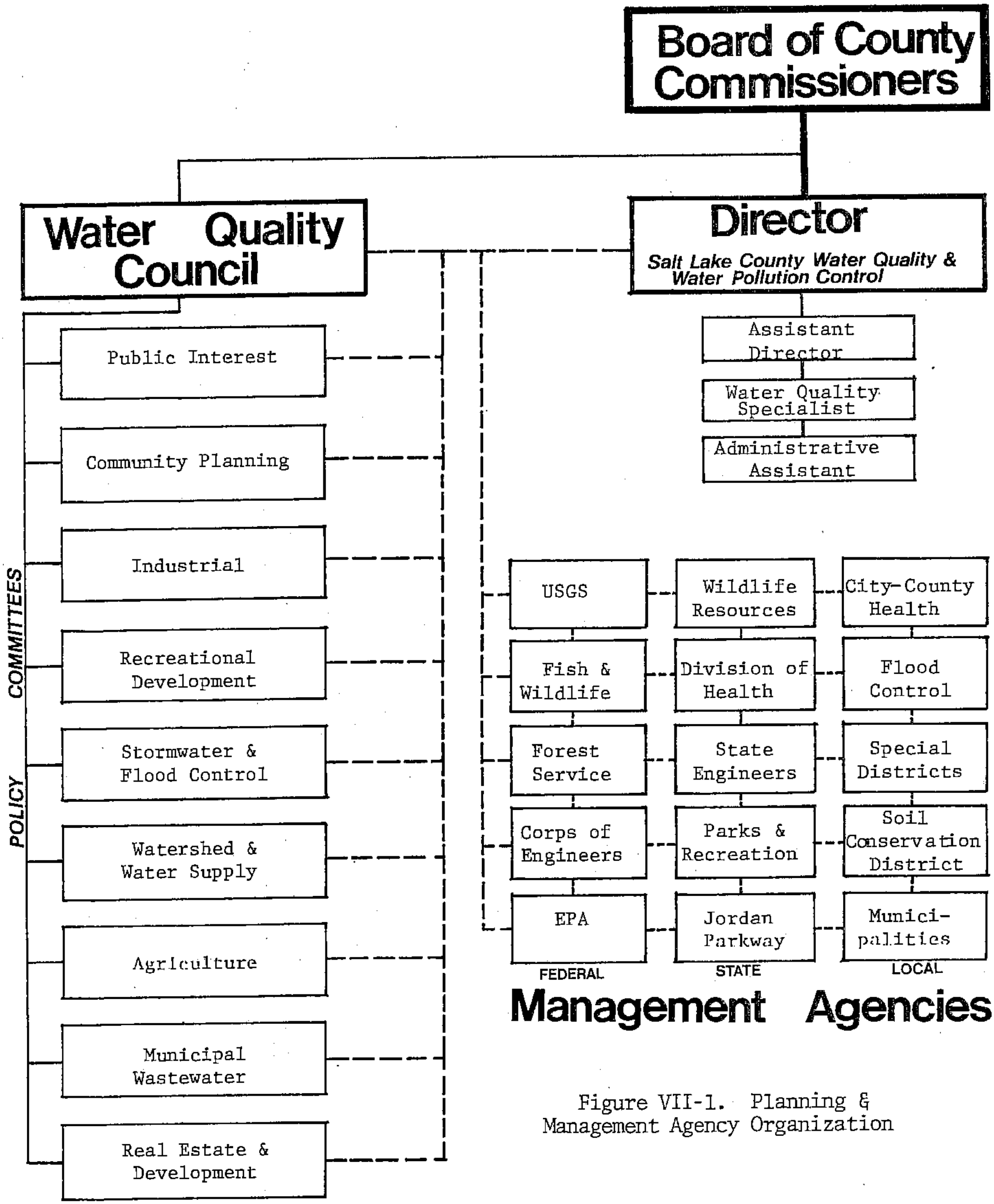


Figure VII-1. Planning & Management Agency Organization

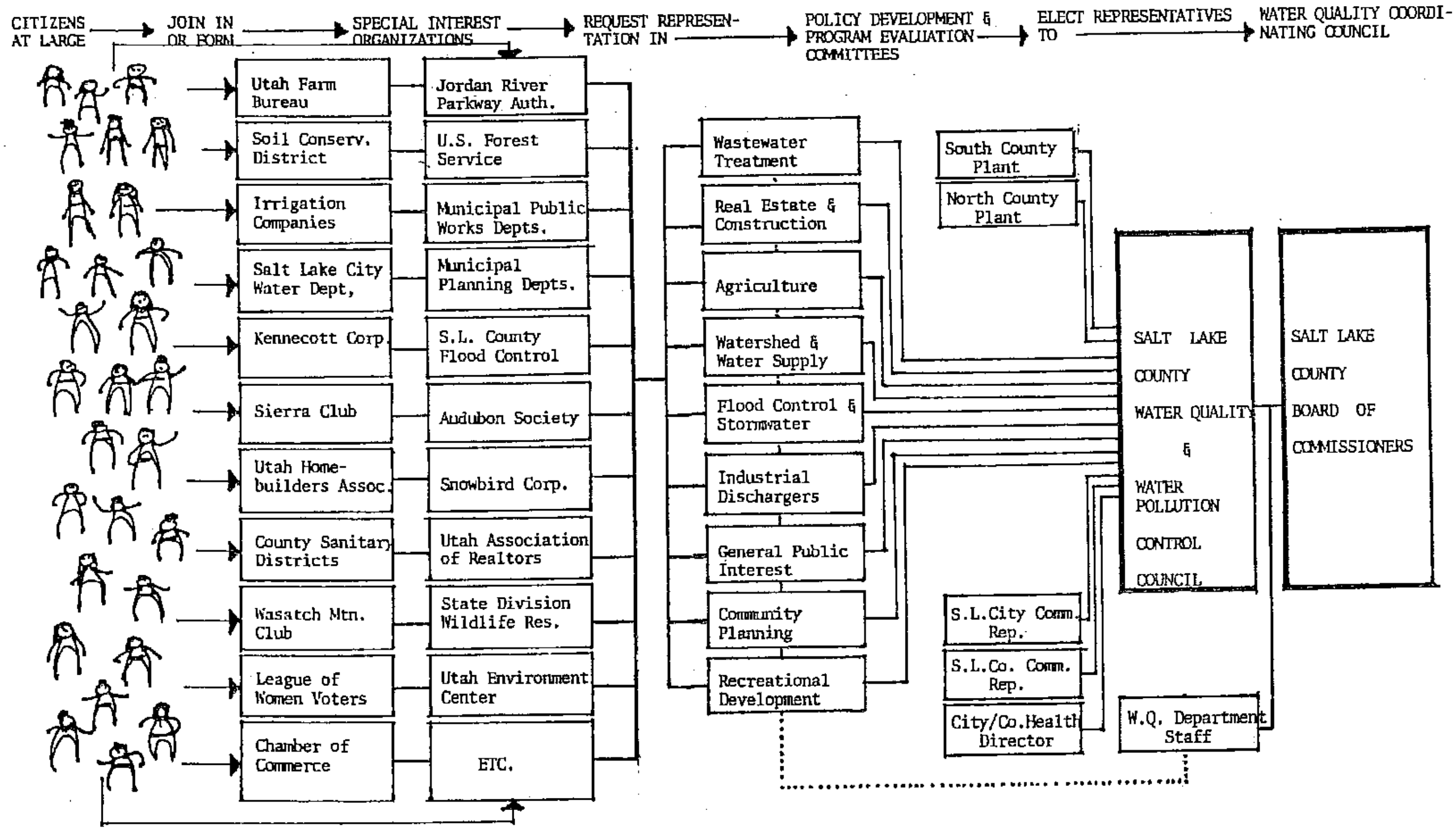


Figure VII-2. Citizen Participation In Water Quality Planning Activities

ENABLING ORDINANCE

ORDINANCE NO. 615

AN ORDINANCE ENACTING TITLE 7, CHAPTER 5, SECTIONS 1 THROUGH 9, INCLUSIVE, OF THE REVISED ORDINANCES OF SALT LAKE COUNTY, 1966, AS AMENDED, ENTITLED "WATER QUALITY AND WATER POLLUTION CONTROL"; WHICH ESTABLISHES A SALT LAKE COUNTY WATER QUALITY AND WATER POLLUTION CONTROL DEPARTMENT, AN ADVISORY COUNCIL TO THE SALT LAKE COUNTY COMMISSION FOR SAID DEPARTMENT, AND POLICY DEVELOPMENT AND EVALUATION COMMITTEES TO AID THE COUNCIL; AND FURTHER PROVIDES AREAS OF CONCERN AND ACTIVITY FOR BOTH COUNCIL AND COMMITTEES.

The Board of County Commissioners of the County of Salt Lake ordains as follows:

SECTION I. That Title 7, Chapter 5, SECTIONS 1 through 9, inclusive, of the Revised Ordinances of Salt Lake County, 1966, as amended, entitled "Water Quality and Water Pollution Control," is hereby enacted as follows:

CHAPTER 5

WATER QUALITY AND WATER POLLUTION CONTROL

Sections:

7-5-1 Preamble
7-5-2 Advisory Council
7-5-3 Composition of Advisory Council
7-5-4 Policy Development and Program Evaluation Committees
7-5-5 Selection of Committee Members and Terms of Office
7-5-6 Duties of Council
7-5-7 Duties of Policy Development and Program Evaluation Committees
7-5-8 Duties of Department
7-5-9 Severability

WATER QUALITY AND WATER POLLUTION CONTROL ORDINANCE

Sec. 7-5-1. PREAMBLE. In order to facilitate the performance of the responsibilities of the Board of County Commissioners of Salt Lake County to enforce all laws and regulations for the prevention of water pollution, and to assist in fulfilling the flood control responsibilities of the Commission, there is hereby established a department to be known as the "Salt Lake County Water Quality and Water Pollution Control Department", hereinafter referred to in this chapter as the "Department."

No provision herein shall be construed tq permit or encourage the regulation, allocation or reallocation of water rights or of culinary water collection or distribution systems.

Sec. 7-5-2. ADVISORY COUNCIL. There is hereby established as an advisory council to the Salt Lake County Board of Commissioners a "Salt Lake County Water Quality and Water Pollution Control Council" hereinafter referred to in this chapter as the "Council."

Sec. 7-5-3. COMPOSITION OF ADVISORY COUNCIL. The Council established in Section 7-5-2 above, is comprised of one representative from each of the interest groups and organizations affected by the planning for compliance to, and enforcement of, laws, ordinances and regulations, intended to prevent pollution of the general hydrologic system and specific surface and underground waters in Salt Lake County.

Sec. 7-5-4. POLICY DEVELOPMENT AND PROGRAM EVALUATION COMMITTEES. The following interest groups and organizations are entitled to membership on the Council:

1. Real Estate Development and Construction Group;
2. Wastewater Treatment and Collection Organizations;
3. Agriculture and Soil Conservation Group;
4. Water Supply Organizations;
5. Salt Lake County Flood Control Department and Municipal Public Works and Public Improvements Departments within Salt Lake County and other Drainage authorities;
6. Salt Lake County Planning Commission and Municipal Planning and Zoning authorities within Salt Lake County;
7. Individuals and organizations concerned with the preservation and enhancement of land areas and waters for recreational purposes, including operators of recreational facilities and government agencies of the United States, the State of Utah, Salt Lake County and municipalities within Salt Lake County responsible for maintenance and enforcement of laws, regulations and policies related thereto;
8. Industrial organizations whose operations effect

the water quality of the hydrologic system in Salt Lake County or who are involved in research and development of water pollution control or water purification technology;

9. All other individuals, groups, and organizations not described above, having an interest in the operation of the Department and the prevention of pollution of the hydrologic system in Salt Lake County;

10. In addition to the representative from each of the groups defined above, a member of the Salt Lake County Commission, the director of the Salt Lake City-County Health Department, a member of the Salt Lake City Commission and a representative from each of the North, Central and South regional sewage treatment plants shall be members of the Council. The regional sewage treatment area represented by the chairperson of the Wastewater Treatment and Collection organizations shall not be entitled to double representation by additional Council memberships provided herein. The chairperson of that committee shall also be the representative of the regional plant area represented.

Each of the nine interest groups and organizations set forth above shall convene separately and be known as "policy development and program evaluation committees," and shall elect by majority vote a council representative from each committee, who shall also serve as chairperson of each committee, and, who shall be approved by the County Commission before being seated on the Council.

Each committee shall be entitled to a seat on the Council for the purpose of representing the interest of each committee and for the purpose of participating in the decisions, the formation of policies and to generally serve the purposes for which the Council is organized.

Sec. 7-5-5. SELECTION OF COMMITTEE MEMBERS AND TERMS OF OFFICE.

(a) Appointment to each committee shall be by the Board of County Commissioners after receiving nominations from each specific interest group, provided however, that each municipality, improvement district, sanitary district, or other government agency is entitled to participate in such committees as deal with the specific area of interest corresponding to the direct official district or other government agency. Any committee member may designate a substitute member for any particular purpose.

(b) Nominations for membership on the policy development and program evaluation committees shall be received in writing by the Board of Commissioners of Salt Lake County annually.

Membership on the policy development and program evaluation committees shall not be restricted to a specific number of individuals unless the Board of Commissioners of Salt Lake County determines and finds that restriction of membership to any particular committee is necessary to prevent disruption of the committee's work or prevent over-representation by a specific special interest group or organization.

The term of office for any single committee representative to the Council shall not exceed three (3) years, but the term of office may be set at a shorter period than three (3) years upon a vote by a majority of the membership of each committee. By majority vote any committee may remove its representative from the Council. Any committee representative may serve more than one term and may designate a substitute representative for any particular meeting.

(c) To provide for overlapping terms of office, the first representative to the Council shall serve terms of office staggered as follows:

(1) Four (4) members for a term of one (1) year,

(2) Four (4) members for a term of two (2) years,

(3) All other members for a term of three (3) years.

At the first Council meeting, each member other than the Director of the City-County Health Department, the member of the Board of

County Commissioners and the member of the Salt Lake City Commission, shall draw lots to determine the term of office served by each member.

(d) The members of the Wastewater Treatment and Collection organizations from the regional areas not represented by the chairperson Council member shall elect by a majority vote, a representative for each regional area to the Council subject to the approval of the County Commission. The term of office and the procedure for removal from office shall be the same as that established by this ordinance for any single committee representative to the Council.

Sec. 7-5-6. DUTIES OF COUNCIL. The Council may meet as often as deemed necessary, shall elect by majority vote a chairperson and a vice chairperson, one of whom shall represent a committee with a particular interest in non-point source pollution, and shall:

(a) In conjunction with the Department prepare an annual update and recommend recertification of a long-range, comprehensive water quality management plan.

(b) Review and evaluate the progress of all phases of the water quality management plan implementation.

(c) Coordinate the planning activities of all water quality management agencies and interest groups.

(d) Promote the best management practices (BMP's) and nonstructural solutions for water quality problems.

(e) Recommend construction priorities in Salt Lake County for water quality management facilities.

(f) Recommend legislation for improvement of state and local action and funding programs affecting water quality.

(g) Provide for public education and continuing public participation in water quality matters.

(h) Encourage continuing review of new developments and considerations of innovative practices in technological, legal, and administrative aspects of water quality management.

Sec. 7-5-7. DUTIES OF POLICY DEVELOPMENT AND PROGRAM

EVALUATION COMMITTEES. Each policy development and program evaluation committee within the area of it's expertise, shall:

(a) Develop recommendations for policies and procedures pertaining to the committee's specific field of responsibility, for adoption and promulgation by the Council of the Board of County Commissioners of Salt Lake County.

(b) Annually, or more often, if needed, identify and appraise all sources, or potential sources, of pollution within the purview of the committee. Review statutes and ordinances pertaining to such pollution sources and recommend that regulatory agencies are designated, and possess adequate statutory authority, and are conducting effective pollution control programs.

(c) Recommend legislative action, or ordinance action, where needed, to improve regulatory provisions.

(d) Regularly review existing water quality standards, pertaining to the committee's field of interest, recommend changes as needed, and insure publication of such standards to agencies or persons concerned.

(e) Maintain liaison with each implementation agency involved in the committee's field of interest and insure coordination of activities relevant to that field.

(f) Develop recommendations for contracts or memorandums of agreement between implementation agencies and Salt Lake County or the Council.

(g) Receive and evaluate reports, questions, recommendations, or problems referred by the Council for study by the committee--and recommend appropriate actions by the Board of County Commissioners of Salt Lake County, the staff, or the responsible agency.

(h) Recommend construction priorities within the committee's field of expertise.

Sec. 7-5-8. DUTIES OF DEPARTMENT. The Department, under the direction of the Board of County Commissioners and in conjunction with the Council shall:

(a) Encourage a "planning philosophy" and assist in identifying roles among all cognizant levels and functions of government and other entities.

(b) Develop and recommend a basic 20 year water quality plan for Salt Lake County, provide for a continuous planning process and prepare documentation for the annual plan update and recertification.

(c) Propose legislative action required to achieve effective water quality management.

(d) Coordinate policies and implementation with other area wide water quality programs, air quality programs, solid waste disposal planning, etc.

(e) Develop and help implement programs for public education and participation.

(f) Assist the Salt Lake County Commission, and all local agencies concerned with water quality, in communicating with state and federal govenment agencies.

(g) Seek, obtain and administer on behalf of Salt Lake County, loans and grants for comprehensive water quality planning.

(h) Upon request from local entities, assist local entities in preparing and processing grant applications for water quality improvement projects.

(i) Administer and develop contracts for study programs and consulting activities.

(j) Establish, obtain approval for, and administer the departmental budget.

(k) Investigate and evaluate major pollution problems, including conducting cooperative monitoring of pollution problems, and encourage and assist management agencies in planning and implementation of solutions.

(l) Conduct research and/or supervise contract research and development to develop best management practices (BMP's) in non-point source pollution control.

(m) Encourage coordination and consistent policies and practices among local agencies, in planning and zoning, subdivision development, etc.

(n) Promote coordination in water quality control among water providers and purveyors.

(o) Review adequacy and assist in improving water quality monitoring, testing, and permit compliance activities.

(p) Continually review new research in water quality management by universities, industries, or government/non-profit agencies and assure availability of new information or developments to local agencies and organizations.

(q) Conduct such other activities as directed by the Council or the Board of County Commissioners and attend meetings of the program development and evaluation committees.

Sec. 7-5-9. SEVERABILITY. If any provision, clause, sentence or paragraph of this ordinance or the application thereof to any person or circumstance shall be held to be invalid, such invalidity shall not affect the other provisions or applications of this ordinance which can be given effect independent from the invalid provision or application, and to this end the provisions of this ordinance are hereby declared to be severable.

SECTION II. That this ordinance shall become effective within 15 days after the enactment thereof, if, within the 15-day period, it has been published in a newspaper of general circulation within the County of Salt Lake. If not published at such time, then immediately upon its first publication thereafter.

Approved and Passed this 31st day of October, 1977.

BOARD OF COUNTY COMMISSIONERS
OF SALT LAKE COUNTY

By [signature]
WILLIAM E. DUNN, Chairman

ATTEST: [signature]

Commissioner Dunn voting "Aye"
Commissioner Kutulas voting "Aye"
Commissioner Hutchinson voting "Aye"

Other Program Evaluation Committees will develop recommendations pertaining to their specific field of responsibility, including the implementation of the Water Quality Plan elements they either affect or are affected by. Therefore a specific design for implementation of all plan elements will be based on the following factors:

1. The relative priority of all plan elements to each other.
2. The degree of critical impacts generated by each plan element.
3. Public sentiment and perception.
4. The amount of supporting data that justifies the implementation of any specific plan element.

Based on data obtained, analyzed, and evaluated during the two-year 208 planning period, the Water Quality Department staff will present recommendations for immediate implementation of those elements enumerated in the Water Quality Management Plan to the appropriate Program Evaluation Committees. Due to the nature of the elements contained in the Plan, and due to Federal and State mandates outlined under P.L. 92-500, a positive implementation program will evolve from this process. It is very doubtful that "do nothing" policies will result, particularly if research and analysis identify the existence of problems. The Water Quality Management Plan identifies those areas presently and possibly defined as problems, thus providing a basis for Committee and Council action.

Water Quality Implementation

The requirement for overall policy guidance of water quality implementation is the responsibility of Salt Lake County Water Quality and Water Pollution Control. The update of the county-wide plan will necessitate needs for data retrieval and implementation progress for inclusion into the plan. In addition to this critical function, the planning agency has primary responsibility for identification of plan implementing management agencies and designation of those agencies by the Governor of the State of Utah. Designation of a management agency by the governor is a function of this portion of the water quality plan. Federal regulations specify that no designation is possible unless in accordance with the approved water quality plan.

The purpose of this chapter is to identify those agencies to be designated, and their role in implementation. These agencies will have responsibility for either regulatory or non-regulatory programs in dealing with identified pollution sources, and must provide the necessary legal and institutional tools to insure that the program is implemented on a county-wide basis, regardless of the form or fabric of local government.

NON-POINT SOURCE MANAGEMENT AGENCIES

Management agencies vary in their authority and role, with some agencies assuming responsibility for one to five implementation tasks. Table VII-1 summarizes which management agencies are to be initially designated for non-point source control, and the non-point source areas in which they have jurisdiction. Tables VII-2 through 4 detail these roles and responsibilities.

Management agencies are necessary from the federal level down to the local level. There are three federal offices that should sign agreements with the county-wide planning agency to insure proper coordination where federal jurisdiction predominates, and three state agencies that play key roles in implementation of park-related facilities that depend on increased beneficial use of waters resulting from improvement in water quality.

Each municipality has a responsibility for plan implementation and enforcement, particularly in the area of erosion-sediment control, stormwater detention, and septic-tank related problems. Although Salt Lake County has delegated

Table VII-1. Management Agencies To Be Designated For Plan Implementation

		Regulatory			Regulatory				Non-Reg.
		URBAN RUNOFF	Detention Parks/Basins	Erosion-Sediment Control	RECREATION/WATERSHED RUNOFF	Erosion-Sediment Control	"Watch-Dog" Monitoring	Septic Tank Enforcement	AGRICULTURAL RUNOFF
FEDERAL	Forest Service					X	X	X	
	Soil Conservation Service/District			X		X			X
	Corps of Engineers		X						
STATE	Division of Jordan River Parkway		X						
	Division of Parks & Recreation		X						
COUNTY	Agricultural Extension Service			X					X
	Attorney			X		X	X		
	Health						X	X	X
	Flood Control		X	X		X			
	Planning			X		X			
	Recreation		X	X		X			
	Surveyor		X	X		X			
	Building Inspection			X		X			
MUNICIPAL	Salt Lake City		X	X		X	X	X	
	South Salt Lake City			X				X	
	Murray		X	X				X	
	Midvale			X				X	
	Sandy		X	X		X		X	
	West Jordan		x	x		x		x	
	South Jordan		X	X		X		X	
	Riverton		X	X		X		X	
	Draper		X	X		X		X	
	Town of Alta			X		X		X	

state authority for stormwater planning and enforcement, informal arrangements are all that presently exist between the county and municipalities for storm-related implementation. This condition must be formalized before designation may occur.

County management agencies can be expected to enter into inter-agency agreements with the Water Quality Planning Agency.

POINT SOURCE MANAGEMENT AGENCIES

Most of the specific requirements for 208 Management Agencies set forth in PL 92-500 relate to financing, construction, operation, and maintenance of waste-water treatment works. In this section, the existing institutional capabilities are analyzed, area-wide implementation alternatives are reviewed and evaluated, and the 208 point source management plan is evaluated in light of existing facts.

Existing Institution Capabilities

There are 20 county improvement districts, special service districts, or municipalities within Salt Lake County providing for the treatment of wastewater. Organization structures, taxing limits, and bonding capacity for each are established by state law. There are also major differences in size, financial capability, treatment capacity, and management practices and procedures.

Improvement Districts

Title 17, Chapter 6, UCA 1953, as amended, allows for the creation of improvement districts that may set a tax mill levy not to exceed 4 mills. Bonding capacity for improvement districts cannot exceed 12% of the assessed valuation of the real property within the district. The tax may be set by the board of trustees without a vote of the general public. All bonding proposals must be approved by the trustees and the voters of the district. Most of unincorporated

Table VII-2. Management Agencies to be Designated for Urban Runoff Program Category.

GRAM: URBAN RUNOFF
MENT: EROSION-SEDIMENT CONTROL

el of Government	FEDERAL	COUNTY				
Agency	Soil Conservation Service	Flood Control	Surveyor	Building Inspection	Planning Commission	Recreation
Institutional Responsibility	Conserve soil resources, prevent soil erosion, conserve water declared necessities.	Implementation, Enforcement, Operation & Maintenance of Flood Contro & water pollution facility development	Provide all engineering for Salt Lake County	Provide for the enforcement of zoning regulations by means of withholding bldg. permits.	Provide for physical development & zoning of the unincorporated territory of Salt Lake County	Planning, implementation maintenance of public ope space facilities.
a of Jurisdiction	County-wide	County-wide	Salt Lake County	Salt Lake County	Salt Lake County	Dejure: County-wide Defacto: Salt Lake Count
al Authority	62-1-8 Utah Code Ann. (1953 as amended)	Utah Code 17-8-5	Utah Code Ann. 17-23-1	Utah Code Ann. 17-5-35	Utah Code Ann. 17-27-9	Utah Code Ann. 11-2-1
ancial Source	Federal Appropriation	County-wide Mill Levy		Department Fees	County Municipal Services Fund Federal Grants-in-Aid	County Capital Improv. Budget, Fed. Grants-in-Ai Obligation & Revenue Bond
er Quality agerial Tasks	Inventory & monitor erosion from agriculture areas. Provide assistance for & develop materials on plant propogation & other techniques for erosion-sediment control	Administer & enforce erosion-sediment control program for all new development in Salt Lake County. Recommend improvements to be required and bond developer for installation	Provide design criteria for slope-stabilization of all new construction in Salt Lake County on behalf of the Flood Control Department. Provide estimate of performance bond to cover on-site and off-site improvements for erosion-sediment control. Provide Engineering review of development proposals for compliance with erosion-sediment control provisions. (Chapter 70, Uniform Bldg. Code).	Review individual subdivision lot plans for compliance with Chapter 70, Uniform Bldg Code, concerning erosion-sediment control and/or slope stabilization. Enforce provisions of Chapter 70 on a lot-by-lot basis.	Review plans for construction or other land-disturbing activities within unincorporated Salt Lake County. Recommend standards as measures to be implemented for effective pollution control. Recommend ordinances implementing such standards or measures for effective pollution control. Coordinate with the WQ Planning Agency for plan review of land-disturbing activities within Salt Lake County, where soil conditions indicate potential water quality impact.	Recommend measures for implementation of effective pollution control from land disturbing activities within Salt Lake County.
ject Initiation Date	FEBRUARY 1, 1979					
imated Project pletion Date	ON-GOING					

Table VII-2. Continued

PROGRAM: URBAN RUNOFF
ELEMENT: EROSION-SEDIMENT CONTROL

Level of Government	COUNTY		MUNICIPAL
Agency	Agricultural Extension Service	Attorney	Municipalities
Institutional Responsibility	To assist soil conservation districts and agriculture-at-large with technical information regarding conservation.	Provide legal advice and counsel to designated planning and management agencies.	Insure provision of adequate standards for the protection of public health, safety, and welfare.
Area of Jurisdiction	Salt Lake County	County-wide (Incorporated and unincorporated areas).	Within respective municipal boundaries (Ref III-10)
Legal Authority	53-32-30 Utah Code Annotated, (1953, as amended)	Utah Code 17-18-1 thru 3	Utah Code 10 - Chapter 8-13
Financial Source	State Appropriation County Appropriation	County General Fund	Federal Grants-in-Aid, Misc. State/County Appropriations, General Obligations & Revenue Bonds
Water Quality Managerial Tasks	Provide assistance for & develop materials on plant propagation and other techniques for erosion-sediment control.	Administer performance bonding program for erosion-sediment control (BMP's) & water quality monitoring	Insure implementation of erosion-sediment control through effective coordination with other water quality management agencies and area-wide water quality planning agency.
Project Initiation Date	FEBRUARY 1, 1979		
Estimated Project Completion Date	ON-GOING		

Table VII-2. Continued

PROGRAM: URBAN RUNOFF
ELEMENT: DETENTION FACILITIES

Level of Government	FEDERAL	STATE		COUNTY			MUNICIPAL
Agency	Corps of Engineers	Div. of Parks & Recreation	Div. of Jordan River Parkway	Flood Control	Surveyor	Recreation	All Municipalities
Institutional Responsibility	Installation of Stormwater Detention Facilities	Development of State Park Recreational Facilities	Property Acquisition, Planning & Coordination of Development of Jordan River Parkway	Implementation, Enforcement, Operation, & Maintenance of Flood Control & Water Poll. Facility Development	Provide all work & Engineering Design of all County Facilities	Planning, Implementation, & Maintenance of public open-space facilities	Insure provision of adequate public facilities for protection of public health, safety & welfare
Area of Jurisdiction	Jordan River State Park (Ref. Fig. VI-8)	Jordan River State Park (Ref. Fig VI-8)	Length of Jordan River, Salt Lake County	County-wide (Incorp & unincorp. areas (Ref. Fig. VI-14)	Dejure: S.L. Co. Defacto: County-wide	Dejure: County-wide Defacto: S.L. County	Within Respective Municipal Boundaries (Ref. Fig. III-10)
Legal Authority	Water Resources Planning Act, 1974 Clean Water Act as Amended Sec. 40	63-11-17 Ut Code Ann. (1953 as amend.)	65-10-1 Utah Code Ann.	Utah Code 17-8-5	Utah Code 17-23-10	11-2-1 Utah Code Ann. (1953 as amend.)	Utah Code 10 - Chapters 8-13
Financial Source	Federal Construction Appropriation	State Appropriations, Federal Grants-in Aid	State Appropriations, Donations, Federal Grants-in-Aid	County-wide Mill Levy	Salt Lake County General Fund, State Road Appropriation	Federal Grants-in-Aid, Obligation & Revenue Bonds, County Capital Improvement Budget	Federal Grants-in Aid, State/County Appropriations, Obligation & Revenue Bonds
Water Quality Managerial Tasks	Design, Construction, & periodic inspection of facilities	Coordinate water quality facility construction with over-all park development	Coordinate water quality facility construction with over-all parkway development	Site acquistion, design approval, supervision of const, operation, maint. of Flood Cont. & W.Q. Facilities. Keep & enforce NPDES Permits Stormwater Discharge to the Jordan R.	Design & Inspection of water pollution Control Facilities	Coordinate & integrate park and open space facility design with water quality design.	Coordinate development of detention facilities and, at option, assume responsibility for operation and maintenance of facilities
Project Initiation Date	FEBRUARY 1, 1979						
Estimated Project Completion Date							

Table VII-3. Management Agencies to be Designated for Recreation/Watershed Runoff Program Category.

PROGRAM: RECREATION/WATERSHED RUNOFF
ELEMENT: EROSION-SEDIMENT CONTROL

Level of Government	FEDERAL		COUNTY		
Agency	Forest Service	Soil Conservation Service	Attorney	Flood Control	Recreation
Institutional Responsibility	Management of all land use within boundaries of Wasatch National Forest	Conserve soil resources, prevent soil erosion, conserve water declared necessities.	Provide legal advice and counsel to designated planning and management agencies.	Implementation, enforcement operation & maintenance of flood control & water pollution and facility development	Planning, implementation & maintenance of public open-space facilities
Area of Jurisdiction	Wasatch National Forest	County-wide (Inc. & uninc. areas)	County-wide (Inc. & uninc. areas)	County-wide (Inc. & uninc. areas)	Dejure: Co.-wide Defacto: S.L.Co.
Legal Authority	P.L. 85-862 Creative Act, 1891 Organic Act, 1897	Utah Code Ann. 62-1-8 (1953, as amended)	Utah Code 17-18-1 thru 3	Utah Code 17-8-5	Utah Code Ann. 11-2-1 (1953, as amended)
Financial Source	Federal Appropriation	Federal Appropriation	County General Fund	County-wide mill levy	Co. Cap. Imp.Budget Fed. Grants-in-Aid Oblig.& Revenue Bnds
Water Quality Managerial Tasks	Implement anti-degradation policy: Review all development plans within forest boundaries & on lands adjacent that drain into forest watershed. Require mandatory slope stabilization. Monitor construction & intensive recreation use areas. Provide water quality data. Coord. with planning agency on plan update.	Provide assistance for & develop materials on plant propogation & other techniques for slope stabilization or appropriate BMP.	Administer performance bonding program for erosion-sediment control (BMP's) & water quality monitoring.	Administer & enforce erosion-sediment control program for all new development in Wasatch Canyons or other watershed. Recommend improvements reuuired and bond developer for installation.	Recommend measures for implementation of effective pollution control from land disturbing activities within the canyons.
Project Initiation Date	FEBRUARY 1, 1979.				
Estimated Project Completion Date	ON-GOING				

Table VII-3. Continued

PROGRAM: RECREATION/WATERSHED RUNOFF
ELEMENT: EROSION-SEDIMENT CONTROL

Level of Government	COUNTY			MUNICIPAL
Agency	Planning Commission	Surveyor	Building Inspection	Municipalities
Institutional Responsibility	Provide for physical development & zoning of the unincorporated territory of Salt Lake County	Provide all engineering for Salt Lake County	Provide for the enforcement of zoning regulations by means of withholding bldg. permits	Insure provision of adequate standards for the protection of public health, safety, and welfare.
Area of Jurisdiction	Salt Lake County	Salt Lake County	Salt Lake County	Within respective municipal boundaries (Ref III-101)
Legal Authority	Utah Code 17-27-1 thru 27	Utah Code 17-23-10	Utah Code 17-27-12	Utah Code 10 - Chapter 8-13
Financial Source	County Municipal Services Fund Federal Grants-in-Aid	Salt Lake County General Fund, State Roads appropriate.	Departmental Fees	Federal Grants-in-Aid Mis. State/Co. Appropriation Gen. Obligations & Revenue Bonds
Water Quality Managerial Tasks	Review plans for construction or other land-disturbing activities within canyons of Salt Lake Co. Recommend standards or measures to be implemented for effective pollution control. Recommend ordinances implementing such standards or measures for effective pollution control. Coordiante with the WQ planning agency for plan review of land-disturbing activities with the canyons.	Provide design criteria for slope stabilization of all new construction in Salt Lake Co. canyons on behalf of the Flood Control Dept. Provide estimate of performance bond to cover on-site and off-site improvements for erosion-sediment control. Provide engineering review of canyon development proposals for compliance with erosion-sediment control provisions. (Chapter 70, Uniform Bldg Code)	Review individual subdivision lot plans for compliance with Chapter 70, Uniform Building Code, concerning erosion-sediment control and/or slope stabilization. Enforce provisions of Chapter 70 on a lot-by-lot basis.	Insure implementation of erosion-sediment control through effective coordination with other water quality management agencies and area-wide water quality planning agency.
Project Initiation Date	FEBRUARY 1, 1979.			
Estimated Project Completion Date	ON-GOING			

Table VII-3. Continued

PROGRAM: RECREATION/WATERSHED RUNOFF
ELEMENT: "WATCHDOG" WATER QUALITY MONITORING

Level of Government	FEDERAL	COUNTY		MUNICIPAL
Agency	Forest Service	Attorney	City-County Health	Municipalities
Institutional Responsibility	Management of all land within boundaries of Wasatch National Forest	Provide legal advice and counsel to designated planning and management agencies.	Protection of public health, safety and welfare through the water quality monitoring and analysis of the streams, rivers, and lakes of Salt Lake County.	Insure provision of adequate standards for the protection of public health, safety, and welfare.
Area of Jurisdiction	Wasatch National Forest	County-wide (Incorporated and unincorporated areas).	County-wide	Within respective municipal boundaries (Ref III-101)
Legal Authority	P.L. 85-862 Creative Act, 1891 Organic Act, 1897	Utah Code 17-18-1 thru 3	Utah Code Ann. 26-5-1 (1953, as amended)	Utah Code 10 - Chapter 8-13
Financial Source	Federal Appropriation	County General Fund	County-wide Mill Levy	Federal Grants-in-Aid, Mis. State County Appropriation, General Obligation or Revenue Bonds
Water Quality Managerial Tasks	Implement anti-degradation policy: To assist the water quality planning and other management agencies by providing water quality monitoring of development sites within their jurisdiction, or of those sites that may influence water quality outside such jurisdiction. To coordinate with the water quality planning agency on provision of water quality data.	Administer performance bonding program for water quality monitoring.	To assist the local water quality planning agency by providing for the chemical analysis and collection of water quality samples as specified by the planning agency.	Insure implementation of water quality monitoring through effective coordination with other water quality management agencies and area-wide water quality planning agency.
Project Initiation Date	FEBRUARY 1, 1979			
Estimated Project Completion Date	ON-GOING			

PROGRAM: AGRICULTURAL RUNOFF
ELEMENT: NON-REGULATORY ACTIVITIES

Level of Government	COUNTY		
Agency	Soil Conservation District	City County Health	Agricultural Extension Serv.
Institutional Responsibility	Conserve Soil Resources Prevent Soil Erosion Conserve water-declared necessities	Protection of public health, safety, and welfare through water quality monitoring & abatement of pollution conditions which degrade water quality of public watershed	To assist soil conservation districts and agriculture-at-large with technical information regarding conservation
Area of Jurisdiction	County-wide	County-wide	Salt Lake County
Legal Authority	Utah Code Ann. 62-1-8 (1953, as amended)	Utah Code Ann. 26-5-1 (1953, as amended)	53-32-30 Utah Code Ann., (1953, as amended)
Financial Source	Salt Lake Co. Appropriation Federal Appropriation	County-wide Mill Levy	State Appropriation County Appropriation
Water Quality Managerial Tasks	Implement non-regulatory program for non-point source management in agricultural areas.	To assist the local water quality planning agency by providing for the chemical analysis and collection of water quality samples as specified by the planning agency.	Provide assistance for & develop materials on plant propogation and other techniques for erosion-sediment control
Project Initiation Date	February 1, 1979		
Estimated Project Completion Date	On-going		

Table VII-4. Management Agencies to be Designated for Agricultural runoff Program Category.

Salt Lake County is organized into Chapter 6 improvement districts to provide for wastewater treatment.

Cities

Title 10, Chapter 7, UCA 1953, as amended, authorizes cities to provide wastewater treatment services. They have a ceiling of 35 mills that may be levied for general fund needs, including sewer service. In addition to the general fund ceiling, they have an additional 4 mill tax capacity to pay for construction of waste treatment facilities or to make payments on bonds issued for such capital construction. They may also charge for providing such a service and may bond for capital expenditures connected with the service. The bonding capacity for 1st and 2nd class cities is 8% of the assessed valuation, while for 3rd class cities and towns limits are set at 12%. All general obligation bonding requires public authorization. As a general rule, municipalities in Salt Lake County are not using general fund revenues for sewer services. General sources of funding for wastewater treatment are service charges or fees.

Special Service Districts

In 1975 the legislature authorized the creation of multipurpose entities called Special Service Districts, in Title 11, Chapter 23, UCA 1953, as amended, which could be established to furnish waste treatment. In 1977, the legislature amended the act in Senate Bill 148 to allow the district to be created in addition to existing districts constituting a taxing authority which could be created in addition to existing districts. The overlap permitted by S.B. 148 can only exist when consent is obtained from the existing districts or municipalities. The special service district is a separate body politic; a quasi municipal public corporation. It is not limited by statute to a specific mill levy limit. It may bond up to 12% of the district's assessed valuation.

Guaranteed bonds may exceed the 12% limitation. It may also charge fees for services. All taxes and bonds must be approved by the public in an election.

County Service Areas

Title 17, Chapter 29, UCA 1953, as amended, allows for the creation of county service areas to provide for special service, which could include sewer service. There is a 7 mill limit on the levy and presently three Salt Lake County service areas exist as a funding source for special county services. County Service area #3 is the Snowbird sewage collection system and is the only county service area act entity involved in sewage collection or treatment. The County Service Area Act has been the subject of unfavorable rulings by the Supreme Court of Utah, raising doubts about funding and bonding activities. Since bonding is generally necessary for wastewater treatment works construction, Utah's County Service Area Act is not a suitable implementation vehicle until corrected by the legislature and tested in the courts. Counties in Utah have the authority to plan, construct, operate and maintain sewage treatment facilities.

County Government

County government has been financially and structurally limited by the legislature to the point that counties have been unwilling to fund sewage collection and treatment. Counties have a general mill levy limit of 16 mills for all purposes and a bonding capacity of 2% of the assessed valuation. Because of these limits, the County has not funded waste treatment. For the foregoing reasons, funding of waste treatment has been handled by the municipalities and improvement or special districts, and not by the county.

Management Alternatives Evaluation

Institutional implementation of the wastewater treatment plan required analysis of management agency alternatives to select an appropriate institutional alternative for planning, construction, and operation of regional facilities. The following alternative management agencies were evaluated.

1. Establishment of a management agency by interlocal agreement of the parties;
2. Salt Lake County Water Conservancy District;
3. Designation of Salt Lake County;
4. Creation of additional improvement districts;
5. Establishment of a special service district.

Alternative #1

Each existing entity has the authority to enter into interlocal agreements to consolidate functions authorized by Utah law. All of the entities are authorized to conduct sewage treatment operations and may therefore contract with each other to consolidate such functions. In the interlocal agreement agency concept, no additional funding authority is created and the existing entities retain control and ownership of treatment works.

This alternative (interlocal agreement agency) is the overwhelming choice of the entities involved.

Alternative #2

Water Conservancy Districts in Utah are not authorized to conduct sewage treatment operations

Alternative #3

Designation of Salt Lake County would remove control from existing entities.

Alternative #4

Creation of another improvement district would pose the potential problem of loss of control from existing entities to a widely elected board of trustees of the new district but would provide additional funding authority.

Alternative #5

Creation of a special service district would add new bonding and funding authority but would shift control to the Board of County Commissioners who, by law, are the trustees of special service districts in Utah.

Alternative #1 (management agency through interlocal agreement) has been selected for both facilities in the Jordan planning area and is therefore politically feasible and capable of implementation.

Designated Management Agencies

South Plant

The south plant would consolidate the services for Midvale, Salt Lake City Suburban Sanitary District No. 2, West Jordan, Salt Lake County Sewage Improvement District No. 1, Sandy Suburban Improvement District, and Sandy. These entities have entered into an agreement pursuant to the Interlocal Cooperation Act to construct, operate, and maintain a regional plant. Each entity has taxing and bonding capacity sufficient to fund the plant. Because of the need and local support, bonding authorization is possible to obtain and would be necessary in order to construct the plant. Copies of the contract documents are found in the appendix.

North Plant

The north plant would consolidate services for Salt Lake City Suburban No. 1, South Salt Lake, Granger-Hunter, Murray City and Cottonwood Sanitary District. These entities have executed an interlocal agreement similar in concept to the South Valley facility agreement. Bonding may be necessary and each entity has sufficient bonding and taxing ability to fund the cooperative plan.

Salt Lake City and Magna

Salt Lake City operates a treatment plant and has the capacity to construct, operate, fund, and maintain its own plant. In the Magna planning area the Magna water and sewer improvement district operates a treatment plant and has

has the authority to plan, construct, operate and maintain appropriate facilities for the Magna area.

Management Agency Contracts and Agreements

Implementation of both non-point and point source plans will occur with the culmination of interlocal agreements, interagency agreements, and intergovernmental contracts. All documents relating to the implementation of any portion of the non-point or point source plan can be reviewed in the Appendix to the Water Quality Management Plan. The appendix is to be published as a separate document to accompany the Plan due to the lengthiness of the contract documents and other supporting material.

VIII. Environmental Assessment

VIII. ENVIRONMENTAL ASSESSMENT

Introduction

The following information provides an assessment of the possible impacts resulting from implementation and construction of the water quality plan components. The components addressed by the assessment include only those involving structures or facilities and where sufficient data exists to support need for the facilities. Figure VIII-1 summarizes in which assessment category positive and negative impacts are likely. Negative impacts may require further analysis to determine their severity or whether or not they can be overcome. Positive impacts indicate a relative enhancement or improvement over existing conditions.

Locations of point source facilities are included in Figures VIII-2 through VIII-5. Locations of non-point source facilities are indicated on Figures VI-8, 9, 14 and 15. Areas of priority erosion control implementation are indicated on Figure VI-16.

The assessment was prepared in accordance with guidance provided by the U.S. Environmental Protection Agency in the publication, Environmental Assessment of Water Quality Management Plans (October, 1976). The impact categories of economic, land use, social, physical, and ecologic provide a useful framework for addressing a broad spectrum of impacts and issues that components of a water quality plan may raise. The assessment hopes to provide a rational method of weighing trade-offs and benefits resulting from the implementation of the water quality plan.

economic impact

The economic impacts of implementing the point and non-point elements of the water quality management plan are generally positive. These positive impacts occur in the form of increases in employment, personal income, and population on a county-wide basis. The negative impacts result from slightly higher housing costs in areas prioritized for erosion control and increases in public revenues to support detention and sewage disposal facilities. However, both these negative impacts are countered through increases in employment sectors by the creation of new jobs and personal income sources.

Equitable distribution of these increases among wage earners is insured through appropriate utility service charges in financing wastewater treatment facilities, mill levy increases for financing multi-purpose stormwater detention/open space facilities, and appropriate cost increases to consumers of new housing starts in areas where slope stabilization costs are incurred (mostly along benchlands or within the canyons).

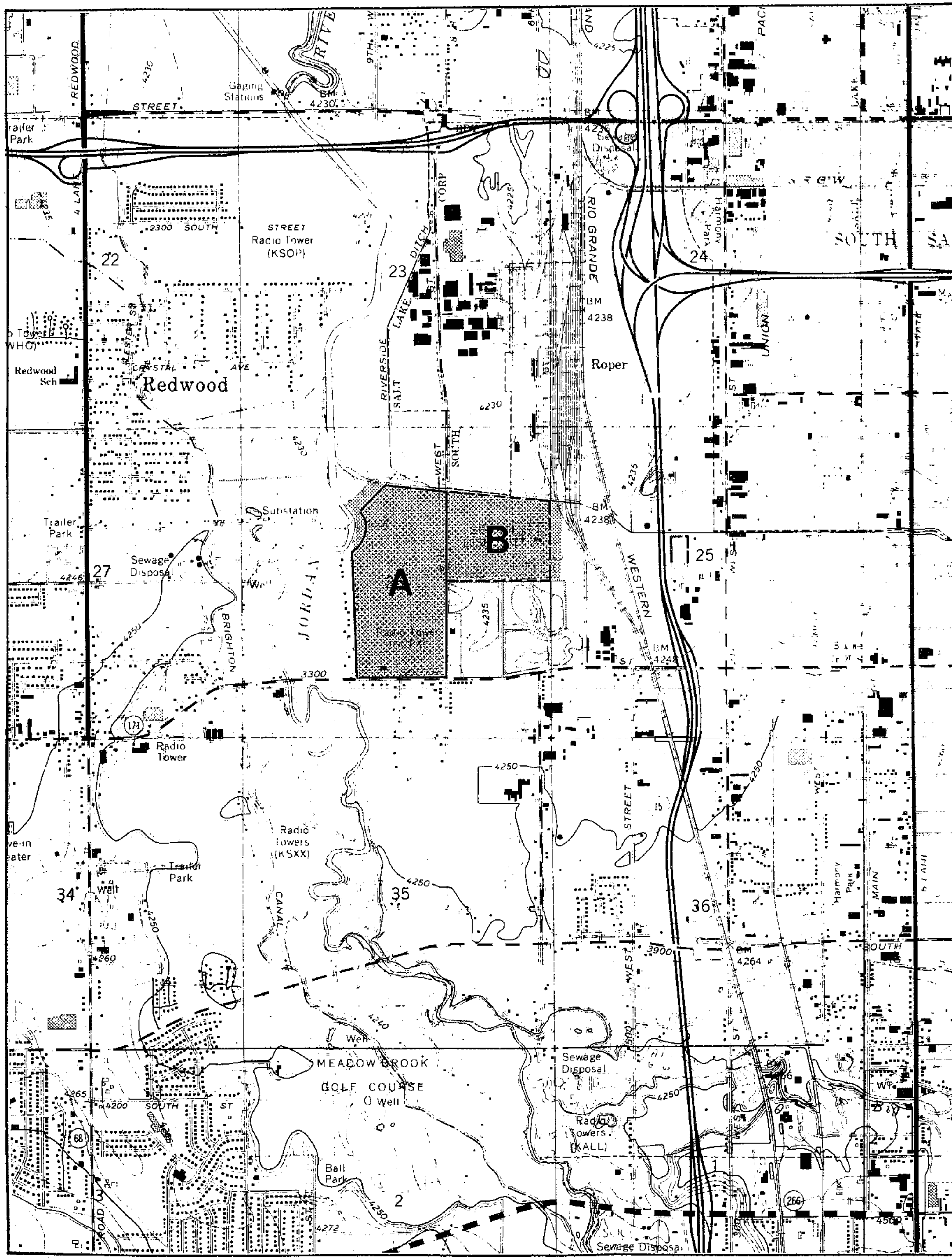
The possibility of additional water quality management costs exist in other areas related to storm runoff control. These are in programs such as street cleaning or control of runoff from hazardous wastes such as radioactive tailings. These costs will be estimated as the data base for water quality impact becomes more inclusive.

Estimated economic impact of the Water Quality Management Plan is shown in Figure VIII-6.

Plan Components		ECONOMIC					LAND USE							PHYSICAL			SOCIAL				ECOLOGIC					
																					Non-Living				Living	
	Impact Category	EMPLOYMENT	POPULATION	INCOME	PUBLIC REVENUES	PUBLIC EXPENDITURES	RESIDENTIAL	INDUSTRIAL	COMMERCIAL	INSTITUTIONAL	PARKS	AGRICULTURAL	TRANSPORTATION	VISUAL	TOPOGRAPHIC	FLOODWAYS	RECREATION	EDUCATION	HEALTH	SAFETY	SOILS	GEOLOGY	AIR QUALITY	WATER QUALITY	WILDLIFE	VEGETATION
Point Facilities	SOUTH VALLEY	+	+	+	-	+	-	+	+	+	-	+	+	+	+	-	-	+	-	-	-	-	+	+	-	-
	CENTRAL VALLEY	+	+	+	-	+	+	+	+	+	-	+	+	+	+	-	-	+	-	-	-	-	+	+	-	-
	SALT LAKE CITY	+	+	+	-	+	-	+	+	+	+	+	+	+	+	-	+	+	-	-	-	-	+	+	+	+
	MAGNA	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+
Non-Point Facilities	DETENTION FACILITIES	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+
	EROSION CONTROL	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

FIGURE VIII-1. SUMMARY OF ENVIRONMENTAL IMPACTS RESULTING FROM IMPLEMENTING THE WATER QUALITY PLAN.

FIGURE VIII-2. FACILITY SITE LOCATION CENTRAL VALLEY



A PRINCIPAL SITE AREA

B POSSIBLE SECONDARY SITE EXPANSION

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

acres 40

feet (1000's) 0 1 2 3

NORTH

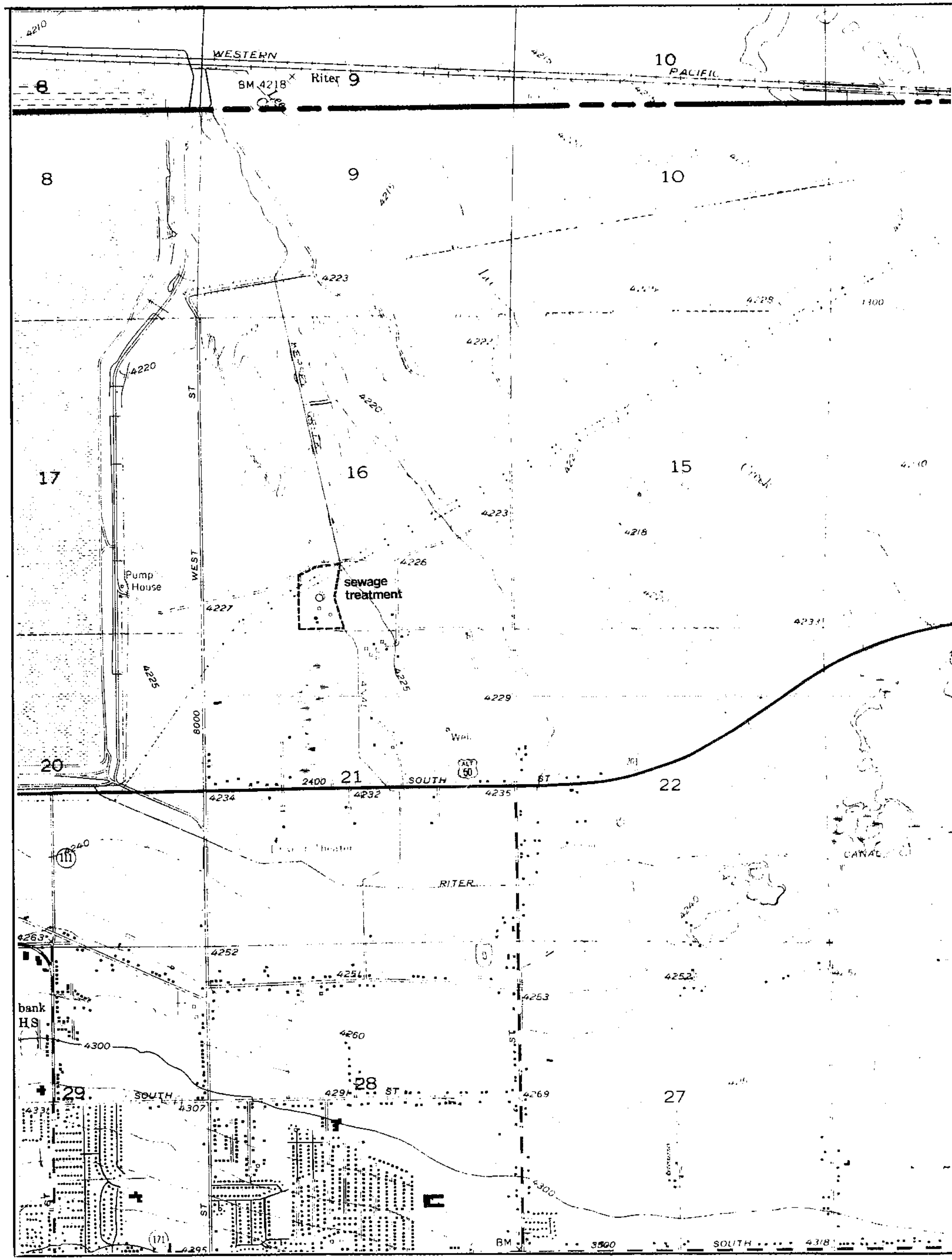


FIGURE VIII-3. LOCATION MAGNA FACILITY SITE LOCATION

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

acres 40

feet (1000's) 0 1 2 3

NORTH

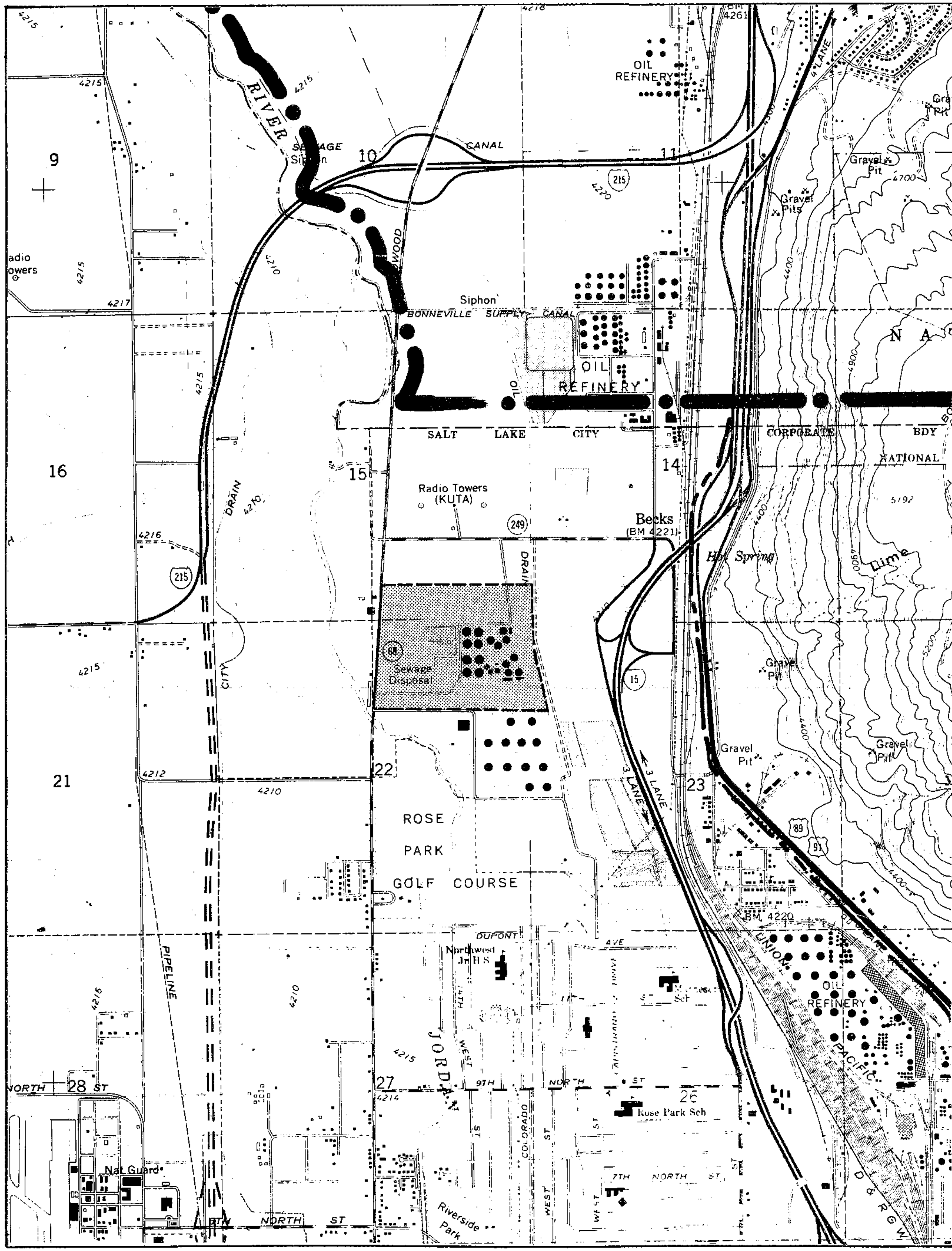


FIGURE VIII-4. SALT LAKE CITY FACILITY SITE LOCATION

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

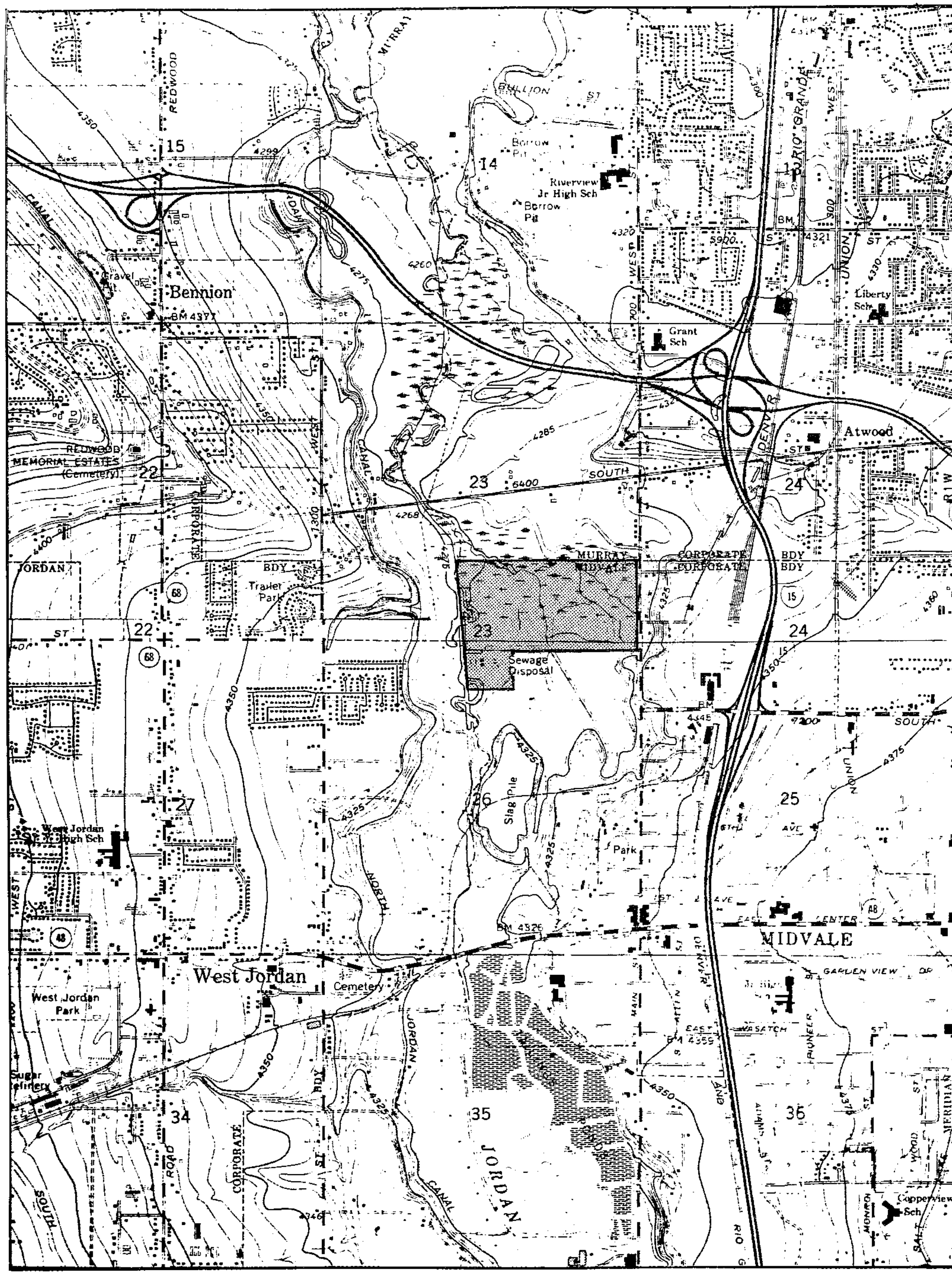
Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

acres 40

feet (1000's) 0 1 2 3

NORTH

FIGURE VIII-5. SOUTH VALLEY FACILITY SITE LOCATIONS



Salt Lake County Water Quality & Pollution Control

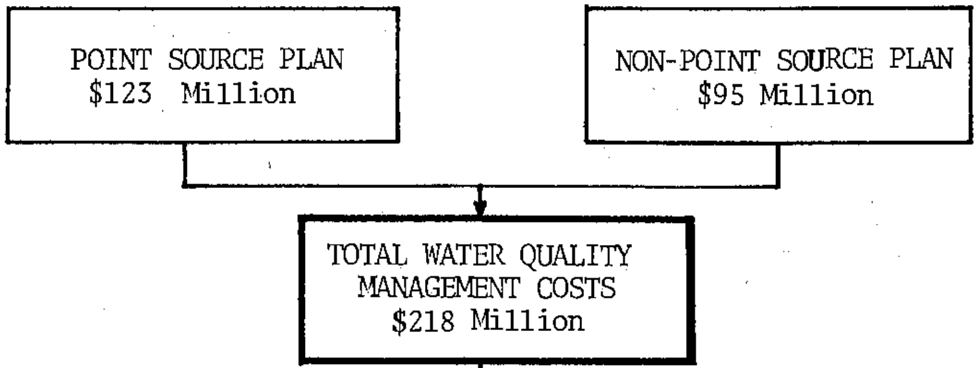
208 Water Quality Plan

NORTH

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

feet (1000's)
0 1 2 3



Employment Sectors %	Construction 50%	Service 7%	Trade 42%	Government 1%
Investment Dollars	$109 Million	$15 Million	$92 Million	$2 Million
Total Added Jobs	9000	1140	7208	151
Average Annual Added Jobs	450	57	360	7.5
Total Added Population	13410	1698	10740	225
Average Annual Added Population	670	85	537	11

		With Plan	Without Plan
Population		816,611	790,538
Total Employment		398,164	380,665
JOBS	Construction	24,607	15,607
	Trade	98,946	91,740
	Service	112,675	111,535
	Government	59,915	59,764
Total Income (10^9)		13.3	13.1
Public Expenditure (10^9)		120.2	120.
Public Revenues		120.2	120.

Figure VIII-6. Estimated Economic Impact of Proposed Water Quality Management Actions.

land use impact

POINT SOURCE PLAN

Central Valley Facilities

The impact of the proposed Central Valley facilities on adjacent land uses is projected to be minimal. Detailed development plans for the Big Cottonwood Planning District (Salt Lake County Planning Commission, 1974) indicate that the proposed facility site will not incur long-term conflict with neighborhood or residential development. The proposed plant site should be surrounded by industrial uses on the east, north, and a portion of the west property lines. Property not developed for facility use on 3300 South should develop into related non-conflicting industrial use. The plant site does impact land proposed to be developed for the Jordan River Parkway. Unless facility design accommodates open space or recreational opportunity in the northwest corner of the site, conflicting land use relationships between parkway and facilities development will be a possibility.

Magna Facilities

Evaluation of present development plans for projected land use near the Magna facility site indicates that no conflicting uses will result from wastewater treatment plant expansion. The Magna plant site is in very close proximity to the Salt Lake County Sanitary Landfill which is being considered for expansion and improvement so as to comply with Federal and State landfill regulations. Projected land use around both facility sites indicates maintaining the "Salt Desert" and "Marsh" environment.

Salt Lake City Facilities

Expansion of wastewater treatment facilities at the present Salt Lake plant site will produce possible conflicts with proposed high density residential development. Recently, approximately 40 acres of high density residential zoning was granted south of the treatment plant site. However, some related industrial development near the plant could provide a buffer between any use conflicts. (The residential zoning conflicts with the proposed industrial classification shown in the present master plan)

Although the most recent Salt Lake City master plan does not indicate Jordan River Parkway facilities north of the Glendale Golf Course, the facility site sits in close proximity to the Jordan River and recreational use present at the golf course. Any expansion of these facilities necessitates the addition of landscaping (shrubs, lawn, and preferably trees) sufficient to soften the conflict between the physical settings.

South Valley Facilities

The sources of projected land use in the study area were derived from detailed "District Development Plans" completed by the City of West Jordan and Salt Lake County in cooperation with Midvale and Murray City. These plans reflect a combination of citizen goals together with estimates of acreage required to accommodate anticipated uses and demands relating to park/open space, transportation, etc. A short discussion of each projected use will touch on the main conflicts or possible constraints.

Residential

The only significant residential projection is in the continued location of a large mobile home park directly adjacent to the north of the proposed plant site. However, the existence of land presently utilized for sewage lagoons could present some opportunities for "buffer zone" incorporation into plant expansion. The existence of the mobile home park does present the possibility of land use conflict due to sewage odor. Remaining residential acreage is planned above grade of the plant site and of sufficient distance to preclude odor problems due to the northern and southern wind patterns.

Industrial

The majority of the acreage within the site corridor is projected for industrial use. The term "Industrial Reserve" is used from direct reference to the Little Cottonwood District Development Plan. This "reserve" area has since been developed for use as sewage lagoons.

Agriculture

The land east of the irrigation canal and west of the plant site is projected for continued agricultural use. The land characteristics, together with the existing Utah Power & Light corridor, sufficiently limit the use of of this land to either agricultural or open space use.

Park/Open Space

A continuous corridor of land on each side of the Jordan River has been projected for the length of Salt Lake Valley. The intent here is consistent with the citizen goals and policy of reserving land for the Jordan River Parkway and opportunities for Parkway implementation are open with the development of a regional treatment facility at this location.

Treatment plant grounds and facility design should provide for dedication of a portion of the plant site for parkway utilization either in the form of bikeways/walkways or open space design that provides stop/rest benches, landscaping, etc.

Insofar as two additional public parks are planned in the area close to the sewage treatment facility, plans should contribute to Parkway implementation that will provide incremental links between Park facilities.

Transportation/Circulation

Proposals exist for the extension of 7200 South Street East to connect to 7000 South. As a major collector street, this extension will be designed at either an 80' or 106' right-of-way. The road will pass through or close to the new treatment facility site.

Coordination with State and County highway design teams will be necessary during the Step I facility design phase in order to incorporate and integrate grading, excavation, and open space considerations at the time the new treatment facility is built. Access considerations to the new plant and parkway areas should also be included during this design phase.

Commercial

No commercial facilities are planned outside the present downtown Midvale location.

Figures VIII-7, 8, 9, 10, 11, 12, 13, and 14 summarize both existing and projected land use near the Central Valley, Magna, Salt Lake City and South Valley Facilities respectively.

NON-POINT SOURCE PLAN

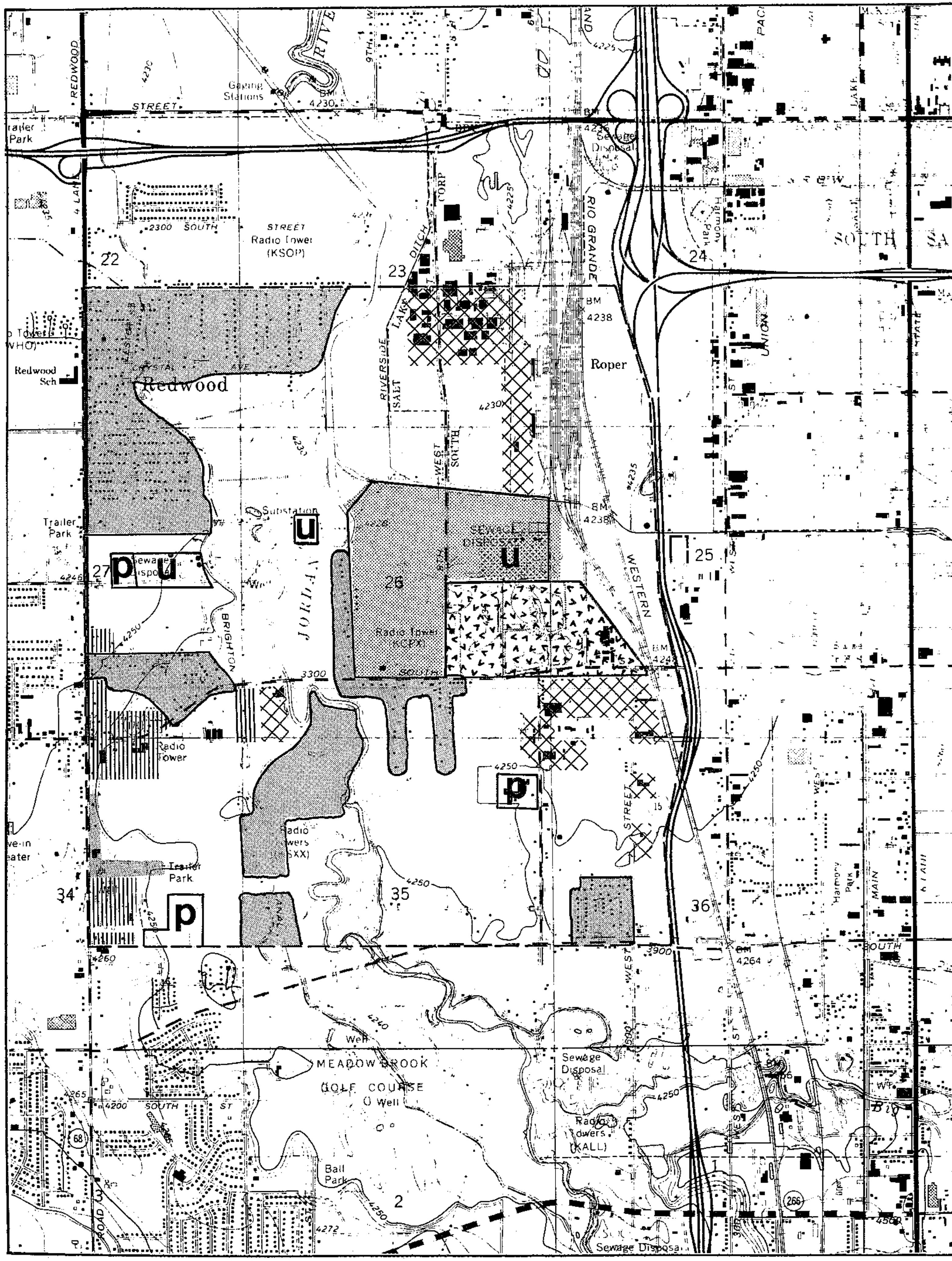
The impacts on land use resulting from proposed actions under the non-point source plan are confined to those regulatory programs which produce structural improvements. Such improvements include stormwater detention facilities as well as some structural improvement for erosion control in sensitive canyon/foothill areas.

Dentention facilities range in their design and location, from 200 acre tracts located near floodway zones to three and four acre facilities built in and around neighborhood and community parks (Reference Figures VI-8, 9, and 14).

The integration of water pollution control modifications into stormwater runoff facilities for flood control will have little - if any - negative impact on adjacent land uses. Where additional modifications increase stormwater detention time, the added ground inundated by the detention will be confined to park-open space uses owned and maintained by public entities. Positive land use relationships will be created where detention facilities are built in conjunction with parks and open spaces. Those facilities not located in neighborhood parks will be placed close to the Jordan River where storm drains discharge. All of these facilities will be integrated into the overall parkway design.

Erosion control along sensitive foothill or canyon settings may include - when appropriate - the construction of retaining walls, diversion ditches, flow dissipators, flumes, and berms. No adverse land use conflicts are anticipated from the installation of these kinds of facilities. Insofar as excavation and grading operations for development commonly produce negative visual and flood-related impacts on adjacent residential areas, the stabilization of such operations will reduce the present negative impacts. Priority areas for erosion control measures are referenced to Figure VI-16.

FIGURE VIII-7. EXISTING LAND USE, CENTRAL VALLEY FACILITY



(shaded)	RESIDENTIAL
(vertical lines)	COMMERCIAL
(cross-hatched)	INDUSTRIAL
(dotted)	VITRO TAILINGS - HAZARDOUS WASTE
u	PUBLIC UTILITY
p	PUBLIC PARK/INSTITUTIONAL
(blank)	AGRICULTURAL/VACANT

SOURCE: SALT LAKE COUNTY PLANNING COMMISSION. PROPERTY PLAT LAND USE INVENTORY, 1975. SALT LAKE COUNTY WATER QUALITY. PHOTO-INTERPRETATION @ 1" = 200'. 1975.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

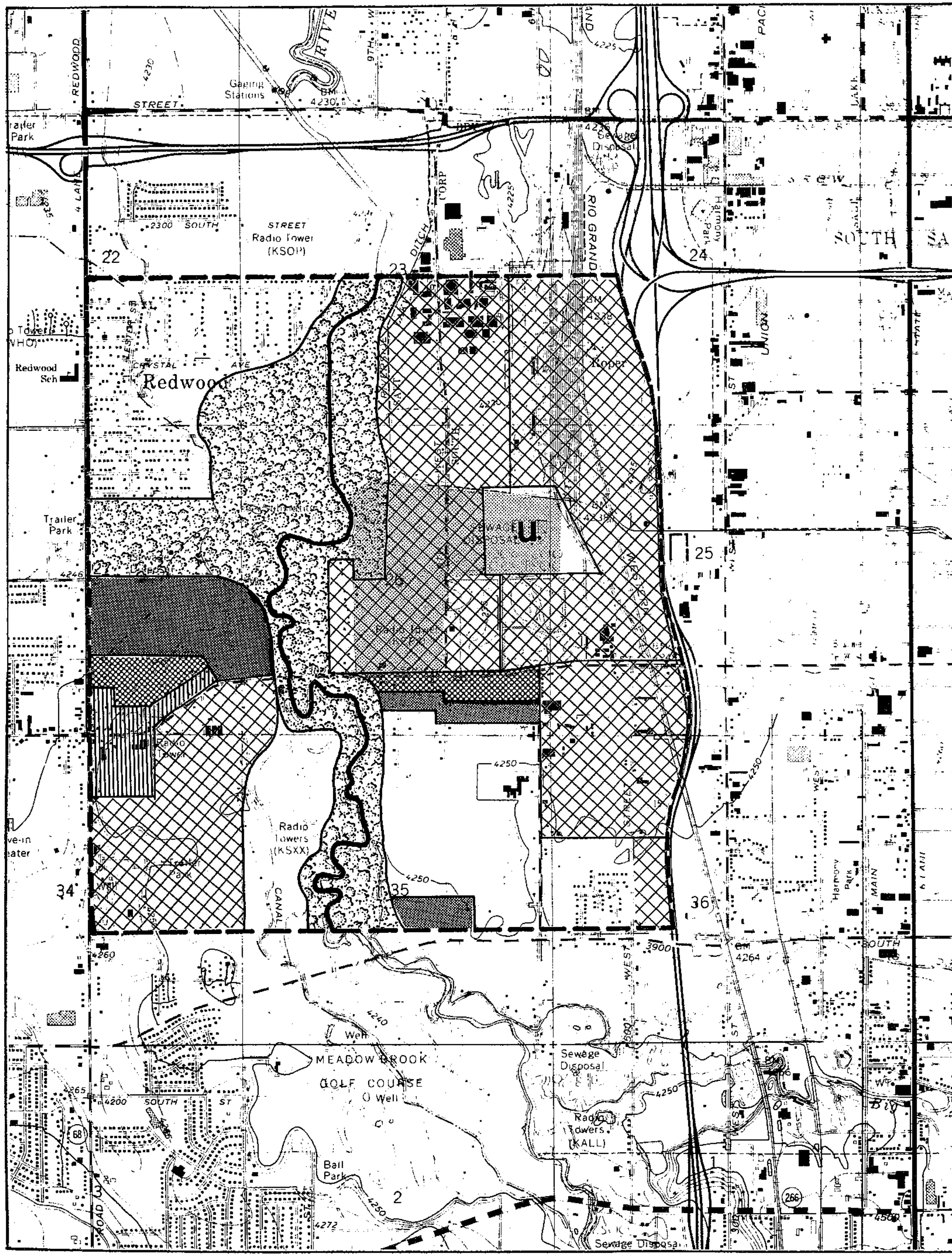
NORTH

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

feet (1000's) 0 1 2 3

FIGURE VIII-8. PROJECTED LAND USE, CENTRAL VALLEY FACILITY



RESIDENTIAL - LOW DENSITY (1-7 UNITS PER ACRE)

RESIDENTIAL - HIGH DENSITY (14-20 UNITS PER ACRE)

RESIDENTIAL - MEDIUM DENSITY (7-14 UNITS PER ACRE)

INDUSTRIAL

COMMERCIAL

JORDAN RIVER PARKWAY

u PUBLIC UTILITY

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

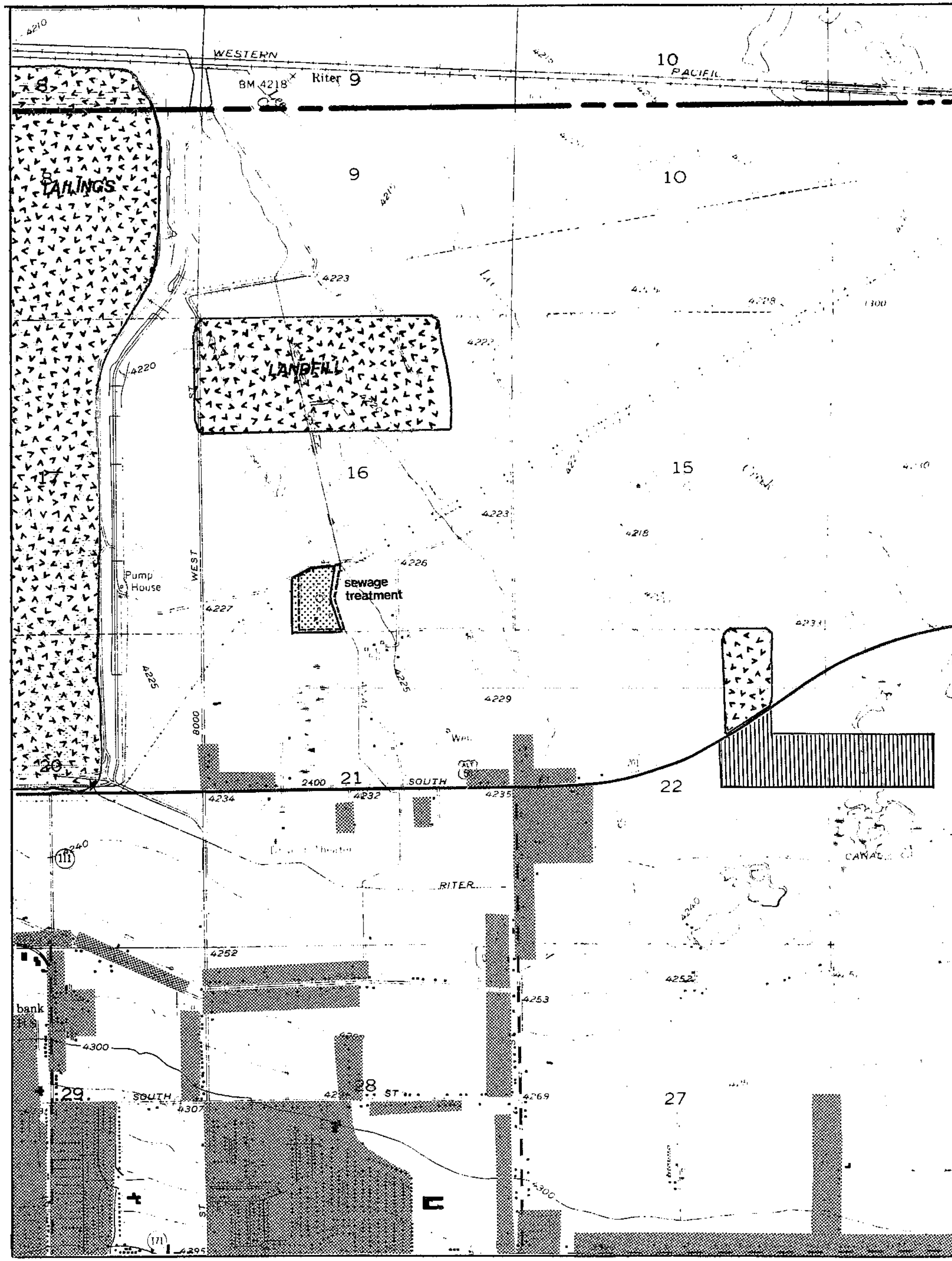
Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

NORTH

acres 40

feet (1000's) 0 1 2 3

FIGURE VIII-9. EXISTING LAND USE, MAGNA FACILITY



EXISTING FACILITY SITE BOUNDARIES

RESIDENTIAL

INDUSTRIAL

COMMERCIAL

AGRICULTURAL/VACANT

SOURCE: SALT LAKE COUNTY PLANNING COMMISSION. PROPERTY PLAT LAND USE INVENTORY, 1975. SALT LAKE COUNTY WATER QUALITY. PHOTO-INTERPRETATION @ 1" = 200'. 1975.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

acres 40

feet (1000's) 0 1 2 3

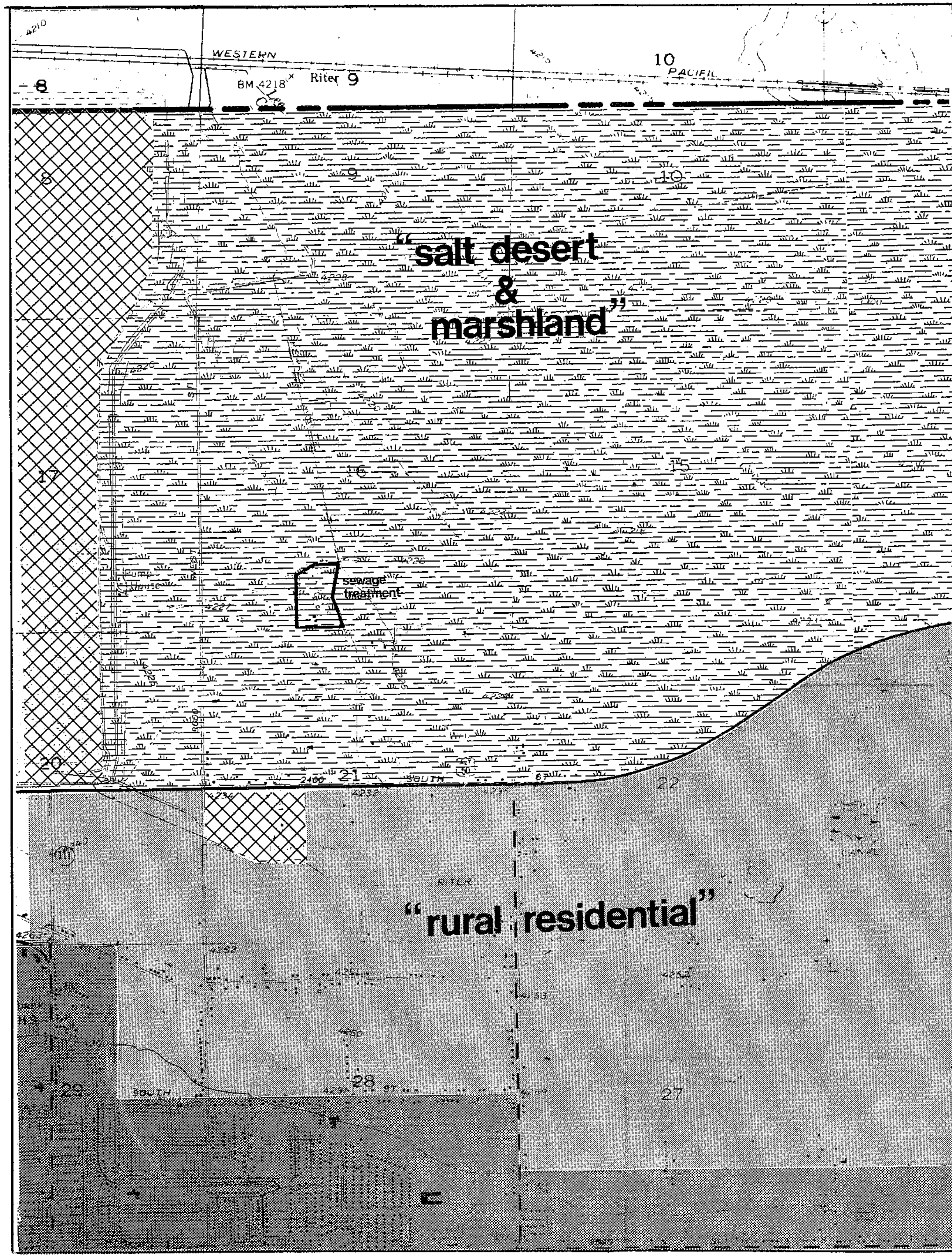


FIGURE VIII-10. PROJECTED LAND USE, MAGNA FACILITY

RESIDENTIAL

"RURAL RESIDENTIAL"

INDUSTRIAL

"SALT DESERT & MARSHLAND"

SOURCE: SALT LAKE COUNTY PLANNING COMMISSION, <u>MAGNA DISTRICT DEVELOPMENT PLAN</u>, 1974, AND <u>SALT LAKE VALLEY MASTER PLAN</u>, 1965.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

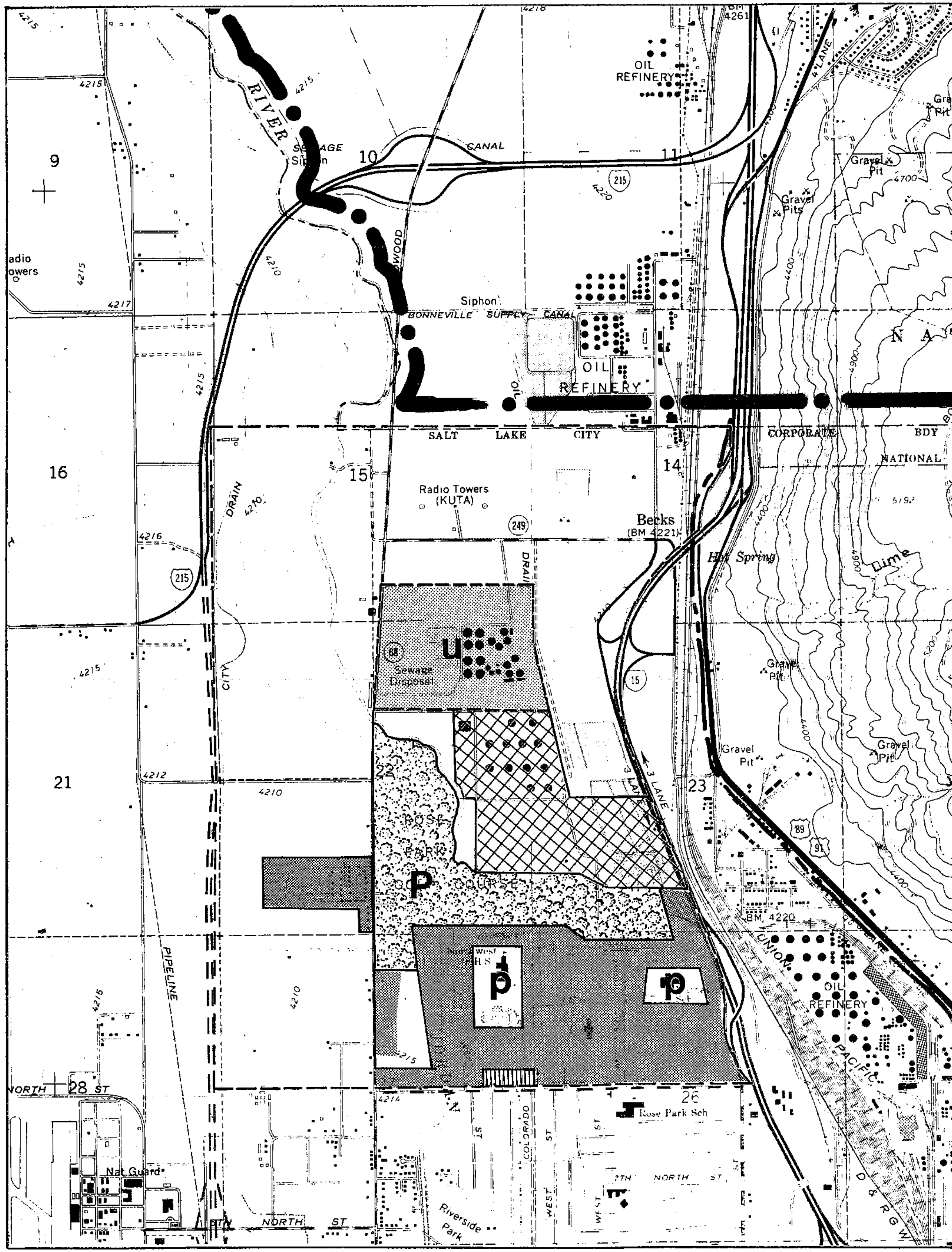
Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

acres 40

feet (1000's) 0 1 2 3

NORTH

FIGURE VIII-11. EXISTING LAND USE, SALT LAKE CITY FACILITY



RESIDENTIAL

COMMERCIAL

INDUSTRIAL

PUBLIC PARK/OPEN SPACE

PUBLIC FACILITIES

PUBLIC UTILITY (SEWAGE DISPOSAL)

VACANT/AGRICULTURAL

SOURCE: SALT LAKE COUNTY PLANNING COMMISSION, PROPERTY PLAT LAND USE INVENTORY, 1975. SALT LAKE COUNTY WATER QUALITY. PHOTO-INTERPRETATION @ 1" = 200'. 1975.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

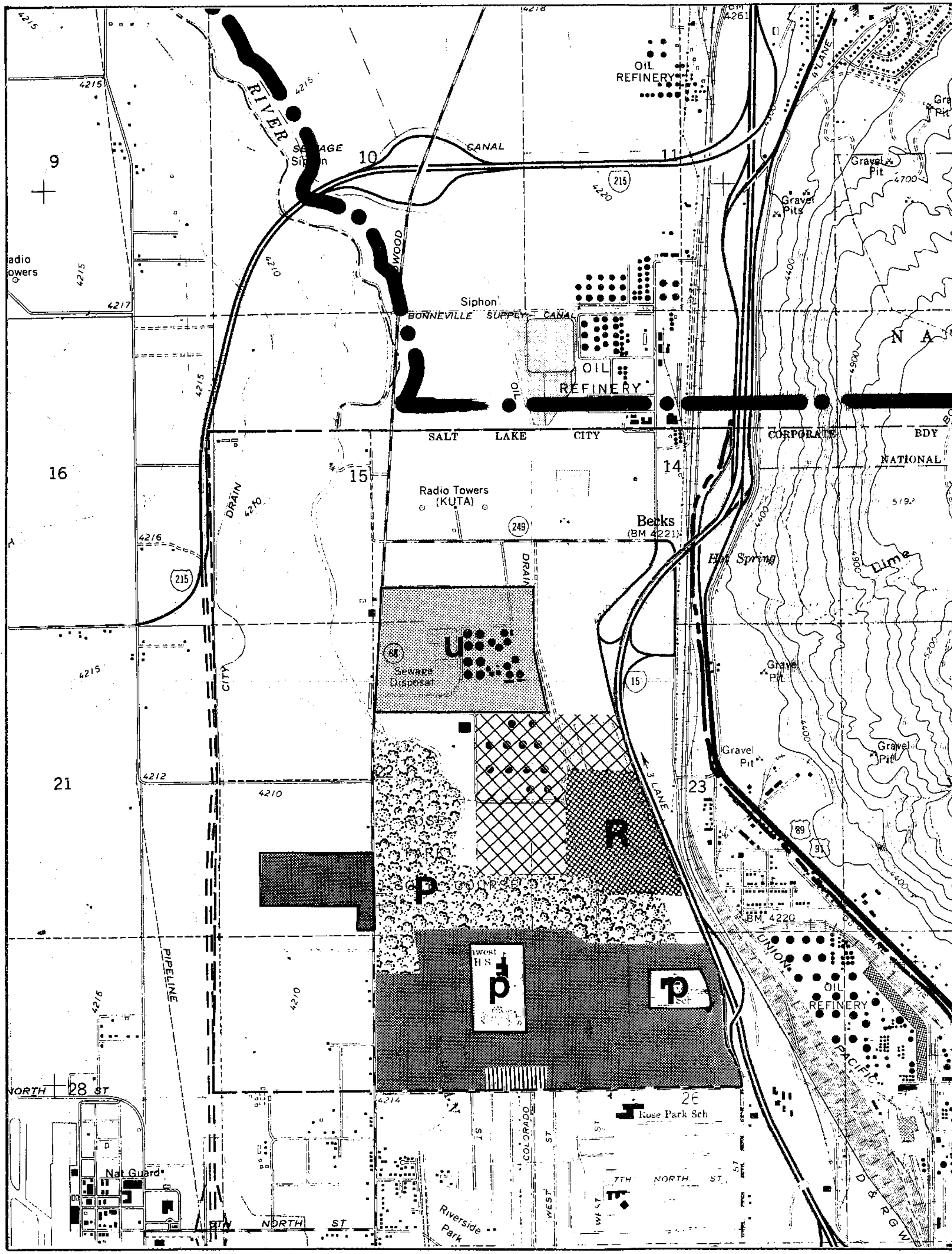
NORTH

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

feet (1000's) 0 1 2 3

FIGURE VIII-12. PROJECTED LAND USE, SALT LAKE CITY FACILITY



	RESIDENTIAL - LOW DENSITY
R	PROPOSED RESIDENTIAL - HIGH DENSITY
	COMMERCIAL
	INDUSTRIAL
P	PARK/OPEN SPACE
p	PUBLIC FACILITIES
u	PUBLIC UTILITY (SEWAGE TREATMENT)
	VACANT/AGRICULTURAL

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

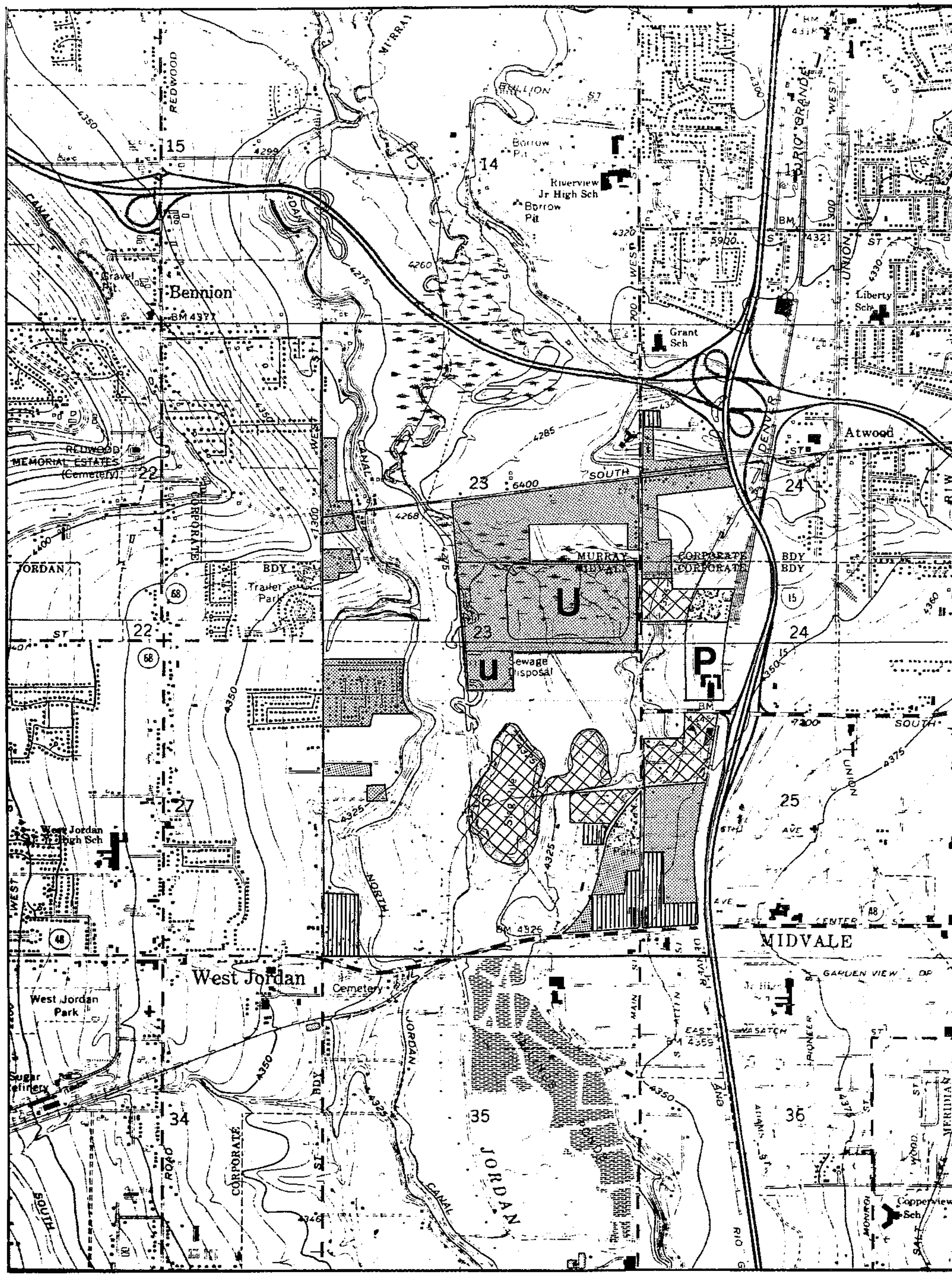
NORTH

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

feet (1000's)
0 1 2 3

FIGURE VIII-13. EXISTING LAND USE, SOUTH VALLEY FACILITY



RESIDENTIAL

COMMERCIAL

INDUSTRIAL

PARK/OPEN SPACE

u — PUBLIC UTILITY (EXISTING FACILITIES)

P — PUBLIC MAINTENANCE FACILITY

AGRICULTURAL/VACANT

SOURCE: SALT LAKE COUNTY PLANNING COMMISSION, PROPERTY PLAT LAND USE INVENTORY, 1975. SALT LAKE COUNTY WATER QUALITY, PHOTO-INTERPRETATION @ 1" = 200'. 1975.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

feet (1000's) 0 1 2 3

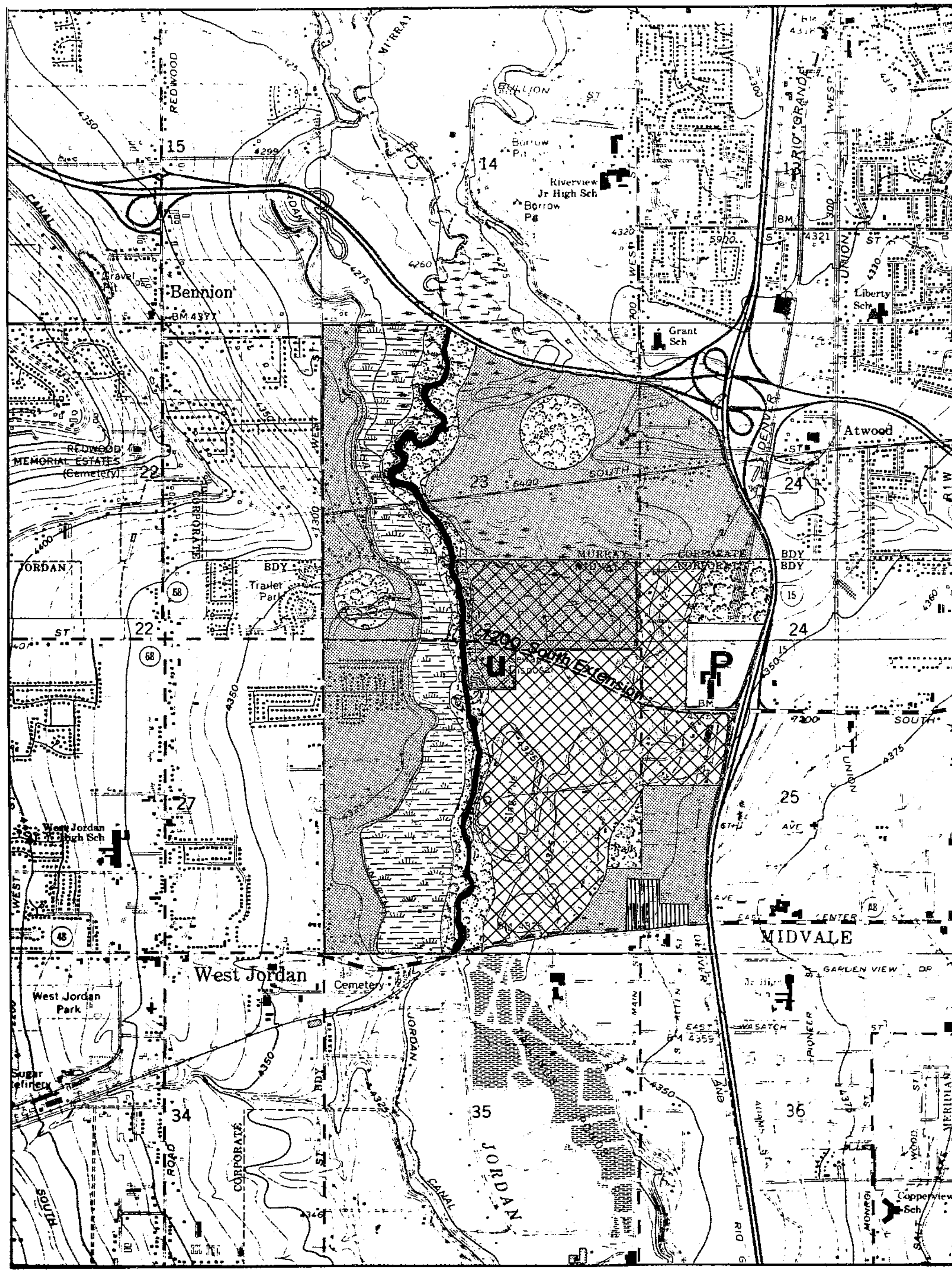


FIGURE VIII-14. PROJECTED LAND USE, SOUTH VALLEY FACILITY

- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PARK/OPEN SPACE
- P PUBLIC MAINTENANCE FACILITIES
- u PUBLIC UTILITY (SEWAGE DISPOSAL)
- AGRICULTURAL
- PROPOSED PARKS

SOURCES: SALT LAKE COUNTY PLANNING COMMISSION. "LITTLE COTTONWOOD DISTRICT DEVELOPMENT PLAN." DUNCAN & JONES, ASSOC. 1976. WEST JORDAN CITY. "WEST JORDAN MASTER PLAN." PLANNING & RESEARCH ASSOC. 1977

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

NORTH

feet (1000's) 0 1 2 3

and make direct access by children unattractive. Such design integration is entirely possible through careful site selection where wetlands conditions are prevalent or where wetland conditions could be expanded or allowed to dominate. Existing park facilities in the county have demonstrated this design approach to be viable and attractive.

The health and safety impacts of erosion control are generally positive. The reduction of surface runoff volume and velocity play a key role in reducing down-slope or downstream flood effects. The benefits of erosion control are of a preventive, indirect nature. Prevention of loss of life and property is only one benefit, while others include savings in tax dollars, operation and management expenditures, soil loss, and flooding loss.

EDUCATION

The concept of public parks serving a multiple use carries unlimited benefits to education. There are particularly beneficial aspects to wetlands enhancement in the public park multiple use role. The opportunities available to park users in a multiple use park go far beyond traditional recreational diversion:

1) The provision of diversity of vegetation and wildlife species offers educational benefits in the study of biology, ecology, and related subjects.
2) Density and diversity of landscaping materials - through the enhancement of natural floral species - offers greater artistic benefits.
3) The variety of leisure recreational activities can be expanded through diversity of landscape design.

4) Preservation or enhancement of diverse habitat conditions fosters greater wildlife diversity - the symbol of healthy ecologic conditions.

The design of detention and desilting facilities fits well into a multiple use park/open space concept. Erosion control, however, provides fewer educational benefits. Erosion measures are site-specific in their application, and apply to areas impacted by grading, excavation, or other land-disturbing activities. The addition of erosion controls to construction scheduling will serve little educational benefit except for those who are interested in measuring their impacts and describing their benefits to the community.

RECREATION

The benefits to recreation from stormwater detention facility construction include the possible enrichment of the recreational experience through diversification of vegetative and wildlife, species. The multiple use of park facilities will also enable gaining economies in park development through the coordination and integration of various Federal Grant programs. Other educational benefits will add to the value of such multiple use facilities.

The impacts of erosion control on recreation are minimal. The addition of vegetation or other slope stabilization measures will add only visual improvement as a recreational benefit.

SOCIAL IMPACTS

Central Valley Facilities

There are two possible social impacts that can be expected with construction of facilities at the proposed site:

1) Recreational facilities or recreational quality relating to the Jordan River Parkway may be impaired unless adequate measures are taken to integrate the public wastewater treatment facilities with public parkway development. These measures should be given heavy consideration in the design and construction of new facilities.

2) Public health and safety may be desperately impaired if measures to remove flood hazards are not taken. The inundation of sewage treatment facilities may cause untold damage to confinement and control efforts for disease related to sewage wastes. Loss of life of plant personnel is also a consideration for ignorance of real flooding hazard.

Magna Facilities

There are no anticipated social impacts as a result of expanding the Magna facilities. There exist no recreational, educational, or residential resources that could be impaired and no natural hazards to public health or safety.

Salt Lake City Facilities

There are two possible social impacts relating to construction of treatment works at the Salt Lake City plant site:

1) Impairment of public health and safety due to location within the intermediate zone floodway.

2) Objectionable odor problems affecting the quality of the nearby high density residential environment.

South Valley Facilities

Possible social impacts may occur in the following categories:

Recreation

The compatability between the proposed regional treatment facility and proposed community and Jordan River Parkway facilities depends largely on how the new sewage plant integrates open space design into its surrounding landscape, what kinds of recreationally oriented amenities are provided, and how the plant deals with potential odor problems which could make recreational activity undesirable near the plant.

Since extensive recreational opportunities exist near the plant and are projected to satisfy local needs for all county residents, the possibility of the new facility expansion being incompatible with recreation use does exist. However, design considerations could effectively mitigate any anticipated conflict.

Public Safety

The construction of additional vehicular access, development of recreational facilities and close proximity to mobile home residential use, all present increased hazards to public safety. These are hazards that are, however, created as a result of increaseduse not directly attributable to the operation of a wastewater treatment facility.

The facility itself may reduce these risks through the incorporation of a number of safety measures which include:

* Constructing facilities that provide limited access opportunities directly inside plant equipment or structures.
* Providing adequate fencing, landscape buffers, and fencing that direct or inhibit human activity within treatment plant works.
* Provision of around-the-clock personnel or security.

Public Health

The expansion of treatment facilities in close proximity to mobile home residential use does present the possibility of increased airborne pollutants and odor.

Education

Educational opportunities will possibly accompany the development of public wastewater facilities in conjunction with Jordan River Parkway facilities. As described under "Projected Water Quality Impacts," the attainment of new effluent standards through advanced sewage plant design and process will be a reality.

The educational value to be gained at this site involves a public demonstration as to the preservation of environmental quality concurrent with development activity. The provision of public open space areas around the plant may give incentive to such demonstrations for school, civic, and church groups in addition to providing a local environment pleasant to visit or at least not unpleasant.

Cultural Resource Survey

It is emphasized that any construction of facilities between the Jordan River low water channel and existing facilities may necessitate a "cultural resource survey" through the State Historic Preservation office. (See Appendix A-7.)

NON-LIVING MATTER

Soils

Central Valley Facilities

The soil conditions at the Central Valley facilities site include hazards for erosion, shrink-swell, high watertable, salt/alkali, high water runoff potential and very slow permeability. This combination of conditions may produce diseconomies in the life and performance of the facilities over time. Mitigation of high shrink-swell potential, salt/alkali, and watertable problems should be demonstrated in any design details for facilities at this site. In addition, the high runoff and erosion potential imply additional sensitivity to construction runoff and controlling grading and excavation. Because this site can potentially contribute large loads of suspended sediment and associated pollutants to Class 3A receiving waters, such controls should be mandatory and addressed in the Step I completion phase.

Magna Facilities

The soil mapping units present on the Magna facilities site possess the same limiting characteristics as those of the Central Valley facilities site. The same mitigating procedures that apply to new construction for the Central Valley site apply to construction at the Magna site.

Examples of such procedures include:

1. Gravel "collaring" around building foundations to prevent shrink-swell.

2. Provision of sub-surface underdrain system for disposal of seasonal high watertable seepage. Include drainage around gravel collars.

3. Treatment of all subsurface utilities with salt/alkali retardant material or chemical to prevent premature wear of such utilities.

4. Design of erosion control plan in connection with surface drainage plan so as to preclude unnecessary discharge of polluted stormwater into receiving streams.

Salt Lake City Facilities

The Decker Association soils are characterized by high shrink-swell potential, strong salt/alkali effects, and slow permeability. These are the primary soil conditions that will impact the expansion of the Salt Lake facilities. Mitigation such as those given in examples above should apply under these circumstances.

South Valley Facilities

The existing soil conditions at the subject site indicate that a high seasonal water table (0"-30") is present within five of the six mapping units which cover the site. Three of six mapping units possess strong salt/alkali conditions and a high water runoff potential. Other constraining factors present on the site include high erosion hazard, very rapid permeability, very slow permeability, and high shrink-swell potential.

The implications of these soil constraints are that additional data in the form of test borings at greater depths are necessary to corroborate the problems that may result from construction on the site without installation of proper mitigating techniques.

The soil conditions present for the Jordan Valley, Magna, Salt Lake City, and South Valley facility sites are summarized in Figures VIII-22 through VIII-25 respectively.

Geology

A description of primary geologic features in Salt Lake County has previously been presented in Figure III-8. Therefore only a description of geologic conditions at each wastewater facility site and general influences to detention facilities will be presented here.

The point source management plan involves construction of wastewater treatment facilities at four locations in Salt Lake County (Reference Figure IV-3). Geologic conditions at wastewater facility sites are characterized by a preponderance of Lake Bonneville deposits that have been eroded and carved by the meandering Jordan River and the River in turn has left flood plain deposits of post Lake Bonneville age. All deposits are those of Quaternary age, ranging from cobbly alluvial material to fine silted clays:

> The River ran across the lake bottom sediments of what is now the Jordan Valley and cut a valley in them marked by several prominent terraces on each side. The Jordan River changes from an erosional stream to a depositional stream at about 3300 South and from this point Northward has been engaged in flood plain and levee building for the past few thousands of years.

Both geologic mapping sources, the United States Geological Survey and the Utah Geological and Mineralogical Survey point out that the South Valley facility site is located within a marshland or swamp. Clarification of this marshland identification is necessary in determining its applicability as a "wetlands" area, as defined by the U.S. Corps of Engineers in the administration of dredge and fill permits as authorized under Section 314b of the 1977 Clean Water Act. Local Corps officials have already informally indicated that this site is categorized as a wetland. Permits for any excavation near the river or within the identified wetland will most likely have to be secured.

The North Valley Plant site (also termed Central Valley Plant) marks the division between floodplain deposits and those with associated delta complexes of the same age. Changes in elevation at the North Plant site are indicative of Provo and younger aged Lake bottom silts and sands of ancient Lake Bonneville.

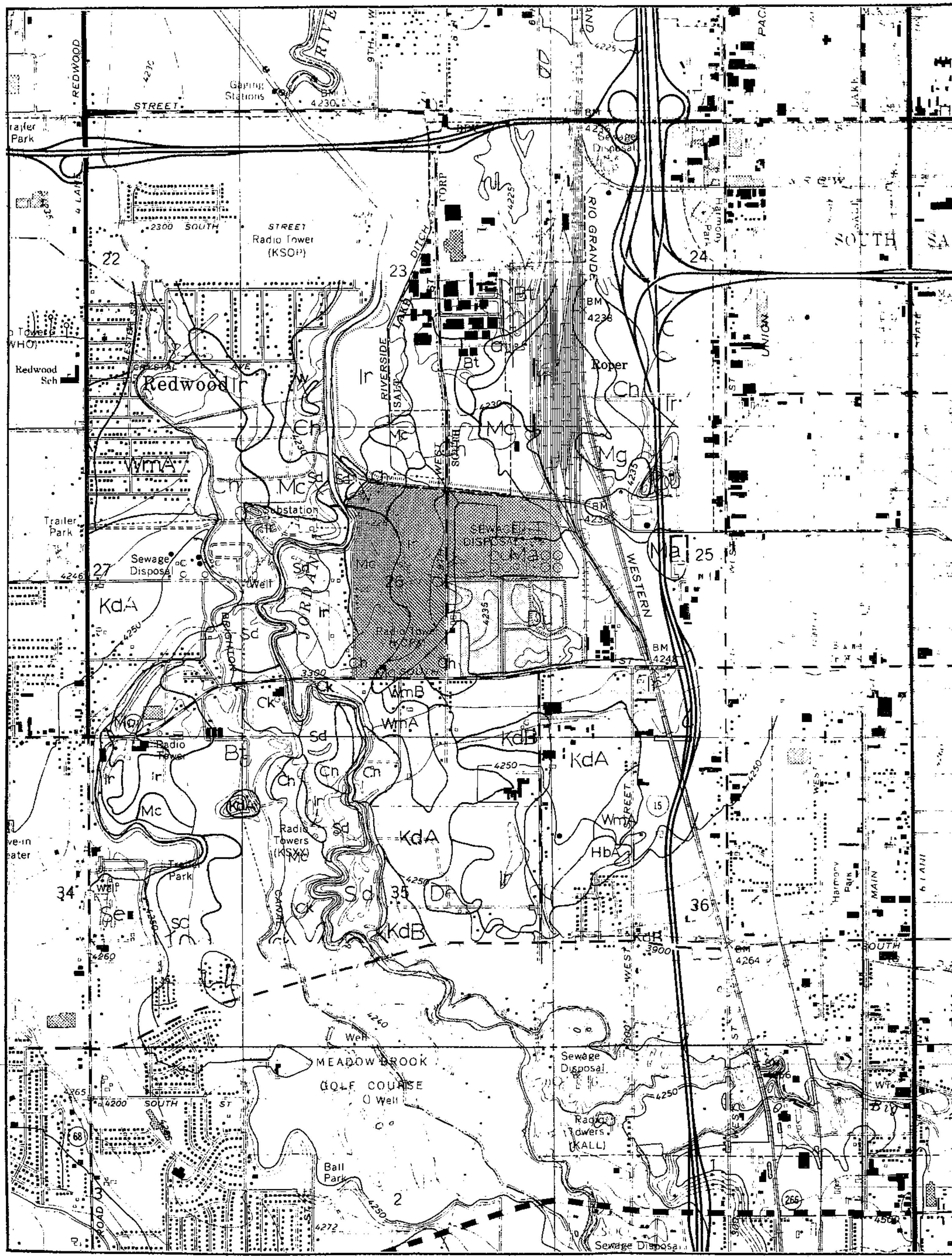


FIGURE VIII 22. EXISTING SOIL CONDITIONS

CENTRAL VALLEY FACILITIES

SOIL SURVEY INCLUDES ONLY THOSE CONSTRAINING FACTORS TO CONSTRUCTION, REQUIRING MITIGATION OR SPECIAL SITE PREPARATION MEASURES.

Source: U.S. Department of Agriculture Soil Survey of Salt Lake Area Utah. Soil Conservation Service. 1974.

*May be a severe constraint area due to subsidence, insects, methane gas generation, and radioactive substances.

SOIL UNIT	SEVERE CONSTRAINING FACTORS	High Erosion Hazard	High Shrink-Swell Potential	0"-30" Watertable Depth	Impermeable, Very Slow	High Water Runoff	Strong Salt/Alkali
Ma: Made Land		X					
Mc: Magna Silty Clay			X	X	X	X	
Mg: Magna Silty Clay-Peaty Surface			X	X	X	X	
Ch: Chipman Silty Clay Loam				X		X	
Ir: Ironton Loam				X			X
Du: Dump*							

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

NORTH

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

feet (1000's) 0 1 2 3

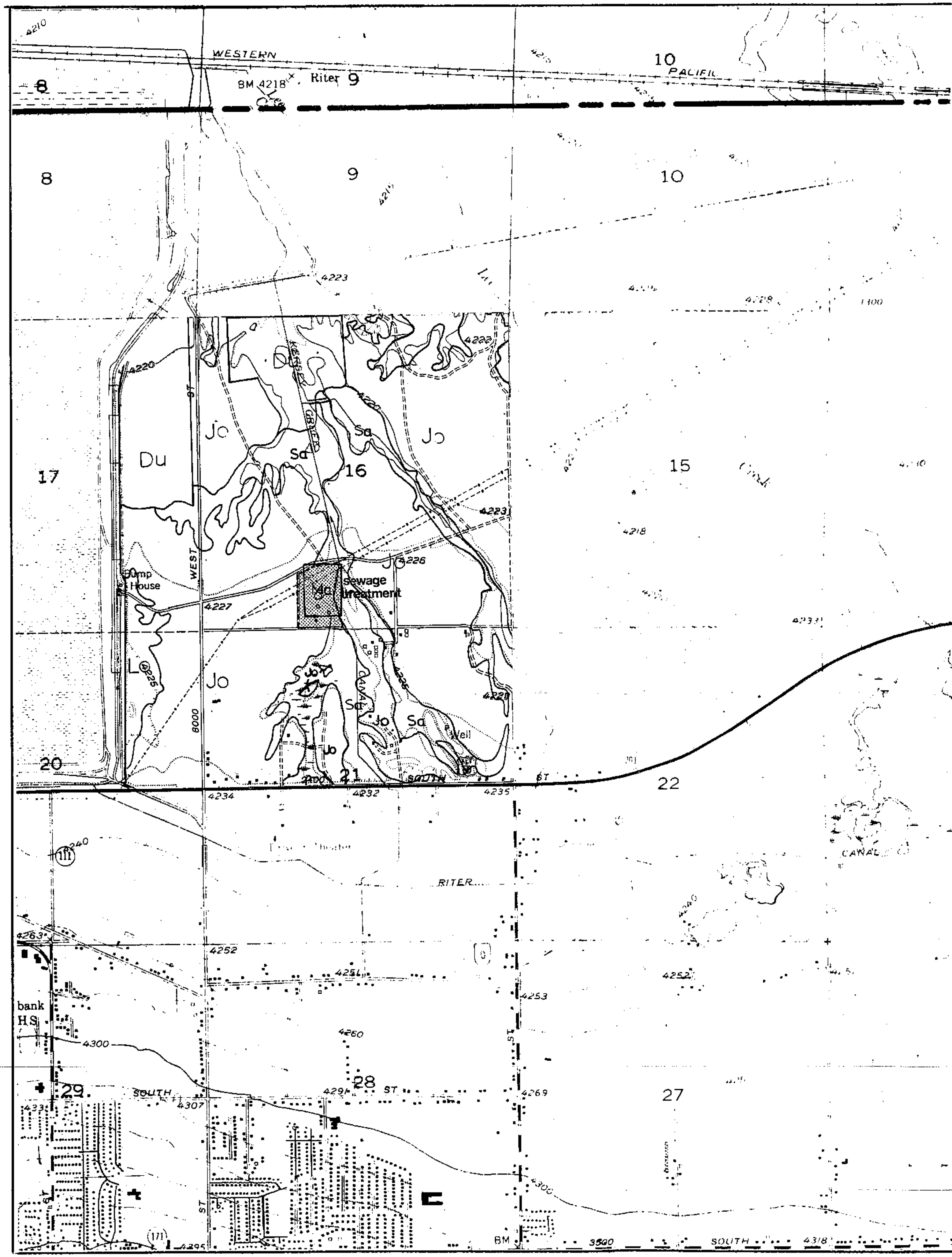


FIGURE VIII-23. EXISTING SOIL CONDITIONS, MAGNA FACILITIES

SOIL SURVEY INCLUDES ONLY THOSE CONSTRAINING FACTORS TO CONSTRUCTION, REQUIRING MITIGATION OR SPECIAL SITE PREPARATION MEASURES.

SOIL UNIT	SEVERE CONSTRAINING FACTORS	High Erosion Hazard	High Shrink-Swell Potential	Strong Salt/Alkali	Impermeable, Very Slow	High Runoff Potential	0"-30" Watertable
Ma: "Made Land"		X					
Jo: Jordan Silty Clay Loam			X	X	X	X	
Sa: Saltair Silty Clay Loam				X	X	X	X

Source: U.S. Department of Agriculture Soil Survey of Salt Lake Area Utah. Soil Conservation Service. 1974.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

acres 40

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

feet (1000's) 0 1 2 3

NORTH

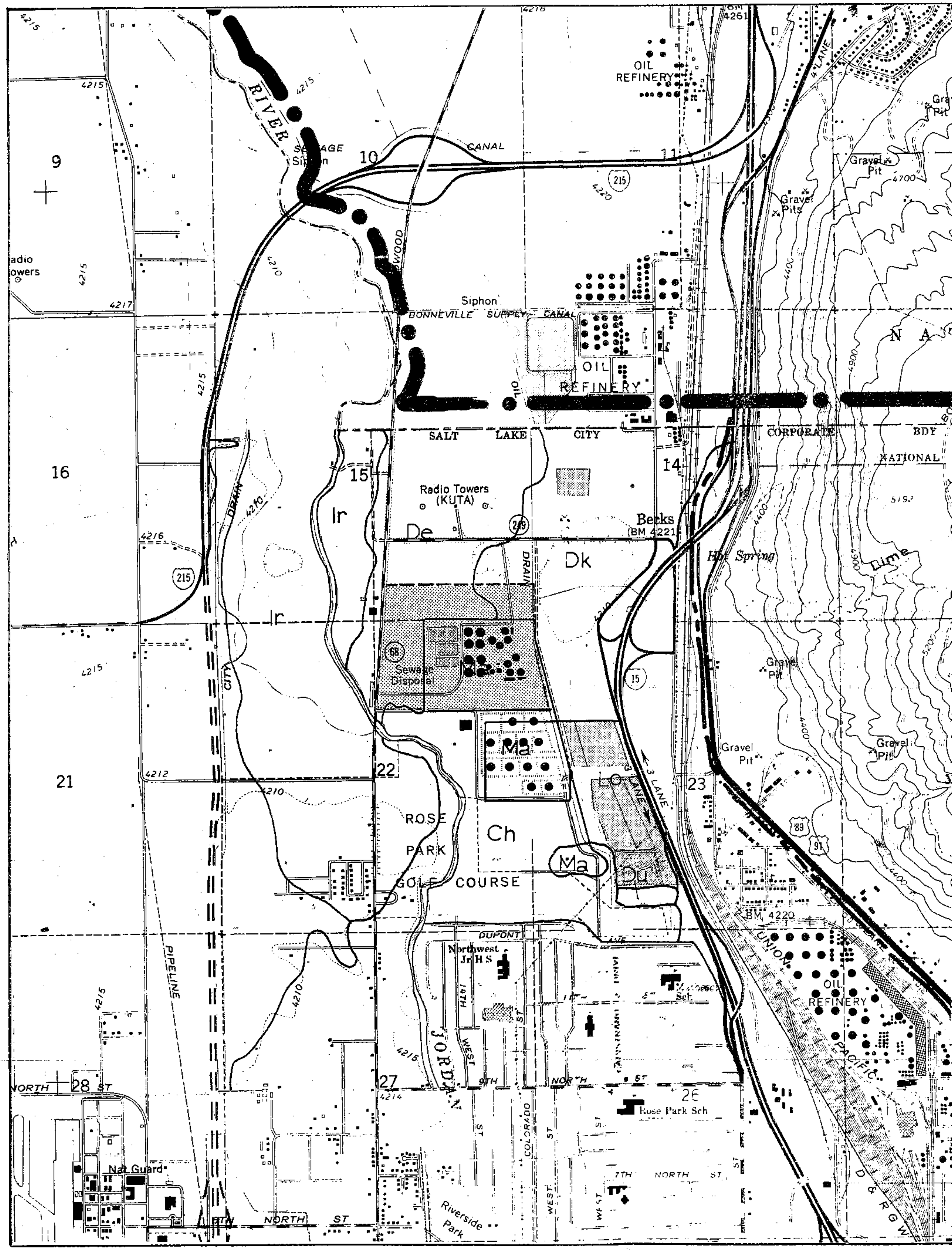


FIGURE VIII-24. EXISTING SOIL CONDITIONS, SALT LAKE CITY FACILITY

SOIL SURVEY INCLUDES ONLY THOSE CONSTRAINING FACTORS TO CONSTRUCTION, REQUIRING MITIGATION OR SPECIAL SITE PREPARATION MEASURES.

SOIL UNIT	SEVERE CONSTRAINING FACTORS	High Shrink-Swell Potential	Strong Salt/Alkali	Impermeable, Very Slow	High Erosion Hazard
De: Decker Fine Sandy Loam		X	X	X	
Dk: Decker Loam - Strongly Saline/Alkaline		X	X	X	
Ma: Made Land					X

Source: U.S. Department of Agriculture, Soil Survey of Salt Lake Area, Utah, Soil Conservation Service, 1974.

Salt Lake County Water Quality & Pollution Control

208 Water Quality Plan

Financed Under Section 208 of the Federal Water Pollution Control Act of 1972, as amended.

acres 40

feet (1000's) 0 1 2 3

NORTH

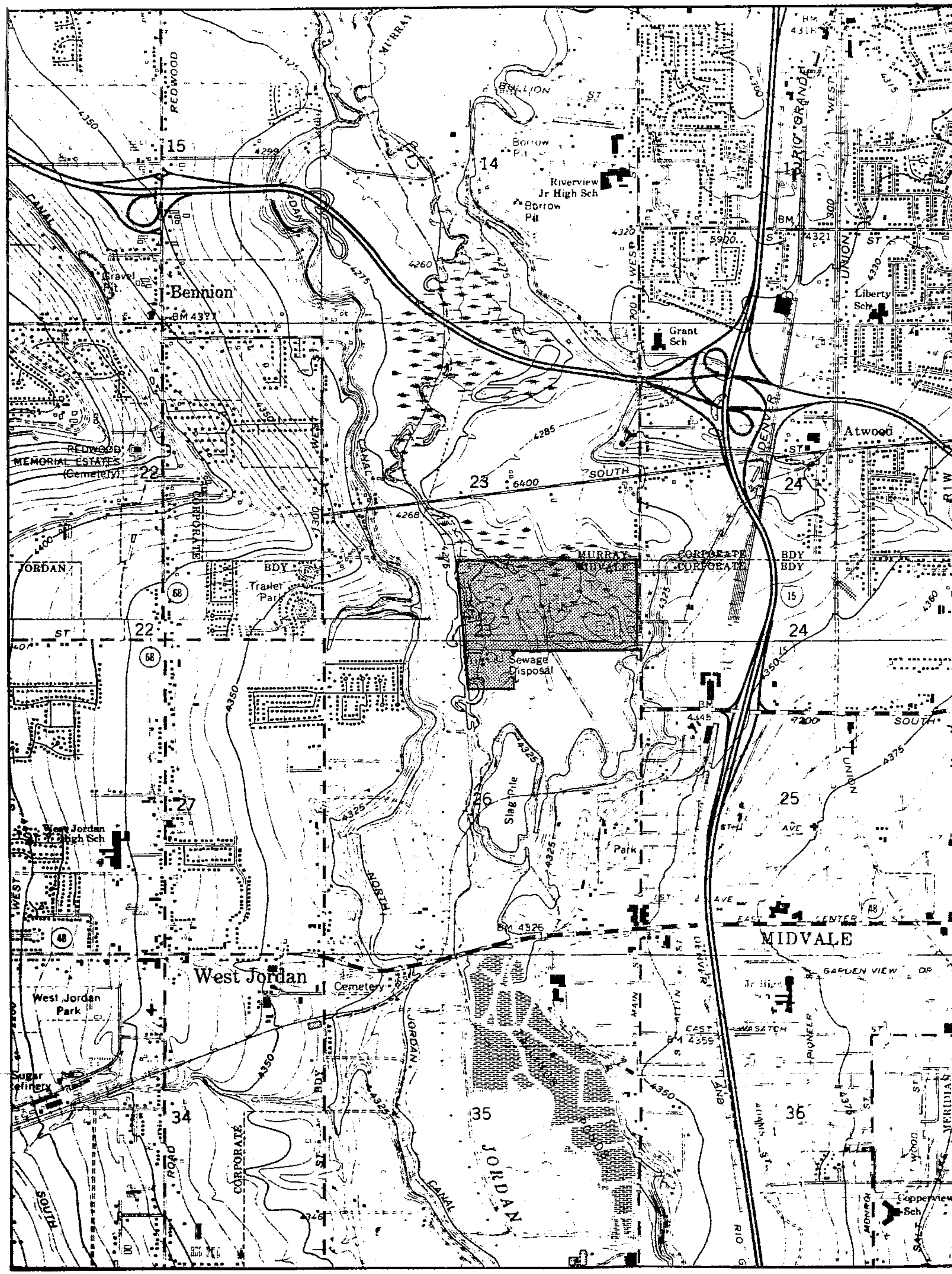


FIGURE VIII-25. EXISTING SOIL CONDITIONS, SOUTH VALLEY FACILITIES

SOIL SURVEY INCLUDES ONLY THOSE LIMITING OR CONSTRAINING FACTORS TO CONSTRUCTION, REQUIRING MITIGATION OR SPECIAL SITE PREPARATION OR CONSTRUCTION MEASURES.

Soil Unit	Severe Constraining Factor	High Erosion Hazard	Very Rapid Permeability	0"-30" Water Table	Strong Salt/Alkali	High Runoff Potential	High Shrink-Swell	Very Slow Permeability
Mc: Magna Silty Clay				X		X	X	X
Mg: Magna Silty Clay, Peaty Surface				X		X	X	X
Mu: Mixed Alluvial Land				X	X			
Ck: Chipman Silty Clay Loam				X	X	X		
Bt: Bramwell Silty Clay Loam		X	X					
Sd: Sandy Alluvial Land		X	X	X	X			

Source: U.S. Department of Agriculture, Soil Survey of Salt Lake Area, Utah, Soil Conservation Service, 1974.

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Salt Lake City Facilities are built on the same floodplain/delta complex as the Central Valley facilities, and the Magna treatment works will be located on the Lake Bonneville and Provo silts and sands.

The only limitations involving geologic conditions may occur at the South, Central, and Salt Lake City facilities. These limitations are a function not of the geologic conditions per se (such as those relating to structural bearing capacity, compaction, etc.) but to the condition producing the geologic condition: The Jordan River. Frequency of the intermediate and standard project flood are estimated by the U.S. Corps of Engineers at 100 years and greater than 100 years respectively:

> "....an intermediate regional flood has a frequency of occurrence of about once in 100 years on the average, and a standard project flood would occur less frequently than the intermediate regional flood. Although the standard project Flood is a rare event, it can reasonably be expected to occur in the future." (From U.S. Corps of Engineers, Floodplain Information, March, 1974.)

Floods of major proportions are not only possible at or within identified floodzones, but they are entirely probable, and all but predictable.

The non-point plan elements, primarily stormwater detention facilities, will not be adversely affected by underlying geologic conditions within Salt Lake County. The majority of detention basins are located above substrate with very good drainage comprised of shore facies of sand and gravel of Quaternary age. However, some detention areas will be underlain by ancient lake bottom sands and silts. These areas must be further evaluated to insure that groundwater recharge is possible and that extreme periods of long standing stagnant water can be avoided or sufficiently reduced.

Figures VIII-26 and VIII-27 summarize geologic conditions at the Central Valley and South Valley facility sites respectively.

Present Water Quality

Present water quality of the Jordan River, the Jordan River tributaries, irrigation canals, drainage canals, and storm drainage in Salt Lake County has been described in detail in Section III and will not be repeated here.

Projected Water Quality

Future water quality of the Jordan River tributaries has been described in Section III and will not be repeated here. Future water quality of the Jordan River with implementation of the selected point source plan is listed in Table VIII-1 and shown graphically in Figure VIII-28 for low flow (summer) conditions.

Present Air Quality

Present air quality has been discussed in Section III and will not be repeated here.

Projected Air Quality

Future air quality impacts from implementing elements of the point and non-point source plans will be both direct and indirect. Direct impacts result from construction of sewage treatment plants and detention basins. Indirect impacts will result from the operation of these facilities and from additional growth related to expansion of sewage treatment facilities (principally transportation).

As delineated in Sections III, V, and VII, the entities that have jurisdiction over these facilities are so diverse in nature that they cannot reasonably be expected to control air quality impacts generated from the implementation of point and non-point plans. Attainment of the December 31, 1982 or the December 31, 1987 air quality standards is the responsibility of the State Bureau of Air Quality through implementation of the State Implementation Plan (SIP). As of this date, there exists no SIP for Utah.

A discussion of the situation is presented in Section IV and will not be repeated here.

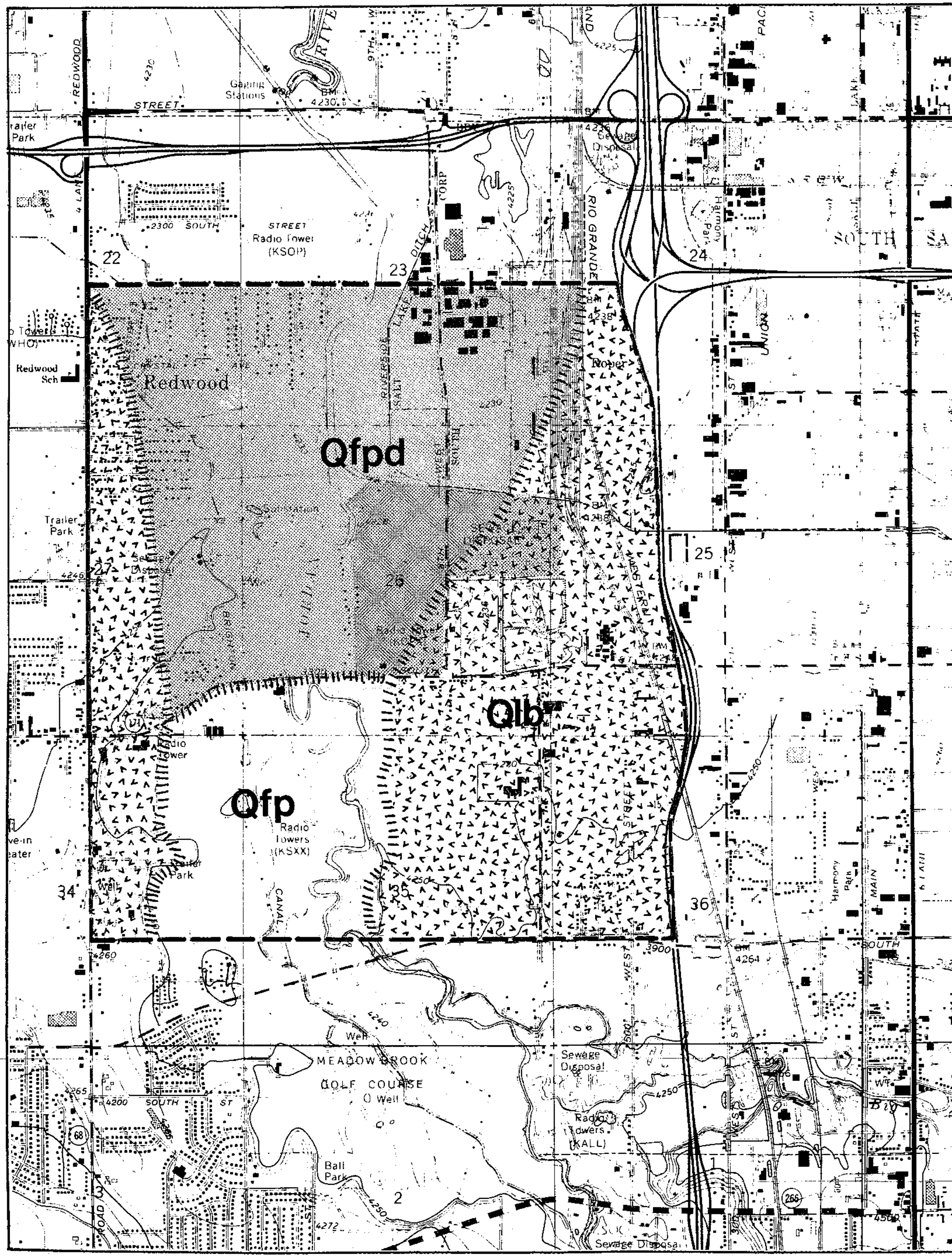

FIGURE VIII-26. GEOLOGY, CENTRAL VALLEY FACILITY

QFPD: JORDAN RIVER FLOOD PLAIN & DELTA COMPLEX

QLB: PROVO & YOUNGER LAKE BOTTOM SILTS & SANDS

QFP: FLOOD PLAIN DEPOSITS ALONG EXISTING STREAMS

RELATIVE BOUNDARY BETWEEN GEOLOGICAL MAPPING UNITS

Sources: Utah Geological and Mineralogical Survey. "Geologic Map of Salt Lake County," in Bulletin 69. University of Utah, June, 1960.

United States Geological Survey. "Midvale Quadrangle" and 'Salt Lake City South Quadrangle." Denver, CO. (Photo revised, 1969).

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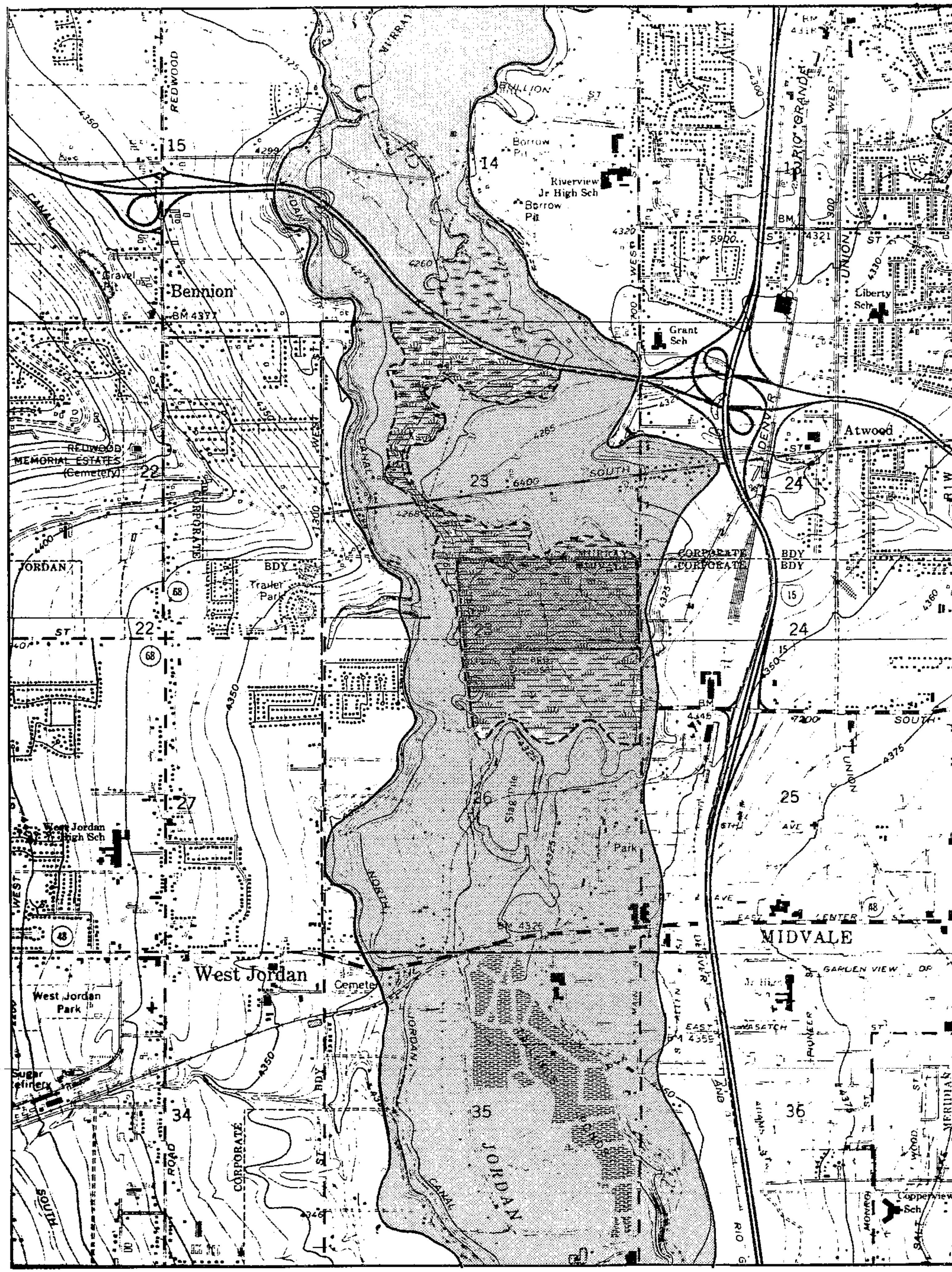

FIGURE VIII-27. GEOLOGY,
SOUTH VALLEY FACILITY

Post Lake Bonneville (Quaternary) Flood Plain Deposits

Marshland. (As identified by United States Geological Survey)

Sources: Utah Geological and Mineralogical Survey. "Geologic Map of Salt Lake County," in Bulletin 69. University of Utah, June, 1960.

United States Geological Survey. "Midvale Quadrangle" and "Salt Lake City South Quadrangle." Denver, CO. (Photo revised, 1969).

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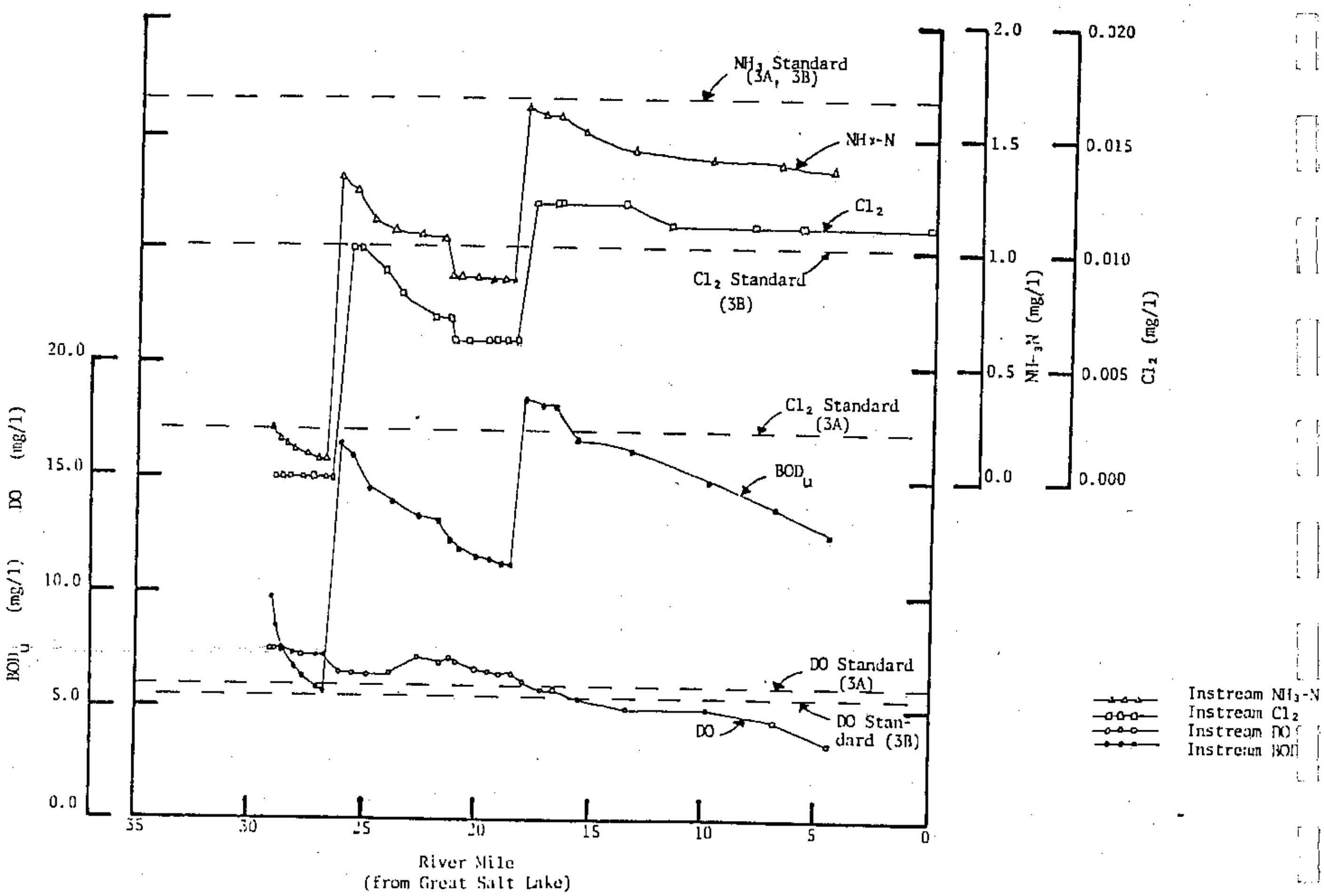
TABLE VIII-1. Jordan River Water Quality Projections with Implementation of Selected Municipal Sewage Treatment Plan.

River Mile (from Great Salt Lake)	UBOD, (mg/l)	DO (mg/l)	NH_3-N (mg/l)	River Mile (from Great Salt Lake)	Cl_2 (mg/l)
29.0	9.88	7.54	0.21	28.9	0.000
28.8	8.56	7.47	0.17	28.6	0.000
28.4	7.38	7.41	0.14	28.2	0.000
28.0	6.79	7.34	0.12	27.7	0.000
27.5	6.32	7.27	0.10	27.2	0.000
27.0	5.95	7.21	0.09	26.7	0.000
26.6	5.82	7.19	0.09	26.5	0.000
26.1	16.53	6.51	1.31	25.7	0.010
25.5	15.97	6.50	1.26	25.3	0.010
24.8	14.58	6.48	1.13	24.2	0.009
23.8	13.94	6.52	1.07	23.4	0.008
22.7	13.28	7.06	1.06	22.0	0.007
21.7	13.06	6.99	1.04	21.4	0.007
21.3	12.19	7.10	0.87	21.2	0.006
20.9	11.94	6.94	0.86	20.5	0.006
20.1	11.60	6.74	0.83	19.6	0.006
19.5	11.50	6.69	0.83	19.3	0.006
19.0	11.30	6.57	0.81	18.7	0.006
18.5	11.18	6.50	0.80	18.3	0.006
18.0	18.55	6.09	1.62	17.7	0.012
17.2	18.13	5.88	1.59	16.7	0.012
16.7	18.06	5.86	1.59	16.6	0.012
15.7	16.69	5.42	1.51	14.7	0.012
13.3	16.19	4.99	1.43	11.8	0.011
9.9	14.87	4.92	1.40	8.0	0.011
6.9	13.84	4.42	1.38	5.8	0.011
4.5	12.52	3.56	1.34	0.0	0.011

From: Way, T., 1978, The Jordan River: Ammonia/Chlorine Projections, S.L. County Water Quality and Water Pollution Control, Salt Lake City. See Figure VIII-28 for river and effluent conditions.



*Summer Conditions,
River, T=20°C, pH=7.5, $K_d(Cl_2)$=0.0/day, $K_d(NH_3)$=0.15/day
Effluent (mg/1): BOD_5=10, SS=10, NH_3=5.0, DO=4.9, Cl_2=0.04

Figure VIII- 28. Projected Jordan River Water Quality Summary*

LIVING MATTER

Wildlife Communities

All terrestrial ecosystems that occur in Salt Lake County will be affected by implementation of the point and non-point source plans. These ecosystems, as described in Section III, are the Great Salt Lake Desert, Grass-Sagebrush, Lower Montane, Upper Montane, and Sub-Alpine ecosystems. General characteristics of these ecosystems are shown below (from 303 (e) EIS).

Ecosystems	Altitudinal Limits* (feet above MSL)	Average Annual* Precipitation (Inches)	Frost Free* Period (Days)
Great Salt Lake Desert	4200-4300	11-16	130-190
Grass-Sagebrush	4300-6000	14-18	160
Lower Montane	6000-7500	18-25	95
Upper Montane	7500-9000	25-35	65
Subalpine	9000-11000	35	65

*Approximate

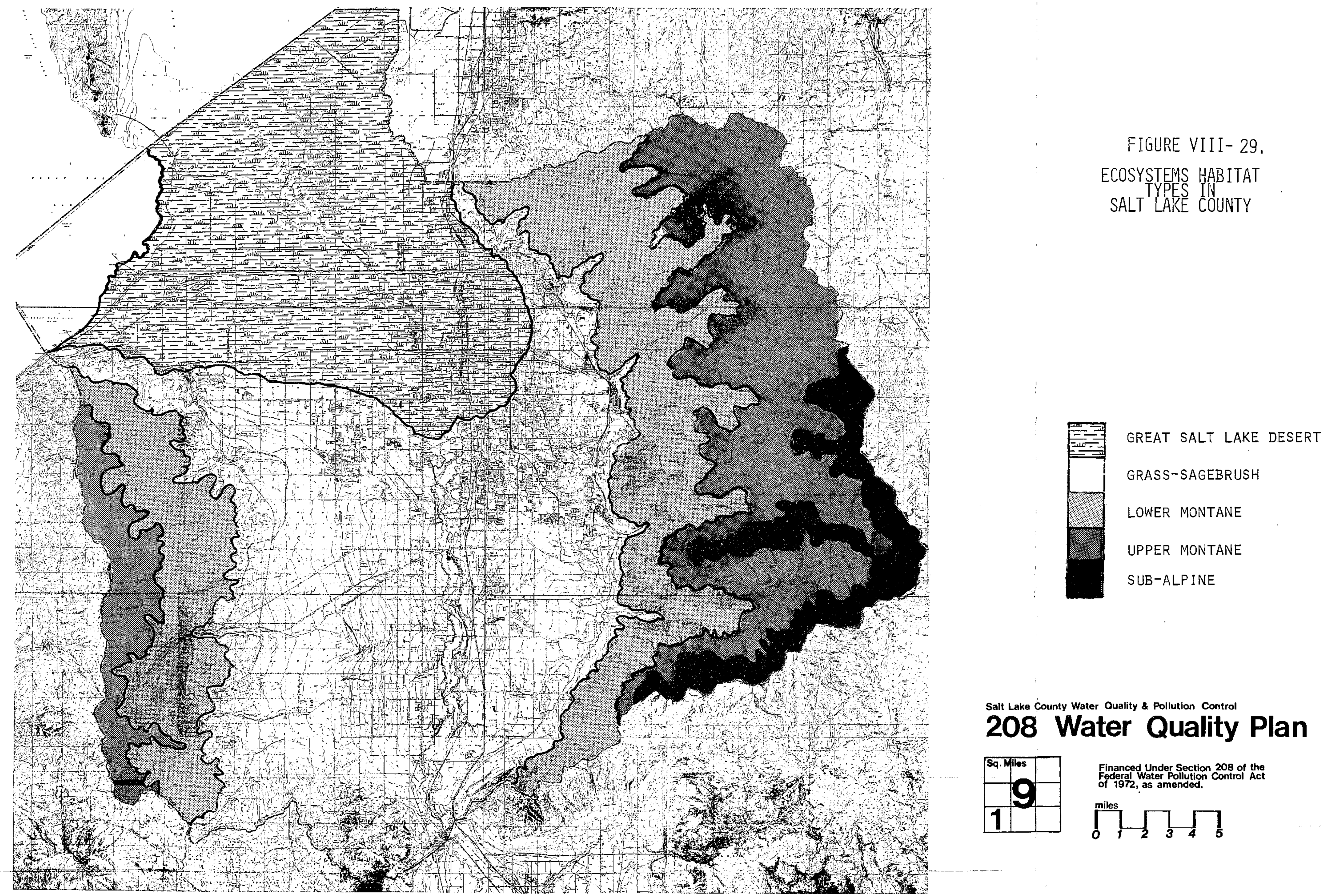
The approximate extent of these ecosystems in Salt Lake County is shown in Figure VIII-29.

The principle wildlife forms found in the above described ecosystems (and their associated communities) are shown in Appendix A-7. It should be noted that since ecosystem boundaries are of a non-exact nature (especially the montane ecosystems), wildlife forms do migrate between ecosystems and should be considered to occur in specified and adjacent communities.

As identified in U. S. Fish and Wildlife Service Circular 39 (1956), the considered areas for expansion of the South Valley Water Reclamation Facility and possibly the Magna Treatment Plant may be determined to be a Type 1 or Type 2 wetland. The value of Type 1 wetland is for stimulation of waterfowl production by providing breeding areas while the value of a Type 2 wetland is for supplemental waterfowl feeding. The State Division of Wildlife Resources has indicated that the development of proposed sewage treatment facilities at the South Valley Water Reclamation Facility site and the secondary site ("B" site) at the Central Valley Water Reclamation Facility site would not result in a significant loss of wildlife resource (See Appendix A-7).

FIGURE VIII- 29.

ECOSYSTEMS HABITAT TYPES IN SALT LAKE COUNTY



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Vegetative Communities

The vegetation of the subject sites was determined according to "Range Sites" as described in the Soil Survey of the Salt Lake Area, published by the U.S. Soil Conservation Service:

> A range site is a distinctive kind of rangeland that differs from other kinds of rangeland in its potential to produce native plants. It is the product of all environmental factors responsible for its development. In the absence of abnormal disturbance and physical site deterioration, a range site supports a plant community characterized by an association of species that are different from those of other range sites in terms of kinds or proportions of species or in total yield.
>
> Range condition is the present stage of vegetation of a range site in relation to the potential native plant community for the site. Four classes of range condition have been recognized. A range in excellent condition has from 76 to 100 percent of the vegetation characteristic of the potential, or original, vegetation; one in good condition, 51 to 75 percent; one in fair condition, 26 to 50 percent; and one in poor condition, less than 26 percent.
>
> To facilitate the determination of range condition, plants are grouped as decreaser, increaser, or invader plants, according to their response to grazing.
>
> Decreasers are species in the potential native plant community that decrease in relative abundance if such a community is subject to continued excessive grazing. Generally, the decrease results from excessive grazing associated with high performance for the species during the season the plant is grazed.
>
> Increasers are species in the potential native plant community that normally increase in relative abundance if the community is subject to excessive grazing. These plants are generally less desirable to grazing animals.
>
> Invaders are not members of the climax plant community for the site. They invade the community as a result of various kinds of disturbance, mainly excessive grazing.
>
> Climatic zones and their effect on range
>
> Plants growing on the range in different parts of the survey area are affected not only by differences in the kinds of soil, but also by differences in climate. Four distinct climatic zones are recognized in the survey area. These zones are determined on the basis of differences in the amount of

moisture received and on differences in the average annual temperature and the length of the growing season. They are the Upland climatic zone, the Mountain climatic zone, the High Mountain climatic zone, and the Wet and Semiwet climatic zone.

Wet and Semiwet Climatic Zone. - In this zone the climate is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation is 11 to 16 inches. Most of the water for plant production is run-in water from adjacent irrigated soils or from a ground-water table. The period of plant growth begins about April 15 and continues until frost occurs, about September 1. The frost-free period is about 130 to 190 days. Elevations range from 4,200 to 4,300 feet. Average annual temperature is 45°F.

Range sites in the Wet and Semiwet climatic zone are the Alkali Bottoms, Meadow, and Wet Meadow range sites.

- Range Site Plant Characteristics -

Alkali Bottoms Range Site

This site is on low lake terraces, lake plains, and flood plains in the Wet and Semiwet climatic zone. It consists of soils in the Bramwell, Bramwell, hardpan variant Chipman, Decker, Jordan, Lasil, Leland, and Terminal series. Slopes range from 0 to 3 percent. Most of these soils are deep or moderately deep and somewhat poorly drained to very poorly drained. Most are moderately or strongly affected by salt and alkali. The surface layer ranges from fine sandy loam to silty clay loam, and the subsoil or underlying layer ranges from sandy clay loam to silty clay. The Terminal soil has a hardpan at a depth of less than 20 inches.

Intake rate is moderate to slow, and permeability is moderate to very slow. Runoff is slow or very slow, and the hazard of erosion is slight to moderate. In most places the water table is at a depth of 20 to 40 inches. The available water holding capacity is 4 to 14 inches to a depth of 5 feet or to the hardpan. The amount of water available to plants is greatly reduced because of the salt in the soils.

The potential native vegetation consists of 80 to 90 percent perennial grasses, as much as 20 percent shrubs, and less than 5 percent forbs. All of these are tolerant of salts and alkali and a fluctuating water table. Important decreaser grasses are alkali bluegrass, alkali cordgrass, alkali sacaton, Great Basin wildrye, creeping wildrye, native bluegrass, and needle-and-thread. Important increaser grasses are salt-grass, foxtail, and squirreltail. Sedges and rushes also are important increasers. Important shrubs are Nuttal saltbush, four-wing saltbrush, bud sagebrush, Gardner saltbush, and winterfat. Forbs are native clover, globemallow, bassia, pickleweed, and annual kochia.

Plants that are dominant if the site is in poor condition are greasewood, rubber rabbitbrush, iodinebush, cheatgrass, big sagebrush, and annual weeds.

In areas where irrigation water is available, clearing and seeding to tall wheatgrass is profitable.

Wet Meadow Range Site

This site is on flood plains of the Jordan River in the Wet and Semiwet climatic zone. It consists of soils in the Magna series. Slopes range from 0 to 3 percent. These soils are deep and very poorly drained. The surface layer is mainly silty clay and is high in organic-matter content. The underlying layer is dominantly silty clay. In most places the water table is within 20 inches of the surface at least part of the time. Intake rate is slow, and permeability is very slow. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is about 14 inches.

The potential native vegetation consists mainly of water-tolerant grasses and grasslike plants. Important decreaser grasses are slender wheatgrass, tall native bluegrass, tufted hairgrass, redtop, and alkali sacaton. Increaser grasses and grasslike plants are sedges, rushes, saltgrass, Kentucky bluegrass, foxtail, wiregrass, squirreltail, western wheatgrass, Great Basin wildrye, cattail, arrowgrass, and horsetail.

The important forbs are yarrow, dandelion, plantain, black medic, cinquefoil, curly dock, and native clovers. Shrubs are willows, wildrose, dogwood, hawthorn, cottonwood and river birch.

Plants that are dominant if the site is in poor condition are largely rushes, sedges, saltgrass, rubber rabbitbrush, and annual weeds.

Semiwet Meadow Range Site

This site is on the smooth to undulating, low flood plains of perennial streams that are subject to occasional flooding. It consists of Mixed alluvial land and Sandy alluvial land. These land types are somewhat poorly drained, stratified, mixed alluvium that has textures ranging from loamy sand to clay. They commonly contain gravel or sand below a depth of 3 feet and are very stony or very cobbly in places. The water table is at or near the surface during the period of peak runoff but recedes when runoff subsides.

The potential native vegetation consists mainly of perennial grasses, but there is a small percentage of forbs, shrubs, and overstory trees.

Important decreaser grasses are tufted hairgrass, native bluegrasses, alkali sacaton, redtop, slender wheatgrass, and timothy. Increaser grasses and grasslike plants are saltgrass, Kentucky bluegrass, squirreltail, Sandberg bluegrass, sedges, baltic rush, western wheatgrass, and Great Basin wildrye.

Important forbs are aster, false Solomon's seal, groundsel, native clovers, dandelion, curly dock, Dutch clover, and yarrow. Shrubs and overstory trees are wild rose, willows, hawthorn, cottonwood, river birch, and boxelder.

Plants that are dominate if this site is in poor condition are rubber rabbitbrush, aster, curly dock, gumweed, povertyweed, Canada thistle, foxtail, and bullthistle.[6]

Vegetative communities impacted by the Central Valley, Magna, SLC, and South Valley facility expansion or construction are summarized in Figures 30 through 33.

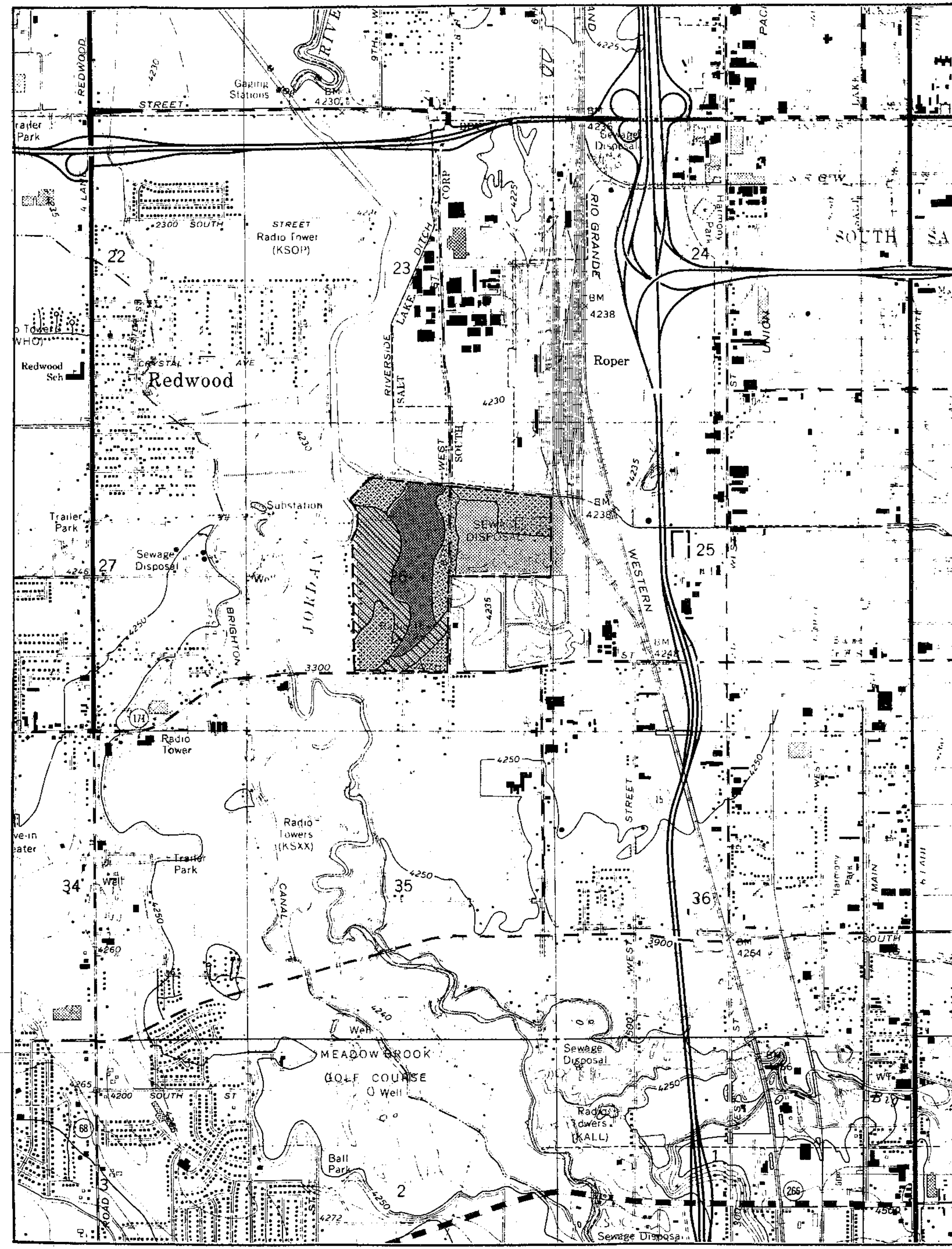

FIGURE VIII-30. EXISTING DOMINANT VEGETATION BY RANGESITE, CENTRAL VALLEY FACILITY

WET MEADOW RANGE SITE

- 90% Grass: Slender Wheatgrass, Tall Native Bluegrass, Tuffed Hairgrass, Redtop, Alkali Sacaton, Saltgrass, Sedges, Rushes, Foxtail, Wiregrass, Squirreltail, Western Wheatgrass, Gr. Basin Wildrye, Cattail, Arrowgrass, Horsetail
- 5% Forbes: Aster, Solomon's Seal, Groundsel, Clover, Dandelion, Curly Dock, Dutch Clover, Yarrow
- 5% Shurbs & Trees: Wild Rose, Willow Hawthorn, Cottonwood, River Birch, Box Elder

Ironton Series: Wet Meadows, Grasses, Tules, and Sedges (Not in a Rangesite)

Chipman Series: Saltgrass, Wiregrass, Alkali Sacaton, Wet Meadow Grasses (Not in a Rangesite)

"Made Land" & Dumps: No Native Vegetation Present

SOURCE: U.S. DEPARTMENT OF AGRICULTURE SOIL SURVEY OF SALT LAKE AREA UTAH. SOIL CONSERVATION SERVICE, 1974.

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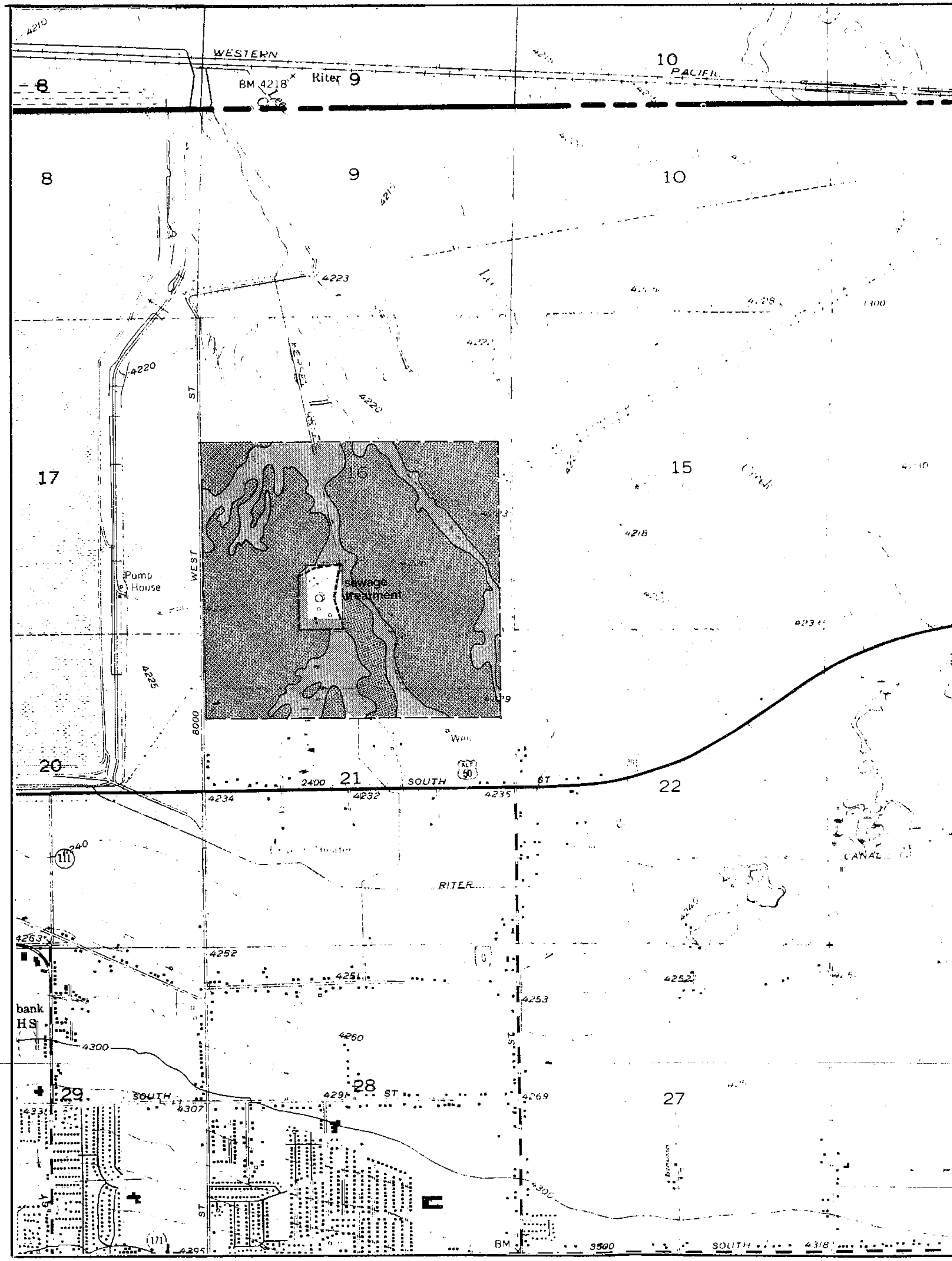

FIGURE VIII-31. EXISTING DOMINANT VEGETATION BY RANGESITE, MAGNA FACILITIES

ALKALI BOTTOMS RANGESITE

- 80% Grass: Cheatgrass, Annual Weeds, Alkali Bluegrass, Alkali Cordgrass, Alkali Sacaton, Great Basin Wildrye, Creeping Wildrye, Native Bluegrass, Saltgrass, Foxtail, Squirreltail, Cheatgrass
- 5% Forbs: Clover, Globemallow, Bassia, Pickleweed, Kochia
- 15% Shrubs & Trees: Saltbush, Forwing Saltbrush, Sagebrush, Gardner Saltbush, Winterfat, Greasewood, Rabbit-Brush, Iodine Bush

"Made Land": No Native Vegetation Present

Pickleweed, Seepweed, Saltgrass

SOURCE: U.S. DEPARTMENT OF AGRICULTURE SOIL SURVEY OF SALT LAKE AREA UTAH, SOIL CONSERVATION SERVICE. 1974.

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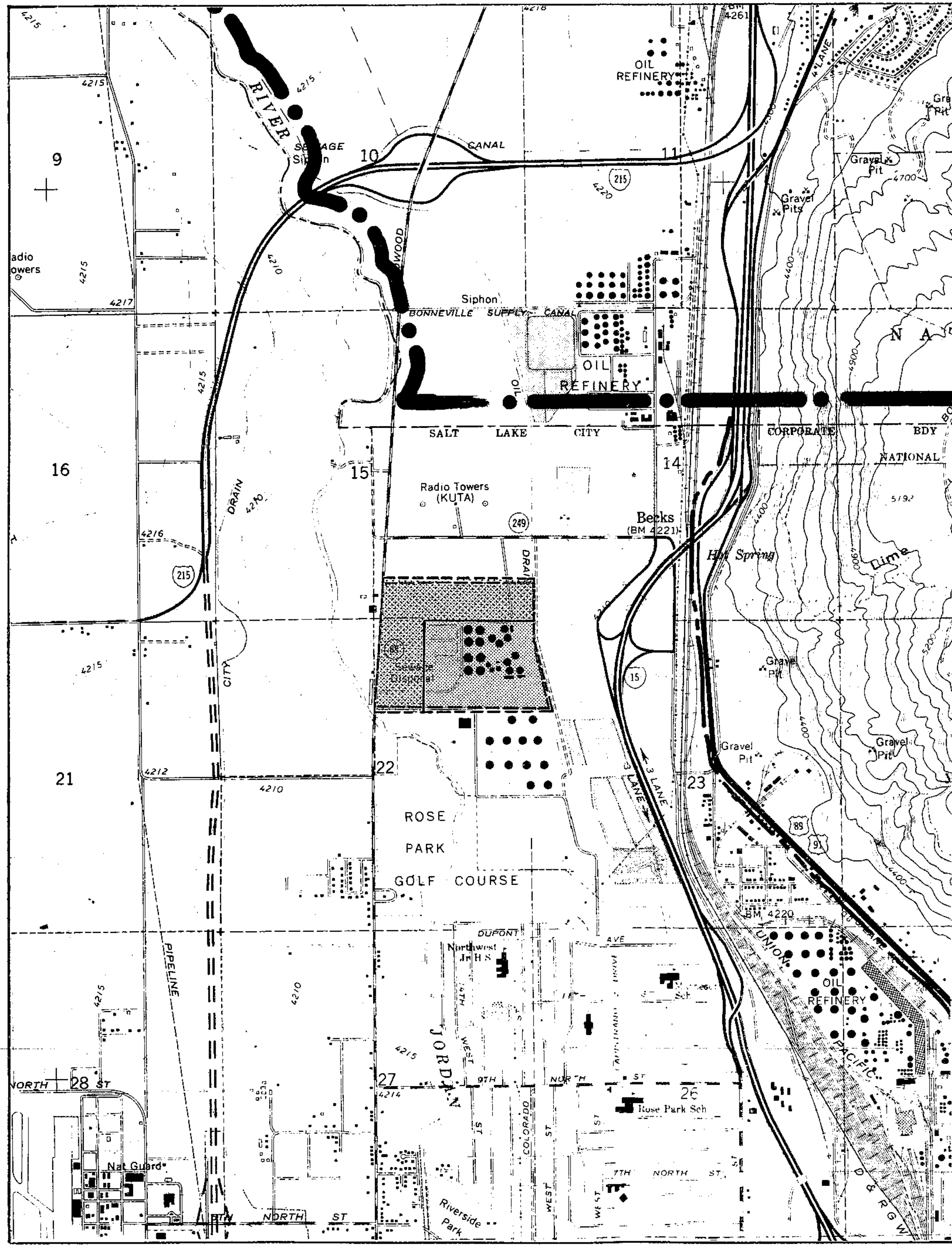
FIGURE VIII-32. EXISTING DOMINANT VEGETATION BY RANGESITE, SLC FACILITIES



ALKALI BOTTOMS RANGESITE

80% Grass: Cheatgrass, Annual Weeds, Alkali Bluegrass, Alkali Cordgrass, Alkali Sacaton, Great Basin Wildrye, Creeping Wildrye, Native Bluegrass, Saltgrass, Foxtail, Squirreltail, Cheatgrass

5% Forbs: Clover, Globemallow, Bassia, Pickleweed, Kochia

15% Shrubs & Trees: Saltbush, Forwing Saltbrush, Sagebrush, Gardner Saltbush, Winterfat, Greasewood, Rabbit-Brush, Iodine Bush

"Made Land": No Native Vegetation Present

SOURCE: U.S. DEPARTMENT OF AGRICULTURE SOIL SURVEY OF SALT LAKE AREA UTAH. SOIL CONSERVATION SERVICE, 1974.

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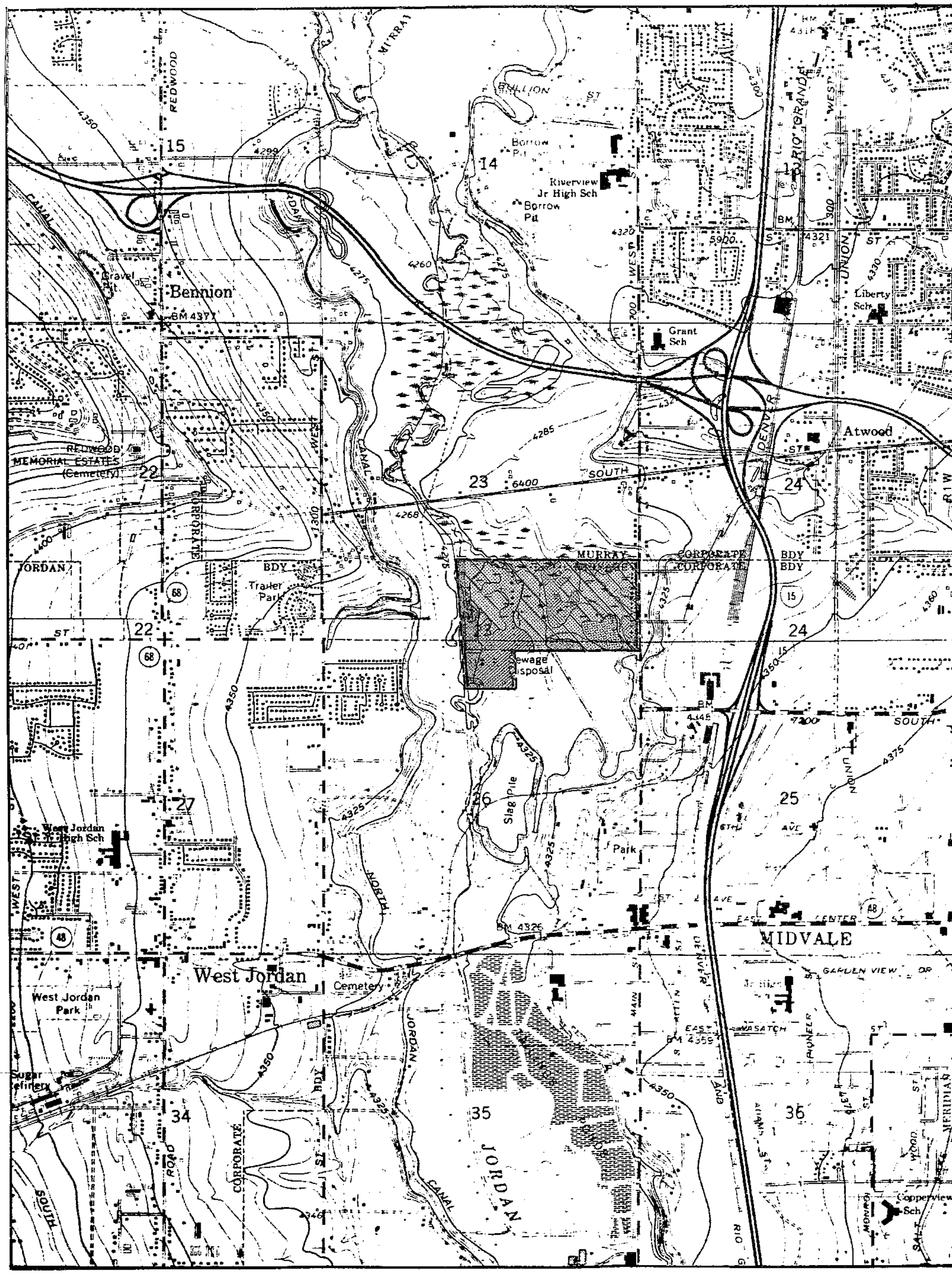
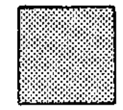


FIGURE VIII-33. EXISTING DOMINANT VEGETATION BY RANGESITE, SOUTH VALLEY FACILITIES

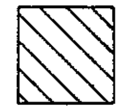


ALKALI BOTTOMS RANGESITE

80% Grass: Cheatgrass, Annual Weeds, Alkali Bluegrass, Alkali Cordgrass, Alkali Sacaton, Great Basin Wildrye, Creeping Wildrye, Native Bluegrass, Saltgrass, Foxtail, Squirreltail, Cheatgrass

5% Forbs: Clover, Globemallow, Bassia, Pickleweed, Kochia

15% Shrubs & Trees: Saltbush, Forwing Saltbrush, Sagebrush, Gardner Saltbush, Winterfat, Greasewood, Rabbit-Brush, Iodine Bush

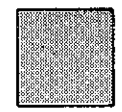


WET MEADOW RANGE SITE

90% Grass: Slender Wheatgrass, Tall Native Bluegrass, Tuffed Hairgrass, Redtop, Alkali Sacaton, Saltgrass, Sedges, Rushes, Foxtail, Wiregrass, Squirreltail, Western Wheatgrass, Gr. Basin Wildrye, Cattail, Arrowgrass, Horsetail

5% Forbes: Aster, Solomon's Seal, Groundsel, Clover, Dandelion, Curly Dock, Dutch Clover, Yarrow

5% Shurbs & Trees: Wild Rose, Willow Hawthorn, Cottonwood, River Birch, Box Elder

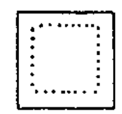


SEMI-WET MEADOW RANGE SITE

90% Grass: Tufted Hairgrass, Native Bluegrass, Alkali Sacaton, Redtop, Slender Wheatgrass, Timothy, Saltgrass, Kentucky Bluegrass, Squirreltail, Sedges, Baltic Rush, West. Wheatgrass, Gr. Basin Wildrye

5% Forbs: Aster, Solomon's Seal, Groundsel, Clover, Dandelion, Curly Dock, Dutch Clover, Yarrow

5% Shrubs & Trees: Wild Rose, Willow, Hawthorn, Cottonwood, River Birch, Box Elder



EXISTING LAGOON DIKE

Source: U.S. Department of Agriculture Soil Survey of Salt Lake Area Utah. Soil Conservation Service. 1974.

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feet (1000's) 0 1 2 3

ecological analysis

This general discussion of the state of the ecological environment will encompass the concepts of floral and faunal density, diversity, productivity, and succession. Specific data concerning the state of the ecological environment is not available at this time. Therefore, this discussion will describe the general habitat and wildlife conditions as extracted from various sources.

A diverse environment is generally a healthy environment. Diversity, in terms of flora and fauna, is indicated by numbers of species and numbers of individuals per species. The greater the number of species and number of individuals per species, the greater the diversity.

Point Source Plan Elements

The diversity of the flora and fauna at the South Valley site is not very great from a micro-environment point of view. Man's encroachment into the natural setting has disrupted the communities by: draining the wetland areas (semi-wet meadow and wet meadow rangesites); constructing large lagoons over approximately 70 acres of wet meadow and alkali bottom rangesites; construction of a secondary trickling filter sewage treatment plant over wet meadow range sites; and deposition of a slag dump from copper and lead concentrator/smelter operations (located to the south of the project area) over more wet meadow rangesites; attendant vegetative damage from air emissions related to the historical smelting operation. The diversity of the study area from a macro point of view is somewhat greater than the micro point of view in that there exists at least three different rangesites (as per SCS) and at least two ecosystem habitat types with three communities (as per 303 (e) in the immediate vicinity of the South Valley.

Wildlife productivity is estimated to be fair to good with good nesting areas for meadow-type birds and small mammals. Nesting areas for larger birds and waterfowl are limited but forage areas are present and apparently in good condition.

Floral productivity is apparently on the decline. Abundance of "decreasers" (undesirable vegetation associated with receding productivity) occurs within all range sites in the South Valley area. Drainage systems construced in the area have undoubtedly contributed significantly to this condition. Natural succession toward climax communities has been disrupted by the drainage and construction and smelting activities and has resulted in an unstable condition in various stages of succession occuring in all communities. Healthy communities are fairly homogeneous but do exhibit gradient of successional types from one end of the community spectrum to the other. This condition does not occur at the South Valley.

The diversity of the flora and fauna at the Central Valley site is not very great from a micro-nor a macro-environment point of view. Man's encroachment into the natural setting has disrupted the communities by: draining wetland areas (wet meadow rangesite); deposition of uranium mill tailings on an extensive area (emitting radon gas); construction of a secondary trickling filter sewage treatment plant on a portion of the site; construction of commercial-industrial buildings along the site boundaries. There exists only one rangesite (as per SCS) and one ecosystem habitat type with one, perhaps, two communities.

Wildlife productivity is estimated to be poor to fair with some nesting for meadow-type birds and small mammals.

Floral productivity is on the decline as indicated by an abundance of "decreasers". Natural succession toward climax communities has been disrupted by mill tailings dumping and construction. There exists no gradient of successional floral types in the Central Valley site.

The diversity of the flora and fauna at the Salt Lake City site is poor. The majority of the site consists of "made land" (as per SCS) which means that the area has been totally built up by man. The only native flora or fauna present is from invaders, i.e., those species that have revegetated and are not removed by grounds-keepers. Displaced vegetative communities are those that occur in an alkali bottom rangesite.

Wildlife productivity is estimated to be poor. Vegetative productivity is estimated to be poor.

Floral and faunal diversity at the Magna site is fair to good from a micro-environment point of view. On a larger scale, the habitat is limited to alkali bottom rangesite or saturated alkali soil that is good for waterfowl habitat (as per SCS).

Faunal productivity is limited by man's encroachment in the vicinity of the site. Major developments include a secondary trickling filter sewage treatment plant, the Salt Lake County landfill, Kennecott Copper Corporation's tailings pond, some residential development and large amounts of discarded material on virtually every parcel of open (vacant) land.

Floral productivity is also limited at the Magna site by man's activity. Decreaser species are present but not abundant.

Overall condition of the wildlife habitat at the Magna, Salt Lake City, Central Valley (District No. 1) and the South Valley (Midvale) sites can be described as poor to fair. There should be no significant loss of habitat resource with implementation of the proposed point-source plan.

Non-Point Source Plan Elements

The major elements of the non-point source plan, detention basins and erosion-sediment control programs, should result in the overall improvement of floral and faunal productivity in the valley and the canyons. Due to the diverse nature of the non-point plan implementation elements, only a general analysis of ecological impacts can be made.

The construction, operation and maintenance of detention facilities for storm/urban runoff quality improvement could result in an increase of riparian habitat. An example of this increase of habitat is the Big Cottonwood Dentention Park. The streamside communities have been left unaltered for the greater part. However, much of the park has been landscaped and is covered by lawn. Lawn is not good habitat for wildlife. During high flows, much of the park adjacent to the stream is flooded, or at least the soil is saturated, and native vegetation is prevalent resulting in the preservation of habitat. Other detention facilities could be designed along this conceptual line. However, there is the facet of public health that must be addressed. Standing water is a breeding place for mosquitos and other insect vectors and will be considered in design of these facilities.

Desilting basins are different than other detention facilities in that they are relatively small, compact, concrete facilities that offer no wildlife habitat in and of themselves. Area around desilting could be designed so that habitat is improved or at least maintained. Site by site design criteria must be evaluated by the Department to incroporate conceptual ideas for wildlife habitat maintenance. Again, health aspects must also be considered in design.

Erosion and sediment control programs will result in an overall improvement of wildlife conditions. Programs such as revegetation or building gabion walls (non-structural and structural slope stabilization respectively) actually create improved wildlife habitat where there is none or is in poor condition. Improvement of habitat will result in increased wildlife productivity and in diversity and density.