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 re-stabilization, 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

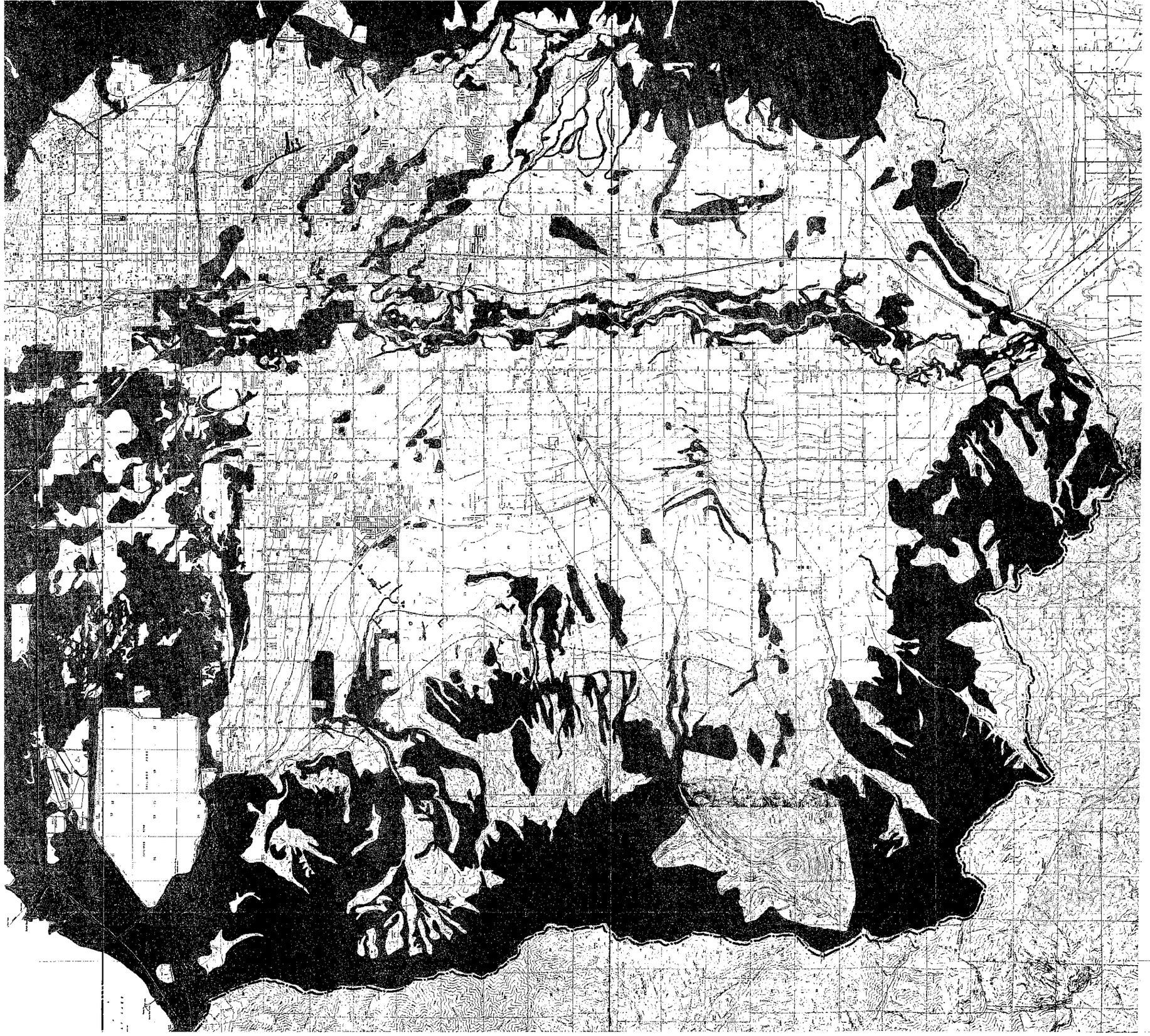

FIGURE VI-2

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.

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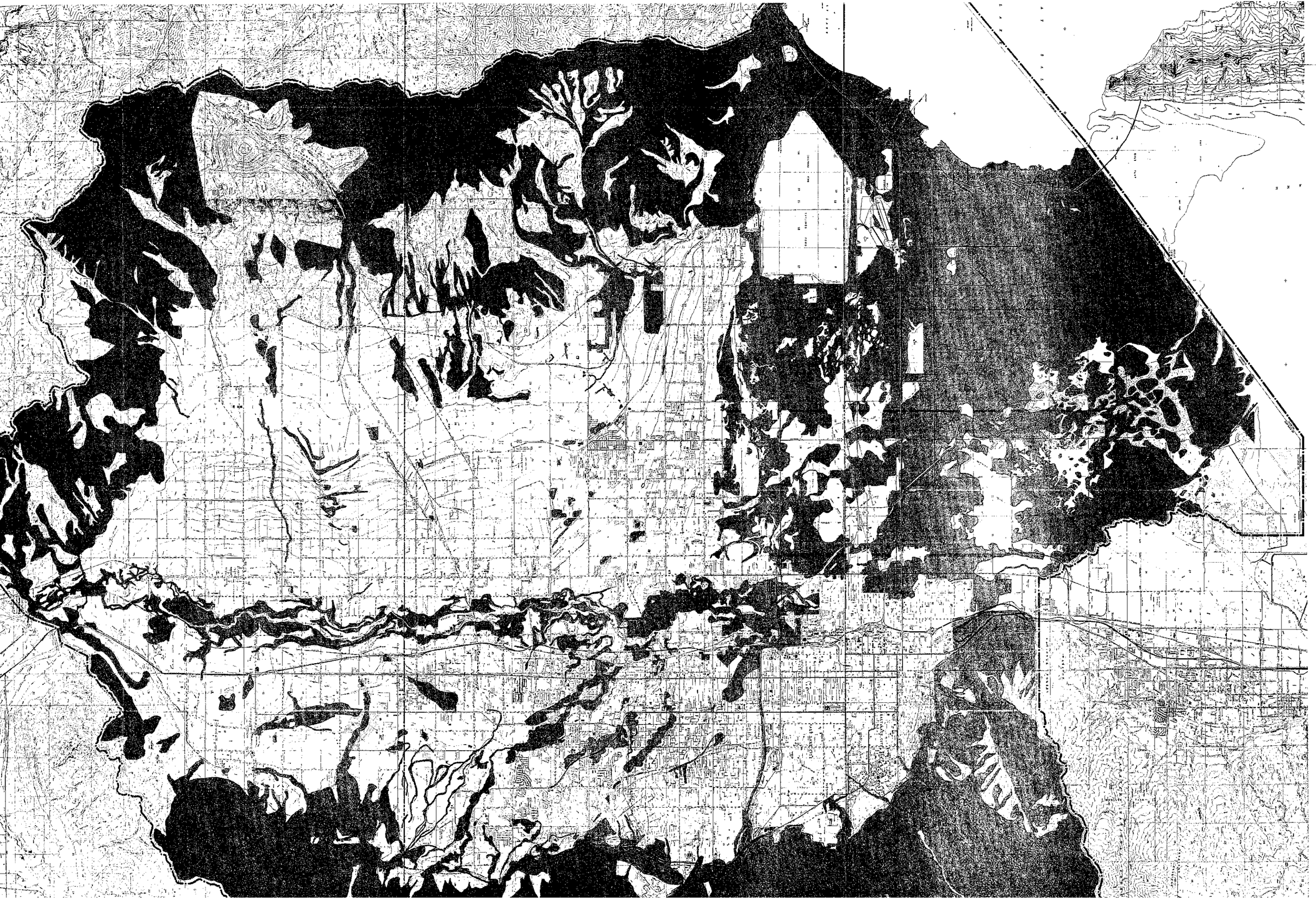

FIGURE VI-2

HIGH EROSION AND RUNOFF

POTENTIAL SOILS

AREAS WITH HIGH EROSION OR RUNOFF

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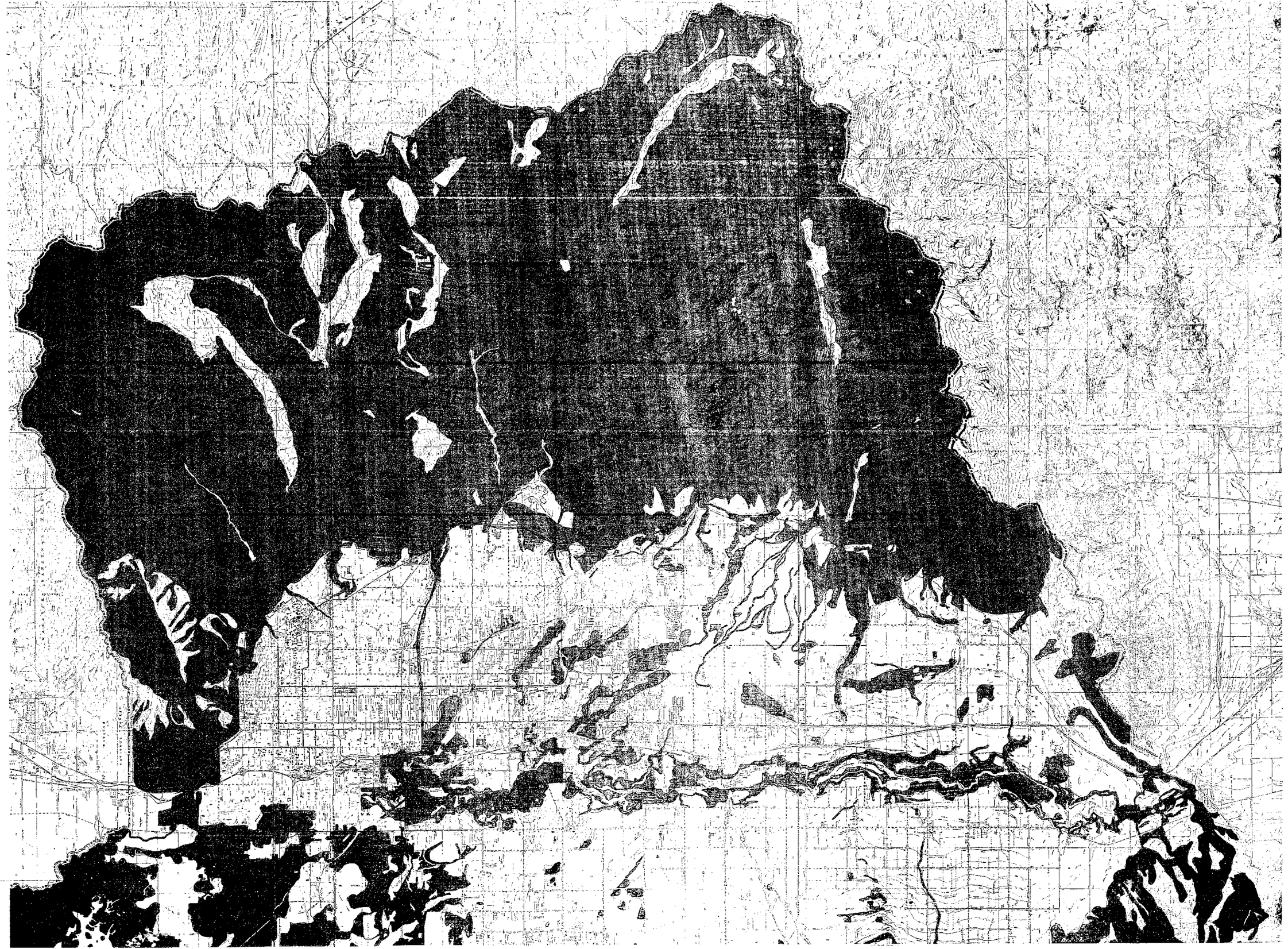

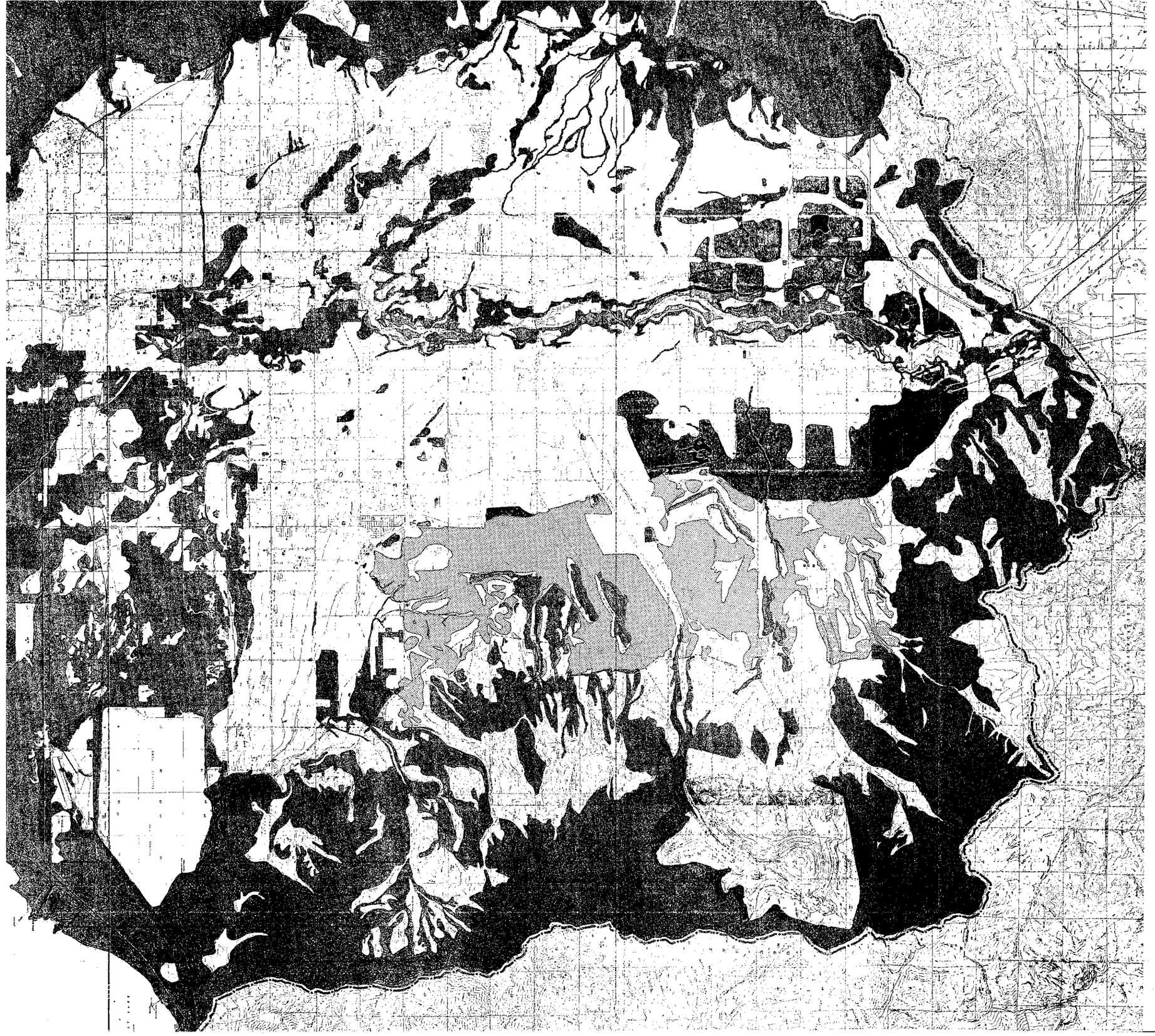

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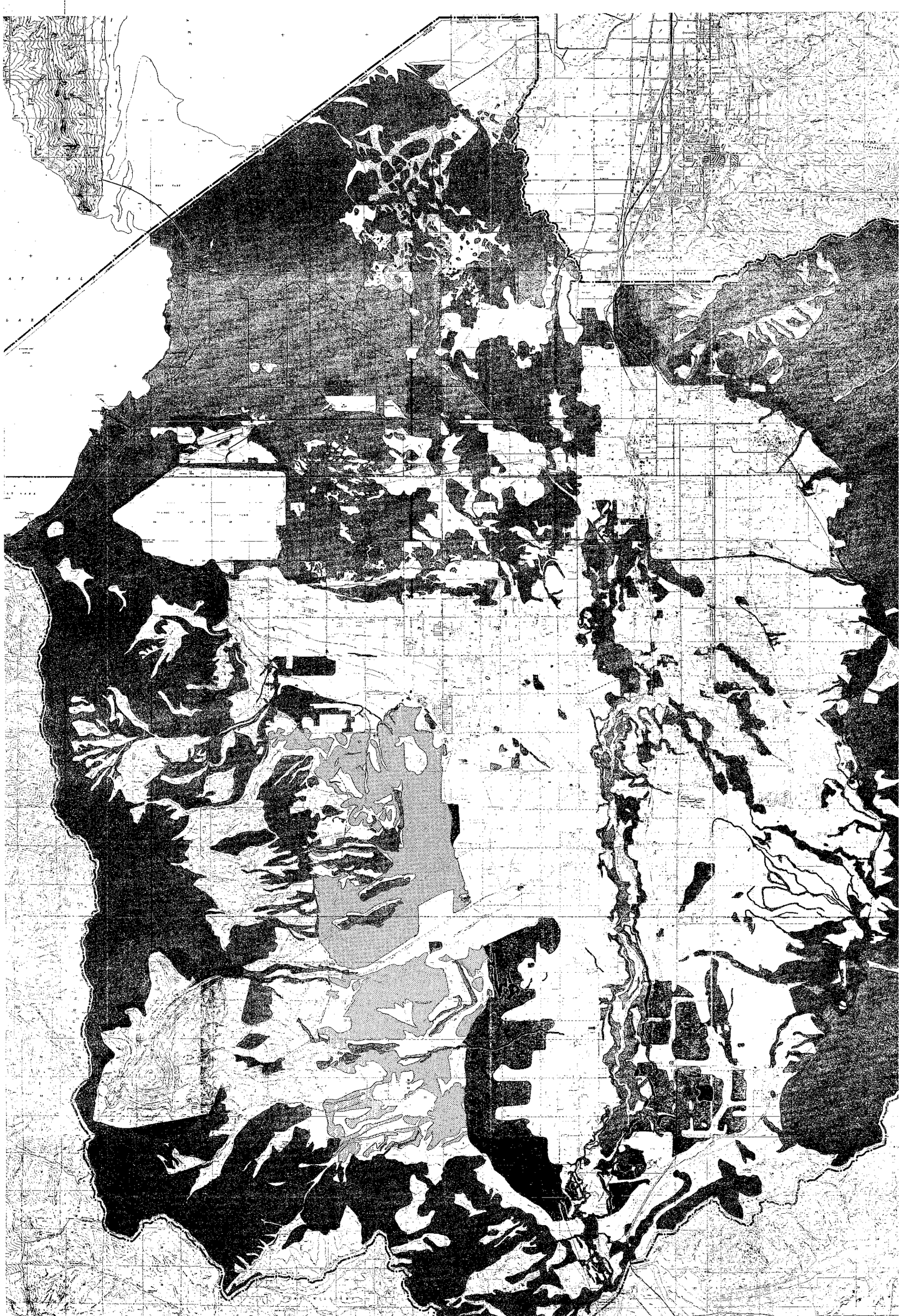

FIGURE VI-3

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

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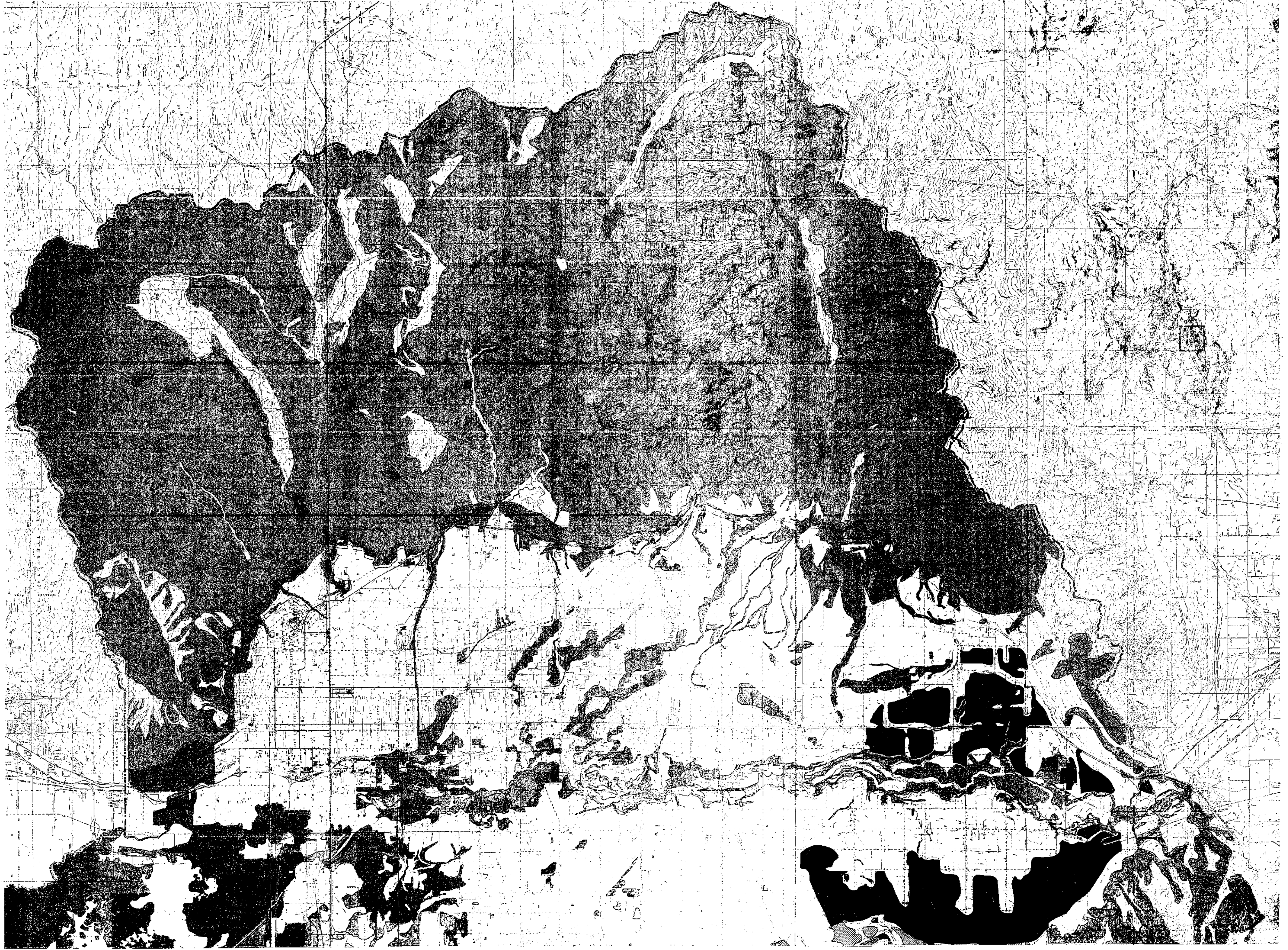

Creeks or confine runoff to their site; where storm drains do exist, most, if not all, discharge directly into the Jordan without any detention time. Detention facilities currently in place merely stow the water runoff allowing temporary detention, but without the utilization of riser pipes, straining 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 problems," (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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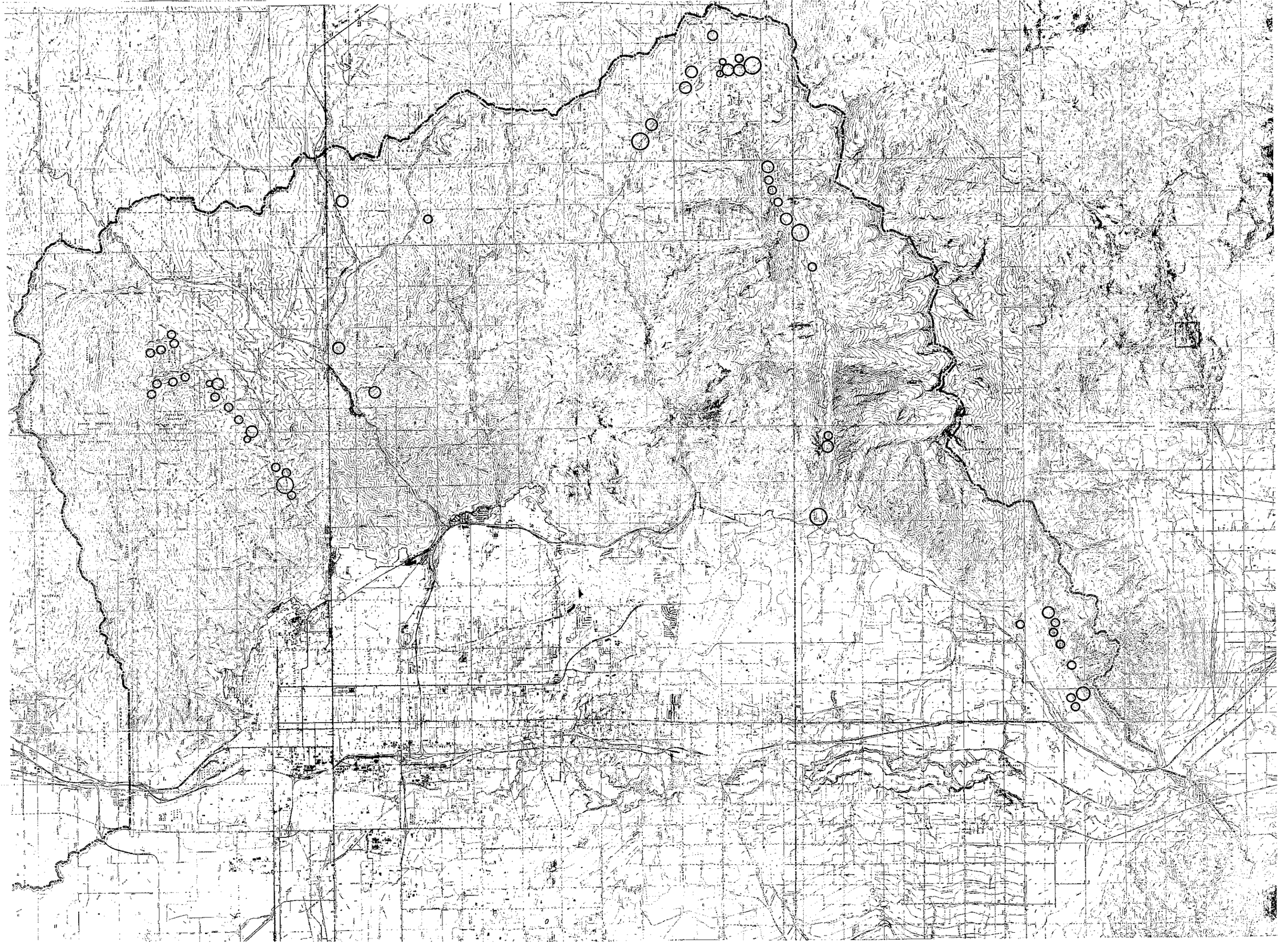

Septic Groundwater Seepage and Non-Degradation

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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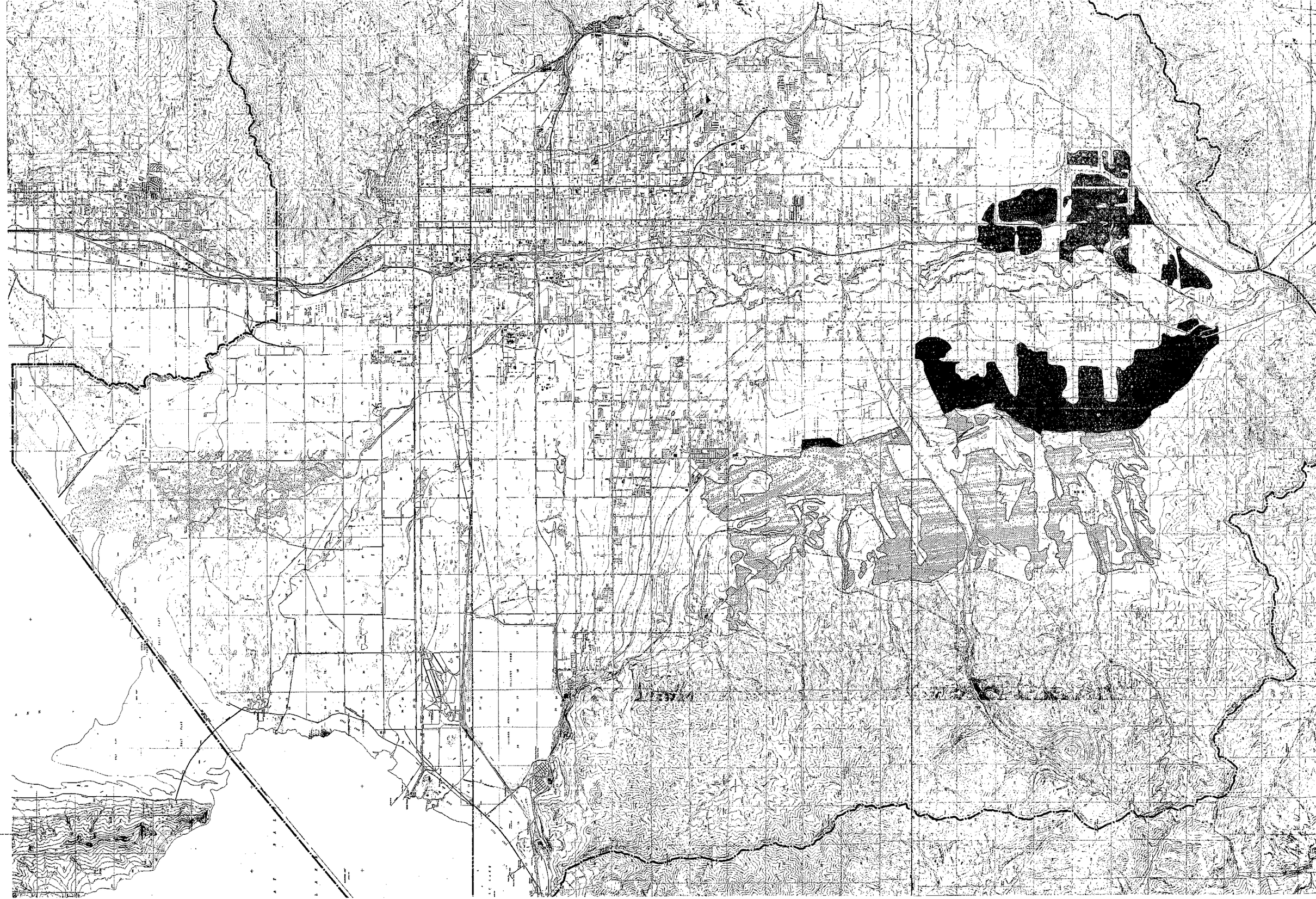

FIGURE VI-7
EXISTING CROPLAND AND ANIMAL CONCENTRATIONS

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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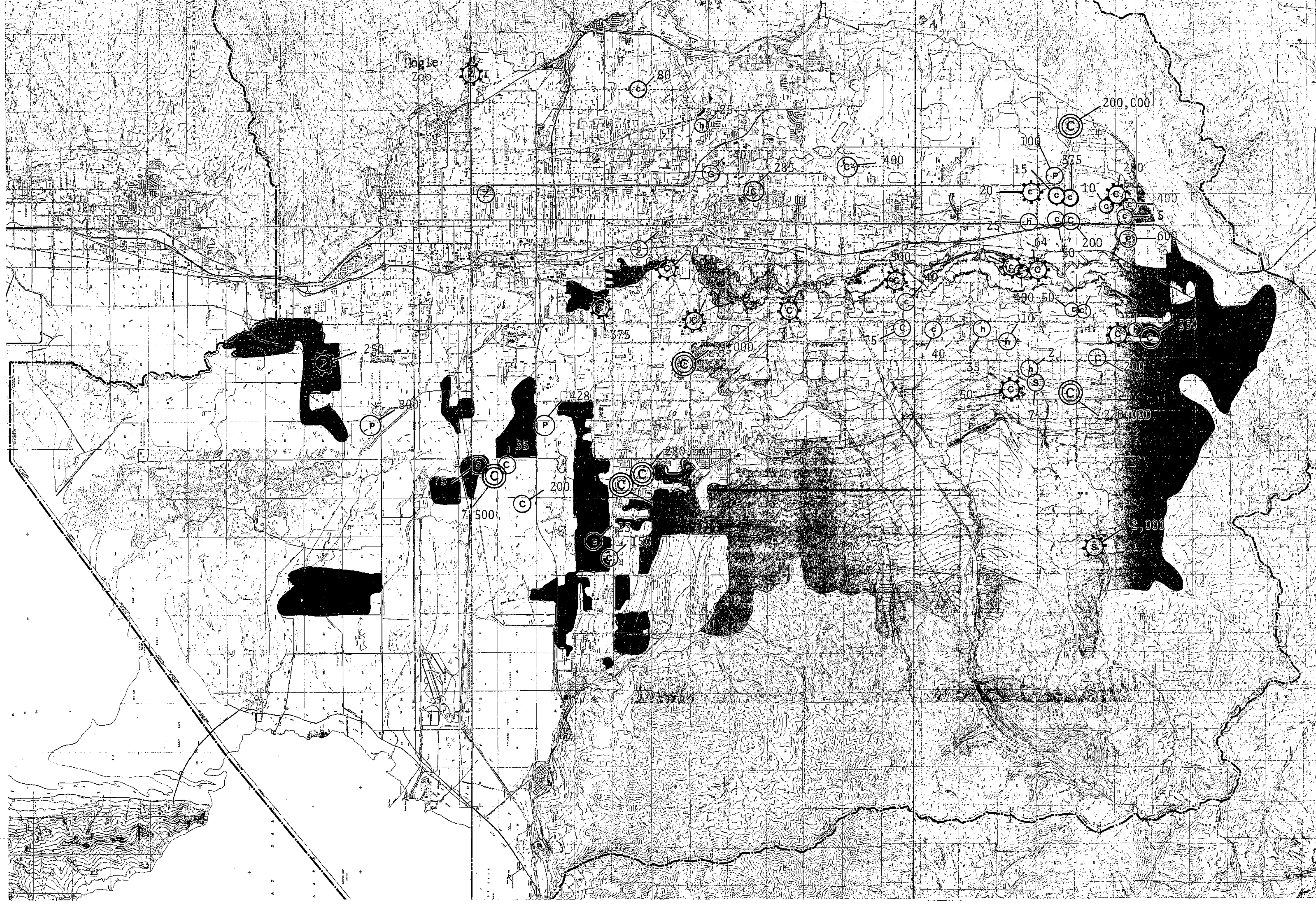
Zoo
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75
200
7,500
23
150
2,000

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.

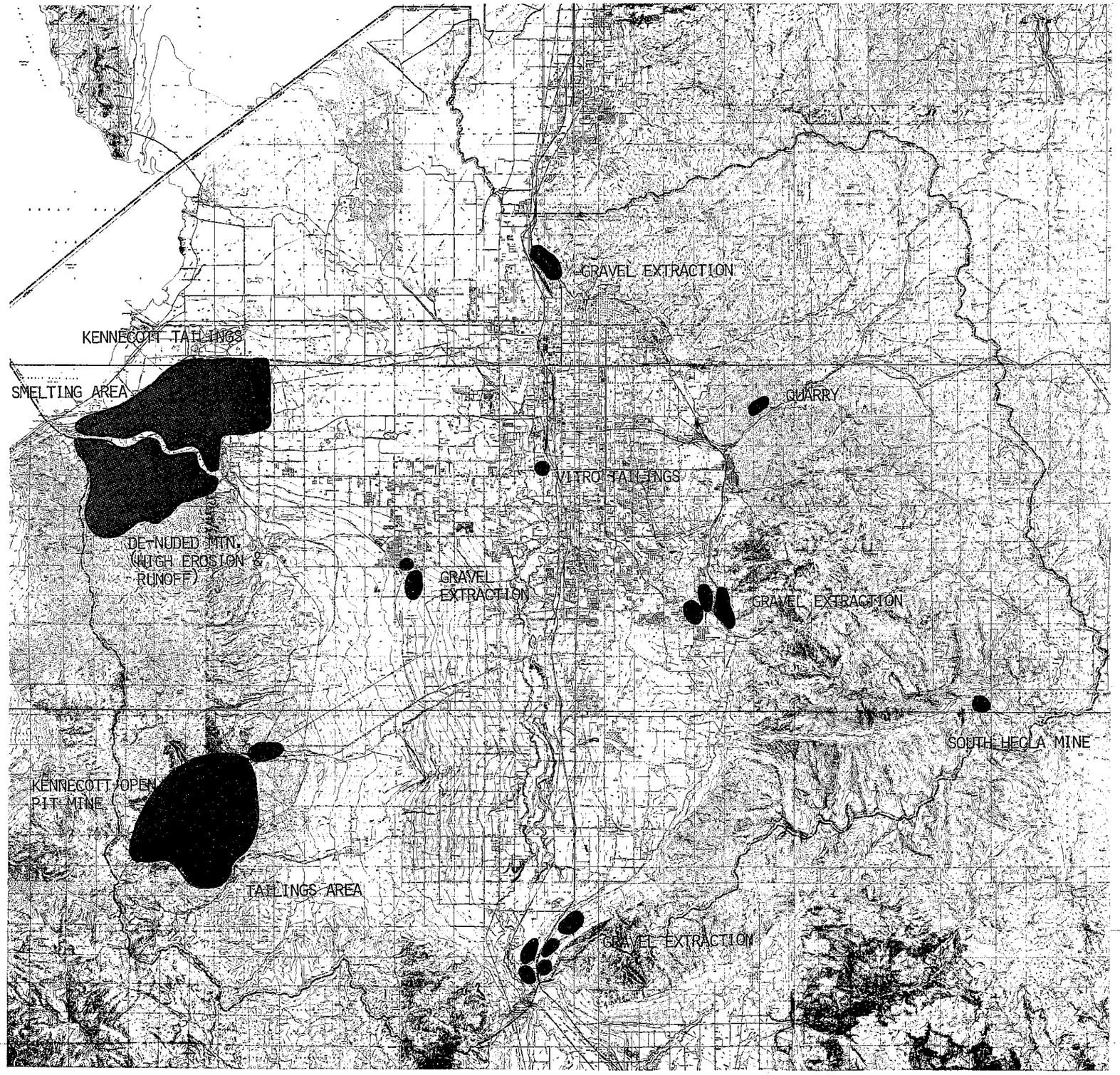


FIGURE VI - 7a

LOCATION OF SIGNIFICANT MINING AND EXTRACTION OPERATIONS

SOURCE: SALT LAKE COUNTY WATER QUALITY, 1" = 200' RECTIFIED AERIAL PHOTOGRAPHY, 1975.

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

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.

URBAN CORE

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.

Secondary Non-point Source Factors

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, horseback 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.

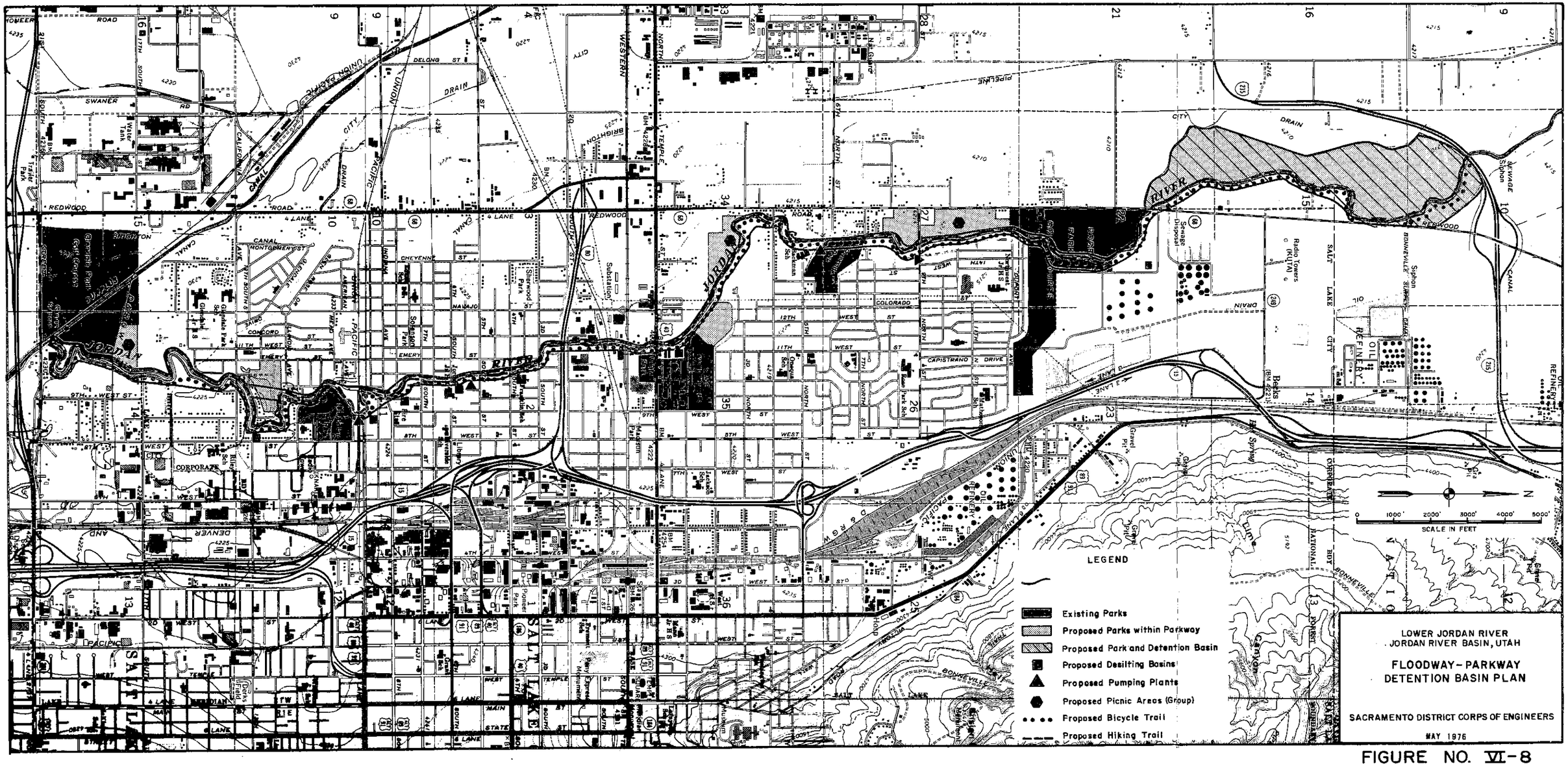
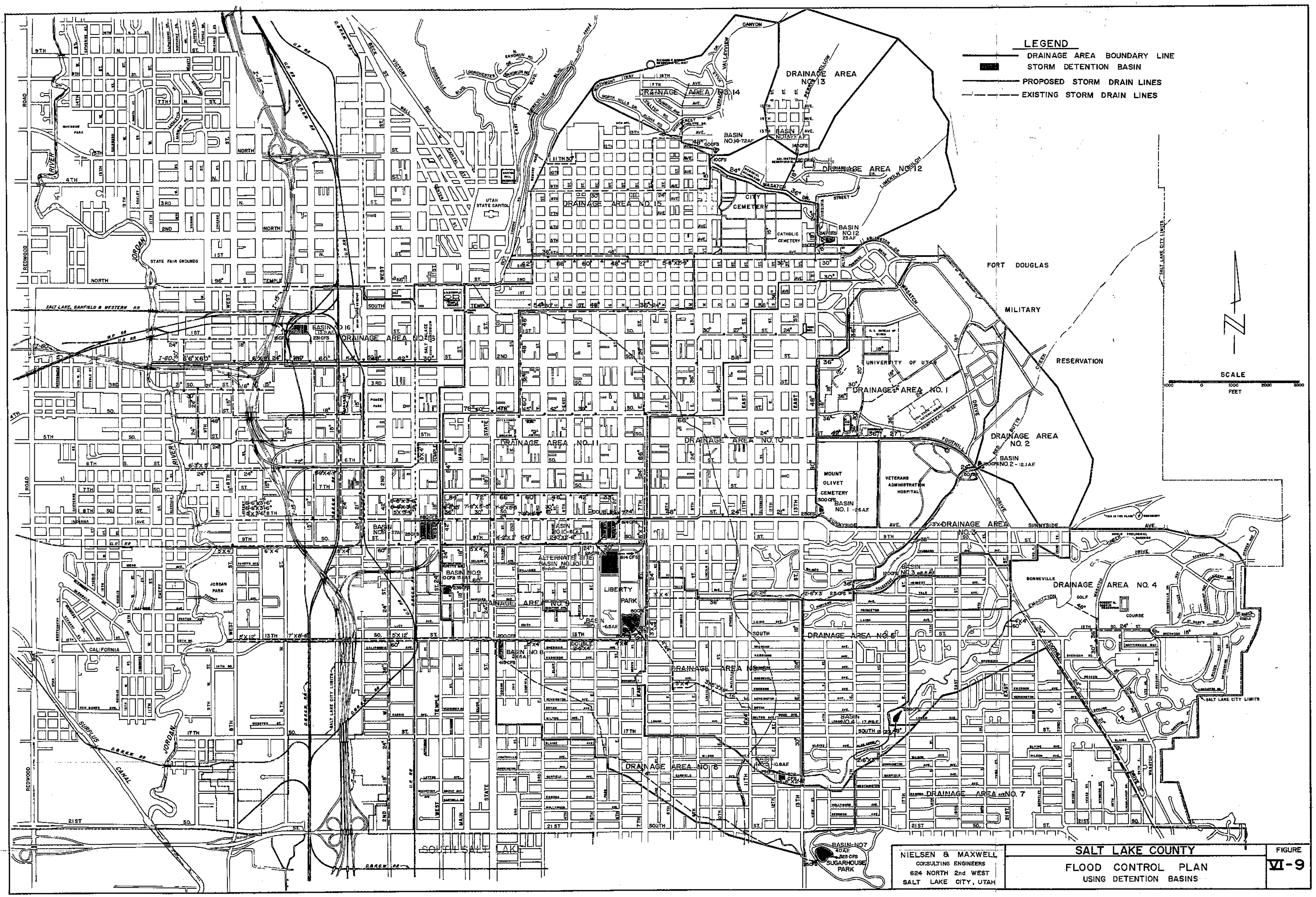
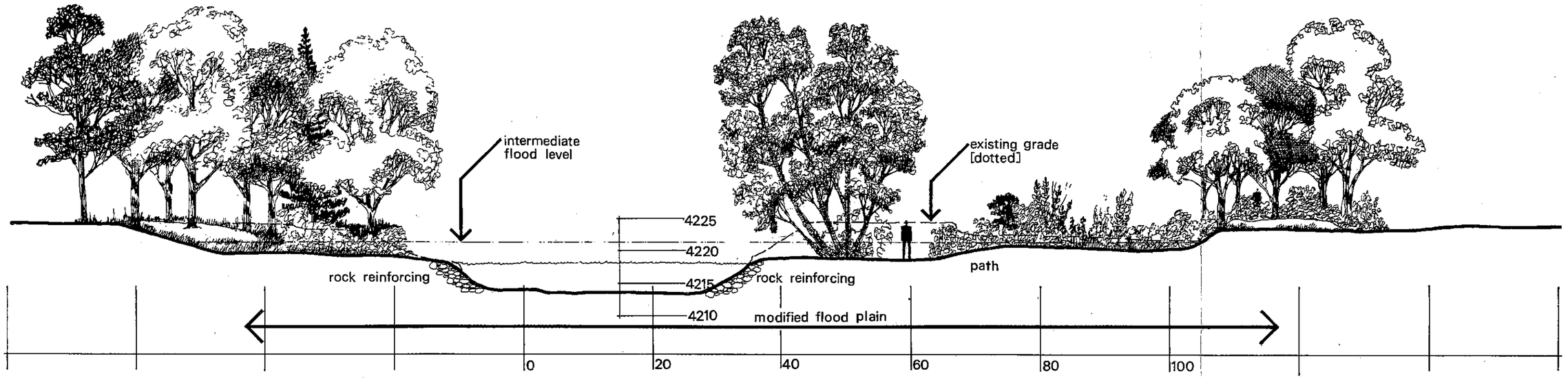


FIGURE NO. VI-8


LEGEND
DRAINAGE AREA BOUNDARY LINE
STORM DETENTION BASIN
PROPOSED STORM DRAIN LINES
EXISTING STORM DRAIN LINES
SCALE
FEET
DRAINAGE AREA NO. 13
DRAINAGE AREA NO. 14
DRAINAGE AREA NO. 12
DRAINAGE AREA NO. 15
DRAINAGE AREA NO. 1
DRAINAGE AREA NO. 2
DRAINAGE AREA NO. 3
DRAINAGE AREA NO. 4
DRAINAGE AREA NO. 5
DRAINAGE AREA NO. 6
DRAINAGE AREA NO. 7
DRAINAGE AREA NO. 9
DRAINAGE AREA NO. 10
DRAINAGE AREA NO. 11
UTAH STATE CAPITOL
CITY CEMETERY
CATHOLIC CEMETERY
FORT DOUGLAS
MILITARY
RESERVATION
UNIVERSITY OF UTAH
MOUNT OLIVET CEMETERY
VETERANS ADMINISTRATION HOSPITAL
STATE FAIR GROUNDS
JORDAN PARK
LIBERTY PARK
SUGARHOUSE PARK
BONNEVILLE GOLF COURSE
SOUTH SALT LAKE
SALT LAKE CITY LIMITS
JORDAN RIVER
SURPLUS CANAL
NIELSEN & MAXWELL
CONSULTING ENGINEERS
624 NORTH 2nd WEST
SALT LAKE CITY, UTAH
SALT LAKE COUNTY
FLOOD CONTROL PLAN
USING DETENTION BASINS
FIGURE
VI-9



detail of modified flood plain

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.

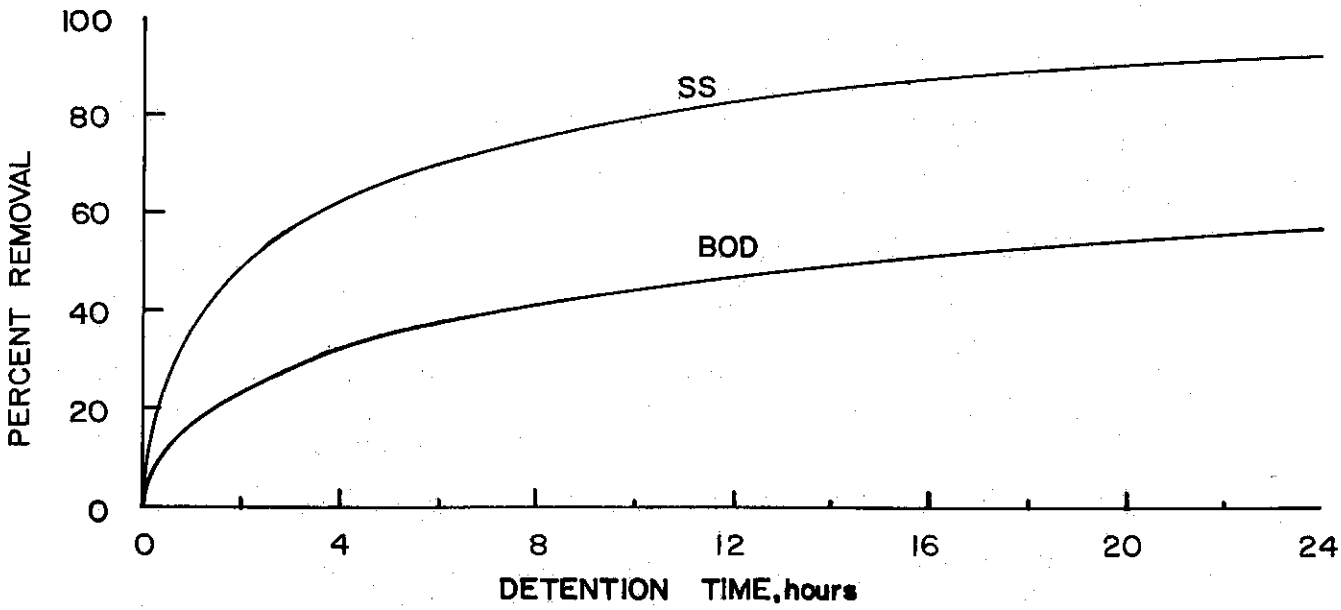


FIGURE VI-11
REDUCTION OF SS AND BOD BY SETTLING
IN 14-INCH HIGH GRADUATED CYLINDERS
after Jou

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^{o} 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.

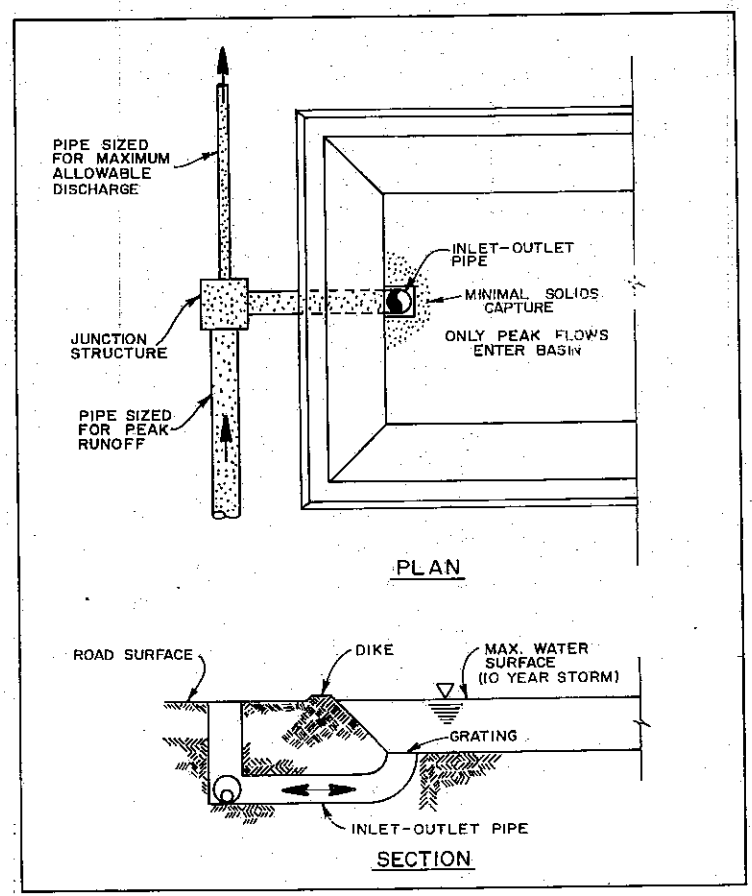


FIGURE VI-12
CONVENTIONAL DETENTION BASIN DESIGN

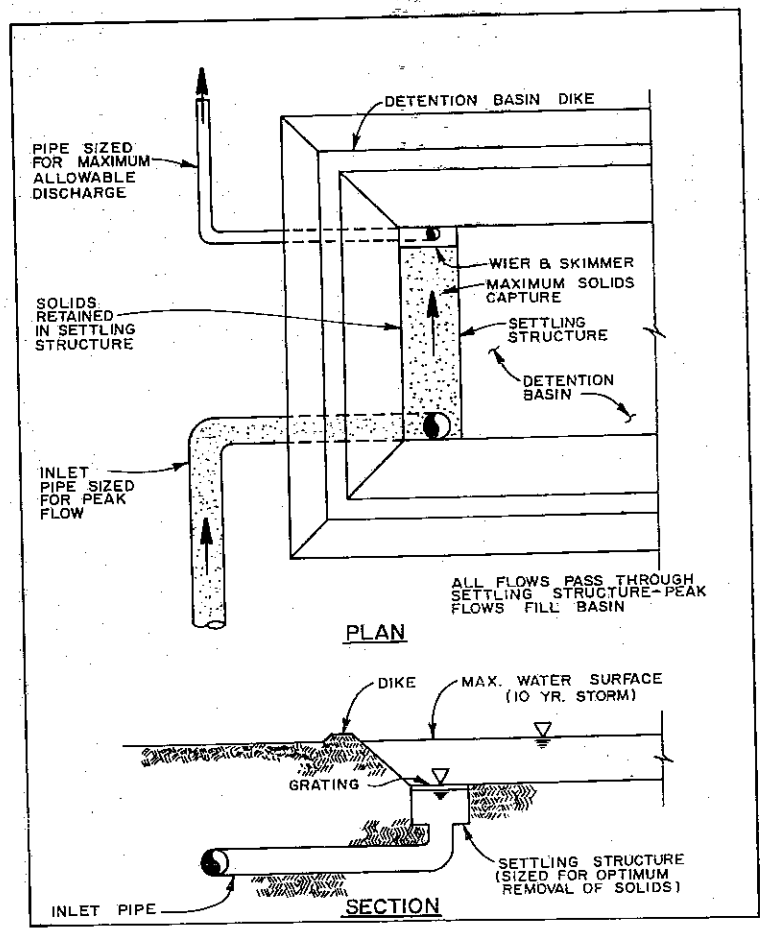


FIGURE VI-13
MODIFIED DETENTION BASIN DESIGN

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

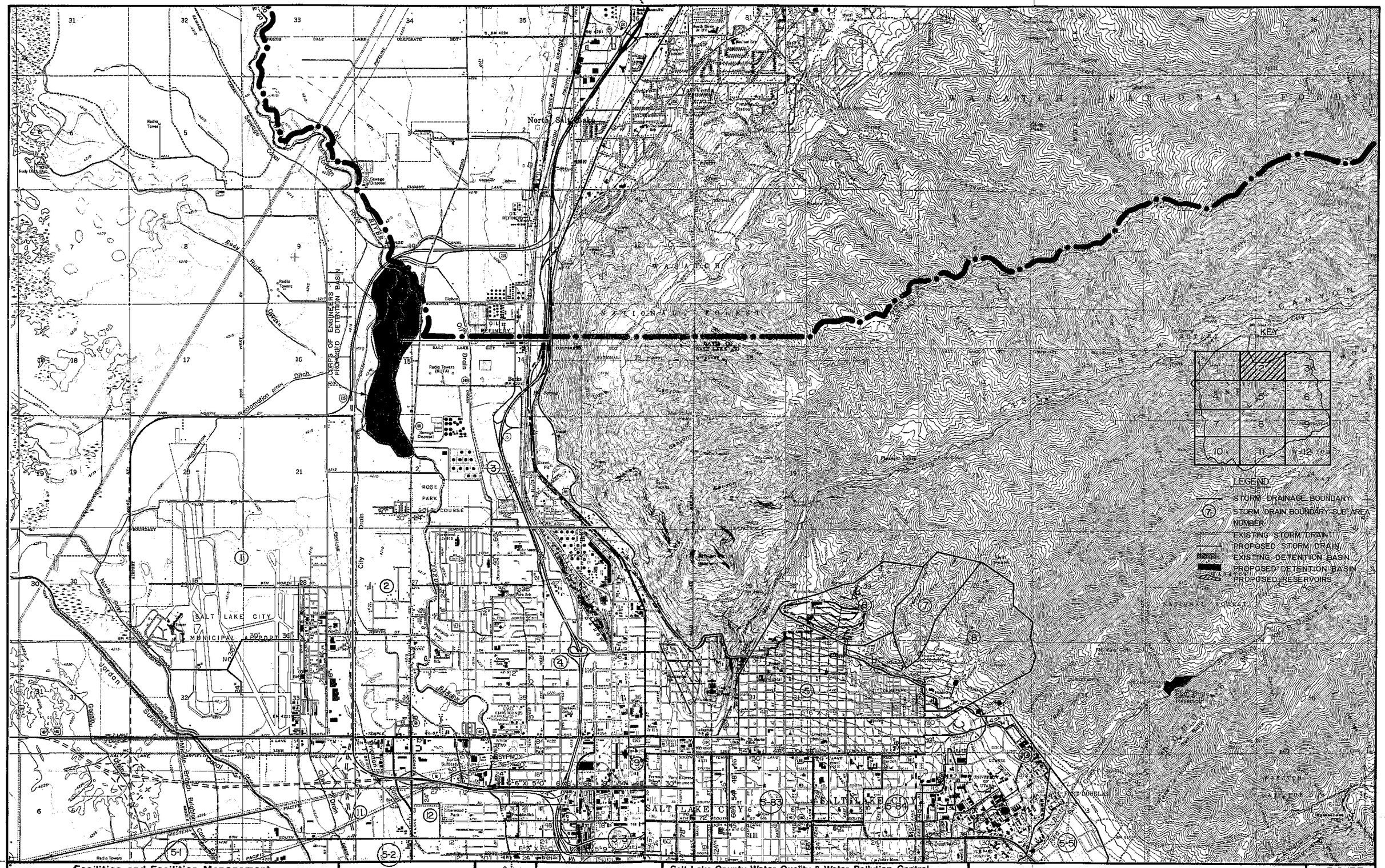
The cost estimates shown for both priority areas include a total cost of constructing the proposed flood protection plan and a cost per acre which would be required to construct the regional detention basins within these areas. All cost estimates obtained from references were updated as of Deptember 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

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208 Water Quality Plan

URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI - 14
MAP NO. 2

KEY

LEGEND

STORM DRAINAGE BOUNDARY

② STORM DRAIN BOUNDARY SUB AREA NUMBER

EXISTING STORM DRAIN

PROPOSED STORM DRAIN

EXISTING DETENTION BASIN

PROPOSED DETENTION BASIN

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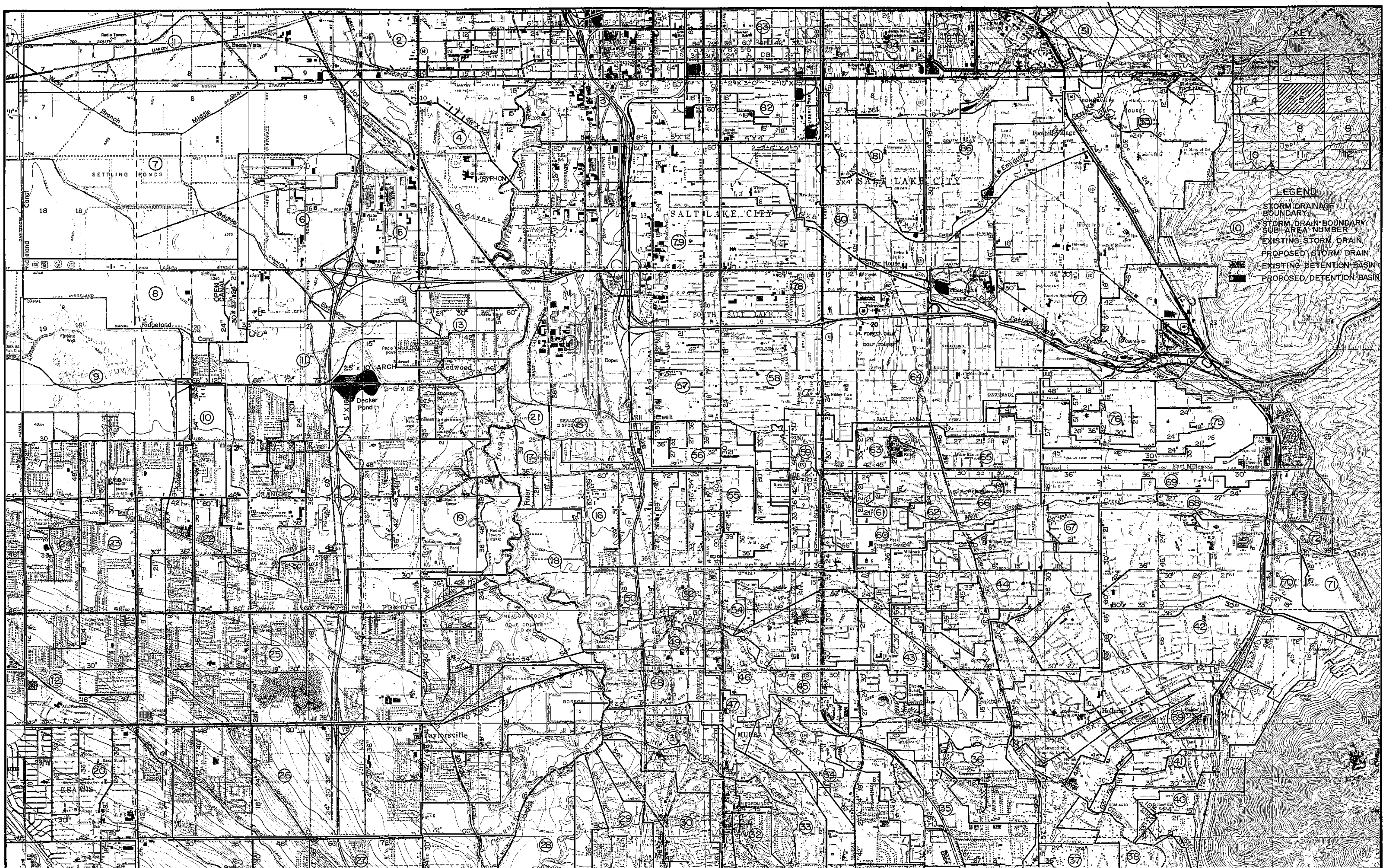
URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI-14

MAP NO. 4



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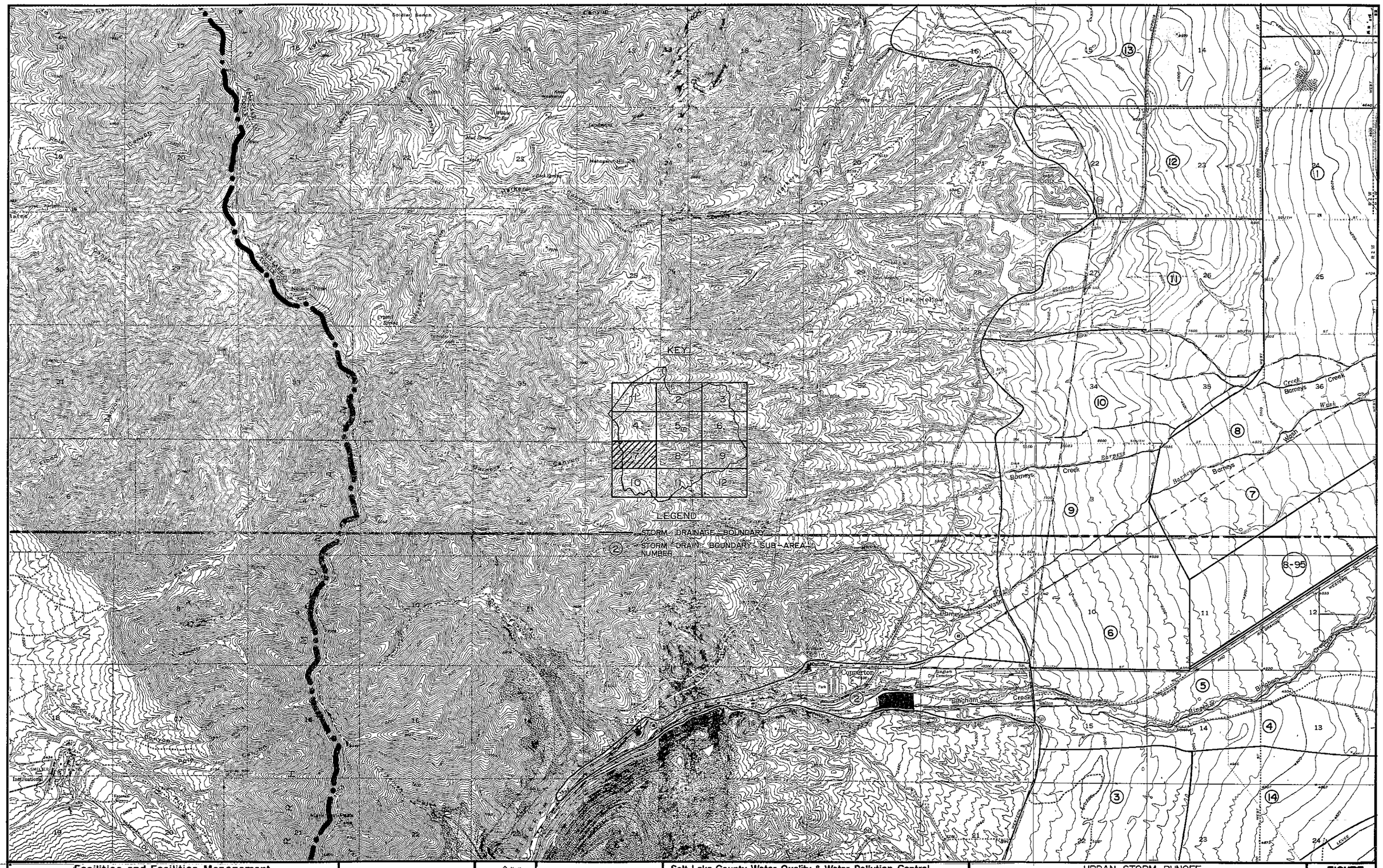
URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI - 14

MAP NO. 5



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URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI-14
MAP NO. 7

LEGEND

STORM DRAINAGE BOUNDARY

STORM DRAIN BOUNDARY SUB-AREA NUMBER (16)

EXISTING STORM DRAIN

PROPOSED STORM DRAIN

EXISTING DETENTION BASIN

PROPOSED DETENTION BASIN

PROPOSED RESERVOIRS

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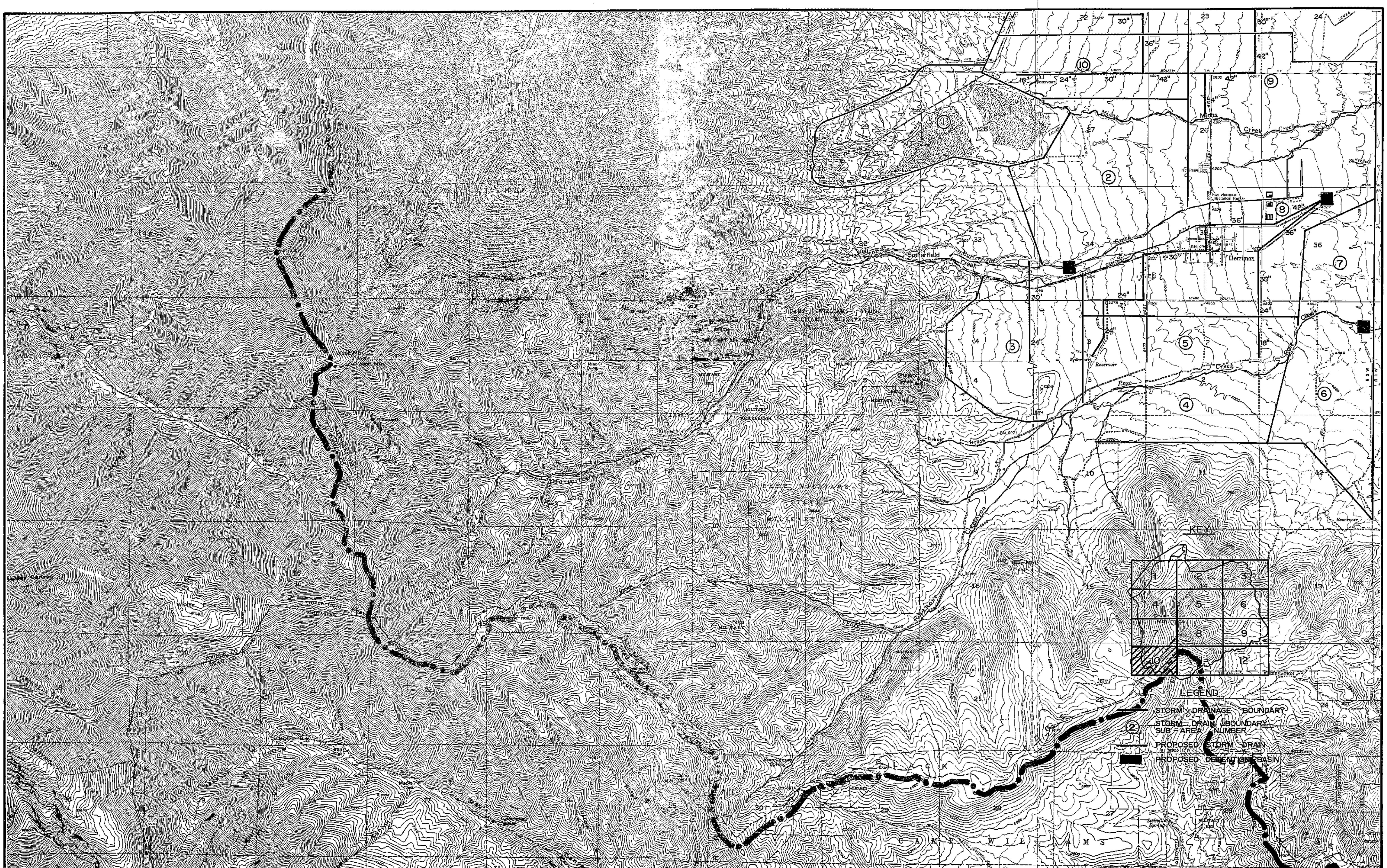
URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI-14

MAP NO. 8



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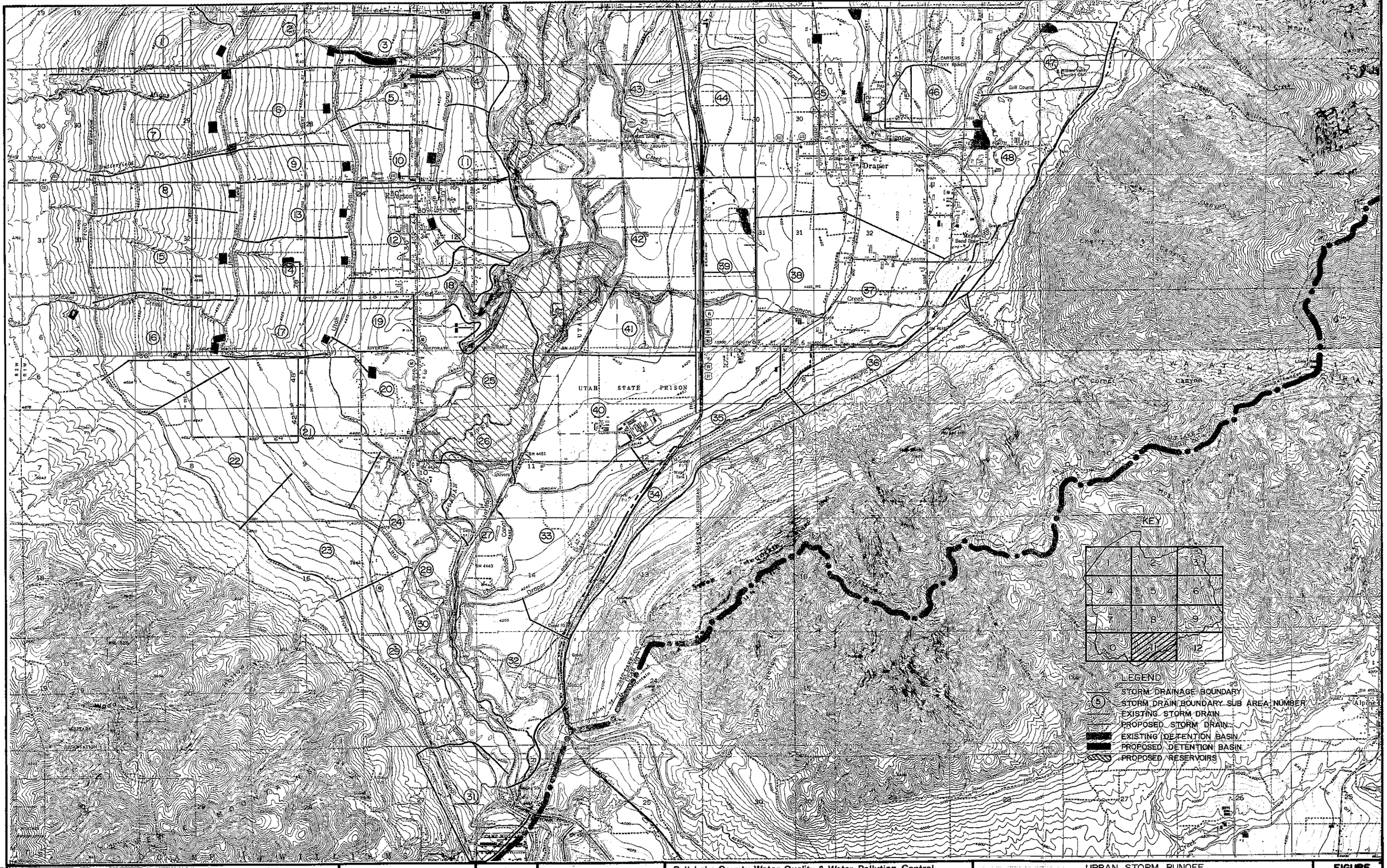
URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI-14

MAP NO. 10



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208 Water Quality Plan

URBAN STORM RUNOFF

EXISTING & PROPOSED FACILITIES

FIGURE VI-14
MAP NO. II

"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/1." 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/1 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.

■ PROPOSED DETENTION BASINS

PROPOSED DRY WEATHER STORMWATER COLLECTOR SEWER

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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)	(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

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MILES

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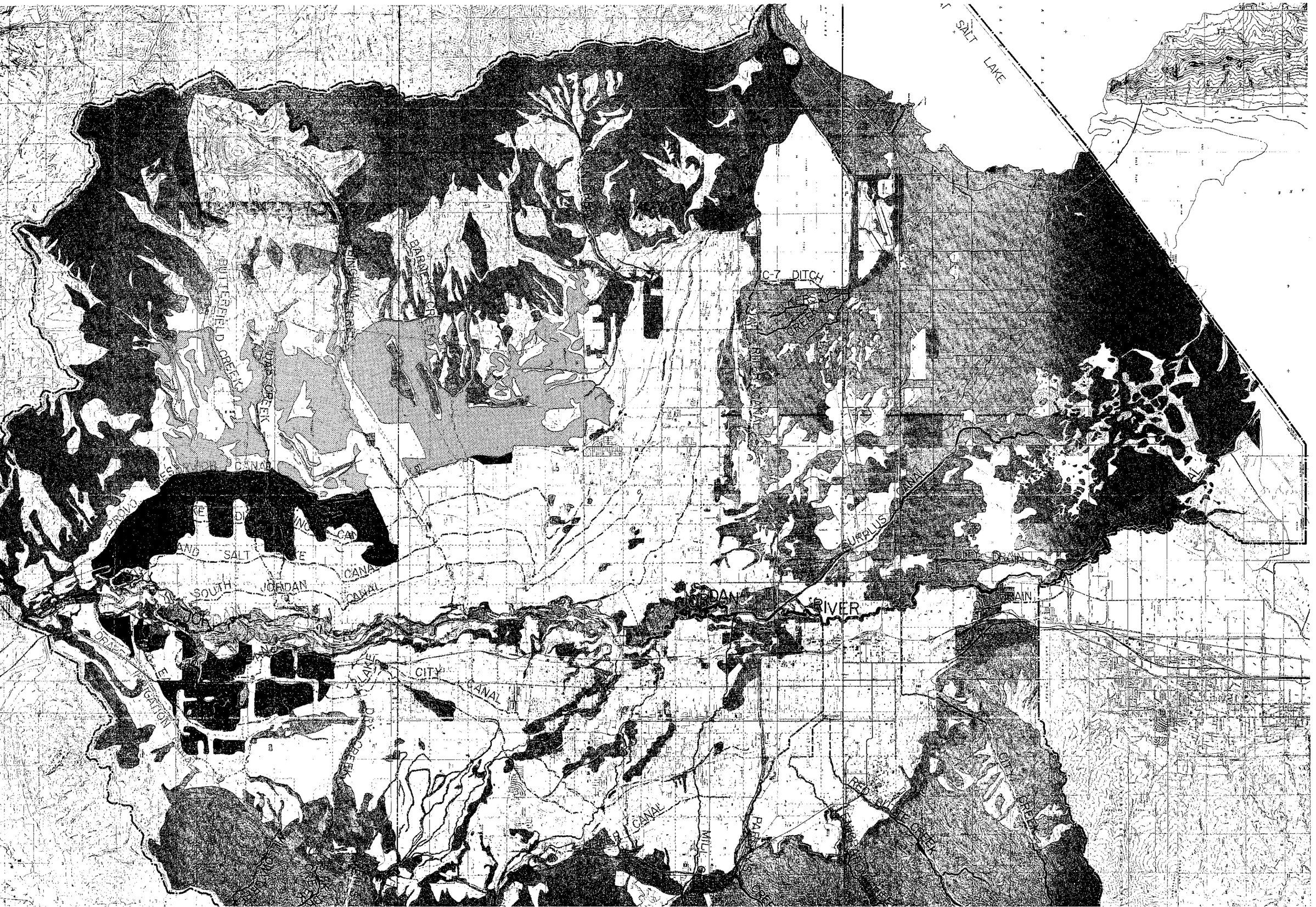
SALT LAKE
C-7 DITCH
KERR CREEK
BARNES CR
BUTTERFIELD CREEK
DRY CREEK
MIDVALE CANAL
SURPLUS CANAL
SOUTH JORDAN CANAL
JORDAN RIVER
CITY DRAIN
CITY CANAL
DRAPER IRRIGATION
RED BUTTE CREEK
CANAL

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

640 ACRES

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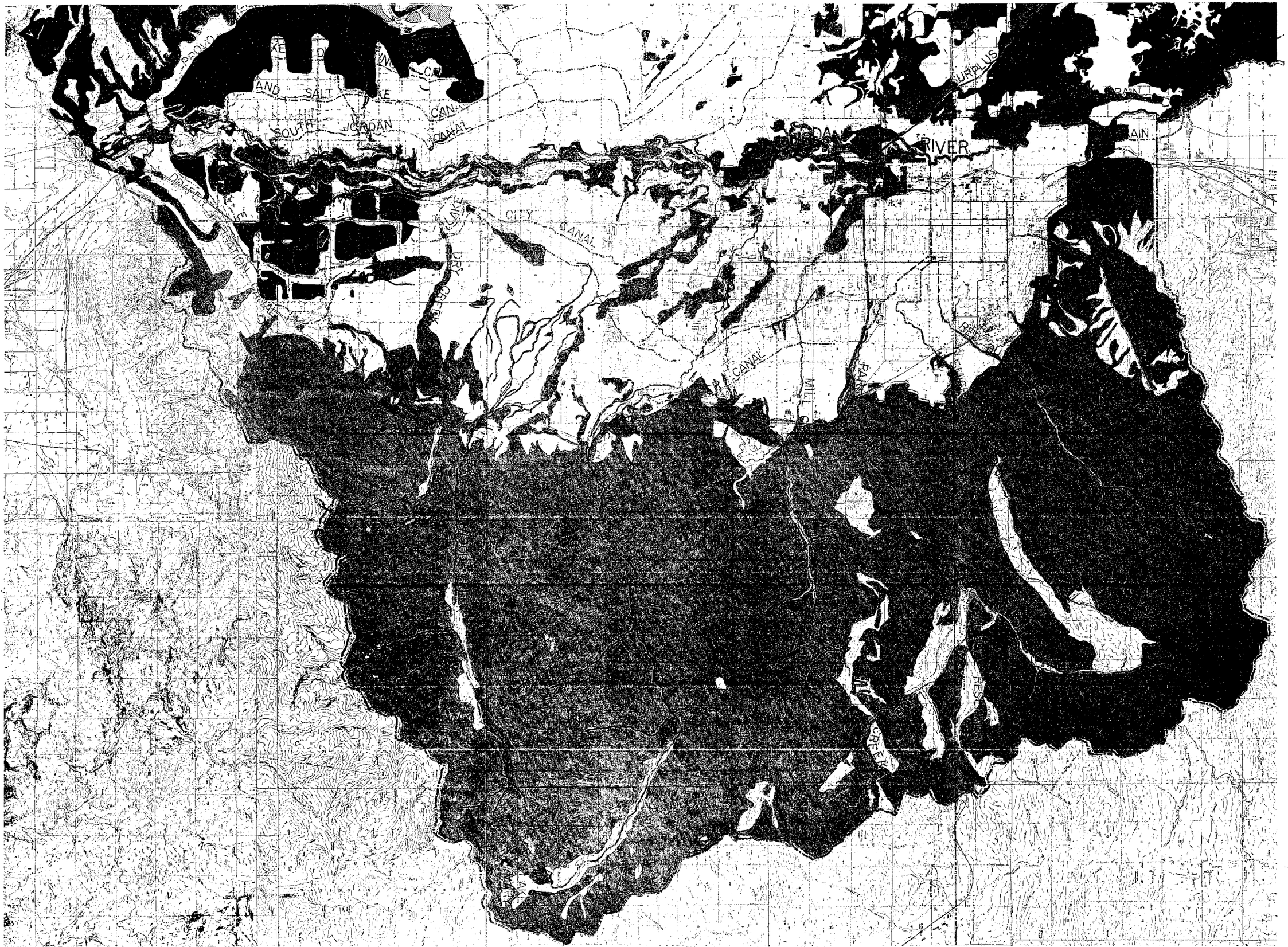
SALT
SOUTH
JORDAN
CANAL
CITY
CANAL
RIVER

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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