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Addendum To The Environmental Assessment

Annex B

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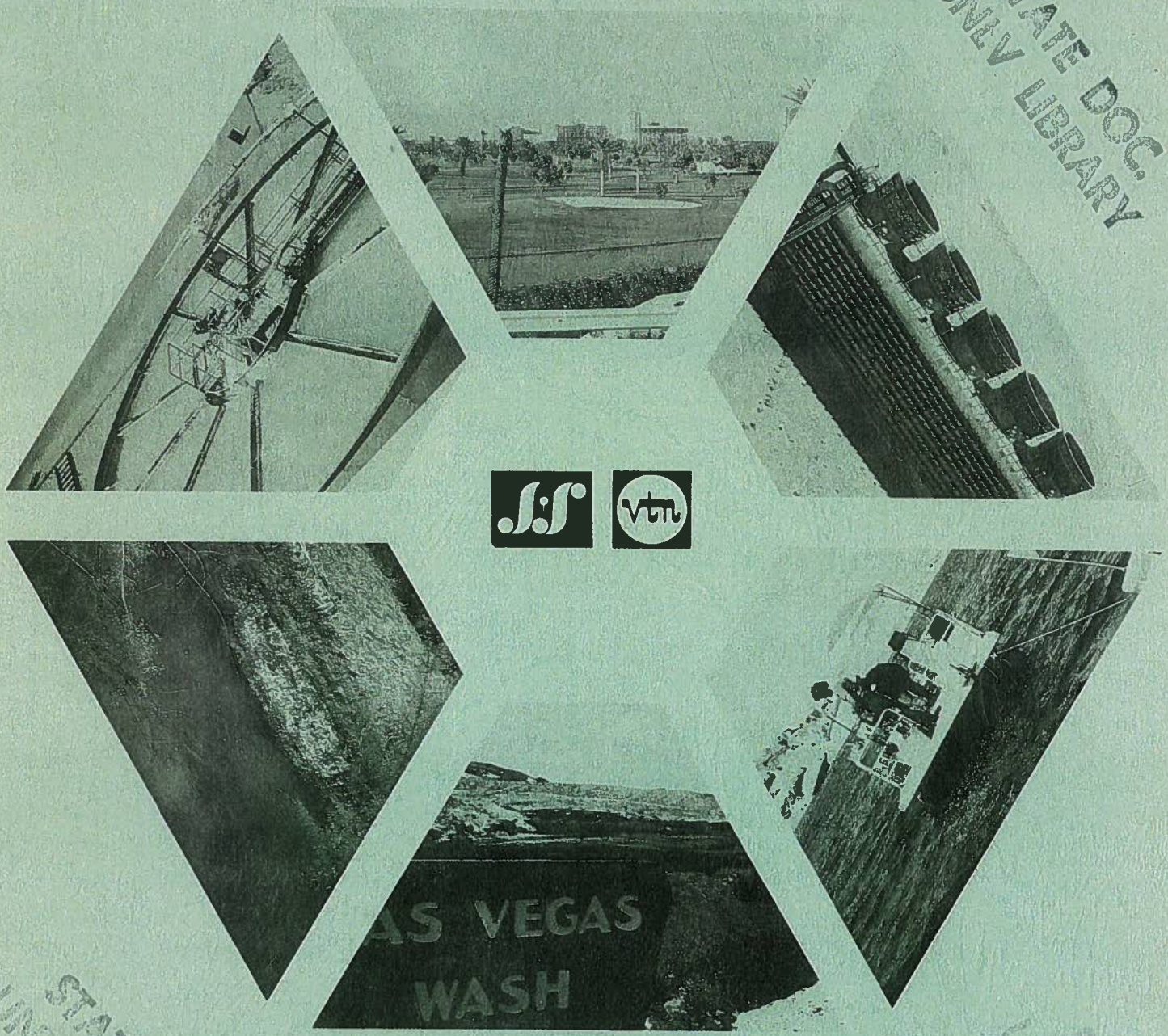

J.S VTN

Las Vegas Wash/Bay
Pollution Abatement Project

July 1974

FOR
BOARD OF COUNTY COMMISSIONERS, CLARK COUNTY, NEVADA

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Submitted To

BOARD OF COUNTY COMMISSIONERS
CLARK COUNTY, NEVADA

July 1, 1974

ADDENDUM TO THE ENVIRONMENTAL ASSESSMENT
POLLUTION ABATEMENT PROJECT
LAS VEGAS WASH AND BAY, ANNEX B

Submitted By

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ENVIRONMENTAL ASSESSMENT ADDENDUM
LAS VEGAS WASH/BAY POLLUTION ABATEMENT PROJECT

TABLE OF CONTENTS

Chapter	Title	Page
1.	SUMMARY AND CONCLUSIONS	1
2.	INTRODUCTION AND BACKGROUND	8
	A. The Problem	8
	B. The Plan for a Solution	9
	C. Project Objectives	9
	D. Purpose of the Environmental Assessment	11
	E. Environmental Assessment Approach	11
	F. Study Team	11
3.	PRESENT ENVIRONMENT	12
	A. Introduction	12
	B. Regional Environment	12
	1. Geography	12
	2. Topography	12
	3. Population	13
	4. Cultural Features	15
	5. Archeology and Paleontology	15
	6. Climate	15
	7. Air Quality	15
	8. Noise	18
	9. Geology and Groundwater	18
	10. Earthquake Potential	24
	11. Water Supply	24
	12. Wastewater Treatment	24
	13. Biota of the Region	25
	14. Scenic Values	27
	15. Recreation	27
	16. Land Use	28
	17. History of Las Vegas Wash	29

TABLE OF CONTENTS (continued)

Chapter	Title	Page
3.	(Continued)	
	C. Site Environments	36
	1. Experimental Recharge Well	36
	2. Wastewater Collection System	37
	3. Advanced WastewaterTreatment Plant	41
	4. Sludge Disposal Site	41
	5. Pilot Desalination Plant	42
	6. Potential Brine Disposal	43
	7. Las Vegas Valley Lands to be Irrigated	43
	D. Las Vegas Wash	44
	E. Las Vegas Bay	48
	F. Environment of the Colorado River	50
4.	ENVIRONMENTAL QUALITY OBJECTIVES	55
	A. Introduction	55
	B. Environmental Quality Objectives	55
5.	LEGAL, REGULATORY, AND INSTITUTIONAL CONSTRAINTS	57
	A. Introduction	57
	B. Guidelines for Environmental Assessment	57
	1. National Environmental Policy Act of 1969	57
	2. Council on Environmental Quality Guidelines	58
	3. Environmental Protection Agency, Interim Regulation	58
	C. Constraints Related to the Proposed Project	58
	1. Federal Water Pollution Control Act	59
	2. Senate Bill No. 288 (NRS 790)	59
	D. Regulatory Constraints	60
	1. Water Quality Standards	60
	2. Air Quality Standards	61
	3. Construction Specifications	63

TABLE OF CONTENTS (continued)

Chapter	Title	Page
6.	PROJECT DESCRIPTION	64
	A. General	64
	1. System Overview	64
	2. Expansion and Flexibility	65
	B. Project Element Descriptions	66
	1. Wastewater Collection System	66
	2. Advanced Wastewater Treatment Plant	67
	3. Desalination Plant	69
	4. Groundwater Recharge Program	71
	5. Discharges to Las Vegas Wash	72
	6. In-Valley Irrigation	72
	C. Energy Requirements	78
	D. Potential Future Projects	79
	1. Export Pipeline	79
	2. The Allen Power Project	79
	3. Decentralized AWT Plant	80
	4. Las Vegas Wash Collection System	80
7.	ENVIRONMENTAL IMPACTS	82
	A. Introduction	82
	B. Ability of the Project to Meet Environmental Quality Objectives and Project Objectives	82
	1. Project Objectives	82
	2. Environmental Quality Objectives	83
	C. Environmental Impacts and Mitigation Measures	86
	1. General Construction Impacts	86
	2. Impacts of Project Elements	90
	3. Impacts on Las Vegas Wash	100
	4. Impacts on Las Vegas Bay	105
	5. Impacts on the Colorado River	107
	6. Other Impacts	107
	D. Environmental Impact Considerations of Modified Alternative No. 3	112

TABLE OF CONTENTS (continued)

Chapter	Title	Page
7.	(continued)	
	D. 1. Construction Impacts	112
	2. Impacts of Project Elements	113
	3. Impacts on Las Vegas Wash	113
	4. Impacts on Las Vegas Bay	114
	5. Impacts on the Colorado River	114
	6. Other Impacts	115
	E. Evaluation of Alternatives	115
8.	ENVIRONMENTAL IMPACT SUMMARY	119
	A. Environmental Impacts of the Proposed Project	119
	B. Unavoidable Adverse Impacts	120
	C. Alternatives to the Proposed Project	120
	D. Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity	121
	E. Irreversible and Irretrievable Commitments of Resources	121
9.	PROJECT ALTERNATIVES	122
10.	BIBLIOGRAPHY	125
APPENDIX	A Fauna Listings	
APPENDIX	B Air Quality	
APPENDIX	C Water Quality	
APPENDIX	D Supplemental Information	
APPENDIX	E Project Plan	
APPENDIX	F Public Comments	
APPENDIX	G Glossary	

LIST OF ILLUSTRATIONS

Figures		Following Page
1.	Study Area	12
2.	Population Projections for Las Vegas Valley	13
3.	Variations in Average Day Wastewater Flow	25
4.	Water Demand and Wastewater Production	25
5.	The Spanish Trail	31
6.	The Southwest before the Mexican War	32
7.	Las Vegas Wash - 1855	32
8.	Las Vegas Valley - 1871	34
9.	Las Vegas Wash - 1866	35
10.	Las Vegas Rancho	35
11.	1973 Average Day Wastewater Flows	44
12.	Distribution of Plant Communities	46
13.	Advanced Wastewater Treatment Plant	67
14.	Pilot Desalination Plant	70
15.	Relationship of Discharges to Las Vegas Wash and Flows at USGS Gauging Station	100
B-1	1973 NO_2 Concentrations	Appendix B
B-2	1973 Oxidant Concentrations	Appendix B
B-3	1973 Particulate and SO_2 Emissions	Appendix B
B-4	1973 CO and HC Emissions	Appendix B
B-5	1973 NO_x Emissions	Appendix B
D-1	Las Vegas Valley Water Resources Management Plan	Appendix D
E-1	Las Vegas Wash/Bay Pollution Abatement Project	Appendix E

LIST OF ILLUSTRATIONS (continued)

Tables		Page
1.	Population of Las Vegas Valley and Clark County	14
2.	1973 Emissions Inventory	17
3.	Irrigation Water and Return Flow - 1973	22
4.	Land Use in Las Vegas Valley - 1972	28
5.	Projected Land Use in Las Vegas Valley - 2000	29
6.	Basic Biota of the Site Environment	38
7.	Point and Diffuse Discharges into Las Vegas Wash	46
8.	Vegetation types and Biotic Communities of the Las Vegas Wash	47
9.	Maximum Discharge in Las Vegas Wash at Pabco Road	48
10.	Salinity Projections Along the Colorado River	51
11.	Weighted Average Salinity Detriment	52
12.	Reject Solids and Disposal Area Requirements	69
13.	Projected Wastewater Availability and Reuse	73
14.	Projected Expansion of In-Valley Irrigation	73
15.	Projected Land Areas and Volume of Reused Wastewater	74
16.	Potential Acreage for Irrigation with Advanced Treated Wastewater	75
17.	Estimated Electric Power Consumption	78
18.	Estimated Power Demands and Supply	79
19.	Reclaimed Wastewater Deliveries - Allen Power Project	80
20.	Noise Emissions from Construction Equipment	87
21.	Estimated Annual Flows to Las Vegas Wash and Lake Mead - 1971 to 1973	101

LIST OF ILLUSTRATIONS (continued)

Tables		Page
22.	Existing and Future Wastewater Characteristics	104
23.	Projected AWT Plant Reserve Capacity	110
A-1	Threatened Species List	Appendix A
B-1	Projected Stack Gas Conditions	Appendix B
B-2	Ambient Air Quality Standards	Appendix B
C-1	Water Quality Characteristics	Appendix C
C-2	Selected Nevada Water Pollution Control Regulations	Appendix C

CHAPTER 1

SUMMARY AND CONCLUSIONS

CHAPTER 1

SUMMARY AND CONCLUSIONS

Municipal and industrial wastewaters from the Las Vegas Valley along with highly saline subsurface flows are discharged into Las Vegas Wash, thereby polluting Lake Mead and the Colorado River downstream. The principal effects of the pollution have been algal blooms in the Las Vegas Bay of Lake Mead, and increases to the salt load of the Colorado River.

Major efforts toward developing a solution to the pollution abatement problem in the Las Vegas Wash-Lake Mead area have been made since 1967. These efforts have been made by the citizens of the Las Vegas area, and concerned public agencies at the Federal, State and local levels. In December 1971, the U.S. Environmental Protection Agency instituted a 180-day enforcement action against the major polluting agencies and industries discharging into Las Vegas Wash. The 1971 Nevada Legislature designated the Las Vegas Valley Water District (LVVWD) as the agency responsible for developing a plan to abate the pollution caused by wastewater flows in Las Vegas Wash.

The plan, which outlined a program for export of polluted waters to the Dry Lake area, was completed in December of 1972. The 1973 Nevada State Legislature through its passage of Senate Bill 288 (NRS 790) approved the final written report of the Las Vegas Valley Water District. The Legislature also recognized that there may be further alternative solutions to the pollution abatement problem, and in Senate Bill 288 transferred the responsibility of developing a solution to the problem to the Board of County Commissioners for Clark County.

The 1972 Environmental Assessment prepared by VTN Nevada and Jones and Stokes Associates, Inc. was a part of the plan developed by the LVVWD. The Assessment evaluated nine possible actions formulated to accomplish wastewater management in Las Vegas Valley. Six of the possible actions, or alternatives, were developed by Boyle Engineering and Cornell, Howland, Hayes, and Merryfield (Boyle - CH_2 M) in the "Phase III" report. The seventh alternative, which was selected by the LVVWD, was a combination of several alternatives. The eighth alternative was suggested at a public hearing, and the ninth was required to conform to the National Environmental Policy Act of 1969. Subsequent to this the LVVWD retained Nevada Environmental Consultants (NECON) to prepare a project report describing the selected alternative.

In accordance with the directives of Senate Bill 288, the Board of County Commissioners has reviewed the program proposed in December 1972, and is considering a tenth alternative solution to the pollution abatement problem. This alternative has been made possible by recent revisions to Nevada's Water Pollution Control Regulations. These Federally approved Regulations of October 24, 1973 establish, among other things, water quality standards for Las Vegas Wash.

This Addendum has been prepared as a supplement to the 1972 Environmental Assessment. The Assessment is required according to the provisions of Section 102(2)c of the National Environmental Policy Act of 1969. Throughout the text, reference is made to the 1972 Environmental Assessment, and the documents which have been developed over the history of the Las Vegas Wash/Bay Pollution Abatement Project.

The purpose of this Environmental Assessment Addendum is to reevaluate the nine previously considered alternatives along with the new alternative. This evaluation has been guided by 1) the most recent laws, regulations, and policies providing guidelines for identifying environmental impacts, and 2) a reexamination of the overall objectives of the project in light of new agency responsibilities and revised project emphasis.

The approach followed to develop this Addendum is the same as presented on page 15 of the 1972 Environmental Assessment. The descriptive catagories of the present environment in Chapter 3 include those of the 1972 Environmental Assessment, and a new section on Las Vegas Bay.

The Environmental Quality Objectives in Chapter 4 have remained unchanged, but in light of new agency responsibilities and recent changes in legal and regulatory contraints the project objectives have been reevaluated. The project objectives developed for this evaluation are:

1. To achieve water quality in Las Vegas Bay compatible with State and Federal water quality regulations

2. To provide for advanced treatment and maximum beneficial reuse of wastewater

3. To minimize, to the greatest extent possible, any adverse economic or environmental impact of any plan developed

A description of the relevant laws, regulations, and policies which have guided the formulation of the proposed project, and aided in the identification of environmental impacts is presented in Chapter 5.

A brief description of the alternative projects which have been considered for implementation is shown below:

Alternative No. 1 - Groundwater recharge.
Alternative No. 2 - Complete treatment.
Alternative No. 3 - AWT and return to Lake Mead.
Alternative No. 4 - Export to Dry Lake.
Alternative No. 5 - Export to Eldorado Valley.
Alternative No. 6 - Export to Hidden Valley and Jean Lake.
Alternative No. 7 - Combination alternative.
Alternative No. 8 - Deep Well Disposal.
Alternative No. 9 - No action.
Alternative No. 10 - Amended Combination Alternative

Alternative 10 is an amended combination alternative comprised of discharge to Lake Mead through Las Vegas Wash, and land and subsurface reuse of treated wastewater. An expanded description of alternative 10 is shown below.

Alternative No. 10 - Amended Combination Alternative

Wastewater at a central collection point would be given advanced wastewater treatment sufficient to meet water quality standards. Effluent from this facility would be available for use by 1) Allen Power Project 2) an in-valley irrigation program, 3) a water source for a pilot desalination plant, 4) a water source for a pilot groundwater recharge program, 5) maintenance of a greenbelt in Las Vegas Wash, and 6) return flow credit from the Colorado River when returned to Lake Mead.

Environmental impacts of the amended combination alternative (Alternative 10) are presented in Chapter 7. A comparative evaluation of the new alternative with the previously considered alternatives is developed based on an updated ranking system. The following table shows the relationship of the ten alternatives to the environmental quality objectives, and the revised project objectives.

COMPARATIVE EVALUATION OF ALTERNATIVES TO PROJECT AND ENVIRONMENTAL QUALITY OBJECTIVES

		Alternatives									
		1	2	3	4	5	6	7	8	9	10
Project Objectives											
1.	Achieve water quality to meet State and Federal Regulations	1	1	1	1	1	1	1	2	3	1
2.	Provide for advanced wastewater treatment and beneficial reuse	1	1	1	3	3	3	2	3	3	1
3.	Minimize any adverse economic or environmental impact	2	2	1	2	2	2	1	3	3	1
Environmental Quality Objectives											
1.	Attains a clean desert environment	No Basis for Comparison									
2.	Maintains Las Vegas Wash as a riparian area	3	1	1	3	3	3	2	3	1	1
3.	Develop additional greenbelt areas	No Basis for Comparison									
4.	Optimize the use of water	2	1	2	3	3	3	2	3	3	1
5.	Protect environment from adverse construction impacts	Not of Sufficient Duration to Rank									
	SUBTOTAL	9	6	6	12	12	12	8	14	13	5

Key: 1 - Achieves objective
2 - Questionable
3 - Does not achieve objective

The ten alternatives were then evaluated against six major environmental impacts. Four of the major impacts were considered in the 1972 Environmental Assessment. The two remaining impacts were added to the Addendum based on the analysis of impacts resulting from the new alternative. The results of the impact evaluation are shown below.

COMPARATIVE EVALUATION
OF ALTERNATIVES TO KEY
ENVIRONMENTAL IMPACTS

Impacts	Alternatives 1	2	3	4	5	6	7	8	9	10
1. Potential to cause earthquakes	1	1	1	1	1	1	1	3	1	1
2. Pollute regional water resources	1	1	1	1	2	2	1	1	3	1
3. Change environment of large surface areas	3	3	1	3	3	3	3	1	3	1
4. Pollutes regional air resources	2	2	2	2	2	2	2	2	1	2
5. Contributes to salt load of Las Vegas Wash	1	1	2*	1	1	1	1	1	3	2*
6. Prevents growth	1	1	1	1	1	1	1	1	3	1
SUBTOTAL	9	9	8	9	10	10	9	9	14	8

Key: 1 - No
2 - Questionable
3 - Yes

The comparative evaluation of alternatives against project objectives, environmental quality objectives, and major environmental impacts were then combined resulting in a numerical ranking of the alternatives. The subtotals in the above tables were added with the lowest cumulative total representing the most environmentally sound alternative. The cumulative totals and overall ranking is shown below.

---

* Alternatives 3 and 10 includes discharge to Las Vegas Wash this contributing to the salt load of the Wash. However, the salt load will be dedecreased through advanced treatment and a rating of "2" is appropriate.

ENVIRONMENTAL RANKING OF ALTERNATIVES

	Alternatives									
	1	2	3	4	5	6	7	8	9	10
SUBTOTAL FROM PROJECT AND ENVIRONMENTAL QUALITY EVALUATION	9	6	6	12	12	12	8	14	13	5
SUBTOTAL FROM KEY IMPACT EVALUATION	9	9	8	9	10	10	9	9	14	8
TOTAL	18	15	14	21	22	22	17	23	27	13
ENVIRONMENTAL RANKING	5	3	2	6	7*	7*	4	8	9	1

*Equal Ranking

Based on the comparative evaluation of alternatives described above, it can be concluded that the four most environmentally sound alternatives include:

Alternative No. 2 - Complete Treatment

Alternative No. 3 - Advanced Wastewater Treatment and Return to Lake Mead

Alternative No. 7 - Combination Alternative

Alternative No. 10 - Amended Combination Alternative

A complete cost-effective analysis of these alternatives is included in the facilities plan.

In the preparation of the Environmental Assessment Addendum, and previously in the 1972 Environmental Assessment a number of conclusions became apparent from the evaluations. The five points noted on page 7 of the 1972 Environmental Assessment still appear to be valid. The following conclusions are presented in addition to those previously indentified.

1. Wastewater management in the Las Vegas Wash-Lake Mead area must include substantial flexibility to be responsive to changes in the future. The more significant changes to be considered include, a) future water demand, use, and wastewater production, b) actual population growth and distribution, and c) changing regulatory standards at Federal, State, and local levels.

2. Any on-going wastewater management system which effects Las Vegas Wash, Lake Mead, and the groundwater basin in Las Vegas Valley should be monitored to insure the protection of these important water resources.

Chapter 2

INTRODUCTION AND BACKGROUND

Chapter 2

INTRODUCTION AND BACKGROUND

A. The Problem

A description of the events leading to the development of the Las Vegas Wash/Bay Pollution Abatement Project is presented in the 1972 Environmental Assessment. Since completion of the 1972 Assessment, a number of pertinent events have occurred which are described below to explain the background of the project evaluated in this Environmental Assessment Addendum.

Pollution of the Las Vegas Bay of Lake Mead and the Colorado River downstream remains the problem to which a solution is being proposed. The factors affecting a solution to the problem have changed. These changes are reflected in; 1) the passage of Senate Bill 288 (NRS 790) by the 1973 Nevada Legislature, and 2) the adoption of revised water quality standards by the State Environmental Commission and the EPA.

It was indicated in the 1972 Environmental Assessment that the EPA instituted enforcement action against the major polluting governmental agencies and industries required that a workable solution to the problem be scheduled and submitted to EPA for approval. The 1971 enforcement action is still in effect. However, the steps that have been taken by local agencies to develop both a County-wide Water Quality Management Plan, and a program to eliminate the pollution of Lake Mead and the Colorado River downstream appear to be an acceptable course of action to the EPA.

Acting under authority of the Federal Water Pollution Control Act Amendments of 1972, the EPA has required essentially all of the agencies and industries discharging wastewaters to Las Vegas Wash to obtain a permit under the National Pollutant Discharge Elimination System (NPDES). The status of permit issuance to the various agencies varies and is, of course, dependent on the individual compliance actions being taken. EPA has advised that in the case of Las Vegas Wash, water quality standards are a controlling factor and that NPDES permit will be tailored to these standards.

The Nevada Water Pollution Control Regulations adopted by the State on October 24, 1973 were approved with one exception by the U.S. Environmental Protection Agency on November 30, 1973. The one exception to EPA's approval of the State regulations was the temperature criterion for Las Vegas Wash. Along with EPA's approval, a number of water quality standards intended to be supplementary

to those adopted by Nevada were proposed by EPA. Two of the proposed standards most pertinent to this addendum were; 1) a temperature standard for Las Vegas Wash, and 2) a limit on the quantity of total dissolved solids discharged to Las Vegas Bay from Las Vegas Wash. Discussions on the development of an acceptable temperature standard continued throughout early 1974 and on April 9th a revised standard was adopted by the State Environmental Commission. On March 28, 1974 the EPA proposed salinity standard for Las Vegas Wash was held in abeyance.

The recently adopted Water Pollution Control Regulations, as revised, and the relevant standards currently under review by the U.S. Environmental Protection Agency are presented in Appendix C. These standards represent important guides through which the proposed project has been developed.

B. The Plan for a Solution

It was noted in the 1972 Environmental Assessment that the 1971 Nevada Legislature enacted legislation designating the Las Vegas Valley Water District as the agency responsible for developing a plan for eliminating the pollution of Lake Mead by wastewaters in Las Vegas Wash. In accordance with the directives of that legislation the District prepared a plan and submitted it to the Nevada Legislature in December 1972.

The 1973 Nevada State Legislature through its passage of Senate Bill 288 (NRS 790) transferred the responsibility of developing a solution to the pollution abatement problem in the Las Vegas Wash-Lake Mead Area to the Board of County Commissioners for Clark County. The legislature also approved the December 1972 final written report of the Las Vegas Valley Water District, which outlined a program for export of polluted waters to the Dry Lake area. It was recognized in the 1973 legislation that there may be further alternative solutions to the pollution abatement problem, and the report of which this Environmental Assessment Addendum is a part represents the plan developed by the Board of County Commissioners in accordance with the directives of Senate Bill 288.

C. Project Objectives

The original Environmental Assessment set forth several project objectives, and identified a primary project objective. As part of the development of an Environmental Assessment Addendum it appears appropriate to reexamine these objectives in light of new agency responsibilities and revised project emphasis.

The Las Vegas Valley Water District adopted the following project objectives which were included verbatim in the original Environmental Assessment.

1. The development of the most feasible plan to materially reduce or eliminate, if possible, pollutants now entering Lake Mead from Las Vegas Wash.

2. The protection and best use of the water resources of the area.

3. The development of an interim plan, if possible, for the immediate relief of the problems caused by Las Vegas Wash.

4. Minimizing, to the greatest extent possible, any adverse economic or environmental impact of any plan developed.

The Environmental Assessment also stated:

> The Legislature designated the Las Vegas Valley Water District as "...the agency to undertake elimination of the water pollution problems..." in the Lake Mead-Las Vegas Wash area of Clark County. The primary project objective may therefore be phrased: Eliminate the pollution of Lake Mead from Las Vegas Wash.

Although the referenced law was repealed by the Nevada Legislature in Senate Bill 288, (NRS 790), the primary project objective still appears to be valid.

The Consultants believe that two project objectives are implied for the newly proposed alternative project. They can be stated as

1. Remove pollutants from wastewater by advanced treatment, and

2. Maximize the beneficial reuse of treated wastewater.

It may also be desirable to restate the objectives more clearly incorporating this new emphasis:

1. To achieve water quality in Las Vegas Bay compatible with Federal and State water quality regulations.

2. To provide for the protection and best use of the water resources of the area by:

   a. removing pollutants from wastewater by advanced treatment, and
   b. maximizing the beneficial reuse of treated wastewater.

3. To minimize, to the greatest extent possible, any adverse economic or environmental impact of any plan developed.

D. Purpose of the Environmental Assessment

The discussion on page 14 of the 1972 Environmental Assessment regarding the purpose of the Environmental Assessment is still applicable to this Addendum. The exceptions to the text therein are 1) the Board of County Commissioners for Clark County have assumed the role of the Las Vegas Valley Water District, and 2) the Nevada State Commission of Environmental Protection has become the State Environmental Commission.

E. Environmental Assessment Approach

The procedure outlined on pages 15 and 16 of the 1972 Environmental Assessment was used unchanged to identify and evaluate environmental impacts in this Addendum. The project proposed herein was evaluated along with the nine previously considered alternatives in light of revised project objectives and the environmental quality objectives in Chapter 4 of the 1972 Environmental Assessment. These environmental quality objectives are also shown in Chapter 4 of the Environmental Assessment Addendum.

F. Study Team

VTN Nevada and Jones and Stokes Associates, Inc. have prepared this Environmental Assessment Addendum with the cooperation and help of many agencies and individuals. Special consultants to the report have included Claude N. Warren, Ph. D. archeology; C. Bernard Caliendo, paleontology; and Stanley H. Paher, history. The contributions of the Clark County Wastewater Management Agency staff (formerly Clark County Pollution Abatement Project), the Clark County Regional Planning Council (Robert Hanzel), Center for Water Resources Research, Desert Research Institute staff (Jerry Westphal), Nevada Environmental Consultants (J. David Griffith, P.E.), and the faculty and students of the University of Nevada at Las Vegas have been of invaluable assistance.

The VTN Nevada team was comprised of N. A. Schmidt (Project Director), Curtis E. Spencer (Assistant Project Director), John G. Hemington, Ph. D. (Project Manager), James C. Saucerman, Douglas M. Ross, James P. Tomany, and Fred Proby. Review, coordination, management, and representation at public meetings was contributed by Robert L. Jones of Jones & Stokes Associates Inc. Additional Jones & Stokes professionals contributing to the preparation of this Addendum were Jonathan Ives and Steven Herrera.

Chapter 3

PRESENT ENVIRONMENT

Chapter 3

PRESENT ENVIRONMENT

A. Introduction

The format used in describing the present environment is the same in this addendum as was used in the 1972 Environmental Assessment. The division of the present environment into descriptive categories is similar, with the first four environments remaining the same. Based on the additional data now available on the Las Vegas Bay, this environment has been expanded as a separate section. The present environment is now organized into the following sections:

1. Regional environment, consisting of the Las Vegas Valley.
2. Site Environments, including locations of proposed project facilities and areas of project impact.
3. Las Vegas Wash
4. Las Vegas Bay, as it relates to the Las Vegas Wash and the Pollution Abatement Project.
5. The Colorado River System

B. Regional Environment

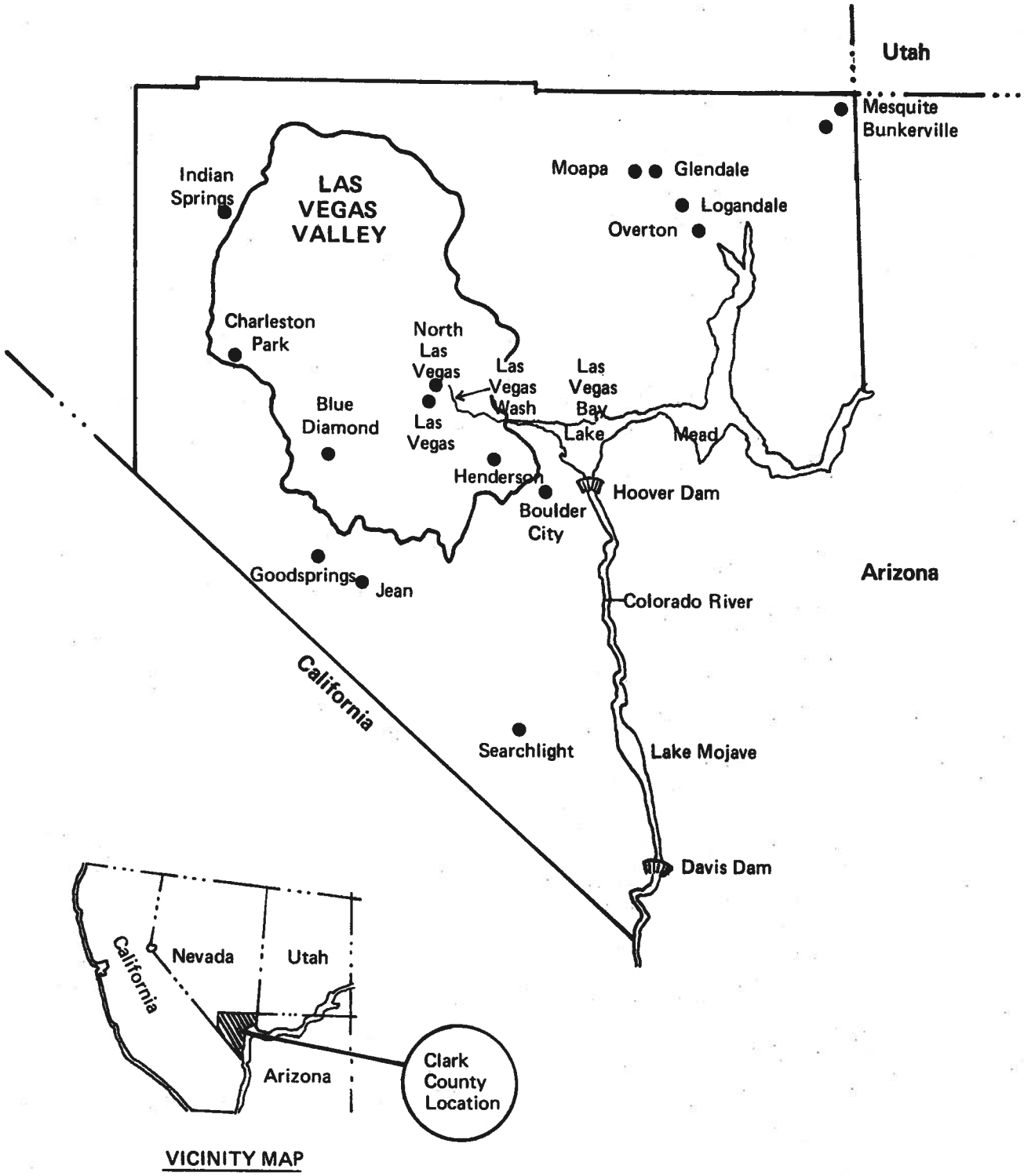
The regional environment includes those areas of Southern Nevada to be affected in some way by the proposed project or its alternatives. In the 1972 Environment Assessment, five areas were identified under the regional environment. Within this addendum only one area is considered a part of the regional environment - the Las Vegas Valley. Description of the Las Vegas Valley has been covered in some detail in the main report, however the following information is presented as an update or expansion of that previous account.

1. Geography

The regional area of concern lies exclusively within Clark County, Nevada (Figure 1). Las Vegas Valley is located near the junction of the States of Nevada, Arizona and California, and approximately 11 miles to the west of Lake Mead.

2. Topography

The following information supplements are shown on page 17 of the 1972 Environmental Assessment.



VICINITY MAP

Source: NECON

ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

FIGURE 1

STUDY AREA

Prepared by VTN

The Clark County region is characterized by a diverse topography, with elevation varying from near 500 feet at the Colorado River to over 11,900 feet at Charleston Peak. Las Vegas Valley is situated at the 2,000 foot elevation and is rimmed by numerous isolated mountain chains that range in a general north-south direction.

3. Population

Based on the Bureau of the Census population data for 1970, approximately 268,065 people inhabited the Las Vegas Valley in 1970. This constitutes 98 percent of the total population of Clark County. Census data indicated there was a doubling trend in the county population every 10 years from 1920 until 1970.

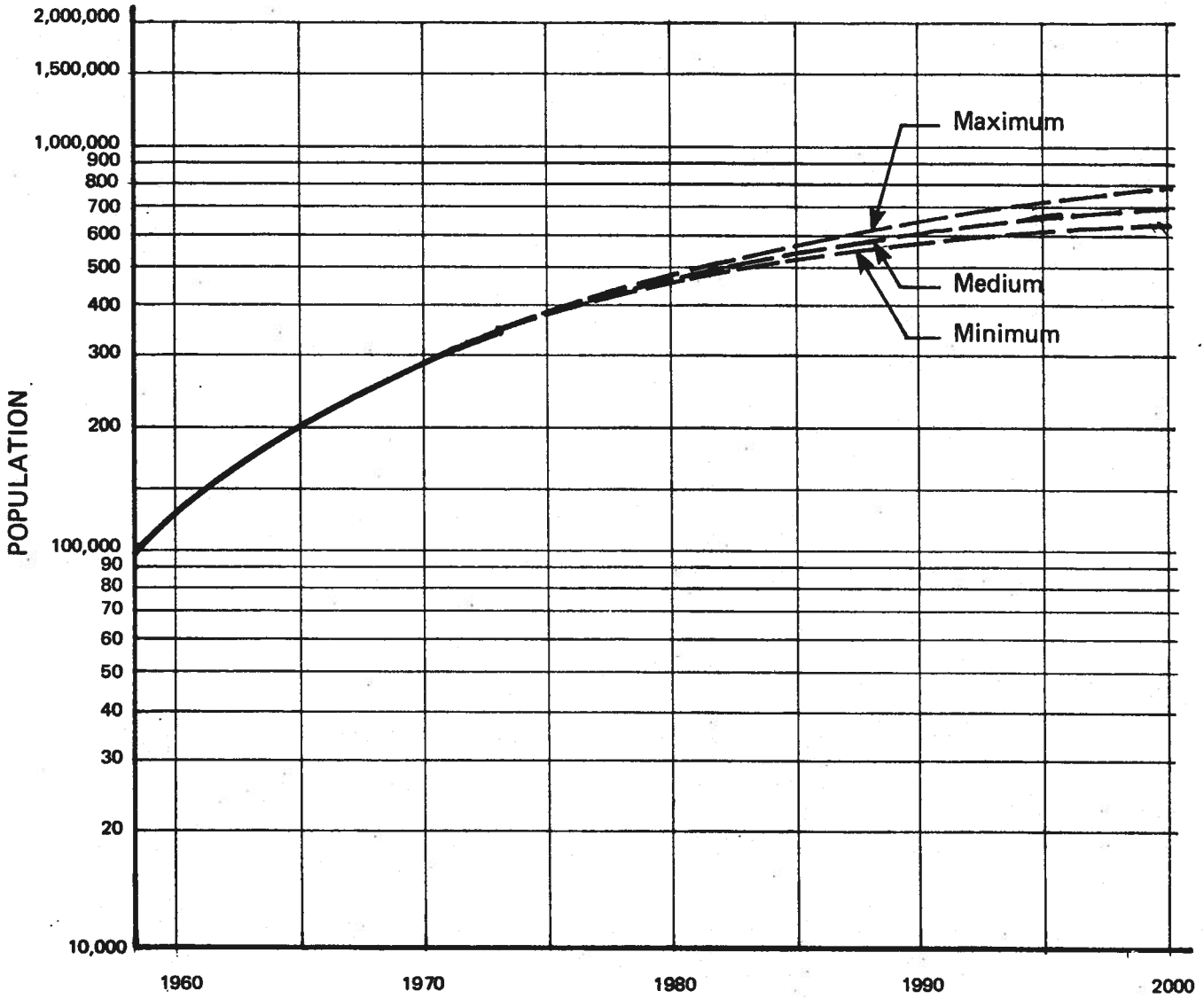
In 1972, the Clark County Regional Planning Council adopted population projections presented in the report entitled "Population Projections, Clark County, Nevada 1980 - 2000." These projections refer to the estimated permanent population as presented in Figure 2.

The expected distribution of the population of Clark County by the year 2000 still remains a question. The Clark County Regional Planning Council (C.C.R.P.C.) has calculated that of the 750,000 people expected to inhabit Clark County in 2000, 93 percent (700,000) of the population will be in the Las Vegas Valley. The population components of the Las Vegas Valley are projected to be, 295,000 people in the City of Las Vegas, 284,000 in unincorporated areas, 91,000 in North Las Vegas and 30,000 in Henderson.

Recent demographic projections for the City of Henderson suggest that the city population will approach 44,000 people by the year 2000, and that new planned communities of Green Valley and Lake Adair will increase the population of the Henderson area to 159,280 by 2000 (Hill, Ingman & Chase, Inc., pers. comm.). Henderson presently represents approximately 5.4 percent of the total Las Vegas Valley population, and is projected to maintain 4.3 percent of the valley population in the year 2000, based on C.C.R.P.C. figures (Table 1). If future populations shifted to the Henderson area, this distribution percent could change significantly.

Because the City of Las Vegas is a tourist attraction, a substantial portion of demand placed on public services comes from the tourist and transient segment. The transient population has been estimated to add 9 to 18 percent to the permanent population (NECON, 1974), with a high season in summer.

With an average daily transient population of over 45,400 in 1973, there has been strong emphasis on the development of accommodations and entertainment to serve these people. As a result, there are over 27 major hotels and 28,000 plus rooms available for the tourist (Las Vegas Report, 1973).



SOURCES:
1. Bureau of the Census, Department of Commerce
2. Clark County Regional Planning Council
3. NECON

FIGURE 2

ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

HISTORICAL AND PROJECTED POPULATION CURVE FOR LAS VEGAS VALLEY, NEVADA

Prepared by VTN

TABLE 1

HISTORICAL AND PROJECTED POPULATIONS
OF THE LAS VEGAS VALLEY AND CLARK COUNTY, NEVADA

YEAR	CLARK COUNTY	LAS VEGAS VALLEY	POPULATION COMPONENT OF LAS VEGAS VALLEY			
			LAS VEGAS	UNINCORP-ORATED AREA	NORTH LAS VEGAS	HENDERSON
HISTORY*						
1920	4,859					
1930	8,532					
1940	16,414					
1950	48,289					
1960	127,016	122,957	64,405	27,605	18,422	12,525
1970	273,288	268,065	125,787	89,667	35,216	16,395
PROJEC-TIONS**						
1973	331,700	316,725	135,355	122,320	41,400	17,650
1980						
Minimum	420,000	403,000	185,000	144,000	55,000	19,000
Medium	435,000	421,000	190,000	152,000	58,000	21,000
Maximum	460,000	446,000	202,000	159,000	61,000	24,000
1990						
Minimum	560,000	530,000	244,000	187,000	76,000	23,000
Medium	600,000	565,000	262,000	196,000	82,000	25,000
Maximum	650,000	621,000	284,000	214,000	91,000	32,000
2000						
Minimum	700,000	661,000	275,000	274,000	86,000	26,000
Medium	750,000	700,000	295,000	284,000	91,000	30,000
Maximum	850,000	805,000	335,000	309,000	111,000	50,000

*Bureau of the Census, Department of Commerce
** Clark County Regional Planning Council projection with modification to North Las Vegas and unincorporated areas made by NECON.

4. Cultural

The following information is meant to supplement the more complete discussion of cultural and social features presented in the 1972 Environmental Assessment on page 18.

Las Vegas has been identified as the "Entertainment Capital of the World". In 1972, over 17.4 million people visited Las Vegas. Because of this heavy tourist influence, approximately 42 percent of the employment in the Las Vegas area is related to the service industry, primarily recreation, gambling, conventions and hotels. Other important employers in the county include the wholesale-retail trade which accounts for 17 percent of the employment and the various governmental entities which constitute 13 percent of the Clark County employment.

Outstanding features of the Las Vegas area include Nellis Air Force Base, the AEC Nevada Test Site, Hoover Dam and Lake Mead and the University of Nevada, Las Vegas. Numerous organizations and cultural features occur in the area. Some of these include the Las Vegas Art Museum, Las Vegas Symphony Society, Desert Research Institute Museum and Nevada Historical Society (Las Vegas Report, 1973).

5. Archeology and Paleontology

An overview of the archeology of the Las Vegas Valley and surrounding areas was presented on page 19 of the 1972 Environmental Assessment. In order to provide a more detailed discussion of both archeological and paleontological impacts, field surveys of the proposed locations of selected project elements were performed.

The field surveys were conducted from February 23 through March 2, and April 8 through April 10, 1974, by C. Bernard Caliendo, Prof. Claude N. Warren, and students from the University of Nevada at Las Vegas. The reports describing the results of the field survey are included in Appendex D.

6. Climate

An account of the climatic conditions of the Las Vegas region was presented in the 1972 Environmental Assessment. Reference to this regional aspect can be made on page 21 of that document.

7. Air Quality

The discussions of Air Quality on page 22 of the 1972 Environmental Assessment were based on 1971 data from the Air Pollution

Control Division of the Clark County Health Department. The following discussions on Air Quality have been updated utilizing 1973 data. In addition, this section is addressed to the recently adopted "complex source" amendments to the State of Nevada Air Quality Regulations.

Motor vehicles are the major contributors to air pollution in Clark County, Nevada accounting for 97.0%, 81.43% and 51.97% of the carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO_X) emissions, respectively; see Figures B-4 and B-5. The other industrial activities responsible for air quality degradation in the County are power generation and various process operations. As illustrated in Figure B-3, the power plants discharge 89.14% of the sulfur oxides and 21.8% of the total particulates. In the 1973 emissions inventory summary for Clark County, shown in Table 2, mobile sources are responsible for the annual discharge of 162,442 tons CO; 42,527 tons HC; 35,057 tons NO_X; 2,661 tons SO_2; and 1,951 tons of particulates for a total of 244,638 tons/year as compared to 82,984 tons/year for power plants and 55,475 tons/year for industrial processes.

The above data identifies the importance of controlling motor vehicle emissions as a means for the attainment and maintenance of clean air standards. In addition, the evaulation of the potential air quality impact associated with the proposed project must consider not only the various project elements, but the motor vehicle activity associated with those elements. This consideration is further emphasized by the "complex source" amendments to Nevada Air Quality Regulations.

Nevada has been among the earliest state governments to adopt "complex sources" amendments to their Air Quality Regulations. These amendments to the State of Nevada Air Quality Regulations, as shown in Appendix B define a complex source as a facility which involves secondary activity that may emit any air contaminant for which there is an ambient air quality standard. Thus, shopping centers, parking lots, residential or institutional developments and water, sewer, power and gas lines are examples of facilities which will involve increased air pollutant emissions from motor vehicles. In the assessment of the impact of these emissions on the ambient air quality, the need for background air quality data becomes mandatory. Thus, the final air quality is represented by the sum of the emissions from a complex source and the existing or background concentrations of the various pollutants.

The Air Pollution Control Division of the District Health Department of Clark County has developed some background data for oxidants photochemically produced from the reaction of nitrogen oxides and hydrocarbons, nitrogen oxides and particulates. These are shown in Figures B-1, and B-2 for each month

TABLE 2

1973 EMISSIONS INVENTORY SUMMARY
FOR CLARK COUNTY, NEVADA

Emission Source	(Tons Per Year) Particulates	SO_2	CO	HC	NO_X	Source Total (tons per year)
1. Mobile	1,951 (2.63)	2,661 (6.72)	162,442 (97.0)	42,527 (81.43)	35,057 (51.92)	244,638
2. Industrial Processes	41,986 (56.7)	519 (1.31)	3,001 (1.79)	8,480 (16.24)	1,489 (2.2)	55,475
3. Power Generation	16,127 (21.8)	35,257 (89.14)	1,810 (1.08)	861 (1.65)	28,929 (42.84)	82,984
4. Domestic, Industrial, Commercial Space Heating	458 (.61)	1,107 (2.8)	169 (0.10)	345 (.66)	2,047 (3.03)	4,126
5. Solid Waste Disposal	19 (.02)	8 (.02)	32 (.02)	14 (.02)	9 (.01)	82
6. Other Fugutive Dust	13,478 (18.2)	-0-	-0-	-0-	-0-	3,478
TOTAL EMISSIONS	74,019	39,552	167,454	52,227	67,531	400,783

Note: Number in parenthesis is percent of total emissions

Source: Air Pollution Control Division of the District Board of Health of Clark County

of the year 1973, as monitored in the vicinity of downtown Las Vegas. The values for each pollutant are plotted against a reference value representing the State of Nevada Ambient Air Quality Standards; 160 ug/m for the oxidants, 100 ug/m for nitrogen oxides and 150 ug/m for particulates. Both the photochemical oxidants and particulates ambient air concentrations lie above the standard values. Parallel data for CO and HC are unavailable at the present time.

Because of the major role played by motor vehicles in the degradation of air quality in Clark County, Nevada, the complex source legislation constitutes a realistic approach for the assessment of automotive emission sources. However, there is a requirement for additional background air quality data for the implementation of the complex source regulation. Aware of this need, the U.S. Environmental Protection Agency awarded a contract to TRW, Inc. in mid-February 1974 to develop air quality projections for Clark County. This study involves the examination and upgrading of an emissions inventory for both mobile and stationary sources followed by the conversion of these values to air quality concentrations for CO and the oxidants. This program should produce results near the end of May 1974 with a final report made available sometime in August 1974.

In order to assist in the implementation of the complex sources regulation, the State of Nevada has contracted Aerovironment, Inc. to monitor ambient air quality and develop data on wind patterns, vertical temperature structure, and inversion incidence in Nevada. These data will permit the development of diffusion models to facilitate the conversion of motor vehicle emissions to ambient air concentrations for the major pollutants. This study will also address itself to the meteorological and topographical conditions peculiar to the State of Nevada.

8. Noise

Reference to noise conditions of the region can be made to page 23 of the 1972 Environmental Assessment.

9. Geology and Groundwater

a. Introduction

The geological and groundwater aspects of the Las Vegas Valley were discussed on pages 23 to 27 of the 1972 Environmental Assessment. Since finalization of that report additional knowledge of groundwater features of the Las Vegas Valley has been gained. The following discussions on groundwater have been developed with the assistance of the Center for Water Resources Research, Desert Research Institute, University of Nevada System.

The Las Vegas Ground Water Basin is comprised of the alluvial fill of Three Lakes Valley, the southern part of Indian Spring Valley, the northern part of Ivanpah Valley and Las

Vegas Valley. The entire basin is surrounded by a series of high mountain ranges which act as barriers to ground water movement and form the general limits of the ground water basin. From a hydrologic standpoint, the Spring Mountains, that make up the western topographic divide, are the dominant features of the watershed. These mountains are the highest in the region, and large alluvial fans from these mountains extend far out into the Valley below. In contrast the alluvial fans from the eastern side of the Valley are small in areal extent.

Based upon their hydrologic properties the geologic formations of the area can be divided into two general groups; 1) consolidated rocks of low permeability that underlie the alluvium in the Valley and form the mountains that encircle the ground water basin, and 2) the relatively permeable sedimentary deposits of the valley fill that form the Las Vegas ground water basin. These alluvial deposits contain virtually all of the ground water of economic importance in the basin. Therefore, emphasis within this Environmental Assessment Addendum is placed on the occurrence, movement and water quality of the underground water within these unconsolidated deposits.

Major drainage within the watershed is towards the southeast through Las Vegas Wash to the Colorado River. Storm runoff is usually limited to the higher elevations above 6,000 feet where it ultimately infiltrates into the porous alluvial fans. After intense summer storms, however, runoff may be sufficient to flow onto the floor of the Valley, and discharge into Las Vegas Wash. Geologists have divided the aquifers underlying Las Vegas Valley into four principal hydrologic units on the basis of their stratigraphic positions. These are the near-surface aquifer, the shallow zone of aquifers, the middle zone of aquifers and the deep zone acquifers.

b. Near-Surface Aquifer

Ground water is found in Las Vegas Valley at depths from 1 to 50 feet below ground surface. This water body is referred to as the near-surface aquifer. Water within this aquifer is generally unconfined in the Las Vegas Valley. The maximum thickness of the near-surface aquifer system is about 200 feet thick. Beds and lenses of caliche, sand, silt and clay make up the near-surface aquifer system. In the Valley these beds are commonly saturated with ground water within a few feet of the surface. Recharge of the near-surface aquifer occurs from upward leakage from the deeper aquifers and from surface recharge from cooling water, sewage effluent, lawn and parkway irrigation and possibly from surface ponding of storm runoff.

While the chemical character of the near-surface groundwater varies considerably across the Valley, most samples have been high in total dissolved solids (TDS)*. From the city limits of Las Vegas Southeast to the boundary of the basin, shallow groundwater is unsuitable for either domestic or irrigation uses because of high mineralization.

c. Confined Aquifers

In the Las Vegas Valley there are three major aquifer zones which are under pressure. Each of these aquifers has its own pressure (piezometric) surface or level; the deeper zones are generally under greater confining pressure. Within the Valley, pressures within the various aquifers have tended to become equalized by vertical movement of water within individual water wells and between formations. Vertical interchange between aquifers has resulted because of irregular deposition and erosion of sediments, faulting in the Valley fill and leakage due to improper well construction.

Geologic investigations of the southeast part of Las Vegas Valley have indicated that only insignificant amounts of this confined water escapes from the Valley via subsurface flow. Studies of the Valley margins indicate that escape of the underground water is unlikely in any part of the Valley. Total discharge of waters from the upper, middle and lower aquifer zones is represented by well extractions, upward leakage into the near-surface aquifer and discharge into springs.

The shallow zone of aquifers lies between 200 and 500 feet below ground surface. Four principal sand and gravel lenses within this horizon provided most of the potable water for the Valley prior to 1940. A marker bed of blue clay separates the shallow zone from the middle zone. The middle zone of aquifers lies from 500 to 700 feet deep. This is the most productive aquifer in Las Vegas Valley and presently supplies most of the water pumped in from the Basin. All of the aquifers lying below 700 feet have been included in the deep zone of aquifers. Only small quantities of water are presently being withdrawn from this depth. The sediments consist of siltstones interbedded with thin sandy strata of fine sand and silt. All or most of the deep zone of aquifers occur in the Muddy Creek formation.

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*Typically TDS levels range from 2,000 to 8,000 mg/l. Measurements assembled by the Desert Research Institute indicate that the average concentration may approach 5,000 mg/l.

d. Natural Recharge

Almost all of the natural recharge that occurs to the confined aquifer system is by infiltration of rainfall and runoff occurring principally in the Spring Mountains and in the Sheep Range. At altitudes above 6,000 feet, rainfall commonly accumulates in quantities sufficient to permit some water to percolate through the alluvial material into the saturated ground water zone. Runoff from heavy mountain rainfall infiltrates into the fractured mountain rock and into the porous alluvial aprons where it can percolate downslope into the Valley fill. The main recharge (intake) area for the Las Vegas ground water basin is probably along the base of the mountains, particularly to the west in the areas of the large alluvial fans radiating out from the Spring Mountains. From these principal recharge areas, the ground water moves downslope and laterally in the direction of the hydraulic gradient toward the discharge areas to the southwest portions of the Valley.

In the lower parts of the basin below elevation 6,000 feet, the annual rainfall averages less than 5 inches per year. There is probably no direct natural recharge to the near-surface or the confined aquifers, because of the high soil moisture demand. All of this rainfall is undoubtedly lost to the processes of evaporation and transporation.

e. Irrigation Return Flow

In the Las Vegas Valley excess lawn irrigation water percolating to the shallow water table is probably the greatest source of salinity in the entire ground water basin. The water passing the root zone of the grass and ornamental plants contains saline concentrations significantly higher than the applied irrigation water due to the processes of evapotranspiration which tend to concentrate salts in the drainage waters. For example, in 1973 over 33,000 acre-feet of irrigation water was applied to lawns and shrubs in the Valley. Of that amount, it was estimated that almost 22,000 acre-feet was percolated to the shallow ground water table. From the evapotranspiration processes, the salt concentration of the return flow would be estimated to be about 40 percent greater than applied water salinity. In addition, significant quantities of soluble fertilizers were probably carried with the downward percolating return flow.

An even greater source of salinity is the native salt which is present in the alkali soils that cover much of the Valley. Due to the low yearly rainfall in the basin, natural leaching of these salts has not taken place in recent geologic time. with the development of subdivisions and the subsequent "over-irrigation" practices of the typical homeowner, these saline soils are now increasingly flushed out by the ensuing return irrigation flows.

The total impact of agricultural and lawn watering practices in the Valley cannot be quantified, but the cumulative effect of evapotranspiration, fertilizers and saline soils must be significant. In addition to the residential lawn watering practices in the Valley the irrigation of golf courses, agricultural crops, park and school lawns, and miscellaneous commercial lawns contributes to the degradation of the near-surface aquifer system. The following table describes the volumes of water that were used for irrigation in 1973, and the estimated excess irrigation water that probably percolated past the root zone in that year. It should be noted that only a portion of the total return flow to the near surface aquifer returns to Las Vegas Wash (see Figure 11).

TABLE 3

LAS VEGAS APPLIED IRRIGATION WATER AND RETURN FLOW TO THE NEAR-SURFACE AQUIFER - 1973

Type of Irrigation	Applied Water (Ac-Ft)	Return Flow (Ac-Ft)
Golf Courses	7,468	3,357
Crop Irrigation	7,156	3,693
Residential, Public and Commercial	33,372	21,624
TOTAL	47,996	28,674

f. Other Sources of Groundwater Recharge

Groundwater recharge via septic tank effluents in the Valley contributed another 1,254 acre-feet during 1973. Seepage from the BMI wastewater discharge ponds may have been responsible for adding another 5,000 acre-feet of highly mineralized water during 1973. Thus, the total recharge to the near-surface ground water system from man's activity in the Valley was in excess of 40,000 acre-feet during 1973. The quantity of new salt which was carried into the ground water system by man's actions is not quantifiable at this stage of the Desert Research Institute's investigation, but the amount must be significant as evidenced by the very high TDS levels of the upper horizon of the near-surface ground water system.

g. Groundwater Investigation by the Desert Research Institute

Currently, the Center for Water Resources Research, Desert Research Institute (DRI), University of Nevada System, is in the final months of a four year study for the U.S. Environmental Protection Agency entitled "Effect of Water Management on Quality of Ground and Surface Recharge in Las Vegas Valley". A keystone of this comprehensive study is

the development of a series of digital ground water models that will ultimately simulate the hydro-dynamics of the shallow* groundwater aquifers and will model the movement of conservative chemical constituents within this ground water system. This study is the most rigorous study that has been made of the Las Vegas groundwater basin involving both ground water hydraulics and water quality. While the final conclusions and recommendations will not be available for inclusion within this Environmental Assessment Addendum, the results can ultimately be incorporated into the pollution abatement project for Las Vegas Wash and Bay. Some of the key objectives of this research project are listed below:

- Valleywide definition and analysis of the shallow ground water flow system.
- Demonstration of the effect of return flows (recharge on the shallow ground water system.
- Analysis of water quality problems of the shallow ground water system utilizing techniques of chemical modeling.
- Based upon solutions to the above objectives and upon previous investigations, try to demonstrate the interface between irrigation return flows and other return flows. From this directions for water management can be suggested to achieve a comprehensive management solution.
- Design a water resources response monitoring program which will enable water managers to assess the hydrogeologic effects of the various management strategies.
- Occurrence and movement of water in and through the shallow flow system will be described quantitatively in terms of storage volumes, movement rates and distribution of hydraulic potentials.
- Assess the responses in the shallow ground water flow system to irrigation return flows. This includes the definition of changes in ground water quality brought about by importing Lake Mead water and by extensive use of higher quality ground water from the deeper aquifers.

h. Existing In-Valley Irrigation

Of the total of 47,996 acre-feet of water which was applied to lawns and crops throughout the Valley, about 9,427 acre-feet was supplied from secondary treated effluent. Odor and

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*Generally, the alluvium within the top 300 feet of Valley fill.

soil plugging problems have been experienced in using secondary treated effluent for golf course irrigation in Las Vegas Valley. In 1973, the odor problem became so acute at the Winterwood Golf Course that they are converting to use of groundwater to alleviate the problem. It appears that the use of secondary effluent where land is not cultivated will be seriously restricted in light of the problems encountered.

i. Groundwater Monitoring Program

The complexity of the Las Vegas ground water basin due to the nature of sediment deposition and subsequent faulting within the alluvium has created many obstacles to understanding hydrodynamics of subsurface flow. While there have been many ground water wells drilled within the Valley, there were virtually none that were constructed for monitoring both water levels and water quality of specific aquifers.

In 1970, the Desert Research Institute (DRI) drilled and cased 27 observation wells throughout the Valley. Twenty of these 27 wells are deeper wells installed in 20 separate piezometer nests thoughout the eastern portion of the Valley. Another 12 shallow wells were added to the network during 1971. Due to financial limitations at the time, the DRI was unable to expand this network to include the necessary shallow well system needed to define the shallow water table and the water quality characteristics of the shallow aquifer system.

10. Earthquake Potential

The regional and local seismic history and fault structures of the Las Vegas area have been dealt with in the 1972 Design Appendix prepared by NECON.

11. Water Supply

A discussion of the water supply for the regional area is presented on page 28 of the 1972 Environmental Assessment. Groundwater is still a major source of water supply for the area, however the use of groundwater has decreased in recent years, and the use of Colorado River water and reclaimed water has increased. Groundwater withdrawals decreased from about 86,700 acre-feet in 1969 to 70,100 acre-feet in 1973. In the same time period Colorado River diversions increased from 33,700 acre-feet to about 75,000 acre-feet. Reclaimed wastewater used for golf course irrigation, agricultural irrigation, and power has increased to about 9,400 acre-feet from 8,700 acre-feet in 1969.

12. Wastewater Treatment

A basic discussion of existing wastewater systems in the region was presented in the 1972 Environmental Assessment, page 29. This discussion explained the service areas and discharge points of each treatment plant in the area.

The hourly and monthly fluctuation of wastewater flows in Las Vegas Valley are relatively stable. Figure 3 shows the variation in average day demands for each month of the year. These demand figures are based on the average daily flow (in mgd) for 1973 in the Las Vegas Valley.

For 1973 the estimated per capita wastewater flow in the entire Las Vegas Valley was 144 gallons per capita per day (gpcd). The City of Las Vegas had a significantly higher average of 171 gpcd. The existing and projected wastewater production and water demand for the Las Vegas Valley, is shown in Figure 4.

13. Biota of the Region

A description of the biota of the regional environment, as it was originally defined, was presented on page 30 of the 1972 Environmental Assessment.

The floral and faunal characteristics of the region have been described in the following paragraphs, using the classification system devised by Bradley (1964) and later modified by Bradley and Deacon (1967) and Bradley and Niles (1973) to reflect more recent understanding of the biotic communities of the Las Vegas Region.

Biotic Communities

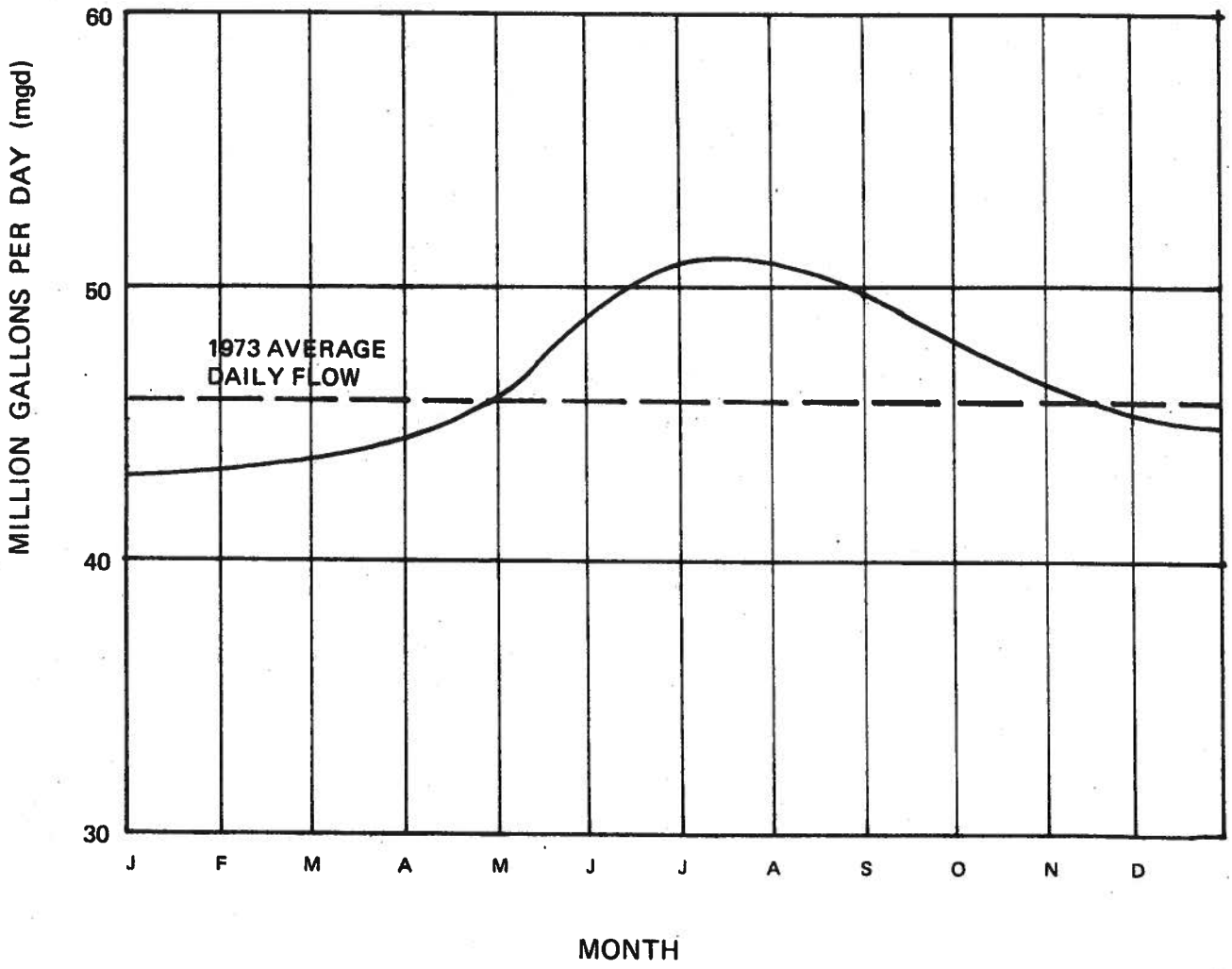
Three vegetation types and eight biotic communities occur in the Las Vegas region. These are as follows:

a. Desert Shrub vegetation type
   (1) Creosote bush community

b. Shrub and Woodland vegetation type
   (1) desert riparian community
   (2) saltbush community
   (3) Mesquite community
   (4) Salt Cedar community
   (5) Pickleweed community

c. Marsh vegetation type
   (1) cattail community
   (2) bulrush community

Of these the mesquite, salt cedar, pickleweed, cattail and bulrush communities were recognized as occurring only in the Las Vegas Wash and therefore will be described in a succeeding section entitled "Las Vegas Wash".



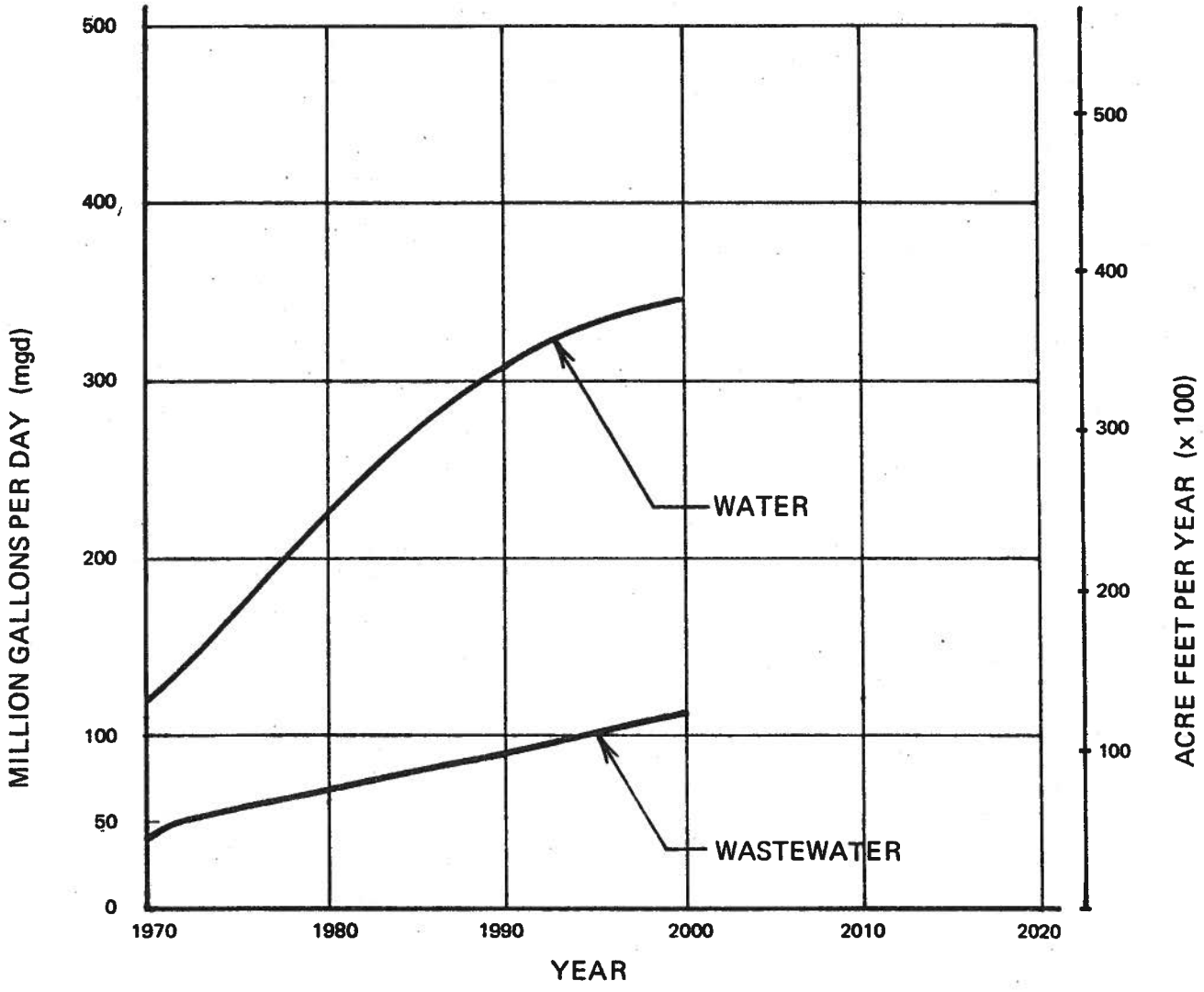
Source: Modified from data by NECON.

FIGURE 3

TYPICAL VARIATIONS IN AVERAGE DAY WASTEWATER FLOWS BY MONTH IN LAS VEGAS VALLEY

ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

Prepared by VTN



Sources: 1) Figure adopted for Las Vegas Valley by Clark County Regional Planning Council.

2) Based on projected average day wastewater and average day water demand flows by NECON.

FIGURE 4

WATER DEMAND AND WASTEWATER PRODUCTION IN LAS VEGAS VALLEY (POPULATION: 700,000)

ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

Prepared by VTN

Predominant biotic communities of the Las Vegas region are the creosote bush, desert riparian and saltbush communities. They are characteristic of the common xeric desert conditions. Each is identified by characteristic (indicator) plant species, soil conditions, elevation, topography and fauna.

(1) Creosote bush community - This community is most dominant in the Las Vegas Valley region. Common plant species include creosote bush (Larrea divaricata), burro bush (Franseria dumosa), mojave yucca (Yucca schidigera), cholla (Opuntia sp.) and barrel cactus (Ferocactus acanthodes). Mammals characteristic of this community are the desert jackrabbit (Lepus californicus), desert cottontail (Sylvilagus audubonii), white-tailed antelope ground squirrel (Citellus leucurus), several species of bats, and the Meriam's and desert kangaroo rats (Dipodomys merriami and D. deserti). Common reptiles include the side-blotched lizard (Uta stansburiana), western whiptail (Cnemidophorus tigris), zebra-tailed lizard (Callisaura draconoides), and the desert iguana (Byisaurus dorsalis) to name a few. Bradley and Deacon (1967), indicated that 33 species of birds occur in this community, among them the cactus wren, horned-lark, Gambel's quail, common raven and Leconte's thrasher. A more complete list of the fauna of the region can be found in Appendix A of the 1972 Environmental Assessment.

(2) Desert riparian community - This biotic community is common along the desert washes and is characterized by such floral species as cheese weed (Hymenclea salsola), snake weeds (Gutierrizia sp.), bladder sage (Salazoria mexicana), golden weeds (Haplopappus sp.) and mesquite (Prospis juliflora). Many of the reptiles occurring in the Creosote bush community also occur here. Several of the more common mammals include the deer mouse (Peromyscus eremicus) desert wood rat (Neotoma lepida) plus other species found in the Creosote bush community.

(3) Saltbush community - This community is characteristic of the playas between the Creosote bush and sagebrush deserts. Characteristic plant species include shadscale (Atriplex confertifolia), hop sage (Grayia spinosa), red molly (Kochia americana), mesquite and other species of Atriplex. According to Bradley and Deacon (1967), many of the vertebrate fauna found in adjoining biotic communities are found in varying numbers within the saltbush community.

Rare and Endangered Species

There are no known rare or endangered plant species within the study area, however, future research in the region may identify some species as needing this classification.

Since the printing of the 1972 Environmental Assessment, the U.S. Bureau of Sport Fisheries and Wildlife has updated the Federal publication of rare and endangered wildlife. The 1973 publication is entitled "Threatened Wildlife of the United States" and no longer catagorizes wildlife as rare or endangered. As a result of changes in the status of several wildlife species inhabiting the Las Vegas region, 13 species are now considered threatened or of undetermined status. The revised list in Appendix A of this addendum reflects these changes.

14. Scenic Values

A brief account of the regional scenic values was prepared in the 1972 Environmental Assessment, page 33. Any description of scenic values of an area always presents some degree of value judgement of the viewers. The Mojave Desert, of which the Las Vegas Valley is a part, maintains some basic scenic qualities for which it is known. The characteristically clear, dry air of the desert, coupled with the array of natural colors of the mountains, canyons and open desert, provide for colorful and enjoyable sunrises and sunsets. Additionally, the desert environment denotes a sense of openness and vastness. Because of this open nature, distances appear less than they really are.

15. Recreation

The recreational opportunities of the Las Vegas region are numerous. Clark County supports a substantial gaming, night time and urban related entertainment industry, which makes the area an attractive year-round resort for the more populous neighboring states.

In addition to the nightclub atmosphere of Las Vegas, Lake Mead National Recreation Area provides for substantial water-oriented recreational opportunity. This recreation area encompasses over 3,000 square miles of lake area and surrounding desert environment, and provides both local and out-of-state visitors with fishing, boating, swimming and other forms of recreation. Over 70% of the 5.6 million annual visitors to the Lake Mead area come from out-of-state (Las Vegas Report, 1973).

The Bureau of Land Management (BLM) administers over 3 million acres of public lands (greater than 51 percent of the land in the County) within Clark County. Approximately 183,250 acres of this BLM land has been classified as having recreational, protective or scenic qualities.

16. Land Use

Within the Las Vegas Valley the three major urbanized areas consist of the cities of Las Vegas, North Las Vegas and Henderson. These cities encompass approximately 162.2 square miles of the 1,800 square miles in the Las Vegas Valley.

The existing land uses in the Las Vegas Valley, as of 1972, are indicated in Table 4.

TABLE 4

LAND USE IN THE LAS VEGAS VALLEY - 1972

Use	Acres
Single family	16,310
Multiple family	2,820
Commercial	3,570
Industrial	2,080
Public	15,170
Quasi-public	2,650
Parks	2,390
Total	44,990 acres

Source: NECON - Water Quality Management Plan, Draft (March 1973).

In 1968 the Clark County Regional Planning Council adopted the "Coordinated General Plan for the Las Vegas Valley", and a "Land-Use Element - Coordinated General Plan" in 1971.

In the Coordinated Plan, future land uses in the Las Vegas Valley were projected from 1975 to 2000 at 5 year intervals, with the 2000 figures based on an estimated population of 700,000 people (Table 5).

TABLE 5

PROJECTED LAND USES IN THE LAS VEGAS VALLEY - 2000

Use	Acreage
Low density residential	56,700
High density residential	13,045
Commercial/industrial	30,275
Parks and recreation	9,430
Agricultural	2,000
Total	111,450 acres

Source: Clark County Regional Planning Council, 1973

17. History of the Las Vegas Wash

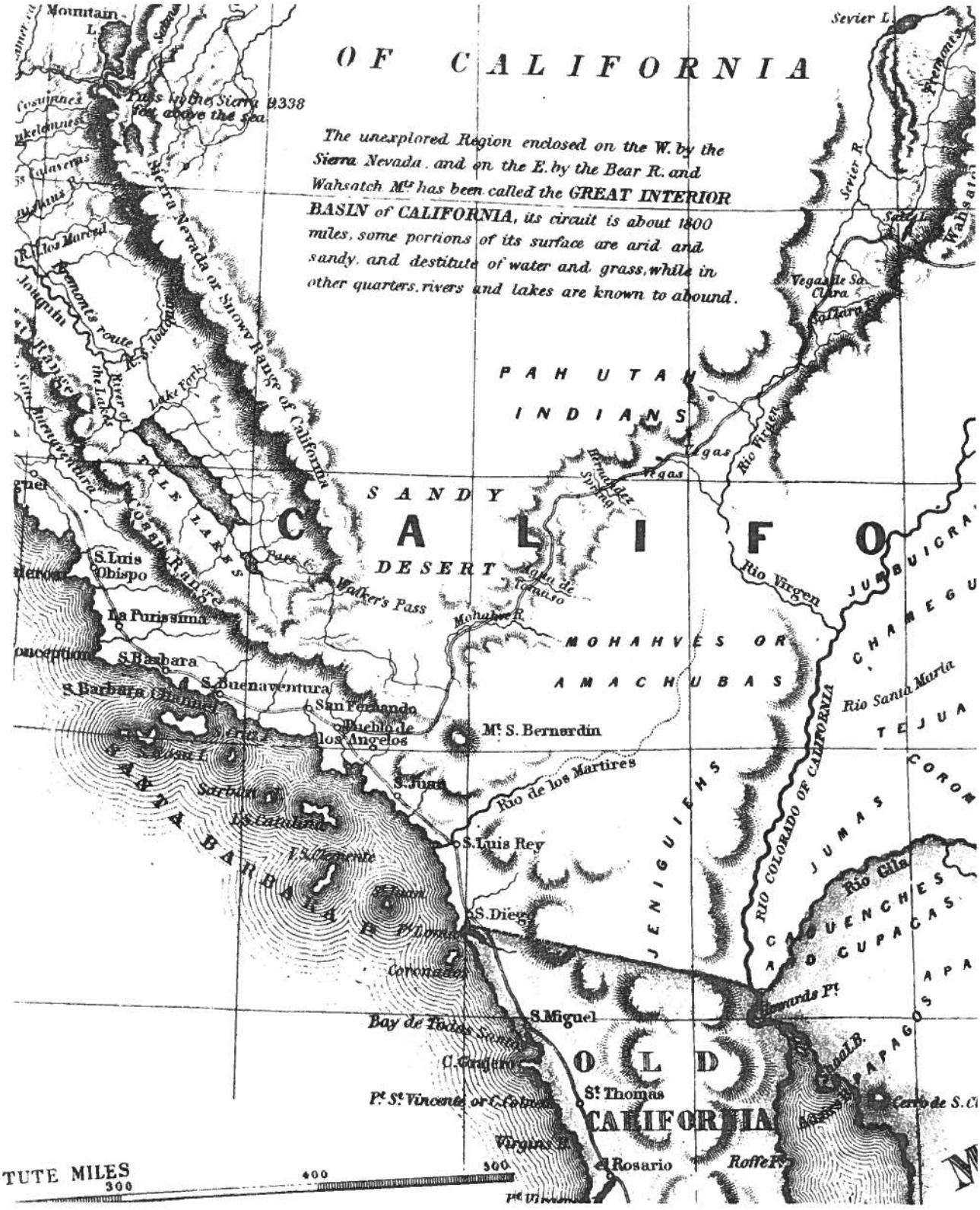
For untold centuries before the first European came to Las Vegas Wash in the winter of 1829-30, only the nomadic Southern Pahutes (Root Diggers, or Pah Utah Indians) disturbed the Wash.

As described by a cartographer on an 1841 map of Upper California prepared by the U. S. Ex. Ex. and Best Authorities regarding the Great Sandy Plain (Mojave and Great Basin Deserts),

> "This plain is a waste of sand, with a few detached mountains (some of which rise to the region of perceptual snow), whose positions are unknown; from these flow small streams that are soon lost in the sand. A few Indians are scattered over the plain, the most miserable object in creation."

Before 1829 there were apparently no permanent Indian settlements, although nomadic Indians from the nearby mountains and the Colorado River passed through on occasion. The chief features were the cool waters of Las Vegas Spring and the long stringed beans of the native Mesquite trees that grew in Las Vegas Valley, at the upper end of the Wash.

The diary of Antonio Armijo (reproduced below) shows the apparent first intrusion by Europeans into Las Vegas Wash. The main body of his caravan entered the Wash on January 7, 1830, although Rivera, a scout who rode alone and ahead of the caravan, very likely entered Las Vegas Wash about a week before when he was looking for a possible short cut for the party.



ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

FIGURE 5

THE SPANISH TRAIL

Prepared by VTN

The noted historian, LeRoy Hafen (Old Spanish Trail, Santa Fe to Los Angeles, Arthur Clarke Co., 1954), explains the party's movements:

> On the seventh of January, while the pack train was waiting at the mouth of Las Vegas Wash, Rivera returned to the main camp. He reported having reached the Mojave River (while scouting ahead). Buoyed by this report, the pack train forsook the Colorado (without Rivera's Report they would have stayed with the river) and set forth in a generally southwestward course across the Nevada desert. The first night they camped at a salty arroyo the second night at a dry lake; and on the third reached "the little spring of the turtle". This was apparently Cottonwood Spring of today about 17 miles southwest of Las Vegas.

December 1829

20. At the Severo River.
21. Stopping: reconnaissance party went out.
22. At the Milpas (Cornfield) River: at this point the reconnaissance party rendezvoused without mishap.
23. At Calabacillas (Little Wild Squash) Arroyo.
24. Below (or beyond) the Milpas River
25. We hit the Severo River again, from which point the reconnaissance party went out.
26. Down the same river.
27. Ibid. We found a settlement of Indians with rings in their noses. Nothing happened for these Indians are gentle and cowardly.
28. Down the same river.
29. At the slough of the same river.
30. At the aforementioned river.
31. At the same river the reconnaissance party rendezvoused.

January

1. Again at the Rio Grande (Colorado): Citizen Rafael Rivera is missing from the reconnaissance party of the day before.
2. Down the Rio Grande: rugged trail.
3. Ditto.
4. Stopping: on this day the reconnaissance party went in search of Rivera.
5. Stopping: reconnaissance party returned and did not find Rivera.
6. At Yerba del Manso (a curative herb) Arroyo, at which point the reconnaissance party goes out in search of Rivera.
7. Stopping: waiting for the reconnaissance party. Citizen Rivera returned and announced that he had discovered the villages of the Cucha Payuches and the Hayatas, and had recognized the ford where he had crossed the Rio Grande the previous year in going to Sonora.
8. Stopping: Reconnaissance party looking for Rivera arrived with nothing to report and went out again.
9. At Salado (Salty) Arroyo, with nothing new.

10. At a dry lake.
11. At the little spring of the turtle.
12. At the pass without water.
13. At the Little Salty Springs.
14. At the River of the Payuches, where a village was found; nothing happened for it was gentle.
15. Down the same river.
16. At the Salitrosa (Alkali) River: where the reconnaissance party rendezvoused without mishap.
17. A day's journey without water.
18. At the lake of El Milagro (Miracle).
19. At the Ojito del Malpais (little spring of the lava beds, or badlands).
20. A day's journey without any water.
21. At the arroyo of the Hayatas, at the end of which comes in the trail from Moqui, traveled by the Moquis with the object of trading shells with the said Hayatas.

John Charles Fremont, the noted explorer and pathfinder, came to Las Vegas Wash on May 3, 1844. He commented on the springs of Las Vegas, situated in the middle of Las Vegas Valley. With a temperature of about 72 the springs gushed forth suddenly with a quick current producing two clear springs four or five feet deep.

The trail labeled on Figure 5 is the Spanish Trail (often romantically called the Old Spanish Trail). Its eastern terminus was Santa Fe, New Mexico and its western terminus was Los Angeles. It functioned from 1830 until 1848. Nearly every year, if in fact not every year, for 18 autumns a westbound trading caravan traversed the trail, and in doing so they crossed the upper reaches of Las Vegas Wash. Each spring the trading caravan returned to Santa Fe, retracing their steps.

Fremont, in his report to Congress, commented on the vegetation at the upper end of Las Vegas Wash: there were mesquite trees with their yellow flowers and a colored assortment of spring wildflowers in bloom. Fremont also recorded other species of shrub in his Congressional report, entitled Report of the Exploring Expedition to the Rocky Mountains in the Year 1842, and to Oregon and north California in the years 1843-44. Washington: Gales and Seaton, 1845. (U.S. 28th Congress, 2nd session, Sen. Ex. doc. 174).

Until 1848, the Las Vegas Wash area remained the property of Mexico. The United States engaged in a war with Mexico during 1846-48, ending with American victory with the signing of the treaty of Guadelupe Hidalgo. Under its provisions, the U.S. acquired all of its present southwestern lands (excepting southern Arizona).

For more information on the nature of the Spanish Trail, see Eleanor Lawrence, "Mexican Trade Between Santa Fe and Los Angeles, 1830-1848", California Historical Society Quarterly pp. 27-39.

Figure 6 is a map published in 1850 showing the status of the Southwest before the end of the Mexican War in 1848. The Spanish Trail is clearly shown, as is "Vegas".

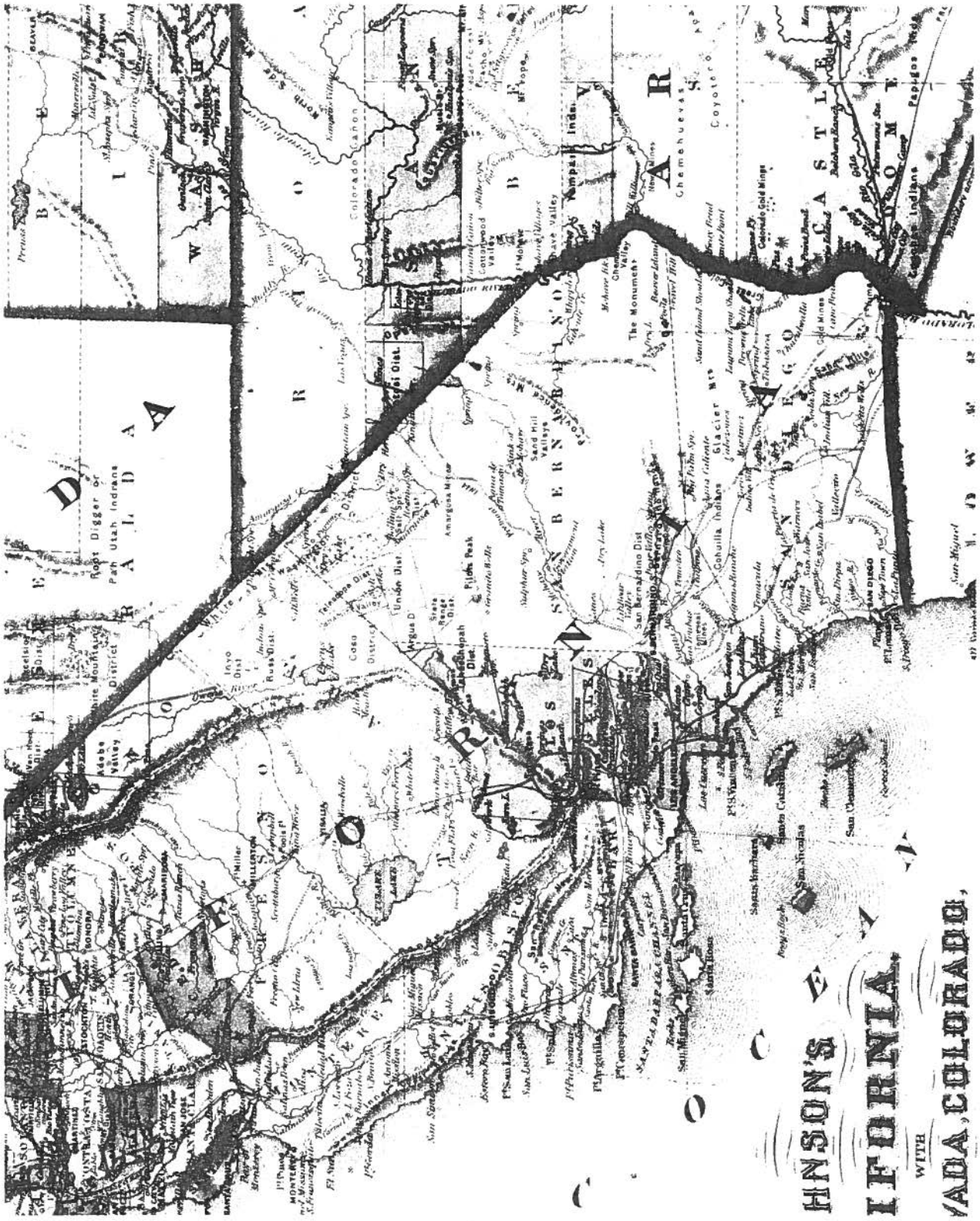
Though the Spanish Trail became history in 1848, the discovery of gold in California brought about increased traffic through the southwest. A popular trail in 1849 and for years thereafter was the Salt Lake - Los Angeles trail, which from southern Utah to Los Angeles essentially was the same as the retired Spanish Trail. Mormons traveled this trail from Salt Lake City to their colony in San Bernardino beginning in 1851. California bound gold seekers used the same trail. All partook of the cool waters of the Vegas and crossed the upper end of Las Vegas Wash.

In June 1855 the Mormons decided to establish a mission and fort in the very heart of Las Vegas Valley on the route of the Salt Lake trail. By that date this spot had become well known as a good place to rest and recuperate on the trek between centers of civilization. The water and the grassy places were hailed with thanksgiving by travelers. This Mormon mission was the first white settlement in Las Vegas Valley.

Figure 7 is a crudely hand drawn map prepared by Mormon missionary John Steele. It is extremely significant in determining what Las Vegas Wash looked like 120 years ago, in 1855. The top of the map is east; to the right is south; at bottom is west, and to the left is north. The 150-foot square Mormon fort is in the lower left; immediately to its right is the Las Vegas Creek, which originated in the springs Fremont noted, three miles west (off the bottom of the map). Along that creek was a "tooly grass" area 2-1/2 miles long and about a half a mile wide. Also to the east of the fort were farm and garden plots established by the Mormons in 1855. Beyond them, prominent on the map, is a vast mesquite forest extending from the fort down Las Vegas Wash to the base of Sunrise (Frenchman) Mountain, which is the dark object in the background of the map. The forest passes by that mountain and spreads out toward the Colorado River, in the upper right corner of the map.

On either side of this forest of mesquite was desert--mostly low forms of plant life and sagebrush. There were no trees in those Areas except occasional mesquite.

This map's significance cannot be underestimated. It is reproduced from the diary of John Steele, which is in the Office of the Historian of the Church of Jesus Christ of Latter-Day Saints, in Salt Lake City.

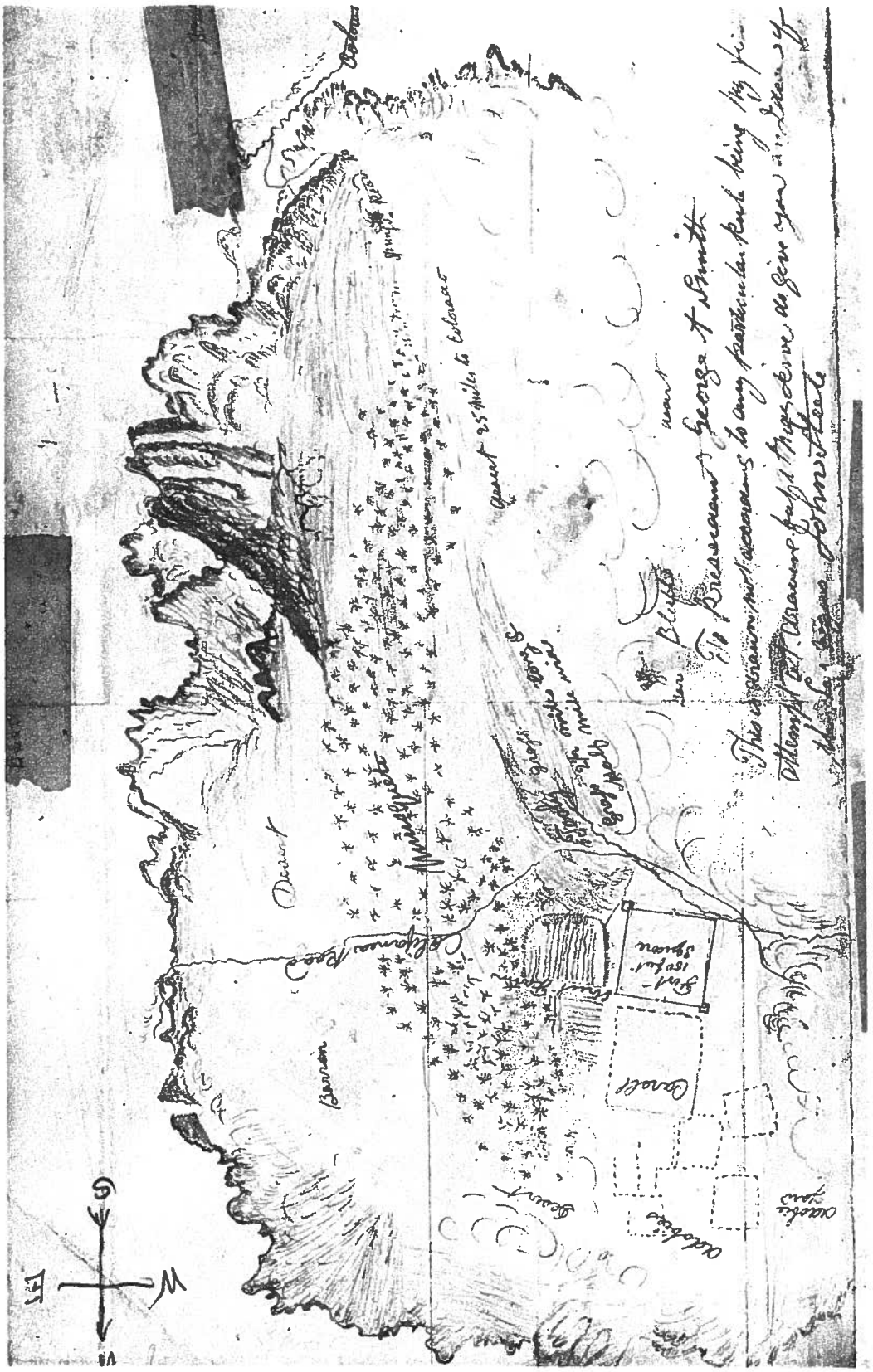


ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

FIGURE 6

THE SOUTHWEST BEFORE THE
MEXICAN WAR

Prepared by VTN



ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

FIGURE 7

LAS VEGAS WASH – 1855

Prepared by VTN

It must have been quite a sight to see that vast tract of woodland stretching for so many miles. The mesquite trees closer to the fort were cut and used for fencing and for fuel. Mesquite wood burns readily, even when it is green. It creates a very hot fire, and as a fuel some say it is equal to hickory. It is also an exceptional building material.

The trees of Las Vegas Wash were all of short, scrubby growth, with the trunk of each tree several inches in diameter. Each tree seldom attained a height of more than twenty feet. The limbs are short, crooked and thickly studded with long sharp thorns. The leaves are pennated; the bark is dark gray and brittle. The heart of each limb and the trunk is very hard. These trees only grow in high quality soil.

The trees blossom late in spring; the fruit appears in long slender beans from which Mexicans and Indians made a cool beverage. The beans ripen in early fall; the mature fruit which falls to the ground affords sustenance to small birds and wild animals. The highly nutritious pods afforded food for the Indians, who crush and press the beans into delectable cakes.

The Mormons abandoned their Las Vegas mission in 1857 after only two years of effort. They had cultivated nearly 150 acres and gathered some fair crops of vegetables, grains, and even some cotton and tobacco. Clearing away tracts of land proved to be an immense job because of the presence of saleratus--alkali in the soil. This saleratus, or sodium bicarbonate (baking soda), appears on the top of the ground in many areas of Las Vegas Wash after a rainstorm. It bubbles up like fizz water, and leaves a coating on top of the ground which is known as alkali.

After the Mormons left in 1857 (some stayed until 1858), the trail between Salt Lake and Los Angeles was busier than ever. Mormon missionaries, emigrants, mail riders, freighters, and others all passed through the upper end of Las Vegas Wash and stopped at the welcome springs of Las Vegas. This was an all year travel route, as opposed to the one through northern Nevada and northern California, which was snowbound in winter. For further discussion on this activity, including descriptions of Las Vegas Springs, see Milton R. Hunter, "The Mormon Corridor", Pacific Historical Review, June 1939, and Appendix "A", entitled "Early Freighting on the Salt Lake San Bernardino Trail", in the book Los Angeles Star by William B. Rice. (Los Angeles, 1947).

During 1859-1865, several settlers took up land in Las Vegas Valley for ranching and farming. They sold their surplus to travelers on the Salt Lake trail and to miners who began working at nearby Potosi and Eldorado Canyon mining districts. Early in 1865 Octavius Gass and two partners began to rebuild the old Mormon farms at the upper end of Las Vegas Wash. But within

a few years Gass bought them out, and by owning all of the local water he became a virtual king of the valley. Gass sold out Las Vegas Ranch to Archibald Stewart in 1881; in 1902 the widowed Mrs. Stewart sold most of the ranch and water rights to the San Pedro Los Angeles & Salt Lake Railroad, which built a railroad across the valley and upper end of Las Vegas Wash during the winter of 1904-05.

During the years of the Gass ownership, 1865-1881, there were some reports which describe the valley. The Mining and Scientific Press, a mining magazine published in San Francisco, described Las Vegas in 1867:

> Las Vegas (is) the tressled conduit of myriad cool springs and a few warm ones. Here, mesquite and wild grape vines cover the valley proper, while the table land is dotted with clumps of cottonwood, willows and wildflowers--indicating the points where water bubbles up. The vines in the valley bear grapes of the largest and most luscious kinds, and have the appearance of having descended from the Spanish or English grape.

Nevada's State Mineralogist visited Las Vegas Valley in 1871, and filed this report:

> The most productive and valuable tract of land in Las Vegas Valley is near its center, where is situated the Las Vegas Ranch. . . There are several hundred acres of very rich land here, though only about 150 acres are tilled. This portion of it is well fenced, and improved with shade and fruit trees. The orange, lemon, peach, apple, pear, apricot, fig and pomegranate, are some of the varieties of fruit trees. Grapes also grow. . . The mesquite bushes, of which there are many in the valley, furnish a very nutritious bean, which all animals feed upon as soon as the grasses die in the fall. Stock keeps as fat upon this feed during the winter months, as though fed upon the best of hay and grain.

Figure 8 is an 1871 map of Las Vegas Valley and shows the locations of the Las Vegas Springs, Las Vegas Ranch, and Las Vegas Wash.

Early in 1868, the owner of the ranch, Octavius Gass, tried to sell his holdings. In an advertisement in the Rio Virgen Times, in St. George, he described the soil in the upper Las Vegas Wash as a black rich loam that would produce vegetables or grains in abundance.

In 1969-1970 Stanley H. Paher conducted oral interviews with the son of Octavius Gass, who recalled living at Las Vegas Ranch. He said that the dark soil was indeed good, especially for the growing of pink Mexican beans, as well as truck produce.

ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

FIGURE 8

LAS VEGAS VALLEY – 1871

Prepared by VTN

This son, Fenton Gass, also noted the lush green belt that extended in the direction of Henderson, and further described Las Vegas wash as a wet area with moisture.

Figure 9 is a map that indicates a stream originating in Las Vegas Valley and emptying into the Colorado River. There are important variations which indicate that the cartographers did not simply copy one another, as early cartographers did in copying John Fremont's map. In this 1866 map of the Las Vegas area (publisher unidentified), plainly showing the Salt Lake - Los Angeles wagon road, it is shown that the upper limit of Las Vegas wash is not precisely defined.

On September 12, 1867 the serenity of Las Vegas Ranch and the Wash below it was interrupted by a gunfight. A man named Mooney arrived at the ranch after fleeing across the desert to the east. He had murdered a man 60 miles east of Las Vegas and was being pursued by a posse of three horsemen. The exausted Mooney quenched his thirst by flinging himself into Las Vegas Creek. After reviving himself in the water, he ran a few hundred yards east into the mesquite thicket of Las Vegas Wash. His pursuers ignored the stream and pursued Mooney. They flushed him out and gunfire ensued. Mooney was shot in the heart and then immediately buried beside a gnarled mesquite tree.

An important milestone in the history of Las Vegas Wash occured with the sale of the aforementioned Las Vegas Ranch to the San Pedro, Los Angeles & Salt Lake Railroad in 1902. In 1904 a local surveyor named J. T. McWilliams surveyed the ranch; a reproduction of the survey is shown in Figure 10 following. This was in preparation for the surveying of Las Vegas Townsite, which was auctioned on May 15, 1905. This was when the City of Las Vegas was born. Las Vegas attained a population of about 800 by 1910.

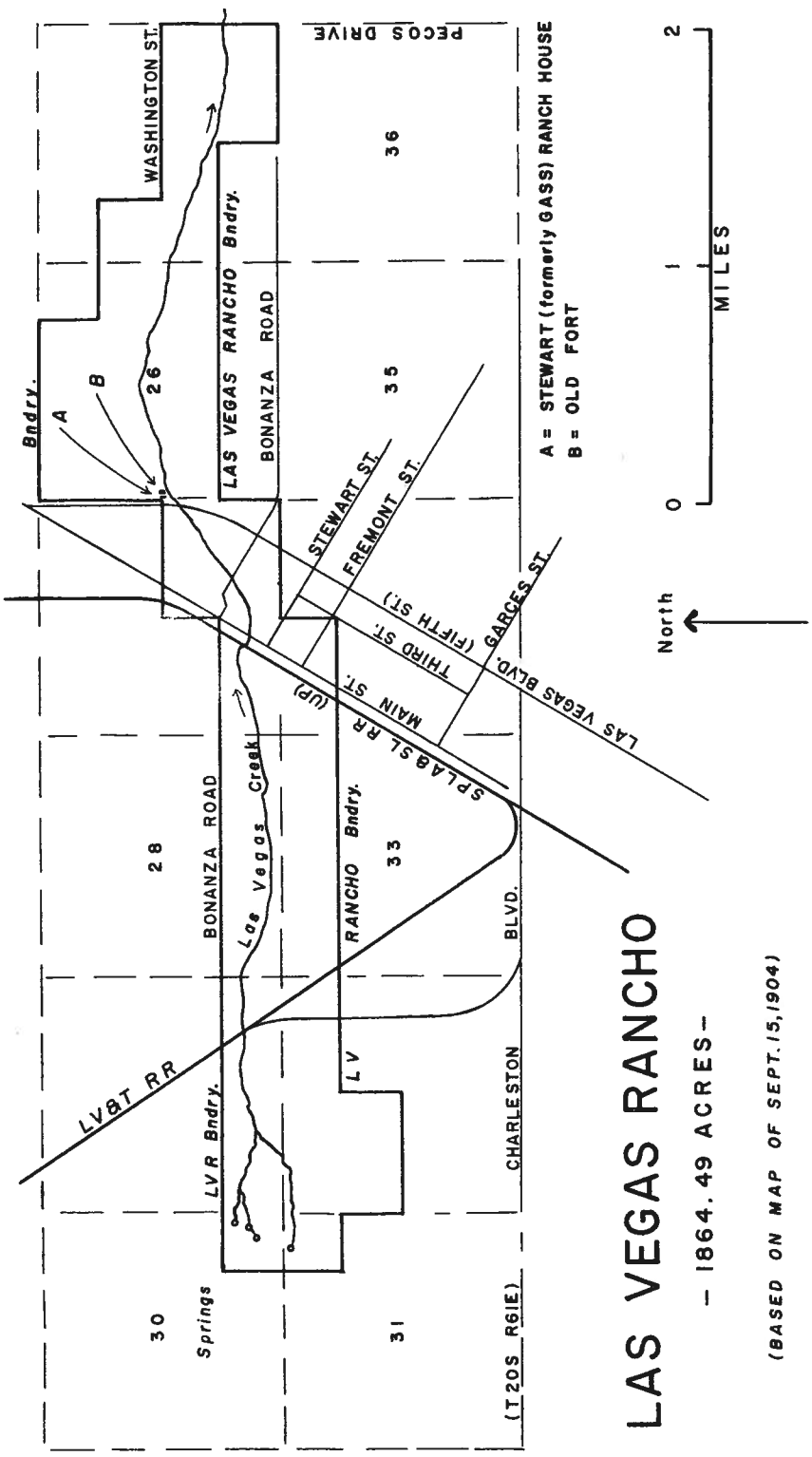
By that date homesteads of ranches and small farms flourished throughout the valley, including in Las Vegas Wash. Development was naturally slow because it took several months to uproot mesquite and sagebrush and prepare the ground for cultivation. But the Las Vegas Springs could not meet the demands of homesteaders. Exploration began for underground sources. The result was several hundred artesian wells sunk between 1907 and 1914. (Artesian wells flow spontaneously from the surface and require no pumping.) Probably the largest ranch in Las Vegas Wash was the Winterwood Ranch. It acquired its name because people in Las Vegas would go there to cut mesquite trees for their winter wood for cooking and heating purposes. Approximate site of that ranch is marked on the map. That map is a United States Geological Survey map dated 1908.

ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

FIGURE 9

LAS VEGAS WASH – 1866

Prepared by VTN



ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

FIGURE 10

LAS VEGAS RANCHO

Prepared by VTN

Over the years until the present, hundreds of people settled in the upper end of Las Vegas Wash. The Winterwood Ranch became a huge subdivision. Success in growing things in Las Vegas Wash depended on a knowledge of the Wash's soil and water make-up. The Mormons had encountered the alkali (saleratus), as did the builders of Las Vegas Stadium, which is situated in the heart of the Wash.

CONCLUSION

Except for those ruins noted in Dr. Warren's report, there is probably nothing close of historical (tangible) significance in Las Vegas Wash, except for the ruins of the so-called Mormon fort in the City of Las Vegas, at the extreme upper end of the Wash. The building of subdivisions and roads have greatly defaced the upper end of the Wash, and it may well be impossible to find additional ruins of former structures of the Mormon mission and Las Vegas Ranch.

C. Site Environments

In the following section the existing environments of the sites to be a part of the project, will be described in more specific terms than were presented in the regional environment section. The sites considered to be occupied by project facilities include:

1. Experimental recharge well site
2. Wastewater collection system
3. Advanced wastewater treatment plant
4. Sludge disposal ponds
5. Pilot desalination plant site
6. Potential brine disposal
7. Las Vegas Lands to be irrigated

Specific locations of these areas can be found in Figure E.1.

1. Environment of the Experimental Recharge Well Site

One element of the proposed pollution abatement project includes the experimental recharge of desalinized water into the middle aquifer of the groundwater basin. This will be accomplished by using an injection well located in Section 1 of Range 60 East, Township 21 South. This section is located on the west side of Las Vegas and is bordered by Charleston Boulevard on the north, West Sahara Avenue to the south, Decatur Boulevard to the east and Jones Boulevard to the west. Alternative site locations for the recharge well have also been considered. These include sites located in Section 25 and 36 of Township 20 South, Range 50 East and Township 20, Range 61 East, Sections 30 and 31.

Land Use - Much of Section 1 (640 acres) has low density housing with a population of approximately 6,000 people (C.C.R.P.C., 1973). There is some limited commercial development on Sahara Avenue and Decatur Boulevard and an elementary school on West Oakey Boulevard.

The alternative sections (2,560 acres) are extensively developed with single and multiple family dwellings, commercial enterprises, schools, recreation acreas. The population approximates 22,000 people (C.C.R.P.C., 1973).

Pipeline to the Injection Well Field - The pipeline to the injection well field will originate at the desalination plant located on Las Vegas Valley Water District land near Alta Drive and Valley View Boulevard. The pipeline will extend for 2.5 miles and will be buried its entire length. It will follow existing road rights-of-way for most of its length. The routing of this line is dependent the final selected site of the recharge well.

2. Environments of the Wastewater Collection System

The collection system will consist of three pipelines - one from each of the existing secondary wastewater treatment plants, Clark County, the City of Las Vegas and the City of Henderson. These secondary effluent lines will join at the influent surge pond located adjacent to the Clark County plant. The pipeline from the existing City of Las Vegas plant will run south toward the Clark County W.W.T.P. and will border irrigated agricultural lands and densely vegetated areas of salt cedar before joining the pipelines from the Clark County and Henderson plants. An existing dirt road separates the thick salt cedar in the wash and the irrigated pasturage to the west.

Vegetative species common at this site include salt cedar (Tamarix pentandra), bassica (Bassica hyssopifolia), bermuda grass (Cynodon dactylon) and other grass species. Based on results from Bradley and Niles (1973) study of the wash, the most common mammalian species in this area were deer mice, house mice, long-tailed pocket mice (Perognathus formoscus), desert cottontails and black-tailed jackrabbits. Common avian species included Gambel's quail, mourning dove, verdins, Bewick's wrens, mockingbirds, brown-headed cowbirds and Abert's towhee (refer back to Table 6 for the basic biota of the site environment).

The Henderson plant pipeline will run west from a pump station adjacent to the treatment plant and thence south of a mobile home park and borrow pit to Fremont Street. Much of the area consists of sparse creosote bush. The pipeline will then parallel the Boulder Highway in a northwesterly direction to Missouri and Stephanie Streets. The pipeline will parallel these streets, cross some sparse creosote bush habitat and then will run east

TABLE 6

Basic Biota of the Site Environments

Biota	Scientific Name	1. Recharge Well Site*	2. Wastewater Collection	3. AWT Plant	4. Sludge Disposal Site	5. Pilot Desalination Plant	6. Brine Disposal*	7. Irrigated Lands
Flora								
Creosote Bush Community								
Creosote bush	Larrea divaricata		X		X	X		
Mormon tea	Ephedra torreyanna				X	X		
Ratney	Krameria parvifolia							
Niggerheads	Echinocactus polycephalus							
Cholla	Opuntia begelovii							
Prickley pear cactus	O. erinacea							
Mojave yucca	Yucca schidigera							
Burro bush	Franseria dumosa				X			
Desert Riparian Community								
Desert wash willow	Chilopis linearis				X	X		
Indigo bush	Dalea fremonti							
Cat claw	Acacia greggii							
Snakeweed	Gutierrezia sarothrae							
Salt cedar	Tamarix gallica		X	X		X		
Cheese weed	Hymenoclea salsola		X	X				
Bassia	Bassia hyssopilolia		X	X				
Quail brush	Atriplex lentiformis		X	X				
Saltbush Community								
Shadscale	Atriplex confertifolia					X		
Hop sage	Grayia spinosa					X		
Agricultural Crops								X
Grazing lands								
Bermuda grass	Cynodon dactylon		X	X				
Golf Courses and Parks								X

*Information as to the exact location of this element is insufficient to determine existing biota.

Common Name	Scientific Name	1. Recharge Well Site*	2. Wastewater Collection	3. AWT Plant	4. Sludge Disposal Site	5. Pilot Desalination Plant	6. Brine Disposal*	7. Irrigated Lands
Fauna								
Mammals								
California leaf-nosed bat	Macrotis californicus		X	X	X	X		X
California myotis (bat)	Myotis californicus		X	X	X	X		X
Western pipistrell (bat)	Pipistrellus hesperus		X	X	X	X		X
White-tailed antelope ground squirrel	Citellus leucurus		X	X	X	X		X
Round-tailed ground squirrel	C. tereticaudus		X	X				
Merriams kangaroo rat	Dipodomys merriami		X		X			
Desert kangaroo rat	D. deserti				X			
Black-tailed jackrabbit	Lepus californicus		X	X	X			X
Coyote	Canis latrans		X		X			X
Deer mouse	Peromyscus eremicus		X	X	X	X		X
Birds								
Gambel's quail	Lophortyx gambelii		X	X				
Cactus wren	Campylorhynchus brunneicapillum		X		X			
Raven	Corvus corax		X	X	X	X		X
Horned lark	Eremophila alpestris			X				X
Abert's towhee	Pipilo aberti		X	X				X
House finch	Carpodacus mexicanus		X	X				X
Red-tailed hawk	Buteo jamaicensis		X	X	X			
Verdin	Auriparus flaviceps		X	X				
Mourning dove	Zenaidura macroura		X	X				X
Starling	Sturnus vulgaris		X	X	X	X		X
Song sparrow	Melospiza melodia		X	X				X
Brown-headed cowbird	Molothrus ater		X	X				
Mockingbird	Mimus polyglottos		X	X				
Bewick's wren	Thryomanes bewickii		X					

Common Name	Scientific Name	1. Recharge Well Site*	2. Wastewater Collection	3. AWT Plant	4. Sludge Disposal Site	5. Pilot Desalination Plant	6. Brine Disposal*	7. Irrigation Lands
Reptiles								
Side-blotched lizard	Uta stansburiana		X		X	X		
Western whiptail	Cnemidophorus Tigris		X		X	X		X
Zebra-tailed lizard	Callisaura draconoides		X		X	X		
Desert Iguana	Dipsosaurus dorsalis		X		X			
Leopard lizard	Cnotaphytus wislizeni		X	X	X	X		X
Pacific gopher snake	Pituophis catenifer		X	X	X	X		X
Coachwhip	Masticophis flagellum		X		X			
Sidewinder	Crotalus cerastes		X		X			

bordering irrigated pasture and creosote bush to the surge ponds. Along much of the route the land has been disturbed by man's activities in varying degrees. For the most part, the proposed route will follow existing dirt roads or rights-of-way along most of the distance.

The pipeline from the Clark County W. W. T. P. will follow the existing effluent discharge channel until it joins the surge pond.

3. Environment of the Advanced Wastewater Treatment Plant

The proposed location of the Advanced Wastewater Treatment facilities is in an 80 acre pasture to the south and east of the existing Clark County Sanitation District wastewater treatment plant. Much of the area has been extensively disturbed or altered by construction activities and cattle and horse grazing. Portions of the eastern boundary of this study site are vegetated with dense areas of salt cedar and some marsh vegetation within the Las Vegas wash itself. A preponderance of the site is irrigated pasturage of bermuda grass (Cynodon dactylon) and areas disturbed by heavy equipment yarding and other activities.

Due to the high disturbance factor, many of the mammals and reptiles commonly occurring in less disturbed habitats are absent at this site. The salt cedar and marsh vegetation to the east however, is known to support fauna characteristic of the salt cedar vegetative community (Bradley and Niles, 1973). A more concise amount of existing floral and faunal components of this site occurs in the Bradley and Niles final report of the ecology of Las Vegas Wash.

Undoubtedly many more species do exist on the area. Appendix A of the 1972 Environmental Assessment lists those vertebrate species known to occur in the different biotic communities and in Las Vegas Wash and Bay areas.

Noise - Ambient noise levels at this site are at times quite high due to the close proximity of construction activities, particularly related to the Clark County Road Department. Operation of the existing secondary waste treatment facilities also creates a moderate level of noise.

4. Environment of the Sludge Disposal Site

Sludge from the Clark County Advanced Wastewater Treatment plant will be transported by pipeline from the plant facilities to a 48 acre evaporation site approximately 1/4 mile to the east of the Clark County Sanitation District Plant. The location of this evaporation pond facility is shown in Figure E-1.

Two pipelines from the wastewater treatment plant will run easterly across the Las Vegas Wash and Telephone Line Road to the ponds located approximately 200 feet from the road. The pipeline will be buried its entire length.

Biota The well site is sparsely vegetated, displaying the creosote bush community. The vegetated areas are primarily restricted to wash areas while the more exposed areas are generally barren. Because of the rocky soil and washes, this site appears as a somewhat barren and desolate area.

Vegetation and fauna in this area are likely characteristic of the creosote bush community as described by Bradley and Deacon (1967). The vegetative species identified during field reconnaissance and some of the fauna commonly associated with this vegetation are presented in Table 6.

Land Use - At the present time there is considerable open space around the site of the sludge disposal ponds. To the east the land rises toward the rugged and colorful rainbow garden and Lava Butte area. In areas adjacent to the site numerous jeep trails and a recent pipeline excavation crisscross the area. The site is bordered to the west and south by Hollywood Boulevard and Telephone Line Road. The Las Vegas Wash is located immediately to the south and west of these roadways. A gravel pit operation is being undertaken somewhat to the north of the well site.

Noise - In terms of its present noise level, this site can be best described as basically being unaffected by the high ambient noise levels of the nearby City of Las Vegas. Some road traffic occurs on the two bordering boulevards but for the most part the areas has few sources of bothersome noise.

Scenic - Much of the site is crisscrossed by numerous trails and dirt roads, along which trash has been piled in numerous places. From Hollywood Boulevard, this site appears as a rocky desert scene.

5. Environment of the Pilot Desalination Plant Site

The proposed location of the pilot desalinization plant is at a site owned by the Las Vegas Valley Water District at Valley View Boulevard and Alta Drive. Much of the area is presently open space bordered by areas of low density residential dwelling, a small public park and scattered commercial establishments.

Noise - Noise levels in the area are periodically high due to the presence of boulevards and potable water wells on and near the site.

Land Use - Much of the land bordering the proposed desalination plant site is presently owned and maintained by the Las Vegas Valley Water District. Numerous groundwater wells are scattered throughout the area. Two 10,000,000 gallon storage tanks are located at the north end of the site while an electrical substation borders the area on the west.

The area has been substantially distrubed in the past and has numerous roads crisscrossing the site. A disjunct wash crosses the site from west to east. Due to extensive development of the area in the past, storm flows are now diverted to a concrete channel at the west of the site and therefore no longer enters the site.

Biota - The area is sparsely vegetated with remnants of desert riparian flora, particul arly adjacent to the ephemeral wash. Fauna on the site is likely scarce due to the high disturbance factor of the area. Those species inhibiting the area are probably those most adaptable to habitat change.

6. Potential Brine Disposal

Three alternative means of desalt brine disposal have been considered. These include 1) discharge to lined ponds near the desalination plant, 2) piping waste brine to the solids disposal ponds to be used for the AWT plant and 3) discharging the brine to the City of Las Vegas' wastewater collection system. The latter means of disposal does not require a specific site location, however, the first two alternatives do. The site location for alternative No. 2 is the same as described on page , "Environment of the Sludge Disposal Site", while the identification of a disposal site near the desalination plant (Alternative No. 1) has not yet been made.

7. Environment of Las Vegas Valley Lands to be Irrigated

The proposed project includes a system of using tertiary treated wastewater for irrigation of parks, golf courses and greenbelt areas in the Las Vegas Valley. The irrigation program will be developed in four stages.[1] Stage I will consist of approximately 26.4 miles of 4 to 30 inch pipeline, two lift stations and two storage reservoirs. Stage III will have 33.5 miles of 4 to 24 inch pipeline, two lift stations and two reservoirs.

The majority of the lands to be irrigated are existing irrigated lands in the Valley.

The in-valley irrigation system may add considerable new greenbelt or agricultural areas to the Las Vegas Valley (See Table 16).

---

1. The principal stages of the system are Stages I and III.

Pipelines

Beginning at the advanced wastewater treatment plant, the main pipelines for the irrigation and desalt plant systems will parallel Monson Road, cross the Boulder Highway to Flamingo Road. The pipeline will continue paralleling Flamingo Road for approximately five miles to Paradise Road where it will bend northward to Twain Avenue and then cross to Las Vegas Boulevard - south. It will continue along Las Vegas Boulevard - south until it intersects Spring Mountain Road and then Richards Boulevard and Campbell Avenue. From there it will follow Alta Drive to the Desalt Plant site.

Smaller irrigation lines will branch from the maintrunk line at McLeon Avenue, Eastern Avenue, Maryland Parkway (for UNLV) and the Tropicana Country Club, Desert Inn Country Club and Las Vegas Country Club. A more concise description and location of the irrigation pipeline system can be found on Figure E-1.

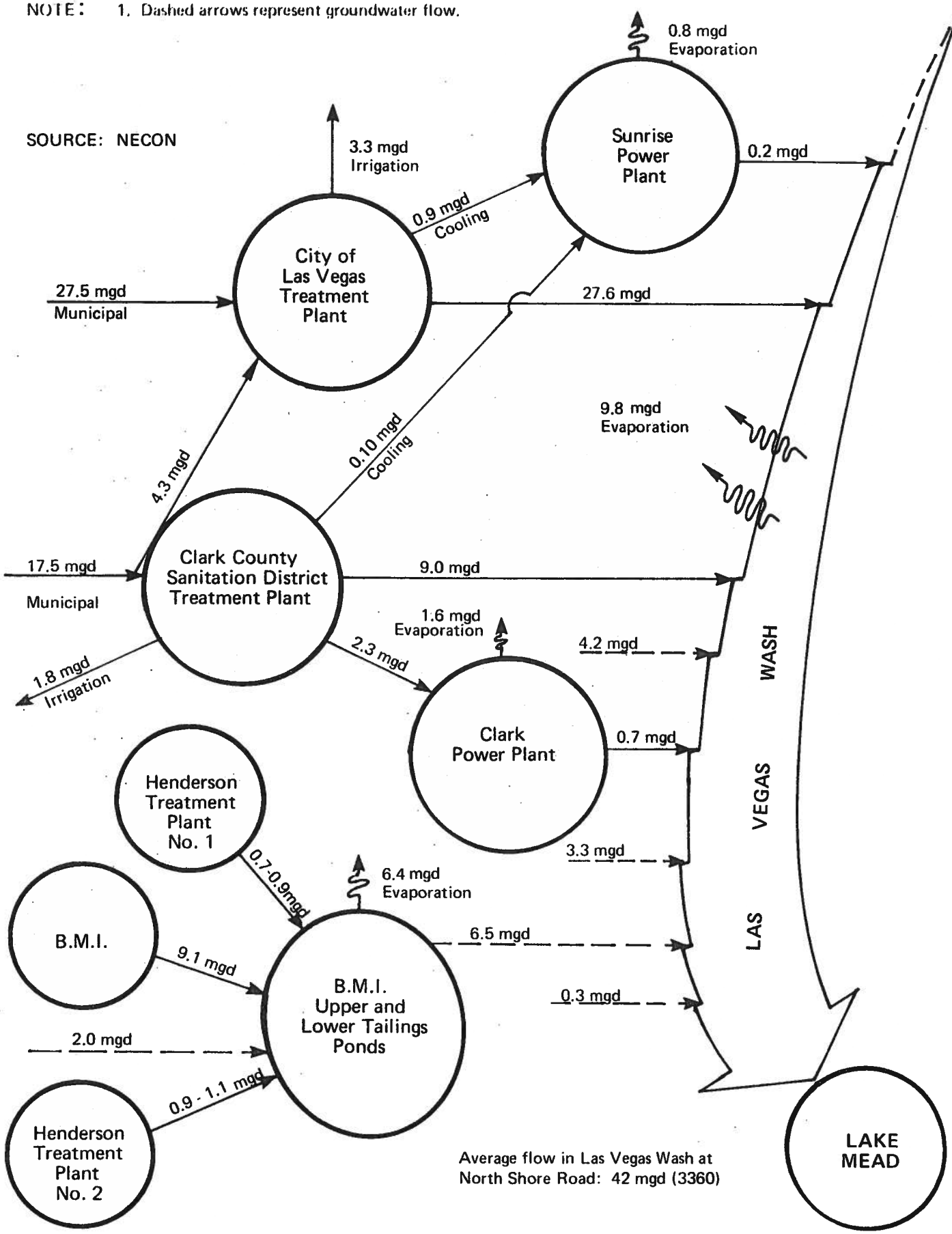
Biota - Much of the land to be irrigated or used for pipeline routing, has been disturbed considerably by man's activities. As a result, the areas support few floral species characteristic of the more natural areas. In addition, only those mammalian, reptilian and avian species adaptable to habitat changes are likely to occur on the irrigated areas. Some of these species are listed in Table 6 entitled, Basic biota of the site environments.

Noise - Since the irrigation pipeline parallels existing boulevards and avenues, noise levels along the route are quite high. This is particularly true along such major roads as Flamingo Road, Paradise Road and Las Vegas Boulevard - South.

Noise levels on the lands to be irrigated are variable, however since most are either golf courses or parks, noise levels are likely fairly low except where bordered by busy streets, construction operations or some such activities.

D. Las Vegas Wash

Substantial changes in the sources and quantities of water to Las Vegas Wash have occurred since completion of the 1972 Environmental Assessment. In 1972, eight sources of water discharge to the wash were identified. These were the Nevada Rock and Sand Company, Sunrise and Clark Power Plants, the City of Las Vegas and Clark County Sewage treatment plants, the Henderson treatment plant, B. M. I., and groundwater return. At that time, those sources accounted for flows of approximately 43. 9 mgd. A more recent evaluation indicates that there are now five point sources discharging into Las Vegas Wash as shown in Figure 11. The agencies which have ceased discharging since 1972 are 1) Nevada Rock and Sand Company, 2) The City of Henderson Wastewater Treatment Plant, and 3) Basic Management, Inc. (BMI).



ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

FIGURE 11
1973 AVERAGE DAY POINT AND DIFFUSE FLOWS TO LAS VEGAS WASH

Prepared by VTN

Of principal concern in describing Las Vegas Wash, is both the quality of water in the Wash, and the quality of waters discharged to the Wash. In addition to the identifiable point sources of discharge to Las Vegas Wash, there was an estimated 7.8 mgd of diffuse subsurface flow which contributed to the total surface flow entering Lake Mead. Table 7 shows the daily discharge of total dissolved solids, phosphorus, and nitrogen entering Las Vegas Wash from each of the sources shown in Figure 11.

Since the completion of the 1972 Environmental Assessment, an extensive study of the biotic characteristics of Las Vegas Wash has been concluded by Drs. W. Glen Bradley and Wesley E. Niles. Their study included an inventory and species list of vascular plants and vertebrate fauna of the Las Vegas Wash, an analysis of habitats and biotic communities, and determination of the relative abundance of vertebrate species of the wash. Their study results provide an important baseline from which to work when determining changes likely to occur in the floral and faunal regimes of the Wash as a result of alteration of wastewater flows.

A short description of the Las Vegas Wash can be found on page 54 of the 1972 Environmental Assessment.

Biota of the Wash

Based on the Bradley and Niles study, three major vegetative types were identified in the Las Vegas Wash. Within each vegetation type, a number of biotic communities exist. The distribution of the plant communities along Las Vegas is shown on Figure 12. Generally speaking, the classification of these biotic communities was based on moisture gradients as shown in Table 8.

Data showed that vegetative species diversity was greatest in the desert plant communities rather than in the marsh and stream riparian habitats. This was basically due to the lack of annual (herb) species within the marsh vegetation type.

Conversely, the avifauna (birds) was found to be more diverse and abundant in the riparian communities as compared to the adjoining desert communities. This was due in part, to the availability of open water for waterfowl and shorebird species which constituted approximately 40 percent of all bird species in the shrub-woodland-marsh vegetation type. The fauna determined to occur in the Las Vegas Wash included 2 species of fish, 6 amphibians, 29 reptiles (1 tortoise, 13 lizards and 15 snakes), 39 mammals (1 shrew, 10 bats, 16 rodents, 2 rabbits, 9 carnivores and 1 ungulate (Bighorn sheep)), and 161 species of birds. Many of the species were observed to occupy the ecotone between the xeric desert habitat and the hydric conditions of the marsh.

TABLE 7

POINT AND DIFFUSE DISCHARGES
INTO LAS VEGAS WASH 1973

	Point Sources	Average Daily Flow (mgd)	Total Dissolved Solids Contribution (lb/day)	Phosphorus Contribution (lb/day)	Nitrogen Contribution (lb/day)
1.	Sunrise Power Plant	0.2	5,800	2	32
2.	City of Las Vegas Treatment Plant	27.6	243,500	2,070	4,370
3.	Clark County Sanitation District Treatment Plant	9.0	137,400	800	1,330
4.	Clark Power Plant	0.7	20,800	7	71
5.	BMI and Henderson Ponds	6.5	379,500	-0-	1,400
	DIFFUSE SOURCES				
1.	Groundwater Return	7.8	389,900	-0-	unknown
	TOTAL	42	1,176,900	1,400	3,580

Source: NECON

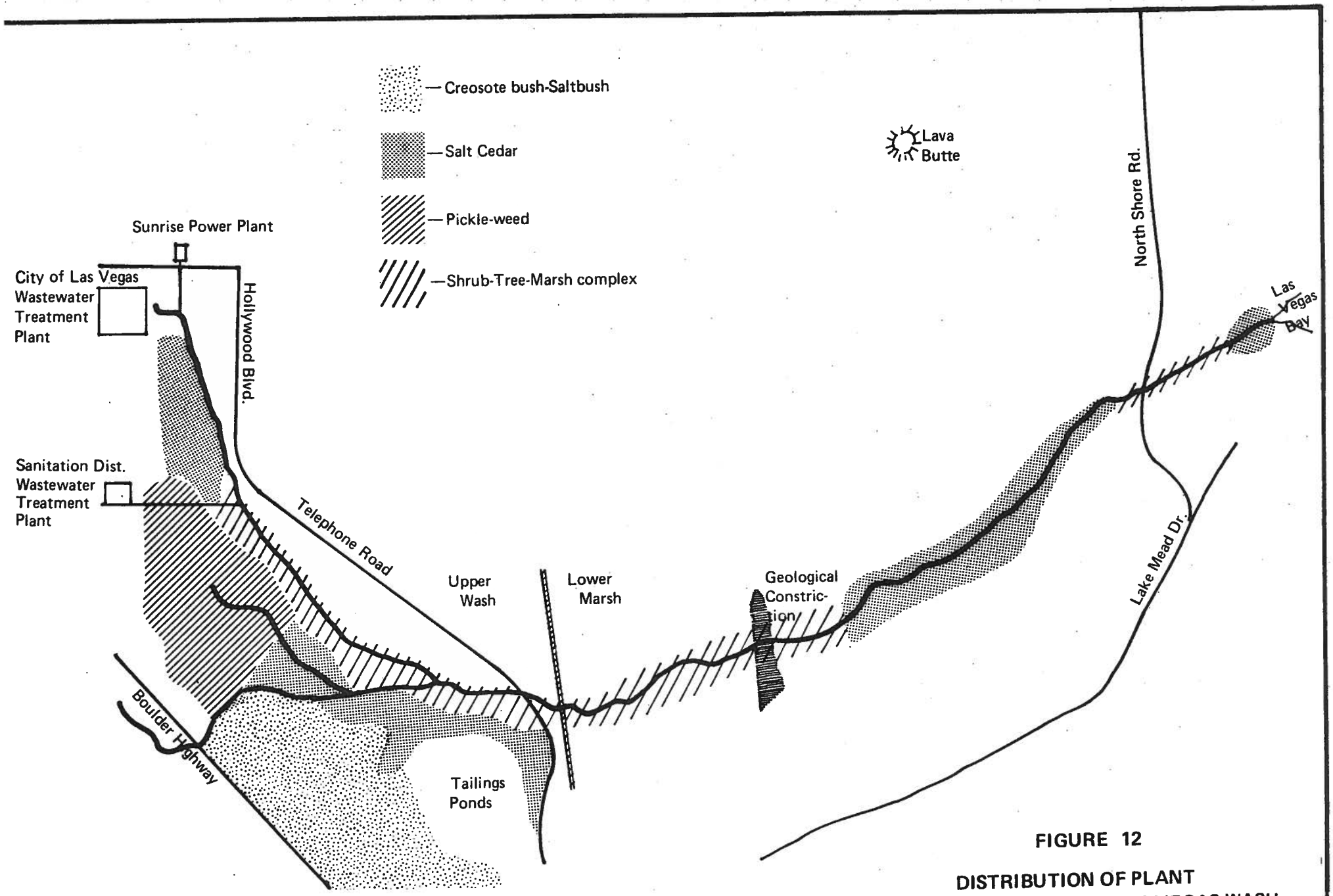


FIGURE 12

DISTRIBUTION OF PLANT COMMUNITIES ALONG LAS VEGAS WASH AS DETERMINED BY BRADLEY AND NILES (1973)

ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

TABLE 8

VEGETATION TYPES AND BIOTIC COMMUNITIES
OF THE LAS VEGAS WASH

Vegetation types & biotic Community	Soil Salinity	Soil Moisture
Desert shrub vegetation type		
Creosote bush community	0.4%	1.6%
Shrub & woodland vegetation type		
Saltbush community	0.5%	2 - 5%
Mesquite community	0.5%	4.1%
Salt cedar community	0.4 - 2%	8.5%
Pickleweed community	1.8 - 6%	15 - 30%
Marsh vegetation type		
Cattail community	0.8%	standing water
Bulrush community	0.5%	standing water

Source: Bradley & Niles (1973)

A more complete account of the ecology of the Las Vegas Wash occurs in the "Study of the impact on the ecology of Las Vegas Wash under alternative action in water quality management", by W. G. Bradley and W. E. Niles. In addition, complete lists of terrestrial wildlife of the region, birds of the region and avifauna of the Las Vegas Wash and Las Vegas Bay are presented in Appendix A of the 1972 Environmental Assessment.

Cultural Factors

Reference to cultural aspects of the Las Vegas Wash can be made to page 55 and 56 of the 1972 Environmental Assessment.

Noise characteristics of the Wash are also covered in that document on page 56.

Flood Flows

The following information is meant to supplement the flood flow information presented on page 56 of the 1972 Environmental Assessment. The flood plain in Las Vegas Wash is shown in the Wash Development Report (Appendix D).

The U.S. Army Corps of Engineers have projected three possible flood magnitudes in the Las Vegas Wash. These projections are based on a total drainage area of approximately 1,571 square miles. The different flood magnitudes considered include a "lesser flood" (50 year) of 27,000 CFS, an "intermediate regional flood" (100 year frequency) of 39,000 CFS and a "standard project flood" (largest likely to occur of 100,000 CFS. These projected discharges appear extreme when considering that the greatest recorded discharge in the wash was 1,400 cubic feet per second in August 1957. The following table shows the maximum discharges recorded in the wash per year since 1957.

TABLE 9

MAXIMUM DISCHARGE IN LAS VEGAS WASH
AT PABCO ROAD, 6.0 MILES ABOVE LAKE MEAD
(water year ending 9/70)

Water Year	Date	Discharge
1957	3/21/57	1400 cfs
1958	2/4/58	68 cfs
1959	11/12/58	1150 cfs
1960	11/2/59	72 cfs
1961	8/29/61	472 cfs
1962	9/27/62	280 cfs
1963	9/4/63	102 cfs
1964	6/26/64	880 cfs
1965	8/17/65	602 cfs
1966	8/19/66	200 cfs
1967	12/8/66	180 cfs
1968	11/23/67	550 cfs
1969	1/26/69	190 cfs
1970	8/14/70	504 cfs

E. Las Vegas Bay

The Las Vegas Bay is being considered here as an important segment of the environments of the region because of the substantial influence Las Vegas Wash has on the chemical, physical and biological conditions of the Bay. A study, recently completed by Dr. J. Deacon, describes the relationships between nutrient flow from Las Vegas Wash and some of the biological conditions of the Las Vegas Bay. In the 1972 Environmental Assessment, mention of Las Vegas Bay was made on page 51 to 54. Since publication of that document, additional studies have revealed information on the water quality and aquatic vegetation characteristics of the Bay. The following sections reflect this new information.

Geography

Refer to page 51 of the original Environmental Assessment for an account of the geography of the Las Vegas Bay.

Water Quality

Water quality conditions in the Las Vegas Bay portion of Lake Mead have been declining during the past 20 years. A study conducted in the late 1940's and early 1950's by Nevada's Department of Fish and Game indicated no evidence of pollution except for one unexplained fish kill in 1953 and an unusual reduction in the water's transparency caused by a large algae bloom in 1952 (Nevada Fish and Game, 1953).

Through the years, as more and more algal nutrients and dissolved solids were discharged into Las Vegas Bay, the more severe the pollution problems became. Within the last few years algal growth and blooms have risen to levels resulting in a substantial reduction of water quality and have at times reduced the recreational attractiveness of the area.

Many studies have been conducted to determine the cause and extent of this problem. Conclusions drawn from these studies indicate that the primary problem is the effluent from Las Vegas Wash, which is high in algal nutrients and dissolved solids. Algal growths resulting from the increased availability of these nutrients, especially phosphorus, will produce objectionable aesthetic conditions. If these conditions are allowed to persist, they could eventually affect the quality of recreation of the area and pose a public health hazard. Studies conducted in 1972 and 1973 by Dr. James Deacon, indicate that plankton populations increase in Las Vegas Bay during the warm summer months. During this period, the upper water layers of the bay are considered mildly eutrophic or nutrient-rich. This is in contrast to the oligotrophic (characteristic of a deep lake having low nutrient concentrations) conditions which occur during most of the year (Las Vegas Valley Water District, 1972).

In order to better understand the interrelationship between Las Vegas Wash discharges and water quality and algal populations in Las Vegas Bay, a County funded monitoring study will be conducted on a continuing basis by Dr. Deacon and his staff. This program will involve the establishment of eight sampling stations including one at North Shore Road, one in the channel at the head of Las Vegas Bay, the mouth of Las Vegas Bay (3 stations), one above Hoover Dam, one below Boulder Canyon and one at the Boulder Basin. At these stations the following parameters will be analyzed: number and kinds of phytoplankton per milliliter, chlorophyll content in milligrams per cubic meter, dissolved and total phosphrous, nitrate, nitrogen and turbidity in Jackson turbidity units. Additional measurements will include temperature, conductivity, dissolved oxygen, pH, COD (chemical oxygen demand), coliform counts, total free chlorine, BOD (Biochemical oxygen demand) and methylene blue active substance (a means of determining presence of detergents) (UNLV/Clark County Contract, 1974).

Vegetation

Terrestrial and aquatic: See pages 51 and 52 of the 1972 Environmental Assessment for accounts of these topics.

Wildlife

Terrestrial: a short account of existing terrestrial wildlife of the Las Vegas Bay has been presented on page 52 of the 1972 Environmental Assessment. The following information is presented here to expand on that account.

Much of the Las Vegas Bay and other portions of Lake Mead provide important wintering habitat for numerous water birds, the most notable being western grebes (Aechmophorus occidentalis), eared grebes (Podiceps caspicus), red-breasted merganser (Mergus merganser) and herring, California and ring-billed gulls (Larus argentatus, L. californicus and L. delawarensis). The grebes characteristically feed on the common forage fish such as threadfin shad (Dorosoma petenense) (Lawson, pers. comm.).

Aquatic: a description of existing fish species of Las Vegas Bay and Lake Mead is presented on page 53 of the 1972 Environmental Assessment.

F. Environment of the Colorado River

The description of the environment of the Colorado River presented on pages 56 to 62 of the 1972 Environmental Assessment is still applicable for purposes of this Addendum. The most pertinent changes since preparation of the 1972 Assessment have been related to water quality.

Salinity or total dissolved solids in the Colorado River continues to be of major concern with regard to water quality. Salinity is already approaching critical levels in some areas of the Colorado River Basin, and without corrective measures the problem is expected to increase in magnitude. The concern for this problem is emphasized by recent actions at the Federal level. These actions include:

1. The treaty of August 30, 1973 between Mexico and the United States, and

2. The Colorado River Basin Salinity Control Act introduced into the U.S. Congress in January 1974.

Valentine (1974) has recently reviewed the impacts of Colorado River Salinity within the United States. According to this report:

> "The major harmful impact of the salinity of Colorado River water within the United States is essentially experienced in the Lower Colorado River Basin States of Arizona, Nevada and California. Because of its relatively high dissolved salt content, its use has been accompanied by increased economic costs.....The economic impacts will be felt in a larger area in the near future as Colorado River water will be diverted to the Central Arizona area and as diversions to the Las Vegas, Nevada, area increases in quantity.

"Continued growth and development in the Colorado River Basin states will cause the rivers salinity to increase substantially in the absence of any measures to reduce salinity (see Table 10).

TABLE 10

PROJECTIONS OF SALINITY AT SELECTED LOCATIONS ALONG THE COLORADO RIVER

Location	Average Annual Salinity 1972	Projected Salinities		
		1980	1990	2000
Lee Ferry	568	618	710	804
Lake Mead	746	758	896	992
Parker Dam	743	761	912	1012
Palo Verde Dam	760	809	988	1097
Imperial Dam	867	900	1112	1238

Footnote:

a. From U.S. Geological Survey Records.
b. Colorado River Board of California Projections.
c. All values shown are in milligrams per liter.

"As salinity concentrations increase, the adverse problems arising from the river's salinity on Lower Basin water users will likewise increase, resulting in direct economic losses to water users and indirect economic losses to the basin's economy."

Valentine (1974) also summarizes the nature of impacts on both agricultural and urban areas (see Table 11).

Direct impacts to agricultural areas result from the necessity of having to use:

a) underground drains
b) application of additional water for leaching out salts
c) precise land leveling
d) special irrigation practices
e) choosing crops with high salt tolerance

Some indirect agricultural impacts are:

a) additional farm labor
b) added fertilizer costs
e) reduced crop quality and quantity

Damages from high salinity water in urban areas include effects on:

a) domestic plumbing
b) domestic water heaters
c) municipal waterworks equipment
d) industrial water treatment
e) domestic and commercial impacts of water hardness

TABLE 11

COMPUTATION OF WEIGHTED AVERAGE SALINITY DETRIMENT VALUE FOR 2000 WITH SALINITY INCREMENTS AT IMPERIAL DAM

Diversions	Annual diversions in acre-feet	Agricultural detriments $/mg/l	Urban detriments $/mg/l	Ratio of salinity increment at diversion point to Imperial Dam	Total detriments x ratio $/mg/l
(1)	(2)	(3)	(4)	(5)	(6)
Nevada, Urban diversions at Lake Mead	313,000	------	47,000	0.66	31,000
Nevada, Urban diversions below Lake Mead	37,000	------	5,600	0.66	3,700
California, Nevada border to Parker Dam					
Miscellaneous Urban	5,000	------	800	0.73	500
Metropolitan Water District,					
Urban	380,000	------	57,000	0.73	41,600
Agricultural	60,000	1,200	------	0.73	900
Arizona, Lake Mead to Parker Dam					
Miscellaneous Urban	10,000	------	1,500	0.73	1,100
Miscellaneous Agricultural	110,000	2,200	------	0.73	1,600
Central Arizona Project,					
Urban	310,000	------	46,500	0.73	33,900
Agricultural	610,000	12,200	------	0.73	8,900
Arizona, Parker Dam to Headgate Rock Dam					
Urban	1,000	------	200	0.73	100
Agricultural	720,000	14,400	------	0.73	10,500
California, Headgate Rock to Palo Verde Dam					
Urban	60,000	------	9,000	0.91	8,200
Agricultural	990,000	19,800	------	0.91	18,000
California, Palo Verde Dam to Cibola					
Urban	5,000	------	800	0.91	700
Agricultural	0	0	------	0.91	0
Arizona, Palo Verde Dam to Cibola					
Urban	0	------	0	0.91	0
Agricultural	30,000	600	------	0.91	500
California, Cibola to Imperial Dam					
Urban	14,000	------	2,100	1.00	2,100
Agricultural	3,360,000	67,000	------	1.00	67,200
Arizona, Cibola to Imperial Dam					
Urban	25,000	------	3,800	1.00	3,800
Agricultural	1,240,000	24,800	------	1.00	24,800
Totals	8,280,000				259,100
Weighted average unit Salinity detriment:		$\frac{259,100}{8,280,000}$ = $0.031 per acre-ft/mg/l			

Source: Valantine, 1974

The summary of Valentine's report is worth quoting in its entirety:

> "Unless measures are taken to control the salinity of the Colorado River, the average annual salinity at Imperial Dam will increase from 867 mg/l in 1972 to 1238 mg/l in 2000, an increase of 371 mg/l. This increase would cause deleterious impacts on irrigation and urban water users in the states of Arizona, California and Nevada amounting to $95 million a year in the year 2000. The unit values of salinity detriments were found to be $0.028/acre-ft./mg/l and $0.031/acre-ft./mg/l for pre-and post-central Arizona project conditions. These detriments indicate the stake that the people of the Colorado River Basin have in measures to control the River's salinity."

Four Salinity Control Projects would be authorized for construction under the Colorado River Basin Salinity Control Act that will benefit water users in the United States and Mexico. These projects would achieve the near term objective of the EPA and the Seven Colorado River Basin States by removing 514,000 to 594,000 tons of salt annually. The four projects are:

1. Paradox Valley Colorado: a 14,000 foot thick pure salt dome is within 60-100 feet of the ground surface. Rising groundwater picks up over 200,000 tons of salt per year. The project plans to lower groundwater by well pumping and transport of brines to an evaporation reservoir for disposal. Estimated salt removal is 180,000 tons per year which will reduce salinity at Imperial Dam by 20 ppm in the year 2000.

2. Grand Valley, Colorado: about 80,000 acres of land are irrigated in the valley. The soils are derived from Muncos Shale which has a high salt content. Return flows from agriculture lands are estimated to contain 500,000 tons per year of salt. The Grand Valley Salinity Control project would include a) improved irrigation management methods such as scheduling times and amounts of water to apply and b) lining drainage canals and laterals to reduce sepage, and c) on-farm improvement such as measuring and control devices and installation of proper drains. Estimated salt load reduction is 200,000 to 280,000 tons per year and a subsequent reduction of TDS at Imperial Dam of 23 to 32 ppm in the year 2000.

3. Crystal Ceyser, Utah: the crystal geyser is an abandoned oil test well which erupts periodically. The water has a TDS of 11,000 to 14,000 ppm and contributes 3000 tons of salt per year to the river. The project plan would construct a dike around the geyser and drain the water to an evaporation pond. Estimated salt removal is 3000 tons per year and would reduce salinity at Imperal Dam by 0.3 ppm in the year 2000.

4. Las Vegas Wash, Nevada: the wash adds about 209,000 tons of TDS per year to the Colorado River system. Sources are both point and diffuse and contribute approximately 20% and 80% of the total, respectively. Rising ground water over long established groundwater mounds beneath the industrial waste ponds and other discharges constitute the diffuse sources. The proposed project plan would collect groundwater flow by subsurface drains and pump the water to evaporation ponds. Estimate salt load reduction is 131,000 tons per year which would reduce TDS at Imperial Dam by 13 ppm.

Other potential salinity control projects include the following:

Point source control

La Verkin Springs, Utah
Littlefield Springs, Arizona
Glenwood-Dotsero Springs, Colorado

Irrigation source control

Lower Gunnison, Colorado
Uintah Basin, Utah
Colorado River Indian Reservation, Arizona
Palo Verde Irrigation District, California

Diffuse source control

Price River, Utah
San Rafael River, Utah
Dirty Devil River, Utah
McElmo Creek, Colorado
Big Sandy River, Wyoming

Chapter 4

ENVIRONMENTAL QUALITY OBJECTIVES

Chapter 4

ENVIRONMENTAL QUALITY OBJECTIVES

A. Introduction

The environmental quality objectives for the Las Vegas region were devised to support the desires of the community to maintain and further attain a high environmental quality in the Las Vegas area. The objectives for this project addendum will remain unchanged since they continue to reflect the attainable goals of environmental quality for the region.

B. Environmental Quality Objectives

1. To attain a clean desert environment.

   In many areas the existing conditions must be improved. In areas where the conditions are satisfactory, the environmental quality must be maintained.

2. To maintain the Las Vegas Wash as a permanent riparian environment.

   The riparian vegetation in Las Vegas Wash is not a natural feature of the environment as it is dependent upon additional water. It is, however, compatible with the surrounding desert, forming an attractive green scene and supporting a variety of wildlife not found in adjacent dry washes. The wash attracts significant numbers of recreationists, students and educators.

3. To develop additional greenbelts.

   The extremely dry sparsely vegetated desert is made more attractive to man when greenbelts are established. People are less apt to litter green areas than the open desert.

4. To optimize the use of water.

   Water is scarce and there are many demands for its use. Waste of water in a desert area is unacceptable. Efficient use for any purpose and recycling is desirable. Efficient use of water means that man does not use water unnecessarily, and that he does not degrade his water resources, other than that part which he beneficially uses.

Chapter 5

LEGAL, REGULATORY, AND INSTITUTIONAL CONSTRAINTS

Chapter 5

LEGAL, REGULATORY, AND INSTITUTIONAL CONSTRAINTS

A. Introduction

Relevant laws, regulations, policies, and institutional arrangements which provide guidelines for identifying environmental impacts in both Las Vegas Valley and the Colorado River System are presented below. In addition, a number of Federal State and local laws and regulations have been enumerated to provide a background for; 1) identifying the relationship of the proposed project to the various plans and policies, and 2) evaluating specific environmental impacts. Those laws and regulations pertaining to specific environmental impacts are related principally to water and air quality.

The constraints noted in this chapter have shaped the objectives of the proposed project, and will affect future plans and programs designed to protect and enhance the environment. The legal and policy constraints used in identifying environmental impacts of the project include the following·

1. National Environmental Policy Act of 1969, Section 102 (2) c
2. Council on Environmental Quality Guidelines, August 1, 1973, Section 1500.8
3. Preparation of Environmental Impact Statements, Interim Regulation, Environmental Protection Agency, January 17, 1973 FR.
4. Numerous Federal, State and local laws, regulations, and requirements which regulate environmental quality.

The relevant constraints identified below have been catagorized to make clear their applicability to the Environmental Assessment Addendum, and to the project.

B. Guidelines for Environmental Assessment

The documents described in this section have been used to identify areas of National interest with regard to environmental policy, specific environmental impacts, and the recommended format in which the Environmental Assessment Addendum is presented.

1. National Environmental Policy Act of 1969

The description of the National Environmental Policy Act of 1969 on page 64 of the 1972 Environmental Assessment is applicable to this Addendum as presented.

2. Council on Environmental Quality Guidelines

The Council on Environmental Quality guidelines defines the points which must be covered in environmental statements. These points are:

a. A description of the proposed action including technical data and maps.

b. The relationship of the proposed action to Federal, State, and local land use policies, plans, and controls including those developed in response to the Clean Air Act or the Federal Water Pollution Control Act Amendments of 1972.

c. The probable impact of the proposed action on the environment, to include both primary and secondary significant consequences.

d. An evaluation of alternative courses to the proposed action, which might avoid some or all of the adverse environmental effects.

e. Probable adverse environmental effects which cannot be avoided.

f. The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.

g. Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

h. A discussion (where appropriate) of problems and objections raised by other Federal, State and local agencies and by private organizations and individuals in the review process, and the disposition of the issues involved.

3. Environmental Protection Agency, Interim Regulation

Section 6.32 of the Interim Regulation on Preparation of Environmental Impact Statements promulgated by EPA in the Federal Register on January 17, 1973 was used to define the points presented in the Environmental Assessment Addendum. The major points presented in Section 6.32 include those listed above under the Council on Environmental Quality Guidelines with the exception of Item 2.

C. Constraints Related to the Proposed Project

The documents identified below have served through their interpretation, to guide the development, execution, and definition of the project.

1. Federal Water Pollution Control Act

The Federal Water Pollution Control Act (FWPCA) of 1965 required a viable areawide Water Quality Management Plan to be in effect before Federal grants were offered for construction of pollution abatement projets. A preliminary Water Quality Management Plan was being developed for Clark County. The 1972 amendments to the FWPCA (Public Law 92-500) significantly expanded the scope of the Act and required that water pollution control planning proceed along new guidelines to be developed by the U.S. Environmental Protection Agency. Working guidelines for final planning are not yet available.

The Las Vegas Wash/Bay Pollution Abatement Project represents a significant element in the successful development of areawide water pollution control efforts.

2. Senate Bill No. 288 (NRS 790)

Senate Bill No. 288, described in Chapter 790, Statutes of Nevada, 1973, transferred the responsibility for developing the Las Vegas Wash/Bay Pollution Abatement Project from the Las Vegas Valley Water District to the Board of County Commissioners for Clark County, Nevada. The Nevada State Legislature also approved the 1972 final written report of the Las Vegas Valley Water District, which outlined a program for export of polluted waters to the Dry Lake Area. Senate Bill 288 further directed:

a. The Board of County Commissioners to make a review of the program proposed in December 1972.

b. Complete the review by September 1, 1973 and recommend a course of action to the Legislative Committee and the Governor of Nevada.

c. After approval by the appropriate authorities, the Board of County Commissioners are authorized to construct the project through the issuance of State supported bonds provided the Federal Government provide at least 50 percent of the financing required.

Steps a. and b. have been completed by the Board of County Commissioners. The Board recommended that an alternative solution to the pollution abatement problem be investigated, and the report of which this Addendum is a part presents the project recommended in accordance with the directives of the above described legislation.

D. Regulatory Constraints

Both existing and proposed regulations which have been considered in the Environmmental Assessment Addendum are enumerated below. These documents relate primarily to the evaluation of environmental impacts related to water and air quality, and assist in evaluating the impact of the proposed project in light of plans and policies for the regional environment.

1. Water Quality Standards

a. State of Nevada

Water Pollution Control Regulations, (WPCR) for the waters of the State of Nevada were adopted by the State Environmental Commission on October 24, 1973. Existing standards for the State include the revisions adopted April 10, 1973, June 26, 1973, and those of October 24, 1973. The October 24, 1973 standards were approved with one exception by the U.S. Environmental Protection Agency on November 30, 1973.

The one exception to EPA's approval of the October 24, 1973 Water Pollution Control Regulations was the temperature criterion for Las Vegas Wash. A standard for temperature was included as one of ten proposed amendments which accompanied EPA'S approval of the October Regulations. On April 9, 1974 after continuing discussion of an acceptable temperature standard, the State Environmental Commission adopted a temperature standard that will be included in the State Regulations if approved by EPA. The October 24, 1973 WPCR and the April 9, 1974 revisions to the Regulations are shown in Appendix C.

b. Environmental Protection Agency

The U.S. Environmental Protection Agency along with its approval of the Nevada Water Pollution Control Regulations proposed amendments to 40 CFR 120, "Interstate and Intrastate Waters of the State of Nevada". Two of the ten proposed amendments are particularly relevant to the evaluation of the presently proposed project. As noted above, discussions on the proposed amendments continued, and on April 9, 1974 the State Environmental Commission adopted revisions to the State Regulations. These State adopted revisions were essentially the same as those proposed by EPA.

Among the original amendments proposed by EPA was a salinity standard for Las Vegas Wash. On March 28, 1974 in a letter to the Governor of Nevada, the EPA Regional Administrator elected to hold the salinity standard in abeyance pending the conclusion of negotiations with the Colorado River Basin Salinity Control Forum. Thus, there is not presently a numerical salinity standard for Las Vegas Wash.

c. Colorado River Basin Salinity Control Act

An international agreement to cut salinity levels in the Colorado River was signed by Mexico and the United States on August 30, 1973. This agreement (Minute 242) established that the salinity of water arriving at Morelos Dam must not exceed by more than 115 plus, or minus 30 parts per million of dissolved solids the salinity of water arriving at Imperial Dam. Any reductions in total dissolved solids of waters entering Lake Mead as a result of the operation of the Las Vegas Wash/Bay Pollution Abatement Project will contribute favorably to resolution of this international water quality problem.

The Colorado River Basin Salinity Control Act, introduced into the U.S. Congress as H.R. 12165 on January 21, 1974, was developed in response to the need for a definitive solution to the international salinity problem in the Colorado River. This Bill, if adopted, would authorize the construction, operation, and maintenance of certain works in the Colorado River Basin to control the salinity of water delivered to users in the United States and Mexico. Section 202, Part 4 of the proposed legislation identifies the Las Vegas Wash unit, Nevada, as consisting of "Facilities for collection and disposition of saline ground water of Las Vegas Wash..." The potential for facilities identified in this proposed legislation emphasizes the relationship of the proposed Las Vegas Wash/Bay Pollution Abatement Project to areawide planning at Federal, State, and local levels.

d. U.S. Public Health Service Drinking Water Standards

A description and enumeration of the 1962 U.S. Public Health Service Drinking Water Standards is presented on page 72 and in Appendix C, Table G of the 1972 Environmental Assessment.

2. Air Quality Standards

Legal and regulatory constraints which can be identified as aiding in the evaluation of air quality impacts exist at Federal, State, and local levels. The State of Nevada has submitted and received approval of their implementation plan from the Environmental Protection Agency. Therefore, those regulations most directly affecting the air pollution impact assessment of the proposed project are presented below.

a. State of Nevada Air Quality Regulations

In accordance with the directives of the Clean Air Act as administered by the Environmental Protection Agency, the State

of Nevada has developed an Implementation Plan (SIP) through which it intends to move toward the attainment and maintenance of the National primary and secondary Ambient Air Quality Standards (NAAQS). The State of Nevada and Clark County Ambient Air Quality Standards are essentially the same as the Federal Standards.

On February 25, 1974 the State adopted amendments to the Air Quality Regulations which provide for the review and approval of complex (indirect) sources of air pollution. The full text of the adopted amendments is presented in Appendix B

b. Clark County

The Clark County District Board of Health adopted amended Air Pollution Control Regulations on January 28, 1973. A number of sections included in the Regulations are particularly applicable to the assessment of air quality impacts from the proposed project and are described below.

Section 9 - NEW AND MODIFIED SOURCES

No person shall install or construct any new stationary source, or make modifications to any existing source which will increase or change the effects or characteristics of air contaminants discharged, or install an air cleaning device, unless a Registration Certificate therefor has been issued by the Control Officer.

Section 13 - OPEN BURNING

The description of this section is unchanged from that on page 68 of the 1972 Environmental Assessment.

Section 16 - EMISSION OF VISIBLE AIR CONTAMINANTS

The description of this section is unchanged from that on page 68 and 69 of the 1972 Environmental Assessment.

Section 18 - PARTICULATE MATTER FROM PROCESS EQUIPMENT

Section 18 of the Clark County APCR's prescribes the maximum allowable weight of particulate discharged into the atmosphere based on the process weight. The process rate and allowable particulate emissions are discussed further in Chapter 7.

Section 19 - FUGITIVE DUST

The description of this section is unchanged from that on page 69 of the 1972 Environmental Assessment.

Section 26 - FUEL BURNING EQUIPMENT

Particulate matter from fuel burning equipment (including recalcination furnaces and carbon regeneration furnaces) will be limited according to the heat input to the furnaces, expressed in British thermal units (BTU) per hour. Appendix B presents a summary of the pertinent elements detailed in Section 26 of the Regulations.

Section 29 - ODORS IN THE AMBIENT AIR

An odor occurrence shall be deemed a violation when a complaint is received and substantiated within two hours by the Control Officer. The Control Officer shall deem the odor occurrence a violation if he is able to make two odor measurements within a period of one hour, these measurements being separated by at least 15 minutes. An odor measurement shall consist of a detectable odor after the odorous air has been diluted with two or more volumes of odor-free air.

Section 36 - AMBIENT AIR QUALITY STANDARDS

The Ambient Air Quality Standards adopted by Clark County are the same as those for the State of Nevada. The pertinent standards are shown in Appendix B.

In addition to the above described Air Pollution Control Regulations (APCR) of January 28, 1973 Clark County is presently proposing amendments to the Regulations to provide for the review and registration of "Complex sources" of air pollution. The proposed amendments, dated March 27, 1974 would substantially expand Section 9 described above, and also Sections 1, 8, and 10 of the current APCR.

3. Construction Specifications

Page 70 of the 1972 Environmental Assessment presents a discussion of existing Construction Specifications.

Chapter 6

PROJECT DESCRIPTION

Chapter 6

PROJECT DESCRIPTION

A. General

1. System Overview

In response to the legislative intent of Senate Bill 288 (NRS 790) the Board of County Commissioners for Clark County unanimously adopted a six-point program emphasizing the fullest beneficial use of wastewater generated in Las Vegas Valley. This six-point program includes primary emphasis on:

a. Advanced wastewater treatment (AWT);
b. Beneficial use of AWT effluent;
c. Cooperation with the Federal Government in development of a Las Vegas Wash saline groundwater collection system;
d. The appointment of a citizen committee to develop recommendations of regarding the recreational potential of Las Vegas Wash;
e. The appointment of a Waste Water Negotiating Committee to develop markets for the sale of wastewater; and
f. A monitoring program for Las Vegas Wash and Bay.

The proposed Las Vegas Wash/Bay pollution abatement project has been developed in accordance with the intent of the County's six-point program. This Environmental Assessment Addendum presents an evaluation of the environmental impacts of the proposed project. The project consists of the following elements:

a. Wastewater collection systems from the City of Las Vegas Treatment Plant, the Clark County Sanitation District Treatment Plant, and the City of Henderson Treatment Plants.
b. An Advanced Wastewater Treatment (AWT) facility designed for a maximum day flow of 90 MGD.
c. A pilot desalination plant designed for a maximum product water capacity of 1.0 MGD.
d. Pipelines and a pilot recharge well associated with a pilot groundwater recharge program.
e. Pipelines within the metropolitan area to deliver reclaimed AWT wastewater to selected parks, play grounds, and golf courses for in-valley irrigation.

In addition to the five project elements above, it is helpful for purposes of the Environmental Assessment Addendum to identify discharges from the AWT plant to Las Vegas Wash as a project element.

The location of each element of the proposed project is depicted in Figure E-1. The operational dates of the various elements of the project are detailed in subsequent sections of this chapter.

2. Expansion and Flexibility

The selection and design of the initial project facilities, and the expansions of these facilities lend a great deal of flexibility to the overall project. This flexibility has been incorporated to provide for a systematic approach to, 1) the solution of the immediate problem of pollution in Las Vegas Wash and Bay, and 2) the long range protection and development of the water resources of Las Vegas Valley. Decisions regarding the expansion of certain project elements, and the inclusion of future elements are dependent upon further studies and analyses concerned with agency policies, water quality standards, costs, and feasibility. However, expansions are presently planned for two of the initial project elements; 1) the AWT plant, and 2) the in-valley irrigation system.

Based on present population projections, the Advanced Wastewater Treatment Plant will be expanded in two 22.5 MGD modules. These expansions will provide an ultimate maximum day capacity of 135 MGD by the year 2000. The staging of AWT plant modules will be determined in large part by the actual rate of increase of wastewater flows, the development of reclaimed water uses, and economics.

It is presently anticipated that the pilot desalination plant may be expanded after 1990. This expansion is largely dependent on the results of studies associated with the pilot desalination plant and the pilot groundwater recharge program. After determination of actual operational feasibility and criteria a more precise definition of desalination plant expansion and phasing will be made.

Expansion of the in-valley irrigation facilities will be accomplished in four stages as shown below.

Stage	Estimated Operational Date
I	January 1981
II	January 1982
III	July 1983
IV	July 1985

Staging of these facilities lends further flexibility to the project in allowing project element expansion to be coordinated with and responsive to city and county land use planning and needs. The in-valley irrigation element will permit the beneficial use of AWT plant effluent for irrigation of agricultural lands, landscaping of parks and public facilities, golf courses, and greenbelt areas within Las Vegas Valley.

Additional flexibility in project operation will be realized through the availability of AWT plant effluent for discharge to Las Vegas Wash. Demands for advanced treated effluent will change with time in response to 1) in-valley irrigation needs, 2) potential expansion of the groundwater recharge program, and 3) the demand for cooling water by the Allen Power Generating facility. Quantities of AWT plant effluent not used to supply these needs will be available for discharge to Las Vegas Wash to 1) maintain the Wash as a permanent riparian habitat, and 2) apply as return flow credit from the Colorado River.

In addition to the presently planned elements of the Las Vegas Wash/Bay Pollution Abatement Project a number of potential future projects in Las Vegas Valley have been described in a later section of this chapter. These descriptions have been provided to identify the relationship of the presently proposed project to future programs of pollution abatement and beneficial use of wastewate. These projects include:

a. An export pipeline to the Allen Power Generating facility near Dry Lake.
b. A decentralized AWT Plant to treat wastewater from the City of Henderson.
c. A Federally constructed collection system to intercept diffuse subsurface flows in Las Vegas Wash. This sytem may include a 16.16 MGD desalination plant for treatment of intercepted Las Vegas Wash flows.

B. Project Element Descriptions

1. Wastewater Collection System

The wastewater collection system of the proposed project consists of three pipelines and a pump station designed to collect wastewater flows from the City of Las Vegas and Clark County Sanitation District Treatment Plants, and the City of Henderson Municipal Wastewater Treatment Plants. Wastewater from each of the treatment plants will be conveyed to the influent surge ponds of the Advanced Wastewater Treatment Plant. Figure E.1 shows the location and alignment of these collection facilities.

The pipeline from the City of Las Vegas Treatment Plant (CLVTP) will be a 60-inch concrete gravity flow line approximately 8,000 feet long. The line will extend in a north-south direction from the CLVTP to a junction box near the AWT site where flows from the City, County, and Henderson Treatment Plants will blend and be delivered to the surge ponds. The CLVTP collection pipeline is designed for a year 2000 peak hour flow of 93.4 MGD.

The collection pipeline from the Clark County Sanitation District Treatment Plant (CCSDTP) will consist of 36-inch and 60-inch concrete gravity lines approximately 2200 feet long. The 36-inch

initial section of the pipeline will extend southeasterly on the CCSDTP site, and will include about 50 feet of 48-inch concrete pipe and 150 feet of 24-inch concrete pipe to convey effluent from County Plant into the system. Near the southeast corner of the CCSDTP site the line will turn eastward and extend to the junction box with the CLVTP line.

Wastewater collected from the Henderson Treatment Plants will be pumped through a 24-inch pressure line from the proposed Henderson Pump Station. The Henderson Collection line will be approximately 25,000 feet long, and will run westerly from the pump station to Boulder Highway, then run northwest along and within the highway right-of-way. The line will depart from the highway and run in a northerly direction parallel to Missouri and Stephanie Streets, and will enter the AWT plant influent junction box.

2. Advanced Wastewater Treatment Plant (AWT)

a. General

Advanced treatment of secondary effluents collected from the City of Las Vegas, Clark County Sanitation District, and Henderson Treatment Plants will be accomplished in a modular AWT Plant. The proposed plant will be located adjacent to the existing Clark County Sanitation District Plant (Figure E.1). The AWT Plant will occupy a site of approximately 80 acres.

Figure 13 shows a flow diagram of the proposed AWT Plant.

b. Process Description

Advanced Wastewater Treatment (AWT) was formally initiated through the implementation of an Advanced Waste Treatment Research Program by the U.S. Public Health Service in July 1960. Today well over 100 AWT plants in the United States are operating or are in design stages. AWT encompasses wastewater treatment processes which can remove biological oxygen demand (BOD), chemical oxygen demand (COD), phosphorus, nitrogen, suspended and dissolved solids beyond the amounts removed in traditional biological secondary treatment.

AWT processes to be used in the Las Vegas Wash/Bay Pollution Abatement Project AWT Plant include 1) chemical precipitation by lime coagulation, and 2) multimedia filtration.

Influent wastewater flows to the proposed AWT Plant will be pumped from parallel surge ponds to rapid mix basins where lime will be added as the coagulant. Preliminary studies on the treatability of effluent from the City of Las Vegas and

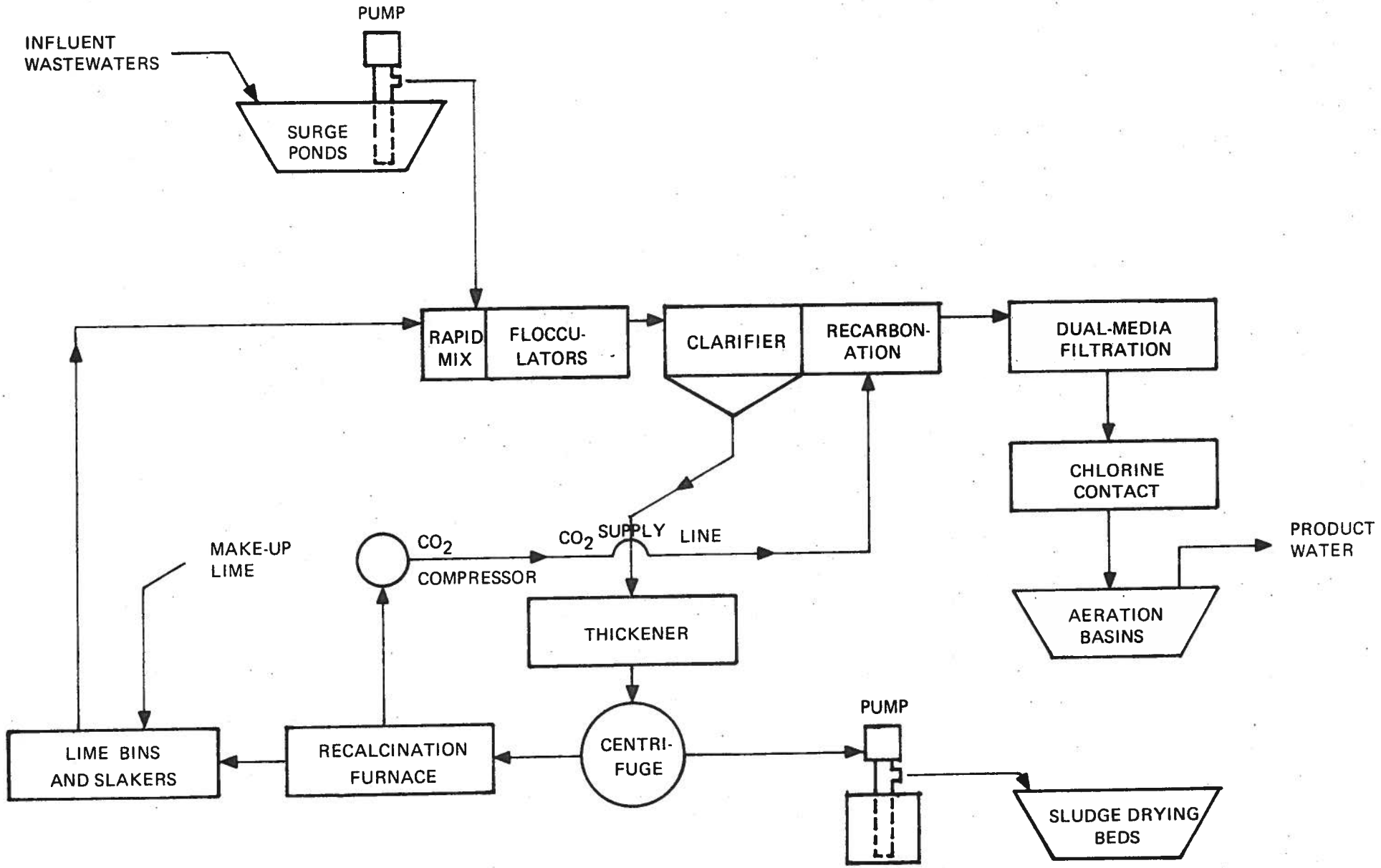


FIGURE 13

ADVANCE WASTEWATER TREATMENT PLANT

Clark County Sanitation District Treatment Plants have indicated that the required phosphorus removal will be accomplished with a lime dosage of 300 to 350 mg/l. After lime addition and flocculation the treated flow will be clarified and recarbonated before filtration. The removal of suspended solids will be accomplished by sedimentation and dual-media filtration. The final plant effluent will be chlorinated and aerated before delivery as the product water. The paragraphs below present a brief description of the processes employed in the AWT Plant.

Chemical Precipitation

Chemical precipitation is a chemical process for removing phosphate. Based upon past experience in treating Las Vegas wastewaters, lime was selected as the coagulant to be used in the AWT Plant. In the process, lime is added to secondary effluent resulting in the precipitation of hydroxyapatite in the sedimentation basins. It was concluded in the initial treatibility study that phosphorus removals down to 0.25 mg/l were achievable through the process. Laboratory tests further showed that in addition to phosphorus removal the basic lime coagulation process is effective in removing total dissolved solids (TDS), COD, alkalinity, total hardness, calcium, magnesium, suspended solids, and turbidity.

Multi-Media Filtration

Suspended solids and fine particles of floc which remain in the wastewater after lime coagulation and sedimentation are removed by multi-media filtration. Multi-media filtration is a process using two or more types of granular material.

The filter is arranged during backwash with the largest, least dense media at the top of the filter. Suspended solids in the filter influent therefore contact successively smaller media as they penetrate the filter. This type of filter bed allows deep uniform penetration of the suspended material, and thus gives long filter runs. The AWT plant will use a multi media filter with two or more media.

c. Phasing

The first module of the AWT Plant is designed for a maximum day flow of 90 MGD. Construction of the plant is to begin in January 1976, and will be completed and operational by mid-1978. Two additional modules of 22.5 MGD each will be added to provide an ultimate maximum day capacity of 135 MGD. The first 22.5 MGD module will be completed by 1982, and the second module will be completed by 1992.

d. Sludge Handling

The disposal of sludge from the AWT processes will be accomplished by thickening and conveying the sludge to drying beds east of the plant site. The area in which the drying beds will be located is shown in Figure E-1. Table 12 below shows the net and gross land area* required for sludge drying for selected project years.

TABLE 12

REJECT SOLIDS DISPOSAL
AREA REQUIREMENTS - AWT PLANT

Year	Net Area Required For Drying Beds	Gross Area Required For Drying Beds
1978	43.8	60
1980	47.3	60
1990	65.4	80
2000	82.5	100

Source: NECON

3. Pilot Desalination Plant

a. General

A program of pilot groundwater recharge is included as a project element to investigate the feasibility of using demineralized wastewater for immediate or future beneficial use. Before major financial commitments are made toward such a program it is necessary to investigate the feasibility of recharge through the operation of a pilot recharge well. A pilot desalination plant will be constructed and operated to provide a highly treated effluent which can be used in the pilot recharge well operation. In addition, the desalted effluent will be used for chemical, bacteriological, and virological testing, and investigations into the potential for potable reuse of highly treated wastewater. The pilot desalination plant will provide a capacity for delivery of up to 1.0 MGD of demineralized wastewater.

*Net land area is the calculated total area of the water surface required to evaporate the wet sludge at a given rate. Gross land area is the net land area plus the area required for support facilities, roads, and embankments.

Figure E-1 shows the location of the pilot desalination plant. The desalination plant and influent surge ponds will occupy a gross land area of approximatley 2 acres.

b. Process Description

A block diagram of the pilot desalination plant is shown in Figure 14. The plant will employ two advanced treatment processes; activated carbon adsorption and desalination. These processes are discussed below.

Desalination

The removal of dissolved solids from water is accomplished in any number of processes including ion exchange, reverse osmosis, electrodialysis, distillation, and freezing. For reasons of ease of operation, and its applicability to small sized desalting systems, the desalting system contemplated in the project is of the reverse osmosis type.

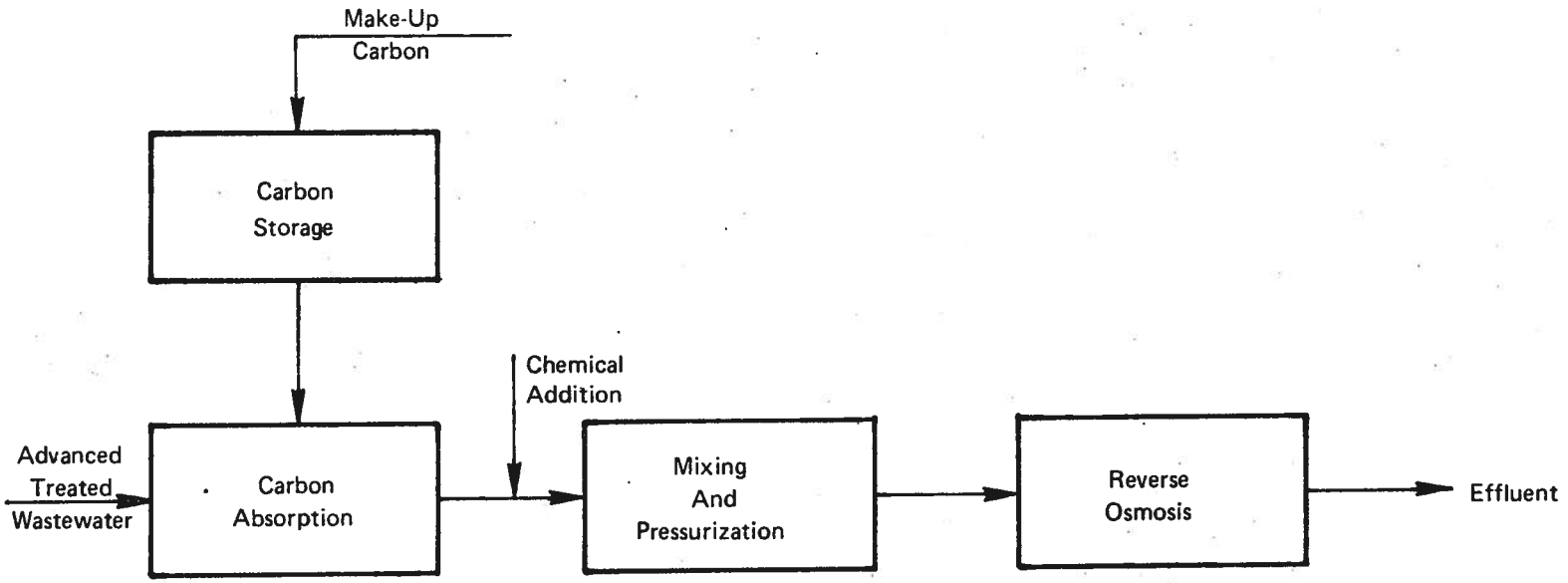
In the reverse osmosis process water is seperated from dissolved solids in solution by filtering through a semipermeable membrane at a pressure greater than the osmotic pressure caused by the dissolved solids in the wastewater. The concentrated brine is progressively flushed out of the system as more wastewater enters to be treated. Fouling of the cellulose-acetate membrane with organic and colloidal matter is a common problem, however operational efficiency is greatly increased by pretreatment by activated carbon adsorption or filtration.

Activated Carbon Adsorption

Activated carbon adsorption is a process for removing soluble organic matter from water. As noted in the paragraph above this process is an effective pretreatment method to reduce clogging of the membrane in desalination by reverse osmosis. Both powdered and granular carbon have been used in the process but regeneration of powdered carbon has not yet been perfected thus restricting the feasibility of its use.

The granular carbon adsorption process consists of passing treated wastewater over granular carbon contained in a vessel. The wastewater flow rate is controlled to allow sufficient contact time for adsorption to take place. The carbon pores eventually become saturated with adsorbed soluble organics after which backwashing is necessary. Ultimately the carbon becomes exhausted and must be regenerated or replaced.

The economic feasibility of carbon regeneration is partly a function of plant size. Regeneration facilities will not be included in the pilot desalination plant.



1. Chemical Testing and System Stabilization
2. On Developing Operational Data On Recharge, Effluent Will Supply Recharge Well

ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

FIGURE 14

PILOT DESALINATION PLANT

c. Phasing

The 1.0 MGD pilot desalination plant will be operational by 1981. The final design, use, and operational characteristics of a full scale plant will be determined on evaluation of the pilot operations, however it is presently planned that an expansion of the pilot plant may be accomplished after 1994.

d. Brine Disposal

Three alternatives have been considered for disposal of the brine wastes generated by the pilot desalination plant:

(1) Discharge to lined evaporation ponds in the vicinity of the desalination plant.
(2) Pipe the waste stream to remotely located evaporative ponds.
(3) Discharge to the wastewater collection system of the City of Las Vegas.

Chapter 7 of this Environmental Assessment Addendum presents the impacts associated with each of the brine disposal alternatives.

4. Pilot Groundwater Recharge Program

a. General

An experimental groundwater recharge program is included as a project element to investigate the technical and financial feasibility of recharging the Las Vegas Groundwater Basin with reclaimed wastewater. Evaluation of the qualitative aspects of groundwater recharge will be undertaken by operating an experimental recharge well near the site of the pilot desalination plant.

A tentative site for the experimental recharge well has been identified in Section 1, Township 21 South, Range 60 East. Additional sites would lie in Sections 25 and 36 of Township 20 South, Range 60 East and Sections 30 and 31 of Township 20 South, Range 61 East. The final selection of a specific site involves land availability and other non-technical considerations which should be deferred until program funds are available. The recharge well will be sized to receive the full 1.0 MGD output from the pilot desalination plant.

b. Approach

The operation of the pilot groundwater recharge program will be done in conjunction with the pilot desalination plant operation. During initial operation, the pilot recharge well will be supplied with groundwater to determine the dynamic response of the groundwater system to injection. Concurrently, the pilot desalination plant will be operated for six months to one year for equipment check-out, debugging, acceptance testing and stabilization. On developing reliable operational characteristics of the pilot recharge well and the pilot desalination plant, the demineralized effluent from the plant will be used as a supply to the recharge well.

A monitoring system to provide performance data on the pilot recharge program will be provided throughout the life of the test program. It is presently anticipated that the pilot program will require an operational period of 24 months.

5. Discharges to Las Vegas Wash

Quantities of advanced treated wastewater discharged from the AWT plant will be available for a number of beneficial reuses. Scheduled reuses include in-valley irrigation, cooling water for the Allen Power Generating Facility, and supply for the pilot desalination plant. Those quantities of AWT plant effluent not used for these purposes will be discharged to Las Vegas Wash. These discharges will aid the maintenance of a greenbelt in the Wash, and can be used for return flow credit from the Colorado River.

Table 13 shows the projected availability of advanced treated wastewater and the distribution for each beneficial reuse in the proposed project.

6. In-Valley Irrigation

a. General

The in-valley irrigation element includes the distribution pipelines and facilities necessary to permit the beneficial use of AWT Plant effluent for irrigation of agricultural lands, landscaping of parks and public facilities, golf courses, and greenbelt areas within Las Vegas Valley. Construction of the supply pipelines to areas within the Valley will be staged to allow the expansion of in-valley irrigation to be responsive to 1) changing demands for irrigation water, and 2) the availability and success of irrigation with advanced treated wastewaters. Table 14 shows the projected operational dates of each stage of in-valley irrigation.

TABLE 13

PROJECTED WASTEWATER AVAILABILITY
AND SCHEDULED BENEFICIAL REUSE
FOR SELECTED PROJECT YEARS

End of Year	Projected Wastewater Flow (AF/yr)	Allen Power Project (AF/yr)	In-Valley Irrigation (AF/yr)	Pilot Desalination and Recharge (AF/yr)	Discharge to Las Vegas Wash (AF/yr)
1979	68,000	4,480	-	-	63,520
1980	70,700	13,440	-	-	57,260
1981	73,400	22,400	9,280	1,456	40,264
1982	76,100	31,370	10,870	1,456	32,404
1983	78,800	35,848	14,990	1,456	26,506
1985	84,200	35,848	19,670	1,456	27,226
2000	123,200	35,848	ALL REUSES = 20,235		67,117

Note: Values shown were developed from data by NECON

TABLE 14

PROJECTED EXPANSION
OF IN-VALLEY IRRIGATION

Stage	Year
I	January 1981
II	January 1982
III	July 1983
IV	July 1985

Table 15 show the projected land areas anticipated for irrigation with advanced treated wastewater. The average annual demand, which was reflected in Table 13, is also shown.

TABLE 15

PROJECTED LAND AREAS
AND ANNUAL VOLUME OF REUSED
WASTEWATER FOR IN-VALLEY IRRIGATION

Stage	Annual Volume of Revised Wastewater (AF/yr)	Total Irrigated Area (acres)
I	9,280	1,856
II	1,590	318
III	8,235	1,647
IV	1,130	226

Source: NECON

As suggested in the above table, Stage I and Stage III of the in-valley irrigation element are the larger irrigation systems. Figure E-1 shows the alignment of the supply pipeline for these two stages. Stage II is included to supply the Henderson area, and Stage IV will supply miscellaneous areas within the Valley where feasible.

Table 16 presents a maximum number of areas which could be considered for irrigation with advanced treated wastewater.

TABLE 16

POTENTIAL AREAS FOR IRRIGATION
WITH ADVANCED TREATED WASTEWATER

Township and Range	Type of Facility	Potential Area (acres)
T 19 S, R 60 E	community & neighborhood parks	0
	regional parks	0
	golf courses	0
	other	0
		0
T 19 S, R 61 E	community & neighborhood parks	0
	regional parks	707
	golf courses	0
	other	0
		707
T 19 S, R 62 E	community & neighborhood parks	0
	regional parks	0
	golf courses	0
	other	0
		0
T 19 S, R 63 E	community & neighborhood parks	0
	regional parks	0
	golf courses	0
	other	0
		0
T 20 S, R 60 E	community & neighborhood parks	13
	regional parks	0
	golf courses	0
	other	10
		23

POTENTIAL AREAS FOR IRRIGATION WITH ADVANCED TREATED WASTEWATER (continued)

Township and Range	Type of Facility	Potential Area (acres)
T 20 S, R 61 E	community & neighborhood parks	384
	regional parks	80
	golf courses	304
	other	452
		1220
T 20 S, R 62 E	community & neighborhood parks	15
	regional parks	100
	golf courses	70
	other	0
		185
T 20 S, R 63 E	community & neighborhood parks	0
	regional parks	0
	golf courses	0
	other	0
		0
T 21 S, R 60 E	community & neighborhood parks	0
	regional parks	0
	golf courses	0
	other	0
		0
T 21 S, R 61 E	community & neighborhood parks	53
	regional parks	2
	golf courses	520
	other	246
		819
T 21 S, R 62 E	community & neighborhood parks	54
	regional parks	60
	golf courses	150
	other	9
		273

POTENTIAL AREAS FOR IRRIGATION WITH ADVANCED TREATED WASTEWATER (continued)

Township and Range	Type of Facility	Potential Area (acres)
T 21 S, R 63 E	community & neighborhood parks	0
	regional parks	0
	golf courses	0
	other	0
		0
T 22 S, R 60 E	community & neighborhood parks	0
	regional parks	0
	golf courses	0
	other	0
		0
T 22 S, R 61 E	community & neighborhood parks	0
	regional parks	325
	golf courses	0
	other	40
		365
T 22 S, R 62 E	community & neighborhood parks	2
	regional parks	0
	golf courses	136
	Henderson	-
	other	0
		138
T 22 S, R 63 E	community & neighborhood parks	136
	regional parks	0
	golf courses	118
	Henderson	-
	other	2
		256
	GRAND TOTAL	3986

C. Energy Requirements

Power requirements for each of the previously considered alternatives are in Appendix D of the 1972 Environmental Assessment. The requirements are based on a year 2000 population of 1,000,000 persons. The following tables show the estimated power demand and consumption for alternatives 2, 3, 7, and 10 using the presently accepted population projections. Alternative 1 is indicated in Chapter 7 of this addendum as one of the five most environmentally sound alternatives. However a preliminary screening of alternatives in the Facilities Plan eliminated further consideration of this alternative. Energy requirements for Alternative 1 are not shown below.

The estimated daily electric power consumption for the four most viable alternatives is given in Table 17.

TABLE 17

ESTIMATED MAXIMUM DAY ELECTRIC POWER CONSUMPTION FOR SELECTED YEARS

Alternative	1978	1985	1990	2000
No. 2 - Complete Treatment	471,000	581,000	638,000	865,000
No. 3 - AWT and Return to Colorado River	86,400	108,000	126,000	158,000
No. 7 - Combination Alternative	180,000	243,000	301,000	401,000
No. 10 - Amended Combination Alternative	108,000	135,000	157,000	198,000

Notes: 1. Units shown are kilowatt hours per day.
2. Power consumption is assumed to be proportional to flow

Source: NECON

Using the estimated power demand figures of Table 17 the following has been developed to show the relationship of the energy requirements of the most viable alternatives to the projected available power supply for Las Vegas Valley.

TABLE 18

ESTIMATES OF PROJECTED POWER DEMANDS FOR MOST VIABLE ALTERNATIVES AND PROJECTED POWER SUPPLYS FOR LAS VEGAS VALLEY

Alternative	Power Demand (megawatts)		Power Available to Las Vegas Valley (megawatts)		Available Power Used (%)	
	1978	2000	1978	2000	1978	2000
No. 2	19.500	36.100	1,241	3,455	1.6	1.0
No. 3	3.600	6.600	1,241	3,455	0.2	0.2
No. 7	7.500	16.700	1,241	3,455	0.6	0.5
No. 10	4.500	8.300	1,241	3,455	0.4	0.2

Source: NECON

D. Potential Future Elements

1. Export Pipeline

An export pipeline from the site of a prototype advanced Wastewater Treatment plant to Dry Lake was a principal element of the alternative selected in the 1972 Environmental Assessment. However, as referenced in this Addendum, the export pipeline would be a facility for supplying AWT plant effluent to the Allen Power Generating facility. In addition, this pipeline could be used for "slug flow" pumping of brines for evaporative disposal at Dry Lake.

2. The Allen Power Project

The City of Las Vegas, Clark County Sanitation District No. 1, and the County of Clark are presently developing an agreement with Nevada Power Company (NPC) to deliver AWT plant effluent for use in the Allen Power Generating Facility. This proposed facility is identical to the Arrow Canyon Project referred to in the 1972 Environmental Assessment, and merely reflects a change in name by NPC. In accordance with the agreement, an export pipeline from the proposed AWT Plant to a point selected by NPC will be provided with an ultimate peak capacity of 48 MGD. Deliveries of AWT effluent to the Allen Project are to be phased as indicated in Table 19.

TABLE 19

RECLAIMED WASTEWATER DELIVERIES
ALLEN POWER PROJECT

Peak Demand (MGD)	Average Demand (MGD)	To Be Delivered After
12	8	June 1, 1979
24	16	June 1, 1980
36	24	June 1, 1981
48	32	June 1, 1982

Source: Draft, Reclaimed Wastewater Purchase Agreement. CLV, CCSD No. 1, CC, NPC. February 1974.

The export pipeline will include pumping stations, reservoirs, and other ancillary facilities necessary to supply advanced treated effluent to the project. It is recognized in the draft agreement that the County may desire a pipeline with a capacity greater than 48 MGD. Further, various other modifications may be incorporated into the delivery system depending upon 1) the availability of secondary effluent from the City of Las Vegas and Clark County Sanitation District Treatment Plants, and 2) the availability of reclaimed wastewater from the AWT Plant. Thus, with the flexibility incorporated into the agreement a more precise definition of facilities to supply reclaimed wastewater to the Allen Project is not available at this time. These facilities are not elements of the presently proposed project.

3. Centralized versus Decentralized AWT

The preceeding discussions in this Chapter have assumed a centralized AWT plant for treatment of secondary effluents from the CLVTP, CCSDTP, and the City of Henderson Treatment Plants. Consulting Engineers for the City of Henderson have recently submitted a report titled "Comprehensive Wastewater Planning Study for the City of Henderson, Nevada" dated April 1974. This study considers the cost-effectiveness of ten alternatives for accomplishing wastewater management in the City of Henderson. The recommended alternative, Plan No. 4, include an AWT plant to treat 3.7 MGD of secondary effluent from the City of Henderson. If such a plan were implemented it would represent decentralized AWT of wastewaters in Las Vegas Valley.

A cost-effectiveness analysis of centralized versus decentralized AWT is presented in the Facilities Plan. This analysis indicates that centralized advanced treatment of wastewater in Las Vegas Valley is more cost-effective. Further, it is noted that centralization will provide:

a. Central responsibility for the qualities of treated wastewater discharged to Las Vegas Wash and Bay
b. Centralized management for the quantities of wastewater discharged to maintain Las Vegas Wash
c. Cost-effectiveness in meeting the regional need for accomplishing wastewater management in Las Vegas Valley.

4. Las Vegas Wash Collection System

The 1972 Project Report described a facility for intercepting a portion of the surface and subsurface flows in Las Vegas Wash. The collection and disposal of waters discharging from Las Vegas Wash was identified as a means of effectively completing the pollution abatement of the Las Vegas Bay of Lake Mead. Such a collection system is not included as a project element herein, but a facility of this nature may be included as an element of a basinwide salinity control program for the Colorado River.

The potential for a Las Vegas Wash collection system is emphasized by The Colorado River Basin Salinity Control Act introduced into the U.S. Congress as H.R. 12165 and S. 2940 in January 1974. As an outgrowth of a joint meeting with representatives of the Seven Colorado River Basin States, the Environmental Protection Agency and the Bureau of Reclamation in February 1973, a salinity control program for Las Vegas Wash was included in the Act.

Chapter 7

ENVIRONMENTAL IMPACTS

Chapter 7

ENVIRONMENTAL IMPACTS

A. Introduction

The 1972 Environmental Assessment presented the environmental impacts of nine alternative actions considered to accomplish wastewater management in Las Vegas Valley, and eliminate the pollution of Lake Mead. The nine alternatives were compared and ranked on their ability to meet project objectives and environmental quality objectives. The project objectives described in Chapter 2 of this addendum are revisions of those considered in the 1972 Environmental Assessment. The environmental quality objectives remain unchanged. This Chapter defines the environmental impacts of the proposed project, and reevaluates the nine alternatives previously considered along with the proposed project on the basis of the new project objectives and the environmental quality objectives of Chapter 4.

A number of environmental impacts related to elements of the proposed project are identical to those identified in the 1972 Environmental Assessment. Therefore, in presenting the impacts of the proposed project, reference is made to the original assessment where possible. Newly identified impacts which have resulted from changes in project features element locations are detailed herein. In addition, more in-depth discussion of previously identified impacts is included where necessary.

B. Ability of the Proposed Project to Meet Project and Environmental Quality Objectives

1. Project Objectives

The project proposed in this addendum represents a tenth alternative solution to the pollution abatement problem in the Las Vegas Wash-Lake Mead area. An evaluation of the nine previously considered alternatives is presented in the 1972 Environmental Assessment. This discussion on the ability of the proposed project to meet project and environmental quality objectives permits a comparative evaluation of the ten alternatives. The comparative evaluation of alternatives is presented in Part D of this Chapter.

The revised project objectives in Chapter 2 of this addendum were developed to clearly state the specific objectives on which the alternatives are compared. These objectives have been expanded in light of new agency responsibilities and revised project emphasis.

The principal parameter of water quality contributing to the pollution of the Las Vegas Bay of Lake Mead has been identified as phosphorus. Total dissolved solids or salinity also contributes to the degradation of water quality in Las Vegas Bay, but its importance is related more to the downstream Colorado River than

Las Vegas Bay. The proposed project provides for treatment of the wastewater contributing the greatest amounts of phosphorus to Las Vegas Wash. Discharges of treated wastewater to the wash will not be eliminated by the project, but the quality of discharge will meet the existing Federally approved State standards described in Chapter 5, and those recently adopted by the State of Nevada.

As with the nine previously considered alternatives, Alternative 10, the proposed project does not totally meet the project objectives. Highly saline groundwater flows will continue to surface in Las Vegas Wash and discharge to Lake Mead. Further, as reuse of treated wastewater for irrigation in Las Vegas Valley increases, a portion of the salts added to the groundwater system through leaching will eventually be discharged to the wash. The proposed project does, however, provide for 1) the reduction of phosphorus which appears to be the controlling factor of algal growth in Las Vegas Bay, 2) the reuse of highly treated wastewaters for beneficial uses in Las Vegas Valley, 3) the continuing evaluation of the environmental effects of selected project elements, and 4) some reduction of the total dissolved solids discharged to Las Vegas Wash.

2. Environmental Quality Objectives

a. Attain a Clean Desert Environment

As noted in the 1972 Environmental Assessment, a composite ranking of alternatives on their ability to attain a clean desert environment is not possible. The aspects of environmental quality related to elements of each alternative cannot be equated on the same base.

b. Maintain Las Vegas Wash as a Permanent Riparian Environment

Implementation of the proposed project will remove substantial quantities of nutrients presently discharged to Las Vegas Wash. The effects on vegetation and wildlife downstream from the discharge of the AWT plant of removing these quantities of nutrients is not known. Discharges of secondary treated wastewaters from the City of Las Vegas Treatment Plant will be piped to the AWT plant for advanced treatment. However, discharges to the Wash may be made periodically to provide adequate nutrients to maintain the vegetation of the Wash. Alternative 10 does provide flexibility in operation by which the above noted effects can be substantially controlled.

The recommendations by Bradley and Niles 1973, and the Las Vegas Wash Development Committee regarding the management and maintenance of Las Vegas Wash emphasize the importance of flexibility in the selected project. As the supply,

use, and demand of wastewater in Las Vegas Valley changes in the future the importance of flexibility will be further emphasized. Alternative 10 provides flexibility with regard to water quantity, water quality, project operation, expansion, and wastewater management. The proposed project is rated as favorably as Alternatives 2 and 9 of the 1972 Environmental Assessment as maintaining Las Vegas Wash as a permanent riparian environment.

c. Develop Additional Greenbelts by In-Valley Irrigation

Alternatives 1 through 8 of the 1972 Environmental Assessment and Alternative 10 provide for a program on In-Valley irrigation. Thus, the development of additional greenbelts in Las Vegas Valley is a common feature of these nine alternatives. However, a comparative evaluation of the ability of the alternatives to develop additional greenbelts cannot be made since the in-valley irrigation element would be the same for each alternative.

The more important aspects of developing additional greenbelts in Las Vegas Valley relate to irrigation practices, water quality, and groundwater impact. Existing information on the factors controlling the success of irrigation indicates that use of advanced treated wastewater can substantially reduce a number of problems encountered through the use of secondary treated wastewater. A program of monitoring could be implemented to evaluate the success of irrigation with advanced treated wastewater on an on-going basis.

d. Optimize the Use of Water

A discussion of the factors considered in evaluating the optimization of water use was presented on pages 117 and 118 of the 1972 Environmental Assessment. Optimization was described as the maximum possible reuse of water with the disposal of unusable water without contaminating any existing water resources.

For purposes of the Environmental Assessment Addendum it is desirable to evaluate the proposed project on the same basis as the previous alternatives. The two key factors on which the previous alternatives were evaluated were 1) provision for reuse of wastewaters, and 2) protection of water resources in the area.

Alternative 10 provides for the reuse of wastewaters from Las Vegas Valley to a greater degree than any of the previous alternatives. Beneficial use of advanced treated wastewaters for 1) industrial cooling water, 2) groundwater recharge, 3) in-valley irrigation, and 4) return to Las Vegas Wash is included before and after 1990. Alternative 10 will provide for the continued discharge of treated wastewater in Las Vegas Wash, but through AWT these discharges will meet the water quality standards for the Wash.

The rating of Alternative 10 to be added to the list on page 118 of the 1972 Environmental Assessment follows:

COMPARATIVE RATING OF ALTERNATIVE 10
OPTIMIZATION OF WATER USE

Before 1990		After 1990		
Reuse	Protection of Resources	Reuse	Protection of Resources	Composite Rating
A	Yes	A	Yes	A

from 1972 E.A.

A - Best
B - Second Best
C - Limited
D - Fails

e. Protection of Environment from the Adverse Impacts of Construction

The construction of the various elements of any alternative selected must be done in compliance with existing construction specifications. Specifications have been adopted for Clark County, Las Vegas, North Las Vegas, Henderson, and Boulder City. Compliance with existing specifications and mitigation of potential permanent impacts from construction is received as a common feature of each alternative.

C. Environmental Impacts and Mitigation Measures

This section identifies those impacts likely to occur as a result of project construction and future operation. The impacts will be evaluated under the major categories of 1) construction impacts, 2) impacts of project elements, 3) impacts on the Las Vegas Wash, 4) impacts on Las Vegas Bay, 5) impacts on the Colorado River and 6) other impacts which include economic, growth inducing, and air quality considerations.

Many of the impacts resulting from the project can be minimized through mitigation measures designed to lessen the effect of construction and operations. Many mitigation measures are aimed at reducing some aspects of the project which might adversely affect the human element as well as the natural biota.

The impacts mentioned in the following sections are those resulting from 1) changes in project design, the addition of project elements or changes in the location of facilities, or 2) necessary expansion or more in-depth discussions of impacts previously identified in the 1972 environmental assessment as they relate to the new project.

1. Construction Impacts

The impacts determined to result from project element construction activities were initially presented on pages 124-127 of the 1972 Environmental Assessment. Those impacts in general are considered to be common to all elements of the project. The more specific impacts likely to result from construction activities at each project element site were outlined on pages 127 to 129.

The following construction impacts are those determined to occur in addition to the ones outlined in the 1972 Environmental Assessment. Accompanying each impact are suggested mitigation measures designed to lessen the impact magnitude.

Construction activities such as movement of diesel-powered trucks, earth movers and associated equipment would create short-term noise impacts on the area. These noise impacts would last from the time of construction commencement to its completion. Noise emissions expected from various types of construction equipment are presented in Table 20. Wildlife would be affected by noise from these trucks adjacent to the areas of construction. Feeding bird species and mammals close to construction roads would likely be displaced and may feed elsewhere or return to the area after the noise ceases. Sustained high noise levels may affect animals that rely on the use of auditory signals to detect and locate prey, evade predators or stake out territories.

TABLE 20

NOISE EMISSIONS FROM
CONSTRUCTION EQUIPMENT

Noise Source	dBA* Level at 50 Feet
Front loader	72-85
Tractor	78-96
Scraper graders	80-93
Heavy-duty diesel trucks	90-95

*dBA: A unit of noise measurement.

NOISE STANDARDS

Maximum level for normal conversation	67 dBA
Communications become difficult	76 dBA
Communications impossible at normal distance	105 dBA

Source: EPA, 1971; CUADRA, 1972

Proper use of muffling equipment and noise baffles on construction equipment would aid in reducing some noise emissions. In addition, the timing of construction activities in relation to the seasonal abundance and critical use of the area by wildlife would also reduce the impact. In general, the time of greatest impact would occur during the spring breeding season.

Construction equipment used on the project should be operated within the standards expressed in the Occupational Safety and Health Act (OSHA) which stipulates permissible levels of sound and duration of exposure to construction workers. Additionally, construction activities should only proceed during a twelve hour work period per day during the normal week, thus eliminating the noise exposure to weekend recreationists and to local residents after the daylight hours.

Air quality changes related to construction activities are not expected to be significant on the study area. In areas where motorized equipment would be used, some modification in particulate and oxidant levels may occur. Any burning of brush and waste material would create localized periodic air quality changes.

In order to minimize effects of construction efforts on local air quality, burning activities should be limited to times when atmospheric conditions are suitable and when the practice is absolutely necessary and material cannot be disposed of by alternative means such as shredding.

a. Experimental recharge well construction impacts.

The construction impacts at the experimental recharge well site will be due to: storage of drilling mud, casing, drill pipe, mud-tanks and miscellaneous drilling equipment; excavation of a large mud pit and ditches; and the disposal of cuttings and drilling mud. Also the turbid waters pumped from the injection zone during development of the well must be disposed of at the drilling site. Approximately 1.5 acres of land will be damaged temporarily at the well site. Existing vegetation will undoubtably be destroyed during the construction activity. Methods will have to be provided for disposal of the spent drilling mud. Mud could be hauled away in trucks to a more suitable disposal site, if none is available adjacent to the drilling site. Once the well has been cased and developed, the site can be graded and leveled in such a manner as to minimize any permanent adverse impacts of the construction activity. Upon completion, most of the area damaged during construction can be restored to its original condition.

b. Wastewater collection system construction impacts.
Short-term impacts resulting from the construction of pipe lines and the Henderson pump station are presented on pages 127 and 128 of the 1972 Environmental Assessment. Changes

in the proposed project design include an influent surge pond for the AWT Plant in lieu of the reservoir considered in alternative 7, and the reduction in the size of the Henderson pipeline from 42 inches to 24 inches in diameter.

Because much of the pipeline route from Henderson to the Clark County Plant is along existing dirt roads and rights-of-way, construction activities will likely cause some disruption in traffic flows, particularly where the pipeline crosses roads.

Construction of the pipeline will necessitate the removal of vegetation and disturbance of the soil. Because the pipeline will be buried, vegetation will be able to grow back after completing construction. In order to insure that proper revegetation occurs, poor soil areas along the pipeline route should be fertilized.

c. AWT Plant Construction Impacts

The advanced wastewater treatment plant will be located in an area that has been extensively altered by man's activities. Since most of the site is irrigated pasture, few major construction impacts will occur. The general impacts mentioned previously will likely occur.

d. Impacts of Sludge Disposal Pond Construction

In addition to the general construction impacts previously mentioned, sludge pond construction will cause increased erosion and turbidity in Las Vegas Wash as a result of soil disturbance and removal of vegetation.

Construction of the sludge disposal ponds may permit the transportation and deposition of sediments into the Las Vegas Wash by storm flows. In order to minimize the likelihood of this problem, all on-site waste materials should be stockpiled in an area not susceptible to storm flows (i.e., outside the flood plains of seasonal washes). These materials should then be removed from the area and disposed of at a designated site after completion of construction.

e. Pilot Desalination Plant Construction Impacts

The pilot desalination plant will be located near a number of heavily traveled roadways and adjacent to residential areas. The construction activities will likely cause disruption of traffic patterns, disturbance to adjacent residents in terms of increased dust, noise and adverse visual impacts.

The effects should be mitigated by conducting construction activities during a period from 7:00 am to 7:00 pm, proper use of muffling equipment and limiting dust through the use of water application. Where possible, screening devices should be used to limit the visual impact and cut down on some construction noises. In addition, the aforementioned general construction impacts will occur.

f. Brine Disposal Construction Impacts

The three alternatives considered for brine disposal include 1) use of lined evaporation ponds near the desalination plant, 2) transport to the sludge disposal ponds and 3) discharge to the city sewerage system.

The brine evaporation ponds will cover approximately 55 to 60 acres of land in the general vicinity of the desalt plant. Impacts resulting from construction of this facility would include disruption of traffic and disturbance to nearby residences. The general construction impacts mentioned previously will also occur.

The construction impacts resulting from the use of the sludge ponds for brine disposal will be similar to those covered on page 153, "d. Impacts of Sludge Disposal Pond Construction".

If alternative No. 3 (discharge to sewerage system) was considered, any construction impacts would result from the enlargement of existing sewerage lines if necessary to support the waste flows (approximately 0.27 mgd) from the desalination plant. The impacts would include those identified under the general construction impact section at the beginning of this chapter.

g. Construction impacts of the lands to be irrigated.

The most substantial short-term impacts resulting from construction of the irrigation system and subsequent irrigation of lands, will be inconvenience to residents and disruption of automobile traffic. These effects will occur when irrigation system pipelines are constructed near existing residential areas and adjacent to roadways.

The general impacts mentioned earlier will also occur.

2. Impacts of Project Elements

In the following section the impacts from each physical element of the project will be considered. Those elements include the experimental recharge well, the wastewater collection system, the advanced wastewater treatment plant, the sludge disposal ponds, desalination plant, brine disposal, ponds and Las Vegas lands to be irrigated.

The impacts are primarily long-term in nature since the short-term construction impacts have been previously discussed. The impacts of several of the project elements mere analyzed in the 1972 Environmental Assessment.

Reference to that document and those impacts will continue to be made where possible.

a. Experimental Recharge Well Impacts

Surface and subsurface impacts resulting from the recharge well facility were considered in the 1972 Environmental Assessment. For that account, the reader should refer to page 135 of that document.

In addition to those impacts previously mentioned, other surface and subsurface impacts have been identified.

The experimental recharge well site and related facilities will permanently eliminate approximately 2 acres of wildlife habitat and vegetation. Since much of the area has been significantly disturbed, this impact will not be significant.

The recharge well and facilities will cause a permanent change in the visual environment of the area. In order to minimize the impact of the well housing structure on the surrounding environment, the facilities should be designed to conform with the desert environment and to be as unobtrusive as possible. The area should be landscaped to include shrubs and trees that will aid in shielding the structure from adjacent residential areas.

Pumps and related equipment may create noise levels that will adversely affect adjacent residents. In order to properly determine the expected noise levels of the equipment, noise sources should be identified and the estimate voise output determined. It will then be possible to determine method such as enclosing pumps or providing baffles to reduce noise levels that are above ambient and considered to have an adverse effect.

The experimental recharge well will be drilled into the middle aquifer zone (500 to 700 feet below ground surface), and sized to recharge 1.0 MGD of desalted effluent. It is estimated that the product water from the desalination plant will have a TDS concentration in the range of 300 mg/l. This is close to the background level of potable ground water of the middle zone in this sector of the Valley. A series of ground water

observation wells will be installed in the vicinity of the recharge well to monitor the effects of the injection operation on the ground water system. This monitoring will permit identification of any potential degradation of the potable water supply.

Implacement of renovated wastewaters by well injection into the middle zone of aquifers could enhance the environment by conserving reuseable waters that normally would have been discharged out of the basin. A continuous discharge of 1 MGD would add 1,120 acre-feet per year of potable water into the basin's water supply. Since the product water utilized for injection is close to the background TDS level of the middle zone, there would be no adverse salt balance effects due to the operation.

During the initial stages of the experimental recharge operation, the recharge well will be supplied with groundwater. A system of observation wells will be provided to evaluate the response of the groundwater system to the recharge operation. This system of monitoring wells will permit the termination of operation in the event that undesirable effects or problems develop.

b. Wastewater Collection System Impacts

Since the wastewater collection pipelines will all be buried underground the long-term surface and visual impacts will be minor.

The Henderson pump station and the AWT surge pond will create some visual impacts. These visual effects can be reduced by providing attractive design and landscaping.

The surge pond will permanently remove approximately 8 acres of vegetation and wildlife habitat. This open pond will create some odors and collect solids and algae which will need periodic removal and disposal.

Potential odor problems will be reduced by the operation of surface aerators. Periodic pond cleaning should be practiced to remove accumulated solids and algae. These solids should then be transported to a designated sanitary landfill or to the sludge disposal pond. Furthermore, design of the surge pond should specify that the pond be deep enough to prevent substantial algal growth on the bottom. Algae growth can be effectively controlled by using short retention times in the pond.

c. Impacts from the Advanced Wastewater Treatment Plant

The proposed AWT plant will create both beneficial and adverse environmental impacts.

Beneficial

The addition of an advanced wastewater treatment facility to the existing secondary systems of the City of Las Vegas, Clark County and Henderson, will aid greatly in reducing water pollution to the Las Vegas Wash and Bay. This is considered to be a long-term beneficial impact. In addition, by providing a centralized AWT facility the effluent quality can be more carefully controlled as compared to the higher variable quality of effluent produced from the 3 existing systems. Instead of having 3 separate points of discharge as with the existing system, the proposed system will have only one.

The AWT system will provide for substantial flexibility in the treatment and management of wastewater in the Las Vegas Area. The modular design of the plan will insure that proper sewage disposal is maintained as the population of the Las Vegas area increases by allowing for both expansion of capacity and the addition of new treatment devices as required.

Adverse

Construction of the AWT plant will necessitate the conversion of 80 acres of irrigated pasture and adjoining salt bush, seep-weed and bassia close to the wash. This land use change will result in the displacement of grazing practices and the wildlife species associated with the agricultural practices and the adjacent natural vegetation.

The AWT plant processes may create some unpleasant odors which will have impact upon the surrounding area. The generation of odoriferous gases is likely to be minor and difficult to assess due to the close proximity of the existing secondary treatment facility (trickling filters) which at the present time create offensive odors to adjacent residents. Any odors that are created can be alleviated by the use of sanitary operational techniques, chlorination and injection of deodorizing chemicals into the air, and fuel air collection and treatment.

The expected impact from noise created by AWT operations is expected to be slight. The only noise sources will be from pumps, fans and motorized vehicles. All equipment concerned with the operation of the treatment plant that would generate noise will be located within buildings insulated or baffled to reduce noise.

In the Advanced Wastewater Treatment Plant, the calcining furnace is the greatest source of uncontrolled particulate emissions. A multiple-hearth furnace is tobe used and the emissions from it are characterized as moderate to heavy. The calcining temperature is sufficiently high to cause the discharge of a high proportion of submicron particulates which makes the control problem difficult. In the process it is intended to recycle the CO_2 -content gas stream from the calciner. However, there will be periods, during initial start-up, shut-down, for equipment malfunctions etc. when the gases will be discharged to the atmosphere. Therefore the particulate emissions control equipment must be designed for such periods.

The processing rates, discharge loadings and gas flow rates for the calcining furnace are not yet finalized. Therefore assumptions will be made in the assessment of the impact made by the various items of equipment. It is estimated that the original particulates discharge loading would be about 2 to 5 grains/actual cubic foot (ACF). A refractary lined cyclone would reduce the high value to about 1 grain/ACF and a follow-on wet scrubber would further reduce this value to less than 0.01 grains/ACF. This should satisfy the most stringent emissions regulations, being specified by Clark County at a Ringelmann No. 1.

A properly designed wet scrubber would ensure collection of the submicron particulates. The liquid effluent from the scrubber, containing up to 5% $Ca(OH)_2$ can be recycled to the process.

The lime feeding, transfer, and slaking operations could be particulate emission sources if conventional control equipment were not provided. However, fabric filters for the feeder and pneumatic and/or mechanical transfer equipment are normally provided as standard control devices for these operations. Practically "zero" emissions, somewhere in the order of 0.005 grain/ACF, would be predicted with this type of collector.

Truck delivery and make-up lime to the calcining system can pose a serious particulates emission problem, depending on the truck type. If a fully-enclosed back-vented pneumatic delivery type of vehicle is used, then the emissions will be negligible. However, a dump-truck will require an effective shrouding and ventilation system to minimize the escape of the very fine calcium oxide (CaO) particulates during the unloading operation. This material poses a health hazard and an air pollution potential so that its control will probably fall under OSHA jurisdiction. With an effective hood and ventilation system, the material can be easily collected in a fabric filter.

The long-term impacts of brine disposal at the sludge pond site (Alternative 2) would be similar to those identified on page 164 "d. Impacts of Sludge Disposal". Brine which accumulates in the sludge ponds will eventually need to be disposed of at a sanitary land fill site or some other location where possible contamination of the groundwater resources would be unlikely.

In Alternative 3 the waste brine would be disposed of in the municipal wastewater collection system of the City of Las Vegas. This alternative will have the adverse impact of raising the salinity level at the CLVTP by about 3%. This increase in salinity would be reflected in treatment costs over the life of the pilot program.

g. Impact on Las Vegas Lands to be Irrigated

Increased irrigation of lands in the Las Vegas Valley will create few surface impacts. Those that do occur will be either beneficial or subtle.

Perhaps the most prominent impact will be the increase in green areas throughout the city. To many people, the presence of green belts are an amenity and a definite asset to the populace since they provide areas for recreation and a visual relief from the surrounding city or the starkness of the desert.

The application of additional water in a normally dry, hot climate may produce subtle microclimatic changes, particularly in terms of the humidity and temperature of the area where water is applied. This will constitute a minor impact, however, in an area of extensive irrigation the effects could be monitored.

Groundwater flowing toward the Las Vegas Wash as a result of irrigation could result in some changes in vegetation wherever more water becomes available to the plants. This could likely occur in areas downslope and adjacent to lands to be irrigated. These changes may occur subtly or where there is substantial irrigation runoff, the vegetation changes may be substantial.

Some areas presently irrigated with secondary treated wastewater may be converted to AWT water as it becomes available. This conversion will create some beneficial impacts, one of which will be a significant reduction in the presence of odor now created by application of secondary water. Also, the elimination of soil clogging by nutrients and suspended solids may be realized. Of principal importance is the reduced health hazard in irrigating with a highly treated wastewater.

As a part of the proposed Las Vegas Wash and Bay Pollution Abatement Project, pipelines will be constructed to deliver reclaimed wastewater.

By the year 2000, the theoretical requirements of the "In-Valley" irrigation system could surpass 70,000 acre-feet per year. Expansion of neighborhood and regional parks within the Valley could add as much as 9,000 acres of grass and green-belts to the existing system.

More realistic projections of the anticipated new irrigable acreage which could feasibly be served by AWT plant effluent, indicate that a maximum of 25,000 acre-feet per year of reclaimed wastewater could be disposed of within the valley by 2000. On completion of all stages of in-valley irrigation an annual supply of about 20,000 acre feet is anticipated. The main factors discouraging a more extensive irrigation system include:

- Sites which are too remote from the effluent sources.
- Small size of many of the new sites will make the service costs prohibitively high.

The most beneficial aspects of In-Valley irrigation are from water conservation benefits. Every acre-foot of reclaimed wastewater which is used for irrigation purposes is one less acre-foot which will have to be taken from the potable water supply. In-Valley irrigation is beneficial because it is a recycling process of one of our scarce resources.

From the adverse side, any increase in the irrigated acreages within the Valley will be ultimately reflected in poorer water quality of the waters within Las Vegas Wash. In previous sections it has been shown that the soil column within the basin is vulnerable to salt leaching in the environment of surface irrigation.

Due to the geology of the valley, it is believed that some of the near surface ground water will ultimately migrate down gradient and discharge into Las Vegas Wash. Increased salts which are added to the system due to the initiation of irrigation practices will contribute greater TDS concentration to the near surface groundwater.

Much of the groundwater within the near-surface aquifer system is located in areas physically remote from Las Vegas Wash, and the fact that these shallow aquifers are often made up of sediments of low permeability will tend to offset the near future salinity impacts. There are sectors of the valley where it might take hundreds of years for the salts (within the near-surface aquifer) to migrate to the Wash.

Therefore, any effort to increase the irrigated acreage within the valley can only move in the direction of greater degradation of the waters in the near surface aquifer system. This is the case whether the irrigation water supply is potable water or reclaimed wastewater. If the piezometric levels of the potable aquifers continue to drop, there is also the possibility of the near-surface aquifer recharging the deeper zones due to the shift in potentials.

Prior to implementation of the proposed project, it is recommended that a network of observation wells be constructed adjacent to selected in-valley irrigation sites. This network should be designed to monitor the near-surface and the shallow aquifer system continguous to the irrigated areas. Well casings should be designed to allow both water level measurements and pumped water quality samples to be collected from each well. At each monitoring site two wells should be drilled; a shallow well (30 to 50 feet deep) to measure the condition of the near-surface ground water, and a deeper well (300 feet deep) which would monitor the reaction of the deeper aquifers to the stresses of increased irrigation. Several monitoring well nests should also be constructed adjacent to Las Vegas Wash down gradient from the irrigated areas so that the movement and quality of the return flows can be traced.

Construction of a minimum network of wells will provide the County with the necessary baseline data (both water table elevations and water quality measurements) prior to initiation of the in-valley irrigation element.

A tentative water quality sampling procedure should be adopted to insure that representative data is collected from each observation well. For the first year following the installation of the observation wells, it is recommended that water quality samples be collected at each piezometer every fourteen days. A gallon sample should be grabbed after pumping each well a sufficient period to reach chemical stability. Chemical stability can be defined as repeat samples having the same electrical conductivity readings. With each sample, a record should be made of the date, well location, depth of sample, water temperature, color, pH, and turbidity and odor. Sample bottles should be completely filled to exclude trapped air in the neck. Cognizance should be taken of certain time-dependent chemical changes that can occur in water samples. Sample bottles should be refrigerated shortly after collection and held no longer than 24 hours. Nitrogen and phosphorus need to be stabilized by adding 40 mg $HgCL_2$ per liter at the time of collection. Chemical analyses which should be run in the lab include the common cations Na, Mg, K, Ca and anions CO_3, HCO_3, SO_4, CL, NO_3. In addition,

total phosphorus, total dissolved solids, total solids, specific conductance and total hardness should be run. Total coliforms should be run on the sample from the shallower wells once a month prior to the effluent irrigation operations and every two weeks once the irrigation begins.

3. Impacts on Las Vegas Wash

Due to alterations in the points of wastewater effluent discharge and quality and quantities of discharge, changes in the Las Vegas Wash are likely.

It has been well established that monthly and annual fluctuations in wastewater flows to the wash have occurred in the past and will continue to change with the increase in water demand, reduction of nonpoint discharges to the wash and greater demand for wastewater reuse in the Las Vegas Valley. Table 21 shows the changes in flows to Las Vegas Wash for the years 1971 through 1973. These flows are expected to continue to increase as the population of the valley grows.

One of the most important aspects of the Las Vegas Wash is the relationship between average monthly wastewater flows in Las Vegas and the amount of water measured at the USGS gauging station at North Shore Road at the lower end of the wash. Figure 15 shows that although the peak discharges to the wash (in terms of wastewater flows) occur during the summer months, the lowest flows in the wash also occur during that time period. This is undoubtedly due to the high rate of evapotranspiration in the upper wash. In terms of continued maintenance of vegetation and water conditions in the wash, this means that any future discharge programs related to the project will require determination of water requirements in the wash on a month-to-month basis and water releases according to that schedule.

One of the features of the proposed project is the change in the point of wastewater discharge to the wash. Centralization of the City of Las Vegas, Clark County Sanitation District and Henderson secondary wastewater flows for advanced wastewater treatment will eliminate existing discharges to the Wash from the City of Las Vegas and the Henderson treatment plants.

The effects of the elimination of discharge from the City of Las Vegas plant will have the greatest impact on 1) vegetation composition, 2) the amounts and location of vegetative communities, and 3) the wildlife use and species composition as a result of the floristic changes. Existing discharges above the Clark County discharge point, amount to approximately 27.8 mgd (City of Las Vegas treatment plant and Sunrise power plant).

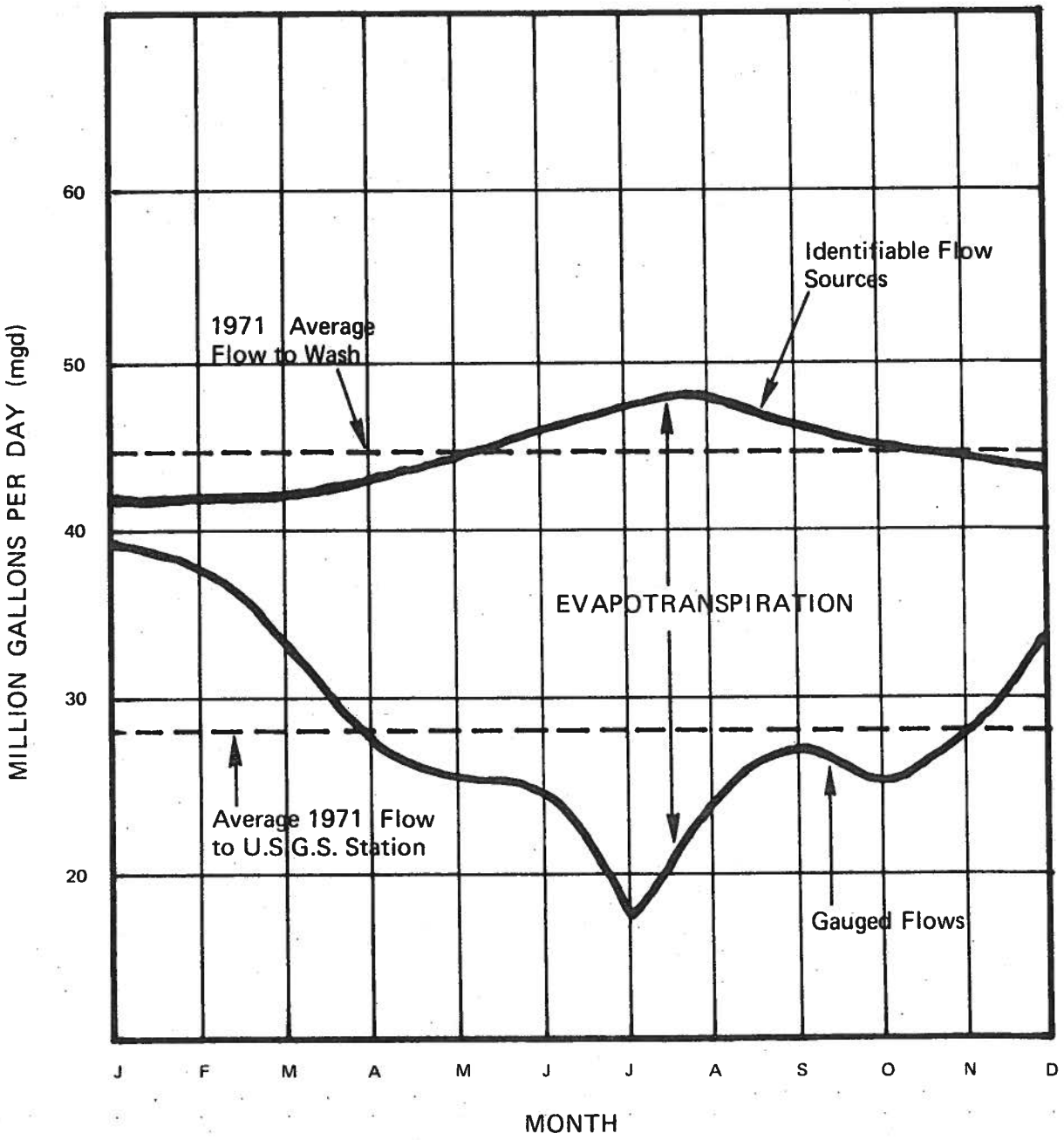


FIGURE 15

ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

RELATIONSHIP OF AVERAGE DISCHARGES TO LAS VEGAS WASH PER MONTH (IDENTIFIABLE FLOWS) AND AVERAGE FLOWS AT THE U.S.G.S. GAUGING STATION AT NORTH SHORE ROAD FOR 1971

Prepared by VTN

TABLE 21

ESTIMATE OF ANNUAL FLOWS TO LAS VEGAS WASH AND LAKE MEAD FOR THE YEARS 1971 TO 1973

	Source of Discharge to Las Vegas Wash	1971 mgd	1972 mgd	1973 mgd
1.	City L.V. WWTP	20.99	22.00	27.60
2.	Clark Co. San. Dist. WWTP	7.90	10.00	9.00
3.	NPC - Sunrise Power Plant	0.20	0.20	0.20
4.	NPC - Clark Power Plant	0.94	0.70	0.70
5.	Nevada Rock & Sand near Sunrise	0.50	0.50	-0-
6.	BMI Pond Seepage	3.87	3.87	6.50
7.	Undescribed Sources	7.11	7.11	3.6
8.	From Las Vegas Valley	2.95	2.95	4.20
	TOTAL OF IDENTIFIABLE SOURCES	44.46	47.33	51.8
	Less evaporation & transpiration	-13.10*	-13.10*	-9.80
	Computed discharge to Lake	31.36	34.23	42.0

*Includes 3.3 MGD evapotranspiration below the geologic barrier.

Sources: NECON, 1971 and 1973; 1972 Environmental Assessment

According to Bradley and Niles (1973), the primary plant community above the Clark County STP is the salt cedar biotic community. With the reduced flows, the salt cedar community is likely to change to more arid and drought tolerant plants such as those characteristic of the mesquite or salt bush communities. The total area to be impacted would amount to approximately 400 acres. Historically, this upper wash area contained dense areas of mesquite which were maintained, in part, by the Las Vegas springs which flowed to Las Vegas Creek (see Historical account in the PRESENT ENVIRONMENT section), so it seems likely that the mesquite community would again become dominant unless management measures are taken.

In the recent "Report to the Board of County Commissioners" by the Las Vegas Wash Development Committee, recommendations for educational and recreational use of the area included maintenance of the salt cedar forest in the area of the wash above the Clark County treatment plant (Appendix D). In order to accomplish this recommendation, changes in the proposed discharge regime will be necessary. Among the possible mitigation measures would be 1) an additional pipeline from the AWT plant to a discharge point near the existing City of Las Vegas discharge, 2) the periodic release of controlled quantities of secondary effluent from the City of Las Vegas treatment plant or 3) construction of a spur pipeline off of the projected Allen power export pipeline, which would return AWT water to the wash. Any of these methods would reduce the impact on upper wash vegetation and wildlife.

In addition to vegetative changes above the Clark County treatment plant as a result of effluent discharge relocation, vegetation downstream is also expected to be altered. From the present until 1978 when the first phase of project operation begins, the amount of water to be discharged to the wash can be expected to follow the general upward trend as experienced in the past. During the first phase of project operation approximately 58.3 mgd of wastewater effluent will be produced, of which 18.6 mgd will be reused and 49.7 mgd available for direct discharge to Las Vegas Wash from the AWT plant. This will be approximately 7.7 mgd more than is presently discharged.

During the first two years of project operation, brine from the desalination plant may be discharged into the Las Vegas city sewerage system. This will amount to approximately 0.27 MGD of brine which will add approximately 15,500 pounds of salts per day to the Wash. The resultant change in TDS will affect those plant species of the Wash which are intolerant to higher salt levels. Consequently, there will be transformation of some vegetative types with more salt tolerant species such as pickleweed, salt cedar, desert salt bush or four-winged salt bush. After the initial two years of the pilot program, brine will likely be disposed of by evaporation either at Dry Lake or at a permanent evaporation pond.

As more water is released to the wash, the area and the vegetative species composition are expected to change to more shrub and woodland and marsh vegetation types. In addition, the amount of surface water will likely increase. This in turn will provide additional habitat for water dependent wildlife species.

By the year 1981, the use of AWT water for In-Valley irrigation, pilot groundwater recharge and export for power plant cooling, will require a reduction of discharges to the wash. This action will cause changes in downstream biotic communities and a reversion from moist to more arid conditions.

In order to minimize the effects of flow reduction on wash vegetation and wildlife, recommendations have been made by Bradley and Niles (1973) and the Las Vegas Development Committee (1974) to, 1) establish a management plan for the wash to include such things as a levee system, check dams, etc., 2) release of at least 19 mgd of water during the critical summer months, 3 MGD during the winter and an annual average of 10 MGD, 3) a monitoring system in the wash to determine changes in biotic communities as a result of changes in discharge regime and to determine if the above recommended releases are adequate or if additional flows are needed to maintain the wash in a viable state. In order to insure the perpetuation of Las Vegas Wash, these recommendations should be implemented.

One of the features of the proposed project is the flexibility of the system. Wastewater demand will fluctuate considerably from one month to the next and one season to the next. Any excess water will be released to Las Vegas Wash. Projected In-Valley irrigation for 1982 will amount to 9.4 MGD, however, this amount may never be used for that purpose. Any amount not used will be discharged to Las Vegas Wash. With additional In-Valley irrigation, more water is expected to return to the wash as underflow from the alluvial fan.

In addition to the expected changes in discharges to the wash, the quality of the effluent will differ significantly from existing effluent characteristics. Table 22 lists the quality of the effluents from the treatment plants to be centralized and the effluent quality expected from advance wastewater treatment. One important characteristic will be the reduction in the amount of phosphorus in the effluent from the existing 9 to 10 milligrams per liter (mg/l) to approximately 0.5 mg/l. Under existing conditions the vegetation in Las Vegas Wash assimilates large amounts of phosphorus. This is evidenced by the low phosphorus levels at North Shore Road. The most likely effect of phosphorus reduction would be the loss of vigor in vegetative growth and possibly some die-offs and composition changes. Because the definite effect of reduction of phosphorus levels to 0.5 mg/l can not be determined without monitoring of the vegetative trend, this will constitute a problematical impact.

TABLE 22

EXISTING AND FUTURE WASTEWATER CHARACTERISTICS
OF CITY OF LAS VEGAS, CLARK COUNTY SANITATION DISTRICT,
HENDERSON, AND ADVANCED WASTEWATER TREATMENT PLANTS

Effluent Parameter	Unit	Clark Co.	City of Las Vegas	Henderson #1	Henderson #2	Future AWT (average monthly mean)
Suspended Solids	mg/l	38	18.4	NA	NA	2.0
BOD Biochemical oxygen demand	mg/l	30.5	14.7	NA	NA	10.0
COD Chemical oxygen demand	mg/l	128	NA	NA	NA	40
PO_4 as P	mg/l	10.7	9	NA	NA	0.5
NH_4 as N	mg/l	16	18	NA	NA	-
TDS Total dissolved solids	mg/l	1831	1058	2293	1000	1425-1725
Alkalinity as $CaCO_3$	mg/l	236	247	319	240	-
Hardness as $CaCO_3$	mg/l	546	413	825	270	-
Calcium as Ca	mg/l	124	80	305	100	-
Temperature (influent)	°C	25.2	22.7	NA	NA	27.0
pH		7.5	7.6	7.2	7.4	6.5-8.5
Chlorine residual	mg/l	2.4	1.0	NA	NA	-
LAS	mg/l	2.3	NA	NA	NA	-
Coliform		-	-	-		200/100
Dissolved oxygen	mg/l	-	-	-		5.0

One possible means of mitigating the effect of phosphorus reduction, if it was found to be a problem, would be the periodic discharge of controlled quantities of secondary wastewater from the City of Las Vegas treatment plant. These releases would have to be made to provide the necessary nutrients to maintain vigorous vegetative growth without exceeding the water quality standards for Las Vegas Wash.

The discharge of AWT water in place of the secondary treated water will improve the desirability of the Wash in terms of aesthetic quality. This will constitute a beneficial impact. The presence of odoriferous and unpleasant looking secondary wastewater reduces the desirability of the area at the present time. Advanced wastewater treatment will greatly reduce both of these unpleasant features.

The availability of good quality water will enhance the recreational and educational opportunities in the wash. This is considered a beneficial impact. The Wash Development Committee in a recent report outlined the educational and recreational development goals for the wash based on the identified qualities of the area and the desires of the population.

The improvement of water quality to the wash will reduce the health hazard potential. Advanced wastewater treatment will significantly reduce biochemical oxygen demand and bacteria present in the secondary effluent. By decreasing the nutrient discharges, the likelihood of bacterial growth will be diminshed. This will constitute a long-term beneficial impact.

4. Impacts on Las Vegas Bay

An account of expected impacts on Las Vegas Bay was presented on page 133 of the 1972 Environmental Assessment. The following section presents the impacts resulting from implementation of the proposed project. These impacts have been identified as beneficial or problematic.

Beneficial

The elimination of secondary wastewater discharge to Las Vegas Wash will have a number of beneficial impacts on Las Vegas Bay, all of them related primarily to the quality of the advanced treated effluent.

Some of the characteristics of wastewater entering Las Vegas Bay from the wash are expected to change significantly. Initial changes will likely be minor since the water quality in the wash is determined, in part, by groundwater inflows from a number of sources. The residual effect of the poor quality water will be slowly reduced over time as the AWT water has a diluting effect.

Perhaps the most significant change will be the reduction in amounts of phosphorous entering the bay. According to Deacon and Tews (1973), approximately 814 pounds of phosphorous enter Las Vegas Bay daily from the wash. This amount would be significantly greater if it were not for the vegetation in the wash which assimilates a large portion.

Existing phosphorous discharges from the City of Las Vegas and Clark County treatment plants is from 9 to 11 mg/l. Future discharge will be 0.5 mg/l or less.

Other water quality parameters which will drop will include the suspended solids, biochemical oxygen demand, chemical oxygen demand and total dissolved solids (TDS); however, the reduction of TDS is likely to be minor in comparison to the totals quantity discharge to Las Vegas Bay daily. The amount of nitrogen entering the bay has been estimated at 3,234 pounds per day according to Deacon and Tews (1973). Some reduction will likely occur as a result of AWT discharge, however, a significant portion of that amount is known to come from a nonpoint source near the BMI evaporation ponds. The effects of changes in water quality will, therefore, constitute beneficial impacts on Las Vegas Bay.

During the initial phase of operation, the amount of AWT water to be discharged to the wash and ultimately to the bay, will be greater than existing releases of secondary treated water. This wastewater return to Lake Mead may be credited to the amount of water diverted to the Las Vegas Valley from the Colorado River. This water will also contribute a slight amount to the generation of power at Hoover Dam. These will both be beneficial impacts.

Any decrease in algal populations resulting from phosphorous decreases may have a beneficial impact on the quality of recreation in the Las Vegas area. Maintenance on boats moored in the area should decrease as a result of decreases in algal growth. In addition, the noxious odors produced from algal blooms and die-offs in the bay should be reduced. The benefits of reduced algal blooms may also be realized by consumers of water supplied through the Southern Nevada Water project.

Problematic

Some shifting in the distribution of biota may occur as a result of any changes in algal populations. According to Deacon and Tews (1973), threadfin shad characteristically concentrate at the thermocline of Las Vegas Bay, probably due to the presence of large amounts of organic debris on which they feed. Much of this organic debris is provided by flows from the wash and from algal production. Reduction and dispersion of organic matter and algae may cause these fish to eventually redistribute, however, this appears problematical. This may consequently result in a shift in the carnivorous game fish which depend on threadfin shad populations as a source of food.

5. Impacts on the Colorado River

The reduction in total dissolved solids or salinity realized through the advanced treatment of wastewater discharged to Las Vegas Wash will have a beneficial impact on the Colorado River. The importance of controlling salinity throughout the Colorado River Basin is discussed in Chapter 3 of this Addendum, and is documented in numerous reports and publications. It is estimated that the present economic impact of salinity for each milligram per liter increase in salinity at Imperial Dam may be $160,000. Las Vegas Wash presently contributes an increase in salinity at Imperial Dam of 17 to 18 milligrams per liter.

In addition to the reduced salinity of advanced treated wastewater discharged to Las Vegas Wash, beneficial reuse of wastewater as envisioned in the proposed project will divert additional salts from the Colorado River. The reuse of wastewater for cooling in the Allen Power Generating Facility will divert over 60,000 tons per year of salt from the River. In-valley irrigation will divert over 235,000 pounds of salt per day, however some portion of these diversions may return to Las Vegas Wash as diffuse subsurface flows.

The reuse of wastewater in Las Vegas Valley will reduce the demands on the Colorado River. Return of acceptable quality water to the River would go as a credit to Nevada's allotment of 300,000 acre feet per year, thus enhancing the use of this valuable resource.

6. Other Impacts

a. Economic

In the 1972 Environmental Assessment an analysis of the likely general economic impacts of the project were described on pages 123 to 124 of that report. The following account is based on the proposed project as it is presented in this addendum.

The project costs of the wastewater treatment system are expected to be based on a cost sharing formula of up to 75 percent contribution by the Federal Government and 25 percent contribution each from local governments. This is based on the stipulation that the treatment system protects the natural environment and the overall long-term productivity of the area.

This project will require the acquisition of private land for a number of the facilities. These include land for the wastewater collection system, In-Valley irrigation pipelines and reservoirs, the sludge disposal pond, the pilot recharge well and pipeline right-of-way from the pilot desalination plant and the brine disposal site. Cost of this land will vary according

to the site, however, since many of the facilities are located in or adjacent to residential and commercial areas, the cost of acquisitions of land, rights-of-way and severance fees will be substantial. The costs are contained in the main body and appendices of the facilities plan.

Construction and operation of the pollution abatement facilities will provide part-time and permanent jobs for contractors, laborers, engineers and personnel to man the new facilities. A significant portion of their earnings would be spent in the Las Vegas Valley.

b. Growth Accommodating

Mention of the relationship of the pollution abatement project to growth in the Las Vegas area was previously made on page 123 of the 1972 Environmental Assessment. Additional aspects of the growth question are presented in the following section.

The consolidation, expansion and upgrading of wastewater treatment can be viewed as accommodating further population and economic growth in the Las Vegas Valley rather than inducing development. The first modular phase of the AWT plant will begin operation in 1978 and will have a capacity of 90 MGD. With the projected maximum day wastewater production of 85.2 MGD by 1980 the initial AWT plant will have a reserve capacity of 4.8 MGD. The second stage of AWT will be on line by 1982 and will provide for a maximum AWT capacity of 112.5 MGD (90 MGD + 22.5 MGD). This capacity will be sufficient until about 1990. The construction of the third AWT stage will provide an additional 22.5 MGD capacity which will be sufficient to treat wastewater flows until the year 2000.

The extent of future growth is greatly dependent on political decisions made by the residents of the Las Vegas Valley and reflected in city and county general plans and in policies designed to attract or discourage various types of industrial and commercial activities.

A major question to consider when evaluating the role of the wastewater treatment system as a growth inducing factor, is whether or not the projected population figures for the area appear reasonable and particularly if the area can adequately support that population environmentally. For the Las Vegas region, the environmental constraints that might well dictate future population growth would be air quality in the Las Vegas Valley and the availability of future potable water. Both questions are considered in succeeding portions of this impact section.

The availability and future use of AWT and desalted water could be important growth considerations in the future. By 1981 the uses of AWT water will include in-valley irrigation, pilot desalination and experimental groundwater recharge, cooling water for the Allen power plant, and discharge to Las Vegas Wash.

The use of AWT water for in-valley irrigation and groundwater recharge can be considered to play a neutral growth inducement role. However, the provision of AWT water to the future Allen power plant can be viewed as a growth accommodating impact. This question of the relationship between the Allen power facility and the availability of AWT is considered to a greater degree in a succeeding portion of this impact section.

c. Regional Air Quality

The major air pollution sources considered for the proposed project are construction activities, motor vehicles, the AWT plant, and the pilot desalination plant. A discussion of the impact on air quality from construction activities and emissions from the advanced wastewater treatment plant is presented in a preceeding section of this chapter. The following discussion considers the impact of the proposed project on the broader frame of regional air quality.

Motor vehicle emissions immediately related to the AWT plant and pilot desalination plant are induced by the vehicle volumes generated by operating and maintenance personnel. It is assumed that neither facility will constitute a significant tourist attraction. It is estimated that the pilot desalination plant will require 4 men/shift, and the AWT plant from 25 to 30 men/shift. Thus, each facility may be provided with a maximum of about 40 parking spaces. The emissions associated with this number of parking spaces would be negligible. In addition, the existing State of Nevada Air Pollution Control Regulations and the proposed amendments to Clark County's Regulations specify a cutoff of 500 parking spaces before a review is required.

The provision of Advanced Wastewater Treatment for wastewater from Las Vegas Valley will permit 1) compliance with water quality standards, 2) reduction of salt loads to the Colorado River, and 3) beneficial reuse of wastewater to enhance the overall water resources of the area. As a corollary to these benefits a long term impact on the air quality of the region will be realized from the growth accommodated by the proposed project. Projections of future air quality as affected by any growth accommodated by the proposed project would be of questionable accuracy.

There is a need for additional meteorological data for the region specifically patterned for the conversion of source emissions to air quality concentration. More knowledge of wind patterns, vertical temperature structure, and inversion incidence must be developed. As noted in Chapter 3 these data are being developed. Another variable in the long term projection of regional air quality is the actual population growth versus the projected growth used in sizing the project facilities. Based on the projected maximum day wastewater flows for Las Vegas Valley the following Table has been developed to show the range of reserve or deficit capacity of the AWT plant as presently planned.

TABLE 23

PROJECTED AWT PLANT
RESERVE CAPACITY

Year	AWT Cap. (MGD)	Range of Excess or Deficit Capacity
1980	90	+ 9% to - 0.4%
1990	112.5	+ 5.6% to - 10.5%
2000	135	+ 3.9% to - 16.4%

\+ indicates excess capacity
\- indicates deficit capacity

From the above Table it can be seen that, depending on actual population growth, there may be no excess plant capacity at some time in the future. However, the time spans considered over the life of the project will permit interim actions to be responsive to 1) actual needs, 2) changing regulations, and 3) advances in technology. The potential impact on regional air quality in quantified terms is problamatic.

d. Environmental Constraints

Simply stated, life cannot exist in the absence of water. Perhaps more than other areas, residents of the deserts of the United States are aware of the importance of water to their very existence. As part of the desert ecological system, man is bound by limitations common to all biological systems; limitations of food supply, accumulations of waste products and limitation of water supply. These parameters may act to limit population growth and to reduce the quality of life, and as such they may be regarded as environmental constraints.

This report is addressed to the proposed wastewater management program in Clark County and clearly illustrates the complexity and importance associated with the supply of high quality water and the disposition of wastewater.

Limitations of both water quantity and quality as an environmental constraint have already been described in various sections of this addenda. Maintenance of Las Vegas Wash illustrates this clearly since the existence of this riparian habitat with an uncommonly diverse plant and animal community is dependent on the existing discharges of effluent. Similarily, the Las Vegas Valley population is supported by its present water supply - both underground and the Colorado River and the origins of Las Vegas are linked to the presence of this naturally abundant resource (see Chapter 3).

The role of water resources as supporting the community population is analogous, in part, to the concept of carrying capacity (see Appendix D). Carrying capacity is a concept which relates the size of natural populations to an upper limit which is determined by the ability of a region to support that population without degradation of the area. As applied to Las Vegas Valley only a limited number of people may reside in Las Vegas or other communities and still maintain the quality of life presently enjoyed. Population projections (figure 2) have suggested a maximum ranging from 700, 000 to 1, 000, 000 persons.

In addition to water quality and quantity operating as environmental constraints in Clark County, similar arguments have been developed for the entire Colorado River Basin. The economic impact of Colorado River water quality has been described in Chapter 3. The importance of Colorado River water quantity is also well documented in Arizona vs. California, when the U.S. Supreme Court decree apportioned the waters of the Lower Colorado River Basin among the States of California, Nevada and Arizona. Nevada'a entitlement to water in the mainstream of the Colorado River is set at 300, 000 acre-feet per year.

e. Allen Power Generating Facility

As described throughout this report, supply of cooling water to the future Allen Power Generating Facility is a presently planned beneficial reuse of some advanced treated wastewater from the AWT plant. The agreement presently being developed between the Nevada Power Company (NPC), Clark County, the City of Las Vegas, and Clark County Sanitation District No. 1 to supply AWT effluent for the power facility, provides that in the event AWT effluent is not available by 1979 NPC may elect to purchase secondary effluent from the City and District.

In terms of the overall distribution of advanced treated wastewater; by the year 2000 the projected average day wastewater flow in Las Vegas Valley will be about 123,200 acre feet per year or 110 MGD. On expansion to full capacity the Allen power facility would reuse an annual average of 29% of the available AWT plant effluent. Total reuses of AWT effluent will be about 54% of the available wastewater in the Valley leaving 46% or approximately 56,672 acre feet per year (51 MGD) available for discharge to Las Vegas Wash and return flow credit from the Colorado River. The concerns and environmental impacts described for the Arrow Canyon Project in the 1972 Environmental Assessment are also applicable to the Allen Project.

D. Environmental Impact Considerations of Modified Alternative No. 3 -- Advanced Wastewater Treatment and Return to Lake Mead.

In the 1972 Environmental Assessment, the impacts likely to result from implementation of Alternative 3, advanced treatment with return to the Colorado River below Hoover Dam, were analyzed. At that time the Colorado River return alternative was considered viable due to the stringent wastewater discharge requirements for Las Vegas Wash. Due to subsequent changes in the proposed standards, a new discharge point to Lake Mead via Las Vegas Wash, is now possible. Because the consequences of utilizing this route of discharge were not considered in the 1972 Environmental Assessment, this section has beed added to define the probable impacts.

1. Construction Impacts

The impacts related to construction activities of various project facilities for nine alternatives were presented on pages 124-127 of the 1972 Environmental Assessment. Those impacts identified as general (common to all construction elements of the project) are considered comparable when evaluating this alternative.

Under the modified Alternative No. 3, certain of the physical features of Alternative No. 10 (amended combination alternative) would not be considered. Those elements not a part of modified Alternative No. 3 would be 1) the experimental recharge well, 2) pilot desalination plant, 3) brine disposal, and 4) the Allen Power Plant. The specific construction impacts of project facilities relevant to modified Alternative No. 3 are as follows:

a. AWT Plant Construction Impacts
See Part C of this addendum.

b. Impacts of Sludge Disposal Pond Construction
See Part C of this addendum.

c. Construction Impacts of the Lands to be Irrigated
See Part C of this addendum.

2. Impacts of Project Elements

The impacts of each element of modified Alternative No. 3 are considered in this section. The elements of this alternative have been evaluated previously in the 1972 Environmental Assessment and in this document. Under this alternative the elements include 1) the wastewater collection system, 2) advanced wastewater treatment plant, 3) sludge disposal ponds, and 4) Las Vegas lands to be irrigated. For accounts of the impacts of those elements, see Part C of this Chapter.

3. Impacts on Las Vegas Wash

Under modified Alternative No. 3 significantly more AWT water than provided for in Alternative No. 10 would flow down Las Vegas Wash to Lake Mead. This is because there would be less provision for beneficial reuse of water in modified alternative No. 3 than in alternative No. 10. Quantitites of water returning to Las Vegas Wash with Alternatives No. 3 and No. 10 would be as follows:

Year	Projected Wastewater Flow (AF/yr)	Projected Discharge to Las Vegas Wash (AF/yr)	
		Modified Alternative No. 3	Alternative No. 10
1979	68,000	68,000	63,520
1980	70,700	70,700	57,260
1981	73,400	64,120	40,264
1982	76,100	65,230	32,404
1983	78,800	63,810	26,506
1985	84,200	64,530	27,226
2000	123,200	103,530	67,117

Because there would be such a large amount of water entering Las Vegas Wash with modified Alternative No. 3, some of the quantity-related impacts identified for Alternative No. 10 in this document would not be applicable. The substantial increase in water volume entering the wash would change the width of the stream and velocity of the flow. This increase in water will also create changes in the vegetative composition of the wash. Areas now supporting the more arid plant species will likely shift to more moisture-dependent species.

The provision of a greater quantity of water in the Wash would allow for a greater variety of uses for wildlife and recreational enhancement in the Wash. There would be considered beneficial impacts.

With modified Alternative No. 3, the point of discharge of AWT water to Las Vegas Wash would be the same as proposed for Alternative No. 10, the amended combination alternative. The account of the impacts likely to occur due to changes in discharge points from existing conditions, is presented in this document. Because AWT will be discharged to the Wash under this alternative, quality changes will occur. The effect of this change on plant species composition and vigor has been covered in depth in this addendum. All other impacts on Las Vegas Wash as presented herein will be applicable to this alternative.

4. Impacts on Las Vegas Bay

An account of expected impacts on Las Vegas Bay was presented on page 133 of the 1972 Environmental Assessment and in this document. The impacts resulting from implementation of modified Alternative No. 3, AWT with discharge to Lake Mead, will be essentially the same as those previously identified. Additional impacts are presented in the following account.

One of the major beneficial impacts of this alternative is the return of AWT water to the Colorado River (Lake Mead) for return flow credit. This would allow for withdrawals from Lake Mead above the 300,000 acre-feet/year allocation. The increase in water entering Lake Mead would provide additional water for power generation at Hoover dam.

5. Impacts on the Colorado River

The reduction in total dissolved solids or salinity realized through the advanced treatment of wastewater provided for in modified Alternative No. 3 will have a beneficial impact on the Colorado River. Advanced wastewater treatment in lieu of secondary wastewater treatment (existing conditions) will result in a decrease of approximately 150 milligrams per liter of TDS in the discharge effluent of the Wash. Because modified Alternative No. 3 has only in-valley irrigation as a beneficial reuse of water, this alternative will ultimately provide for a greater total discharge of salts to Lake Mead and the Colorado River than would occur with Alternative No. 10, which would divert over 60,000 tons a year of salt to the Allen Power project. As with No. 10 alternative, in this alternative approximately 235,000 pounds of salt per day will be diverted for in-valley irrigation, however, an unknown amount of that will subsequently return to the Wash as diffuse subsurface flows.

6. Other Impacts

a. Economic
An economic analysis of this alternative as related to other viable project alternatives, has been covered in the "Facilities Plan -- Pollution Abatement Project, Las Vegas Wash and Bay, Annex A". The impacts identified in the 1972 Environmental Assessment (pages 123-124) and in this report are relevant to this alternative. However, because this project alternative would not have a pilot desalination and groundwater recharge program, land purchases for those facilities would be unnecessary.

b. Growth Accommodating
The discussion of this impact as presented previously remains relevant.

c. Regional Air Quality
Air quality impacts and considerations presented in Part C of this addendum are applicable to this alternative.

d. Environmental Constraints
See subpart d. of this report.

e. Allen Power Generating Facility
The sale of AWT water to the Allen Power generating facility is not considered in this alternative and therefore no impacts are considered.

E. Evaluation of Alternatives in Relation to Project and Environmental Quality Objectives and Selected Impacts

In the 1972 Environmental Assessment, an environmental evaluation of the alternatives was made by ranking the alternatives of the project against four impacts identified as being of major concern. Those four impacts were: 1) cause earthquakes (adverse), 2) pollute regional water resources (adverse), 3) change the environment of large areas (problematical), and 4) prevent growth (adverse).

Based on the analysis of impacts determined to occur as a result of the new project identified in this addendum, the following new major impacts have been chosen:

1. Pollute regional air resources (adverse).
2. Contribute to the Las Vegas Wash salt loading problem (adverse).

The future quality of air in the Las Vegas region is now an important question due to the close cause and effect relationship between population growth, the provision of community services (in this case, a sewerage facility), and the air quality of the valley. Air quality

is of particular concern in the Las Vegas area due to the natural basin configuration of the region and the fact that the national primary ambient standards for photochemical oxidants and nitrogen dioxides have been exceeded in the past.

One significant change between the 1972 Environmental Assessment and the present addendum is that of projected population. The 1972 project was based on a population projection of 800,000 persons in the year 2000. This addendum uses a population projections of 700,000 people as the basis for analysis.

In the following tables, the ten alternatives to the project are evaluated against the project objectives, environmental quality objectives and the six previous mentioned environmental impacts. A number rank is given to each alternative based on its ability to meet the objective or impact. At the bottom of the impact evaluation table, the subtotals from the impact ranking and the objectives ranking are totaled, with the lowest cumulative total being considered to represent the most environmentally sound alternative.

The four alternatives concluded to be the best environmentally are:

Alternative No. 2 - Complete Treatment
Alternative No. 3 - AWT and return to Lake Mead
Alternative No. 7 - Combination Alternative
Alternative No. 10 - Amended Combination Alternative

COMPARATIVE EVALUATION OF ALTERNATIVES TO PROJECT OBJECTIVES AND ENVIRONMENTAL QUALITY OBJECTIVES

	Groundwater Recharge	Complete Treatment	Return to Lake Mead	Export to Dry Lake	Export to Eldorado Valley	Export to Hidden Valley and Jean L.	Combination	Deep Well Injection	No Action	Amended Combination Alternative
	1	2	3	4	5	6	7	8	9	10
Project Objectives										
1. Achieves water quality in Las Vegas Bay that meets state and federal regulations	1	1	1	1	1	1	1	2	3	1
2. Provides for advanced waste treatment and beneficial reuse of wastewater.	1	1	1	3	3	3	2	3	3	1
3. Minimized any adverse economic or environmental impact.	2	2	1	2	2	2	1	3	3	1
Environmental Quality Objectives										
1. Attains a clean desert environment	---------- No Basis for Comparison ---------									
2. Maintains Las Vegas Wash as a riparian area.	3	1	1	3	3	3	2	3	1	1
3. Develop additional greenbelts	---------- No Basis for Comparison ---------									
4. Optimizes the use of water	2	1	2	3	3	3	2	3	3	1
5. Protects the environment from adverse construction impacts	---------- Not of Sufficient Importance --------									
SUBTOTAL	9	6	6	12	12	12	8	14	13	5

KEY: 1 - Achieve objective
2 - Questionable
3 - Does not achieve objective

COMPARATIVE EVALUATION OF ALTERNATIVES TO KEY ENVIRONMENTAL IMPACTS

	Groundwater Recharge	Complete Treatment	Return to Lake Mead	Export to Dry Lake	Export to Eldorado Valley	Export to Hidden Valley and Jean L.	Combination	Deep Well Injection	No Action	Amended Combination Alternative
	1	2	3	4	5	6	7	8	9	10
Impacts										
1. Potential to cause earthquakes	1	1	1	1	1	1	1	3	1	1
2. Pollutes regional water resources	1	1	1	1	2	2	1	1	3	1
3. Changes environment of large areas	3	3	1	3	3	3	3	1	3	1
4. Pollutes regional air resources	2	2	2	2	2	2	2	2	1	2
5. Contributes to the Las Vegas Wash salt loading problem	1	1	2	1	1	1	1	1	3	2
6. Prevent growth	1	1	1	1	1	1	1	1	3	1
IMPACT SUBTOTAL	9	9	8	9	10	10	9	9	14	8
SUBTOTAL FROM PROJECT AND ENVIRONMENTAL QUALITY OBJECTIVES	9	6	6	12	12	12	8	14	13	5
TOTAL	18	15	14	21	22	22	17	23	27	13
ENVIRONMENTAL RANKING	5	3	2	6	7*	7*	4	8	9	1

KEY: 1 - No
2 - Questionable
3 - Yes

*Equal Ranking

Chapter 8

ENVIRONMENTAL IMPACT SUMMARY

Chapter 8

ENVIRONMENTAL IMPACT SUMMARY

A. Environmental Impacts of the Proposed Project

The following summary of the significant environmental impacts caused by the proposed project is presented in response to the requirements of the National Environmental Policy Act of 1969. A number of impacts shown below are common to both the previously selected alternative (Alternative 7) and the alternative selected in this Addendum. However those common impacts are restated for ease of reference.

1. Substantially reduce the pollution of Lake Mead
2. Effect a change in the plant community of Las Vegas Wash between the City of Las Vegas and the Clark County Sanitation District Treatment plants. (approximately 400 acres)
3. Improve the quality of water in Las Vegas Wash.
4. Provide for the beneficial use of wastewaters in Las Vegas Valley.
5. Enable continued growth.
6. Increase the cost of sewer service.
7. Contribute to the reduction of salt loads to Las Vegas Wash and the Colorado River from existing wastewater flows.
8. Remove property from tax rolls.
9. Create construction and maintenance employment.
10. Create visual impacts.
11. Create solid waste.
12. Temporarily create noise, dust, inconvenience, erosion, loss of vegetation, and loss of wildlife habitat due to construction.
13. Cause a permanent loss of 144 acres of vegetation and wildlife habitat.
14. Encourage the leaching of salts from the near-surface groundwater aquifer.
15. Increase groundwater flows into Las Vegas Wash.
16. Create noise from pumps and treatment plants.

17. Enhance the recreational value of Las Vegas Wash.

18. Require a long-term commitment of electrical energy.

B. Unavoidable Adverse Impacts

1. Increase the cost of sewer service.

2. Remove property from tax rolls.

3. Create visual impacts.

4. Create solid waste.

5. Temporarily create noise, dust, inconvenience, erosion, loss of vegetation, and loss of wildlife habitat due to construction.

6. Cause a permanent loss of 144 acres of vegetation and wildlife habitat.

7. Create noise from pumps and treatment plants.

8. Require a long-term commitment of electrical energy.

C. Alternatives to the Proposed Project

A detailed evaluation of the following alternatives was presented in the 1972 Environmental Assessment. A comparative evaluation of these alternatives with the proposed project is presented in this addendum.

1. Groundwater Recharge

2. Complete Treatment

3. AWT and Return to Lake Mead

4. Export to Dry Lake

5. Export to Eldorado Valley

6. Export to Hidden Valley and Jean Lake

7. Combination Alternative

8. Deep Well Disposal

9. No Action

D. Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The construction and operation of the proposed regional wastewater treatment system represents the commitment of time, money and resources to alleviate the pollution of Las Vegas Wash, and the Las Vegas Bay or Lake Mead. The allowance of continued degradation of downstream water supplies by wastewater flows would be severly damaging to the long term productivity and maintenance of man's environment.

The present means of discharging wastewater to the environment can be considered an unacceptable short-term use that, with proper wastewater treatment, can become a benefit to the environment in terms of meeting the federal and state water quality standards, maintaining wildlife habitat in Las Vegas Wash, and providing for the beneficial reuse of wastewater in a desert environment.

The consumption of electrical power, use of materials for construction, loss of undeveloped lands and all adverse impacts associated with the pollution abatement project, represent commitments and tradeoffs that are necessary to achieve the goals of clean water and beneficial reuse of wastewater.

The construction of an advanced wastewater treatment plant will facilitate wastewater treatment for future development in the Las Vegas Valley. However, the presence or absence of proper wastewater treatment facilities is merely one aspect that determines the level of growth or lack of growth in an area.

E. Irreversible and Irretrievable Commitment of Resources

The primary resources committed through implementation of the proposed project are:

1. Money
2. Land
3. Materials (raw and processed)
4. Energy
5. Labor
6. Wastewater

The quantities of these resources committed through implementation of the proposed project are detailed throughout the text, and are compared to the most viable alternatives.

CHAPTER 9

PROJECT ALTERNATIVES

CHAPTER 9

PROJECT ALTERNATIVES

The following descriptions are presented to detail each of the alternatives that have been considered for implementation to abate pollution of the Las Vegas Wash-Lake Mead area, and to meet water resource management goals in the Las Vegas Valley. The October 24, 1973 water quality standards for Las Vegas Wash, as amended, have made possible the Amended Combination Alternative, Alternative No. 10, and a modified Alternative No. 3. The remaining alternatives were evaluated in the 1972 Environmental Assessment.

Alternative No. 1 - Groundwater Recharge

Wastewater would be advanced treated, desalinized and injected through wells to recharge the groundwater basin underlying the Las Vegas Valley. Secondary treated wastewater would also be used for industrial purposes and irrigation in the Las Vegas Valley. Brine wastes resulting from the desalination process and some secondary treated wastewater would be exported by pipeline to Dry Lake Valley and evaporated.

Alternative No. 2 - Complete Treatment

Wastewater would be tertiary treated and discharged to Las Vegas Wash or directly to Lake Mead, and by 1980, would be desalinized and discharged in the same manner, or possibly added to the domestic water supply for direct reuse. Secondary treated wastewater would also be used for industrial purposes and irrigation in the Las Vegas Valley, with brine wastes resulting from the desalination process and some secondary treated wastewater being exported by pipeline to Dry Lake Valley for evaporation.

Alternative No. 3 - AWT and Return to Lake Mead

Alternative No. 3 which was developed by Boyle Engineering and Cornell, Howland, Hayes, & Merryfield in the "Phase III" Report, included advanced wastewater treatment, desalination, and possibly refrigeration, and discharge to the Colorado River below Hoover Dam. This alternative was developed in light of the water quality standards which existed for Las Vegas Wash in mid-1973. On October 24, 1973 revised water quality standards were adopted for Las Vegas Wash and certain points in the Colorado River. These new standards permit a modification of Alternative No. 3 as described below.

Wastewater at a central collection point, would be given AWT to a level that would meet water quality standards for Las Vegas Wash. Most of the advanced treated effluent would be discharged to Las Vegas Wash, and would flow into Lake Mead. Quantities of effluent not discharged

to Las Vegas Wash could be used for in-valley irrigation or other potential non-potable water needs. This alternative is the same as Alternative 10 with the exception of certain reuse programs.

Alternative No. 4 - Export to Dry Lake

Secondary treated wastewater would be used for industrial purposes and irrigation in the Las Vegas Valley, with the remainder exported by pipeline to Dry Lake Valley for evaporation. In the time period from 1990 to 2000, depending on population growth, AWT and desalinization of part of the wastewater will be started to insure a continued adequate water supply. Brine wastes from the desalinization process would also be exported by pipeline to Dry Lake Valley for evaporation.

Alternative No. 5 - Export to Eldorado Valley

Secondary treated wastewater would be used for industrial purposes and irrigation in the Las Vegas Valley, with the remainder exported by pipeline to Eldorado Valley for agricultural irrigation and evaporation. Between 1990 and 2000, desalinization of part of the wastewater will be started to obtain additional domestic supply, with the brine exported to Eldorado Valley for evaporation.

Alternative No. 6 - Export to Hidden Valley and Jean Lake

Secondary wastewater would be used for industrial purposes and irrigation in the Las Vegas Valley, with the remainder exported by pipeline to Hidden Valley and Jean Lake for evaporation. Between 1990 and 2000, desalinization of wastewater will be started to obtain additional domestic supply, with the brine exported to Hidden Valley and Jean Lake for evaporation.

Alternative No. 7 - Combination Alternative

All of the secondary treated effluent would be classified as good quality. A portion of this good quality wastewater would be used for industrial purposes, for irrigation in Las Vegas Valley and for maintenance of vegetation in the upper portions of Las Vegas Wash, with most of the rest exported to Dry Lake for evaporation. The remainder of the good quality wastewater would be given tertiary treatment. Some of the tertiary water would be desalinized and used in pilot groundwater injection and irrigation programs. Poor quality wastes and brine from the desalinization plant would be exported to Dry Lake for evaporation.

Alternative No. 8 - Deep Well Disposal

Wastewater would be filtered and injected thousands of feet underground, below presently developed aquifers for permanent disposal, through a series of 130 to 240 deep wells. Secondary treated wastewater would also be used for industrial purposes and irrigation in the Las Vegas Valley. In the time period from 1990 to 2000, desalinization of secondary treated waste water will be started to insure a continued adequate water supply. Brine wastes from desalinization would also be injected into the deep wells.

Alternative No. 9 - No Action

In this alternative, no action would be taken to prevent the pollution of Lake Mead by wastewaters flowing in Las Vegas Wash.

Alternative No. 10 - Amended Combination Alternative - - Recommended Project

Wastewater, at a central collection point, would be given AWT to meet existing water quality standards. Effluent from the AWT plant would be available for a number of beneficial reuses including, 1) cooling water for the Allen Power Project, 2) in-valley irrigation, 3) source water for a pilot desalination plant, 4) source water for a pilot groundwater recharge program, 5) maintenance of vegetation in Las Vegas Wash, and 6) a water supply for return flow credit from the Colorado River. This alternative is the same as Alternative No. 3 with the additional reuse programs noted above.

CHAPTER 10

BIBLIOGRAPHY

CHAPTER 10

BIBLIOGRAPHY

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APPENDIX A

FAUNA LISTINGS

TABLE A.1

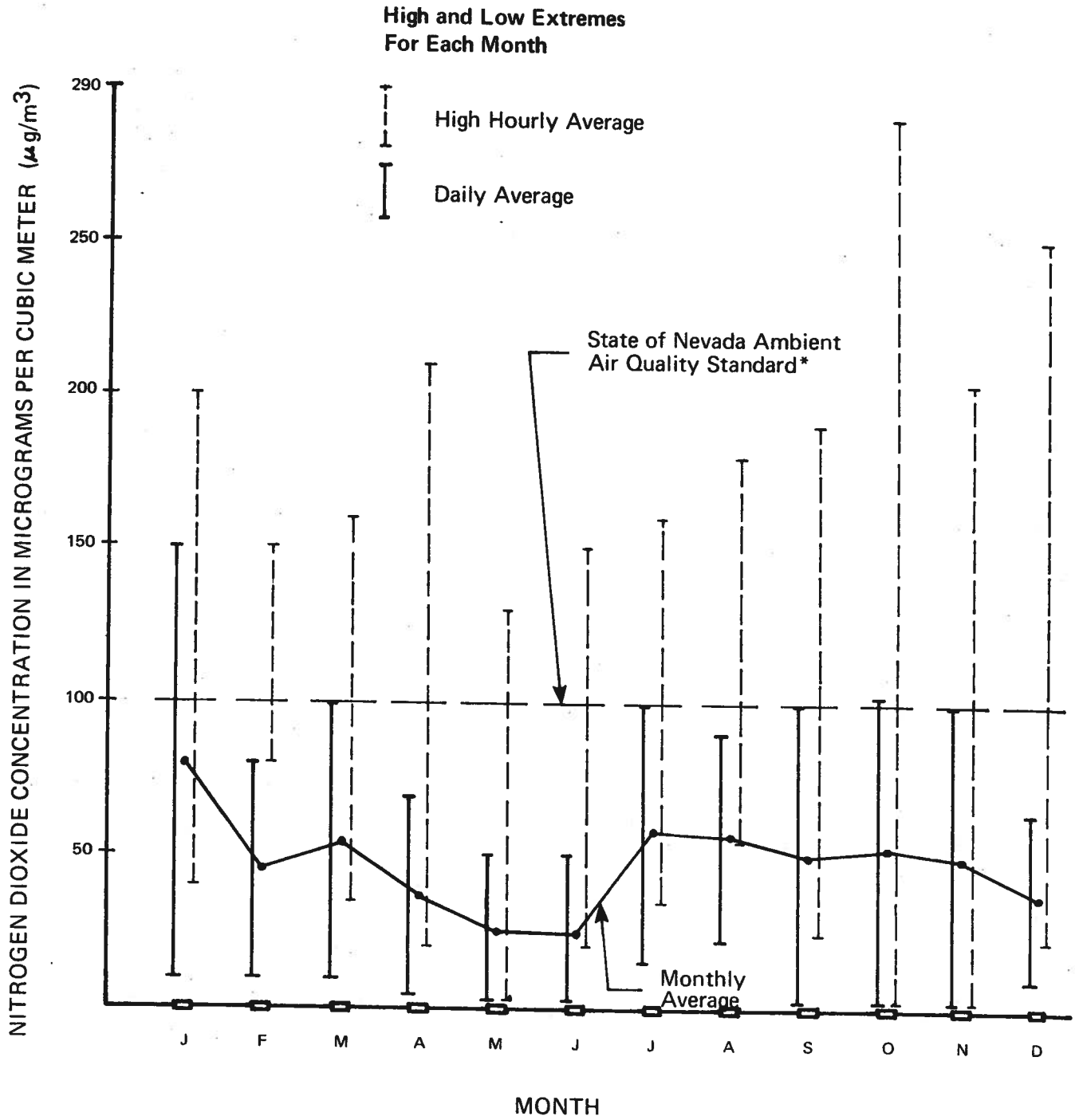
THREATENED SPECIES LIST

Common Name	Scientific Name	F.R.	B.S.F.&W.
Vegas valley leopard frog	Rana fisheri		T
Gila monster	Heloderma suspectum		U
Spotted bat	Euderma maculata		T
Prairie falcon	Falco mexicanus		T
California brown pelican	Pelecanus occidentalis	E	U
Wood ibis	Mycteria americana		U
American peregrine falcon	Falco peregrinus	E	T
Ferruginous hawk	Buteo lagopus		U
Osprey	Pandion haliaetus		U
Mountain plover	Eupoda montana		U
Long-billed curlew	Numenius americanus		U
Prairie pigeon hawk	Falco columbianus richardsonii		U
Bald eagle	Haliaeetus leucocephalus		T

1 F.R. Federal Register, vol. 38, no. 106. June 4, 1973.
2 B.S.F.&.W. Bureau of Sport Fisheries and Wildlife. Threatened Wildlife of the United States, 1973
E Endangered
T Threatened
U Status uncertain

APPENDIX B

AIR QUALITY



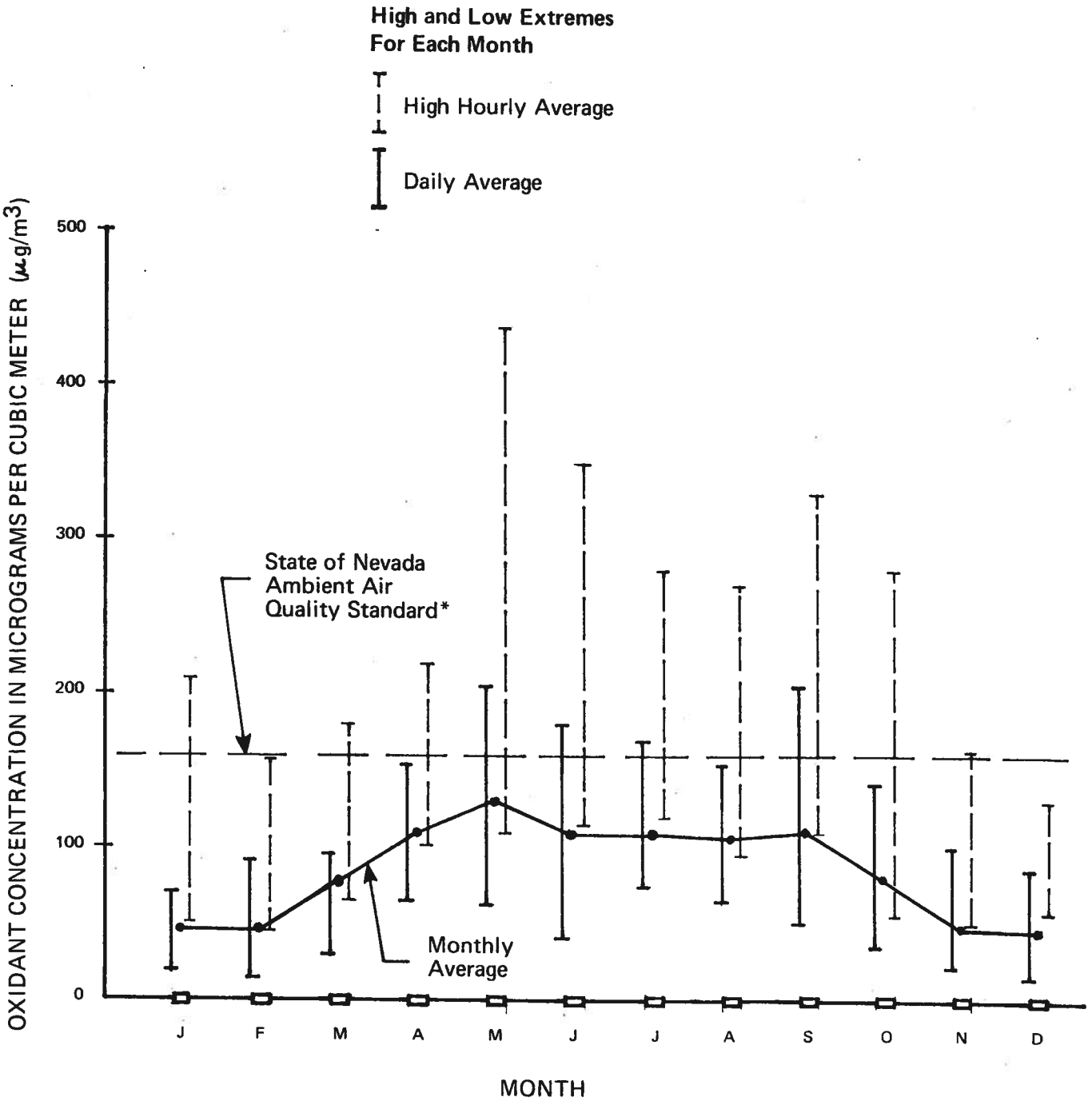
*Annual Arithmetic Mean

FIGURE B-1

ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK
COUNTY BOARD OF COMMISSIONERS

1973 NITROGEN DIOXIDE CONCENTRATIONS
CLARK COUNTY
HEALTH DEPARTMENT STATION
LAS VEGAS, NEVADA

Prepared by VTN



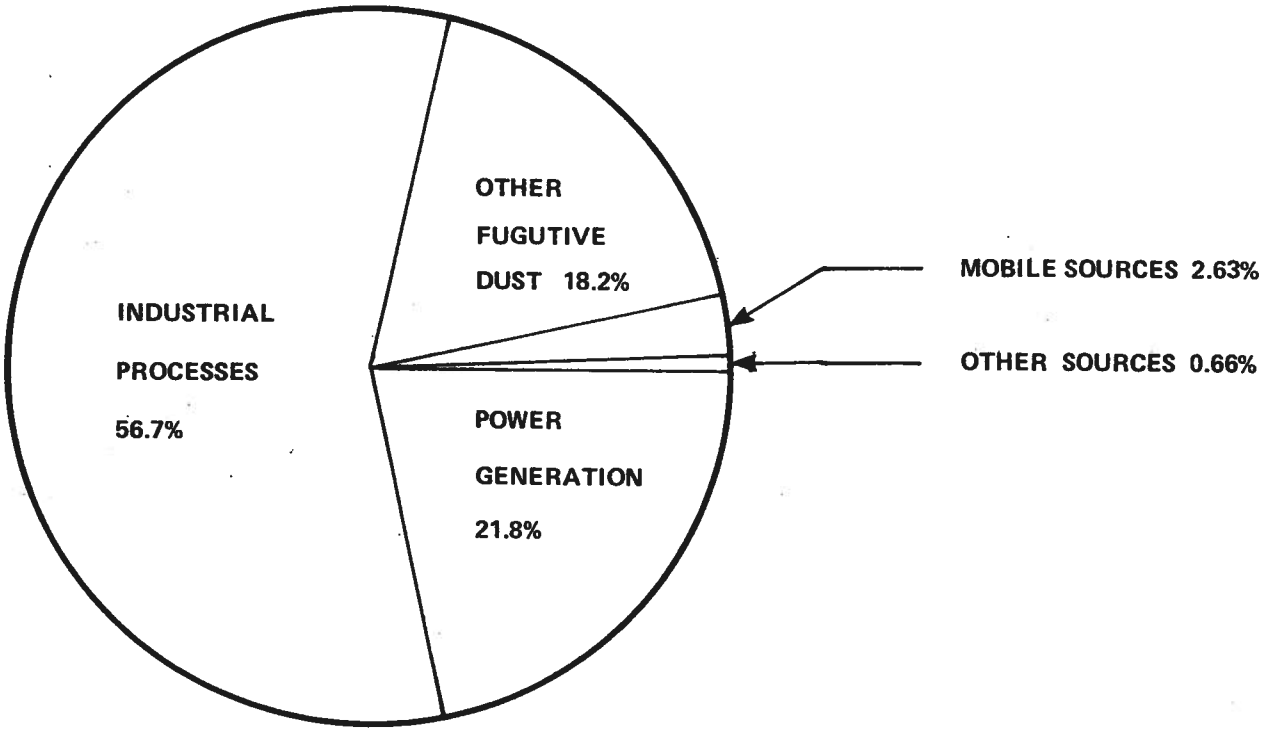
*Maximum one-hour concentration.

FIGURE B-2

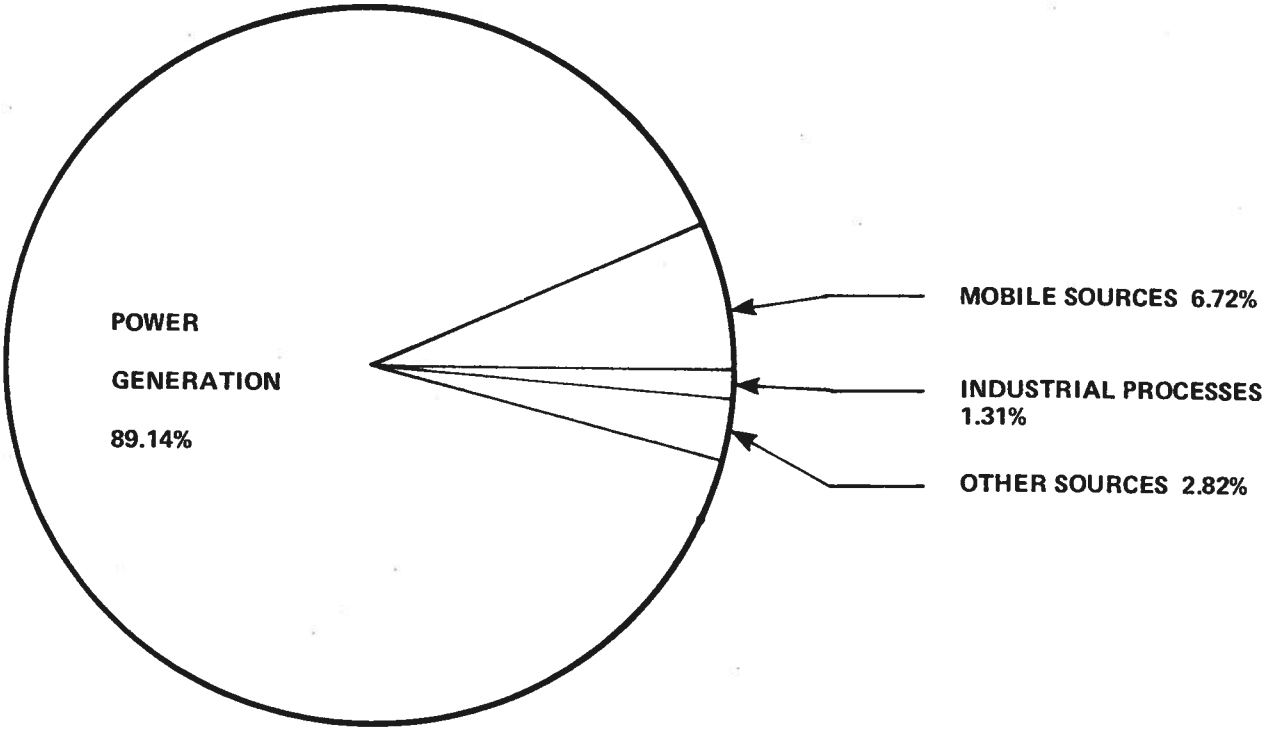
1973 PHOTOCHEMICAL OXIDANT CONCENTRATIONS – CLARK COUNTY HEALTH DEPARTMENT STATION LAS VEGAS, NEVADA

ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

Prepared by VTN



Particulate Emissions



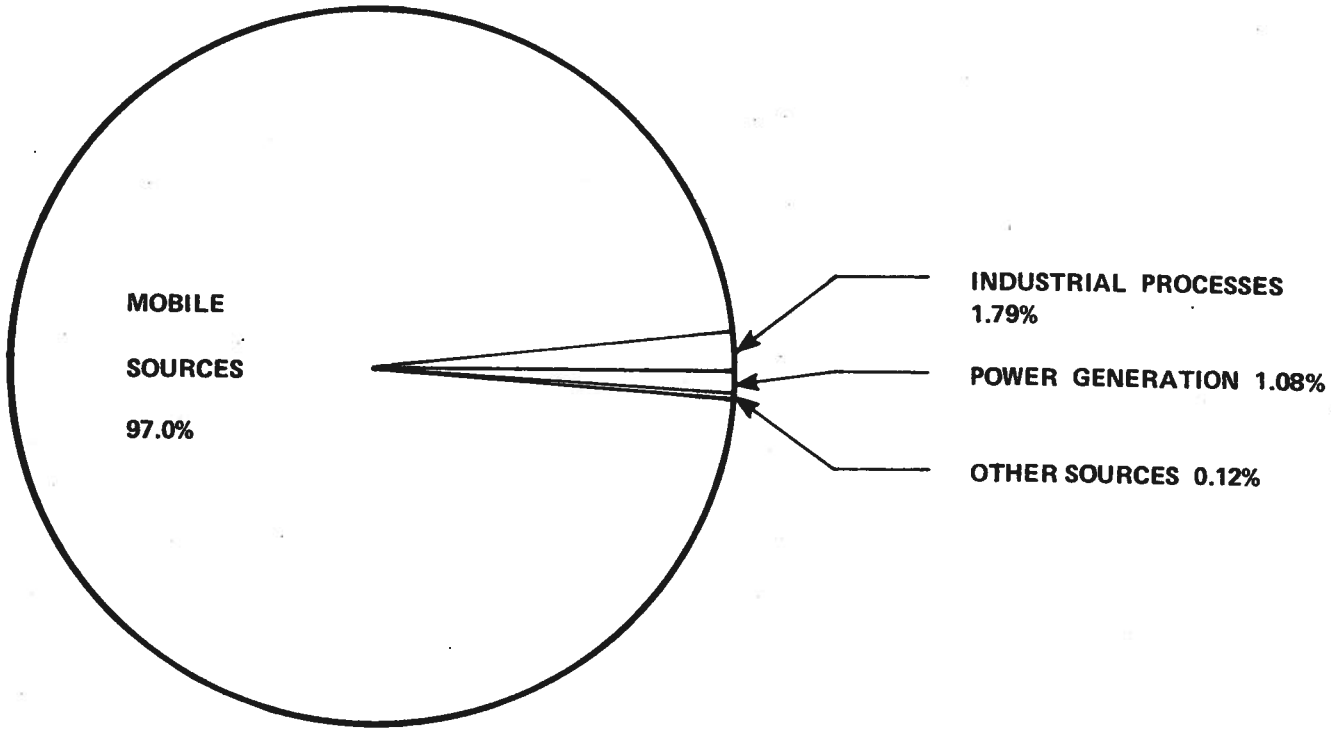
SO_2 Emissions

FIGURE B-3

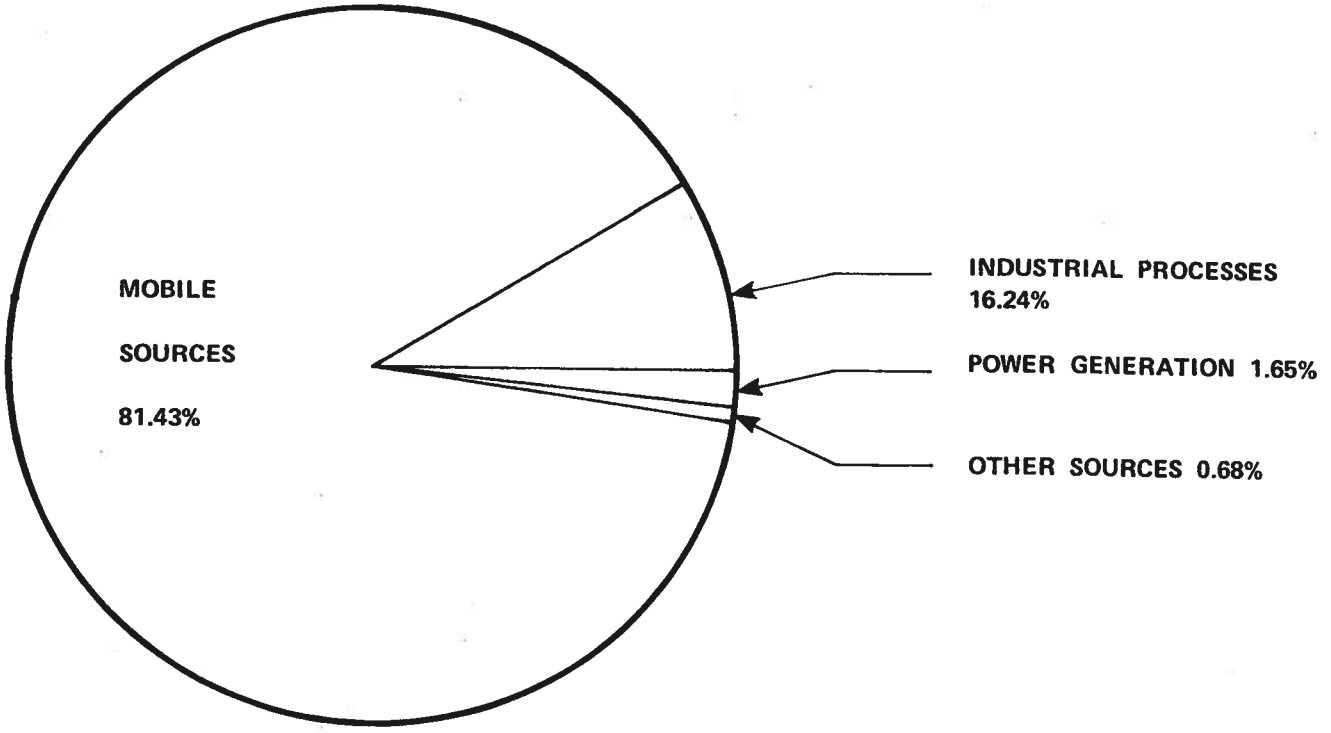
ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK COUNTY
BOARD OF COMMISSIONERS

1973 PARTICULATE AND SO_2
EMISSION PERCENTAGES
FOR CLARK COUNTY
AQCR 013

Prepared by VTN



CO Emissions



HC Emissions

ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK COUNTY
BOARD OF COMMISSIONERS

FIGURE B-4

1973 CO AND HC
EMISSION PERCENTAGES
FOR CLARK COUNTY
AQCR 013

Prepared by VTN

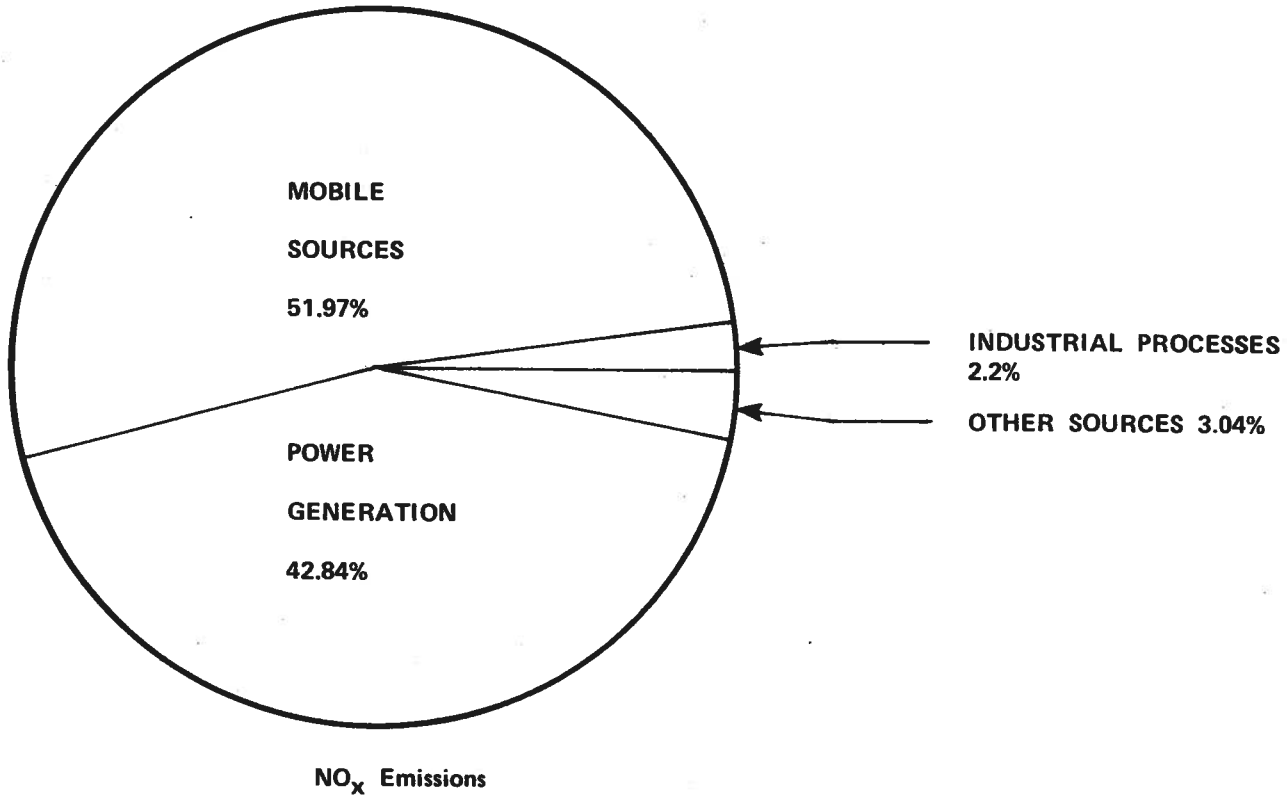


FIGURE B-5

1973 NO_x EMISSION PERCENTAGES FOR CLARK COUNTY AQCR 013

ENVIRONMENTAL ASSESSMENT
ADDENDUM FOR THE CLARK COUNTY
BOARD OF COMMISSIONERS

Prepared by VTN

TABLE B-1

PROJECTED STACK GAS CONDITIONS
FOR ADVANCED WASTEWATER
TREATMENT PLANT CALCINER

Fuel Type	Conditions (pounds/hour) Avg.	Max.	Avg. ACFM
CH_4 (natural gas)	49,702	67,374	32,267
#2 fuel oil	50,586	68,547	31,982 (120-130 °F)

GAS ANALYSIS FOR NATURAL GAS (approximately the same for low sulfur #2 fuel oil)

Gas	Average (pound/hour)	Maximum (pound/hour)
CO_2	8,512	12,876
N_2	25,360	33,521
SO_2	0 (approximate)	0
O_2	176	237
H_2O	14,656	19,746
	48,704	66,380

POLLUTANT

Projected controlled emissions discharge estimated at 0.03 grains/DSCF* or less of total particulates. The SO_2 discharge rate will be a function of the sulfur content of the fuel oil. Clark County APCR specify oil sulfur content of less than 0.5%.

EQUIPMENT TYPE

Variable throat venturi followed by 2 stage impingement. Discharge will be at dew point, but some cooling below dew point will be accomplished.

*DSCF: dry standard cubic foot

Source: CH_2M

SECTION 26. FUEL BURNING EQUIPMENT

2. b. Maximum allowable emission rates of particulate matter for heat input greater than 10 million but less than 4000 million BTU per hour shall be determined by using the equation

$Y = 1.02 \times^{-0.231}$. Maximum allowable emission rates of particulate matter for heat inputs equal to or greater than 4000 million BTU per hour shall be determined by using the equation

$Y = 17.0 \times^{-0.568}$ where Y = allowable rate of emission in pounds per million BTU and X = maximum heat input in millions of BTU per hour.

c. No person shall cause or permit the emission of sulfur dioxide from any fuel-burning equipment in excess of the quantity set forth in the following table:

Heat input, millions of British thermal units per hour	Maximum allowable rate of emission of sulfur dioxide, pounds per hour
1,000	150
5,000	750
10,000	1,500
15,000	2,250
20,000	3,000
25,000	3,750
30,000	4,500
35,000	5,250
40,000	6,000
45,000	6,750
50,000	7,500

d. Maximum allowable emission rate of sulfur dioxide shall be determined by using the equation $Z = 0.15 X$ where Z = allowable rate of sulfur dioxide emission in pounds per hour and X = maximum heat input in millions of BTU per hour.

SECTION 27. PROVISIONS OF REGULATIONS SEVERABLE

If any provision of these Regulations or the application thereof to any person or circumstances is held invalid or unconstitutional, such invalidity or unconstitutionality

SECTION 35. COMPLIANCE SCHEDULES

4. Compliance schedules shall contain as a minimum:

   a. Appropriate increments of progress.

   b. Final date of compliance with the appropriate emission limitations.

SECTION 36. AMBIENT AIR QUALITY STANDARDS

1. The following concentrations of air contaminants shall not be exceeded at any single point in the ambient air:

   a. Sulfur oxides as sulfur dioxide:

Annual arithmetic mean	60 ug/M^3	(0.02 ppm
Maximum 24 hr. concentration	260 ug/M^3	(0.1 ppm
Maximum 3 hr. concentration	1300 ug/M^3	(0.5 ppm

   b. Suspended particulate matter:

Annual geometric mean	60 ug/M^3
Maximum 24 hr. concentration	150 ug/M^3

   c. Carbon monoxide:

Maximum 3 hr. concentration	10 mg/M^3	(9.0 ppm
Maximum 1 hr. concentration	40 mg/M^3	(35.0 ppm

   d. Photochemical oxidant:

Maximum 1 hr. concentration	160 ug/M^3	(0.08 ppm

   e. Non-methane hydrocarbons:

Maximum 1 hr. concentration	160 ug/M^3	(0.24 ppm

   f. Nitrogen dioxide:

Annual arithmetic mean	100 ug/M^3	(0.05 ppm

2. ug/M^3 means micrograms of air contaminant per cubic meter of air.

   mg/M^3 means milligrams of air contaminant per cubic meter of air.

   ppm means parts of air contaminant by volume per million parts of air by volume.

SECTION 36. AMBIENT AIR QUALITY STANDARDS (Continued)

3. The methods of measurement shall be those precribed in Appendices A through F, inclusive, of § 410 of Chapter IV, Title 42, Code of Federal Regulation, published in the Federal Register on April 30, 1971. These may change from time to time.

4. Adoption of these Ambient Air Quality Standards shall not be considered in any manner to allow significant deterioration of existing air quality in any portion of Clark County.

AMENDMENTS
TO THE
STATE OF NEVADA AIR QUALITY REGULATIONS

1.59 Complex source. Any property or facility that has or solicits secondary or adjunctive activity which emits or may emit any air contaminant for which there is an ambient air quality standard, notwithstanding that such property or facility may not itself possess the capability of emitting such air contaminants. Complex sources include, but are not limited to:

a. Shopping centers;
b. Sports complexes;
c. Drive-in theaters;
d. Parking lots and garages;
e. Residential, commercial, industrial or institutional developments;
f. Amusement parks and recreational areas;
g. Highways;
h. Sewer, water, power and gas lines;

and other such property or facilities which will result in increased air contaminant emissions from motor vehicles.

1.44 Registration certificate. A document issued and signed by the Director certifying adequate empirical data for the single or complex source has been received and shall constitute approval of location.

1.60 Vehicle trip. A single movement by a motor vehicle which originates or terminates at the single or complex source.

1.61 Contiguous Property. Any property which is in physical contact, touching, near or adjoining. Public property or public right-of-way shall not be deemed as a break in any contiguous property.

3.1.9 Registration certificates for single and complex sources and operating permits for single sources may be issued through an approved local air pollution control program.

3.2.4 Within 5 days after receiving an application for registration, the Director shall determine what, if any, additional information is needed. Within 15 days after receiving adequate information the Director shall make a preliminary determination to issue or deny issuance of a registration certificate. Within 75 days after receiving adequate information, pursuant to Article 13, the Director shall issue or deny issuance of a registration certificate.

3.2.5 A registration certificate shall only expire if construction of a new or modified source, including a complex source, is not commenced within one year from the date of issuance thereof or construction of the facility is delayed for one year after initiated.

3.3.2 A stop order can be issued at any time before the operating permit is granted, except that a stop order for a source shall not be issued after construction or modification has commenced if the construction is in accordance with the provisions of the registration certificate as submitted and approved by the Director under Article 13 hereof.

13.1 General provisions for the review of new sources.

13.1.1 Prior to the issuance of any registration certificates in accordance with this Article the applicant shall submit to the Director an environmental evaluation and any other information the Director may deem necessary to make an independent air quality impact assessment.

13.1.2 The preliminary intent to issue or deny issuance of a registration certificate for a complex source shall be made within 15 days after receiving adequate information for reviewing the registration application. The application, the Director's review and preliminary intent to issue or deny shall be made public and maintained on file with the Director during normal business hours at 201 South Fall Street, Carson City, Nevada and in the Air Quality Region where the source is located, at a site specified in a public announcement by the Director for thirty (30) days to enable public participation and comment. All comments on the Director's review and preliminary intent for issuance or denial shall be submitted in writing to the Director within 30 days after the public announcement. Within the time period prescribed by Article 3.2.4, the Director shall make his decision, taking into account written public comments on the Director's review and preliminary intent for issuing or denial, project proponent submittal and the effect of such a facility on the maintenance of the ambient air quality standards as contained in Article 12 and the control strategy contained in the Air Quality Implementation Plan.

13.1.3 The Director shall not issue a registration certificate for any source if the environmental evaluation submitted by the applicant, or if the Director determines, in accordance with the provisions of this Article, that the source will prevent the attainment and maintenance of the State Ambient Air Quality Standards or will cause a violation of the applicable control strategy contained in the approved Air Quality Implementation Plan.

13.1.4 The Director may impose any reasonable conditions on his approval, including conditions requiring the source owner or operator to conduct ambient air quality monitoring at the facility site for a reasonable period prior to commencement of construction or modification, and for any specified period after the source has commenced operation.

13.1.5 Where a proposed source located on contiguous property is constructed or modified in increments which individually are not subject to review as provided in this Article, all such increments occurring since the effective date of this Article shall be added together for determining the applicability of this Article.

13.1.6 Approval and issuance of a registration certificate to any source construction or modification shall not affect the responsibilities of the owner or owners to comply with any other portion of the control strategy.

13.1.7 Any source or proposed facility shall, upon written application to the Director, receive within thirty (30) days a written notice of his determination, either requiring the submittal of an environmental evaluation or exempting the source from such requirement.

13.4 Environmental Evaluation

13.4.1 The environmental evaluation required for new or modified single or complex sources, as determined by this Article or as required by the Director, shall include the following:

13.4.1.1 An environmental evaluation shall be a careful and detailed assessment of the environmental aspects of a proposed action.

13.4.1.2 An environmental evaluation shall contain adequate environmental safeguards to be implemented by the applicant to provide for the maintenance of acceptable air quality and shall consider:

a. Ambient air concentrations before, during and after construction, empirically calculated with recognized methods as approved by the Director; or, in the case of existing ambient air concentrations, they may be measured with approved methods at approved site locations for not less than one year. Estimates shall be empirically determined for ambient air concentration immediately contiguous to the facility and at the point of predicted maximum concentration within the surrounding region.

b. Diffusion models used to determine the location and estimated value of highest air contaminant concentration shall contain:

1. Assumptions and premises.
2. Evaluation at the recorded most adverse meteorological conditions in the last 100 years
3. Evaluation at the recorded most adverse meteorological conditions in the last year.
4. Geographic area considered in the evaluation.
5. Dispersion equations.
6. Predicted contaminant buildup.
7. Location, type and amount of emissions.
8. Meteorological information

c. Alternate proposals which could be implemented as conditions of approval.

d. Other probable environmental effects, before, during and after construction shall be considered in the narrative portion of the evaluation.

13.5 The following are exempt from Article 13.2:

1. Complex source or single sources existing prior to February 25, 1974 and remaining unmodified thereafter or those facilities which have received local approval and necessary building or construction permits by April 1, 1974, and commence a continuous program of construction before July 1, 1974

2. Those complex sources or single sources obtaining an exemption granted by the President under section 118 of the Clean Air Act of 1970.

APPENDIX C

WATER QUALITY

TABLE C-1

WATER QUALITY CHARACTERISTICS OF CITY OF LAS VEGAS, CLARK COUNTY SANIATION DISTRICT, AND ADVANCED WASTEWATER TREATMENT PLANT EFFLUENTS[1]

Effluent Parameter		City of Las Vegas T.P.	Clark Co. San. Dist. T.P.	Advanced Wastewater T.P.
BOD	mg/l	14.7	30.5	10
COD	mg/l	100-120[2]	128	40
PO_4-P	mg/l	9	10.7	0.5
T °C		22.7	25.2	25
D.O.	mg/l			5.0
PH	units	7.6	7.5	6.5-8.5
SS	mg/l	18.4	38	2.0
COLIFORM				200/100 ml

Notes: 1. Figures shown are 1973 averages unless otherwise shown.

Source Data: NECON

STATE OF NEVADA

WATER POLLUTION CONTROL REGULATIONS

ADOPTED BY THE STATE ENVIRONMENTAL COMMISSION

OCTOBER 24, 1973

DEPARTMENT OF HUMAN RESOURCES
BUREAU OF ENVIRONMENTAL HEALTH
CARSON CITY, NEVADA 89701

TABLE 44
WATER QUALITY STANDARDS
Lake Tahoe

Control Point
Existing sampling points

pH Units
Single Value. . . . . Within range 7.0 - 8.4

Dissolved Oxygen - % of Saturation
Single Value. . . . . Not less than 90

Chlorides - mg/l
Single Value. . . . . Not more than 5
Annual Average. . . . . Not more than 3

Soluble Phosphorus - ug/l
Annual Average. . . . . Not more than 7

Total Soluble Inorganic Nitrogen - ug/l
Annual Average. . . . . Not more than 25

Coliform Organisms - MPN/100 ml
A density not greater than the values shown in the following table:

	Median	Maximum
Undeveloped Lake Front areas		
10 yrds. offshore.	5	32
100 yrds. offshore.	3	15
Developed Lakefront Area		
10 yrds. offshore.	240	700
100 yrds. offshore.	15	64
Directly Influenced by Stream		
10 yrds. offshore.	240	700
100 yrds. offshore.	32	240

Temperature °C
Permissible temperature increase above natural receiving water temperature. . . . . .None

Algal Growth Potential - The mean annual algal growth potential at any point in the lake shall not be greater than twice the mean annual algal growth potential at a limnetic reference station and using analytical methods determined jointly with the Environmental Protection Agency, Region IX.

Plankton Count - number per ml
Average (June through September). . . . . Not to exceed 100
Single Value. . . . . Not to exceed 500

Specific Electrical Conductance - micromhos per cm at 20°
Annual Average. . . . . Not to exceed 95
Single Value. . . . . Not to exceed 105

Clarity - The vertical extinction coefficient of less than 0.08 per meter when measured at any depth below the first meter, and a turbidity less than 3 Jackson Units at any point of the lake too shallow to determine a reliable extinction coefficient.

TABLE 45
WATER QUALITY STANDARDS
Colorado River

Control Point
One mile below Willow Beach Resort and various points in Lake Mead

Temperature °C
Average (June through September). . . . . Not more than 16
Summer Single Value . . . . . Not more than 15
Winter Single Value . . . . . Not more than 14
Allowable temperature increase above natural receiving water temperatures. . . . . None when water temperature is greater than or equal to 14°C.
1° when water temperature i less than or equal to 13°C.

pH Units
Annual Median . . . . . Within range 7.5 - 8.2
Single Value. . . . . Within range 7.0 - 8.5

Dissolved Oxygen - mg/l
Average (June through September). . . . . Not less than 6.0
Single Value. . . . . Not less than 5.0

BOD - mg/l
Single Value. . . . . Not more than 2

Phosphates (PO_4)
(Pending further analysis)

Nitrates (NO_3) - mg/l
Single Value. . . . . Not more than 7
Annual Average. . . . . Not more than 4

MF Coliforms/100 ml (Average of the last five samples)
Maximum value of 1000 if MF Fecal Streptococci are less than 100.
Maximum value of 500 if MF Fecal Streptococci are less than 20.
To apply to all swimming areas of the Colorado River within Nevada.

The "Guidelines for Formulating Water Quality Standards for the Interstate Waters of the Colorado River System" as adopted January 13, 1967, are incorporated as a supplement to the standards for this stream (Appendix A).

The salinity standard for the Colorado River System is included in Appendix B.

TABLE 46
WATER QUALITY STANDARDS
Colorado River

Control Point
Gage Station located half a mile downstream from Davis Dam

Temperature °C
Average (June through September). . . . . Not more than 20
Summer Single Value . . . . . Not more than 25
Winter Single Value . . . . . Not more than 16
Allowable temperature increase above natural receiving water temperatures. . . . . Not more than 1

pH Units
Annual Median . . . . . Within range 7.5 - 8.0
Single Value. . . . . Within range 6.5 - 8.5

Dissolved Oxygen - mg/l
Average (June through September). . . . . Not less than 6.0
Single Value. . . . . Not less than 5.0

BOD - mg/l
Single Value. . . . . Not more than 3

Phosphates (PO_4) - mg/l
(Pending further analysis)

Nitrates (NO_3) - mg/l (tentative)
Single Value. . . . . Not more than 7.0
Annual Average. . . . . Not more than 5.0

The "Guidelines for Formulating Water Quality Standards for the Interstate Waters of the Colorado River System" as adopted January 13, 1967, are incorporated as a supplement to the standards for this stream (Appendix A).

The salinity standard for the Colorado River System is included in Appendix B.

TABLE 47
WATER QUALITY STANDARDS
Las Vegas Wash

Control Point
North Shore Road (No sampling will be required upstream of the control point if the regulations are satisfied at the control point.)

Temperature °C
Monthly Mean. . . . . Less than 32
Single Value in 90% of samples. . . . . Less than 35

pH Units
Monthly Median . . . . . Within range 6.5 - 8.5
Single Value in 90% of samples . . . . . Within range 6.5 - 8.5

Dissolved Oxygen - mg/l
Monthly Mean . . . . . Not less than 5.0
Single Value in 90% of samples . . . . . Not less than 4.0

BOD_5 - mg/l
Monthly Mean . . . . . Not more than 10.0
Single Value in 90% of samples . . . . . Not more than 15.0

COD - mg/l
Monthly Mean . . . . . Not more than 40.0
Single Value in 90% of samples . . . . . Not more than 50.0

SS - mg/l
Monthly Mean . . . . . Not more than 2.0
Single Value in 90% of samples . . . . . Not more than 5.0

MBAS - mg/l
Monthly Mean . . . . . Not more than 0.8
Single Value in 90% of samples . . . . . Not more than 1.0

Phosphorus as P - mg/l
Monthly Mean . . . . . Not more than 0.5*
Single Value in 90% of samples . . . . . Not more than 1.0*
*But not to exceed 400 pounds/day during April through October

Turbidity - JTU
Monthly Mean . . . . . Not more than 5.0
Single Value in 90% of samples . . . . . Not more than 10.0

Fecal Coliform - The fecal coliform concentration, based on a minimum of 5 sample during any 30-day period, shall not exceed a geometric mean of 200 per 100 milliliters, nor shall more than 10% of total sample during any 30-day period exceed 400 per 100 milliliters.

The beneficial uses to be protected in the Las Vegas Wash are as follows: Fish and wildlife, esthetics, irrigation and stock watering and recreation.

AMENDMENTS TO NEVADA'S
WATER POLLUTION CONTROL REGULATIONS

I. Amend Article 3.2.2 to read:

The duration of permits may be variable, but shall not exceed 5 years. The expiration date shall be recorded on each permit issued. A new application must be filed with the Department to obtain renewal or modification of a permit. Applications for renewal shall be filed at least 180 days prior to expiration of permit.

II. Amend Article 3.3.2 to read:

Authorized representatives of the Bureau of Environmental Health shall be permitted access to the premises of all facilities owned or operated by the permittee at all reasonable times for the purpose of making inspections, surveys, collecting samples, obtaining data, and carrying out other necessary functions related to the permit.

III. Amend Article 3.4.1 by adding the following sentence after the fifth sentence of Article 3.4.1: "In the case of a municipal, State, or other public facility the application must be signed by either a principal executive officer, ranking elected official, or other duly authorized employee."

IV. Add the following section to Article 3:

3.9 Emergency Powers

In accordance with the powers granted in subsections 1, 9 and 12 of NRS 445.214 and NRS 445.317, 445.321, 445.324, 445.327, 445.331, 445.334 and 33.010, the Director may take any appropriate action authorized under the Nevada Water Pollution Control Law against a pollution source or any combination of sources which the Director has evidence is presenting an imminent and substantial endangerment to the health or welfare of persons, where such endangerment is to the livelihood of such persons.

V. Amend 4.1.2(d) by adding the following paragraph:

The presence of toxic materials in a water shall be evaluated by use of a 96-hour bioassay. Survival of test organisms shall not be less than that in control tests which utilize appropriate experimental water. Experimental water shall be obtained from the most upstream control point in the stream system, or laboratory water with quality closely approximating that of the most upstream control point, or other appropriate experimental water defined by the State and concurred in by EPA. Failure to determine presence of toxic substances by this method shall not preclude determination of excessive levels of toxic substances on the basis of other criteria or methods.

VI. Amend Table 22 (Virgin River) and Table 23 (Beaver Dam Wash) in Article 4.2.5 by adding:

Color

Color shall not exceed that characteristic of natural conditions by more than 10 units Platinum Cobalt Scale.

Turbidity

Turbidity shall not exceed that characteristic of natural conditions by more than 10 Jackson Units.

VII. Amend Table 44 (Lake Tahoe) in Article 4.2.5 by adding:

Turbidity

In order to minimize turbidity levels in the Lake and tributary streams and control erosion:

1. The discharge of solid or liquid waste materials including soil, silt, clay, sand, and other organic and earthen materials to Lake Tahoe or any tributary thereto, is prohibited.

2. The discharge of solid or liquid waste materials including soil, silt, clay, sand, and other organic and earthen materials to lands below the high water rim of Lake Tahoe or along any tributary to Lake Tahoe in a manner which will cause the discharge of such waste materials to Lake Tahoe or any tributary thereto, is prohibited.

3. The placement of material below the high water rim of Lake Tahoe or along any tributaries to Lake Tahoe, in a manner which will cause the discharge of solid or liquid waste materials including soil, silt, clay, sand and other organic and earthen materials to Lake Tahoe or any tributary thereto, is prohibited.

VIII. Amend Table 45 (Willow Beach Colorado River) in Article 4.2.5 by replacing the coliform standard and adding color, turbidity and phosphate standards by adding:

Phosphates (PO_4) - mg/l

Annual Average.....not more than 0.040
Maximum value in 90% of samples.....not more than 0.060

Color

Color shall not exceed that characteristic of natural conditions by more than 10 units Platinum Cobalt Scale.

Turbidity

Turbidity shall not exceed that characteristic of natural conditions by more than 10 Jackson Units.

Fecal Coliform

The fecal coliform concentration, based on a minimum of 5 samples during any 30-day period shall not exceed a geometric mean of 200 per 100 milliliters, nor shall more than 10% of total samples during any 30-day period exceed 400 per 100 milliliters.

IX. Amend Table 46 (Colorado River below Davis Dam) in Article 4.2.5 by replacing the coliform standard and adding color, turbidity and phosphate standards by adding:

Phosphates (PO_4) - mg/l

Annual Average.....not more than 0.060
Maximum value in 90% of samples.....not more than 0.100

Color

Color shall not exceed that characteristic of natural conditions by more than 10 units Platinum Cobalt Scale.

Turbidity

Turbidity shall not exceed that characteristic of natural conditions by more than 10 Jackson Units.

Fecal Coliform

The fecal coliform concentration, based on a minimum of 5 samples during any 30-day period shall not exceed a geometric mean of 200 per 100 milliliters, nor shall more than 10% of total samples during any 30-day period exceed 400 per 100 milliliters.

X. Amend the temperature standard in Table 47 (Las Vegas Wash) in Article 4.2.5 to read:

Temperature - °C

Monthly mean - June 1 to September 30.....not more than 27°
October 1 to May 31.....not more than 23°

Single value in 90 percent of samples:
June 1 to September 30.....not more than 31°
October 1 to May 31.....not more than 27°

XI. Amend Article 4.2.5 by adding the following table:

TABLE 48
WATER QUALITY STANDARDS
Pyramid Lake

Control Point - Various Points

Temperature - °C

Permissible temperature increase above natural receiving water temperature.....not more than 2

pH Units

Single value.....6.5 - 9.0

Dissolved Oxygen - mg/l

Single value.....not less than 6

Fecal Coliform

The fecal coliform concentration, based on a minimum of 5 samples during any 30-day period, shall not exceed a geometric mean of 200 per 100 milliliters, nor shall more than 10% of total samples during any 30-day period exceed 400 per 100 milliliters.

XII. Amend Article 4.2.5 by adding the following table:

TABLE 49
WATER QUALITY STANDARDS
Walker Lake

Control Point - Various points

Temperature - °C

Permissible temperature increase above natural water temperature.....not more than 2

Dissolved Oxygen - mg/l

Single value.....not less than 6.0

Fecal Coliform

The fecal coliform concentration, based on a minimum of five samples during any 30-day period, shall not exceed a geometric mean of 200 per 100 milliliters, nor shall more than 10% of total samples during any 30-day period exceed 400 per 100 milliliters.

XIII. Add the following as a footnote to the phosphate standard in Tables 45 and 46:

> Interpretation of this standard shall not be construed to restrict the phosphorus passing the North Shore Road control point as defined in Table 47, i.e., monthly mean of not more than 0.5 mg/l as P and single value in 90% of samples of not more than 1.0 mg/l as P but not to exceed 400 pounds/day during April through October.

ADOPTION: NOW, THEREFORE, by affirmative vote of the Nevada State Environmental Commission, these Water Pollution Control Regulations are hereby revised and compliance therewith ordered.

To become effective _____, 1974.

_____

Norman Glaser, Chairman
Environmental Commission

APPENDIX D

SUPPLEMENTAL INFORMATION

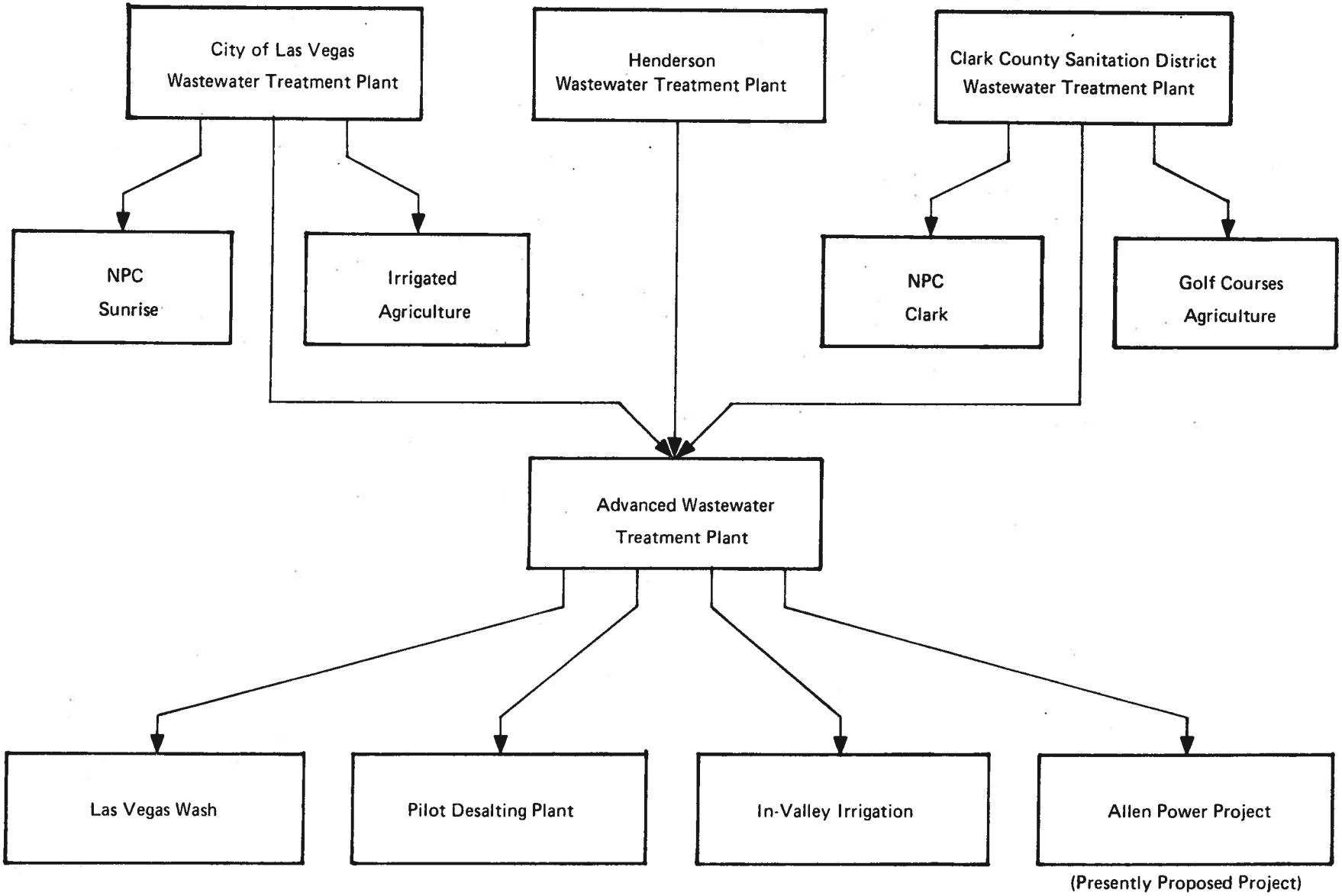


FIGURE D.1

LAS VEGAS VALLEY
WATER RESOURCES MANAGEMENT PLAN

March 5, 1974

VTN Consolidated, Inc.
2301 Campus Drive
Irvine, California 92664

Attention: Mr. Chris Caliendo

Dear Mr. Caliendo:

The following is the Archaeological Impact for the Collection Pipeline: AWT and Desalting Plants Site

The right-of-way was walked from the Henderson sewage treatment ponds to the Las Vegas sewage treatment plant, with the exception of two areas; 1) in East Las Vegas where the right-of-way passes through an area of heavy concentration of houses and other buildings, 2) and the area under cultivation by L.D.S. Farm and Clark County Rehabilitation Farm. The East Las Vegas area has been thoroughly disturbed by construction and if sites were once there, they would be completely destroyed unless completely buried and not recognizable from a surface survey. The agricultural area has also greatly modified the surface and has such heavy vegetation that the surface of the ground cannot be adequately observed. The agricultural area was spot checked at several localities, but no indication of archaeological remain were discovered.

The remaining part of the right-of-way was walked by one or more persons who systematically passed back and forth across the width of the right-of-way. Where possible indications were found, intrusion observations were undertaken in order to determine the significance if any.

Two areas where impact will occur on archaeological sites were located. Both were adjacent to the Boulder highway between Russell Road and where the right-of-way angles away from the Boulder highway toward the Henderson Sewage treatment ponds.

Site 1 is a fragile pattern site consisting of stone artifacts and flakes scattered over an area of several hundred feet in diameter. These artifacts are essentially in place, as left by their makers. They are, however, on the surface of the ground and will be destroyed by heavy equipment passing over the area or by indiscriminate collecting. This site is very important because it is

a rare type about which we know very little. Salvaging the archaeological data from this site rather than attempting preservation is recommended for two reasons: 1) the salvage operation requires mapping, collecting, and very limited excavation, and is consequently inexpensive, 2) this site has been preserved by shear accident. There is no reason to believe that, other construction, vandalism, or off-road vehicles will not destroy it in the near future.

Site 2 is located on the southeast corner of Russell Road and the Boulder Highway, in and adjacent to several small sand dunes. It consists of an aboriginal and perhaps an historic occupation covering an area about 250 feet in diameter. The aboriginal occupation is indicated by the occurance of pot sherds from two cultures (Pueblo and Lower Colorado), a mortar fragment, a projectile point, and a scattering of waste flakes.

The historic component is indicated by what appears to be two areas where semi-permanent structures (perhaps tents) were located. This occupation may be as late as World War II when there was a large influx of people into Las Vegas Valley and inadequate housing. There are very few written records regarding the life ways of the people who literally lived in the desert (while working in the Henderson plant) until houses could be provided. The archaeology of these camps can fill in a rather large gap in the history of Las Vegas.

Recommendation for this site at this time is a small series of test excavations to determine the significance of the occupation. The nature of the deposits (drifting sand) and recent trash in the area tend to obscure the surface indications. A series of test pits can provide additional data needed to determine the nature of the occupations, the extent of the impact on the archaeological and historical remains, and provide a basis for making further recommendations regarding excavations.

A third site is an historic house on the corner of Dodd and Missouri Streets in East Las Vegas. Proper research has not yet been undertaken on the history of this house because of the lack of time. This however, may be the Whitney house which is the earliest house in East Las Vegas (formerly Whitney). This house may not be directly on the right-of-way, but on the opposite side of Missouri Street. At this time, further research is needed to evaluate the structure and in lieu of this research steps should be taken to insure its protection from accidental destruction during the construction of the pipeline.

No other areas of impact on archaeological or historic resources were noted on the collection pipeline.

Very truly yours,

Claude N. Warren

CNW:dc

March 13, 1974

VTN CONSOLIDATED, INC.
2301 Campus Drive
Irvine, Cal. 92664

Attention: Mr. Jim Saucerman

Dear Mr. Saucerman:

The following is the Paleontological impact for the Las Vegas wash pollution abatement collection pipeline: AWT and desalting plant site.

A Field survey of the Las Vegas wash pollution abatement project was conducted on February 23 thru March 2, 1974 by C. Bernard Caliendo, Prof. C. Warren, and students from the University of Nevada at Las Vegas. No evidence of fossil remains were observed and it is felt that further surveys will not be neccessary on this project. During excavation, isolated fossils may be discovered in the Quaternary (recent to 1 million years ago) alluvial deposits consisting mainly of unconsolidated and consolidated conglomerates of sand, gravel and boulders. For location of alluvial deposits, note geologic map in appendix. Isolated animals could have been trapped in mudflows of this material and may have been preserved as fossils.

No known sites are threatened by the project: however, there is a possibility of uncovering an isolated fossil deposit in the alluvial material. The Geology Department at the University should be provided with the excavation plans and tentative schedule of operation. They should be permited to periodically inspect the trench and be permited to excavate any fossil discovery in a scientific manner.

If I can be of any further help to you, please let me know. I thank you for contacting me.

Sincerely Yours,

C. Bernard Caliendo

C. Bernard Caliendo

Field Associate
Vertebrate Paleontology
Natural History Museum of Los Angeles

SELECTED REFERENCES

I. C. R. Longwell, E. H. Pampeyan, Ben Bowyer, R. J. Roberts. 1965 Geology and Mineral Deposits of Clark County, Nevada. Bulletin 62 Nevada Bureau of Mines.

II. Converse, Davis and Associates. 1972 Project Report NO. N-72-841-AH 3.

III. Verbal Communication, University of Nevada at Los Vegas, Geology Department and University Museum.

The Las Vegas Formation is described as being late pleistocene, approximately 7,500 to 40,000 years ago in age. It consists of light-colored deposits of clay, silt and mudstone in the horizontal layers interbeded and cut by lenses of water warm gravel and sand. The nature of these deposits and the assemblage of fossils from streams, lake or lacustrine, and terrestrial environments suggests that the environment at the time of deposition of these sedements had more abundent rainfall then currently found in the area. The area altered from a stream or wide flood plain which transported and redeposited terrestrial fossils to a lake or locustrine environment. Possibly these streams connected a series of shollow lakes. The altering of these environments gives evidence that there has been probable tectonic moving or tilting of the earths surface in the Las Vegas area during this period.

Many fossils have been recovered from this deposit. These fossils are more commonly called Ice Age fossils and are very similar to those found in the Rancho La Brea Tar Pits in California. They are placed in the Wisconsinan stage. The fossils are more commonly: freshwater mollusks, horse, camel, mammoths, bison, sheep and deer. Any excavation of this formation should have a qualified paleontologist to observe and excavate any fossils discovered in a scientific manner. Distribution of Las Vegas formation can be found in Geologic age in Appendix.

University Nevada, Nevada State Museum Anthropological Paper No. 13, October 1967, Pleistocene Studies in Southern Nevada.

April 16, 1974

VTN Consolidated, Inc.
2301 Campus Drive
Irvine, California 92664

Attention: Mr. Chris Caliendo

Subject: Preliminary Archaeological Survey of Pilot Desalination Plant Site at Big Springs (Las Vegas Valley Water District) and Stage I In-Valley Irrigation System

Dear Mr. Caliendo:

This is a preliminary survey of the proposed in-valley irrigation pipeline system, Phase I and the proposed desalination plant at Big Springs. As such, this report indicates only where some of the archaeological resources will be impacted by construction and recommends that an intensive archaeological survey be completed after the right-of-way has been established. At the present time it is only possible to indicate areas where there are known concentrations of sites because the boundaries of the right-of-way have not been established.

This survey was conducted in 3 days of field work which did not allow time for a complete walk-over of the entire right-of-way. Furthermore, since the exact location of the right-of-way was unknown, it was often impossible to determine which side of the road it would follow. Therefore, this preliminary survey was carried out in the following manner:

1) The entire right-of-way was examined superficially from an automobile and areas where archaeological resources were felt most likely to occur were noted.

2) Portions of the right-of-way were then selected for their assumed high potential for archaeological resources.

3) The selected portions of the right-of-way were then walked by two persons, ten to twenty yards apart, who followed a zig-zag pattern across the general area of the right-of-way.

The following areas were surveyed:

1) From Flamingo Road south along McLeod Street (or easement) to Eldorado Lane, except for area of Sunset Park.

2) From Flamingo Road north along Eastern Avenue to Tropicana Wash.

3) From Paradise Road west along Tropicana Wash to the Tropicana Golf Course.

4) Small open area along Twain, behind the Sands Hotel.

5) The site of the desalination plant on Las Vegas Valley Water District property at Big Springs.

The results of these investigations are as follows:

The area along McLeod between Flamingo Road and Patrick Avenue contained only scattered and very limited archaeological remains. However, south of Patrick Avenue to the end of the pipeline the archaeological resources are dense (Map 1). These archaeological resources are known to correspond rather closely with the distribution of Mesquite and sand dunes along the northern edge of Duck Creek Valley. They extend for several miles east and west of the proposed pipeline route so that it would appear that some impact of these resources is inevitable if the pipeline is to serve Sunset Park.

The sites in this area vary from prepottery to historic Paiute occupations, and are usually in sand dunes often being several feet in depth. This is a critical area of archaeological resources for the Las Vegas Valley. A more intensive survey is necessary after the right-of-way has been established.

The area from Flamingo Road north along Eastern Avenue to Tropicana Wash yielded no archaeological resources.

The area from Paradise Road west along Tropicana Wash to the Tropicana Golf Course yielded no archaeological resources. However, this area has been badly disturbed by construction and landfill. An old spring mound is located just east of the Tropicana Golf Course and could have provided water for prehistoric man and animals. This is a potential archaeological and paleontological site site. Intensive investigation of this locality is needed.

The area on Twain Avenue behind the Sands Hotel yielded no archaeological resources.

The site of the desalination plant at Big Springs (# 3 on Map 2) is in close proximity to both historic and prehistoric sites (#'s 1 & 2 on Map 2). An archaeological resource inventory of the property has been made (Warren et al 1972) and has shown that man occupied the area rather intensively for many hundreds of years. The planned location of the desalination plant is in a highly disturbed area. However, it must be noted that the area is a "highly sensitive" one in that additional roads, pipelines, etc., as well as the construction activities could have considerable impact on these resources which are of great value.

When the plans for the desalination plant are complete in detail (including additional roads, pipelines, etc.) a very careful and intensive study of possible impact must be made.

The remaining portions of the right-of-way have yet to be properly investigated. What this preliminary survey has shown is that there are archaeological resources that will be impacted by the pipeline construction. The quantity of resources and the degree of impaction remains to be defined. Therefore, a thorough archaeological survey of the entire right-of-way must be undertaken once the right-of-way has been established. Until the right-of-way is established and the survey completed, we can not provide specific data on location of resources and the extent of projected destruction to them.

Very truly yours,

Claude N. Warren

CNW:vah

REPORT TO THE BOARD OF COUNTY COMMISSIONERS
BY THE
LAS VEGAS WASH DEVELOPMENT COMMITTEE

TABLE OF CONTENTS

Section	Title	Page
	Recommendations	i
I.	Authority	1
II.	Introduction	1
III.	Description of Las Vegas Wash	3
IV.	Recommended Boundaries of the Las Vegas Wash Wildlife Education/Recreation Area	4
V.	Educational/Recreational Development Goals	8
VI.	Acquisition and Control	11
VII.	Funding	13
VIII.	Managing Agency	13

List of Maps	Following Page
Location of Las Vegas Wash Recreation Area	3
Tentative Boundary of Las Vegas Wash Recreation Area	4
Land Ownership Within Las Vegas Wash Recreational Area	4
Zoning Within Las Vegas Wash Recreational Area	5
Flood Plain Within Las Vegas Wash Recreational Area	6
Educational and Recreational Facilities Within Las Vegas Wash Recreational Area	8
Significant Natural and Man-made Features	8

Appendices

1. Las Vegas Wash and Rainbow Gardens - Potential State Parks
2. Letter from John L. Meder Regarding Senate Bill No. 333
3. Youth Opinion Poll Concerning Wash Development, Undertaken by David Wright, Member of Boy Scouts of America

Appendices (continued)

4. Communication from Bobby Williams, Las Vegas Motocross Club and Nevada TT Association

5. Letter from Paul Howard Regarding National Audubon Society Support for Las Vegas Wash

6. Letter to Mr. Robert Stringer Regarding Land Acquisition

7. Letter to Mr. Glen Taylor, Basic Management, Inc., Regarding Land Acquisition

8. Letter from Mr. John Donaldson, Nevada Department of Fish and Game, Regarding Wildlife and Hunting Use in the Las Vegas Wash Area

9. Resource Persons and Agencies

10. Footnotes

Tables

1. Las Vegas Wash Habitats and Communities

2. Major Federal Aid Programs for Parks and Recreation

3. Outline of State Organization and Recreation Functions

RECOMMENDATIONS

1. The Las Vegas Wash Development Committee recommends this report be forwarded to the proper governmental agencies with the request that they review it and initiate actions to implement the proposed program.

2. We recommend the water release of 19 million gallons per day, presently believed required in summer months, and 3 million gallons per day, presently believed required in winter months, to maintain the ecological system of the Wash. This is an annual average of 10 million gallons per day. However, since the exact required flow is unknown and the above amounts are only best estimates at this time, we believe Recommendation No. 3 is very pertinent.

3. We recommend that the Wash be monitored for the ecological effect of management procedures for a number of years until a stable effect of management is reached. Scientists and consultants cannot tell us the exact effect their best estimates of water requirement calculations will produce on wildlife habitat in the Wash. If effects are undesirable, the monitoring program may provide clues to the corrective action that can be taken. A monitoring program would also provide accurate flow needed to maintain the desired habitat.

4. The Committee strongly recommends that the Board of County Commissioners request the assistance of the Las Vegas Valley Conservation District Board of Supervisors in gathering resource data in a soil survey of the Las Vegas Wash area outlined in this report. We suggest the survey include the following:

   A. Water management interpretation.
   B. General soils map.
   C. Some engineering interpretation.
   D. Urban use interpretation.
   E. Selective recreation and wildlife interpretation.

   We feel this recommendation is mandatory for land-use planning in the area. It is a vital first step in development of a wildlife-oriented recreation area. It will also give a more accurate basis for land values. Taking into account volunteers to be trained by the Soil Conservation Service at no cost, the computer fee (under $500) is the only cost of such a soil survey.

5. We recommend the County undertake an archaeological inventory in the Wash area. Such an inventory would record any archaeological sites and historical data. If significant sights are discovered by an archaeological survey crew, they would recommend preservation, protection, or salvage. Dr. Richard Brooks, Director of Archaeological Survey, University of Nevada, Las Vegas, estimates that such an archaeological and historical inventory would cost from $1000 to $1500. It is possible that volunteers could assist in this survey also. Dr. Brooks is willing to donate some of his time to this project.

6. We recommend that a first priority of the managing agency of the Las Vegas Wash Wildlife Education/Recreation Area be the establishment of a use ceiling within various areas. The unique benefits of the Wash to the community depend upon its natural, wild character. This character is easily eroded by man's use.

7. We recommend that an advisory committee such as the Las Vegas Wash Development Committee continue to function. Such a committee could perform the following functions:

   A. Investigate and recommend funding possibilities from private foundations and national societies.

   B. Coordinate development efforts of volunteer associations, other participating agencies, and the managing agency.

   C. Preserve the intent of this proposal - the preservation of the natural character of Las Vegas Wash as a community educational/recreational resource.

Having been referred to REPORT, COLORADO RIVER WATER QUALITY IMPROVEMENT PROGRAM - STATUS REPORT, JANUARY, 1974, U. S. DEPARTMENT OF INTERIOR, BUREAU OF RECLAMATION, we believe that at this time accommodation of a salinity control project in the Wash area is compatible with these recommendations.

I. AUTHORITY

At its August 6, 1973, meeting, the Board of County Commissioners, recognizing the importance of the possible future development of the Las Vegas Wash as a park, bird sanctuary, or other beneficial development, authorized the formation of the Las Vegas Wash Development Committee.

This report is the culmination of that committee's work since that time. The committee is submitting this report now in order that it can be included within a comprehensive plan for wastewater management.

II. INTRODUCTION

Las Vegas is home to over one-third of a million people today. It is a rapidly urbanizing area, with the problems inherent to that condition. But Las Vegas has one unique advantage over similar areas elsewhere:

> *"Within easy bicycling distance from its main drags and sprawling housing developments, boys can spend Saturday catching a mess of bluegills, bass and perch. Horse paths wind through thickets of tamarisk and along the banks of ponds where dabble ducks upend to bill for tidbits in the bottom mud.*
>
> *"There is this primitive area where the old folks and the kids can have a Sunday picnic under an athol tree or weeping willow by a ten foot water fall. In the pond above, teal busy themselves in the tight cover of the cattails and marsh grass. Great blue herons fish for minnows and frogs. Ibis and rails and phalaropes and avocets wade the shallows, while killdeer and sandpipers run the shores in search of food. In the trees and bushes are silky flycatchers, and blackbirds by the hundreds. Overhead soars an occasional hawk. There also are coyotes and badgers, but only the lucky ones see them.*
>
> *"It is called a poor peoples' wilderness, a legacy park, an urban wetland recreation area. But you know it as Las Vegas Wash."* [1]

Many Clark County residents have, for years, recognized the potential educational and recreational values of Las Vegas Wash. Bill Vincent's description is only part wishful thinking the flowing water, tamarisk thickets, marshlands, ponds, and diverse biota are already there. Families of hikers and amateur geologists have found the wild paths of the lower Wash. Horseback riders and cyclists are frequent visitors. Birdwatchers and hunters have found the numbers and variety of ducks, geese, and shorebirds around the existing marsh and ponds to be an amazing desert anomaly. Classes of students have been taken to the Wash for nature lessons, plant and biota collections and identifications, and other aspects of

environmental education. Youth groups have initiated natural history projects there. The area is, in fact, considered by many as an oasis in the desert.

The task faced by this Committee was to come up with some guidelines for the development of the full recreational and educational potential of this unique area. We are not the first group to have formally considered such development. In POTENTIAL STATE PARKS IN CLARK COUNTY, NEVADA (Appendix 1), Ribera and Sue list the lower portion of the Wash as a *"marsh preserve"* which could be managed through the Department of Fish and Game in coordination with the Nevada State Parks System. The boundaries they give are very similar to those developed by the Wash Development Committee, with a central section running from the lower Basic Management, Inc., tailing ponds about three miles downstream to the *"narrows."* This report suggests later acquisition of a corridor along the Wash downstream of the narrows for connection to the Lake Mead National Recreation Area. They also support later acquisition of the approximately 320 acres of BMI *"upper ponds,"* contending that *"increase in the surface area of open water would increase species diversity and improve the interpretive value of the area."* [2]

The U. S. Fish and Wildlife Service conducted a biological ascertainment of Las Vegas Wash. The Service found the area to be of vast urban benefit in recreational/educational application to both wildlife resources and habitat.

Surveys by the National Outdoor Recreation Resources Review Commission[3] have shown that the availability of water is a prime factor in the enjoyment of most outdoor recreation. In a desert environment, however, water is a valuable natural resource, and to recycle and preserve this resource through planned wetlands development is an important additional function.

Gordon Culp *et al*, in WATER RESOURCE PRESERVATION BY PLANNED RECYCLING OF TREATED WASTEWATER,[4] stresses the importance of *"controlled indirect reuse,"* which includes not only the natural safeguards of dilution of wastes and separation in time and space from effluent source to later potable reuse, but which also depends on the most recent developments in advanced waste treatment (AWT):

> *"The addition of AWT techniques to conventional treatment processes greatly reduces the pollution load to be assimilated by the receiving waters and, in turn, increases the efficiency and reliability of the natural purification processes."*

Even the 1972 FEDERAL WATER POLLUTION CONTROL ACT recognizes the importance of managing treated effluents in this way. In the section entitled *"Grants for Construction of Treatment Works,"* it states that:

> *"The Administrator shall encourage waste treatment management which combines 'open space' and recreational considerations with such management."* [5]

In summary, the actual effectiveness of the Wash for recreational and educational use depends primarily upon four factors which are:

A. Proximity to people.
B. Suitability for recreational land use.
C. Physical and legal accessibility to the water and adjoining lands, and
D. Provision of recreational/educational facilities.

III. DESCRIPTION OF LAS VEGAS WASH

Las Vegas Wash originates in the mountains about 28 miles north of the City of Las Vegas and continues southeastward for about 42 miles to the Colorado River. It is the chief drainage channel of the 1,590 square-mile drainage basin known as *"Las Vegas Valley."* For the purposes of this Committee, the Wash was considered to be that portion beginning at the City of Las Vegas Wastewater Treatment Plant on Vegas Valley Drive and ending 11 miles downstream beyond North Shore Road where it flows into the Las Vegas Bay Arm of Lake Mead (Please refer to the location map on the following page.).

Before the Wash was used for wastewater flows, it was an ephemeral desert stream following natural drainage patterns which have been in existence for 15,000 to 30,000 years. As this region became increasingly arid, the natural Wash became intermittent. However, with increases in regional growth and water use, the Wash became the principal channel for removal of much of the treated municipal and industrial wastewater produced in the Las Vegas Valley. The present wastewater flow of more than 40 million gallons per day (MGD) supports a perennial, densely vegetated marsh of about 2000 acres, with a diverse and abundant wildlife population. In addition to the domestic and industrial discharges, the Wash receives measureable groundwater flows from the Valley's near-surface aquifer and from waste disposal sources in the Henderson industrial area. These flows are documented in the Desert Research Institute report entitled RECONNAISSANCE ANALYSIS OF EFFECTS OF WASTEWATER DISCHARGE ON THE SHALLOW GROUNDWATER FLOW SYSTEM.[6]

No long-term flood history is available for the Wash because stream-gauging stations were not maintained on any of its tributaries until approximately a decade ago.

Ecological studies in the Wash area have been made. Bradley and Niles[7] developed a faunal list which includes two fish, five amphibians, 28 reptiles (one tortoise, 12 lizards, 15 snakes), and 41 mammals (one shrew, 12 bats, 16 rodents, two rabbits, nine carnivores, and a bighorn sheep).

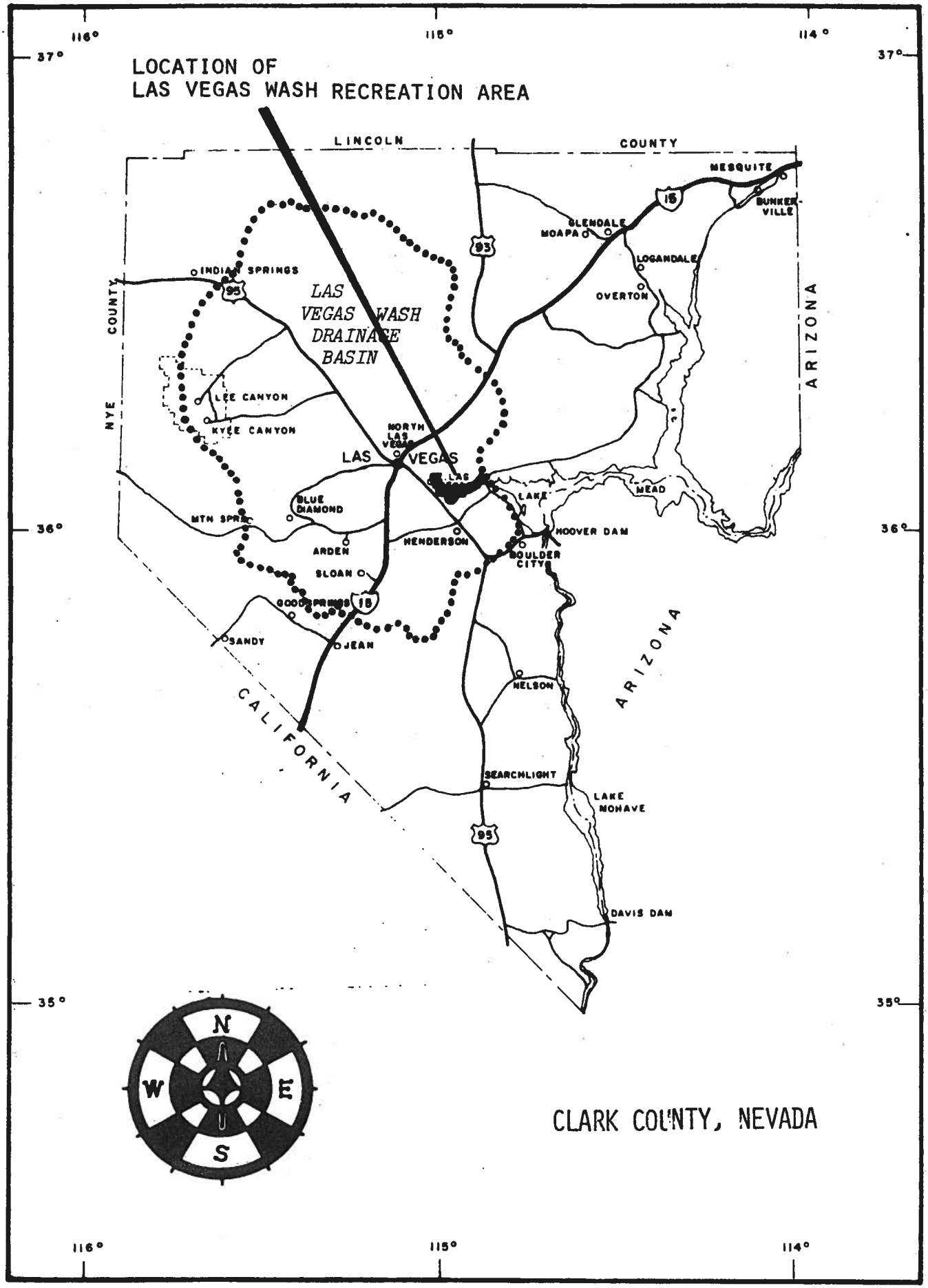

LOCATION OF
LAS VEGAS WASH RECREATION AREA
LINCOLN COUNTY
NYE COUNTY
ARIZONA
CALIFORNIA
LAS VEGAS WASH DRAINAGE BASIN
116°
115°
114°
37°
36°
35°
MESQUITE
BUNKERVILLE
BLENDALE
MOAPA
LOGANDALE
OVERTON
INDIAN SPRINGS
LEE CANYON
KYLE CANYON
NORTH LAS VEGAS
LAS VEGAS
LAKE MEAD
BLUE DIAMOND
MTN SPRG
ARDEN
HENDERSON
HOOVER DAM
BOULDER CITY
SLOAN
GOODSPRINGS
SANDY
JEAN
NELSON
SEARCHLIGHT
LAKE MOHAVE
DAVIS DAM
15
93
95
N
W
E
S
CLARK COUNTY, NEVADA

FIGURE 1

C. S. Lawson's survey of the bird life of the Wash[8] lists 248 species of birds. He claims this figure represents 65 percent of the species known to have occurred in Nevada, including prehistoric records and species now extinct.

Of those species surveyed by Bradley and Niles, about 42 percent are waterfowl or shore birds which are dependent upon the marshlands and ponds of the Wash. Another 37 percent are perching birds which utilize the Wash for watering and shelter.

The flora list of species found in the Wash lists 48 common-to-abundant plant species, 28 of which are characteristic of desert communities, while 15 are characteristic of stream, river, and marsh habitats. The Bradley and Niles report classified the Las Vegas Wash habitats and communities by moisture needs (Table 1).

Aquatic life in the Wash has been documented.[9] In addition to mosquito fish and carp fish, there is presently a wide diversity of invertebrates in the water and the bottom sediment including snails, micro-crustaceans, insect nymphs, larvae, and aquatic adults. Much of this fauna is considered to be *"pollution tolerant."* However, with improved water quality, the development of a more diverse, clean-water fauna would be favored.

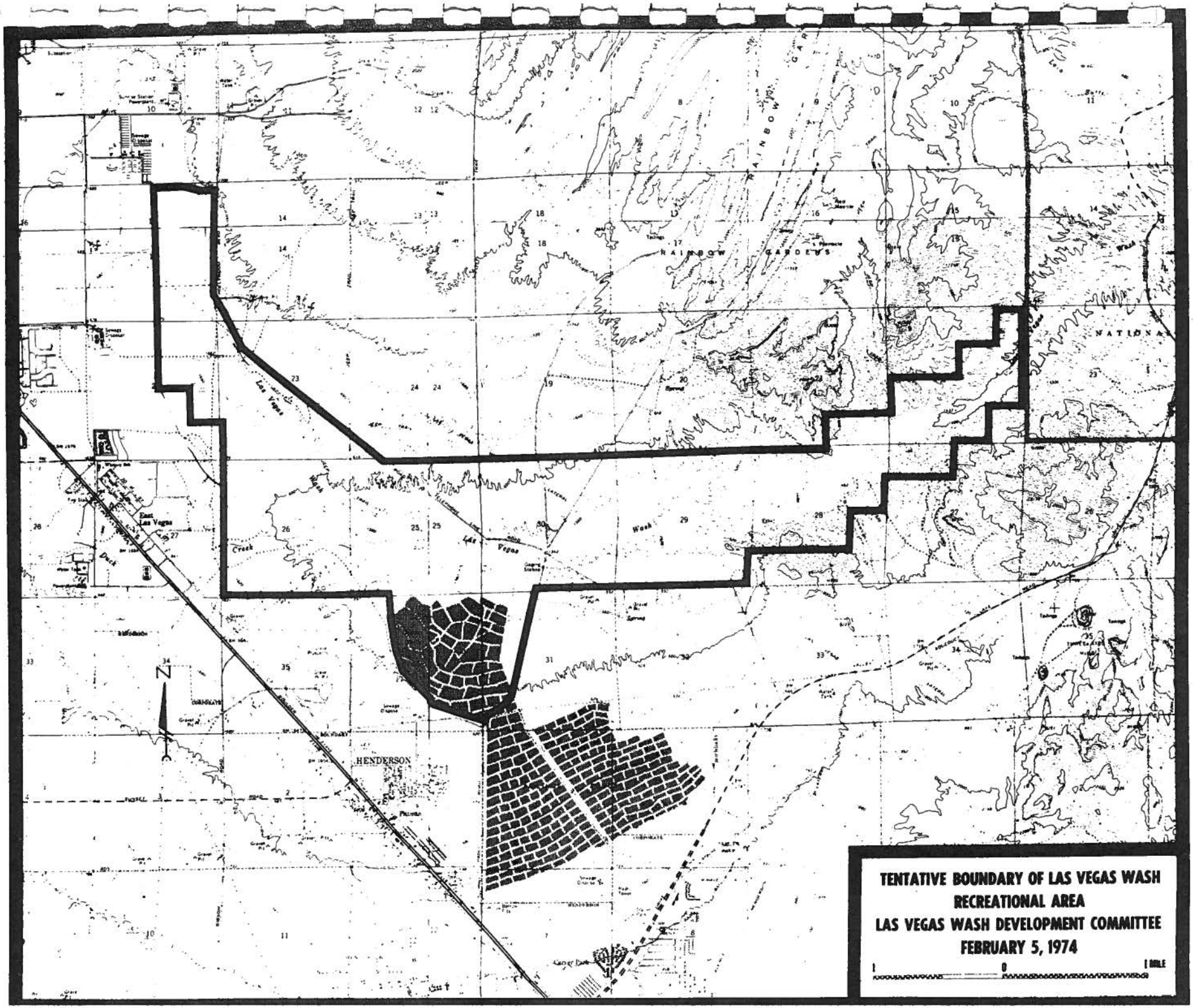
In summary, the Las Vegas Wash is a unique and valuable asset to the entire Southern Nevada area. Future growth and development in Las Vegas Valley may be shaped so that the Las Vegas Wash will remain and grow in value and use as an educational/recreational resource.

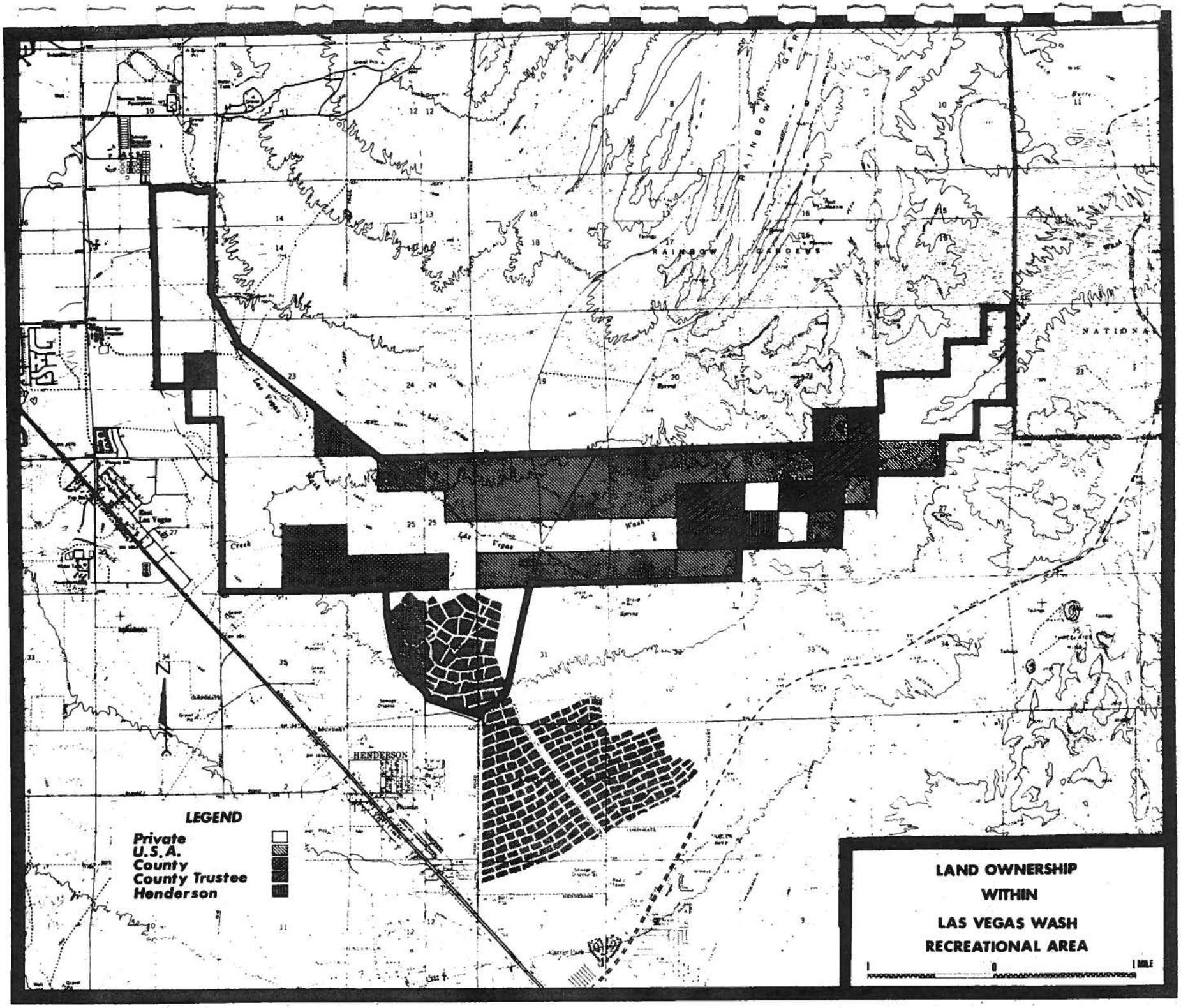
IV. RECOMMENDED BOUNDARIES OF THE LAS VEGAS WASH WILDLIFE EDUCATION/RECREATION AREA

The Wash Development Committee feels that the boundaries as proposed (Please refer to the boundary map on the following page.) represent the minimum requirement necessary to preserve, protect, and develop in its entirety the total recreational and educational potential of Las Vegas Wash. In the development of these boundaries, the Committee considered land ownership, implementation of Senate Bill 333, the flood plain position of the Wash, proposed transportation routes, and significant natural and man-made features.

Ownership within the proposed boundaries is approximately 50 percent private, 40 percent Federal, and 10 percent County and/or trusteeship status (Please refer to the land ownership map on the second following page.). The private lands are primarily located in the flood hazard area.

The Committee does not hold the location of the boundary line as unalterable. As more information is available, especially


RAINBOW GARDENS
HENDERSON
East Las Vegas
Las Vegas Wash
TENTATIVE BOUNDARY OF LAS VEGAS WASH
RECREATIONAL AREA
LAS VEGAS WASH DEVELOPMENT COMMITTEE
FEBRUARY 5, 1974
1 0 1 MILE



LAND OWNERSHIP WITHIN LAS VEGAS WASH RECREATIONAL AREA

soil survey and archaeological data (Please refer to Recommendations No. 4 and 5.), portions of the line may be located differently.

To implement Senate Bill 333 of the 1973 Nevada State Legislature, the Division of State Lands has asked for local suggestions pertaining to potential areas of critical environmental concern from political entity planners (Appendix 2). Planning directors have been requested to prepare a list of areas within their regions to be utilized in preparation of the master list of potential sites and criteria for determining areas of critical concern. *"Areas of critical concern"* are defined by the Legislature as *"any area in this state where uncontrolled development could result in irreversible degradation of more than local significance."* Clark County's Planning Director has stated:

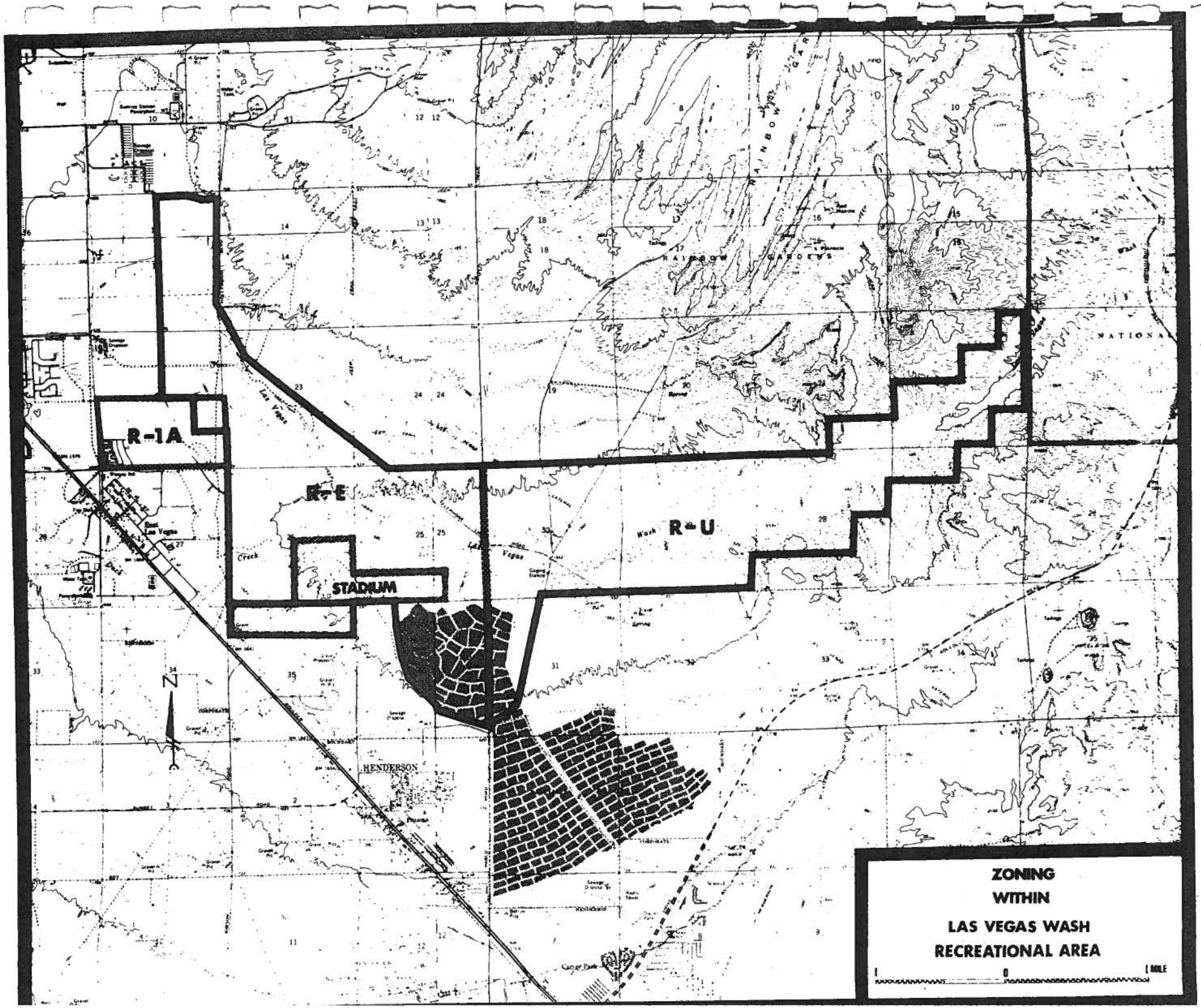
> *"As far as I'm concerned under Senate Bill 333 there are definitely areas within the Valley that should be designated as 'areas of critical environmental concern' and should be so considered by the State, such as Las Vegas Wash area and other State recreational areas."*

Following a telephone conversation with John L. Meder, Administrator, Division of State Lands, Carson City, we understand that, if the Wash were so designated, only land uses deemed by the State to be compatible with such designation will be possible.

As already noted, the State Parks System's projected boundaries arrived at two years ago for a potential State park in Las Vegas are similar to the boundaries proposed by our Committee except for their exclusion of the northwestern section. We believe that our inclusion of this section, although it is primarily in private ownership, provides potential for development capability and highly valuable wildlife habitat.

The proposed boundaries are compatible with zoning and land-use plans in the area. Under the new County General Plan[10], the Wash area is designated as public recreation facility lands. Clark County zoning in the Wash area is classified RU (open land, .5 dwelling units per acre) and RE (rural estates, 2 dwelling units per acre). However, all RE lands in the area have no public water, and the County Planning and Health Departments have adopted the policy of granting one dwelling unit per acre only, rather than RE use (Please refer to the zoning map on the following page.).

Considering land-use planning for the area, the Committee recognizes that the Lake Adair properties, which are partially within the proposed boundaries in the northeastern extreme, are envisioned by Mr. Carlton Adair as a residential development based on water recreation facilities. Also, the City of Henderson is considering recreational use of its present land fill/dump site in the southeastern central section. The County recreation planners are considering further development


R-1A
R-E
R-U
STADIUM
HENDERSON
N
ZONING
WITHIN
LAS VEGAS WASH
RECREATIONAL AREA
1
0
1 MILE

of organized sport facilities in the area surrounding Las Vegas Stadium in the southwestern sector of the proposed boundaries.

Approximately 40 percent of the Las Vegas Wash presently being considered by the Committee for inclusion in a wildlife education/recreation area is considered to be in the 100-year flood hazard area (Please refer to the flood plain map on the following page.). New residential and recreational development is occurring in the Wash area just east and southeast of the City of Las Vegas. If this kind of development is extended into the Wash area, the potential flood damage would increase.[11]

Flood prevention works such as diversion levees, detention basins, and outlet channels were authorized by the Flood Control Act of July 14, 1960, for Las Vegas Creek, Flamingo Wash, and Duck Creek, all of which are tributary to the Wash. James Scholl, Clark County Deputy Director of Public Works, Flood Control and Off-sites, stated that the cost of protecting any residential development that might be undertaken within the proposed boundaries against a 50-year flood would be approximately $12.6 million. Additionally, any future development of flood hazard areas in the Wash must consider the following factors influencing the cost of financing:

1. Federal Housing Authority requires first-floor elevation be such that the proposed structure will be free of high water during a 100-year frequency flood. Analysis indicates that a flood of this magnitude would create depths of flow ranging from two to 12 feet on the Wash flood plains.

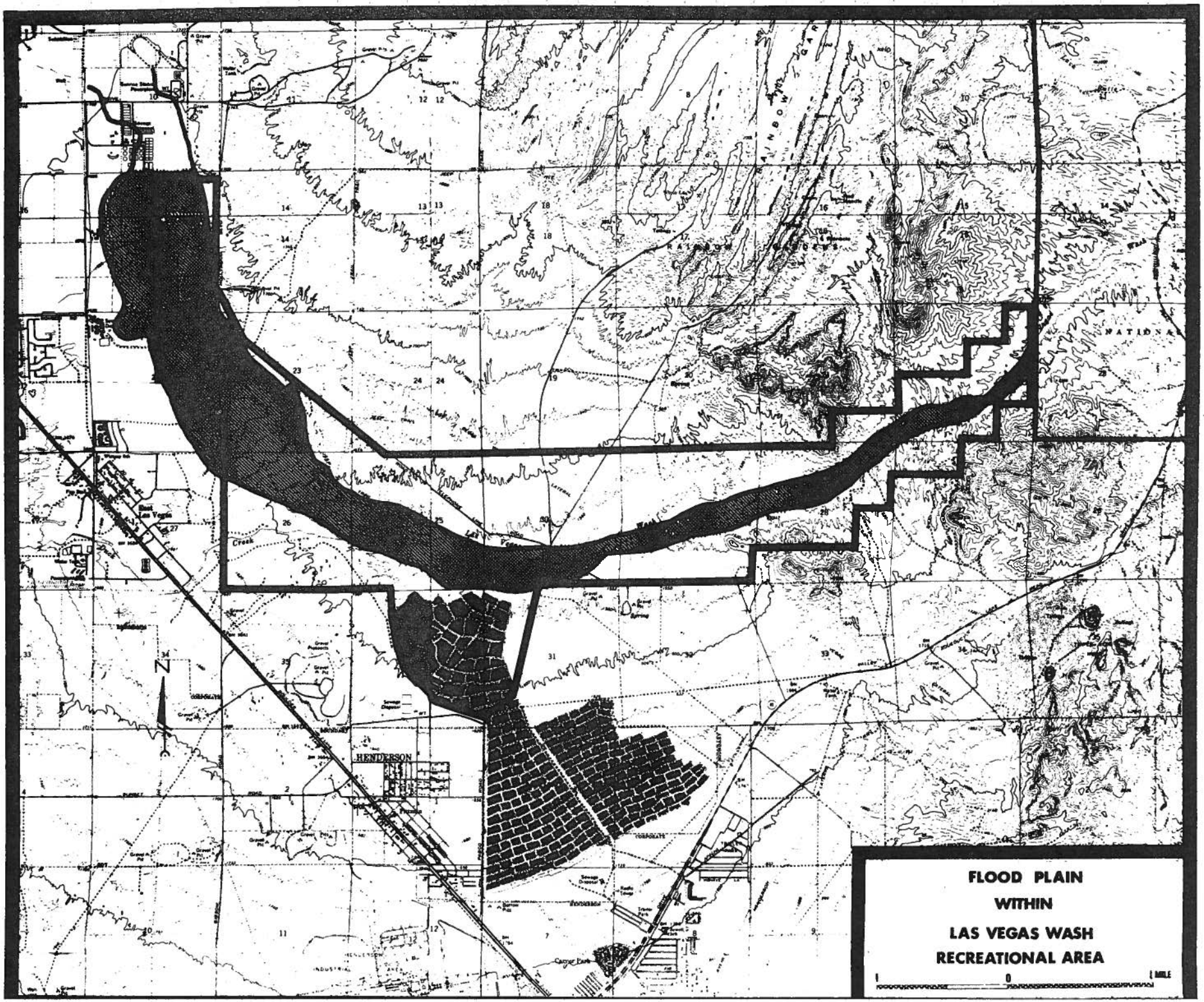
2. Presidential Executive Order 11296[12] calls for the evaluation of flood hazards in locating Federally owned or financed buildings, roads, and other facilities, and in disposing of Federal lands and properties.

Since the availability of Federal loans and mortgage insurance and land-use planning programs are determining factors in the utilization of lands, the Executive Order requires that:

> *"All executive agencies responsible for the administration of Federal grant, loan, or mortgage insurance programs involving the construction of buildings, structures, roads, or other facilities shall evaluate flood hazards in connection with such facilities and shall, as far as practicable, preclude the uneconomic, hazardous, and unnecessary use of flood plains in such connection."*

The Executive Order further states:

> *"All executive agencies responsible for the disposal of Federal lands or properties shall evaluate flood hazards in connection with lands or properties proposed for disposal to non-Federal public instrumentalities or private interests and, as may be desirable in order to minimize future Federal expenditures for*


HENDERSON
FLOOD PLAIN
WITHIN
LAS VEGAS WASH
RECREATIONAL AREA
1 0 1 MILE

flood protection and flood disaster relief and as far as practicable, shall attach appropriate restrictions with respect to uses of the lands or properties by the purchaser and his successors and may withhold such lands or properties from disposal."

The Army Corps of Engineers' regional office has pointed out that flood damages in the Wash area can successfully be prevented or reduced by informed planning and careful control of flood plain development.[13] This latter point does not preclude the use of flood plain area for greenbelts, parks, and other beneficial public uses. The Corps of Engineers suggests construction in the flood plain area be limited to that which absolutely must be there, and that these necessary structures be built in such a way that they do not deter or divert the passage of flood waters.

In direct conflict with these Corps of Engineers suggestions are the roads for the Las Vegas Wash Area as proposed in the LAS VEGAS VALLEY TRANSPORTATION STUDY for a 700,000 population. Costs of flood damage to such road construction would be great as implied earlier in this report.[14]

We also discovered imcompatibility between our land-use proposal and the Study's 700,000 population land-use projection. Specifically, we noted Arterials F and K, Flamingo Road Extended and Tropicana Avenue Extended (Figure 12-9 of the transportation study), are in conflict with this recommendation. Conditions and attitudes have changed since 1965 when most of the Study's data were gathered.

Since the new general plan and population plan for Clark County does not project a population in that area requiring arterials suggested by the old general plan, we suggest realignment of roads in the area be considered in the 1976-77 update.

Steven Borroum, Civil Engineer, Regional Street and Highway Commission of Clark County, said:

"If land use plans are changed to reflect your proposals the Transportation Study when reviewed will take into account the proposed land use. Changes could possibly mean reduction of the road requirements in the vicinity of Las Vegas Wash."

He also stated:

"The Las Vegas Valley Transportation Study Policy Committee hopes to provide the transportation needs for the community. Land use development is supervised by local planning agencies."

The connection of Broadbent Boulevard and Tropicana Road, which was approved for priority status by the Regional Street and Highway Commission on March 21, 1974, could also be in

conflict with our land-use proposal. The connection would cross into the interpretive park (Please refer to the educational and recreational facilities map on the following page.). Understanding this intersection's value to transportation serving Las Vegas Stadium and because it may not markedly violate the area, a change of boundary or road could be worked out which would resolve the conflict.

Additional justification of the proposed boundaries is based on the inclusion of significant natural areas (Please refer to the features map on the second following page.).

The oldest and largest salt cedar forest in Nevada exists in the northwestern sector. It is a habitat for perching birds and small mammals. It could be developed to provide an unusual park-like picnic area with interpretive trails.

The southernmost reach of the boundary line encompasses the proposed bird sanctuary with its series of diked ponds providing manageable waterfowl habitats. The BMI evaporative ponds (mostly drained at present) have served diverse populations of migratory birds and waterfowl in the past. Alternative diking and dredging of other areas within the boundaries to create a sancturary may be feasibile, but would incur additional pond construction costs.

A buffer zone in the north-central sector provides protection to the marsh and allows for trail development and possible tie-in to the Rainbow Gardens area at some future date.

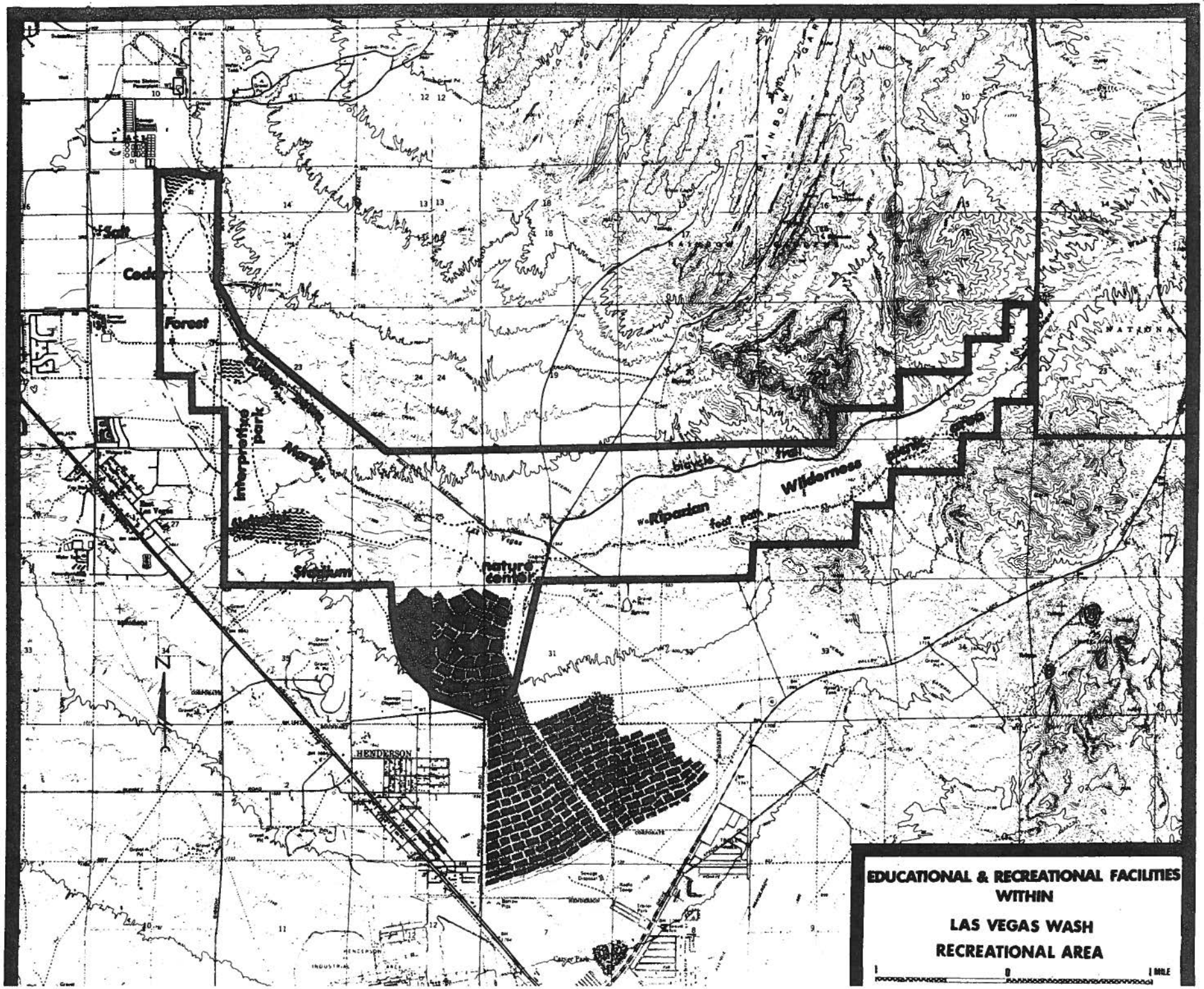
The marsh area indicated on the natural feature map is the largest fresh-water marsh in Southern Nevada. It represents near-ideal habitat for aquatic animals and plants. Within the area is a fine stand of Sea Lavendar Lamonium. According to Dr. Wesley Niles, botanist at University of Nevada, Las Vegas, this coastal marsh plant has not been found inland often - never in Arizona, and only in Las Vegas Wash in Nevada.

The river bank habitat at the eastern end of the area also provides attractive horse and foot trail views of the red, pink, green, tan, and black formations high and to the north in the Rainbow Gardens area. It provides a natural area link toward the Lake Mead National Recreation Area.

Inclusion of the Las Vegas Stadium in the southwestern corner of the proposed boundaries could provide public entry and parking areas for easy Wash access. Inclusion of this area also provides a holistic approach to a recreation complex in which the wetlands/wildlife area would be a unique unit, while the organized sport facilities would be part of another contiguous, but non-interfering, unit.

V. EDUCATIONAL/RECREATIONAL DEVELOPMENT GOALS

In development of plans, preservation of the natural state of Las Vegas Wash has been uppermost in thought.


Salt
Cedar
Forest
interpretive
park
Marsh
Stadium
nature
center
Riparian
Wilderness
trail
foot path
HENDERSON
EDUCATIONAL & RECREATIONAL FACILITIES
WITHIN
LAS VEGAS WASH
RECREATIONAL AREA
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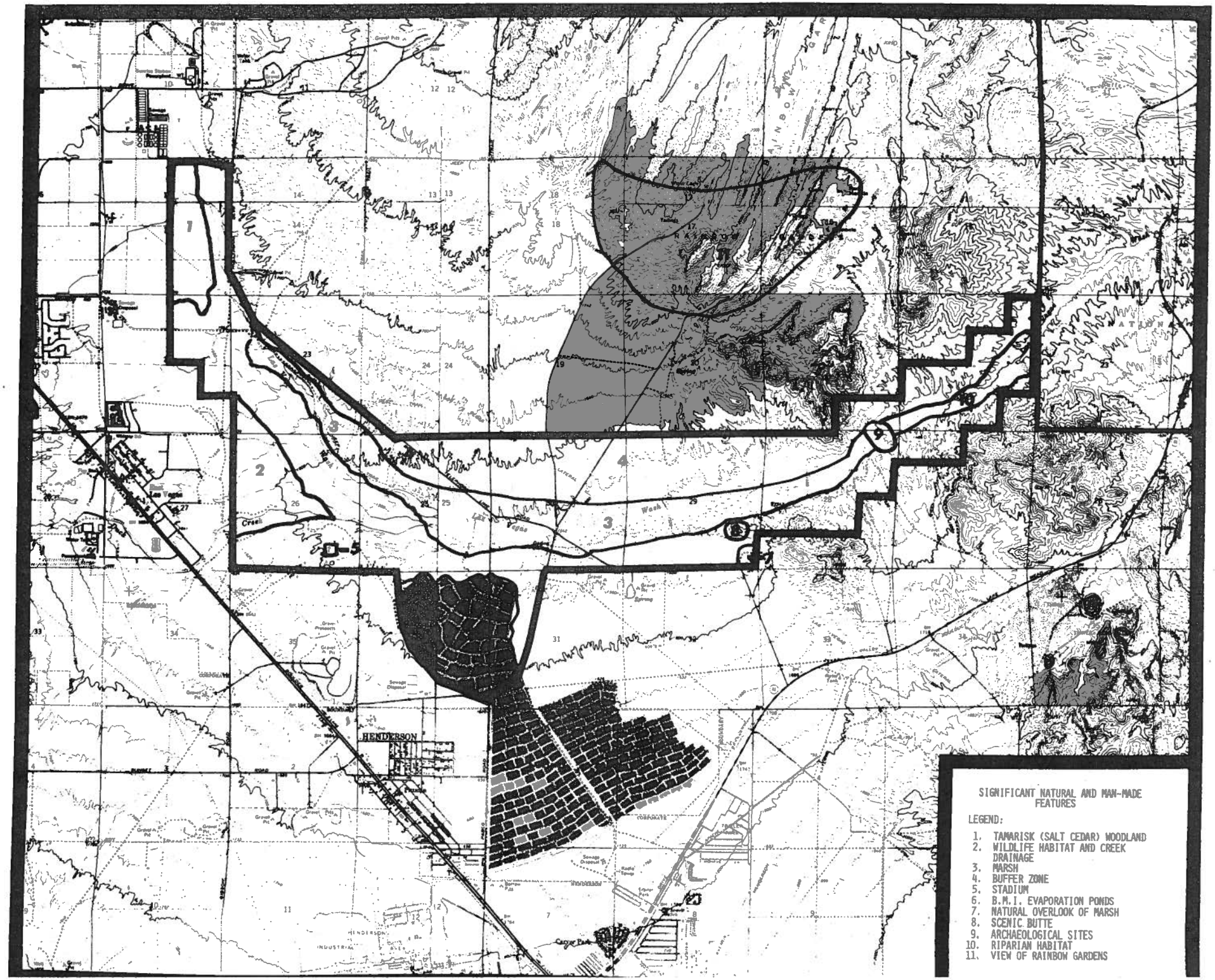

HENDERSON
SIGNIFICANT NATURAL AND MAN-MADE FEATURES
LEGEND:
1. TAMARISK (SALT CEDAR) WOODLAND
2. WILDLIFE HABITAT AND CREEK DRAINAGE
3. MARSH
4. BUFFER ZONE
5. STADIUM
6. B.M.I. EVAPORATION PONDS
7. NATURAL OVERLOOK OF MARSH
8. SCENIC BUTTE
9. ARCHAEOLOGICAL SITES
10. RIPARIAN HABITAT
11. VIEW OF RAINBOW GARDENS

The purposes of the plan for development are these:

A. Maintain the unique ecology of the area.
B. Enhance the natural area for plants and animals.
C. Enhance the educational and recreational experiences for the community.
D. Keep the Wash in harmony with its flood-plain status within the Valley.

Having few technical skills and many unknown factors to consider at these early planning stages, the Committee addressed itself to essential conceptions rather than detailed plans. Also, the Committee realizes that, while a managing agency will have to finance most major projects within the area, some local groups such as school clubs, scouts (Appendix 3), Audubon Society, and Motocross Club (Appendix 4) may be persuaded to handle special projects such as initial clean-up of the area, trail building, and other special-interest developments.

The Wash Development Committee has approved the following developmental guidelines for land use in the Las Vegas Wash Wildlife Education/Recreation Area.

A. Short-term Goals

1. Development of public conveniences in the area.

   a. Gravel parking areas and access roads.
   b. Portable chemical comfort stations.
   c. Interpretive entrance sign delineating significant features of area & development plans
   d. Picnic areas.

2. Habitat enhancement.

   a. Some tree and shrub planting to increase scenic and wildlife values and reduce noise and wind hazard in high-density use areas.
   b. Development of additional open-water areas.

3. Bird sanctuary.

   a. Development of diked ponds with suitable observation and photography blinds.
   b. Limit accessibility for sanctuary protection.

4. Controlled hunting areas (Appendix 8).

5. Retriever dog training areas for water and field trials.

6. Improved trails (using both those in existence and making some new ones in some areas).

   a. Foot trails of varying length and difficulty, some possibly self-guiding or some adapted for handicapped persons.

b. Horse trails.
c. Motorcycle trails.
d. Auto-loop around perimeter of area, perhaps with several branching access roads to different sections of the area.

7. Managed ponds for casting, juvenile fishing, and aquatic study by school groups.

8. Archery range area.

9. Target practice area.

B. Long-term Goals

1. Interpretive areas with displays depicting geology, biota, and other features of interest.

2. Observation points.

a. Sanctuary blinds.
b. Development of natural buttes for look-out over marsh and Rainbow Gardens area.
c. Outdoor nature center near sanctuary.

Interviews with knowledgeable persons in the fields of recreation, education, wildlife management, and community planning have aided our Committee's development of these goals. In regard to the goal of controlled hunting, the Nevada Department of Fish and Game has stated that *"the Las Vegas Wash supplies a great amount of recreational hunting during open seasons...in addition to year round non-appropriative use of game and non-game by bird watchers, high school and university biology classes, youth groups, and many others."* Recreational hunting as provided for by County law in the Wash is with a shotgun and only during the hunting season. Hunting in designated areas is deemed feasible at this point in time until public safety, education, and other recreational values are deemed by the managing agency to outweigh the values of recreational hunting.

Dr. William E. Fiero, Director of Environmental Studies at UNLV, stated in 1973 that:

> *"The Las Vegas Wash is an outstanding area of ecological diversity. It is not currently utilized as a study area for local schools to the extent possible. Park status, guided study trails, ecological sites, and written information for students and teachers would turn the area into an ideal environmental study area. Diversity, proximity, and accessibility - the keys for classroom utilization."*

As indicated by Dr. Fiero, with some relatively minor development (See short-term goals.), the Wash would become an excellent educational resource. Even now, UNLV classes utilize the Wash, but such developments as the establishment of designated nature trails and enlarged ponds for waterfowl

and aquatic studies would increase such usage. Presently, some school district in-service classes for teachers use the Wash but, again, guided study trails would enable these teachers to use this resource with their students. It should be noted that three of the six *"conceptual schemes"* advocated by the new elementary science curriculum would be served by the use of the Wash as an outdoor classroom. They are: Living Things, Heredity, and Environment.[15]

Recreation would be served by some of the educational developments. For example, private hikers could enjoy the self-guided nature trails. In addition to the trails presently worn from hiking and cycle use, others could be developed.

Development of the Wash as outlined above would provide the community with a unique and easily accessible recreation area that could eventually be tied into a mass transit system for even greater urban access.

VI. ACQUISITION AND CONTROL

Many methods of acquiring and/or controlling variously owned lands within the designated boundaries have been discussed by the Las Vegas Wash Development Committee. It is the general sentiment of the Committee that no single method of acquisition is suitable for all of the area, but rather a combination of methods of acquisition and/or control will prove most beneficial. Furthermore, not all methods are available to every level of management, so any attempt to specify particular parcels which may be acquired through one method or another would be premature at this time. The following listing of acquisition and/or control methods is indicative of the Committee's discussion:

A. Outright purchase of lands is preferred in areas where the imminent use of those areas is, or is due to become, completely incompatible with recreation as a land use.

B. Gifts or donations of land for parks and recreation purposes may be solicited.

C. Transfer of title is another method of acquiring recreation land at little or no cost and usually involves the transfer of land surplus to the needs of one department to that of another department.

D. Land acquired through tax liens, condemnation, and reclamation of neglected or submarginal areas are other methods.

E. Use of subdivision ordinance dedication of a certain percentage of the land to be subdivided for recreation use by the public. *"Public"* in this case, however, is usually defined to mean only subdivision residents.

F. If the park area is likely to serve the people of several adjoining areas, a broader tax base should be used to support it; i.e., at the regional level. This type of regional approach could be accomplished either through State administration or through the invention of a regional level of government in the recreation field.

G. The purchase of easements or partial rights to land may provide recreation opportunities at less cost than fee-simple purchase of all rights. This technique may be particularly useful in those land and water areas that do not involve the heavy on-site public usage typically found in conventional city parks.

1. Affirmative easements, for example, could provide for limited public access such as a riding and hiking trail, or fishing and hunting access. These easements provide public recreation opportunities at lower cost than outright land purchase, and the land continues to produce tax revenue.

2. Negative easements may restrict the uses to which a landowner may put his land, thus helping to preserve badly needed open space. In this way it functions much like a zoning restriction, but is more permanent, as the easement becomes a permanent endorsement to the deed, not subject to changes as is zoning.

H. Natural resource/open space zoning should be used to protect marshes, flood plains, agricultural lands, watersheds, etc., where they are serving urban demands.

I. If fee-simple (full rights) acquisitions are necessary the use of lease backs and sale backs should be given serious consideration. A public agency can acquire tracts of land and then lease them to private individuals for specific open space uses in accordance with the approved general plan for the area. The land can produce rent for the public body as well as recreation opportunities, etc., for the public.

J. Agreements with public and private agencies for combination or multiple land use may be worked out. For example, public and private utility districts (along their pipeline or cable rights-of-way, etc.); local irrigation, flood control and water supply/waste-water treatment agencies at impoundment structures, and along conveyance facilities. The result of fostering such joint agreements for the multiple use of lands and facilities will be a net reduction in the amount of acreage that must be acquired in fee title by local governments.

VII. FUNDING

The recommendation of the Wash Development Committee is to continue research into Federal funds which are available through the following governmental departments:

A. U. S. Department of Agriculture.
B. U. S. Department of the Army.
C. U. S. Department of Commerce.
D. U. S. Department of Defense.
E. U. S. Department of Health, Education and Welfare.
F. U. S. Department of Housing and Urban Development.
G. U. S. Department of Interior.
H. U. S. Department of Labor.
I. U. S. Department of Transportation.
J. U. S. Department of Treasury.
K. Various independent agencies (Table 2).

There are other organizations at the State and County levels of government which have funds allocated to aid in development projects.

Also, special interest groups such as the National Audubon Society have contributions to assist in environment-related activites (Appendix 5).

All Federal Government programs are outlined in the manual FEDERAL ASSISTANCE FOR RECREATION AND PARKS published by the National Recreation and Park Association, 1601 North Kent Street, Arlington, Virginia 22209. Another useful booklet is published by Southern Nevada Resource Action Council and printed by the Clark County Cooperative Extension Service. The title is SOUTHERN NEVADA RESOURCE ACTION COUNCIL - ITS FUNCTIONS - ITS AGENCIES AND THEIR DUTIES.

VIII. MANAGING AGENCY

At the present time, two particular entities - State (Table 3) and County - seem to be the logical agencies to be involved with the potential management responsibilities of the Wash if it is to become a recreational area.

However, through a study by an Urban Action Committee Task Force, there are possibilities of large facilities (acreage-wise) being classified as regional parks and, as such, being under the administration of a regional park board. This type of regional classification would certainly include the Wash area, which would then be under management control of this newly contemplated jurisdiction.

Whichever agency is established as the control, it would have to know well ahead in order to plan for the overall expenses involved. It would probably inherit the planning, development, and funding, in addition to the management and operation, that would immediately follow the construction stages. Therefore, whichever agency is to be given the overall responsibilities must be in a financial position to adequately accept all that is involved.

APPENDICES

Las Vegas Wash

Resource Value

- Water bodies
- Marsh vegetation
- Wildlife

Potential Uses

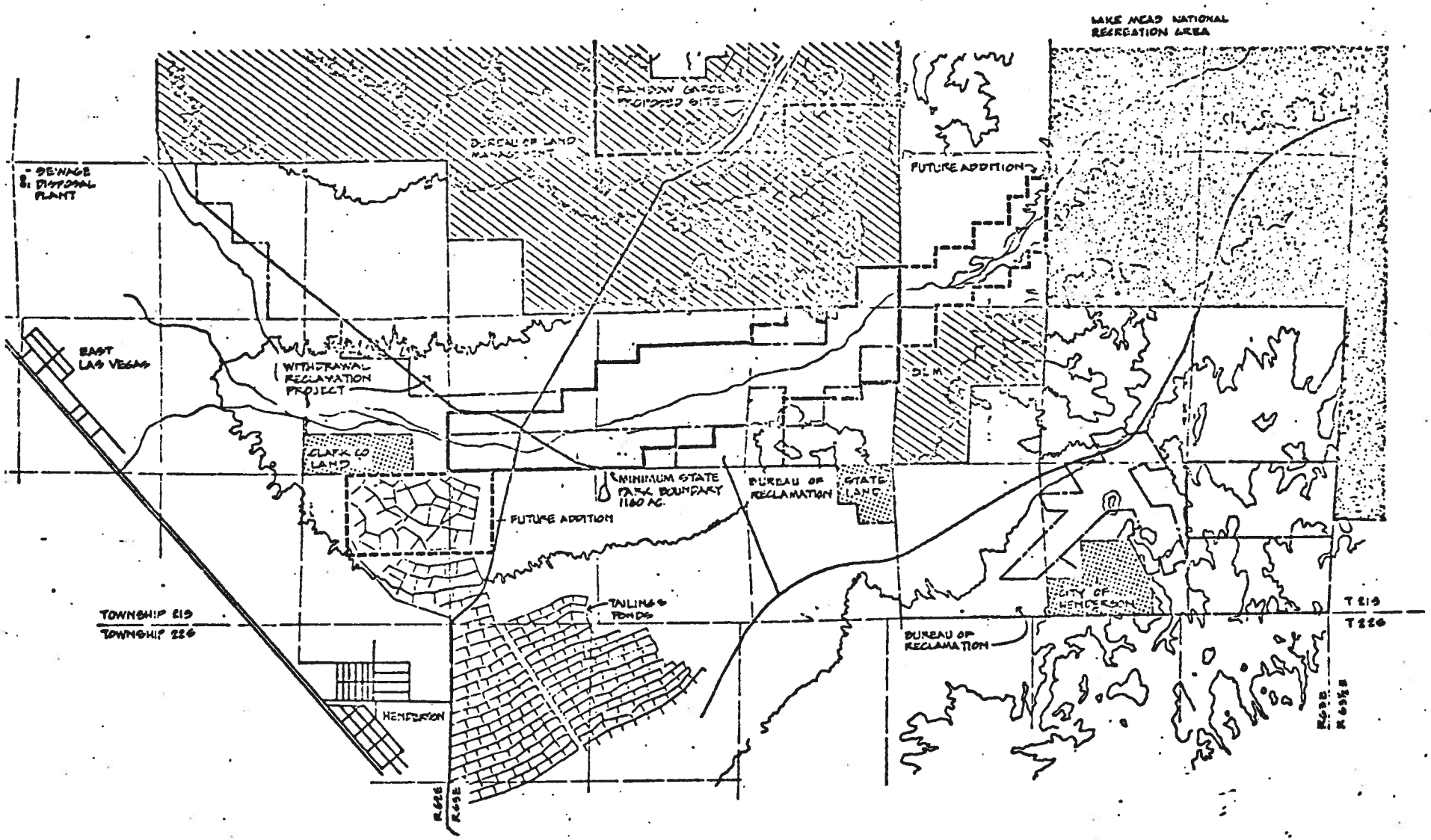
- Wildlife–Recreation Park
- Observation and interpretation
- Ecological research
- Picnicking
- Hiking and bicycling
- Horseback riding
- Fishing

Copies made from
Potential State Parks in
Clark County, Nevada
Rivera + Lee
San Francisco
Revised 1974

Site Qualities

On the eastern outskirts of Las Vegas lies a unique strip of wetlands with a diversity of botanical and wildlife features unparalled in Southern Nevada. Over 300 species of birds have been counted and several species of fish manage to survive. During the course of a year thousands of people go to this wildlife wetland to walk, picnic, study, fish or just to enjoy the peace and quiet. School and university groups are currently using Las Vegas Wash as an ecological study area.

The existing balance of water flow is complex and involves a number of technical problems and political issues. It may be explained by an oversimplified model. Most of the water enters the wash from three sources; outflow from the Las Vegas sewage treatment plant; industrial discharge (primarily B. M. I.); and ground water return flow from irrigation of lawns, etc. in the City. Removal of water occurs through evaporation from open water and transpiration by water plants (phreatophytes). The remaining flow continues into Lake Mead. Political issues are centered around proposals to transport sewage effluent out of the wash and the elimination of polluted water flowing into Lake Mead.



e Location & Ownership

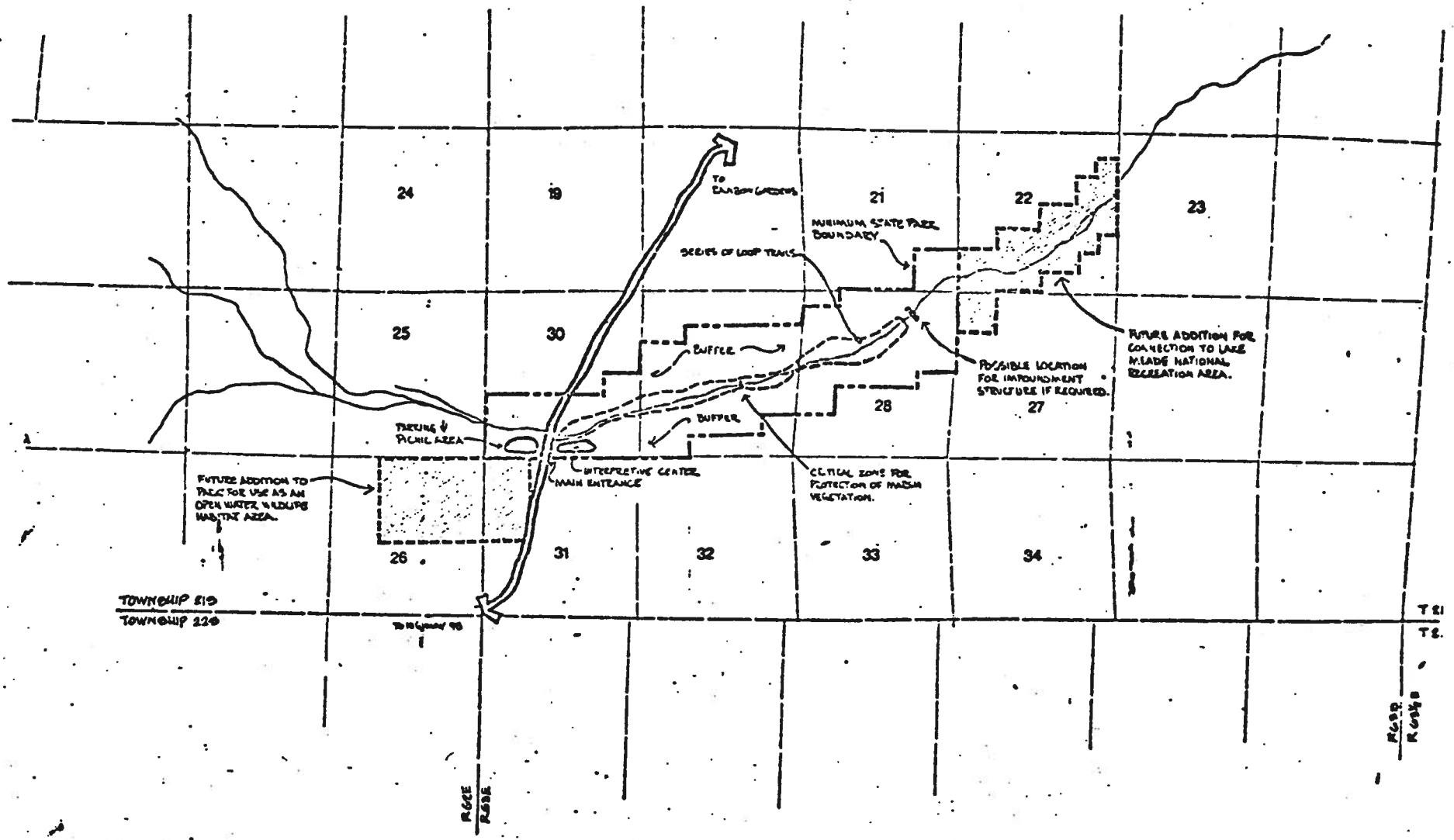
Problems

At this point in time the problems of Las Vegas Wash are shrouded by many unknowns. They are best expressed as questions which need to be answered before State Park feasibility can be assessed.

- What are the technical alternatives available for sustaining a large area of marshland with a satisfactory water quality?
- What are the economic implications of maintaining a) the present area of marshland, b) the lower section as outlined, and c) an expanded area?
- What effect will the final political decision on sewage disposal have on the site?
- What political decisions will have to be made in the future to establish an optimum technical solution?
- What is the magnitude and cost of private land relating to the Wash?
- What other assistance is available?

Inter-agency cooperation will be essential to the establishment of the Las Vegas Wash as a park. The State Park System could act as the central coordinating agency. The following list indicates some of the sources of cooperative assistance through financial aid, technical information, land acquisition and control, or hydrologic engineering projects.

Nevada State Park System
Environmental Protection Agency
Department of Housing & Urban Development
Bureau of Outdoor Recreation
National Park Service
Land and Water Conservation Fund
Hotel Recreation Fee
U.S. Department of Fish & Wildlife
U. S. Department of Game Management
Desert Research Institute, University of Nevada
Colorado River Commission
Las Vegas Valley Water District
Clark County Planning Department
Clark County Parks & Recreation Department
Bureau of Land Management
Bureau of Reclamation
Federal Housing Authority
Corps of Engineers
Private Landowners.



Land Use Study

Potential

The primary goal for State Park use should be to preserve a marsh area of great magnitude. Development and management practices which would enhance the wildlife habitat would be the responsibility of the Department of Fish and Game and should be coordinated with the Nevada State Parks System.

Interpretation of these natural features would be possible by the use of instructional walkways and blinds for bird watching. In general the facilities should provide for low intensity day use activities such as picnicking, horseback riding, bicycling, hiking and fishing.

Initial site reconnaisance indicates that the lower reach of the Wash may be most feasible as a Recreation-Wildlife State Park. The tentative boundary outlined on the accompanying diagram indicates a central section running from the tailings ponds approximately three miles down to where the Wash narrows. This totals 1,160 acres, 700 of which are privately owned, the remaining 460 acres being controlled by the Bureau of Reclamation. It is recognized that the area essential for recreation purposes is only the marsh and heavily vegetated part; however, in order to maintain its integrity, a buffer on either side of the marsh has been included within the recommended boundaries. Of the total 1,160 acres, about 400 acres is immediate flood plain or marsh land and three-quarters of this section of wetland is privately owned.

Since this is flood plain status and not prime subdivision land, without a flood control project, land values are not likely to be excessive. If a flood control project were to be approved, upstream acquisition costs may become prohibitive.

Extraction of sand and gravel is the only other current economic land use. Subsequent phases of acquisition should consider the 260 acres necessary for connection to the Lake Mead National Recreation Area to the east, and 320 acres of tailings ponds to the southwest. An increase in the surface area of open water would increase species diversity and improve the interpretive value of the area. To achieve this, tailings ponds which are now almost dry, could be flooded or small excavations could be made elsewhere in the wash.

Not far from Las Vegas Wash lies the colorful area known as Rainbow Gardens (see later discussion). If these two potential park areas were to be linked by a trail or road connection, a unique interpretive program encompassing two very different resources could be established.

Rainbow Gardens

Resource Values

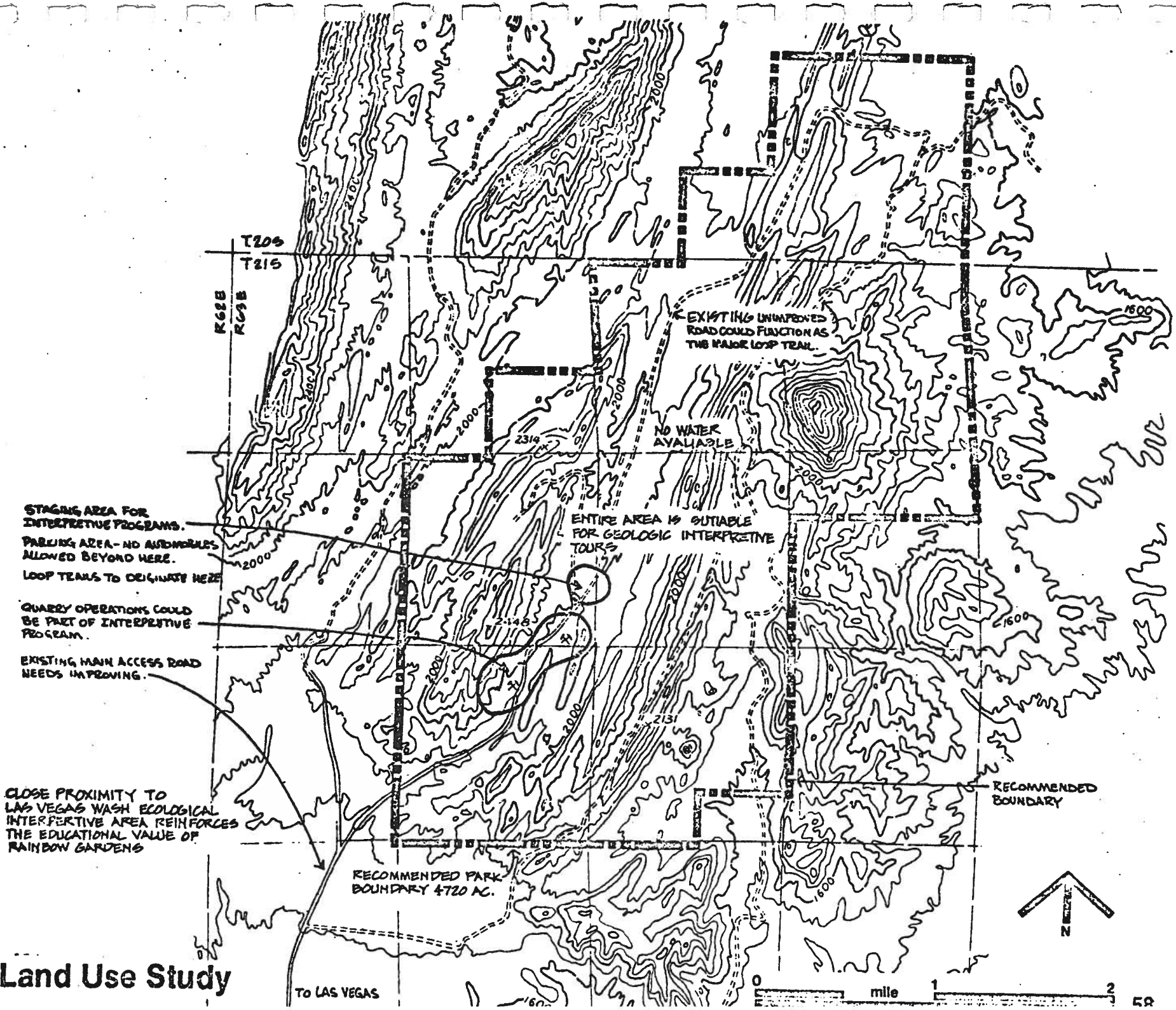
- Geologic Formations
- Diverse Terrain

Potential Uses

- Interpretation

Site Qualities

The major significance of Rainbow Gardens lies in its geologic structure. The area contains the best developed and clearest, most easily visualized area of faulting in southern Nevada. Strike-slip faults, normal faults, reverse faults and thrust-faults can all be found. Coloration is varied. Reds, tans and pinks contrast with the grey and black formations. A distinct advantage is its close proximity to Las Vegas. It is only 10 - 15 miles from the City and one mile north of the proposed Las Vegas Wash Recreation-Wildlife Park. About 4,720 acres would be required to encompass major geologic features and access roads.



Land Use Study

ELMO F. DERICCO, *Director*
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES
STATE LAND REGISTER

ADDRESS REPLY TO
DIVISION OF STATE LANDS
NYE BUILDING
TELEPHONE 882-7481

STATE OF NEVADA

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

Division of State Lands

CARSON CITY, NEVADA 89701

February 27, 1974

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MAR 11 1974

COUNTY PLANNING

Mr. E. J. Downey
Clark County Planning Dept.
Attn: Greg Borgel
Courthouse Annex
Las Vegas, NV 89101

Gentlemen:

Since meeting with the Nevada local planners recently, the State Land Use Planning Agency has compiled an analysis of S.B. 333, a glossary of pertinent terms, a summarization of federal and state agency activities within Nevada, and a status sheet on local planning and regulation. Any or all of these documents are available for your information if you desire. A copy of the status sheet on local planning and regulation is enclosed in an effort to obtain any needed revisions. Your assistance in this effort would be appreciated.

At our previous meeting, it was proposed that our agency solicit local suggestions pertaining to potential areas of critical environmental concern. A list of problem areas within your region with a description of the circumstances and reasons for the problems would be valuable to this agency. Your input will be utilized in preparation of the master list of potential sites and criteria for determining areas of critical environmental concern. As you are aware, our legislation has defined "Area of Critical Environmental Concern" as "any area in this State where uncontrolled development could result in irreversible degradation of more than local significance."

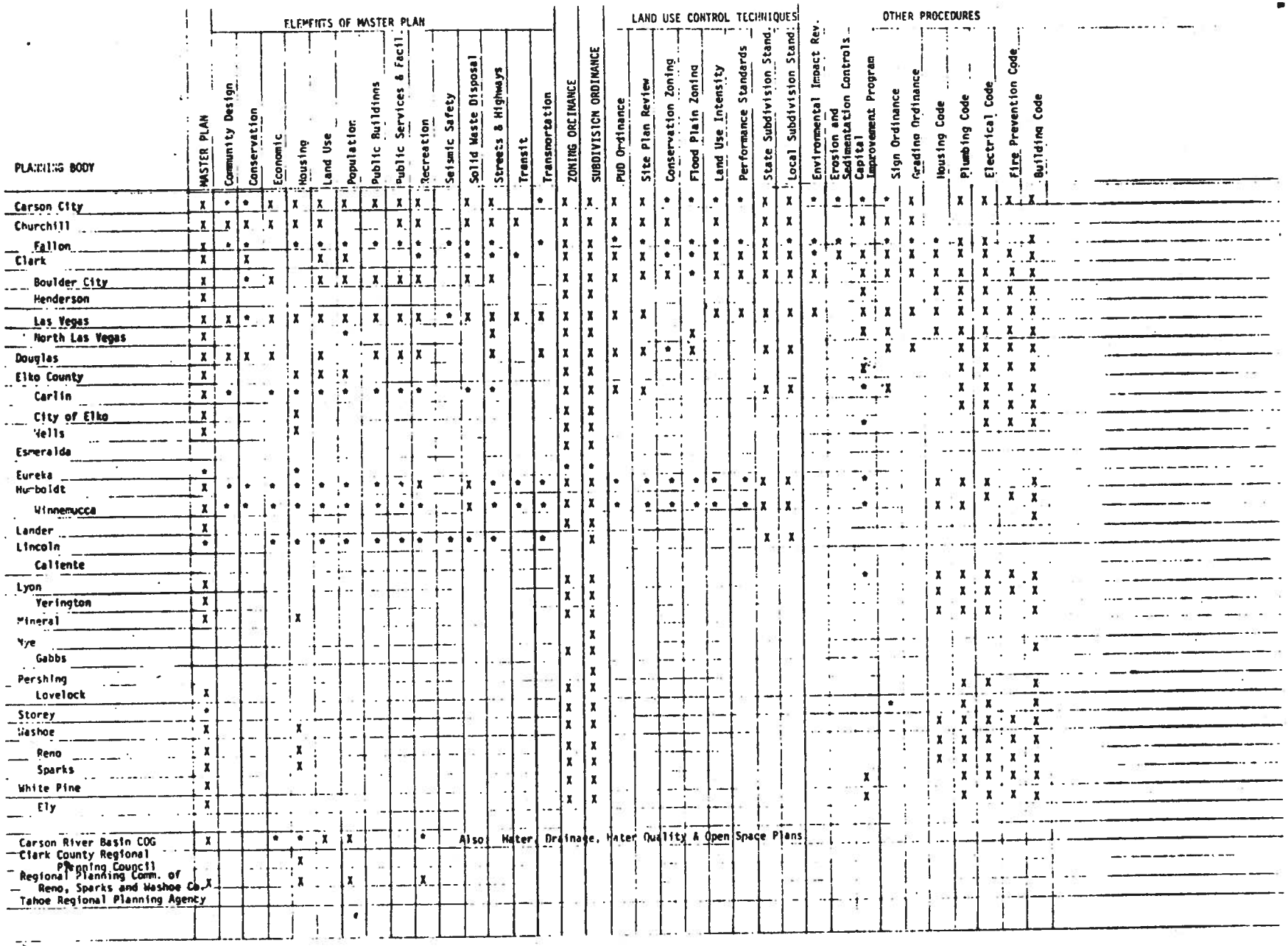
Any additional suggestions which you might have would also be appreciated. Thank you for your input and assistance.

Sincerely,

John L. Meder
Administrator

km

APPENDIX 2



* Adopted or in Effect
In Progress

STATUS OF PLANNING - NEVADA
CITIES, COUNTIES AND REGIONS

Incomplete

What would YOU do if you had to make a decision about the Las Vegas Wash?

By David Wright

The Wash is a river of mostly sewage water 11 miles long from the County Sewage Disposal Plant to Lake Mead. The county plant which is located a mile north of the LDS(Mormon) Welfare Farm on Vegas Valley Road, is where the sewage water starts. It then goes about a mile and a half and creates a marshy land where many waterfowl and useful insects live. This marsh land is the marshy area just east of East Las Vegas that covers about 2½ square miles. It then compacts itself and the water filters through a pipe at the gaging station. The pipe transfers the water across a road at at the station to the other side of the road causing a second marsh with much insect and plant life.

The second marsh then travels about 2¼ miles where there is a narrow passage between two mountains that the water passes through. The water then is a river that goes winding to Lake Mead. Surprisingly enough, the sewage water is very clear when it reaches Lake Mead. Nature filters itself of impurities.

Back near the gaging station just north and east of Henderson, on and around Pabco Road, are Tailing Ponds from one of the Henderson disposal plants. Most of these ponds are dry, but some behind the L.V. Stadium still have water. This water if not cared for, but just left there, smells up the area in and around the stadium. If it is cared for by putting in a treatment plant and adding more good water, birds, insects, and plant life would come and live in the area; and the smell would be virtually gone.

QUESTIONNAIRE

1. What would you like done with the marshy area behind the Mormon Farm? Would you like it _____
   a. to have more water fowl for hunting?
   b. to have insects and water fowl for biology and zoology field trips?
   c. to have both of the above?

2. What would you like done with the marsh near the gaging station? Would you like it _____
   a. used for motorcycle trails?
   b. used for hunting areas?
   c. used as a wildlife refuge?
   d. used for biological field trips?

3. What would you like done with the Tailing Ponds behind the stadium? Would you like to _____
   a. circulate it into the Wash and taken to the Lake?
   b. put in a treatment plant to get red of the rotten smell?
   c. put in the plant and use the area for horse-back riding?
   d. put in the plant and have motorcycle areas?

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JAN 22 1974
POLLUTION ABATEMENT PROJECT

4. Would you like to have the marsh made into _____
   a. residential
   b. commercial
   c. neither

5. Would you like some of the marshy area used for recreation such as _____
   a. bird-watching
   b. photography
   c. insect study

6. List any other suggestions on the back of this paper.

The results of my survey of the Las Vegas Wash are as follows:*

Question 1
- Answer a 18%
- Answer b 27%
- Answer c 55%
- Undecided 3%

Question 2
- Answer a 33%
- Answer b 12%
- Answer c 55%
- Answer d 16%
- Undecided 2%

Question 3
- Answer a 11%
- Answer b 38%
- Answer c 35%
- Answer d 25%
- Undecided 2%

Question 4
- Answer a 7%
- Answer b 15%
- Answer c 00%
- Undecided 2%

Question 5
- Answer a 20%
- Answer b 45%
- Answer c 33%
- Undecided 15%

Question 6

One person said that the area had too many insects. Another said that everything I suggested should be put in. Someone else said to leave it the way it is, and a couple of people said to put in a park. Three people said to use it for motorcycles and two more said to use a half for horse back riding and a half for motorcycles.

* The total for each answer is more than 100% because some people wrote more than one answer per question.

Conclusion: Most of the people want the marsh to have more animals and birds that are protected.

February 19, 1974

To: Las Vegas Wash Development Committee

Member: Pat Foster, League of Women Voter's Representative

First, as a 32 year resident of Clark County, let me express my personal gratitude for the leadership, time and effort, you are putting forth to help insure the future welfare of all Clark County residents.

I regret that we are somewhat late in our efforts to stop pollution, save wildlife and making positive steps to insure our youngsters adequate recreation; but, I am convinced that your project and hundreds like it throughout the United States will not only be successful, but will set the example for pollution abatement in the future.

Now, as to my personal interest in the Las Vegas Wash Development Project: I represent the Las Vegas MotoCross Club and the Nevada TT Association. These organizations have a combined 1973 membership of 765 Motorcycle racing athletes and their families. Their primary recreational interest is closed course, dust free Motorcycle racing.

Our youngest members are 7-10 years old, 35 of them. Our oldest members are 35-43 years old, 23 of them. That leaves 707 competition licenses going to ages 11-34. Needless to say, this is a Family Sport.

The growth rate for the past 5 years has been 28% per year. A Motorcycle, like a baseball, is fun to play with but usually ends up in some form of competition, thus, the need for Las Vegas MotoCross Club.

For financial and legal reasons, Las Vegas MotoCross Club, Nevada TT Association and Williams Raceway, are licensed under Corporate Charter as a profit organization. They are, in fact, subsidiaries of Williams Distributing Company, Inc.; thereby, opening avenues of credit that would otherwise be closed.

These recreational organizations have been in existence for

two years at absolutely no expense to the tax payers of Clark County.

I propose it stay that way, but we do need your help or advice.

Our organizations are in dire need of 50-100 acres of rock free, reasonably priced land, such as some of the land in which you are dealing.

We are not in the land business, so we have no objection to purchasing land then donating it to the County with a lease-back agreement, thereby, keeping the Motordycle Sport self supporting and at the same time helping to enhance the total recreational picture in Clark County.

I am open to any suggestions from your Committee and hope our goals fit in some small way with the overall goals of the Las Vegas Wash Development Committee.

Please keep me posted on your progress and feel free to call for any reasons.

Bob Williams

Bob Williams
560 E. St. Louis
Las Vegas, Nev. 89104
734-6703

AUDUBON SOCIETY
NATIONAL OFFICE
P.O. Box 4[illegible]
[illegible], Calif. 9592[illegible]

February 21, 1974

Mrs. Glade Koch
237 Greenbriar Townhouse Way
Las Vegas, Nevada 89121

Dear Mrs. Koch:

Thank you very much for your good letter of February 7. Yes, I do remember meeting you during the visit to Las Vegas. It is my hope, of course, that someday soon a chapter of the National Audubon Society could be established in your community. I am sure this would be extremely helpful in dealing with matters such as the one you have brought to my attention.

I spent a day with Chuck Lawson visiting the Las Vegas Wash and learning from him of its critical importance to the ecosystem there. Although I am not in a position to make a judgement on the availability of funds for the acquisition of the Wash property with Whittell funds, I will present it for consideration; however, the nature of the disposition of the funds thus far has been such that I would not want to hold out any hope. Nevertheless be assured I will present your request to our advisors.

On the chance there are those in your group who are interested in moving ahead with a Chapter, I am enclosing two leaflets which describe the criteria for Chapter formation. Also enclosed is a sample constitution and bylaws. I would be very pleased to meet with your group at any mutually convenient time to discuss this further.

Perhaps there are those who could attend the Western Audubon Conference at Asilomar, too. Registration forms are enclosed.

Very sincerely

PAUL HOWARD
Representative

PH/gr
enc.

ADDENDUM E

March 14, 1974

Mr. Robert Stringer
2747 South Newark Court
Denver, Colorado

Dear Mr. Stringer:

The Las Vegas Wash Development Committee has progressed significantly in its efforts to arrive at viable recommendations for a multi-purpose recreational area in Las Vegas Wash. We are presently preparing our report to the Clark County Board of County Commissioners and plan to have it to the printers by March 25, 1974. Formal submission of this report to the Commissioners is scheduled for April 5, 1974.

However, questions concerning the acquisition of certain parcels of land within the proposed boundaries of the recreational area remain unanswered. Consequently, we would appreciate receiving information from you indicating the availability of land in Section 22, Township 21 South, Range 63 East. As you are aware, it is the committee's opinion that this land would be an integral part of the total recreational area because it lies in one of the more picturesque regions of the Wash.

Also, may we have your permission to include your response in our report? We will be glad to send you a copy of the final report.

Thank you for your consideration. We look forward to your response.

Sincerely,

PATRICIA FOSTER, Chairman
Las Vegas Wash Development Committee

PF:EJG:lj

February 12, 1974

Mr. Glen Taylor, Manager
Basic Management, Inc.
P. O. Box 2065
Henderson, Nevada 89015

Dear Mr. Taylor:

In your capacities as Manager of Basic Management, Inc., and also as a consultant to the Las Vegas Wash Development Committee, you know that the so-called "lower ponds" have become a habitat for water fowl. In fact, the entire Las Vegas Wash immediately adjacent to your ponds has evolved into an equatic ecosystem. This marshland is all the more unique situated, as it is, in a desert environment.

It is the opinion of the Las Vegas Wash Development Committee that this system should be preserved and protected. With some repairs and maintenance and good game management practices, the value of the ponds as a bird habitat could be enhanced. Such a scheme is compatible with the multi-purpose recreation concept proposed for the Wash.

The Committee would like you to ascertain how receptive your board would be to the suggestion that the lower ponds be donated to the managing agency of the recreation area. This donation could be classified as good neighbor policy to improve public relations.

If it is at all possible, the Committee would like to receive your comments at the next meeting, which is scheduled for 3:00 p.m., February 19, in the Pollution Abatement Project conference room. Should this arrangement be inconvenient for you, Mr. Tom Steele, also a Committee member, is willing to meet with you and report to the Committee. He can be reached at 564-1451.

Sincerely,

DAVID FINNE
Project Director

DF:CRM:lj
cc: Mr. Tom Steele

APPENDIX 7

STATE OF NEVADA
DEPARTMENT OF FISH AND GAME
1100 VALLEY ROAD, RENO, NEVADA • TELEPHONE 784-6214
MAIL: P.O. BOX 10678, RENO, NEVADA 89510

MIKE O'CALLAGHAN
Governor

GLEN K. GRIFFITH
Director

IN REPLY REFER TO: Region III
4747 W. Vegas Drive
Las Vegas, Nevada 89108

March 27, 1974

RECEIVED
☒ A.M. ☐ P.M.
MAR 28 1974
WASTEWATER MANAGEMENT AGENCY

Mrs. Pat Foster, Chairman
Las Vegas Wash Development Committee
Clark County Courthouse
209 East Carson
Las Vegas, Nevada 89101

Dear Mrs. Foster:

Attached please find a report from the Department of Fish and Game relative to wildlife and hunting use in the Las Vegas Wash area. We hope this will be helpful to your committee in planning for the comprehensive development and use of this wildlife area.

We have reviewed your proposed draft for presentation to the Clark County Commissioners and are basically in agreement with it.

The committee has done a tremendous amount of good work on this project and is certainly to be commended.

It is indeed encouraging to see concern and a local level approach to wildlife habitat preservation and proper use.

Sincerely,

John Donaldson
Regional Supervisor

JD:eo
Attachment
cc: Director Glenn K. Griffith
Mrs. Glade Koch

APPENDIX 8

SPECIAL REPORT
DATA AND RECOMMENDATIONS ON THE
WILDLIFE AND RECREATIONAL DEVELOPMENT OF LAS VEGAS WASH

by Nevada Department of Fish and Game

The Nevada Department of Fish and Game under the regulatory control of the Board of Fish and Game Commissioners is responsible for the protection, restoration, conservation, introduction and/or the management of all fish and wildlife species and their related habitats within the boundaries of the State of Nevada regardless of land status. An important segment of wildlife management is to provide a maximum of consumptive (hunting) and non-consumptive (educational and aesthetic) outdoor recreational wildlife experiences for the people of Nevada consistent with the above-mentioned species protection and enhancement responsibilities.

The Nevada Department of Fish and Game made statements in September 1972 concerning the Environmental Impact Statement proposed alternatives of pollution abatement for the Las Vegas Wash that remain essentially the same, or as follows: "The Las Vegas Wash supplies a great amount of recreational hunting during open seasons (approximately September 1 through February 28) every year in addition to year around non-appropriative use of game and non-game by bird watchers, high school and university biology classes, youth groups and many others. Any alternative which retains or increases the habitat supporting these wildlife forms and recreational uses would be encouraged and, conversely, any alternative causing a diminution of wildlife habitat would be opposed."

The Department recommends that controlled hunting be maintained as a part of recreational activities for the Las Vegas Wash area because of its relative importance to local hunters by their usage of the area. The attached Table I provides you with 1972 Departmental 10% hunter questionnaire data for Clark County compared with our field personnel's best estimates of hunter use and success for the five listed game species within the subject Las Vegas Wash area. Because we have no specific breakdown of questionnaire data for Las Vegas Wash, it was necessary to make said "estimates" based upon law enforcement activities and random bag-check data. Background data for the above computations is available at Region III headquarters.

Table I indicates a total of 1,156 hunters used the Las Vegas Wash area in 1972 a total of 8,044 days and harvested 3,740 animals (doves, waterfowl, quail and cottontail). This indicates hunters using the Las Vegas Wash area in 1972 represented 17% of the total Clark County hunters pursuing the above game species, but they expended 26% of the total hunting

days to harvest 7% of the County's total for all species. In other words, this area is popular regardless of hunter success rate.

The Department further recommends the habitat within the area be maintained, altered or improved to protect other wildlife and non-game species found within the area. We are in favor of the Committee's development goals for a "Wildlife Sanctuary." However, it is important that goals for a ceiling of use by people be looked at in the future in order to insure or maintain present wildlife use in the area.

Prepared by: Ronald M. Lee

Ronald M. Lee
Regional Game Assistant

3-25-74

HARVEST-HUNTER INFORMATION
TABLE I of 10% QUESTIONNAIRE (1972 DATA OF HARVEST
FOR THE LAS VEGAS WASH AREA

Area & Species	Total Harvest	Hunters	Hunter Days	Kill/ Hunter	Kill/ Day	Total Statewide Harvest	% of Total Statewide Hunters
Clark-Dove	34,078	2,163	9,339	15.7	3.6	28.5	21.3
Las Vegas Wash	3,030	470	2,020	15.7	3.6	2.5	4.6
Clark-Ducks	10,579	1,310	7,590	8.0	1.3	7.07	8.96
Las Vegas Wash	251	208	2,500	1.2	.1		
Clark-Geese	133	1,310	7,590	.1	.0	6.64	8.96
Las Vegas Wash	15	208	2,500	.07	-	-	-
Clark-Cottontail	1,335	760	2,810	1.7	.4	4.49	10.30
Las Vegas Wash	44	110	424	.4	.1		
Clark-Quail	4,948	1,083	3,106	4.5	1.5	13.33	14.18
Las Vegas Wash	400	160	600	2.5	.67		
Total Clark	51,073	6,626	30,435				
Total L.V.Wash	3,740	1,156	8,044				

RESOURCE PERSONS AND AGENCIES

Balk, James - Director, Environmental Protection and Beautification, Clark County Public Works Department.

Baugh, Edward - Naturalist, Las Vegas.

Borroum, J. Steven - Civil Engineer, Regional Street and Highway Commission, Clark County.

Bradley, Elizabeth - Science Instructional Resource Center, Clark County School District, Las Vegas.

Brooks, Richard - Ph. D., Director, Archaeological Survey, University of Nevada, Las Vegas.

Burgwardt, Lester - Ph. D., Cashman Jr. High School, Las Vegas.

Downey, E. J., Director, Clark County Planning Department, Las Vegas.

Cronkhite, Eric R. - Administrator, Nevada State Parks System, Reno, Nevada.

Deacon, James E. - Ph. D., Professor of Biology, University of Nevada, Las Vegas.

Donaldson, John - Regional Supervisor, Nevada Fish and Game Department, Las Vegas.

Dunning, William L. - District Conservationist, Soil Conservation Service, Las Vegas.

Eisner, Stanley A. - A.I.P., Simon Eisner Associates, Planning Consultants, South Pasadena, California.

Federal Housing Authority, Las Vegas.

Fiero, G. William - Ph. D., Associate Professor of Geology, University of Nevada, Las Vegas.

Hanzel, Robert - Clark County Regional Planning Council.

Hemington, John D. - Ph. D., Senior Ecologist, VTN, Irvine, California.

Holdren, Jeff - Realty Specialist, Bureau of Land Management, Las Vegas.

Iverson, Mervin - Coordinator, Media Services, Clark County School District, Las Vegas.

Ives, Jon - VTN, Irvine, California.

Jones, Robert L. - Jones & Stokes Associates, Inc., Sacramento, California.

Lawson, C. S. - Clark County Representative, Lahontan Audubon Society, Las Vegas.

Lee, Ronald - Regional Assistant, Game, Nevada Fish and Game Department, Las Vegas.

Meder, John L. - Administrator, Nevada Department of Conservation and Natural Resources, Carson City, Nevada.

Monahan, George - Director of Public Works, Clark County, Nevada.

Niles, Wesley E - Ph. D., Chairman, Department of Biological Sciences, University of Nevada, Las Vegas.

Paff, Donald L. - Administrator, Colorado River Commission of Nevada, Las Vegas.

Scholl, James - Deputy Director of Public Works, Flood Control and Off-sites, Clark County, Nevada.

Turnbaugh, Jean - Chairman, Task Force Three, Parks and Recreation Sub-committee, Urban Action Committee, Las Vegas.

VanWert, Fran - Professional Growth Services, Clark County School District, Las Vegas.

Whitney, Robert T. - Director of Public Works, Henderson, Nevada.

Williams. Bobby - Las Vegas Motocross Club and Nevada TT Association, Las Vegas.

Wright, David G. - Eagle Scout Candidate, Boy Scouts of America.

Clark County Wastewater Management Agency.

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TABLES

TABLE 1

LAS VEGAS WASH HABITATS AND COMMUNITIES

Vegetation Type and Biotic Community	Remarks
Desert Shrub	
Creosote bush community	Arid, low, widely spaced shrubs
Shrub and Woodland	
Salt bush community	Shrubs, small to large, spacing variable, arid to seasonal surface moisture
Mesquite community	Woodland with roots reaching water table
Pickle-weed community	Seasonal, surface moisture with salt crust
Marsh Vegetation Type	
Cat-tail community	Aquatic, roots in water
Bulrush community	Aquatic, roots in water

TABLE 2

MAJOR FEDERAL AID PROGRAMS UTILIZED FOR PARKS AND RECREATION PURPOSES

Program Title and Authorizing Legislation	Administering Agency	Program Description
Land and Water Conservation Fund Land and Water Conservation Fund Act of 1965	Bureau of Outdoor Recreation, Department of the Interior	Grants are made to States, and through them to local governments, for planning, acquisition, and development of public outdoor recreation areas and facilities. Grants are made to finance 50 percent of allowable project costs.
Neighborhood Facilities Housing and Urban Development Act of 1965	Office of Urban Neighborhood Services, Department of Housing and Urban Development	Grants are made to local governments to help finance neighborhood or community centers providing a variety of social services. Grants may cover up to two-thirds of project costs, or up to three-fourths in redevelopment areas.
Community Action Programs Economic Opportunity Act of 1964	Office of Economic Opportunity	Through the Community Action Programs grants are made for public or private nonprofit antipoverty projects. Outdoor recreation projects are included as eligible programs. Grants cover 50 percent of program costs.
Model Neighborhoods Demonstration Cities and Metropolitan Development Act of 1966	Model Cities Administration, Department of Housing and Urban Development	Grants are made to local governments to plan, develop, and carry out comprehensive programs for rebuilding or restoring slum and blighted areas through coordinated use of all available Federal programs and private and local resources. Grants cover 80 percent of the cost of planning, developing, and administering programs, and up to 80 percent of non-Federal contributions required under Federally-assisted projects.
Open-Space Land Housing Act of 1961	Office of Urban Neighborhood Services, Department of Housing and Urban Development	Grants are made to State and local governments for the acquisition of land for permanent open-space use. Basic improvements on the land also qualify for grants. Matching funds are available for both acquisition and improvements.
Urban Beautification Housing Act of 1961	Office of Urban Neighborhood Services, Department of Housing and Urban Development	Grants up to 50 percent are made to State and local governments to help beautify publicly-owned land in accordance with an overall beautification program.
Federal Surplus Real Property Federal Property and Administrative Services Act of 1949 as amended	Property Management and Disposal Service, General Services Administration	Surplus land, buildings, and other real property no longer required for Federal use may be transferred to State or local governments for park and recreation uses at 100 percent of the fair market value. The Bureau of Outdoor Recreation assists in determining if property is suitable and desirable for public park or recreation area use.

TABLE 3

OUTLINE OF STATE ORGANIZATION AND RECREATION FUNCTIONS

Organization	Function
Division of State Parks	Acquires, develops, operates, maintains, and interprets a well-balanced system of areas of outstanding scenic, recreational, scientific and historic importance. Prepares and maintains a comprehensive state-wide outdoor recreation plan and is responsible for on-going State park planning projects. Establishes qualifications and standards for a historic marker program, establishes and maintains a State Historic Marker registry system and develops and maintains a system of historic site markers.
Fish and Game Department	Manages fish and game resources, and enforces hunting and fishing laws. Acquires access rights to fishing waters in cooperation with Federal, State and local levels of government. Coordinates Federal Aid programs under Pittman-Robertson and Dingell-Johnson Acts.
State Parks Advisory Commission	Reports to the Governor or Legislature relative to the park and recreation policy of the State and advises the Administrator of the Division of State Parks concerning formulation of the policy of the Division.
State Highway Department	Constructs, maintains and operates roadside rest areas and administers beautification programs.

WATER RESOURCES CARRYING CAPACITY

by

Phillip A. Renn

Water as a Resource

In the application of carrying capacity concepts to water resources, it is useful to consider the character of water as a basic resource. Water in its natural state is a flow resource (certain underground basins which required hundreds of years to fill may be considered a stock resource). The usable supply of water may vary throughout the year depending on local conditions such as precipitation and temperatures. The quantity of water available at any one time in the future can only be estimated as a probabilistic process from past records. The quality of water is naturally variable depending on minerals encountered, vegetation in and along the water way, types of soils in the watershed, and water using activities and wastewater discharge in the water resource basin. The quality of the water supply can limit the activities which may utilize the water (Great Salt Lake wouldn't be used for drinking nor a sulfur spring for irrigation). Hence, quantity and quality are natural limiting characteristics in assessing carrying capacities of water resources for various activities.

Development can change the water resource to a partial stock resource and thus augment the basic carrying capacity. Damming a river or constructing water storage facilities for groundwater will allow the utilization of water at a later time. Recycling and importation along with storage can change the quantity of available water and thus increase the carrying capacity for possible activities within a region.

Man can alter the quality of the water, thereby utilizing it for different activities. Treatment, the best known alteration of water, has been applied to water supplies to make them drinkable. New treatment methods, such as desalinization, which outputs pure water, have aided regional growth in areas where only salt water had existed. Some areas (Lake Tahoe and Chicago) have exported wastewater from the area so local waters would not be used as waste receiving waters and their quality thereby degraded.

Activities and Related Carrying Capacities

The water resource, however utilized, is the basis for the activities and carrying capacity of a region. These activities which use the resource, include water supply (municipal and industrial), agriculture through irrigation, flood control, recreation, hydropower, waste disposal, fish and wildlife, navigation, industrial cooling, and aesthetics. Each activity demands different quality and quantity levels along with different types of facilities.

The most critical use of water for an area is drinking water. The use of water for domestic purposes combines the quality and quantity aspects of the resource. The lack of drinking water can limit the population and growth, thus setting the carrying capacity of the region. In the Middle East, areas had a human carrying capacity of zero until desalting plants provided water. Central Arizona has professed the need for additional water supplies in order to continue regional growth (Committee on Water of the National Research Council, 1968). This situation points up trade-offs in capacity of water to sustain competing but interrelated uses because the water is to be utilized for irrigation and industries as well as domestic supply. Industrial use of water similarly affects the economic growth of the area. Often, industries with low water demands are encouraged to settle in dry areas.

Agricultural uses of water require large quantities of water at the time of year when natural flows are low. The probability of receiving the necessary quantity must be high or farmers will be forced to sell out. The quality of water supplies is not critical as long as there are not any toxic substances or herbicides in the water. The return flow from irrigation may contain added minerals, salts, and insecticides which can affect downstream activities. For this type of input the river does not act as a sink and decreases the loading as it flows. In the Colorado River the salt content has been increased

by return flow to the point where the water is becoming too brackish to be utilized for agriculture in Mexico. Thus, for agricultural uses the saline carrying capacity of the river is being approached.

The use of waters for waste disposal has gone unchecked until recently. Waste inputs exceeded carrying capacities of many rivers and lakes so they could not assimilate these wastes and renew themselves. The results were: many fish kills, decreased recreational opportunities, and a loss of aesthetic appeal. The quality and quantity of the waste input is as important as the quality and flow quantity of the receiving waters. The quality of effluent can range from 3,000 mg/l BOD from industries to 10 mg/l BOD from highly treated wastes. These varying qualities combined with the quantity of effluent can have no affect on the receiving water or can kill all normal life in the water. The receiving water, if pure, may have a large domain of stability while a water near its carrying capacity of biological matter may need only minimal inflow to exceed its domain of stability. The quantity of the receiving water determines the size of the sink, thus, low flow augmentation is used when more dilution and renewal capabilities are necessary to assimilate the inflow. Along with these factors, the rejuvenescent characteristics of the receiving waters are critical. The natural aeration potential has kept some rivers from exceeding tolerable dissolved oxygen levels where slow-moving waters would not have been able to maintain such levels (Lake Francis, in Florida,

utilized aerators to maintain adequate dissolved oxygen levels; Fletcher, 1971).

The quality of the water directly affects the fish and indirectly affects other wildlife. Each species of fish need a different dissolved oxygen level to exist. Thus, the quality of the water dictates which fish, if any, can survive. Animals, such as otters and bears who depend on fish for a food supply, are affected by polluted water. Shell fish and spawning areas at the ocean outlets are decreased by pollution. Consequently, the future yields of commercial catches may be severely reduced.

Development on rivers has affected yields of anadromous fish (salmon and shad). Dams and channelization can stop the fish from getting to the spawning areas. Pollution can form a barrier impenetrable as the highest dam to stop fish from getting up the rivers. Pollution from Philadelphia, Pennsylvania, has virtually stopped fish from traveling up the Delaware River.

Water pollution can limit water based recreation to boating, thus the resource is utilized far below its normal potential. For waters where pollution is not a factor, carrying capacities have been established for different activities with the limiting factor usually being spatial (Kusler, 1972). Areas used as water supplies may have decreased carrying capacities due to quality problems or restraints.

The remaining activities, such as flood control and navigation, affect a region. The additional trade and business opportunities can expand the area's growth potential (it should be noted that this may cause other social, ecological, and spatial problems). Flood control has more localized results in that it provides a measure of security which may result in the area's growth. Oftentimes the flood control measures provide too much confidence and new construction takes place in the flood plain. This can be a short lived development because the new construction usually oversteps the flood protection (White, 1961) which may result in additional damages.

Some exceeded carrying capacities affect flood control and navigational measures. Erosion from overgrazed range land or from development, such as house or road construction, can cause siltation within shipping lanes and flood water storage areas. These examples show the interdependency of one carrying capacity on another throughout the water resources planning area, thus, exhibiting the need for comprehensive planning which can internalize many of the externalities of past efforts.

The resources, activities and outputs which have been individually described are all part of an interrelated system. Each component has its individual capacity requirements. However, they must be analyzed as part of the whole system (see Figure C-1).

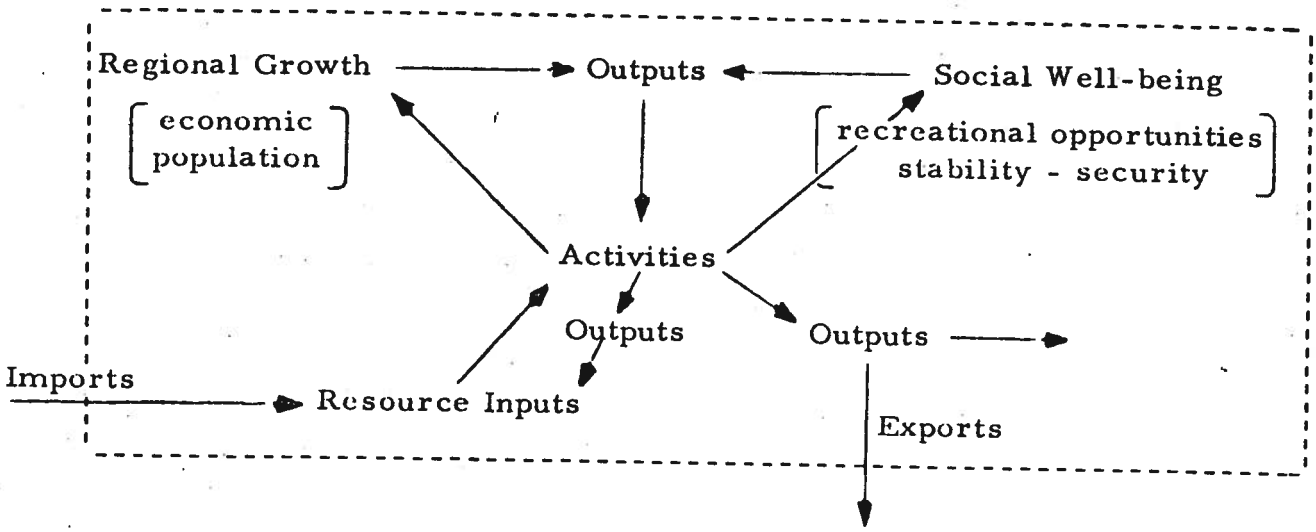
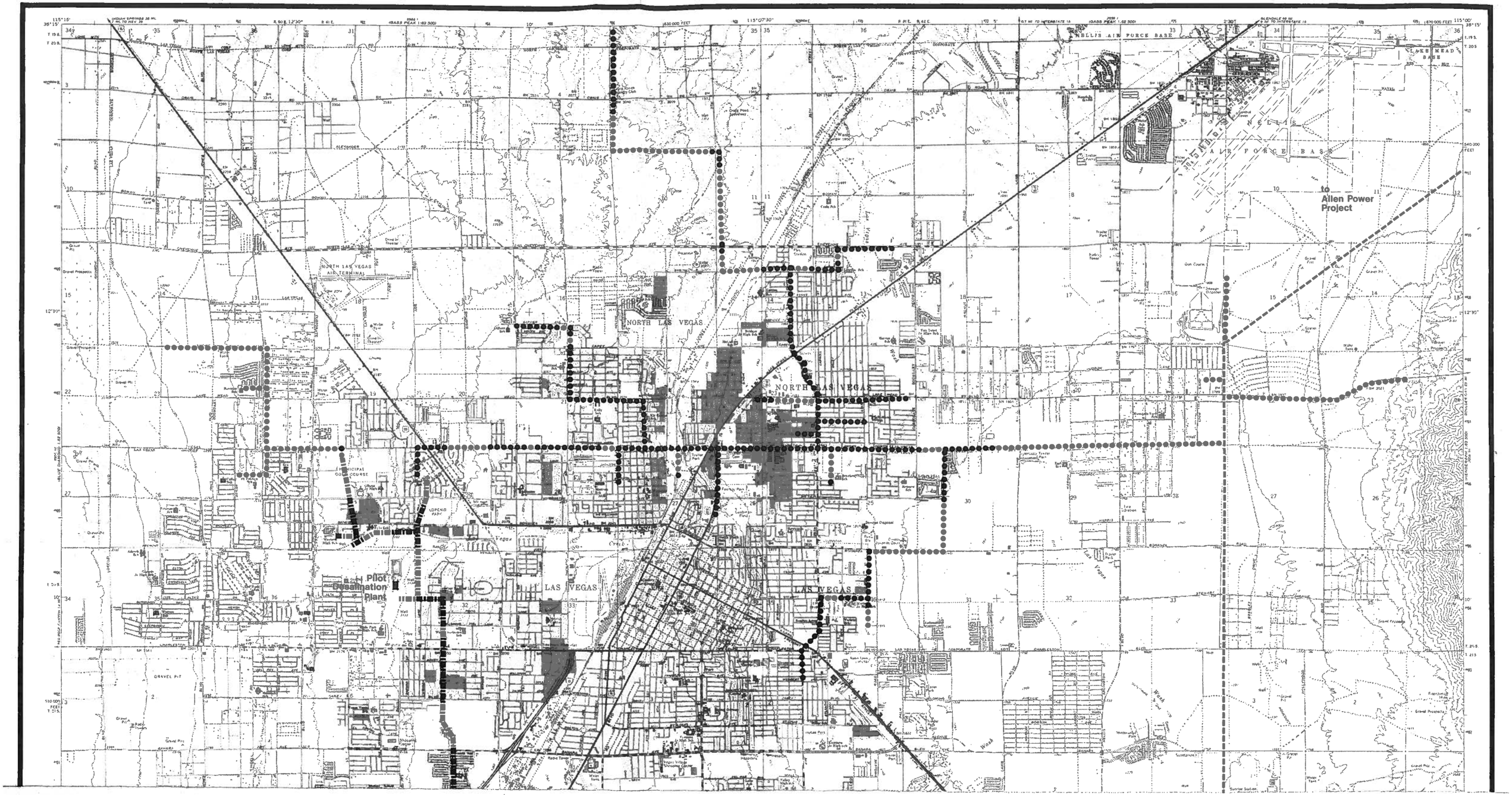


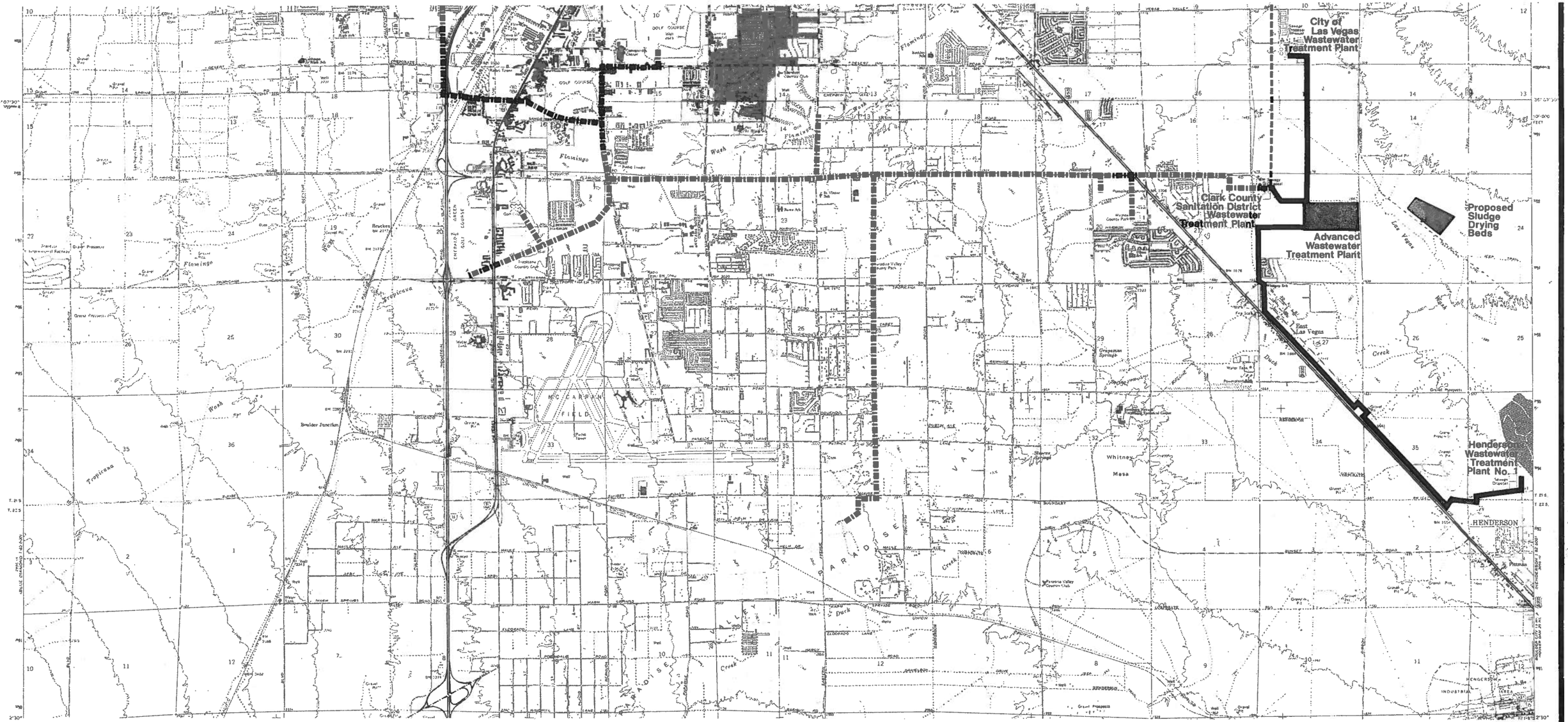
Figure C-1. System within planning boundaries.

Figure C-1 shows the system with its inputs, activities, and outputs. The inputs to the activity sector do not all occur at the same time. Often, one activity takes place and its outputs affect the inputs of another activity. Recycled materials act as inputs to other activities, also other outputs such as sewage dumped in a river affects downstream activities (recreation, fish, and wildlife). However, there are some outputs which do not affect the rest of the system (contained in this group are exports). Activities also affect the growth of the region and the social well-being of the population. These affects result in outputs from the social sector which in turn cause changes in the activities with the system. Thus, the many relationships within the system must be analyzed in some way if the carrying capacity is to be utilized.

APPENDIX E

PROJECT PLAN


NELLIS AIR FORCE BASE
LAKE MEAD BASE
NELLIS AIR FORCE BASE
to
Allen Power
Project
NORTH LAS VEGAS AIR TERMINAL
NORTH LAS VEGAS
NORTH LAS VEGAS
MUNICIPAL GOLF COURSE
LOPEZ PARK
Pilot
Desalination
Plant
LAS VEGAS
LAS VEGAS
GRAVEL PIT



ENVIRONMENTAL ASSESSMENT ADDENDUM FOR THE CLARK COUNTY BOARD OF COMMISSIONERS

Legend

- Stage 1 - In Valley Irrigation
- Stage 3 - In Valley Irrigation
- Wastewater Collection Line

Figure E.1

LAS VEGAS WASH/BAY POLLUTION ABATEMENT PROJECT

APPENDIX F

PUBLIC COMMENTS

APPENDIX F

PUBLIC COMMENTS

The following pages present the comments and responses that were received both during and after the public hearing on the Las Vegas Wash and Bay Pollution Abatement Project on June 6, 1974.

Testimony at the public hearing was given by 1) Mr. Jack Mitchell, North Las Vegas, 2) Ms. Glade Koch, Lahontan Audubon Society, and Dr. Thorne Butler, President, Las Vegas Valley Water District (Dr. Butler's testimony was given as a private citizen). Written comments were received from J. Steven Borroum, Civil Engineer. Responses to the comments made by Messrs. Mitchell, Butler, and Borroum are included in Appendix G of the Facilities Plan.

A summary of Ms. Koch's comments and responses are presented below.

1. Ms. Koch asked some questions about Figure E-1 of the Addendum. These questions were answered at the public hearing, and some additional descriptions were subsequently added to the Figure for clarity.

2. Ms. Koch commented that AEC's Nevada Test Site was a notable feature of the cultural picture in the Las Vegas area and should be included in the Addendum. This feature has been included in Part 4 of Chapter 3.

Las Vegas Valley Water District

RECEIVED
☐ A.M. ☒ ☑ P.M.
JUN 12 1974
WASTEWATER MANAGEMENT AGENCY

June 12, 1974

Mr. Tom Wiesner
Chairman, Board of Clark County Commissioners
Clark County Courthouse
Las Vegas, Nevada 89101

Dear Mr. Wiesner:

Enclosed is my statement on the Facilities Report and Environmental Assessment being submitted for review and/or approval by the Commission.

Because I have been closely associated for several years with the Pollution Abatement Program for Lake Mead and serve as President of the Las Vegas Valley Water District, I am submitting this brief introductory cover letter to avoid any confusion as to the District's position in this matter.

Naturally, the District has actively participated in the Sewage and Waste Water Advisory Committee (SWAC) and supplied technical data to the consultants preparing the reports now under consideration.

I want to clearly state that the ideas, recommendations, and comments in my statement do not reflect any official positions of the District's staff or Board of Directors. The submitted statements are derived from my analysis of the reports.

Yours sincerely,

Thorne J. Butler, M. D.
President, Las Vegas Valley Water District

TJB:gcs

3700 WEST CHARLESTON BOULEVARD - POST OFFICE BOX 4427

STATEMENT FROM THORNE J. BUTLER
on
FACILITIES REPORT AND ENVIRONMENTAL ASSESSMENT
to
THE CLARK COUNTY COMMISSIONERS

Both the amended facilities plan and its attached environmental assessment are directed to accomplishing two goals.

1. The elimination of pollution of Lake Mead by flows from the Las Vegas Wash. This objective was established by the 1971 Nevada State Legislature and has been endorsed as being still valid by both of the consultants who prepared these reports. The bulk of the facilities report is devoted to accomplishing this end.

2. The conservation of the potable water supplies available to the Las Vegas community. This goal is to be met by the substitution of properly treated waste waters for potable water.

My comments to the first of these objectives are very limited and brief. I would like to concentrate my comments on the in-valley irrigation, desalinization and ground water recharge programs. As a member of the Board of Directors of the Las Vegas Valley Water District I believe that this program is of paramount importance to the District's goal of continuing to supply adequate potable water to this area.

With respect to the pollution abatement phase of the project, Table VII-3, entitled "Monetary Cost Effectiveness", needs to be corrected. In the column "Total Annual Cost", the Alternatives 7 and 10 are not evenly stated. The reason being that, in Alternative 10 one of the factors for the determination of net annual cost is based upon the development of the Allen Power Project which will utilize approximately 37% of the annual average flows through the year 2000. Therefore, to Alternative 10 should be added the cost of piping and pumping the AWT water to the power project. To balance the total costs, to Alternative 7 must be added the cost of treating the secondary effluent to make it acceptable as an industrial cooling water. Computing these additional costs, I calculate for Alternative 7, $467.00 per million gallons treated and for Alternative 10, $438.00 per million gallons treated. Alternative 7 may be higher in total costs because included is the pickup and disposal of the ground water discharges. Naturally, the net annual cost to the Las Vegas community depends on variable factors such as the amount of federal participation, revenues derived from the Allen Power Project and possible other minor revenues from the sale of AWT water.

In the same sense, Table VIII-4 should be corrected to include power requirements for pumping water to the Allen Power Project in Alternative 10 and for the AWT process in Alternative 7. When these two alternatives are balanced in the terms of cost and energy consumption, both programs are equal.

I would like to make recommendations on the proposed in-valley irrigation, desalinization and ground water recharge programs as outlined in Sections 8.4 through 8.6. There is little doubt that the accomplishing of an in-valley irrigation system to utilize reclaimed waters for irrigation as a substitute for pumping large amounts of high grade ground water is a goal that has both short-term and long-term benefits to this community. For that reason, I feel strongly that the in-valley irrigation program, as part of the overall Pollution Abatement Program, should go ahead with all due speed. With respect to these programs, I would like to recommend that the in-valley irrigation phase and desalinization aspects be coupled together, and furthermore, the ground water recharge program be conducted independently. The reason for these recommended changes in the program are outlined below.

One of the major problems involving the use of reclaimed waste water for agricultural irrigation use is the build-up of salt concentrations in the superficial soil layers. As indicated in this facilities report and in the Phase III report, the application of large quantities of AWT water to the soil for agricultural uses will require periodic leaching with better grade water to assure continuation of plant growth. The actual percentage of better grade water necessary to accomplish this leaching varies from 10% to almost 30% of the total volume of reclaimed water applied. Therefore, periodically, all of the land area receiving reclaimed waste water from the AWT process will have to be permitted to apply high grade water, either from wells, Lake Mead water, or the product of a desalinization operation.

The second element in this interrelated area is the program to develop ground water recharge. The objective behind ground water recharge, of course, is to bank in the groundwater aquifer, properly treated waste water. Everyone who has been involved over any period of time with the pollution abatement problem in the Las Vegas area, has been interested in the possibilities of recharging the ground water. It is an accepted fact that a requirement for the quality of recharged water is that it be of quality equal to, if not better than, the water existing in the underground aquifer. For that reason, AWT water would necessarily have to be subject to a desalinization process to bring it to such a quality. In this proposal, the pilot desalinization plant product water would have a TDS of 150 mg/L. Since the ground water currently being pumped from the western areas of the valley has an average TDS of approximately 250 mg/L, it seems that desalinated water would be perfectly adequate to accomplish ground water recharge. Unfortunately, there are many other complicating problems associated with ground water recharge. The report identifies them and rightfully takes the position that a pilot recharge program using well water should be undertaken to evaluate the feasibility of such a project. My comment, with respect to the pilot recharge phase, is that a two-year time plan may be too short to appropriately evaluate the success of a recharge program. I believe that many consultants recommend that a time period of from 5 to 8 years is required to appropriately evaluate the possibilities of accomplishing ground water recharge.

As previously stated, the purpose for ground water recharge is to bank water in the ground water aquifer. Therefore, you have to not only pump the water down into the aquifer, but later, when you decide to recover it, you have to pump it back out. Both of these efforts increase the cost of that recoverable ground water.

Because this plan more carefully coupled the in-valley irrigation program to desalinization and ground water recharge, I believe that a less expensive approach would be to utilize the desalinated water within the in-valley irrigation system. Since there is evidence that all in-valley irrigated areas receiving AWT water will have to be periodically leached with a higher grade water, then desalinated water would be ideal for that purpose. Again, our objective of reducing withdrawals from the ground water aquifer would be maintained. Whether we add to the ground water volume by recharge, or we reduce withdrawal by substituting desalinated water, the net effect is to increase the available ground water. Furthermore, the desalinated water would be appropriately utilized at a far less cost than pumping it into the aquifer and pumping it out at a later date. As the desalinization program increased in size, producing greater volumes of water per day, it could be mixed with AWT water to, in a sense, sweeten it for various uses.

I would recommend that the location for a desalinization plant be adjacent to the AWT plant. The report suggests that a desalinization plant be located on the property of the Las Vegas Valley Water District. I believe that the construction of a factory-like building in that area would meet with substantial citizen objections. Might it not be simpler to construct it near the AWT plant being proposed? The product water could then be added into the in-valley irrigation pipeline system and be delivered to appropriate sites to be used either for mixing with AWT water or for the purposes of leaching. Assuming that the various health arguments which currently prevent the use of desalinated water for potable purposes are finally solved to everyone's satisfaction, then excess desalinated waters (when available) could be directly added into the main transmission line running near the Clark County Sanitation District from the Southern Nevada Water Project. Furthermore, the brine produced by such a desalinization program could be pumped into the export line which will be part of the Allen Power Project.

While I do not want to totally throw cold water on the concept of ground water recharge, I think that this report permits one to put it into a different perspective. Ground water recharge has a large number of unknown factors associated with it and may require a very long time frame to properly evaluate its success or failure. But, with a large-scale, in-valley irrigation system on line, it would be possible to make direct use of desalinated water without the additional cost of pumping it into the underground and then pumping it back later. For every gallon that we can apply to the surface it means that we save and conserve another gallon in our valuable underground aquifer.

A final recommendation on saline control is less detailed, but does apply to the overall project philosophy. Since the saline control program for the Colorado River is receiving strong federal support, I believe we will see an active program undertaken within the next five years. For that portion of the saline program which applies to the Las Vegas Wash discharges, I recommend the Commission adopt the position that the saline control program planned by the Bureau of Reclamation be integrated into the pollution project now being considered.

I appreciate the opportunity of presenting these comments and recommendations to the Commission. I would recommend that the Commission adopt both the facilities report and its environmental assessment as a course of action to solve the pollution of Lake Mead.

Yours sincerely,

Thorne J. Butler, M. D.

TJB:gcs

June 12, 1974

J. Steven Borroum
1315 Exley Avenue
Las Vegas, Nevada

RECEIVED
☑ A.M. ☐ P.M.
JUN 12 1974
WASTEWATER MANAGEMENT AGENCY

Mr. Robert N. Broadbent
County Commissioner
Clark County, Nevada

COMMENT ON THE LAS VEGAS WASH AND BAY POLLUTION ABATEMENT PROJECT

As one who remembers the "clean" Lake Mead of the '50's when you could even "limit out," I am naturally concerned with the continued degradation of the lake's water quality. There are other concerns motivating me to comment, among them are: my concern over the future importance of water to this growing desert community; and the realization that all governmental spending, be it locally or federally funded, is and/or will be financed by us.

I would first like to comment on the overall concern of the importance of water to the Las Vegas Valley. Las Vegas, to a large part, grows on itself; to say, that the Las Vegas economy is based on growth. In order to perpetuate the Las Vegas economic community, most of the area's planning agencies have projected the valley's growth to "unfathomable" levels. The Wastewater Management Agency is no exception. They are operating under the assumption that the total water and power demands of the "unfathomable" population levels must be met. I believe that they have failed to realize as "keepers of the water valve" they control the future economic development and subsequent growth of the Las Vegas Valley; and that because of this, the question about the future direction of the Valley should be addressed prior to implementation of an overall program geared to suit our future water requirements. It is imperative that this program be set in context with an overall, comprehensive Regional Plan; which I feel has not been done. The assumption of near infinite growth is a gross one.

To address some more specific comments now, I am unsure as to whether the AWT plant will treat just the valley's municipal effluents or all effluents. Going on assumption of the former, I would find it rather hard to justify any expenditure of funds for desalinization of just municipal effluent when one of the major

contributing sources remains unchecked, ground water seepage. Also along these lines, now might be the time to examine the possibility of treating our water prior to consumption with respect to mineral removal, which would inturn lower the mineral content of the final product, rather than removing the minerals after it has been "used."

As to the eutrophication of Lake Mead, I don't feel this to be a major problem; for most all bodies of water exhibit some degree of eutrophication. Even if it were considered a problem, I don't believe that nutrient removal at the head waters of the Las Vegas Wash will eliminate it. I would tend to believe that the only economically feasible solution, if indeed one exists at all, would be in the form of a deep water outfall as suggested by Dr. James E. Deacon for all effluents, and subsequently eliminating all overland flows except storm water.

If and when it is determined by the comprehensive planning process that water reclamation is necessary, I feel that a broader range of methods should be examined than as presently proposed, e.g. as an engineer who has studied the technique of ground water injection of a high quality effluent, I have serious doubts about the economic and environmental feasibility of this reclamation method; but I am optimistic about the potentialities of the surface spreading techniques of a lower quality effluent.

Thank You for this opportunity to comment, for I feel public awareness and "feedback" should be among the corner stones for all public works projects.

J. Steven Borroum
Civil Engineer

lk

cc: David Finnie
J. David Griffith

APPENDIX G

GLOSSARY

APPENDIX G

GLOSSARY

Calcining	-	A process in which lime used in the advanced wastewater treatment system is reclaimed by heating the chemical sludge in a furnace
Caliche	-	Crusted calcium carbonate formed on certain soils in dry regions by evaporation.
Complex (indirect) source	-	Any property or facility that has or solicits adjunctive activity which may emit an air contaminant for which there is an ambient air quality standard.
Confined aquifer	-	A porous, water-bearing geologic formation which is confined by strata of law hydraulic conductivity. Also referred to as an artesian aquifer.
dBA	-	decibels - A scale. A unit of noise measurement weighted to a selected acoustical or sound-pressure scale.
Demographic	-	Of or related to the statistical study of population density, distribution, etc.
Ecology	-	A branch of biology which deals with the relationship between living organisms and their environment.
Effluent	-	As related to wastewater treatment, means the water that is discharged from the treatment process or processes.
Environmental Assessment	-	As related to the guidelines under which this document has been prepared, means a written analysis of the environmental impacts of actions undertaken with the financial support of the U.S. Environmental Protection Agency.

Horizon	-	As related to soil mechanics, refers to the distinct layers or soil profile which is created by the prevailing soil moisture movement to the water table.
Hydric	-	Refers to the moisture regime of a plant environment. Hydric implies a relatively high moisture environment. (see Xeric)
Infiltration	-	Passage of water into the soil medium through the air-soil interface.
Leaching	-	The extraction of soluble material from soil by the washing action of a filtering liquid.
Particulate	-	A parameter of air quality which is designed as any solid or liquid material, except uncombined water, that exists in the atmosphere or in a gas stream.
Perculation	-	The movement of underground water through the soil medium.
Permeability (Hydraulic Conductivity	-	A quantitative measure of the rate at which a liquid will move through a given soil environment.
Piezometric	-	As related to flow through porous media, means of or related to the pressure at some point in the medium.
Riparian	-	Adjacent to, or living on the bank of a wash, river, stream, pond, etc.
Sedimentary	-	A type of rock formed through the deposition and subsequent hardening or induration of soil.
Senate Bill 288 (NRS 790)	-	A bill introduced into the Nevada Legislature and approved on May 3, 1973. Presently Nevada Revised Statutes, Chapter 790. Among other things, NRS 790 1) approves the final written report of the Las Vegas Valley Water District, 2) recognizes that

there may be further alternative solutions to the pollution abatement problem in the Las Vegas Wash-Lake Mead area, and 3) transfers the responsibility for developing a solution to the problem to the Board of County Commissioners for Clark County.

Surge Ponds - Control structures designed to hold the incoming flow to a wastewater treatment plant, and provide capacity to accept fluctuations in the incoming flow. Such structures also provide for storage in the event of a power outage.

Unconfined Aquifer - A porous, water bearing geologic formation in which the upper surface of the water is unconfined by low permeability strata.

Xeric - Refers to a relatively low moisture regime of a plant environment. (see Hydric)